CENSUS

OF THE

COMMONWEALTH OF AUSTRALIA

TAKEN FOR THE NIGHT BETWEEN THE

2nd and 3rd APRIL, 1911.

VOLUME I.

STATISTICIAN'S REPORT

INCLUDING APPENDICES.

ISSUED UNDER THE AUTHORITY

OF THE

MINISTER OF STATE FOR HOME AND TERRITORIES.

BY

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PREFACE.

In issuing Volume I. of the Census of the Commonwealth of Australia, 3rd April, 1911, it may be pointed out that Volumes II. and III. were published on 30th September, 1914. At that time it was intended to issue shortly thereafter Volume I. containing the Report of the Statistician and other matter. The disorganisation of duties which resulted from the war and the work involved in the taking of the War Census of 1915 were, however, so great that it has been found impracticable to complete the Volume until now.

The Report, which occupies 438 pages of the present Volume, furnishes in some detail an historical review of Census-taking—ancient, mediæval, and modern—and provides an analysis of the data collected and tabulated at the Australian Census of 1911. In the presentation of the data in this Volume, graphical representation has been freely used, and a series of maps has been provided for the purpose of illustrating the geographical distribution and density of the population. A series of Appendices is attached to the Report: these contain copies of the principal instructions issued to Supervisors, Enumerators, and Collectors, and the Reports on the collection in the several States furnished by their respective Supervisors. A special feature of the Volume is Appendix A, which, with its index, etc., covers 466 pages, and which, for convenience in issue as a separate publication, has been paginated separately from the earlier portion of the Volume.

This Appendix contains the results of a number of extended investigations made with the object of formulating at least some of the elements of a mathematical theory of population, and of resolving and interpreting the large body of crude demographic data, which has been accumulated in the statistical records of Australia.

In conclusion, I desire to place on record my appreciation of the services rendered, directly or indirectly, by the senior officers of the Bureau in connection with the work of the Census. Mr. H. Spondly, who was placed in charge of the organisation for the collection of the Census material; Mr. C. H. Wickens, A.I.A. (now Supervisor of Census), who directed the tabulation and analysis of the data; Mr. Gerald Lightfoot, M.A., F.S.S., Barrister-at-Law, to whom were allotted all matters relating to the history of Census-taking, and the preparation of an account of the preliminary arrangements for the Census of 1911; and Mr. F. W. Barford, M.A., A.I.A., who helped in the compilation of the Life Tables; all rendered valuable assistance; while Messrs. J. Stonham, M.A., E. T. McPhee, and F. D. Rossiter, M.A., rendered material aid by assuming increased responsibilities, involved through other officers being directly engaged on Census duties.

G. H. KNIBBS,
COMMONWEALTH STATISTICIAN.

CENSUS BUREAU,
MELBOURNE,
21*st May*, 1917.

CONTENTS.

INDEX TO GRAPHS AND DIAGRAMS.

INDEX TO CENSUS MAPS.

SYNOPSIS.

CHAPTER I.—HISTORICAL REVIEW OF CENSUS DEVELOPMENT.

CHAPTER II.—MODERN METHODS OF CENSUS-TAKING.

CHAPTER III.—CENSUSES OF MODERN TIMES.

CHAPTER IV.—CENSUS TAKING IN AUSTRALIA.

CHAPTER V.—THE CENSUS AND STATISTICS ACT, 1905.

CHAPTER VI.—THE CENSUS SCHEDULE.

CHAPTER VII.—PRELIMINARY WORK OF THE CENSUS.

CHAPTER VIII.—COLLECTION AND COMPILATION.

CHAPTER IX.—POST-CENSAL ADJUSTMENT OF POPULATION ESTIMATES FOR THE INTERCENSAL PERIOD 1901-1911.

CHAPTER X.—AGES.

CHAPTER XI.—BIRTHPLACES.

CHAPTER XII.—LENGTH OF RESIDENCE.

CHAPTER XIII.—EDUCATION.

CHAPTER XIV.—SCHOOLING.

CHAPTER XV.—RELIGION.

CHAPTER XVI.—BLINDNESS AND DEAFMUTISM.

CHAPTER XVII.—NON-EUROPEAN RACES.

CHAPTER XVIII.—CONJUGAL CONDITION.

CHAPTER XIX.—FAMILIES.

CHAPTER XX.—LIFE TABLES.

CHAPTER XXI.—OCCUPATIONS.

CHAPTER XXII.—DWELLINGS.

CHAPTER XXIII.—GEOGRAPHICAL DISTRIBUTION.

APPENDICES.

CORRIGENDA.

Page 159. For "Section 4" read "4(*a*)."

Page 290. Section 15. Table. The word "Years" should be omitted from the columns headed "Average Issue."

Page 334. Graphs Nos. 128 and 129. Heading. For "(l_x)" read "$(\mathring{e}_x)$."

CENSUS OF THE COMMONWEALTH OF AUSTRALIA

3rd APRIL, 1911.

CHAPTER I.

HISTORICAL REVIEW OF CENSUS DEVELOPMENT.

SECTION I.—INTRODUCTION.

1. **General.**—Under the Commonwealth of Australia Constitution Act 1900, the Commonwealth Government is empowered " to make laws for the peace, order, and good government of the Commonwealth, with respect to," *inter alia*, "Census and Statistics." In exercising the power so conferred, a " Census and Statistics Act"[1] was passed in 1905, and in the following year the " Commonwealth Bureau of Census and Statistics" was created. Part III. of the Act of 1905[1] provides for the taking of a census decennially, and in accordance with this provision a census of the Commonwealth was taken for the night between the 2nd and 3rd April, 1911.

As the publication here presented forms the Report of the first census taken for the whole of the Commonwealth under the Federal Constitution, it has been thought desirable to furnish a fairly complete, though necessarily a condensed, account of the historical development of census-taking from the earliest times. The history of census-taking in Australia is referred to briefly in the part of Chapter III. dealing with " British Dominions," but a separate and more complete account will be found in Chapter IV. hereinafter.

2. **The Census at Various Periods.**—The word " Census," without other qualification, is now almost solely used to denote the enumeration of the people, periodically undertaken in most European countries, in the United Kingdom, in the British Colonies, in the United States of America, and in certain other countries. It may, of course, include other elements, as wealth, production, etc.

(i.) *Origin of the term Census.* The Latin term, " Census," originally implied an enumeration of the people by the Roman Censors, who were charged with (*a*) the official registration of citizens (*census*), (*b*) the superintendence of public morals (*regimen morum*), (*c*) arrangements for the valuation of property, (*d*) the collection of the public revenue, and (*e*) the execution of public works. The Roman Census had special regard to fiscal matters and to the adjustment of civic rights and obligations on a numerical and property basis, and it appears that the statistic or economic aspect of the process of enumeration, viz., as a valuable source of knowledge for the purposes of morals or legislation, occupied a less prominent place than in the earlier censuses of Babylon, and the later ones of mediæval times.

(ii.) *Earliest Known Enumerations.* It would appear that in Babylonia, enumerations of the people were carried out at a very early date (prior to B.C. 3800).[2] In Egypt also " numberings " of the people took place certainly as early as about B.C. 2500.[3] In China, statistical results date as far back as about 3000 B.C., while in ancient Greece systematic statistical inquiries, both as to population and other matters, were frequently undertaken. In Rome fairly elaborate statistics commenced from the time of Servius Tullius, while the first census in the presence of the Censors was in 435 B.C.

(iii.) *The Roman Census.* The scope of inquiry of the Roman Census was in some respects elaborate, embracing not only the number and classes of all free persons, but also their domestic positions as fathers or mothers, husbands or wives, and sons or daughters. Slaves and freedmen were included with the personal possessions of the head of the house, and real property was classified according to its character.

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[1] The provisions of the Census and Statistics Act 1905, in regard to the census, are dealt with in detail in Chapter V. hereof. [2] "The First of Empires," by W. St. Chad. Boscawen. Harper Bros., London, 1903, p. 147. [3] *Ibid*, and also " A History of Egypt," by J. H. Breasted. Hodder & Stoughton, London, 1906, p. 44.

(iv.) *The Hebrew Census.* Several enumerations of the Hebrew race are referred to in biblical history. Unlike both the Roman and the modern census, the Hebrew Census was ordinarily undertaken with the object, mainly, of ascertaining their available military strength, but would appear to have sometimes included matters of fiscal import. Probably the technique of the Hebrew Census was derived from the Egyptians, and both from the Babylonians.

(v.) *Mediæval Census.* Though special branches of general statistic were often very fully developed in the Middle Ages there are practically no recorded instances of general censuses of population being carried out, and it was not until the 17th century that census-taking was revived. Since that time censuses have been instituted or reinstituted in all the more important countries of the world.

(vi.) *The Modern Census.* At the present time the primary object of a census is the demographic one, viz., to supply information as to the numbers and local distribution of the population, the numbers of each sex and age, their so-called conjugal condition (*i.e.*, whether single, married, widowed, or divorced), and their birthplace. This is the minimum amount of information necessary for administrative purposes. Many other facts concerning the population, however, are of importance to the economist and publicist, and ordinarily the census is the only means by which the requisite data can be collected. Of these desiderata the following may be mentioned:—The size and structure of the family, its position in the social scale, the economic position of its head; the nature of employment of its members, the wage or income of each member and of the family as a whole; the rent and size of their house; their educational condition; their religions; and their infirmities. These are the raw materials from which are deduced, in conjunction with statistics of mortality, valuable secondary results, such, for example, as tables representing the probable duration of life, the relative mortality at various ages, in various occupations, and according to conjugal condition, to birthplace, etc. It is no doubt desirable to collect many other things in a census: for example, the relative extent to which the population is employed, the value of possessions, the quantity of currency in use, etc. The question as to which of the matters referred to shall be investigated and which neglected is now ordinarily decided by expediency rather than on principle, and is influenced mainly by two factors, viz., the intelligence of the community in responding to inquiries, and the cost of making the inquiries and analysing the results. The considerations affecting the development and structure of the schedules, by means of which the information to be tabulated is collected, are further discussed in a later part of this Report. (See Chapter II.).

SECTION 2.—CENSUSES IN ANCIENT TIMES.

1. **Babylonian Census.**—In Babylonia the census dates back to a very early period—certainly prior to B.C. 3800—in connection with what appears to have been a perfect fiscal or revenue control, by which the wealth of the country could be estimated minutely. No such system is known to have existed in any other ancient country: perhaps it was most nearly approached by the administration of Egypt in the time of the 18th dynasty, under the priests of Amen. Prior to the consolidation of the Empire, and the centralisation of the administration in Babylon, about B.C. 2300, each district had its own returns. For the purpose of ascertaining the country's wealth, an accurate survey and census was made, and was perfected about B.C. 2500.

Our knowledge of this, and of the ancient Revenue Board by which it was carried out, is derived from a series of some 30,000 tablets found at Tello or Sirpurra, dated in the reigns of the Kings of the 2nd dynasty of Ur. These reigned from about B.C. 2500 to 2300. The major portion of these tablets is now preserved in the British Museum. They refer to the administration of the temple property, to agriculture, stock-raising, the produce of farms and gardens in the district, and are the returns of cadastral surveys of the districts. The surveys appear to have been made at intervals of about 6 or 7 years.[1]

Careful inventories of live-stock, asses and oxen were drawn up, and butter, honey, milk, wool, and even vegetables were inventoried.

2. **Egyptian Census.**—In Egypt, as far back as 3050 B.C., the systematising of the arrangements for the construction of the pyramids demanded a considerable body of statistics; about 2200 B.C., maps of the whole country and statistical data relating thereto were compiled; and about 1400 B.C., a complete *cadastre* appears to have been made by Ramses II. For the purpose of carrying on public works as well as for taxation and census records the country was divided into administrative districts. An elaborate registration system was in force; every head of a family was enrolled, with all members belonging to his household.[2]

In the organisation of Egypt under the Romans, a census was provided for and "*laographoi*"[3] were appointed in each village for the sole purpose of collecting census returns.[4]

[1] See "The First of Empires," pp. 147-8. W. St. Chad. Boscawen. Harper Bros., London, 1903. [2] See "A History of Egypt," p. 165. J. H. Breasted, Ph.D. Hodder & Stoughton, 1906. [3] The census or enrolment was called a λαογραφια. [4] See "The History of Egypt"—Under Roman Rule—by J. G. Milne, M.A., pp. 6-8. Methuen & Co., 1898.

3. **Early Chinese Census.**—The historical development of general statistics has been traced by various writers as far back as the earliest of the civilised nations,[1] viz., the Chinese. In the year 550 B.C., the book known as the Shu-king, was compiled by Kong Fu-tze (Confucius). This book was translated into French in the year 1770, under the title "*Le Chouking, ouvrage recueilli par Confucius.*" It dealt not only with the enumeration of the people and the survey of the country, but also furnished, among other things, agricultural, industrial, and commercial statistics from the time of the Emperor Yu, about 3000 years before the Christian era.

4. **Hebrew Census.**—The Hebrew Census was ordinarily undertaken with the object of ascertaining the number of adult males available for military purposes, and, unlike the Roman Census, was not, as a rule, employed for the assessment of taxes. The first biblical record of an enumeration of the people is in the book of Exodus (xxx., 11-16), where it is stated that Moses was directed to number the children of Israel, and to levy a poll-tax of half a shekel of silver per head. The assigned date of this was B.C. 1491 (Usher's Chronology).

B.C. 1490—The first systematic census biblically recorded was, however, that undertaken by Moses and Aaron about B.C. 1490, during the wandering of the Israelites in the wilderness of Sinai.[2] The number of adult males was found to total 603,550, exclusive of the Levites, whose duties as ministers of the Tabernacle rendered them exempt on this occasion, but of whom separate censuses were subsequently made.[3]

B.C. 1017.—Four hundred and seventy-three years appear to have passed before any further numbering occurred, when, in B.C. 1017, a notable census was carried out by the Hebrew King David, through the unwilling agency of Joab, who was directed to go through all the tribes of Israel, from Dan to Beersheba, and to number the people. There are two accounts of this census, which appears to have been undertaken primarily for military purposes. (*a*) According to the book of Samuel[4] "the valiant men who drew the sword" of Judah and Israel numbered 1,300,000. It would appear, however, that this number was incomplete, for after numbering for 9 months and 20 days, it is subsequently stated[5] that Joab "finished not, because there fell wrath for it against Israel." (*b*) According to the first book of Chronicles[6] the number of men of Israel and Judah "that drew sword" was set down as 1,570,000. It is interesting to note that although, according to the usually accepted chronology, nearly 500 years had elapsed since the enumeration by Moses, the number of fighting men in Israel and Judah had but little more than doubled; a smaller rate of increase than any of which there is recent experience. The many points of uncertainty in the record makes it, however, impracticable to draw any definite inferences. It has been stated that the biblical account of the Divine wrath, which resulted from the action of David in carrying out this enumeration of the Israelites, had the effect of delaying the adoption of the census by Christian Europe for many years.

B.C. 1017 *and* 1015.—Two censuses of the number of strangers in Israel were taken, in connection with the building of the Temple, by the commands of David[7] and Solomon[8] respectively. The number enumerated at the latter of these was 153,600, and their object was, apparently, to ascertain the amount of available labour which could be impressed for the construction of the Temple.

B.C. 536.—In this year a census was taken of the number of Children of the Captivity,[9] with a record of their servants, their horses, mules, camels and asses. They numbered 42,360, besides 7337 servants and 245 singing men and women. Other occasions are also mentioned in the Bible, viz., when from time to time the Hebrew people or single tribes appear to have been enumerated, either for purposes of taxation or war.

5. **Greek Census.**—In ancient Greece the various classes of citizenship, their privileges, obligations, property, and taxes, demanded the institution of many statistical inquiries of a systematic character. In Solon's tax-census, in 594 B.C., the people were divided into four classes, according to the returns of their property estimated in wheat, and a poll-tax was imposed on alien residents; this system seems to have remained in force until the time of Herodotus, about B.C. 450.[10] A census taken in Athens in 309 B.C., distinguished the different classes in the population, there being 21,000 citizens, half that number of aliens, and nineteen or twenty times that number of slaves.

6. **Roman Census.**—The object and nature of the Roman Census has already been referred to (see Sec. 1., § 2. hereinbefore). With the exception of the employment of the information collected for the apportionment of rights and duties, little, if any, use appears to have been made of it. Its utility for any of those sociological and other purposes, for which statistical knowledge is now deemed so valuable, was not appreciated. The Roman Census was, however, found to be of such benefit for the purposes for which it was designed, that it came to be a regular and recognised Roman institution, conducted at frequent intervals, generally, it would appear every fifth year.

[1] Bibliogr. hist. de la Stat. en Allemagne, Heuschling (Bruxelles, 1854). Preuss. Stat. Zeitschrift, Engel, (Berlin, 1862); Handbuch der Statistik, v. Scheel, 1880. [2] Numbers, i., 1-46. [3] Numbers iii., 14-22, and iv., 34-49; and I. Chronicles, xxiii., 3. [4] II. Samuel, xxiv., 1-17. [5] I. Chronicles, xxvii., 24. [6] I. Chronicles, xxi., 1-6. [7] I. Chronicles, xxii., 2. [8] II. Chronicles, ii., 17. [9] Ezra, ii., 1-61, and Nehemiah, vii., 6-69. [10] See Herodotus, Bk. II., c. 177.

(i.) *Censuses Recorded by Livy.* Livy, the Roman historian (born B.C. 59, the year of Cæsar's first consulship), refers on several occasions to the taking of census, viz. :—

B.C. 457.[1] "The census commenced in the preceding year is completed, the number of citizens rated being 117,319."

B.C. 193.[2] "Cornelius now closed the lustrum,[3] the number of citizens rated being 143,704."

B.C. 188.[4] "The Campanians were directed by the Censors, in accordance with a decree of the Senate issued during the previous year, to be included in the general Census of Rome." . . . . . "Marcus Claudius Marcellus, the Censor, closed the lustrum,[3] 258,308 citizens being rated."

B.C. 173.[5] "This year the lustrum[3] was closed. . . . . At this census 269,015 Roman citizens were rated."

(ii.) *Roman Censuses Recorded in the Bible.* There are two Roman Censuses referred to in the New Testament.

B.C. 5. Mention is made by St. Luke[6] of a notable census, taken about B.C. 5 (according to the usually accepted chronology) by the command of Cæsar Augustus, who issued a decree "that all the world" (*i.e.*, the Roman Empire) "should be taxed" or enrolled. This was the first census undertaken whilst Cyrenius was Governor of Syria.

A.D. 3 (*circa*). A few years later it appears that another census was carried out by Cyrenius, during which occurred the revolt of Judas of Galilee and his followers.[7]

(iii.) *Censuses Recorded by Tacitus.* Several censuses are mentioned by the Roman historian Tacitus, who lived in the latter half of the first and in the early part of the second century of our era.

A.D. 14. Tacitus[8] states that, in this year, during the reign of Tiberius Cæsar, the German Legions mutinied against Germanicus, their General, whilst he was carrying out the assessments (census) of Gaul, and that, during the collection of the taxes, Germanicus received news of the death of Augustus.

A.D. 16. In this year Publius Vitellius and Caius Antius were appointed to continue the collection of the taxes (census) of Gaul.

A.D. 48. The Emperor Claudius closed the lustrum in A.D. 48, the number of citizens enumerated amounting to 5,984,072. This number, however, apparently included only the males between the ages of 17 and 60.[9]

SECTION 3.—MEDIÆVAL CENSUSES.

1. **Adoption of Census by Christian Europe.**—After the sacking of Rome (A.D. 410), the practice of census-taking appears to have fallen into disuse, and a period of at least twelve hundred years elapsed before the census was adopted by Christian Europe. In the opinion of some authorities the biblical account of the Divine wrath against David's enumeration of his fighting men effectually discouraged any census undertaking. It may be observed, however, that in mediæval times the real nature and value of the census was hardly recognised, since neither taxation nor the adjustment of social rank required an enumeration of the people, while its economic or statistic utility was even less appreciated than by the Romans.

2. **Mediæval Censuses.**—During the Middle Ages, taxes, military service, tithes, and customs duties gave rise to inquiries and records to some degree of a statistical character, and various compilations were published in Europe dealing in a descriptive manner with different states or countries. Though these publications can hardly be said to have a close degree of similarity with the census, either ancient or modern, they served to some extent the same purpose, and one of the latest directions in the evolution of the modern census is, after all, somewhat in the same direction, viz., to enumerate not only individuals, but also their belongings ; we need not only a census of population, but also a census of industry, of production, and of wealth.

[1] Livy, III., 24. [2] Livy, XXXV., 9. [3] The census was followed by a sacrifice of purification or lustration, whence the term of five years came to be designated a lustrum. [4] Livy, XXXVIII., 36. [5] Livy, XLII., 10. [6] St. Luke, ii., 1. [7] Acts, v., 37. [8] Tacitus, I., 31. [9] Tacitus, XI., 25.

The publications referred to were ordinarily of the nature of cosmographies, and consisted generally of a description of the country, its soil and production, national character-religion, customs, internal and external relations of the people, their military strength, and economic position. Among notable examples of such compilations may be mentioned the following :—

(*a*) A.D. 807. Caroli Magni Memoratorium.
(*b*) A.D. 808. Brevis Capitulorum. (The Breviary of Charlemagne).
(*c*) A.D. 830. Al-Mamun's Description of the Khalifate.
(*d*) A.D. 1086. The Domesday Book of William the Conqueror.
(*e*) A.D. 1231. The Land Register of the Danish King, Waldemar II.
(*f*) A.D. 1515. Macchiavelli's "Ritratti della Francia e della Allemagna."

It is stated (on the authority of Mr. H. H. Risley, of H.M. Bengal Civil Service) that during the 13th century, at about the time when the Venetian traveller Marco Polo visited China, a census of Tibet was taken by Kubla Khan.

SECTION 4.—REVIVAL OF CENSUS-TAKING IN MODERN TIMES.

1. **Revival of Census-taking.**—During the 16th century various statistical compilations, answering to the same ideal as that of the mediæval cosmographies, were made. It would appear, however, that there is no record of any regular and systematic census being taken during the Middle Ages, nor indeed until the 17th century, when the credit of first attempting the compilation of population statistics in more modern times belongs to the Canadian Province of Quebec, or *La Nouvelle France*, as it was then called, where between the years 1665 and 1754, no fewer than fifteen regular censuses were taken, most of them nominal—that is, recording by name every individual enumerated. During the latter portion of the same period seven censuses of Nova Scotia (then Acadia) and six of Newfoundland were also taken. In Europe, registration of local citizenship was commenced in Württemburg in 1622, but systematic records of population do not appear to have commenced until the 18th century. In 1719, Frederick William I. of Prussia began his half-yearly accounts of population, their occupations of houses and real estate generally, and of finances, taxes, etc. Enumerations of the people took place—in Hesse-Darmstadt, 1742 ; Hesse-Cassel, 1747 ; Sweden, 1748 ; Gotha, 1754 ; Saxony and Hanover, 1755 ; Brunswick, 1756 ; Denmark, 1769 ; Bavaria, 1777 ; Mecklenburg-Strelitz, 1784 ; German Austria, 1785 ; Spain, 1787 ; the two Sicilies, 1788 ; and in Savoy and Nice in 1789.[1]

In the United States the first census was taken in 1790. In England and in France the first regular censuses were taken in 1801, in Norway in 1815 ; in New South Wales in 1828 ; in Belgium in 1831 ; while in later years, during the 19th century, censuses were instituted in nearly all the remaining important countries of the world.

2. **Later Developments of the Modern Census.**—Before proceeding to discuss further the development of the modern census, it will be convenient in the next Chapter to give some idea of the chief objects of the census, the various methods of enumeration, the forms of schedules used, the scope of the census, methods of tabulation, and the periodicity of the census in the more important countries of the world. The development of the census in each of these countries will then be briefly dealt with in Chapter III, and in Chapter IV. a more complete account of census matters in the Commonwealth will be given.

[1] See Geschichte, Theorie, und Technik der Statistik, von Professor Aug. Meitzen, Berlin, 1886

CHAPTER II.

MODERN METHODS OF CENSUS-TAKING.

SECTION 1.—OBJECTS AND USES OF THE CENSUS.

1. **General.**—Though it would appear, as has already been stated, that the principal objects of the census in early times were merely either to ascertain the military strength of the nation, or to assess taxes and adjust the rights and duties of the citizens, the results obtained from the census at the present time are of the utmost importance, and of a very varied character. They form the necessary basis for many administrative, sociological, and other inquiries. Further, the elucidation of many questions affecting the political, economical, and social welfare of the community is possible only through their existence. The more prominent objects of the modern census may be conveniently dealt with under the following heads :—

Demographic.

(i.) *Population and its distribution.*
(ii.) *Sex, age, and conjugal condition.*
(iii.) *Birth rates.*
(iv.) *Marriage rates.*
(v.) *Death rates and Life Tables.*

Social and Economic.

(i.) *Families, dwellings, education, religion, and occupation.*
(ii.) *The infirm and dependent.*
(iii.) *Scale of emolument, scope, and continuity of employment.*
(iv.) *Currency.*

Ethnographic.

(i.) *Race and nationality.*
(ii.) *Immigration.*
(iii.) *Environment.*

Statistical and Administrative.

(i.) *The Standardisation of statistical data.*
(ii.) *Financial.*
(iii.) *Administration.*
(iv.) *General.*

2. **Demographic.**—(i.) *Population and its Distribution.* The principal object of census-taking, and the one probably which is best understood and arouses the greatest measure of public interest, is the determination of the aggregate number of persons in the community and their local distribution, as well as the progress or decline of the community in all its varied aspects since the date of the preceding census. The changes which have occurred during the intercensal period expressed either absolutely, or relatively to similar changes during previous intercensal periods or among other communities, are disclosed.

Whether the population is rapidly or slowly increasing, whether it is aggregating itself at centres or is distributing itself over the country, whether the production of wealth or other benefits in any locality relate to few or many, whether political representation will be affected ; these and similar questions are answered only by means of a census.

(ii.) *Sex, Age, and Conjugal Condition.* Population falls into natural groups according to two characteristics present everywhere, viz., sex and age, and although the distribution according to conjugal condition (single, married, widowed, or divorced) does not depend upon natural causes, but upon the social institution of marriage, this institution is so well established in civilised communities, that the classification of the population according to conjugal condition is comparable in importance to classification according to sex and age.

Serious differences between the number of males and females affect marriage, the increase of population, and the economic condition of the community, and the characteristics of sex distribution react on various social phenomena, such as morality, disposition to disease, manifestation of vice and crime, etc., thus exemplifying the fundamental importance of a classification, according to sex. It is equally obvious that the classification of occupations according to sex is of a social and economic significance, which would be difficult to exaggerate.

As regards age, it is important to know whether a community is normally or abnormally constituted ; for example, whether it has an excessive number of children and old people, thus increasing the burden on the productive class ; or has a deficiency of children, pointing to depopulation and race-suicide. Incidentally it may be noted that emigration and immigration are reflected in the numbers of persons at each age, thus disclosing whether the economic power of a nation is losing by drafts on the full-grown and able-bodied, or whether its power is increasing by additions to its adult and vigorous life. Again, the numbers between certain ages furnish evidence of military and voting power. In many instances particular sections of the community, differentiated according to age, afford the only appropriate standards for the observation of social phenomena. For example, a full analysis of the phenomena of changing birth rates presupposes that the number of women of marriageable age and their reproductive efficiency at each age can be taken into account, since the potential element in the growth of population is the number of women of child-bearing age, and to a less extent the suitable ages of their consorts. Thus, to obtain a measure of other considerations operating to facilitate or retard the exercise of the maternity function, the measure of the potential element is essential, and without a census these considerations could not be satisfactorily studied. The incidence of disease, mortality, criminality, and similar phenomena vary in intensity with variation in the distribution of sex and of age-classes. Hence, classification by sex and age permits of the elimination of causes of variation, dependent merely upon the accident of particular numbers, and enables search for causes arising from human tendencies, motives, or economic conditions, etc., to be made. In short, it gives precision to any possible deductions.

Conjugal condition reflects the changes taking place in the social organisation. Hence economic independence of women reacts on the relative numbers of single and married, and the latter must be studied in relation to growth of population, to the number of births, to the constitution of the family, as well as in relation to social morality. Both widowhood and divorce have important economic and social effects, and the influence of both the married and widowed states are marked in the phenomena of death, disease, insanity, suicide, vice, and crime. Thus the combination of conjugal condition and age reveals many important relations.

(iii.) *Birth Rates.* The immediate cause of an increase or decrease of population is ordinarily due to the relation of the number of births to the number of deaths. The facts for a particular country may be distorted by emigration or immigration ; when it is remembered, however, that with a population of any size it is far more easy to recruit its losses and to develop it by natural increase than by immigration, it is easy to see that statistics of births and birth rates are of primary importance. The crude birth rate (usually expressed as the number of births per 1000 of the population) can be ascertained accurately only by the help of the census, since during intercensal periods all estimates of rate have to be based on more or less imperfect estimates of population. The number in the community given by any one census and the enumeration result of the following census, constitute the initial and closing values for all intercensal estimates of population, by means of which all intercensal adjustments are made possible. Estimates of the death rate and of the relationship between the birth rate and death rate are obviously limited in a similar way.

The birth rates occurring among different classes in the community, as, for example, urban and rural, rich and poor, agricultural and industrial, have obviously a far-reaching significance in regard to national evolution, and behind these are many questions of deeper significance, viz., the characteristics of fecundity, the factors conducing to a large or small birthrate or producing variations therein, the age of life at which these operate, the light they throw on the growth of national tradition, etc. By means of the census, in conjunction with statistics of birth, investigations can be carried out with a view to ascertaining climatic, topographical, and seasonal influences on the birthrate, the influence of similarity or disparity in the ages of parents, etc. The influences of race, density of population, residence in town or country, occupation, economic prosperity, and social position on birthrate, are each important as regards national welfare, and it is the census alone which provides sufficiently accurate data for elucidating these problems, which, notwithstanding their immense importance, have so far been inadequately attacked.

(iv.) *Marriage Rates.* The most significant sociological event in the life of man is marriage. For the community it has significance, not only because the number of marriages profoundly affects the maintenance of the population strength, but also because marriage establishes the family and through its influence on the life of the individual permeates all the phenomena of social life. As with birth-rates, so with marriage-rates, only by means of periodic censuses can they be ascertained. A sudden decline in marriage-rate is usually referable to some economic calamity or to the shock of war ; a gradual decline may be due to diminishing economic prosperity or to some change in social condition, habits, or public opinion. A gradual rise is ordinarily an index of economic prosperity, of hopefulness in regard to the future, and for national destiny probably always a hopeful sign.

Just as in the case of birth rate, so with marriage-rate, there are many causes, both physical and psychical, affecting its frequency, such, for example, as climate, season, race, prosperity or adversity, laws, public opinion, social ambition, etc. The attempt to measure the effect of these on national destiny demands precision in data, because here it is the *change* of rate which is to be ascertained, and the labyrinth of sociological laws can be traced out only when the movement of this change is exactly ascertained.

(v.) *Death Rates.* Since, disregarding the effects of immigration and emigration, increase in population depends upon the difference of birth rate and death rate, any peculiarity in the latter must necessarily be reflected in the features of the population increase. This rate, which is similarly dependent upon the census for its determination, is an index of the fluctuating condition of the community, of the salubrity of localities, or of the conditions of its life. Wars, epidemics and adversity on the one hand, or prosperity, peace, and social morality on the other, reflect themselves in the fluctuations. Its variations are the pulsations of the social life, and by its means many useful investigations may be carried out. For example, excessive mortality or morbidity rates furnish evidence of the need and necessary directions for prophylaxis. And it may be here remarked that statistical results of such a nature have disclosed the fact that popular impressions are often wholly erroneous. The variation of death rate with sex, age, and conjugal condition; in different localities and climates; according to seasons; among different races; in town and country; and in different occupations; is of importance to the student of social science, and to those charged with public administration.

It is worthy of note that it is only through the statistical precision attained by means of the census that the requisite data for the construction of general life tables can be obtained. Such tables are of practical and scientific value, and shew with what degree of success a community is guarding its vital forces. In its simple form a national life table shews the number of persons who, out of a given number born in any community, will attain each successive year of age, and therefore shews also the number who will die each year until all are extinct. It may here be added that such tables as are referred to are desirable for each community, and are essential in all cases where conditions of life diverge materially from those of communities for which such tables are already in existence.

3. **Social.**—(i.) *Families, Dwellings, Education, Religion, and Occupation.* Social condition is intimately related to the family and family life. Hence an enumeration of families and a description of their composition as to number form the data for a study of sociological development. For example, the number living alone and living in families of specified sizes indicates the social tendencies of the people, and their inclination for the married state, while the varying size of families affords evidence of the fertility of the population. The social significance of particulars as to families requires to be interpreted in connection with other facts, as, for example, relatively small families may, on the one hand, indicate prudence and foresight, and result in comfort, well-being, and low death rates, or may, on the other hand, express a state of things by no means consistent with national well-being. As indicative of the influence of other phenomena, such as the effects of urban life, national competition, increase of luxury, change in domestic or religious ideals, statistics of families are of interest and value.

The number and kind of houses occupied by the community, the number of persons and families aggregated in a single house, are important indications of the social condition of the people, and the value of the information is increased when the constitution of the dwellings, *i.e.*, the material of which they are constructed and the number of rooms therein, is known; classification of houses and their actual value as dwellings becomes increasingly important, for with the crowding of population into large cities the social problem of house accommodation has of recent years become more complex.

The condition of a people may be gauged by its intelligence or by the prevalence of education. Ignorance often reinforces poverty, vice, and crime, and though men are not made moral by a knowledge of "the three R's," yet an intelligent community lives on a higher plane of moral life. The present means of obtaining information by the census as to the intelligence of the community by the enumeration of illiteracy is unsatisfactory, and must be regarded merely as a makeshift. The single test of absolute illiteracy is very crude, but taken in conjunction with statistics of educational facilities, it serves to give some rough idea of the efficiency of the educational machinery.

Religious belief furnishes a definite classification of population, and, although the political significance of religious differences has, perhaps, less weight to-day than formerly, there is still a public demand for an enumeration of the number of adherents of each sect. In cases where an inquiry as to religious belief is instituted, it is ordinarily left optional to reply. Certain characteristics appear to accompany different religions, so that the statistics thereof are not without value as an index of social condition.

That the classsification of the people according to occupation and economic condition is of fundamental importance is obvious. It is the material for an intelligent review of national industry or of what is implied in the terms capital and labour, employers and employees, masters and servants, rich and poor, producers and non-producers, plutocracy and wage-slavery. The correlation of these things with physical conditions and physical environment, the incidence

of natural phenomena as revealed in their fluctuation, demand a close study of those well-enumerated facts that a census alone can supply. These various phenomena are complex and involved; indeed the complexity of social life is like that of a living organism, and the classification and arrangement of its various characteristics, and the analysis of its numerous interrelations are essential to disentangle cause and effect. In most cases all that can at present be done is to carefully review the facts and wait for future knowledge to show the proper correlation and the appropriate scheme for complete analysis.

The sociological inquiries which can be instituted under the above heads are at present limited by the very elementary questions to which trustworthy answers can be obtained.

(ii.) *The Infirm and Dependent.* Since in every community there is a certain number of persons who suffer from some form of physical or mental infirmity, their presence indicates some limitation in the social organism, or in the physical or moral life or environment of the people. Thus their enumeration, when accurate, is of value. Since, too, in a well-ordered State, a study of the condition of these persons with a view to its amelioration, is essential both for their own sake and that of the community, a census cannot wholly neglect to take account of infirmities. Unfortunately in many cases, however, satisfactory answers cannot be obtained, as, for example, in respect of mental alienation and imbecility, and in impaired vision or hearing, in nervous instability, etc. In these the *degree* of the defect is important; yet popular replies would be nearly worthless. For this reason, and with a community at present insufficiently instructed in the matter, the inquiry has, on the present occasion, been restricted to questions as to total blindness and deafmutism.

(iii.) *Scale of Emolument, Scope and Continuity of Employment.* The ultimate object of any inquiry as to salary or wages is to determine the amounts of annual earnings of different sections of the community classified according to occupation, to economic condition, or in some similar way. In conjunction with statistics of production and of rates of wages this inquiry furnishes material for the answer to many important questions relating to the economic condition of various classes of the community and to the state of the market for labour. A mere comparision of daily or weekly earnings in different occupations would, however, be insufficient. Most trades vary in activity with the season of the year, the difference being frequently very great; at any particular time therefore it might happen that for one industry the results would be exceptionally favourable, and for another exceptionally unfavourable. To avoid comparisons on different bases therefore, and since the number of full weeks' wages obtained in a year is not known, except in certain non-intermittent trades, it is necessary to supplement any census inquiry as to amounts of wages or salary by another inquiry as to average time worked during a year. The investigation may then resolve itself into subordinate inquiries in regard to the condition of workers in various occupations at different places and at different times. Such inquiries may be grouped under the following heads:—(*a*) To determine the ordinary annual incomes in different occupations; (*b*) To compare the incomes in different occupations in different countries, or in different parts of the same country; (*c*) To compare incomes at different periods; (*e*) To correlate money wages with cost of living in all the preceding cases, *i.e.*, to measure the efficiency of wages; and (*f*) To correlate wages with other economic phenomena. The proposal to include in the Australian Census Schedule of 1911 an inquiry as to scale of emolument, was overruled by a resolution of the Federal Senate.

(iv.) *Currency.* Statistics of the production, use, and movements of currency are of value, since the monetary and credit system of every country are influenced by the amount and velocity of movement of its supply of money. The actual quantity of money in existence; the rapidity of its circulation; the extent of the use of paper money, cheques, and other credit instruments by means of which the use of coin is to a large extent obviated; are all elements of importance in the financial system of a nation. These are all influenced by the character of the trade, whether wholesale or retail, whether internal or international, whether for cash or credit, and upon the habits of the people in the use of cheques and bank accounts. A knowledge of the amount of currency in existence is essential in any thorough consideration of the relation of money to prices, and since a change in price-level affects all incomes, an inquiry as to this matter must be of interest to every member of the community. And it may be added that the velocity of circulation of currency, itself a measure of the efficiency of the monetary system of any community, demands for its determination the quantity of currency involved: without this quantity the solution of the problem is not possible. The proposal to include in the Australian Census Schedule of 1911 an inquiry as to amount of currency in actual circulation was also overruled by the Federal Senate.

4. **Ethnographic.**—(i.) *Race and Nationality.* The ethnological is the most general division of mankind, and though no rigid classification of the distinguishing marks of race or stock has been generally adopted, there are important influences both upon social organisation and the economic life of the community associated with the term "race." Closely connected with the distinction of race, and more or less correlated therewith, is the distinction of nationality, though members of a nationality are not, of course, necessarily members of the same race. Both of these have immense importance for the sociologist, especially in his study of origins, and in his study of national and racial characteristics. Some writers, for example, appear disposed to associate free political institutions with the spread of the Anglo-Saxon race, believing that, wherever he is found, his racial tendency will thus express itself.

The relative strength of different nationalities held together in the same political unity, as in Australia, is often an important economic as well as social question. To follow the intermixture of nationalities, such as is going on in the Commonwealth ; to follow the foreign-born in their distribution over the country, in their choice of occupation, possibly in their effect on the moral and social welfare of the community ; is of obvious sociological importance.

(ii.) *Migration. A priori,* it is evident that migration may have considerable influence upon the population, both of the country losing the migrants, and of the country receiving them. It is the object of the census to describe and analyse the quality of migration, especially immigration, according to the race or birthplace of the individuals, their sex, age, and conjugal condition, and their occupation and economic condition. All these questions are important in considering the effect of immigration ; by depicting the ebb and flow of migration it may be possible to indicate the influences which govern its intensity and direction. Migration gives rise to ethnical mixtures, and to complicated questions of the reciprocal influence of men of different races and culture upon each other. Such questions involve not merely the number of the population, but the whole social and economic development of the community. Besides migration from one country to another, an almost equally important phenomenon is the change of residence of people within a country. A typical example of this is the migration from country to city, a tendency strongly expressing itself in the features of modern life, and yet one which may rightly give some concern as to the stamina of a people.

(iii.) *Environment.* Philosophical historians have attempted to refer the peculiarities of national development to the physical characteristics of the country occupied by particular nations. The tracing of this influence of the physical environment upon the development of nations and communities is an important field for investigation, and by special study of particular countries it becomes possible to ascertain the influence of natural factors in determining the distribution of the population in a growing community, in directing the course of immigration, or in effacing national differences. All influences manifested in social institutions or customs, representing what may be called the social environment, have important bearing on and affect the life of man. As civilisation becomes more complex the number of these influences increases. It will be evident that we shall do well in this country, in which the British race is transplanted, and where new influences are at work, to watch with adequate attention the evolution of the people and to systematically study the development of the race both from the physical and psychical aspects.

5. **Statistical and Administrative.**—(i.) *The Standardising of Statistical Data.* From the standpoint of general statistics a census is indispensable. Vital statistics and records of production, transport, communication, trade, shipping, etc., derive their significance by being related to the population from which they have been derived. The census furnishes the necessary standard by means of which the statistical date respecting the community may be measured and compared, both among themselves and with corresponding data respecting other communities. To know the value of production in different industries without knowing the number, sex, and age of those engaged in such industries ; to know the extent of trade without knowing the number of people represented therein ; or to know the amount of the public debt without knowing the number of the population on whose behalf it has been incurred ; would deprive our knowledge of the greater part of its value. The census therefore provides suitable norms or standards by means of which the extent and tendency of the varied activities of a community can be accurately gauged.

(ii.) *Financial.* A knowledge of the number of the people is an essential also from the point of view of public finance. In the Commonwealth of Australia, where the relative populations of the several States formerly governed, to a slight extent, the allocation to them of Commonwealth revenue and expenditure, and now governs the whole amount paid per annum by the Commonwealth to the States, population statistics are essential. Up to the 30th June, 1910, all " new " expenditure of the Commonwealth was debited to the States on a *per capita* basis, and under the financial scheme, brought forward by the second Fisher Ministry, the populations of the several States were made the basis of allocation of Commonwealth subsidy. It is often necessary also to review proposed expenditures of public or other moneys in the light of actual or anticipated local populations.

(iii.) *Administrative.* The machinery of administrative government, involving the provision for transport and communication, or for education, for police or other protection, or for any other of the many requirements of the community, has necessarily to be based upon an accurate knowledge of the extent and distribution of the population.

(iv.) *General.* In addition to the objects and uses of the census thus far indicated, there are many others of minor importance. But enough has been said to shew that the modern census is an institution of great value ; that the results obtained by it are essential for intelligent administration, and for the proper investigation of economic and sociological questions. In short, it is a *sine qua non* in a civilised country. Apart from its immediate utilities, the census furnishes the basis for that derivative analysis without which legislation and administration would be operations in the dark. It is this analysis that makes possible the review of a nation's affairs ; which enables some estimate to be made of the success or failure of its administrative efforts ; which discloses whether it is moving toward success or disaster. In short, without statistics based upon and corrected by census results, a satisfactory review of national affairs or a prognosis in regard thereto would be an impossibility.

SECTION 2.—METHODS OF ENUMERATION..

1. **General.**—The methods of enumeration may be classified (i.) according to the manner of determining the locality to which each person enumerated is to be credited, and (ii.) according to the method adopted for recording the population.

2. **Manner of Determining the Locality of Population.**—There are two modes of referring population to locality; one depending on domicile, the other upon actual location, at the time of the census. The former is known as a *de jure* enumeration, and the locality to which the person is assigned is ordinarily that in which he usually resides. The latter is known as a *de facto* enumeration, and refers each person to the locality in which he is residing at the date of the enumeration.

(i.) *Population de jure.* In some countries only those persons are considered to belong to the population of a place who habitually reside therein. In countries where the number of regularly domiciled inhabitants determines many financial arrangements relating to the amount of payments to be made by and to a community, and also is the foundation on which numerous details of municipal and general administration are based, doubtless this definition of the term "population" is that which best answers practical purposes. It involves, however, a strict enumeration not only of persons temporarily absent, but also of strangers temporarily present. In France "*la population de fait*," which consists of all present in the district at a given time, is distinguished from "*la population de droit*," consisting of all usually resident in the district, inclusive of those temporarily absent, and exclusive of those only temporarily present; and also from "*la population municipale*," which is "*la population de droit*," less prisoners, inmates of hospitals, scholars resident in schools, members of convents, the army and navy.[1]

(ii.) *Population de facto.* The number of people actually present within the boundaries of a district at a given time form the "de facto" population, and it is this number which is counted by the Australian Census as well as by the censuses of the whole British Empire, except in Canada, where the "de jure" system has been adopted. All persons who are actually present in a place at the given moment, whether natives or foreigners, strangers or habitual residents, whether lodged in houses or ships, whether tramps, vagrants, or other houseless persons, are alike counted as units of the population. For the main purposes to which the census of Australia is subservient, this actual population is at present the more important to take into account.

(iii.) *Comparative Advantages of Enumerations de facto and de jure.* The great advantages of enumerating the population *de facto* would appear to be on the score of simplicity, inasmuch as it only necessitates for any district a statement as to the number of persons who actually spent the census night in that district. On the other hand, the *de jure* system requires the exclusion of those temporarily present and the inclusion of those temporarily absent. In this connection it may be noted that it may be by no means easy to decide what should constitute temporary and what permanent residence in a locality, for example, in cases where a person has two or more residences and occupies each for a certain portion of the year.

The chief objections to the *de facto* method of enumeration are that under it visitors are included while temporary absentees are excluded, so that such places as watering places and health resorts may have their populations unduly inflated, while the districts from which the visitors to those places have come have their populations unduly diminished. To minimise these objections it is usual to fix the time for the census at an hour of the day and at a season of the year at which the displacement of population is a minimum.

It may here be noted that in the censuses of many European countries, *e.g.*, Belgium, Germany, and France, the population *de facto* and *de jure* are both enumerated.

3. **Methods of Recording the Population**—As regards the responsibility for the original record of the number of persons living it may be broadly stated that there are two distinct methods of enumeration which may be respectively designated (i.) the Householder method and (ii.) the Canvasser method. Thus generally throughout the British Empire (with the exception of Ireland, Canada, India, Ceylon, and also a few other places of minor importance) the occupier of each "dwelling" is the person held primarily responsible for furnishing a written record of the desired particulars relative to the inmates of the "dwelling" occupied by him. The document in which he is required to fill in the desired particulars is known as the Householder's or Occupier's Schedule. In the United States of America, Ireland, Canada, India (except in the case of Europeans and natives of high rank), and Ceylon, however, the original entries are made by the enumerator as the result of inquiries instituted by him.

[1] See Cours elementaire de statistique, Bertillon, p. 146.

(i.) *The Householder Method.* This method has four important advantages, viz.:—
Firstly, the liability of error is diminished; all statements resting on the householder's own authority, erroneous entries through hurry or carelessness in taking down the answers cannot occur.
Secondly, the time of the enumerator is saved and the cost is thereby reduced.
Thirdly, the labour of writing out the particulars is divided.
And fourthly, such division makes it possible for the particulars to be synchronous for all parts of the country.

The chief objection to the householder's schedule is that the accuracy of a census carried out through its agency is limited by the intelligence and literary capacity of the population to readily grasp the meaning and requirements of the blank forms and to fill them in properly. There are, of course, many countries in which, owing to the general illiteracy of the population, the householder's schedule cannot be used, and experience has shewn that people even fairly well educated find a considerable difficulty in thoroughly understanding a blank form, even when accompanied by copious explanatory notes, or by a supposititious example furnished for their guidance. Further, it frequently occurs that no proper attempt is made to comprehend the object or scope of the inquiries instituted in the schedule, the notes on which are not even read, while the whole matter is regarded as a somewhat irksome imposition, if not an inquisitorial impertinence. Comparatively few people adequately realise the enormous amount of preparation entailed by a general enumeration, the vast field of the inquiry, the amount of detail to be covered, and the importance of the results. The intelligence, co-operation, and good-will of the enumerated on the one hand, and of the enumerator on the other, are the links in the chain upon which the success of a census carried out by means of the householder's schedule largely depends.

(ii.) *The Canvasser Method.* If the householder's schedule could be made so simple in form that it would present no difficulty to the least intelligent householder, or if, on the other hand, the standard of intelligence could be raised so that the meaning and requirements of blank schedules could be readily grasped by all, there is no doubt that the householder method would be the best for universal adoption. The chief advantage of the canvasser method is that the difficulties due to ignorance and illiteracy of those enumerated are to a large extent obviated. The chief requirement for the success of this method is intelligence on the part of the enumerator, who should not only himself have a clear knowledge of what is required and how it should be recorded, but should also have the ability to readily obtain the desired information by means of questions well chosen and carefully asked.

The chief disadvantage of the canvasser method lies in the fact that the enumeration, owing to the time taken in obtaining the desired information, is not synchronous for the whole country, and thus it becomes difficult to avoid omissions and duplications due to changes of address, and also errors due to defective recollections of the fact as they existed on census day. In some countries special expedients have been adopted to reduce as much as possible the objectionable features of this method; for example, in India and Ceylon a preliminary canvass is made, followed by a final revision on census night.

(iii.) *Comparative Merits of the two Methods.* A consideration of the various points in favour of and against the two methods of enumeration discussed above, leads to the conclusion that, in countries where both methods are equally practicable, a census involving only a few simple inquiries should be taken by the householder method, and that for more extensive inquiries a special canvass not connected with the general census should be made.

(iv.) *Enumerations of Uncivilised Communities.* It has occasionally been found necessary to adopt special means of enumeration in a census of uncivilised or partially civilised races. Thus in the census of the natives of the Gold Coast in 1891, grains of Indian corn and cowrie shells were made use of for enumerative purposes, while in India bamboo sticks have been similarly employed. Another method which has at times been put into practice in enumerating some of the remote districts of India, has been that of taking a complete census of a few typical villages and obtaining an estimate for the whole district by taking into account the number of such villages. This method has also been suggested for use in estimating the population of some of the partially civilised parts of Africa.

Another special method which has sometimes been employed when the enumeration is recognised as very incomplete, is that of making an addition, either by way of percentage or otherwise, to the population enumerated to allow for those unrecorded. This, however, is open to considerable objection, inasmuch as ordinarily sufficient data, on which the number or percentage to be added can be based, do not exist. Such estimates are very unreliable, and in most cases are prejudiced by preconceived ideas of what the population ought to be.

4. **The Form of the Schedule.**—It must be admitted that to the uninitiated the sheet form of census schedule, with its numerous vertical columns and horizontal lines, with the closely-printed heading and elaborate hints and cautions, is likely to be a source of some perplexity, more particularly since the directions and notes furnished for the householder's guidance have not always been expressed in the simplest language or with the least ambiguous phraseology. A check on the particulars filled in by the householder is, however, ordinarily provided to some extent by requiring the collector to insert any missing, or correct or complete any obviously erroneous or deficient information.

(i.) *The Schedule in Sheet Form.* The English method heretofore of presenting the various inquiries at the head of vertical columns has been adversely criticised as being less clear to the average householder than the method of placing the inquiries in the form of questions in the left-hand margin and reserving a vertical column for each person enumerated. The latter plan is followed in some countries, and though used in the United States Census of 1890 was discontinued in that of 1900, on the grounds of economy of space. It would, however, for purposes of convenience or lucidity appear to make little difference whether the subjects of inquiries are specified at the top of the vertical columns or at the side of the schedule.

(ii.) *The Individual Card or Schedule.* What has been called the individual card or schedule, a modification of the " householder's schedule," has been adopted in most European countries, *e.g.*, in France, Germany, Belgium, Italy. In these countries the householder is usually required to fill in a card or schedule containing certain general particulars relative to the household as a whole, and further to fill in for each member a separate card or schedule containing personal details. In the individual card the inquiries will naturally appear at the side rather than at the top. The use of a separate card for collecting the information from each person has many advantages. When the ordinary form of schedule is filled in by persons unused to such work the liability to error is considerable. With the personal card, on the other hand, each reply has to be written in contiguity to the question, and the chance of error is thus greatly reduced. The division of labour arising from the householder method of collection is, by the provision of personal cards, considerably extended, since each person in the household possessing the necessary ability can be entrusted with the filling in of his own personal card. This is a distinct advantage in the case of hotels, boarding-houses, etc. A further advantage arising in such cases from the use of personal cards, is that the only person in the hotel who need see the cards is the proprietor or manager, who is responsible for the collection in respect of the " dwelling " of which he is the " occupier." With a large schedule or number of schedules the particulars furnished by those entered early is often open for inspection by those entered later. This was necessarily the case where each person was asked to fill up the line relating to himself or herself. Another advantage of the use of personal cards for collection is that the information is at once available in a convenient form for any tabulation by hand sorting that it may be desired to make.

The advantages of the individual and householder's cards led to their adoption at this Commonwealth Census (1911) ; the form and requirements of the cards are referred to in detail in Chapter VI. hereof.

5. **The Scope of the Census.**—While naturally there is considerable similarity as regards some of the inquiries made in the census of the different countries of the world, there is a great variety both in detail and also, in some countries, as to the general scope of the census. Initially the Government of each country instituted such inquiries as seemed most suited to its requirements, but in later days much has been done by means of International Statistical and other Congresses to co-ordinate and unify the range and subjects of inquiry.

In Australia, as well as in the United Kingdom and the British Empire generally (with the exception of Canada), the practice of the census authorities is to ask for very few particulars and to *concentrate their efforts on getting these with the greatest attainable accuracy*, whereas in the United States, Canada and in Germany and certain other countries the ordinary schedules comprise a far greater number of particulars, while supplementary schedules are also used for special investigations. Generally speaking, all countries now enumerate the population according to age, sex, birthplace, conjugal condition, and occupation, while some (for example, in Cape Colony, Orange River Colony, and some of the Australasian colonies) have taken advantage of the occasion to collect agricultural and industrial statistics. Again, in other countries the scope of the inquiry is greatly extended, and by means of the census it is endeavoured to present an account of the national history during the intercensal period, and to sum up the effects of the vicissitudes of seasons, of religious and social movements, of educational effort, and of commercial and industrial progress. In India the conditions are entirely different to what they are in any other country, and the census methods employed in that Empire present very little resemblance to those adopted in most other parts of the British Dominions.[1] The census of Ceylon resembles that of India in many respects.

(i.) *International Minimum.* At the meeting of the International Statistical Institute, held in St. Petersburg in 1872, the following minimum requirements were agreed to :—(*a*) that the census should be nominal, (*b*) that it should enumerate " *la population de fait*," (*c*) that it should be decennial, (*d*) that it should be completed within 24 hours, (*e*) that the information to be obtained should include ; i., the name of the individual ; ii., his age ; iii., his sex ; iv., his relationship to the householder ; v., his civil status ; vi., his occupation ; vii., his religion ; viii., his language ; ix., his education ; x., his birthplace and nationality ; xi., his residence ; and xii., special mention of infirmities, such as blindness, deaf-mutism, cretinism, idiocy, and insanity.

[1] See Modes of Census-taking in the British Dominions, R. H. Hooker, M.A. Journal of the Royal Statistical Society, Vol. LVII., p. 298.

(ii.) *Development of the English and Australian Schedules.* The progressive extension of the English schedule since 1801 is indicated in the tabular statement given below. For purposes of comparison the scope of the inquiries made at the censuses of New South Wales (the State in which the first Australian Census was taken) is also shewn :—

Particulars.	Name.	Age.	Sex.	Relationship to Head of Family.	Civil Condition.	Conjugal Condition.	Number of Children.	Birthplace.	Nationality.	Length of Residence in Country.	Habitations.					Religion.	Sickness or Infirmities.		Occupation.		Language.	Education.		
											Occupied.	Unoccupied.	Being Built.	Materials.	Number of Rooms.		Blind and Deafmutism.	Insanity or Idiocy.	Nature.	Grade.		Read and Write.	Attend School.	University.
ENGLAND AND WALES.																								
1801	..	..	X	..	..	..	..	..	..	..	X	X	..	..	..	..	..	..	X[1]	..	..	..	..	..
1811	..	..	X	..	..	..	..	..	..	..	X	X	X	..	..	..	..	..	X[1]	..	..	..	..	..
1821	..	X[2]	X	..	..	..	..	..	..	..	X	X	X	..	..	..	..	..	X[1]	..	..	..	..	..
1831	..	X[3]	X	..	..	..	..	..	..	..	X	X	X	..	..	..	..	..	X[4]	X[5]	..	..	..	..
1841	X	X	X	..	..	..	..	X	..	..	X	X	X	..	..	..	..	..	X[4]	X[8]	..	..	..	..
1851	X	X	X	X	..	X	..	X	..	..	X	X	X	..	..	..	X	..	X[6]	X[8]	..	..	..	..
1861	X	X	X	X	..	X	..	X	..	..	X	X	X	..	..	..	X	..	X[6]	X[8]	..	..	..	..
1871	X	X	X	X	..	X	..	X	..	..	X	X	X	..	..	..	X	X	X[6]	X[8]	..	..	..	..
1881	X	X	X	X	..	X	..	X	..	..	X	X	X	..	..	..	X	X	X[6]	X[8]	..	..	..	..
1891	X	X	X	X	..	X	..	X	..	..	X[7]	X	X	..	X[7]	..	X	X	X	X[9]	X[11]	..	..	..
1901	X	X	X	X	..	X	..	X	X	..	X[7]	X	X	..	X[7]	..	X	X	X	X[10]	X[11]	..	..	..
1911	X	X	X	X	..	X	X[14]	X	X	..	X[12]	X	X	..	X[12]	..	X[13]	X[13]	X	X[10]	X[11]	..	..	..
NEW SOUTH WALES (State in which first Australian Census was taken).																								
1828	X	X[15]	X	..	X	..	..	..	..	X[16]	X[17]	..	..	..	..	X[18]	..	..	..	..	..	..	..	..
1833	X	X[15]	X	..	X	..	..	..	..	X[16]	..	..	..	..	..	X[18]	..	..	..	..	..	..	..	..
1836	X	X[15]	X	..	X	..	..	..	..	X[16]	..	..	..	..	..	X[18]	..	..	..	..	..	..	..	..
1841	X	X	X	..	X	X	..	..	..	..	X	X	..	X	..	X	..	..	X[19]	..	..	..	..	..
1846	X	X	X	..	X[2]	X	..	X	..	..	X	X	..	X	..	X	..	..	X	X[20]	..	..	..	..
1851	X	X	X	..	X[2]	X	..	X	..	..	X	X	..	X	..	X	..	..	X	X[20]	..	..	..	..
1856	X	X	X	..	..	X	..	X	..	..	X	X	X	X	..	X	..	..	X	..	..	X	..	..
1861	X	X	X	X	..	X	..	X	..	..	X	..	..	X	X	X	X	..	X	..	..	X	..	..
1871	X	X	X	X	..	X	..	X	..	..	X	X	..	X	..	X	X	..	X	..	..	X	..	..
1881	X	X	X	X	..	X	..	X	X	..	X	X	..	X	X	X[2]	X[21]	X	X[22]	..	..	X	X	X
1891	X	X	X	X	..	X	..	X	X	..	X	X	X	X	X	X[2]	X[23]	X	X	X	..	X	X	X
1901	X	X	X	X	..	X	X[14]	X	X	X	X	X	X	X	X	X[2]	X[23]	X	X	X	..	X	X	X
1911[24]	X	X	X	X	..	X	X[14]	X	X	X	X	X	X	X	X	X[2]	X	..	X	X	..	X	X	X

1. Under three classes only (agriculture, trade, and others). 2. Optional. 3. Males above and under 20. 4. For males over 20 only. 5. In agriculture only. 6. Rank, profession, or occupation. 7. Number of rooms occupied if less than 5. 8. Employers only specified. 9. Employer, employed, or on own account. 10. Homeworkers added. 11. For Wales and County of Monmouth only ; whether speaking Welsh only or English and Welsh. 12. Number of rooms in dwelling. 13. Includes also age at which person became afflicted. 14. Includes also for each married woman number of years married. 15. Under or over 12 years. 16. For prisoners only. 17. Sydney only. 18. Protestants, Roman Catholics, Jews, or Pagans. 19. Sexes not distinguished. 20. Journeymen, apprentices, and assigned servants. 21. Also incapacity for work through sickness or accident. 22. Included relatives assisting on farms or stations, and unemployed. 23. Included sickness, accident, and other infirmities. 24. First Commonwealth Census.

It may be seen that each successive schedule has approached more closely to the standard suggested at the St. Petersburg meeting, but that for the census of 1911 the schedule for England and Wales, and in a lesser degree that for the Commonwealth, is still deficient in certain matters. In England there are no inquiries as to either religion or education, while the inquiries as to language and residence are only dealt with to a limited extent. In the Commonwealth there is no inquiry as to language, nor as to cretinism, idiocy, and insanity, but the card provides for certain additional inquiries not specified among the requirements agreed to at the St. Petersburg conference, viz., those as to (*a*) Date of existing marriage ; (*b*) Number of children (living and dead) from existing marriage and from previous marriage ; and (*c*) Period out of work (if for more than a week prior to census). The question as to profession or occupation is extended so as to include " grade " of occupation (*i.e.*, whether employer ; if in business on own account but not employing others for salary or wages ; if assisting head of household but not receiving salary or wages ; or if earning salary or wages) ; and also occupation of employer (if any).

6. **Methods of Tabulation.**—The method of tabulation adopted in the Census Office of England and Wales, prior to the Census of 1911, for dealing with the data obtained by the enumeration was as follows :—When returned by the householders, the schedules were copied by the enumerators into enumeration books ; these were sent to the Registrar for the sub-district. After examination and revision by the Registrar a fresh summary was made out for the whole

sub-district from the enumeration books.[1] These summaries were sent to the Census Office and used for obtaining district, county, and other totals for the preliminary census. The different facts contained in the enumeration books were afterwards transferred to tabulation sheets of different kinds—one for ages and civil condition, others for birthplaces, occupations, infirmities, and so forth.[2] The tabulation sheets contained various compartments for the particulars as given in the final printed volumes.

According to this system, therefore, the facts were rearranged in written schedules. There are, however, two other methods of tabulation in use, viz.—(i.) The Card or Slip system. (ii.) Mechanical tabulation.

(i.) *The Card System.*[3] This system has been used in connection with the censuses of the Australasian Colonies,[4] India,[5] Ceylon,[5] the South African Colonies,[6] and of a number of European countries. In the classification of policies for the purpose of actuarial valuations by Life Insurance Companies, the use of cards has long since supplanted the older system of classification on written schedules. By their use the subdivision into the necessary groups and ages is rendered much simpler, and a considerable saving of time and labour is effected. The use of cards or slips in connection with the tabulation of census results is said to have been first successfully employed by Professor von Mayr in the Bavarian Census of 1871,[7] and has since been extended with complete success to the censuses of many other countries. The form and size of the cards or slips used may naturally vary according to the extent of the information furnished by the population schedules. Each card is devoted to a single individual, the whole number of cards used corresponding therefore to the whole population. On each card all the particulars to be tabulated concerning each individual are copied from the schedules. In some cases the card is divided into a number of chief divisions corresponding to the subjects of inquiry. Each of these chief divisions is then divided into a number of compartments, each compartment corresponding to one of the several particulars under which it is desired to tabulate the various subjects of inquiry. The copying of each particular from the schedule on to the card is done by simply drawing a bar across the compartment corresponding to the particular which it is desired to enter for the individual concerned. In the cards used in other countries, spaces are provided for each of the chief subjects of inquiry, and the necessary particulars are filled in by hand, abbreviations being, of course, extensively used. When the cards are all filled up, the work of tabulation is performed by simply sorting the cards under any given head or heads and counting them. When another branch of the census statistics forms the subject of inquiry the cards are re-sorted under that head, and so on until the whole of the recorded items have been abstracted. In general, cards of different colour are used to indicate the more important divisions, such as sex and civil condition, the tabulation under these important divisions *per se* being thus carried out by simply counting the cards of different colours.

(ii.) *Tabulation from the Individual Schedule.* It may be noted that in countries where the individual " schedule " (see par. 4 of the present section) is used, there is no necessity for the particulars for each individual to be copied on to cards, the schedules themselves being used as cards for the purposes of tabulation. A considerable saving of time, labour, and money is thereby effected.

This method of tabulation was adopted in connection with the present Commonwealth Census. As will appear hereinafter, the use of mechanical tabulating and sorting machinery necessitates the preliminary punching of a special card for each individual. Delay is thus caused in the tabulation of the census results, and although it would appear that the cost of tabulation is reduced by the use of mechanical devices, the early publication of the more important census results was considered, after due deliberation, to be in Australia of paramount importance. Many of the devices are still only in the experimental stages, and do not appear suitable without considerable modification for the purpose of the census of this country. It may also be added that the advantages of adopting mechanical tabulators are less striking in a country like Australia, where the population is not very large, and where the combinations required are not of a very elaborate nature, than they are in the United States, where the population is large and where the opportunity is taken of collecting at the census a large amount of industrial statistics.

(iii.) *Electrical Tabulators.* During the work of the tenth census—that of the year 1880—of the United States of America, Dr. Herman Hollerith saw the need of adopting a mechanical method for tabulating population and similar statistics.[8] The Hollerith

[1] See Census Report, England and Wales, 1901, p. 8. [2] See The Case for Census Reform. G. H. Ryan, F.I.A., Journal of the Institute of Actuaries. Vol. XXXVI., p. 348. [3] Probably first used for statistical purposes by Mr. A. G. Finlaison, of the National Debt Office, London, in 1852. [4] First used in Australia for census purposes in the Victorian Census of 1881, taken by Mr H. H. Hayter. [5] In 1901. [6] In 1904. [7] See Census Report, India, 1901, Vol. I., p. XXII., where a brief account of the system as used in Bavaria in 1871 is given. [8] See The Electrical Tabulating Machine. Dr. Herman Hollerith, Journal of the Royal Statistical Society, Vol. LVII., p. 678, where a fairly full description of the machine is given. Various important improvements have been made in the machine since that paper was written (1894).

system of electrical tabulation may be best described as a mechanical development of the card system of tabulation. The cards are prepared by punching holes in them, the relative positions of such holes defining the individual responses to the questions asked. In the United States Census of 1890 the cards used were $3\frac{1}{4}$ inches by $6\frac{5}{8}$ inches, their surfaces being divided into 288 imaginary spaces, each $\frac{1}{4}$ inch square. To each of these spaces some particular value or meaning was assigned ; thus a hole in one place may mean a white person, in another a black, or again, one hole may indicate a certain age group, and another gives the exact year in that group. A combination of two holes in another part of the card indicates the occupation of the particular individual. In this way at the United States Census of 1890 answers were recorded not only to the twenty-six inquiries contained in the population schedule, but the particular State, county, city, and enumeration district in which each individual resided were also recorded. The punching of the cards was carried out by means of a special " keyboard " punch, and a " gang " punch, the latter being used for making the same combination of holes in all the cards of a given district. Having thus prepared a punched transcript for each individual, the cards are tabulated on the electrical machine, the main features of which are described by Dr. Hollerith, as follows :—" The machine consists primarily of a press or circuit-closing device, the upper and movable portion of which is provided with projecting spring-actuated needles or points corresponding in number and relative position to the holes which may possibly be punched in the record card. The lower or fixed plate consists of a piece of hard rubber provided with a corresponding number of cups partially filled with mercury, which through suitable wires are connected with the binding posts of the switchboard. If a punched card is placed in the bed and the handle depressed, wherever there is a hole in the card, the needle will dip down into the mercury, while at all other points the needles will be pressed back. Counters are used, and consist of electro-magnets so arranged that each time a circuit is closed through it the armature is actuated so as to register unity. Combinations of groups are secured by a simple use of the well-known electrical relay."

In the year 1901, towards the close of the work of tabulation of the twelfth census of the United States, the Hollerith machine was improved by the addition of automatic feeders, by means of which punched cards placed in a receiver in lots of 400 or 500 were automatically tabulated. A further improvement consists in a device whereby cards which pass through the machine without being tabulated fall into what is known as the reject box, for further examination.

The average speed of the Hollerith machine at the United States Census of 1900 was 80,000 to 90,000 cards in a working day of seven hours, including stoppages for reading dials.[1]

Modifications of the Hollerith electrical tabulator have been made in Austria, Japan, and Switzerland.

The question of the adoption of electrical tabulators at the present (1911) census of the Commonwealth has already been referred to. (See (ii.) above).

(iv.) *The Automatic Sorter.* This machine was first used in connection with the United States Census of 1900. As in the Hollerith machine, the cards are fed downward one by one. The circuit established through holes in the cards by means of electric magnets controls ten chutes of varying lengths leading to ten boxes. As each card is pushed downward it enters the chute which has been determined by the electro-magnet as the proper one to receive it, and is assisted by fingers into its proper receptacle. In this way cards which have been placed in the feeder box pass through the machine, and are deposited in one or other of the ten boxes, according to the combinations which have been worked out previously by the adjustment of pins in the box. The separation of cards into not more than ten classes requires but one run through this machine ; any number of classes exceeding ten requires two or more runs. If a card is imperfect the machine does not advance it, but passes it into a reject box. The automatic sorting machine can be operated at a speed of from 75,000 to 175,000 cards per day.[2]

(v.) *The Automatic Sorter and Counter.* At the suggestion of the Commonwealth Statistician, counting mechanisms have been added to the automatic sorter, so that the cards may be counted at the same time as they are sorted.

(vi.) *The Classicompteur Imprimeur.* This machine may be used for arranging schedules in different classes, and for counting the number in each class. It consists essentially of a horizontal table carrying an inclined keyboard, of which the keys operate the counters. The results are printed by depressing a lever. The machine thus permits of the direct examination of the schedules without preliminary transcription on to special cards.

7. **Intercensal Periods.**—General experience and practice point to the unanimous conclusion that the interval from census to census should in no case be greater than ten years. Considerations of expense have in the majority of cases prevented the census from being taken

[1] See American Census-taking. Hon. W. R. Merriman, 1903, p. 22. [2] See American Census-taking Hon. W. R. Merriman, 1903, pp. 22-3.

at shorter intervals, but for many years an agitation for reducing the period from ten to five years has been more or less vigorously carried on. The following statement has been prepared in order to show the intercensal periods in the more important countries according to their present practice :—

Periodicity of Census in Various Countries.

Country.	Periodicity.	Year in which present arrangements commenced.
1. United Kingdom and Ireland		
England, Scotland, and Wales	10 years	1801
Ireland	10 „	1811
2. British Possessions, etc.		
Bahama Isles	10 „	1891
Canada	10 „	1871
Cape Colony[1]	10 „	1891
Ceylon	10 „	1871
Hong-Kong[2]	10 „	1881
India	10 „	1871
Mauritius	10 „	1851
Natal[1]	10 „	1891
Newfoundland	10 „	1891
New South Wales	10 „	1861
New Zealand	5 „	1881
Orange River Colony[3]	10 „	1880
Queensland[4]	10 „	1891
South Australia	10 „	1861
Tasmania	10 „	1861
Transvaal[5]	..	..
Victoria	10 „	1861
West Australia	10 „	1881
3. Continent of Europe.		
Austria	10 years	1880
Belgium[6]	10 „	1856
Denmark	5 „	1901
France[7]	5 „	1821
Germany	5 „	1875
Greece	Varies.	..
Italy	10 years	1861
Netherlands	10 „	1829
Norway	10 „	1900
Portugal	Varies.	..
Russia[8]	..	..
Spain	10 years	1900
Sweden	10 „	1860
Switzerland[9]	10 „	1860
4. America.		
United States	10 „	1790
Mexico	10 „	1900

1. The census proposed for 1901 was abandoned owing to abnormal conditions created by military operations; a census was taken in 1904 and in 1911. 2. An intermediate census was taken in 1897. 3. Censuses taken in 1880, 1890, 1904, and 1911; see also note 1 hereof. 4. An Act of 1875 provided for a quinquennial census; this was held in abeyance in 1896 and 1906. 5. Censuses taken in 1890, 1904, and 1911; see also footnote 1 hereof. 6. Since 1880 the decennial census has been taken in the last year of the decade. 7 Owing to the Franco-Prussian War the census due in 1871 was taken in 1872. 8. First complete census taken in 1897; none taken since. 9. Census taken in 1888 instead of 1890.

(i.) *The Question of a Quinquennial Census.* The above analysis shews a marked preference for the decennial period according to present practice. It may be seen, however, that the quinquennial period is adopted by such important countries as France, Germany, Denmark, and New Zealand. The United Kingdom has worked under a decennial census for over a century, but the administrative County of London (under the Equalisation of Rates Act, 1894) makes an intermediate enumeration, thus adopting the principle and practice of quinquennial censuses. Since the middle of the nineteenth century an agitation for reducing the intercensal period in the United Kingdom from ten to five years has been more or less vigorously carried on. The Royal Statistical Society, the Institute of Actuaries, and the Census Committee of 1890 have made various representations to the Government with this end in view. In this connection the following paragraph taken from the General Report on the Census of Western Australia in 1891 is of interest :—" Should the federation of the Australian Colonies become an established fact, ... it may be taken for granted that a quinquennial census under federal direction will become an absolute necessity as far as Australia is concerned, while the principal British Statists appear to be unanimously in favour of the population of the United Kingdom being enumerated every five years."

(ii.) *The Advantages of a Quinquennial Census.* Perhaps the chief argument in favour of a quinquennial census is its desirability as a basis for the more correct calculation of birth rates and death rates. In all such computations in the interval between two successive censuses, it is obviously necessary to interpolate corresponding values for the population, and though the error in the interpolated value for the total population of a country may be small, experience has shewn that estimates as to the local distribution of population are erroneous and misleading.[1] The changes in industrial conditions brought about by opening up new districts to settlement, by new inventions, and by improved facilities of transport and communication, are now far more rapid than formerly, especially in a new country like Australia; so rapid that there is an unquestionable want of more frequent information than is furnished by a decennial census.[2] Further, in many countries population is recognised as a basis for representative and administrative purposes both with regard to the general and local government systems, whereas under

[1] See The Case for Census Reform. G. H. Ryan, F.I.A., Journal of the Institute of Actuaries, Vol. XXXVI., p. 334. [2] See Studies in Statistics, Longstaff, p. 202.

existing arrangements a few years after the taking of a census estimates of the local distribution of the population are likely to be misleading. Thus in Australia the numerical representation of the several States in the Commonwealth House of Representatives is based upon their respective populations, and the actions of the State Government are in certain respects largely governed by considerations of the local distribution of population, as, for instance, in the extension of railway and educational facilities, and in determining the amounts of grants to be made to local authorities. In addition, the amount and the allocation to the States of Australia of the annual subsidy from the Commonwealth Government is based upon the estimated number of people in the respective States at the middle of the financial year (Dec. 31st). With so long an interval as 10 years between censuses marked inaccuracies in the estimates are possible, and consequently a check count at least once in five years is desirable. For general statistical purposes, moreover, a census more frequent than every ten years is very desirable. The figures with which the statistician deals are always related either directly or indirectly to population, so that it is of paramount importance that the populations of the countries and districts concerned should be known. Another advantage of a more frequent census would be that the people enumerated would come to regard the census as an ordinary occurrence, and would learn to appreciate its utility and importance in the common good. If people had to return their ages more frequently, there would be a strong tendency towards more truthful statements; they would become more accustomed to the inquiry, some of the glaring misstatements would be avoided through a fear that the previous return might be remembered, and the margin of error would be reduced.[1] A further reason for taking the census more frequently is that the experience gained by those employed on the duty is in a large measure lost when so long a period as ten years elapses between each enumeration.

(iii.) *The Objections to Quinquennial Census.* The only objection to the introduction of the quinquennial census would appear to be on the score of expense. The total cost of the Commonwealth Census of 1911 may be put down approximately as £175,000. At the outside, therefore, a further equal amount would need to be charged upon the revenues of a period of ten years. The maximum increased annual cost of a quinquennial census in Australia would therefore be about £17,500, a sum that would make but little difference in the £50,000,000 which in the financial year 1910-11 represented the normal national expenditure of the Commonwealth and State Governments. In at least two important directions, however, this cost would be materially reduced—(*a*) by restricting the facts to be elicited at the intermediate censuses to numbers, age, and sex, and (*b*) by reason that the special census staff, which has now to be reorganised and drilled anew once every ten years, would become better acquainted with their duties and would carry them out more rapidly and efficiently, with a corresponding saving in cost. The intermediate quinquennial census would also offer a favourable opportunity for the introduction of an Industrial Census, which would enable matters of the utmost importance in Australia to be opened up to further inquiry and investigation, such matters, for instance, as the development and economic condition of the agricultural, pastoral, dairying, manufacturing, and mining industries; the extent of employment and earnings in various industries; the cost of living of various social and industrial classes; and the wealth of the people and its distribution among the classes.

[1] See The Case for Census Reform, G. H. Ryan, F.I.A. Journal of the Institute of Actuaries. Vol. XXXVI., p. 336.

CHAPTER III.

CENSUSES OF MODERN TIMES.

SECTION 1.—GREAT BRITAIN AND IRELAND.

1. **England and Wales.**[1]—Prior to the commencement of the nineteenth century, no direct method had been adopted to enumerate the population of England. Various estimates of the population had, however, been formed at previous periods, based upon the Domesday Book, Subsidy Rolls, and payments of Hearth and Poll taxes, but they involved of necessity so large an intermixture of guesswork as to greatly diminish the value of their results.

(i.) *First Proposal for Systematic Enumeration*, 1753. No proposal to ascertain the population of England and Wales by systematic enumeration appears to have been made until the middle of the 18th century. On the 30th March, 1753, Mr. Thomas Potter, M.P., introduced a Bill " for taking and registering an annual account of the total number of the people, and of the total number of marriages, births, and deaths ; and also of the total number of the poor receiving alms. . . . . " This measure met with violent opposition in certain quarters and called forth denunciations and prophecies of an extraordinary and virulent nature, and, although successful in passing through all its stages in the House of Commons, was eventually thrown out in the House of Lords.

(ii.) *First Census*, 1801. Nearly half a century elapsed before the proposal was renewed. In 1800 a Census Act (41 Geo. III., 31st Dec., 1800) was passed through all its stages without opposition, this change in public opinion being probably attributable to some extent to the fear that the people were increasing so rapidly as to outstrip the means of subsistence. This alarm was accentuated by the great dearth which prevailed in the country at the time when the Bill was brought forward, and also by the attention excited by the publication of Malthus' essay " On Population," which first appeared anonymously in 1798. The census provided for by the Act of 1800 was taken on the 10th March, 1801, when England and Wales were found to contain 8,892,536 and Scotland 1,608,420 inhabitants. The census of 1801 did not extend to Ireland.

(iii.) *Censuses*, 1801 *to* 1831.[2] The census of 1801 has been followed by enumerations made decennially in the first year of each decade. The important work of census-taking has, strange to say, not yet been recognised by the British Legislature as being of a permanent character, and consequently, a special authorising Act has to be passed for each census.

The first four censuses of England and Wales were taken by the agency of the overseers of the poor, or of substantial householders in each parish or place, and the results were abstracted under the superintendence of Mr. Rickman, Assistant Clerk to the House of Commons. These censuses differed but little from each other as regards both the scope and machinery of the inquiry.

(*a*) *Method of Collection.* The overseers collected information concerning the inhabitants of their respective parishes by personal inquiry, and, on the basis of the information thus collected, framed answers to printed questions addressed to them concerning the numbers and occupations of the persons living in their parishes.

(*b*) *Scope of Inquiry.* The principal population inquiries were those relating to (1) Families ; (2) Sexes ; and (3) Occupations.

A list of questions was transmitted to the overseers of the poor or a substantial householder[3] in " every Parish, Township, and Place," and such overseers and householders were required to take the necessary steps for obtaining answers thereto. In 1801 each overseer was required to furnish for his district the number of families, the number of persons of each sex, exclusive of soldiers and seamen, the number of houses inhabited and uninhabited, and the number of persons employed in (*a*) Agriculture, (*b*) Trades, Manufactures, or Handicraft, or (*c*) neither of the foregoing. In 1811 the Occupation inquiry was amended and was made to relate to families instead of persons, while the number of houses being built was also included. At the census of 1821 provision was for the first time made for a record of ages in groups. It

[1] See Census Report, England and Wales, 1881 ; also " Some Account of the Census from 1801 to 1881" by A. F. Burridge, F.I.A. Journal of the Institute of Actuaries, Vol. XXV., p. 83. [2] See Census of Great Britain, 1851, Vol. I., Population Tables, pp. ix. and x. [3] The whole of the country had not been placed under the Poor Law Acts.

was, however, optional for the overseer to make the inquiry, and it was also optional for the person enumerated to furnish a reply. At the census of 1831 the number of questions addressed to the overseers was increased from seven to sixteen ; the Occupation inquiry was considerably extended, but the detailed enumeration of ages was dropped, the only age particulars ascertained being the number of males aged upwards of 20 years engaged in each of the seven groups of occupations specified. The areas of the parishes were given for the first time at the census of 1831.

(iv.) *Present System Introduced*, 1841. In the year 1840 a lengthy report was issued by a Committee of the Statistical Society of London (now the Royal Statistical Society), appointed for the purpose of considering the best mode of taking the census of the United Kingdom in 1841.[1] This Committee, after reviewing the census methods adopted by the leading European countries, and in the United States, recommended that the statutory co-operation of the Poor Law Commissioners and of the Registrar-General appeared to be essential to the proper conduct of the census of 1841. The Committee also recommended that the system of enumeration by names, as pursued at the Irish Censuses of 1821 and 1831, and not by mere marks, was of great importance in order to obtain " security against fallacious returns." The subjects of inquiry suggested by the Committee were as follows : (*a*) age, (*b*) sex, (*c*) unmarried, married, or widowed, (*d*) occupations, (*e*) place of birth, (*f*) religious persuasion, and (*g*) healthy, sick, or permanently infirm. The Committee also recommended that the work of actual enumeration should be carried out in rural districts by the entry in books at each house of the particulars concerning its inmates, but that in the towns, the method then pursued in Belgium of circulating householder's schedules in the form of queries to the master of each house should be adopted. Seven queries were suggested, each relating to one of the suggested subjects of inquiry. The recommendations of this Committee were to a large extent adopted at the census of 1841, and in many respects they now form the basis of census methods both in the United Kingdom and Australia, as well as many other parts of the British Empire.

The Registration (Births, Deaths, and Marriages) Act had come into force in 1837 ; and for the purposes of this Act, the whole country had been mapped out into a number of districts, each with a superintendent registrar, and these districts again subdivided into sub-districts, each with a resident registrar, whose duty it was to keep account of the births and deaths in his sub-district ; while, presiding over the whole system, was the Registrar-General with a staff of assistants in London. It was obvious that such an organisation as this was well adapted to furnish the framework of the machinery for the work of enumeration, and the business was therefore taken out of the hands of the parochial overseers and entrusted to the new body of local registrars.[2]

(*a*) *The Occupiers' Schedules.* Other important alterations were also introduced at the census of 1841. The age inquiry was reintroduced, the birthplaces were recorded, and the occupations were all arranged, according to the householder's statement, alphabetically. A very important change was also made in the method of enumeration, the submission of a list of questions to overseers, etc., being discarded in favour of *Occupiers' Schedules*, in which the desired particulars were entered by the occupier himself with regard to all persons present in his house on a certain fixed night. Each person was specified by name, so that this was the first " nominal " census taken in England.

(*b*) *Collection and Compilation.* The schedules were distributed and collected by special enumerators, each registrar's sub-district being parcelled out by him for that purpose. At the first four censuses each overseer was required to classify and summarise the information collected by him, returning in his report simply the numerical results for his district. At the 1841 and subsequent censuses, however, all compilation and tabulation was carried out at the Head Office, thereby securing greater uniformity than had been hitherto obtainable.

(v.) *The Census of* 1851. The method of enumeration introduced at the census of 1841 was found to answer so well that it has been continued on each subsequent occasion without material alteration. A report, issued by the Census (1851) Committee of the Statistical Society in 1850, approved generally of the adoption, at the census of 1851, of the methods used in 1841.[3] The system has, however, been amplified and amended in certain minor respects. The census of 1851 exhibited statistics not only of parishes and parliamentary and municipal boroughs, but also of all important large towns and ecclesiastical districts and parishes.[4] In addition to the subjects of inquiry previously included in the schedule of 1841, it was determined to ascertain various relationships (such as husband, wife, son, daughter), the conjugal condition (as married, unmarried, widow, etc.), and the number of persons blind, deaf, or dumb. Two collateral branches of inquiry were prosecuted in 1851 by means of the census machinery, but not under the compulsory powers of the statute ; these related to (*a*) the provision existing for religious worship, (*b*) the means existing for education, and the attendance at churches and schools.

[1] See Journal of the Statistical Society of London, Vol. III., pp. 72 to 102. [2] See General Report, *Census*, 1881, Vol. IV. [3] See Journal of the Statistical Society, Vol. XIII., pp. 268-70. [4] See Report of Commissioners of Census of United Kingdom, 1851.

In 1851, Dr. Farr introduced a classification in which the occupations were divided into six classes, containing eighteen orders. This principle has, with some modifications and extensions, been since maintained, and in the classification used at the present Commonwealth Census there are now eight classes, and twenty-seven orders.

(vi.) *The Census of* 1861. In 1861 the census of Scotland, which had always previously been provided for in the same Act as that of England and Wales, was arranged for in a separate Act. This practice was continued until 1901, when the original method of legislating for the whole of Great Britain in the same Act was reverted to. The census of 1861 distinguished sex, age, conjugal condition, relation to head of family, profession, and birthplace. The collateral inquiries as to religion and education were dropped. The census of Ireland has always been the subject of separate legislation.

(vii.) *The Census of* 1871. The census taken on the 3rd April, 1871, marked an important extension of the system, since on that occasion, for the first time, an attempt was made to enumerate the population of the whole of the British Possessions. It should be noted, however, that this census was by no means synchronous throughout the Empire ; in Western Australia and Tasmania the census was taken in 1870, while the enumeration was not synchronous either for the whole of the Indian Empire or for the Dominion of Canada. The Census (1871) Committee of the Statistical Society reported in 1870 that it was not desirable to depart from the arrangements made at previous censuses, but recommended that the inquiries made at the census of 1851 into (*a*) the provision existing for religious worship and the attendance thereon, and (*b*) the means existing for education and the attendance at schools and places of instruction, should be reintroduced. Those recommendations, however, were not adopted.[1]

The total number of persons in the British Empire enumerated in 1871 was 234,802,593, of which number 31,484,661 were in the United Kingdom, and 191,307,070 in British India. The number of registration districts in England and Wales for the census of 1871 was 626. The important development of the census of 1871 opened the way for fresh ranges of inquiry, by which questions of great importance could be approached. Materials were furnished for ascertaining the relative growth of different colonies—their progress by immigration or natural increase—and rates of mortality in different parts of the Empire could be compared.

(viii.) *Later Censuses.* Since the year 1871, simultaneous censuses of the various portions of the British Empire have been taken in 1881, 1891, 1901, and 1911, and in England and Wales the system in force at the census of 1871 has not since been materially departed from. The total population of the British Empire recorded at the Census of 1901 was 398,401,704, while that enumerated at the census of 1911 exceeded 420,000,000.

Particulars have already been given in tabular form as to the progressive development of the English schedule. (See p. 14 hereinbefore.)

(ix.) *Reports on Censuses by Committees of Royal Statistical Society.* In 1879 a committee was appointed by the Council of the Statistical Society of London for the purpose of considering whether advantageous suggestions as regards improvements in the inquiries or machinery connected with the census of 1881 could be made. The more important recommendations of this Committee were as follow :—

(*a*) That the same form of schedule should be adopted in all parts of the United Kingdom.
(*b*) That additional subjects of inquiry should include " religious profession" and " number of rooms in each dwelling house," and
(*c*) That the classification of houses and the inquiry as to birthplaces be extended.

The Committee also expressed an opinion that it was desirable, for a variety of purposes, that the census should be taken quinquennially.[2] The only one of these recommendations adopted was that dealing with the inquiry as to " birthplaces."

In 1888 another Committee appointed by the Council of the Royal Statistical Society with reference to the census of 1891, submitted a report[3] recommending that a permanent Act should be passed for a quinquennial census, and that a separate and permanent Census Office should be created. At the 1891 census of England and Wales particulars were included as to whether employer, employee, or neither, and as to the number of rooms occupied if less than five. Otherwise the schedule was identical with that used at the previous census. The taking of a census in the United Kingdom limited to number, age, and sex, midway between the decennial periods, and the establishment of a permanent census staff were further urged in a memorial and by a deputation[4] from the Royal Statistical Society to the President of the Local Government Board in 1894.

A further Committee of the Royal Statistical Society reported in 1897[5] with reference to the proposed universal census of 1900 that the following five facts were all that should be insisted on for uniform treatment :—(*a*) Number of *de facto* population. (*b*) Sex. (*c*) Age—the first 5 years separately, the rest in quinquennial periods, distinguishing the sexes. (*d*) Conjugal condition—as single, married, widowed, combined with sex and age. (*e*) Birthplace. A second

[1] See Journal of the Statistical Society, Vol. XXXIII., p. 113. [2] See *Ibid*, Vol. XLIII., p. 134. [3] See *Ibid.*, Vol. LI., p. 816. [4] See *Ibid*, Vol. LVII., pp. 379-83. [5] See *Ibid.*, Vol. LX., p. 162.

report was furnished by this Committee in 1899, making several recommendations as to alterations in the schedules and especially with a view to attaining uniformity of the schedules throughout the United Kingdom.[1] The majority of these recommendations were adopted by Parliament and incorporated in the Census Act, 1900. An unsuccessful attempt was made in 1900 to obtain the insertion in the Census Act of that year of a clause providing for an interim census in 1906, and again, in 1904, a deputation (representing the Royal Statistical Society, the Institute of Actuaries, the Society of Medical Officers of Health, and the British Medical Association) to the President of the Local Government Board unsuccessfully urged the establishment of a quinquennial census of a limited character, viz., dealing with numbers, sex, and age only.[2]

In September, 1908, the first report of the Census (1911) Committee of the Royal Statistical Society was issued.[3] This report dealt with questions which were considered urgent in connection with the preparatory work. The second report, adopted in April, 1909, contained recommendations as to the form in which the final results of the census should be exhibited, together with proposals regarding an organised enumeration of the Empire. The first part of the final report[4] was divided into three sections dealing respectively with (i.) Schedule, etc., (ii.) Tabulation, and (iii.) A permanent Census Office. The second part of the report dealt with the question of an Imperial Census.

I. (i.) *Schedule, etc.* The Committee recommended (*a*) that an Act should be passed providing for a general census to be taken every ten years, and for an enumeration by sex and age every intervening fifth year ; (*b*) that the schedule should be uniform throughout the United Kingdom as to the main subjects of inquiry ; (*c*) that in the inquiry as to Conjugal Condition, the condition of " divorced " should be recognised ; (*d*) that an optional inquiry as to religion should be instituted ; (*e*) that the inquiries as to occupation and birthplace be extended ; and (*f*) that the inquiry as to infirmities should be amended. A draft of the schedule headings and instructions, in which the above recommendations were embodied was appended to the report.

(ii.) *Tabulation.* The recommendations of the Committee as to the form in which the results of the census should be finally exhibited comprise the additions consequent upon the suggestions regarding the schedule, together with such modifications of the tables of the last census as were held to be statistically desirable. With regard to the classification of occupations the Committee suggested, with a view to an Imperial compilation, that the returns should be adapted so as to permit of a scheme of tabulation such as is found amongst the Australian returns of 1901.

(iii.) *A Permanent Census Office.* The advantages of a permanent establishment to deal with work connected with the census were again referred to, and the establishment of a Census Commission was recommended.

II. *Imperial Census.* The Committee held that uniformity in the schedule or scope of the inquiry throughout the Empire is no more attainable or necessary than in the actual date of the enumeration. It was pointed out, however, that it is desirable that the States of South Africa should bring their operations into line with those of other parts of the Empire, and also that the census should not be again allowed to lapse in those West Indian Colonies where none was taken in 1901. The Committee were of opinion that the subjects to which Imperial comparison can be most usefully directed are :— (*a*) Sex ; (*b*) Age ; (*c*) Conjugal Condition ; (*d*) Birthplace ; and (*e*) Occupation.

2. **Scotland.**—The earliest census in Scotland was taken in 1801 in conjunction with the first census of England and Wales. The actual work of collection was, however, and has subsequently been, quite distinct from that of England and Wales, and has been controlled by specially appointed census authorities in Edinburgh. In Scotland the method was adopted of employing the parish schoolmasters to perform the local duty of enumerating the population in the country districts. As previously pointed out, provisions for the censu of Scotland were, from 1801 to 1851 inclusive, contained in the same Act as those for the census of England and Wales, while from 1861 to 1891 inclusive, separate legislation was passed for the two divisions. In 1901 the original method of including all the provisions for the census of Great Britain in one Act was reverted to.

(i.) *Census of* 1861. In Scotland there having been no such organisation of registrar's districts as had been effected in England in 1837, the important administrative changes in the 1841 census of England could not be adopted at the 1841 census of Scotland.[5] The Registration Act for Scotland came into force, however, on the 1st January, 1855, and the census of 1861 was made under the superintendence of the Registrar-General for Scotland through the agency of 1001 local registrars, and 8075 enumerators. At this census the population of Scotland

[1] See Journal of the Royal Statistical Society, Vol. LXII., pp. 679-81. [2] See *Ibid*, Vol. LXVII., pp. 272-81. [3] See *Ibid*, Vol., LXXI., pp. 496-8. [4] See *Ibid*, Vol. LXXII., pp. 574-593. [5] See *Ibid*, Vol. III., p. 96.

was 3,062,294. The forms and instructions issued were all based on, and in most cases virtually the same as, those used in England in the census of 1851. Other features of the census of Scotland of 1861 were the tabulation of particulars relative to the number of families in every parish and county, to the number of dwellings having windows, and to the number of children between the ages 5 and 13 in attendance at school.

(ii.) *Census of* 1871. The returns of this census for Scotland contained some new features, such as the ecclesiastical subdivision of civil counties, grouping the population into three great divisions according as they inhabited towns, villages, or rural parts, and returns as to houses, families, and population in parliamentary constituencies.

(iii.) *Later Censuses.* The census of 1891 introduced additional inquiries as to the number of (1) Employers, (2) Employed, (3) Workers on their own account, and (4) others of whom no statement is made. The schedules used in recent censuses have been substantially the same as those used in England and Wales.

3. **Ireland.**—Prior to the inauguration of periodical census-taking in Ireland, several population estimates had been made at various times, the earliest on record being that of Sir William Petty in 1672. Another estimate, concerning which brief particulars appear in the transactions of the Royal Society of London, was made in 1695 by Captain South. Again, during the eighteenth century, numerous estimates of a more or less trustworthy nature were made on the basis of the number of houses returned by the Hearth-money Collectors, while in 1731 an inquiry was instituted by order of the House of Lords of Ireland for ascertaining the population through the medium of the Magistracy and the Established Clergy. In 1805 Major Newenham published an estimate of the population in the preparation of which he had endeavoured to correct the inaccuracies of the Hearth-money returns.

(i.) *Early Censuses.* The first attempt at a general census was made in 1811, but it was decidedly unsuccessful. It was repeated in 1821, but went no further than a bare enumeration. The census of 1821 was taken under the Population Act, 1815 by which the duty of superintending the general management of the proceedings throughout the counties was transferred from the grand juries to the bench of magistrates assembled at sessions.[1] The census taken in 1831 was subjected to correction in 1834, to make it the basis of a new system of national education.

(ii.) *Later Censuses.* In 1841 it was resolved to obtain statistics of agricultural production in Ireland. The attempt was found so successful that it was renewed in greater detail at the census of 1851. The enumeration of the people of Ireland in 1861 was effected for the first time throughout the country (excepting the metropolis) by the officers and men of the Royal Irish Constabulary. In 1871 the enumeration of Ireland was undertaken by the Registrar-General of Ireland.[2] Later censuses have been taken decennially, and are provided for on each occasion by special legislation, as in England, Wales, and Scotland.

SECTION 2.—BRITISH POSSESSIONS AND DEPENDENCIES.

A.—INTRODUCTION.

1. **General.**—In most of the British Possessions and Dependencies the census methods of England and Wales are followed more or less closely, the population being enumerated by means of householders' schedules. In India and Ceylon, however, the conditions are greatly different to those of other countries, and consequently it has been found necessary to adopt different methods of enumeration. The enormous population to be enumerated, the general illiteracy of the masses, the varieties of race, and the distinctions of caste and religions, all combine to make the taking of an Indian census a task of considerable difficulty. In Canada the census has been modelled upon that of the United States rather than on that of England and Wales, and in that Dominion the schedules are not left with the householders, but are filled up by the enumerator himself. Another important difference in Canada is that the population *de jure* is enumerated.

2. **Census Methods.**—As a rule in all British Possessions and Dependencies each country is divided for census purposes into districts placed under a superior officer, often named the "Supervisor" or "Enumerator," who is under the immediate control of the Superintendent of the Census; these districts are again parcelled out into convenient areas for purposes of collection. For each of these latter districts a collector is appointed. The time allowed for the collection of the schedules varies in different countries; in a great number of cases it is found that the collector has to fill in the schedules himself, and the time taken in collection is thus prolonged.

[1] See Journal of the Statistical Society of London, Vol. III., p. 91. [2] The Registration Act for Ireland came into force on the 1st January, 1864.

Magistrates, registrars, and civil officers are usually appointed as supervisors or enumerators for their respective districts. The supervisors frequently arrange the division of their districts into collectors' sub-districts, and subject to the approval of the superintendent select their own collectors, and instruct them in the performance of their duties. They arrange for the proper distribution and collection of census forms and books, and audit and examine the collectors' books. The method of payment of the collectors varies considerably; some countries have adopted the system of paying by results, *i.e.*, so much for every person recorded; in other countries a fixed sum is allotted to each official, while in others the collectors are paid by the day. The method of payment by results has been objected to as tending to bring about an exaggeration of the number of persons enumerated. In order to give as much publicity as possible to the fact that a census is about to be taken, advertisements and announcements are usually inserted in the press, and the co-operation of persons of local prominence—such as teachers, and other officials—in each district throughout the country is secured.[1]

B.—AFRICA.

1. **Cape of Good Hope.**—From the commencement of the colonisation of the Settlement at the Cape of Good Hope in 1652, it was the practice to have annual enumerations of the population, live-stock, and agricultural produce for the purpose of communicating the ascertained results to the Netherlands East India Company. The earliest known of these returns, however, is that for the year 1687, from which date, with a few casual exceptions, they run down to 1785. These annual returns were also made under the English administration from 1823 to 1856, when they were discontinued, owing to the untrustworthiness of the results. The first complete census of the Colony in the proper acceptation of that term, was taken in 1865, when the total white population numbered 20,638 persons. The second census was taken in 1875, and the third in 1891. It was originally intended to take the fourth census in 1901 in conjunction with the rest of the British Empire; the abnormal conditions created by the military operations in that year, however, compelled the abandonment of the project. Now that it was too late to combine with the rest of the Empire, the chief object to be served was to effect a simultaneous census throughout British South Africa, and it was found that this could not be carried out until 1904. Before the final arrangements were made for the census of that year an Intercolonial Census Conference was organised at Pretoria to discuss the mode of procedure to be adopted in order to secure uniformity in the more essential points in all the different Territories. The Colonies represented were as follows:—Cape of Good Hope, Natal, Transvaal, Orange River Colony, Bechuanaland Protectorate, and Basutoland. As the Cape Government had, prior to the date of this conference, completed the preliminary arrangements for the census in that Colony, the schedules and forms adopted by the other South African Colonies followed with minor modifications the lines which the experience of the Cape had proved useful and practical. The information required to be collected on the schedule at the census of 1904, according to the plan agreed upon by the Conference of Delegates, embraced the following categories:—(*a*) Name. (*b*) Sex. (*c*) Age. (*d*) Conjugal Condition. (*e*) Relation to head of household. (*f*) Profession or occupation. (*g*) Sickness or infirmities. (*h*) Race or nationality. (*i*) Country where born and length of residence in Colony. (*j*) Religious denomination. (*k*) Education. (*l*) Description of dwelling, and (*m*) Live-stock kept.

(i.) *Census of* 1904. The Census Act of 1903 provided for the taking of an account of the number of persons and the number of each kind of live-stock within the Colony, and also for the collection of agricultural, educational, ecclesiastical, industrial, friendly societies' and other statistics by the census supervisors and enumerators. The Colony was divided for census purposes into 108 districts, corresponding to the Fiscal Divisions of the Colony proper, and the Magisterial Districts in the Transkeian Territories. In the former of these the Civil Commissioners and in the latter the Resident Magistrates were appointed *ex officio* supervisors. The basis finally adopted for fixing the enumerators' sub-districts was to parcel out the country, so that an urban area might be completely traversed by the enumerator in from three to five days, and a rural area in up to nine or ten days. In some instances, however, over a fortnight, and in two cases as much as twenty days, had to be allowed for the collection of the schedules. The total number of the collectors' districts was 2394. Special arrangements were made for the Native census.[2]

(ii.) *Tabulation.* In addition to the householder's schedule, special forms (viz., Agricultural, Education, Ecclesiastical, Industrial, Fisheries, and Friendly Societies) were used at the census of 1904. In the work of tabulation two distinct methods were employed. The particulars regarding individual inhabitants, viz., Race, Sex, Birthplace, Religion, Age, Degree of Education, Conjugal Condition, Profession or Occupation, and Sickness or Infirmity, were entered from the schedules on to cards; while, on the other hand, the particulars as to buildings and dwellings and those contained in the special forms were transcribed to the tabulating sheets direct.

[1] See "Modes of Census-taking in the British Dominions," R. H. Hooker, M.A. Journal of the Royal Statistical Society, Vol. LVII., p. 327. [2] See Census Report, Cape of Good Hope, 1904, p. i.

2. **Natal.**—The first occasion in which a census was taken in this country was in 1891, but no attempt was made in that year to enumerate the natives. The second census was taken in 1904 in conjunction with the census for the whole of British South Africa. The arrangements, as well as the nature of the particulars collected, at the census of 1904 were very similar to those in the Cape of Good Hope.[1]

3. **The Orange Free State.**— The first census of the Orange Free State was taken in 1880, the second in 1890. The third census was taken in the year 1904, and was synchronous with the censuses of the other South African Colonies.[2] The Magisterial Districts of the Colony (24 in number) were adopted as census districts, to each of which was appointed an enumerator. There were 405 sub-districts, in which 424 collectors and 39 interpreters were employed. The arrangements for the census and the nature of the information collected were similar to those adopted in the Cape of Good Hope, as adopted at the Pretoria Conference. Three householders' schedules were used ; one in English, one in Dutch, and the third for natives. Eight special schedules were also used. The cost of the census of 1904 was £6146. For the purposes of tabulation, cards, similar to those used in the Cape of Good Hope, were adopted at the Orange Free State Census of 1904.

4. **The Transvaal and Swaziland.**—The first census of the Transvaal was taken in 1890 ; no details are available as regards the number of enumerators, and the general carrying out of the work. In 1896 a census of the municipality of Johannesburg, with very full details, was taken. At the census of 1904, taken in conjunction with the censuses of the other South African Colonies, the whole of the Transvaal and Swaziland was divided into 21 supervisors' districts, and 779 collectors' districts. These included 28 districts for the railways, and 6 for the military establishment. The total number of supervisors was 21, collectors 2115 (including 1120 native assistants, and 31 interpreters.[3])

5. **Mauritius.**—The first census of this island appears to have been taken in 1846. The second census was taken in 1851, and from that year onward a decennial census has been taken, usually on or about the date of the census of the United Kingdom. At the census of 1901 the staff employed comprised 15 superintendents, 98 enumerators, and 239 collectors.

6. **Seychelles Archipelago.**—Though the Seychelles Islands are dependencies of Mauritius, separate censuses have been taken decennially since 1851.

7. **Protectorates and Minor Possessions.**—In most of the British Protectorates and minor Possessions in Africa, censuses, more or less complete, were taken in 1901, under the authority of special Ordinances.

C.—ASIA.

1. **India.**—In the Indian Empire the social system and the ethnic distribution are the most complicated, the most varied, and the most elaborate that the world presents, and the work of taking a census is thereby rendered exceptionally costly and laborious. Further, the general illiteracy and narrow horizon of an agricultural population not only render the supply of enumerating agency less abundant in India, but also increases the work of enumerating, since it puts out of question the practice of leaving the responsibility of filling in the schedule to the householder.[4] In the work of census-taking, the official administration is used as far as possible ; the ordinary administrative business of the country necessitates the presence in each village community of an official who is generally acquainted with every house and family in the place. It is thus possible to largely decentralise the census work. Furthermore, in India there is practically no overlapping of areas.

(i.) *Historical.* In certain provinces such as Madras and the Punjâb, the custom of making periodic estimates of the population, founded on more or less accurate data, is of very old standing, but the first systematic attempt to obtain a census for the whole of the Empire of India was made in the years 1871 and 1872, and even then resulted in an incomplete enumeration. Earlier provincial censuses had been taken in the North-West Provinces in 1853 and 1865, in Oude in 1869, in the Punjâb in 1868, in the Hyderabad Assigned Districts in 1867, and in the Central Provinces in 1866. In Madras quinquennial returns had been prepared since 1851. Mention is made of a census having been taken in Bombay in 1716, while unsuccessful attempts are recorded for 1833-4, 1849, 1851 (twice), and 1861, the first really satisfactory census appearing

[1] See Census Report, Natal, 1904, p. 22. [2] See Census Report, Orange River Colony, 1904. [3] See Census Report of the Transvaal, 1904, Vols. I and II. [4] See "On Census-taking and its Limitations," Journal of the Royal Statistical Society, J. A. Baines, C.S.I. (now Sir J. Athelstone Baines), Vol. LXIII., p. 44

to have been that of 1864.[1] The enumeration mentioned above as having been made in 1871-2 was, in addition to being incomplete, also non-synchronous. The first synchronous census of all India was that taken in 1881, and this has since been followed by similar enumerations in 1891, 1901, and 1911. The earliest attempts to enumerate the people of any portion of British India were probably those made in 1820.[2]

(ii.) *Census Methods.* The organisation of the census of India is placed in the hands of a Commissioner, under whom Superintendents are appointed in charge of each province, large agency, or more than one small agency. Under the Superintendents are Charge-superintendents, each of whom has charge of a group of " circles." The smallest sub-division for census purposes is a " block " consisting of from 30 to 50 houses in charge of an enumerator. Above the " block " comes the " circle," a compact group of from 10 to 15 blocks, or about 500 houses under a supervisor, who is responsible for the work of all the enumerators in his circle. At the census of 1901 there were in the whole Indian Empire in round numbers 9800 Charge-superintendents, 122,000 Supervisors, and 1,325,000 Enumerators,[3] in all about 1,456,800. A special feature of the Indian Census is the preliminary enumeration, which is made some few weeks prior to the actual census day. At this enumeration all the required particulars are duly entered for every person then resident in each enumerator's district, so that on census day it is only necessary to bring up to date these returns. This is effected by striking out the particulars concerning those who have died or departed in the meantime, and adding others for those who have since arrived or been born.

(iii.) *Method of Tabulation and Cost.* At the censuses of 1881 and 1891 the information contained in the schedules was extracted on " abstraction sheets," but at the census of 1901 this method was abandoned in favour of what is known as the slip or card system. The total actual cost of the 1901 census was £137,674, or £146,265 including charges not debited against the census budget in the public accounts.[4]

(iv.) *The Schedules.* In India it is specially laid down that the schedules must be filled in by the enumerators, but this does not apply to Europeans or to natives of high rank. The schedule for the census of 1871 contained space for the name, sex, age (under and over 12 only), caste or tribe, religion, occupation, education, and infirmity. The census of 1881, the first synchronous enumeration of all India, added inquiries as to the individual ages, conjugal condition, and language, and at the census of 1891 inquiries as to birthplace and nationality were included. In 1901 the scope of the schedule was the same as in 1891.

2. **Ceylon.**—The census of Ceylon, both in scope and machinery, bears a strong resemblance to that of India, and this resemblance was at the census of 1901 increased by the adoption of the Indian method of preliminary enumeration, and subsequent revision. The Government Agents and the Chairmen of Municipalities and Local Boards are, under the Census Ordinance, *ex officio* Commissioners of Census for their respective areas. A supervisor is the officer in charge of a " circle," *i.e.*, a group of enumeration " blocks," which contains from 50 to 100 houses, and for each of which an enumerator, in rural districts the village headman, was appointed.

(i.) *Historical* Under the native rulers of Ceylon there does not appear to have been anything in the nature of a census, though there is evidence, both historical and physical, to show that the population must have been very much larger than at present. The decline in the population was probably due to the wars and internecine strife which preceded the establishment of the British Dominion. The earliest enumeration of which there is any record is that taken by the Dutch East India Company in 1789. This census, although apparently incomplete, seems to have been more successful than the first attempt in 1814, under British rule. In 1824 the first complete census of the island was commenced ; the returns were published in 1827. At this census particulars were obtained as to sex, race, and age, but the age details related only to the numbers above and below the age of puberty. In 1868 the first legislative provision for a census was made, and three years later the first census, in the proper acceptation of that term, was undertaken. Since 1871 a decennial census has been taken.

(ii.) *Census Methods.* At the census of 1901 great importance was attached to the " drilling " of the enumerators. Each supervisor was required to put his enumerators through a practical course of training by making them visit a number of houses and fill in schedules for the residents. These trial forms were examined by the supervisor, and mistakes in them were pointed out to, and corrected by, the enumerators. The schedules used were of five kinds :— (*a*) form to be filled by householders, (*b*) form to be filled by enumerators, (*c*) form for the enumeration of the estate population, (*d*) form for sea-going population, and (*e*) form for the outdoor population. The form (*a*) was issued in English only, the rest were issued in each of the three

[1] See Census of the Island of Bombay, 1864, p. 1. [2] See Geographical, Statistical, and Historical Description of Hindustan, by W. Hamilton, 1820, and Reports on the State of Education in Bengal, by W. Adam, 1835-38. [3] See Census Report of India for 1901. The supervisors of India were generally subordinate revenue officers, village accountants, and where non-officials were appointed, as in towns, the position was ordinarily looked upon as an honour. Many enumerators were volunteers, and received special certificates where the work was well done. Minor officials were also largely employed for this purpose, and the number of paid enumerators was relatively small. [4] See General Report, Census of India, 1901, Part I., p. xv.

languages, English, Singhalese, and Tamil. In the 1901 schedule a column was added for conjugal condition, and various amendments were made in regard to the particulars asked for concerning nationality, religion, occupation, and English literacy. Particulars of caste are not asked for in Ceylon. For the tabulation of results the " Slip System " was used, on the same lines as the system used in the census of India.[1]

3. **Hong-Kong.**—The first regular census was taken in Hong-Kong in the year 1881 ; it was, however, in certain respects, incomplete. Later censuses were taken in 1891, 1897, and 1901, but were not satisfactory in regard to certain of the particulars asked for.[2] The census is taken by police officers, and the " double block " system has been adopted. Under that system each census block is worked by two enumerators, instead of one, the size of the blocks being correspondingly increased. The two enumerators work together, and it is found that a great deal of time is thus saved, as one man can interrogate the members of the house, while the other takes down in writing the information thus obtained. A special feature of the Hong-Kong census is the enumeration of the Chinese living in various kinds of water craft.

D.—AUSTRALASIA.

1. **Commonwealth of Australia.**—The historical development of census-taking in each State of the Commonwealth is discussed in some detail in the succeeding Section of this Report. (See Chapter IV.). It has, however, been thought desirable, in order to preserve the continuity of this Section, to here give a brief account of the past censuses of Australia.

(i.) *The Creation of the Colonies.* Although the shores of Australia had been visited from time to time during the 16th and 17th centuries by various Spanish and Portuguese expeditions, it was not until the 23rd August, 1770, that the history of Australia was brought into political connection with western civilisation. It was on that date that Captain Cook took possession " of the whole eastern coast, from lat. 38° to this place, lat. 10½° S., in right of His Majesty King George the Third." Cook, however, proclaimed British sovereignty only over what are now the eastern parts of New South Wales and Queensland, and formal possession, on behalf of the British Crown, of the whole of the eastern part of the Australian Continent and Tasmania was not taken until the 26th January, 1788. It was on this last date that Captain Phillip's commission, first issued to him on the 12th October, 1786, and amplified on the 2nd April, 1787, was read to the people whom he had brought with him in the " First Fleet."

A full historical account of the period referred to may be found in the " Historical Records of New South Wales," vol. I., parts 1 and 2.

The western part of Australia was annexed on the 2nd May, 1829, when Captain Fremantle, who had been despatched from England in H.M.S. *Challenger* in charge of a party of intending settlers, hoisted the British flag on the south head of the Swan River, and took possession of " all that part of New Holland which is not included within the territory of New South Wales." Tasmania was constituted a separate colony in 1825, and in 1836 South Australia was created a " province." In 1841 the separation of New Zealand from New South Wales was proclaimed, while Victoria and Queensland were separated in 1851 and 1859 respectively. Though the boundaries of some of the colonies were changed after the year 1859, no further colonies were created subsequent to that date. The following table shews the dates of annexation, first settlement, and creation of the several colonies which now form the Commonwealth, as well as the date of the first regular census taken in each individual colony :—

Australian Colonies.—Dates of Annexation, Settlement, Creation, and of First Censuses.

Colony.	Date of Annexation.	Date of First Permanent Settlement.	Date of Creation as Separate Colony.	Date of First Census.
New South Wales ..	1770	1788	1786	1828
Tasmania	1788	1803	1825	1841*
South Australia ..	1788	1836	1834	1844
Victoria	1770	1834	1851	1854*
Queensland	1770	1824	1859	1861*
Western Australia ..	1829	1829	1829	1848

* Previously included with New South Wales.

A more complete account of the colonisation of Australia may be found in " The Official Year Book of the Commonwealth of Australia," No. IV., pp. 12 to 27.

[1] See The Census of Ceylon, 1901, Vol. I., p. 36. [2] See Census Report of Hong-Kong, 1901, p. 1.

(ii.) *Early Musters.* Though regular censuses were not instituted in the several colonies until the years specified in the preceding table, population returns in one form or another have existed from a very early period in the history of Australia. The earliest enumerations were known as " musters," and although the actual results of very few of them have been preserved, it is probable that during the early days of colonisation they were of frequent occurrence. The first official " muster " was taken in 1788, soon after the new settlement at Sydney Cove was formed, and in 1803 the first "muster" of convicts in Van Diemen's Land was conducted. In 1813 Liverpool was included among the " mustering " stations ; and in 1815 vital statistics were given for the towns of Castlereagh and Richmond, thus shewing the spread of settlement along the Nepean River. In the reports of subsequent "musters" the growth of the infant colony may be clearly traced. Thus in 1822 appear such names as Evan District in County Cumberland, Wilberforce on the further bank of the Hawkesbury, Illawarra, and Argyleshire. The statement of 1823 gives the new " mustering " stations of Bringelly, Campbelltown, and Cawdor ; in 1824 Moreton Bay, consequent upon Oxley's discovery of the Brisbane River, and Melville Island, indicating the settlement of a military post on the northern coast of Australia, first appear. The growth of the metropolitan district is also shewn in the returns ; thus in 1825 the Field of Mars is shewn as a distinct area, while such additional districts or parishes as Sackville Reach, Pitt Town, Kelso, and Christ's Church also appear.

(iii.) *The Development of the Census.* The first regular Australasian Census was taken in New South Wales in November, 1828, and included the population at Moreton Bay (now Queensland), and Van Diemen's Land (now Tasmania). Particulars were asked as to the names, ages, and civil conditions of the inhabitants. The next census was taken in 1833, and was followed by another in 1836, when arrangements were made for the enumeration of the population of the newly-established settlement at Port Phillip (Victoria). These two censuses were similar in their scope and provisions to that of 1828. In 1841 separate censuses were taken in New South Wales (including the Moreton Bay and Port Phillip districts) and Tasmania. New Zealand, which was first settled in 1839, was expressly exempted from the provisions of the New South Wales Census Act 1841 ; but it was not until May, 1841, that the islands composing the group were proclaimed an independent colony. Up to that date they continued a dependency of New South Wales. The first regular census was taken in South Australia in 1844, and in Western Australia in 1848. The dates of succeeding censuses are shewn in the tabular statement given in Chapter IV hereinafter. All the early censuses of the Australian colonies were based in their main features upon the methods adopted in England, and do not at present call for further notice.

(iv.) *Recent Censuses and Census Conferences.* While the fact that the census methods adopted in the several Australian colonies were based on a common prototype had the beneficent result of conducing towards general uniformity, it also gave rise to the reproduction of certain defects in English methods and to want of conformity to local circumstances. In course of time it appeared evident that the methods of inquiry and tabulation were in certain respects ill-adapted to Australasian conditions, and in 1890 a Conference of Statisticians was held at Hobart for the purpose of preparing a scheme by means of which the census information could be collected and tabulated throughout Australasia in a uniform and effective manner. Though neither Queensland nor Western Australia was represented at this Conference, the decisions of the Conference were followed in the collection and compilation of the censuses in these colonies. This Conference resulted in considerable improvement in the degree of uniformity attained in the censuses of 1891 and in the increased fertility of the inquiries.

In 1900 another Conference of Australasian Statisticians was held in Sydney. The colonies represented were New South Wales, Victoria, Queensland, South Australia, Western Australia, Tasmania, and New Zealand. The object of the Conference was to agree to such measures as would lead to uniformity in regard to—(*a*) the date of the census ; (*b*) the subjects of inquiry ; and (*c*) the methods of compilation and tabulation. Although practical uniformity was attained in some respects in the census methods of the Australasian Colonies in 1901, yet the facts that the modes of presentation of the reports and tabular matter were not uniform, that the results of all the inquiries were not completely tabulated for all the States, and that differences arose as to interpretation of terms, rendered it difficult and in some cases impossible to obtain totals for the whole Commonwealth.

2. **New Zealand.**—Reference has already been made to the facts that New Zealand, which was first permanently settled in 1839, was separated from New South Wales in 1841, and was expressly exempted from the provisions of the New South Wales Census Act of that year. In 1852 representative government was granted in New Zealand, with a Legislative Council for the whole Colony, and six provincial district Councils, presided over by an elective superintendent. The provincial governments were abolished in 1876.

(i.) *The First Census,* 1851. So far as can be ascertained, the first general census of New Zealand was taken in 1851 under authority of an Ordinance (No. 8) of the Legislative Council. The different settlements constituted Census Districts. Resident Magistrates promulgated all information for filling in schedules, etc., and collectors were appointed by the Governor-in-Chief at a rate not exceeding ten shillings per day. No information is available as to scope of inquiry, methods of compilation, or cost of census.

In 1853 the Constitution Act came into operation, and an effort was then made to present the General Statistics of the entire Colony in one comprehensive and authorised compilation. But after considerable delay and some embarrassing difficulties it was found that the work was incomplete in several particulars. The census abstracts had their own peculiar difficulties, arising from such circumstances as the census having been taken at different times in the several Provinces, and even in the same Province in different months, on successive occasions. There was also want of uniformity in the schedules, not merely as to absence of details but also as to important branches of inquiry. Tables which could be completed for parts of the Colony, could not be completed even approximately for the whole.

(ii.) *Census of* 1858. The census taken in 1858 under authority of the "Census Act 1858," was the first to be taken throughout the whole of New Zealand on a uniform system. The machinery for the collection of the census information in each Province was virtually organised by its own Provincial Government. The divisions of Provinces under the Constitution Act were adopted as census districts. The number of districts was seven. The appointments of enumerators for the several Provinces were all made by the Governor, on the recommendation of the several superintendents. Sub-enumerators were appointed by enumerators. Masters or keepers of asylums, gaols, etc., were appointed sub-enumerators.

(*a*) *Scope of Inquiry.* The following were the subjects of inquiry in 1858:—(1) Domestic and social condition. (2) Number and descriptions of houses and buildings. (3) Names and surnames of the people. (4) Relation to heads of the households. (5) Their condition as married, single, etc. (6) Age and sex, profession or occupation. (7) Extraction and place of birth. (8) Religious denominations. (9) The date of entry into Colony: whether British subjects or aliens. (10) The number of persons able to read or write. (11) The number of acres under crops, sown grasses, etc., and the number of acres fenced. Information was also requested concerning churches, chapels, etc., their situation, the number of persons each would contain, and the number generally attending, and as to hospitals, asylums, dispensaries, etc., savings banks, friendly and benevolent societies, mechanics' institutes, and other literary or scientific institutions, manufactories, mills, works, mines and quarries. The returns shewing this information were, however, incomplete, and of little value.

(*b*) *Compilation.* The returns were compiled by enumerators from the schedules, and transmitted to the Registrar-General.

(iii.) *Census of* 1861. The census of 1861 was taken under authority of the "Census Act 1858," and the "Census Act Amendment 1860." The person responsible for the carrying out of the census was the Registrar-General. The machinery for collection of the census information in each Province was virtually the same as at the preceding census. Arrangements were made to obtain the required information, not only as formerly for each Province of the Colony, but also for each electoral district. Electoral districts as defined by the Representation Act 1860 were constituted census districts, of which there were 43. The scope of inquiry was similar to that of 1858.

(iv.) *Census of* 1864. The census of 1864 was taken on the same lines as that of 1861, the number of census districts being 45. The military settlers and defence forces in the North Island were a new addition to the population, and were included in the numbers for the Provinces, but not in those for the Electoral Districts. Officers of Regiments were appointed enumerators.

(v.) *Censuses of* 1867, 1871, 1874, *and* 1878. The census of 1867 was taken under authority of the Census Act 1867. There were 64 census districts. Special inquiries concerning uninhabited houses and houses building were introduced this year.

Schedules III. and IV. of the Census Act, 1858, were repealed by the Census Act of 1867, and the following subjects of inquiry were substituted:—Extent of holding, freehold or leasehold. Extent of land fenced. Extent and description of fencing. Extent of land broken up but not under crop. Extent of land in crop in detail. Horses, cattle, sheep, etc. Annual production of butter and cheese. All kinds of machinery and description of manufactories.

The methods adopted at the censuses of 1871 and 1874 were substantially the same as in previous years. The census of 1874 was the last of the triennial censuses which commenced in 1858. In 1878 it was thought that the Provinces were too large to admit of proper supervision and control as enumerators' districts, and the colony was accordingly subdivided into 25 districts. As the Census Act 1877 did not apply to Maoris, the census taken of them by the Native Department was quite distinct in character from that taken of the rest of the population. Since this Act was passed statistics of manufacturing industries have also been collected at each of the New Zealand censuses.

(vi.) *Censuses of* 1881, 1886, 1891, *and* 1896. The census of 1881 was the first of the quinquennial censuses which have been taken in New Zealand since that year; the system adopted in 1881 was similar to that at the previous census. The New Zealand householder's schedule contained very extensive inquiries, as, in addition to the particulars of persons

information had to be given thereon as to lands occupied and unoccupied, the nature of tenure, the amount of fencing, the numbers and description of live-stock and poultry, the annual produce of butter and cheese, and the number of threshing and reaping machines, steam ploughs, and harrows.

In 1886 a more elaborate census was taken of the Maoris than at any previous census, the tabulation being effected through the "Native Officers" according to numbers, sex, ages, principal tribes, and counties.

At the censuses of 1891 and 1896 the inquiries made embraced the same subjects as before, with the exception that in the latter year no information was required as to land cultivation and live-stock, for the reason that these matters were dealt with annually under the provisions of the Agricultural and Pastoral Statistics Act 1895. In 1896 the inquiry as to the domestic and social condition of the people covered the following matters:—(*a*) Number and description of dwellings. (*b*) Names. (*c*) Relation to head of household. (*d*) Conjugal condition. (*e*) Sex and age. (*f*) Occupation. (*g*) Nationality and birthplace. (*h*) Religion. (*i*) Naturalisation. (*j*) Sickness, accident, and infirmity, and (*k*) Education. Manufacturing statistics were also obtained on special schedules, and returns were collected under the fourth schedule of the Act of 1877, as to the number of churches, their accommodation and the attendance thereat, and as to land and building societies, mechanics' institutes, and other literary or scientific institutes. In 1896 the card system of compilation was adopted for the first time.

(vii.) *Censuses of* 1901 *and* 1906. As a result of the deliberations of the Australasian Statistical Conference held in February and March, 1900, arrangements were made for a uniform householder's schedule, and for general agreement in methods of compilation, so as to render the results for the several Colonies more fully comparable. As regards New Zealand, the most important alteration in the schedule was by way of introducing an inquiry as to length of residence of all persons not born in the colony. In 1906 the schedule was practically identical with that of 1901. In 1906 the Maori population was not enumerated by the officers who took the general census. It had been found impossible to take an account of the Maoris for one night, and the required particulars were collected during the month of April by "native agents" and magistrates of "native districts." A third count was made on special lines, viz., that of the population of the Cook and other South Sea islands, which now form part of New Zealand.

(viii.) *Population and Cost of Censuses.* The following table gives particulars of the population enumerated and the cost (exclusive of printing) of each census from 1851 to 1911, inclusive:—

New Zealand Censuses, Population Enumerated and Cost, 1851 to 1911.

Census.	Population.		Cost of Collection.			Cost of Compilation, etc.	Total Cost.	Cost per Head.
	European.	Maori.	European Census.	Maori Census.	Total.			
	No.	No.	£	£	£	£	£	d.
1851	26,707	[1]	[1]	..	[1]	[1]	[1]	[1]
1858	61,224	[1]	[1]	..	[1]	[1]	2,018	8
1861	106,315	[1]	[1]	..	[1]	[1]	3,296	7½
1864	184,131	[1]	[1]	..	[1]	[1]	6,245	8¼
1867	220,123	[1]	[1]	..	[1]	[1]	6,787	7½
1871	256,393	[1]	[1]	..	[1]	[1]	9,649	9
1874[2]	299,514	45,470	[1]	[1]	[1]	[1]	8,741	6¼
1878	414,412	43,595	[1]	106	[1]	[1]	10,084	5¼
1881	489,933	44,097	[1]	278	[1]	[1]	12,250[3]	5½
1886	578,482	41,969	10,119	573	10,692	3,959	14,651	5¾
1891	626,658	41,993	9,734	789	10,523	5,608	16,131	5¾
1896	703,360	39,854	10,216	819	11,035	5,317	16,352	5¼
1901	772,719	43,143	12,202	962	13,164	6,237	19,401	5¾
1906	888,578	47,731	14,310	1,378	15,688	8,229	23,917	6¼
1911	1,008,468	49,844	18,058	1,419	19,477	11,123	30,600	7

[1] Not available. [2] First Maori Census. [3] Approximate.

E.—BRITISH NORTH AMERICA.

1. **Canada.**—The Department of Agriculture, which has charge of the Canadian Census operations, has shewn itself far more ambitious than the Governments of other parts of the British Empire, and has modelled the census upon that of the United States. An elaborate investigation is made into the components of the general wealth and economic condition of the country. In 1901 the enumeration proper was conducted with the help of 17 chief or supervising officers for the Provinces or Territories, of 351 directing and revising commissioners and assistant commissioners for the census districts, and of 8800 enumerators for the polling divisions.

(i.) *Historical.* The first Canadian Census, and probably the first regular census of modern times, was that of the province of Quebec, then known as La Nouvelle France. This census was taken in the year 1665. From that year onward until 1754 enumerations were of frequent occurrence,no fewer than fifteen regular censuses (in addition to numerous "statements of population") being taken during that period. Censuses of " Canada" were taken in 1765 and 1784, while in " Upper Canada"—or what is now practically the province of Ontario—the census was annual from 1824 till 1842. Censuses in the different districts continued to be frequent until 1861, after which date no official enumeration took place until 1869-71. The census of 1871, the first after the passing of the British North American Act in 1867, included Ontario, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island, other parts of the Colony having enumerated their populations just previously. Since 1871 the census of Canada has been decennial, but an intermediate census was taken in the North West Territories in 1885, and in Manitoba in 1886.

(ii.) *Census Methods.* There are two important points to be noticed in connection with the Canadian Census, viz. (*a*) that the *de jure* population is enumerated (see p. 11 hereinbefore), and (*b*) that the schedules are filled up by the enumerators and not by the householders. In 1901 there were 206 census districts, and 3204 sub-districts. The enumeration in the field was required to be completed within 30 days, including time for the revision of all schedules by the Commissioners before transmission to the Census Office.

(iii.) *Tabulation and Cost.* In tabulating the returns, the Hollerith electrical tabulating machine, introduced in the United States, was employed at the 1891 and subsequent Canadian Censuses. The general object and working of this machine is described elsewhere (see pp. 15 and 16 hereinbefore). Particulars as to the cost of the census of 1901 are not available. The cost of the census of 1891 (when the population enumerated was 4,833,239) was £108,000, of which £85,000 were for the enumeration (local expenses), £20,000 for compilation and tabulation (office expenses), and the remainder represented printing and incidental expenses.

As regards the scope of the inquiry, the first census (1665) enumerated the population *de jure* by families, age, sex, conjugal condition, and professions and trades (not occupations of the whole people). The scope of the inquiry has varied in succeeding censuses ; the " professions and trades" were soon dropped, but agricultural statistics and particulars of buildings were, on the other hand, included. The scope of the censuses taken during the 18th century was not generally so wide as in the preceding censuses. During the 19th century the inquiries differed materially in their scope. The ages at first consisted of two groups only—persons under and over 16—but the number of groups was gradually increased. Birthplaces appear for the first time in 1817 (in a census of Nova Scotia), occupations reappear in 1827, in which year also the earliest reliable statistics of religion, births, marriages, deaths, education, and industries are given ; infirmities were first recorded in 1842.[1]

During more recent censuses, owing to the large amount of information which is sought to be obtained, a number of different schedules, each comprising a considerable number of questions and printed in both English and French, are used. The census of 1891 was taken with 9 schedules, comprising in all 216 questions, and the census of 1901 with 11 schedules, comprising 561 questions, as shewn in the following tabular statement :—

Canada—Schedules and Inquiries at 1901 Census.[1]

No. of Schedule.	Subject.	No. of Inquiries.	No. of Schedule.	Subject.	No. of Inquiries.
I.	Living persons	34	VI.	Live-stock and animal products	26
II.	Buildings, lands, churches, and schools	35	VII.	Agricultural values	25
III.	Deaths	15	VIII.	Manufacturers	67
IV.	Farmlands, fruits, and plantations	37	IX.	Forest products and furs ..	51
V.	Field products	37	X.	Fisheries	130
			XI.	Mines..	104

[1] See Census Report, Canada, 1901, Vol. I., p. vii.

Besides the foregoing, there were used at the 1901 census of Canada special forms for obtaining records of (*a*) persons temporarily absent, (*b*) persons such as boarders and lodgers, not present when the enumerator called and of whom particulars could not be given by the head of the household, (*c*) cheese and butter products, and (*d*) manufactures of clay products. The schedules contained inquiries to ascertain for every trade, occupation, and profession the time each person was employed and the amount of his earnings, and for all children of school age the time at school in the year.

2. **Newfoundland and Labrador.**—In this Colony the first complete census appears to have been taken in 1857. Later censuses were taken in 1869, 1874, 1884, and 1891, and since the last of these dates the census has been taken decennially.

[1] See Modes of Census-taking. Hooker, J.R.S.S., Vol. LVII., p. 337.

In many respects the census of Newfoundland resembles that of Canada, and deals not only with persons living, but also with births, marriages, and deaths (for the year preceding that in which the census is taken), fisheries, buildings, ships and boats, primary production, mines and minerals, and mills and factories.

The census of Labrador is not simultaneous. A large number of the population can be found at their homes only during the winter season—a time when it is impossible to take the census owing to difficulties of communication. In the summer these people are engaged in the fisheries off the coast—but the enumerator counts them as resident in their place of abode during the winter. Special provision has to be made to avoid duplication of entry, and in most cases the schedules are retained until December, when most of the people have returned home, and the sheets can be checked.[1] The number enumerated, therefore, appears to be a compromise between the *de jure* and *de facto* population.

F.—WEST INDIES AND BRITISH SOUTH AMERICA.

1. **General.**—In the West Indies (with which may be grouped British Guiana, British Honduras, and the Bermudas) the particulars collected and the arrangement made for the censuses are similar to those in other British Possessions. The principal feature of note is the inquiry which is usually made as to colour and native population.

2. **Bahama Islands.**—In these islands there has been a decennial census since the year 1891. Particulars are collected with regard to sex, age, conjugal condition, profession or occupation, nationality, infirmities, and education, and a special inquiry is made as to the number of people vaccinated.[2]

3. **British Honduras.**—In this Colony one quarter of the schedules were printed in Spanish at both the 1891 and 1901 censuses. As regards the degree of education, the return is more clearly defined than usual with reference to writing, persons being required to state whether they could write their names.[3]

4. **Other British Possessions.**—In other British possessions (including Bermudas, Barbados, Jamaica, the Leeward Islands, Trinidad, and British Guiana) censuses were taken in 1891 and 1901. The particulars collected and the arrangements made were much the same as elsewhere, but in the smaller colonies the returns comprise only a few sheets. The principal points calling for remark are the inquiries as to colour and Indian population.[4]

SECTION 3.—FOREIGN COUNTRIES.

A.—EUROPE.

1. **General.**—The censuses of most European countries are now carried out through the agency of the local authorities, the chief executive officers of which are in many countries also officers of the Central Government.[5] The work of the census is ordinarily under the control of the Minister of the Interior, or some other responsible Minister, by whom explicit instructions are issued to the Local Government officers as to their duties and functions, and as to the methods of enumeration to be adopted. By these means the work of census-taking is greatly facilitated, and in many countries the cost of the census is considerably reduced by reason of the fact that the work is carried out by the Local Government authorities without extra pay or for a small extra allowance. The work of tabulation is also in many cases carried out primarily by the local authorities for their respective districts, and the results forwarded to the central office, where the final tables are compiled.

In France, for example, the direction of the census is under the control of the Minister of the Interior, by whom instructions and notes are issued to the Prefects of the various Departments. The prefect has charge of the census in his Department, which is divided into arrondissements, generally under the control of sub-prefects; one or more arrondissements form a commune or municipality, of which the mayor is the representative, as well as being the agent of the Central Government. Similarly in Prussia the Local Government districts are Provinces, Government Districts (*Regierungsbezirke*), urban circles (*Stadtkreise*), and rural circles (*Landkreise*). Similarly in Switzerland there are cantons, districts (*Amtsbezirke*), and communes, and in Belgium, provinces, communes and arrondissements.

[1] See Census Report, Newfoundland, 1901, p. v. [2] See Census Report of Bahama Islands, 1901, p. 7. [3] See Census Report, British Honduras, 1901, p. 11. [4] See Hooker, "Modes of Census-taking in the British Dominions." J.R.S.S., Vol LVII., pp. 341-2. [5] Some description of the systems of local government in force on the Continent of Europe is given in the Official Year Book of the Commonwealth of Australia, No. 2 (1909), p. 978-80.

The individual " schedule " (see p. 13) has been very generally adopted on the Continent of Europe, the work of tabulation being carried out (without transcription) on the " card system " (see p. 15) by the use of these schedules. In many countries both the population *de facto* and the population *de jure* are enumerated.

2. **Spain.**—A census is said to have been taken in the Kingdom of Aragon as early as the 14th century. In the following century an enumeration of the people of Castille was ordered by the Crown, and a report of this enumeration printed at Madrid.[1] In the eighteenth century two general censuses of Spain were taken and reports thereof were published in 1787 and 1801 respectively. In later years census-taking in Spain has proceeded irregularly, the next enumeration of which there is any record being made in the year 1857. This was followed by censuses in 1860, 1877, 1887, 1897, and 1900.

3. **Germany.**—With the exception of the enumerations said to have taken place in Spain in the 14th and 15th centuries, just referred to, the earliest development of the modern census in Europe appears to have taken place in districts which are now part of the German Empire. These early enumerations have already been referred to. (See Chapter I., Section 4, p. 5.)

In Prussia a central bureau was established in 1805, through which population reports were obtained; a yearly census was taken from 1815 until 1822, and after that year triennial censuses were taken until the year 1867. In 1843 several of the States agreed to take a synchronous census on a uniform basis, and in 1852 other States entered into the agreement. The first census for the whole of the German Empire was taken in the year of its foundation, viz., in 1871,[2] and the second in 1875. Since that date the German Census has been taken quinquennially in the fifth and tenth year of each decade. An occupation census of Germany was taken in 1907.

4. **Sweden.**—The " Table Commission," which was charged with the duty of collecting through the clergy periodical returns of population and annual returns of births, marriages, and deaths, was founded in 1748, and the superintendence of the enumerations of the people was entrusted to that body. A census was taken in 1749,[3] and was followed by seven triennial censuses during the period from 1757 to 1775, and after that by a quinquennial census until 1860, and by a decennial census from the last-mentioned year up to the present time.

5. **France.**—In France official estimates of the population were made in 1700, and again in 1784, the latter being founded on the mean annual number of births. A " census of hearths" was taken by the Duc d'Argenson in 1753.[4] A regular census was ordered in 1791, but it was not accomplished until ten years later, the delay being due to the Revolution. The second census was taken in 1806, the third in 1821, and the fourth in 1831. An estimate was prepared for the year 1816, based on the figures of the 1806 census, and the records of births and deaths which had occurred in the interval. From the year 1831 onwards a census has been taken quinquennially with the single exception that, owing to the Franco-Prussian war, the census which should have been taken in 1871 was deferred until 1872.

6. **Belgium.**—Special provision was made for the collection of statistics in Belgium in 1831, and in 1856 a law was passed providing that a general census of the people should be taken every ten years, and indicating the method of enumeration to be adopted. In 1880 a further law was passed providing that the census should be taken decennially in the tenth year of each decade. An enumeration is made both of " *la population de fait* " and " *la population de droit.*" The " *bulletin de menage* " forms the basis of the schedule, which is carried out by the Local Government authorities with the aid of " *agents recenseurs* " remunerated by the Government.[5]

7. **Norway.**—The Norwegian census was instituted as early as 1769. The second census was taken in 1801, the third in 1815, the fourth in 1825, and the fifth in 1835. It is now taken decennially in the tenth year of each decade.

8. **Switzerland.**—The original constitution of the Swiss Federation required a census once every twenty years, but in 1860 a Federal law was passed prescribing a decennial enumeration. This law, however, does not appear to have been strictly complied with, as the census of 1880 was followed by one in 1888, and this latter by the census of 1900.

9. **Italy.**—One of the most complete censuses of any which had up to that time been executed in Europe was that taken in Sardinia in 1838. A Bureau of Statistics was created in 1860, and the first regular census of Italy was taken in 1861, succeeded by further censuses in 1871 and 1881. A gap of twenty years then occurred, the next census being that of 1901.

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[1] See Review of the Statistics of Spain to 1857. F. Hendriks, Journal of the Royal Statistical Society, Vol. XXIII., p. 148. [2] See Statistik des Deutschen Reichs, Band 150. Die Volkszählung, 1900, Erster Teil, pp. 1-2. [3] See On the Vital Statistics of Sweden, from 1749 to 1855, by F. Hendriks. Journal of the Royal Statistical Society, Vol. XXV., p. 111. [4] See Studies in Statistics, Longstaff, p. 193. [5] See Statistique de la Belgique, Recensement General, 1900, p. iv.

10. **Austria.**—Prior to 1851 no census of Austria had been taken, the only population returns obtainable being those connected with military conscription. The first complete census was taken in 1869, and was followed by the census of 1880. Since the latter date the census has been taken decennially in the last year of the decade.

11. **Greece** —The first census of modern Greece is stated to have taken place in 1836, and to have been succeeded by annual enumerations until the year 1845. From that year onwards censuses appear to have been taken at irregular intervals, the most recent being those of 1879, 1889, 1896, and 1907.

12. **Russia.**—Partial censuses of the population for purposes of revenue and military conscription are said to have been taken in Russia as early as the year 1700, and at irregular intervals throughout the eighteenth century, but it appears that these enumerations did not include females. More complete *revisions* were taken in 1812, 1815, 1834, 1850, and thenceforward at somewhat irregular intervals. The first and only complete and regular census of the Russian Empire was taken in 1897.

13. **Netherlands.**—The first census of the Netherlands was taken in 1829, and has been succeeded by censuses taken decennially.

B.—AMERICA.

1. **The United States.**—Provision for a decennial census in the United States of America was contained in the Constitution of 1787, the first enumeration to be made " within three years after the first meeting of the Congress of the United States." This provision was rendered necessary for the purpose of equitably allocating the representation of the States in, and their financial obligations to, the Federal Government. The first census was taken in the year 1790 under the superintendence of the marshals of the several judicial districts, the returns all being referred to the 1st August of that year, though the work of canvassing was extended over a considerable period. The first census comprised six questions as to population, distinguishing free persons, their sex and colour, and the number of free males 16 years of age and over.[1] Subsequent censuses have been taken decennially, the thirteenth being taken for the 13th April, 1910. Incidentally it may be here mentioned that Elkanah Watson predicted in 1815 the population of the United States very accurately up to 1860. From that time on the prediction is increasingly in error.[2]

(i.) *Scope of the Census.* Beginning with six simple questions relating to population, the amount and scope of the information secured at the census of the United States has increased to such an extent that it has become too extensive to be tabulated by hand within a reasonable period. The peculiar features by which this census has come to differ from that of other countries are probably attributable to the fact that no special power is granted under the Constitution to the Federal Government to undertake general statistical inquiries. The provision for a decennial census has, therefore, been taken advantage of to secure much statistical information which ordinarily is not connected with a census. The first such enlargement of the scope of the census was in 1810, when particulars of manufacturing establishments were collected. In 1840 inquiries respecting schools were incorporated. It was at the seventh census in 1850, however, that the main enlargement was effected. By an Act passed in that year, the census was extended to cover the name of every free person, the number of dwellings and families, the value of real estate owned, birthplace, number of persons married within the year, number of paupers and convicts, mortality, and social statistics ; the inquiries concerning population, agriculture, and manufactures were systematised, and a separate schedule was used for slaves. The census of 1850 marked the beginning of scientific census inquiry in the United States and in consequence the census of that year is known as the first modern census of that country. By an Act of 1902 the Census Office was made a permanent bureau of the Government. At the thirteenth census of the United States, taken on the 13th April, 1910, as at preceding censuses, a number of different schedules was used. The advance schedule of population was filled in prior to the date of the census by the head of the family; the schedule proper, filled in by the enumerator, contained inquiries as to name, relationship to head of family, sex, colour or race, age, conjugal condition, number of years married, number of children born and living (referred to mothers only), birthplace (of each person and of his father and mother), date of immigration, naturalisation, language, occupation, whether out of work at date of census and number of weeks out of work during 1909, education, ownership of home, whether a survivor of the Union or Confederate, Army or Navy, and whether blind, deaf, or dumb. A special individual slip was provided for persons absent during census day. Special schedules were used for hotels, for families absent from their usual places of abode on census day, for agriculture (32 questions), for slaughterhouses, for Indians on reservations, and for domestic animals not on farms or ranges. The census of mines, quarries, petroleum, and natural gas comprised 38 different schedules, while 56 schedules were used for the census of manufactures.

[1] See American Census-Taking, The Hon. W. R. Merriman, Director of Census, Department of Commerce and Labor, 1903, p. 7. [2] See Encyclopaedia Britannica, 9th Ed., Vol. XXIII., p. 818.

(ii.) *Method of Enumeration.* The method of enumeration in the United States has invariably been that of entry of particulars by the canvassing enumerator after inquiries made either *viva voce* or by post, or by advance schedules. In 1850 the supervision of the census was committed to the newly created Department of the Interior. In 1880 a radical change was effected ; up to this time the work of enumeration had been entrusted to the marshals, but by an Act passed in that year a new body of census officials, known as supervisors, was created. The supervisor's district was divided into enumeration districts, each of which was assigned to an enumerator or collector.

(iii.) *Tabulation.* At the first four censuses of the United States very little tabulation was required to be carried out, the returns of the marshals being transmitted direct to the printer. By 1870, however, the population of the country and the scope of the inquiry had extended to such a degree that it was found necessary to obtain mechanical assistance in the work of tabulation. At that time it became evident that a point would be reached before many decades had passed when complete tabulation within the census period would be actually impossible without mechanical assistance. At the census of 1870 and 1880, therefore, the Seaton tabulating machine was used. This machine was composed of parallel rollers, by which the blank tabulating columns were brought into close proximity so as to facilitate the work of the clerk. In 1890 the Hollerith electrical tabulating machine was adopted, and this machine was used also at the succeeding census of the United States, viz., in 1900. A brief description of the Hollerith machine has already been given (see p. 15 *ante*). At the census of 1900 also, automatic electric sorters were first adopted, and their use was greatly extended in connection with the census of 1910. A brief description of these automatic sorters has also been given above (see p. 16 *ante*). For the 1910 census a new mechanism was employed.

The total number of persons employed in the twelfth (1900) census of the United States was 59,373 ; the total number of schedules received was 7,296,925, and of cards punched was 215,893,174. The population enumerated was 76,085,794, and the total cost £2,439,000, or 7.69 pence per capita.

CHAPTER IV.

CENSUS-TAKING IN AUSTRALIA.

SECTION 1.—INTRODUCTION.

1. **General.**—The historical development of the census in Australia has been briefly referred to hereinbefore (see Chapter III., Section 2 D). It is proposed to deal with this matter more fully in the present Chapter.

2. **Dates of Censuses in Australia.**—The first regular census in Australia was that of New South Wales, in November, 1828. The dates on which censuses have been taken in the several States, and the populations enumerated thereat are shewn in the following tabular statement :—

Australian Censuses.

Census Year.	Population Enumerated (exclusive of Full-blooded Aboriginals).						
	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Commonwealth. (Total)
1828	(Nov.) 36,598	..	..	..	..	..	..
1833	(2nd Sept.) 60,794	..	..	..	..	..	..
1836	(2nd Sept.) 77,096	..	..	..	..	..	..
1841	(2nd March) 130,856	..	..	..	..	(27th Sept.)[1] 50,216	..
1844	..	..	..	(26th Feb.) 17,366	..	..	..
1846	(2nd March) 189,609	..	..	(26th Feb.) 22,390	..	..	..
1848	..	..	..	..	(10th Oct.) 4,622	(1st Jan.) 70,164	..
1851	(1st Mar.)[2] 268,344	..	..	(1st Jan.) 63,700	..	(1st March) 70,130	..
1854	..	(26th April)[1] 234,298	..	..	(30th Sept.) 11,743	..	..
1855	..	..	..	(31st March) 85,821	..	..	..
1856	(1st March) 269,722	..	..	..	..	..	..
1857	..	(29th Mar.) 408,998	..	..	..	(31st Mar.) 81,492	..
1859	..	..	..	..	(31st Dec.) 14,837	..	..
1861	(7th April) 350,860	(7th April) 538,628	(7th April)[1] 30,059	(7th April) 126,830	..	(7th April) 89,977	..
1864	..	..	(1st Jan.) 61,467	..	..	..	..
1866	..	..	..	(26th Mar.) 163,452	..	..	..
1868	..	..	(2nd Mar.) 99,901	..	..	..	..
1870	..	..	..	..	(31st Mar.) 24,785	(7th Feb.) 99,328	..
1871	(2nd April) 502,998	(2nd April) 730,198	(1st Sept.) 120,104	(2nd April) 185,626	..	..	..
1876	..	..	(1st May) 173,283	(26th Mar.) 213,271	..	..	..
1881[3]	749,825	861,566	213,525	279,865	29,708	115,705	2,250,194
1886	..	..	(1st May) 322,853	..	..	..	..
1891[4]	1,123,954	1,139,840	393,718	320,431	49,782	146,667	3,174,392
1901[5]	1,354,846	1,201,070	498,129	363,157	184,124	172,475	3,773,801
1911[6]	1,646,734 [7] 1,714	1,315,551	605,813	408,558 [8] 3,310	282,114	191,211	[7]4,455,005

[1] Previously included with New South Wales. [2] Including Port Phillip District, which afterwards became the Colony of Victoria. [3] 3rd April. [4] 5th April. [5] 31st March. [6] 3rd April. [7] Federal Territory previously included with New South Wales. [8] Northern Territory previously included with South Australia.

3. **Uniformity in Census Methods.**— The desirability of obtaining uniformity throughout the British Empire in census matters has long been recognised by those responsible for carrying out the censuses of the several Australian Colonies, and various efforts have from time to time been made in that direction. The degree of uniformity which it is possible to attain is, however, limited by various extraneous considerations. The conditions of progress in the Commonwealth are not, for instance, identical with those in the United Kingdom, and an absolutely uniform census of the British Empire, embracing such diverse populations, conditions, and characteristics as those of South Africa, India, Canada, and Australia, could only be possible at the expense of completeness in many parts of the Empire.

(i.) *The Question of a Simultaneous Census for the British Empire.* Again, as to the desirability of attempting to carry out simultaneously a census for the whole Empire, it is of course a matter of impossibility to select any special date which would not at some time, or in some place, be unsuitable or inconvenient. Though the date now ordinarily fixed for the taking of the census, viz., about the first Sunday in the month of April, is probably the most favourable in the British Isles owing to climatic and other conditions, serious difficulties have occurred in taking the census at that time in Australia. For example, at the census of 1891, and again in 1911, the collectors in Queensland were greatly inconvenienced in carrying out their duties by the heavy rains which occurred and the boggy nature of the country, while at the same time the collectors in Western Australia had in some cases to contend against the effects of a drought and scarcity of feed for their horses. Again, the census of India was taken on the night of 1st March, 1901, instead of on the 31st March, the date originally chosen by the Imperial authorities. The former date was selected partly with reference to the age of the moon, and partly with the object of avoiding as far as possible the anniversaries of great religious festivals. Beyond the somewhat sentimental interest which may attach to a statement specifying the whole population of the British Empire on a given day, the possible advantages of a simultaneous census would appear to be outweighed by the possible disadvantages of the time fixed for census day, at any rate from an Australian point of view. It would appear to be preferable for each part of the Empire to make its own arrangements concerning the date of its census. Such dates should, however, be as near to each other as circumstances will permit.

(ii.) *Uniformity in Other Matters.* As regards certain subjects upon which comparisons can be made, there would seem to be no reason why the classification adopted should not be similar throughout practically the whole Empire. The number, sex, ages, conjugal condition, birthplace, and religion of the people could all form the object of an investigation on Imperial lines. The inquiry as to " Nationality " would probably present more difficulties, since the legislation of different Governments varies on this subject, while in the case of " Occupations " and " Infirmities," so many other considerations require to be taken into account that comparisons may at times be fallacious.

(iii.) *Dates of Census Conferences in Australia.* There have been two Census Conferences held in Australia, viz., (1) one held at Hobart in March, 1890, and (2) the other held at Sydney in February, 1900. The efforts towards obtaining uniformity in census matters in Australia have chiefly been made in three directions, namely, (*a*) uniformity as to date of census, (*b*) uniformity as to scope of the inquiry made by the schedules, and (*c*) uniformity as to tabulation and presentation of results.

4. **The Census Conference, 1890.**—The early censuses of the Australian Colonies were based, in all essential features, upon the methods adopted in England, and though this had the good effect of conducing towards uniformity, it also resulted in the defects of English methods being to some extent reproduced in Australia. The first simultaneous census of the British Empire was that taken on the 3rd April, 1881. This date was fixed by the Imperial Government for the United Kingdom, India, and the Crown Settlements, and was assented to by the self-governing Colonies and Dominions. At the later censuses of the Australian Colonies the English system was followed as closely as local circumstances would permit, but less attention was paid than in the United Kingdom to some of the heads of inquiry, while considerably more was paid under other heads. The scheme of tabulation also generally agreed closely with that of England and Wales.

In course of time, defects in the methods of census inquiry became evident, more especially as regards classification and tabulation, and the sterility of the inquiry in respect of important economic conditions. With the object of remedying these defects, of discussing reforms, and for securing greater uniformity in methods of inquiry and in the final statistical tabulation of results, it was decided, in 1890, to hold a Conference of Australasian Statisticians.

(i.) *The Colonial Conference,* 1887. In the meantime the subject of the census of the British Empire had been considered incidentally at the Colonial Conference held in London in April, 1887. It was then stated that in July, 1886, the Registrar-General of Ireland had called attention to the want of information on the subject of census statistics, and had made proposals for a simultaneous census of the Empire under the direction of representatives of the United Kingdom, India, and the Colonies; also that the Royal Colonial Institute and the Imperial Federation League had made representations to the Colonial Office on the same subject. It

was further stated that the Registrar-General of England had reported generally against these proposals, and had expressed himself of the opinion that it was best to leave to each individual part of the Empire the choice of subjects of inquiry which should be included in its census, and the form in which the information, when collected, should be tabulated, so as to meet its own special conditions and requirements. The matter was discussed by the members of the Conference, but no decision was arrived at, the general feeling appearing to be that the census of the Empire should be taken at a given date, that uniformity of treatment should be secured when possible, and that this could best be obtained by the transmission of suggestions from the Imperial Government to the Colonial Governments two years before the date at which such census should be taken.

(ii.) *First Australian Census Conference*, 1890. In pursuance of the outcome of the discussion just referred to, a circular despatch, dated the 28th February, 1889, was forwarded to the Governors of the respective Colonies, with a request that certain suggestions, enumerated by the Registrar-General of England, should be considered, and that the Colonial Office should be informed as to whether these suggestions met with the concurrence of the Colonial Governments. Early in the year 1890 it was decided by the Governments of several Australasian Colonies to hold a Census Conference in Hobart in March, 1890. The Conference was accordingly held, the Colonies represented being New South Wales, Victoria, South Australia, Tasmania, and New Zealand. Queensland, Western Australia, and Fiji were not represented, but expressed themselves generally as willing to fall in with the arrangements recommended by the Conference so far as circumstances might allow. The results of the Conference may be summarised as follows :—

(*a*) The subjects of inquiry and the principles upon which the householder's schedule should be framed were agreed upon, and a model schedule based thereon was drawn up and adopted.

(*b*) Forms for classifying the census returns under the several heads of inquiry were decided upon, due regard being paid to the suggestions made by the Registrar-General of England as specified in the despatch of the 28th February, 1889, and

(*c*) Many minor points calculated to promote uniformity in the tabular statements published in the several Colonies were discussed and settled. As a result of this Conference the degree of uniformity attained in the censuses of 1891 of the Australasian Colonies was much greater than had previously been reached.

5. **The Census Conference, 1900.** At a meeting of the Premiers of the several Australasian Colonies held at Sydney in January, 1900, it was decided that a Conference of Statisticians should be held to arrange for the collection and compilation of the Australasian Census of 1901 upon a uniform basis, to be mutually agreed upon. In compliance with this decision a Conference took place in Sydney on the 26th February, 1900, and following days. The Colonies represented were—New South Wales, Victoria, Queensland, South Australia, Western Australia, Tasmania, and New Zealand. The business of the Conference consisted in discussing and agreeing to such measures as would lead to uniformity throughout Australasia in the following particulars :—(i.) The date of the census ; (ii.) the scope of the inquiry ; and (iii.) the methods of compiling the results.

(i.) *The Date of the Census.* The practice in the United Kingdom and also on recent occasions in Australia had been to take the census on the night of the first Sunday in April ; but as, on the occasion of the census of 1901, this date would fall on Easter Sunday, and the population would, consequently, be very much displaced owing to the holidays, it was agreed that to hold the census on that date would be very ill-advised. Eventually it was decided to fix the census for the 28th April, by which date it was considered that sufficient time would have elapsed after Easter for holiday-makers to have returned to their homes. This decision was, however, afterwards overruled by the Premiers, who came to the conclusion that, notwithstanding the recognised local objections, the census should be taken on the 31st March, the date which, on the recommendation of the Royal Statistical Society, had been fixed by the Imperial authorities for taking the census in the United Kingdom. The accuracy of the general result was probably not seriously prejudiced by the adoption of this date.

(ii.) *The Scope of the Inquiry.* Several suggestions were offered for adding to the number of heads of inquiry contained in the schedule, as adopted at the Conference of 1890; but as the majority of the members were of opinion that to overburden the schedule would probably prejudice the accuracy of the returns, only one addition was made, viz., that when a person was not born in the Colony in which he was enumerated, he was asked to state the length of time he had resided therein. The making of inquiries as to land, stock, and crops was left optional. The subjects of inquiry ultimately decided upon, thirteen in number, were as follows :—Name sex, age, conjugal condition, relation to head of household, occupation, sickness and infirmity, birthplace, length of residence in Colony, religion, education, materials of houses, and number of rooms in houses. It was decided that any person having an objection to furnish a reply as to his or her religious belief should be allowed to insert the word " object " instead of replying

to the inquiry. It was also agreed that, in addition to the above heads of inquiry, it should be optional for any Colony to obtain particulars with regard to—(*a*) Sunday-school teachers; (*b*) assessed annual value of dwellings and how occupied; and (*c*) year of marriage, and number of children, living or dead. An additional column was subsequently, with the concurrence of the other statisticians, included in the Western Australian schedule, asking for the name and place of the college or school attended by each child receiving instruction.

(iii.) *Methods of Compilation and Tabulation.* The remaining duties of the Conference were to arrange a uniform method dealing with the classification, compilation, and tabulation of the information, so as to admit of direct comparisons being made between the results of the various Colonies. With this end in view certain rules, for the classification of particulars concerning which it was likely that differences of opinion might exist, were adopted, while a revised classification of occupations was approved.

6. **Results of Conferences.**—Briefly, the results of the Census Conferences of 1890 and 1900 were to bring about the adoption of a uniform procedure by which the census authorities throughout Australia agreed to institute the same inquiries on the same date, and to present the results in the various reports drawn up by them, as nearly as practicable, in the same manner. Although uniformity in the form of the schedule was attained, minor differences arose as to the interpretation of terms. It should be noted also that the method of presentation of the results differed considerably in the several colonies, that the results of all the inquiries were not tabulated for all the States, and that there was no co-ordinating authority to bring the results together so as to form a total for Australia. This, of course, was regrettable. At the census of 1911, the first census taken under the *ægis* of the Commonwealth Government, the control of the census of the whole of Australia was centralised in the Commonwealth Statistician, thus permitting of practically absolute uniformity in census methods being attained throughout the Commonwealth.

The advantages to be derived from making the task of regularly enumerating the people a Federal one are obvious. Only by means of centralised control was it possible to secure all the essential conditions for the presentation of thoroughly homogeneous statistics. Under such control it has been easy to obtain (*a*) substantial identity in the method of collection, (*b*) identity of categories under which the returns are to be tabulated, and (*c*) uniformity in the interpretation of terms and in the scheme of presenting the facts. The Commonwealth Census of 1911, apart from being more reliable by reason of this homogeneity, is of greater utility than preceding censuses, inasmuch as the complete totals given for all the six States are directly comparable in every way.

7. **The Progressive Development of the Schedules.**—The tabular statement on page 40 shews the progressive development of the census schedules in each of the States since their first censuses. The several States—New South Wales, Victoria, Queensland, South Australia, Western Australia, and Tasmania—are indicated by the letters "N," "V," "Q," "S," "W," and "T" respectively, and in each case in which any of the specified subjects of inquiry was instituted at a census in any of the States, the corresponding letter for that State is inserted in the table. When a subject of inquiry has been instituted in the censuses of all the States, the letter " A " is inserted.

It should be pointed out that the subjects of inquiry indicated are only those of a *personal* nature, and those referring to *habitations*. At various censuses additional inquiries were included as to land, live-stock, crops, agricultural implements, etc. Furthermore, the table is intended to shew only *subjects* of inquiry, and not the *scope* of the inquiries. Although, as pointed out in the preceding parts of this sub-section, practical uniformity in the form of the schedule was attained at the more recent censuses of the several States, yet both the nature and form of many of the inquiries have in the past varied considerably, both as among the several States and in the individual States themselves. It would not be possible in a table of convenient size to shew the precise nature and scope of the inquiries made at these censuses.

As regards the subjects of inquiry at the Commonwealth Census of 1911, twenty of these subjects are identical with those adopted by all the States at the last census. The only subject of inquiry omitted at the Commonwealth Census was that relating to " insanity or idiocy." Of the remaining subjects, one, viz., that relating to number of children and duration of marriage, was included in part, in so far as it related to children born to present marriage, in New South Wales and Victoria, but was extended at the Commonwealth Census to include a separate enquiry as to number of children from previous marriage. In addition the Commonwealth schedule included queries as to the following matters :—(*a*) In relation to buildings—(i.) the nature of the building, (ii.) whether the occupier is the owner, tenant, or rent purchaser, (iii.) the amount of weekly rent payable or rental value per week; and (*b*) in relation to persons—(i.) the race to which they belong, and (ii.) the date of their arrival in Australia.

PROGRESSIVE DEVELOPMENT OF AUSTRALIAN CENSUS SCHEDULES.

Year.	Name.	Age.	Sex.	Relationship to Head of Family.	Civil Condition.	Conjugal Condition.	No. of Children born to present Marriage and Duration of Marriage	Birthplace.	Nationality.	Length of Residence in Country	Habitations.					Religion.	Sickness or Infirmities.		Occupation.		Education.		
											Occupied.	Unoccupied.	Being Built.	Materials.	No of Rooms.		Blindness and Deafmutism.	Insanity or Idiocy.	Nature.	Grade.	Read and Write.	Attend School.	University.
1828	N	N	N		N					N	N					N							
1833	N	N	N		N					N						N							
1836	N	N	N		N					N						N							
1841	N T	N T	N T		N T	N T					N T	N T	T	N T		N T			N T				
1844	S	S	S			S					S					S			S				
1846	N S	N S	N S		N	N S		N			S					S			S				
1848	WT	WT	WT		T	T					T	T	T	T		N S			N S	N			
1851	N S T	N S T	N S T		N T	N S T		N	S	S	N S T	N T	T	N T		N T	S		N S T	N			
1854	V W	V W	V W		W	V W				V	V	V		V		V W			V W		V		
1855	S	S	S	S		S			S	S	S						S		S				
1856	N	N	N			N		N			N	N	N	N		N			N			N	
1857	V T	V T	V T	V	T	V T		V			V T	V T	V T	V T	V	V T			V T	V	N		
1859	W	W	W		W	W		W			W	W	W			W			W			V	V
1861	NVQS T	NVQS T	NVQS T	VQS T		NVQS T		NVQS T	V	S	NVQS T	VQ T	VQ T	NVQ T	NV	NVQS T	NV S		NVQS T	V	NVQS T	Q	V T
1864	Q	Q	Q	Q		Q		Q			Q	Q	Q	Q		Q			Q		Q	Q	
1866	S	S	S	S		S		S		S	S												
1868	Q	Q	Q	Q		Q		Q			Q	Q	Q	Q		S	S		S		S		
1870	WT	WT	WT	WT	W	WT		WT			WT	WT	WT	WT	W	WT			Q		Q	Q	
1871	NVQS	NVQS	NVQS	VQS		NVQS		NVQS	VQ	S	NVQS	NVQ	VQ	NVQ	V	NVQS	NV S	V	NVQS	V	NVQS	Q	VQ
1876	QS	QS	QS	QS		QS		QS	Q	S	QS	Q	Q	Q		Q	S		QS		QS	Q	Q
1881	A	A	A	A	W	A		A	A	SW	A	A	VQSWT	A	NV SWT	A	NV SW	NV SWT	A		A	A	A
1886	Q	Q	Q	Q		Q		Q	Q		Q	Q	Q	Q		Q			Q		Q	Q	Q
1891	A	A	A	A		A		A	A		A	A	A	A	A	A	A	A	A	A	A	A	A
1901	A	A	A	A		A	NV	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
1911 [1]	A	A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	A [2]	A	A	A	A	A

[1] First Commonwealth Census. In addition to the particulars specified, the schedule included the following :—(*a*) In relation to buildings—(i.) the nature of the building, (ii.) whether the occupier is the owner, tenant, or rent purchaser, (iii.) the amount of weekly rent payable or rental value per week ; (*b*) in relation to persons—(i.) the race to which they belong, (ii.) the number of their children living or dead from previous marriage, (iii.) the date of their arrival in Australia. [2] Inquiry was made as to the descriptive name of each sickness and the cause of each accident.

8. **Cost of Censuses.**—The following table shews, so far as particulars are available, the cost of the censuses of Australia from 1871 to 1901 :—

Australia.—Cost of Censuses, 1871 to 1901.

Particulars	N.S.W.	Victoria.	Queensland.	S. Aust.	W. Aust.	Tasmania.	C'wealth.
			TOTAL COST.				
	£	£	£	£	£	£	£
1871	15,930	11,460[1]	8,649[2]	..[3]	..[3]	2,071[4]	..[3]
1881	21,318	12,432[1]	12,149	..[3]	..[3]	3,015	..[3]
1891	34,290	27,714	21,935	13,679	..[3]	1,820[5]	..[3]
1901	35,913	31,678	26,191	16,071	11,993	3,767	125,613
			COST PER PERSON ENUMERATED.				
	d.	d.	d.	d.	d	d.	d.
1871	7.58	3.76[1]	11.98[2]	..[3]	..[3]	4.88	..[3]
1881	6.81	3.46[1]	13.74	..[3]	..[3]	6.23	..[3]
1891	7.27	5.83	13.37	10.24	..[3]	2.98[5]	..[3]
1901	6.36	6.33	12.62	10.62	15·63	5.24	7.99

[1] Cost of collection only, *i.e.*, amounts paid to enumerators and collectors. Further particulars not available. [2] In 1876. [3] Not available. [4] Census of 1870. Exclusive of amounts paid to enumerators, for which particulars are not available. [5] Exclusive of cost of tabulation and general expenses, for which particulars are not available.

These figures in all cases understate the actual cost of the Census, owing to the exclusion in most instances of the cost of printing, and preparation of plans, as well as rental value of premises occupied by Census staff.

SECTION 2.—NEW SOUTH WALES.

1. **Musters and Enumerations in Early Days.**—As already stated, census returns in one form or another have existed in Australia ever since the first settlement was established in 1788, the early enumerations being called " musters." Their main object appears to have been that of furnishing a basis upon which the probable victualling and other requirements of the infant colony could be estimated. During the early days of colonisation, the " musters " were of frequent occurrence, but the actual results of only a few have been preserved. They were carried out by requiring the inhabitants to attend on a certain day at a specified place in their respective districts. The results obtained by such means do not appear to have been very reliable, as frequent references either to the number of persons estimated to have been unaccounted for or to the number of unrecorded deaths are made in the existing reports dealing with them, while successive enumerations recorded by the same individual in some cases appear to be inconsistent. The earliest "musters" were taken by the Governor himself, assisted by the Deputy Commissary-General ; subsequently this duty was delegated to the Lieutenant-Governor ; and still later to the Magistrates of the different mustering districts. The earliest of the "musters" was held in 1788, soon after the " First Fleet " arrived in Sydney Cove, and they were repeated, probably at first frequently, perhaps weekly, and afterwards at intervals of not more than a year, from 1788 to 1825. An interval of three years then occurred, followed by the census of 1828, which may be considered as the first regular census taken in Australia. A complete account of the early " musters," so far as records have been preserved, may be found in the Statistician's Report on the Eleventh Census (1891) of New South Wales.

The number of persons debarked from the " First Fleet " in January, 1788, was probably 1035. By the end of the year 1825 the estimated population of Australia (including Tasmania) had increased to 52,505.

2. **First Regular Census,** 1828.—In connection with the first regular census in Australia, viz., that taken in New South Wales in November 1828, the Governor and Council of New South Wales passed an Act (9 Geo. IV., No. 4), which made provision for ascertaining the number, names, age-groups, sex, civil condition of the inhabitants of the Colony, and also the number of horses, horned cattle and sheep, and the area of land located, cleared and cultivated. The census statement of 1828 gives also some particulars regarding the nominal religious professions of the population. as well as information as to habitations in the town of Sydney. The resident magistrates were required to superintend the work of collection in their respective districts, and a separate return had to be filled up for each householder by the constables or other competent persons appointed by the magistrates. The number of persons enumerated in New South Wales in November, 1828, was 36,598, but this was exclusive of the military establishment, numbering about 1400,

and of an estimated number of 2000 " runaway convicts in the bush," " persons who have no fixed place of residence," and " omissions which may have occurred in taking the census." The total population of the Colony would thus be brought up to 40,000, of which 10,815 lived in Sydney (town and district). At this census, taken in one day, the population, as regards age was divided into two groups, viz., over and under the age of 12 years. Particulars as to civil condition distinguished between free persons, pardoned, those holding tickets-of-leave, and other convicts.

The New South Wales Census of 1828 did not include Tasmania, which had already been constituted a separate Colony in 1825, but it included the Moreton Bay District (Queensland).

3. **The Census of 1833.**—After the taking of the census of 1828 a period of five years elapsed before another enumeration of the people was made. The Census Act of 1833 (4 William IV., No. 4) differed but little from the Act of 1828, but while retaining the inquiries relating to sex and age, it narrowed the enumeration of " classes " to two, viz., free people and convicts, and no provision was made in the Act to distinguish either those born free within the Colony or free immigrants from those who had become free by pardon, nor to distinguish those holding tickets-of-leave from other convicts, although this information appears to have been collected by the Justices of Petty Sessions, under whose direction the census was taken. In subsequent censuses, when the distinctions referring to civil condition were revived, the classes enumerated were as follows :—(*a*) Those who were born in the Colony, (*b*) those who had come free to the Colony, and (*c*) other free persons. The convicts were divided into (*a*) those holding tickets-of-leave, (*b*) those in Government service, and (*c*) those in private assignment. The last census in which reference was made to the civil condition (*i.e.*, whether free or bond) of the people was that of 1851, when a decade had elapsed since the cessation of transportation.

The census of 1833 was taken on the 2nd September. The total population of the Colony on that date was 60,794, shewing an increase of 20,794 since the year 1828. The increase in population by immigration was 22,813, of which number 16,792 were convicts, and 6021 free persons. The growth in the population of Sydney was remarkable, the inhabitants of the town alone numbering 16,232, being an increase of 5417 on the population in 1828 of the whole town and district of Sydney.

Persons employed by the Justices in the collection of census returns were allowed 7s. 6d. per diem. During the taking of the census an effort was made to ascertain the population out side the surveyed boundaries, but the Act made no provision for any enumeration or estimation of aborigines.

4. **The Census of 1836.**—The Census of 1836 was taken under an Act (7 William IV., No. 1) similar in its scope and provisions to that under which the census of 1833 was taken, and was subject to the same limitations. The census was taken on the 2nd September, 1836, and the total number of inhabitants of New South Wales and Dependencies is recorded as 77,096, or an increase of 16,302 in three years. Since 1828 the population had almost doubled, having increased from approximately 40,000. During the latter period the total number of convicts despatched from the United Kingdom was 27,378, and of immigrants 10,634, making a total addition to the population from outside sources of 38,012. The population of the town of Sydney in 1836 was 19,729, shewing an increase of 3497 in three years.

The census statement of 1836 gives particulars of the population of the Port Phillip (Victoria) District, which appears for the first time with 224 inhabitants.

5. **The Census of 1841.**—This census shewed a marked advance over all previous enumerations, particularly inasmuch as more complete information was furnished as to the local distribution of the population, the tabulation of the results was on better lines, and more numerous age groups were adopted, viz., under two years, two and under seven, seven and under fourteen, fourteen and under twenty-one, twenty-one and under forty-five, forty-five and under sixty, and sixty and upwards. Other improvements were the classifications of the conjugal condition of the people and of the various callings of the industrial population. The Act (4 Vict., No. 26) under which the census of 1841 was taken differed only slightly from previous Census Acts, but special provision was made for enumerating the inhabitants of the undefined portions of the Port Phillip District and of the Commissioners' districts beyond the boundaries of locations. A supplementary clause was specially passed providing that it should not be compulsory for any person to supply the information asked for with regard to civil condition (*i.e.*, whether bond or free). The classification of religions embraced the following denominations :—Church of England, Church of Scotland, Wesleyan Methodists, other Protestants, Roman Catholics, Jews, and Mahometans and Pagans. The industrial classification of the workers under their various callings marks the emergence of the Colony from its first condition purely as a penal settlement. The heads of classifications adopted were—(1) Landed Proprietors, Merchants, Bankers, and Professional Persons ; (2) Shopkeepers and other Retail Dealers; (3) Mechanics and Artificers: 4) Shepherds and others in the care of sheep ; (5) Gardeners, Stockmen, and Persons employed in Agriculture ; (6) Domestic Servants; and (7) All other Persons. A census of habitations was

also made for the first time for the whole colony, an enumeration of the houses in Sydney having been made at the census in 1828. The classification adopted in 1841 was—(1) Material, subdivided into (*a*) stone or brick, and (*b*) wood ; and (2) occupied or unoccupied. The remuneration given to collectors for their services was fixed at 10 shillings a day for those employed on foot, and 15 shillings for those on horseback.

The census of 1841 was taken in March, and under the Census Act of that year New Zealand was expressly excepted from the operations of the Act, though it was not until May, 1841, that New Zealand was proclaimed a separate Colony.

The total population enumerated in 1841 was 130,856, giving an increase of 53,760 since the census of 1836. The population of New South Wales (proper) was 114,601, of whom 29,973 resided in the town of Sydney, as against 19,729 in that town in 1836. The population of Moreton Bay was 200, of Norfolk Island 2187, and of Port Phillip 11,738, while 2130 persons were engaged on colonial vessels.

Since the census of 1836 the progress of Australia had received a great stimulus from the work of exploration carried out by Sir Thomas Mitchell, McMillan, Strzelecki, and others, and from the consequent opening up to agricultural and pastoral development of various districts, among which may be especially mentioned the Gippsland district in Victoria, and the district called by Mitchell " Australia Felix " in the neighbourhood of the Loddon River.[1]

6. **The Census of 1846.**—The census of 1846 was taken on the 2nd March, under an Act which was somewhat wider in its scope than that regulating the census of 1841. The schedule appended to the Act, besides providing for the enumeration of the inhabitants by wards in the case of cities and towns, set forth two new branches of inquiry, viz., " Education " and " Birthplace" ; the classification under the heading " Occupation " provided for ascertaining the grade of employment as follows :—(*a*) Principal journeyman ; (*b*) Apprentice ; and (*c*) Hired or Assigned Servant ; and the list of occupations was considerably lengthened ; while a new subdivision—" Other Persuasions"—was added to the tabulation of " Religions." The inquiry as to civil condition (see par. 5, p, 42 hereinbefore) was again made not compulsory. As regards "Habitation," information was sought as to whether the houses were shingled or slated.

The scheme of tabulation for the 1846 census was much more elaborate than in any prior census of the Colony. Instead of five tables, as in the census of 1841, the results were presented in fifty-six tables. Under each head of inquiry a separate table was prepared for the chief localities. The Port Phillip District was enumerated by counties and Commissioners' districts, the populations of each ward of the town of Melbourne and of country towns and villages were given. The remainder of the Colony, viz., the Middle District and the Moreton Bay District, was subdivided into counties and Commissioners' districts, police districts, parishes in the County of Cumberland, the City of Sydney, its wards and suburbs, and country towns and villages.

The total population of New South Wales in 1846 was 189,609 persons, shewing an increase of 58,753 since the taking of the census in 1841. The population of New South Wales proper was 152,009, of the Port Phillip District 32,879, of the Moreton Bay District 2525, while 2196 persons were engaged on colonial vessels.

The total number of habitations enumerated in 1846 was 31,761, as against 16,776 in 1841. The Port Phillip District contained 5198 houses in 1846, as against 1490 in 1841, and the Moreton Bay District 316. The total number of houses in New South Wales proper was 26,247.

7. **The Census of 1851.**—This census was taken on the 1st March, 1851, under the authority of an Act (14 Vict., No. 18) which was practically a copy of the preceding Census Act. The subjects of inquiry were the same as at the census of 1846. The inquiry as to civil condition was again not compulsory, and was included in the census of 1851 for the last time.

The total number of persons enumerated was 268,344, of whom 178,668 resided in New South Wales proper, 8575 in the Moreton Bay and Queensland Squatting Districts, and 77,345 in the Port Phillip District, while 2708 persons were engaged in the colonial marine, were travellers, or in military service, and 1048 persons were on board British and Foreign vessels in port. The total number of houses in New South Wales proper was 30,641, and in Moreton Bay and other Queensland Districts was 1021.

This was the last census taken before the separation of Victoria on the 1st July, 1851.

8. **The Census of 1856.**—The census was taken under the authority of an Act (19 Vict., No. 5) which differed but slightly from the preceding Census Act, and was the first census of New South Wales supplemented by a General Report.

The census of 1856 was taken on the night preceding Saturday, the 1st March, and the results were tabulated generally on the same basis as had been adopted for the tabulation of the 1846 and 1851 censuses. After the publication of the General Report the population of the Colony was tabulated for the first time according to Electoral Districts, of which there were 34, comprising counties, pastoral districts, boroughs, and towns. The necessary sub-divisions of the Colony numbered about 400.

[1] See " Official Year Book of the Commonwealth," No. 2, 1901-1908, pp. 25-6.

At the taking of this census, Police Magistrates, Crown Lands Commissioners, and Benches of Magistrates were relieved of the duty previously imposed upon them of making abstracts of returns.

(i.) *Payment of Collectors.* The allowance to collectors was raised to 20 shillings per diem for those employed on foot, and to 25 shillings for those on horseback. This was double the rate in the case of collectors on foot paid in 1851, but it was due to the general rise in wages throughout Australia consequent on the gold discoveries. The total number of collectors employed was 300.

(ii.) *Population Enumerated.* The total population enumerated at this census was 269,722, of which number 249,282 belonged to New South Wales, as defined by its present limits, and 16,907 to what is now known as Queensland, while the undefined and unclassified population amounted to 3533. The population of Sydney and suburbs was 69,173. A considerable increase was shewn since the last census in the number of houses. In New South Wales proper the number had increased from 30,641 to 39,373, and in the Moreton Bay and other northern squatting districts from 1021 to 2106.

(iii.) *Scope of Census.* The scope of the inquiry at the census of 1856 was practically the same as at the preceding census ; the heads of classification were, however, extended in certain respects. The table giving the occupations of the people was enlarged by the addition of six new heads of classification, and the educational condition of the people was taken in combination with the more important religious denominations. With regard to the birthplaces of the people, the tables for 1856 were amplified, so as to distinguish those born in the United States of America, China, Germany, and France, from which countries a considerable number of immigrants had been attracted by the discovery of gold, and by the prevalent high rate of wages.

9. **The Censuses of 1861, 1871, and 1881.**—In 1859 letters patent issued on the 6th June constituted what were then known as the Moreton Bay and Northern Squatting Districts, together with the reputed County of Stanley, a separate Colony under the name of Queensland. The census of New South Wales, therefore, refers henceforward only to what constitutes the State of New South Wales at the present day, including the Federal Territory at Canberra.

(i.) *Simultaneous Census of British Empire.* The census of 1861 was taken on the 7th April under the authority of an Act (24 Vict., No. 5) which provided that the day of enumeration should be identical with that chosen for the United Kingdom. The other Colonies forming the Australasian group, with the exception of Western Australia and New Zealand, also adopted this day. In 1871, of the Australasian Colonies only New South Wales, Queensland, Victoria, and South Australia adopted the Imperial date, but in 1881 all the Australasian as well as most of the other Colonies fell into line and the first simultaneous census of the British Empire was taken. Practically simultaneous censuses were also taken in 1891, 1901, and 1911.

(ii.) *The Schedules.* In 1861 various minor alterations were made in the schedule, such as the insertion of an inquiry as to infirmity (blindness and deafmutism), and the relationship, if any, of the person enumerated to the head of the family. The schedules used at the census of 1871 and 1881 (taken under Acts 33 Vict., No. 12, and 44 Vict., No. 2 respectively) did not differ in any material point from that used in the census of 1861. Education in relation to Religion, tabulated for the first time in 1856, is not presented in the census of 1861, and does not again appear until 1881. In 1871 the tabulation as to education was separately carried out for Chinese and aborigines, the latter being specially noticed for the first time.

In 1861 the information as to roofing material was omitted, but inquiries were instituted for the first time with regard to the number of rooms in each dwelling. In 1871 the distinction of " iron " as a building material was no longer made, and information as to the number of rooms was not collected. In that year, however, the inhabited were distinguished from the uninhabited dwellings, a distinction neglected in the tabulation of the census of 1861.

(iii.) *Divisions and Sub-divisions.* In 1861 the information was collected according to registry districts, of which there were 78, the district registrars of the Colony acting as enumerators. There were employed on the work 80 enumerators and 464 collectors. The results were subsequently presented in registry districts, in police districts, in electoral districts, (in accordance with the Electoral Act of 1858), in counties and pastoral districts, in towns and villages, in parishes of the County of Cumberland, and in municipalities, which had recently been constituted under the Municipalities Act, 1858. In 1861 the rate of payment to collectors on foot was reduced from what it had been in 1856, namely, 20 shillings a day, to from 15 to 20 shillings a day ; the rate paid to collectors on horseback remained the same, namely, 25 shillings a day. In 1871 the same plan was adopted with regard to divisions and sub-divisions, and the whole of the Colony was, for the purposes of enumeration, divided into 91 districts, corresponding with the registration districts already established, the boundaries of some of which were altered for the convenience of the work, so as to give as nearly as possible a maximum population of 10,000 inhabitants, in order that such area might be conveniently placed under the superintendence of one person acting as an enumerator. The divisions of the Colony under which the information was grouped in 1871 were similar to those adopted in 1861. The census results of 1881 were destroyed by fire, and only a number of summary tables in the hands of the Government Printer were preserved. The results of the census were arranged according to electoral districts, as defined by the Electoral Act, 1880, but no tabulation of the population in counties had been made before the destruction of the documents.

(iv.) *Tabulation.* In 1861 a more complete tabulation of the ages of the people was introduced, the number of each age for successive years up to fifteen being given, and then in progressive quinquennial periods up to eighty, the last group embracing persons of eighty years of age and upwards. The table devoted to " Conjugal and Domestic Condition " was extended, and the branch of inquiry, "Houses and Other Residences," was tabulated in connexion with the information relating to "Conjugal Condition." The tabulation of "Occupations" in 1861 shewed some improvement upon that of 1856, and coincided in all material respects with the classification employed in England, and also with that generally adopted, with slight modifications to suit local requirements, by all the Australasian Colonies.

The general work of tabulation in 1861 was arranged according to the several divisions of the Colony, and was classified according to (*a*) Census or Registry districts, (*b*) Police districts, (*c*) Electorates, (*d*) Counties and Pastoral districts, and (*e*) Municipalities, towns, villages, and parishes in the County of Cumberland. In each of these series of districts the population was tabulated (*a*) by age, (*b*) by conjugal and domestic condition, (*c*) by occupation, (*d*) by birthplace (*e*) by religion, and (*f*) by education.

The tabulation of the results of the census of 1871 differed from that of 1861 in only a few details. The ages of the people were given in greater detail by the addition of two groups, while under the heading of " Religion " six new denominations were added. The details formerly classified under the head of " Conjugal and Domestic Condition " now appeared under that of " Social Condition," and the particulars were tabulated in age groups. The presentation of the details under the heading of " Occupations " was an improvement upon that adopted in 1861. The people were arranged in 13 classes, which were divided into sub-orders, in which the various trades and professions therein embraced were consecutively enumerated. The tabulation of the people in counties in 1871 presented a considerable number of changes owing to the inclusion of five new counties, the greater portion of the population of which had been included in the old squatting districts. The number of towns enumerated at the census of 1861 was 105, and at the census of 1871 was 167, both exclusive of the city and suburbs of Sydney. In 1871 twenty-five new municipalities were included.

The tabulation in 1881, as far as it went, was practically the same as in the preceding census, although a few unimportant changes were made in the classification.

(v.) *The Populations Enumerated.* The total population enumerated was 350,860 at the census of 1861 ; 503,981 at the following census ; and 751,468 in 1881. The figures here given for 1871 and 1881 include full-blooded aboriginals which are excluded in the table on p. 36. The population of Sydney and suburbs increased from 95,789 in 1861 to 137,776 in 1871, and to 224,939 in 1881.

10. **The Census of 1891.**—With the object of obtaining uniformity in the censuses of 1891 of the Australasian Colonies, a Conference of Statisticians was held at Hobart in March, 1890. This Conference has already been referred to in some detail (see p. 37) ; it will suffice to mention here that as a result of the resolutions passed at that Conference, practical uniformity was secured in all the Australasian Colonies as to (i.) date of census ; (ii.) subjects of inquiry ; and (iii.) tabulation of results.

(i.) *Date of Census.* The date upon which it was decided to take the census (the 5th April, 1891) was determined by the British Government for the United Kingdom, India, and the Crown settlements, and was assented to by the various self-governing Colonies, although it was not always the most convenient date. Only in India, Ceylon, Hong-Kong, Borneo, and in some outlying parts of Canada was it found impracticable, chiefly for climatic reasons, to take the census in the month of April. The relative advantages and disadvantages in taking the census simultaneously throughout the British Empire is referred to in an earlier part of this Report (see p. 37).

(ii.) *Subjects of Inquiry.* The Act (54 Vict., No. 31) under which the census of 1891 was taken in New South Wales appointed the day upon which the census was to be taken, and gave the Government Statistician of the Colony the authority necessary to carry out the various objects of the census. The Act provided also for the collection of Industrial and Commercial Statistics, and of particulars relating to live-stock, crops, and occupation of lands. The Householders' Schedule did not form part of the Act, but was provided for by regulation ; it corresponded closely with the schedule drafted by the Hobart Conference and differed but little from the schedule used at the previous census. The items of inquiry were :—(*a*) Name and surname, (*b*) relation to head of family, (*c*) conjugal condition, (*d*) sex, (*e*) age, (*f*) occupation, (*g*) whether employer, employed or working on own account, (*h*) birthplace, (*i*) religion, (*j*) education, (*k*) sickness or infirmity, and (*l*) particulars relating to habitations.

(iii.) *Divisions and Sub-divisions.* For the purpose of taking the census of 1891 the Colony was divided into 100 districts, the areas of some of which were of considerable size, particularly those situated in the western parts of the Colony. The largest census district was Bourke, with an area of about 22,680 square miles. The most populous was the second Sydney Census District, comprising the wards of Cook, Phillip, and Denison, with a population of over 60,000. Each census district was placed under the charge of an officer, called an enumerator, who was nominated by the magistrates.

(iv.) *Number and Payment of Collectors.* Each enumerator's district was divided into collectors' districts. The total number of collectors employed was 1203. A journey of from 30 to 35 miles was considered a fair day's work for a collector on horseback, and for those on foot about 12 miles. The rate of payment sanctioned was 10 shillings a day for those on foot, and 20 shillings for those on horseback. Special rates up to 40 shillings a day were paid to horsemen in certain districts. The census in some localities had to be taken by men in boats, and in the few instances in which they were thus employed, 15 shillings a day was paid.

(v.) *Tabulation of Results.* For tabulation purposes, cards were used, the whole of the returns being transferred from the schedules. The varieties of card employed were four in number, viz. : —one for each male, for each female, for each married couple, and for each habitation. Generally the scheme of tabulation was the same as for the census of 1871, but the tables were considerably elaborated, and an exhaustive General Report was issued.

(vi.) *Population Enumerated.* The total population of the Colony inclusive of aboriginals had increased from 751,468 in 1881 to 1,132,234 in 1891, and the population of Sydney had increased during the same period from 224,939 to 383,283.

11. **The Census of 1901.**—The Census Act (64 Vict., No. 65) of 1900 provided that the householders' schedule should contain particulars shewing (*a*) the name, sex, age, condition, duration of marriage, number of children born to each marriage, relation to head of household, profession or occupation, sickness or infirmity, religion, education, and birthplace, and (when the person was born abroad) length of residence in New South Wales, and nationality of every person who abode in each dwelling on the night of the census, and (*b*) the materials of the dwelling and the number of rooms contained therein. The Act also provided for obtaining certain particulars relating to live-stock, crops, the occupation of land, and also industrial statistics. A General Report of this census was commenced but was not published. The scope of the inquiry and the census methods adopted were similar to those in use at the preceding census.

(i.) *Divisions and Sub-divisions.* The whole State was divided into enumerators' districts in the same way as had been done in previous censuses, the districts being apportioned in the Census Office. Natural or fixed boundaries were adopted as far as possible, each district being no larger than it was thought possible for one man to conveniently supervise. The collectors' districts were apportioned by the enumerator, and 95 enumerators and 1379 collectors were employed.

(ii.) *Tabulation.* Generally the method and scheme of tabulation were similar to those adopted in 1891. The greatest number of persons employed as tabulators at any one time was 64, the average number while the work was in full progress being about 40.

(iii,) *Population Enumerated.* The total population, inclusive of aboriginals, had increased from 1,132,234 in 1891, to 1,359,133 in 1901, and that of Sydney and suburbs from 383,283 to 481,830,

SECTION 3.—VICTORIA.

1. **Early Enumerations.**[1]—The first permanent settlement of Victoria (first known as the Port Phillip District of New South Wales) was made in 1835 by John Batman, who was shortly after followed by John Pascoe Fawkner.[2] The enumerations of the people taken up to the time of the constitution of the Port Phillip District as a separate Colony (1851) were generally, though not invariably, carried out in conjunction with the censuses of New South Wales.

An officer, sent in 1836 by Sir Richard Bourke, then Governor of New South Wales, to report upon the newly settled Port Phillip District, ascertained that on the 25th May, 1836, the population, exclusive of aborigines (of whom no estimate was made), consisted of 177 persons. A later return, made by Captain Lonsdale, the first Resident Magistrate of the District, shews that the population on the 29th September, 1836, was 224. Two years later, by which time a considerable stream of migration chiefly from New South Wales and Tasmania had set in, it was decided to take a census on the 12th September, 1838, as a result of which the population was found to number 3511.

2. **The Censuses of 1841, 1846, and 1851.**—These enumerations were made in the Port Phillip District in connexion with the New South Wales Censuses, to which reference has already been made (see Section 2, §§5, 6, 7, above). In 1841 the population was returned at 11,738; it had increased to 32,879 in 1846, and to 77,345 in 1851. The census of 1851 was taken on the 2nd March before the constitution of the Port Phillip District as a separate Colony, which event did not take place until the 1st July, 1851.

[1] See Census Report of Victoria, 1891. [2] Mr. Edward Henty had established a station at Portland Bay in November, 1834, but this can hardly be said to have led to the permanent settlement of the Port Phillip District.

3. **The Census of 1854.**—This was the first census taken of Victoria as a separate Colony. Chiefly in consequence of the gold discoveries in 1851, a large influx of population had taken place, and it was therefore determined to enumerate the population on the 26th April, 1854. An Act (17 Vict., No. 9) was passed providing for the taking of the census, and the various forms of schedules employed in the 1841 census of the United Kingdom were adapted to the circumstances and requirements of the Colony, which was divided into 26 districts, each in charge of an enumerator. Police magistrates were appointed enumerators for their respective districts, excepting in Melbourne, where the Town Clerk acted as enumerator. The number of sub-enumerators employed was 194, their rate of pay depending on the nature and extent of the country they had to traverse, and on the number of people to be enumerated. The heads of inquiry comprised age, sex, religion, conjugal condition, education, and occupation. Returns were also collected as to area of land alienated. The population was tabulated according to counties and pastoral districts, electoral districts and provinces, goldfields, seaport towns, rural and mining districts, and towns and villages. The population enumerated was 236,798, including 2500 aboriginals, and the estimated cost of the census was £11,000.

4. **The Census of 1857.**—The Victorian goldfields continuing to cause a considerable accession of population, another census was taken after an interval of three years, viz., on the 29th March, 1857.

For the purpose of making the preliminary arrangements for the census of 1857, a Commission was appointed by the Government to prepare the form of the householders' schedule, and to frame regulations and instructions for the guidance of the officers engaged in carrying out the provisions of the Census Act. The Commissioners obtained the co-operation of the municipal and other local authorities, and were thus enabled to frame a scheme of sub-divisions of the Colony, whereby the greater part of the enumeration was taken and supervised by means of local agency. The enumerators were selected by the local authorities, but were appointed by, and responsible to, the Government. A new and useful regulation framed by the Commissioners was that which required the sub-enumerators to fill up a return shewing the name and residence of every householder with whom he had left a blank schedule.

(i.) *Divisions and Enumerators.* The Colony was divided into 60 census districts, which were again subdivided into 907 sub-enumerators' districts. The total number of persons employed in collecting the returns was 1005, of whom 60 were enumerators, 930 sub-enumerators (of whom 477 had to perform their duties on horseback), and 15 were Chinese interpreters or assistant sub-enumerators.

(ii.) *Scope of Inquiry.* The schedule used at the census of 1857 contained 10 columns under the following heads of inquiry :—(*a*) Name and surname, (*b*) Relation to head of household, (*c*) Conjugal condition, (*d*) Sex, (*e*) Age, (*f*) Rank, profession, or occupation, (*g*) Where born, (*h*) Religion, (*i*) Education, and (*j*) Description of house. The tabulation of results was carried out on a similar plan to that adopted in 1854.

(iii.) *Population Enumerated and Cost of Census.* The total population at the census of 1857 was 410,766, including 1768 aborigines. The cost of the census, exclusive of printing, postage, and of the expenses of the central office, was £15,242.

5. **The Censuses of 1861, 1871 and 1881.**—The Census Act of 1861 (24 Vict., No. 120) provided that the census should be conducted entirely by the Registrar-General, and not by a Commission as had been the case in the preceding census. This provision was also continued in the subsequent Census Acts of Victoria. The census of 1881 was taken under Act 44 Vict., No. 667. The census of 1861 was taken on the 7th April ; that of 1871 on the 2nd April ; and that of 1881 on the 3rd April. At the census of 1881 the " Card System " (see p. 15 hereinbefore) of tabulation was first used in Victoria.

(i.) *Divisions and Sub-divisions.* In 1861 and 1871 the general method of dividing the Colony into districts for census purposes was the same as that adopted in 1857. In 1861 the Colony was divided into 67 census districts ; in 1871 it was divided into 60 districts. In 1876 the Electoral Act Amendment Act was passed and the electoral districts upon which the enumerators' districts at previous censuses were based were changed. In 1881 the Colony was therefore entirely redivided for census purposes, so that the census districts might fit in as far as possible with the counties, which are permanent divisions. The number of districts into which the Colony was divided for census purposes in 1881 was 78.

(ii.) *Enumerators and Sub-Enumerators.* In 1861 there were 67 enumerators appointed, their rate of pay ranging from £10 to £50 ; the number of sub-enumerators employed was 1021. The maximum rates, which in the first instance were sanctioned by the Government to be paid to sub-enumerators, were 25 shillings a day to those on foot, and 50 shillings to those on horse back. In certain districts it was, however, found impossible to engage suitable men on foot at a lower daily rate than 30 shillings. In 1871 there were 60 enumerators and 1568 sub-enumerators. The rate of payment to enumerators was practically the same as in 1861, but the rate for sub-enumerators was reduced to 15 shillings per diem for those acting on foot, and to 30 shillings per diem for those on horseback. In 1881 there were 78 enumerators, and 1869 sub-enumerators.

The payments of the enumerators were fixed according to the size and presumed population of the different districts, the original amounts varying from £12 to £35. Many of the enumerators were, however, granted extra allowances, the average amount actually paid being about £28. The rate of payment sanctioned to sub-enumerators was 10 shillings per diem to those acting on foot, and £1 per diem to those on horseback.

(iii.) *Scope of Inquiry.* The nature of the information sought to be obtained at the censuses of 1861, 1871, and 1881 was prescribed in the householders' schedules appended to the Census Acts. In 1861 it comprised the same heads of inquiry as in 1857, and an additional column was introduced for "health," in which entries were to be made of cases of sickness or accident, and of the numbers of deaf and dumb, and blind. In 1871 the schedule was identical with that of 1861, but columns were added for area of land in occupation, for holdings of more than one acre in extent, and for numbers of live-stock kept, while the inquiry as to Rank, Profession, or Occupation was supplemented by a column specifying past occupation. The scope of the inquiry at the census of 1881 was the same as in 1871.

(iv.) *Population Enumerated.* The population enumerated in 1861 was 540,322, of whom 1694 were aboriginals. By 1871 the number of inhabitants had increased to 731,528, of whom 1330 were aboriginals, and by 1881 it had increased to 862,346, of whom 780 were aboriginals. The total population of Melbourne and suburbs in 1861 was 126,536; by the year 1881 the number enumerated in Greater Melbourne had increased to 282,947. The total number of inhabited dwellings in Victoria was 128,617 in 1861; 151,478 in 1871; and 170,086 in 1881.

6. **The Census of 1891.**—The Census of Victoria, 1891, as well as that of all the other Australasian Colonies, was taken as referring to midnight on Sunday, the 5th April of that year, which time corresponded to that appointed for enumerating the population of the United Kingdom and most of the outlying portions of the British Empire.

(i.) *Scope of Inquiry.* The Act (54 Vict., No. 1171) under which the census of 1891 was taken was similar to the previous Census Acts, but the householders' schedule was not, as on former occasions, appended to the Act, which embodied only the heads of inquiry to be arranged in the schedule according to the method agreed upon at the Hobart Conference. For the information of the Educational Department a form of schedule was attached to the Act, in which provision was made for obtaining information as to the name, sex, and place of residence of every child under 15 years of age, also whether it was receiving education, and, if so, at what place.

(ii.) *Divisions and Sub-divisions.* The Electoral Districts, 84 in number, were taken as the basis for the census districts, of which there were in all 90. Each census district was divided by the enumerator into sub-districts of such size that in populous areas the work of enumeration could be completed in three days, viz., one day for delivering and two days for collecting the schedules.

(iii.) *Enumerators and Sub-enumerators.* The enumerators were 90 in number, and they were paid sums ranging from £20 to £25 in town districts, and from £25 to £70 in country districts. In some cases special allowances were made. The number of sub-enumerators employed was 2330, of whom 976 acted on foot, 1310 on horseback, and 44 partly on foot and partly on horseback. There were also 45 interpreters to the Chinese. The rate of payment to sub-enumerators was the same as in 1881, viz., 10 shillings a day to those on foot, and £1 a day to those on horseback. Each sub-enumerator was allowed half a day at the foot rate for making up his returns. Four of the sub-enumerators were females.

(iv.) *Tabulation.* The scheme of tabulation was in accordance with the terms of the agreement arrived at by the Census Conference of 1890 (see p. 37). During the census compilation, the largest number of extra clerks attached at any one time was 65, but the employment of so many only lasted for about five months. The card system of tabulation was used.

(v.) *Population Enumerated.* The population of Victoria enumerated on the 5th April, 1891, was 1,140,405, of whom 565 were aboriginals. The population of Melbourne at the same date was 490,896. The total number of habitations in Victoria was 241,560, of which 224,021 were inhabited, 15,846 were uninhabited, and 1693 were being built.

7. **The Census of 1901.**—This census was taken under the provisions of the Census Act, 1900 (64 Vict., No. 1669), on Sunday, the 31st March, 1901. No General Report of this census was issued, and the available information with regard to general census methods is somewhat meagre. Generally the system of preparation for, and the method of collection and tabulation at the 1901 census were carried out on much the same lines as in the case of the 1891 census.

(i.) *Divisions and Sub-divisions.* With regard to the division of the State into census districts the basis as adopted in 1891 was taken for the 1901 census, viz., the State Electoral districts were treated as enumerators' districts excepting in four cases; these latter, being too large, were each subdivided into two or more census districts.

(ii.) *Enumerators and Sub-enumerators.* The number of enumerators employed was 94, and of sub-enumerators 2235, in addition to 37 interpreters to the Chinese. Enumerators were paid from £20 to £65; sub-enumerators on foot were paid 10 shillings a day, on bicycle 14 shillings a day, and on horseback 18 shillings a day; and interpreters were paid 10 shillings a day. Six of the sub-enumerators were women.

(iii.) *Scope of Inquiry and Method of Tabulation.* The subjects of inquiry specified in the Act were as follows:—(*a*) name, sex, age, condition as to and duration of marriage, number of children born to each marriage, relation to head of the household, profession or occupation, sickness or infirmity, religion, education, and birthplace, and (where the person was born abroad) length of residence in Victoria, and nationality of every person who abode in each dwelling on the night of the census day; (*b*) the materials of the dwelling and the number of rooms contained therein. Provision was also made for the collection of statistics as to the area, tenure and cultivation of occupied land held in connexion with or in the vicinity of the dwelling occupied and of the numbers, kinds, sex, age, and breed of live-stock kept thereon.

(iv.) *Population Enumerated.* The population of Victoria increased from 1,140,405 in 1891 to 1,201,341 in 1901; of the latter number 271 were aboriginals. The population of Melbourne and suburbs increased during the same period from 490,896 to 496,079, and the number of habitations in Victoria from 241,560 to 253,656.

8. Cost of Collection 1857 to 1901. The cost of taking the census on the last six occasions so far as payments to enumerators and sub-enumerators are concerned was as follows. In addition to the amounts specified, considerable sums were expended on each occasion on clerical labour, office buildings, fittings and furniture, stationery, printing, advertising, railway fares, and other charges.

Victoria.—Amounts Paid to Enumerators and Sub-enumerators, 1857 to 1901.

Year.	AMOUNTS PAID.			Population.	Cost of Collection per Head.
	To Enumerators.	To Sub-enumerators.	Total.		
	£	£	£	No.	Pence.
1857	1,856	13,386	15,242	410,766	8.91
1861	1,936	12,966	14,902	540,322	6.62
1871	1,643	9,817	11,460	731,528	3.76
1881	2,144	10,288	12,432	862,346	3.46
1891	2,713	11,631	14,344	1,140,405	3.02
1901	2,693	11,258	13,951	1,201,341	2.78

SECTION 4.—QUEENSLAND.

1. **Early Enumerations in Moreton Bay District.**—The first permanent settlement in the Moreton Bay District dates from 1824, when a penal station was established near the present site of the town of Brisbane. In the same year the district of Moreton Bay is specified in the returns of the "muster" held in New South Wales (of which the Moreton Bay District then formed part) with a population of 33. The first proper enumeration of the inhabitants of the district was carried out in connection with the New South Wales Census of 1828, when the population of the distant and penal settlements in the Colony was stated to be 1337. The population of the Moreton Bay and Northern Squatting Districts was enumerated at the subsequent censuses of New South Wales, until the year (1859) of the constitution of Queensland as a separate Colony. These censuses have already been referred to. (See Section 2, New South Wales.)

2. **First Census of Colony of Queensland, 1861.** The first census of the Colony of Queensland was taken under an Act of Council (24 Vict., No. 5) on the night of the 7th April, 1861. The Colony was divided into 17 enumerators' districts, coinciding with the Police or Commissioners' districts, and into 131 collectors' sub-districts. The subjects of inquiry embraced sex and age, education, conjugal condition, habitations (materials), birthplace, religion, and occupation. In addition to these subjects the collectors were required to obtain returns of areas of land under cultivation and of numbers of live-stock. The total population enumerated at the census of 1861 was 30,059.

3. **The Census of 1864.**—This census was taken under a special Act on the 1st January, 1864. Police districts (the boundaries of which coincided with registration districts) were, as before, used as census districts; each municipality was, however, excised from its particular district, and made into a separate census district. The total number of enumerators' districts was 31, and of collectors' districts was 142. The amount paid to enumerators was £229, and to collectors £1960, the total cost of the census being £2671. The scope of the inquiry was practically the same as in 1861. Since the previous census the occupied area of the Colony had extended considerably and the population had increased from 30,059 to 61,467.

4. **The Census of 1868.**—The third census of Queensland was taken on the 2nd March, 1868, under a special Act (31 Vict., No. 32). The same plan for the division and subdivision of the Colony was adopted as at previous censuses. Town Clerks in municipalities and Police Magistrates, Lands Commissioners, or Clerks of Petty Sessions in other districts were appointed enumerators. The total number of enumerators' districts was 50, and of collectors' districts 191. The amount paid to enumerators was £360, and to collectors £2811, the total cost of the census being £3750. The subjects of inquiry were the same as at the previous census, and the total population enumerated was 99,901.

5. **The Census of 1871.**—This was the last census taken under the provisions of a special Act (34 Vict., No. 23) before the Quinquennial Census Act, 1875, came into force; it was the first of a series of five quinquennial censuses taken in Queensland in 1871, 1876, 1881, 1886, and 1891, followed by the census of 1901, the Quinquennial Act having been suspended in 1896.

(i.) *Divisions and Sub-divisions.* At the census of 1871 an important change was made with regard to the division of the Colony for census purposes. On former occasions the well-known boundaries of established police districts and municipalities were adopted, but on this occasion the Act required that the boundaries of pastoral districts and parishes should be followed, as far as practicable, in defining the census districts and sub-districts. The Colony was divided on that basis into 42 enumerators' districts, and into 213 collectors' sub-districts.

(ii.) *Scope of Inquiry and Tabulation.* Both the scope of inquiry and the scheme of tabulation were similar to those adopted at previous censuses. The "Occupation" column was supplemented by provision for specifying cases where a person was prevented from following his usual calling through sickness or accident. The aboriginals in the Colony were not included in this or in any previous census of the Colony.

(iii.) *Population Enumerated.* The total population enumerated was 120,104, of which number 18,455 lived in Brisbane and suburbs.

6. **Censuses of 1876, 1881, 1886, and 1891.**—These censuses, as well as the succeeding census in 1901, were all taken under the provisions of the Quinquennial Census Act 1875 (39 Vict., No. 2). This Act provided that a census of the population of Queensland should be taken on the 1st May, 1876, and on the same day in every fifth year thereafter, and that every such census should contain the particulars specified in the schedule appended. These particulars were the same as those contained in the schedule used in the previous censuses. The Act also provided that the boundaries of pastoral districts and parishes should be followed as far as possible in defining the census districts, thus preserving the provisions of the Census Act of 1871 in this respect. The Quinquennial Census Act was amended in 1889 by an Act which provided that in addition to the particulars specified in the principal Act, the census should contain such further particulars as might be prescribed by regulations. In 1880, 1890, and 1900 special Acts were passed providing that the census should be taken on 3rd April, 1881, the 5th April, 1891, and the 31st March, 1901, respectively, so as to be simultaneous with the censuses in other parts of the British Empire, and in 1895 another Act was passed postponing the taking of the census due in 1896 for a period of five years. In 1891 the "card system" was adopted for tabulating the returns; at previous censuses the particulars had been posted from the schedules on to tabulating sheets.

(i.) *Divisions and Sub-divisions.* As the settled districts of the Colony extended it became necessary to increase the number of census districts, the boundaries of which were made to coincide as far as possible with the pastoral and parish boundaries. In 1876 the Registry districts were re-adjusted so as to make their boundaries correspond throughout with those of the census districts. Before the enumeration of 1881 it was thought necessary to again readjust the census districts and sub-districts, so as to make the subdivisional lines coincide with the outside boundaries of Divisions constituted under the Divisional Boards Act, 1880. In 1867 and 1881 there were 52 census districts. In 1886 the number of census districts was increased to 58, and these districts were again subdivided into collectors' districts much smaller than at the previous census. In 1891 practically the same arrangements were adopted as in 1886, the number of districts, however, being increased to sixty.

(ii.) *Enumerators and Collectors.* The number of enumerators at the census of 1876 was 52, and they were paid each a fee of 4 guineas in addition to an amount calculated on the following basis :—five shillings per hundred persons enumerated up to one thousand ; three shillings per hundred over a thousand, and not exceeding five thousand ; and two shillings per hundred persons over five thousand. The number of collectors was 285, and they were paid, for men on foot 10 shillings a day, and for mounted men 15 shillings a day. Higher rates were, however, given in several cases. At the censuses of 1881, 1886, and 1891 enumerators and collectors were paid generally at the same rates as in 1876 ; in some districts, however, especially in those where horsemen had to travel long distances through uninhabited country, the rate of pay was much higher.

(iii.) *Scope of Inquiry.* The scope of inquiry at the censuses of 1876, 1881, and 1886, was, in all essential particulars, as provided for in the Quinquennial Census Act, 1875. In 1880 an Act was passed giving power to make any alterations necessary to assimilate the form of the schedule to that used in the United Kingdom. It was not, however, considered that any alterations were necessary, as there was practically no difference in the forms of the schedule, except that the schedule used in the United Kingdom did not provide for inquiries as to religion or education, as shewn in the Queensland and other Australian Colonies schedules. In 1889 it was considered that the schedule prescribed in the Act of 1875 was not suitable to the requirements of the Colony, and an amending Act (referred to above) was passed providing that the schedule should be alterable at the will of the Governor in Council. Though Queensland was not represented at the Hobart Census Conference of 1890, a schedule nearly identical with the one approved by the Conference was adopted for the census of that Colony in 1891. The schedule adopted for the census of 1891 was practically the same as that used in New South Wales. The inquiries as to occupations and as to sickness and infirmity were extended, while the reply to the branch of inquiry as to religion was made optional.

(iv.) *Cost of Censuses.* The cost of the census of 1876, exclusive of printing in the Government office, was £8649, or 11.98 pence per head. In 1881 the total cost was £12,149, or 13.74 pence per head ; in 1886 it was £21,001, or 15.61 pence per head ; and in 1891 it was £21,935, or 13.37 pence per head.

(v.) *Population Enumerated.* The total population enumerated in 1881 was 213,525, as against 173,283 in 1876. In 1886 the total population enumerated was 322,853 persons ; and in 1891 it was 393,718. The number of dwellings inhabited in 1891 was 78,429, and uninhabited 2224.

7. **The Census of 1901.**—The date of the ninth census of Queensland was fixed by special Act to be taken on the 31st March, 1901, so as to coincide with the date of the censuses in the United Kingdom and most parts of the British Empire. In the meantime the Sydney Census Conference of 1900 had taken place (see p. 38 hereinbefore) and all matters in connexion with the form of the schedule, the subjects of inquiry, and the methods of compilation, and the scheme of tabulation had been considered. This was the first census at which an account was taken of the aboriginals in Queensland.

(i.) *Divisions and Sub-divisions.* The same scheme of division into census districts was adopted in 1901 as in 1891. Two additional census districts were, however, created, so that including one new Registration district, the whole of Queensland was divided into 63 census districts. An enumerator was appointed for each census district, the total number of collectors employed being 583.

(ii.) *Population Enumerated and Cost.* The total population enumerated was 503,266, including 5137 full-blooded aboriginals, and 1533 half-castes ; the number of dwellings was 100,610, of which 1670 were uninhabited. The cost of the census of 1901 was increased owing to the climatic conditions. Whilst a drought prevailed over the greater part of Western Queensland there were heavy rains in many of the coastal districts, and floods in the north. The rates of pay demanded by collectors was much in excess of those paid in 1891. The total cost of the census in 1901 was £26,191, equal to 12.62 pence per head of the total number of persons enumerated.

In 1905 a special Act was passed authorising the omission of the census which was due to be taken in 1906 under the Quinquennial Census Act, 1875.

(iii.) *Scope of Inquiry and Tabulation.* The scope of inquiry and scheme of tabulation were in all essential particulars the same as those adopted at the 1901 censuses of the other Australian States. The total number of persons employed in the work of tabulation, including the permanent staff, was sixty.

SECTION 5.—SOUTH AUSTRALIA.

1. **Introduction.**—On the 15th August, 1834, an Act (4 and 5 William IV., cap. 95) was passed by the British Parliament, creating South Australia a " province." The first settlers left London in February, 1836, and arrived in the new Colony towards the end of the same year. The first Governor, Captain Hindmarsh, R.N., arrived at Holdfast Bay on the 28th December. 1836, and on the same day the Province of South Australia was officially proclaimed. The first census was taken in 1844, when the population enumerated was 17,366. Information regarding the historical development of the census in South Australia is incomplete.

2. **Dates of Censuses and Authority under which Taken.**—The following statement shews in tabular form the dates of the several South Australian Censuses, together with the authority under which each enumeration was made.

South Australia.—Dates of Censuses and Authority under which Taken.

Ordinance or Act.	Date Passed or Assented to.	Date Census Taken.
No. 13 of 1843[1]	3rd November, 1843[2] ..	26th February, 1844
,, 13 ,, 1845[1]	22nd July, 1845[2] ..	26th February, 1846
,, 8 ,, 1850[1]	11th June, 1850[2] ..	1st January, 1851
,, 13 ,, 1854	15th December, 1854 ..	31st March, 1855
,, 12 ,, 1859	1st September, 1859 ..	1st April, 1860[3]
,, 18 ,, 1860	17th October, 1860 ..	7th April, 1861
,, 4 ,, 1865	4th August, 1865 ..	26th March, 1866
,, 7 ,, 1870	21st September, 1870 ..	2nd April. 1871
,, 4 ,, 1875	22nd September, 1875 ..	26th March, 1876
,, 167 ,, 1880	11th August, 1880 ..	3rd April, 1881
,, 479 ,, 1890	24th October, 1890 ..	5th April, 1891
,, 740 ,, 1900	5th December, 1900 ..	31st March, 1901

[1] Ordinance. [2] Passed. [3] In the Report for 1861 a note states :—" A census taken in 1860 ; but owing to the temporary absence of a portion of the population and other disturbing influences, tending to an incomplete enumeration, the numbers then arrived at have been proved by the present census to have been erroneous and are consequently not referred to for comparison."

3. **Census Methods.**—Each of the first four censuses was carried out under the supervision of the Colonial Secretary, while the fifth was carried out by the Under Secretary of the Colony. For each subsequent census from that of 1861 to that of 1901 a Superintendent of Census was appointed. At all the censuses of South Australia, the work of collection was carried out by collectors acting under the direct control of the Superintendent, without the intervention of " enumerators " or similar officers. In tabulating the results of the censuses of 1851, 1855, and 1860 the Colony was divided into municipal corporations and wards, counties and hundreds, and districts comprising country outside of counties. From 1861 to 1901 the districts were so arranged as to admit of particulars being abstracted for each county, electoral district, hundred, district council, municipal corporation, and principal township ; outer portions of the Province were divided into convenient areas comprising the chief pastoral districts not included in counties. The card system of tabulation was first adopted in 1901.

4. **Scope of Inquiries.**—At the censuses of 1844 and 1846 the inquiries were made as to name, sex, age, conjugal condition, religion, occupation and habitations. In 1851 inquiries as to nationality, length of residence in the Province, and sickness and infirmity were added, while the question as to religion was omitted. In 1855 the inquiries were the same as in 1851, with the addition of a question as to relationship to head of household. In 1861 an inquiry as to birthplace was substituted for that as to nationality, the inquiry as to religion was revived, and an inquiry as to education was added. The scope of the inquiry was not altered until 1881, when it was extended to comprise nationality, number of houses unoccupied and being built, number of rooms occupied, and education at school and university degrees. Since 1881 the census schedule has substantially retained its form, being slightly modified in 1891 and 1901 so as to come into line with those of the other States of the Commonwealth.

5. **Remuneration of Collectors and Total Cost of Census.**—At the more recent censuses up to that of 1901, the remuneration of collectors was at the rate of £1 per day, limited to the period estimated to be necessary for the collection ; for the 1901 census the rate was 15 shillings per day for collectors in municipal corporations, and £1 per day in country districts.

The cost of the censuses of 1891 and 1901 is shewn in the following statement :—

South Australia.—Cost of Censuses, 1891 and 1901.

Particulars.	Collection.	Compilation.	Printing, Stationery, etc.	Printing Tables.	Total.
	£	£	£	£	£
1891	7,597[1]	4,519	811	752	13,679
1901	8,304[1]	5,981	1,062	724	16,071

[1] Two-fifths of this sum was debited to electoral expenses for collection of names on rolls.

SECTION 6.—WESTERN AUSTRALIA.

1. **Early Enumerations.**—The Colony of Western Australia was first permanently settled in 1829, when Lieutenant-Governor Stirling, with a party of intended settlers and a detachment of marines, disembarked and encamped on the north bank of the Swan River, near the place known as Rous Head. Enumerations of the number of settlers in the infant Colony were made from time to time, usually annually ; they were not, however, of an entirely trustworthy nature, and the information obtained thereby was very meagre, relating, as it did, up to 1840, only to the numbers of each sex in each district of the Colony. From 1840 to 1843 partial particulars as to age were obtained, the numbers of each sex under and over 12 years being recorded. These early enumerations ceased in 1843.

2. **The First Census, 1848.**—The first regular census of Western Australia was taken on the 10th October, 1848, under the superintendence of the Registrar-General. This census was taken under the provision of an ordinance (12 Vict., No. 4), which was passed in order " to make provision for ascertaining with accuracy the number of persons in the Colony of Western Australia, together with the amount of live-stock and crop and other statistical particulars." No mention is made in the report either of the method of enumeration or of the nature of the schedule on which the information was obtained. It is consequently impossible to say with certainty, whether the householder schedule method or the canvasser method was followed, though it would appear from a reference in the report on the second census to the " novel forms " and new mode of distribution and collection of individual returns " made use of thereat, that at the first census the latter of the above methods was employed.

(i.) *Scope of Inquiry.* The objects of the inquiry at the census of 1848 were as follows:—(*a*) The number of colonists in each county, town, or village, distinguishing the sexes, ages, and social condition of the inhabitants. (*b*) The religion of each individual. (*c*) The occupation of individuals in 18 divisions, and (*d*) aboriginal natives actually employed by colonists, and an estimate of their numbers in the located districts.

(ii.) *Population Enumerated.* The population enumerated, exclusive of aboriginals, was 4622. There were 541 aboriginals in private employ, and an estimated number of 1960 in located districts.

3. **The Census of 1854.**—The second census of Western Australia was taken on the 30th September, 1854. As no description is given in the report of the method of enumeration, and no sample of the schedule used is published therein, the nature of the particulars asked for cannot be precisely indicated. From an examination of the tables published it would appear that the scope of inquiry was identical with that in 1848. Coming, as this census did, within a few years of the conversion of the Colony into a Penal Settlement, a great deal of interest was centred in the question of the relative proportions of " free " and " bond," and six tables are devoted to an analysis of the male population into the classes of " Civilian," " Military," " Conditional Pardon," " Ticket-of-Leave," and " Imprisoned." The total population enumerated, exclusive of aboriginals, was 11,743.

4. **Censuses of 1859 and 1870.**—The third census of Western Australia was taken on the 31st December, 1859, and the fourth on the 31st March, 1870. For neither of these censuses are copies or descriptions of the schedules used now available, and the nature of the information obtained can only be ascertained by an examination of the published tables. The method of enumeration was similar to that now in force, involving the distribution and collection of schedules, on which the heads of the several households supplied the required information. The schedules were distributed and collected by the police, under the supervision of the several Resident Magistrates. In 1859 a distinct advance was made on the previous censuses, no less than three new heads of inquiry, viz., Habitations, Birthplace, and Education, being added, while the particulars tabulated with regard to ages and also with regard to occupations are much fuller than those previously published. In the tabulation of religions, the classification was extended. The scope of inquiry in 1870 covered almost exactly the same ground as the census of 1859, though in one or two instances the inquiries in 1870 appear to have been somewhat more detailed. The total number enumerated (exclusive of aboriginals), was 14,837 in 1859, and 24,785 in 1870.

5. **Censuses of 1881 and 1891.**—The fifth census was taken on the 3rd April, 1881, and is notable as being the first occasion of a simultaneous enumeration being made throughout Australasia, the date chosen being that selected by the Imperial authorities for the census of Great Britain and Ireland. The sixth census was taken on the 5th April, 1891, in accordance with the resolutions passed at the Hobart Conference of 1890, already mentioned. The census of 1881 was taken under an Act (44 Vict., No. 2) passed to perpetuate the provisions of the Ordinance referred to above (see para. 2 hereof). In spite, however, of this perpetuation, a new Act (54 Vict., No. 7) was passed, which repealed both the Acts previously mentioned, and under

which the censuses of 1891 and 1901 were taken. The census of 1891 appears to have been the first census of Western Australia at which the services of any persons outside the police force were enlisted for the distribution and collection of the schedules. The census of 1891 is notable as being the first census of Western Australia at which the card system of tabulation was used.

(i.) *Scope of Inquiry.* At the census of 1881 the heads of inquiry were considerably extended, and were as follows :—(*a*) Name, (*b*) Relation to head of family, (*c*) Conjugal condition, (*d*) Sex, (*e*) Age, (*f*) Occupation, (*g*) State of health, (*h*) Year of arrival in Colony, (*i*) Birthplace, (*j*) Country where married, (*k*) Religion, (*l*) Education, (*m*) Class (free or bond), and (*n*) Description of dwelling; while agricultural, live-stock, and mining statistics were also collected. It will be noticed that in connection with the ordinary census matter two new heads, viz., State of Health and Year of Arrival in Colony, were added. In 1891 some of the heads of inquiry made use of at the previous census, viz., the inquiries as to " Country where Married," " Year of Arrival in Colony," and " Class (free or bond)" were omitted, while several new ones were introduced. The new subjects were in connection with Occupations and Sunday Schools. Persons following certain occupations were asked to state whether they were " manufacturers " or " dealers," and in the case of each occupation whether " employer," " wage earner " or " unemployed." It was also requested that in the event of any person being a Sunday School teacher or scholar the fact should be noted on the schedule. Particulars as to acreage of land under cultivation, and numbers of live-stock, were still obtained in 1891, but other agricultural and mining inquiries were dropped.

(ii.) *Enumerators' Divisions.* At both these censuses the census districts were again identical with the districts of the Stipendiary Magistrates, each Magistrate directing the distribution and collection of schedules in his own district. In 1881 the number of Census Districts was 14, and in 1891 was 18. At the latter Census the number of sub-enumerators' districts was 129.

(iii.) *Population Enumerated.* The population enumerated (exclusive of full-blooded aboriginals) was 29,708 in 1881, and 49,782 in 1891.

6. **The Census of 1901.**—This census was taken, under the Act of 1890 (54 Vict., No. 7) already referred to (see paragraph 5 hereof), on the 31st March, 1901, simultaneously with the censuses of the other Commonwealth States and of practically the whole of the British Empire.

(i.) *Divisions and Sub-divisions.* The existing Magisterial Districts were adopted as Census Districts, and the Stipendiary Magistrates were appointed enumerators for their respective districts. The census districts were divided into sub-enumerators' districts by the respective enumerators in such a manner as to allow of the duties of distribution and collection of the schedules being performed by one sub-enumerator in each district within the allotted time.

(ii.) *Enumerators and Sub-enumerators.* Where possible the services of the police were obtained to act as sub-enumerators ; in other cases civilians were appointed. The total number of enumerators was 37, and of sub-enumerators 494. Gratuities to the enumerators ranged from a minimum of £5 to a maximum of £26 each, the total amount thus granted being £313. The maximum general rate of pay for sub-enumerators was 10 shillings a day for those on foot, and £1 a day if mounted ; an extra half day at the foot rate was allowed for making up the returns. In special cases higher rates of pay were, however, paid to the sub-enumerators than those just specified.

(iii.) *Scope of Inquiry.* The scope of the inquiry was in accordance with the resolutions passed at the Census Conference of 1900 (see p. 38 hereinbefore), the schedule being practically identical with those used at the 1901 censuses of the other States of the Commonwealth. Particulars as to areas of land held and cultivated, live-stock, and agriculture were not collected.

(iv.) *Population Enumerated and Cost of Census.* The total population enumerated at the census of 1901 (exclusive of full-blooded aboriginals), was 184,124. The total cost of the census was £11,993, or 15.63 pence per head.

SECTION 7.—TASMANIA.

1. **Introduction.**—Although official estimates of the population of Tasmania—or Van Diemen's Land, as it was then called—were prepared from time to time after the first settlement was established in the island on the 12th September, 1803, it was not until the 27th September, 1841, that the first proper census of the population was undertaken. The succeeding censuses, up to and including that of 1870, were taken fairly frequently, the average interval being only

about 5½ years; the later censuses—those of 1881, 1891, and 1901—were taken decennially. The following table shews the dates of the censuses and the authority under which each was taken.

Tasmania.—Dates of Censuses and Authority under which Taken.

Act.	Date Assented to	Date of Census.
5 Vict., No. 7	30th June, 1841	27th September, 1841
7 „ „ 5	15th November, 1843	1st January, 1848[1]
9 „ „ 3	31st October, 1845	1st March, 1851[2]
20 „ „ 11	17th January, 1857	31st March, 1857[3]
24 „ „ 10	4th October, 1860	7th April, 1861[4]
33 „ „ 7	22nd October, 1869	7th February, 1870[5]
44 „ „ 1	20th October, 1880	3rd April, 1881
55 „ „ 2	11th July, 1891	5th April, 1891
64 „ „ 3	24th August, 1900	31st March, 1901

[1] Date fixed by proclamation 15th November, 1847. [2] By proclamation 22nd January, 1851. [3] By proclamation 16th February, 1857. [4] By proclamation 25th February, 1861. [5] By proclamation, 3rd January, 1870.

2. **Early Censuses.**—The earliest enumerations of the population were carried out by means of "musters," which were conducted on lines nearly similar to those in New South Wales.[1]

In 1803 the settlement of Risdon in Van Diemen's Land appeared for the first time on the New South Wales muster-sheets; but it was succeeded almost immediately by Sullivan Cove, which designation in turn quickly disappeared under the general title of Derwent River, and later still of Hobart Town.

(i.) *Census of* 1841. In 1841 an Act was passed directing that an account of the population should be taken annually; for this purpose Commissioners were to be appointed, and the island was to be divided into convenient parishes. The subjects of inquiry at the first census were name, age, sex, civil and conjugal condition, habitations, religion, and occupation. An abstract of the census returns was published in the Hobart Town Gazette of the 20th May, 1842.

(ii.) *Census of* 1848. In 1843 an Act was passed repealing the previous Act, and directing that a census should be taken triennially, commencing on the 1st January, 1846. In 1845, however, another Act was passed, repealing the provision for a triennial census and providing that thenceforward the dates of the census should be fixed by proclamation. Under this provision censuses were taken in 1848 and 1851. The subjects of inquiry at both these censuses were substantially the same as in 1841.

(iii.) *Census of* 1857. In 1857 another Act was passed providing for a new division of the Colony into parishes for census purposes, and in February a proclamation was issued appointing the 31st March as the day for taking the next census. The heads of inquiry were not altered.

(iv.) *Censuses of* 1861 *and* 1870. The Census Act of 1860 provided that a census should be taken on the same day as that appointed for a like purpose in the United Kingdom. The date of the census of 1870 was fixed by proclamation under an Act of 1869. At both the censuses the original subjects of inquiry were extended by the addition of questions as to (*a*) relationship to head of household, (*b*) birth-place, and (*c*) education, while the inquiry as to civil condition (bond or free) was omitted.

3. **The Census of 1881.**—This census was taken on the same date (3rd April) as that appointed for the census of the United Kingdom. Certain particulars as to which information was to be collected were specified in the Census Act, 1880, and the Governor in Council was empowered to prescribe the forms to be used and to make regulations for carrying out the Act. On this occasion "religion" was not included among the subjects of inquiry, but two new subjects were added—(*a*) Physical and mental condition, whether deaf-and-dumb, blind, lunatic, or idiot, and (*b*) Land in occupation. Additional information was also sought as to the attendance of children at school, and as to the number of children and young persons under 20 receiving instruction. The work of tabulation was carried out more elaborately than on previous occasions and was extended so as to comprise (*a*) electoral, (*b*) municipal and police, and (*c*) registration districts. The number of persons enumerated was 115,705, and the total cost of the census was £3015, or 6.23 pence per head. The rate of remuneration paid to collectors was 10 shillings per day while acting on foot, and 20 shillings per day on horseback.

[1] See page 41 hereof, and see "General Report on Eleventh Census of New South Wales," pp. 24-6.

4. **The Census of 1891.**—This census was carried out in accordance with the plan agreed upon by the Conference of Australasian Statisticians held in Hobart in 1890 (see p. 37 hereinbefore). The scope of the schedule was enlarged by the addition of an inquiry as to grade of occupation—(*a*) employer of labour; (*b*) in business on one's own account; (*c*) relative, assisting head of family in his business, not receiving a nominal salary or wage; (*d*) wage earner; (*e*) unemployed during week preceding census day—while the inquiry as to religion was revived, the reply thereto being made optional. The information compiled under different categories and sub-divisions was considerably widened, and the card system (see p. 15) of tabulation was utilised. The number of persons enumerated was 146,667. Particulars are not available as to the total cost of this census; the cost of enumeration only was £1820, as compared with £1896 in 1881, and £1778 in 1870, the corresponding amounts per head of population being 2.98, 3.93, and 4.30 pence.

5. **The Census of 1901.**—The arrangements for this census, as well as the methods of enumeration and tabulation, were similar to those adopted in 1891, and were in accordance with the resolutions passed by the Census Conference held in Sydney in February and March, 1900 (see p. 38). An inquiry as to the length of residence in the Colony (if not born therein) was added to the schedule, while that as to sickness and infirmity was somewhat restricted. The actual work of enumeration was carried out by 390 sub-enumerators, the cost of such work being £1888. The population enumerated was 172,475, the total cost of the census being £3,767, or 5.24 pence per head of population.

6. **Cost of Censuses, 1861 to 1901.**—The following table shews, so far as particulars are available, the cost of the censuses of Tasmania since 1861.

Tasmania.—Cost of Censuses, 1861 to 1901.

Particulars.	1861.	1870.	1881.	1891.	1901.
	£	£	£	£	£
Collection	1,439	1,778	1,896	1,820	1,888
Tabulation and General Expenses	181	293	1,119	..[1]	1,879
Total	1,620	2,071	3,015	..[1]	3,767
Per Head	4.32d.	4.88d.	6.23d.	..[1]	5.24d.

[1] Not available.

CHAPTER V.

THE CENSUS AND STATISTICS ACT, 1905.

SECTION 1.—INTRODUCTION.

1. **General.**—Commonwealth legislation dealing with census matters is confined to the Census and Statistics Act, 1905 (No. 15 of 1905), which was passed on the 8th December, 1905. This Act, as its name implies, deals not only with the census, but also with statistics generally; it is divided into five parts, of which the third relates specifically to the census. The text of the Act is given in full in Appendix 1 hereof. Provisional Census Regulations (Statutory Rules 1910, No. 96) were made under the Act on the 27th October, 1910; these Provisional Regulations were confirmed by Statutory Rule 1911, No. 4, and may under that Rule, be cited as the Census Regulations, 1911. These Regulations may be found in Appendix 2 hereof.

2. **Administration.**—On the 18th June, 1906, the first Statistician of the Commonwealth of Australia was appointed, and it is the duty of that officer to carry out the provisions of the Act, subject to the regulations and directions of the Minister for Home Affairs. Later in the same year the Commonwealth Bureau of Census and Statistics was organised, and the principal officers were selected and appointed. It is the function of the Commonwealth Statistician, under the Act of 1905, to take all necessary steps for the taking and collection of the census, and it is expressly stated in the Act that the Governor-General may enter into arrangements with the State Governments for the execution by State officers of any powers or duties conferred or imposed by the Act. Under the authority thus given, arrangements were made whereby responsible officers of the several States, acting under instructions from and under the immediate direction of the Commonwealth Statistician, were made supervisors of the collection of the census within their own States. The officers thus appointed were the State Statisticians of New South Wales, Victoria, Queensland, South Australia, and Tasmania, and the Chief State Electoral Officer of Western Australia.

SECTION 2.—THE TAKING OF THE CENSUS.

1. **Periodicity and Date of Census.**—The Act provides (*a*) that "the census shall be taken in the year 1911, and in every tenth year thereafter," and (*b*) that "the census day shall be a day appointed for that purpose by proclamation." The date of the census was fixed to be the 3rd April, 1911, by proclamation issued on the 31st January, 1911, that date being selected in order to make the Commonwealth Census synchronous with the censuses of the United Kingdom and other parts of the British Empire.

2. **The Householders' Schedule.**—The duty of preparing and issuing forms and instructions and of making all necessary arrangements for the taking of the census is imposed by the Act upon the Statistician, subject to the regulations and directions of the Minister. In addition it is provided by Section 10 of the Act that "for the purpose of taking the census a form called the householder's schedule, shall be prepared and left, in accordance with the regulations, at every dwelling throughout the Commonwealth." Every occupier of a dwelling, with whom a householder's schedule has been left, is required to supply all the particulars specified therein, duly signing and delivering the schedule to the collector authorised to receive it.

In view of the adoption of a personal card for each person of a household it was thought desirable to make further provision for the filling in of the particulars on these cards by individual persons, as distinguished from the filling in of the householder's card by the householder. Accordingly it was prescribed by the Census Regulations (see Appendix 2, Regulation 12 (2)) that each person who abides in a dwelling-house on the night of census day must fill in the particulars required on the personal card so far as relates to himself or herself, or must supply to the occupier all information necessary to enable him to fill in such particulars.

By Section 21 of the Act it is, however, expressly provided that "no person shall be liable to any penalty for omitting or refusing to state the religious denomination or sect to which he belongs or adheres." This is the only query on the census schedule to which the option of refusing to furnish a reply is allowed; in every other case a refusal renders the person liable to a fine of £10.

It is the duty of each collector, if requested, to assist occupiers of dwelling houses in filling up the schedule, and to satisfy himself by inquiries from occupiers or other persons that the schedule has been correctly filled up. Every person must, to the best of his knowledge and belief, answer all such questions asked him by a collector as are necessary to obtain any information required in the schedule.

3. **Particulars in Schedule.**—The particulars to be included in the schedule are not strictly delimited by the Act, inasmuch as in addition to those particulars which are specifically mentioned, others may be prescribed by Regulation. The provisions of the Act in this respect thus allow of sufficient elasticity for such variations to be made from time to time in the schedule used at successive enumerations as the exigencies of the case may require. By Section 12 of the Act it is provided that the particulars to be specified in the schedule shall include the following :—

(*a*) The name, sex, age, condition as to, and duration of, marriage, relation to head of the household, profession or occupation, sickness or infirmity, religion, education, and birthplace, and (where the person was born abroad) length of residence in Australia and nationality of every person abiding in the dwelling during the night of the census day ;

(*b*) The material of the dwelling and the number of rooms contained therein ;

(*c*) Any other prescribed matters.

By the Census Regulations, 1911, (No. 8 (3)) it is provided that the schedule shall, in addition, include the following :—

(*d*) In relation to buildings—(i.) the nature of the building, (ii.) whether the occupier is the owner, tenant, or rent purchaser, (iii.) the amount of weekly rent payable or rental value per week.

(*e*) In relation to persons—(i.) the race to which they belong, (ii.) the number of their children living or dead from any existing or previous marriage, (iii.) the date of their arrival in Australia.

4. **Nature of Householder's Schedule.**—The nature of the " form called the Householder's Schedule," referred to in the Act, is not specified therein, but is defined by the Census Regulations, 1911, No. 8 (see Appendix 2). It is thereby prescribed (*a*) that the householder's schedule shall consist of a householder's card, and a personal card for each person of the household, and (*b*) that the householder's card and personal card shall be in accordance with such forms as the Commonwealth Statistician thinks fit. A detailed consideration of the schedule may be found in Chapter VI. hereof.

5. **Definition of a Dwelling.**—The provisions of Section 10 of the Act to the effect that a schedule should be left at every dwelling throughout the Commonwealth, made it desirable that the meaning of the word " dwelling " should be defined in the Act. Accordingly in Section 3 it is stated that " dwelling " means " a building, erection, or tenement, whether permanent or temporary, which is wholly or partly used for the purpose of human habitation, and includes any ship or other vessel in any port of the Commonwealth, or in any inland waters thereof, or any ship or vessel registered in Australia on a passage between any two Commonwealth ports." Later in the Act, Section 10 (2), it is further provided that " where a dwelling is let, sub-let, or held in different apartments and occupied by different persons or families, each part so let, sub-let, or held and used for the purpose of human habitation, shall be deemed a dwelling-house."

Under the Commonwealth Act, therefore, a dwelling may be (i.) a complete dwelling house, (ii.) a flat, (iii.) apartments in a dwelling house, (iv.) an hotel, (v.) an institution, religious, educational, charitable, etc., (vi.) caretaker's quarters in a store, office, etc., (vii.) a tent, (viii.) a vessel in a Commonwealth port, (ix.) an Australian registered vessel on a passage between Commonwealth ports.

SECTION 3.—MISCELLANEOUS.

1. **Declaration of Secrecy.**—Secrecy on the part of all officers engaged in the census is enjoined by a Declaration prescribed under Section 7 of the Census and Statistics Act. This Declaration is signed not only by those persons, such as enumerators and collectors, engaged in the actual taking of the census, but also by all officers (including compilers, draftsmen, clerks, etc.) engaged at the Central Bureau, either in the preparatory work or in the tabulation and analysis of the census returns. Under Section 24 of the Act, any officer who, after having made the prescribed regulation, divulges the contents of any schedule or card or any information furnished in pursuance of the Act, is punishable upon conviction by a penalty not exceeding £50.

2. **Penalties.**—The penal clauses of the Act and the Regulations made thereunder (see Appendices 1 and 2) provide for penalties, ranging from £5 to £50, in case of infringement of the various provisions of the Act. The penalty specified at the foot of any section, regulation, or paragraph indicates that any contravention of the section, regulation, or paragraph is punishable upon conviction by a penalty not exceeding the penalty mentioned.

CHAPTER VI.

THE CENSUS SCHEDULE.

SECTION 1.—INTRODUCTION.

1. **General.**—In this chapter it is proposed to discuss briefly the leading features of the schedule adopted for the first Commonwealth Census. To begin with, it should be observed that the scope of the census in most countries is at present seriously limited in various ways, among which the principal one is probably the difficulty of obtaining intelligent and accurate answers to census inquiries. If the questions asked are of a complicated nature, too great a strain will be put upon the intelligence or comprehension of the less educated class of citizens; if they are of such a character that they can be interpreted as an undue invasion of the privacy of the individual, for example as regards property, income, or social matters, even though the answers thereto would assist in the solution of economic and social problems of the greatest national importance, such questions will be met by some with passive resistance, by others with indignant opposition—or, by what may be worse, inaccurate replies. In practice, therefore, the census inquiries are advisedly worded in such a way that they cannot well be misunderstood even by the more ignorant members of the community, and are limited to such subjects as will not unnecessarily invade the privacy of the individual; they must also be in such a form that they will elicit the same sort of information from all persons.

2. **The Nature of the Schedule.**—In previous Australian Censuses the information has been asked for on a schedule in which the various queries appeared at the head of vertical columns, the particulars concerning each person being written on a horizontal line extending across the face of the schedule. Each schedule usually made provision for twenty persons. At the census now under review the nature of the "householder's schedule" referred to in the Census and Statistics Act 1905, was prescribed by Regulation (see Appendix 2) and consisted of a householder's card (see p. 64) and a personal card (see p. 60) for each person in the household. Supplementary to the schedule were an envelope (see p. 65) and a set of instructions (see Appendix 3) with each personal card. One householder's card was provided for every dwelling, and was filled in by the head of the household or the person in charge; a personal card was provided for each member of every household who was present on the night from the 2nd to 3rd April, 1911, or who, being absent on that night, returned next day, and was filled in either by the individual to whom the card referred, by the head of the household, or in some cases by the collector. The advantages of using a separate card for collecting the information from each person have already been referred to (see p. 13 hereinbefore), and it may here be remarked that the adoption of these cards at the first Commonwealth Census has been amply justified, without regard to other benefits, merely by the ease with which it has been possible to deal with the returns at the Central Bureau.

The progressive development of the Australian Census schedules has already been dealt with, and the subjects of inquiry included in the schedule used at the first Commonwealth Census have been compared with those comprised in the schedules used at previous censuses in Australia. (See p. 40 hereinbefore.)

3. **Duties of Householder or Person in Charge.**—General directions for the guidance of the householder or person in charge of the dwelling were furnished on the face of the envelope, a copy of which is reproduced on page 65 hereinafter, and in the first part of the Instructions. (See Appendix 3.)

The householder or person in charge of the dwelling was required to fill in the personal cards and the householder's card (forming together a householder's schedule) contained in the envelope, or was to see that each person who abode in the dwelling on the night of Sunday, 2nd April, 1911, himself or herself filled in one of the personal cards. The householder or person in charge of the dwelling was further required to furnish on personal cards particulars regarding those persons travelling or out at work during that night (and not included elsewhere), and who returned to the house or dwelling on Monday, 3rd April. If the house was occupied by different families on separate floors or in separate tenements, each such floor or tenement was required to be treated as a separate dwelling, and the occupier or person in charge of each had to make a return upon a separate householder's card. In the case of large pastoral and other similar establishments the proprietor or superintendent was allowed to fill in the returns of his complete

establishment, but a separate householder's card had in this case to be used for each of the out-station dwelling-houses or huts in which a distinct family or person resided, in addition to that for the home station ; and if any out-station was in a different collector's district from that of the home station, the schedule (householder's and personal cards) for it had to be delivered to the collector of the district in which such dwelling was situated.

It was the collector's duty to verify the facts, and, if the cards from any cause should not have been filled in, or should have been erroneously or insufficiently filled in, to record the necessary particulars or make the necessary corrections, from enquiries which he was authorised to make for that purpose.

SECTION 2.—THE PERSONAL CARD.

1. **General Features.**—The particulars which were asked for on the personal card in regard to each individual are comprised under fourteen headings, and are of a simple and readily ascertainable nature. A reduced copy of the personal card is reproduced below. The cards used in all the States, and in the Northern Territory, were precisely similar, except that the names of the individual States (and of the Northern Territory) were respectively specified immediately above the heavy horizontal line at the head of the queries.

Commonwealth of Australia.—Census, 3rd April, 1911.

Reduced Copy of Personal Card.

Census Form 3. CONFIDENTIAL.

Before filling in this Card please study the Directions on the accompanying Sheet and the Specimen Card on the Back hereof.

A. COMMONWEALTH OF AUSTRALIA.

CENSUS, 3rd APRIL, 1911.

PERSONAL CARD

For every Person present in the Night from 2nd to 3rd April, 1911, or returning on 3rd April (if not included elsewhere).

Personal Card No.....; of Householder's Schedule No.....; of Mesh No....., of Collector's District.....; of Census District No.....

STATE OF

This column is to be left blank

1. Name in full..... (Underline Surname.)
2. Sex { Write M for Male / Write F for Female }.....
3. Date of Birth :—Day.....; Month....., Year.....
(a) If exact date of birth is unknown, state age at last birthday.....years.
4. { If married, write M. / If widowed, write W. / If divorced, write D. / If never married, write N. M. }.....
5. Date of existing Marriage :—Year.....
6. Number of Children (living and dead) from existing Marriage.....
(a) Number of Children (living and dead) from previous Marriage.....
7. Relation to Head of Household.....
8. State if Blind or Deaf and Dumb.....
9. Country or Australian State where Born.....
10. { If a British Subject by Parentage, write P. / If a British Subject by Naturalization, write N. } ..... Race :—
11. If born outside Commonwealth, state length of residence therein—.....years
(a) Date of Arrival in Commonwealth :—Day.....; Month.....; Year.....
12. Religion.....
13. Education.....
(a) At present receiving Education.....
14. Profession or Occupation..... (If engaged in more than one occupation, underline principal occupation.)
(a) State if Employer or Employee, &c..... (See Instructions, page 4, line 14 (a) and (b).)
(b) If out of work, state period.....
(c) Occupation of Employer (if any).....

C.P.C.

FACE OF CARD.

SPECIMEN OF A FILLED IN PERSONAL CARD.

A. COMMONWEALTH OF AUSTRALIA.

CENSUS, 3rd APRIL, 1911.

PERSONAL CARD

For Every Person present in the Night from 2nd to 3rd April, 1911, or returning on 3rd April (if not included elsewhere).

Personal Card No. 3.; of Householder's Schedule No. 27; of Mesh No. 3; of Collector's District B; of Census District No. 8.

State of— Victoria.

1. Name in full— Miller, James. (Underline Surname.)
2. Sex— { Write M for Male / Write F for Female } M.
3. Date of Birth :—Day, 3; Month, Sept.; Year, 1890.
(a) Where exact date of birth is unknown, age at last birthday.....years.
4. { If married, write M. / If widowed, write W. / If divorced, write D. / If never married, write N. M. } N. M.
5. Date of existing Marriage :—Year.....
6. Number of Children (living and dead) from existing Marriage.....
(a) Number of Children (living and dead) from previous Marriage.....
7. Relation to Head of Household— Son.
8. State if Blind or Deaf and Dumb.....
9. Country (or Australian State) where Born— Scotland.
10. { If a British Subject by Parentage, write P. / If a British Subject by Naturalization, write N. } P. Race :—
11. If born outside Commonwealth, state length of residence therein— 9 years.
(a) Date of Arrival in Commonwealth :—Day, 13; Month, March; Year, 1902.
12. Religion— Presbyterian Ch. of Australia.
13. Education— R.W. B.Sc. Melbourne.
(a) At present receiving Education— N.
14. Profession or Occupation— Student at University. (If engaged in more than one occupation, underline principal occupation.)
(a) State if Employer or Employee, &c..... (See Instructions, page 4, line 14 (a) and (b)).
(b) If out of work, state period.....
(c) Occupation of Employer (if any).....

BACK OF CARD.

A copy of the instructions, issued with each personal card, will be found in Appendix 3 hereof.

The column on the right of the card was left blank so as to allow space for filling in at the Census Office for tabulation purposes certain numbers or symbols representing the particulars furnished for the individual referred to. This matter is dealt with further in Chapter VIII. (see p. 82) hereinafter. It may be observed that the upper right hand corner of each card was clipped at the place indicated in the sample above ; this was done for the sake of convenience in counting the cards and in sorting them into packs or bundles during the process of tabulation. The actual size of the card was 8 in. by 5 in.

2. **Particulars to be Filled in by Collector.**—The particulars specified above the heavy line on the card had to be filled in by the collector. These particulars were provided as a key to the place (*i.e.*, the electoral division, district, or province, or municipal district, etc.) to which each individual should be allocated, and were necessary so that the population of the various districts and divisions of the Commonwealth and its component States and territories, electoral and municipal districts, city wards, suburbs, etc., might be accurately ascertained.

3. **Particulars to be Filled in by Individuals.**—Having indicated the locality, the next thing required was to obtain an account of the individual; this was accomplished by means of the queries specified below the heavy line.

(i.) *Name.* The first query was provided for the insertion of the full name of the individual, and hence the census is what is known as a " nominal " census, as distinguished from one in which the names are not given, but merely the number of persons arranged under certain specified heads. As before pointed out (see p. 20), the early censuses of England were of this latter nature, but the many recognised advantages attaching to a nominal census have now led to its almost universal adoption. In the first place, it is necessary to legally connect the person to whom the information applies with the information furnished, in order to ensure just returns being made. Secondly, the nominal census is much easier for those required to make the returns; and thirdly, owing to the information being given separately for each person of either sex, the number of possible combinations of the various particulars for tabulation purposes is increased, and the practical scope of the census is thus usefully extended.

So far as the actual tabulating and compiling work performed at the central Census Bureau is concerned, particulars as to name are of no importance, except as an indication of sex, since the census results are, of course, absolutely impersonal, and refer to aggregates only. These particulars serve, however, as a useful check both in collecting and compiling, and the objects of the query may be said to be (*a*) to facilitate further inquiry by the collector if it is found that any of the later queries have been erroneously or insufficiently answered, (*b*) to enable the number of each sex specified in the householder's card to be verified, and (*c*) if necessary, to provide a check on the accuracy of the information asked for in the query relating to sex.

(ii.) *Sex.* The statement of the sex of each person was provided for in the second item of inquiry, in reply to which the letter " M " was required to be inserted if the person was a male, and " F " if a female. This query was necessary since names do not invariably furnish a reliable indication of the sex.

(iii.) *Date of Birth.* In this query provision was made for ascertaining the age of the person to whom the card referred. Many persons seem to think that it is a matter of comparatively little importance what age they fill in on the census schedule, so long as it is somewhere near the mark. In past censuses of Australia, as well as of other countries, the returns in regard to age have been grossly inaccurate, large numbers concentrating at the ages ending in 0 and 5, the concentration being most marked at ages ending in 0. This practice is much to be deplored, since many of the uses to which the census results are put require that the ages should be, as nearly as possible, correct; hence inaccurate returns render the results much less valuable than if the true ages were given. The present form of inquiry is new to Australian Censuses, and was adopted because it was thought that most people, when they wish to state their ages, refer back to the date of birth. It was, however, pointed out on the card that where the exact date of birth was unknown, the age at last birthday should be given, a special line being provided on the card for this purpose. The results of the present census (1911) exhibit much less in the way of inconsistent age deviations than has been the case in previous censuses. (See Chapter X., Ages, hereinafter).

(iv.) *Conjugal Condition.* Query 4 related to the condition as to marriage, and was not required to be answered in the case of children under twelve years of age. Provision was made for denoting to which of the four divisions—married, widowed, divorced, or never married—the individual belonged, the letters " M," " W," " D," or " N.M." being used to indicate the respective conditions. Many interesting and important questions, social and economic, depend for their elucidation upon the information furnished in reply to this query.

(v.) *Date of Existing Marriage.* The immediate object of this inquiry was to obtain particulars as to duration of marriage of persons at various ages, for tabulation in conjunction with sizes of families, in investigating the question of fertility.

(vi.) *Number of Children.* This inquiry, to be answered by married, widowed, or divorced persons, related to the number of children (living and dead) born to the person to whom the card referred. Separate queries were made in respect of children from an existing and from a previous marriage. The main object of this and the preceding inquiry was to throw some light upon what are generally regarded as some of the most pressing problems of the day, viz., the causes of the decline in the birthrate, the postponement of marriage to a later age than formerly, the average number of children per family, and the fertility or reproductive powers of married couples in relation to their ages at the time of marriage, and in relation to their birthplaces and religions. Such problems as these are of immense importance from the standpoint of our national destiny. If a nation is content to drift along the path of least resistance, it

must necessarily suffer from a one-sided or defective development. It will be evident, further, that in this country where we have the British race transplanted and new influences at work, it is desirable to watch with adequate attention the evolution of the people, and to systematically study the development of the race. Schemes for the guidance of national growth, and for the welface of the constituent elements of an infant nation, cannot hope to be uniformly successful unless directed by an adequate study of the development of population in every material relationship.

(vii.) *Relation to Head of Household.* Query 7 provided for the statement of the relation which the particular individual referred to bore to the head of the household—that is, whether wife, son, daughter, or other relative, visitor, lodger, or servant, and in the case of public institutions whether officer, patient, nurse, prisoner, etc. Although it is not ordinarily tabulated, the information here furnished is of value for checking purposes, and is, in the case of dependents, used in connection with the tabulation of occupations.

(viii.) *Blindness and Deaf-mutism.* Provision was made for the statement of cases of blindness or deaf-mutism. It was pointed out in the instructions that only persons totally unable to see should be entered as blind, and as deaf and dumb only those who were deaf as well as dumb.

This query differs somewhat from the corresponding one in the schedules of the 1901 Australian Censuses, owing to the omission of certain inquiries relative to each person who at the time of the census was " laid up or unable to follow his or her usual occupation by reason of illness or accident." A return of sickness, taken for a specified date, while furnishing interesting and valuable information for the time being, cannot be regarded as one likely to furnish reliable data on which an estimate could be based of the amount of sickness experienced throughout the year, since the accuracy of any such estimate must necessarily depend on whether the date chosen for the enumeration is one at which the amount of sickness is normal. It would only be by making several such inquiries in the course of the year, or by the adoption of compulsory notification for all important cases of sickness coming directly under medical observation —that thoroughly reliable and therefore useful information of this nature could be obtained.[1] In the case of accidents, the effect of the season would not be so marked as it would be in that of sickness, but the mere record of persons incapacitated by accident through various causes at any particular point of time would be of little value as a guide to the total accidents occurring during a specified period. Blindness and deaf-mutism being permanent infirmities, statistics relating thereto are, of course, not subject to seasonal fluctuations.

(ix.) *Birthplace.* In answer to this query, only the name of the Country, Colony, or State of the Commonwealth was required to be specified, since the entry of some insignificant town or district as " country where born " often entails a considerable waste of time in inquiry and investigation by the census clerks.

(x.) *Nationality and Race.* In connection with this and the preceding query, it may be noted that three distinct matters are frequently confused, viz., country of birth, race, and nationality (*i.e.*, political allegiance). No attempt was made on the card to ascertain any particulars concerning nationality, except such as were required in order to enable a distinction to be made between those persons who were British subjects and those who were subjects of foreign powers. A person may be a British subject by reason, either of place of birth (which would be disclosed in query 9), by parentage or by naturalization (query 10). In query 10, in case where a person was a British subject by parentage, the letter " P " was required to be inserted, and where by naturalization, the letter " N." The inquiry as to race was not required to be answered by persons of European race ; in all other cases the proper information, such as Aboriginal, Chinese, Japanese, Hindu, Javanese, Manilaman, Negro, Polynesian, or Aboriginal half-caste, Chinese half-caste, etc., as the case may be, was to be inserted. In view of the requirements of the Commonwealth Representation Act, of the expressed determination of the people of the Commonwealth to preserve their country as a " white Australia," and of other questions relating to the number of aliens—especially of the Chinese and Japanese in the Commonwealth—it was considered of importance that this information should be carefully collected.

(xi.) *Length of Residence in Commonwealth.* This query provides for a statement of the number of years each individual, not born in the Commonwealth, had resided therein. As a check on the number of years stated, the date of arrival in the Commonwealth was also asked.

As an indication of the permanence of settlement of the Commonwealth, this information is of considerable value, as also in connection with the conditions of residence imposed under the Commonwealth old-age and invalidity pensions system. As shewing the difficulty which has been experienced in drafting unambiguous questions, so that they cannot well be misunderstood, it may be mentioned that at the 1901 census of Western Australia, in one case the reply received to the query " Length of residence. If not born in Western Australia, state length of residence therein," was, " 36-ft. half-block " ; while in several cases the " length of residence " was stated to be 6 by 8, evidently referring to a tent of those dimensions.[1]

[1] See Report of Census of Western Australia, 1901, p. 170.

(xii.) *Religion.* Religious denomination was the subject of inquiry in query 12, and it was asked that the denomination or sect to which each person belongs should be explicitly stated. Vague, indefinite terms, which might mean one of several different religious bodies, were to be avoided. If any person, however, conscientiously objected to state his religious denomination, the word " object " could be inserted, this being the only query on the census card to which the option of refusing to furnish a reply was allowed. In every other case, a refusal rendered the person liable to a fine of £10. In the case of children, however young, the religion in which it was intended they should be brought up was required to be inserted.

(xiii.) *Education.* Query 13 provided for particulars relating to education. In the first line, provision was made for the degree of education to be stated, the information required being, however, of a very simple nature. If a person could not read, the letters " C.R." were to be inserted ; if able to read English but not to write it, the letter " R," was to be inserted ; and if able to read and write English, the letters " R.W." If not able to read English, but able to read though not to write, a foreign language, the letters " R.F." were to be inserted ; and if not able to read and write English, but able to both read and write a foreign language, the letters " R.W.F." If the person to whom the card related had obtained a University degree, the degree was to be stated, as well as the name of the University and the country in which the degree was obtained. Query 13 (*a*) referred only to persons receiving instruction at the time of the census. In this line, the kind of school, etc., was to be indicated. For this purpose " U." denoted a university, " S." a State school, and " P." any other school ; while " H." was to be inserted if instruction was being received at home. The name of the school, etc., was to be added.

(xiv.) *Profession or Occupation.* Query 14, the last on the personal card, related to profession or occupation ; and, detailed directions as to filling in the answers thereto were given in the Instructions distributed with the cards (see Appendix 3). It was considered of the greatest importance to ascertain accurately the proportion of the population which obtained a living in each of the many avenues of employment, and the instructions were intended to ensure that the occupations should be stated with sufficient clearness to admit of their being grouped under well-defined heads, and classified according to the nature of the object for which the work was performed. Thus, for example, the term " labourer " is such a very broad one, and embraces so many and such varied occupations, differing essentially both in nature and object, that it is absolutely necessary that some distinguishing words or phrase should be used in order that the person enumerated might be counted in that class to which he rightly belongs. Similar remarks apply to such designations as clerk, carter, book-keeper, salesman, etc. These all required to be duly qualified, as, for example, clerk to grocer, brewer's carter, drapery salesman, etc., in order that the employment provided by each class of occupation might be accurately ascertained. In order to give still greater precision to the nature of the occupation, a subsidiary query 14 (*c*) was added, specifying the occupation of the individual's employer, if any.

The system of classification which has been adopted in the compilation of the present census, provides for the division of occupations into eight main classes :—(i.) Professional (ii.) Domestic. (iii.) Commercial. (iv.) Transport and communication. (v.) Industrial. (vi.) Agricultural, pastoral, mineral, and other primary producers. (vii.) Independent; and (viii.) Dependents. These classes are divided into 27 orders, which are further divided into 111 sub-orders, and these in turn into 654 groups of occupations. The occupation to be specified was that which each person was following and deriving support from at the date of the census. If any person was unemployed at that date, the occupation usually followed was to be inserted. If out of work for a period exceeding one week immediately prior to the date of the census, the period should be specified in reply to query 14 (*b*). The object of this query is to afford some further indication as to the economic condition of different industries, and the state of the labour market, employment, etc.

Query 14 (*a*) provided for a statement of the grade, etc., of the occupation, letters being used for the purpose of distinguishing. Thus " E." inserted in this line, denoted an employer of other labour than that of household servants ; " O." a person in business on his own account, but not employing others ; " A." a person assisting the head of the household in his business, but not receiving salary or wages ; " W." a person receiving salary or wages ; " N." a person who, at the date of the census, was out of work, and had been so for more than a week prior to that date. The information furnished in reply to this query supplies the means for obtaining an interesting indication of the magnitude of the various branches of industry in the community, as well as furnishing a basis for the investigation and establishment of schemes for social insurance.

SECTION 3.—THE HOUSEHOLDER'S CARD.

1. **General.**—The principal objects in view in providing householder's cards in addition to the personal cards relating to each member of the household, were :—

(*a*) To enable a preliminary count merely of the numbers of each sex to be obtained as soon as possible after the date of the census.

(*b*) To act as a check on the number of personal cards in each household.

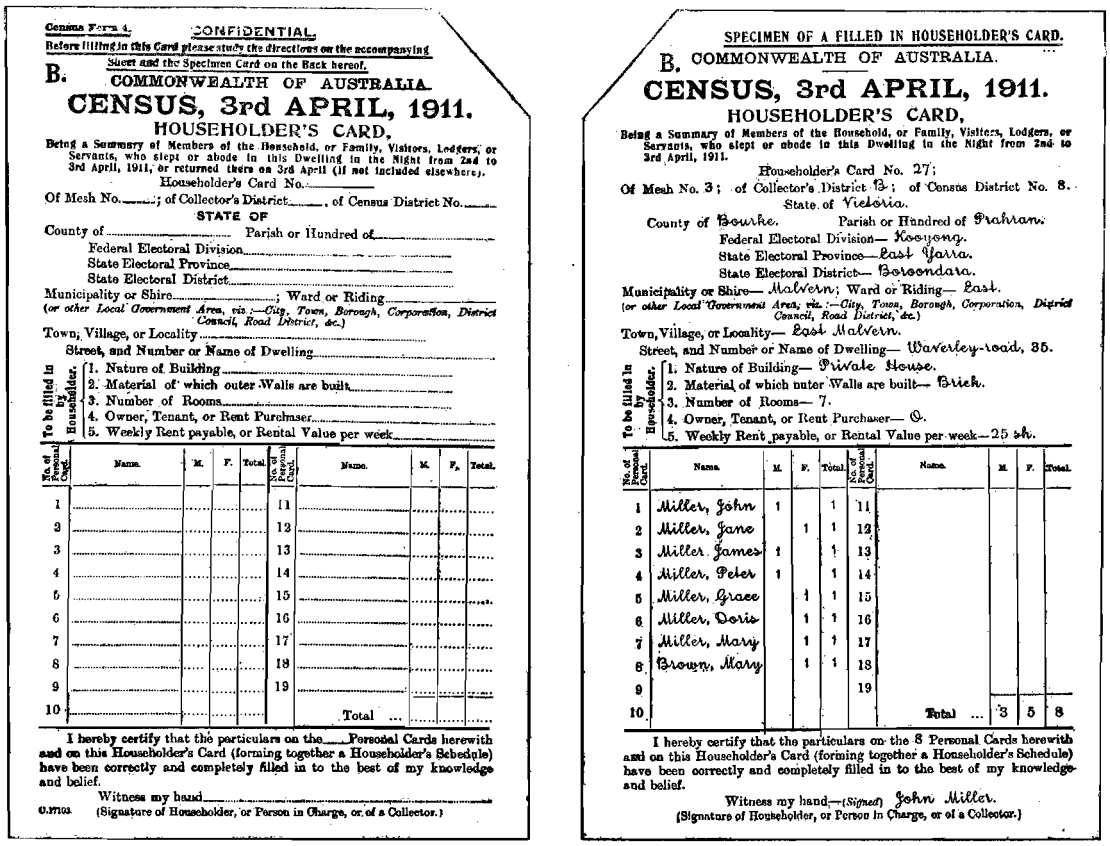
(*c*) To obtain information as to dwellings.

A reduced copy of the householder's card is reproduced below.

The householder's card was of the same size (8 in. by 5 in.) and shape as the personal card, and was the same for each of the States and the Northern Territory except that the name of each particular State or Territory was specified in its proper place.

Commonwealth of Australia, Census, 3rd April, 1911.

Reduced Copy of Householder's Card.



Census Form 4. CONFIDENTIAL.

Before filling in this Card please study the directions on the accompanying Sheet and the Specimen Card on the Back hereof.

B. COMMONWEALTH OF AUSTRALIA.

CENSUS, 3rd APRIL, 1911.

HOUSEHOLDER'S CARD.

Being a Summary of Members of the Household, or Family, Visitors, Lodgers, or Servants, who slept or abode in this Dwelling in the Night from 2nd to 3rd April, 1911, or returned there on 3rd April (if not included elsewhere).

Householder's Card No.

Of Mesh No. ; of Collector's District , of Census District No.

STATE OF

County of Parish or Hundred of

Federal Electoral Division

State Electoral Province

State Electoral District

Municipality or Shire ; Ward or Riding

(or other Local Government Area, viz.:—City, Town, Borough, Corporation, District Council, Road District, &c.)

Town, Village, or Locality

Street, and Number or Name of Dwelling

To be filled in by Householder.

1. Nature of Building
2. Material of which outer Walls are built
3. Number of Rooms
4. Owner, Tenant, or Rent Purchaser
5. Weekly Rent payable, or Rental Value per week

No. of Personal Card.	Name.	M.	F.	Total.	No. of Personal Card.	Name.	M.	F.	Total.
1					11				
2					12				
3					13				
4					14				
5					15				
6					16				
7					17				
8					18				
9					19				
10					Total ...				

I hereby certify that the particulars on the Personal Cards herewith and on this Householder's Card (forming together a Householder's Schedule) have been correctly and completely filled in to the best of my knowledge and belief.

Witness my hand

O.37103. (Signature of Householder, or Person in Charge, or of a Collector.)

FACE OF CARD.

SPECIMEN OF A FILLED IN HOUSEHOLDER'S CARD.

B. COMMONWEALTH OF AUSTRALIA.

CENSUS, 3rd APRIL, 1911.

HOUSEHOLDER'S CARD.

Being a Summary of Members of the Household, or Family, Visitors, Lodgers, or Servants, who slept or abode in this Dwelling in the Night from 2nd to 3rd April, 1911.

Householder's Card No. 27;

Of Mesh No. 3; of Collector's District B; of Census District No. 8.

State of Victoria.

County of Bourke. Parish or Hundred of Prahran.

Federal Electoral Division— Kooyong.

State Electoral Province—East Yarra.

State Electoral District— Boroondara.

Municipality or Shire— Malvern; Ward or Riding— East.

(or other Local Government Area, viz.:—City, Town, Borough, Corporation, District Council, Road District, &c.)

Town, Village, or Locality— East Malvern.

Street, and Number or Name of Dwelling— Waverley-road, 35.

To be filled in by Householder.

1. Nature of Building— Private House.
2. Material of which outer Walls are built— Brick.
3. Number of Rooms— 7.
4. Owner, Tenant, or Rent Purchaser— O.
5. Weekly Rent payable, or Rental Value per week—25 sh.

No. of Personal Card.	Name.	M.	F.	Total.	No. of Personal Card.	Name.	M.	F.	Total.
1	Miller, John	1		1	11				
2	Miller, Jane		1	1	12				
3	Miller, James	1		1	13				
4	Miller, Peter	1		1	14				
5	Miller, Grace		1	1	15				
6	Miller, Doris		1	1	16				
7	Miller, Mary		1	1	17				
8	Brown, Mary		1	1	18				
9					19				
10					Total ...		3	5	8

I hereby certify that the particulars on the 8 Personal Cards herewith and on this Householder's Card (forming together a Householder's Schedule) have been correctly and completely filled in to the best of my knowledge and belief.

Witness my hand,—(Signed) John Miller.

(Signature of Householder, or Person in Charge, or of a Collector.)

BACK OF CARD.

Directions for filling in the householder's card were given on the envelope (see p. 65 hereinafter), and the Instructions (see Appendix 3). These were required to be carefully read before a start was made at filling in the face of the card.

2. **Particulars to be Filled in by Collector.**—As in the personal card, so in the householder's card, the first lines—down to, and including particulars of street, and number or name of dwelling—were to be filled in by the collector, and were embodied on the card for the purpose of fixing the localities to which the persons enumerated belonged. Particulars as to locality were specified on the householder's card in greater detail than in the personal card, since each of the latter could be identified (as regards locality) by means of the corresponding householder's card.

3. **Particulars to be Filled in by Householder or Person in Charge.**—The five queries grouped together under bracket relate to dwellings, and were required to be filled in by the householder or person in charge. These particulars are of great importance both from an economic, social, and hygienic point of view, as throwing light on the subject of the housing of the people.

(i.) *Nature of Building.* Query 1 relates to nature of building, and particulars were to be inserted specifying whether the dwelling was a private house, a tenement in a private house, an hotel, a boarding or lodging house, a religious or educational institution, a military establishment, a charitable institution, a penal establishment, or other class of dwelling.

(ii.) *Materials.* In query 2 provision was made for inserting particulars as to the material of which the outer walls of the dwelling were composed. Each householder was required to state whether these consisted of stone, brick, concrete, wood, iron, canvas, or whatever material may have been used.

(iii.) *Number of Rooms.* In reply to the third query the number of rooms was to be stated. The kitchen was to be included as one of the rooms, but such a room as a shop, office, store, bathroom, pantry, or outhouse was to be excluded, unless some one slept therein. In case of a tenement the number of rooms in the tenement only was to be given.

(iv.) *Owner, Tenant, or Rent Purchaser.* Query 4 provided for a statement as to whether the householder was the owner, tenant, or rent purchaser of the dwelling. The information was to be given by inserting the letter " O." if an owner, " T." if a tenant, and " R.P." if a rent purchaser.

(v.) *Rent or Rental Value.* In reply to the fifth query particulars were to be given as to the weekly rent payable or rental value per week. Tenants were required to specify the actual rent per week ; owners, rent purchasers, and others not paying rent had to state the rental value per week.

(vi.) *Tabular Statement of Persons in Household.* In the tabular statement the name of each individual, for whom personal cards were filled in, was to be specified. The name of the head of the household was inserted first, followed, when necessary, by those of the wife, children, other relatives, visitors, lodgers, and servants in their respective order. It was pointed out that it was desirable that the full Christian name or names should be given in all cases where space permitted, as often providing a useful check on the accuracy of the information supplied in the personal cards, but where it was found impossible to insert full Christian names, initials were accepted.

The householder's card, after being carefully filled in, had to be signed by the householder or person in charge of the dwelling to which it referred.

(vii.) *Houses Uninhabited or being built.* A separate householder's card was to be filled in by the collector relative to each house intended for a residence which was uninhabited or in course of erection at the date of the census ; giving, so far as possible, all the particulars required. The word " uninhabited " or " being built," as the case might be, was to be written across the card. It appears, however, that in many cases the collectors did not fully carry out their instructions in respect to this matter, and that returns of the houses uninhabited or being built are therefore defective.

SECTION 4.—THE ENVELOPE.

1. **General.**—Each householder's card, with its corresponding personal cards, was placed by the collector, before delivery to the householder or person in charge, in a special envelope. The particulars printed on the face of the envelopes are shewn below ; the back of the envelopes was left blank. Their actual size was $8\frac{1}{2}$ in. by $5\frac{1}{2}$ in., or somewhat larger than the size of the cards themselves.

Commonwealth of Australia, Census, 3rd April, 1911.

Reduced Copy of Face of Envelope used to hold Householder's and Personal Cards.

Census Form 6.

CONFIDENTIAL.

COMMONWEALTH OF AUSTRALIA. **CENSUS, 3rd APRIL, 1911.**

ENVELOPE No._____; of Mesh No._____; of Collector's District_____; of Census District No._____.

STATE OF

D.

TO THE HOUSEHOLDER,

Mr. (Mrs. Miss)_____

Blank Forms.	This Envelope contains—	Filled-in Forms returned to Collector.
	Personal Cards A	
	Householders' Cards B	

GENERAL INSTRUCTIONS.

This Envelope containing a Householder's Schedule (consisting of.....Householders' Cards and.....Personal Cards) will be called for by the Collector on Monday, 3rd April, or as soon after as practicable. By that date the answers on each Personal Card should be written on the proper lines, and the Householders' Cards completed and duly signed by the householder or person in charge. It is the Collector's duty to verify the facts, and, if the cards from any cause should not have been filled in, or should have been erroneously or insufficiently filled in, to record the necessary particulars or make the necessary corrections, from inquiries which he is authorized to make for that purpose. Under Section 11 of the *Census and Statistics Act* 1905, every occupier of a dwelling with or for whom a Householder's Schedule has been left, is required, under a penalty of Ten pounds, to fill in all the particulars required to the best of his knowledge and belief, and to deliver the schedule so filled in and duly signed to the Collector authorized to receive it. Under Section 14 of the same Act every person is required, under a penalty of Ten pounds, to answer to the best of his knowledge and belief, all questions asked him by a Collector necessary to obtain any information required to be filled in and supplied in the schedule. It is, however, confidently expected that you will render the Collector every assistance, so as to render the work of collection as easy as possible.

Attention is drawn to the fact that REPLIES TO ALL QUESTIONS MUST BE EXACT, and that Section 26 of the "Census and Statistics Act 1905" imposes a penalty of Fifty pounds on any person who, in any form supplied under the Act, or in reply to any question asked him under the authority of the Act, shall knowingly make any statement which is untrue in any material particular.

C.17106. (*Signed*) G. H. KNIBBS, Commonwealth Statistician.

2. **Object of Envelopes.**—The primary object of providing the envelopes was, of course, to minimise the risk of loss of individual cards and to keep each householder's card in contiguity with its corresponding personal cards. It was considered necessary that the cards should be so kept together for the following reasons, viz., (*a*) For the convenience of the collector in keeping a record of the number of cards delivered to, and collected from, each householder, and in order to enable the collector to readily ascertain that the number and sexes of the persons specified on the personal cards for each household corresponded with the particulars given on the tabular statement on the householder's card. (*b*) To enable a further check to be made at the Central Census Bureau to ensure that the particulars of numbers of each sex specified on the householder's card corresponded with the number and sex of the persons for whom personal cards were furnished. (*c*) To enable the tabulation of certain particulars—such, for example, as the relative ages, birthplaces and religions of husbands and wives, and the sizes of families in relation to ages of parents to be readily effected.

3. **Particulars to be Inserted.**—All the particulars on the envelope, with the exception of that relating to the number of filled-in forms returned to the collector, had to be filled in by the collector before delivering the schedule. The particulars as to forms returned were required to be filled in by the collector when collecting the schedule.

CHAPTER VII.

PRELIMINARY WORK OF THE CENSUS.

SECTION 1.—INTRODUCTION.

1. **General.**—As the census of the 3rd April, 1911, was the first census taken for the whole Commonwealth under the Federal Constitution, it is thought desirable to place on record in this Report not only the procedure followed and the preparations made previous to the actual taking of the census, but also to note some of the principal experiences then gained. Such a record will probably prove of general interest, and will also be of material assistance to those officers who are entrusted with the organisation of the arrangements for the next Commonwealth Census. Further, it is hoped that these matters will be of technical interest and value to persons, not only in the Commonwealth, but also in other parts of the world, who are concerned in the operation of census-taking, a matter of interest in all civilised countries.

2. **Nature of Preliminary Work and Method of Organisation.**—Probably only those who have closely studied or have been engaged in carrying out a census realize the enormous amount of preparatory work entailed, the extent of the field of inquiry, and the amount of detail to be covered for the purpose of getting accurate returns. In the first place the nature and extent of the questions to be submitted had to be carefully considered from various points of view, and possible objections to certain queries or methods of presenting them had to be investigated before even the form of the census schedule could be drafted.[1] Then the whole country had to be divided up into census districts and collectors' districts, in the most advantageous manner possible under the existing circumstances, care being taken that the collectors' districts were not too large, so that the collector was able to distribute and collect all the schedules within the allotted time. This subdivision in the first place entailed the preparation of maps on a large scale covering the whole country, shewing as clearly as possible the boundaries of the most important divisions, such as counties, electoral districts, municipalities, etc., and then these maps had to be divided into appropriate census districts. For each such district an officer—called an " Enumerator " —had to be selected, possessing such qualifications as would warrant his appointment in charge of the collection for that census district. For the purposes of organisation at the present census, the census districts were grouped together for each of the States of the Commonwealth, the census arrangements for each State being placed in charge of a supervisor, subject to the general control of the Commonwealth Statistician. The total number of enumerators employed at the census was 346. On each enumerator devolved the duty of cutting up his census district into suitable collectors' districts, and of selecting for each a person capable of carrying out the actual work of collection in that collector's district. The number of collectors engaged at the recent census was 6952; for each collector a map of his sub-district had to be provided. Those collecting in populous centres carried out their work on foot, while in the more remote districts bicycles, horses, motors, other vehicles, boats, and, in some cases, camels were required.

3. **Visit of Commonwealth Statistician to Europe.**—After the organisation of the Commonwealth Bureau of Census and Statistics, the initial steps towards making arrangements for the census were taken by the Commonwealth Statistician during a visit to Europe extending from April to December, 1909. The primary object of the Statistician's tour was to make inquiries as to the organisation and equipment of the more important Census and Statistical Bureaux in Europe, and to acquire information as to recent developments in the evolution of scientific methods regarding census and statistics. It may here be observed that the most striking feature of modern statistics is the development which is taking place along scientific lines. The wide reach of statistical method, and the demands it makes in regard to the necessary technical knowledge and mathematical equipment, in a word, its general scope and outlook, mark it out as among the wider fields of human knowledge. Mere tabulations of figures are only the foundation of statistics, not its superstructure, nor can mere compilers of, and commentators on, statistical tables be regarded as statisticians ; probably much of the almost meaningless tabulation which in the past has passed current for statistics will in the near future be dispensed with, while penetrating investigations on scientific bases will take their place. This will, of course, in no way prevent analyses of returns being presented in popular form for the general reader.

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[1] See preceding Chapter VI. hereof, p. 59.

In the course of his tour, the Commonwealth Statistician visited the Census and Statistical Bureaux at Rome, Florence, Vienna, Budapest, Munich, Stuttgart, Paris, Berne, Lucerne, Zurich, Berlin, Hamburg, Copenhagen, The Hague, and London, and acquired valuable information from the officers of these Bureaux. Arrangements were made, after consultation between the Commonwealth Statistician and the Registrar-General of England, for identity of dates and methods to be followed at the censuses of England and the Commonwealth.

Special inquiries were also made by the Statistician in regard to machinery employed for facilitating statistical and census work, and the following apparatus were examined, viz., (*a*) The Hollerith machine and the card-punching machine used in connection therewith ; (*b*) The Austrian modification of the Hollerith Census Machines ; (*c*) The Census Machines being constructed for the Statistical Department in Switzerland ; (*d*) The " Classicompteur Imprimeur " used in the Statistical Bureau for France ; (*e*) The Sorting Machine of the British Tabulating Machine Company ; (*f*) The new machinery in course of preparation for the Director of the United States Census. The Statistician also acquired information regarding the new machnie then being constructed for use in the Census of Japan, and inquired into the feasibility of attaching " counters " to sorting machines, so that they would sort and count at the one operation.

As a result of these inquiries it was decided, as previously stated (see p. 15 hereinbefore), that it was not desirable to use either tabulating or sorting machines at the first Commonwealth Census.

SECTION 2.—THE CENSUS BUREAU AND THE STATE SUPERVISORS.

1. **General.**—Towards the end of December, 1909, a preliminary scheme was prepared by the Commonwealth Statistician for the organisation and conduct of the work involved in carrying the census to a successful issue, and in February, 1910, after various proposals and matters of special concern had been carefully considered, a modified scheme covering the main features of the work was drafted and received the approval of the Minister for Home Affairs. The first matter of importance, towards the execution of the scheme, was the selection of an officer in each State to act as the Commonwealth Statistician's deputy, and it was considered judicious, in the common interests of both Commonwealth and States, to secure the services, in the capacity of State Supervisor, of each State Statistician, or, failing him, of one of the State officers who had had experience in the organisation and conduct of any recent Australian Census.

2. **Appointment of State Supervisors.**—On the 2nd March, 1910, communications were addressed by the Commonwealth Government to the State Premiers, asking if it would be agreeable to their several Governments, that their Statisticians should act in the way suggested, subject to the following conditions, viz. :—

(*a*) That each State Supervisor should sign a declaration of fidelity under Section 7 of the Census and Statistics Act.

(*b*) That all communications with such officers acting under the Census and Statistics Act should be direct.

(*c*) That the State Supervisors should attend at the Commonwealth Bureau of Census and Statistics, Melbourne, to receive personal instructions from the Commonwealth Statistician ; and

(*d*) That each Supervisor should be paid a fee of £105 on the conclusion of his duties. (This fee was afterwards increased to £157 10s.)

By the middle of April, 1910, letters were received from the Premiers of each of the States, except Western Australia, agreeing to the appointment of the State Statisticians as Supervisors, under the conditions suggested. The Statistician of Western Australia was unable to undertake the duties of State Supervisor of Census owing to pressure of official business and for private reasons, and arrangements were eventually completed on the 29th June, 1910, whereby the duties of Supervisor were undertaken by the Chief Electoral Officer of Western Australia, an officer who not only had taken a responsible part in the 1901 Census of Western Australia, but who also possessed a wide general knowledge of census and statistical matters, and whose experience in electoral organisation rendered his services particularly valuable. The appointments of the State Statisticians of New South Wales, Victoria, Queensland, South Australia, and Tasmania, were not actually confirmed until the 31st October, 1910, and were notified in the Commonwealth Gazette of the 5th November, 1910. The Gazette notices of the arrangements made (for all the States except Western Australia) were identical, and the forms thereof are shewn in Appendix 4. The appointment of the Chief Electoral Officer of Western Australia as Supervisor of Census for that State was not confirmed until the 24th November, 1910, and was notified in the Commonwealth Gazette of the 26th November following. It was stated in each of the Gazette notices that the arrangements made were deemed to have taken effect on and from the 1st July, 1910 ; the State Supervisors, however, took up their duties at an early date after the assent of their respective Governments to the suggested conditions had been obtained.

The names of the officers appointed to act as State Supervisors of Census in the several States are as follows :—

Commonwealth of Australia.—Census, 3rd April, 1911.—State Supervisors of Census.

New South Wales	J. B. TRIVETT, F.S.S., F.R.A.S.
Victoria	A. M. LAUGHTON, F.I.A., F.F.A.
Queensland	THORNHILL WEEDON, F.S.S.
South Australia	L. H. SHOLL, I.S.O., J.P.
Western Australia	E. G. STENBERG, F.S.S.
Tasmania	R. M. JOHNSON, I.S.O., F.S.S.

3. **Meeting of Commonwealth Statistician and State Supervisors.**—In the meantime, in anticipation of the formal appointment as State Supervisors of the Government Statisticians of the five States which had already assented to the proposed arrangement, the Commonwealth Statistician was authorised on the 11th May, 1910, to at once ask each of these State Statisticians to attend at Melbourne. Towards the end of the same month a meeting was accordingly held and the preliminary scheme formulated by the Commonwealth Statistician was communicated, and the functions and duties of the State Supervisors were set forth. The nature and form of the census schedule, the scope of the inquiries to be included therein (having special regard to the requirements of the Census and Statistics Act), and the division of the States into census and collectors' districts were matters which received special attention.

4. **The Scope of the Inquiry and Other Preliminary Investigations.**—Whilst the arrangements for the appointment of the State Supervisors were being made, a number of matters were under consideration at the Census Bureau ; of these there were two of special importance, viz., (i.) the nature, form, and scope of the householder's schedule, and (ii.) the preparation and examination of maps to shew the division of each State into suitable census districts.

(i.) *The Householder's Schedule.* The nature and most suitable form of schedule having been decided,[1] the question as to subjects of inquiry to be included required careful consideration. The census being an occasion on which the whole of the community is brought under review and on which it may be said that every individual is personally interviewed, a very natural feeling exists that such an opportunity should be utilised to the utmost, and that the list of inquiries should be very extensive. From the point of view of those responsible for carrying the project to a successful issue this general impression is extremely unfortunate, since it leads to requests for the making of many inquiries which lack the qualities necessary to warrant their inclusion in a census form, and prevents those advancing such requests from recognising the reasonableness of the reply that any such inquiry would overweight the schedule. Such persons usually find a difficulty in seeing how the addition of one question on a subject which appears to them of paramount importance could possibly have so disastrous an effect. What is usually overlooked is that if a concession is made in their case it will become increasingly difficult to refuse a similar concession to others who have, perhaps, equally strong claims to consideration. It may be laid down as a general principle that no inquiry is worthy to be included on the census schedule unless if has for its object the eliciting of some fact of wide general interest, information concerning which is of importance for administrative, economic, or sociological purposes.

Among the various matters with regard to which suggestions were received for inclusion as subjects of inquiry the following may be mentioned, viz., (*a*) Rate of wages or salary. (*b*) Days lost from work. (*c*) Contributions to income by wife and children. (*d*) Rent. (*e*) Bathroom. (*f*) Size of yard. (*g*) Whether a landowner or Crown lessee. (*h*) Whether the person desires to settle on the land; and (*i*) Use of alcoholic liquors as a beverage. Various suggestions were also received as to tabulation and presentation of results, and for enabling certain items of information to be supplied in such a manner that neither the head of the household nor the collector should be aware of their character.

It was eventually proposed to include in the census schedule (by Regulation under Section 12 of the Census and Statistics Act), in addition to the queries ultimately adopted, inquiries as to the following matters, and in the following form, viz.,—

(*a*) *Salary or Wages.* State here the amount of your salary or wages at present time per day £.....*s*.....*d*., or per week £.....*s*.....*d*., or per month £.....*s*.....*d*., and amount earned during year ended 31st December, 1910 £.....*s*.....*d*.

(*b*) *Average Number of Hours' Work* per day.....or per week.....

(*c*) *Notes and Coin in Circulation.* State here the amount of money held by you, for example, on your person, in your business tills, in safe deposit, but not in any Bank or similar institution :—Notes, £.....*s*. ; sovereigns and half-sovereigns, £.....*s*. ; silver, £.....*s*.....*d*. ; copper, £.....*s*.....*d*.

[1] The special advantages of the householder's and personal cards as compared with the old form of schedule have already been referred to (see p. 13).

(*d*) *Total Abstinence.* If you are a total abstainer from alcoholic beverages, write "Yes"; if you are not, write "No".....

It was considered desirable that these queries should appear at the end of the personal card, and be so arranged that the part of the card containing them could be folded and sealed, in order that the replies thereto would not be open to inspection by the collectors. It was also proposed to include among the confidential inquiries necessary references to divorce.

Draft Regulations for the inclusion of the queries specified above, together with copies of the cards proposed, were in due course submitted for the consideration of the Commonwealth Legislature, in the course of which it was decided by the Senate that the four queries specified above should be disallowed. The form of cards and the subjects of inquiry approved of by Parliament were as shewn on pages 60 and 64 hereinbefore, the confidential inquiries being discarded and the inquiry as to divorced persons being transferred to query 4 of the personal card.

It may incidentally be remarked that the form of the card as finally approved by Parliament was substantially identical with that originally submitted, and the range of questions was unaltered.

(ii.) *Other Elements of Preparatory Work.* The scheme of collection having been formulated, the scope of the inquiry defined, and the State Supervisors appointed, the other main elements of the preparatory work of the census requiring attention consisted of :—

(*a*) Issue of instructions to Supervisors.
(*b*) Appointment of draftsmen and provision of accommodation for same.
(*c*) Preparation of enumerators' maps for each State.
(*d*) Appointment of enumerators.
(*e*) Drafting and printing of forms and instructions for enumerators.
(*f*) Division of enumerators' (census) districts into collectors' sub-districts. Selection of collectors.
(*g*) Preparation of collectors' maps.
(*h*) Appointment of collectors.
(*i*) Drafting and printing of forms and instructions for collectors.
(*j*) Supply of material to collectors.
(*k*) Explanation of duties to collectors.
(*l*) Advertisement of census and issue of pamphlets etc., thereon.
(*m*) Provision for special collections in trains, in ships, etc.
(*n*) Appointment of interpreters.
(*o*) Preparation of scheme of tabulation.
(*p*) Co-ordination of material collected at past censuses.
(*q*) Examination and appointment of tabulating staff.
(*r*) Provision of accommodation for tabulation staff.
(*s*) The writing of the Census Report, preliminary Chapters.
(*t*) Preparation for analysis of results and technical and scientific investigations.

5. **General Instructions to State Supervisors.**—The next matter of importance requiring attention was the preparation and issue of a set of instructions for the guidance of the State Supervisors. In these instructions (which were issued on the 30th June, 1910, and of which a copy is given *in extenso* in Appendix 5 hereof) the Supervisors were notified of their appointment and were furnished with a copy of the Census and Statistics Act, 1905. They were informed that their appointments would date from the 1st July, 1910, and would terminate on the 30th June, 1911, and they were invited to make any desired queries, comments, or suggestions as to the collection of the census, and to forward the same to the Commonwealth Statistician.

As soon as possible after these instructions were issued, large-sized maps, which, with the exception of those for Tasmania, had been prepared at the Census Bureau, were forwarded to each supervisor, shewing the partition of his State into census (enumerators') districts.

In the case of Tasmania all maps for census purposes were prepared by the Surveyor-General's Department of that State, under the guidance of the State Supervisor.

(i.) *Emolument of Enumerators.* The State Supervisors in due course submitted to the Commonwealth Statistician statements on forms specially provided for that purpose, specifying what would be a fair rate of emolument for the person undertaking the duties of enumerator in each census district. The supervisors were instructed that the basis of such emolument was to be a guaranteed fee of at least £10 10s., together with such further payment, dependent on the amount of work involved, having regard to the area and probable population of each district.

(ii.) *Selection and Appointment of Enumerators.* On receipt of the Statistician's approval of the suggested rates of emolument, the supervisors were directed to select for each census district a duly qualified person willing to undertake the duties of enumerator at the rate specified. Where obtainable, the following persons were suggested as being suitable for appointment :— (*a*) Resident or police magistrates. (*b*) Town clerks. (*c*) Shire secretaries. (*d*) Clerks of Courts. (*e*) Mining Registrars. (*f*) Electoral Returning Officers. (*g*) Persons who had

satisfactorily performed similar duties on a previous occasion. Where such persons were not available, the supervisors were instructed to obtain suitable persons by inquiry or advertisement. On completion of the list of enumerators, the supervisor forwarded the same to the Commonwealth Statistician for approval, on the forms which had been used for transmitting suggested rates of emolument. These forms were submitted by the Statistician to the Minister for Home Affairs for final approval. The supervisors, on receipt of such approval, formally notified the persons approved of their appointment, at the same time obtaining from each a declaration of secrecy and fidelity, and a service undertaking signed in duplicate. The appointments of enumerators were subsequently notified in the Commonwealth Gazette.

(iii.) *Enumerators' Maps and Sub-divisions.* When the appointment of each enumerator had been notified, a list of instructions was forwarded to him direct from the Census Bureau, together with a map of his division on a large scale, for subdivision into collectors' districts. These districts were to be of such a size that the work of distributing and collecting the census forms therein could be readily carried out in a limited time to be prescribed by the enumerator and approved by the Commonwealth Statistician. On the completion of the work of subdivision each enumerator forwarded his map to his supervisor, together with a rough description of the boundaries proposed and a distinguishing letter for each proposed collector's district. After having satisfied himself that the districts proposed were suitable, and in accordance with the instructions issued to the enumerator, the supervisor forwarded the maps and descriptions to the Commonwealth Statistician. After approving each subdivisional scheme submitted, a set of maps shewing collectors' districts was prepared at the Census Bureau. A list of these was forwarded for the information and guidance of the supervisor, and a map of his census district, shewing the boundaries of the collectors' districts comprised therein, was forwarded to each enumerator, while a set of maps, each dealing with one collector's district, was forwarded for the use of the collectors themselves. A general map was also forwarded for the guidance of the supervisor.

(iv.) *Selection and Appointment of Collectors.* As early as possible after the approval of his scheme of subdivision, each enumerator nominated for each collector's district comprised in his division a person considered suitable to act as collector; and on completing his list of collectors submitted the same to his supervisor for revision, after which it was transmitted to the Commonwealth Statistician. On being informed that the list was considered satisfactory, the supervisor transmitted to the enumerator the necessary forms of service " undertaking " between the enumerator and collector, together with the letter of authority to act as collector. Each collector was required to make a declaration of fidelity and secrecy; these declarations, and also, on the satisfactory completion of service, the undertakings made by the collectors, were transmitted by the enumerators to the supervisor, by whom they were eventually forwarded to the Commonwealth Statistician.

(v.) *Instructions to Enumerators and Collectors.* The supervisors were directed to make themselves familiar with the instructions issued to enumerators and collectors, so as to be in a position to promptly advise these officers on any points which might arise in the performance of their respective duties. In case of doubt reference was to be made to the Statistician, if time permitted; if not, the supervisors were to act on their own responsibility.

(vi.) *Final Revision of Census Arrangements.* The supervisors were requested to assure themselves during the month of March, 1911, that all preparations for the census had been duly made, and that all enumerators and collectors were ready to carry out the work of collection expeditiously. Special care was to be taken that no islands had been omitted from the scheme of collection.

(vii.) *Other Matters.* The Supervisor's Instructions also contained directions as to various other matters, viz.:—emergency appointment of enumerators and collectors, census posters, preliminary count, transmission of forms, enumerators' vouchers, postal and telegraphic arrangements, printing, and general census provisions; the most important of these matters are further dealt with in their proper order in the succeeding parts of this Report.

6. **Instructions to Record Clerks Assisting State Supervisors.**—It had been arranged that each State Supervisor should be furnished with the services of a record clerk and a typist, and on the 30th June, 1910, instructions were issued from the Census Bureau to these record clerks (see Appendix 6). After drawing attention to the fact that the records of the State Supervisors were to be forwarded to the Census Bureau, when the work of census collection was completed, and to the necessity for uniformity in keeping these records in the several States, the system to be adopted was outlined, and directions were given for the preparation, numbering, and indexing of appropriate files, for the keeping of précis sheets, and for the registration of correspondence inwards and outwards. Instructions were also given as to postage books, stamps, and stationery.

7. **Financial Instructions to State Supervisors.**—Financial instructions were issued in September, 1910; a copy of these instructions may be found in Appendix 7, and it may be seen that the first part thereof related specifically to State Supervisors. For the purposes of providing to each supervisor a sub-advance to be operated upon for paying incidental and petty

cash expenditure, an account, designated " Commonwealth Census Account," was opened in each of the State capitals. Provision was made for travelling expenses, cost of conveyance, and postage stamps, and the supervisors were informed that the authority of the Minister for Home Affairs, through the Commonwealth Statistician, was to be obtained for expenditure, such as printing, clerical assistance, etc., prior to any liability being incurred; in cases of extreme urgency the supervisors could, however, incur the expenditure in anticipation of Ministerial approval. Persons engaged for clerical assistance were to be selected from the register of applicants in the office of the Public Service Inspector, and orders for services other than those paid for by petty cash were to be issued by the Commonwealth Statistician.

SECTION 3.—THE ENUMERATORS, AND THEIR DUTIES.

1. **General.**—In a previous part of this Chapter the method of selection and appointment of enumerators has been outlined, and their preliminary duties have been indicated (see p. 70 hereinbefore). On the 30th September, 1910, instructions were issued by the Statistician to the enumerators; these instructions (a copy of which may be found in Appendix 8) were divided into four parts, viz. :—(i.) Preliminary; (ii:) Definition of Collector's Districts; (iii.) Selection and Appointment of Collectors; and (iv.) Final Instructions; and it will be convenient to refer briefly to their main requirements under each of these four heads.

2. **Preliminary Matters.**—The attention of the enumerators was first drawn to the fact that the collection of the census data was to be effected on cards, instead of on schedules as on former occasions, and the nature of the " householders' schedule " adopted under the Census and Statistics Act 1905, and consisting of a householders' card and personal cards with the supplementary instructions and envelope, was described. Notice was to be given later to each enumerator of the number of police constables (if any) which would be available for the work of collection in his district.

3. **Definition of Collectors' Districts.**—The boundaries of each census district were shewn in broad red-coloured lines on the plan forwarded by the Commonwealth Statistician to the enumerator. The boundaries of the Commonwealth Electorate Divisions were marked in green, those of the State Electorate Divisions in blue, those of the State Electoral Provinces in broken blue lines, those of Counties in yellow, those of Municipalities or other Local Government areas in neutral tint, and those of Municipal Sub-divisions (Wards or Ridings) in broken lines of neutral tint.

(i.) *Method of Subdivision into Collectors' Districts.* The first duty of each enumerator, after having made a careful study of the map of his district, was to suggest a scheme for the division of the whole of his district into collectors' districts. In regard to all municipalities and towns, and also to other populous centres, the census district had to be so divided as to admit of all schedules being distributed during the four days preceding Sunday, 2nd April, and collected during the eight working days following on that date. In the scattered country districts more time was to be allowed, but the sub-divisions were to be such that all the returns, even in the most remote part, might be collected by the 24th April, at the very latest. Each enumerator was directed to carefully consider, and to enter in a prescribed form, the number of days which, in his opinion, should be allowed each collector for the distribution and collection of the schedules; except under special circumstances, payment to collectors was to be allowed only for the number of days thus allotted. The boundaries marked on the enumerators' maps—including those of counties,[1] parishes or hundreds, Commonwealth electoral divisions, State electoral districts and provinces, municipalities, and in certain cases, municipal wards—were to be taken into account in fixing the boundaries of the collectors' districts. Wherever practicable, the boundary of a collector's district was not to cross any of the boundaries thus shewn.

(ii.) *Lettering of Collectors' Districts and Numbering of Meshes.* Each census district was numbered, and a distinguishing letter was given to each collector's district therein; the letters for each such district were duly recorded in the prescribed schedules supplied to the enumerators. The lettering of the collectors' districts in each census district ran from A onwards.

In cases where the boundary of a collector's district was crossed by the boundary or boundaries of any electoral, municipal, or other divisions, the areas (within each of such collectors' districts) formed by the intersection of the boundaries of the electoral, municipal, or other divisions, either with each other, or with the boundary of the collector's district itself, were termed " meshes," and were distinguished by consecutive numbers, commencing at unity, suffixed to the particular letter indicating the collector's district in question. The population living within each " mesh " had to be accurately ascertained. The object of this arrangement was to enable the population of any electoral, municipal, or other division to be determined by allocating thereto the number of persons within the particular " meshes " comprised in such division.

[1] In Western Australia statistical districts were also shewn.

(iii.) *Density of Population.* In apportioning collectors' districts the enumerators were directed to consider the distance to be traversed by the collectors in going from dwelling to dwelling. It was pointed out in the instructions that in a town where the houses adjoin or are only a few yards apart, from 150 to 200 inhabited houses might be included in each collector's district, whilst in suburban districts and villages or townships where the dwellings are moderately contiguous, although further apart than in a closely-built town, the number might be from 100 to 150 ; in the more settled agricultural districts where there is occasionally a distance of more than half-a-mile between one dwelling and the one nearest to it, the number might be from 50 to 100 ; and in the more scattered districts where intervals of 2 miles or upwards may intervene between the dwellings, less than 50 might be included in a collector's district. Due consideration had also to be given to the collector's method of travelling, *i.e.*, whether on foot, bicycle, horse, or otherwise.

(iv.) *Definition of Boundaries.* The enumerators were instructed that the boundaries of the collectors' districts were to be well defined and clearly described and that, where possible, well marked, natural or artificial boundaries such as rivers, creeks, roads, railways, telegraph lines, etc., should be adopted. In cases where streets, roads, or rivers were used as boundaries, the boundary-line was invariably to be understood to run in the middle of the street, road, or river, so that the houses on one side would be in one collector's district, and those on the other side in another collector's district adjoining. Wherever possible each municipality or ward, if not too large, was constituted a collector's district.

(v.) *Approval of Scheme of Subdivision.* The enumerators were directed to cause the boundaries of, and the letter given to, each collector's district (and the number of each mesh) to be marked in pencil on the maps already forwarded, and also to give a description of the boundary lines of such districts on the prescribed schedules, which have already been referred to (see p. 72 hereinbefore) in connexion with the number of days to be allowed for the distribution and collection of the schedules, and which had to be made out in duplicate. The enumerators also had to specify in these schedules, in the columns provided for such purposes, the estimated number of dwellings, and the number of householder's schedules, and personal cards required in each collector's district, and had to state in each case whether it was proposed that the collector should act on foot, bicycle, horseback, or otherwise. The maps, with one copy of the schedule, were transmitted to the State Supervisor, by whom they were in due course despatched to the Commonwealth Statistician for final approval.

Immediately upon the receipt in the Census Bureau of these maps and schedules, the enumerators' suggestions were taken into consideration and, when finally approved, maps were at once prepared in duplicate on the largest scale available, shewing the boundaries of each census districts, and its component collector's districts and meshes, and a separate map of each collector's district was prepared for the use of the collector.

(vi.) *Other Matters.* The enumerators were directed to make special arrangements (*a*) for providing the necessary collectors' districts for the shipping in port, fishing fleets, pearling fleets, etc., and (*b*) for the enumeration of the inhabitants of the islands off the coast. Arrangements for the collection of particulars relative to persons travelling on the railways were made by the State Supervisors.

4. **Selection and Appointment of Collectors.**—When the enumerator's schedule and maps shewing the proposed division into collectors' districts had been examined, a transcript of the schedule, containing such alterations or additions as were thought desirable, was returned to the enumerator, together with maps shewing the approved boundaries of the collectors' districts and sectional maps of each such district for the use of the collectors.

(i.) *Selection of Collectors.* The enumerators were instructed to proceed, on the receipt of these maps, with the selection of persons qualified to act as collectors. To those enumerators in whose districts the services of police officers to act as collectors were available, a list, containing the names, addresses, etc., of such officers, was forwarded.

(*a*) *Police Collectors.* It may here be remarked that in May, 1910, a communication was addressed by the Commonwealth Government to the Premiers of each of the States asking the State Governments to co-operate in the work by making available the services of the police for the distribution and collection of the schedules, on the conditions that the Commonwealth should recoup the States all out-of-pocket expenses actually incurred in rendering the service and that a bonus of 2s. a day for foot police, and 1s. a day for mounted police be paid to the individual members of the police force engaged in the work. It was not proposed to utilise the services of the police in the closely settled parts, but only in the outlying districts. The Governments of South Australia, Western Australia, and Tasmania granted the services of their police to the extent required, but in the other States the proposal was not accepted ; in New South Wales, however, arrangements were ultimately made for the employment of police officers as collectors in a few districts where the enumerators stated it was impossible to obtain civilian collectors. The services of the police were also obtained in all the States in the days immediately following the census in obtaining particulars of travellers, tramps, campers, etc., who might have been overlooked by the regular collectors. In cases where police officers were available as collectors, the enumerators

were instructed to place themselves in communication with the officers commanding the police in the particular districts in question, and to obtain their views and suggestions as to the allocation of collector's districts to the police officers available.

(*b*) *Civilian Collectors.* The most suitable collectors' districts having been decided upon and duly allotted to police collectors in the census districts in which they were available, the services of civilians had to be obtained for the remaining districts. The enumerator was, therefore, reminded that a collector, to enable him to fulfil his duties satisfactorily, must be a person of intelligence and activity, must neither be too young nor yet too old, must read and write well, and must be sufficiently healthy and strong to undergo the exertion of performing his task with promptness ; that he must be of temperate habits and sufficiently good address to convey all the requisite information concerning the census in a manner calculated to command the good-will and co-operation of all concerned. It was further necessary that he should be thoroughly acquainted with the collector's district in which he was required to act, and he should, therefore, by preference, all other qualifications being equal, be selected from among those applicants who had resided in the district for some time, and whose business had brought them into frequent and direct personal contact with its inhabitants. It was further pointed out that it was desirable that each collector should live in or near his own collector's district, so that he should not have the additional labour of going far from his home before he could commence his duties. This rule was not, of course, to be rigidly adhered to, but had to be left to the discretion of the enumerator, who had to bear in mind that character and fitness were qualities to be considered of paramount importance. The enumerator was, in addition, directed to obtain the services of interpreters to accompany the collectors in any districts where large numbers of Asiatics or other persons unable to speak English existed.

(ii.) *Rates of Remuneration of Collectors and Time Allowed.* With regard to the remuneration to be offered, it was arranged, except where otherwise specially authorised, to pay collectors acting on foot at the rate of 10s. per diem, collectors acting on bicycles at 15s. per diem, and on horseback at 20s. per diem ; bicycles, horses, vehicles, petrol, and fodder were to be provided by the collectors. Should it be impossible, however, to obtain suitable collectors in some of the more remote districts at the above rates, and be found absolutely necessary to offer higher rates to secure eligible men, it was the enumerator's duty to submit in full his reason for so doing ; this also applied in cases where it was necessary for a collector to hire camel or boat, or where any exceptional circumstances occurred.

No payment was to be allowed to the collectors for any time occupied in receiving instructions or in giving up returns after the census was over, but an additional sum of 5s. was to be allowed to each collector for the work of completing and summarising the entries in the collector's compilation book. Before submitting the name of any person for appointment as collector, the enumerator had to ascertain whether such person would agree to perform the work of distribution and collection of the schedules within the number of days already suggested by the enumerator in the schedule referred to (see p. 72) ; and the time thus agreed upon was specified in each case in the notification of appointment forwarded later by the enumerator to the collector. If the collector could not complete the collection in his district within the time specified he was bound by his instructions (to which he had undertaken to adhere) to continue until he had completed his work for the sum indicated in his appointment.

(iii.) *Appointment of Collectors.* As soon as the enumerator had obtained suitable applicants for the duties of collector in each of the sub-districts, he despatched to the State Supervisor a schedule stating the name, age, occupation, postal address, and suggested rate of pay *per diem*, if in excess of fixed rate, of each candidate, and the distinguishing letter of the sub-district proposed to be allotted to him. This schedule was forwarded by the Supervisor after revision to the Commonwealth Statistician, and after due consideration had been given to the circumstances of each case and any alterations made which were considered necessary, the schedule was approved and a transcript thereof returned to the supervisor, who in turn transmitted the same to the enumerator, together with the necessary forms of (i.) notification of appointment of collectors, (ii.) undertakings by collectors, and letters of authority to act as collector. In the transcribed schedule were embodied, in addition to the particulars referred to in the enumerator's schedule, the details of an estimate, which he had previously been required to furnish (see p. 73 hereinbefore), as to the number of dwellings in each collector's district, the number of householder's and personal cards required, and the number of days which he calculated should be allowed for the distribution and collection of the schedules in each collector's district. The letter of appointment was not to be delivered to the collector until he had made a declaration of fidelity and secrecy and signed an undertaking, the form of which had been previously submitted to, and obtained the approval of, the Commonwealth Law Officers.

The essential points of this undertaking under which the collector accepted the appointment were as follows :—(*a*) That he would faithfully perform the duties of census collector. (*b*) That he would carry out, in every particular, the instructions of the Statistician or his State Supervisor, or the enumerator of his census district. (*c*) That he would not desert from his duty, nor refuse nor neglect, without just excuse, to perform his duties.

It was further pointed out in the notification of appointment (*a*) that the collector must preserve all cards, forms, and other documents and articles committed to his charge, and that he must, at the close of his work, render to the supervisor an account of the same; (*b*) that his appointment was terminable at the will of the Commonwealth Statistician; (*c*) that he was required to complete his duties within the time specified, and (*d*) that he would be paid therefor the sum indicated.

5. **Final Instructions.**—It was specially impressed upon the enumerators, that, while the preceding instructions were being complied with, they were to make themselves thoroughly conversant with all the details connected with the actual taking of the census, as set forth in the Census and Statistics Act, and in the several sets of instructions issued by the Statistician for the guidance of enumerators and collectors, and also in the instructions issued with the householder's schedule, etc. They were further directed to be particularly careful that all preliminary work was completed as long beforehand as possible, so that nothing remained unsettled or undecided on census day. In case of any doubt arising as to their own or their collectors' duties, or as to the various forms and instruction supplied to them, they were to at once apply to the State Supervisor. Enumerators of adjoining census districts were to be consulted when doubt existed as to the exact position of boundary lines common to both districts, and every precaution was to be taken to avoid the omission of any portion of the area allotted to them.

(i.) *Explanation to Collectors.* The enumerator, after having made himself familiar with the collector's duties, was, wherever practicable, to personally explain them to each of his collectors and to go over his map with him, carefully pointing out and explaining the boundaries of the district; he was not only to fully explain the details of the householder's schedule and the manner in which the enumeration was to be performed, so as to secure uniformity of action, but was also to take an opportunity of ascertaining whether the instructions to collectors were properly understood by each. Where the district allotted to any collector was intersected by a boundary of any electoral or municipal division, etc., special care was to be taken to impress upon the collector the necessity for carefully ascertaining the position of any such boundary, and for correctly inserting the name of such division in the cards delivered by him in each particular " mesh " in his district.

(ii.) *Supply of Materials to Collectors.* Forms and all other necessary articles were to be supplied by the enumerator to each collector in the quantities required, and in ample time to enable him to leave a householder's schedule at each dwelling within his sub-district within the appointed time. The enumerator was directed to obtain a receipt from the collector on a duplicate schedule for all cards and other articles supplied. After the work of collection was completed the enumerator obtained from each collector an account of the disposal of the cards and other things, and took over from him any balance remaining.

(iii.) *Marking and Numbering of Cards and Envelopes.* The enumerator was requested to cause every envelope and every householder's and personal card, *before* being handed over to the collector, to be stamped with the number of the census district. The letter distinguishing the collector's district, the " mesh " number, and other particulars specified in a later part of this Chapter (see Section 4, par. 3), were to be filled in by the collector.

(iv.) *Enumerations of Persons on Board Vessels.* In addition to obtaining schedules for all vessels in port in the Commonwealth on census night, the enumerators were instructed to make arrangements for collecting the requisite census information regarding all persons on board any vessel, other than a warship, which on census night was on a voyage from any port *within* the Commonwealth and of which the first port of call after sunrise on Monday, 3rd April, was in the Commonwealth. In case of vessels which arrived after sunrise on that day from any port *outside* the Commonwealth, schedules were not required. The master of each vessel leaving any Australian port for any other port in the Commonwealth during the week preceding Sunday, 2nd April, was to be supplied with schedules, so that returns could be furnished without delay at the next port of call. The collection on board warships in port was arranged by the State Supervisor.

(v.) *Miscellaneous.* The enumerator was enjoined to duly impress upon the collector, before the latter actually commenced his work, (*a*) that having once accepted office he was not at liberty under Section 22 of the Census and Statistics Act to refuse the position or neglect the due performance of his duties, under a penalty of £20, (*b*) that he was not entitled to payment until he had faithfully performed his duties, (*c*) that no payment in excess of 5s. would be allowed for the time taken up in making up compilation books and schedules after the census was over, and (*d*) that under Section 24 of the said Act the householder's schedule and all other census forms were confidential documents, and that any officer divulging the contents of any such form was liable to a penalty of £50.

Should an enumerator for any cause deem it advisable to recommend the dismissal of a collector, he was empowered to temporarily appoint a substitute, but was directed to at once forward his report and recommendation for the consideration and approval of his supervisor.

In case an enumerator was prevented by sudden illness or other unavoidable cause from carrying out his duties, he was to report the fact at once by telegram to the supervisor, and if there were not sufficient time to enable the supervisor to appoint a successor, the enumerator was directed to depute at once some person to act for him ; the appointment of that person as enumerator was to be subject to the subsequent approval of the supervisor.

6. **Financial Instructions to Enumerators.**—Financial instructions to enumerators were issued on the same form as that on which similar instructions were given to the State Supervisors (see Appendix 7). As regards travelling expenses, each enumerator travelling under authority from a State Supervisor was allowed 12s. per diem, except when travelling by steamer or other vessel in which the fare paid includes subsistence, in which case the allowance was 3s. per diem. In travelling by rail, road, or sea, the actual fare was allowed in addition to the above travelling expenses. Each enumerator was furnished by his supervisor with a supply of postage stamps, and was directed to keep a separate " stamp account."

Collectors were directed to forward all correspondence with the enumerator or supervisor in envelopes supplied for that purpose ; postage stamps were not required for these, since the postage was to be paid by the enumerator or supervisor on receipt. Telegrams sent by a collector to his enumerator or supervisor were to be marked " Collect " on production to the telegraph officer of the letter of authorisation as evidence of his appointment.

SECTION 4.—INSTRUCTIONS TO COLLECTORS.

1. **General.**—It was found necessary to commence at an early date the preparation of the instructions to be issued for the guidance of the collectors ; and since it was upon these men that the responsibility for the actual taking of the census depended, it was of importance that their instructions should contain minute and explicit directions as to the proper fulfilment of their duties. It may readily be understood that the efficiency of a collector largely depends upon his ability to grasp the idea as to how he is expected to carry out his duties, and that the drafting of a set of instructions equally suitable and intelligible to all is, therefore, a work of peculiar importance and difficulty. Whilst it is necessary that these instructions should be lucid, explicit, and easily understood, it is equally essential that they should be as concise as is compatible with completeness and intelligibility. Considerable care was therefore bestowed upon the instructions at the time of drafting them, while they were subsequently revised with minute attention ; from knowledge since acquired it would appear that these instructions generally served their purpose admirably, though it is manifest that in a few cases no proper attempt can have been made to master their contents.[1]

A copy of " Instructions to Collectors " will be found in Appendix 9 hereof.

2. **Scheme of Collection.**—As soon as was practicable after his appointment, each collector was required to make himself thoroughly acquainted with the instructions to collectors and with the instructions accompanying the householder's schedules ; he was also furnished with a copy of the Census and Statistics Act (see Appendix 1), and was directed to thoroughly master those Sections (principally Sections 8 to 15), which particularly pertained to him, and in addition he was to make himself acquainted with the manner in which the entries were to be made by the householder and others. In case the directions given were not absolutely clear, or in case of any doubt as to the exact position of the boundaries of his district, as shewn on the plan furnished to him, he was to confer with his enumerator. The attention of the collectors was specially drawn to the fact that the collection of the data was to be effected on cards, instead of on schedules, as on former occasions, and the precise nature of the " householder's schedule," with its supplementary " instructions " and " envelope," was pointed out.

3. **Marking and Numbering of Envelopes and Cards.**—The divisions shewn on the plan of each collector's district comprised portions of counties, parishes or hundreds, Commonwealth electoral divisions, State electoral districts and provinces, local government areas, and wards or ridings. As previously explained (see p. 72 hereinbefore), each enumerator's district was distinguished by a number, and each collector's district therein by a letter ; and where a collector's district consisted of portions of two or more of any of the divisions referred to, such as portions of two or more counties, or portions of two or more electoral divisions, etc., the different " meshes " into which the district was thus divided were distinguished by numbers, commencing at unity, suffixed to the letter indicating the particular collector's district.

On each collector's map was affixed an explanatory note shewing the nature of the division indicated by each of the boundaries marked on the plan. The scale of the map and the bearings were also indicated.

[1] In some cases the collectors in distributing the schedules did not include a personal card for the householder himself ; in other cases a set of instructions for guidance in filling in the cards (see Appendix 3) was provided only for each householder's card, and not for each personal card, as directed. These defects were afterwards made good.

In addition to the above explanatory note each collector's plan was accompanied by a schedule in tabular form, on which the following particulars were specified for each " mesh " within the district, viz. :—County, Federal Electoral Division, State Electoral Province, State Electoral District, and Local Government Area, while columns were also provided for " Additional " and " Remarks." The collector was thus provided with a key to his plan, and he was able to ascertain at a glance the particular county, electoral division, etc., in which any " mesh " was situated.

With this explanation it may now be stated that one of the first duties of the collector, after having made himself thoroughly acquainted with his instructions, and the nature of his duties, was to fill in the requisite particulars as to locality on all householder's cards prior to delivery, the name of the State having already been printed, and the number of the census district stamped on these cards before they were issued to him. On reference to the form of householder's card given on p. 64 hereof, and to the information in regard thereto, it may be seen that the collector had to write on each householder's card prior to delivery, the following particulars, viz., number of householder's card, mesh number, distinguishing letter of collector's district, county, parish or hundred, federal electoral division, State electoral province and district, municipality or shire, ward or riding, town, etc. It was by means of the plan of his district, together with the explanatory note and schedule of " meshes," that the collector was enabled to fill in these requisite particulars without difficulty. As explained hereinafter, the blank spaces at the head of personal cards and envelopes, with the exception of those referring to the number of cards contained in the envelope, were to be filled in by the collector when delivering the schedules.

SECTION 5.—OTHER PREPARATORY WORK.

1. **General.**—While the work mentioned in the preceding parts of this Chapter was systematically proceeding, arrangements had to be made for commencing the tabulation and analyses of the material so soon as it reached the Census Bureau, so that as little delay as possible might occur after the actual enumeration had been completed ; and in this connexion the results of previous Australian Censuses had to be collected and co-ordinated so far as possible, so that they could be compared directly with the results of the present census of the whole Commonwealth, and the tendency of the community in the direction of gain or loss could be thereby determined. This necessarily involved the study of past census reports, both local and of various other countries, as well as of much current literature bearing on the subject ; for the methods of presentation of the facts had to be carefully weighed and considered as to whether and how far they were suited to present requirements, as altered or necessitated by recent progress.

2. **Arrangements for Tabulation.**—So soon as the most desirable system for the presentation of the census results had been decided upon, and the methods of tabulation and analysis of results had been adopted, the forms necessary for these purposes had to be carefully drafted and printed, while arrangements had to be made for the selection and accommodation of the special census staff to carry out the work of tabulating the data.

The preparation of this Report and of the preliminary work for the special investigations included herein had also to be considered. It may here be observed that it would appear that a comprehensive *aperçu* of the history and methods of census-taking throughout the civilised world has not hitherto been published. As a considerable amount of special research and study was undertaken to carry out the census in the light of what has previously been undertaken, it seemed desirable to place on record in the preliminary Chapters of this Report such information in regard to census-taking as the study referred to revealed.

3. **Advertising the Census.**—Although, in accordance with the provisions of the Census and Statistics Act, the date for the taking of the census had been duly appointed by the Governor-General in Council, and a Proclamation to that effect published on the 31st January, 1911, and thus all statutory obligations in this respect had been complied with, it was considered desirable to still further advertise the event, so as to direct public attention to its importance and to cause its advent to be anticipated and its occurrence facilitated throughout every portion of the Commonwealth, however remote or difficult of access.

(i.) *The Census Pamphlet.* With the object of first bringing before the public the chief features of the purport and significance of the census a pamphlet entitled " The First Commonwealth Census," was prepared and printed, and about 25,000 copies were distributed throughout the Commonwealth during February, 1911. This pamphlet, which extended to 19 pages, was divided into six Chapters. The first was introductory and pointed out the importance of the census results as presenting a picture of national life and character ; the second Chapter was historical, and gave a short *résumé* of the origin of the census with particular reference to previous Australian Censuses ; the third Chapter dealt with the objects and uses of the census, whilst

in the fourth mention was made of the preparatory work involved. The nature of the personal card and the householder's card and of each query thereon were then thoroughly explained, both as to their object and the form in which it was desired that the particulars should be furnished. Finally in the sixth Chapter brief information was given in regard to the procedure that would be followed in the distribution and collection of the returns, and the methods of tabulation and analysis were touched upon.

(ii.) *Press Notices.* A sufficient number of these pamphlets was first of all despatched to each State Supervisor to enable him to supply, through the enumerator, a copy to each collector, whilst retaining one for his own use and for that of each enumerator. Copies were then sent to the Editors of all the leading newspapers with a view to furnishing material for press notices of the Census, its objects and organisation.

(iii.) *Lessons to School Children.* On the 31st January, 1911, a letter was sent to the Director of Education in each of the States, pointing out the probability that the work of filling in the Census schedules would to some extent devolve upon the elder children of the various families, and asking that, if practicable, arrangements might be made for giving a series of lessons to the elder scholars on the nature and requirements of the Census. With this request the several Education Departments cordially complied, and a supply of 10,000 copies of the census pamphlet mentioned above was despatched for distribution to the various head teachers, to enable them to give to the elder scholars during March a short series of lessons based thereon.

(iv.) *Census Posters.* Arrangements were made with the Postmaster-General's Department, with the Railway Departments of the several States, and with the several State Commissioners of Police for the exhibition of Census Posters on notice boards and hoardings under their control. For this purpose 6,500 posters were forwarded to the Postmaster-General's Department. 4,250 posters to the Railway Departments, and 3,500 to the Commissioners of Police. A further supply of 1,100 posters was sent to the State Supervisors for distribution amongst their enumerators, with direction to have them posted in such places, in addition to those indicated above, as appeared suitable.

(v.) *Newspaper Advertisements.* As a further guarantee of publicity, the Census proclamation was inserted throughout Australia, as an advertisement in the principal morning and evening daily papers of Saturday, 25th March, and Saturday, 1st April, 1911, and in the principal weekly papers of the 18th and 25th March, 1911, or the dates of issue nearest thereto.

(vi.) *Notifications in Chinese.* To ensure a thorough understanding of the census provisions by the relatively large Chinese communities existing in some of the States, circulars in Chinese were prepared and forwarded to the State Supervisors for distribution by the Collectors, with the cards where such action was necessary. In addition a special advertisement was inserted in a Chinese newspaper published in Sydney, and another in a similar journal published in Melbourne.

CHAPTER VIII.

COLLECTION AND COMPILATION.

SECTION 1.—DISTRIBUTION OF SCHEDULES.

1. **Collector's Outfit.**—Each collector, before commencing the work of distribution, had been supplied with the following outfit to enable him to carry out the duties of his office:—

1. Requisite supply of Householders' Schedules, etc., comprising (*a*) Householders' Cards ; (*b*) Personal Cards ; (*c*) Instructions, and (*d*) Envelopes.
2. Collector's Record Book.
3. Collector's Compilation Book.
4. Necessary articles of Stationery.
5. Bag for holding schedules (if required).
6. Certificate of Appointment.
7. Map of District.

The Collector's Record Book, which each collector carried with him while distributing, contained provision for the entry of the name and address of each householder to whom a census schedule was delivered, and also for the date of such delivery. These particulars were filled in by the collector at the time. A further column in the book provided for the insertion of the date of collection, while in the event of such collection not taking place, the collector was required to furnish the reason for the omission in a column headed " Remarks." By these means provisions were made for securing a record of all schedules issued.

2. **Period of Distribution.**—Provision was made in the allocation of collectors' districts, and the selection of collectors, that where practicable in the more populous areas the time allowed for distribution should not exceed the four days immediately preceding Sunday the 2nd April. In outlying districts, however, the large area to be covered, and the difficulty of securing the services of suitable collectors for short periods, rendered it necessary to allow a considerable amount of latitude in the allocation of time for distribution. In some of these cases the distribution had to be commenced more than a fortnight prior to census day.

SECTION 2.—COLLECTION.

1. **Actual Work of Collectors.**—In accordance with instructions, the actual work of collection was commenced throughout Australia on Monday, 3rd April, 1911, the collectors revisiting the houses at which census schedules had been delivered prior to Census Day. If all instructions for filling in the schedules had been carefully complied with, the collector should have found in each case that a householder's card had been duly prepared for each dwelling, and a personal card for each person who had spent the night of Sunday, 2nd April, therein, or who being absent at work, or travelling on that night, had returned to the dwelling on the 3rd April. In many cases, however, the duties of the collector were much more arduous than the mere receiving of the cards and the comparison of the number of personal cards with the particulars shewn on the householder's card to ascertain that every one had been duly accounted for. Frequently it was found that no cards had been filled in, and in numerous other cases the collector was obliged to ascertain missing particulars and insert them on the cards. Taking the Commonwealth as a whole, it may be said that this part of the work of collection was fairly well done, and though cases came to light in which collectors had exercised very little, if any, care in obtaining a supply of the missing particulars, in numerous instances the records furnished indications of painstaking zeal.

2. **Period for Collection.**—The instructions to Census Enumerators provided that in allocating the boundaries of Collectors' Districts, the area selected should, in populous districts, be such that the work of collecting the schedules should not extend over more than eight working days, *i.e.*, that it should be completed not later than the 11th April, 1911. In remote and

sparsely populated country a longer period was allowed, but it was stipulated that every endeavour should be made to have all cards collected not later than the 24th April, 1911, thus allowing a maximum period of three weeks for collection. In actual practice it was found that in a few instances even this later limit had to be exceeded owing to the difficulty of securing suitable collectors willing to undertake the heavy travelling and other difficulties involved in the collection of some of the more remote areas.

3. **Collectors' Difficulties.**—Apart from the difficulties arising from the indifference, wilful neglect, or ignorance of the householders, which were met with in greater or less extent in all parts of the Commonwealth, special difficulties were experienced in some of the districts.

In some cases these took the shape of heavy floods, which, in addition to making rivers impassable, frequently had the effect of rendering the country so boggy that progress was seriously impeded. This trouble was most in evidence in Queensland, where cases occurred in which a collector was held up for a week or more at a time through stress of weather or boggy roads. In some parts of South Australia, on the other hand, droughty conditions rendered collection difficult, owing to shortage of water and scarcity of horse feed.

Enormous distances had, in some cases, to be covered by the collectors to obtain the records of a comparatively small number of persons. This was particularly the case in Queensland, Western Australia, and the Northern Territory, and added considerably to the difficulty of securing the services of suitable collectors.

Another source of difficulty, this time mainly in populous areas, arose in connection with small colonies of foreigners unable to read or speak English. These were provided for as far as possible by the appointment of interpreters, where necessary, to accompany the collector, or in some instances to undertake themselves the duties of collector. In the case of the Chinese, advertisements in Chinese were, in addition, inserted in two of the leading Chinese newspapers published in Australia, and a poster in Chinese was issued for display where necessary.

4. **Preliminary Count.**—For the purpose of enabling a preliminary count of the population to be made at the earliest possible date after Census Day, each collector was supplied with a compilation book, in which, when collecting his schedules, he was required to enter daily the number of persons enumerated in each household. This book was so drafted as to allow one line for each household, provision for 28 households being made on each page. The particulars provided for in respect of each household were :—(i.) Name of householder ; (ii.) Mesh number ; (iii.) Locality ; (iv.) Number of Envelope ; (v.) Total number of persons (distinguishing sexes) ; (vi.) Number of Aboriginals included in v. (distinguishing sexes); and (vii.) Remarks.

On completing his enumeration each collector was required to total the several pages of his compilation book, summarise the results on a special page provided for the purpose, and forward the results to his enumerator as soon as possible thereafter. A special sum of 5s. was allowed to each collector for the work involved in preparing this summary. Similarly each enumerator was required, on receipt of such returns, to check the summary by comparison with the collector's compilation book, and then forward the result by letter or wire to the Commonwealth Statistician, and also to the State Supervisor. By such means progress results for the various parts of the Commonwealth became available at the earliest possible date. On the whole the system worked well, but in some cases regrettable delays occurred, the totals for a State being, in one case, held up for a considerable time by reprehensible lack of promptness on the part of one or two collectors.

The result of the final count of the cards in the Census Office shewed that the preliminary figures understated the population of the Commonwealth by only 5512, a decrepancy of less than an eighth of one per cent. The closeness of the results reflects credit on the enumerators and collectors for the care exercised by them in compiling the returns from which the preliminary figures were derived.

The preliminary figures for the Commonwealth as a whole were completed on the 27th June, 1911, twelve weeks after the date of the census, but, as stated above, the progress results had already been made public from time to time as they came to hand. A comparison of the preliminary and final figures for each of the States is as follows, the Federal Territory being included with New South Wales, and the Northern Territory with South Australia.

State or Territory.	Preliminary Count (completed 27th June, 1911).	Final Count (completed 30th Oct., 1911).	Deficiency in Preliminary Figures.	
			Numerical.	Per Thousand of Final Count.
New South Wales[1]	1,648,210	1,648,448	238	0.14
Victoria	1,315,000	1,315,551	551	0.42
Queensland	603,908	605,813	1,905	3.15
South Australia[2]	411,161	411,868	707	1.72
Western Australia	280,316	282,114	1,798	6.37
Tasmania	190,898	191,211	313	1.64
TOTAL	4,449,493	4,455,005	5,512	1.24

[1] Including Federal Territory. [2] Including Northern Territory.

The largest actual deficiency occurred in the case of Queensland, and the largest proportional deficiency in Western Australia, but in no case was the discrepancy at all considerable.

5. **Check and Return of Schedules.**—Each collector, on completing his work, returned his schedules and record and compilation books to his enumerator, by whom they were required to be checked and forwarded to the State Supervisor. The State Supervisor exercised a further but necessarily less detailed check, and forwarded the material to the Census Office, Melbourne. In the majority of cases care was taken by the enumerator to see that the work done by his collectors had been carried out in accordance with instructions, but in some instances it was evident that little more had been done than to transmit to the State Supervisor the material received from the collector. As the State Supervisor was not required to check in detail the work of the collectors, the outcome of such neglect on the part of an enumerator, was that a great deal of supplementary correspondence was thrown on the Census Office before the actual tabulation of results could be proceeded with. The principal cause of this correspondence was the want of agreement in certain cases between the number of persons shewn on the householder's card and the number of personal cards received. In a large proportion of cases, where more names appeared on the householder's card than there were persons for whom personal cards had been received, it was found that absentees, and in some cases members of the family who had been dead some years, were recorded on the householder's card. Such errors should, of course, have been rectified by the collector at the time of the collection, or failing that, by the enumerator before transmitting the schedules to his State Supervisor. No attempt was made by the Census Office to collect by means of correspondence items of information which had been omitted from individual cards, as the work involved would have been prohibitive, and the delay in the census work would have been considerable.

In this connexion it may be noted that 23,384 persons failed to state their ages, while 30,468 failed to specify their birthplaces.

6. **Collecting Staff.**—The total number of enumerators employed in the Commonwealth as a whole in connexion with the Census was 346, giving an average population of 12,876 per enumerator. The total number of collectors employed was 6952, giving an average of 20 collectors per enumerator, and an average population of 641 per collector.

The details for the several States are as follows :—

Enumerators and Collectors Employed at the Census of 3rd April, 1911.

State.	No. of Enumerators.	No. of Collectors.	Av. No. of Collectors to each Enumerator.	Population Enumerated.	Av. Population per Enumerator.	Av. Population per Collector.	Area.	Av. Area per Enumerator.	Av. Area per Collector.
							sq. miles.	sq. miles.	sq. miles.
New South Wales[1]	93	2,028	22	1,648,448	17,725	813	310,372	3,337	153
Victoria	95	2,322	24	1,315,551	13,848	567	87,884	925	38
Queensland	62	1,042	17	605,813	9,771	581	670,500	10,815	643
South Australia[2] ..	45	634	14	411,868	9,153	650	903,690	20,082	1,425
Western Australia ..	28	611	22	282,114	10,075	462	975,920	34,854	1,597
Tasmania	23	315	14	191,211	8,313	607	26,215	1,140	83
TOTAL	346	6,952	20	4,455,005	12,876	641	2,974,581	8,597	428

[1] Including Federal Territory. [2] Including Northern Territory.

It will be seen that the average population per enumerator was greatest in New South Wales and least in Tasmania, while the average per collector was greatest in New South Wales and least in Western Australia. The average area per enumerator, and also per collector, was greatest in Western Australia and least in Victoria.

SECTION 3.—TABULATION.

1. **Tabulating Staff.**—For the purpose of selecting a suitable body of tabulators, an examination was held in each of the States on 8th April, 1911, at which candidates for employment were subjected to an elementary education test in Arithmetic, Spelling, and Writing, the examination being carried out by the Commonwealth Public Service Commissioner. The necessity for such a test was shewn by the fact that although 1066 candidates presented themselves, less than a quarter of these succeeded in securing 40 per cent. or upwards of full marks.

From these latter, together with officers who had already been employed on the preliminary work of the census, the compiling staff was made up. Owing to the necessity for concentrating the staff, and to the lack of sufficient accommodation, suitably situated, it was decided to work two shifts, the earlier shift commencing at 7.45 a.m., and the later at 3.30 p.m. This

arrangement lasted from 1st August, 1911, to 30th June, 1912. The tabulating staff reached a maximum of 270, and was reduced by fortnightly retrenchments from 15th March, 1912, to 30th June, 1912. Further retrenchments were effected from time to time as various sections of the tabulation were completed, the more competent officers being retained from stage to stage.

2. Tabulation Organisation.—For the purpose of securing adequate supervision of the tabulating staff, sections comprising ten men in each were constituted, one member of the section being placed in charge under the designation of " section leader," while one section leader in each shift was selected as the responsible officer in charge of the shift, under the designation of " shift supervisor," the work of the shifts being superintended and co-ordinated by the " tabulation superintendent," who was directly in touch with the tabulators on the one hand, and the permanent " Central Supervisor of Census " on the other. All of the officers, from the " tabulation superintendent " downwards, were temporary hands, at the following rates of pay :—

	PER DAY.
" Tabulation Superintendent"	.. 15s.
" Draftsmen and Special Computers "	10s. to 15s.
" Shift Supervisors "	13s. 6d.
" Section Leaders "	12s. 6d.
Storeman	12s. 6d.
Tabulators (aged 21 and upwards) ..	.. 10s.

	PER DAY.
Tabulators (under 21)	.. 5s
Female Adding Machinists (aged 21 and upwards)	.. 8s.
,, ,, (under 21)	.. 5s.
	PER WEEK.
Messengers (boys)	15s. to £1

The method adopted in the tabulation of the data was that of employing all the staff on the same tabulation for the whole Commonwealth. This was considered preferable to the alternative method of allocating the several States to groups of tabulators to be tabulated throughout, as it simplified the work of control and storage, and by distributing the work to different tabulators at different stages tended to greater accuracy in the results.

3. Segregation of Census Cards.—One of the acts preparatory to that of tabulation was the separation of the cards from their envelopes, and the removal and destruction of envelopes and blank cards. It was necessary, however, that particulars in regard to married couples, such as the relative ages, religions, and birthplaces of husbands and wives should be extracted on " conjugal " cards before the census cards were removed from their envelopes, and it was considered expedient, both for the writing of these " conjugal " cards, and also for convenience of subsequent tabulation from the census cards, that age, birthplace, and religions should all be indicated by numbers on the space specially provided on the right hand margin of the personal card. In each case the number used for age was the age last birthday, while for birthplaces a classification under 75 heads was provided, and a similar classification under 30 heads for religions, each birthplace or religion being indicated by its classification number. Similar markings were also required in connexion with the replies to " number of children," and to " length of residence." To avoid delay in the issue of population results for electoral and Treasury purposes, the classification of occupations was deferred to a later stage.

In connexion with this process of special marking, a general check of the various items on the personal cards was undertaken with a view to correcting evident misstatements, such, for example, as length of residence in excess of age, misstatement of sex as disclosed by the statements of " Relation to head of household," and " Occupation," etc.

On the completion of this check, " Conjugal " cards were written, and census cards relating to males and females were separated, the covering envelopes being destroyed. Throughout all the succeeding processes male and female cards were separately treated.

4. Successive Tabulations.— The most pressing requirement was the ascertainment, for the purposes of the Commonwealth Electoral Office, of the population of the several States, exclusive of aliens disqualified under Section 25 of the Commonwealth Constitution. For this purpose a careful count was made of the populations in the various census meshes, and also of the number of persons of Non-European race in each State. The information respecting total population of each State was also urgently required by the Commonwealth Treasury for the purpose of allocating the subsidy of 25s. per head of population, payable to the several States under the Commonwealth Surplus Revenue Act 1910.

The next tabulation was that of ages. Owing to the importance of this item greater geographical detail was obtained than was the case with any other item of information, details for single ages being tabulated for each mesh. The succeeding tabulations in the order in which they were carried out were :—Birthplaces, Length of Residence, Religions, Education, Schooling, Blindness and Deaf-Mutism, Non-European Races, Conjugal Condition, Localities, Families, Occupations, Dwellings.

For classifying occupations prior to tabulation a special staff was selected, who devoted themselves continuously to this class of work, whilst the balance of the staff were engaged on other tabulations. For the purposes of this classification a complete index of occupations was prepared on the lines of the classification used at the Census of 1901. In classifying, each card was marked in the margin with the appropriate Order, Sub-order and Group of the occupations specified thereon.

5. Mechanical Assistance.— As mentioned when dealing with the preliminary census arrangements (p. 68), it was not considered desirable to make use of any of the existing mechanical devices for the punching, sorting, and counting of cards. With few exceptions the tabulations were carried out entirely by means of hand-sorting and personal counting. One of the exceptions to this rule was in the case of the tabulation according to localities from the householders' cards. These cards shewed, amongst other things, the number of males, females and total persons enumerated in each household, and the tabulation of the results after the cards had been sorted into locality groups was greatly facilitated by the use of electrically-propelled Burroughs' Adding Machines.

The principal work done by this machine is that of addition. It is provided with a key-board on which any number within the range of the machine may be set up by depressing the appropriate keys. These keys remain depressed until released by depressing the recording bar, when the number so set up is printed on an attached slip, and the keyboard automatically returns to its normal position, the printed slip at the same time being automatically moved upwards one space to allow room for the next item. By continuing the process, the items to be added are obtained printed in columnar form. Finally, the pressure of the " total " key and the printing bar adds all the items recorded and prints their total at the foot of the column.

When a " total " is obtained, the machine automatically clears itself, and is ready for a fresh operation. If, however, it is desired to record intermediate totals, the pressure of the " sub-total " key and printing bar will cause the total from the commencement of the operation to any desired point to be printed, without clearing the machine, which then continues the adding process as if nothing had occurred. To prevent possibility of error, a small "s" is automatically printed after each " sub-total," and similarly an asterisk (*) after each " total." This arrangement effects a considerable saving of time in certain of the calculations involved in statistical and actuarial work, such, for example, as the work of obtaining the total population at and above each year of age.

To enable several distinct columns of figures to be recorded and totalled at the same time, the machines used in the Census Office are provided with what is known as a " split " device. The effect of this device is that for many purposes the machine may be *considered* to be divided into 2, 3, 4, or 5 separate machines, capable of being operated at the same time, and recording their results on the same slip. Care needs to be taken in so using the machines, that the extreme left-hand figure of any total will not carry over into the next division. Two grades of machines are in use in the Census Office, one grade having a total range of 15 figures, and the other a total range of 17 figures. The 15-figure machine is capable of division by means of the " split " device into the following :—

(i.) Three groups, 5 figures in each.
(ii.) Five groups, 3 figures in each.
(iii.) Two groups, 7 and 8 figures.
(iv.) Three groups, 4, 5 and 6 figures.
(v.) Three groups, 3, 6 and 6 figures.
(vi.) Four groups, 3, 4, 4 and 4 figures.

The 17-figure machines may be divided as follows :—

(i.) Four groups, 4, 4, 4 and 5 figures.
(ii.) Five groups, 4, 4, 3, 3 and 3 figures.
(iii.) Four groups, 2, 5, 5 and 5 figures.
(iv.) Two groups, 8 and 9 figures.
(v.) Five groups, 4, 3, 3, 3 and 4 figures.
(vi.) Three groups, 5, 5 and 7 figures.

In addition, each of the machines may be used as a single machine of full range, but care needs to be taken in interpreting the printed results, since zeros which should occupy the initial spaces in any division are not printed, but are represented by blank spaces.

To each machine a small electric motor is attached, which is operated by pressing the recording bar, or the machines may be operated by hand.

For various computations involved in the compilation of the census data, considerable use was made of the " Millionaire " calculating machine, and several models of the " Brunsviga " all of which did satisfactory work.

SECTION 4.—PUBLICATION.

1. **Scheme for Presentation of Results.**—Throughout the " detailed tables " published in Volumes II. and III. of the Census Results, particulars are given under every head for males and females separately, and in most cases for males and females in combination. The principal cases in which results for the sexes combined have not been published, are in the " Life Tables " of Part XI., and many of the " Occupation " tabulations of Part XII. In the former of these cases the combination of sexes would be inappropriate, while in the latter the publication of full results for the sexes combined as well as for males and females separately would have added considerably to the bulk and consequent cost of the publication, without furnishing any commensurate advantage. The general plan followed in connexion with each of the subdivisions of the " Parts " into which the detailed tables are divided, has been that of giving the particulars for the Commonwealth in the earlier tables followed by similar particulars for the several States and Territories arranged in order of population. Succeeding these, summarised results for the several Metropolitan areas are given, and these are followed by summarised data in respect of subdivisions of the States and Territories, the subdivisions of each State or Territory being given in lexicographical order. In connexion with these subdivisions, it may be be mentioned that before the adoption of such subdivisional units, the Statisticians' of the several States were consulted, and the following were selected as likely to be the most serviceable : New South Wales, Counties ; Victoria, Counties ; Queensland, Census Districts ; South Australia, Counties and Divisions ; Western Australia, Statistical Districts ; Tasmania, Municipalities ; Northern Territory, Counties.

For these subdivisions summarised particulars in respect of Age, Birthplace, Education, Schooling, Religion, Conjugal Condition, Occupations, and Dwellings have been published in their appropriate places in the Detailed Tables. In addition, particulars as to population, and in some few cases other items, have been published for Commonwealth Electoral Divisions, State Electoral Provinces, State Electoral Districts, and Local Government Areas, as well as for all Localities containing 50 persons or more at the date of the Census.

CHAPTER IX.

POST-CENSAL ADJUSTMENT OF POPULATION ESTIMATES FOR THE INTERCENSAL PERIOD, 1901-1911.

1. **Census Results.**—On the 31st March, 1901—or, rather, as at the moment of midnight between 31st March and 1st April of that year—the population of Australia was determined by means of a census, taken under the census laws of the several States, the control of the necessary administrative organization being placed in the hands of the State Statisticians. The total population of the Commonwealth so found was as follows :—

Males, 1,977,928 ; Females, 1,795,873 ; **Total, 3,773,801.**

On the 3rd April, 1911, a similar enumeration was carried out under the control of the Commonwealth Statistician, in accordance with the Commonwealth Census and Statistics Act 1905, which itself conferred the necessary powers. The population of the Commonwealth as then ascertained was as follows :—

Males, 2,313,035 ; Females, 2,141,970 ; **Total, 4,455,005.**

In both cases the figures given are exclusive of full-blooded aboriginal natives of Australia, but are inclusive of half-caste aboriginals.

It should be noted, in connexion with the census of 1911, that a slight change in defining the date of reference has been made in order to accord with the English practice. In previous Australian censuses the date of the census has been taken to be that of the day preceding the midnight which is adopted as the determining point. Thus, at the census of 1901, where the figures given relate approximately to midnight between the 31st March and the 1st April, the Australian census was stated to be that of the 31st March, while in a precisely similar case in England it was stated to be that of 1st April. At the census of 1911, taken as at midnight between the 2nd and 3rd April, the date of the census has, in accordance with the English practice, been stated to be the 3rd April, and that day was gazetted as the day of the census.

2. **Intercensal Records.**—Between the dates of the censuses of 1901 and 1911 there elapsed 10 years and 2 days. During the whole of this intercensal period records were kept of the effect of the several elements contributing to variations in population—(i.) of the Commonwealth as a whole, and (ii.) of the component States and Territories of the Commonwealth. As regards the former, the only variations possible were additions by birth and by oversea arrivals and deductions by death and by oversea departure, where the term " oversea " refers to all countries outside the Commonwealth, and to those alone. As regards the latter—viz., the populations of the component States and Territories—inter-State migration also operates, and this may be either by land or by sea. In the case of any particular State, therefore, to which migration by land is possible, there were eight distinct sets of records kept, viz. :—(i.) births registered ; (ii.) deaths registered ; (iii.) oversea arrivals ; (iv.) inter-State arrivals by sea ; (v.) inter-State arrivals by land ; (vi.) oversea departures ; (vii.) inter-State departures by sea ; (viii.) inter-State departures by land.

The records of inter-State migration by land are necessarily incomplete, as the only particulars of this nature which it is practicable to collect are those relating to migration by rail. Incidentally, it may be observed that any efficient method of obtaining the record of overland migration, other than by rail, would be found intolerably irksome. The records of this kind exist, therefore, only in the case of those States which are connected by rail—viz., New South Wales, Victoria, Queensland, and South Australia, and then only to the extent to which such migration takes place by rail.

3. **Comparison of Census Results with those Derived from Intercensal Records.**—Taking, first the case of the Commonwealth as a whole, the number of births registered during the 10 years from 1st April, 1901, to 31st March, 1911, was as follows :—

Males, 552,983 ; Females, 525,218 ; **Total, 1,078,201.**

Against this must be set off the deaths registered, as follows :—

Males, 261,661 ; Females, 192,447 ; **Total, 454,108.**

The natural increase—viz., the excess of births over deaths—during the decennium was therefore—

Males, 291,322; Females, 332,771; **Total, 624,093.**

The oversea arrivals in the Commonwealth, as recorded during the decennium, were—

Males, 456,742; Females, 208,013; **Total, 664,755.**

During the same period the oversea departures as recorded were—

Males, 360,705; Females, 177,318; **Total, 538,023.**

Thus, by the records, the net immigration to the Commonwealth—that is, the excess of oversea arrivals over oversea departures—during the decennium was as follows:—

Males, 96,037; Females, 30,695; **Total, 126,732.**

Taking these recorded results in conjunction with the population at the census of 31st March, 1901, an estimate of the population at 31st March, 1911, is obtained as follows:—

Particulars.	Males.	Females.	Total.
Census Population, 31st March, 1901	1,977,928	1,795,873	3,773,801
Natural Increase recorded during decennium	291,322	332,771	624,093
Net Immigration „ „	96,037	30,695	126,732
Estimated Population, 31st March, 1911, based on recorded intercensal data	2,365,287	2,159,339	4,524,626

In order to be able to compare this result with that obtained at the census of 1911, it is necessary to make a small allowance for the differences in date, as the above estimate relates to 31st March, 1911, while the census figures relate to the midnight which marks the termination of the 2nd April. Exact records for the first two days of April are not available, but a sufficiently close approximation is obtained by taking the one-fifteenth part of the totals recorded for that month. This gives the following results:—

Particulars.	Males.	Females.	Total.
Census Population on 3rd April, 1911	2,313,035	2,141,970	4,455,005
Less Estimated Increase during 1st and 2nd April, 1911	376	268	644
Estimated Population on 31st March, 1911, as based on census results of 3rd April, 1911	2,312,659	2,141,702	4,454,361

A comparison of this estimate for 31st March, 1911, with that for the same date based on intercensal records, indicates that the effect of using the intercensal records exactly as furnished would be the *overstatement* of the population of the Commonwealth at the 31st March, 1911, by the following numbers, viz.:—

Males, 52,628; Females, 17,637; **Total, 70,265.**

This overstatement indicates a steady accumulation of error at an average rate of about 7,000 per annum, and suggests the desirability of at least a check-count or minor census more frequently than once in ten years.

4. **Causes of Discrepancy.**—It is clear, from the nature of the case, that errors in excess or defect are probable in all records of population, and in all records of its fluctuations; and, further, that errors in defect are in most cases more likely to occur than errors in excess. That is to say, omissions to record are probably more frequent than duplications of record. Owing to the provisions made for securing accuracy, it is probable that the errors in the census records, and, in Australia, in the registration of births and deaths, are not serious in their effect on the population results. As regards records of birth, death, and migration, it may be noted, that if, in practice, birth registration was seriously defective, the effect, so far as this element alone is concerned, would be to cause the enumerated results to exceed the intercensal estimate. If any such defect has actually existed it has been much more than counterbalanced by some defect of an opposite nature, arising from other causes, and hence, in the absence of some direct evidence, the existence of such defect in any marked degree cannot be assumed. As regards the registration of deaths, the stringent provisions of the law throughout Australia in relation to certification of cause of death, and to the disposal of a dead body, renders it wholly improbable that there is any error of serious magnitude from omission to register. In the case of the census records, the fact that the taking of the census is widely advertised, that a very extensive collecting organization is instituted for the special purpose, and that every effort is made after census day to make good any omissions, renders it improbable that any appreciable defect can be attributed thereto. There remain, then, in the case of the Commonwealth as a whole, the records of oversea arrivals and departures, and there appears to be no reasonable ground for doubting that the greater

part of any ascertainable discrepancy is properly chargeable thereto. In this connexion an important point requires to be borne in mind—viz., that at the date of the census all persons on board of vessels in Commonwealth ports, or on voyage between Commonwealth ports, are included as part of the population of Australia, whether such persons are on board in the capacity of passengers or of crew. It is also to be borne in mind that the oversea migration recorded during the intercensal period relates practically only to passengers, and to individual members of crew actually engaged, discharged, or deserting in Australia, it being assumed that the crews of incoming and outgoing vessels substantially balance each other. It is thus clear that if, at the date of any census, there were many vessels in Australian waters, the actual population at a subsequent date might differ somewhat materially from the estimated, owing simply to the fact that the departure of certain of these vessels was not approximately counterbalanced by the arrival of others. In other words, that portion of the population of Australia, which consists of crews of oversea vessels, has always, in the compilation of Australian population statistics, been tacitly assumed, as already said, to maintain a condition of equilibrium through equality of influx and efflux. In view of the degree of uncertainty involved in this tacit assumption, it is clear that any attempt at great refinement in the matter of oversea migration statistics would be illusory and unwarranted. It is thus evident that, while the discrepancy between enumerated and estimated population arises from numerous causes, the bulk of it is due to errors of migration record. And since, as before noted, errors of omission are more probable than errors of duplication, and since, further, the resultant error is usually that of overstatement of population, it is reasonably certain that the major portion of the discrepancy is due to omission to record departures. This conclusion, which has been arrived at from general considerations, is confirmed by actual experience, as it has been found that in many cases discrepancies have arisen through late bookings or passages taken on board, thus resulting in unrecorded departures.

5. **Adjustment of Discrepancy.**—For practical purposes it has been found convenient to attribute the whole of the discrepancy to defects in the records of departure, and, in readjusting population estimates between two censuses, to ascertain the ratio of the discrepancy to the aggregate recorded departures, in order to apply this ratio to the departures recorded for successive periods. This method does not appear to be open to any serious objection. Since it is simple in application and gives results which are probably not wide of the truth at any moment during the intervening period, and in the aggregate are doubtless as accurate as figures furnished by any other possible method, it has been adopted on the present occasion for adjusting the Commonwealth population estimates for the whole of the intercensal period.

6. **Adjustment of Commonwealth Discrepancy.**—From the figures given in paragraph 3 above it will be seen that the discrepancy, as ascertained for 31st March, 1911, represented approximately 14.59 per cent. of the aggregate male oversea departures for the decennium, and approximately 9.95 per cent. of the aggregate female oversea departures. Applying these percentages to the recorded oversea departures for the successive periods the requisite corrections are derived by means of which an adjusted estimate of the population of the Commonwealth is obtained for successive quarters throughout the intercensal decennium. A comparison of the results so obtained with the estimates published from time to time by the Commonwealth Bureau of Census and Statistics is important, as shewing to what magnitude the errors in question can accumulate, and is as follows :—

POPULATION OF THE COMMONWEALTH.

31st Dec.	Commonwealth Intercensal Estimate.			Adjustment on basis of Census Results.			Excess of Intercensal Estimate over Post-censal Adjustment.		
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.
1901	2,006,784	1,819,502	3,826,286	2,004,836	1,820,077	3,824,913	1,948	– 575	1,373
1902	2,037,710	1,845,369	3,883,079	2,028,008	1,847,310	3,875,318	9,702	– 1,941	7,761
1903	2,059,444	1,867,525	3,926,969	2,045,144	1,871,448	3,916,592	14,300	– 3,923	10,377
1904	2,092,818	1,891,572	3,984,390	2,072,783	1,901,367	3,974,150	20,035	– 9,795	10,240
1905	2,133,978	1,918,452	4,052,430	2,100,118	1,932,859	4,032,977	33,860	–14,407	19,453
1906	2,173,545	1,945,936	4,119,481	2,126,730	1,964,755	4,091,485	46,815	–18,819	27,996
1907	2,212,480	1,984,557	4,197,037	2,160,213	2,001,509	4,161,722	52,267	–16,952	35,315
1908	2,252,027	2,023,279	4,275,306	2,193,981	2,038,297	4,232,278	58,046	–15,018	43,028
1909	2,305,637	2,068,501	4,374,138	2,242,215	2,081,745	4,323,960	63,422	–13,244	50,178
1910	2,365,549	2,117,347	4,482,896	2,296,308	2,128,775	4,425,083	69,241	–11,428	57,813

NOTE.— – denotes excess of post-censal adjustment over intercensal estimate.

Incidentally, it may be here noticed, that the methods adopted up to 1906 inclusive, shew a persistent and increasing tendency to underestimate the female population of the Commonwealth (indicated by the minus sign).

7. **Intercensal Estimates of State Populations.**—Having ascertained the adjusted results for the Commonwealth as a whole, the next problem was that of adjusting the populations of the several States in such a manner as to furnish results which, in the aggregate, would coincide for any date with that already determined for the whole Commonwealth. The data available for this

purpose, in addition to the birth and death records and the returns of oversea arrivals and departures, comprised returns of inter-State migration by sea and by rail. Up to the end of 1906 these inter-State records had been compiled on the basis of returns and computations of the several State statistical authorities; but from the beginning of 1907 onwards they have been based on returns specially collected on behalf of the Commonwealth Bureau of Census and Statistics. In the earlier period, as each State was acting on its own account, without any definite system of co-ordinating the results for the Commonwealth as a whole, the question of ensuring that the State aggregates should coincide with the results for the whole Commonwealth was not in any way considered. As a matter of fact, a Commonwealth total obtained by adding together the State totals was usually considerably in error. It has been found that by this process the Commonwealth population, or its distribution according to sex, was varied materially from no other cause than a transfer from one State to another. After a careful consideration of this aspect of the question, the Commonwealth Statistician, who under the laws of the Commonwealth is solely responsible for the estimates of population, decided that such an anomalous position of affairs could not be allowed to continue, and consequently a system was introduced under which, for any period, all inter-State arrivals were duly accounted for as departures from other States—viz., the States from which they were reported to have come. This principle was applied to inter-State migration both by sea and by rail. In the case of migration by rail there were, up to the end of 1907, in operation no less than three distinct methods of recording such migration—

(*a*) by single ticket records (Victoria and South Australia);

(*b*) by return ticket records (New South Wales);

(*c*) by actual count at border stations (Queensland).

In the case of ticket records, as no information was available concerning the sexes of the persons travelling on these tickets, an assumption was made that the proportion of the two sexes in the migration to or from any State by rail might be regarded as the same proportion ascertained to exist in the corresponding migration by sea. This naturally led to anomalous results. For example, a train-load of passengers leaving Victoria would, as departures from that State, be distributed as regards sex in proportion to the Victorian departures by sea, but the same train-load, on arriving in New South Wales, would be distributed as regards sex in the proportion of New South Wales arrivals by sea. By such means the sex distribution of the population of the Commonwealth would be altered merely by a transfer of population from one part of the Commonwealth to another. Such extraordinary inconsistencies were wholly ignored by the State statisticians, since they were concerned only with the results as deduced for their own States; but they could *not* be ignored by anyone dealing with the population of the entire Commonwealth—a fact which reveals very clearly the advantage of a central authority dealing with the question. A consideration of all the facts led to the conclusion that, for the compilation of statistics of inter-State migration by sea, only records of arrivals should be used, these being also preferable, as already pointed out, on other grounds. The analysis of such arrivals according to States of departure give the requisite statistics of departures, and ensure that the population of the Commonwealth shall not be increased or diminished by the mere fact of transfer from one State to another. In the case of inter-State migration by rail, the system of counting at border stations is preferable to the ticket system, for the following reasons:—

(i.) Statistics of sex can be obtained direct.

(ii.) All migration by rail will be recorded, regardless of whether the traveller has or has not a ticket, or is adult or infant.

(iii.) It furnishes a direct count, instead of compelling the statistician to rely upon questionable inferences.

Under the ticket system, not only is sex not registered, but through-passengers, passengers on season tickets and passes, and infants go unrecorded. Moreover, the actual ticket records are not identical in the several States, and consequently in this case also fictitious gains or losses to the Commonwealth result from the mere fact of inter-State transfers. In short, the system is one which does not arithmetically balance, and must consequently be rejected as inherently unsatisfactory. On the other hand, under the system now adopted by the Commonwealth, every inter-State credit of population to any State is accompanied by a corresponding debit to some other State, thus maintaining consistency of total population, which consistency, as already explained, did not exist in the method superseded.

8. **Post-Censal Adjustments of State Populations.**—One of the first steps to be taken in the post-censal adjustment of the State populations for the decennium 1901–11 was that of remedying the defect due to the want of identity between aggregate inter-State arrivals and departures for the successive quarters of the earlier portion of the decennium—that is, to the end of 1906. The figures for 1907 were so adjusted when the Commonwealth system of migration was introduced in 1908, and figures for succeeding years were so determined as to require no such adjustment. For the purpose of this adjustment to the end of 1906, the inter-State departures by sea and by rail were dealt with separately. In each case the recorded inter-State departures for any quarter for each State were multiplied by such a factor as would make the aggregate inter-State departures for the quarter identical with the aggregate inter-State arrivals. As regards oversea migration to and from the several States, the arrivals were allowed to stand as recorded, while the departures for each State were corrected by means of the factor determined for the Commonwealth as a whole. This was necessary, inasmuch as there was no direct warrant for preferring the records

of any particular State as being more accurate in this respect than the records of any other State. After these adjustments had been effected, there still remained a correction for the defective record of inter-State migration, other than the want of coincidence between the aggregates of arrivals and departures. The extent of this residual error in the case of each sex in each State was determined by computing, from the adjusted figures derived in accordance with the foregoing scheme, the estimated population of each sex as at 31st March, 1911, and comparing this with the corresponding figure deduced from the records of the census of 3rd April, 1911. As the result of this comparison it was found that the residual errors, remaining for adjustment, were as follows :—

State.	Males.	Females.	Persons.
New South Wales	− 4,399	− 1,736	− 6,135
Victoria	+ 5,677	− 495	+ 5,182
Queensland	− 10,039	− 155	− 10,194
South Australia	+ 13,933	+ 2,179	+ 16,112
Western Australia	− 549	+ 598	+ 49
Tasmania	− 4,623	− 391	− 5,014
Commonwealth	—	—	—

It was necessary that these errors should be so adjusted that at any point of time during the decennium the aggregate of the several adjustments should be zero. The application of the correction as a percentage, on, say, recorded departures, would in practice involve awkward complications. A careful consideration of this matter led to the conclusion that a uniform distribution of the error in each case over the 40 quarters comprised in the decennium would probably accord as closely with the actual (but unknown) facts as any that could be devised, and would, in addition, be simple in application as well as satisfactory from the standpoint of Commonwealth total The corrections so applied to the figures for the several quarters were approximately as follows :—

State.	Males.	Females.	Persons.
New South Wales ..	+ 110	+ 43	+ 153
Victoria	− 142	+ 12	− 130
Queensland	+ 251	+ 4	+ 255
South Australia	− 348	− 54	− 402
Western Australia ..	+ 14	− 15	− 1
Tasmania	+ 115	+ 10	+ 125
Commonwealth	—	—	—

On the basis of these principles the populations of the several States as at the end of each quarter from 31st March, 1901, to 31st March, 1911, have been determined, and from these the mean populations for the several intercensal years have been computed. These re-computed means have been employed in the adjustment of all intercensal rates based upon population.

CHAPTER X.

AGES.

1. **Form of Inquiry.**—A striking feature of the results of any Census tabulated according to single ages is the tendency for accumulations at ages which are multiples of 5, and especially at ages which are even multiples of 5, that is to say, ages which end in 0. Owing to this tendency, the results of the present Census shewed that 74,013 persons had given their ages as 30, whilst only 70,496 gave 29, and only 68,200 gave 31. Similarly, whilst 46,872 persons gave 50 as their age, only 43,785 gave 49, and only 39,413 gave 51. It is clear that under ordinary circumstances the number of persons aged 30 should not differ materially from the number aged 29 or 31, or the number aged 50 from the number aged 49 or 51. In many cases there is little doubt that the age is *incorrectly* stated in round numbers, owing to the fact that nothing more definite is known, while in other cases the misstatement is due either to indifference or to intention to mislead. At previous Censuses in Australia the form of inquiry on the Census Schedule was that of asking the age last birthday. On the present occasion this was amended by asking the date of birth, and in addition asking that those whose date of birth was unknown should state their age last birthday. In the majority of cases the date of birth was inserted, but judging by the results obtained, it would appear that in some of these instances the year of birth must have been computed on the basis of what the person *assumed* to be his or her age last birthday. The results, however, taken on the whole, did not exhibit as great a degree of irregularity at and around quinquennial ages as was shewn in the results for 1891 and 1901. This suggests that the ages were stated with a higher degree of general accuracy than has characterised previous Australian Censuses. This is a matter for congratulation in view of the important purposes for which statistics of age are required, and indicates an increasing appreciation on the part of the community of the desirability of furnishing accurate age returns. There is little doubt that if people generally had any realisation of the value and range of application of statistics of age there would be little difficulty in getting more accurate returns.

2. **Ages Unspecified.**—For the Commonwealth as a whole the number of persons whose ages were unspecified was 23,384, of whom 12,401 were males, and 10,983 were females. It thus appears that the number who failed to state their ages represented 5.36 per 1000 of total male population, and 5.13 per 1000 of total female population. An examination of the other particulars on the Census Cards in the case of persons of unspecified age frequently enabled a fairly accurate idea to be obtained of the period of life in which the person was, that is, whether the card related to an adult or a child. The terms " adult " and " child " are here used somewhat loosely, and without any very clearly indicated line of demarcation. In some cases, however, such a distinction was not practicable, as certain of the cards received contained little more than the name and sex of the person enumerated. On completion of the age tabulation the number of such cards for each sex in each State and Territory was divided into the two groups of " Adults" and " Children," in proportion to the numbers directly allocated to these groups. The total numbers so obtained for the several States and Territories are as follows :—

Approximate Distribution into Adults and Children of Persons of Unspecified Age.

Particulars.	States.						Territories.		Total, C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
MALES.									
Children	631	602	214	115	108	101	1	3	1,775
Adults	3,859	2,657	1,768	803	1,044	431	59	5	10,626
Total	4,490	3,259	1,982	918	1,152	532	60	8	12,401

Approximate Distribution into Adults and Children of Persons of Unspecified Age—*continued.*

Particulars.	States.						Territories.		Total C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W A.	Tas.	N.T.	F.T.	
FEMALES.									
Children	548	570	177	143	153	92	..	4	1,687
Adults	3,255	3,210	1,007	811	567	438	4	4	9,296
Total	3,803	3,780	1,184	954	720	530	4	8	10,983
PERSONS.									
Children	1,179	1,172	391	258	261	193	1	7	3,462
Adults	7,114	5,867	2,775	1,614	1,611	869	63	9	19,922
Total	8,293	7,039	3,166	1,872	1,872	1,062	64	16	23,384

The figures given in this table were then distributed over the ages 0–14 in the case of "Children," and 15 to oldest age in the case of "Adults," in proportion to the numbers recorded at individual ages in these two sections of the table.

3. **Single Age Comparisons with previous Censuses.**—For the purpose of enabling a comparison to be made with the corresponding results for previous Censuses, the figures for the Censuses of 1891 and 1901 were also adjusted to allow for persons of unspecified age. In the case of Queensland the Census returns for 1891 and 1901 gave single ages for the period 0–14, then a quinquennial group (15–19) followed by a single age (20), a quadrennial group (21–24), and quinquennial ages thence forward. To enable a total for single ages for the Commonwealth as a whole to be obtained, the figures for the various age groups in the Queensland returns were distributed over the ages comprised in such groups in the proportions shewn by the corresponding figures for the rest of the Commonwealth. The assumption involved in such a distribution, although somewhat arbitrary, furnishes results which are probably not very wide of the truth. The comparative results so obtained for Males, Females, and Persons will be found in Table No. 7 of Census Detailed Tables, Part I., Ages. (See Vol. II., pp. 15 and 16).

This table furnishes interesting evidence of the greater regularity of the 1911 age results already referred to in section 1, above. As an illustrative example, the figures for ages 28, 29, 30, 31 and 32 may be taken:—

Number of Persons Recorded at Single Ages in Group 28-32.

Age Last Birthday.	Number of Persons Recorded.			Proportion per cent. of Aggregate for the Five Ages 28–32.		
	1891.	1901.	1911.	1891.	1901.	1911.
				%	%	%
28	65,518	66,336	76,467	23.24	21.44	21.45
29	55,871	59,513	70,961	19.82	19.23	19.90
30	65,849	71,105	74,504	23.35	22.98	20.90
31	44,752	52,302	68,651	15.87	16.90	19.25
32	49,965	60,208	65,962	17.72	19.45	18.50
Total, 28–32 ..	281,955	309,464	356,545	100.00	100.00	100.00

Under normal circumstances, and in the absence of fairly extensive migration, or marked variations in the number of births and deaths, if ages were correctly stated in a group such as that given above, the number at age 30 would represent approximately 20 per cent. of the total for the group, while the number for each age under 30 would be greater, and the number at each age above 30 would be less than 20 per cent. of the total for the age-group. The evidence furnished by the table is, that, in the case of age 30 and adjacent ages, there was much greater accuracy of statement in 1911 than at the two preceding Censuses.

To take another example, the following table furnishes similar results in connexion with age 50 :—

Number of Persons Recorded at Single Ages in Group 48-52.

Age Last Birthday.	Number of Persons Recorded.			Proportion per cent. of Aggregate for the Five Ages, 48–52.		
	1891.	1901.	1911.	1891.	1901.	1911.
				%	%	%
48	25,184	29,103	48,777	21.26	21.81	22.49
49	21,177	25,846	44,073	17.88	19.37	20.32
50	34,425	34,381	47,185	29.06	25.77	21.75
51	16,588	20,033	39,673	14.00	15.02	18.29
52	21,078	24,054	37,187	17.80	18.03	17.15
Total, 48–52 ..	118,452	133,417	216,895	100.00	100.00	100.00

From this table again it is clear that the results for 1911 are much more consistent, and, consequently, are probably much more accurate than those for the two preceding Censuses. It may be noted in passing, that the figures for ages 48 and 52, taken together, represented in 1891 39.06 per cent. of the aggregate for the five ages, 39.84 per cent. in 1901, and 39.64 per cent. in 1911. In a normally constituted population, the proportion per cent. for these two ages would approximate to 40 per cent. of the total for the five ages, and the fact that at all three of the Censuses such an approximation was obtained, renders it improbable that the excess at age 50 was due to any great extent to deficiencies at ages 48 or 52. On the other hand, the corresponding percentage for ages 49 and 51, taken together, viz., 31.88 per cent. in 1891, 34.39 per cent. in 1901, and 38.61 per cent. in 1911, suggests the probability of a heavy transfer from these ages to age 50, the extent of such transfer, however, diminishing with succeeding Censuses.

4. **Age Grouping.**—In the compilation of statistics of population, or of demography generally, the amount of detail involved usually renders it impracticable to deal throughout with results for single ages. It consequently becomes necessary to adopt some method of grouping for the tabulation of data according to age. The method which has been very generally employed in statistical offices throughout the world, is that of quinquennial grouping with a multiple of 5 at the beginning of each group, as for example, 10–14, 15–19, 20–24, etc. For the majority of purposes at the present Commonwealth Census this method of grouping has been followed, since comparisons with results of previous Censuses and with tabulations of statistical data generally for Australia and other countries are thereby facilitated. As already noted, an examination of the Census results for single ages discloses the fact that the heavy accumulations of misstated ages appear at ages ending in 0, and also furnishes an indication that these accumulations are drawn from both sides of the ages ending in 0, and in the main from the ages immediately adjacent on either side. These facts suggest that a desirable method of grouping would be such as would associate the age at which accumulations appear with those from which such accumulations have been drawn, that is to say, that in the case of quinquennial arrangement of data, the grouping should be 13–17, 18–22, etc. As mentioned above, it has not been considered desirable on the present occasion to interfere with the usual grouping, commencing with a multiple of 5, particularly as this grouping lends itself readily, if required, to a decennial rearrangement with the age ending in 0 in the middle, as for example, 15–24, 25–34, etc.

5. **Discrepancy at Infantile Ages.**—A case of misstatement of age is frequently disclosed by the Census results relative to young children. Where, as is usually the case, the migration of very young children is practically negligible, and birth and infantile death-rates are not subject to marked fluctuations, the number of children at successive infantile ages last birthday should diminish from age 0 last birthday onwards.

In many cases, however, it has been found that the number of children returned as between the ages of 1 and 2 is not only less than the number returned as under 1 year of age, but is also less than the number returned as between the ages of 2 and 3. In Australia this sort of error does not appear very markedly in recent Censuses, as will be seen from the following table, giving the results for both sexes for the last three Censuses:—

Numbers Recorded in Australia at Infantile Ages.

Age last Birthday.	1891.	1901.	1911.	Age last Birthday.	1891.	1901.	1911.
0	96,009	93,324	115,970	3	88,428	86,002	102,342
1	87,163	84,979	107,485	4	85,807	86,113	99,433
2	90,165	84,699	101,693				

It will be seen that for the Census of 1891 the number recorded at age 2 was greater by 3,002 than at age 1, and that in 1901 the number at age 2 differed by only 280 from the number at age 1, but fell short by 1,303 of the number at age 3. In the case of the Census of 1911 the numbers at successive ages declined in fairly regular order for ages 0, 1, and 2 last birthday, but increased by 649 from age 2 to age 3. The divergence in 1891 between ages 1 and 2 is probably due largely to inaccuracy of statement, but those in 1901 and 1911 are of such a nature that they may possibly be accounted for in part by immigration.

6. **Comparisons of Infantile Census Returns with Registration Records.**—If the registrations of births were complete, and were in such a form as to shew the exact number of births which occurred in any given calendar or other year, and if in addition the deaths under one year of age for that year could be analysed so as to shew separately deaths arising from births which occurred in that year, and deaths arising from births which occurred in the preceding year, it is clear, since the net migration of infants under one year of age is necessarily small, that the subtraction of these deaths from the births recorded for the year would give approximately the number of children who should be shewn as aged 0 last birthday on the returns of a Census taken at the end of the year, that is, the number who, at the date of the Census, were living and were under the age of one year.

Although these particulars are not available in the form specified, fair approximations to them can be obtained from the existing records. For the year ended 31st March, 1911, the number of births registered in Australia was 118,369, of which 61,003 were males, and 57,366 were females. During the same period the number of deaths under one year of age registered was 8,359, of which 4,787 were males, and 3,572 were females. What is required to be known is the number of these deaths which arose from births which took place in the year ended 31st March, 1911. Having this number, its subtraction from the number of births for that year would give approximately the number of registered children under one year of age living at the 31st March, 1911. The fact that statistics of deaths under one year of age for the year in question were available in considerable detail, enabled a fairly accurate estimate of the required number of deaths to be obtained. The following example, based on the deaths under one year for the whole Commonwealth, will render the process clear :—

Deaths Under One Year of Age, Registered in the Commonwealth during the Year ended 31st March, 1911.

Age at Death.	Deaths under One Year of Age Registered.			Approximate Proportion whose Birth Occurred in the Year ended 31st Mar., 1911.	Estimated number of Deaths during Year ended 31st March, 1911, arising from Births which took place in that Year.		
	Males.	Females	Total.		Males.	Females.	Total.
Under 1 week	1,458	1,028	2,486	$\frac{103}{104}$	1,444	1,018	2,462
1 week and under 2 weeks ..	274	198	472	$\frac{101}{104}$	266	193	459
2 weeks and under 3 weeks ..	188	143	331	$\frac{99}{104}$	179	136	315
3 weeks and under 1 month ..	170	105	275	$\frac{97}{104}$	159	98	257
1 month and under 2 months	445	329	774	$\frac{21}{24}$	389	288	677
2 months ,, ,, 3 ,,	360	254	614	$\frac{19}{24}$	285	201	486
3 ,, ,, ,, 4 ,,	356	241	597	$\frac{17}{24}$	252	171	423
4 ,, ,, ,, 5 ,,	255	216	471	$\frac{15}{24}$	159	135	294
5 ,, ,, ,, 6 ,,	225	201	426	$\frac{13}{24}$	122	109	231
6 ,, ,, ,, 7 ,,	222	166	388	$\frac{11}{24}$	102	76	178
7 ,, ,, ,, 8 ,,	194	168	362	$\frac{9}{24}$	73	63	136
8 ,, ,, ,, 9 ,,	170	149	319	$\frac{7}{24}$	50	43	93
9 ,, ,, ,, 10 ,,	177	127	304	$\frac{5}{24}$	37	26	63
10 ,, ,, ,, 11 ,,	145	124	269	$\frac{3}{24}$	18	16	34
11 ,, ,, ,, 12 ,,	148	123	271	$\frac{1}{24}$	6	5	11
TOTAL	4,787	3,572	8,359	..	3,541	2,578	6,119

It appears from the foregoing table that of the 8,359 deaths under one year registered during the year ended 31st March, 1911, approximately 6,119 or 73.20 per cent. were the deaths of children who had been born in that year. The percentages for males and females separately were 73.97 and 72.17 respectively.

The rationale of the process of estimation may be stated as follows :—

Of the deaths in any year of children aged under one week, all except those who died in the first week of the year must have been born in that year, while of those who died in the first week, a proportion would have been born in the preceding year. In the above calculation, this proportion has been assumed to be $\frac{1}{2}$, which is probably somewhat too high, but not sufficiently

so to seriously affect the results. In consequence of this assumption, $\frac{51\frac{1}{2}}{52}$ or $\frac{103}{104}$ of the whole year's deaths are taken. Similar explanation applies to each of the other ages.

It may be noted that percentages, ranging from 71.5 to 74.2, have been found to hold for other years for which similar investigations have been made. It may consequently be stated that according to present Australian experience, of all deaths under twelve months of age occurring in any given year, approximately 73 per cent. are those of children born in that year.

Similar calculations to that described above have been made for the several States for the year ended 31st March, 1911, and the figures obtained have been compared with the registration returns. The results obtained are as follows :—

Comparison of Census and Registration Results for Infant Ages.

State.	Births Registered during the Year ended 31st March, 1911.	Approximate Number of Deaths in Year ended 31st March, 1911, arising from Births in that Year.	Estimated Number under One Year of Age at 31/3/11 based on Registration Returns.	Census Results.	Excess of Census Results over Registration Estimate.
MALES.					
New South Wales ..	23,703	1,393	22,310	22,957	647
Victoria	16,524	946	15,578	15,869	291
Queensland	8,492	451	8,041	8,329	288
South Australia ..	5,444	305	5,139	5,378	239
Western Australia ..	3,908	242	3,666	3,808	142
Tasmania	2,932	204	2,728	2,761	33
COMMONWEALTH ..	61,003	3,541	57,462	59,102	1,640
FEMALES.					
New South Wales ..	22,446	1,021	21,425	22,136	711
Victoria	15,270	668	14,602	15,089	487
Queensland	8,031	332	7,699	7,967	268
South Australia ..	5,166	225	4,941	5,124	183
Western Australia ..	3,776	177	3,599	3,684	85
Tasmania	2,677	155	2,522	2,584	62
COMMONWEALTH ..	57,366	2,578	54,788	56,584	1,796
TOTAL.					
New South Wales ..	46,149	2,414	43,735	45,093	1,358
Victoria	31,794	1,614	30,180	30,958	778
Queensland	16,523	783	15,740	16,296	556
South Australia ..	10,610	530	10,080	10,502	422
Western Australia ..	7,684	419	7,265	7,492	227
Tasmania	5,609	359	5,250	5,345	95
COMMONWEALTH ..	118,369	6,119	112,250	115,686	3,436

In connexion with a comparison such as that given above, there are certain causes operating to prevent absolute identity in the two sets of returns. The principal of these are :—

(i.) The fact that the births and deaths registered in any year do not represent the occurrences of that year ;

(ii.) The fact that whilst deaths are registered within a few days of their occurrence, births are frequently not registered for over two months after they occur ;

(iii.) The fact that there is often a tendency at early ages to misstate age ;

(iv.) The fact that the migration of infants, although small, is yet not entirely negligible

In view of these facts, it must be admitted that the divergences between the two sets of results are very small, and as these results have been obtained by organisations which are entirely distinct from each other, it may be said of the Census and Registration returns, that each furnishes an indication of the substantial accuracy of the other.

7. **Smoothed Results.**—As previously mentioned in Sections 1 and 3 above, the results obtained by tabulation of the replies to the age query on the Census cards, furnished indications of tendencies to misstate ages in such a way as to give unreasonable accumulations at ages ending in 0 and 5. With a view to obtaining results which are more nearly in accord with the actual facts than are the tabulated replies, a process of smoothing was applied to the figures for each sex for each of the States and Territories for the present Census. A similar process was also applied to the figures for the Commonwealth as a whole for the Censuses of 1881, 1891 and 1901. These smoothed results will be found in Tables 9, 10, 11 and 18 of Part I. (Ages) of the Detailed Census Tables. (See Volume II., pp. 17-22 and 32-.33)

The method adopted in carrying out the smoothing process was as follows :—The number of persons of either sex for each age or group of ages last birthday, from 0 upwards, was plotted as a rectangle on cross-ruled paper, the base of each rectangle being a length proportional to the number of years contained in the age group involved, and the height being so determined that the area of the rectangle would represent proportionally the number of persons in that age group. Through the upper part of these rectangles a smooth curve was drawn in such a manner that the area contained between it and the base would in some cases be greater and in others less than the area of the corresponding rectangle, the principle involved being that of making the excesses balance the defects *within as short a range as practicable,* consistently with the maintenance of a fair degree of smoothness in the curve. From the curve so drawn values were read off for determining the areas which had by its means been substituted for the original rectangles, and these areas were compared item by item with the original data. A table shewing the deviations from the data at each point, the accumulated deviations up to that point, and the first differences of the readings was then prepared. Where these results indicated that the curve had, over a given range, been taken too low or too high, or that the sweep of the curve was less regular than was desirable, the necessary adjustments were made in the readings, and the resulting deviations were tested. By these means, adjustments of the original observations were obtained which conform closely to the two principal requisites of a good graduation, viz. :—

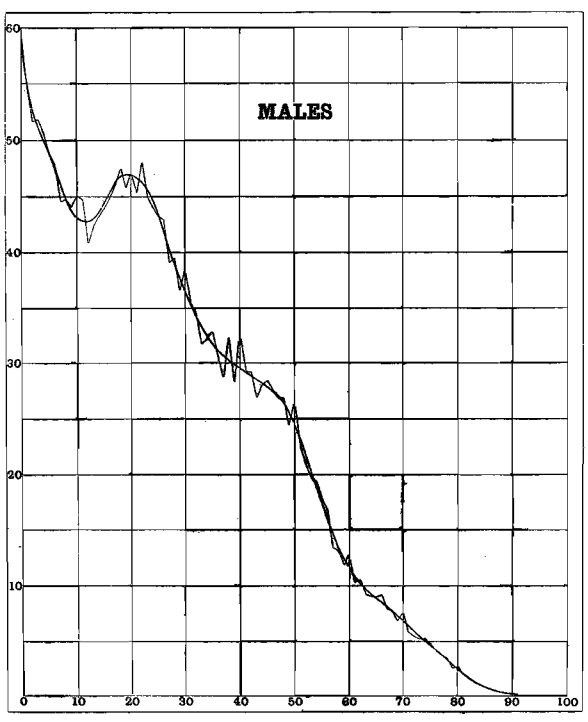
(i.) That the resulting curve should exhibit a reasonable degree of smoothness ;

(ii.) That it should satisfactorily fit the original data.

Graphs Nos. 1 and 2 hereunder represent the crude data and the adjusted results for males and females respectively for the Commonwealth as a whole at the Census of 1911. In each case the base of each small rectangle represents a period of age of ten years' duration, and the vertical height represents 5,000 persons. The serrated line in each case represents the crude data as furnished by the Census cards, while the curve represents the adjusted results obtained by the method outlined in the present section. In this case the crude data are represented, not by areas, but by ordinates drawn at the appropriate points and connected at their upper extremities to indicate their relation to the smooth curve.

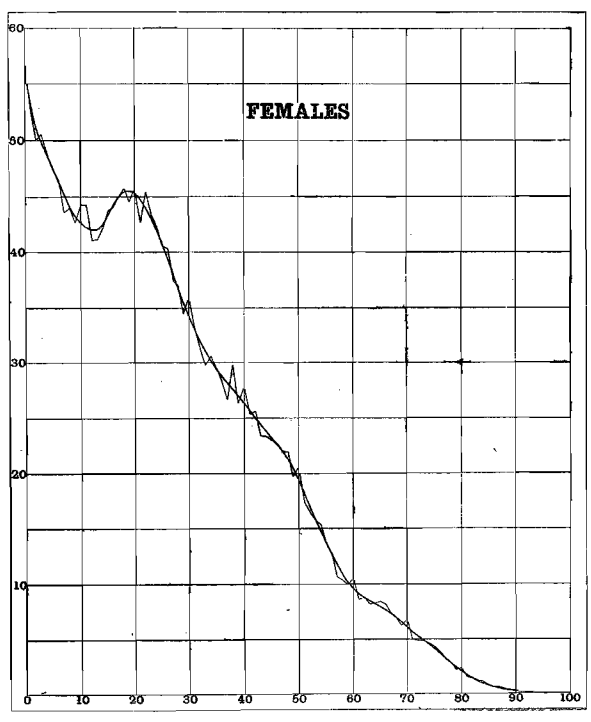
Ages of Commonwealth Population, Crude Data and Adjusted Results.—Census of 1911.

MALES.



GRAPH No. 1.

FEMALES.

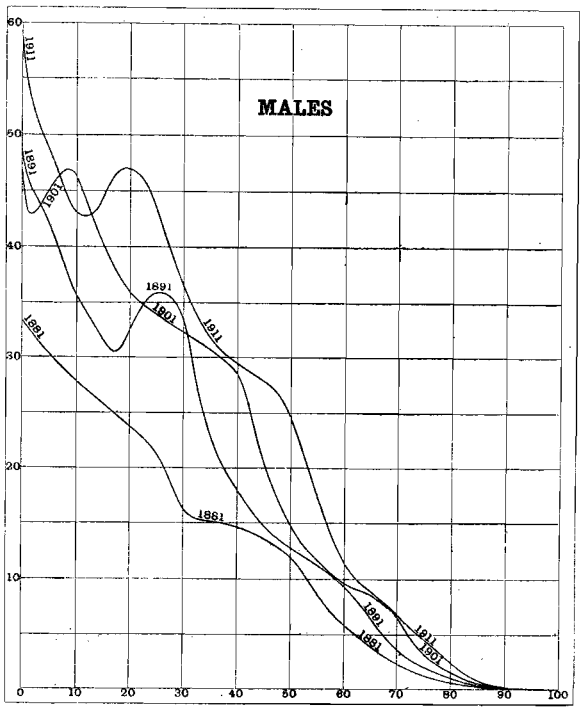


GRAPH No. 2.

Graphs Nos. 3 and 4 hereunder relate to adjusted results only at the Censuses of 1881, 1891, 1901 and 1911, for the Commonwealth as a whole. They furnish an interesting view of the growth of the population of Australia at all ages during the 30 years under review. The scale in this case is identical with that for graphs 1 and 2. The corresponding numerical results will be found in Volume II. pp. 32-33.

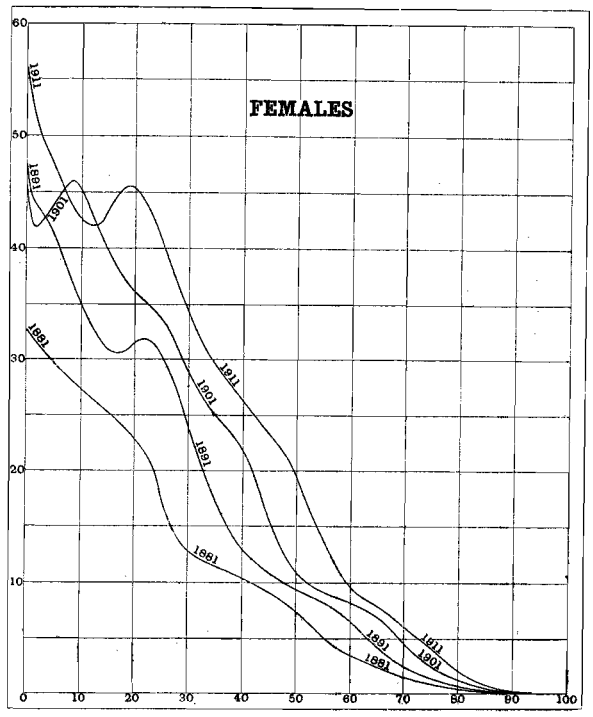
Ages of Commonwealth Population, Adjusted.—Censuses 1881, 1891, 1901, and 1911.

MALES.



GRAPH No. 3.

FEMALES.

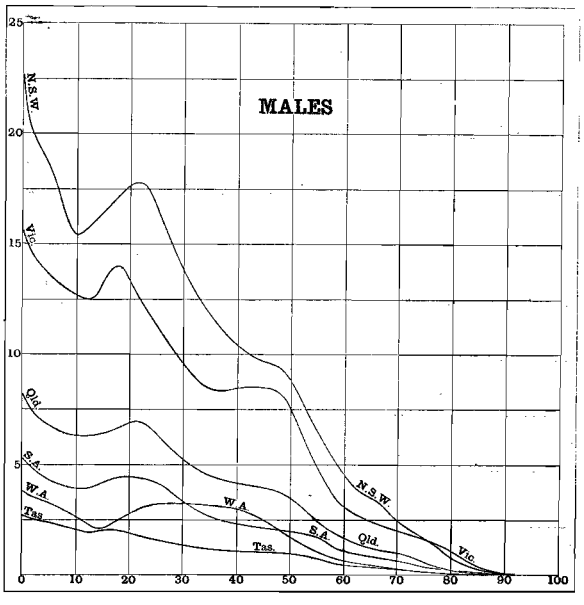


GRAPH No. 4.

Graphs Nos. 5 and 6 hereunder furnish a representation of the age data in respect of the several States at the Census of 1911. In this case the vertical height of each small rectangle represents 2,500 persons. The corresponding numerical results will be found in Volume II. pp. 17-20.

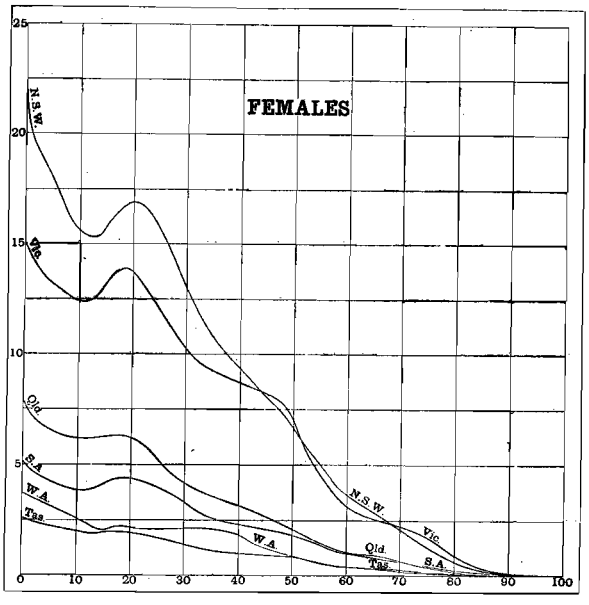
Ages of Population in each State, Adjusted Results.—Census of 1911.

MALES.



GRAPH No. 5.

FEMALES.

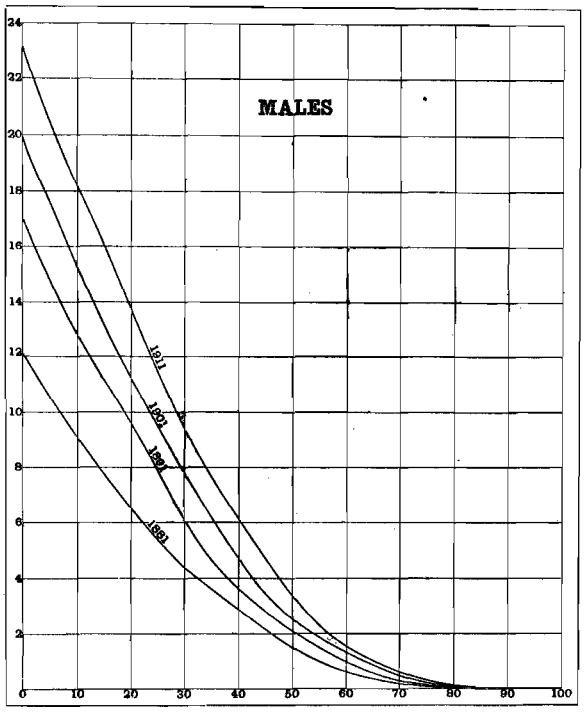


GRAPH No. 6.

Graphs Nos. 7 and 8 hereunder furnish a representation of the number of persons of each sex who were, at and above each age at the Australian Censuses 1881 to 1911. In these cases the height of each small square represents 200,000 persons.

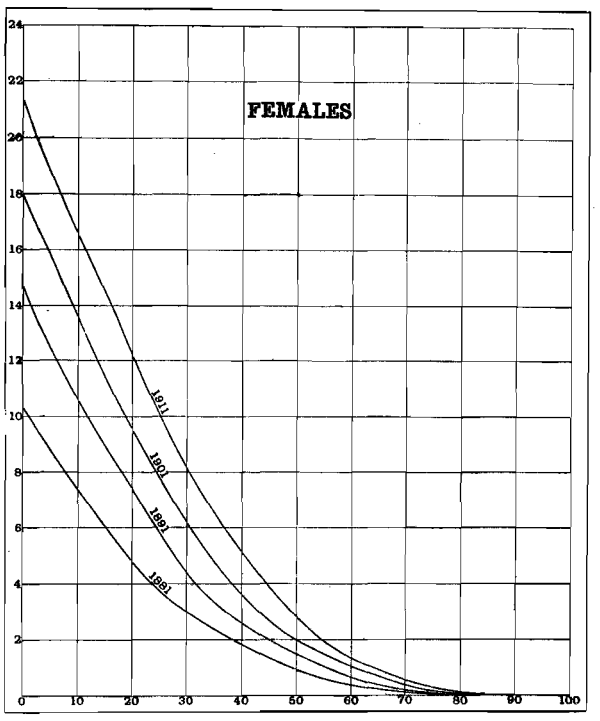
Commonwealth Population at and above each Age, Adjusted Results.—Censuses 1881, 1891, 1901, and 1911.

MALES.



GRAPH No. 7.

FEMALES.

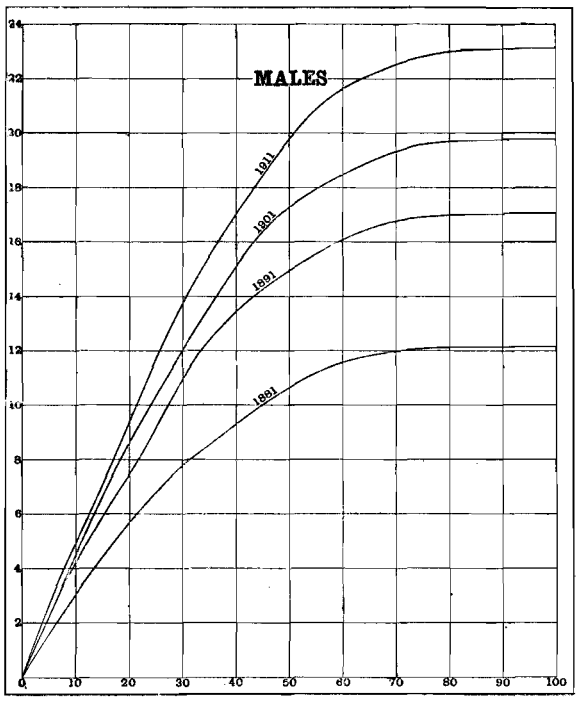


GRAPH No. 8.

Similarly Graphs Nos. 9 and 10 hereunder furnish a representation of the number of persons of each sex who were under each age at the Australian Censuses of 1881 to 1911. In these cases the height of each small square represents 200,000 persons.

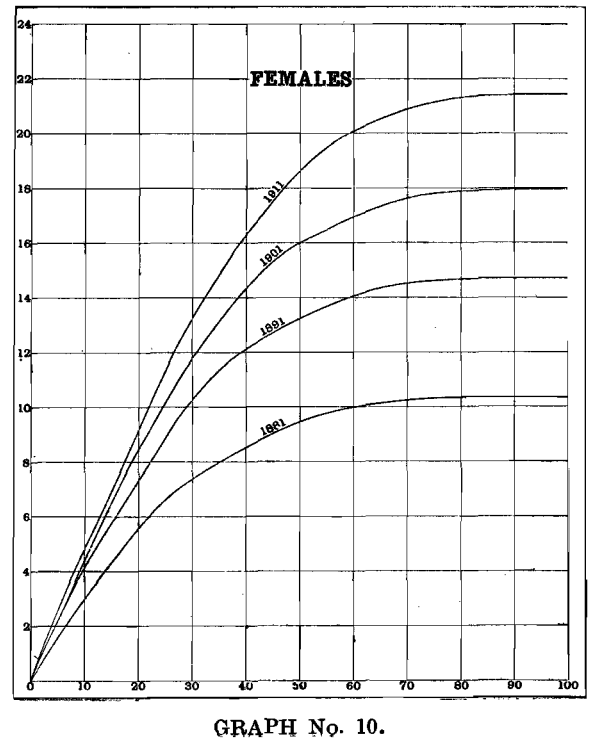
Commonwealth Population below each Age.—Censuses 1881, 1891, 1901, 1911.

MALES.



GRAPH No. 9.

FEMALES.

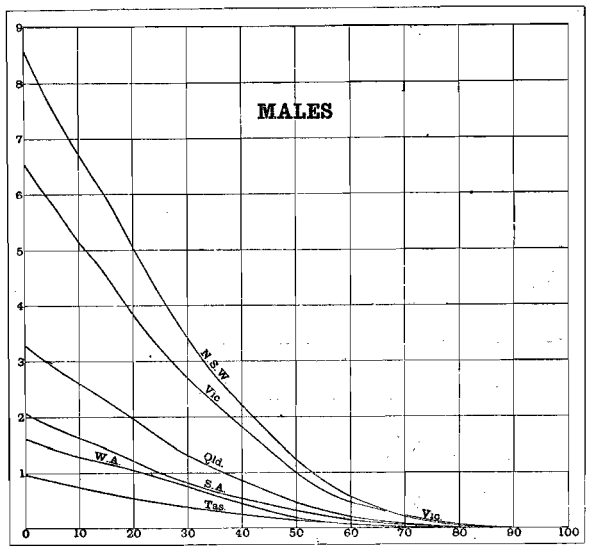


GRAPH No. 10.

Corresponding to Graphs Nos. 7 and 8 above for the whole Commonwealth at the last four Censuses, Graphs Nos. 11 and 12 hereunder furnish a representation of the male and female population of the several States, at and above each age, at the Census of 1911. In these cases the height of each small square represents 100,000 persons. The corresponding numerical results will be found in Volume II., pp. 22-25.

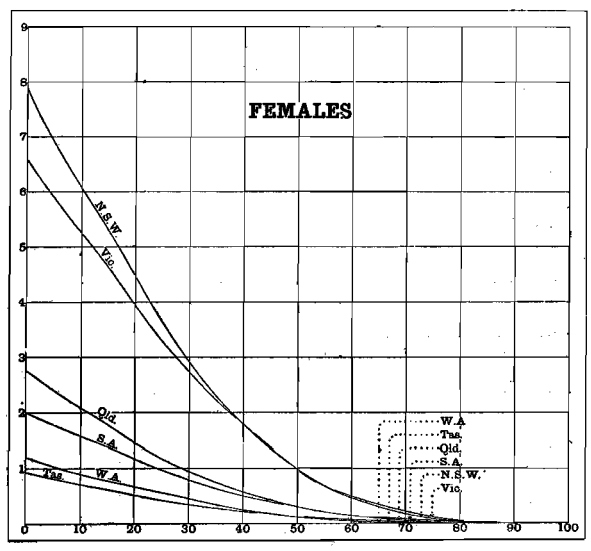
Population in States at and above each Age, Adjusted Results.—Census of 1911.

MALES.



GRAPH No. 11.

FEMALES.

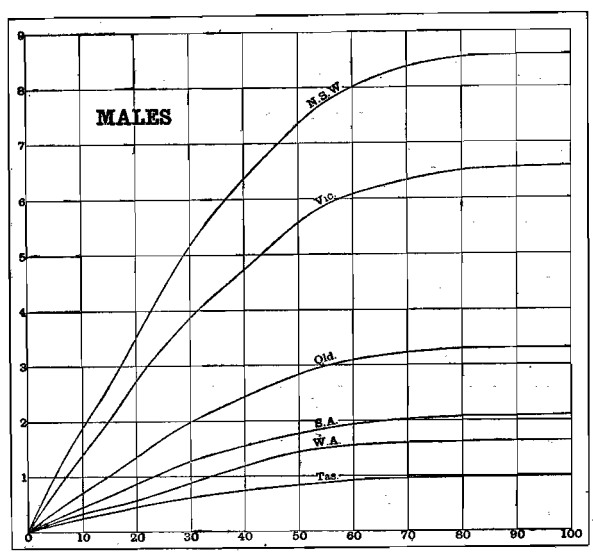


GRAPH No. 12.

Corresponding to Graphs Nos. 9 and 10 above for the whole Commonwealth at the last four Censuses, Graphs Nos. 13 and 14 hereunder furnish a representation of the male and female population of the several States, under each age at the Census of 1911. In these cases the height of each small square represents 100,000 persons. The corresponding numerical results will be found in Volume II., pp. 27-30.

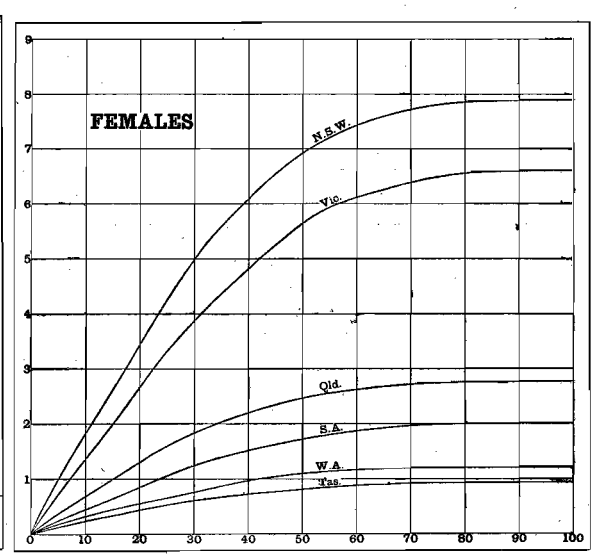
Population in States under each Age, Adjusted Results.—Census of 1911.

MALES



GRAPH No. 13.

FEMALES.



GRAPH No. 14.

8. **Masculinity According to Age.**—The "masculinity" or "femininity" of the population indicates the extent to which either sex predominates in the total, and may be computed in various ways. A method which has been used very extensively is that of calculating the ratio of the number of males to the number of females, the result being usually multiplied by 100, and generally quoted as the "masculinity" or the "number of males to each 100 females." The reciprocal of this ratio, also multiplied by 100, would give the "femininity" or the "number of females to each 100 males." A second method which has been used is that of calculating the ratios of the number of males and of females respectively to the total population. These multiplied by 100 may also be called the "masculinity" and "femininity" respectively. A third

method, which has theoretical advantages over either of the others mentioned, and which is, in addition, more convenient in practice than that first quoted, consists in calculating the ratio between the excess of males over females, or excess of females over males to the total population. For convenience of reference this result may, as in the case of the two other methods, be multiplied by 100. In this case the "femininity" will be the arithmetical complement of the "masculinity." Thus, if the "masculinity" were represented by + 6, the "femininity" would be represented by — 6, and each would signify that in an average hundred of the population under review, the number of males exceeded the number of females by 6, in other words, that there were 53 males to each 47 females. The following table furnishes particulars for the several States and Territories, and for the Commonwealth as a whole, deduced from the adjusted Census results for quinquennial age-groups. The figures given represent in each case the "masculinity" of the population, in accordance with the third method described above.

Masculinity of Population. (Excess of Males over Females in each 100 of Population.)

Age Last Birthday.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
0–4	1.39	1.69	1.87	1.51	1.27	2.37	2.30	— 8.70	1.59
5–9	.56	1.27	1.40	.92	1.59	2.30	1.09	— 1.16	1.06
10–14	1.11	.41	1.20	.88	.41	1.39	2.36	.51	.87
15–19	1.80	.48	2.35	.47	4.75	1.29	7.89	10.10	1.49
20–24	2.94	— 2.48	7.41	1.67	16.11	— 2.41	50.53	25.61	2.47
25–29	2.75	— 3.11	10.78	1.79	20.63	— 2.28	54.84	30.43	3.16
30–34	3.73	— 4.09	11.28	.98	19.61	1.27	56.64	26.67	3.49
35–39	4.68	— 3.75	12.44	.75	20.63	5.49	75.76	25.23	4.36
40–44	6.55	— .07	15.83	.91	28.07	5.51	81.68	24.21	7.04
45–49	11.22	2.41	20.94	2.14	32.08	6.29	88.84	28.40	10.16
50–54	13.89	4.33	24.20	5.74	30.78	8.04	93.26	29.58	12.29
55–59	12.54	1.23	22.91	8.15	27.82	8.92	94.05	33.33	10.88
60–64	9.61	— .71	20.74	2.68	20.58	3.09	96.32	36.17	7.72
65–69	9.15	— 3.48	15.86	1.13	16.72	— 1.57	89.47	24.32	5.27
70–74	9.97	— 4.29	22.78	.11	16.87	— 2.16	93.55	39.13	5.42
75–79	12.61	1.45	20.04	— 6.07	19.88	— 3.72	77.78	33.33	6.69
80–84	9.48	9.14	6.83	— 6.81	25.63	— 2.09	100.00	— 14.29	7.25
85–89	— 3.13	.87	3.17	— 17.87	13.04	2.24	..	— 33.33	— 2.11
90–94	— 13.95	— 3.32	12.38	— 16.76	39.39	15.00	..	..	— 5.16
95–99	1.05	— 17.50	— 14.29	— 14.29	25.00	23.08	..	..	— 4.65
100 and over	11.11	— 20.00	.00	.00	..	100.00	..	..	5.26
All Ages	4.17	— .33	8.78	1.51	14.54	2.08	65.20	15.75	3.84

Note. — denotes excess of females over males.

For the Commonwealth as a whole, it will be seen that the masculinity of the population varies with age in a remarkably regular manner, diminishing consistently from the earliest age to a minimum of .87 in the group 10–14. thence increasing continuously to a maximum of 12.29 in the group 50–54, thence diminishing to a further minimum of 5.27 in the group 65–69, followed by a further regular rise, fall, and subsequent rise.

A similar comparison of the Commonwealth masculinity at the Censuses of 1881, 1891 1901 and 1911 is furnished in the following table :—

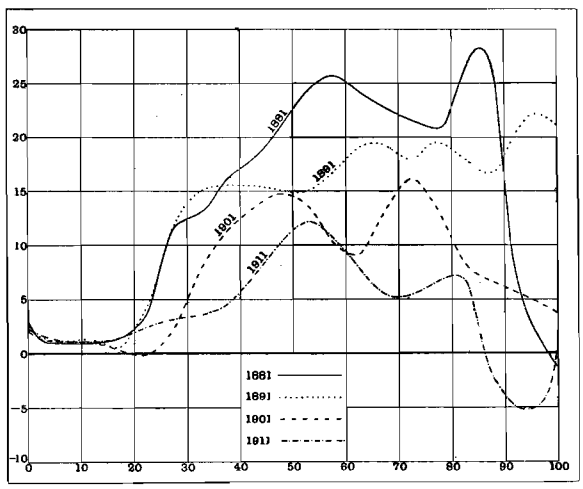
Masculinity of Population of Australia, 1881 to 1911. (Excess of Males over Females in each 100 of Population.)

Age Last Birthday.	1881.	1891.	1901.	1911.	Age Last Birthday.	1881.	1891.	1901.	1911.
0–4	1.02	1.37	1.23	1.59	55–59 ..	25.55	16.23	10.22	10.88
5–9	.90	.98	1.11	1.06	60–64 ..	23.99	19.45	8.81	7.72
10–14	.94	1.20	.98	.87	65–69 ..	22.50	19.31	13.19	5.27
14–19	1.33	.39	.22	1.49	70–74 ..	22.23	17.72	16.63	5.42
20–24	3.49	4.19	— .16	2.47	75–79 ..	20.04	19.89	13.25	6.69
25–29	12.48	11.80	2.18	3.16	80–84 ..	26.35	17.80	7.71	7.25
30–34	12.49	15.53	7.81	3.49	85–89 ..	28.96	12.31	6.90	— 2.11
35–39	15.18	14.83	11.27	4.36	90–94 ..	3.17	25.42	5.31	— 5.16
40–44	17.89	16.10	13.29	7.04	95–99 ..	— 5.26	23.97	6.21	— 4.65
45–49	20.73	14.76	14.74	10.16	100 & over	20.00	17.65	.00	5.26
50–54	24.50	15.27	13.83	12.29					
					All Ages	7.98	7.36	4.82	3.84

Note. — denotes excess of females over males.

The wave-like progression of masculinity with age, referred to above in the case of 1911, will be seen to have been in evidence also in the years 1881, 1891 and 1901, though usually less regular than in the case of 1911. Another feature of interest is the general tendency for the masculinity in any given age group above age 20, to diminish with successive Censuses, the only exception of importance being an increase in the ages 20 to 29 in 1911, as compared with 1901, brought about mainly by the exceptional reduction of 1901 figures due to male migration at these ages during the period 1891 to 1901. For ages under 20 the masculinity has fluctuated somewhat, but has remained positive and small throughout, indicating a small excess of males in all cases. In this connexion it may be noted that the masculinity of the births registered for the years 1881, 1891, 1901 and 1911 were as follows :—1881, 2.80 ; 1891, 2.42 ; 1901, 2.01 ; 1911, 2.31. The figures given in the above table for ages under 20 consequently indicate that the excess of males over females in the case of births tends to be reduced by the higher rates of mortality existing amongst males, but that, under normal conditions, equality has not been reached by the ages at which the masculinity is again affected by the preponderance of male over female immigrants.

Masculinity of Commonwealth Population.—Censuses of 1881, 1891, 1901, and 1911.



GRAPH No. 15.

The accompanying Graph (No. 15) furnishes a representation of the variations in the masculinity of the population of of the Commonwealth at successive ages, at each of the Censnses of 1881 to 1911.

9. **Average Age.**—For many purposes it is of value to know not only the number of persons at each age, but also, the average age of each sex or of the whole community. There are two kinds of average frequently employed in this class of statistics, viz. :—

(i.) The mean age, obtained by totalling the ages of all the population, male, female, or combined, and dividing by the number of each sex, or of both combined, as the case may be.

(ii.) The median age, obtained by ascertaining that age for either sex, or for both combined, which is so situated that there are as many persons above it as there are below it.

In the case of the mean age, it is clear that since, in the Census returns, all persons are shewn as at their age last birthday, the totalling of the recorded ages and the division by the number of persons will understate the true mean age by approximately $\frac{1}{2}$, since on the average approximately half a year has elapsed since the last birthday.

In computing the average ages for the purposes of this section, use has been made of the smoothed results, as these are believed to represent the position with greater accuracy than the original data. The difference in average between crude data and adjusted results will, however, be insignificant. In the actual work of computing the mean age, use has been made of an interesting property of Tables 12, 13, and 14 of Part I. (Ages) of the Detailed Census Tables (See Volume II., pp. 22-27). These tables shew for each age the number at and above that age. By totalling these results and dividing by the total population the mean age next birthday is obtained, the subtraction of $\frac{1}{2}$ from which gives approximately the true mean age. Computed on this basis, the mean age for each sex, and for both combined, for each State and Territory, is as follows :—

Mean Age of Population at Census of 3rd April, 1911.

State or Territory.	Mean Age.			State or Territory.	Mean Age.		
	Males.	Females.	Persons.		Males.	Females.	Persons.
States—				Territories—			
New South Wales	27.46	26.17	26.84	Northern Terr.	41.34	21.74	37.93
Victoria ..	28.11	28.19	28.15	Federal Terr.	29.32	24.69	27.37
Queensland ..	27.48	24.88	26.29				
South Australia	27.43	27.31	27.37				
Western Australia	28.28	24.79	26.79				
Tasmania ..	26.33	25.98	26.16	C'wealth ..	27.67	26.65	27.18

For the Commonwealth as a whole, the mean age of males exceeded that of females by almost exactly one year, whilst in Victoria the mean age of females was slightly in excess of that of males. Apart from the Territories, where the numbers involved are very small, the highest mean age for males occurred in Western Australia, and the lowest in Tasmania, the former being due largely to heavy adult male immigration, the latter to adult male emigration, combined with a comparatively high birth rate. Similarly, apart from the Territories, the highest mean age for females occurred in Victoria, the lowest in Western Australia. Amongst the States, the greatest deviation between mean male and mean female ages (3.49 years) occurred in the case of Western Australia, the least (.08 years) in Victoria.

The following table gives particulars relative to median ages for the same date:—

Median Age of Population at Census of 3rd April, 1911.

State or Territory.	Median Age.			State or Territory.	Median Age.		
	Males.	Females.	Persons.		Males.	Females.	Persons.
States—				Territories—			
New South Wales	24.41	23.10	23.77	Northern Terr.	44.51	18.69	41.73
Victoria ..	24.51	24.89	24.71	Federal Terr.	25.89	19.20	23.19
Queensland ..	24.44	21.35	22.98				
South Australia	24.05	23.82	23.93				
Western Australia	28.03	22.78	25.94				
Tasmania ..	22.50	22.22	22.36	C'wealth ..	24.61	23.39	24.01

In all cases, except those of the Northern Territory Males and Persons, the median age was less than the mean age, the difference in the case of the Commonwealth as a whole being 3.06 years for males, 3.26 years for females, and 3.17 years for persons. The male median age for the Commonwealth exceeded the female by 1.22 years, as compared with a corresponding excess of 1.02 years in the case of mean ages.

A similar computation for the Commonwealth as a whole for the Censuses of 1881, 1891, 1901 and 1911, furnishes the following mean and median ages :—

Commonwealth Mean and Median Ages, 1881 to 1911.

Year of Census.	Mean Ages.			Median Ages.		
	Males.	Females.	Persons.	Males.	Females.	Persons.
1881	25.43	22.49	24.08	21.74	18.42	20.08
1891	25.54	23.29	24.50	23.10	20.08	21.65
1901	26.66	24.97	25.86	23.62	21.45	22.53
1911	27.67	26.65	27.18	24.61	23.39	24.01

It will be seen from this table that the mean age of the Australian population increased by 3.10 years, and the median age by 3.93 years in the 30 years between the Census of 1881 and that of 1911. During the period mentioned, the male mean age increased by 2.24 years, and the female mean age by 4.16 years, while the male median age increased by 2.87 years, and the female median age by 4.97 years.

10. **Full Age.**—One of the most important divisions of population according to age is that which distinguishes between the population under 21 years of age, and that aged 21 years and over.

The following table gives for each of the States and Territories of the Commonwealth at the Census of 3rd April, 1911, the number of persons of each sex and of the two sexes combined who were aged 21 and over, and in each case the percentage on the corresponding total for all ages.

Adult Population, 3rd April, 1911.

State or Territory.	Males Aged 21 Years and Upwards.		Females Aged 21 Years and Upwards.		Persons Aged 21 Years and Upwards.	
	Number.	Percentage on Total Males of all Ages.	Number.	Percentage on Total Females of all Ages.	Number.	Percentage on Total Persons of all Ages.
		%		%		%
STATES—						
New South Wales	489,148	57.03	429,736	54.46	918,884	55.80
Victoria	371,091	56.60	380,300	57.62	751,391	57.12
Queensland ..	188,276	57.14	140,277	50.77	328,553	54.23
South Australia ..	116,974	56.41	112,502	55.92	229,476	56.17
Western Australia	102,469	63.42	64,121	53.19	166,590	59.05
Tasmania	51,505	52.78	49,121	52.47	100,626	52.63
TERRITORIES—						
Northern Territory	2,381	87.09	254	44.10	2,635	79.61
Federal Territory	595	59.98	335	46.40	930	54.26
Commonwealth	1,322,439	57.17	1,176,646	54.93	2,499,085	56.10

Leaving the Territories out of account, Western Australia shewed the highest percentage of adult males, and Tasmania the lowest, while Victoria had the highest percentage of adult females, and Queensland the lowest.

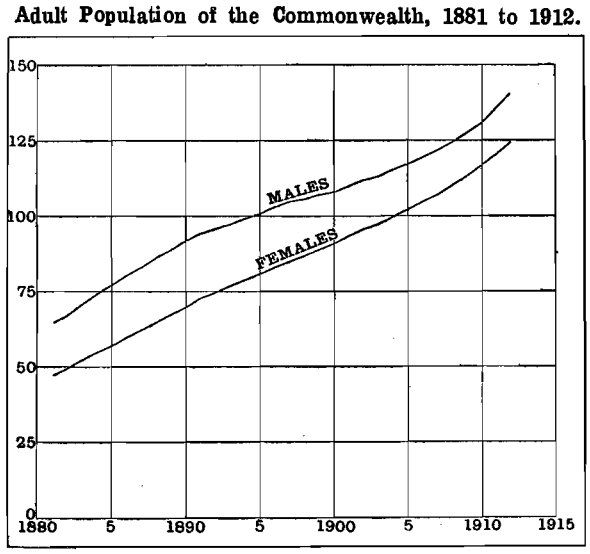
The following table furnishes corresponding results for the Commonwealth as a whole for the Censuses of 1881, 1891, 1901 and 1911 :—

Commonwealth Adult Population, 1881 to 1911.

Year of Census.	Males Aged 21 Years and Over.		Females Aged 21 Years and Over.		Persons Aged 21 Years and Over.	
	Number.	Percentage on Total Males of all Ages.	Number.	Percentage on Total Females of all Ages.	Number.	Percentage on Total Persons of all Ages.
		%		%		%
1881	624,633	51.41	457,641	44.20	1,082,274	48.10
1891	923,639	54.20	706,153	48.03	1,629,792	51.34
1901	1,080,728	54.64	913,973	50.89	1,994,701	52.86
1911	1,322,439	57.17	1,176,646	54.93	2,499,085	56.10

A feature of this table worthy of special remark is the increasing proportion of adults which the figures disclose for succeeding Censuses, amounting to 5.76 per cent. in the case of males, and 10.73 per cent. in the case of females, when the results for 1881 are compared with those for 1911. The proportion of adults is, throughout, less in the female than in the male population, but the difference in these proportions has continuously and rapidly diminished in the period under review from 7.21 per cent. in 1881, to 2.24 per cent. in 1911.

Adult Population of the Commonwealth, 1881 to 1912.



GRAPH No. 16.

The accompanying graph (No. 16) furnishes a representation of the adult male and female population of the Commonwealth from 1881 to 1912. The base of each small square represents a duration of five years, and the height represents 250,000 persons.

The following table, giving the estimated adult population, and mean population for each of the years 1881 to 1912, has been computed on the assumption that the adult percentage for each sex exhibited a linear progression between the successive Censuses, and that the percentage for the Census of 3rd April, 1911, held good for the years 1911 and 1912 :—

Estimated Adult Population of Australia, 1881–1912.

Year.	Estimated Adult Population at 31st December.			Estimated Adult Mean Population for Year.		
	Males.	Females.	Persons.	Males.	Females.	Persons.
1881	643,700	471,400	1,115,100	631,000	462,200	1,093,200
1882	669,400	492,800	1,162,200	656,600	482,100	1,138,700
1883	708,300	519,600	1,227,900	688,800	506,200	1,195,000
1884	740,700	544,800	1,285,500	724,400	532,200	1,256,600
1885	770,100	567,900	1,338,000	755,400	556,300	1,311,700
1886	801,000	592,600	1,393,600	785,600	580,200	1,365,800
1887	830,900	618,600	1,449,500	815,900	605,600	1,421,500
1888	862,800	646,700	1,509,500	846,800	632,600	1,479,400
1889	888,100	672,100	1,560,200	875,400	659,400	1,534,800
1890	916,300	699,100	1,615,400	902,200	685,600	1,587,800
1891	941,800	725,800	1,667,600	929,600	712,600	1,642,200
1892	959,000	746,900	1,705,900	950,400	736,300	1,686,700
1893	973,300	766,500	1,739,800	966,100	756,600	1,722,700
1894	991,700	786,900	1,778,600	982,500	776,600	1,759,100
1895	1,009,600	808,000	1,817,600	1,000,700	797,400	1,798,100
1896	1,027,600	827,500	1,855,100	1,018,600	817,800	1,836,400
1897	1,045,000	849,500	1,894,500	1,036,300	838,500	1,874,800
1898	1,056,800	867,800	1,924,600	1,050,900	858,600	1,909,500
1899	1,069,400	887,800	1,957,200	1,063,100	877,800	1,940,900
1900	1,080,000	908,800	1,988,800	1,074,700	898,300	1,973,000
1901	1,099,300	931,800	2,031,100	1,087,000	919,700	2,006,700
1902	1,117,100	953,200	2,070,300	1,107,600	941,900	2,049,500
1903	1,131,700	973,200	2,104,900	1,123,300	962,800	2,086,100
1904	1,152,200	996,400	2,148,600	1,141,100	984,200	2,125,300
1905	1,172,700	1,020,700	2,193,400	1,161,700	1,008,000	2,169,700
1906	1,193,000	1,045,500	2,238,500	1,182,300	1,032,600	2,214,900
1907	1,217,200	1,073,100	2,290,300	1,204,100	1,058,700	2,262,800
1908	1,241,800	1,101,100	2,342,900	1,228,700	1,086,400	2,315,100
1909	1,274,800	1,133,000	2,407,800	1,257,100	1,116,200	2,373,300
1910	1,311,400	1,167,200	2,478,600	1,291,700	1,149,000	2,440,700
1911	1,359,500	1,203,400	2,562,900	1,334,100	1,184,700	2,518,800
1912	1,410,400	1,244,900	2,655,300	1,383,700	1,221,900	2,605,600

11. **Natural Age Groups.**—An interesting view of the distribution of the population of Australia, and of the increases at different stages from 1881 onwards, may be obtained by a classification into what have been termed " Natural Age Groups." For the purposes of the present report these groups have been taken as follows :—Infancy (Ages 0 and 1), Childhood (Ages 2 to 13 inclusive), Adolescence (Ages 14 to 20 inclusive), Early Adult Life (Ages 21 to 44 inclusive), Mature Age (Ages 45 to 64 inclusive), Old Age (65 and over). In each case the ages here quoted are the ages last birthday.

Classified in this manner, the adjusted particulars for the four Censuses, 1881 to 1911, are as follows :—

Population of the Commonwealth of Australia, 1881 to 1911.

Age Last Birthday.	Period of Life.	Males.				Females.			
		Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.	Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.
0–1	Infancy ..	66,240	94,500	90,000	113,407	64,800	91,750	87,900	109,383
2–13	Childhood	349,320	466,250	539,150	556,347	342,880	455,900	527,100	544,563
14–20	Adolescence	174,720	219,650	268,050	320,842	169,960	216,550	266,900	311,378
21–44	Early Adult Life ..	410,440	646,350	740,400	855,059	323,840	507,800	650,600	789,826
45–64	Mature Age	179,760	222,850	255,050	366,980	111,920	161,100	198,600	296,791
65 and over	Old Age ..	34,433	54,439	85,278	100,400	21,881	37,253	64,773	90,029
Total		1214913	1704039	1977928	2313035	1035281	1470353	1795873	2141970

The percentage of the total population included in each of the natural age groups shewn in the above table is as follows, the percentages being given for each sex separately :—

Percentage of Commonwealth Population of each Sex in each Natural Age Group, 1881 to 1911.

Age Last Birthday.	Period of Life.	Males.				Females.			
		Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.	Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.
		%	%	%	%	%	%	%	%
0–1	Infancy ..	5.45	5.55	4.55	4.90	6.26	6.24	4.89	5.11
2–13	Childhood	28.75	27.36	27.26	24.05	33.12	31.01	29.35	25.42
14–20	Adolescence	14.38	12.89	13.55	13.87	16.42	14.73	14.86	14.54
21–44	Early Adult Life ..	33.78	37.93	37.43	36.97	31.28	34.53	36.23	36.87
45–65	Mature Age	14.80	13.08	12.90	15.87	10.81	10.96	11.06	13.86
65 and over	Old Age ..	2.84	3.19	4.31	4.34	2.11	2.53	3.61	4.20
Total		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

A comparison of the percentages for 1911 with those for 1881 discloses the fact that there has been a heavy proportionate reduction in the numbers in the periods of "infancy," " childhood," and " adolescence," and a corresponding increase in the periods of " early adult life," " mature age," and " old age." These variations are more marked in the case of females than in that of males.

The following table furnishes similar particulars for males in the several States and Territories of the Commonwealth for the Census of 3rd April, 1911:—

Males in Natural Age Groups, 3rd April, 1911.

Age Last Birthday.	Period of Life.	States.						Territories.		C'wlth.
		N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
		NUMBER.								
0–1	Infancy ..	43,525	30,780	15,980	10,338	7,400	5,316	33	35	113,407
2–13	Childhood	206,300	158,780	79,190	49,968	34,952	26,745	201	211	556,347
14–20	Adolescence	118,725	94,940	46,060	30,078	16,744	14,025	119	151	320,842
21–44	Early Adult Life ..	318,275	230,820	122,940	75,432	73,264	32,901	1,053	374	855,059
45–64	Mature Age	134,325	106,880	52,100	32,280	25,284	14,724	1,217	170	366,980
65 and over ..	Old Age ..	36,548	33,391	13,236	9,262	3,921	3,880	111	51	100,400
Total All Ages		857,698	655,591	329,506	207,358	161,565	97,591	2,734	992	2313035
		PERCENTAGE ON TOTAL, ALL AGES.								
0–1	Infancy ..	% 5.08	% 4.70	% 4.85	% 4.98	% 4.58	% 5.45	% 1.21	% 3.53	% 4.90
2–13	Childhood	24.05	24.22	24.03	24.10	21.63	27.40	7.35	21.27	24.05
14–20	Adolescence	13.84	14.48	13.98	14.50	10.36	14.37	4.35	15.22	13.87
21–44	Early Adult Life ..	37.11	35.21	37.31	36.38	45.35	33.71	38.52	37.70	36.97
45–64	Mature Age	15.66	16.30	15.81	15.57	15.65	15.09	44.51	17.14	15.87
65 and over ..	Old Age ..	4.26	5.09	4.02	4.47	2.43	3.98	4.06	5.14	4.34
Total All Ages		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Corresponding details for females are given in the succeeding table :—

Females in Natural Age Groups, 3rd April, 1911.

Age Last Birthday.	Period of Life.	States.						Territories.		C'wlth.
		N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
		NUMBER.								
0–1	Infancy ..	42,175	29,500	15,360	9,966	7,232	5,076	31	43	109,383
2–13	Childhood	202,950	155,460	76,960	48,960	34,144	25,671	197	221	544,563
14–20	Adolescence	114,175	94,700	43,710	29,772	15,052	13,752	94	123	311,378
21–44	Early Adult Life ..	294,075	244,080	97,910	73,410	47,660	32,277	199	215	789,826
45–64	Mature Age	105,500	102,020	33,140	29,442	13,726	12,825	49	89	296,791
65 and over ..	Old Age ..	30,161	34,200	9,227	9,650	2,735	4,019	6	31	90,029
	Total All Ages	789,036	659,960	276,307	201,200	120,549	93,620	576	722	2141970
		PERCENTAGE ON TOTAL, ALL AGES.								
0–1	Infancy ..	% 5.35	% 4.47	% 5.56	% 4.95	% 6.00	% 5.42	% 5.38	% 5.95	% 5.11
2–13	Childhood	25.72	23.56	27.85	24.33	28.32	27.42	34.20	30.61	25.42
14–20	Adolescence	14.47	14.35	15.82	14.80	12.48	14.69	16.32	17.04	14.54
21–44	Early Adult Life ..	37.27	36.98	35.44	36.49	39.54	34.48	34.55	29.78	36.87
45–64	Mature Age	13.37	15.46	11.99	14.63	11.39	13.70	8.51	12.33	13.86
65 and over ..	Old Age	3.82	5.18	3.34	4.80	2.27	4.29	1.04	4.29	4.20
	Total All Ages	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

12. **School Age.**—In all the States of the Commonwealth, ages are fixed within the limits of which children must be sent to school, except under certain special circumstances. In New South Wales, Victoria, Queensland, Western Australia, and Tasmania, this compulsory provision covers all children who have attained age 6, but are less than 14 years of age. In South Australia the corresponding limits of age are 7 and 13. The extension of the upper limit in the case of Queensland to age 14 took effect as from 1st July, 1912. At the date of the Census (3rd April, 1911) the Queensland upper limit was 12, that is to say, children who had reached age 12 were exempt from the compulsory provision.

The number of children at each of the ages last birthday from 6 to 13 inclusive at the date of the Census was as follows :—

Children of School Age, 3rd April, 1911.

Age Last Birthday.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
	MALES.								
6	17,875	13,380	6,620	4,182	3,124	2,325	20	17	47,543
7	17,000	13,180	6,500	4,080	3,020	2,268	19	17	46,084
8	16,250	13,000	6,400	3,990	2,900	2,208	18	17	44,783
9	15,700	12,840	6,340	3,930	2,780	2,145	17	18	43,770
10	15,425	12,680	6,300	3,894	2,644	2,073	15	18	43,049
11	15,500	12,560	6,280	3,882	2,492	2,007	13	19	42,753
12	15,725	12,520	6,290	3,894	2,328	1,959	12	20	42,748
13	15,975	12,580	6,310	3,954	2,180	1,959	12	20	42,990
Total	129,450	102,740	51,040	31,806	21,468	16,944	126	146	353,720
	FEMALES.								
6	17,450	13,040	6,420	4,116	3,028	2,208	19	17	46,298
7	16,800	12,860	6,320	4,008	2,924	2,163	19	17	45,111
8	16,250	12,680	6,250	3,918	2,804	2,118	18	17	44,055
9	15,875	12,520	6,190	3,852	2,692	2,073	16	18	43,236
10	15,625	12,420	6,160	3,810	2,584	2,022	15	18	42,654
11	15,400	12,400	6,140	3,804	2,480	1,965	14	19	42,222
12	15,325	12,440	6,140	3,822	2,340	1,902	12	20	42,001
13	15,325	12,580	6,160	3,900	2,180	1,896	11	20	42,072
Total	128,050	100,940	49,780	31,230	21,032	16,347	124	146	347,649

Children of School Age, 3rd April, 1911—*continued.*

Age Last Birthday.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S. A.	W.A.	Tas.	N.T.	F.T.	
TOTAL.									
6	35,325	26,420	13,040	8,298	6,152	4,533	39	34	93,841
7	33,800	26,040	12,820	8,088	5,944	4,431	38	34	91,195
8	32,500	25,680	12,650	7,908	5,704	4,326	36	34	88,838
9	31,575	25,360	12,530	7,782	5,472	4,218	33	36	87,006
10	31,050	25,100	12,460	7,704	5,228	4,095	30	36	85,703
11	30,900	24,960	12,420	7,686	4,972	3,972	27	38	84,975
12	31,050	24,960	12,430	7,716	4,668	3,861	24	40	84,749
13	31,300	25,160	12,470	7,854	4,360	3,855	23	40	85,062
Total]	257,500	203,680	100,820	63,036	42,500	33,291	250	292	701,369

The figures here given are the adjusted results for the Commonwealth and for the several States and Territories.

A comparative statement shewing the number of children above 6 and under 14 in the Commonwealth at each of the last four Censuses is furnished in the following table :—

Children of School Age, Commonwealth of Australia, 1881 to 1911.

Age last birthday.	Number.				Increase.*		
	Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.	From 1881 to 1891.	From 1891 to 1901.	From 1901 to 1911.
MALES.							
6	29,720	40,750	45,800	47,543	11,030	5,050	1,743
7	29,200	39,350	46,400	46,084	10,150	7,050	— 316
8	28,720	37,950	46,850	44,783	9,230	8,900	—2,067
9	28,240	36,650	46,850	43,770	8,410	10,200	—3,080
10	27,800	35,550	46,300	43,049	7,750	10,750	—3,251
11	27,360	34,700	45,100	42,753	7,340	10,400	—2,347
12	26,960	33,850	43,700	42,748	6,890	9,850	—952
13	26,560	33,000	42,400	42,990	6,440	9,400	590
Total	224,560	291,800	363,400	353,720	67,240	71,600	—9,680
FEMALES.							
6	29,200	39,900	44,750	46,298	10,700	4,850	1,548
7	28,680	38,500	45,400	45,111	9,820	6,900	—289
8	28,200	37,250	45,900	44,055	9,050	8,650	—1,845
9	27,720	36,100	45,850	43,236	8,380	9,750	—2,614
10	27,280	35,000	45,100	42,654	7,720	10,100	—2,446
11	26,840	33,950	44,050	42,222	7,110	10,100	—1,828
12	26,440	32,950	42,850	42,001	6,510	9,900	—849
13	26,080	32,050	41,750	42,072	5,970	9,700	322
Total	220,440	285,700	355,650	347,649	65,260	69,950	—8,001
TOTAL.							
6	58,920	80,650	90,550	93,841	21,730	9,900	3,291
7	57,880	77,850	91,800	91,195	19,970	13,950	—605
8	56,920	75,200	92,750	88,838	18,280	17,550	—3,912
9	55,960	72,750	92,700	87,006	16,790	19,950	—5,694
10	55,080	70,550	91,400	85,703	15,470	20,850	—5,697
11	54,200	68,650	89,150	84,975	14,450	20,500	—4,175
12	53,400	66,800	86,550	84,749	13,400	19,750	—1,801
13	52,640	65,050	84,150	85,062	12,410	19,100	912
Total	445,000	577,500	719,050	701,369	132,500	141,550	—17,681

* — Signifies decrease.

The decreases shewn in the preceding table for the period from 1901 to 1911, in the ages 7 to 12 inclusive, resulted from the diminution in the number of births during the period 1898 to 1903 inclusive, as compared with those for the period 1888 to 1893. A comparison of the number of births in the several years of these two periods is as follows :—

Comparison of Births Registered in Australia.

Period	1888	1889	1890	1891	1892	1893
Births Registered	104,080	104,724	108,683	110,187	110,158	109,322
Period	1898	1899	1900	1901	1902	1903
Births Registered	98,845	100,638	102,221	102,945	102,776	98,443
Excess of Births in earlier period over those in corresponding period 10 years later	5,235	4,086	6,462	7,242	7,382	10,879

It is evident from these figures that if it had not been for the marked improvement in the rates of infantile mortality during the later period, the decreases in the numbers at ages 7 to 12 would have been much greater than actually resulted. From 1904 onwards the number of births has increased rapidly, and the indications are that the numbers for all ages from 6 to 13 inclusive at the Census of 1921 will shew a large increase over those for 1911.

13. **Supporting Age.**—The male population may conveniently be divided in respect of age into three groups in relation to its breadwinning capabilities. The first group, that of Dependent Age, ranges from 0 to 14 inclusive, the second, that of Supporting Age, from 15 to 64 inclusive, and the final group of Old Age from 65 upwards. Details for the Commonwealth and for the several States and Territories as at the date of the Census are as follows :—

Australian Male Population, 3rd April, 1911.

Age Last Birthday.	Period of Life.	MALE POPULATION.								
		States.						Territories.		C'wlth
		N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
		NUMBER.								
0–14	Dependent Age	266,050	202,440	101,520	64,362	44,448	34,041	247	267	713375
15–64	Supporting Age	555,100	419,760	214,750	133,734	113,196	59,670	2,376	674	1499260
65 & over	Old Age	36,548	33,391	13,236	9,262	3,921	3,880	111	51	100400
Total		857,698	655,591	329,506	207,358	161,565	97,591	2,734	992	2313035
		PERCENTAGE.								
0–14	Dependent Age	% 31.02	% 30.88	% 30.81	% 31.04	% 27.51	% 34.88	% 9.03	% 26.92	% 30.84
15–64	Supporting Age	64.72	64.03	65.17	64.49	70.06	61.14	86.91	67.94	64.82
65 & over	Old Age	4.26	5.09	4.02	4.47	2.43	3.98	4.06	5.14	4.34
Total		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Amongst the States, the highest proportion of " supporting age " was 70.06 per cent. in the case of Western Australia, and the lowest 61.14 per cent. in the case of Tasmania. Similarly, for " dependent age," the highest proportion was 34.88 per cent. in Tasmania and the lowest 27.51 per cent., in Western Australia while for " old age" Victoria was highest with 5.09 per cent. and Western Australia lowest with 2.43 per cent.

Similar particulars for the Commonwealth for each of the last four Censuses are furnished in the following table :—

Australian Male Population, 1881 to 1911.

Age Last Birthday.	Period of Life.	MALE POPULATION.							
		Number.				Percentage.			
		Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.	Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.
						%	%	%	%
0–14	Dependent Age	441,720	592,950	670,350	713,375	36.36	34.80	33.89	30.84
15–64	Supporting Age	738,760	1056650	1222300	1499260	60.80	62.01	61.80	64.82
65 and over ..	Old Age	34,433	54,439	85,278	100,400	2.84	3.19	4.31	4.34
Total		1214913	1704039	1977928	2313035	100.00	100.00	100.00	100.00

During the 30 years from 1881 to 1911, the proportion per cent: of male population in the " dependent age" group decreased by 5.52, while the proportion for " supporting age" increased by 4.02 and that for " old age" by 1.50. The diminution in the case of " dependent age" and the increase in the case of " old age" have each been continuous for the period, but the increase in the case of " supporting age" evidences a setback in the 1901 figures. This is mainly due to the male emigration arising from the financial crisis of 1893, and to the departure of troops for South Africa in 1899 and 1900.

14. **Childbearing Age.**—With reference to the function of childbearing, a convenient division of the female population, according to age, is into three groups of Immature, Reproductive, and Sterile. The limits of these groups are not clearly defined, but in practice they may be taken as 0–14 for the Immature, 15–44 for the Reproductive, and 45 onwards for the Sterile. It is, of course, true that cases of reproduction are not infrequent beyond 44, and are even not unknown beyond 50, but the Australian experience for the four years, 1909–12, indicates that of 481,213 mothers, only 2,896, or 6 per thousand births, were aged 45 or upwards. Cases of birth under 15 also occur, but during the same period of four years only 92 were registered, or less than 1 in every 5,000 births. Details for the Commonwealth and for the several States and Territories as at the date of the Census are as follows :—

Australian Female Population, 3rd April, 1911.

Age Last Birthday.	Period of Life.	FEMALE POPULATION.								
		States.						Territories.		C'wlth
		N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
		NUMBER.								
0–14 ..	Immature ..	260,575	197,820	98,500	62,928	43,436	32,667	238	284	696,448
15–44 ..	Reproductive ..	392,800	325,920	135,440	99,180	60,652	44,109	283	318	1058702
45 & upwards	Sterile	135,661	136,220	42,367	39,092	16,461	16,844	55	120	386,820
Total		789,036	659,960	276,307	201,200	120,549	93,620	576	722	2141970
		PERCENTAGE.								
		%	%	%	%	%	%	%	%	%
0–14 ..	Immature ..	33.03	29.97	35.65	31.28	36.03	34.89	41.32	39.34	32.51
15–44 ..	Reproductive	49.78	49.39	49.02	49.29	50.31	47.12	49.13	44.04	49.43
45 & over ..	Sterile ..	17.19	20.64	15.33	19.43	13.66	17.99	9.55	16.62	18.06
Total		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Amongst the States the highest proportion of " reproductive age" was 50.31 per cent. in Western Australia and the lowest 47.12 per cent. in Tasmania. Similarly, for the " immature age," the highest proportion was 36.03 per cent. in Western Australia and 29.97 per cent. in Victoria, while for the " sterile age," the highest proportion was 20.64 per cent. in Victoria and the lowest 13.66 per cent. in Western Australia.

Similar particulars for the Commonwealth for each of the last four Censuses are furnished in the following table :—

Australian Female Population, 1881 to 1911.

Age.	Period of Life.	Female Population.							
		Number.				Percentage.			
		Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.	Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.
						%	%	%	%
0–14	Immature ..	433,360	579,000	655,700	696,448	41.86	39.38	36.51	32.51
15–44	Reproductive ..	468,120	693,000	876,800	1058702	45.22	47.13	48.82	49.43
45 and over ..	Sterile	133,801	198,353	263,373	386,820	12.92	13.49	14.67	18.06
Total		1035281	1470353	1795873	2141970	100.00	100.00	100.00	100.00

During the 30 years from 1881 to 1911, the proportion per cent. of female population who were of " immature age " declined by 9.35, while the proportion of " reproductive age" increased by 4.21, and the proportion of sterile age by 5.14. The increases and decreases have been continuous throughout.

15. **Military Age.**—In accordance with Section 125 of the Defence Act 1903 and subsequent amendments, all male inhabitants of Australia (excepting those exempted under the Act) who have resided therein for 6 months, and are British subjects, are liable to be trained as follows :—

(i.) From 12 to 14 years of age as Junior Cadets.

(ii.) ,, 14 to 18 years of age as Senior Cadets.

(iii.) ,, 18 to 26 years of age in the Citizen Forces.

The number of males in each of these age groups in the Commonwealth, and each of its component States and Territories at the 3rd April, 1911, was as follows :—

Australian Male Population of Training Age, 3rd April, 1911.

Age Last Birthday.	Male Population, 12–25.								
	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
	Number.								
12–13	31,700	25,100	12,600	7,848	4,508	3,918	24	40	85,738
14–17	66,400	53,920	25,800	16,848	8,812	8,097	56	86	180,019
18–25	139,350	101,180	53,880	34,746	23,156	14,511	215	166	367,204
Total	237,450	180,200	92,280	59,442	36,476	26,526	295	292	632,961
	Percentage on Total Male Population.								
	%	%	%	%	%	%	%	%	%
12–13	3.69	3.83	3.83	3.78	2.79	4.01	.88	4.03	3.71
14–17	7.74	8.23	7.83	8.13	5.46	8.30	2.05	8.67	7.78
18–25	16.25	15.43	16.35	16.76	14.33	14.87	7.86	16.74	15.88
Total	27.68	27.49	28.01	28.67	22.58	27.18	10.79	29.44	27.37

Under Section 59 of the same Act, all male inhabitants of Australia (excepting those who are exempt from service) who have resided therein for 6 months, and are British subjects, and are between the ages of 18 and 60 years, are in time of war liable to serve in the Citizen Forces. The total number of males between the ages of 18 and 60 at the date of the Census (*i.e.*, at ages 18 to 59 inclusive, last birthday), and the percentage of total male population which they represent are as follows :—

Australian Male Population of Military Service Age, 3rd April, 1911.

Age Last Birthday.	MALE POPULATION, 18–59.								
	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
Number	485,100	364,760	187,790	115,998	103,732	51,498	2,173	577	1311628
Percentage on Total Males ..	56.56	55.64	56.99	55.94	64.20	52.77	79.48	58.17	56.71

From the preceding tables it will be seen that at the date of the Census, 27.37 per cent. of the male population were of training age, while 56.71 per cent. were of such age as to be liable to serve in the Citizen Forces in the event of war. Particulars concerning the number of these that for various reasons would be exempt are not available.

16. **Metropolitan Population in Ages.**—The following table gives the number of persons in each age group resident in the several metropolitan areas of the Commonwealth, and the aggregates for these areas combined. In compiling these results persons of unspecified age have been distributed pro rata over the several age groups.

Metropolitan Population According to Age (Sexes Combined) 3rd April, 1911.

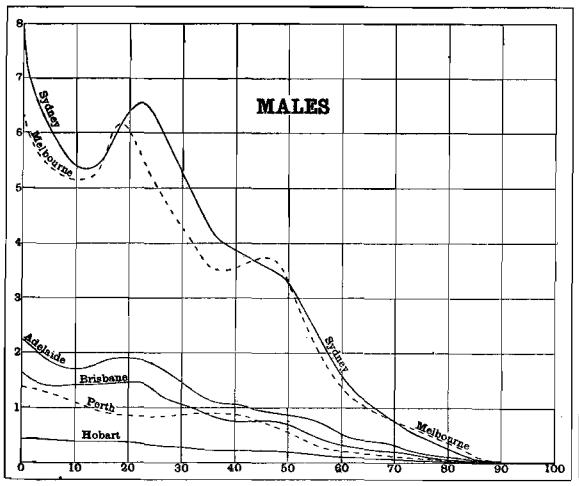
Age Last Birthday.	Sydney and Suburbs.	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total Metropolitan Areas.
0–4	67,854	57,237	14,828	20,381	13,238	4,347	177,885
5–9	56,983	52,216	13,533	17,599	11,973	3,858	156,162
10–14	54,175	51,809	14,178	17,404	10,355	3,735	151,656
15–19	62,418	62,044	15,338	19,473	9,654	4,256	173,183
20–24	69,850	62,156	15,560	19,851	9,318	4,066	180,801
25–29	62,325	52,436	12,532	17,928	8,765	3,507	157,493
30–34	51,336	44,105	10,393	14,425	8,955	2,785	131,999
35–39	42,861	39,548	8,766	11,822	8,950	2,417	114,364
40–44	38,340	39,884	8,046	10,976	7,990	2,364	107,600
45–49	35,176	38,062	7,560	9,816	6,030	2,197	98,841
50–54	29,154	29,350	5,939	8,693	4,136	1,840	79,112
55–59	19,897	18,142	4,054	6,745	2,483	1,347	52,668
60–64	14,613	13,389	2,989	4,836	1,880	1,029	38,736
65–69	10,864	10,782	2,509	3,946	1,427	858	30,386
70–74	7,080	8,186	1,800	2,716	886	604	21,272
75–79	4,168	5,599	917	1,657	473	408	13,222
80–84	1,726	2,895	398	922	193	210	6,344
85–89	522	881	112	352	69	81	2,017
90–94	135	218	26	82	15	23	499
95–99	20	28	..	20	1	4	73
100 and over	6	4	2	2	1	1	16
Total	629,503	588,971	139,480	189,646	106,792	39,937	1,694,329

The general trend of the metropolitan population curve will be seen to be a decline from the earliest age to the age group 10–14, a rise thence to the group 20–24, and a subsequent decline throughout. Sydney, Melbourne, Adelaide and the total metropolitan areas are strictly in accord with this trend, while Brisbane and Hobart vary but slightly from it. Perth, on the other hand, exhibits a fairly complete decline in numbers throughout, the only exception being a slight fluctuation at ages 30–34 and 35–39. In Sydney, Melbourne, Brisbane and the total metropolitan areas, the figures for the group 20–24 exceed those for 0–4, as do also those for 15–19 in Melbourne and Brisbane. In Adelaide, Perth and Hobart, the age group 0–4 contains a larger number than any other group.

The accompanying graphs, Nos. 17 and 18, furnish a representation of the male and female population of each metropolitan area at the Census of 1911. For numerical details see Volume II., pp. 38-41.

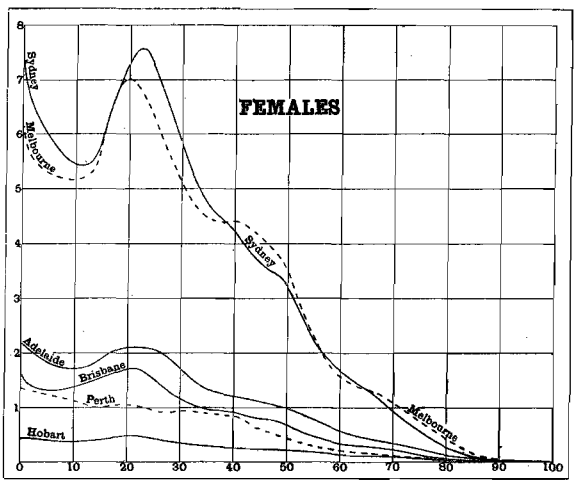
Metropolitan Population.—Census 1911.

MAMES.



GRAPH No. 17.

FEMALES.



GRAPH No. 18.

The proportion per cent. of the total for each metropolitan area, represented by the number in each age group is shewn in the following table :—

Proportion per cent. in each Quinquennial Age Group (Sexes Combined) 3rd April, 1911.

Age Last Birthday.	Sydney and Suburbs.	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total Metropolitan Areas.
	%	%	%	%	%	%	%
0–4	10.78	9.72	10.63	10.75	12.40	10.89	10.50
5–9	9.05	8.87	9.70	9.28	11.21	9.66	9.22
10–14	8.61	8.80	10.16	9.18	9.70	9.35	8.95
15–19	9.92	10.54	11.00	10.27	9.04	10.66	10.22
20–24	11.10	10.55	11.16	10.47	8.73	10.18	10.67
25–29	9.90	8.90	8.98	9.45	8.21	8.78	9.30
30–34	8.16	7.49	7.45	7.61	8.39	6.97	7.79
35–39	6.81	6.72	6.28	6.23	8.38	6.05	6.75
40–44	6.09	6.77	5.77	5.79	7.48	5.92	6.35
45–49	5.59	6.46	5.42	5.18	5.65	5.51	5.83
50–54	4.63	4.98	4.26	4.58	3.87	4.61	4.67
55–59	3.16	3.08	2.91	3.56	2.32	3.37	3.11
60–64	2.32	2.27	2.14	2.55	1.76	2.58	2.29
65–69	1.73	1.83	1.80	2.08	1.34	2.15	1.79
70–74	1.12	1.39	1.29	1.43	.83	1.51	1.25
75–79	.66	.95	.66	.87	.44	1.02	.78
80–84	.27	.49	.29	.49	.18	.53	.37
85–89	.08	.15	.08	.18	.06	.20	.12
90–94							
95–99	.02	.04	.02	.05	.01	.06	.04
100 and over							
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

The proportions per cent. in the groups 0–14, 15–64 and 65 and over in the several metropolitan areas are as follows :—

Proportion per cent. (Sexes Combined) 3rd April, 1911.

Age Last Birthday.	Sydney and Suburbs.	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total Metropolitan Areas.
	%	%	%	%	%	%	%
0–14	28.44	27.39	30.49	29.21	33.31	29.90	28.67
15–64	67.68	67.76	65.37	65.69	63.83	64.63	66.98
65 and over	3.88	4.85	4.14	5.10	2.86	5.47	4.35
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

It thus appears that for the metropolitan areas as a whole, 28⅔ per cent. of the population were under 15, 67 per cent. were between 15 and 65, while 4⅓ were above 65 years of age. For the extra-metropolitan areas of the Commonwealth, the corresponding figures were as follows :— Under 15, 33½ per cent. ; between 15 and 65, 62¼ per cent. ; above 65, 4¼ per cent. It will be

seen that the extra-metropolitan population of the Commonwealth contains a much larger proportion of persons under 15, and a correspondingly smaller proportion between 15 and 65, than is the case with the metropolitan areas, the proportions of persons aged 65 and upwards differing but slightly.

The masculinity in age groups of the several metropolitan populations determined in accordance with the third method described on pp. 98, 99 ante, is given in the following table :—

Masculinity of Metropolitan Population. (Excess of Males over Females in each 100 of Population), 3rd April, 1911.

Age Last Birthday.	Sydney and Suburbs.	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total Metropolitan Areas.
0–4	2,12	1.41	2.64	.36	1.30	1.96	1.73
5–9	.51	.66	2.28	.96	.48	3.84	.84
10–14	—1.06	— .52	— .75	—1.01	—2.37	—1.42	— .94
15–19	—4.72	—5.22	—5.23	—3.79	—7.17	—7.75	—5.05
20–24	—7.06	—9.64	—8,64	—6.31	—9.06	—17.66	—8.34
25–29	—6.54	—9.55	—6.08	—7.89	—4.28	—12.92	—7.68
30–34	—4.62	—10.21	—5.15	—6.86	—2.42	—12.89	—6.80
35–39	—5.11	—11.17	—5.86	—7.66	1.47	—10.63	—7.13
40–44	—2.41	—7.18	—6.79	—8.20	5.33	—8.12	—4.65
45–49	— .13	—3.78	— .11	—8.23	9.82	—5.05	—1.84
50–54	3.33	—2.03	1.94	—4.20	11.36	—7.07	.59
55–59	2.34	—3.20	— .35	.37	2.38	—10.32	— .54
60–64	—5.50	—10.08	—3.45	—7.57	1.06	—9.62	—6.97
65–69	—9.87	—16.53	—8.89	—3.55	—1.47	—17.48	—11.15
70–74	—8.47	—15.71	—2.67	—9.20	4.29	—19.21	—10.63
75–79	—7.97	—9.63	1.64	—13.58	10.36	—20.59	—8.44
80–84	—9.85	—6.94	—7.54	—12.58	19.17	—6.67	—7.79
85–89	—20.31	—11.24	—17.86	—21.59	10.14	1.23	—14.53
90–94	—39.26	—14.68	.00	—26.83	33.33	21.74	—19.44
95–99	—30.00	—50.00	..	—50.00	100.00	50.00	—36.99
100 and over	—66.67	—50.00	.00	—100.00	—100.00	100.00	—50.00
All Ages ..	—2.87	—5.61	—3.03	—4.48	— .31	—7.42	—3.96

Note. — denotes excess of females over males.

It will be seen that in all the metropolitan areas there was a preponderance of females in the total population, and that in the total for the metropolitan areas this preponderance was in evidence at all ages except 0–9 and 50–54. The general characteristics of the variation of masculinity with age are very similar to those for the general population commented upon on page 99, the wavelike variation being strongly in evidence.

In the succeeding table, particulars are furnished relative to the proportion of the persons in each age group who were resident in the metropolitan areas of the several States and of the Commonwealth as a whole.

Proportion of Population in Metropolitan Areas (Sexes Combined), 3rd April, 1911.

Age Last Birthday.	Sydney and Suburbs	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total Metropolitan Areas.
	%	%	%	%	%	%	%
0–4	33.71	39.78	20.08	42.79	37.79	17.49	33.76
5–9	33.79	40.20	21.27	43.56	40.89	17.40	34.37
10–14	34.40	40.96	22.66	44.53	44.09	18.87	35.33
15–19	37.82	45.49	23.98	45.16	42.38	21.48	38.36
20–24	40.79	48.58	24.53	46.77	36.53	22.26	40.25
25–29	41.61	48.42	23.68	47.49	33.54	22.32	40.29
30–34	41.10	46.81	23.60	48.19	33.87	21.03	39.62
35–39	40.24	45.77	22.82	47.98	34.85	21.30	38.98
40–44	40.36	46.63	23.03	48.13	36.27	22.45	39.66
45–49	41.50	47.58	24.21	47.98	36.45	22.62	40.64
50–54	41.80	47.58	23.86	48.31	36.98	22.49	40.74
55–59	40.81	47.51	24.21	49.89	37.17	23.99	40.57
60–64	39.92	47.25	23.95	50.10	40.47	25.27	40.34
65–69	38.03	44.57	24.80	50.69	44.37	26.66	39.36
70–74	36.65	41.95	25.35	51.21	45.34	27.77	38.38
75–79	34.81	39.15	25.92	49.24	49.27	29.02	37.18
80–84	34.70	39.46	28.95	51.22	48.86	29.45	38.21
85–89	33.35	38.71	23.93	53.01	56.10	29.78	37.55
90–94	31.62	40.82	25.49	49.10	42.86	28.75	37.10
95–99	28.99	31.11	..	52.63	25.00	17.39	30.04
100 and over	19.35	22.22	40.00	66.67	33.33	25.00	25.00
Total	38.23	44.77	23.02	46.42	37.85	20.89	38.03

The general trend indicated by the figures for total metropolitan areas is that the proportion resident in such areas increases with age to the group 25–29, declining thence to group 35–39, rising thence to group 50–54, and declining thereafter throughout. This trend is also clearly marked in the cases of Sydney and Melbourne, but is less regular in most of the other capitals, while in the case of Adelaide the proportion increases with age throughout, except for some minor fluctuations.

It will be seen from the above that on the average, 38 per cent. of the population of the Commonwealth was resident in metropolitan areas, the percentage for ages between 15 and 75 being above this average, while for ages under 15 and above 75 the proportion was below this average, with the exception of age-group 80–84.

In Section 9 of the present Chapter, dealing with " Average Age," (p. 100) the mean and median ages of the populations of the several States and Territories of the Commonwealth are shewn. Similar particulars in respect of the various metropolitan areas are given in the following table :—

Metropolitan Mean and Median Ages, 3rd April, 1911.

Metropolitan Areas.	Mean Age.			Median Age.		
	Males.	Females.	Persons.	Males.	Females.	Persons.
	years.	years.	years.	years.	years.	years.
Sydney and Suburbs	27.69	28.06	27.88	25.09	25.41	25.26
Melbourne and Suburbs	28.32	29.39	28.88	25.07	26.41	25.81
Brisbane and Suburbs	26.92	27.37	27.15	23.46	24.03	23.77
Adelaide and Suburbs	27.81	28.76	28.31	24.39	25.59	25.03
Perth and Suburbs	26.81	25.93	26.37	25.15	23.71	24.37
Hobart and Suburbs	27.50	29.04	28.33	23.57	25.38	24.61
Total, Metropolitan ..	27.79	28.44	28.13	24.84	25.56	25.22

On comparing these figures with those given in Section 9, it will be seen that both for mean and median ages the averages for the metropolitan areas are higher than those for the Commonwealth as a whole. Thus, the metropolitan mean age for persons was 28.13, as compared with the Commonwealth mean age of 27.18, whilst the metropolitan median age for persons was 25.22, as compared with the Commonwealth median age of 24.01.

For the metropolitan areas, the mean age for persons exceeded the median age by 2.91 years, as compared with an excess for the Commonwealth as a whole of 3.17 years.

17. **State Subdivisions.**—In addition to the information specified in the preceding Section, relative to metropolitan Populations, particulars were tabulated for various subdivisions of the several States and Territories, and the majority of these are published in Part I. (Ages) of the Census Detailed Tables. (See Volume II., pp. 44-98.)

In all cases the number of persons of each sex and of the sexes combined under and over 21 years of age, is published for each Commonwealth Electoral Division, as well as for each State Electoral Province and Electoral District. In addition, details for each quinquennial age group, and for each single age under 5 is published in respect of Counties in New South Wales and Victoria, Census Districts in Queensland, Counties and Divisions in South Australia, Statistical Districts in Western Australia, Municipalities in Tasmania, and Counties in the Northern Territory.

CHAPTER XI.

BIRTHPLACES.

1. **Form of Inquiry and Tabulation.**—At the Census of the 3rd April, 1911, each person was asked to state on a " personal " card, the " Country or Australian State where born," and from the replies to this query, taken in conjunction with the other data furnished, the tables contained in Part II. (Birthplaces) of the Detailed Census Tables have been compiled. (See Volume II., pp. 105-385). As usual in such cases the replies given were frequently more minute than was required, the province, county, town, or even village of birth being supplied instead of the country, thus entailing extensive reference to atlases and gazetteers in the course of classification. For convenience of tabulation a scheme of classification of birthplaces was drawn up, comprising 75 items, and these items, with their allotted numbers, formed the basis for tabulation of birthplaces in all parts of the Report and Detailed Tables.

The scheme of classification was as follows :—

Birth-place No.		Birth-place No.	
	Australasia—		**Asia**—*continued*—
	Commonwealth of Australia—	40	Java
1	New South Wales	41	Philippine Islands
2	Victoria	42	Syria
3	Queensland	43	Other Asiatic Countries
4	South Australia		
5	Western Australia		**Africa—**
6	Tasmania	44	Cape of Good Hope
7	Northern Territory	45	Mauritius
8	Australia (undefined)	46	Natal
9	New Zealand	47	Orange Free State
		48	Transvaal
	Europe—	49	South Africa (undefined)
10	England	50	Other African Brit. Possns.
11	Wales	51	Egypt
12	Scotland	52	Other African Countries
13	Ireland		
14	Isle of Man		**America—**
15	Other European Brit. Possns.	53	Barbadoes
16	Austria-Hungary	54	Canada
17	Belgium	55	Jamaica
18	Denmark	56	Newfoundland
19	France	57	Other American Brit. Possns.
20	Germany	58	Argentine Republic
21	Greece	59	Brazil
22	Italy	60	Chile
23	Netherlands	61	Mexico
24	Norway	62	Peru
25	Portugal	63	United States of America
26	Russia	64	Other American Countries
27	Spain		
28	Sweden		**Polynesia—**
29	Switzerland	65	Fiji
30	Other European Countries	66	Friendly Islands
		67	Papua
	Asia—	68	Other Polynesian Brit. Possns.
31	British India	69	New Caledonia
32	Ceylon	70	New Hebrides
33	Hong Kong	71	Samoa
34	Straits Settlements	72	Other Polynesian Islands
35	Other Asiatic British Possns.	73	Sth Sea Islands (so described)
36	Afghanistan		
37	Arabia	74	**At Sea**
38	China		
39	Japan	75	**Unspecified**

It will be seen that the principle involved in this classification has been that of grouping the birthplaces under the various continents of birth, and of distinguishing for each continent the British from the foreign birthplaces, the British birthplaces being given first, usually, though not invariably, in alphabetical order, followed by the foreign birthplaces similarly arranged. Every personal card was before tabulation marked with its appropriate birthplace number

and these numbers were used in all subsequent tabulations. To assist in the process of classification an index of birthplaces was prepared. In addition to the totals for each of the 75 items, details in respect of numbers of each sex in each State and Territory were taken out in respect of the countries comprised under the comprehensive items 15, 30, 35, 43, 50, 52, 57, 64, 68 and 72. These details are shewn in their appropriate places in Tables 1 to 3 of Part II. (Birthplaces) of the Detailed Census Tables. See Volume II., pp. 109 to 119.

2. **Unspecified Birthplaces.**—On the present occasion the total number of persons who failed to specify their birthplaces on the Census Schedule was 30,470, of whom 16,418 were males, and 14,052 were females. These somewhat heavy numbers represented 7.1 per 1,000 of the total in the case of the male population and 6.6 per 1,000 in the case of the female population. For the several States and Territories the total unspecified per 1000 of total population worked out as follows :—New South Wales, 6.6 ; Victoria, 8.4 ; Queensland, 4.7 ; South Australia, 5.0 ; Western Australia, 7.5 ; Tasmania, 8.1 ; Northern Territory, 8.5 ; Federal Territory, 21.6. Leaving the Territories out of account the States with the highest proportion of persons of unspecified birthplace were Victoria and Tasmania, while those with the lowest proportion were Queensland and South Australia. In all cases the proportion was higher than was desirable, and furnished evidence of neglect in the detailed check of the personal cards by certain of the collectors. In the tabulation of the results given in pages 105 to 385 of Volume II., Detailed Tables, the particulars in respect of persons of unspecified birthplace have been tabulated under the heading " Unspecified," but in preparing the figures for this report the data relative to the unspecified have been distributed proportionately. It will be understood, therefore, that in this chapter, unless otherwise indicated, the figures given represent the results obtained after the adjustment made to allow for the unspecified. Similarly in the case of those recorded for " Australia, undefined," a distribution over the several States was carried out. In all cases the figures shewn are exclusive of aboriginal natives of the full blood, but include half-caste aboriginals.

3. **General View of Results.**—Dealing first with what may for convenience be termed the Continental division of birthplaces, the following table furnishes a convenient summary of the results for the several States and Territories of enumeration :—

Birthplaces of Population at Census of 3rd April, 1911.

Birthplace.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
MALES.									
Australasia	703,175	550,444	235,302	175,109	113,819	88,188	1,051	862	1,867,950
Europe	138,277	95,730	82,258	30,249	40,801	8,477	273	121	396,186
Asia	10,493	6,007	8,454	1,042	5,671	586	1,377	5	33,635
Africa	1,096	753	334	194	246	71	9	..	2,703
America	3,145	1,897	1,230	528	823	186	12	4	7,825
Polynesia	684	122	1,582	23	57	21	11	..	2,500
At Sea	828	638	346	213	148	62	1	..	2,236
Total	857,698	655,591	329,506	207,358	161,565	97,591	2,734	992	2,313,035
FEMALES									
Australasia	695,772	576,939	215,308	177,579	99,537	86,817	478	672	1,853,102
Europe	88,732	79,553	59,387	22,755	19,956	6,346	42	49	276,820
Asia	1,087	745	492	213	395	201	54	..	3,187
Africa	917	758	196	165	180	76	..	..	2,292
America	1,326	1,123	474	243	313	97	..	1	3,577
Polynesia	532	159	161	32	31	23	1	..	939
At Sea	670	683	289	213	137	60	1	..	2,053
Total	789,036	659,960	276,307	201,200	120,549	93,620	576	722	2,141,970
PERSONS.									
Australasia	1,398,947	1,127,383	450,610	352,688	213,356	175,005	1,529	1,534	3,721,052
Europe	227,009	175,283	141,645	53,004	60,757	14,823	315	170	673,006
Asia	11,580	6,752	8,946	1,255	6,066	787	1,431	5	36,822
Africa	2,013	1,511	530	359	426	147	9	..	4,995
America	4,471	3,020	1,704	771	1,136	283	12	5	11,402
Polynesia	1,216	281	1,743	55	88	44	12	..	3,439
At Sea	1,498	1,321	635	426	285	122	2	..	4,289
Total	1,646,734	1,315,551	605,813	408,558	282,114	191,211	3,310	1,714	4,455,005

Birthplaces of Population at Census of 3rd April, 1911—*continued.*

Birthplace.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
MASCULINITY (Excess of males over females per 100 of population).									
Australasia	5.29	— 2.35	4.44	— .70	6.69	.78	37.48	12.39	.40
Europe	21.83	9.23	16.15	14.14	34.31	14.38	73.33	42.35	17.74
Asia	81.23	77.93	89.00	67.67	86.98	48.92	92.45	100.00	82.69
Africa	8.89	— .33	26.04	8.08	15.49	— 3.40	100.00	..	8.23
America	40.68	25.63	44.37	36.96	44.89	31.45	100.00	60.00	37.26
Polynesia	12.50	—13.17	81.53	—16.36	29.55	— 4.55	83.33	..	45.39
At Sea	10.55	— 3.41	8.98	..	3.86	1.64	..	..	4.27
Total ..	4.17	— .33	8.78	1.51	14.54	2.08	65.20	15.75	3.84

Note. — Indicates excess of females over males per 100 of population.

For each of the birthplaces specified the largest numbers were those for New South Wales, Victoria ranking second for all birthplaces except Asia and Polynesia, in which cases Queensland occupied second place and Victoria third.

In the succeeding table is shewn for each sex separately and for the two sexes in combination, the percentage of the number from each birthplace on the total for each State and Territory :—

Percentage for each Birthplace in each State and Territory at Census of 3rd April, 1911.

Birthplace.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
MALES.									
Australasia	81.98	83.96	71.41	84.45	70.45	90.37	38.44	86.90	80.76
Europe	16.12	14.60	24.96	14.59	25.25	8.69	9.98	12.20	17.13
Asia	1.22	.92	2.57	.50	3.51	.60	50.37	.50	1.45
Africa	.13	.11	.10	.09	.15	.07	.33	..	.12
America	.37	.29	.37	.26	.51	.19	.44	.40	.34
Polynesia	.08	.02	.48	.01	.04	.02	.40	..	.11
At Sea	.10	.10	.11	.10	.09	.06	.04	..	.09
Total ..	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
FEMALES.									
Australasia	88.18	87.42	77.93	88.26	82.57	92.73	82.99	93.07	86.51
Europe	11.24	12.06	21.49	11.31	16.55	6.78	7.29	6.79	12.92
Asia	.14	.11	.18	.11	.33	.22	9.38	..	.15
Africa	.12	.12	.07	.08	.15	.08	..	..	.11
America	.17	.17	.17	.12	.26	.10	..	.14	.17
Polynesia	.07	.02	.06	.02	.03	.03	.17	..	.04
At Sea	.08	.10	.10	.10	.11	.06	.17	..	.10
Total ..	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
PERSONS.									
Australasia	84.96	85.70	74.38	86.33	75.63	91.53	46.20	89.50	83.52
Europe	13.79	13.32	23.38	12.97	21.54	7.75	9.52	9.92	15.11
Asia	.70	.51	1.48	.31	2.15	.41	43.23	.29	.83
Africa	.12	.12	.09	.09	.15	.08	.27	..	.11
America	.27	.23	.28	.19	.40	.15	.36	.29	.25
Polynesia	.07	.02	.29	.01	.03	.02	.36	..	.08
At Sea	.09	.10	.10	.10	.10	.06	.06	..	.10
Total ..	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

It will be seen from the preceding table that of the total population of the Commonwealth at the date of the Census only 1.37 per cent. had been born elsewhere than in Australasia or Europe, the percentage for the sexes separately being 2.11 per cent. for males, and 0.57 per cent. for females.

As regards the constitution of the population of the several States, it will be seen that Tasmania furnished the highest proportion of persons of Australasian birth, and the lowest proportion of persons of European birth, while the proportion for other birthplaces, viz., 0.72 per cent., is lower for Tasmania than for any other State except South Australia, where the proportion is 0.70 per cent.

In general it may be said that New South Wales, Victoria and South Australia exhibited a fair degree of similarity of constitution as regards birthplace, whilst Western Australia and Queensland were similar to each other in shewing relatively low proportions of Australasian born population and relatively high proportions of persons of European and Asiatic birth.

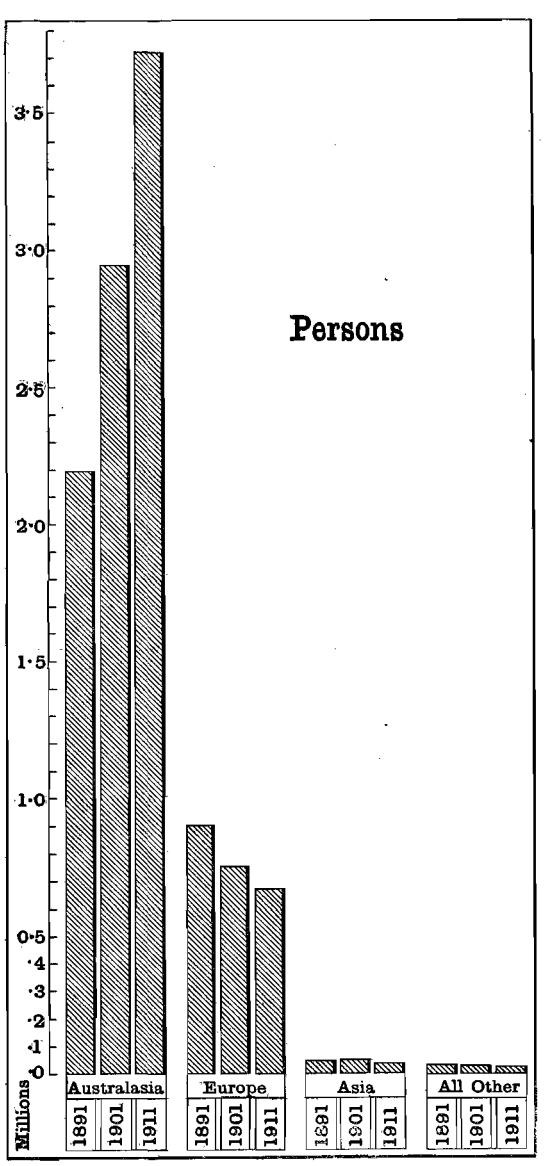
It is of interest to note that for both sexes the number of persons born at sea represented for practically all the States a uniform proportion of about 1 per thousand.

4. **Comparative Results for the three Censuses.**—A comparison of the birthplace statistics for the Commonwealth for the Censuses of 1891, 1901 and 1911, furnishes the following results :—

Commonwealth Population according to Birthplace, 1891, 1901 and 1911.

Birthplace	Males.			Females.			Persons.		
	1891.	1901.	1911.	1891.	1901.	1911.	1891.	1901.	1911.
				NUMBER					
Australasia	1,103,336	1,474,121	1,867,950	1,086,690	1,466,108	1,853,102	2,190,026	2,940,229	3,721,052
Europe ..	532,418	437,103	396,186	372,255	318,336	276,820	904,673	755,439	673,006
Asia ..	44,157	43,875	33,635	2,643	3,248	3,187	46,800	47,123	36,822
Africa ..	1,835	1,746	2,703	1,219	1,129	2,292	3,054	2,875	4,995
America ..	9,855	8,910	7,825	3,602	3,625	3,577	13,457	12,535	11,402
Polynesia ..	9,409	9,420	2,500	1,304	967	939	10,713	10,387	3,439
At Sea ..	3,029	2,753	2,236	2,640	2,460	2,053	5,669	5,213	4,289
Total	1,704,039	1,977,928	2,313,035	1,470,353	1,795,873	2,141,970	3,174,392	3,773,801	4,455,005
				PERCENTAGE ON TOTAL.					
Australasia	64.75	74.53	80.76	73.91	81.64	86.51	68.99	77.91	83.52
Europe ..	31.24	22.10	17.13	25.32	17.73	12.92	28.50	20.02	15.11
Asia ..	2.59	2.22	1.45	.18	.18	.15	1.47	1.25	.83
Africa ..	.11	.09	.12	.08	.06	.11	.10	.08	.11
America ..	.58	.45	.34	.24	.20	.17	.42	.33	.25
Polynesia ..	.55	.47	.11	.09	.05	.04	.34	.27	.08
At Sea ..	.18	.14	.09	.18	.14	.10	.18	.14	.10
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Birthplaces of Australian Population.



GRAPH No. 19.

It will be seen from the preceding table that between the Census of 1891 and that of 1911 the number of persons in Australia of Australasian birth increased by upwards of 1,530,000, while the percentage on total population increased from 69 per cent. to upwards of 83½ per cent. During the same period the population of European birth diminished by upwards of 231,000 in number, and in proportion from 28½ per cent. to 15 per cent. of the total. The population from all other birthplaces taken together diminished in number by nearly 19,000, and in proportion from 2½ per cent. to 1⅓ per cent. of the total population.

It is of interest to note that the only one of the birthplaces specified, other than Australasia, which shewed a higher number and proportion in 1911 than in 1891 or 1901 was Africa, mainly due to an increase in the number of immigrants from South Africa arising as a consequence of the Australian intervention in the South African War at the commencement of the decade. Both numerically and proportionately the Asiatic and Polynesian races diminished rapidly during the twenty years under review.

The accompanying graph (No. 19) furnishes a representation of the number of persons (males and females combined) enumerated at the Australian Censuses of 1891, 1901 and 1911, who had been born in "Australasia," "Europe," "Asia," and "all other birthplaces" respectively. This graph brings out clearly the increase in the number of Australian born and the decrease in the number born elsewhere, which has taken place in the 20 years covered by the graph.

The masculinity of the population for each birthplace is shewn in the following table :—

Masculinity of Australian Population according to Birthplace, 1891 to 1911. (Excess of Males over Females per 100 for Sexes combined for the Birthplaces in question).

Census.	Birthplace.							Total.
	Australasia.	Europe.	Asia.	Africa.	America.	Polynesia.	At Sea.	
1891	.76	17.70	88.71	20.17	46.46	75.66	6.86	7.36
1901	.27	15.72	86.21	21.46	42.16	81.38	.56	4.82
1911	.40	17.74	82.69	8.23	37.26	45.39	4.27	3.84

5. **British Subjects.**—Amongst the questions put at the recent Census was one relating to nationality, each person being asked to state if he were a British Subject by parentage or by naturalisation. In addition to these all persons born in British possessions were in tabulation classified as British subjects by birthplace, while the foreign born wives of British subjects were tabulated as British subjects by naturalisation, in accordance with the provisions of the Commonwealth Naturalisation Act. In the succeeding table the results obtained are shewn for each of the continental divisions of birthplaces.

British Subjects in Australia at the Census of 3rd April, 1911.

Birthplace.	British Subject.			Total British Subjects.	Others.	Total Population.
	By Birthplace.	By Parentage.	By Naturalisation.			
MALES.						
Australasia	1,867,950	..	..	1,867,950	..	1,867,950
Europe	342,546	1,857	34,002	378,405	17,781	396,186
Asia	6,719	294	4,081	11,094	22,541	33,635
Africa	2,484	67	90	2,641	62	2,703
America	2,687	2,516	1,184	6,387	1,438	7,825
Polynesia	1,126	300	223	1,649	851	2,500
At Sea	..	2,071	99	2,170	66	2,236
Total	2,223,512	7,105	39,679	2,270,296	42,739	2,313,035
FEMALES.						
Australasia	1,853,102	..	..	1,853,102	..	1,853,102
Europe	258,158	1,508	12,432	272,098	4,722	276,820
Asia	1,898	173	369	2,440	747	3,187
Africa	2,193	61	19	2,273	19	2,292
America	1,049	1,702	334	3,085	492	3,577
Polynesia	535	205	52	792	147	939
At Sea	..	1,940	61	2,001	52	2,053
Total	2,116,935	5,589	13,267	2,135,791	6,179	2,141,970
PERSONS.						
Australasia	3,721,052	..	..	3,721,052	..	3,721,052
Europe	600,704	3,365	46,434	650,503	22,503	673,006
Asia	8,617	467	4,450	13,534	23,288	36,822
Africa	4,677	128	109	4,914	81	4,995
America	3,736	4,218	1,518	9,472	1,930	11,402
Polynesia	1,661	505	275	2,441	998	3,439
At Sea	..	4,011	160	4,171	118	4,289
Total	4,340,447	12,694	52,946	4,406,087	48,918	4,455,005

These figures given shew that less than 2 per cent. of the male population of the Commonwealth, and only about 3 per 1000 of the female population were foreign subjects. Taking the sexes together, 1.1 per cent. of the whole population of the Commonwealth at the date of the Census were foreign subjects.

6. **Metropolitan Population.**—An interesting point in connexion with the question of birthplace is the relative extent to which those born in different parts tend to aggregate in the Metropolitan areas of the several States. For the various Continental divisions of birthplaces, the number of persons of each sex resident in each of the Metropolitan areas is shewn in the following table :—

Metropolitan Population according to Birthplace, 3rd April, 1911.

Birthplace.	Sydney and Suburbs.	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total Metropolitan.
MALES.							
Australasia	236,877	226,386	47,510	74,315	38,644	16,346	640,078
Europe	62,208	46,756	19,082	15,428	13,171	1,954	158,599
Asia	3,891	2,940	553	368	994	117	8,863
Africa	610	490	72	113	77	22	1,384
America	1,458	1,046	292	251	277	27	3,351
Polynesia	365	67	46	11	15	6	510
At Sea	319	271	73	92	53	15	823
TOTAL	305,728	277,956	67,628	90,578	53,231	18,487	813,608
FEMALES.							
Australasia	271,270	264,649	52,154	84,649	42,716	19,503	734,941
Europe	49,695	44,112	19,191	13,839	10,337	1,801	138,975
Asia	584	524	133	145	167	50	1,603
Africa	605	542	72	130	87	30	1,466
America	874	720	184	161	161	31	2,131
Polynesia	398	99	20	19	18	16	570
At Sea	349	369	98	125	75	19	1,035
TOTAL	323,775	311,015	71,852	99,068	53,561	21,450	880,721
PERSONS.							
Australasia	508,147	491,035	99,664	158,964	81,360	35,849	1,375,019
Europe	111,903	90,868	38,273	29,267	23,508	3,755	297,574
Asia	4,475	3,464	686	513	1,161	167	10,466
Africa	1,215	1,032	144	243	164	52	2,850
America	2,332	1,766	476	412	438	58	5,482
Polynesia	763	166	66	30	33	22	1,080
At Sea	668	640	171	217	128	34	1,858
TOTAL	629,503	588,971	139,480	189,646	106,792	39,937	1,694,329

For the total population Sydney contains the greatest number in respect of each of the birthplaces specified, while Melbourne ranks second throughout. Brisbane occupies third place in respect of Europe, America and Polynesia; Adelaide is third with Australasia, Africa, At Sea, and Total, while Perth is third in the case of Asia.

The succeeding table furnishes similar information respecting the proportion per cent. which the Metropolitan numbers for each sex and birthplace bore to the total for that sex and birthplace in the whole State or Commonwealth.

Proportion per cent. Resident in Metropolitan Areas, 3rd April, 1911.

Birthplace.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	C'WLTH.
MALES.							
	%	%	%	%	%	%	%
Australasia	33.69	41.13	20.19	42.44	33.95	18.54	34.27
Europe	44·99	48.84	23.20	51.00	32.28	23.05	40.03
Asia	37.08	48.94	6.54	35.32	17.53	19.97	26.35
Africa	55.66	65.07	21.56	58.25	31.30	30.99	51.20
America	46.36	55.14	23.74	47.54	33.66	14.50	42.82
Polynesia	53.36	54.92	2.91	47.83	26.32	28.57	20.40
At Sea	38.53	42.48	21.10	43.19	35.81	24.19	36.81
TOTAL	35.65	42.40	20.52	43.68	32.95	18.94	35.17

Proportion per cent. Resident in Metropolitan Areas, 3rd April, 1911—*continued.*

Birthplace.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	C'wealth.
FEMALES.							
Australasia	38.99	45.87	24.22	47.67	42.91	22.46	39.66
Europe	56.01	55.45	32.32	60.82	51.80	28.38	50.20
Asia	53.73	70.34	27.03	68.08	42.28	24.88	50.30
Africa	65.98	71.50	36.73	78.79	48.33	39.47	63.96
America	65.91	64.11	38.82	66.26	51.44	31.96	59.58
Polynesia	74.81	62.26	12.42	59.38	58.06	69.57	60.70
At Sea	52.09	54.03	33.91	58.69	54.74	31.67	50.41
TOTAL	41.03	47.13	26.00	49.24	44.43	22.91	41.12
PERSONS.							
Australasia	36.32	43.56	22.12	45.07	38.13	20.48	36.95
Europe	49.29	51.84	27.02	55.22	38.69	25.33	44.22
Asia	38.64	51.30	7.67	40.88	19.14	21.22	28.42
Africa	60.36	68.30	27.17	67.69	38.50	35.37	57.06
America	52.16	58.48	27.93	53.44	38.56	20.49	48.08
Polynesia	62.75	59.07	3.79	54.55	37.50	50.00	31.40
At Sea	44.59	48.45	26.93	50.94	44.91	27.87	43.32
TOTAL	38.23	44.77	23.02	46.42	37.85	20.89	38.03

From these tables it will be seen that the tendency for the Australasian born to concentrate in Metropolitan areas is less marked than is the case for most other of the birthplaces enumerated. Thus, whilst 36.95 per cent. of the Australasian-born population of the Commonwealth was to be found in Metropolitan areas, as high a percentage as 44.22 of the European-born population was so found. As regards Australasian and European born population this relation holds good for both sexes in all the States except in the case of males in Western Australia. It is most marked in the case of New South Wales, where for the sexes combined 36.32 per cent. of the Australasian-born population of the State dwelt in Sydney, whilst 49.29 per cent. of the European-born population were so resident.

In this connexion it is also of interest to note that whilst in the case of the Australasian-born the females in every instance largely exceeded the males, the reverse held true in the case of the European-born for all Metropolitan areas except Brisbane. It may be noted as a matter of curiosity that in all the Metropolitan areas the females born at sea exceeded the males so born.

7. **Birthplace and Age.**—At the Commonwealth Census of 1911 much more complete details of birthplaces and ages in conjunction were tabulated than had previously been the case with Australian Censuses. This detail comprised for each State and Territory, and for each sex, the compilation of particulars in respect of single ages 0 to 4, and quinquennial groups thence forward, the information being furnished in respect of each of the 75 birthplace items comprised in the classification of birthplaces. (See p. 114).

For the Continental divisions of birthplaces the particulars in respect of males are as follows :—

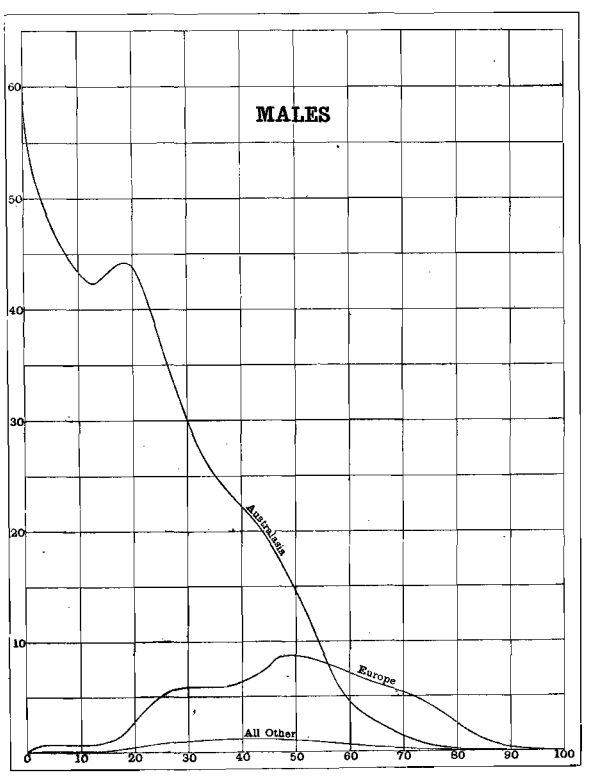
Male Population of Australia according to Birthplace and Age, 3rd April, 1911.

Age Last Birthday.	Australasia.	Europe.	Asia.	Africa.	America.	Polynesia.	At Sea.	Total.
0 ..	59,095	127	8	..	4	9	5	59,248
1 ..	54,241	378	15	15	18	15	5	54,687
2 ..	51,059	533	18	48	25	9	3	51,695
3 ..	51,005	673	26	78	31	15	3	51,831
4 ..	49,753	686	18	120	19	14	2	50,612
5–9 ..	225,774	3,635	113	446	102	79	10	230,159
10–14 ..	212,298	3,484	170	214	94	75	9	216,344
15–19 ..	220,503	6,813	545	82	184	182	20	228,329
20–24 ..	206,507	20,107	2,021	184	492	319	72	229,702
25–29 ..	167,706	28,954	3,240	285	686	228	164	201,263
30–34 ..	136,852	29,689	4,461	218	688	202	166	172,276
35–39 ..	117,300	29,291	4,902	157	847	274	132	152,903
40–44 ..	105,263	34,292	4,911	158	718	355	151	145,848
45–49 ..	85,281	43,238	3,944	221	751	270	271	133,976
50–54 ..	61,237	42,626	3,482	160	802	226	326	108,859
55–59 ..	31,144	37,924	2,099	114	711	103	446	72,541
60–64 ..	16,435	32,937	1,487	88	555	68	189	51,759
65–69 ..	10,650	28,481	793	51	377	31	108	40,491
70–74 ..	3,811	24,327	655	26	324	15	97	29,255
75–79 ..	1,411	16,818	429	29	224	9	31	18,951
80–84 ..	457	8,053	203	7	122	1	20	8,863
85–89 ..	120	2,419	70	1	37	1	3	2,651
90–94 ..	35	582	12	..	11	..	1	641
95–99 ..	10	93	8	..	3	..	2	116
100 & over	3	26	5	1	..	..	..	35
TOTAL ..	1,867,950	396,186	33,635	2,703	7,825	2,500	2,236	2,313,035

The following graphs (Nos. 20 and 21) furnish a representation of the number of males at each age according to the birthplaces specified in the preceding table. In each case the base of a small square represents 10 years of age. In the case of graph No. 20 the height of a small square represents 5000 persons, while in graph No. 21 it represents 500 persons.

Ages and Birthplaces—
Australasia, Europe, and all other Birthplaces.
Census of 1911

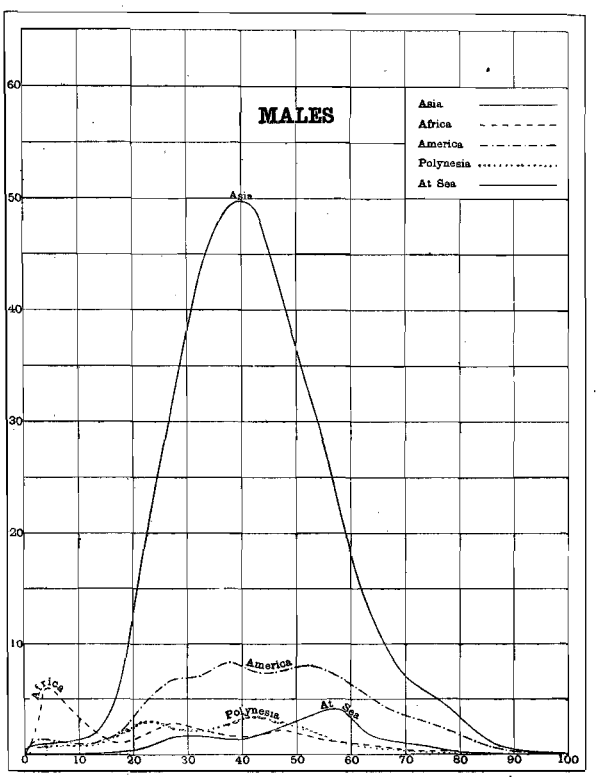
MALES.



GRAPH No. 20.

Ages and Birthplaces—
Asia, Africa, America, Polynesia, and at Sea.
Census of 1911.

MALES.



GRAPH No. 21.

Similar particulars in respect of the female population are furnished in the succeeding table.

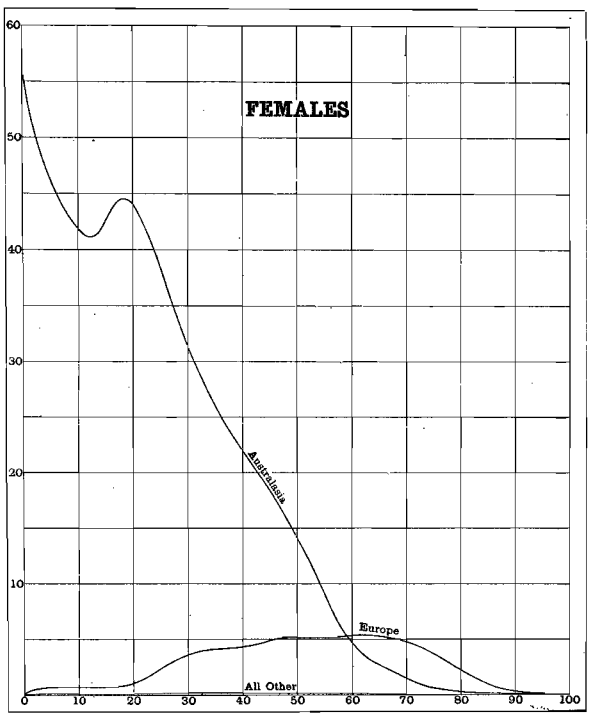
Female Population of Australia according to Birthplace and Age, 3rd April, 1911.

Age Last Birthday.	Australasia.	Europe.	Asia.	Africa.	America.	Polynesia.	At Sea.	Total.
0 ..	56,579	120	1	4	6	4	8	56,722
1 ..	52,380	359	10	13	17	15	4	52,798
2 ..	49,361	548	17	32	27	7	6	49,998
3 ..	49,762	634	14	73	20	7	1	50,511
4 ..	48,014	623	20	123	26	14	1	48,821
5–9 ..	220,122	3,315	94	497	96	73	9	224,206
10–14 ..	209,046	3,351	114	185	89	72	13	212,870
15–19 ..	219,184	3,477	133	99	137	90	18	223,138
20–24 ..	210,996	7,751	227	127	212	101	81	219,495
25–29 ..	172,632	15,814	381	266	294	116	166	189,669
30–34 ..	140,127	19,599	416	158	317	114	147	160,878
35–39 ..	118,122	21,057	437	127	463	113	148	140,467
40–44 ..	101,957	22,530	359	95	324	70	127	125,462
45–49 ..	82,083	26,201	279	144	243	48	244	109,242
50–54 ..	58,885	25,545	180	85	337	40	264	85,336
55–59 ..	30,053	26,225	133	100	335	17	427	57,290
60–64 ..	16,387	27,208	153	71	245	17	181	44,262
65–69 ..	11,102	25,198	100	40	160	12	88	36,700
70–74 ..	4,093	21,803	65	23	104	5	83	26,176
75–79 ..	1,533	14,931	34	16	70	1	24	16,609
80–84 ..	499	7,175	15	9	29	3	10	7,740
85–89 ..	145	2,544	5	4	20	..	2	2,720
90–94 ..	28	670	..	1	4	..	1	704
95–99 ..	9	116	..	..	2	..	..	127
100 & over	3	26	..	..	..	..	..	29
TOTAL ..	1,853,102	276,820	3,187	2,292	3,577	939	2,053	2,141,970

A representation of the number of females of each age for the birthplaces specified in the foregoing table is furnished in the following graphs (Nos. 22 and 23). In each case the base of each small square represents 10 years of age. The height of each small square represents 5000 persons in the case of graph No. 22, and 100 persons in the case of graph No. 23.

Ages and Birthplaces—
Australasia, Europe, and All Other.
Census of 1911.

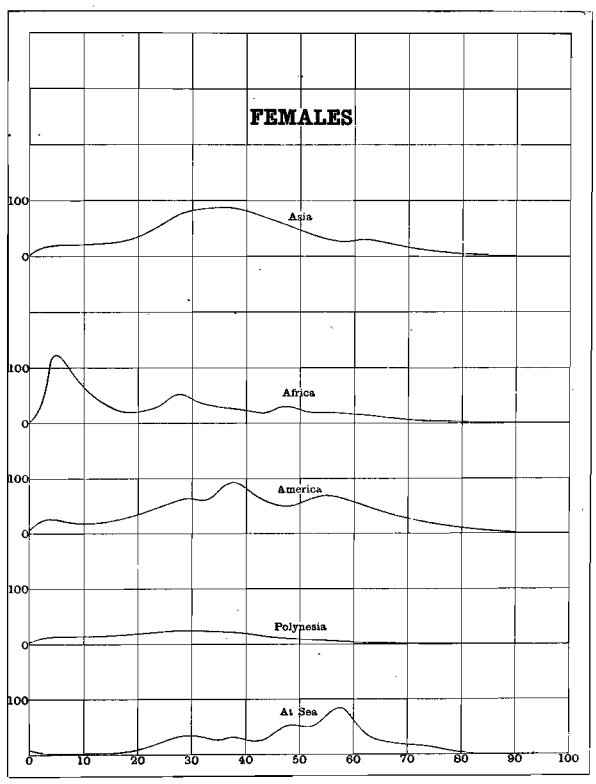
FEMALES.



GRAPH No. 22.

Ages and Birthplaces—
Asia, Africa, America, Polynesia, and At Sea.
Census of 1911.

FEMALES.



GRAPH No. 23.

For the two sexes combined the particulars are as follows :—

Total Population of Australia according to Birthplace and Age, 3rd April, 1911.

Age Last Birthday.	Australasia.	Europe.	Asia.	Africa.	America.	Polynesia.	At Sea.	Total.
0 ..	115,674	247	9	4	10	13	13	115,970
1 ..	106,621	737	25	28	35	30	9	107,485
2 ..	100,420	1,081	35	80	52	16	9	101,693
3 ..	100,767	1,307	40	151	51	22	4	102,342
4 ..	97,767	1,309	38	243	45	28	3	99,433
5–9 ..	445,896	6,950	207	943	198	152	19	454,365
10–14 ..	421,344	6,835	284	399	183	147	22	429,214
15–19 ..	439,687	10,290	678	181	321	272	38	451,467
20–24 ..	417,503	27,858	2,248	311	704	420	153	449,197
25–29 ..	340,338	44,768	3,621	551	980	344	330	390,932
30–34 ..	276,979	49,288	4,877	376	1,005	316	313	333,154
35–39 ..	235,422	50,348	5,339	284	1,310	387	280	293,370
40–44 ..	207,220	56,822	5,270	253	1,042	425	278	271,310
45–49 ..	167,364	69,439	4,223	365	994	318	515	243,218
50–54 ..	120,122	68,171	3,662	245	1,139	266	590	194,195
55–59 ..	61,197	64,149	2,232	214	1,046	120	873	129,831
60–64 ..	32,822	60,145	1,640	159	800	85	370	96,021
65–69 ..	21,752	53,679	893	91	537	43	196	77,191
70–74 ..	7,904	46,130	720	49	428	20	180	55,431
75–79 ..	2,944	31,749	463	45	294	10	55	35,560
80–84 ..	956	15,228	218	16	151	4	30	16,603
85–89 ..	265	4,963	75	5	57	1	5	5,371
90–94 ..	63	1,252	12	1	15	..	2	1,345
95–99 ..	19	209	8	..	5	..	2	243
100 & over	6	52	5	1	..	..	..	64
TOTAL ..	3,721,052	673,006	36,822	4,995	11,402	3,439	4,289	4,455,005

The next table furnishes for each birthplace the percentage which the population for the sexes combined in each quinquennial group bore to the total for the birthplace in question.

Age-Group Percentage of Total Population of Australia for each Birthplace, 3rd April, 1911.

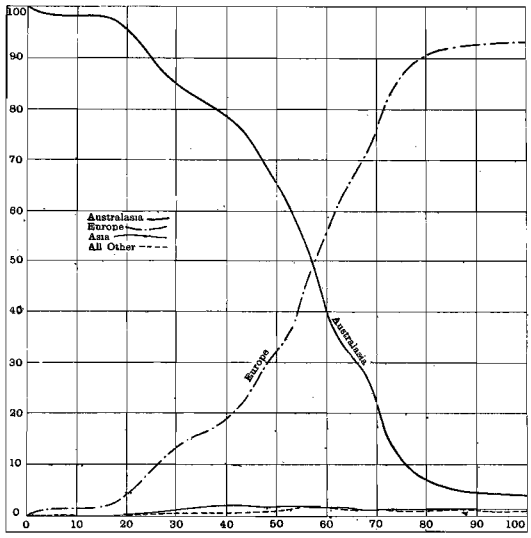
Age Last Birthday.	Australasia.	Europe.	Asia.	Africa.	America.	Polynesia.	At Sea.	Total.
0–4 ..	14.01	.69	.40	10.13	1.69	3.17	.88	11.83
5–9 ..	11.98	1.03	.56	18.88	1.74	4.42	.44	10.20
10–14 ..	11.32	1.02	.77	7.99	1.61	4.27	.51	9.63
15–19 ..	11.82	1.53	1.84	3.62	2.82	7.91	.88	10.13
20–24 ..	11.22	4.14	6.11	6.23	6.17	12.21	3.57	10.08
25–29 ..	9.15	6.65	9.83	11.03	8.60	10.00	7.69	8.78
30–34 ..	7.44	7.32	13.25	7.53	8.81	9.19	7.30	7.48
35–39 ..	6.33	7.48	14.50	5.69	11.49	11.25	6.53	6.59
40–44 ..	5.57	8.44	14.31	5.07	9.14	12.36	6.48	6.09
45–49 ..	4.50	10.32	11.47	7.31	8.72	9.25	12.01	5.46
50–54 ..	3.23	10.13	9.95	4.90	9.99	7.74	13.76	4.36
55–59 ..	1.64	9.53	6.06	4.28	9.17	3.49	20.35	2.91
60–64 ..	.88	8.94	4.45	3.18	7.02	2.47	8.63	2.16
65–69 ..	.58	7.98	2.43	1.82	4.71	1.25	4.57	1.73
70–74 ..	.21	6.85	1.96	.98	3.75	.58	4.20	1.24
75–79 ..	.08	4.72	1.26	.90	2.58	.29	1.28	.80
80–84 ..	.03	2.26	.59	.32	1.32	.12	.70	.37
85–89 ..	.01	.74	.20	.10	.50	.03	.12	.12
90–94 ..	..	.19	.03	.02	.13	..	.05	.03
95–99 ..	..	.03	.02	..	.04	..	.05	.01
100 & over ..	..	.01	.01	.02	..	..	..	..
TOTAL ..	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

From the succeeding table, which shews for each age group the proportion per cent. born in each of the birthplaces specified, it will be seen that the Australasian proportion which was 98.92 per cent. for the group 0–4, declined almost continuously throughout, reaching 50 per cent. at approximately age 56. In other words, at all ages under 56 more than half the population of the Commonwealth were Australasian-born, whilst at all ages above 56 less than half were so born.

Birthplace Percentage of Total Population of Australia in each Age Group, 3rd April, 1911.

Age Last Birthday.	Australasia.	Europe.	Asia.	Africa.	America.	Polynesia.	At Sea.	Total.
0–4 ..	98.92	.89	.03	.09	.04	.02	.01	100.00
5–9 ..	98.14	1.53	.05	.21	.04	.03	.00	100.00
10–14 ..	98.17	1.59	.07	.09	.04	.03	.01	100.00
15–19 ..	97.39	2.28	.15	.04	.07	.06	.01	100.00
20–24 ..	92.95	6.20	.50	.07	.16	.09	.03	100.00
25–29 ..	87.06	11.45	.93	.14	.25	.09	.08	100.00
30–34 ..	83.14	14.80	1.46	.11	.30	.10	.09	100.00
35–39 ..	80.25	17.16	1.82	.10	.45	.13	.09	100.00
40–44 ..	76.38	20.94	1.94	.09	.39	.16	.10	100.00
45–49 ..	68.81	28.55	1.74	.15	.41	.13	.21	100.00
50–54 ..	61.86	35.10	1.88	.13	.59	.14	.30	100.00
55–59 ..	47.14	49.41	1.72	.16	.81	.09	.67	100.00
60–64 ..	34.18	62.64	1.71	.17	.83	.09	.38	100.00
65–69 ..	28.18	69.54	1.16	.12	.69	.06	.25	100.00
70–74 ..	14.26	83.22	1.30	.09	.77	.04	.32	100.00
75–79 ..	8.28	89.28	1.30	.13	.83	.03	.15	100.00
80–84 ..	5.76	91.72	1.31	.10	.91	.02	.18	100.00
85–89 ..	4.94	92.40	1.40	.09	1.06	.02	.09	100.00
90–94 ..	4.68	93.09	.89	.07	1.12	..	.15	100.00
95–99 ..	7.82	86.01	3.29	..	2.06	..	.82	100.00
100 & over	9.38	81.25	7.81	1.56	..	..	..	100.00
ALL AGES	83.52	15.11	.83	.11	.25	.08	.10	100.00

Percentage of Total Population at each Age.



GRAPH No. 24.

The accompanying graph (No. 24) furnishes for the Census of 3rd April, 1911, a representation of the proportion of the total population of Australia at each age, that had been born in "Australasia," "Europe," "Asia," and "All other birthplaces," respectively. The base of each small square represents 10 years of age, while the height represents 10 per cent. of the population of Australia for the age in question. This graph furnishes an interesting representation of the relative insignificance of population other than of Australasian or European birth. The curves representing the populations born in Europe and Australasia intersect slightly below the 50 per cent. horizontal line at a point corresponding to about age 56.

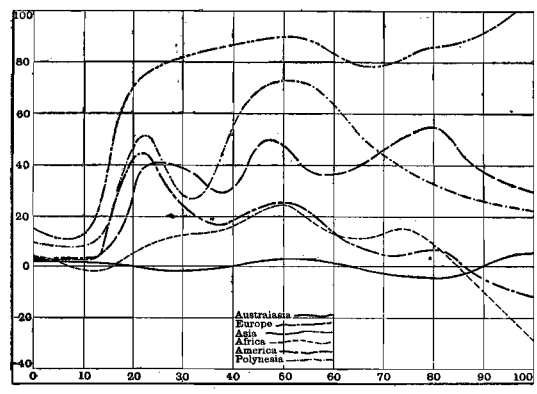
The masculinity of the population of the Commonwealth, according to birthplace and age, is shewn in the following table :—

Masculinity of Commonwealth Population (excess of Males over Females per 100 of Sexes combined for each Birthplace), 3rd April, 1911.

Age Last Birthday.	Birthplace.							Total.
	Australasia.	Europe.	Asia.	Africa.	America.	Polynesia.	At Sea.	
0–4 ..	1.74	2.41	15.65	3.16	.52	13.76	— 5.26	1.75
5–9 ..	1.27	4.60	9.18	— 5.41	3.03	3.95	5.26	1.31
10–14 ..	.77	1.95	19.72	7.27	2.73	2.04	— 18.19	.81
15–19 ..	.30	32.42	60.77	— 9.39	14.64	33.82	5.26	1.15
20–24 ..	— 1.08	44.35	79.80	18.33	39.77	51.90	— 5.88	2.27
25–29 ..	— 1.44	29.36	78.96	3.45	40.00	32.56	— .61	2.97
30–34 ..	— 1.18	20.47	82.94	15.96	36.92	27.85	6.07	3.42
35–39 ..	— .35	16.35	83.63	10.56	29.31	41.60	— 5.71	4.24
40–44 ..	1.60	20.70	86.38	24.90	37.81	67.06	8.63	7.51
45–49 ..	1.91	24.54	86.79	21.10	51.11	69.81	5.24	10.17
50–54 ..	1.96	25.06	90.17	30.61	40.83	69.92	10.51	12.11
55–59 ..	1.78	18.24	88.08	6.54	35.95	71.67	21.76	11.75
60–64 ..	.15	9.53	81.34	10.69	38.75	60.00	2.16	7.81
65–69 ..	— 2.08	6.12	77.60	12.09	40.41	44.19	10.20	4.91
70–74 ..	— 3.57	5.47	81.94	6.12	51.40	50.00	7.78	5.55
75–79 ..	— 4.14	5.94	85.31	28.89	52.38	80.00	12.73	6.59
80–84 ..	— 4.39	5.77	86.24	— 12.50	61.59	— 50.00	33.33	6.76
85–89 ..	— 9.43	— 2.52	86.67	— 60.00	29.82	100.00	20.00	— 1.28
90–94 ..	11.11	— 7.03	100.00	— 100.00	46.67	..	..	— 4.68
95–99 ..	5.26	— 11.01	100.00	..	20.00	..	100.00	— 4.53
100 & over	..	..	100.00	100.00	..	..	..	9.38
All Ages	.40	17.74	82.69	8.23	37.26	45.39	4.27	3.84

Note. — denotes excess of females over males per 100 of population.

Masculinity According to Birthplace and Age.



GRAPH No. 25.

The accompanying graph (No. 25) furnishes a representation of the masculinity of the population of Australia at the Census of 3rd April, 1911, according to birthplace and age. The base of each small square represents 10 years of age, while the height represents a masculinity of 20. It will be seen that the masculinity curve for persons of Australasian birth oscillates with age about the line of zero masculinity, and does not at any stage diverge greatly from it. All the other curves have much more extensive oscillations, and, except in two instances at extreme ages, are well above the zero line.

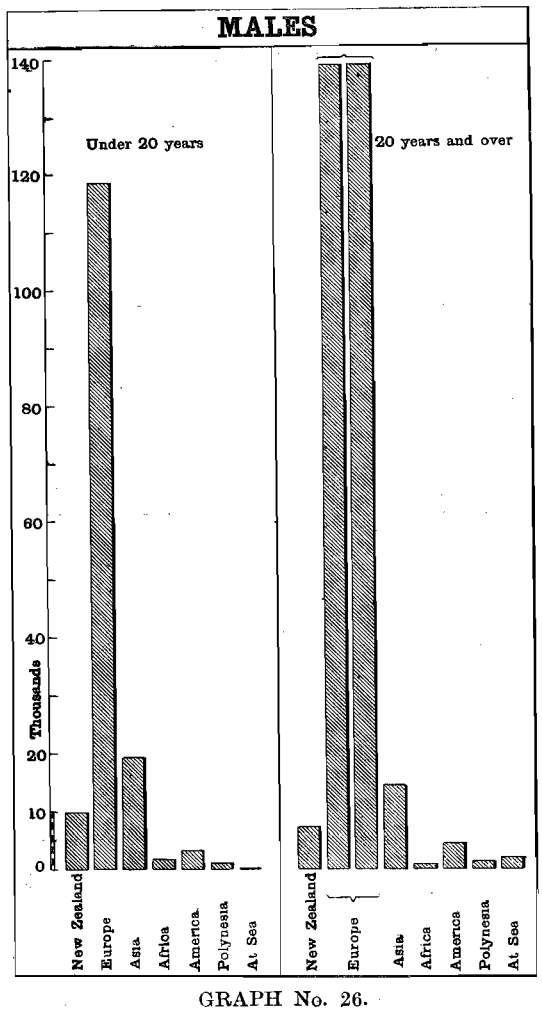
8. **Birthplace and Length of Residence.**—Omitting the persons whose birthplaces were unspecified, there were 756,865 persons resident in the Commonwealth at the date of the Census whose birthplace was recorded as other than Australia. Of these 216,330 stated that they had been in the Commonwealth less than 20 years, 500,639 stated that they had been so resident for 20 years or upwards, while 39,896 failed to specify their length of residence. After adjustment of the results to allow in due proportion for those unspecified as to birthplace as well as for those unspecified as to length of residence, the figures for birthplace and length of residence, in combination are as follows :—

Length of Residence of Oversea Population of Australia, 3rd April, 1911.

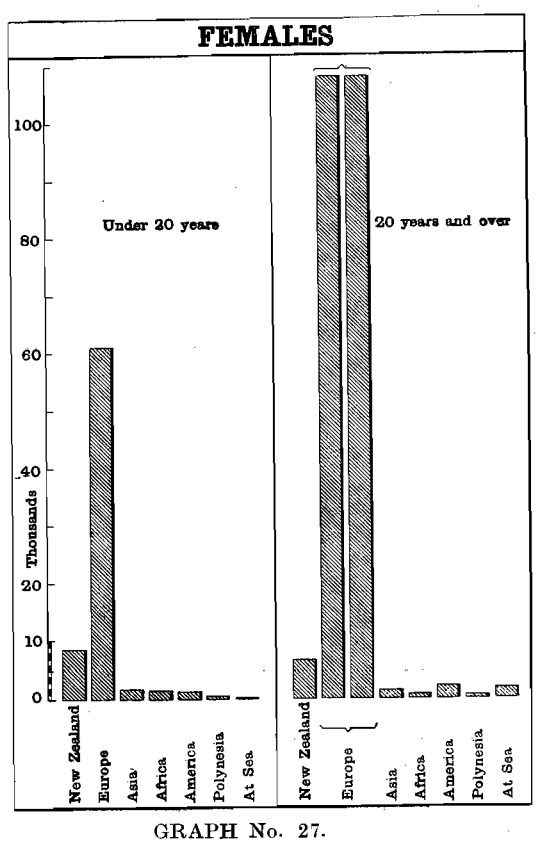
Birthplace.	Males.			Females.			Persons.		
	Under 20 Years.	20 Years & over.	Total.	Under 20 Years.	20 Years & over.	Total.	Under 20 Years.	20 Years & over.	Total.
New Zealand	9,799	7,199	16,998	8,587	6,532	15,119	18,386	13,731	32,117
Europe ..	118,595	277,591	396,186	61,017	215,803	276,820	179,612	493,394	673,006
Asia ..	19,372	14,263	33,635	1,702	1,485	3,187	21,074	15,748	36,822
Africa ..	1,755	948	2,703	1,560	732	2,292	3,315	1,680	4,995
America ..	3,328	4,497	7,825	1,376	2,201	3,577	4,704	6,698	11,402
Polynesia ..	1,132	1,368	2,500	534	405	939	1,666	1,773	3,439
At Sea ..	239	1,997	2,236	233	1,820	2,053	472	3,817	4,289
Total	154,220	307,863	462,083	75,009	228,978	303,987	229,229	536,841	766,070

For the oversea population as a whole, 70 per cent. had, at the date of the Census, been resident in Australia for 20 years or more, the corresponding proportion for males being 67 per cent., and for females 75 per cent. For the birthplaces specified above, the corresponding proportions for the sexes combined were as follows :—New Zealand, 43 per cent. ; Europe, 73 per cent. ; Asia, 43 per cent. ; Africa, 34 per cent. ; America, 59 per cent. ; Polynesia, 52 per cent. ; At Sea, 89 per cent.

Length of Residence of Oversea Population, 3rd April, 1911.



GRAPH No. 26.



GRAPH No. 27.

The accompanying graphs (Nos. 26 and 27) furnish a representation of the length of residence of the oversea population of Australia at the Census of 1911, the particulars being furnished separately for the two sexes. The scales are the same for the two graphs.

9. **Birthplace and Education.**—On the present occasion particulars respecting the elementary education of the population have been tabulated and published in conjunction with birthplace. This had previously been done for some of the States, but not for all. The particulars relative to education which were asked at the Census were very meagre relating as they did solely to the ability to read or write English, or failing that to read or write a foreign language. The following table furnishes particulars of this nature for the Continental divisions of birthplaces for the population aged 5 years and upwards. All persons, irrespective of birthplace, who were under the age of 5 were classed as unable to read, even though the cards in respect of them had indicated ability to read or read and write, as it was considered that unless in exceptional cases the degree of proficiency attained at age 5 would be negligible.

Birthplace and Education.—Commonwealth Population aged 5 and upwards, 3rd April, 1911.

Birthplace.	English.		Foreign Language only.		Cannot Read.	Total, 5 Years & upwards.
	Read & Write	Read only.	Read & Write	Read only.		
MALES.						
Australasia	1,539,335	3,227	80	32	60,123	1,602,797
Europe	368,529	2,939	9,611	674	12,036	393,789
Asia	8,340	172	16,061	1,848	7,129	33,550
Africa	2,179	15	52	3	193	2,442
America	7,447	43	40	4	194	7,728
Polynesia	976	101	32	5	1,324	2,438
At Sea	2,101	19	3	2	93	2,218
Total ..	1,928,907	6,516	25,879	2,568	81,092	2,044,962
FEMALES.						
Australasia	1,544,563	3,354	80	13	48,996	1,597,006
Europe	252,413	5,572	3,703	455	12,393	274,536
Asia	2,323	29	334	34	405	3,125
Africa	1,863	13	15	2	154	2,047
America	3,406	15	10	..	50	3,481
Polynesia	775	5	31	2	79	892
At Sea	1,940	20	9	1	63	2,033
Total ..	1,807,283	9,008	4,182	507	62,140	1,883,120
PERSONS.						
Australasia	3,083,898	6,581	160	45	109,119	3,199,803
Europe	620,942	8,511	13,314	1,129	24,429	668,325
Asia	10,663	201	16,395	1,882	7,534	36,675
Africa	4,042	28	67	5	347	4,489
America	10,853	58	50	4	244	11,209
Polynesia	1,751	106	63	7	1,403	3,330
At Sea	4,041	39	12	3	156	4,251
Total ..	3,736,190	15,524	30,061	3,075	143,232	3,928,082

The following table furnishes for each of the Continental divisions of birthplaces the percentage of persons aged 5 years and upwards who at the date of the Census were recorded as being unable to read.

Percentage of Persons Aged 5 and Upwards who were Unable to Read, 3rd April, 1911.

Birthplace.	Males.	Females.	Persons.	Birthplace.	Males.	Females.	Persons.
Australasia ..	3.75	3.07	3.41	America ..	2.51	1.44	2.18
Europe	3.06	4.51	3.66	Polynesia ..	54.31	8.86	42.13
Asia	21.25	12.96	20.54	At Sea ..	4.19	3.10	3.67
Africa	7.90	7.52	7.73	Total ..	3.97	3.30	3.65

10. **Birthplace and Conjugal Condition.**—In connexion with the tabulation of data relative to birthplace, particulars of Conjugal Condition were tabulated on the present occasion for each sex and for each State and Territory in respect of the 75 items included in the birthplace classification. The figures in respect of population aged 15 years and upwards are given in the following table for each of the Continental divisions of birthplaces.

Birthplace and Conjugal Condition of Persons Aged 15 and Upwards, 3rd April, 1911.

Birthplace.	Married.	Never Married	Widowed.	Divorced.	Total, 15 & upwards.
MALES.					
Australasia	491,858	647,395	23,996	1,476	1,164,725
Europe	227,746	120,161	37,976	787	386,670
Asia	11,766	20,604	861	36	33,267
Africa	893	783	93	13	1,782
America	3,778	3,023	684	47	7,532
Polynesia	594	1,618	67	5	2,284
At Sea	1,470	541	184	4	2,199
Total	738,105	794,125	63,861	2,368	1,598,459

Birthplace and Conjugal Condition of Persons Aged 15 and Upwards, 3rd April, 1911—*continued.*

Birthplace.	Married.	Never Married.	Widowed.	Divorced.	Total, 15 & upwards.
FEMALES.					
Australasia	570,273	541,285	54,580	1,700	1,167,838
Europe	157,387	38,346	71,723	414	267,870
Asia	1,852	675	385	5	2,917
Africa	844	317	201	3	1,365
America	1,926	754	603	13	3,296
Polynesia	358	348	37	4	747
At Sea	1,248	330	432	1	2,011
Total	733,888	582,055	127,961	2,140	1,446,044
PERSONS.					
Australasia	1,062,131	1,188,680	78,576	3,176	2,332,563
Europe	385,133	158,507	109,699	1,201	654,540
Asia	13,618	21,279	1,246	41	36,184
Africa	1,737	1,100	294	16	3,147
America	5,704	3,777	1,287	60	10,828
Polynesia	952	1,966	104	9	3,031
At Sea	2,718	871	616	5	4,210
Total	1,471,993	1,376,180	191,822	4,508	3,044,503

11. **Birthplace and Religion.**—A further innovation introduced into the tabulation of birthplace data for the present Census is the compilation of results shewing particulars for birthplace in conjunction with religion. These particulars are given in Volume II., pp. 238 to 291 of the detailed tables, for each sex, in respect of the Commonwealth as a whole and also in respect of each State and Territory. Details are furnished for each of the 75 items comprised in the birthplace classification in conjunction with each of the 30 items comprised in that relating to religion. For the total population of the Commonwealth the particulars in respect of the Continental divisions of birthplaces are as follows :—

Birthplace and Religion.—Total Commonwealth Population, 3rd April, 1911.

Religion.	Aus-tralasia.	Europe.	Asia.	Africa.	America	Poly-nesia.	At Sea.	Total.
CHRISTIAN—								
Church of England	1,489,510	251,049	5,460	2,157	4,050	1,461	1,786	1,755,473
Presbyterian	470,905	98,031	1,068	535	1,496	403	635	573,073
Methodist	492,898	65,142	926	445	1,084	548	507	561,550
Baptist	81,900	16,890	167	134	362	9	93	99,555
Congregational	62,270	13,098	101	90	207	111	71	75,948
Lutheran	51,544	22,699	27	35	121	14	68	74,508
Church of Christ	34,795	4,509	219	42	91	30	46	39,732
Salvation Army	23,168	3,962	44	21	50	45	58	27,348
Seventh Day Adventists	5,147	962	18	9	94	11	8	6,249
Unitarian	1,171	1,017	14	5	37	..	4	2,248
Protestant (undefined)	83,108	28,720	329	185	555	120	144	113,161
Roman Catholic	806,871	131,193	3,008	903	2,195	360	716	945,246
Greek Catholic	415	2,013	345	27	9	3	2	2,814
Catholic (undefined)	66,417	10,182	419	64	226	54	48	77,410
Others	22,379	9,083	329	117	263	71	27	32,269
Total Christian	3,692,498	658,550	12,474	4,769	10,840	3,240	4,213	4,386,584
NON-CHRISTIAN—								
Hebrew	11,373	5,943	228	127	134	20	12	17,837
Confucian	245	2	6,414	..	1	..	1	6,663
Mohammedan	299	27	4,611	29	2	1	2	4,971
Buddhist	59	25	4,100	1	2	..	..	4,187
Pagan	68	14	1,755	..	2	17	..	1,856
Others	571	365	6,163	..	13	1	2	7,115
Total Non-Christian	12,615	6,376	23,271	157	154	39	17	42,629
INDEFINITE—								
Freethinker	1,976	1,294	18	10	69	4	9	3,380
Agnostic	1,824	1,259	58	9	48	..	10	3,208
No Denomination	2,129	602	10	3	15	4	3	2,766
Others	3,767	1,836	130	28	82	3	8	5,854
Total Indefinite	9,696	4,991	216	50	214	11	30	15,208
NO RELIGION—								
No Religion	5,809	2,777	832	18	173	148	25	9,782
Atheist	325	232	26	1	19	1	4	608
Others	109	80	3	..	2	..	..	194
Total No Religion	6,243	3,089	861	19	194	149	29	10,584
Grand Total	3,721,052	673,006	36,822	4,995	11,402	3,439	4,289	4,455,005

The succeeding table shews for each of the birthplaces specified the proportion per cent. of the total population who were adherents of the various religions.

Religion Percentage of Total Commonwealth Population for each Birthplace, 3rd April, 1911.

Religion.	Australasia.	Europe.	Asia.	Africa.	America	Polynesia.	At Sea.	Total.
CHRISTIAN—	%	%	%	%	%	%	%	%
Church of England ..	40.03	37.30	14.83	43.19	35.52	42.48	41.64	39.40
Presbyterian	12.66	14.57	2.90	10.71	13.12	11.72	14.80	12.86
Methodist	13.25	9.68	2.52	8.91	9.51	15.94	11.82	12.61
Baptist	2.20	2.51	.45	2.68	3.17	.26	2.17	2.24
Congregational	1.67	1.95	.27	1.80	1.82	3.23	1.66	1.71
Lutheran	1.39	3.37	.07	.70	1.06	.41	1.59	1.67
Church of Christ ..	.94	.67	.59	.84	.80	.87	1.07	.89
Salvation Army ..	.62	.59	.12	.42	.44	1.31	1.35	.61
Seventh Day Adventists	.14	.14	.05	.18	.82	.32	.19	.14
Unitarian	.03	.15	.04	.10	.32	..	.09	.05
Protestant (undefined)	2.23	4.27	.89	3.71	4.87	3.49	3.36	2.54
Roman Catholic ..	21.68	19.49	8.17	18.08	19.25	10.47	16.69	21.22
Greek Catholic	.01	.30	.94	.54	.08	.08	.05	.06
Catholic (undefined) ..	1.78	1.51	1.14	1.28	1.98	1.57	1.12	1.74
Others	.60	1.35	.89	2.34	2.31	2.06	.63	.72
TOTAL CHRISTIAN—	99.23	97.85	33.87	95.48	95.07	94.21	98.23	98.46
NON-CHRISTIAN—								
Hebrew	.30	.88	.62	2.54	1.17	.58	.28	.40
Confucian	.02	.01	17.42	..	.01	..	.02	.15
Mohammedan			12.52	.58	.02	.03	.05	.11
Buddhist			11.13	.02	.02	..	..	.10
Pagan			4.77	..	.02	.05	..	.04
Others	.02	.06	16.74	..	.11	.03	.05	.16
TOTAL NON-CHRISTIAN	.34	.95	63.20	3.14	1.35	1.14	.40	.96
INDEFINITE—								
Freethinker	.05	.19	.05	.20	.61	.12	.21	.08
Agnostic	.05	.19	.16	.18	.42	..	.23	.07
No Denomination ..	.06	.09	.03	.06	.13	.12	.07	.06
Others	.10	.27	.35	.56	.72	.08	.19	.13
TOTAL INDEFINITE ..	.26	.74	.59	1.00	1.88	.32	.70	.34
NO RELIGION—								
No Religion	.16	.41	2.26	.36	1.52	4.30	.58	.22
Atheist	.01	.05	.07	.02	.16	.03	.09	.01
Others			.01	..	.02	..	..	.01
TOTAL NO RELIGION	.17	.46	2.34	.38	1.70	4.33	.67	.24
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

12. **Australasian-born Population.**—As already noted, the Australasian-born population of the Commonwealth, comprising those born in Australia and New Zealand, numbered 3,721,052, and represented no less than 83½% of the total population. Of these 3,688,935 were Australian-born, of whom 1,850,952 were males, and 1,837,983 females. The remaining 32,117 had been born in New Zealand, and comprised 16,998 males and 15,119 females.

The following table furnishes particulars concerning the interchange of Australasian-born population between Australia and New Zealand as indicated by the Censuses of 1891, 1901 and 1911.

Native-born Population of Australasia, 1891, 1901 and 1911.

Birthplace.	Number resident in—								
	Australia.			New Zealand.			Australasia.		
	Males.	Females.	Persons.	Males.	Females.	Persons.	Males.	Females.	Persons.
CENSUS OF 1891.									
Australia ..	1,090,521	1,075,682	2,166,203	7,692	8,276	15,968	1,098,213	1,083,958	2,182,171
New Zealand	12,939	11,011	23,950	183,965	183,338	367,303	196,904	194,349	391,253
Australasia	1,103,460	1,086,693	2,190,153	191,657	191,614	383,271	1,295,117	1,278,307	2,573,424

Native-born Population of Australasia—*continued.*

Birthplace.	Number resident in—								
	Australia.			New Zealand.			Australasia.		
	Males.	Females.	Persons.	Males.	Females.	Persons.	Males.	Females.	Persons.
CENSUS OF 1901.									
Australia ..	1,460,602	1,453,882	2,914,484	14,244	12,763	27,007	1,474,846	1,466,645	2,941,491
New Zealand	13,600	12,242	25,842	258,020	258,377	516,397	271,620	270,619	542,239
Australasia	1,474,202	1,466,124	2,940,326	272,264	271,140	543,404	1,746,466	1,737,264	3,483,730
CENSUS OF 1911.									
Australia ..	1,850,952	1,837,983	3,688,935	28,031	22,037	50,068	1,878,983	1,860,020	3,739,003
New Zealand	16,998	15,119	32,117	352,497	350,821	703,318	369,495	365,940	735,435
Australasia	1,867,950	1,853,102	3,721,052	380,528	372,858	753,386	2,248,478	2,225,960	4,474,438

In this table the figures for persons resident in New Zealand, as well as for those resident in Australia, have been adjusted to allow for persons of unspecified birthplace.

It will be seen that the number of Australian-born persons resident in New Zealand had, at the date of the last Census, grown to a figure considerably in excess of the number of New Zealand-born persons resident in Australia, the respective figures being 50,068 Australian-born persons resident in New Zealand, as compared with 32,117 New Zealand-born persons resident in Australia. On the other hand, the proportion of native-born New Zealanders resident in Australasia but outside their land of birth, is much greater than is the case for the Australians similarly situated. Such proportions for New Zealand are 6.12 per cent. in 1891, 4.77 per cent. in 1901 and 4.37 per cent. in 1911. While for Autralians the corresponding proportions are 0.73 per cent. in 1891, 0.92 per cent. in 1901 and 1.34 per cent. in 1911.

While these figures indicate a greater proportionate tendency for New Zealanders to migrate to Australia than for Australians to migrate to New Zealand, they also indicate a progressively diminishing tendency for New Zealanders, and a progressively increasing tendency for Australians to so migrate.

In the foregoing table and calculations based thereon Maoris and full-blooded Australian Aboriginals have been left out of account.

13. **Native-born Population.**—(i.) *General View.*—At the Census of 3rd April, 1911, more than 82¾ per cent. of the total population of the Commonwealth claimed Australia as their birthplace. Of the persons resident in the several States and Territories the proportions native-born were as follows :—New South Wales, 84 per cent. ; Victoria, 84¾ per cent. ; Queensland, 74½ per cent. ; South Australia, 86 per cent. ; Western Australia, 74½ per cent. ; Tasmania, 91½ per cent. ; Northern Territory, 45¾ per cent. ; Federal Territory, 88 per cent. The birthplaces which contributed most largely to the Australian-born total were New South Wales and Victoria, which between them accounted for upwards of two-thirds of the total. New South Wales provided 1,341,522, and Victoria 1,206,298 out of a total of 3,688,935 Australian-born. In this section persons recorded as having been born in the Northern Territory have been classed to South Australia, and those born in the Federal Territory have been classed to New South Wales. Particulars in respect to each State as birthplace are given in the succeeding table :—

Native-born Population of the Commonwealth, 3rd April, 1911.

Birthplace.	Males.	Females.	Persons.			Masculinity. (Excess of males over females per 100 of sexes combined).
			Number.	Percentage on total Australian-born.	Percentage on total population.	
				%	%	
New South Wales[1] ..	674,145	667,377	1,341,522	36.37	30.11	.50
Victoria	603,809	602,489	1,206,298	32.70	27.08	.11
Queensland	212,382	210,694	423,076	11.47	9.50	.40
South Australia[2] ..	202,581	201,151	403,732	10.94	9.06	.35
Western Australia ..	58,839	57,630	116,469	3.16	2.61	1.04
Tasmania	99,196	98,642	197,838	5.36	4.44	.28
Total ..	1,850,952	1,837,983	3,688,935	100.00	82.80	.35

[1] Including Federal Territory. [2] Including Northern Territory.

(ii.) *Figures for Previous Censuses.*—The Census of 1891 was the first at which full details were published by all the States in respect of the birthplaces of the Australian-born population. In two cases for 1881 the published figures shew separately only the number born in the State of enumeration, those born in other States of Australia being included with particulars for other birthplaces. In view, however, of the fact that the number so included was relatively small, a fairly reliable estimate can be made of the number of Australian-born resident in the Commonwealth at the Census of 1881. The figures so obtained have been combined, in the attached comparative table, with those for the Censuses of 1891, 1901 and 1911.

Native-born Population of the Commonwealth, 1881 to 1911.

Date of Census.	Males.	Females.	Persons.		Masculinity. (Excess of males over females per 100 of sexes combined).
			Number.	Percentage on total population.	
				%	
3rd April, 1881	714,180	708,545	1,422,725	63.23	.40
5th April, 1891	1,090,521	1,075,682	2,166,203	68.24	.69
31st March, 1901	1,460,602	1,453,882	2,914,484	77.23	.23
3rd April, 1911	1,850,952	1,837,983	3,688,935	82.80	.35

The increases in the number of native-born residents of the Commonwealth during the three decennial periods under review are as follows :—

Increases in Native-born Population of the Commonwealth, 1881 to 1911.

Period.	Males.		Females.		Persons.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
1881–1891	376,341	52.70	367,137	51.82	743,478	52.26
1891–1901	370,081	33.94	378,200	35.16	748,281	34.54
1901–1911	390,350	26.73	384,101	26.42	774,451	26.57

It will be seen that whilst in the case of females the increase in the number of the native-born population progressively increased during the three decennia under review, that for males fell in 1891-1901, and rose again in the succeeding decennium. This latter result was due mainly to two causes : (i.) The financial crisis and resultant commercial distress of the early " nineties," and (ii.) the outbreak of the South African War in the late " nineties." Each of these causes was responsible for the exodus from Australia of some of her native-born males.

A comparison of the numbers born in each State who were resident in the Commonwealth at the Censuses of 1881, 1891, 1901 and 1911, is furnished by the following table :—

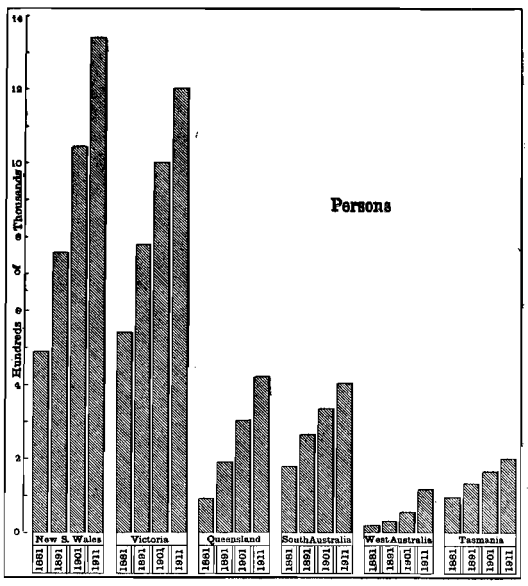
Native-born Population of the Commonwealth, 1881 to 1911.

Birthplace.	Persons.				Percentage on total Australian-born.				Percentage on total, all birthplaces.			
	1881.	1891.	1901.	1911.	1881.	1891.	1901.	1911.	1881.	1891.	1901.	1911.
					%	%	%	%	%	%	%	%
New South Wales [1]	491,988	767,531	1,046,403	1,341,522	34.58	35.43	35.90	36.37	21.86	24.18	27.73	30.11
Victoria	542,315	779,890	1,004,657	1,206,298	38.12	36.00	34.47	32.70	24.10	24.57	26.62	27.08
Queensland ..	93,599	191,097	306,118	423,076	6.58	8.82	10.50	11.47	4.16	6.02	8.11	9.50
South Australia [2]	178,103	265,178	336,989	403,732	12.52	12.24	11.56	10.94	7.92	8.35	8.93	9.06
Western Australia	19,099	29,834	56,374	116,469	1.34	1.38	1.94	3.16	.85	.94	1.49	2.61
Tasmania ..	97,621	132,673	163,943	197,838	6.86	6.13	5.63	5.36	4.34	4.18	4.35	4.44
Australia ..	1,422,725	2,166,203	2,914,484	3,688,935	100.00	100.00	100.00	100.00	63.23	68.24	77.23	82.80

[1] Including Federal Territory. [2] Including Northern Territory.

The proportion which those born in a State represented of the total native-born population increased between 1881 and 1911 in the cases of New South Wales, Queensland and Western Australia, but diminished in the cases of Victoria, South Australia and Tasmania. In all cases the proportion which those born in a State represented of the total Commonwealth population increased during the period under review.

Native-born Population according to States of Birth.



GRAPH No. 28.

The accompanying graph (No. 28) furnishes a comparative view of the number of persons recorded at each of the last four Censuses of Australia, who had been born in each of the States, and were resident in Australia at the dates of the several Censuses.

(iii.) *Interstate Migration of the Native-born.*—It is somewhat widely supposed that the native-born Australian has inherited from his immigrant forbears a tendency to rove, and that he is in consequence little disposed to remain in one place. Such an idea would appear to be supported by the Census results, which shew a large proportion of the native-born resident in other States than those in which they had been born.

The succeeding table gives the number for each sex and for the sexes combined who were born in each of the States, and were, at the date of the last Census, resident in one or other of the States of the Commonwealth.

Native-born Population of Australia, according to State of Birth and State of Residence, 3rd April, 1911.

Birthplace.	State in which resident.						Total.
	N.S.W.[1]	Vic.	Q'land.	S.A.[2]	W.A.	Tas.	
MALES.							
New South Wales[1] ..	**621,486**	13,573	24,171	4,042	9,798	1,075	674,145
Victoria	43,130	**506,333**	10,590	7,741	31,377	4,638	603,809
Queensland	12,130	2,199	**195,200**	612	2,055	186	212,382
South Australia[2] ..	13,304	11,804	2,196	**161,232**	13,593	452	202,581
Western Australia ..	1,277	2,291	257	1,303	**53,594**	117	58,839
Tasmania	5,354	9,231	1,247	656	1,567	**81,141**	99,196
Commonwealth	696,681	545,431	233,661	175,586	111,984	87,609	1,850,952
FEMALES.							
New South Wales[1] ..	**623,610**	15,813	15,203	3,739	7,729	1,283	667,377
Victoria	34,642	**526,888**	5,503	7,159	24,069	4,228	602,489
Queensland	13,542	3,026	**191,616**	464	1,792	254	210,694
South Australia[2] ..	11,430	12,461	1,224	**164,291**	11,260	485	201,151
Western Australia ..	1,254	2,350	230	1,344	**52,324**	128	57,630
Tasmania	5,253	11,254	585	624	1,119	**79,807**	98,642
Commonwealth ..	689,731	571,792	214,361	177,621	98,293	86,185	1,837,983
PERSONS.							
New South Wales[1] ..	**1,245,096**	29,386	39,374	7,781	17,527	2,358	1,341,522
Victoria	77,772	**1,033,221**	16,093	14,900	55,446	8,866	1,206,298
Queensland	25,672	5,225	**386,816**	1,076	3,847	440	423,076
South Australia[2] ..	24,734	24,265	3,420	**325,523**	24,853	937	403,732
Western Australia ..	2,531	4,641	487	2,647	**105,918**	245	116,469
Tasmania	10,607	20,485	1,832	1,280	2,686	**160,948**	197,838
Commonwealth	1,386,412	1,117,223	448,022	353,207	210,277	173,794	3,688,935

[1] Including Federal Territory. [2] Including Northern Territory.

The proportion per cent. of the population born in each State who were resident in the several States is furnished in the following table.

Proportional Distribution according to Residence of Population Born in each State (Sexes combined).

Birthplace.	State in which resident.						Total.
	N.S.W.[1]	Vic.	Q'land.	S.A.[2]	W.A.	Tas.	
	%	%	%	%	%	%	%
New South Wales[1] ..	**92.81**	2.19	2.93	.58	1.31	.18	100.00
Victoria	6.45	**85.65**	1.33	1.24	4.60	.73	100.00
Queensland	6.07	1.24	**91.43**	.25	.91	.10	100.00
South Australia[2] ..	6.13	6.01	.85	**80.63**	6.15	.23	100.00
Western Australia ..	2.17	3.99	.42	2.27	**90.94**	.21	100.00
Tasmania	5.36	10.35	.93	.65	1.36	**81.35**	100.00
Commonwealth ..	37.58	30.29	12.15	9.57	5.70	4.71	100.00

[1] Including Federal Territory. [2] Including Northern Territory.

The preceding table indicates that New South Wales had the highest proportion of those born within her boundaries still resident therein at the date of the Census, while South Australia had the lowest proportion so resident, the respective percentages being 92.81 for New South Wales, and 80.63 for South Australia. This table furnishes an indication of the extent and direction of the outflow of population from the State of birth.

The proportion per cent. of the Australian-born population resident in each State who had been born in the several States of the Commonwealth, is as follows :—

Proportional Distribution according to Birthplace of Australian-born Residents in each State (Sexes combined).

Birthplace.	State in which resident.						C'wlth.
	N.S.W.[1]	Vic.	Q'land.	S.A.[2]	W.A.	Tas.	
	%	%	%	%	%	%	%
New South Wales[1] ..	**89.81**	2.63	8.79	2.20	8.34	1.36	36.37
Victoria	5.61	**92.48**	3.59	4.22	26.37	5.10	32.70
Queensland	1.85	.47	**86.34**	.31	1.82	.25	11.47
South Australia[2] ..	1.78	2.17	.76	**92.16**	11.82	.54	10.94
Western Australia ..	.18	.42	.11	.75	**50.37**	.14	3.16
Tasmania	.77	1.83	.41	.36	1.28	**92.61**	5.36
Commonwealth ..	100.00	100.00	100.00	100.00	100.00	100.00	100.00

[1] Including Federal Territory. [2] Including Northern Territory.

This table furnishes an indication of the extent and direction of inflow of population to each State. This inflow was proportionately greatest in Western Australia, where only 50.37 per cent. of the Australian-born population were natives of that State, and proportionately least in Tasmania, where 92.61 per cent. of the Australian-born population had been born in Tasmania.

An interesting view of the effect of the migration of the native-born is given in the following table, which shews for any given State the difference between the number born in other States who were resident in that State, and the number born in that State who were resident in other States.

Net Migration of Native-born as at 3rd April, 1911.

State from or to which net gain or loss of native-born population had arisen.	State which has experienced net gain or loss. (Gain denoted by + ; loss by —).					
	N.S.W.[1]	Vic.	Q'land.	S.A.[2]	W.A.	Tas.
New South Wales[1]	..	— 48,386	+ 13,702	— 16,953	+ 14,996	— 8,249
Victoria	+ 48,386	..	+ 10,868	— 9,365	+ 50,805	— 11,619
Queensland	— 13,702	— 10,868	..	— 2,344	+ 3,360	— 1,392
South Australia[2]	+ 16,953	+ 9,365	+ 2,344	..	+ 22,206	— 343
Western Australia	— 14,996	— 50,805	— 3,360	— 22,206	..	— 2,441
Tasmania	+ 8,249	+ 11,619	+ 1,392	+ 343	+ 2,441	..
Total	+ 44,890	— 89,075	+ 24,946	— 50,525	+ 93,808	— 24,044

[1] Including Federal Territory. [2] Including Northern Territory.

The State with the greatest net gain was Western Australia, the total being 93,808, while Victoria, with a total of 89,075, was the greatest net loser. Western Australia was the only State which exhibited a net gain from all the other States, whilst Tasmania was the only State which had experienced a net loss to all the others. Of the rest, Queensland gained from all except Western Australia, and South Australia lost to all except Tasmania, while New South

Wales gained from all except Western Australia and Queensland, and Victoria lost to all except Tasmania and South Australia. The largest net gains by one State from another were (i.) a gain of 50,805 by Western Australia from Victoria; (ii.) a gain of 48,386 by New South Wales from Victoria; (iii.) a gain of 22,206 by Western Australia from South Australia; and (iv.) a gain of 16,953 by New South Wales from South Australia.

The net gains or losses in each of the States, as at the Censuses of 1881, 1891, 1901 and 1911, are as follows :—

Net Migration of Native-born, 1881 to 1911.

State.	Net Gain +. Net Loss —.			
	1881.	1891	1901.	1911.
New South Wales[1]	+ 15,721	+ 34,228	+ 33,887	+ 44,890
Victoria	— 3,307	+ 5,323	— 59,782	— 89,075
Queensland	+ 7,221	+ 13,282	+ 17,531	+ 24,946
South Australia[2]	— 5,160	— 36,070	— 46,786	— 50,525
Western Australia	— 770	+ 1,129	+ 70,738	+ 93,808
Tasmania	— 13,705	— 17,892	— 15,588	— 24,044

[1] Including Federal Territory. [2] Including Northern Territory.

It will be seen from this table that throughout the period from 1881 to 1911, New South Wales and Queensland have experienced a net gain of native-born population, while South Australia and Tasmania have throughout experienced a net loss. Western Australia exhibited a net gain at all Censuses except that of 1881, while Victoria exhibited a net loss at all Censuses except that of 1891. The largest net gain shewn at the different Censuses were those of New South Wales in 1881 and 1891, and those of Western Australia in 1901 and 1911, while the largest net losses have been shewn by Tasmania in 1881, South Australia in 1891, and Victoria in 1901 and 1911.

A comparison for the Censuses of 1881 to 1911 of the number and proportion of the persons born in each of the States, who were resident in other States than that of birth, gives a good indication of the strength of the tendency on the part of the native-born to migrate to other States, and of the variations of this tendency during the past thirty years.

Residence in other States than that of Birth, 1881 to 1891.

Birthplace.	3rd April, 1881.		5th April, 1891.		31st Mar., 1901.		3rd April, 1911.	
	Number resident in other States than that in which born.	Proportion per cent. so resident.	Number resident in other States than that in which born.	Proportion per cent. so resident.	Number resident in other States than that in which born.	Proportion per cent. so resident.	Number resident in other States than that in which born.	Proportion per cent. so resident.
MALES.								
		%		%		%		%
New South Wales[1]	12,082	4.88	22,179	5.74	37,307	7.10	52,659	7.81
Victoria	20,951	7.71	34,257	8.74	71,220	14.18	97,476	16.14
Queensland	3,736	7.87	6,732	7.01	10,408	6.78	17,182	8.09
South Australia[2]	7,304	8.18	25,110	18.75	34,478	20.42	41,349	20.41
Western Australia	659	6.89	962	6.37	1,764	6.22	5,245	8.91
Tasmania	8,597	17.65	11,957	17.91	12,957	15.75	18,055	18.20
Commonwealth	53,329	7.47	101,197	9.28	168,134	11.51	231,966	12.53
FEMALES.								
New South Wales[1]	10,597	4.34	18,735	4.92	30,468	5.85	43,767	6.56
Victoria	15,924	5.88	25,985	6.70	53,075	10.57	75,601	12.55
Queensland	3,420	7.41	7,043	7.41	11,113	7.29	19,078	9.05
South Australia[2]	6,948	7.82	21,480	16.36	29,207	17.37	36,860	18.32
Western Australia	648	6.79	984	6.68	1,851	6.61	5,306	9.21
Tasmania	8,736	17.86	12,297	18.65	13,958	17.09	18,835	19.09
Commonwealth	46,273	6.53	86,524	8.04	139,672	9.61	199,447	10.85
PERSONS.								
New South Wales[1]	22,679	4.61	40,914	5.33	67,775	6.48	96,426	7.19
Victoria	36,875	6.80	60,242	7.72	124,295	12.37	173,077	14.35
Queensland	7,156	7.65	13,775	7.21	21,521	7.03	36,260	8.57
South Australia[2]	14,252	8.00	46,590	17.57	63,685	18.90	78,209	19.37
Western Australia	1,307	6.84	1,946	6.52	3,615	6.41	10,551	9.06
Tasmania	17,333	17.76	24,254	18.28	26,915	16.42	36,890	18.65
Commonwealth	99,602	7.00	187,721	8.67	307,806	10.56	431,413	11.69

[1] Including Federal Territory. [2] Including Northern Territory.

This table furnishes evidence of the increasing tendency for persons born in one State to migrate to other States of the Commonwealth. Thus, whilst at the Census of 1881 seven per cent. of the native-born population were resident in States other than that of birth, the corresponding percentage in 1891 was 8.67, in 1901 it was 10.56, and in 1911 it was 11.69. The percentage has throughout been somewhat less for females than for males, but a similar tendency to increase is in evidence in both sexes. The totals disclose the fact that 173,077 persons born in Victoria, 96,426 born in New South Wales, and 78,209 born in South Australia were at the date of the last Census resident in States other than that of birth, and that the same relative positions were occupied by these States in this respect at the Census of 1901. In 1891 South Australia was second and New South Wales was third, while in 1881 Tasmania occupied third place, South Australia being fourth.

(iv.) *Native-born Metropolitan Population.*—The following table shews the extent to which the population born in the several States was resident in the various Metropolitan areas at the date of the Census.

Native-born Metropolitan Population according to State of Birth, 3rd April, 1911.

Birthplace.	Sydney and Suburbs.	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total Metropolitan.
MALES.							
New South Wales[1] ..	209,082	6,320	3,470	2,126	3,259	400	224,657
Victoria	12,401	204,691	1,538	4,237	10,151	700	233,718
Queensland	5,358	1,213	41,627	249	659	51	49,157
South Australia[2] ..	2,204	4,429	261	66,166	3,813	85	76,958
Western Australia ..	611	1,241	63	780	19,669	25	22,389
Tasmania	2,620	5,187	191	398	455	14,920	23,771
Commonwealth ..	232,276	223,081	47,150	73,956	38,006	16,181	630,650
FEMALES.							
New South Wales[1] ..	238,495	8,605	3,650	2,291	3,541	498	257,080
Victoria	14,438	236,090	1,394	4,478	11,385	909	268,694
Queensland	6,878	1,654	46,278	262	763	85	55,920
South Australia[2] ..	2,547	5,826	252	76,045	4,536	113	89,319
Western Australia ..	638	1,327	78	850	21,352	47	24,292
Tasmania	3,577	7,497	186	425	539	17,644	29,868
Commonwealth ..	266,573	260,999	51,838	84,351	42,116	19,296	725,173
PERSONS.							
New South Wales[1] ..	447,577	14,925	7,120	4,417	6,800	898	481,737
Victoria	26,839	440,781	2,932	8,715	21,536	1,609	502,412
Queensland	12,236	2,867	87,905	511	1,422	136	105,077
South Australia[2] ..	4,751	10,255	513	142,211	8,349	198	166,277
Western Australia ..	1,249	2,568	141	1,630	41,021	72	46,681
Tasmania	6,197	12,684	377	823	994	32,564	53,639
Commonwealth ..	498,849	484,080	98,988	158,307	80,122	35,477	1,355,823

[1] Including Federal Territory. [2] Including Northern Territory.

In the next table is shewn for each birthplace the proportion per cent. which those resident in the Metropolis of each State were of the total for that birthplace resident in that State.

Proportion per cent. of Native-born Resident in Metropolitan Areas, 3rd April, 1911.

Birthplace.	State in which resident.						C'wlth.
	N.S.W.[1]	Vic.	Q'land.	S.A.[2]	W.A.	Tas.	
MALES.							
	%	%	%	%	%	%	%
New South Wales[1] ..	33.64	46.57	14.35	52.60	33.24	37.21	33.32
Victoria	28.49	40.46	14.51	54.73	32.33	15.10	38.71
Queensland	47.39	60.38	21.21	40.75	32.07	27.42	23.15
South Australia[2] ..	16.56	37.89	11.87	41.00	28.11	18.85	37.99
Western Australia ..	47.92	54.24	24.51	59.91	36.70	21.55	38.05
Tasmania	48.91	58.45	15.30	60.58	31.97	18.28	23.96
Commonwealth ..	33.36	40.98	20.09	42.09	33.98	18.37	34.07
FEMALES.							
New South Wales[1] ..	38.25	54.42	23.99	61.29	45.79	38.85	38.52
Victoria	40.74	44.88	25.31	62.57	47.29	21.50	44.60
Queensland	54.48	65.40	23.96	56.71	44.83	33.60	26.54
South Australia[2] ..	22.28	46.79	20.57	46.29	40.26	23.30	44.40
Western Australia ..	50.88	56.47	34.06	63.24	40.81	36.72	42.15
Tasmania	68.06	69.71	31.79	68.00	48.13	21.97	30.28
Commonwealth ..	38.66	45.79	24.01	47.49	42.88	22.26	39.45

[1] Including Federal Territory. [2] Including Northern Territory.

Proportion per cent. of Native-born Resident in Metropolitan Area—*continued.*

Birthplace.	State in which Resident.						C'wlth.
	N.S.W.[1]	Vic.	Q'land.	S.A.[2]	W.A.	Tas.	
	PERSONS.						
New South Wales[1] ..	35.95	50.79	18.07	56.77	38.77	38.10	35.91
Victoria	33.98	42.71	18.21	58.50	38.82	18.16	41.65
Queensland	51.13	63.18	22.58	47.62	37.85	30.98	24.84
South Australia[2] ..	19.20	42.48	14.99	43.67	33.62	21.15	41.18
Western Australia ..	49.39	55.37	29.01	61.60	38.73	29.51	40.08
Tasmania	58.39	64.62	20.57	64.20	39.09	20.11	27.11
Commonwealth ..	36.00	43.44	21.97	44.80	38.14	20.30	36.75

[1] Including Federal Territory. [2] Including Northern Territory.

These figures indicate that of the Australian-born residents of other States than that of birth, those born in South Australia shewed the least marked tendency to aggregate in Metropolitan areas, while those born in Tasmania exhibited the tendency to the most marked extent. This will perhaps be better seen from the following table.

Metropolitan Numbers and Proportions of Native-born (Sexes Combined), 3rd April, 1911.

Birthplace.	Australian-born Population resident in State of birth.			Australian-born Population resident in other States than that of birth.		
	Metropolitan Area.	Total.	Percentage of Metropolitan on Total.	Metropolitan Areas.	Total.	Percentage of Metropolitan on Total.
			%			%
New South Wales ..	447,577	1,245,096	35.95	34,160	96,426	35.43
Victoria	440,781	1,033,221	42.66	61,631	173,077	35.61
Queensland	87,905	386,816	22.73	17,172	36,260	47.36
South Australia ..	142,211	325,523	43.69	24,066	78,209	30.77
Western Australia ..	41,021	105,918	38.73	5,660	10,551	53.64
Tasmania	32,564	160,948	20.23	21,075	36,890	57.13
Total	1,192,059	3,257,522	36.59	163,764	431,413	37.96

It will be seen that taking Australia as a whole, 36.59 per cent. of those remaining in their State of birth were residents of Metropolitan areas, while 37.96 per cent. of those resident in other States than that of birth were living in Metropolitan areas.

(v.) *Ages of the Native-born.*—In the following table are given particulars concerning the ages of the native-born population of Australia at the date of the Census, the figures being separately given for each sex in respect of each State of birth.

Native-born Male Population of the Commonwealth in Ages, 3rd April, 1911.

Age last Birthday.	State in which born.						Total.
	N.S.W.[1]	Vic.	Q'land.	S.A.[2]	W.A.	Tas.	
0	22,947	15,913	8,262	5,336	3,784	2,793	59,035
1	20,607	14,840	7,646	4,939	3,503	2,576	54,111
2	19,299	14,087	6,817	4,679	3,458	2,528	50,868
3	19,192	14,227	6,910	4,411	3,499	2,544	50,783
4	18,830	13,820	6,732	4,202	3,461	2,477	49,522
5–9	83,027	65,255	30,462	20,171	14,261	11,763	224,939
10–14	77,290	64,362	30,212	20,118	9,332	10,423	211,737
15–19	80,440	71,849	30,318	22,343	4,275	10,583	219,808
20–24	75,780	66,147	27,450	22,372	3,154	9,734	204,637
25–29	61,108	52,526	18,631	22,252	2,237	8,177	164,931
30–34	47,750	46,940	13,528	17,580	1,889	6,340	134,027
35–39	38,952	44,732	10,484	13,645	1,648	5,798	115,259
40–44	33,335	42,203	7,946	12,736	1,408	5,594	103,222
45–49	26,249	36,393	4,145	10,557	1,134	5,442	83,920
50–54	19,264	25,962	1,778	8,230	792	4,672	60,698
55–59	11,735	9,909	668	5,069	494	2,987	30,862
60–64	8,406	2,856	264	2,502	248	1,995	16,271
65–69	6,304	1,437	86	1,086	158	1,453	10,524
70–74	2,338	253	21	316	65	785	3,778
75 and over	1,292	98	22	37	39	532	2,020
Total	674,145	603,809	212,382	202,581	58,839	99,196	1,850,952

[1] Including Federal Territory. [2] Including Northern Territory.

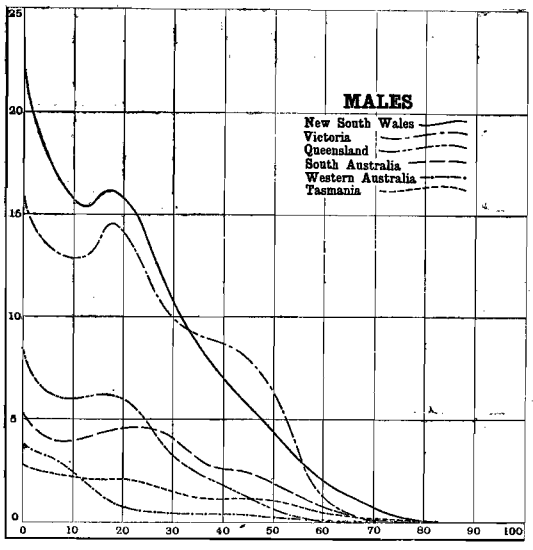
Similar particulars in respect of the native-born female population are furnished in the succeeding table.

Native-born Female Population of the Commonwealth in Ages, 3rd April, 1911.

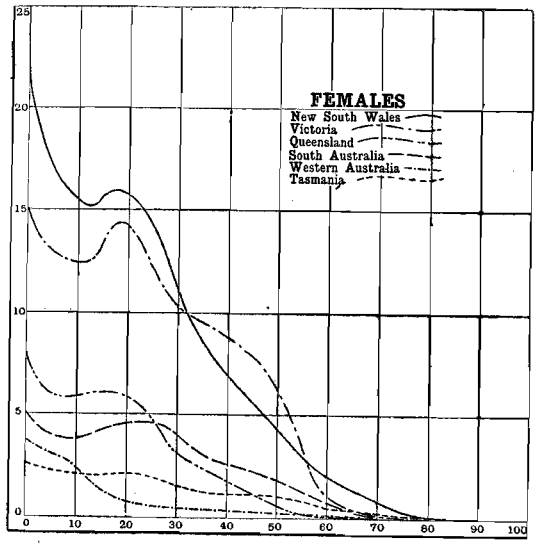
Age last Birthday.	State in which born.						Total.
	N.S.W.[1]	Vic.	Q'land.	S.A.[2]	W.A.	Tas.	
0	22,102	15,099	7,945	5,103	3,666	2,606	56,521
1	19,890	14,321	7,274	4,750	3,482	2,537	52,254
2	19,001	13,254	6,564	4,462	3,418	2,467	49,166
3	18,923	13,921	6,532	4,401	3,370	2,387	49,534
4	17,925	13,605	6,416	4,199	3,258	2,409	47,812
5–9	81,293	63,414	29,941	19,534	13,882	11,199	219,263
10–14	76,255	63,210	30,057	19,910	9,159	9,900	208,491
15–19	79,654	71,463	30,034	22,565	4,351	10,425	218,492
20–24	77,231	67,826	28,331	22,618	3,174	10,200	209,380
25–29	62,790	54,813	19,038	22,522	•2,127	8,673	169,963
30–34	47,937	49,288	13,842	17,661	1,867	6,863	137,458
35–39	38,758	45,884	10,442	13,749	1,594	5,771	116,198
40–44	31,608	41,857	7,626	12,436	1,411	5,477	100,415
45–49	25,000	35,512	3,924	10,311	1,106	5,277	81,130
50–54	18,562	24,970	1,680	8,037	777	4,509	58,535
55–59	11,435	9,376	687	5,050	459	2,837	29,844
60–64	8,489	2,834	240	2,409	249	2,018	16,239
65–69	6,527	1,525	79	1,092	176	1,602	11,001
70–74	2,595	222	31	299	58	868	4,073
75 and over	1,402	95	11	43	46	617	2,214
Total	667,377	602,489	210,694	201,151	57,630	98,642	1,837,983

[1] Including Federal Territory. [2] Including Northern Territory.

Ages and Birthplaces of Native-born Population, 1911.

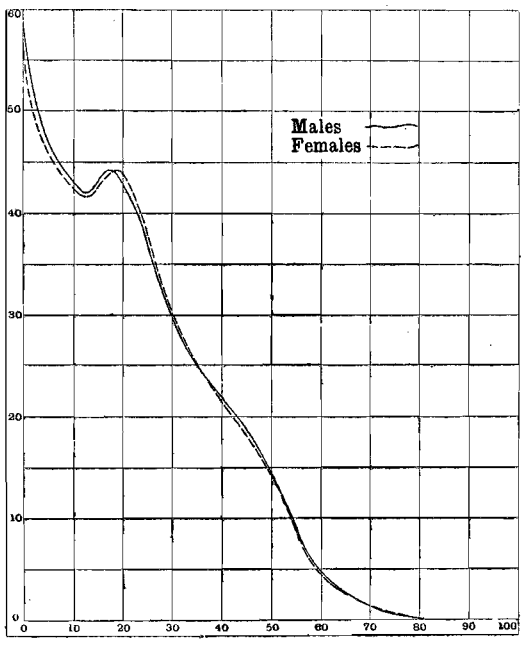


GRAPH No. 29.



GRAPH No. 30.

Ages of Native-born Population of Australia, 1911.



GRAPH No. 31.

The accompanying graphs (Nos. 29 and 30) furnish a representation of the numbers at each age who had been born in each of the States. The base of each small rectangle represents 10 years of age and the height 5000 persons. The similarity of the male and female curves for each State is very marked. It is also of interest to note the pairing of the curves, viz., (i.) New South Wales with Victoria, (ii.) Queensland with South Australia, and (iii.) Western Australia with Tasmania. In each case the curve for the former State commences at a higher point than that for the latter, and subsequently crosses it; the New South Wales curves crossing those for Victoria between ages 30 and 40, Queensland crossing South Australia between 20 and 30, and Western Australia crossing Tasmania between 10 and 20.

Graph No. 31 furnishes a representation of the numbers of native born males and females of each age who were resident in Australia at the Census of 1911. The base of each small square represents 10 years of age, and the height 5000 persons. It will be seen that the male and female curves are very similar in form, the slight excess of males at early ages being due to the usual preponderance of male births and the slight excess of females in early adult ages being due mainly to male emigration.

For the sexes in combination the figures are as follows :—

Total Native-born Population of the Commonwealth in Ages, 3rd April, 1911.

Age last birthday.	State in which born.						Total.
	N.S.W.[1]	Vic.	Q'land.	S.A.[2]	W.A.	Tas.	
0	45,049	31,012	16,207	10,439	7,450	5,399	115,556
1	40,497	29,161	14,920	9,689	6,985	5,113	106,365
2	38,300	27,341	13,381	9,141	6,876	4,995	100,034
3	38,115	28,148	13,442	8,812	6,869	4,931	100,317
4	36,755	27,425	13,148	8,401	6,719	4,886	97,334
5–9	164,320	128,669	60,403	39,705	28,143	22,962	444,202
10–14	153,545	127,572	60,269	40,028	18,491	20,323	420,228
15–19	160,094	143,312	60,352	44,908	8,626	21,008	438,300
20–24	153,011	133,973	55,781	44,990	6,328	19,934	414,017
25–29	123,898	107,339	37,669	44,774	4,364	16,850	334,894
30–34	95,687	96,228	27,370	35,241	3,756	13,203	271,485
35–39	77,710	90,616	20,926	27,394	3,242	11,569	231,457
40–44	64,943	84,060	15,572	25,172	2,819	11,071	203,637
45–49	51,249	71,905	8,069	20,868	2,240	10,719	165,050
50–54	37,826	50,932	3,458	16,267	1,569	9,181	119,233
55–59	23,170	19,285	1,355	10,119	953	5,824	60,706
60–64	16,895	5,690	504	4,911	497	4,013	32,510
65–69	12,831	2,962	165	2,178	334	3,055	21,525
70–74	4,933	475	52	615	123	1,653	7,851
75 and over	2,694	193	33	80	85	1,149	4,234
Total	1,341,522	1,206,298	423,076	403,732	116,469	197,838	3,688,935

[1] Including Federal Territory. [2] Including Northern Territory.

The proportion of the native-born in the several quinquennial age groups is shewn in the attached table.

Proportion per cent. of Native-born Population of Australia in Successive Age Groups, 3rd April, 1911.

Age last birthday.	State in which born.						Total.
	N.S.W.[1]	Vic.	Q'land.	S.A.[2]	W.A.	Tas.	
	%	%	%	%	%	%	%
0–4	14.81	11.86	16.80	11.51	29.96	12.80	14.09
5–9	12.25	10.67	14.28	9.83	24.16	11.61	12.04
10–14	11.44	10.57	14.25	9.91	15.88	10.27	11.39
15–19	11.93	11.88	14.26	11.12	7.41	10.62	11.88
20–24	11.41	11.11	13.18	11.14	5.43	10.08	11.22
25–29	9.24	8.90	8.90	11.09	3.75	8.52	9.08
30–34	7.13	7.98	6.47	8.73	3.22	6.67	7.36
35–39	5.79	7.51	4.95	6.79	2.78	5.85	6.28
40–44	4.84	6.97	3.68	6.24	2.42	5.60	5.52
45–49	3.82	5.96	1.91	5.17	1.92	5.42	4.47
50–54	2.82	4.22	.82	4.03	1.35	4.64	3.23
55–59	1.73	1.60	.32	2.51	.82	2.94	1.65
60–64	1.26	.47	.12	1.22	.43	2.03	.88
65–69	.96	.24	.04	.54	.29	1.54	.58
70–74	.37	.04	.01	.15	.11	.83	.21
75 and over	.20	.02	.01	.02	.07	.58	.12
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

[1] Including Federal Territory. [2] Including Northern Territory.

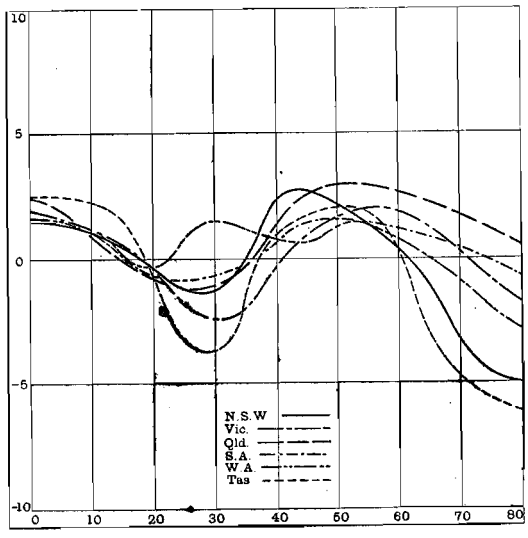
The following table, which shews for each age group the excess of males over females per 100 of the sexes combined, furnishes an interesting view of the relative numbers of males and females at different ages amongst the native-born population.

Masculinity of Native-born Population of the Commonwealth. (Excess of Males over Females per 100 of the Sexes combined), 3rd April, 1911.

Age last birthday.	State in which born.						C'wlth.
	N.S.W.[1]	Vic.	Q'land.	S.A.[2]	W.A.	Tas.	
0–4	1.53	1.88	2.30	1.40	1.46	2.02	1.74
5–9	1.06	1.43	.86	1.60	1.35	2.46	1.28
10–14	.67	.90	.26	.52	.94	2.57	.77
15–19	.49	.27	.47	— .49	— .88	.75	.30
20–24	— .95	— 1.25	— 1.58	— .55	— .32	— 2.34	— 1.15
25–29	— 1.36	— 2.13	— 1.08	— .60	2.52	— 2.94	— 1.50
30–34	— .20	— 2.44	— 1.15	— .23	.59	— 3.96	— 1.26
35–39	.25	— 1.27	.20	— .38	1.67	.23	— .41
40–44	2.66	.41	2.05	1.19	— .11	1.06	1.38
45–49	2.44	1.23	2.74	1.18	1.25	1.54	1.69
50–54	1.86	1.95	2.83	1.19	.96	1.78	1.81
55–59	1.29	2.76	— 1.40	.19	3.67	2.58	1.68
60–64	— .49	.39	4.76	1.89	— .20	— .57	.10
65–69	— 1.74	— 2.97	4.24	— .28	— 5.39	— 4.88	— 2.22
70–74	— 5.21	6.53	— 19.23	2.76	5.69	— 5.02	— 3.76
75 and over	— 4.08	1.55	33.33	— 7.50	— 8.24	— 7.40	— 4.58
All Ages	.50	.11	.40	.35	1.04	.28	.35

[1] Including Federal Territory. [2] Including Northern Territory.

Masculinity of Native-born according to Age, 1911.



GRAPH No. 32.

The accompanying graph (No. 32) furnishes a representation of the masculinity of the native-born population of Australia, according to age, at the Census of 1911. The base of each small rectangle represents 10 years of age, and the height a masculinity of 5. A separate curve is furnished in respect of each State of birth.

In connexion with the foregoing tables interesting evidence was furnished of the tendency of persons of advanced age to overstate their ages. Thus, although settlement in Victoria did not take place until 1836, in South Australia until 1834, or in Western Australia until 1829, there were 25 persons born in Victoria and 9 born in South Australia returned as 80 years of age or upwards, while 2 born in Western Australia were returned as 85 years of age or upwards. The maximum age possible at the date of the Census for a person born in Victoria was 75 years, for one born in South Australia 77 years and 82 years for one born in Western Australia.

(vi.) *Education of the Native-born.*—In response to the Census query relative to ability to read and write, 154 persons who were recorded as having been born in Australia were also recorded as being able to read and write in a foreign language, but not in English, whilst 45 others were recorded as being able to read but not write a foreign language, and in addition unable to read or write English. It is possible that these numbers, small as they are, are somewhat in excess of the truth, since cases came under notice in which the query had been understood as relating to ability to read or write a foreign language in addition to English. These figures strikingly indicate the fortunate freedom of Australia from the bi-lingual difficulties experienced in the Dominion of Canada and the Union of South Africa.

The following table furnishes the Education data tabulated, in respect of the Native-born population aged 5 years and upwards.

Education of Native-born Aged 5 Years and Upwards, 3rd April, 1911.

Birthplace.	English.		Foreign Language only.		Cannot Read.	Total, 5 Years & Upwards.
	Read & Write	Read only.	Read & Write	Read only.		
MALES.						
New South Wales[1] ..	545,842	1,382	16	13	26,017	573,270
Victoria	517,782	515	6	1	12,618	530,922
Queensland	169,940	419	18	13	5,625	176,015
South Australia[2] ..	172,038	306	34	4	6,632	179,014
Western Australia ..	37,651	152	..	..	3,331	41,134
Tasmania	80,185	436	1	1	5,655	86,278
Total	1,523,438	3,210	75	32	59,878	1,586,633
FEMALES.						
New South Wales[1] ..	547,255	1,560	14	..	20,707	569,536
Victoria	521,091	561	6	1	10,630	532,289
Queensland	170,666	328	4	3	4,962	175,963
South Australia[2] ..	172,364	407	51	9	5,405	178,236
Western Australia ..	37,367	117	1	..	2,951	40,436
Tasmania	81,769	354	3	..	4,110	86,236
Total	1,530,512	3,327	79	13	48,765	1,582,696
PERSONS.						
New South Wales[1] ..	1,093,097	2,942	30	13	46,724	1,142,806
Victoria	1,038,873	1,076	12	2	23,248	1,063,211
Queensland	340,606	747	22	16	10,587	351,978
South Australia[2] ..	344,402	713	85	13	12,037	357,250
Western Australia ..	75,018	269	1	..	6,282	81,570
Tasmania	161,954	790	4	1	9,765	172,514
Total	3,053,950	6,537	154	45	108,643	3,169,329

[1] Including Federal Territory. [2] Including Northern Territory.

In the succeeding table is given for each State of birth the proportion per cent. of those aged 5 years and upwards who were recorded as unable to read.

Percentage of Native-born Aged 5 Years and Upwards who were Unable to Read, 3rd April, 1911.

Birthplace.	Males.	Females.	Persons.	Birthplace.	Males.	Females.	Persons.
	%	%	%		%	%	%
New South Wales[1]	4.54	3.64	4.09	W. Australia ..	8.10	7.30	7.70
Victoria ..	2.38	2.00	2.19	Tasmania ..	6.55	4.77	5.66
Queensland ..	3.20	2.82	3.01				
South Australia[2]	3.70	3.03	3.37	TOTAL ..	3.77	3.08	3.43

[1] Including Federal Territory. [2] Including Northern Territory.

The relatively large percentage in the case of Western Australia is due in a great measure to the fact that the Western Australian-born are proportionately much more largely represented in the age group 5–9 than is the case with those born in any other State.

(vii.) *Conjugal Condition of the Native-born.*—The succeeding table furnishes particulars in respect of the Conjugal Condition of the native-born aged 15 years and upwards.

Conjugal Condition of Native-born Aged 15 Years and Upwards, 3rd April, 1911.

BIRTHPLACE.	Married.	Never Married.	Widowed.	Divorced.	Total, 15 & Upwards.
MALES.					
New South Wales[1]	174,283	228,626	9,312	732	412,953
Victoria	170,649	222,287	7,914	455	401,305
Queensland	36,914	77,310	1,057	60	115,341
South Australia[2]	65,059	70,796	2,774	96	138,725
Western Australia	6,385	10,779	361	16	17,541
Tasmania	30,882	30,926	2,220	64	64,092
TOTAL	484,172	640,724	23,638	1,423	1,149,957
FEMALES.					
New South Wales[1]	203,735	186,196	21,223	834	411,988
Victoria	193,529	193,802	17,743	591	405,665
Queensland	49,751	63,716	2,432	66	115,965
South Australia[2]	72,527	59,612	6,576	77	138,792
Western Australia	8,672	7,897	810	16	17,395
Tasmania	34,105	25,755	5,212	65	65,137
TOTAL	562,319	536,978	53,996	1,649	1,154,942
PERSONS.					
New South Wales[1]	378,018	414,822	30,535	1,566	824,941
Victoria	364,178	416,089	25,657	1,046	806,970
Queensland	86,665	141,026	3,489	126	231,306
South Australia[2]	137,586	130,408	9,350	173	277,517
Western Australia	15,057	18,676	1,171	32	34,936
Tasmania	64,987	56,681	7,432	129	129,229
TOTAL	1,046,491	1,177,702	77,634	3,072	2,304,899

[1] Including Federal Territory. [2] Including Northern Territory.

It will be seen that the numbers married, widowed and divorced are very much larger, and the number never married is very much smaller amongst native-born females than amongst native-born males, a result largely due to the fact that females marry on the average at earlier ages than males.

The proportion of the native-born aged 15 years and upwards who were married at the date of the Census is shewn in the following table, the particulars being given separately for each State of birth.

Proportion Married amongst Native-born Aged 15 Years and Upwards, 3rd April, 1911.

PARTICULARS.	STATE OF BIRTH.						TOTAL C'WLTH.
	N.S.W.[1]	Vic.	Q'land.	S.A.[2]	W.A.	Tas.	
	%	%	%	%	%	%	%
Males	42.20	42.52	32.00	46.90	36.40	48.18	42.10
Females	49.45	47.71	42.90	52.26	49.85	52.36	48.69
Persons	45.82	45.13	37.47	49.58	43.10	50.29	45.40

[1] Including Federal Territory. [2] Including Northern Territory.

While the proportion of native-born males married is much smaller in all cases than the proportion of native-born females, the disparity is most marked in the cases of Queensland and Western Australia, a result mainly due to the large proportions at the younger ages for these two birthplaces.

(viii.) *Religions of the Native-born.*—The distribution of the religious denominations amongst the native-born in the several States is by no means uniform, and furnishes in some cases interesting indications of the origins of such populations. For example the extensive German settlements in Queensland and South Australia are reflected in the religious statistics in the large numbers of the native-born of these two States who profess the Lutheran religion. Amongst the Christian Denominations those born in New South Wales were predominant in the cases of the Church of England, the Congregational, the Seventh Day Adventist, the Roman Catholic and the Greek Catholic denominations, whilst those born in Victoria preponderated in the Presbyterian, the Methodist, the Baptist, the Church of Christ and the Salvation Army denominations, and the South Australian-born furnished the largest number of Lutherans.

Particulars in respect of the total native-born population for the various items specified in the religious classification are furnished in the following table :—

Religions of the Native-born (Sexes combined), 3rd April, 1911.

Religion.	State in which born.						C'wlth.
	N.S.W.[1]	Vic.	Q'land.	S.A.[2]	W.A.	Tas.	
CHRISTIAN—							
Church of England ..	625,603	427,538	155,234	119,680	50,764	96,047	1,474,866
Presbyterian	141,975	222,386	51,631	24,339	8,604	16,367	465,302
Methodist	126,573	169,306	46,229	107,001	15,511	25,817	490,437
Baptist	15,203	27,495	10,044	22,004	1,638	4,850	81,234
Congregational ..	17,670	14,895	8,045	13,152	3,167	4,889	61,818
Lutheran	2,438	6,707	16,015	26,044	273	26	51,503
Church of Christ ..	5,130	15,472	1,999	9,424	1,166	1,288	34,479
Salvation Army ..	5,245	6,943	3,065	4,125	894	1,491	22,763
Seventh Day Adventist	1,451	1,414	466	686	526	506	5,049
Unitarian	344	319	41	386	9	35	1,134
Protestant (undefined)	25,391	21,939	11,603	12,676	3,136	7,415	82,160
Roman Catholic ..	327,559	259,044	105,183	51,952	26,694	31,736	802,168
Greek Catholic ..	187	94	51	32	37	12	413
Catholic (undefined)..	31,164	15,045	6,461	6,393	2,423	4,467	65,953
Others	6,129	6,377	4,635	2,444	524	1,922	22,031
Total, Christian ..	1,333,062	1,194,974	420,702	400,338	115,366	196,868	3,661,310
NON-CHRISTIAN—							
Hebrew	4,548	4,451	500	727	531	204	10,961
Confucian	15	9	41	170	10	..	245
Mohammedan ..	72	50	101	59	14	..	296
Buddhist	7	7	16	6	12	9	57
Pagan	6	6	19	3	33	..	67
Others	150	207	103	77	6	13	556
Total, Non-Christian	4,798	4,730	780	1,042	606	226	12,182
INDEFINITE—							
Freethinker	540	778	171	263	50	100	1,902
Agnostic	464	800	200	183	25	85	1,757
No Denomination ..	416	975	151	307	92	148	2,089
Others	899	1,731	307	477	85	157	3,656
Total, Indefinite ..	2,319	4,284	829	1,230	252	490	9,404
NO RELIGION—							
No Religion	1,223	2,146	732	1,068	239	230	5,638
Atheist	82	128	32	39	4	20	305
Others	38	36	1	15	2	4	96
Total, No Religion	1,343	2,310	765	1,122	245	254	6,039
Total	1,341,522	1,206,298	423,076	403,732	116,469	197,838	3,688,935

[1] Including Federal Territory. [2] Including Northern Territory.

The percentage of the persons born in each State who were adherents of the various denominations is shewn in the succeeding table. Proportionately to total for birthplace, the Church of England was most strongly represented amongst those born in Tasmania, Presbyterians in the case of Victoria, Methodists, Baptists, Congregationalists, Lutherans, Church of Christ, Salvation Army and Unitarians in the case of South Australia, Seventh Day Adventists in the case of Western Australia and Catholics in the case of New South Wales.

Religion Percentage of Total Native-born Population for each State of Birth, 3rd April, 1911.

Religion.	State in which born.						C'wlth.
	N.S.W.[1]	Vic.	Q'land.	S.A.[2]	W.A.	Tas.	
CHRISTIAN—	%	%	%	%	%	%	%
Church of England ..	46.63	35.43	36.69	29.64	43.58	48.55	39.98
Presbyterian	10.58	18.44	12.20	6.03	7,39	8.27	12.61
Methodist	9.44	14.03	10.93	26.50	13.32	13.05	13.29
Baptist	1.13	2.28	2.38	5.45	1.41	2.45	2.20
Congregational ..	1.32	1.23	1.90	3.26	2.72	2.47	1.68
Lutheran	.18	.56	3.79	6.45	.23	.01	1.40
Church of Christ ..	.38	1.28	.47	2.33	1.00	.65	.93
Salvation Army ..	.47	.58	.72	1.02	.77	.75	.62
Seventh Day Adventist	.11	.12	.11	.17	.45	.26	.14
Unitarian	.03	.03	.01	.10	.01	.02	.03
Protestant (undefined)	1.89	1.82	2.74	3.14	2.69	3.75	2.23
Roman Catholic ..	24.42	21.47	24.86	12.87	22.92	16.04	21.74
Greek Catholic ..	.01	.01	.01	.01	.03	.01	.01
Catholic (undefined)	2.32	1.25	1.53	1.58	2.08	2.26	1.79
Others	.46	.53	1.10	.61	.45	.97	.60
Total, Christian ..	99.37	99.06	99.44	99.16	99.05	99.51	99.25
NON-CHRISTIAN—							
Hebrew	.34	.37	.12	.18	.46	.10	.30
Confucian	.01	.02	.01	.04	.01	..	.01
Mohammedan ..			.02		.01	..	
Buddhist			.01	.02	.01	..	
Pagan					.03	..	
Others	.01		.02	.02		.01	.02
Total, Non-Christian	.36	.39	.18	.26	.52	.11	.33
INDEFINITE—							
Freethinker	.04	.06	.04	.06	.04	.05	.05
Agnostic	.03	.07	.05	.04	.02	.04	.05
No Denomination ..	.03	.08	.04	.08	.08	.08	.06
Others	.07	.15	.07	.12	.08	.08	.10
Total, Indefinite ..	.17	.36	.20	.30	.22	.25	.26
NO RELIGION—							
No Religion	.09	.18	.17	.27	.20	.12	.15
Atheist	.01	.01	.01	.01	.01	.01	.01
Others							
Total, No Religion	.10	.19	.18	.28	.21	.13	.16
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

[1] Including Federal Territory. [2] Including Northern Territory.

Particulars concerning the relative numbers of male and female adherents of each religion for each State of birth are given in the following table :—

Masculinity of Native-born Religious Adherents (Excess of males over females per 100 of sexes combined), 3rd April, 1911.

Religion.	State in which born.						C'wlth.
	N.S.W.[1]	Vic.	Q'land.	S.A.[2]	W.A.	Tas.	
CHRISTIAN—							
Church of England ..	1.20	1.02	.81	.95	1.46	.60	1.11
Presbyterian	.66	1.18	.44	2.62	2.95	.60	1.18
Methodist	— 1.94	— 2.77	— 1.24	— .56	.91	— 1.99	— 1.77
Baptist	— 7.57	— 8.17	— 3.54	— 4.69	.61	— 8.54	— 6.47
Congregational ..	— 4.92	— 7.54	— 3.07	— 5.22	— 2.18	— 4.93	— 5.32
Lutheran	.57	1.39	.49	3.47	8.42	23.08	2.15
Church of Christ ..	— 11.46	— 10.63	— 12.16	— 10.63	— 1.03	— 8.39	— 10.59
Salvation Army ..	— 8.15	— 11.62	— 8.65	— 8.75	— 2.46	— 2.48	— 9.02
Seventh Day Adventist	— 17.71	— 19.09	— 10.73	— 20.41	— 3.04	— 10.28	— 15.79
Unitarian	7.56	3.45	— 31.71	9.84	77.78	31.43	7.67
Protestant (undefined)	6.87	10.21	6.83	6.26	— .26	11.07	7.96
Roman Catholic ..	.56	.00	.22	1.01	.37	— .45	.35
Greek Catholic ..	15.51	4.26	13.73	.00	18.92	— 16.67	10.90
Catholic (undefined)	— 1.61	4.99	2.77	4.61	— 3.26	5.71	1.36
Others	— 7.10	— 8.61	.24	— 2.78	3.44	— 1.87	— 4.88
Total, Christian ..	.40	— .10	.25	.11	.95	.12	.23
NON-CHRISTIAN—							
Hebrew	— .71	— 1.24	7.20	— 7.84	— 2.45	— 2.94	— 1.41
Confucian	46.67	55.56	12.20	18.82	.00	..	20.00
Mohammedan ..	— 2.78	— 32.00	— 32.67	— 18.64	14.29	..	— 20.61
Buddhist	14.29	100.00	37.50	100.00	— 33.33	55.56	40.35
Pagan	100.00	100.00	26.32	33.33	45.45	..	50.75
Others	— 1.33	— 1.45	— 12.62	— 22.08	— 66.67	— 38.46	— 7.37
Total, Non-Christian	— .46	— 1.18	.77	— 4.41	— .66	— 2.65	— 1.24
Indefinite—							
Freethinker	60.37	65.55	60.23	61.98	44.00	64.00	65.09
Agnostic	64.22	50.75	37.00	57.38	60.00	57.65	56.23
No Denomination ..	5.29	12.82	16.56	15.96	— 8.70	17.57	11.92
Others	11.68	11.27	32.90	22.43	17.65	17.20	15.40
Total, Indefinite ..	32.38	28.85	36.55	34.47	17.46	33.88	32.31
NO RELIGION—							
No Religion	50.78	58.34	42.62	52.81	28.87	63.48	54.65
Atheist	75.61	67.19	43.75	69.23	100.00	80.00	74.43
Others	42.11	94.44	100.00	100.00	100.00	100.00	82.29
Total, No Religion	52.05	59.39	42.75	54.01	30.61	65.35	56.09
Total	.50	.11	.40	.35	1.04	.28	.40

[1] Including Federal Territory. [2] Including Northern Territory.

14. **Oversea Population.**—For the sake of convenience of reference the term " Oversea Population" is here used to denote that portion of the population of Australia born outside the Commonwealth. Particulars in respect of such population are as follows :—

Oversea Population of Australia, 1881 to 1911.

Date of Census.	Males.	Females.	Persons.		Masculinity (Excess of males over females per 100 of sexes combined).
			Number.	Percentage on total population.	
				%	
3rd April, 1881	500,733	326,736	827,469	36.77	21.03
5th April, 1891	613,518	394,671	1,008,189	31.76	21.71
31st March, 1901	517,326	341,991	859,317	22.77	20.40
3rd April, 1911	462,083	303,987	766,070	17.20	20.64

The increases or decreases in the number of the oversea population of the Commonwealth during the three decennial periods under review are as follows :—

Variations Oversea Population, 1881 to 1911.

Period.	Males.		Females.		Persons.	
	Numerical.	Centesimal.	Numerical.	Centesimal.	Numerical.	Centesimal.
		%		%		%
1881–1891	+ 112,785	+ 22.52	+ 67,935	+ 20.79	+ 180,720	+ 21.84
1891–1901	— 96,192	— 15.68	— 52,680	— 13.35	— 148,872	— 14.77
1901–1911	— 55,243	— 10.68	— 38,004	— 11.11	— 93,247	— 10.85

Note.—In this table increases are denoted by +, decreases by —.

15. **New Zealand-born Population.**—(i.) *Distribution.*—As already mentioned, the population of New Zealand birth enumerated at the Australian Census of 3rd April, 1911, totalled 32,117, comprising 16,998 males, and 15,119 females. These were distributed throughout the various States and Territories as follows :—

New Zealand-born Population of Australia, 3rd April, 1911.

States and Territories.	Males.		Females.		Persons.		Masculinity (Excess of males over females per 100 of sexes combined)
	Number.	Per 1000 of male population.	Number.	Per 1000 of female population.	Number.	Per 1000 of total population.	
STATES—							
New South Wales ..	7,354	8.57	6,711	8.51	14,065	8.54	4.57
Victoria	5,013	7.65	5,147	7.80	10,160	7.72	— 1.32
Queensland	1,641	4.98	947	3.43	2,588	4.27	26.82
South Australia ..	557	2.69	435	2.16	992	2.43	12.30
Western Australia ..	1,835	11.36	1,244	10.32	3,079	10.91	19.19
Tasmania	579	5.93	632	6.75	1,211	6.33	— 4.38
TERRITORIES—							
Northern	17	6.22	1	1.74	18	5.44	88.89
Federal	2	2.02	2	2.77	4	2.33	.00
Total	16,998	7.35	15,119	7.06	32,117	7.21	5.85

Leaving the Territories out of account, New South Wales contained the largest number of persons of New Zealand birth, while South Australia contained the smallest number. Proportionately to population New Zealanders were most largely represented in Western Australia, and least largely in South Australia.

(ii.) *Metropolitan Residents.*—As compared with the native-born, the New Zealand residents of the Commonwealth shewed a very marked tendency to aggregate in the Metropolitan areas. Thus, whilst 36.75 per cent. of the native-born population of Australia were resident in the Metropolitan towns, no less than 59.77 per cent. of the New Zealand born population were so resident, these centres accounting for 19,196 out of a total of 32,117.

(iii.) *Ages.*—Tabulated in quinquennial age groups the data in respect of New Zealand-born population are as follows :—

New Zealand-born Population of Australia in Age Groups, 3rd April, 1911.

Age last birthday.	Males.	Females.	Persons.	Masculinity (Excess of males over females per 100 of sexes combined)	Age last birthday.	Males.	Females.	Persons.	Masculinity (Excess of males over females per 100 of sexes combined)
0–4 ..	834	809	1,643	1.52	40–44	2,041	1,542	3,583	13.93
5–9 ..	835	859	1,694	— 1.42	45–49	1,361	953	2,314	17.63
10–14 ..	561	555	1,116	.54	50–54	539	350	889	21.26
15–19 ..	695	692	1,387	.22	55–59	282	209	491	14.87
20–24 ..	1,870	1,616	3,486	7.29	60–64	164	148	312	5.13
25–29 ..	2,775	2,669	5,444	1.95	65–69	126	101	227	11.01
30–34 ..	2,825	2,669	5,494	2.84	70 & over	49	23	72	36.11
35–39 ..	2,041	1,924	3,965	2.95	Total	16,998	15,119	32,117	5.85

Of the total of 32,117 there were 24,286, or rather less than 76 per cent., between the ages of 20 and 50.

(iv.) *Education.*—The particulars ascertained concerning the elementary education of the New Zealand-born population are as follows :—

Education of New Zealand-born Aged 5 Years and Upwards, 3rd April, 1911.

Particulars.	English.		Foreign Language only.		Cannot Read.	Total, 5 Years and upwards.
	Read & Write	Read only.	Read & Write	Read only.		
Males	15,897	17	5	..	245	16,164
Females	14,051	27	1	..	231	14,310
Persons	29,948	44	6	..	476	30,474

Of the New Zealand-born males aged 5 years and upwards, 1.52 per cent. were unable to read, while in the case of the females the corresponding proportion was 1.61 per cent. Five males and one female were recorded as able to read and write a foreign language, but not English. In this connexion see par. 13. (vi.) above. (p. 138).

(v.) *Conjugal Condition.*—The number and percentage of the New Zealand-born population aged 15 and upwards of each sex in each conjugal condition were as follows :—

Conjugal Condition of New Zealand-born Aged 15 and Upwards, 3rd April, 1911.

Particulars.	Married.	Never Married.	Widowed.	Divorced.	Total, 15 and upwards.
MALES.					
Number	7,686	6,671	358	53	14,768
Percentage	52.05	45.17	2.42	.36	100.00
FEMALES.					
Number	7,899	4,307	639	51	12,896
Percentage	61.26	33.40	4.95	.39	100.00
PERSONS.					
Number	15,585	10,978	997	104	27,664
Percentage	56.34	39.68	3.60	.38	100.00

(vi.) *Religion.*—In the following table are given particulars relative to the number, percentage and masculinity of New Zealand-born persons classed under the various religious categories used at the Census.

New Zealand-born Population according to Religion (Sexes combined), 3rd April, 1911.

Religion.	Persons.	Per-centage.	Masculinity (Excess of males over females per 100 of sexes combined).	Religion.	Persons	Per-centage.	Masculinity (Excess of males over females per 100 of sexes combined).
CHRISTIAN—				NON-CHRISTIAN			
Church of England	14,644	45.60	5.57	Hebrew	412	1.28	— 6.80
Presbyterian ..	5,603	17.45	12.48	Confucian ..	..	..	..
Methodist	2,461	7.66	.12	Mohammedan ..	3	.01	— 33.33
Baptist	666	2.07	— 9.61	Buddhist ..	2	.01	100.00
Congregational ..	452	1.41	— 11.50	Pagan	1		100.00
Lutheran	41	.13	— 26.83	Others	15	.05	20.00
Church of Christ ..	316	.98	— 17.72	Total, Non-Christ'n	433	1.35	— 5.31
Salvation Army ..	405	1.26	— 13.09				
Seventh Day Adventist	98	.31	— 12.24	INDEFINITE—			
Unitarian	37	.12	18.92	Freethinker ..	74	.23	67.57
Protestant (undefined)	948	2.95	16.67	Agnostic ..	67	.21	61.19
Roman Catholic ..	4,703	14.64	4.91	No Denomination	40	.12	25.00
Greek Catholic ..	2	.01	00	Others	111	.35	11.71
Catholic (undefined)	464	1.44	— .86	Total, Indefinite	292	.91	39.04
Others	348	1.08	— 4.60	NO RELIGION—			
				No Religion ..	171	.53	68.42
				Atheist	20	.06	90.00
				Others	13	.04	53.85
Total, Christian ..	31,188	97.11	5.28	Total, No Religion	204	.63	69.61
				Total	32,117	100.00	5.85

16. **European-born Population.**—(i.) *Distribution.*—Of the total population of 4,455,005 recorded at the Census of 3rd April, 1911, 673,006, or 15 per cent. were of European-birth, while of these latter 598,182, or nearly 89 per cent. hailed from the United Kingdom. The only other European country largely represented was Germany, with a total of 33,381.

The numbers and proportions of total population for the various birthplaces are as follows :—

European-born Population of Australia according to Countries of Birth, 3rd April, 1911.

Birthplace.	Males.		Females.		Persons.		Masc'linity (Excess of males over females per 100 of sexes combined).
	Number.	Per 1000 of male population	Number.	Per 1000 of female population	Number.	Per 1000 of total population	
EUROPE—							
England	206,934	89.46	143,316	66.91	350,250	78.62	18.16
Wales	7,461	3.23	4,857	2.27	12,318	2.76	21.14
Scotland	55,635	24.05	38,614	18.03	94,249	21.16	18.06
Ireland	70,967	30.68	70,398	32.87	141,365	31.73	.40
Isle of Man	689	.30	330	.15	1,019	.23	35.23
Other European British Possessions ..	1,466	.63	940	.44	2,406	.54	21.86
Austria-Hungary ..	2,425	1.05	382	.18	2,807	.63	72.78
Belgium	244	.11	99	.05	343	.08	42.27
Denmark	4,316	1.87	1,414	.66	5,730	1.29	50.65
France	1,996	.86	914	.43	2,910	.65	37.18
Germany	21,973	9.50	11,408	5.32	33,381	7.49	31.65
Greece	1,713	.74	106	.05	1,819	.41	88.35
Italy ..	5,608	2.43	1,190	.55	6,798	1.53	64.99
Netherlands	651	.28	103	.05	754	.17	72.68
Norway	3,074	1.33	418	.19	3,492	.78	76.06
Portugal	160	.07	15	.01	175	.04	82.86
Russia	3,453	1.49	1,055	.49	4,508	1.01	53.19
Spain	495	.21	171	.08	666	.15	48.65
Sweden	5,144	2.22	508	.24	5,652	1.27	82.02
Switzerland	1,314	.57	442	.21	1,756	.39	49.66
Other Europ. Countries	468	.20	140	.06	608	.14	53.95
Total, Europe ..	396,186	171.28	276,820	129.24	673,006	151.07	17.74

Those born in the United Kingdom represented 134.27 per thousand, or approximately 13½ per cent. of the total population, while the German-born represented 7.49 per 1000. Of the other birthplaces the three Scandinavian countries, Denmark, Sweden and Norway together were represented by 3.34 per 1000, Italy with 1.53 per 1000, and Russia with 1.01 per 1000 being the only other countries to exceed 1 per 1000.

In all cases the number of males exceeded the number of females, the excess being most marked in the cases of Greece, Portugal and Sweden, and least marked in the case of the United Kingdom, especially in that of Ireland, the males in this instance exceeding the females by only 569 in a total of 141,365.

The distribution of the European-born population over the several States and Territories is given in the following table, those born in the various divisions of the United Kingdom being separately shewn.

European-born Population according to States and Territories in which Resident, 3rd April, 1911.

States and Territories.	England.	Wales.	Scotland.	Ireland.	Rest of Europe.	Total, Europe.
			MALES.			
STATES—						
New South Wales	75,637	2,821	19,646	24,497	15,676	138,277
Victoria	48,726	1,516	14,396	19,433	11,659	95,730
Queensland	38,988	1,507	12,274	16,356	13,133	82,258
South Australia	16,938	543	3,334	3,736	5,698	30,249
Western Australia	21,141	902	4,764	5,808	8,186	40,801
Tasmania	5,308	158	1,162	1,062	787	8,477
TERRITORIES—						
Northern	123	13	43	48	46	273
Federal	73	1	16	27	4	121
Total	206,934	7,461	55,635	70,967	55,189	396,186

European-born Population according to States and Territories in which Resident—*continued.*

States and Territories.	England.	Wales.	Scotland.	Ireland.	Rest of Europe.	Total, Europe.
FEMALES.						
STATES—						
New South Wales	47,874	1,608	12,003	22,925	4,322	88,732
Victoria	39,220	1,213	12,567	22,649	3,904	79,553
Queensland	26,932	1,139	8,462	15,557	7,297	59,387
South Australia	13,293	352	2,380	4,351	2,379	22,755
Western Australia	12,137	440	2,249	3,765	1,365	19,956
Tasmania	3,814	103	941	1,125	363	6,346
TERRITORIES—						
Northern	24	2	4	8	4	42
Federal	22	..	8	18	1	49
TOTAL	143,316	4,857	38,614	70,398	19,635	276,820
PERSONS.						
STATES—						
New South Wales	123,511	4,429	31,649	47,422	19,998	227,009
Victoria	87,946	2,729	26,963	42,082	15,563	175,283
Queensland	65,920	2,646	20,736	31,913	20,430	141,645
South Australia	30,231	895	5,714	8,087	8,077	53,004
Western Australia	33,278	1,342	7,013	9,573	9,551	60,757
Tasmania	9,122	261	2,103	2,187	1,150	14,823
TERRITORIES—						
Northern	147	15	47	56	50	315
Federal	95	1	24	45	5	170
TOTAL	350,250	12,318	94,249	141,365	74,824	673,006

In the case of each birthplace the State having the larger total population had the greater number for that birthplace except (i.) in the case of Western Australia, where there were more persons for each birthplace specified than there were in South Australia, and (ii.) in the case of those born in the "Rest of Europe," where the Queensland total exceeded that for any other State.

(ii.) *Metropolitan Residents.*—Amongst the European-born population the tendency to aggregate in Metropolitan areas is most marked in the case of those born in England, and least in evidence in those born outside the United Kingdom. Thus, whilst 48 per cent. of the English-born population of the Commonwealth were resident in Metropolitan areas, 44 per cent. of the Scotch-born, and 41½ per cent. of the Irish-born were so resident, as compared with only 36 per cent. in the case of those born in Wales, and 34½ per cent. in the case of those born outside of the United Kingdom. As already noted, the proportion of the native-born so resident is about 36¾ per cent.

(iii.) *Length of Residence.*—Taken as a whole, about 73 per cent. of the European-born population of the Commonwealth had, at the date of the Census, been resident in Australia for upwards of 20 years. The percentage having such a length of residence varies with the birthplace, and is greatest in the case of those born in Ireland and least amongst those born outside the United Kingdom. The respective percentages are approximately as follows:—Ireland, 85 per cent.; Wales, 76 per cent.; Scotland, 72 per cent.; England, 71 per cent.; and the Rest of Europe, 62 per cent. Details in respect of these birthplaces are as follows:—

Length of Residence of European-born Population, 3rd April, 1911.

Particulars.	England.	Wales.	Scotland.	Ireland.	Rest of Europe.	Total, Europe.
MALES.						
Number resident under 20 years ..	64,390	2,022	17,019	12,124	23,040	118,595
Number resident 20 years and over	142,544	5,439	38,616	58,843	32,149	277,591
TOTAL	206,934	7,461	55,635	70,967	55,189	396,186
Proportion per cent. over 20 years ..	68.88	72.90	69.41	82.92	58.25	70.07
FEMALES.						
Number resident under 20 years ..	36,202	964	9,223	9,258	5,370	61,017
Number resident 20 years and over	107,114	3,893	29,391	61,140	14,265	215,803
TOTAL	143,316	4,857	38,614	70,398	19,635	276,820
Proportion per cent. over 20 years ..	74.74	80.15	76.11	86.85	72.65	77.96

Length of Residence of European-born Population.—*continued.*

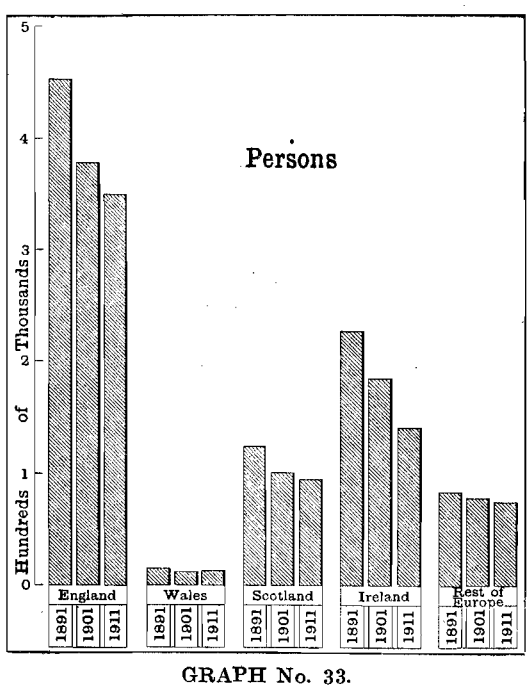
Particulars.	England.	Wales.	Scotland.	Ireland.	Rest of Europe.	Total, Europe.
PERSONS.						
Number resident under 20 years ..	100,592	2,986	26,242	21,382	28,410	179,612
Number resident 20 years and over	249,658	9,332	68,007	119,983	46,414	493,394
TOTAL	350,250	12,318	94,249	141,365	74,824	673,006
Proportion per cent. over 20 years..	71.28	75.76	72.16	84.87	62.03	73.31

(iv.) *Comparative Results for three Censuses.*—The following tables furnish a comparison for the Censuses of 1891, 1901 and 1911 of the number and proportion of the European-born population of Australia.

European-born Population, 1891, 1901 and 1911.

Birthplace.	Males.			Females.			Persons.		
	1891.	1901.	1911.	1891.	1901.	1911.	1891.	1901.	1911.
NUMBER.									
England	272,266	221,664	206,934	181,130	157,223	143,316	453,396	378,887	350,250
Wales	9,065	7,178	7,461	5,629	4,836	4,857	14,694	12,014	12,318
Scotland	73,267	58,892	55,635	50,970	43,078	38,614	124,237	101,970	94,249
Ireland	116,322	92,254	70,967	111,376	92,216	70,398	227,698	184,470	141,365
Rest of Europe ..	61,498	57,115	55,189	23,150	20,983	19,635	84,648	78,098	74,824
TOTAL, EUROPE ..	532,418	437,103	396,186	372,255	318,336	276,820	904,673	755,439	673,006
PER 1000 OF TOTAL FOR AUSTRALIA.									
England	159.78	112.07	89.46	123.19	87.55	66.91	142.83	100.40	78.62
Wales	5.32	3.63	3.23	3.83	2.69	2.27	4.63	3.18	2.76
Scotland	42.99	29.77	24.05	34.66	23.99	18.03	39.14	27.02	21.16
Ireland	68.26	46.64	30.68	75.75	51.35	32.87	71.73	48.88	31.73
Rest of Europe ..	36.09	28.88	23.86	15.74	11.68	9.16	26.66	20.70	16.80
TOTAL, EUROPE ..	312.44	220.99	171.28	253.17	177.26	129.24	284.99	200.18	151.07

European-born Population of Australia.



GRAPH No. 33.

It will be seen from the foregoing table that the only case in which there was a larger number in 1911 than in 1901 was in that of the birthplace Wales, the number of males having in this instance increased by 283, and of females by 21. In all cases the number in 1901 was less than in 1891. The proportion per 1000 of the total population of Australia was less in all cases in 1901 than in 1891, and less in 1911 than in 1901.

The accompanying graph (No. 33) furnishes a representation of the number of persons of European birthplaces who were resident in Australia at the Censuses of 1891, 1901, and 1911. The particulars are shewn separately for those born in (i.) England, (ii.) Wales, (iii.) Scotland, (iv.) Ireland, and (v.) Rest of Europe, and indicate in all cases, except that of Wales, a more or less rapid decline in the numbers at successive Censuses.

The masculinity of the population for each birthplace at each Census is given in the following table, which shews in each case the excess of males over females per 100 of the sexes combined.

Masculinity of European-born Population, 1891, 1901 and 1911.

Census.	England.	Wales.	Scotland.	Ireland.	Rest of Europe.	Total, Europe.
1891	20.10	23.38	17.95	2.17	45.30	17.70
1901	17.01	19.49	15.51	.02	46.26	15.72
1911	18.16	21.14	18.06	.40	47.52	17.74

(v.) *Ages.*—The succeeding table furnishes details in respect of the ages of the European-born males :—

European-born Males, according to Age, 3rd April, 1911.

Age last birthday.	Country of birth.					Total, Europe.
	England.	Wales.	Scotland.	Ireland.	Rest of Europe.	
0–4	1,669	45	443	76	164	2,397
5–9	2,449	55	665	143	323	3,635
10–14	2,230	56	613	157	428	3,484
15–19	3,853	105	805	362	1,688	6,813
20–24	11,356	357	2,779	1,529	4,086	20,107
25–29	16,328	536	4,308	2,771	5,011	28,954
30–34	16,514	612	4,404	3,472	4,687	29,689
35–39	16,078	646	3,890	4,296	4,381	29,291
40–44	18,179	648	4,397	6,214	4,854	34,292
45–49	21,840	878	6,039	8,875	5,606	43,238
50–54	20,864	922	6,165	8,859	5,816	42,626
55–59	19,882	792	5,368	6,830	5,052	37,924
60–64	17,336	579	4,576	6,342	4,104	32,937
65–69	13,706	445	3,711	7,198	3,421	28,481
70–74	10,960	394	3,247	6,998	2,728	24,327
75–79	7,953	224	2,438	4,443	1,760	16,818
80–84	4,128	127	1,290	1,734	774	8,053
85–89	1,256	30	395	494	244	2,419
90–94	302	9	83	136	52	582
95–99	42	1	14	28	8	93
100 and over	9	..	5	10	2	26
Total	206,934	7,461	55,635	70,967	55,189	396,186

Similar particulars in respect of the European-born females are contained in the following table :—

European-born Females, according to Age, 3rd April, 1911.

Age last birthday.	Country of birth.					Total, Europe.
	England.	Wales.	Scotland.	Ireland.	Rest of Europe.	
0–4	1,578	44	425	79	158	2,284
5–9	2,251	52	604	150	258	3,315
10–14	2,219	60	573	169	330	3,351
15–19	2,122	61	569	353	372	3,477
20–24	4,611	117	1,272	1,056	695	7,751
25–29	9,634	340	2,365	2,274	1,201	15,814
30–34	11,789	368	2,904	3,013	1,525	19,599
35–39	11,736	456	2,681	4,545	1,639	21,057
40–44	11,541	366	2,728	6,212	1,683	22,530
45–49	12,726	523	3,264	7,905	1,783	26,201
50–54	12,638	542	3,456	7,080	1,829	25,545
55–59	14,066	550	3,817	5,888	1,904	26,225
60–64	13,855	409	3,634	7,308	2,002	27,208
65–69	11,316	348	3,349	8,532	1,653	25,198
70–74	9,312	289	2,926	8,082	1,194	21,803
75–79	6,603	202	2,275	5,011	840	14,931
80–84	3,587	90	1,225	1,909	364	7,175
85–89	1,323	35	415	610	161	2,544
90–94	354	5	102	171	38	670
95–99	48	..	25	37	6	116
100 and over	7	..	5	14	..	26
Total	143,316	4,857	38,614	70,398	19,635	276,820

The next table contains particulars relative to age for the sexes combined :—

Total European-born Population, according to Age, 3rd April, 1911.

Age last Birthday.	Country of Birth.					Total, Europe.
	England.	Wales.	Scotland.	Ireland.	Rest of Europe.	
0–4	3,247	89	868	155	322	4,681
5–9	4,700	107	1,269	293	581	6,950
10–14	4,449	116	1,186	326	758	6,835
15–19	5,975	166	1,374	715	2,060	10,290
20–24	15,967	474	4,051	2,585	4,781	27,858
25–29	25,962	876	6,673	5,045	6,212	44,768
30–34	28,303	980	7,308	6,485	6,212	49,288
35–39	27,814	1,102	6,571	8,841	6,020	50,348
40–44	29,720	1,014	7,125	12,426	6,537	56,822
45–49	34,566	1,401	9,303	16,780	7,389	69,439
50–54	33,502	1,464	9,621	15,939	7,645	68,171
55–59	33,948	1,342	9,185	12,718	6,956	64,149
60–64	31,191	988	8,210	13,650	6,106	60,145
65–69	25,022	793	7,060	15,730	5,074	53,679
70–74	20,272	683	6,173	15,080	3,922	46,130
75–79	14,556	426	4,713	9,454	2,600	31,749
80–84	7,715	217	2,515	3,643	1,138	15,228
85–89	2,579	65	810	1,104	405	4,963
90–94	656	14	185	307	90	1,252
95–99	90	1	39	65	14	209
100 and over	16	..	10	24	2	52
Total	350,250	12,318	94,249	141,365	74,824	673,006

Of the total of 673,006 there were 213,407, or nearly 32 per cent. above the age of 60, while only 18,466 or about $2\frac{3}{4}$ per cent. were under the age of 15.

The proportion of the European-born in each age group is shewn in the attached table :—

Proportion per cent. of European-born Population in Successive Age-groups. (Sexes combined.) 3rd April, 1911.

Age last birthday.	Country of birth.					Total, Europe.
	England.	Wales.	Scotland.	Ireland.	Rest of Europe.	
	%	%	%	%	%	%
0–4	.93	.72	.92	.11	.43	.69
5–9	1.34	.87	1.35	.21	.78	1.03
10–14	1.27	.94	1.26	.23	1.01	1.02
15–19	1.71	1.35	1.46	.50	2.75	1.53
20–24	4.56	3.85	4.30	1.83	6.39	4.14
25–29	7.41	7.11	7.08	3.57	8.30	6.65
30–34	8.08	7.96	7.75	4.59	8.30	7.32
35–39	7.94	8.95	6.97	6.25	8.05	7.48
40–44	8.48	8.23	7.56	8.79	8.74	8.44
45–49	9.87	11.37	9.87	11.87	9.88	10.32
50–54	9.56	11.89	10.21	11.27	10.22	10.13
55–59	9.69	10.89	9.74	9.00	9.30	9.53
60–64	8.90	8.02	8.71	9.65	8.16	8.94
65–69	7.14	6.44	7.49	11.13	6.78	7.98
70–74	5.79	5.54	6.55	10.67	5.24	6.85
75–79	4.16	3.46	5.00	6.69	3.47	4.72
80–84	2.20	1.76	2.67	2.58	1.52	2.26
85–89	.74	.53	.86	.78	.54	.74
90–94	.19	.11	.20	.22	.12	.19
95–99	.03	.01	.04	.04	.02	.03
100 and over	.01	..	.01	.02	..	.01
Total	100.00	100.00	100.00	100.00	100.00	100.00

The age group most largely represented was 45–49 in the cases of England and Ireland, and 50–54 in those of Wales, Scotland and the Rest of Europe.

The following table furnishes particulars concerning the masculinity of the European-born population in age groups.

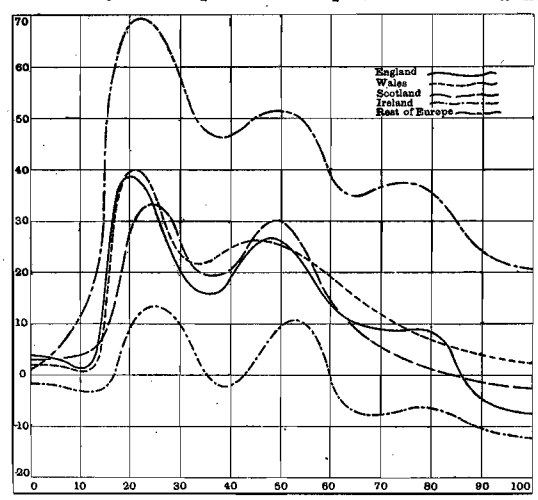
Masculinity of European-born Population. (Excess of males over females per 100 of sexes combined). 3rd April, 1911.

Age last birthday.	Country of birth.					Total, Europe.
	England.	Wales.	Scotland.	Ireland.	Rest of Europe.	
0–4	2.80	1.12	2.07	— 1.94	1.86	2.41
5–9	4.21	2.80	4.81	— 2.39	11.19	4.60
10–14	.25	— 3.45	3.37	— 3.68	12.93	1.95
15–19	28.97	26.51	17.18	1.26	63.88	32.42
20–24	42.24	50.63	37.20	18.30	70.93	44.35
25–29	25.78	22.37	29.12	9.85	61.33	29.35
30–34	16.69	24.90	20.53	7.08	50.90	20.47
35–39	15.61	17.24	18.40	— 2.82	45.51	16.35
40–44	22.34	27.81	23.42	.02	48.51	20.70
45–49	26.37	25.34	29.83	5.78	51.74	24.54
50–54	24.55	25.96	28.16	11.16	52.15	25.06
55–59	17.13	18.03	16.89	7.41	45.26	18.24
60–64	11.16	17.21	11.47	— 7.08	34.43	26.15
65–69	9.55	12.23	5.13	— 8.48	34.84	6.12
70–74	8.13	15.37	5.20	— 7.19	39.11	5.47
75–79	9.27	5.16	3.46	— 6.01	35.38	5.94
80–84	7.01	17.05	2.58	— 4.80	36.03	5.77
85–89	— 2.60	— 7.69	— 2.47	— 10.50	20.49	— 2.52
90 and over	— 7.35	33.33	— 12.82	— 12.12	16.98	— 7.34
All ages	18.16	21.14	18.06	.40	47.52	17.74

NOTE: — signifies excess of females.

In all cases the excess of males was most marked in the age group 20–24, and least in evidence at the young and old ages. In the case of Ireland there was an excess of females at ages under 15 and above 60.

Masculinity of European-born Population of Australia.



GRAPH No. 34.

The accompanying graph (No. 34) furnishes a representation of the masculinity of the European-born population of Australia, at the Census of 3rd April, 1911. The case of each small square represents 10 years of age, and the height a masculinity of 10. An interesting feature of these curves is their wave like form and the approximate synchronising of maximum and minimum points.

(vi.) *Education.*—In the following table are given particulars in respect of the ability of the European-born population to read and write.

Education of European-born Population Aged 5 Years and upwards, 3rd April, 1911.

Birthplace.	English.		Foreign Language only.		Cannot Read.	Total, 5 Years and upwards.
	Read & Write	Read only.	Read & Write	Read only.		
MALES.						
England	198,929	1,126	11	8	5,191	205,265
Wales	7,121	63	5	..	227	7,416
Scotland	54,381	201	..	1	609	55,192
Ireland	66,010	936	3	6	3,936	70,891
Rest of Europe	42,088	613	9,592	659	2,073	55,025
Total, Europe	368,529	2,939	9,611	674	12,036	393,789
FEMALES.						
England	135,908	1,945	5	2	3,878	141,738
Wales	4,415	126	1	3	268	4,813
Scotland	36,781	577	..	6	825	38,189
Ireland	61,506	2,506	6	..	6,301	70,319
Rest of Europe	13,803	418	3,691	444	1,121	19,477
Total, Europe	252,413	5,572	3,703	455	12,393	274,536

Education of European-born Aged 5 Years and Upwards—*continued.*

Birthplace.	English.		Foreign Language only.		Cannot Read.	Total, 5 Years & Upwards.
	Read & Write	Read only.	Read & Write	Read only.		
PERSONS.						
England	334,837	3,071	16	10	9,069	347,003
Wales	11,536	189	6	3	495	12,229
Scotland	91,162	778	..	7	1,434	93,381
Ireland	127,516	3,442	9	6	10,237	141,210
Rest of Europe ..	55,891	1,031	13,283	1,103	3,194	74,502
Total, Europe ..	620,942	8,511	13,314	1,129	24,429	668,325

It will be seen that 57 born in the United Kingdom are recorded as able to read or read and write a foreign language, but not English. In this connexion see par. 13 (vi.) of the present chapter. (p. 138).

The proportion of those aged 5 years and upwards unable to read is given below for each of the birthplaces specified :—

Percentage of European-born Population, Aged 5 Years and Upwards, who were Unable to Read, 3rd April, 1911.

Particulars.	Country of Birth.					Total, Europe.
	England.	Wales.	Scotland.	Ireland.	Rest of Europe.	
	%	%	%	%	%	%
Males	2.53	3.06	1.10	5.55	3.77	3.06
Females	2.74	5.57	2.16	8.96	5.76	4.51
Persons	2.61	4.05	1.54	7.25	4.29	3.66

The largest proportion of illiteracy was in evidence amongst the natives of Ireland, the lowest amongst those of Scotland, but in no case was the proportion a high one.

(vii.) *Conjugal Condition.*—The following table furnishes a classification of the European born population, aged 15 years and upwards, according to sex and conjugal condition.

Conjugal Condition of European-born Population, Aged 15 Years and upwards 3rd April, 1911.

Birthplace	Married.	Never Married.	Widowed.	Divorced.	Total, 15 and upwards.
MALES.					
England	125,008	55,764	19,370	444	200,586
Wales	4,454	2,135	697	19	7,305
Scotland	31,592	16,886	5,350	86	53,914
Ireland	37,822	24,141	8,537	91	70,591
Rest of Europe	28,870	21,235	4,022	147	54,274
Total, Europe	227,746	120,161	37,976	787	386,670
FEMALES.					
England	84,417	19,047	33,557	247	137,268
Wales	3,041	523	1,127	10	4,701
Scotland	21,146	5,822	9,996	48	37,012
Ireland	36,133	10,959	22,837	71	70,000
Rest of Europe	12,576	1,995	4,280	38	18,889
Total, Europe	157,313	38,346	71,797	414	267,870
PERSONS.					
England	209,425	74,811	52,927	691	337,854
Wales	7,495	2,658	1,824	29	12,006
Scotland	52,738	22,708	15,346	134	90,926
Ireland	73,955	35,100	31,374	162	140,591
Rest of Europe	41,446	23,230	8,302	185	73,163
Total, Europe	385,059	158,507	109,773	1,201	654,540

In the succeeding table is shewn for each of the birthplaces specified the proportion of married persons amongst those aged 15 years and upwards.

Proportion Married amongst those Aged 15 Years and upwards, 3rd April, 1911.

Particulars.	Country of Birth.					Total, Europe.
	England.	Wales.	Scotland.	Ireland.	Rest of Europe.	
	%	%	%	%	%	%
Males	62.32	60.97	58.60	53.58	53.19	58.90
Females	61.50	64.69	57.13	51.62	66.58	58.73
Persons	61.99	62.44	58.00	52.60	56.65	58.83

(viii.) *Religion.*—Details concerning the religions of the European-born population are as follows :—

Religions of European-born (Sexes combined), 3rd April, 1911.

Religion.	Country of birth.					Total, Europe.
	England.	Wales.	Scotland.	Ireland.	Rest of Europe.	
CHRISTIAN—						
Church of England	206,175	4,805	7,365	19,913	12,791	251,049
Presbyterian	14,298	1,020	67,765	12,307	2,641	98,031
Methodist	52,679	2,179	3,801	3,645	2,838	65,142
Baptist	12,113	1,396	1,818	598	965	16,890
Congregational	9,433	1,054	1,738	436	437	13,098
Lutheran	73	1	11	11	22,603	22,699
Church of Christ	3,041	113	774	260	321	4,509
Salvation Army	2,911	104	389	235	323	3,962
Seventh Day Adventist	623	13	101	72	153	962
Unitarian	766	18	80	67	86	1,017
Protestant (undefined)	17,970	638	3,636	1,493	4,983	28,720
Roman Catholic	15,859	451	3,947	94,973	15,963	131,193
Greek Catholic	3	..	..	3	2,007	2,013
Catholic (undefined)	1,508	34	322	5,798	2,520	10,182
Others	4,718	308	1,290	840	1,927	9,083
TOTAL, CHRISTIAN	342,170	12,134	93,037	140,651	70,558	658,550
NON-CHRISTIAN—						
Hebrew	2,886	23	47	19	2,968	5,943
Confucian	1	..	1	..	..	2
Mohammedan	8	..	..	..	19	27
Buddhist	16	1	4	1	3	25
Pagan	4	..	6	1	3	14
Others	240	8	44	24	49	365
TOTAL, NON-CHRISTIAN	3,155	32	102	45	3,042	6,376
INDEFINITE—						
Freethinker	709	22	171	129	263	1,294
Agnostic	760	21	211	125	142	1,259
No Denomination	419	10	76	50	47	602
Others	1,214	37	223	128	234	1,836
TOTAL, INDEFINITE	3,102	90	681	432	686	4,991
NO RELIGION—						
No Religion	1,659	57	388	219	454	2,777
Atheist	117	2	28	13	72	232
Others	47	3	13	5	12	80
TOTAL, NO RELIGION	1,823	62	429	237	538	3,089
TOTAL	350,250	12,318	94,249	141,365	74,824	673,006

The religion percentage of total population for each country of birth is shewn in the succeeding table :—

Religion percentage for each Country of Birth, 3rd April, 1911.

Religion.	Country of birth.					Total, Europe.
	England.	Wales.	Scotland.	Ireland.	Rest of Europe.	
CHRISTIAN—	%	%	%	%	%	%
Church of England	58.86	39.01	7.82	14.09	17.10	37.30
Presbyterian	4.08	8.28	71.90	8.70	3.53	14.57
Methodist	15.04	17.69	4.03	2.58	3.79	9.68
Baptist	3.46	11.33	1.93	.42	1.29	2.51
Congregational	2.69	8.56	1.84	.31	.58	1.95
Lutheran	.02	.01	.01	.01	30.21	3.37
Church of Christ	.87	.92	.82	.18	.43	.67
Salvation Army	.83	.84	.41	.17	.43	.59
Seventh Day Adventist	.18	.10	.11	.05	.21	.14
Unitarian	.22	.15	.08	.05	.11	.15
Protestant (undefined)	5.13	5.18	3.86	1.06	6.66	4.27
Roman Catholic	4.53	3.66	4.19	67.18	21.33	19.49
Greek Catholic	..	..	..	..	2.68	.30
Catholic (undefined)	.43	.28	.34	4.10	3.37	1.51
Others	1.35	2.50	1.37	.59	2.58	1.35
TOTAL, CHRISTIAN	97.69	98.51	98.71	99.49	94.30	97.85
NON-CHRISTIAN—						
Hebrew	.82	.19	.05	.01	3.97	.88
Confucian		..	..	..	..	
Mohammedan		..	..	..	.03	
Buddhist	.01	.01	.01	..	..	.01
Pagan		..	..	..	..	
Others	.07	.06	.05	.02	.06	.06
TOTAL, NON-CHRISTIAN	.90	.26	.11	.03	4.06	.95

Religion Percentage for each Country of Birth—*continued.*

Religion.	Country of birth.					Total, Europe.
	England.	Wales.	Scotland.	Ireland.	Rest of Europe.	
INDEFINITE—						
Freethinker	.20	.18	.18	.09	.35	.19
Agnostic	.22	.17	.22	.09	.19	.19
No Denomination	.12	.08	.08	.04	.07	.09
Others	.35	.30	.24	.09	.31	.27
Total, Indefinite	.89	.73	72	.31	.92	.74
NO RELIGION—						
No Religion	.48	.46	.42	.16	.61	.41
Atheist	.03	.02	.03	.01	.10	.04
Others	.01	.02	.01		.01	.01
Total, No Religion	.52	.50	.46	.17	.72	.46
Total	100.00	100.00	100.00	100.00	100.00	100.00

Of those born in England the denomination most largely represented was the Church of England, the Methodist ranking second. Similarly for Wales the leading denominations were Church of England, Methodist and Baptist, for Scotland, Presbyterian and Church of England, for Ireland, Roman Catholic and Church of England, and for the Rest of Europe, Lutheran, Roman Catholic and Church of England.

The relative proportions of males and females for each religion and birthplace are shewn in the next table :—

Masculinity of Religious Adherents of European Birth. (Excess of Males over Females per 100 of the sexes combined). 3rd April, 1911.

Religion.	Country of birth.					Total, Europe.
	England.	Wales.	Scotland.	Ireland.	Rest of Europe.	
CHRISTIAN—						
Church of England	22.57	24.08	2.97	— .43	39.94	21.08
Presbyterian	6.97	23.53	21.71	16.03	44.41	19.47
Methodist	5.18	16.75	— 11.23	— 14.95	27.06	4.44
Baptist	— .54	9.74	— 6.49	— 19.06	13.78	— .17
Congregational	4.02	16.70	— 7.83	— 21.56	21.74	3.21
Lutheran	— 12.33	— 100.00	27.27	9.09	41.57	41.37
Church of Christ	— 8.65	4.42	— 4.13	— 27.69	24.61	— 6.28
Salvation Army	2.99	11.54	— 14.14	— 10.64	32.51	3.13
Seventh Day Adventist	— 25.20	— 53.85	.99	— 33.33	1.96	— 19.13
Unitarian	28.72	66.67	42.50	58.21	67.44	35.69
Protestant (undefined)	31.76	43.57	38.23	16.54	64.16	37.67
Roman Catholic	21.37	13.97	10.87	— 1.10	58.83	9.32
Greek Catholic	33.33	..	..	— 33.33	82.66	82.41
Catholic (undefined)	19.63	11.76	19.25	— 4.14	58.97	15.79
Others	3.98	9.74	6.67	9.52	50.91	15.03
Total, Christian	17.54	20.36	17.37	.07	47.67	17.07
NON-CHRISTIAN—						
Hebrew	15.32	56.52	19.15	— 15.79	29.85	22.67
Confucian	— 100.00	..	100.00	..	..	.00
Mohammedan	— 25.00	..	..	..	89.47	55.56
Buddhist	75.00	100.00	100.00	100.00	33.33	76.00
Pagan	100.00	..	100,00	100.00	100.00	100.00
Others	13.33	75.00	36.36	25.00	51.02	23.29
Total, Non-Christian	15.44	62.50	35.29	11.11	30.64	23.21
INDEFINITE—						
Freethinker	79.13	90.91	78.95	73.64	80.23	78.98
Agnostic	79.47	61.90	83.89	87.20	80.28	80.78
No Denomination	31.74	20.00	50.00	36.00	82.98	38.21
Others	39.21	62.16	50.67	31.25	70.09	44.44
Total, Indefinite	57.19	64.44	67.99	60.65	76.97	61.81
NO RELIGION—						
No Religion	72.03	89.47	81.44	87.21	84.59	76.95
Atheist	84.62	100.00	100.00	69.23	91.67	87.93
Others	74.47	100.00	100.00	100.00	83.33	82.50
Total, No Religion	72.88	90.32	83.22	86.50	85.50	77.92
Total	18.16	21.14	18.06	.40	47.52	17.74

17. **Asiatic-born Population.**—To the total of 36,822 from Asiatic birthplaces, China, British India, Japan and Syria were, in the order named, the largest contributors, the Chinese with 20,994 representing 57 per cent. of the Asiatic total. Particulars for the principal Asiatic birthplaces are as follows :—

Asiatic-born Population according to Countries of Birth, 3rd April, 1911.

Birthplace.	Males.		Females.		Persons.		Masculinity (Excess of males over females per 100 of sexes combined).
	Number.	Per 1000 of male population	Number.	Per 1000 of female population	Number.	Per 1000 of total population	
ASIA—							
British India ..	5,102	2.21	1,610	.75	6,712	1.51	52.03
Ceylon	477	.21	140	.06	617	.14	54.62
Hong Kong	359	.15	59	.03	418	.09	71.77
Straits Settlements ..	648	.28	61	.03	709	.16	82 79
Other Asiatic Brit. Poss.	154	.07	37	.02	191	.04	61.26
Afghanistan	202	.09	..	..	202	.05	100.00
Arabia	33	.01	2	.00	35	.01	88.57
China	20,669	8.94	325	.15	20,994	4.71	96.90
Japan	3,294	1.42	216	.10	3,510	.79	87.69
Java	541	.23	43	.02	584	.13	85.27
Philippine Islands ..	428	.18	20	.01	448	.10	91.07
Syria	904	.39	638	.30	1,542	.35	17.25
Other Asiatic Countries	824	.36	36	.02	860	.19	91.63
Total, Asia ..	33,635	14.54	3,187	1.49	36,822	8.27	82.69

The distribution of the Asiatic-born population over the several States and Territories of the Commonwealth is shewn in the following table, those born in the four countries most numerously represented being separately shewn :—

Asiatic-born Population according to States and Territories in which Resident, 3rd April, 1911.

States and Territories.	China.	British India.	Japan.	Syria.	Other Asiatic Countries.	Total, Asia.
MALES.						
STATES—						
New South Wales	7,586	1,782	126	453	546	10,493
Victoria	4,296	1,191	48	188	284	6,007
Queensland	5,437	636	1,401	72	908	8,454
South Australia	232	551	17	128	114	1,042
Western Austrlaia	1,625	756	1,616	29	1,645	5,671
Tasmania	358	177	1	33	17	586
TERRITORIES—						
Northern	1,134	7	85	..	151	1,377
Federal	1	2	..	1	1	5
Total	20,669	5,102	3,294	904	3,666	33,635
FEMALES.						
STATES—						
New South Wales ..	101	523	14	310	139	1,087
Victoria	57	431	10	139	108	745
Queensland	81	192	66	80	73	492
South Australia	11	122	5	59	16	213
Western Australia	20	195	116	26	38	395
Tasmania	9	146	..	24	22	201
TERRITORIES—						
Northern	46	1	5	..	2	54
Federal	..	..	..	..	..	..
Total	325	1,610	216	638	398	3,187
PERSONS.						
STATES—						
New South Wales	7,687	2,305	140	763	685	11,580
Victoria	4,353	1,622	58	327	392	6,752
Queensland	5,518	828	1,467	152	981	8,946
South Australia	243	673	22	187	130	1,255
Western Australia	1,645	951	1,732	55	1,683	6,066
Tasmania	367	323	1	57	39	787
TERRITORIES—						
Northern	1,180	8	90	..	153	1,431
Federal	1	2	..	1	1	5
Total	20,994	6,712	3,510	1,542	4,064	36,822

18. **African-born Population.**—Of the total of 4995 African-born population, no fewer than 3957, or 79 per cent. were from South Africa. Of this latter number 2050 were males, and 1907 were females. The majority of these gave as birthplace simply " South Africa." Of the cases in which the province of birth was specified the Cape appeared most frequently, and the Orange Free State least often. The only other African country extensively represented was Mauritius with a total of 662.

19. **American-born Population.**—The only American countries at all largely represented in the Australian population were the United States with a total of 6714, and Canada with a total of 2977, these two countries together accounting for 85 per cent. of the total for America. The former figure comprised 4499 males and 2215 females, while the Canadian total was made up of 2150 males and 827 females.

20. **Polynesian-born Population.**—Of the total of 3439 for the various Polynesian birth places 2500 were males and 939 were females. The largest contributor to the total was the Fiji Group, followed by " South Sea Islands " undefined, then New Caledonia and the New Hebrides.

21. **Population Born at Sea.**—The total number born at sea was 4289, of whom 2236 were males, and 2053 were females.

CHAPTER XII.

LENGTH OF RESIDENCE.

1. **Form of Inquiry.**—One of the inquiries made on the " personal " card at the present census was that relating to the length of residence in the Commonwealth, asked in the case of persons born outside Australia. As in the case of the inquiry relative to age, the question was duplicated, the first requisition being : " If born outside Commonwealth, state length of residence therein " ; while the second was : " Date of arrival in Commonwealth." In cases where both forms of inquiry on the card were replied to, and the replies were discordant, the rule followed in tabulation was that of accepting the statement as to date of arrival in preference to that specifically stating duration of residence. This was the first occasion on which information relating to length of residence in Australia had been obtained by means of a census. At the Census of 1901 each of the States asked for information in respect of length of residence within its own boundaries, but particulars in respect of length of residence in Australia as a whole were not obtained.

2. **Objects of Inquiry.**—The inquiry relative to Length of Residence is one which, prior to to Census of 1901, had only on rare occasions been made in the censuses of the Australian States. The main reason for its inclusion on that and the present occasions was undoubtedly the bearing which the results of the inquiry have on the question of Old Age Pensions in Australia, since one of the conditions of grant of such pensions is at present a residence of 20 years in Australia, while under the State regime it was as much as 25 years in certain of the States. In addition to the purpose thus served, the statistics of length of residence furnish interesting and valuable indications of the permanency or otherwise of the migration which has taken place in various periods, and also of the tendency for recent immigration to distribute itself over the metropolitan and extra-metropolitan areas of the several States.

3. **Length of Residence Unspecified.**—Of the total population of 4,455,005 recorded at the Census of 1911, there were 3,667,670 returned as born in Australia. Of the remainder, 727,774 furnished particulars as to length of residence, while 59,561 failed to supply such particulars, some giving a birthplace outside of Australia without furnishing any information as to length of residence, while others failed to supply information as to either birthplace or length of residence. In preparing the census data for analysis for the purposes of the present chapter, the numbers relating to those of unspecified length of residence have been proportionately distributed, care being taken in so doing to make an allowance for Australian-born included therein. As the outcome of this distribution, 21,265 of those of unspecified length of residence were allocated to the Australian-born, and 38,296 to the oversea population, thus giving an oversea total of 766,070. Throughout the present chapter the figures so adjusted have been employed.

4. **General View of Results.**—The data obtained have been tabulated in conjunction with age for each sex for each of the States and Territories of the Commonwealth. The results are contained in Part III., " Length of Residence " of the Detailed Tables. (See Vol. II., pp. 387-439).

The following table furnishes a summary of the results for sex and length of residence :—

Length of Residence in Australia of Oversea Population, 1911.

Length of Residence in Australia in Years.	Period of Arrival.	States.						Territories.		C'wlth.
		N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
		MALES.								
0–9 ..	1901–1911	40,887	17,950	20,388	7,009	20,261	1,557	179	41	108,272
10–19 ..	1891–1901	15,676	9,600	9,245	2,161	8,008	1,086	163	9	45,948
20–29 ..	1881–1891	48,491	28,718	34,247	5,710	12,108	2,938	858	24	133,094
30–39 ..	1871–1881	25,481	12,814	16,186	6,951	4,749	1,144	424	20	67,769
40–49 ..	1861–1871	12,420	14,576	10,154	3,397	2,345	722	37	13	43,664
50–59 ..	1851–1861	15,341	23,935	3,902	5,177	1,801	1,611	21	26	51,814
60 & over	before 1851	4,011	3,666	681	2,275	443	434	3	9	11,522
Total		162,307	111,259	94,803	32,680	49,715	9,492	1,685	142	462,083

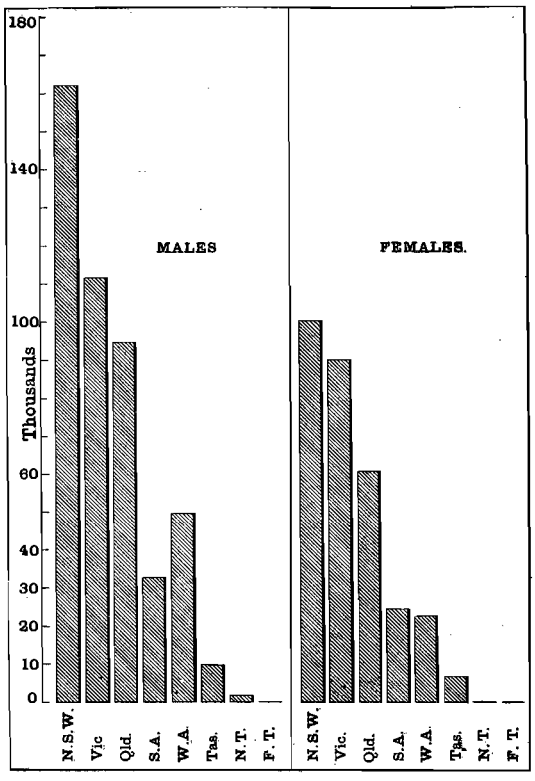
Length of Residence in Australia of Oversea Population, 1911—*continued.*

Length of Residence in Australia in Years.	Period of Arrival.	States.						Territories.		C'wlth.
		N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
FEMALES.										
0–9 ..	1901–1911	19,354	9,946	10,358	2,153	7,937	1,020	17	9	50,794
10–19 ..	1891–1901	8,341	5,688	4,580	1,132	3,788	649	31	6	24,215
20–29 ..	1881–1891	31,960	18,939	24,635	4,093	5,369	2,006	36	14	87,052
30–39 ..	1871–1881	14,683	8,937	10,337	4,981	1,964	611	6	8	41,527
40–49 ..	1861–1871	8,543	15,837	7,549	2,892	1,448	555	4	4	36,832
50–59 ..	1851–1861	12,998	26,323	2,482	5,994	1,478	1,599	4	15	50,893
60 & over	before 1851	4,210	4,312	483	2,816	342	504	1	6	12,674
Total		100,089	89,982	60,424	24,061	22,326	6,944	99	62	303,987
PERSONS.										
0–9 ..	1901–1911	60,241	27,896	30,746	9,162	28,198	2,577	196	50	159,066
10–19 ..	1891–1901	24,017	15,288	13,825	3,293	11,796	1,735	194	15	70,163
20–29 ..	1881–1891	80,451	47,657	58,882	9,803	17,477	4,944	894	38	220,146
30–39 ..	1871–1881	40,164	21,751	26,523	11,932	6,713	1,755	430	28	109,296
40–49 ..	1861–1871	20,963	30,413	17,703	6,289	3,793	1,277	41	17	80,496
50–59 ..	1851–1861	28,339	50,258	6,384	11,171	3,279	3,210	25	41	102,707
60 & over	before 1851	8,221	7,978	1,164	5,091	785	938	4	15	24,196
Total		262,396	201,241	155,227	56,741	72,041	16,436	1,784	204	766,070

It will be seen from the foregoing table that the decennial period which contributed most largely to the oversea population of Australia in 1911 was that from 1881 to 1891, the recorded contribution from that decennium being more than 60,000 in excess of that from the decennium from 1901 to 1911, which ranked next in importance, and more than twice as great as that from 1871 to 1881, which ranked third. When comparing in this manner the contributions from past decennia, it must be borne in mind that the more remote the decennium under review the greater will be the reductions effected by death in the numbers contributed by it. Another point to be observed in this matter is the fact that the returns for those having a length of residence less than one year include a very large number of persons who have come to Australia for purposes other than permanent settlement, such for example as the crews of oversea vessels, commercial travellers from abroad, tourists, etc. Thus, whilst the total recorded at the date of the census having less than one year's length of residence was 56,138, the corresponding figure for one year and less than two was 26,453. This difference was no doubt in part due to expanding immigration, but it was also due in no small measure to the inclusion of " birds of passage."

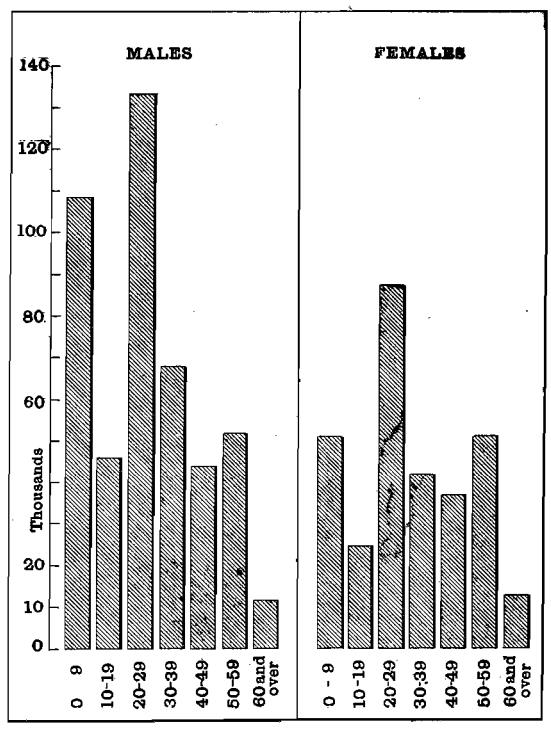
Oversea Population of Australia, 1911.

(a) According to States.



GRAPH No. 35.

(b) According to length of Residence.

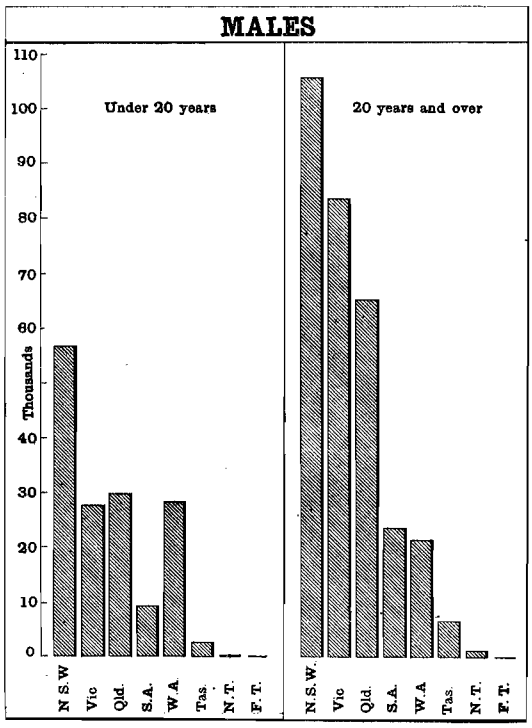


GRAPH No. 36.

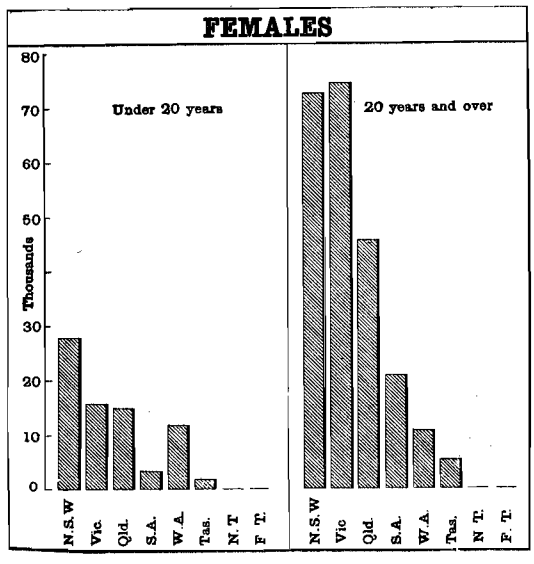
The accompanying Graphs (Nos. 35 and 36) furnish representations of the number of the oversea population, distributed in Graph No. 35, according to the States in which they were resident at the date of enumeration, and in Graph No. 36 according to their length of residence. The figures shewn beneath the columns in Graph No. 36, denote the number of completed years of residence in Australia.

The succeeding graphs (Nos. 37 and 38) furnish a representation of length of residence combined with geographical distribution, the results represented being the numbers of each sex recorded in each State, who had been resident in Australia "under 20 years" and "20 years and over."

Length of Residence and State in which Enumerated, 1911.



GRAPH No. 37.



GRAPH No. 38.

These graphs furnish an interesting view of the marked growth from oversea in the populations of New South Wales, Queensland and Western Australia during the 20 years prior to the date of the Census.

The following table shews the proportion per cent. of the oversea population of each of the States and Territories which was contained in each of the length of residence groups specified in the foregoing table.

Distribution per cent. of Oversea Population according to Length of Residence in Australia, 1911.

Length of Residence in Australia in Years.	Period of Arrival.	States.						Territories.		C'wlth.
		N.S.W. %	Vic. %	Q'land. %	S.A. %	W.A. %	Tas. %	N.T. %	F.T. %	
		MALES.								
0–9 ..	1901–1911	25.19	16.13	21.51	21.45	40.75	16.41	10.62	28.87	23.43
10–19 ..	1891–1901	9.66	8.63	9.75	6.61	16.11	11.44	9.67	6.34	9.95
20–29 ..	1881–1891	29.88	25.81	36.12	17.47	24.36	30.95	50.92	16.90	28.80
30–39 ..	1871–1881	15.70	11.52	17.07	21.27	9.55	12.05	25.16	14.08	14.67
40–49 ..	1861–1871	7.65	13.10	10.71	10.40	4.72	7.61	2.20	9.16	9.45
50–59 ..	1851–1861	9.45	21.51	4.12	15.84	3.62	16.97	1.25	18.31	11.21
60 & over	before 1851	2.47	3.30	.72	6.96	.89	4.57	.18	6.34	2.49
All Durations ..		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
		FEMALES.								
0–9 ..	1901–1911	19.34	11.05	17.14	8.95	35.55	14.69	17.17	14.52	16.71
10–19 ..	1891–1901	8.33	6.32	7.58	4.71	16.97	9.34	31.31	9.68	7.96
20–29 ..	1881–1891	31.93	21.05	40.77	17.01	24.05	28.89	36.37	22.58	28.64
30–39 ..	1871–1881	14.67	9.93	17.11	20.70	8.80	8.80	6.06	12.90	13.66
40–49 ..	1861–1871	8.53	17.60	12.49	12.02	6.48	7.99	4.04	6.45	12.12
50–59 ..	1851–1861	12.99	29.26	4.11	24.91	6.62	23.03	4.04	24.19	16.74
60 & over	before 1851	4.21	4.79	.80	11.70	1.53	7.26	1.01	9.68	4.17
All Durations ..		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Distribution per cent. of Oversea Population according to Length of Residence in Australia, 1911—*continued.*

Length of Residence in Australia in Years.	Period of Arrival.	States.						Territories.		C'wlth.
		N.S.W. %	Vic. %	Q'land. %	S.A. %	W.A. %	Tas. %	N.T. %	F.T. %	
		PERSONS.								
0–9 ..	1901–1911	22.96	13.86	19.81	16.15	39.14	15.68	10.99	24.51	20.76
10–19 ..	1891–1901	9.15	7.60	8.91	5.80	16.37	10.55	10.88	7.35	9.16
20–29 ..	1881–1891	30.66	23.68	37.93	17.28	24.26	30.08	50.11	18.63	28.74
30–39 ..	1871–1881	15.31	10.81	17.09	21.03	9.32	10.68	24.10	13.73	14.27
40–49 ..	1861–1871	7.99	15.11	11.40	11.08	5.27	7.77	2.30	8.33	10.51
50–59 ..	1851–1861	10.80	24.97	4.11	19.69	4.55	19.53	1.40	20.10	13.40
60 & over	before 1851	3.13	3.97	.75	8.97	1.09	5.71	.22	7.35	3.16
All Durations ..		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

For the Commonwealth as a whole 29.92 per cent. of the oversea population had been resident in Australia for less than 20 years. This proportion varied in the several States and Territories, being 32.11 per cent. for New South Wales, 21.46 per cent. for Victoria, 28.72 per cent. for Queensland, 21.95 per cent. for South Australia, 55.51 per cent. for Western Australia, 26.23 per cent. for Tasmania, 21.87 per cent. for the Northern Territory, and 31.86 per cent. for the Federal Territory. The periods of maximum contribution were 1901-11 in the cases of Western Australia and the Federal Territory, 1881-91 in the cases of New South Wales, Queensland, Tasmania, the Northern Territory, and the Commonwealth as a whole, 1871-81 in the case of South Australia, and 1851-61 in the case of Victoria.

4. **Comparison with Migration Statistics.**—A comparison of the length of residence statistics with those of immigration for corresponding periods would furnish interesting results, but unfortunately the data relative to oversea immigration to Australia for early years is not readily available. The following table, however, gives the particulars as to net oversea immigration for the period 1861-1911, in comparison with the length of residence statistics, and furnishes some results of importance.

Net Immigration and Length of Residence.

Period.	Males.			Females.			Persons.		
	Net Immigration*	Survivors at Census of 1911 of immigrants during period.	Ratio of Survivors to net immigration.	Net Immigration*	Survivors at Census of 1911 of immigrants during period.	Ratio of Survivors to net immigration.	Net Immigration*	Survivors at Census of 1911 of immigrants during period.	Ratio of Survivors to net immigration.
1861–1871 ..	79,476	43,664	.549	87,414	36,832	.421	166,890	80,496	.482
1871–1881 ..	124,195	67,769	.546	67,609	41,527	.614	191,804	109,296	.570
1881–1891 ..	244,284	133,094	.545	138,457	87,052	.629	382,741	220,146	.575
1891–1901 ..	14,715	45,948	3.123	10,164	24,215	2.382	24,879	70,163	2.820
1901–1911 ..	30,822	108,272	3.513	9,663	50,794	5.257	40,485	159,066	3.929

* These figures relate to the decennia ended 31st December, 1870, 1880, etc.

As indicated above, the absence of complete statistics of oversea immigration prevents the preparation of a satisfactory comparison between the migration and the length of residence statistics. The figures for net immigration have been compiled from the returns of the several States, in which, although oversea and interstate migration for the earlier years are not separately shewn, the subtraction of the aggregate departures from the aggregate arrivals necessarily eliminates the interstate element and leaves for the Commonwealth as a whole the net immigration from oversea. If the departures consisted entirely or even mainly of what have been termed " birds of passage," a fairly satisfactory comparison would be furnished by the net result, but as the departures include many Australian-born, as well as oversea population of considerable length of residence, the utmost that can be obtained are general indications. A marked feature of the table is the distinction drawn between the period 1861-91 and the period 1891-1911. During the earlier period of 30 years the net immigration to Australia totalled 741,435, while the total number of survivors at the Census of 1911 of those who arrived during the period was 409,938, the survivors thus representing about 55 per cent. of the net immigration. For the latter period of 20 years from 1891-1911, however, the position is very different, the total net immigration being 65,364, and the total number of survivors of those who arrived during the period being 229,229, or $3\frac{1}{2}$ times the net immigration for the period. Allowing for deaths amongst the oversea population, these figures indicate that during the 20 years 1891-1911,

Australia, while receiving an immigration of upwards of 250,000 persons from outside, must have experienced an emigration of upwards of 180,000, who were either native-born, or had settled in Australia prior to 1891. Some of the causes contributing to this outflow were the commercial depression of 1891 and subsequent years, the financial crisis of 1893, the South African war of 1899-1902 and the drought of 1902-3.

For the ten years from 1st April, 1901, to 31st March, 1911, more complete details are available than can be obtained for the whole of the 50 years dealt with in the preceding table. These details relate to the 5 year period from 1st April, 1901, to 31st March, 1906, and to each of the succeeding five years, 1906-7 to 1910-11. Particulars for this period are available for arrivals and departures as well as for the net immigration, but it will be of interest to give first the figures in respect of net immigration for the sake of comparison with the preceding table.

Net Immigration and Length of Residence, 1901 to 1911.

Period.	Males.			Females.			Persons.		
	Net Immigration.	Survivors at Census of 1911 of immigrants during period.	Ratio of Survivors to net immigration.	Net Immigration.	Survivors at Census of 1911 of immigrants during period.	Ratio of Survivors to net immigration.	Net Immigration.	Survivors at Census of 1911 of immigrants during period.	Ratio of Survivors to net immigration.
1st April to 31st Mar.									
1901 „ 1906	— 4,666	19,164	— 4.107	— 10,610	9,704	— .915	— 15,276	28,868	— 1.890
1906 „ 1907	— 3,110	6,117	— 1.967	— 758	2,785	— 3.674	— 3,868	8,902	—2.301
1907 „ 1908	+ 5,620	9,831	+1.749	+ 2,899	4,705	+1.623	+ 8,519	14,536	+1.706
1908 „ 1909	+ 4,342	13,420	+3.091	+ 2,364	6,643	+2.810	+ 6,706	20,063	+2.992
1909 „ 1910	+16,314	18,481	+1.133	+ 6,847	9,283	+1.356	+23,161	27,764	+1.199
1910 „ 1911	+24,909	41,259	+1.656	+ 12,316	17,674	+1.435	+37,225	58,933	+1.583

Note.— + indicates net immigration ; — indicates net emigration.

A more satisfactory comparison of migration and survivors is furnished in the succeeding table, which gives particulars in respect of arrivals instead of net immigration.

Oversea Arrivals and Length of Residence, 1901 to 1911.

Period.	Males.			Females.			Persons.		
	Oversea Arrivals.	Survivors at Census of 1911 of immigrants during period.	Ratio of Survivors to Arrivals.	Oversea Arrivals.	Survivors at Census of 1911 of immigrants during period.	Ratio of Survivors to Arrivals.	Oversea Arrivals.	Survivors at Census of 1911 of immigrants during period.	Ratio of Survivors to Arrivals.
1st April to 31st Mar.									
1901 „ 1906	192,046	19,164	.100	82,605	9,704	.117	274,651	28,868	.105
1906 „ 1907	37,203	6,117	.164	18,910	2,785	.147	56,113	8,902	.159
1907 „ 1908	46,371	9,831	.212	23,016	4,705	.204	69,387	14,536	.209
1908 „ 1909	51,489	13,420	.261	24,482	6,643	.271	75,971	20,063	.264
1909 „ 1910	57,871	18,481	.319	25,818	9,283	.360	83,689	27,764	.332
1910 „ 1911	71,762	41,259	.575	33,182	17,674	.533	104,944	58,933	.562

This table furnishes an indication of the large extent to which the recorded arrivals in Australia from oversea countries are merely " birds of passage." Thus of the total of 274,651 who arrived in Australia during the five years ended 31st March, 1906, only 28,868, or 10½ per cent., were still in Australia at the date of the census. Similarly, less than 16 per cent. of those who arrived during the year 1906-7, and less than 21 per cent. of those who arrived during 1907-8 were still in Australia at the date of the census.

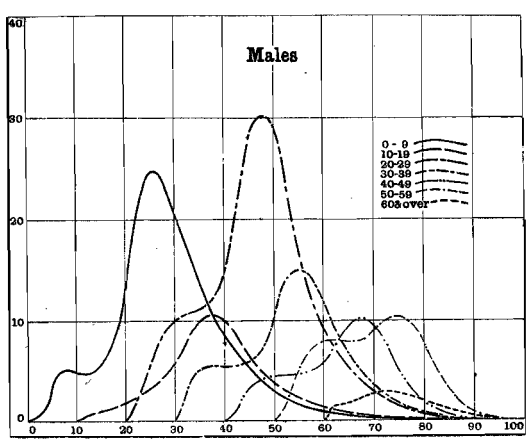
5. **Length of Residence and Age.**—Particulars respecting length of residence and age in conjunction were tabulated in single years from 0 to 4 and in quinquennial groups thence onwards. Details for each sex, and for the sexes combined are given in respect of the Commonwealth as a whole, and also in respect of each State and Territory on pages 392 to 419 of Volume II., Detailed Tables. A summary of the data in respect of the Commonwealth for some important age groups are as follows :—

Length of Residence and Age, Commonwealth Oversea Population, 1911.

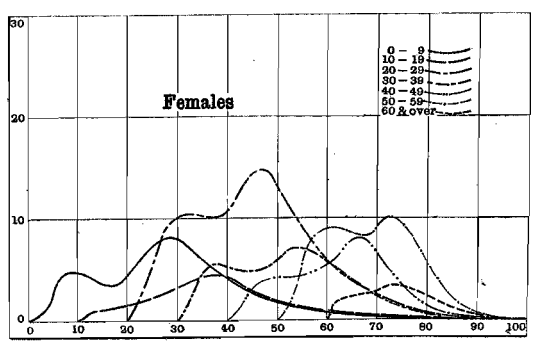
Length of Residence in Completed Years.	Age Last Birthday.						Total.
	Under 5.	5 to 14.	15 to 44.	45 to 59.	60 to 64.	65 and over.	
MALES.							
0–9	3,754	9,272	86,536	7,239	715	756	108,272
10–19	..	555	34,340	9,099	862	1,092	45,948
20–29	..	..	53,344	65,825	6,814	7,111	133,094
30–39	..	..	13,070	35,774	9,673	9,252	67,769
40–49	..	..	1,147	12,932	7,385	22,200	43'664
50–59	..	..	..	9,027	8,580	34,207	51,814
60 and over	..	..	..	..	1,459	10,063	11,522
Total	3,754	9,827	188,437	139,896	35,488	84,681	462,083
FEMALES.							
0–9	3,563	8,757	32,950	4,206	586	732	50,794
10–19	..	565	17,300	4,557	649	1,144	24,215
20–29	..	..	43,423	32,664	4,602	6,363	87,052
30–39	..	..	12,394	18,350	4,689	6,094	41,527
40–49	..	..	1,136	12,666	6,731	16,299	36,832
50–59	..	..	..	9,916	9,140	31,837	50,893
60 and over	..	..	..	..	1,626	11,048	12,674
Total	3,563	9,322	107,203	82,359	28,023	73,517	303,987
PERSONS.							
0–9	7,317	18,029	119,486	11,445	1,301	1,488	159,066
10–19	..	1,120	51,640	13,656	1,511	2,236	70,163
20–29	..	..	96,767	98,489	11,416	13,474	220,146
30–39	..	..	25,464	54,124	14,362	15,346	109,296
40–49	..	..	2,283	25,598	14,116	38,499	80,496
50–59	..	..	..	18,943	17,720	66,044	102,707
60 and over	..	..	..	..	3,085	21,111	24,196
Total	7,317	19,149	295,640	222,255	63,511	158,198	766,070

The accompanying graphs (Nos. 39 and 40) furnish a representation of the oversea population of Australia at the Census of 1911, distributed according to length of residence and age. The base of each small rectangle represents ten years of age, while the height represents 10,000 persons. The key in each graph indicates the type of curve used for the several durations of residence represented.

Length of Residence and Age, 1911.



GRAPH No. 39.



GRAPH No. 40.

The dimorphic or double-headed character of the several curves is due to the fact that the immigrants contain a fair proportion of married persons with children under ten years of age. The fully detailed figures corresponding to the above graphs will be found in Vol. II., pp. 392-3.

6. **Survivors from Previous Censuses.**—By means of the length of residence data taken in conjunction with statistics of age for the Australian-born population, a close estimate may be made of the number of survivors at the Census of 1911 of those recorded at previous censuses. Such an estimate is given in the succeeding table together with a comparison of the figures so obtained with the results of the Censuses of 1881, 1891 and 1901.

Survivors from 1881, 1891 and 1901, in Commonwealth Population, 1911.

Date of Census.	Number Recorded at Census Specified.			Estimated Number of Survivors at Census of 1911.			Ratio per cent. of Survivors to Number Recorded.		
	Males.	Females.	Persons.	Males.	Females.	Persons.	Males.	Females	Persons.
3rd April, 1881	1,214,913	1,035,281	2,250,194	735,350	699,033	1,434,383	60.53	67.52	63.74
5th ,, 1891	1,704,039	1,470,353	3,174,392	1,238,012	1,165,428	2,403,440	72.65	79.26	75.71
31st Mar.,1901	1,977,928	1,795,873	3,773,801	1,715,505	1,616,626	3,332,131	86.73	90.02	88.30

These figures indicate that 63.74 per cent. of the population present in Australia at the Census of 1881 were present at that of 1911, the corresponding percentages for 1891 and 1901 being 75.71 per cent. and 88.30 per cent. respectively. In other words, of the population present in Australia at the Census of 1881, 36.26 per cent. had died or departed in the succeeding 30 years; of those present at the Census of 1891, 24.29 per cent. had died or departed in the succeeding 20 years; while of those present at the Census of 1901, 11.70 per cent. had died or departed during the succeeding 10 years.

Viewed from the opposite standpoint, it may be said that of the population at the Census of 1911, 74.80 per cent. had been present at the Census of 1901, 53.95 per cent. had been present at the Census of 1891, and 32.20 had been present at the Census of 1881. In other words, of the population at the Census of 1911, 25.20 per cent. had arrived or had been born in Australia during the preceding 10 years, 46.05 per cent. had arrived or had been born in Australia during the preceding 20 years, and 67.80 per cent. had arrived or had been born in Australia during the preceding 30 years.

7. **Advanced Ages.**—For the purpose of facilitating estimates for Old Age Pension purposes based on age and length of residence, the data for single ages from 50 to 64 inclusive, and for lengths of residence from 10 to 24 years were tabulated in conjunction. These data appear on pp. 422 to 439 of Volume II. of the Detailed Tables. They are there given for each sex for the Commonwealth and its component States and Territories.

8. **Eligibility for Old Age Pensions.**—Under the present Commonwealth law, the age qualification for males is 65 years, and for females 60 years, whilst the length of residence qualification is in each case 20 years.

In cases of incapacitation the qualifying age for males is reduced to 60 years.

The total recorded number of males aged 65 and upwards at the date of the census was 101,003, of whom 99,155 or 98.17 per cent., had the requisite length of residence qualification.

In the case of females the total number aged 60 and upwards at the date of the census was 135,067, of whom 131,956, or 97.70 per cent., had the necessary residence qualification.

It thus appears that of a total of 236,070 persons qualified in respect of age, 231,111, or 97.90 per cent., were also qualified in respect of length of residence.

The effect as at the date of the census of reducing the general age qualification for males to 60 would be to increase the number of eligible males by 49,054, or 49.47 per cent., and to increase the total number of persons eligible by 21.23 per cent.

It will be understood that the term eligible as here used refers only to age and length of residence. Statistics of eligibility in respect of financial position were, of course, not available in connexion with the census data.

9. **Comparison of Pensioners with Eligible Persons.**—In the course of an investigation made by the Commonwealth Statistician respecting the mortality experience of old age pensioners, statistics were obtained concerning the number of such pensioners at successive ages at the date of the census. A comparison of the figures so obtained with those relating to eligibility furnished by the length of residence data is given in the following table for quinquennial groups of ages:—

Old Age Pensioners and Eligible Persons as at 3rd April, 1911.

Age Last Birthday.	Number having not less than 20 Years' Length of Residence.			Number of Old Age Pensioners at Date of Census.			Ratio per cent. of Pensioners to Number having not less than 20 Years' Residence.		
	Males.	Females.	Persons.	Males.	Females.	Persons.	Males.	Females.	Persons.
60 to 64 ..	50,182	43,027	93,209	1,128	5,294	6,422	2.25	12.30	6.89
65 „ 69 ..	39,618	35,875	75,493	9,026	10,748	19,774	22.78	29.96	26.19
70 „ 74 ..	28,684	25,590	54,274	11,070	10,507	21,577	38.59	41.06	39.76
75 „ 79 ..	18,682	16,343	35,025	8,175	7,677	15,852	43.76	46.97	45.26
80 „ 84 ..	8,767	7,612	16,379	3,583	3,133	6,716	40.87	41.16	41.00
85 „ 89 ..	2,621	2,656	5,277	982	1,005	1,987	37.47	37.84	37.65
90 „ 94 ..	634	699	1,333	247	288	535	38.96	41.20	40.14
95 „ 99 ..	116	125	241	36	37	73	31.03	29.60	30.29
100 and over..	33	29	62	13	10	23	39.39	34.48	37.10
Total, 60 & over	149,337	131,956	281,293	34,260	38,699	72,959	22.94	29.33	25.94

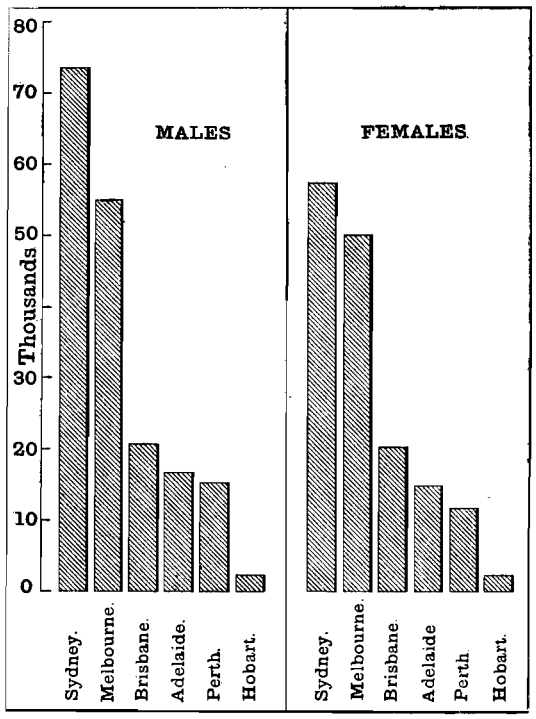
These figures indicate that for all ages, from 60 to 95, the number of female pensioners is a higher proportion of the number of females having the requisite qualifications in respect of age and length of residence than is the case with males. The ratio per cent. of pensioners aged 65 and upwards to the number of such age having not less than 20 years' residence was **33.41** per cent. in the case of males, 37.56 per cent. in the case of females, and 35.38 per cent. for the sexes combined. The corresponding percentages for those aged 70 and upwards were as follows :—Males, 40.49 per cent.; females, 42.71 per cent.; and for the sexes combined, 41.53 per cent.

10. **Metropolitan Population.**—In Chapter XI., dealing with birthplaces, it was shewn that there was a much greater tendency for the oversea population of the Commonwealth to aggregate in the metropolitan areas, than was the case with the native-born. An analysis of the figures relating to length of residence furnishes evidence that this tendency is much more marked amongst the arrivals of comparatively recent years than is the case with those who emigrated to Australia in the early years of its settlement. The following table furnishes particulars in respect of the numbers for certain grouped lengths of residence, who were resident in the several metropolitan areas at the date of the census.

Metropolitan Population from Oversea Countries, 1911.

Length of Residence in Completed Years.	Sydney and Suburbs.	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total Metropolitan.
MALES.							
0–9	19,671	9,529	4,728	3,218	4,969	475	42,590
10–19	8,088	5,518	1,506	1,162	2,716	292	19,282
20–29	24,761	17,365	8,479	3,420	4,387	698	59,110
30–39	11,280	6,937	2,979	4,006	1,531	265	26,998
40–49	4,272	5,891	1,990	1,608	840	157	14,758
50–59	4,405	8,463	686	2,222	630	310	16,716
60 and over	975	1,172	110	986	152	109	3,504
Total	73,452	54,875	20,478	16,622	15,225	2,306	182,958
FEMALES.							
0–9	12,530	6,631	3,754	1,673	4,016	404	29,008
10–19	5,374	3,695	1,409	785	1,920	203	13,386
20–29	19,577	12,936	8,521	2,861	2,897	616	47,408
30–39	8,200	5,496	3,063	3,343	974	179	21,255
40–49	4,290	7,675	2,314	1,572	757	156	16,764
50–59	5,614	11,763	801	3,012	729	432	22,351
60 and over	1,617	1,820	152	1,471	152	164	5,376
Total	57,202	50,016	20,014	14,717	11,445	2,154	155,548
PERSONS.							
0–9	32,201	16,160	8,482	4,891	8,985	879	71,598
10–19	13,462	9,213	2,915	1,947	4,636	495	32,668
20–29	44,338	30,301	17,000	6,281	7,284	1,314	106,518
30–39	19,480	12,433	6,042	7,349	2,505	444	48,253
40–49	8,562	13,566	4,304	3,180	1,597	313	31,522
50–59	10,019	20,226	1,487	5,234	1,359	742	39,067
60 and over	2,592	2,992	262	2,457	304	273	8,880
Total	130,654	104,891	40,492	31,339	26,670	4,460	338,506

Metropolitan Oversea Population, 1911.



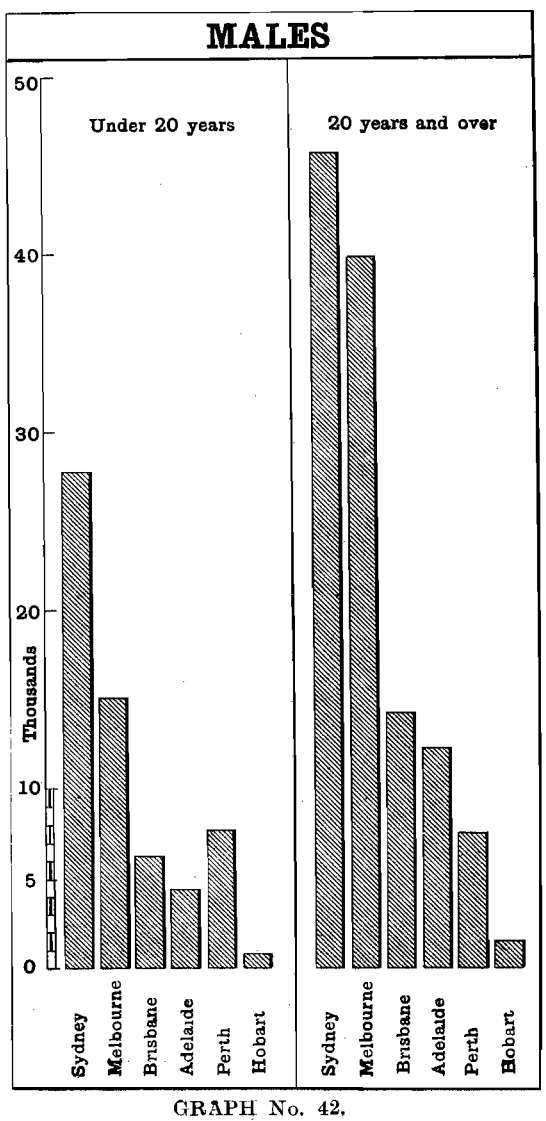
GRAPH No. 41.

In the accompanying graph (No. 41) a representation is furnished of the oversea population of each sex that was resident in the metropolitan centres of the Commonwealth at the Census of 1911. In each case the representation given is that for the specified capital city and its suburbs, usually within a distance of approximately ten miles from the G.P.O.

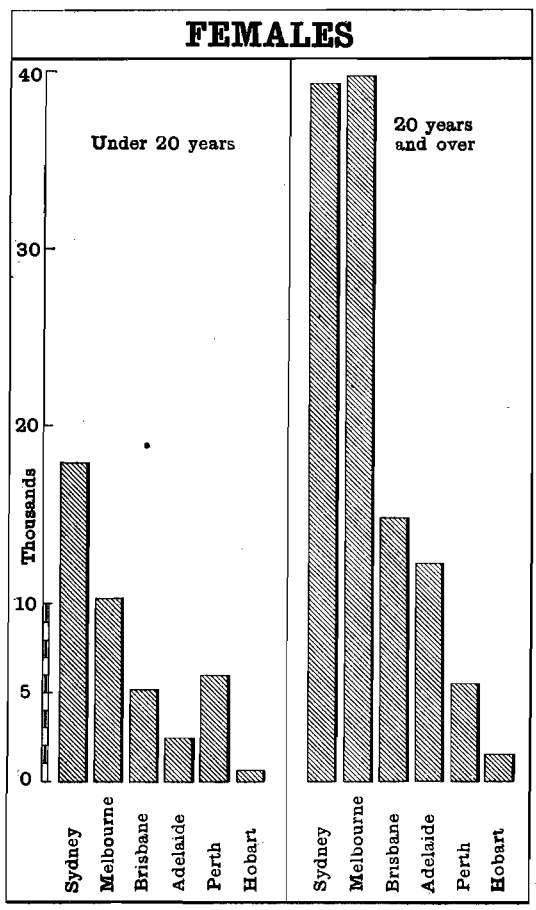
In each case the number of males exceeded the number of females, the difference being most marked in the case of Sydney, and least marked in the cases of Melbourne, Brisbane, and Hobart.

As regards the length of residence the maximum numbers occurred in the period 20-29, in both sexes, in the cases of Sydney, Melbourne, Brisbane, and Hobart; in the period 30-39, in both sexes, in the case of Adelaide; and in the period 0-9, in both sexes, in the case of Perth.

Length of Residence of Metropolitan Oversea Population, 1911.



GRAPH No. 42.



GRAPH No. 43.

The accompanying graphs (Nos. 42 and 43) furnish a further representation of the metropolitan oversea population, distinguishing between those resident in the Commonwealth "under 20 years" and those so resident "20 years and over."

The following table shews the proportion per cent. of the population having the lengths of residence specified who were resident in the metropolitan areas of the Commonwealth and the several States :—

Proportion per cent. Resident in Metropolitan Areas, 1911.

Length of Residence in Years.	N.S.W. %	Vic. %	Q'land. %	S.A. %	W.A. %	Tas. %	C'wlth. %
MALES.							
0–9	48.11	53.09	23.19	45.91	24.52	30.51	39.34
10–19	51.59	57.48	16.29	53.77	33.92	26.89	41.96
20–29	51.06	60.47	24.76	59.89	36.23	23.76	44.41
30–39	44.27	54.14	18.40	57.63	32.24	23.16	39.84
40–49	34.40	40.42	19.60	47.34	35.82	21.75	33.80
50–59	28.71	35.36	17.58	42.92	34.98	19.24	32.26
60 and over	24.31	31.97	16.15	43.34	34.31	25.12	30.41
ALL DURATIONS ..	45.25	49.32	21.60	50.86	30.62	24.29	39.59
FEMALES.							
0–9	64.74	66.67	36.24	77.71	50.60	39.61	57.11
10–19	64.43	64.96	30.76	69.35	50.69	31.28	55.28
20–29	61.25	68.30	34.59	69.90	53.96	30.71	54.46
30–39	55.85	61.50	29.63	67.12	49.59	29.30	51.18
40–49	50.22	48.46	30.65	54.36	52.28	28.11	45.51
50–59	43.19	44.69	32.27	50.25	49.32	27.02	43.92
60 and over	38.41	42.21	31.47	52.24	44.44	32.54	42.42
ALL DURATIONS ..	57.15	55.58	33.12	61.17	51.26	31.02	51.17
PERSONS.							
0–9	53.45	57.93	27.59	53.38	31.86	34.11	45.01
10–19	56.05	60.26	21.08	59.13	39.30	28.53	46.56
20–29	55.11	63.58	28.87	64.07	41.68	26.58	48.39
30–39	48.50	57.16	22.78	61.59	37.32	25.30	44.15
40–49	40.84	44.61	24.31	50.56	42.10	24.51	39.16
50–59	35.35	40.24	23.29	46.85	41.45	23.12	38.04
60 and over	31.53	37.50	22.51	48.26	38.73	29.10	36.70
ALL DURATIONS ..	49.79	52.12	26.09	55.23	37.02	27.14	44.19

It will be seen from the foregoing tables that taking the Commonwealth as a whole, a larger proportion of those who have arrived in Australia during the last 30 years are residents of metropolitan areas than is the case with those who arrived here upwards of 30 years ago. Thus, of 449,375 who arrived within the period 1881-1911, a total of 210,784, or 46.91 per cent., were resident in metropolitan areas, while of 316,695 who arrived prior to 1881, the number resident in metropolitan areas was 127,722, or 40.33 per cent. As previously stated the proportion of the native-born resident in metropolitan areas was 36.75 per cent.

CHAPTER XIII.

EDUCATION.

1. **Nature and Scope of Inquiry.**—The Census and Statistics Act, 1905, specifies "Education" as one of the subjects concerning which inquiry shall be made at the taking of a Census of the Commonwealth, but gives no indication of the range of the inquiry to be made. In the past it has been usual in Australia to restrict the inquiry to a query as to ability to read and write, with occasionally an additional request that in the event of the person enumerated being a University graduate the degree and the name of the University should be stated. From the nature of the case it is clear that a general inquiry concerning education made in connexion with a Census must necessarily be limited in its range, and it has been found on the present occasion that even the question relating to University degrees is by no means suitable. The query on the Census card appeared in the following form :—

"13. Education.....

"13. (*a*) At present receiving Education....."

The corresponding instruction furnished therewith was as follows :—

"Line 13.—Write CR for cannot read, R for read only, and RW for read and write. If "not able to read English, but able to read a foreign language write RF, and if not "able to read and write English but able to both read and write a foreign language "write RWF.

"If the person to whom the card relates has obtained a University degree, state the degree, "and give the name of the University and country in which it was obtained.

"Line 13 (*a*).—Write U if at University, S if at State School, P if at any other school, and "H if being educated at home. Give name of school."

As 13 (*a*) refers to persons in receipt of education at the date of the Census, it will be dealt with more fully in the succeeding chapter on "Schooling."

The inquiry relative to University degrees elicited replies which defied satisfactory tabulation. Not only were there many cases in which known holders of degrees had failed to furnish the desired information, apparently through failure to carefully read the instructions, but there were many cases in which existing and non-existent degrees of existing and non-existent Universities were recorded as possessed by persons whose acquaintance with a University must have been a negligible quantity. In one instance a camp of half-caste aboriginals had all returned themselves as Bachelors of Science.

The cards relating to alleged holders of University degrees were sorted out for tabulation, but after a careful examination of the material so available it was decided that a tabulation of such data would not only be labour wasted, but would be actually misleading.

As regards the other general education inquiry, viz., the ability to read and write in English or other language, it may be doubted whether such an inquiry is of sufficient importance to warrant its inclusion in the Census schedule. With the enforcement of compulsory education the number of cases in which persons reach mature age unable to read is necessarily very small and relatively insignificant.

As previously indicated, the making of an elaborate inquiry as to education would be impracticable in connexion with a Census. It would consequently appear desirable to drop the question entirely and to substitute for it an inquiry on some other subject likely to lead to more serviceable results.

2. **Tabulation of Data.**—In accordance with the usual Australian practice the data have been tabulated for States and Territories and the main divisions thereof according to education, sex and age in combination. It was considered, however, that no useful purpose would be served by continuing the usual practice of tabulating the data for each of the categories in quinquennial age groups to the extremes of old age, since, except under very rare circumstances, persons who had reached the age of 20 without being able to read or write would remain illiterate throughout life. It was consequently decided to limit the age groups to (i.) under 5 ; (ii.) 5–9 ; (iii.) 10–14 ; (iv.) 15–19 ; (v.) 20 and upwards ; and (vi.) unspecified ; thus effecting a saving of fully 50 per cent. in space and more than that in labour without in any way detracting from the real value of the results. The tabulated details appear on pp. 441 to 621 of Volume II., Detailed Tables.

In classifying the data for this tabulation a rule was made that all children under the age of 5 should be classed as unable to read, since the degree of proficiency attained in the first five years is usually so small as to be negligible.

3. **Education Unspecified.**—Of the various items of inquiry on the personal card there was none which furnished so large a proportion of unspecified as did that relating to Education. Notwithstanding the facts (i.) that all children under 5 years of age, whether specified as to education or not, were classified as unable to read, (ii.) that all unspecified persons whose occupations were such as to render writing necessary were classed as able to read and write, and (iii.) that all unspecified children above 5 years of age who were returned as attending school at the date of the Census were classified as able to read and write, there were still 95,727 tabulated as unspecified, representing 2.15 per cent. of the total population, or 2.44 per cent. of the population aged 5 years and upwards. For the purposes of the analyses contained in the present chapter, the numbers relative to the unspecified have been proportionately distributed over the other categories, special attention being given to the question of birthplace in the case of ability to read or write a foreign language only.

4. **General Results.**—The numbers of each sex possessing the specified degrees of education in the several States and Territories of the Commonwealth at the Census of 3rd April, 1911, were as follows :—

Degree of Education, 1911.

Degree of Education.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas	N.T.	F.T.	
MALES.									
English Language—									
Read and Write ..	712,051	559,721	270,621	173,126	133,004	78,398	1,148	838	1,928,907
Read only	2,650	1,311	1,170	573	326	473	4	9	6,516
Foreign Language only									
Read and Write ..	6,899	4,199	7,172	1,343	5,155	211	898	2	25,879
Read only	593	631	803	120	365	24	32	..	2,568
Cannot Read ..	135,505	89,729	49,740	32,196	22,715	18,485	652	143	349,165
Total	857,698	655,591	329,506	207,358	161,565	97,591	2,734	992	2,313,035
FEMALES.									
English Language—									
Read and Write ..	660,566	571,570	228,949	169,374	99,114	76,806	320	584	1,807,283
Read only	3,250	2,729	1,307	1,027	266	424	..	5	9,008
Foreign Language only									
Read and Write ..	680	699	1,842	555	332	32	42	..	4,182
Read only	64	70	262	92	15	4	..	..	507
Cannot Read ..	124,476	84,892	43,947	30,152	20,822	16,354	214	133	320,990
Total	789,036	659,960	276,307	201,200	120,549	93,620	576	722	2,141,970
PERSONS.									
English Language—									
Read and Write ..	1,372,617	1,131,291	499,570	342,500	232,118	155,204	1,468	1,422	3,736,190
Read only	5,900	4,040	2,477	1,600	592	897	4	14	15,524
Foreign Language only									
Read and Write ..	7,579	4,898	9,014	1,898	5,487	243	940	2	30,061
Read only	657	701	1,065	212	380	28	32	..	3,075
Cannot Read ..	259,981	174,621	93,687	62,348	43,537	34,839	866	276	670,155
Total	1,646,734	1,315,551	605,813	408,558	282,114	191,211	3,310	1,714	4,455,005

The number of persons able to " read and write " or " read only " in a foreign language, but not in English, was 33,136, or about 7.5 per thousand of the population, while the number able to " read only " in English was 15,524, or about 3.5 per thousand. On the other hand the number able to read and write English aggregated 3,736,190, or about 84 per cent. of the total. This position is further accentuated if the population under five years of age be eliminated from consideration. Thus the total number and proportion of persons unable to read, but above the age of 5 years, were as follows :—

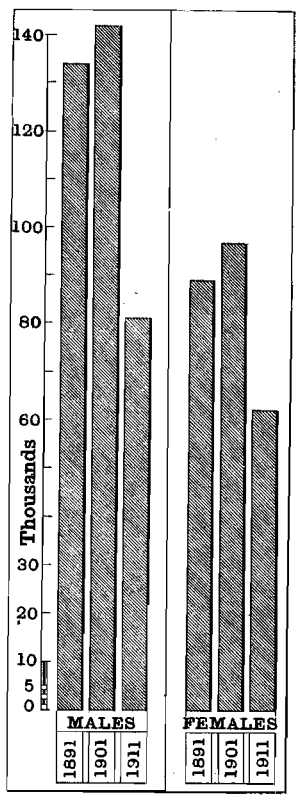
Number and Proportion above 5 Years of Age Unable to Read, 1911.

Particulars.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
NUMBER UNABLE TO READ.									
Males	33,261	16,451	11,936	8,043	4,963	5,812	568	58	81,092
Females	25,405	14,270	7,903	6,678	3,546	4,175	127	36	62,140
Persons	58,666	30,721	19,839	14,721	8,509	9,987	695	94	143,232
PROPORTION PER CENT. OF POPULATION ABOVE 5 YEARS.									
Males	4.40	2.83	4.09	4.39	3.45	6.84	21.43	6.39	3.97
Females	3.68	2.42	3.29	3.76	3.43	5.13	25.97	5.76	3.30
Persons	4.06	2.62	3.73	4.08	3.44	6.00	22.14	6.14	3.65

Leaving the Territories out of account, Victoria had the most satisfactory and Tasmania the least satisfactory percentage for both sexes.

Number and Proportion above 5 Years of Age Unable to Read.—Commonwealth, 1891-1911.

(*a*) **Number.**

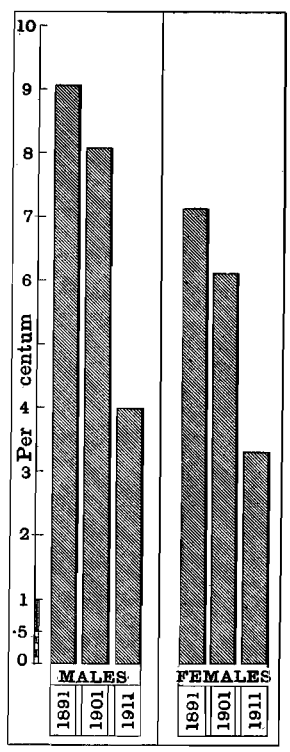


GRAPH No. 44.

The accompanying graphs (Nos. 44 and 45) furnish for the Censuses of 1891 to 1911 a representation of the number of persons of each sex above the age of 5 years who were unable to read (No. 44), and of the proportion which this number bore in each case to the total number of such sex and age (No. 45). It will be readily seen from these, that although the actual number unable to read was slightly higher for each sex in 1901 than in 1891, the proportion of illiterates has continually diminished, the fall for the period 1901 to 1911 being very marked.

At each of the Censuses the number and proportion of male illiterates above the age of five years was greater than the corresponding number and proportion of females, the excess being least marked in the case of the Census of 1911.

(*b*) **Proportion.**



GRAPH No. 45.

For the Commonwealth as a whole for the last three Censuses the number and proportion of those above the age of 5 years who were unable to read were as follows :—

Number and Proportion above 5 Years of Age Unable to Read.

Particulars.	Males.			Females.			Persons.		
	1891.	1901.	1911.	1891.	1901.	1911.	1891.	1901.	1911.
Number unable to read	133,720	141,876	81,092	88,948	96,498	62,140	222,668	238,374	143,232
Proportion per cent. of Persons aged 5 years and upwards ..	9.05	8.07	3.97	7.12	6.10	3.30	8.17	7.14	3.65

The progressive decline at successive Censuses of the proportion above 5 years of age unable to read, furnishes satisfactory evidence of the development of elementary education in Australia.

5. **Education and Age.**—Tabulated in conjunction with age, the data in respect of Education for the Commonwealth as a whole are as follows :—

Education and Age, Commonwealth, 1911.

Degree of Education.	Age last Birthday.					All Ages.
	Under 5.	5–9.	10–14.	15–19.	20 and over	
MALES.						
English Language—						
Read and Write	..	186,650	214,609	225,328	1,302,320	1,928,907
Read only	..	1,171	92	114	5,139	6,516
Foreign Language only—						
Read and Write	..	60	172	955	24,692	25,879
Read only	..	31	11	55	2,471	2,568
Cannot Read	268,073	42,247	1,460	1,877	35,508	349,165
Total	268,073	230,159	216,344	228,329	1,370,130	2,313,035
FEMALES.						
English Language—						
Read and Write	..	185,204	211,620	222,105	1,188,354	1,807,283
Read only	..	1,159	76	51	7,722	9,008
Foreign Language only—						
Read and Write	..	48	99	106	3,929	4,182
Read only	..	8	6	5	488	507
Cannot Read	258,850	37,787	1,069	871	22,413	320,990
Total	258,850	224,206	212,870	223,138	1,222,906	2,141,970
PERSONS.						
English Language—						
Read and Write	..	371,854	426,229	447,433	2,490,674	3,736,190
Read only	..	2,330	168	165	12,861	15,524
Foreign Language only—						
Read and Write	..	108	271	1,061	28,621	30,061
Read only	..	39	17	60	2,959	3,075
Cannot Read	526,923	80,034	2,529	2,748	57,921	670,155
Total	526,923	454,365	429,214	451,467	2,593,036	4,455,005

Of the population between the ages of 5 and 10, there were 80,034, or about 17½ per cent. who were unable to read, while between 10 and 15 less than 6 per thousand, and between 15 and 20 almost exactly 6 per thousand could not read. Above age 20 there were 57,921 unable to read, representing about 2¼ per cent. of the total population above 20 years of age.

6. **Read and Write, English.**—The number and proportion of those of each sex in each State and Territory who could read and write English is given in the following table for the age groups used in this tabulation.

Read and Write, English, 1911.

State or Territory.	Age. 5–9. Number.	5–9. Percentage on total for age group.	10–14. Number.	10–14. Percentage on total for age group.	15–19. Number.	15–19. Percentage on total for age group.	20 and over. Number.	20 and over. Percentage on total for age group.	All Ages above 5 Years. Number.	All Ages above 5 Years. Percentage on total above 5 years.
MALES.										
STATES—										
New South Wales ..	67,223	78.77	78,642	99.14	82,564	98.85	483,622	95.34	712,051	83.02
Victoria	55,462	84.27	63,491	99.55	67,732	99.31	373,036	97.01	559,721	85.38
Queensland	27,512	85.61	31,194	98.96	32,322	98.23	179,593	92.03	270,621	82.13
South Australia ..	15,653	76.33	19,493	99.33	21,381	98.78	116,599	96.02	173,126	83.49
Western Australia ..	12,128	81.71	11,684	98.87	11,433	96.13	97,759	92.87	133,004	82.32
Tasmania	8,565	75.52	9,955	98.41	9,743	97.61	50,135	93.75	78,398	80.33
TERRITORIES—										
Northern	42	44.68	49	75.38	58	73.42	999	41.42	1,148	41.99
Federal	65	72.22	101	100.00	95	98.96	577	93.06	838	84.48
Total	186,650	81.10	214,609	99.20	225,328	98.69	1,302,320	95.05	1,928,907	83.39
FEMALES.										
STATES—										
New South Wales ..	67,392	80.91	77,678	99.38	81,120	99.51	434,376	97.18	660,566	83.72
Victoria	54,871	85.62	62,522	99.71	68,023	99.75	386,154	97.92	571,570	86.61
Queensland	27,163	86.30	30,796	99.18	30,877	99.39	140.113	95.53	228,949	82.86
South Australia ..	15,423	77.52	19,353	99.47	21,390	99.60	113,208	96.84	169,374	84.18
Western Australia ..	11,969	82.90	11,573	99.19	10,826	99.44	64,746	97.69	99,114	82.22
Tasmania	8,278	76.42	9,567	98.83	9,725	98.87	49,236	96.37	76,806	82.04
TERRITORIES—										
Northern	42	47.73	41	68.33	51	69.86	186	69.40	320	55.56
Federal ..	66	71.74	90	100.00	93	100.00	335	95.71	584	80.89
Total	185,204	82.60	211,620	99.41	222,105	99.54	1,188,354	97.17	1,807,283	84.37
PERSONS.										
STATES—										
New South Wales ..	134,615	79.83	156,320	99.26	163,684	99.18	917,998	96.20	1,372,617	83.35
Victoria	110,333	84.94	126,013	99.63	135,755	99.53	759,190	97.47	1,131,291	85.99
Queensland	54,675	85.95	61,990	99.07	63,199	98.80	319,706	93.53	499,570	82.46
South Australia ..	31,076	76.92	38,846	99.40	42,771	99.19	229,807	96.42	342,500	83.83
Western Australia ..	24,097	82.30	23,257	99.02	22,259	97.71	162,505	94.73	232,118	82.28
Tasmania	16,843	75.96	19,522	98.62	19,468	98.23	99,371	95.03	155,204	81.17
TERRITORIES—										
Northern	84	46.15	90	72.00	109	71.71	1,185	44.22	1,468	44.35
Federal	131	71.98	191	100.00	188	99.47	912	94.02	1,422	82.96
Total	371,854	81.84	426,229	99.30	447,433	99.11	2,490,674	96.05	3,736,190	83.86

Amongst the States, Queensland had the highest proportion able to read and write in the age group 5–9, while Victoria had the highest proportion in all the other groups. At the other extreme, Tasmania had the lowest proportion in the age groups 5–9, and 10–14; Western Australia in the age group 15–19, and Queensland in the age group 20 and over. For the Commonwealth as a whole 96 per cent. of the population aged 20 and over were able to read and write English. In all the States and in all age groups the proportions able to read and write English were higher in the case of females than in that of males.

7. **Read only, English.**—Particulars in respect of sex and age for those able to " read only " in English are given in the following table:—

Read only, English, 1911.

State or Territory.	Age.								All Ages above 5 Years.	
	5–9.		10–14.		15–19.		20 and over.			
	Number.	Per 1000 of total for age group.	Number.	Per 1000 of total for age group.	Number.	Per 1000 of total for age group.	Number.	Per 1000 of total for age group.	Number.	Per 1000 of total above 5 years.
MALES.										
STATES—										
New South Wales ..	452	5.30	34	.43	48	.57	2,116	4.17	2,650	3.09
Victoria	166	2.52	9	.14	19	.28	1,117	2.90	1,311	2.00
Queensland	308	9.58	17	.54	10	.30	835	4.28	1,170	3.55
South Australia ..	86	4.19	1	.05	5	.23	481	3.96	573	2.76
Western Australia ..	80	5.39	15	1.27	5	.42	226	2.15	326	2.02
Tasmania	77	6.79	16	1.58	27	2.70	353	6.60	473	4.85
TERRITORIES—										
Northern	..	..	..	..	..	..	4	1.66	4	1.46
Federal	2	22.22	..	..	..	..	7	11.29	9	9.07
Total	1,171	5.09	92	.43	114	.50	5,139	3.75	6,516	2.82
FEMALES.										
STATES—										
New South Wales ..	431	5.17	30	.38	25	.31	2,764	6.18	3,250	4.12
Victoria	204	3.18	11	.18	7	.10	2,507	6.36	2,729	4.14
Queensland	253	8.04	13	.42	8	.26	1,033	7.04	1,307	4.73
South Australia ..	144	7.24	5	.26	6	.28	872	7.46	1,027	5.10
Western Australia ..	54	3.74	4	.34	..	..	208	3.14	266	2.21
Tasmania	73	6.74	13	1.34	5	.51	333	6.52	424	4.53
TERRITORIES—										
Northern	..	..	..	..	..	..	..	..	..	..
Federal	..	..	..	..	..	..	5	14.29	5	6.93
Total	1,159	5.17	76	.36	51	.23	7,722	6.31	9,008	4.21
PERSONS.										
STATES—										
New South Wales ..	883	5.24	64	.41	73	.44	4,880	5.11	5,900	3.58
Victoria	370	2.85	20	.16	26	.19	3,624	4.65	4,040	3.07
Queensland	561	8.82	30	.48	18	.28	1,868	5.46	2,477	4.09
South Australia ..	230	5.69	6	.15	11	.26	1,353	5.68	1,600	3.92
Western Australia ..	134	4.58	19	.81	5	.22	434	2.53	592	2.10
Tasmania	150	6.76	29	1.46	32	1.61	686	6.56	897	4.69
TERRITORIES—										
Northern	..	..	..	..	..	..	4	1.49	4	1.21
Federal	2	10.99	..	..	..	..	12	12.37	14	8.17
Total	2,330	5.13	168	.39	165	.37	12,861	4.96	15,524	3.48

Of the population aged 20 and over about 5 per 1000 were able to read English, but not to write it. Amongst the States this proportion varied between the limits of 6½ per 1000 for Tasmania and 2½ per 1000 in the case of Western Australia.

8. **Read and Write, Foreign.**—Of a total of 30,061 at the Census of 1911 who were able to read and write in a foreign language, but not in English, 28,621, or about 95 per cent., were aged 20 years or upwards. Particulars in respect of sex and age are as follows :—

Read and Write, Foreign Language only, 1911.

State or Territory.	Age. 5–9. Number.	5–9. Per 1000 of total for age group.	10–14. Number.	10–14. Per 1000 of total for age group.	15–19. Number.	15–19. Per 1000 of total for age group.	20 and over. Number.	20 and over. Per 1000 of total for age group.	All Ages above 5 Years. Number.	All Ages above 5 Years. Per 1000 of total above 5 years.
MALES.										
STATES—										
New South Wales ..	7	.08	35	.44	239	2.86	6,618	13.05	6,899	8.04
Victoria	2	.03	21	.33	158	2.32	4,018	10.45	4,199	6.40
Queensland	44	1.37	86	2.73	162	4.91	6,880	35.26	7,172	21.77
South Australia ..	1	.05	5	.25	101	4.67	1,236	10.18	1,343	6.48
Western Australia ..	2	.13	16	1.35	287	24.13	4,850	46.08	5,155	31.91
Tasmania	..	..	..	..	..	..	211	3.95	211	2.16
TERRITORIES—										
Northern ..	4	42.55	9	138.46	8	101.27	877	363.60	898	328.46
Federal	..	..	..	..	..	..	2	3.23	2	2.02
Total	60	.26	172	.80	955	4.18	24,692	18.02	25,879	11.19
FEMALES.										
STATES—										
New South Wales ..	1	.01	12	.15	23	.28	644	1.44	680	.86
Victoria	4	.06	9	.14	27	.40	659	1.67	699	1.06
Queensland	28	.89	60	1.93	41	1.32	1,713	11.68	1,842	6.67
South Australia ..	3	.15	8	.41	2	.09	542	4.64	555	2.76
Western Australia ..	5	.35	7	.60	10	.92	310	4.68	332	2.75
Tasmania	1	.09	..	..	1	.10	30	.59	32	.34
TERRITORIES—										
Northern .. .	6	68.18	3	50.00	2	27.40	31	115.67	42	72 92
Federal	..	..	..	..	..	..	..	..	..	..
Total	48	.21	99	.47	106	.48	3,929	3.21	4,182	1.95
PERSONS.										
STATES—										
New South Wales ..	8	.05	47	.30	262	1.59	7,262	7.61	7,579	4.60
Victoria	6	.05	30	.24	185	1.36	4,677	6.00	4,898	3.72
Queensland	72	1.13	146	2.33	203	3.17	8,593	25.14	9,014	14.88
South Australia ..	4	.10	13	.33	103	2.39	1,778	7.46	1,898	4.65
Western Australia ..	7	.24	23	.98	297	13.04	5,160	30.08	5,487	19.45
Tasmania	1	.05	..	..	1	.05	241	2.30	243	1.27
TERRITORIES—										
Northern	10	54.95	12	96.00	10	65.79	908	338.81	940	283.99
Federal	..	..	..	..	..	..	2	2.06	2	1.17
Total	108	.24	271	.63	1,061	2.35	28,621	11.04	30,061	6.75

Of the total population aged 20 and over, 1.1 per cent. could read and write a foreign language, but not English. The States in which this proportion was heaviest were Western Australia and Queensland. In the former 3 per cent., and in the latter 2.5 per cent. of the population aged 20 and over could read and write a foreign language, but not English. In the other four States the proportions were relatively very small, and ranged between 7.61 per 1000 in the case of New South Wales, and 2.30 per 1000 in that of Tasmania.

9. **Read Only, Foreign.**—The number of persons returned as able to read a foreign language, but not write it, and also unable to read English, was only 3075, or about 7 per 10,000 of population aged five years and upwards. Of these, 2959, or upwards of 96 per cent., were aged 20 years and over. The number and the proportion of the population above the age of 5 years were as follows :—

Read Only, Foreign, 1911.

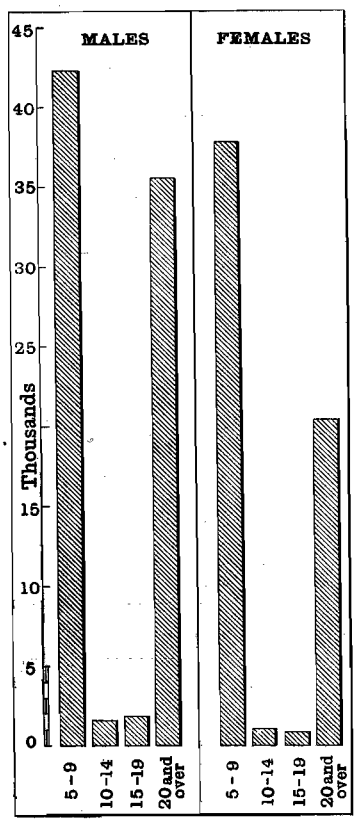
Particulars.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
NUMBER.									
Males	593	631	803	120	365	24	32	..	2,568
Females	64	70	262	92	15	4	..	..	507
Persons ..	657	701	1,065	212	380	28	32	..	3,075
PROPORTION PER 10,000 ABOVE 5 YEARS OF AGE.									
Males	6.91	9.62	24.37	5.79	22.59	2.46	117.04	..	11.10
Females	.81	1.06	9.48	4.57	1.24	.43	..	..	2.37
Persons ..	3.99	5.33	17.58	5.19	13.47	1.46	96.68	..	6.90

As in the case of those able to read and write a foreign language only, the proportion in this case was heaviest for Queensland and Western Australia, the order of these two States being, however, reversed.

10. **Cannot Read.**—The group comprising persons unable to read in any language may conveniently be divided into two sections, one consisting of those under the age of 5 years, concerning whom ability to read could not be expected, and the other, those above that age.

Number and Proportion of Illiterates in Age-groups above 5.—Commonwealth, 1911.

(*a*) **Number.**

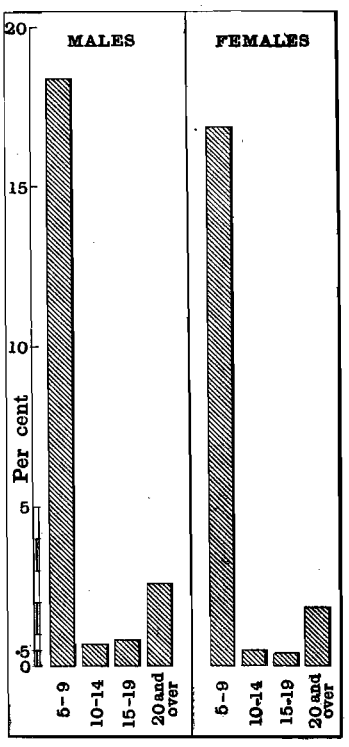


GRAPH No. 46.

In the accompanying graphs (Nos. 46 and 47), a representation is furnished in age-groups of the number of persons of each sex above the age of 5 years who were unable to read at the Census of 1911 (No. 46) and also of the proportion which this number bore in each case to the total population of the same age and sex. These graphs, more particularly No. 47, bring into prominence the fact that above the age of 10 years illiteracy is very rare, and illustrate the comment made in section 1 above concerning the relative unimportance in so far as Australia is concerned of the Census inquiry usually made concerning education.

In all cases the number and proportion of male illiterates exceeded the corresponding number of females.

(*b*) **Proportion.**



GRAPH No. 47.

At the Census of 1911 the group under five contained 526,923, while the groups of five and upwards contained 143,232 out of a total of 670,155 who could not read; that is to say, about 78½ per cent. of those unable to read were under the age of 5 years. Particulars as to sex and age for persons unable to read are as follows :—

Cannot Read, 1911.

State or Territory.	Age.										All Ages.	
	Under 5.		5–9.		10–14.		15–19.		20 and over.			
	Number	Percentage on total for age group.	Number.	Percentage on total for age group.	Number.	Percentage on total for age group.	Number.	Percentage on total for age group.	Number.	Percentage on total for age group.	Number.	Percentage on total all ages.
MALES.												
STATES—												
N.S.W. ..	102,244	100.00	17,650	20.68	612	.77	659	.79	14,340	2.83	135,505	15.80
Vic.	73,278	100.00	10,172	15.46	254	.40	285	.42	5,740	1.49	89,729	13.69
Q'land ..	37,804	100.00	4,266	13.28	217	.69	406	1.23	7,047	3.61	49,740	15.10
S.A.	24,153	100.00	4,763	23.23	125	.64	157	.73	2,998	2.47	32,196	15.53
W.A. ..	17,752	100.00	2,627	17.70	101	.85	144	1.21	2,091	1.99	22,715	14.06
Tas.	12,673	100.00	2,698	23.79	144	1.42	212	2.12	2,758	5.16	18,485	18.94
TERRITORIES—												
N.T.	84	100.00	48	51.06	7	10.77	13	16.46	500	20.73	652	23.85
F.T.	85	100.00	23	25.56	..	..	1	1.04	34	5.48	143	14.42
Total ..	268,073	100.00	42,247	18.36	1,460	.67	1,877	.82	35,508	2.59	349,165	15.10
FEMALES.												
STATES—												
N.S.W. ..	99,071	100.00	15,470	18.57	442	.57	347	.43	9,146	2.05	124,476	15.78
Vic.	70,622	100.00	9,005	14.05	161	.26	134	.20	4,970	1.26	84,892	12.86
Q'land ..	36,044	100.00	4,030	12.80	176	.57	137	.44	3,560	2.43	43,947	15.91
S.A.	23,474	100.00	4,326	21.74	90	.46	77	.36	2,185	1.87	30,152	14.99
W.A. ..	17,276	100.00	2,410	16.69	84	.72	51	.47	1,001	1.51	20,822	17.27
Tas.	12,179	100.00	2,480	22.90	100	1.03	105	1.07	1,490	2.92	16,354	17.47
TERRITORIES—												
N.T.	87	100.00	40	45.45	16	26.67	20	27.40	51	19.03	214	37.15
F.T.	97	100.00	26	28.26	..	..	..	..	10	2.86	133	18.42
Total ..	258,850	100.00	37,787	16.85	1,069	.50	871	.39	22,413	1.83	320,990	14.99
PERSONS.												
STATES—												
N.S.W. ..	201,315	100.00	33,120	19.64	1,054	.67	1,006	.61	23,486	2.46	259,981	15.79
Vic.	143,900	100.00	19,177	14.76	415	.33	419	.31	10,710	1.38	174,621	13.27
Q'land ..	73,848	100.00	8,296	13.04	393	.63	543	.85	10,607	3.10	93,687	15.46
S.A.	47,627	100.00	9,089	22.50	215	.55	234	.54	5,183	2.17	62,348	15.26
W.A. ..	35,028	100.00	5,037	17.20	185	.79	195	.86	3,092	1.80	43,537	15.43
Tas.	24,852	100.00	5,178	23.35	244	1.23	317	1.60	4,248	4.06	34,839	18.22
TERRITORIES—												
N.T.	171	100.00	88	48.35	23	18.40	33	21.71	551	20.56	866	26.16
F.T.	182	100.00	49	26.92	..	..	1	.53	44	4.54	276	16.10
Total ..	526,923	100.00	80,034	17.61	2,529	.59	2,748	.61	57,921	2.23	670,155	15.04

Of the population aged 20 and over, 2¼ per cent. were unable to read, while of those between the ages of 10 and 20 the proportion that could not read was only 6 per 1000. Amongst the States, Tasmania had the highest percentage, (4.06) and Victoria the lowest percentage (1.38) of persons aged 20 and over who were unable to read. In practically all cases the proportion of males unable to read was higher than that for females.

11. **Metropolitan Population.**—The following table furnishes particulars in respect of the education of the metropolitan population of the Commonwealth :—

Metropolitan Population, 1911.

Degree of Education.	Sydney and Suburbs.	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total, Metropolitan.
			MALES.				
English Language—							
Read and Write ..	259,566	240,152	57,891	76,757	44,413	15,427	694,206
Read only	562	402	213	211	80	60	1,528
Foreign Language only—							
Read and Write ..	2,636	1,778	430	305	695	29	5,873
Read only	197	275	64	20	30	13	599
Cannot Read	42,767	35,349	9,030	13,285	8,013	2,958	111,402
Total	305,728	277,956	67,628	90,578	53,231	18,487	813,608
			FEMALES.				
English Language—							
Read and Write ..	281,355	274,824	62,475	85,414	45,470	18,444	767,982
Read only	925	1,029	283	454	119	79	2,889
Foreign Language only—							
Read and Write ..	376	351	245	90	106	6	1,174
Read only	33	28	38	8	7	1	115
Cannot Read	41,086	34,783	8,811	13,102	7,859	2,920	108,561
Total	323,775	311,015	71,852	99,068	53,561	21,450	880,721
			PERSONS.				
English Language—							
Read and Write ..	540,921	514,976	120,366	162,171	89,883	33,871	1,462,188
Read only	1,487	1,431	496	665	199	139	4,417
Foreign Language only—							
Read and Write ..	3,012	2,129	675	395	801	35	7,047
Read only	230	303	102	28	37	14	714
Cannot Read	83,853	70,132	17,841	26,387	15,872	5,878	219,963
Total	629,503	588,971	139,480	189,646	106,792	39,937	1,694,329

The number and proportion of the metropolitan population above the age of 5 unable to read were as follows :—

Number and Proportion above 5 Years of Age Unable to Read, 1911.

Sex.	Sydney and Suburbs.	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total, Metropolitan.
			NUMBER.				
Males	8,121	6,276	1,420	3,058	1,308	742	20,925
Females	7,878	6,619	1,593	2,948	1,326	789	21,153
Persons	15,999	12,895	3,013	6,006	2,634	1,531	42,078
			PROPORTION PER CENT. OF POPULATION ABOVE 5 YEARS.				
Males	3.00	2.52	2.37	3.81	2.81	4.56	2.89
Females	2.71	2.34	2.46	3.32	2.82	4.08	2.67
Persons ..	2.85	2.43	2.42	3.55	2.82	4.30	2.77

For the Commonwealth as a whole the proportion per cent. of the population above 5 years of age who were unable to read was 3.65 per cent., as compared with 2.77 per cent. for the metropolitan areas, indicating a higher proportionate degree of illiteracy in the country districts than in the metropolitan areas. For both sexes the proportion of illiteracy was highest in Hobart, while it was lowest for males in Brisbane, and for females in Melbourne.

The proportion which the metropolitan population of each specified degree of education represented of the total population of that degree in the State or Commonwealth is shewn in the following table :—

Proportion per cent. who were Metropolitan Residents, 1911.

Degree of Education	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	C'wlth.
MALES.							
English Language—							
Read and Write ..	36.45	42.91	21.39	44.34	33.39	19.68	35.99
Read only	21.21	30.66	18.21	36.82	24.54	12.68	23.45
Foreign Language only—							
Read and Write ..	38.21	42.34	6.00	22.71	13.48	13.74	22.69
Read only	33.22	43.58	7.97	16.67	8.22	54.17	23.33
Cannot Read	31.56	39.40	18.15	41.26	35.28	16.00	31.91
Total	35.65	42.40	20.52	43.68	32.95	18.94	35.17
FEMALES.							
English Language—							
Read and Write ..	42.59	48.08	27.29	50.43	45.88	24.01	42.49
Read only	28.46	37.71	21.65	44.21	44.74	18.63	32.07
Foreign Language only—							
Read and Write ..	55.29	50.21	13.30	16.22	31.93	18.75	28.07
Read only	51.56	40.00	14.50	8.70	46.67	25.00	22.68
Cannot Read	33.01	40.97	20.05	43.45	37.74	17.85	33.82
Total	41.03	47.13	26.00	49.24	44.43	22.91	41.12
PERSONS.							
English Language—							
Read and Write ..	39.41	45.52	24.09	47.35	38.72	21.82	39.14
Read only	25.20	35.42	20.02	41.56	33.61	15.50	28.45
Foreign Language only—							
Read and Write ..	39.74	43.47	7.49	20.81	14.60	14.40	23.44
Read only	35.01	43.22	9.58	13.21	9.74	50.00	23.22
Cannot Read	32.25	40.16	19.04	42.32	36.46	16.87	32.82
Total	38.23	44.77	23.02	46.42	37.85	20.89	38.03

These figures indicate that whereas 38 per cent. of the total population of the Commonwealth was resident in metropolitan areas, less than 23½ per cent. of those able to read and write or read only in a foreign language but not in English were so resident. This difference was most marked in the cases of Queensland and Western Australia, and least marked in those of New South Wales and Victoria.

12. **State Sub-divisions.**—Particulars of Education for age and sex are given for State Sub-divisions on pp. 452 to 618 of the Census Detailed Tables, as follows :—New South Wales Counties, pp. 452 to 512 ; Victorian Counties, pp. 513 to 530 ; Queensland Census Districts, pp. 531 to 561 ; South Australian Counties and Divisions, pp. 562 to 582 ; Western Australian Statistical Districts, pp. 583 to 594 ; Tasmanian Municipalities, pp. 595 to 614 ; Northern Territory, pp. 615 to 617 ; Federal Territory, p. 618.

CHAPTER XIV.

SCHOOLING.

1. **Nature and Scope of Inquiry.**—The exact form of the inquiry in respect of schooling has already been quoted in the preceding chapter, paragraph 1 (see p. 166). The particulars asked for differed somewhat from those specified in the Census Schedule, 1901, owing to the omission on the present occasion of any special inquiry concerning " colleges " or " denominational " schools. Experience in the past had shewn that the inquiry concerning colleges led to replies which were unsatisfactory, owing largely to the miscellaneous nature of the educational establishments to which the term was applied, varying, as they did, from infant schools at the one extreme, to colleges affiliated with universities at the other. The classification under the heading " denominational" had also in the past proved difficult and unsatisfactory, and was consequently also abandoned on the present occasion. There remained then four heads concerning which particulars were required, the instruction being that U should be inserted on the personal card of each person who at the date of the Census was a student at a University, S if at a State School, and P if at any other school, while H was to be inserted if education was being received at home.

It should be noted that throughout this chapter the term " State School " comprises all schools, whether primary or secondary, which are under the direct control of the State.

2. **General View of Results.**—Notwithstanding the increased simplicity of the inquiry, a large number failed to give an explicit reply, no fewer than 21,572 furnishing a statement that they were " scholars " without indicating the class of school at which they were receiving education. For the purposes of this chapter the number of these at each age has been distributed proportionately over the groups " State School," " Private School," and " Home," the distribution being effected separately for each sex. In addition a large number, amounting to no fewer than 64,426 of those recorded as between the ages of 6 and 13 years, furnished no indication that they were in receipt of education. To what extent these children were evading the provisions of the Education Acts, or were beyond the reach of educational facilities, it is impossible to say. This question is further discussed in paragraphs 7 and 8 of this chapter (pp. 186 and 188), where comparisons with the enrolments of the several States for 1910 and 1911 are furnished. Of a total of 700,111 actually recorded as between the ages of 6 and 13, there were 496,163, or nearly 71 per cent., returned as attending State schools ; 106,663, or rather more than 15 per cent., as attending private schools ; 17,151, or about $2\frac{1}{2}$ per cent., as being educated at home ; 15,708, or about $2\frac{1}{4}$ per cent., returned simply as " scholar " ; while 64,426, or about $9\frac{1}{4}$ per cent., furnished no indication as to receipt of education.

3. **Aggregates for States.**—After the distribution referred to in the preceding paragraph of those recorded simply as "Scholar," the totals for the several States and the Commonwealth were as shewn in the succeeding table. In this table the column headed " Number not indicated as receiving education " comprises persons beyond school age as well as those of school age concerning whom no such indication was furnished.

Schooling as at 3rd April, 1911.

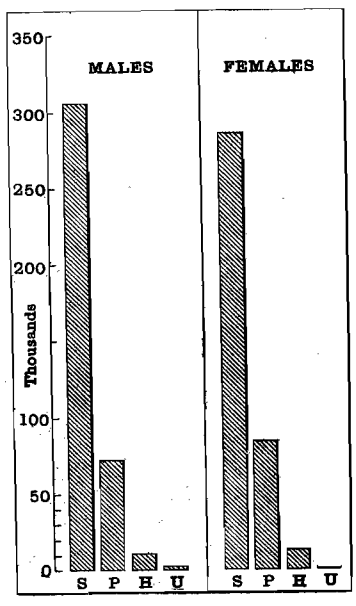
State or Territory.	Number Receiving Education at—				Number not indicated as receiving education.	Total.
	State School.	Private School.	Home.	University.		
	MALES.					
STATES—						
New South Wales	110,704	27,913	4,782	762	713,537	857,698
Victoria	92,547	23,333	1,852	820	537,039	655,591
Queensland	45,633	7,912	1,991	34	273,936	329,506
South Australia	25,548	5,378	711	271	175,450	207,358
Western Australia	18,639	4,618	770	7	137,531	161,565
Tasmania	13,116	2,985	616	32	80,842	97,591
TERRITORIES—						
Northern	37	33	11	..	2,653	2,734
Federal	120	..	25	..	847	992
Total	306,344	72,172	10,758	1,926	1,921,835	2,313,035

Schooling as at 3rd April, 1911—*continued.*

State or Territory.	Number receiving education at—				Number not indicated as receiving education.	Total.
	State School.	Private School.	Home.	University.		
FEMALES.						
STATES—						
New South Wales	102,049	33,841	5,733	171	647,242	789,036
Victoria	86,853	25,259	2,348	204	545,296	659,960
Queensland	43,310	10,152	2,278	22	220,545	276,307
South Australia	24,994	5,500	907	116	169,683	201,200
Western Australia	16,978	5,652	929	7	96,983	120,549
Tasmania	12,388	3,503	784	19	76,926	93,620
TERRITORIES—						
Northern	37	24	7	..	508	576
Federal	106	3	16	..	597	722
Total	286,715	83,934	13,002	539	1,757,780	2,141,970
PERSONS.						
STATES—						
New South Wales	212,753	61,754	10,515	933	1,360,779	1,646,734
Victoria	179,400	48,592	4,200	1,024	1,082,335	1,315,551
Queensland	88,943	18,064	4,269	56	494,481	605,813
South Australia	50,542	10,878	1,618	387	345,133	408,558
Western Australia	35,617	10,270	1,699	14	234,514	282,114
Tasmania	25,504	6,488	1,400	51	157,768	191,211
TERRITORIES—						
Northern	74	57	18	..	3,161	3,310
Federal	226	3	41	..	1,444	1,714
Total	593,059	156,106	23,760	2,465	3,679,615	4,455,005

The smallness of the numbers receiving education at Universities in Queensland and Western Australia is due to the fact that the Universities in these States have only recently been opened, that in Queensland in March, 1911, and that in Western Australia in March, 1913. The number in the case of Western Australia consequently represented students who were away from the Universities at which they were being educated. It will be seen that in all the States the number of males who were students at State Schools and Universities exceeded the number of females, but that in the cases of private school pupils and persons educated "at home," there was in all cases an excess of females.

Schooling as at 3rd April, 1911 (Commonwealth).



GRAPH No. 48.

The accompanying Graph (No. 48) furnishes, for the Commonwealth as a whole, a representation of the number of students of all ages, the sexes being shewn separately. The letter S denotes "State School," the letter P, "Private School," the letter H indicates education "at home," while the letter U denotes "University."

4. **Proportionate Distribution of those Receiving Education.**—In the following table is shewn for each sex and for the sexes combined the proportion of those receiving education who were receiving it at each of the classes of institution specified.

Proportion per cent. at each Class of Institution, Commonwealth, 1911.

State or Territory.	Proportion per cent. receiving education at—				Total.
	State School.	Private School.	Home.	University.	
MALES.					
STATES—					
New South Wales	76.79	19.36	3.32	.53	100.00
Victoria	78.07	19.68	1.56	.69	100.00
Queensland	82.12	14.24	3.58	.06	100.00
South Australia	80.07	16.85	2.23	.85	100.00
Western Australia	77.55	19.22	3.20	.03	100.00
Tasmania	78.31	17.82	3.68	.19	100.00
TERRITORIES—					
Northern	45.68	40.74	13.58	..	100.00
Federal	82.76	..	17. 4	..	100.00
Commonwealth	78.31	18.45	2.75	.49	100.00
FEMALES.					
STATES—					
New South Wales	71.97	23.87	4.04	.12	100.00
Victoria	75.74	22.03	2.05	.18	100.00
Queensland	77.67	18.21	4.08	.04	100.00
South Australia	79.30	17.45	2.88	.37	100.00
Western Australia	72.05	23.98	3.94	.03	100.00
Tasmania	74.21	20.98	4.70	.11	100.00
TERRITORIES—					
Northern	54.41	35.29	10.30	..	100.00
Federal	84.80	2.40	12.80	..	100.00
Commonwealth	74.63	21.85	3.38	.14	100.00
PERSONS.					
STATES—					
New South Wales	74.40	21.59	3.68	.33	100.00
Victoria	76.92	20.84	1.80	.44	100.00
Queensland	79.89	16.23	3.83	.05	100.00
South Australia	79.69	17.15	2.55	.61	100.00
Western Australia	74.82	21.58	3.57	.03	100.00
Tasmania	76.26	19.40	4.19	.15	100.00
TERRITORIES—					
Northern	49.66	38.26	12.08	..	100.00
Federal	83.70	1.11	15.19	..	100.00
Commonwealth	76.49	20.13	3.06	.32	100.00

Of persons of both sexes recorded as receiving education at the date of the Census, the proportion being educated at State schools varied amongst the States between the limits of 74.40 per cent. in the case of New South Wales, and 79.89 per cent. in the case of Queensland. On the other hand, with regard to Private Schools, the same two States furnished the limiting proportions, but Queensland, with 16.23 per cent., furnished the lower, and New South Wales, with 21.59 per cent., the higher limit. Amongst the States Tasmania furnished the highest proportion being educated " at home," and South Australia the highest at a University, the lowest proportions in these cases being furnished respectively by Victoria and Western Australia. In all cases amongst the States the proportion at State schools and Universities was higher for males than for females, while in all cases the proportion for those educated in private schools and at home was lower for males than for females.

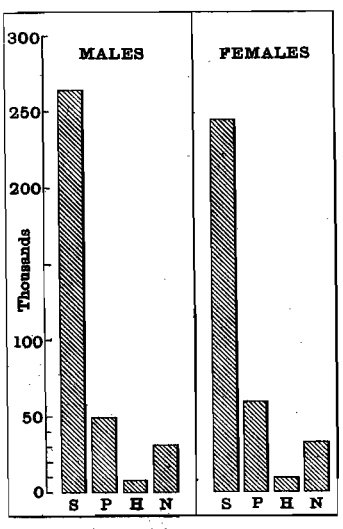
5. **Compulsory School Age.**—As already noted in Chapter X., Ages, the compulsory school age for the States of New South Wales, Victoria, Western Australia, and Tasmania is now, and was at the date of the Census, from 6 to 13 last birthday inclusive. The same range is also now in operation in Queensland, although at the date of the Census the period was only 6 to 11 inclusive. In South Australia the period is now, and was at the date of the Census, 7 to 13 inclusive. The period from 6 to 13 may thus in a general way be regarded as the Australian compulsory school age. Tabulated according to the place of education, the particulars in respect of children of this period of age in each of the States and Territories are as shewn in the succeeding table, in which allowance has been made for the number of children of unspecified age.

Children Aged last Birthday from 6 to 13 Years, 1911.

State or Territory.	Number receiving education at—			Number not indicated as receiving education.	Total aged 6 to 13 last birthday.
	State School.	Private School.	Home.		
MALES.					
STATES—					
New South Wales	95,225	19,804	3,566	11,618	130,213
Victoria	79,947	15,716	1,227	6,022	102,912
Queensland	39,018	5,298	1,551	5,101	50,968
South Australia	23,182	3,609	532	4,408	31,731
Western Australia	15,734	3,330	574	1,661	21,299
Tasmania	11,466	2,197	476	2,843	16,982
TERRITORIES—					
Northern	32	26	10	55	123
Federal	101	..	23	27	151
Total	264,705	49,980	7,959	31,735	354,379
FEMALES.					
STATES—					
New South Wales	86,761	24,074	4,328	12,837	128,000
Victoria	74,804	17,843	1,639	6,514	100,800
Queensland	36,536	6,935	1,756	4,788	50,015
South Australia	22,018	4,132	650	4,305	31,105
Western Australia	14,229	4,146	696	1,822	20,893
Tasmania	10,661	2,591	616	2,513	16,381
TERRITORIES—					
Northern	32	20	6	69	127
Federal	92	3	13	26	134
Total	245,133	59,744	9,704	32,874	347,455
PERSONS.					
STATES—					
New South Wales	181,986	43,878	7,894	24,455	258,213
Victoria	154,751	33,559	2,866	12,536	203,712
Queensland	75,554	12,233	3,307	9,889	100,983
South Australia	45,200	7,741	1,182	8,713	62,836
Western Australia	29,963	7,476	1,270	3,483	42,192
Tasmania	22,127	4,788	1,092	5,356	33,363
TERRITORIES—					
Northern	64	46	16	124	250
Federal	193	3	36	53	285
Total	509,838	109,724	17,663	64,609	701,834

For the Commonwealth, as a whole, the number of males of school age attending State schools exceeded the number of females, while the number of females was in excess in the cases of persons being educated at private schools or at home, or concerning whom no indication was given. Similar excesses were in evidence in each of the States, except for those not indicated as receiving education in Queensland, South Australia, and Tasmania, in which the males exceeded the females.

Children aged 6–13 last Birthday.



GRAPH No. 49.

A representation, for the Commonwealth as a whole, of the number of children of school age, that is, aged from 6 to 13 last birthday, is furnished in the accompanying graph (No. 49), distinction being made between males and females. In this graph, the letter S denotes State School Pupils, the letter P Private School Pupils, the letter H those being educated at home, while the letter N denotes those concerning whom no indication as to education was furnished.

The following table shews the proportion of children of school age in each State and Territory receiving education at each of the specified places of instruction.

Proportion of Children of Compulsory School Age at each Class of Institution, etc., 1911.

State or Territory.	Proportion per cent. receiving education at—			Proportion per cent. not indicated as receiving education.	Total.
	State School.	Private School.	Home.		
MALES.					
STATES—					
New South Wales	73.13	15.21	2.74	8.92	100.00
Victoria	77.69	15.27	1.19	5.85	100.00
Queensland	76.55	10.40	3.04	10.01	100.00
South Australia	73.06	11.37	1.68	13.89	100.00
Western Australia	73.87	15.63	2.70	7.80	100.00
Tasmania	67.52	12.94	2.80	16.74	100.00
TERRITORIES—					
Northern	26.02	21.14	8.13	44.71	100.00
Federal	66.89	..	15.23	17.88	100.00
Commonwealth	74.70	14.10	2.25	8.95	100.00
FEMALES.					
STATES—					
New South Wales	67.78	18.81	3.38	10.03	100.00
Victoria	74.21	17.70	1.63	6.46	100.00
Queensland	73.05	13.87	3.51	9.57	100.00
South Australia	70.79	13.28	2.09	13.84	100.00
Western Australia	68.11	19.84	3.33	8.72	100.00
Tasmania	65.08	15.82	3.76	15.34	100.00
TERRITORIES—					
Northern	25.20	15.75	4.72	54.33	100.00
Federal	68.66	2.24	9.70	19.40	100.00
Commonwealth	70.55	17.20	2.79	9.46	100.00
PERSONS.					
STATES—					
New South Wales	70.48	16.99	3.06	9.47	100.00
Victoria	75.97	16.47	1.41	6.15	100.00
Queensland	74.82	12.11	3.28	9.79	100.00
South Australia	71.93	12.32	1.88	13.87	100.00
Western Australia	71.02	17.72	3.01	8.25	100.00
Tasmania	66.32	14.35	3.27	16.06	100.00
TERRITORIES—					
Northern	25.60	18.40	6.40	49.60	100.00
Federal	67.72	1.05	12.63	18.60	100.00
Commonwealth	72.64	15.63	2.52	9.21	100.00

Amongst the States, Victoria had the highest proportion of children of compulsory school age who were attending State schools, and the lowest proportion being educated at home, and not indicated as receiving education. Tasmania had the lowest proportion being educated at State schools, and the highest proportion not indicated as receiving education, while Queensland had the lowest proportion being educated at private schools, and the highest at home. Western Australia had the highest proportion at private schools.

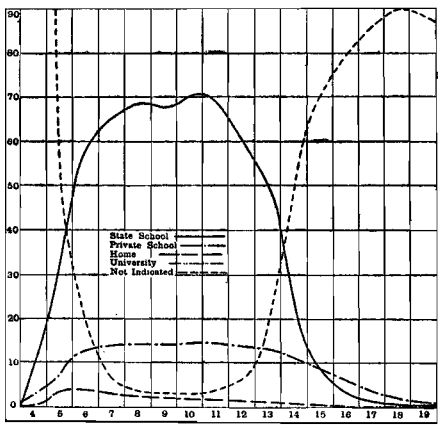
6. **Commonwealth Details for Successive Ages.**—The number of children receiving education at the date of the Census at each of the specified places of instruction was as follows :—

Schooling of Commonwealth Population (sexes combined) 1911.

Age last birthday.	Number receiving education at—				Number not indicated as receiving education.	Total.
	State School.	Private School.	Home.	University.		
Under 5	9,307	2,934	330	..	514,352	526,923
5	33,421	7,298	3,308	..	52,225	96,252
6	58,347	12,474	3,903	..	19,689	94,413
7	64,876	13,880	2,961	..	6,451	88,168
8	68,637	14,079	2,382	..	3,706	88,804
9	67,472	13,908	2,206	..	3,142	86,728
10	69,977	14,380	1,883	..	3,036	89,276
11	68,896	14,419	1,674	..	4,038	89,027
12	60,679	13,495	1,402	..	6,243	81,819
13	50,954	13,089	1,252	..	18,304	83,599
14	24,418	10,980	891	..	49,204	85,493
15	8,749	8,489	573	..	69,892	87,703
16	3,311	6,342	331	73	78,912	88,969
17	1,592	3,698	210	146	85,435	91,081
18	950	2,173	145	333	89,760	93,361
19	685	1,253	90	364	87,961	90,353
20 and over	788	3,215	219	1,549	2,587,265	2,593,036
Total	593,059	156,106	23,760	2,465	3,679,615	4,455,005

The number attending State schools attained a maximum at age 10, private schools at age 11, and " at home " at age 6, while the number not indicated as receiving education attained a minimum at age 10.

Schooling and Age (Sexes combined), Commonwealth, 1911.



GRAPH No. 50.

In the accompanying graph (No. 50) is represented the distribution according to age of the several classes of pupils for the Commonwealth as a whole. The base of each small rectangle represents a year of age, and the vertical height represents 10,000 scholars. In this graph the curves relate to the sexes combined. The figures for university students at ages under 20 are so small relatively as to fail to appear. Features of special interest in this graph are (i.) the rapid rise in the State School curve to age 6, and the rapid fall from age 11; (ii.) the complementary rapid fall and rise in the curve for children whose schooling was " not indicated "; (iii.) the slightness of the variation in the Private school curve from age 6 to age 13; and (iv.) the steady fall in the " Home" curve from age 6.

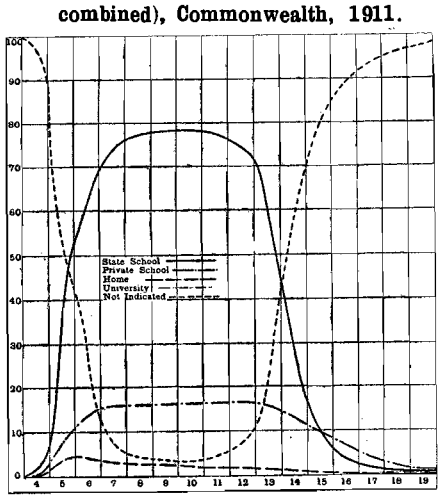
The proportion per cent. of the Commonwealth population at each age specified who were receiving education at each of the places of instruction was as follows :—

Commonwealth Population (sexes combined), 1911.—Proportion per cent. at each Class of Institution, etc.

Age last birthday.	Proportion per cent. receiving education at—				Proportion per cent. not indicated as receiving education.	Total.
	State School.	Private School.	Home.	University.		
Under 5	1.77	.56	.06	..	97.61	100.00
5	34.72	7.58	3.44	..	54.26	100.00
6	61.80	13.21	4.13	..	20.86	100.00
7	73.58	15.74	3.36	..	7.32	100.00
8	77.29	15.86	2.68	..	4.17	100.00
9	77.80	16.04	2.54	..	3.62	100.00
10	78.38	16.11	2.11	..	3.40	100.00
11	77.39	16.20	1.88	..	4.53	100.00
12	74.16	16.50	1.71	..	7.63	100.00
13	60.95	15.66	1.50	..	21.89	100.00
14	28.56	12.84	1.04	..	57.56	100.00
15	9.98	9.68	.65	..	79.69	100.00
16	3.72	7.13	.37	.08	88.70	100.00
17	1.75	4.06	.23	.16	93.80	100.00
18	1.02	2.33	.15	.36	96.14	100.00
19	.76	1.39	.10	.40	97.35	100.00
20 and over	.03	.12	.01	.06	99.78	100.00
Commonwealth	13.31	3.50	.53	.06	82.60	100.00

The maximum percentage at any age attending State schools was 78.38 per cent. at age 10, while the maximum for private schools was 16.50 per cent. at age 12. For those being educated " at home " the maximum percentage was 4.13 per cent. at age 6, while the minimum percentage in the case of those not indicated as receiving instruction, was 3.40 at age 10.

Proportionate Distribution (Sexes combined), Commonwealth, 1911.



GRAPH No. 51.

In graph No. 51, a representation is given of the proportion per cent. of the population (sexes combined) at each age receiving instruction at the several classes of institution indicated. The base of each small rectangle represents a year of age and the vertical height 10 per cent. The features noted in connection with graph 50 representing the *numbers* at each age, are equally striking in the present graph, representing the *proportions* at each age.

The relative numbers of males and females at each age receiving education at each class of institution will be seen from the following table, which gives under each head the excess of males over females per 100 of the sexes combined.

Commonwealth Population, 1911, Masculinity of Scholars.

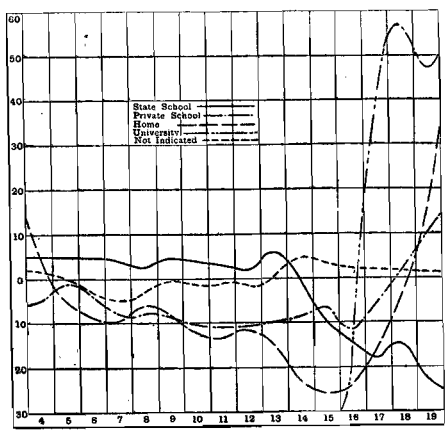
(Excess of Males over Females per 100 of sexes combined.)

Age last birthday.	Masculinity of scholars at—				Masculinity of Persons not indicated as receiving education.	Masculinity of total population
	State School.	Private School.	Home.	University.		
Under 5	5.10	— 4.98	6.06	..	1.73	1.75
5	4.98	— 1.64	— 5.68	..	.10	1.46
6	4.81	— 3.82	— 8.28	..	— 3.01	1.50
7	4.07	— 8.03	— 9.42	..	— 4.67	1.08
8	3.11	— 8.13	— 6.55	..	— 2.97	.82
9	4.20	— 8.46	— 8.07	..	— .76	1.68
10	3.69	— 10.63	— 12.27	..	— 1.25	.88
11	3.45	— 11.16	— 13.14	..	— 1.09	.57
12	2.35	— 10.47	— 11.98	..	— 1.62	— .31
13	5.44	— 9.95	— 15.18	..	.39	1.61
14	— .03	— 9.34	— 23.23	..	4.74	1.28
15	— 9.38	— 6.66	— 25.65	..	2.58	.30
16	— 13.86	— 11.01	— 23.87	— 17.81	2.62	.92
17	— 17.46	— 5.80	— 14.29	39.73	1.76	1.16
18	— 15.58	2.16	— 3.45	55.56	1.96	1.97
19	— 23.50	10.61	17.78	48.35	1.20	1.35
20 and over	— 26.40	17.82	55.25	63.33	5.63	5.68
All Ages	3.31	— 7.53	9.44	56.27	4.46	3.84

Note, — denotes excess of females.

This table clearly indicates the preponderance at State schools of male scholars under the ages of 14, and the similar preponderance of male University students above the age of 16. On the other hand, at practically all ages a preponderance is shewn of females receiving education at private schools and "at home." There is also a preponderance of females amongst those not indicated as receiving education for all ages from 6 to 12 inclusive.

Masculinity of Scholars, Commonwealth, 1911.



GRAPH No. 52.

Graph No. 52 furnishes a representation of the masculinity of the scholars attending each class of school, the curves given relating to the Commonwealth as a whole. As here used the term masculinity denotes the excess of males over females per 100 of the sexes combined. The zero line in the graph consequently indicates equality of the sexes, while a position above this line indicates excess of males, and a position below it excess of females. The base of each small rectangle represents a year of age, and the height a masculinity of 10. The leading features of this graph are : (i.) the preponderance of males in the State school curve to age 13, and of females thereafter ; (ii.) the preponderance of females in Private schools at practically all ages ; (iii.) the preponderance of females amongst those educated at home at nearly all ages.

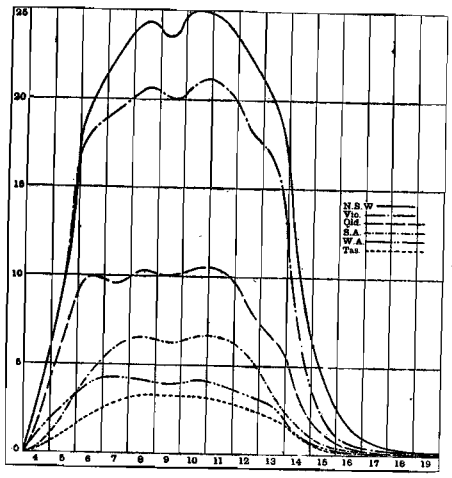
7. **State School Pupils.**—The number of children in each year of age attending State schools in each State and Territory at the date of the Census was as follows :—

Attending State Schools (sexes combined), 1911.

Age last birthday.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
Under 5	2,900	3,152	1,588	334	1,039	293	..	1	9,307
5	10,572	10,530	6,547	2,041	2,576	1,147	3	5	33,421
6	19,927	18,228	9,742	4,423	3,887	2,116	4	20	58,347
7	22,707	19,465	9,677	5,975	4,188	2,831	10	23	64,876
8	24,145	20,484	10,175	6,481	4,105	3,216	8	23	68,637
9	23,813	20,145	10,122	6,279	3,908	3,165	10	30	67,472
10	24,920	20,851	10,404	6,549	4,031	3,183	10	29	69,977
11	24,412	20,734	10,301	6,548	3,871	3,009	6	15	68,896
12	22,242	18,427	8,498	5,595	3,310	2,570	9	28	60,679
13	19,820	16,417	6,635	3,350	2,663	2,037	7	25	50,954
14	9,960	7,232	3,185	1,659	1,190	1,172	5	15	24,418
15	4,050	2,064	1,224	585	434	386	..	6	8,749
16	1,555	689	402	290	178	193	1	3	3,311
17	685	383	183	178	74	87	..	2	1,592
18	361	257	119	119	51	43	..	..	950
19	230	180	81	89	74	29	1	1	685
20 and over	454	162	60	47	38	27	..	..	788
Total	212,753	179,400	88,943	50,542	35,617	25,504	74	226	593,059

The maximum number at any age was attained at age 10 for the Commonwealth as a whole, and in New South Wales, Victoria, Queensland and South Australia ; at age 7 in Western Australia ; and at age 8 in Tasmania. The average ages of the State school pupils in the Commonwealth and its several States and Territories were as follows :—Commonwealth, 9.46 years ; New South Wales, 9.63 ; Victoria, 9.41 ; Queensland, 9.23 ; South Australia, 9.52 ; Western Australia, 9.13 ; Tasmania, 9.59 ; Northern Territory, 9.91 ; Federal Territory, 10.09.

Number of State School Pupils, States and Ages, 1911.



GRAPH No. 53.

Graph No. 53 represents the number of State School pupils at each age in each of the States of the Commonwealth. The base of each small rectangle represents a year of age, and the height represents 5000 scholars. The dip seen in the several curves at age 9 is not peculiar to those relating to State school pupils, but is common to all the Australian curves for juvenile ages for the 1911 census.

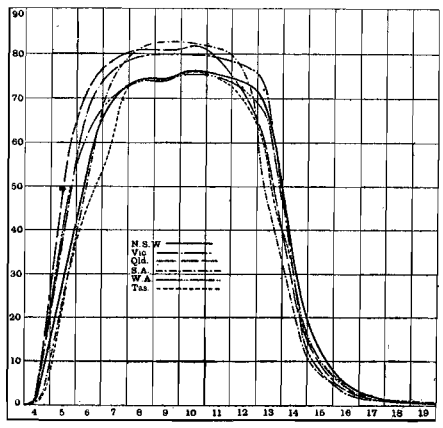
The proportion per cent. of the total children at each age who were attending State schools is shewn in the succeeding table.

Proportion per cent. attending State Schools (sexes combined).

Age last birthday.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
Under 5	1.44	2.19	2.15	.70	2.97	1.18	..	.55	1.77
5	28.89	38.95	50.61	23.81	40.16	24.84	8.11	12.50	34.72
6	56.28	68.81	73.01	52.87	63.22	46.12	12.12	57.14	61.80
7	70.23	76.89	79.00	75.53	71.05	64.53	22.73	62.16	73.58
8	74.24	79.41	81.00	81.50	73.65	74.15	22.86	92.00	77.29
9	74.94	79.75	80.85	82.60	74.44	74.59	30.30	66.67	77.80
10	76.07	79.70	81.47	82.20	75.29	75.93	32.26	74.36	78.38
11	75.46	79.08	78.50	81.12	74.77	74.65	24.00	53.57	77.39
12	73.59	77.44	70.88	75.41	71.66	69.50	31.03	68.29	74.16
13	64.28	66.54	53.40	44.39	63.77	52.41	35.00	71.43	60.95
14	31.81	28.22	25.97	20.55	28.61	29.39	25.00	31.25	28.56
15	12.63	7.80	9.64	7.06	10.17	10.05	..	16.22	9.98
16	4.82	2.54	3.21	3.36	4.12	4.82	4.35	9.09	3.72
17	2.05	1.40	1.42	2.06	1.59	2.19	..	4.35	1.75
18	1.06	.91	.90	1.36	1.06	1.03	..	..	1.02
19	.69	.66	.64	1.01	1.58	.76	3.23	3.23	.76
20 and over	.05	.02	.02	.02	.02	.02	..	..	03
All Ages ..	12.92	13.64	14.68	12.37	12.63	13.34	2.24	13.19	13.31

Amongst the States the highest proportion attending State schools was furnished by Western Australia for ages under 5 ; by Queensland for ages 5, 6 and 7 ; by South Australia for ages 8, 9, 10, and 11 ; by Victoria for ages 12 and 13 ; and by New South Wales for ages 14 and 15.

Proportion of State School Pupils, States and Ages, 1911,



GRAPH No. 54.

In Graph No. 54 a representation is given for each of the States of the proportion per cent. of State school pupils amongst the persons at each age. The base of each small rectangle represents a year of age and the height 10 per cent. It will be seen that although there is a similarity in the general trend of the curves, there are marked divergences, the most striking being the case of Tasmania on the one hand and Queensland on the other.

The relative numbers of males and females of each age attending State schools is shewn in the next table, which gives under each head the excess of males over females per 100 of the excess combined.

Masculinity of State School Pupils (Excess of Males over Females per 100 of the sexes combined), 1911.

Age last birthday.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
Under 5	5.72	5.46	2.27	— 5.39	10.30	3.75	..	100.00	5.10
5	3.22	6.02	4.66	5.14	8.23	6.36	— 33.33	— 60.00	4.98
6	5.47	4.28	3.76	5.00	4.45	8.22	— 50.00	10.00	4.81
7	5.14	3.96	2.72	2.90	6.06	.32	.00	21.74	4.07
8	2.50	3.30	3.31	3.38	4.80	3.42	.00	— 21.74	3.11
9	5.16	3.86	1.82	4.70	6.35	3.25	20.00	— 13.33	4.20
10	4.16	3.33	3.98	1.57	4.59	4.68	20.00	— 17.24	3.69
11	4.65	2.67	2.92	2.23	3.75	3.09	33.33	20.00	3.45
12	2.58	1.16	3.60	1.20	3.56	5.45	11.11	21.43	2.35
13	8.21	4.12	4.69	— 1.79	6.95	1.33	— 71.43	28.00	5.44
14	4.24	.33	— 4.36	— 15.73	— 1.18	— 4.27	60.00	46.67	— .03
15	— 4.64	— 8.72	— 17.48	— 22.39	— 12.44	— 14.51	..	33.33	— 9.38
16	— 9.58	— 11.76	— 14.93	— 33.10	— 17.98	— 20.21	— 100.00	— 33.33	— 13.86
17	— 12.41	— 14.88	— 23.50	— 42.70	— 10.81	— 10.34	..	.00	— 17.46
18	— 21.33	10.51	— 17.65	— 56.30	13.73	— 39.53	..	..	— 15.58
19	— 18.26	— 10.00	— 40.74	— 55.06	— 35.14	31.03	— 100.00	— 100.00	— 23.50
20 and over	— 43.17	18.52	16.67	— 36.17	— 94.74	3.70	..	..	— 26.40
All Ages	4.07	3.17	2.61	1.10	4.66	2.85	.00	6.19	3.31

Note, — denotes excess of females.

This table indicates a predominance in males amongst State school pupils to age 14 inclusive in New South Wales and Victoria, to age 13 inclusive in Queensland, Western Australia and Tasmania, and from age 5 to age 12 inclusive in South Australia. The masculinity varies irregularly with age in the several States, and for the principal ages is higher for Western Australia than for any other State.

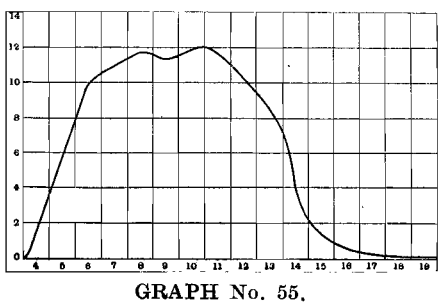
The age distribution per cent. of the State school pupils in each of the States and Territories was as follows :—

Age Distribution per cent. of State School Pupils, 1911.

Age last birthday.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
Under 5	1.36	1.76	1.79	.66	2.92	1.15	..	.44	1.57
5	4.97	5.87	7.36	4.04	7.23	4.50	4.06	2.21	5.64
6	9.37	10.16	10.95	8.75	10.91	8.30	5.41	8.85	9.84
7	10.67	10.85	10.88	11.82	11.76	11.10	13.51	10.18	10.94
8	11.35	11.42	11.44	12.82	11.52	12.61	10.81	10.18	11.57
9	11.19	11.23	11.38	12.42	10.97	12.41	13.51	13.27	11.38
10	11.71	11.62	11.70	12.96	11.32	12.48	13.51	12.83	11.80
11	11.48	11.56	11.58	12.96	10.87	11.80	8.11	6.64	11.62
12	10.46	10.27	9.55	11.07	9.29	10.08	12.16	12.39	10.23
13	9.32	9.15	7.46	6.63	7.48	7.99	9.46	11.06	8.59
14	4.68	4 03	3.58	3.28	3.34	4.59	6.76	6.64	4.12
15	1.90	1.15	1.38	1.16	1.22	1.51	..	2.65	1.47
16	.73	.39	.45	.57	.50	.76	1.35	1.33	.56
17	.32	.21	.21	.35	.21	.34	..	.89	.27
18	.17	.14	.13	.24	.14	.17	..	..	.16
19	.11	.10	.09	.18	.21	.11	1.35	.44	.11
20 and over	.21	.09	.07	.09	.11	.10	..	..	.13
All Ages ..	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Of the total number of State school pupils in the Commonwealth, 85.97 per cent. were aged from 6 to 13 last birthday, the corresponding proportion for the several States and Territories being as follows :—New South Wales, 85.55 per cent. ; Victoria, 86.26 per cent. ; Queensland, 84.94 per cent. ; South Australia, 89.43 per cent. ; Western Australia, 84.12 per cent. ; Tasmania, 86.77 per cent. ; Northern Territory, 86.48 per cent.; and Federal Territory, 85.40 per cent.

Proportionate Age Distribution of State School Pupils, Commonwealth, 1911.



GRAPH No. 55.

In Graph No. 54 there was given for each of the States a representation of the proportion of the total number of children at each age who were attending State schools. In the present graph (No. 55) the representation given is that of the proportion of the total State school pupils of all ages in the Commonwealth who were of each age. This representation is not given separately for the several States, as the State curves are very similar to each other and to that for the Commonwealth as a whole. The base of each small rectangle represents a year of age, and the vertical height represents two per cent.

In the succeeding table a comparison is furnished between the enrolment of State school children in 1910 and 1911, the average attendance in each of those years, and the number attending State schools according to the Census results.

State School Children. Enrolment, Average Attendance and Census Results, 1910 and 1911.

Particulars.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
Enrolment, 1910 ..	* 218,539	206,263	89,695	* 52,929	32,664	27,820	*	*	627,910
Enrolment, 1911 ..	223,299	204,086	91,624	55,662	34,969	28,821	85	304	638,850
Aver. Attendance, 1910	* 157,498	145,968	69,439	* 37,549	27,442	17,974	*	*	455,870
Aver. Attendance, 1911	160,593	146,464	70,194	38,727	29,448	18,130	60	183	463,799
Census Results, 3rd April, 1911	212,753	179,400	88,943	50,542	35,617	25,504	74	226	593,059

* For 1910 the New South Wales figures include those for the Federal Territory, and the South Australian figures include those for the Northern Territory.

Unfortunately the statistics of enrolments are not entirely satisfactory, as the methods of record are not uniform in the several States, and the allowances made for duplicate enrolments are usually on a basis which is more or less arbitrary. Further, the number of pupils whose names are on the rolls at any time during a given year will necessarily be greater than the number actually attending school at a specified date during the year, since those who left prior to the specified date or were admitted subsequently thereto will appear on the rolls, but not in the record of those attending school at the specified date.

In all cases the recorded enrolment for 1911 exceeds, as it should, for the reasons indicated above, the Census results for 3rd April, 1911, except in that of Western Australia, where the Census results are slightly in excess. For the Commonwealth as a whole, the enrolments exceed the Census results by 45,791, or 7.72 per cent., an excess which is barely sufficient to allow for departures between 1st January and 3rd April, 1911, and admissions between 3rd April and 31st December, 1911. Taking into account the admitted uncertainty of enrolment figures, it is thus evident that the Census enumeration of State school children has been very complete.

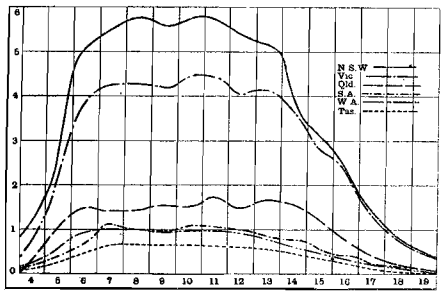
8. **Private School Pupils.**—The number of children of each year of age attending private schools at the date of the Census is given in the succeeding table.

Attending Private Schools (sexes combined), 1911.

Age last birthday.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
Under 5	1,262	785	314	198	260	115	..	..	2,934
5	2,947	2,163	985	385	560	255	3	..	7,298
6	5,114	3,862	1,425	694	928	446	4	1	12,474
7	5,508	4,227	1,439	1,063	996	639	7	1	13,880
8	5,721	4,250	1,443	1,018	988	651	8	..	14,079
9	5,606	4,211	1,526	970	942	648	5	..	13,908
10	5,741	4,415	1,535	1,073	965	644	7	..	14,380
11	5,689	4,385	1,689	1,073	956	617	10	..	14,419
12	5,358	4,098	1,527	999	913	596	4	..	13,495
13	5,141	4,111	1,649	851	788	547	1	1	13,089
14	3,967	3,599	1,567	762	622	462	1	..	10,980
15	3,071	2,808	1,220	585	450	352	3	..	8,489
16	2,305	2,248	773	422	345	248	1	..	6,342
17	1,413	1,313	417	246	208	99	2	..	3,698
18	819	776	221	167	136	53	1	..	2,173
19	495	463	111	109	49	26	..	..	1,253
20 and over ..	1,597	878	223	263	164	90	..	..	3,215
Total	61,754	48,592	18,064	10,878	10,270	6,488	57	3	156,106

The maximum number at any age was at age 11 for the Commonwealth as a whole and in Queensland, at age 10 in New South Wales and Victoria, at ages 10 and 11 in South Australia, at age 7 in Western Australia, and at age 8 in Tasmania. The average ages of the private school pupils were as follows :—Commonwealth, 10.69 years; New South Wales, 10.63 ; Victoria, 10.82 ; Queensland, 10.75 ; South Australia, 10.83 ; Western Australia, 10.27 ; Tasmania, 10.50 ; Northern Territory, 9.91 ; and Federal Territory, 8.67. For the Commonwealth as a whole the average age of private school pupils was 1 year and 3 months greater than that of State school pupils (see p. 184, ante).

Number of Private School Pupils, States and Ages, 1911.



GRAPH No. 56.

In Graph No. 56 is furnished a representation of the number of Private school pupils (sexes combined) in each State at each age. The base of each small rectangle represents a year of age, and the vertical height 1000 pupils.

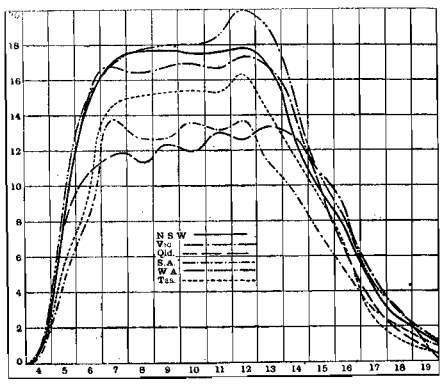
The proportion per cent. of the total children at each age who were attending private schools is shewn in the following table.

Proportion per cent. attending Private Schools (sexes combined), 1911.

Age last birthday.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
Under 5	.63	.55	.43	.42	.74	.46	..	..	.56
5	8.05	8.00	7.61	4.49	8.73	5.52	8.11	..	7.58
6	14.44	14.58	10.68	8.30	15.10	9.72	12.12	2.86	13.21
7	17.04	16.70	11.75	13.43	16.90	14.57	15.91	2.70	15.74
8	17.59	16.48	11.49	12.80	17.72	15.01	22.86	..	15.86
9	17.64	16.67	12.19	12.76	17.94	15.27	15.15	..	16.04
10	17.52	16.88	12.02	13.47	18.02	15.36	22.58	..	16.11
11	17.58	16.72	12.86	13.29	18.47	15.31	40.00	..	16.20
12	17.73	17.22	12.74	13.46	19.77	16.12	13.79	..	16.50
13	16.67	16.66	13.27	11.28	18.87	14.07	5.00	2.86	15.66
14	12.67	14.04	12.78	9.44	14.95	11.58	5.00	..	12.84
15	9.57	10.61	9.60	7.06	10.55	9.16	10.34	..	9.68
16	7.14	8.29	6.17	4.88	7.97	6.20	4.35	..	7.13
17	4.23	4.78	3.23	2.85	4.46	2.49	6.25	..	4.06
18	2.40	2.75	1.68	1.91	2.82	1.27	2.70	..	2.33
19	1.50	1.70	.87	1.23	1.04	.68	..	..	1.39
20 and over	.17	.11	.06	.11	.10	.09	..	..	.12
All Ages ..	3.75	3.69	2.98	2.66	3.64	3.39	1.72	.17	3.50

The maximum proportion for the Commonwealth as a whole, as well as for the States of New South Wales, Victoria, Western Australia, and Tasmania, was at age 12, the maximum in the case of Queensland being at age 13, and for South Australia at age 10.

Proportion of Private School Pupils, States and Ages, 1911,



GRAPH No. 57.

Graph No. 57 furnishes a representation of the proportion of children of each age in each State who were pupils at Private schools. The base of each small rectangle represents a year of age, and the vertical height representes two per cent. The most striking divergence between the several States in respect of this proportion is that shewn between Queensland on the one hand and Western Australia on the other.

The next table shews for each State and Territory the relative numbers of male and female pupils of private schools for each age. It gives under each head the excess of males over females per 100 of the sexes combined.

Masculinity of Private School Pupils (Excess of Males over Females per 100 of sexes combined), 1911.

Age last birthday.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
Under 5	— 8.24	1.40	— 13.38	13.13	— 16.15	4.35	..	..	— 4.98
5	— 2.88	— .88	— 4.77	8.05	— 1.07	3.53	— 100.00	..	— 1.64
6	— 6.34	.31	— 7.79	— 2.02	— 3.23	— 1.79	.00	— 100.00	— 3.82
7	— 5.92	— 8.78	— 14.11	— 3.67	— 13.65	— 5.79	— 14.29	— 100.00	— 8.03
8	— 7.15	— 8.09	— 8.80	— 8.64	— 12.35	— 9.06	50.00	..	— 8.13
9	— 9.70	— 5.20	— 9.70	— 12.99	— 8.28	— 8.64	— 100.00	..	— 8.46
10	— 10.82	— 9.72	— 18.18	— 9.41	— 7.56	— 4.04	14.29	..	— 10.63
11	— 10.60	— 8.28	— 16.64	— 10.90	— 15.48	— 16.37	40.00	..	— 11.16
12	— 13.85	— 6.20	— 17.09	— .50	— 12.16	— 7.05	50.00	..	— 10.47
13	— 13.64	— 3.87	— 13.77	— 3.88	— 14.97	— 11.88	100.00	— 100.00	— 9.95
14	— 15.00	— 4.03	— 11.17	5.51	— 13.83	— 14.72	100.00	..	— 9.34
15	— 11.04	— .28	— 13.28	16.24	— 16.44	— 22.73	100.00	..	— 6.66
16	— 13.58	— 5.34	— 16.95	2.84	— 28.12	— 19.35	— 100.00	..	— 11.01
17	— 8.42	1.75	— 25.18	11.38	— 8.65	— 7.07	100.00	..	— 5.30
18	3.54	.00	— 22.17	31.74	.00	24.53	100.00	..	2.16
19	.61	25.27	— .90	19.27	— 14.29	.00	..	..	10.61
20 and over	— 8.45	38.95	48.88	35.36	68.29	57.78	..	..	17.82
All Ages ..	— 9.60	— 3.96	— 12.40	— 1.12	— 10.07	— 7.98	15.79	— 100.00	— 7.53

Note, — denotes excess of females.

This table indicates that in all the States there is a preponderance of females amongst the private school pupils at the more important ages. For the Commonwealth as a whole this preponderance is in evidence at each age to 17 inclusive. It is least in evidence in South Australia, where there is a preponderance of males at all ages below 6 and above 13.

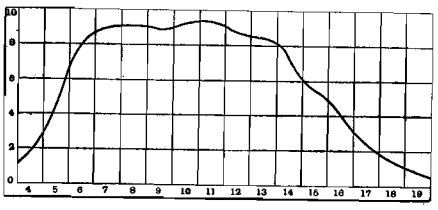
The age distribution per cent. of the private school pupils in each of the States and Territories was as follows :—

Age Distribution per cent. of Private School Pupils (sexes combined), 1911.

Age last birthday.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
Under 5	2.04	1.61	1.74	1.81	2.53	1.77	..	..	1.88
5	4.77	4.45	5.45	3.54	5.45	3.93	5.26	..	4.68
6	8.28	7.95	7.89	6.38	9.04	6.87	7.02	33.33	7.99
7	8.92	8.70	7.97	9.78	9.70	9.85	12.28	33.34	8.89
8	9.26	8.75	7.99	9.36	9.62	10.03	14.04	..	9.02
9	9.08	8.67	8.45	8.92	9.17	9.99	8.77	..	8.91
10	9.30	9.08	8.50	9.86	9.40	9.93	12.29	..	9.21
11	9.21	9.02	9.35	9.86	9.31	9.51	17.55	..	9.24
12	8.68	8.43	8.45	9.18	8.89	9.19	7.02	..	8.65
13	8.32	8.46	9.13	7.82	7.67	8.43	1.75	33.33	8.38
14	6.43	7.41	8.68	7.01	6.06	7.12	1.75	..	7.03
15	4.97	5.78	6.75	5.38	4.38	5.42	5.26	..	5.44
16	3.73	4.63	4.28	3.88	3.36	3.82	1.75	..	4.06
17	2.29	2.70	2.31	2.26	2.02	1.53	3.51	..	2.37
18	1.33	1.60	1.22	1.54	1.32	.82	1.75	..	1.39
19	.80	.95	.61	1.00	.48	.40	..	..	.80
20 and over	2.59	1.81	1.23	2.42	1.60	1.39	..	..	2.06
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Graph No. 58 represents the proportion per cent. of the total Private school pupils in the Commonwealth who were at each age. The base of each small rectangle represents a year of age, and the vertical height represents two per cent. The curve for the Commonwealth gives a fair indication of the curves for the several States.

Proportionate Age Distribution of Private School Pupils, Commonwealth, 1911.



GRAPH No. 58.

Of the total number of private school pupils in the Commonwealth 70.29 per cent. were aged from 6 to 13 last birthday, the corresponding proportions for the several States and Territories being as follows :—New South Wales, 71.05 per cent.; Victoria, 69.06 per cent. ; Queensland, 67.73 per cent.; South Australia, 71.16 per cent. ; Western Australia, 72.80 per cent. ; Tasmania, 73.80 per cent. ; Northern Territory, 80.72 per cent. ; and Federal Territory, 100 per cent.

In the following table is given a comparison between the enrolment of children attending private schools in 1910 and 1911, the average attendance in each of those years and the number of private school pupils according to the Census results.

Private School Pupils.—Enrolment, Average Attendance and Census Results, 1910 and 1911.

Particulars.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
Enrolment, 1910 ..	* 59.247	54,740	16,320	* 11,334	9,400	7,653	*	*	158,694
Enrolment, 1911 ..	60,963	55,893	16,100	11,650	9,000	7,138	50	..	160,794
Aver. Attendance, 1910	* 49,351	44,000	13,950	* 9,408	7,563	5,600	*	*	129,872
Aver. Attendance, 1911	51,569	45,000	13,560	9,395	8,015	5,009	40	..	132,588
Census Results, 3rd April, 1911	61,754	48,592	18,064	10,878	10,270	6,488	57	3	156,106

* For 1910 the New South Wales figures include those for the Federal Territory, and the South Australian figures include those for the Northern Territory.

The remarks on p. 186 relative to the comparison of enrolment statistics and Census results in respect of State school pupils applies to a large extent in the present instance, with the addition that in the case of private schools the enrolment statistics are even less satisfactory than is the case with State schools.

It will be seen that in five instances, viz., in New South Wales, Queensland, Western Australia, the Northern Territory, and the Federal Territory, the Census results exceeded the enrolment figures for 1911, while in the cases of Victoria, South Australia and Tasmania the enrolment figures for 1911 were in excess. For the Commonwealth as a whole the enrolment figures for 1911 exceeded the Census results by only 4688.

9. **Education "At Home."**—Of the total of 775,390 returned as receiving education at the date of the Census, 23,760, or about 3 per cent., were classed as receiving education "at home." The number of such in each year of age is given in the following table :—

Receiving Education "At Home" (sexes combined).

Age last birthday.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
Under 5	163	71	31	12	40	11	..	2	330
5	1,367	704	564	246	272	154	..	1	3,308
6	1,711	781	649	260	280	214	4	4	3,903
7	1,318	480	490	211	248	204	4	6	2,961
8	1,077	372	458	151	174	147	1	2	2,382
9	1,007	288	450	150	155	145	2	9	2,206
10	835	273	354	133	152	130	2	4	1,883
11	721	261	349	126	108	103	1	5	1,674
12	641	236	275	80	81	84	1	4	1,402
13	584	175	282	71	72	65	1	2	1,252
14	379	168	169	61	46	67	..	1	891
15	264	121	87	37	29	34	1	..	573
16	155	77	47	24	14	14	..	..	331
17	87	49	34	22	8	9	..	1	210
18	62	47	14	10	4	8	..	..	145
19	29	39	6	6	6	4	..	..	90
20 and over	115	58	10	18	10	7	1	..	219
Total	10,515	4,200	4,269	1,618	1,699	1,400	18	41	23,760

The maximum number at any age receiving education at home was at age 6 in the case of each of the States.

The proportion per cent. of the total children at each age who were classed as receiving education "at home" is shewn in the succeeding table :—

Proportion per cent. Receiving Education "At Home" (sexes combined).

Age last birthday.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
Under 5	.08	.05	.04	.02	.11	.05	..	1.10	.06
5	3.74	2.60	4.36	2.87	4.24	3.33	..	2.50	3.44
6	4.83	2.95	4.86	3.11	4.55	4.67	12.12	11.43	4.13
7	4.08	1.90	4.00	2.67	4.21	4.65	9.09	16.22	3.36
8	3.31	1.44	3.64	1.90	3.12	3.39	2.85	8.00	2.68
9	3.17	1.14	3.60	1.97	2.95	3.42	6.06	20.00	2.54
10	2.55	1.04	2.77	1.67	2.84	3.10	6.45	10.26	2.11
11	2.23	1.00	2.66	1.56	2.09	2.55	4.00	17.86	1.88
12	2.12	.99	2.29	1.08	1.75	2.27	3.45	9.76	1.71
13	1.89	.71	2.27	.94	1.72	1.67	5.00	5.71	1.50
14	1.21	.66	1.38	.75	1.10	1.68	..	2.08	1.04
15	.82	.46	.69	.45	.68	.88	3.45	..	.65
16	.48	.28	.37	.28	.32	.35	..	..	.37
17	.26	.18	.26	.26	.17	.22	..	2.17	.23
18	.18	.17	.11	.11	.08	.19	..	..	.15
19	.09	.14	.05	.07	.13	.10	..	..	10
20 and over	.01	.01	..	.01	.01	.01	.04	..	.01
All Ages	.64	.32	.71	.40	.60	.73	.54	2.39	.53

Amongst the States the highest proportion receiving education " at home " was furnished by Queensland for ages 5, 6, 8, 9, 11, 12, and 13 ; by Western Australia for ages " under 5 " and for 10 ; and by Tasmania for ages 7, 14 and 15. For the population as a whole Tasmania furnished the highest proportion, Queensland being second and New South Wales third.

The next table shews for each State and Territory the relative number of males and females of each age being educated " at home." It gives under each head the excess of males over females per 100 of the sexes combined.

Masculinity of Children being Educated " At Home " (Excess of Males over Females per 100 of sexes combined), 1911.

Age last birthday.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
Under 5	5.52	29.58	22.58	.00	— 50.00	45.45	..	— 100.00	6.06
5	— 3.00	— 13.92	.00	— 14.63	— 4.41	.00	..	— 100.00	— 5.68
6	— 8.12	— 12.42	— 5.08	— 7.69	— 2.86	— 14.02	100.00	.00	— 8.28
7	— 6.53	— 13.75	— 18.37	1.42	— 14.52	— 1.96	— 50.00	33.33	— 9.42
8	— 5.11	— 9.14	— 3.06	— 16.56	1.15	— 22.45	100.00	100.00	— 6.55
9	— 6.45	— 9.72	— 2.22	— 18.67	— 20.00	— 15.86	100.00	55.56	— 8.07
10	— 12.81	— 15.02	— 4.52	— 12.78	— 22.37	— 10.77	.00	— 50.00	— 12.27
11	— 14.56	— 20.31	— 3.15	— 11.11	— 12.96	— 22.33	100.00	— 20.00	— 13.14
12	— 18.88	— 14.41	— 6.18	— 2.50	3.70	2.38	— 100.00	— 50.00	— 11.98
13	— 14.38	— 33.71	— 4.96	— 21.13	— 5.56	— 23.08	— 100.00	100.00	— 15.18
14	— 24.54	— 26.19	— 26.63	— 21.31	.00	— 19.40	..	100.00	— 23.23
15	— 27.27	— 22.31	— 31.03	— 45.95	— 10.34	.00	— 100.00	..	— 25.65
16	— 30.32	14.29	— 31.91	— 50.00	— 14.29	— 100.00	..	..	— 23.87
17	— 8.05	— 10.20	— 11.76	— 27.27	— 50.00	— 55.56	..	100.00	— 14.29
18	12.90	— 2.13	— 14.29	— 40.00	— 50.00	— 50.00	..	..	— 3.45
19	3.45	48.72	— 33.33	.00	— 33.33	.00	..	..	17.78
20 and over	46.09	68.97	60.00	55.56	80.00	42.86	100.00	..	55.25
All Ages ..	— 9.04	— 11.81	— 6.72	— 12.11	— 9.36	— 12.00	22.22	21.95	— 9.44

Note, — denotes excess of females.

This table indicates a preponderance of females amongst those being educated " at home," at practically all ages in all the States, the preponderance being least marked in the case of Queensland for the ages 8 to 13 last birthday.

The age distribution per cent. of the children being educated " at home " in each of the States and Territories was as follows :—

Age Distribution per cent. of Children being Educated " At Home " (sexes combined), 1911.

Age last birthday.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
Under 5	1.55	1.69	.73	.74	2.35	.79	..	4.88	1.39
5	13.00	16.76	13.21	15.20	16.01	11.00	..	2.44	13.92
6	16.27	18.59	15.20	16.07	16.48	15.29	22.22	9.75	16.43
7	12.54	11.43	11.48	13.04	14.60	14.57	22.22	14.63	12.46
8	10.24	8.86	10.73	9.33	10.24	10.50	5.56	4.88	10.03
9	9.58	6.86	10.54	9.27	9.12	10.36	11.11	21.95	9.28
10	7.94	6.50	8.29	8.22	8.95	9.29	11.11	9.76	7.93
11	6.86	6.21	8.17	7.79	6.36	7.36	5.56	12.19	7.05
12	6.10	5.62	6.44	4.95	4.77	6.00	5.56	9.76	5.90
13	5.55	4.17	6.61	4.39	4.24	4.64	5.56	4.88	5.27
14	3.60	4.00	3.96	3.77	2.71	4.78	..	2.44	3.75
15	2.51	2.88	2.04	2.29	1.71	2.43	5.55	..	2.41
16	1.47	1.83	1.10	1.48	.82	1.00	..	..	1.39
17	.83	1.17	.80	1.36	.47	.64	..	2.44	.88
18	.59	1.12	.33	.62	.23	.57	..	..	.61
19	.28	.93	.14	.37	.35	.28	..	..	.38
20 and over	1.09	1.38	.23	1.11	.59	.50	5.55	..	.92
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Of the total number in the Commonwealth being educated " at home," 74.35 per cent. were aged from 6 to 13 last birthday, the corresponding proportions for the several States and Territories being as follows :—New South Wales, 75.08 per cent. ; Victoria, 68.24 per cent. ; Queensland, 77.46 per cent. ; South Australia, 73.06 per cent. ; Western Australia, 74.76 per cent. ; Tasmania, 78.01 per cent. ; Northern Territory, 88.90 per cent. ; and Federal Territory, 87.80 per cent.

10. **University Students.**—The number of University students at each age in each of the States is shewn in the following table :—

University Students, 1911.

Age last Birthday.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	C'wlth.
MALES.							
16	11	12	..	7	..	..	30
17	36	34	2	25	..	5	102
18	93	120	9	32	..	5	259
19	121	112	7	26	..	4	270
20 and over	501	542	16	181	7	18	1,265
Total	762	820	34	271	7	32	1,926
FEMALES.							
16	16	9	2	15	..	1	43
17	18	13	4	5	3	1	44
18	30	26	5	10	1	2	74
19	25	44	3	17	1	4	94
20 and over	82	112	8	69	2	11	284
Total	171	204	22	116	7	19	539
PERSONS.							
16	27	21	2	22	..	1	73
17	54	47	6	30	3	6	146
18	123	146	14	42	1	7	333
19	146	156	10	43	1	8	364
20 and over	583	654	24	250	9	29	1,549
Total	933	1,024	56	387	14	51	2,465

As already mentioned on p. 178, the Queensland University was opened in March 1911, the Western Australian University in March 1913. The figures for the last-mentioned State consequently refer to students temporarily absent from their Universities.

The relative number of male and female students is shewn in the succeeding table.

Masculinity of University Students (Excess of Males over Females per 100 of sexes combined), 1911.

Age last birthday.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	C'wlth.
16	— 18.52	14.29	— 100.00	— 36.36	..	— 100.00	— 17.81
17	33.33	44.68	— 33.33	66.67	— 100.00	66.67	39.73
18	51.22	64.38	28.57	52.38	— 100.00	42.86	55.56
19	65.75	43.59	40.00	20.93	— 100.00	.00	48.35
20 and over	71.87	65.75	33.33	44.80	55.56	24.14	63.33
Ages 16 and Over	63.34	60.16	21.43	40.05	.00	25.49	56.27

Note, — denotes excess of females.

This table indicates a preponderance of females at age 16, but of males at all other ages, the tendency being for this latter preponderance to increase with age.

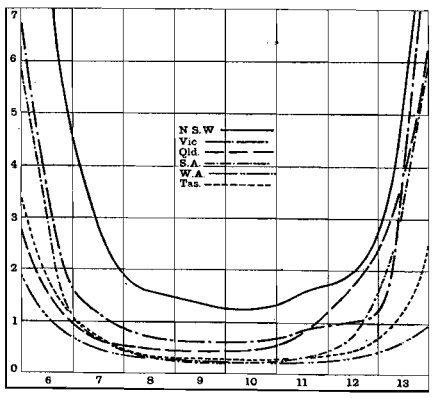
11. **Not Indicated as Receiving Education.**—Of the total of 701,834 children aged last birthday from 6 to 13 years, there were 64,609, or 9.21 per cent., who were not indicated as receiving education. The numbers for each age in each State and Territory are as follows :—

Children Not Indicated as Receiving Education (sexes combined).

Age last birthday.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
6	8,657	3,620	1,528	2,988	1,053	1,812	21	10	19,689
7	2,798	1,143	643	662	462	713	23	7	6,451
8	1,580	690	486	302	307	323	18	..	3,706
9	1,351	615	421	203	245	285	16	6	3,142
10	1,265	623	477	212	206	235	12	6	3,036
11	1,530	839	784	325	242	302	8	8	4,038
12	1,984	1,036	1,690	746	315	448	15	9	6,243
13	5,290	3,970	3,860	3,275	653	1,238	11	7	18,304
Total, 6–13	24,455	12,536	9,889	8,713	3,483	5,356	124	53	64,609

In all the States the numbers were largest at the extreme ages of 6 and 13 last birthday, the totals for these two ages aggregating 37,993, or nearly 59 per cent. of the total aged last birthday from 6 to 13 who were not indicated as receiving education.

Number of Children, aged 6–13, not indicated as Receiving Education, 1911.



GRAPH No. 59.

In the accompanying graph (No. 59) is given a representation of the number of children in the several States aged 6 to 13 last birthday who were not indicated as receiving education. The base of each small square represents a year of age, and the vertical height represents 1000 children.

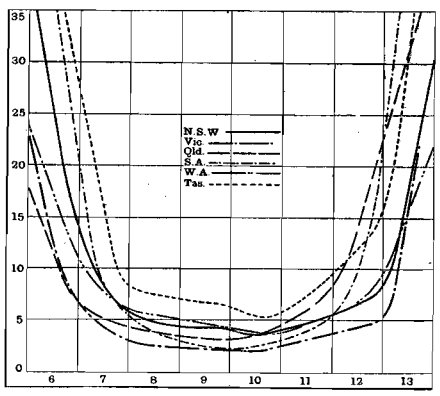
The proportion per cent. of the total children at each age represented by those not indicated as receiving education is shewn in the following table for each State and Territory :—

Proportion per cent. not Indicated as Receiving Education (sexes combined), 1911.

Age last birthday.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
6	24.45	13.66	11.45	35.72	17.13	39.49	63.64	28.57	20.86
7	8.65	4.51	5.25	8.37	7.84	16.25	52.27	18.92	7.32
8	4.86	2.67	3.87	3.80	5.51	7.45	51.43	..	4.17
9	4.25	2.44	3.36	2.67	4.67	6.72	48.49	13.33	3.62
10	3.86	2.38	3.74	2.66	3.85	5.61	38.71	15.38	3.40
11	4.73	3.20	5.98	4.03	4.67	7.49	32.00	28.57	4.53
12	6.56	4.35	14.09	10.05	6.82	12.11	51.73	21.95	7.63
13	17.16	16.09	31.06	43.39	15.64	31.85	55.00	20.00	21.89
Ages, 6–13 ..	9.47	6.15	9.79	13.87	8.26	16.05	49.60	18.60	9.21

Amongst the States, Victoria had the lowest proportion not indicated as receiving education for all ages except 6, for which Queensland was the lowest, and 13, for which Western Australia was the lowest. On the other hand, Tasmania had the highest proportion amongst the States at all ages except 12, for which Queensland was the highest, and 13, for which South Australia was the highest.

Proportion of Children, aged 6–13, not indicated as Receiving Education, 1911.



GRAPH No. 60.

Graph No. 60 furnishes for each State a representation of the proportion of the total children (sexes combined) at each age who were not indicated as receiving education. The base of each small square represents a year of age, and the vertical height represents five per cent.

The following table shews for each State and Territory the relative number of males and females of each age who were not indicated as receiving education.

Masculinity of Children not indicated as Receiving Education (Excess of Males over Females per 100 of sexes combined), 1911.

Age last birthday.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
6	— 2.74	— 5.14	— 2.09	— 2.95	— 10.73	3.20	— 4.76	60.00	— 3.01
7	— 9.22	— 8.84	3.58	5.14	— 4.33	3.51	— 4.35	— 42.86	— 4.67
8	— 4.30	— 12.17	12.76	— 10.60	— 3.58	6.50	11.11	..	— 2.97
9	— 5.40	— 3.41	11.16	1.48	2.86	4.56	— 37.50	100.00	— .76
10	— 9.72	11.08	3.56	6.60	— 18.45	13.19	— 16.67	— 100.00	— 1.25
11	— 1.05	— 1.55	.00	— 2.77	— 8.26	5.30	— 25.00	.00	— 1.09
12	— 10.38	— 2.70	4.14	1.07	6.67	8.48	— 20.00	— 11.11	— 1.62
13	— 4.50	— 3.22	3.26	5.28	1.99	10.34	— 9.09	— 14.29	.39
Ages, 6–13 ..	— 4.98	— 3.92	3.17	1.18	— 4.62	6.16	— 11.29	1.89	— 1.76

Note, — denotes excess of females.

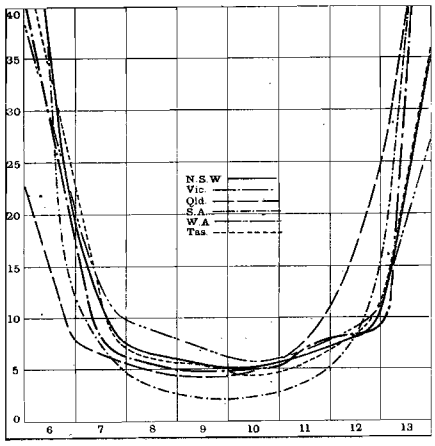
For the Commonwealth as a whole there was a slight proponderance of females at all ages except 13. General preponderances of females were in evidence in New South Wales, Victoria, Western Australia and Northern Territory, and of males in Queensland, South Australia, Tasmania and Federal Territory.

The age distribution per cent. of the children of school age in each State who were not indicated as receiving education is shewn in the succeeding table :—

Age Distribution per cent. of Children not indicated as Receiving Education (sexes combined).

Age last birthday.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
6	35.40	28.88	15.45	34.29	30.23	33.83	16.93	18.86	30.47
7	11.44	9.12	6.50	7.60	13.27	13.31	18.55	13.21	9.99
8	6.46	5.50	4.92	3.47	8.81	6.03	14.52	..	5.74
9	5.53	4.90	4.26	2.33	7.03	5.32	12.90	11.32	4.86
10	5.17	4.97	4.82	2.43	5.92	4.39	9.68	11.32	4.70
11	6.26	6.70	7.93	3.73	6.95	5.64	6.45	15.10	6.25
12	8.11	8.26	17.09	8.56	9.04	8.37	12.10	16.98	9.66
13	21.63	31.67	39.03	37.59	18.75	23.11	8.87	13.21	28.33
Total ..	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Proportionate Age Distribution of Children, aged 6–13, not indicated as Receiving Education, 1911.



GRAPH No. 61.

For the Commonwealth as a whole, as well as for New South Wales, Western Australia and Tasmania the proportion was at a minimum at age 10, whilst for Victoria, Queensland and South Australia the minimum was at age 9.

In Graph No. 60 a representation was given for each State of the proportion of the total number of children of each age who were not indicated as receiving education. In the present graph (No. 61) the representation furnished for each State is that of the proportion of the total children aged 6-13 not indicated as receiving education who were of each age. The base of each small square represents a year of age, and the vertical height represents five per cent.

12. **Pupils in Metropolitan Areas.**—Particulars in respect of the number of pupils in the metropolitan areas of the several States are furnished in the succeeding table :—

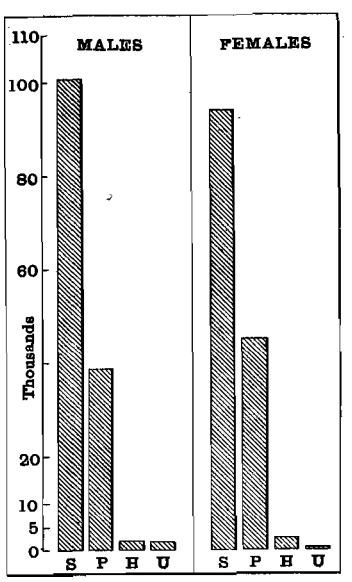
Metropolitan Schooling as at 3rd April, 1911.

Metropolitan Areas including Suburbs.	Number receiving education at—				Number not indicated as receiving education.	Total.
	State School.	Private School.	Home.	University.		
MALES.						
Sydney	36,399	13,875	778	684	253,992	305,728
Melbourne	33,276	14,306	640	770	228,964	277,956
Brisbane	10,137	2,651	125	26	54,689	67,628
Adelaide	10,858	3,757	137	257	75,569	90,578
Perth	7,892	2,716	117	4	42,502	53,231
Hobart	1,968	1,231	55	25	15,208	18,487
Total, Metropolitan ..	100,530	38,536	1,852	1,766	670,924	813,608
FEMALES.						
Sydney	33,414	17,319	1,085	149	271,808	323,775
Melbourne	31,386	15,656	845	188	262,938	311,015
Brisbane	9,354	3,390	171	18	58,919	71,852
Adelaide	10,571	3,896	212	113	84,276	99,068
Perth	7,342	3,252	243	3	42,721	53,561
Hobart	1,841	1,411	77	18	18,103	21,450
Total, Metropolitan ..	93,908	44,926	2,633	489	738,765	880,721

Metropolitan Schooling as at 3rd April, 1911.—*continued.*

Metropolitan Areas including Suburbs.	Number receiving education at—				Number not indicated as receiving education.	Total.
	State School.	Private School.	Home.	University.		
PERSONS.						
Sydney	69,813	31,194	1,863	833	525,800	629,503
Melbourne	64,662	29,964	1,485	958	491,902	588,971
Brisbane	19,491	6,041	296	44	113,608	139,480
Adelaide	21,429	7,653	349	370	159,845	189,646
Perth	15,234	5,968	360	7	85,223	106,792
Hobart	3,809	2,642	132	43	33,311	39,937
Total, Metropolitan	194,438	83,462	4,485	2,255	1,409,689	1,694,329

Metropolitan Pupils, 1911.



GRAPH No. 62.

In this table the column headed "Number not indicated as receiving education" includes persons above school age as well as those of school age concerning whom no such indication was furnished.

As previously indicated the small number of University students shewn for Perth was due to the fact that the Western Australian University had not been opened at the date of the Census, the 7 students shewn being members of other Universities who were resident in Western Australia.

In Graph No. 62 a representation is furnished of the number of pupils attending each class of school, etc., within the metropolitan areas. The letter S indicates State school pupils, the letter P Private school pupils, the letter H indicates those being educated at home, while the letter U indicates University students.

The following table shews for each of the metropolitan areas the proportionate distribution per cent. of the children receiving education according to class of school, etc.

Proportionate Distribution of Metropolitan Pupils according to Class of Institution, 1911.

Metropolitan Areas including Suburbs.	Proportion per cent. receiving education at—				Total.
	State School.	Private School.	Home.	University.	
MALES.					
Sydney	70.36	26.82	1.50	1.32	100.00
Melbourne	67.92	29.20	1.31	1.57	100.00
Brisbane	78.34	20.49	.97	.20	100.00
Adelaide	72.35	25.03	.91	1.71	100.00
Perth	73.56	25.31	1.09	.04	100.00
Hobart	60.02	37.54	1.68	.76	100.00
All Metropolitan Areas	70.45	27.01	1.30	1.24	100.00
FEMALES.					
Sydney	64.30	33.33	2.09	.28	100.00
Melbourne	65.28	32.57	1.76	.39	100.00
Brisbane	72.33	26.21	1.32	.14	100.00
Adelaide	71.47	26.34	1.43	.76	100.00
Perth	67.73	30.00	2.24	.03	100.00
Hobart	55.00	42.16	2.30	.54	100.00
All Metropolitan Areas	66.15	31.65	1.86	.34	100.00

Proportionate Distribution of Metropolitan Pupils according to Class of Institution.—*continued.*

Metropolitan Areas including Suburbs.	Proportion per cent. receiving education at—				Total
	State School.	Private School.	Home.	University.	
PERSONS.					
Sydney	67.32	30.08	1.80	.80	100.00
Melbourne	66.61	30.87	1.53	.99	100.00
Brisbane	75.34	23.35	1.14	.17	100.00
Adelaide	71.91	25.68	1.17	1.24	100.00
Perth	70.63	27.67	1.67	.03	100.00
Hobart	57.49	39.87	1.99	.65	100.00
All Metropolitan Areas	68.31	29.32	1.58	.79	100.00

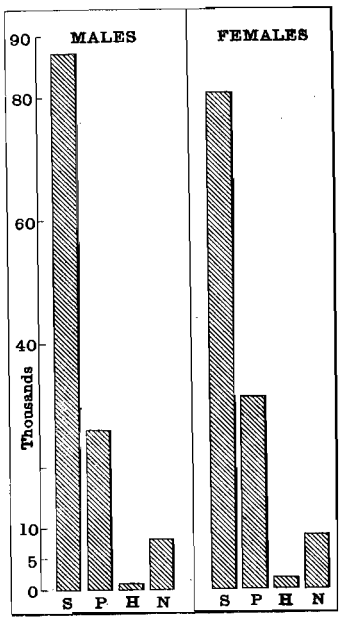
Of those recorded as receiving education at the date of the Census, Brisbane furnished the highest proportion at State schools, and the lowest at private schools and " at home," while Hobart furnished the lowest proportion at State schools, and the highest at private schools and " at home."

In the following table is given for each of the metropolitan areas the number of children of what has been termed "compulsory school age," that is, children aged from 6 to 13 last birthday who were receiving education at each class of school, etc.

Metropolitan Children Aged last Birthday from 6 to 13 Years.

Metropolitan Areas including Suburbs.	Number receiving education at—			Number not indicated as receiving education.	Total.
	State School.	Private School.	Home.		
MALES.					
Sydney	31,132	9,420	390	2,773	43,715
Melbourne	29,056	9,574	380	2,313	41,323
Brisbane	8,741	1,707	72	661	11,181
Adelaide	9,845	2,338	88	1,588	13,859
Perth	6,621	1,823	59	386	8,889
Hobart	1,699	893	37	413	3,042
Total, Metropolitan	87,094	25,755	1,026	8,134	122,009
FEMALES.					
Sydney	28,377	11,852	720	3,136	44,085
Melbourne	27,242	11,061	539	2,361	41,203
Brisbane	8,013	2,197	103	760	11,073
Adelaide	9,263	2,828	120	1,570	13,781
Perth	6,123	2,301	147	469	9,040
Hobart	1,585	981	52	398	3,016
Total, Metropolitan	80,603	31,220	1,681	8,694	122,198
PERSONS.					
Sydney	59,509	21,272	1,110	5,909	87,800
Melbourne	56,298	20,635	919	4,674	82,526
Brisbane	16,754	3,904	175	1,421	22,254
Adelaide	19,108	5,166	208	3,158	27,640
Perth	12,744	4,124	206	855	17,929
Hobart	3,284	1,874	89	811	6,058
Total, Metropolitan	167,697	56,975	2,707	16,828	244,20

Metropolitan Children, aged 6–13 last birthday, 1911.



GRAPH No. 63.

It will be seen that for the combined metropolitan areas the total number of males, aged last birthday 6 to 13, was practically identical with the total number of females of the same age, and that this approximate equality of sexes was also in evidence in separate metropolitan areas. Females were slightly in excess in combined total, and also in Sydney and Perth, while males were slightly in excess in Melbourne, Brisbane, Adelaide, and Hobart.

Graph No. 63 furnishes a representation of the number of metropolitan children of each sex aged from 6 to 13 last birthday classified according to the class of school, etc., at which they were receiving education at the date of the Census. In this graph the letter S indicates State school pupils, the letter P indicates Private school pupils, the letter H denotes those receiving education at home, while the letter N denotes those who were not indicated as receiving education.

The succeeding table shews the proportion of children of "school age" receiving education at each class of school, etc.

Proportion of Children of "School Age" at each Class of School, etc.

Metropolitan Areas including Suburbs.	Proportion per cent. receiving education at—			Proportion per cent. not indicated as receiving education.	Total.
	State School.	Private School.	Home.		
MALES.					
Sydney	71.22	21.55	.89	6.34	100.00
Melbourne	70.31	23.17	.92	5.60	100.00
Brisbane	78.18	15.27	.64	5.91	100.00
Adelaide	71.04	16.87	.63	11.46	100.00
Perth	74.49	20.51	.66	4.34	100.00
Hobart	55.85	29.35	1.22	13.58	100.00
All Metropolitan Areas	71.38	21.11	.84	6.67	100.00
FEMALES.					
Sydney	64.37	26.89	1.63	7.11	100.00
Melbourne	66.12	26.84	1.31	5.73	100.00
Brisbane	72.37	19.84	.93	6.86	100.00
Adelaide	67.22	20.52	.87	11.39	100.00
Perth	67.73	25.45	1.63	5.19	100.00
Hobart	52.55	32.53	1.72	13.20	100.00
All Metropolitan Areas	65.96	25.55	1.38	7.11	100.00
PERSONS.					
Sydney	67.78	24.23	1.26	6.73	100.00
Melbourne	68.22	25.01	1.11	5.66	100.00
Brisbane	75.29	17.54	.79	6.38	100.00
Adelaide	69.13	18.69	.75	11.43	100.00
Perth	71.08	23.00	1.15	4.77	100.00
Hobart	54.21	30.93	1.47	13.39	100.00
All Metropolitan Areas	68.67	23.33	1.11	6.89	100.00

Hobart had the highest proportion being educated at private schools, "at home," and not indicated, and the lowest at State schools. Brisbane had the highest at State schools and the lowest at private schools, while Adelaide had the lowest "at home," and Perth had the lowest not indicated.

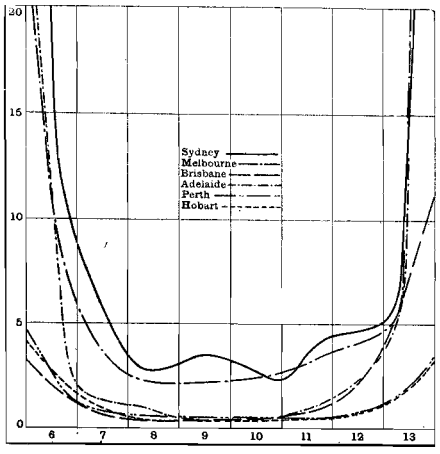
Of the total of 244,207 children aged last birthday from 6 to 13 years in the various metropolitan areas of the Commonwealth, there were 16,828, or 6.89 per cent., who were not indicated as receiving education. The number for each age in each of the metropolitan areas is as follows :—

Metropolitan Children not indicated as Receiving Education (sexes combined).

Age last birthday.	Sydney and Suburbs.	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total, Metropolitan.
6	2,118	1,252	204	1,118	277	284	5,253
7	596	375	70	137	80	98	1,356
8	297	223	37	80	60	38	735
9	334	227	38	37	46	44	726
10	272	244	47	49	48	37	697
11	356	316	82	96	47	42	939
12	473	408	222	241	80	75	1,499
13	1,463	1,629	721	1,400	217	193	5,623
Total, 6–13 ..	5,909	4,674	1,421	3,158	855	811	16,828

As in the case of the whole population, discussed on p. 192, the highest figures occur in each case at the limiting ages 6 and 13, the aggregate for those two ages being no less than 10,876, or 64.63 per cent., of the Metropolitan total aged 6–13 not indicated as receiving education.

Number of Metropolitan Children, aged 6–13, not indicated as Receiving Education, 1911.



GRAPH No. 64.

The minimum number at any age occurred at age 10 for the combined metropolitan areas as well as for Sydney and Hobart ; at age 8 for Melbourne and Brisbane ; and at age 9 for Adelaide and Perth.

Graph No. 64 furnishes a representation of the number of children in each metropolis aged from 6 to 13 last birthday who were not indicated as receiving education. The base of each small rectangle represents a year of age, while the vertical height represents 500 children.

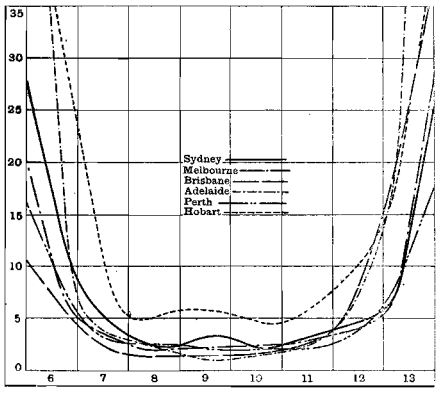
The proportion per cent. of the total children at each age represented by those not indicated as receiving education is shewn in the following table for each of the metropolitan areas.

Metropolitan Proportion per cent. not indicated as Receiving Education (sexes combined).

Age last Birthday.	Sydney and Suburbs.	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	All Metropolitan areas.
6	17.71	11.88	7.37	30.36	11.02	36.50	16.30
7	5.46	3.71	2.55	4.01	3.36	12.44	4.46
8	2.66	2.12	1.35	2.30	2.61	5.23	2.38
9	3.12	2.21	1.41	1.11	2.06	5.61	2.42
10	2.48	2.33	1.64	1.40	2.11	4.83	2.26
11	3.17	2.96	2.80	2.62	2.06	5.80	2.98
12	4.56	4.18	8.35	7.48	3.91	10.39	5.21
13	13.95	16.00	25.32	42.09	11.48	25.13	19.06
Ages, 6–13 ..	6.73	5.66	6.39	11.43	4.77	13.39	6.89

In this case the lowest proportions were shewn by Brisbane for ages 6, 7 and 8, by Adelaide for ages 9 and 10, and by Perth for ages 11, 12 and 13. The highest proportions were shewn by Hobart for all ages except 13, for which Adelaide occupied the highest position. For the Commonwealth as a whole the proportion of those of school age who were not indicated as receiving education was 9.21 per cent., as compared with 6.89 per cent. for the metropolitan areas. Stated somewhat differently, it may be said that the metropolitan proportion was 6.89 per cent. as compared with 10.44 per cent. for the extra-metropolitan population.

Metropolitan Proportion not indicated as Receiving Education, 1911.



GRAPH No. 65.

In Graph No. 65 is furnished for each metropolis a representation of the proportion of the total number of children (sexes combined) at each age, concerning whom there was no indication that they were receiving education. In this graph the base of each small square represents a year of age, while the vertical height represents five per cent.

The following table shews for each of the metropolitan areas the relative number of males and females of each age who were not indicated as receiving education. For the whole of the age group, 6-13 last birthday, there was an excess of males for the combined metropolitan areas, as well as for Sydney, Melbourne, Brisbane, and Perth, but an excess of females in Adelaide and Hobart.

Masculinity of Metropolitan Children not indicated as Receiving Education (Excess of Males over Females per 100 of sexes combined).

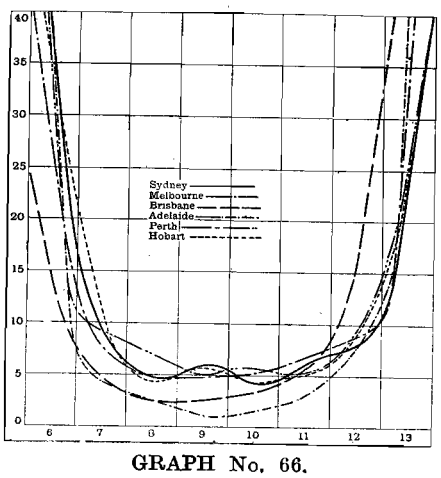
AGE LAST BIRTHDAY.	Sydney and Suburbs.	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	All Metropolitan areas.
6	8.78	3.99	3.92	4.83	19.13	2.82	6.83
7	15.44	13.60	25.71	— 8.03	27.50	— 4.08	12.39
8	— 13.13	— 4.04	— 24.32	7.50	— 6.67	— 10.53	— 8.03
9	— 7.19	— 3.08	10.53	24.32	— 17.39	27.27	— 1.93
10	5.88	— 5.74	31.91	— 14.29	20.83	2.70	3.01
11	— 1.69	— 3.16	14.63	— 6.25	14.89	.00	— .32
12	11.21	4.41	18.92	.41	— 12.50	— 12.00	6.34
13	5.81	— 1.90	1.25	— 4.57	5.99	— 9.84	— .12
AGES, 6–13	6.14	1.03	6.97	— .57	9.71	— 1.85	3.33

The age distribution per cent. of the children of school age in each metropolitan area who were not indicated as receiving education is shewn in the succeeding table :—

Age Distribution per cent. of Metropolitan Children not indicated as Receiving Education (sexes combined).

AGE LAST BIRTHDAY.	Sydney and Suburbs.	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	All Metropolitan areas.
6	35.84	26.79	14.36	35.40	32.40	35.02	31.22
7	10.09	8.02	4.93	4.34	9.35	12.08	8.06
8	5.03	4.77	2.60	2.54	7.02	4.68	4.37
9	5.65	4.86	2.67	1.17	5.38	5.43	4.31
10	4.60	5.22	3.31	1.55	5.62	4.56	4.14
11	6.02	6.76	5.77	3.04	5.50	5.18	5.58
12	8.01	8.73	15.62	7.63	9.35	9.25	8.91
13	24.76	34.85	50.74	44.33	25.38	23.80	33.41
AGES, 6–13	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Proportionate Age Distribution of Metropolitan Children, aged 6–13, not indicated as Receiving Education, 1911.



GRAPH No. 66.

The accompanying graph (No. 66) furnishes a representation for each metropolis of the proportion of the total number of children (sexes combined), aged 6-13 last birthday not indicated as receiving education who were of each age. The base of each small square represents a year of age, and the vertical height represents five per cent.

13. **State Sub-divisions.**—Particulars in respect of schooling tabulated according to sex, age, and class of school are given for State and Territory Sub-divisions on pp. 633 to 743 inclusive of Vol. II. of the Census Detailed Tables, as follows :—New South Wales Counties, pp. 633 to 672 ; Victorian Counties, 673 to 684 ; Queensland Census Districts, 684 to 703 ; South Australian Counties and Divisions, 704 to 717 ; Western Australian Statistical Districts, 718 to 726 ; Tasmanian Municipalities, 726 to 741 ; Northern Territory, 741 to 742 ; Federal Territory, 743.

CHAPTER XV.

RELIGION.

1. **Nature of Inquiry.**—Section 21 of the Commonwealth Census and Statistics Act 1905, under which the Census of 1911 was taken, contains the provision that "no person shall be liable to any penalty for omitting or refusing to state the religious denomination or sect to which he belongs or adheres." For refusal to furnish information in connexion with any other item of inquiry contained in the Census schedule, a maximum penalty of £10 is provided under Sections 11, 14 and 15 of the Act mentioned. In accordance with the provision of Section 21, the instruction relative to supplying information concerning religion was as follows :—"Do not use general terms that include more than one religious denomination or sect. In the case of children, enter the name of the religion in which it is intended they shall be brought up. If you object to state to what religious denomination you belong, write *Object.*" On the personal card itself the query took the form simply of the word "Religion" with a blank space following it for the insertion of the appropriate particulars.

2. **Object to State.**—The total number of persons in the Commonwealth who availed themselves of the option of objecting to state their religion on the Census schedule was 83,003, or 1.86 per cent. of the total population. Of these 55,766 were males and represented 2.41 per cent. of the male population, while 27,237 were females and represented 1.27 per cent. of the female population. The corresponding percentages on total population for the several States and Territories were as follows :—New South Wales, 1.34 per cent. ; Victoria, 1.67 per cent. ; Queensland, 2.08 per cent. ; South Australia, 3.74 per cent. ; Western Australia, 2.18 per cent. ; Tasmania, 2.58 per cent. ; Northern Territory, 2.96 per cent. ; and Federal Territory, 1.28 per cent. The range in the percentage of persons who objected to state their religion was thus between $1\frac{1}{4}$ per cent. in the Federal Territory, and $3\frac{3}{4}$ per cent. in South Australia.

3. **Religion Unspecified.**—In addition to those who specifically objected to state their religion, there were 36,114 in the Commonwealth as a whole who failed to furnish any reply, representing about 8 per thousand of the total population. Of the male population considered separately those unspecified represented about 11 per thousand, and of the female population, somewhat less than 5 per thousand. In reviewing the results in the present chapter the number of those who objected to state their religion and of those who failed to furnish a reply have been distributed proportionately over the specified religions in the various categories.

4. **Classification of Results.**—For convenience of compilation and review the data relative to religions have been classed in six divisions as follows :—I. Christian ; II. Non-Christian ; III. Indefinite ; IV. No Religion ; V. Object to State ; VI. Unspecified. The first four of these have been further divided into the principal denominations and sects comprised thereunder, making, with the classes "object to state" and "unspecified," a total of thirty items. Under these items particulars for each sex and for the sexes combined have been tabulated in respect of birthplaces (see pp. 238 to 291 of the Detailed Tables), and also in respect of age, education and conjugal condition (see pp. 772 to 825 of the Detailed Tables). These particulars are given for the Commonwealth as a whole as well as separately for each State and Territory. For the purposes of tabulation each card was marked in relation to religion with the appropriate number corresponding to one of these thirty items, and the principal tabulations proceeded on the basis of these numbers. For the use of the tabulators engaged on this work an index of religions was prepared. In the case of the conjugal condition cards, which were written up for the tabulation of the relative ages, birthplaces and religions of husbands and wives, the religion number was entered on the card.

In the general tabulation of religious data, however, an arrangement was made whereby the persons included in any of the 30 classified items were specially tabulated according to sex under the precise designations which they themselves furnished. The outcome of this tabulation disclosed the fact that no fewer than 1578 different designations had been furnished, of which 1206, or about $76\frac{1}{2}$ per cent., were represented by less than ten persons each. These latter were for purposes of publication grouped with the designation "Others" under the denomination or sect to which they had been classified, but all designations represented by ten or more persons are published in full for each sex in respect of each State and Territory on pp. 751 to 770 of the Detailed Tables.

In this tabulation the various designations are arranged under the classified items in numerical order, according to the number of persons of both sexes representing each in the Commonwealth as a whole.

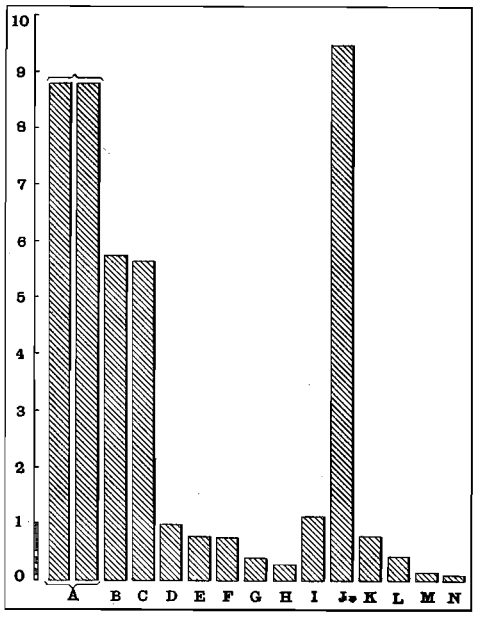
5. **Aggregates for States and Territories.**—After the distribution of the groups "object to state" and "unspecified" referred to in article 3 above, the figures for the total population of the several States and Territories were as follows :—

Numerical Distribution of Population according to Religion (sexes combined), 1911.

Religion.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
CHRISTIAN—									
Church of England ..	748,493	462,388	219,614	119,385	112,975	91,255	678	685	1,755,473
Presbyterian	186,592	240,515	78,048	23,709	27,569	16,295	153	192	573,073
Methodist	153,512	180,339	61,577	104,836	35,298	25,746	121	121	561,550
Baptist	20,965	31,867	14,080	22,799	4,931	4,898	15	..	99,555
Congregational	23,008	16,831	10,735	13,940	6,376	5,032	25	1	75,948
Lutheran	7,177	11,906	24,843	27,794	2,561	202	25	..	74,508
Church of Christ ..	6,495	16,841	2,632	9,718	2,882	1,161	1	2	39,732
Salvation Army ..	7,533	7,968	4,431	4,007	1,944	1,465	..	..	27,348
Seventh Day Adventist	2,033	1,474	650	649	911	532	..	..	6,249
Unitarian	864	527	152	477	151	76	1	..	2,248
Protestant (undefined)	37,684	24,747	19,028	13,895	10,310	7,433	42	22	113,161
Roman Catholic ..	382,740	278,465	141,461	53,467	58,449	29,576	454	634	945,246
Greek Catholic	1,144	501	527	163	438	41	..	..	2,814
Catholic (undefined) ..	37,354	15,058	8,256	6,920	5,524	4,228	20	50	77,410
Others	9,252	8,268	7,883	2,852	1,796	2,211	6	1	32,269
Total, Christian ..	1,624,846	1,297,695	593,917	404,611	272,115	190,151	1,541	1,708	4,386,584
NON-CHRISTIAN—									
Hebrew	7,864	6,470	700	807	1,860	136	..	..	17,837
Confucian	1,661	936	2,002	36	433	59	1,536	..	6,663
Mohammedan	1,036	491	867	569	1,947	12	48	1	4,971
Buddhist	582	62	1,055	32	2,293	127	36	..	4,187
Pagan	326	641	691	3	181	10	4	..	1,856
Others	2,987	1,090	2,368	211	326	50	83	..	7,115
Total, Non-Christian	14,456	9,690	7,683	1,658	7,040	394	1,707	1	42,629
INDEFINITE—									
Freethinker	1,070	825	678	237	466	95	8	1	3,380
Agnostic	1,010	1,009	521	197	398	65	7	1	3,208
No Denomination ..	573	1,208	254	303	275	151	2	..	2,766
Others	1,684	2,349	736	465	481	133	5	1	5,854
Total, Indefinite ..	4,337	5,391	2,189	1,202	1,620	444	22	3	15,208
NO RELIGION—									
No Religion	2,806	2,560	1,894	1,022	1,248	210	40	2	9,782
Atheist	212	155	109	51	75	6	..	..	608
Others	77	60	21	14	16	6	..	..	194
Total, No Religion ..	3,095	2,775	2,024	1,087	1,339	222	40	2	10,584
Grand Total	1,646,734	1,315,551	605,813	408,558	282,114	191,211	3,310	1,714	4,455,005

The principal group in point of numbers is the Church of England, with a total of 1,755,473, the next in numerical order being the Roman Catholic Church. In connexion with this latter, there is reason to believe that a very large proportion, if not practically the whole of the persons who returned themselves simply as "Catholic," and who were in consequence tabulated under the head of "Catholic (undefined)," belonged to the Roman Catholic Church. For many purposes these items may therefore be combined, thus giving a total for the Roman Catholic Church of 1,022,656. The third in numerical importance was the Presbyterian Church, with a total of 573,073, while the Methodist Church, with 561,550, ranked fourth. The four denominations specified thus accounted amongst them for about 88 per cent. of the total population. The only other heading to reach 100,000 was that of "Protestant (undefined)" of whom probably a large proportion should be credited to the Church of England, the Presbyterian and the Methodist Churches. Of the Non-Christian religions the Hebrew, with 17,837, was that most numerously represented.

Distribution according to Religion, Commonwealth, 1911.



GRAPH No. 67.

Graph No. 67 furnishes for the Commonwealth as a whole for the sexes combined a representation of the number of adherents of the principal denominations and religions at the Census of 1911. The significance of the letters used in the graph is as follows:—A, Church of England; B, Presbyterian; C, Methodist; D, Baptist; E, Congregational; F, Lutheran; G, Church of Christ; H, Salvation Army; I, Protestant (undefined); J, Roman Catholic; K, Catholic (undefined); L, Non-Christian; M, Indefinite; N, No Religion. The unit of scale shewn in the margin of the graph is 100,000 adherents, the Church of England adherents being represented by a double column to save space.

The proportion per cent. of the total population represented by the adherents of each denomination, sect, etc., is shewn in the succeeding table :—

Distribution per cent. of Population according to Religion, 1911.

Religion.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A	Tas.	N.T.	F.T.	
CHRISTIAN—									
Church of England ..	45.45	35.15	36.25	29.22	40.05	47.72	20.48	39.96	39.40
Presbyterian	11.33	18.28	12.88	5.80	9.77	8.52	4.62	11.20	12.86
Methodist	9.32	13.71	10.16	25.66	12.51	13.46	3.66	7.06	12.61
Baptist	1.27	2.42	2.33	5.58	1.75	2.56	.45	..	2.24
Congregational	1.40	1.28	1.77	3.41	2.26	2.63	.76	.06	1.71
Lutheran	.44	.90	4.10	6.80	.91	.11	.76	..	1.67
Church of Christ ..	.40	1.28	.44	2.38	1.02	.61	.03	.12	.89
Salvation Army ..	.46	.61	.73	.98	.69	.77	..	..	.61
Seventh Day Adventist	.12	.11	.11	.16	.32	.28	..	..	.14
Unitarian	.05	.04	.03	.12	.05	.04	.03	..	.05
Protestant (undefined)	2.29	1.88	3.14	3.40	3.65	3.89	1.27	1.28	2.54
Roman Catholic ..	23.24	21.17	23.35	13.09	20.72	15.47	13.72	36.99	21.22
Greek Catholic	.07	.04	.09	.04	.15	.02	..	..	.06
Catholic (undefined) ..	2.27	1.14	1.36	1 69	1.96	2.21	.60	2.92	1.74
Others	.56	.63	1.30	.70	.64	1.15	.18	.06	.72
TOTAL, CHRISTIAN ..	98.67	98.64	98.04	99.03	96.45	99.44	46.56	99.65	98.46
NON-CHRISTIAN—									
Hebrew	.48	.49	.12	.20	.66	.07	..	..	.40
Confucian	.10	.07	.33	.01	.15	.03	46.40	..	.15
Mohammedan	.06	.04	.14	.14	.69	.01	1 45	.06	.11
Buddhist	.04	.01	.17	.01	.81	.07	1.09	..	.10
Pagan	.02	.05	.12	..	.07	.01	.12	..	.04
Others	.18	.08	.39	.05	.11	.02	2.51	..	.16
TOTAL, NON-CHRISTIAN	.88	.74	1.27	.41	2.49	.21	51.57	.06	.96
INDEFINITE—									
Freethinker	.06	.06	.11	.06	.17	.05	.24	.06	.08
Agnostic	.06	.08	.09	.05	.14	.03	.21	.06	.07
No Denomination ..	.04	.09	.04	.07	.10	.08	.06	..	.06
Others	.10	.18	.12	.11	.17	.07	.15	.05	.13
TOTAL, INDEFINITE ..	.26	.41	.36	.29	.58	.23	.66	.17	.34
NO RELIGION—									
No Religion	.17	.19	.31	.25	.44	.11	1.21	.12	.22
Atheist	.01	.01	.02	.01	.03	.01	..	..	.01
Others	.01	.01	..	.01	.01		..	..	.01
TOTAL, NO RELIGION ..	.19	.21	.33	.27	.48	.12	1.21	.12	.24
GRAND TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Amongst the States, the Church of England was proportionately most largely represented in Tasmania, New South Wales ranking second; the Roman Catholic Church, including "Catholic (undefined)" most largely in New South Wales, with Queensland second; the Presbyterian Church most largely in Victoria, with Queensland second; and the Methodist Church most largely in South Australia, with Victoria second. Of the other Christian Denominations the Baptist, Congregational, Lutheran, Church of Christ, Salvation Army and Unitarian were all proportionately more largely represented in South Australia than in any other State, while the

Seventh Day Adventists and the Greek Catholics were proportionately most largely represented in Western Australia. Of the Non-Christian religions, the Hebrew, the Mohammedan and the Buddhist, were proportionately most strongly represented in Western Australia, and the Confucian in Queensland.

The proportionate distribution of the adherents of the various religious denominations amongst the several States and Territories of the Commonwealth is shewn in the succeeding table :—

Percental Distribution of Adherents in States and Territories (sexes combined), 1911.

Religion.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
CHRISTIAN—									
Church of England ..	42.64	26.34	12.51	6.80	6.43	5.20	.04	.04	100.00
Presbyterian	32.56	41.97	13.62	4.14	4.81	2.84	.03	.03	100.00
Methodist	27.34	32.11	10.97	18.67	6.29	4.58	.02	.02	100.00
Baptist	21.06	32.01	14.14	22.90	4.95	4.92	.02	..	100.00
Congregational	30.30	22.16	14.13	18.35	8.40	6.63	.03	..	100.00
Lutheran	9.63	15.98	33.34	37.31	3.44	.27	.03	..	100.00
Church of Christ ..	16.35	42.39	6.63	24.46	7.25	2.92	..	..	100.00
Salvation Army ..	27.54	29.14	16.20	14.65	7.11	5.36	..	..	100.00
Seventh Day Adventist	32.53	23.59	10.40	10.39	14.58	8.51	..	..	100.00
Unitarian	38.44	23.44	6.76	21.22	6.72	3.38	.04	..	100.00
Protestant (undefined)	33.30	21.87	16.81	12.28	9·11	6.57	.04	.02	100.00
Roman Catholic ..	40.49	29.46	14.96	5.66	6.18	3.13	.05	.07	100.00
Greek Catholic	40.65	17.80	18.73	5.79	15.57	1.46	..	..	100.00
Catholic (undefined) ..	48.25	19.45	10.67	8.94	7.14	5.46	.03	.06	100.00
Others	28.67	25.62	24.43	8.84	5.57	6.85	.02	..	100.00
Christian	37.04	29.58	13.54	9 22	6.20	4.34	.04	.04	100. 0
NON-CHRISTIAN—									
Hebrew	44.09	36.27	3.93	4.52	10.43	.76	..	..	100.00
Confucian	24.93	14.05	30.05	.54	6.50	.88	23.05	..	100.00
Mohammedan	20.84	9.88	17.44	11.45	39.17	.24	.96	.02	100.00
Buddhist .. .	13.90	1.48	25.20	.76	54.77	3.03	.86	..	100.00
Pagan	17.56	34.54	37.23	.16	9.75	.54	.22	..	100.00
Others	41.98	15.32	33.28	2.97	4.58	.70	1.17	..	100.00
Non-Christian ..	33.91	22.73	18.02	3.89	16.52	.92	4.01	..	100.00
INDEFINITE—									
Freethinker	31.65	24.41	20.06	7.01	13.79	2.81	.24	.03	100.00
Agnostie	31.48	31.45	16.24	6.14	12.41	2.03	.22	.03	100.00
No Denomination ..	20.71	43.67	9.18	10.95	9.94	5.46	.09	..	100.00
Others	28.77	40.13	12.57	7.94	8.22	2.27	.08	.02	100.00
Indefinite	28.52	35.45	14.39	7 90	10.65	2.92	.15	.02	100.00
NO RELIGION—									
No Religion	28.68	26.17	19.36	10.45	12.76	2.15	.41	.02	100.00
Atheist	34.87	25.49	17.93	8.39	12.33	.99	..	..	100.00
Others	39.69	30.93	10.82	7.22	8.25	3.09	..	..	100.00
No Religion ..	29.24	26.22	19.12	10.27	12.65	2.10	.38	.02	100.00
All Religions ..	36.96	29.53	13.60	9.17	6.33	4.29	.08	.04	100.00

In the case of most of the religions the largest number of adherents was naturally found in one or other of the two most populous States, viz., New South Wales and Victoria. Exceptions to this rule were in evidence in the case of Lutherans, which were most numerous in South Australia, Confucians in Queensland, and Mohammedans and Buddhists in Western Australia.

The sex distribution of the adherents of the various denominations and sects in the several States and Territories of the Commonwealth is indicated in the succeeding table, which shews the excess of males over females per 100 of the sexes combined :—

Masculinity of Adherents, 1911 (Excess of Males over Females per 100 of sexes combined).

Religion.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
CHRISTIAN—									
Church of England ..	4.29	.76	9.25	2.16	11.91	2.50	37.46	12.41	4.25
Presbyterian	6.00	.21	9.40	5.99	18.15	2.67	73.86	5.21	4.54
Methodist	.29	— 3.87	2.21	— 1.02	5.23	— .78	14.05	20.66	— .81
Baptist	— 3.94	— 8.93	— 1.78	— 4.94	5.13	— 6.98	86.67	..	— 5.15
Congregational	— 3.36	— 6.87	— .57	— 5.95	3.11	— 3.50	— 4.00	100.00	— 3.69
Lutheran	36.52	20.90	8.68	6.99	48.93	46.53	36.00	..	14.18
Church of Christ ..	— 10.27	— 10.22	— 5.02	— 10.60	— 4.30	— 7.15	-100.00	.00	— 9.46
Salvation Army ..	— 5.72	— 11.95	— 3.77	— 5.96	— 1.85	— 1.57	..	..	— 6.76
Seventh Day Adventist	— 18.74	— 22.93	— 8.62	— 21.11	— 4.06	— 9.02	..	..	— 15.95
Unitarian	22.45	23.72	25.00	6.92	44.37	31.58	-100.00	..	21.35
Protestant (undefined)	16.23	11.75	19.66	10.76	25.00	13.57	47.62	9.09	15.79
Roman Catholic ..	1.92	— 2.42	5.61	1.20	13.88	.55	47.58	20.50	1.88
Greek Catholic	64.69	64 07	60.53	55.83	84.02	2.44	..	..	65.39
Catholic (undefined) ..	.13	3.29	10.03	6.50	13.90	6.62	30.00	20.00	3.73
Others	.32	— 4.43	7.34	2.31	17.04	1.04	.00	100.00	1.98
Christian	3.56	— .83	7.40	1.06	12.49	1.81	41.86	15.46	3.05
NON-CHRISTIAN—									
Hebrew	7.07	3.62	24.86	4.58	13.87	13.24	..	..	7.16
Confucian	99.40	99.15	96.30	100.00	96.30	100.00	85.81	..	95.86
Mohammedan	91.70	86.97	79.93	89.46	99.08	100.00	79.17	100.00	91.71
Buddhist	96.22	100.00	90.14	100.00	91.63	95.28	77.78	..	92.07
Pagan	100.00	99.69	97.11	33.33	85.64	100.00	100.00	..	97.31
Others	89.76	75.23	89.78	61.14	79.75	56.00	97.59	..	86.09
Non-Christian ..	46.52	32.09	85.16	44.87	72.73	62.94	86.06	100.00	56.20
INDEFINITE—									
Freethinker	68.79	62.67	76.70	69.62	76.39	57.90	75.00	100.00	69.70
Agnostic	73.66	55.40	64.68	62.44	75.38	66.15	71.43	100.00	65.84
No Denomination ..	17.28	15.73	30.71	16.83	18.55	9.93	100.00	..	17.57
Others	26.13	12.81	50.00	32.90	49.27	29.32	100.00	100.00	26.38
Total, Indefinite ..	46.55	29.07	59.52	40.93	58.27	34.23	81.82	100.00	42.73
NO RELIGION—									
No Religion	67.85	60.00	68.00	56 16	70.35	60.95	65.00	100.00	64.77
Atheist	81.13	70.32	77.98	84.31	86.67	100.00	..	..	78.95
Others	61.04	83.33	90.48	100.00	100.00	66.67	..	..	77.32
No Religion ..	68.59	61.08	68.77	58.05	71.62	62.16	65.00	100.00	65.82
All Religions ..	4.17	— .33	8.78	1.51	14.54	2.08	65.20	15.75	3.84

Note, — denotes excess of females.

For the Commonwealth as a whole there were six denominations in which there was a preponderance of females, these being the Methodist, the Baptist, the Congregational, the Church of Christ, the Salvation Army and the Seventh Day Adventist. This female preponderance was also in evidence in respect of these denominations in practically all the States, the principal exception being the Methodist denomination, which had a male preponderance in New South Wales, Queensland and Western Australia.

For the Commonwealth as a whole the largest preponderance of males amongst the Christian Denominations occurred in the case of the Greek Church, while the largest preponderance of females occurred in the case of the Seventh Day Adventists.

Amongst the Non-Christian religions males predominated throughout, the predominance being most marked amongst those returned as "Pagan," and least marked amongst the Hebrews.

6. **Religion and Age.**—Particulars as to age for each of the thirty classified items of religion were tabulated for each sex for each of the States and Territories in the five age groups—(i.) Under 5, (ii.) 5 and under 10, (iii.) 10 and under 15, (iv.) 15 and under 20, (v.) 20 and upwards. Full details will be found on pp. 772 to 825 of the Detailed Tables. As regards children it will be remembered that the instructions for filling in the personal cards provided for the insertion of the name of the religion "in which it is intended they shall be brought up."

The numbers in each age group, after adjustment for persons of unspecified ages and for the groups "object to state" and "unspecified" religion, were as follows for the Commonwealth as a whole :—

Religion and Age of Commonwealth Population (sexes combined), 1911.

Religion.	Age Last Birthday.					Total.	Proportion per cent. aged 20 & over
	Under 5.	5 to 9	10 to 14.	15 to 19.	20 and over		
CHRISTIAN—							%
Church of England ..	217,095	181,218	167,668	177,290	1,012,202	1,755,473	57.66
Presbyterian	64,302	55,463	52,903	57,058	343,347	573,073	59.92
Methodist	70,530	62,315	59,938	62,513	306,254	561,550	54.54
Baptist	10,998	10,062	9,892	10,504	58,099	99,555	58.36
Congregational	7,633	7,289	7,263	7,937	45,826	75,948	60.34
Lutheran	7,981	6,982	6,758	7,244	45,543	74,508	61 12
Church of Christ ..	4,687	4,165	4,123	4,789	21,968	39,732	55.29
Salvation Army ..	3,316	3,265	3,091	2,867	14,809	27,348	54.15
Seventh Day Adventist	683	720	732	672	3,442	6,249	55.08
Unitarian	97	94	73	113	1,871	2,248	83.23
Protestant (undefined)	11,741	9,740	9,004	9,846	72,830	113,161	64.36
Roman Catholic ..	111,511	98,572	94,103	95,742	545,318	945,246	57.69
Greek Catholic	202	130	130	302	2,050	2,814	72.85
Catholic (undefined) ..	9,747	8,393	7,805	8,239	43,226	77,410	55.84
Others	3,214	3,217	3,081	2,973	19,784	32,269	61.31
Total, Christian ..	523,737	451,625	426,564	448,089	2,536,569	4,386,584	57.83
NON-CHRISTIAN—							
Hebrew	1,490	1,401	1,447	1,616	11,883	17,837	66.62
Confucian	75	77	65	47	6,399	6,663	96.04
Mohammedan	130	67	44	220	4,510	4,971	90.73
Buddhist	13	12	8	100	4,054	4,187	96.82
Pagan	12	11	10	16	1,807	1,856	97.36
Others	70	53	54	137	6,801	7,115	95.59
Total, Non-Christian	1,790	1,621	1,628	2,136	35,454	42,629	83.17
INDEFINITE—							
Freethinker	92	47	54	134	3,053	3,380	90.33
Agnostic	86	56	63	90	2,913	3,208	90.80
No Denomination .	222	236	206	219	1,883	2,766	68.08
Others	378	323	318	345	4,490	5,854	76.70
Total, Indefinite ..	778	662	641	788	12,339	15,208	81.13
NO RELIGION—							
No Religion	607	444	368	426	7,937	9,782	81.14
Atheist	8	6	4	23	567	608	93.26
Others	3	7	9	5	170	194	87.63
Total, No Religion ..	618	457	381	454	8,674	10,584	81.95
Grand Total	526,923	454,365	429,214	451,467	2,593,036	4,455,005	58.21

The denominations in which there were the largest proportions under the age of 20 were the Salvation Army (45.85 per cent.), the Methodist (45.46 per cent.), the Seventh Day Adventist (44.92 per cent.), and the Church of Christ (44.71 per cent.).

The proportion per cent. of the total population in each age group represented by the adherents of each denomination, sect, etc., is given in the following table :—

Distribution per cent. of Population in each Age Group according to Religion (sexes combined), 1911.

Religion.	Age Last Birthday.					All Ages.
	Under 5.	5 to 9.	10 to 14.	15 to 19.	20 and over.	
CHRISTIAN—						
Church of England ..	41.20	39.88	39.06	39.27	39.03	39.40
Presbyterian	12.20	12.21	12.33	12.64	13.24	12.86
Methodist	13.38	13.72	13.96	13.85	11.81	12.61
Baptist	2.09	2.21	2.30	2.33	2.24	2.24
Congregational	1.45	1.60	1.69	1.76	1.77	1.71
Lutheran	1.51	1.54	1.57	1.60	1.76	1.67
Church of Christ .	.89	.92	.96	1.06	.85	.89
Salvation Army ..	.63	.72	.72	.63	.57	.61
Seventh Day Adventist	.13	.16	.17	.15	.13	.14
Unitarian	.02	.02	.02	.02	.07	.05
Protestant (undefined)	2.23	2.14	2.10	2.18	2.81	2.54
Roman Catholic ..	21.16	21.69	21.93	21.21	21.03	21.22
Greek Catholic	.04	.03	.03	.07	.08	.06
Catholic (undefined) ..	1.85	1.85	1.82	1.82	1.67	1.74
Others	.61	.71	.72	.66	.76	.72
Total, Christian ..	99.39	99.40	99.38	99.25	97.82	98.46
NON-CHRISTIAN—						
Hebrew	.28	.31	.34	.36	.46	.40
Confucian	.01	.02	.02	.01	.25	.15
Mohammedan	.03	.01	.01	.05	.17	.11
Buddhist	.01	.01		.02	.16	.10
Pagan				..	.07	.04
Others	.01	.01	.01	.03	.26	.16
Total, Non-Christian	.34	.36	.38	.47	1.37	.96
INDEFINITE—						
Freethinker	.02	.01	.01	.03	.12	.08
Agnostic	.02	.01	.02	.02	.11	.07
No Denomination ..	.04	.05	.05	.05	.08	.06
Others	.07	.07	.07	.08	.17	.13
Total, Indefinite ..	.15	.14	.15	.18	.48	.34
NO RELIGION—						
No Religion	.12	.10	.08	.09	.31	.22
Atheist	..	..	.01	01	.02	.01
Others	..	..			..	.01
Total, No Religion ..	.12	.10	.09	.10	.33	.24
Grand Total	100.00	100.00	100.00	100.00	100.00	100.00

Of the four leading denominations the Church of England, the Roman Catholic and the Methodist were proportionately more largely represented amongst the population under 20 years of age than amongst that aged 20 years and upwards, the difference being relatively small in all instances, but more marked in that of the Methodist Church than in the other cases. The Presbyterian Church on the other hand was proportionately somewhat more strongly represented amongst the population aged 20 and upwards than amongst those under 20 years of age. All the Non-Christian Religions were proportionately more largely represented amongst those over than amongst those under 20 years of age, the disparity being least marked in the case of the Hebrews.

The sex distribution of the adherents of the various denominations and sects in each age group is indicated in the succeeding table, which shews the excess of males over females per 100 of the sexes combined :—

Masculinity of Adherents in Age Groups, 1911 (Excess of Males over Females per 100 of sexes combined).

Religion.	Age Last Birthday.					All Ages.
	Under 5.	5 to 9.	10 to 14.	15 to 19.	20 and over.	
CHRISTIAN—						
Church of England ..	1.99	1.21	1.21	1.86	6.20	4.25
Presbyterian	1.60	2.05	1.55	1.57	6.45	4.54
Methodist	1.81	2.15	.01	— .56	— 2.23	— .81
Baptist	1.98	— .30	— .79	— 4.19	— 8.25	— 5.15
Congregational	.04	1.30	— 1.12	— 1.80	— 5.84	— 3.69
Lutheran	1.77	.57	— 1.24	4.31	22.30	14.18
Church of Christ ..	.06	.12	— 4.39	— 12.47	— 13.60	— 9.46
Salvation Army ..	.54	1.75	— 3.40	— 16 71	— 9.04	— 6.76
Seventh Day Adventist	3.07	.56	— 6.01	— 15.18	— 25.45	— 15.95
Unitarian	3.09	12.77	28.77	— 2.65	23.89	21.35
Protestant (undefined)	1.73	.74	4.11	10.48	22.23	15.79
Roman Catholic ..	1.25	.72	.65	.51	2.68	1.88
Greek Catholic	5.94	10.77	18.46	78.15	75.80	65.39
Catholic (undefined) ..	1.51	.32	— .12	5.91	5.17	3.73
Others	6.72	3.89	3.47	— 4.00	1.57	1.98
Christian	1.72	1.29	.80	1.00	4.37	3.05
NON-CHRISTIAN—						
Hebrew	1.61	3.21	— 4.63	3.59	10.24	7.16
Confucian	17.33	6.49	41.54	65.96	97.84	95.86
Mohammedan	1.54	— 10.45	31.82	80.91	96.94	91.71
Buddhist	7.69	16.67	.00	96.00	92.65	92.07
Pagan	.00	63.64	40.00	87.50	98.56	97.31
Others	2.86	39.62	22.22	59.12	88.41	86.09
Non-Christian ..	2.12	4.50	— .61	21 44	66.00	56.20
INDEFINITE—						
Freethinker	23.91	27.66	44.44	34.33	73.73	69 70
Agnostic	13.95	3.57	14.29	15.56	71.23	65.84
No Denomination ..	5.41	3.39	— 9.71	3.20	25.44	17.57
Others	10.05	— .93	— 1.89	— 5.51	34.16	26.38
Indefinite ..	10.80	3.02	1.09	6.09	51.37	42.73
NO RELIGION—						
No Religion	17.30	12.61	17.93	39.44	74.85	64.77
Atheist	.00	— 33.33	— 50.00	47.83	83.42	78.95
Others	— 33.33	— 14.29	55.56	60.00	84.71	77.32
No Religion ..	16.83	11.60	18.11	40.09	75.61	65.82
All Religions ..	1.75	1.31	.81	1.15	5.68	3.84

Note, — denotes excess of females.

7. **Religion and Education.**—Particulars as to education in conjunction with religion were tabulated under each of the thirty classified items of religion for each sex for each State and Territory under the five heads (i.) read and write English, (ii.) read only (English), (iii.) read and write foreign language only, (iv.) read only (foreign language only), (v.) cannot read. Full details will be found on pp. 772 to 825 of the Detailed Tables.

After adjustment to allow for those whose degree of education was unspecified, as well as for the groups "object to state," and "unspecified" religion, the particulars for the Commonwealth as a whole for the sexes combined were as follows :—

Religion and Education of Commonwealth Population (sexes combined), 1911.

Religion.	English Language.		Foreign Language only.		Cannot Read.		Total.	Proportion per cent. aged 5 years & upwards unable to read.
	Read and Write.	Read only.	Read and Write.	Read only.	Under 5 Years of Age.	Aged 5 Years and upwards.		
CHRISTIAN—								%
Church of England ..	1,475,501	5,129	1,539	175	217,095	56,034	1,755,473	3.64
Presbyterian	494,198	1,432	393	45	64,302	12,703	573,073	2.50
Methodist	473,549	1,827	420	43	70,530	15,181	561,550	3.09
Baptist	85,572	325	200	33	10,998	2,427	99,555	2.74
Congregational ..	66,340	186	43	4	7,633	1,742	75,948	2.55
Lutheran	58,586	441	4,721	494	7,981	2,285	74,508	3.43
Church of Christ ..	33,858	116	94	7	4,687	970	39,732	2.77
Salvation Army ..	22,711	175	28	6	3,316	1,112	27,348	4.63
Seventh Day Adventist	5,339	16	15	2	683	194	6,249	3.49
Unitarian	2,114	6	7	..	97	24	2,248	1.12
Protestant (undefined)	97,156	352	934	24	11,741	2,954	113,161	2.91
Roman Catholic ..	788,024	4,806	4,707	410	111,511	35,788	945,246	4.29
Greek Catholic ..	1,307	26	965	67	202	247	2,814	9.46
Catholic (undefined)	63,091	360	810	53	9,747	3,349	77,410	4.95
Others	27,175	108	823	67	3,214	882	32,269	3.04
Total, Christian ..	3,694,521	15,305	15,699	1,430	523,737	135,892	4,386,584	3.52
NON-CHRISTIAN—								
Hebrew	15,262	76	500	64	1,490	445	17,837	2.72
Confucian	608	9	4,276	233	75	1,462	6,663	22.19
Mohammedan ..	690	19	1,607	240	130	2,285	4,971	47.20
Buddhist	603	3	2,700	281	13	587	4,187	14.06
Pagan	224	28	725	497	12	370	1,856	20.07
Others	1,617	16	4,070	259	70	1,083	7,115	15.37
Total, Non-Christian	19,004	151	13,878	1,574	1,790	6,232	42,629	15.26
INDEFINITE—								
Freethinker	3,211	6	31	1	92	39	3,380	1.19
Agnostic	3,056	10	15	27	86	14	3,208	.45
No Denomination ..	2,487	2	4	..	222	51	2,766	2.00
Others	5,235	23	85	12	378	121	5,854	2.21
Total, Indefinite ..	13,989	41	135	40	778	225	15,208	1.56
NO RELIGION—								
No Religion	7,932	26	315	31	607	871	9,782	9.49
Atheist	556	1	32	..	8	11	608	1.83
Others	188	..	2	..	3	1	194	.52
Total, No Religion	8,676	27	349	31	618	883	10,584	8.86
Grand Total ..	3,736,190	15,524	30,061	3,075	526,923	143,232	4,455,005	3.65

The headings which furnished the smallest proportion above the age of 5 unable to read were "Agnostic" (0.45 per cent.), "Others, No Religion" (0.52 per cent.), "Unitarian" (1.12 per cent.), "Freethinker" (1.19 per cent.), and "Atheist" (1.83 per cent.). For the four leading Christian denominations the corresponding proportions were "Presbyterian" (2.50 per cent.), "Methodist" (3.09 per cent.), "Church of England" (3.64 per cent.), and

"Roman Catholic" (4.29 per cent.). Amongst the Non-Christian religions the proportion above the age of 5 unable to read was large in all cases except that of the Hebrews, for whom a percentage of 2.72 was recorded.

8. **Religion and Conjugal Condition.**—The Conjugal Condition of the adherents of the various Religions and denominations were tabulated for each sex for each State and Territory, and full details relative thereto will be found on pp. 772 to 825 of the Detailed Tables.

After adjustment to allow for those whose Conjugal Condition was not stated, and for those contained in the groups "object to state" and "unspecified" religion, the particulars for the Commonwealth as a whole for the sexes combined, are as follows :—

Religion and Conjugal Condition of Commonwealth Population (sexes combined), 1911.

Religion.	Married.	Never Married.		Widowed.	Divorced.	Total.
		Under 15 years of Age.	Aged 15 years & over.			
CHRISTIAN—						
Church of England ..	595,905	565,981	517,771	73,605	2,211	1,755,473
Presbyterian	191,962	172,668	182,846	25,116	481	573,073
Methodist	189,519	192,783	158,228	20,732	288	561,550
Baptist	35,465	30,952	28,494	4,573	71	99,555
Congregational	26,298	22,185	23,876	3,544	45	75,948
Lutheran	26,857	21,721	22,234	3,633	63	74,508
Church of Christ ..	13,756	12,975	11,393	1,584	24	39,732
Salvation Army ..	9,228	9,672	7,170	1,260	18	27,348
Seventh Day Adventist	2,097	2,135	1,665	345	7	6,249
Unitarian	1,029	264	742	207	6	2,248
Protestant (undefined)	42,551	30,485	34,479	5,443	203	113,161
Roman Catholic ..	274,652	304,186	321,502	44,118	788	945,246
Greek Catholic	825	462	1,461	61	5	2,814
Catholic (undefined) ..	24,868	25,945	23,393	3,125	79	77,410
Others	11,925	9,512	9,108	1,682	42	32,269
Total, Christian ..	1,446,937	1,401,926	1,344,362	189,028	4,331	4,386,584
NON-CHRISTIAN—						
Hebrew	6,991	4,338	5,602	841	65	17,837
Confucian	2,281	217	4,078	86	1	6,663
Mohammedan	1,271	241	3,259	186	14	4,971
Buddhist	805	33	3,292	51	6	4,187
Pagan	704	33	1,079	38	2	1,856
Others	2,424	177	4,278	232	4	7,115
Total, Non-Christian	14,476	5,039	21,588	1,434	92	42,629
INDEFINITE—						
Freethinker	1,380	193	1,573	216	18	3,380
Agnostic	1,471	205	1,332	189	11	3,208
No Denomination ..	1,074	664	904	121	3	2,766
Others	2,519	1,019	1,826	471	19	5,854
Total, Indefinite ..	6,444	2,081	5,635	997	51	15,208
NO RELIGION—						
No Religion	3,691	1,419	4,197	443	32	9,782
Atheist	224	18	329	35	2	608
Others	92	19	69	14	..	194
Total, No Religion ..	4,007	1,456	4,595	492	34	10,584
Grand Total	1,471,864	1,410,502	1,376,180	191,951	4,508	4,455,005

In the following table is given for each religion or denomination the proportion per cent. of its total adherents aged 15 and upwards belonging to each of the four conjugal condition divisions. At the Census 3 males and 19 females under the age of 15 were recorded as married, whilst all the rest of the population below that age were recorded as never married. For the sake of convenience in review and analysis these 22 persons have in the preceding table and the two succeeding tables been treated as being aged 15. The error so introduced is quite insignificant.

Distribution per cent. of Adherents aged 15 and upwards, according to Conjugal Condition (sexes combined), 1911.

Religion.	Married.	Never Married.	Widowed.	Divorced.	Total.
CHRISTIAN—	%	%	%	%	%
Church of England ..	50.10	43.53	6.19	.18	100.00
Presbyterian	47.94	45.67	6.27	.12	100.00
Methodist	51.39	42.91	5.62	.08	100.00
Baptist	51.70	41.53	6.67	.10	100.00
Congregational	48.92	44.41	6.59	.08	100.00
Lutheran	50.88	42.12	6.88	.12	100.00
Church of Christ ..	51.41	42.58	5.92	.09	100.00
Salvation Army ..	52.21	40.56	7.13	.10	100.00
Seventh Day Adventist	50.97	40.47	8.39	.17	100.00
Unitarian	51.87	37.40	10.43	.30	100.00
Protestant (undefined)	51.47	41.70	6.58	.25	100.00
Roman Catholic ..	42.85	50.15	6.88	.12	100.00
Greek Catholic	35.08	62.12	2.59	.21	100.00
Catholic (undefined) ..	48.32	45.46	6.07	.15	100.00
Others	52.40	40.02	7.39	.19	100.00
Christian	48.48	45.04	6.33	.15	100.00
NON-CHRISTIAN—					
Hebrew	51.79	41.50	6.23	.48	100.00
Confucian	35.39	63.26	1.33	.02	100.00
Mohammedan	26.87	68.90	3.93	.30	100.00
Buddhist	19.38	79.25	1.23	.14	100.00
Pagan	38.62	59.19	2.08	.11	100.00
Others	34.94	61.66	3.34	.06	100.00
Non-Christian ..	38.51	57.43	3.82	.24	100.00
INDEFINITE—					
Freethinker	43.30	49.36	6.78	.56	100.00
Agnostic	48.98	44.36	6.29	.37	100.00
No Denomination ..	51.09	43.01	5.76	.14	100.00
Others	52.10	37.77	9.74	.39	100.00
Indefinite	49.09	42.93	7.59	.39	100.00
NO RELIGION—					
No Religion	44.13	50.19	5.30	.38	100.00
Atheist	37.97	55.76	5.93	.34	100.00
Others	52.57	39.43	8.00	..	100.00
No Religion ..	43.90	50.34	5.39	.37	100.00
All Religions ..	48.35	45.20	6.30	.15	100.00

Of the four leading denominations the Methodist Church had the highest proportion of married persons and the lowest proportion of persons never married, widowed, or divorced. The Roman Catholic Church had the lowest proportion married, and the highest proportion never married or widowed. The Church of England had the highest proportion of divorced persons, while the Presbyterian Church occupied in all cases a position between highest and

lowest. Taking all religions into account, the largest proportions of divorced persons were found amongst the freethinkers (0.56 per cent.), and the Hebrews (0.48 per cent.), while the largest proportion amongst Christian denominations occurred in the case of the Unitarians.

The sex-distribution of the adherents of the various religions and denominations of each conjugal condition is indicated in the succeeding table, which shews the excess of males over females per 100 of the sexes combined :—

Masculinity of Adherents according to Conjugal Condition, 1911 (Excess of males over females per 100 of sexes combined).

Religion.	Married.	Never Married.		Widowed.	Divorced.	Total.
		Under 15 years of age.	Aged 15 years and over.			
CHRISTIAN—						
Church of England ..	.43	1.51	16.75	— 31.50	— .05	4.25
Presbyterian	3.14	1.73	13.73	— 32.39	5.20	4.54
Methodist	— 2.59	1.36	4.45	— 44.84	— 6.94	— .81
Baptist	— 4.30	.36	— 5.34	— 47.65	— 12.68	— 5.15
Congregational	.51	.08	— 5.98	— 42.89	— 6.67	— 3.69
Lutheran	13.00	.45	34.07	— 17.37	49.21	14.18
Church of Christ ..	— 9.87	— 1.33	— 11.54	— 56.82	— 50.00	— 9.46
Salvation Army ..	— 5.37	— .31	— 10.21	— 46.35	— 33.33	— 6.76
Seventh Day Adventist	— 21.32	— .89	— 18.56	— 65.22	42.86	— 15.95
Unitarian	31.39	13.64	16.44	— 2.42	66.67	21.35
Protestant (undefined)	12.62	2.12	35.39	— 7.66	33.99	15.79
Roman Catholic ..	— 6.13	.89	15.00	— 37.11	8.12	1.88
Greek Catholic	47.15	10.82	93.70	44.26	100.00	65.39
Catholic (undefined) ..	— 6.98	.64	23.88	— 35.55	— 24.05	3.73
Others	5.19	4.71	1.25	— 33.29	42.86	1.98
Christian	— .58	1.30	14.04	— 34.44	3.44	3.05
NON-CHRISTIAN—						
Hebrew	9.83	.05	15.46	— 31.99	— 13.85	7.16
Confucian	93.77	20.74	99.85	93.02	100.00	95.86
Mohammedan	87.57	3.73	99.45	97.85	100.00	91.71
Buddhist	76.15	9.09	96.84	92.16	66.67	92.07
Pagan	97.16	33.33	99.63	89.47	100.00	97.31
Others	83.33	17.51	91.87	62.07	.00	86.09
Non-Christian ..	50.12	2.00	75.84	15.20	13.04	56.20
INDEFINITE—						
Freethinker	63.77	30.57	79.78	67.59	88.89	69.70
Agnostic	64.65	11.22	74.77	69.31	100.00	65.84
No Denomination ..	28.86	.00	17.92	9.09	100.00	17.57
Others	29.81	2.85	41.62	— 1.49	57.89	26.38
Indefinite	44.88	5.33	56.31	28.18	80.39	42.73
NO RELIGION—						
No Religion	64.24	16.00	80.70	73.81	75.00	64.77
Atheist	74.11	— 22.22	87.23	82.86	100.00	78.95
Others	80.43	15.79	94.20	57.14	..	77.32
No Religion ..	65.16	15.52	81.37	73.98	76.47	65.82
All Religions ..	.30	1.32	15.41	— 33.46	5.06	3.84

9. **Comparison with Previous Censuses.**—Owing to differences in range and nature of the tabulation of the data for religion at previous Censuses a complete comparison with the results of the present Census cannot be made. The data available are, however, sufficient to admit of a comparison under the leading heads. Such a comparison is furnished in the succeeding table :—

Commonwealth Population according to Religion (sexes combined), 1891, 1901 and 1911.

Religion.	Number of Adherents.			Proportion per cent. of total Population.			Masculinity of Adherents (excess of Males over Females per 100 of sexes combined).		
	1891.	1901.	1911.	1891.	1901.	1911.	1891.	1901.	1911.
CHRISTIAN—									
Church of England ..	1,258,857	1,520,229	1,755,473	39.66	40.28	39.40	7.47	5.08	4.25
Presbyterian	358,937	432,539	573,073	11.31	11.46	12.86	6.96	4.46	4.54
Methodist	405,168	511,615	561,550	12.76	13.56	12.61	.96	.28	— .81
Baptist	73,685	90,652	99,555	2.32	2.40	2.24	— 2.29	— 4.04	— 5.15
Congregational	74,140	74,648	75,948	2.34	1.98	1.71	.31	— 2.75	— 3.69
Lutheran	72,281	76,193	74,508	2.28	2.02	1.67	18.51	15.95	14.18
Church of Christ ..	15,130	24,545	39,732	.48	.65	.89	— 3.45	— 6.42	— 9.46
Salvation Army ..	34,088	31,557	27,348	1.07	.84	.61	1.04	— 4.36	— 6.76
Seventh Day Adventist	726	3,379	6,249	.02	.09	.14	— 5.23	— 14.89	— 15.95
Unitarian	3,971	2,671	2,248	.12	.07	.05	29.09	23.70	21.35
Protestant (undefined)	30,476	20,876	113,161	.96	.55	2.54	17.12	12.18	15.79
Roman Catholic ..	719,354	863,381	945,246	22.66	22.88	21.22	3.64	2.38	1.88
Greek Catholic	637	1,337	2,814	.02	.03	.06	79.91	63.95	65.39
Catholic (undefined) ..	8,607	5,258	77,410	.27	.14	1.74	3.61	6.58	3.73
Others	19,787	22,148	32,269	.62	.59	.72	6.18	.75	1.98
TOTAL, CHRISTIAN ..	3,075,844	3,681,028	4,386,584	96.89	97.54	98.46	5.50	3.42	3.05
NON-CHRISTIAN—									
Hebrew	14,084	15,471	17,837	.45	.41	.40	11.09	7.25	7.16
Confucian	43,810	36,353	6,663	1.38	.96	.15	93.80	94.70	95.86
Mohammedan			4,971			.11			91.71
Buddhist			4,187			.10			92.07
Pagan			1,856			.04			97.31
Others	380	2,508	7,115	.01	.07	.16	63.16	45.06	86.09
TOTAL, NON-CHRISTIAN	58,274	54,332	42,629	1.84	1.44	.96	73.61	67.50	56.20
INDEFINITE—									
Freethinker	15,838	9,350	3,380	.50	.25	.08	62.41	71.49	69.70
Agnostic	882	988	3,208	.03	.03	.07	69.16	72.06	65.84
No Denomination ..	13,520	20,086	2,766	.42	.53	.06	42.62	38.27	17.57
Others	1,767	1,118	5,854	.06	.03	.13	25.07	16.28	26.38
TOTAL, INDEFINITE ..	32,007	31,542	15,208	1.01	.84	.34	52.17	48.39	42.73
NO RELIGION—									
No Religion	7,230	6,597	9,782	.23	.17	.22	60.11	59.16	64.77
Atheist	804	279	608	.03	.01	.01	46.27	79.21	78.95
Others	233	23	194			.01	48.50	65.22	77.32
TOTAL, NO RELIGION ..	8,267	6,899	10,584	.26	.18	.24	58.44	59.99	65.82
GRAND TOTAL	3,174,392	3,773,801	4,455,005	100 00	100.00	100.00	7.36	4.82	3.84

Owing to the comparative largeness of the items "Protestant (undefined)" and "Catholic (undefined)" in 1911 as compared with 1891 and 1901, it is difficult to make a satisfactory comparison of the relative growth of the leading denominations. Assuming that the persons appearing under the head of "Protestant (undefined)" may be equitably distributed proportionately over the denominations appearing above that heading in the preceding table, and that those appearing as "Catholic (undefined)" may be classed as "Roman Catholic," it appears that the adherents of the Church of England represented 40.19 per cent. of the total population in 1891, 40.53 per cent. in 1901, and 40.78 per cent. in 1911. Similarly the Roman Catholic represented 22.93 per cent. in 1891, 23.02 per cent. in 1901 and 22.96 per cent. in 1911; while Presbyterians represented 11.46 per cent., 11.55 per cent., and 13.31 per cent., and Methodists 12.93 per cent., 13.66 per cent., and 13.05 per cent. respectively at the last three Censuses.

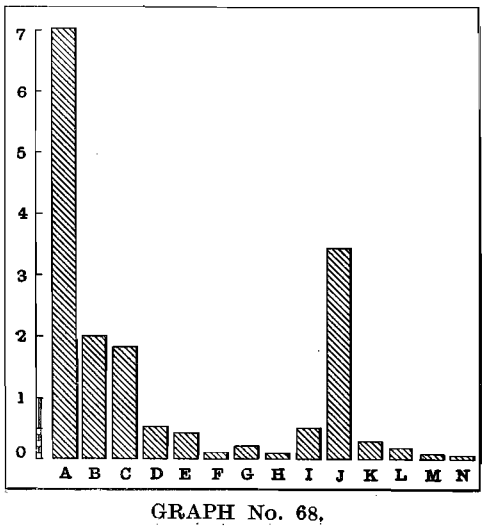
10. **Religions of Metropolitan Population.**—In the following table are given particulars respecting the religions of the residents of metropolitan areas in the several States.

Metropolitan Population according to Religion (sexes combined), 1911.

Religion.	Sydney and Suburbs.	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total Metropolitan.
CHRISTIAN—							
Church of England ..	295,000	223,905	51,197	67,013	43,873	20,042	701,030
Presbyterian	64,035	91,413	18,369	9,776	11,576	3,308	198,477
Methodist	43,772	65,948	15,342	39,918	12,404	3,490	180,874
Baptist	9,447	20,168	5,688	14,430	2,159	668	52,560
Congregational ..	15,750	10,606	3,527	7,859	3,999	1,395	43,136
Lutheran	1,880	2,720	2,895	2,697	809	53	11,054
Church of Christ ..	3,702	9,857	552	6,470	1,576	274	22,431
Salvation Army ..	2,116	3,918	905	1,599	773	216	9,527
Seventh Day Adventist	557	676	107	275	303	191	2,109
Unitarian	644	371	54	363	80	41	1,553
Protestant (undefined)	19,113	13,664	4,669	7,173	3,627	2,752	50,998
Roman Catholic ..	140,139	120,946	30,796	25,245	19,826	6,158	343,110
Greek Catholic	515	403	124	83	199	10	1,334
Catholic (undefined) ..	14,940	7,009	1,257	2,868	1,880	614	28,568
Others	4,975	4,994	2,294	1,848	914	458	15,483
Total, Christian ..	616,585	576,598	137,776	187,617	103,998	39,670	1,662,244
NON-CHRISTIAN—							
Hebrew	6,491	5,717	393	747	1,349	89	14,786
Confucian	721	602	117	4	206	5	1,655
Mohammedan	94	58	47	22	57	..	278
Buddhist	244	23	24	9	160	2	462
Pagan	88	422	19	2	12	7	550
Others	1,212	470	198	117	73	4	2,074
Total, Non-Christian	8,850	7,292	798	901	1,857	107	19,805
INDEFINITE—							
Freethinker	453	418	93	105	118	21	1,208
Agnostic	639	701	147	115	134	28	1,764
No Denomination ..	281	660	88	111	129	24	1,293
Others	1,053	1,700	186	252	200	39	3,430
Total, Indefinite ..	2,426	3,479	514	583	581	112	7,695
NO RELIGION—							
No Religion	1,487	1,483	358	515	337	47	4,227
Atheist	118	91	25	23	14	1	272
Others	37	28	9	7	5	..	86
Total, No Religion ..	1,642	1,602	392	545	356	48	4,585
Grand Total	629,503	588,971	139,480	189,646	106,792	39,937	1,694,329

Church of England, Roman Catholic, Congregational, and Hebrew adherents were more numerous in Sydney than in any other of the capitals, while Presbyterian, Methodist, Baptist, Church of Christ, and Salvation Army adherents were most numerously represented in Melbourne.

Distribution according to Religion—Metropolitan areas, 1911.



GRAPH No. 68.

In the accompanying graph (No. 68) is furnished a representation for the metropolitan areas of the Commonwealth of the number of adherents of both sexes combined of the various religious denominations, etc. The denominations, etc., denoted by the several letters on the graph are as follows:—A, Church of England; B, Presbyterian; C, Methodist; D, Baptist; E, Congregational; F, Lutheran; G, Church of Christ; H, Salvation Army; I, Protestant (undefined); J, Roman Catholic; K, Catholic (undefined); L, Non-Christian; M, Indefinite; N, No Religion. The unit of the scale shewn in the margin of the margin of the graph is 100,000 adherents.

The proportion per cent. of the total population of each metropolitan area represented by the adherents of each denomination and sect is shewn in the following table :—

Distribution per cent. of Metropolitan Population according to Religion (sexes combined), 1911.

Religion.	Sydney and Suburbs	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total Metropolitan.
CHRISTIAN—							
Church of England ..	46.86	38.02	36.70	35.34	41.08	50.18	41.38
Presbyterian	10.17	15.52	13.17	5.16	10.84	8.28	11.72
Methodist	6.96	11.20	11.00	21.05	11.61	8.74	10.68
Baptist	1.50	3.42	4.08	7.61	2.02	1.67	3.10
Congregational	2.50	1.80	2.53	4.14	3.75	3.49	2.55
Lutheran	.30	.46	2.07	1.42	.76	.13	.65
Church of Christ ..	.59	1.67	.40	3.41	1.48	.69	1.32
Salvation Army ..	.34	.67	.65	.84	.72	.54	.56
Seventh Day Adventist	.09	.11	.08	.15	.28	.48	.12
Unitarian	.10	.06	.04	.19	.07	.10	.09
Protestant (undefined)	3.04	2.32	3.35	3.78	3.40	6.89	3.01
Roman Catholic ..	22.26	20.54	22.08	13.31	18.56	15.42	20.25
Greek Catholic	.08	.07	.09	.04	.19	.03	.08
Catholic (undefined) ..	2.37	1.19	.90	1.51	1.76	1.54	1.69
Others	.79	.85	1.64	.98	.86	1.15	.91
Total, Christian ..	97.95	97.90	98.78	98.93	97.38	99.33	98.11
NON-CHRISTIAN—							
Hebrew	1.03	.97	.28	.39	1.26	.22	.87
Confucian	.12	.10	.09	} .02	.19	.01	.10
Mohammedan	.02	.01	.03		.06	..	.02
Buddhist	.04	.01	.02		.15	.01	.03
Pagan	.01	.07	.01		.01	.02	.03
Others	.19	.08	.14	.06	.07	.01	.12
Total, Non-Christian	1.41	1.24	.57	.47	1.74	27	1.17
INDEFINITE—							
Freethinker	.07	.07	.07	.06	.11	.05	.07
Agnostic	.10	.12	.11	.06	.13	.07	.10
No Denomination ..	.04	.11	.06	.06	.12	.06	.08
Others	.17	.29	.13	.13	.19	.10	.20
Total, Indefinite ..	.38	.59	.37	.31	.55	.28	.45
NO RELIGION—							
No Religion	.24	.25	.26	.27	.31	.12	.25
Atheist	} .02	{ .01	} .02	.02	.02	..	.02
Others		{ .01					
Total, No Religion ..	.26	.27	.28	.29	.33	.12	.27
Grand Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Of the four principal denominations the Church of England was proportionately most largely represented in Hobart, Sydney ranking second; the Roman Catholic (including "Catholic undefined") in Sydney, with Brisbane second ; the Presbyterian in Melbourne, with Brisbane second, and the Methodist in Adelaide, with Perth second. Of the other Christian denominations the Baptist, the Congregational, the Church of Christ, the Salvation Army, and the Unitarian were proportionately most largely represented in Adelaide ; the Seventh Day Adventist and the Greek Catholic in Perth, and the Lutheran in Brisbane.

Of the Non-Christian religions, the Hebrew, the Confucian, the Mohammedan, and the Buddhist were all proportionately more largely represented in Perth than in any other of the capitals.

The sex distribution of the adherents of the various religions and denominations in each of the Metropolitan areas is indicated in the succeeding table, which shews the excess of males over females per 100 of the sexes combined.

Masculinity of Adherents in Metropolitan Areas, 1911 (Excess of males over females per 100 of sexes combined).

Religion.	Sydney and Suburbs.	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	All Metropolitan.
CHRISTIAN—							
Church of England ..	— 2.96	— 4.64	— 2.01	— 3.28	— .61	— 8.62	— 3.47
Presbyterian	— .99	— 5.68	— 2.03	.68	2.56	— 5.20	— 3.03
Methodist	— 4.92	— 7.93	— 5.20	— 6.13	— 4.00	— 7.16	— 6.29
Baptist	— 9.66	— 11.31	— 8.44	— 8.37	— 2.27	— 17.96	— 9.61
Congregational	— 6.21	— 9.15	— 7.85	— 10.50	— 2.78	— 12.83	— 7.74
Lutheran	48.09	25.66	2.52	3.60	24.60	24.53	17.95
Church of Christ ..	— 13.72	— 11.66	— 13.41	— 12.74	— 8.63	— 19.71	— 12.24
Salvation Army ..	— 7.66	— 19.19	— 16.24	— 14.32	— 9.44	— 14.81	— 14.64
Seventh Day Adventist	— 33.21	— 31.66	— 17.76	— 36.00	— 26.07	— 10.99	— 29.26
Unitarian	13.98	17.52	— 3.70	— 5.23	35.00	26.83	11.14
Protestant (undefined)	9.41	7.57	9.40	3.55	7.47	10.76	8.03
Roman Catholic ..	— 6.84	— 9.27	— 7.39	— 5.71	— 5.31	— 12.28	— 7.67
Greek Catholic	61.55	61.29	66.13	54.22	78.89	20.00	63.72
Catholic (undefined) ..	— 7.90	— 2.84	8.04	— 8.51	— 2.55	— 2.93	— 5.56
Others	— 7.54	— 10.65	— 7.76	.11	1.31	— 5.24	— 7.07
Christian	— 3.61	— 6.26	— 3.60	— 4.83	— 1.30	— 7.64	— 4.62
NON-CHRISTIAN—							
Hebrew	4.70	2.22	13.49	.13	10.01	7.87	4.25
Confucian	98.34	99.00	91.45	100.00	98.06	100.00	98.07
Mohammedan	68.09	62.07	27.66	100.00	92.98	..	67.63
Buddhist	92.62	100.00	100.00	100.00	90.00	100.00	92.64
Pagan	100.00	100.00	100.00	100.00	66.67	100.00	99.27
Others	79.87	60.64	41.41	33.33	47.95	— 50.00	65.57
Non-Christian ..	26.67	19.78	37.34	8.55	31.07	17.76	24.10
INDEFINITE—							
Freethinker	56.29	49.76	61.29	50.48	64.41	14.29	53.97
Agnostic	67.76	46.36	48.30	63.48	59.70	42.86	56.35
No Denomination ..	18.15	15.76	27.27	22.52	13.18	.00	17.09
Others	10.92	3.65	30.11	33.33	23.00	7.69	10.67
Indefinite ..	35.20	20.09	40.47	40.31	37.69	16.07	29.02
NO RELIGION—							
No Religion	62.21	54.28	56.42	47.57	62.02	65.96	57.18
Atheist	71.19	49.45	68.00	65.22	71.43	100.00	63.24
Others	29.73	64.29	77.78	100.00	100.00	..	55.81
No Religion ..	62.12	54.18	57.65	48.99	62.92	66.67	57.51
All Religions ..	— 2.87	— 5.61	— 3.03	— 4.48	— .31	— 7.42	— 3.96

For the Metropolitan areas, taken as a whole, all the Christian denominations except four exhibited a preponderance of females. In the Non-Christian, Indefinite and No Religion groups a preponderance of males was in evidence throughout.

The following table shews the proportion per cent. of the adherents of the various denominations and sects resident in each State, who were enumerated in the Metropolitan area of that State, similar information being given for the Commonwealth as a whole in respect of the aggregate for Metropolitan areas.

Proportion per cent. of Adherents who were resident in Metropolitan Areas (sexes combined), 1911.

Religion.	Sydney and Suburbs.	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	All Metropolitan.
	%	%	%	%	%	%	%
CHRISTIAN—							
Church of England ..	39.41	48.42	23.31	56.13	38.83	21.96	39.93
Presbyterian	34.32	38.01	23.54	41.23	41.99	20.30	34.63
Methodist	28.51	36.57	24.92	38.08	35.14	13.56	32.21
Baptist	45.06	63.29	40.40	63.29	43.78	13.64	52.79
Congregational	68.45	63.01	32.86	56.38	62.72	27.72	56.80
Lutheran	26.19	22.85	11.65	9.70	31.59	26.24	14.84
Church of Christ ..	57.00	58.53	20.97	66.58	54.68	23.60	56.46
Salvation Army ..	28.09	49.17	20.42	39.91	39.76	14.74	34.84
Seventh Day Adventist	27.40	45.86	16.46	42.37	33.26	35.90	33.75
Unitarian	74.54	70.40	35.53	76.10	52.98	53.95	69.08
Protestant (undefined)	50.72	55.21	24.54	51.62	35.18	37.02	45.06
Roman Catholic ..	36.61	43.43	21.77	47.22	33.92	20.82	36.30
Greek Catholic	45.02	80.44	23.53	50.92	45.43	24.39	47.41
Catholic (undefined) ..	40.00	46.55	15.23	41.45	34.03	14.52	36.90
Others	53.77	60.40	29.10	64.80	50.89	20.71	47.98
Christian	37.95	44.43	23.20	46.37	38.22	20.86	37.89
NON-CHRISTIAN—							
Hebrew	82.54	88.36	56.14	92.57	72.53	65.44	82.90
Confucian	43.41	64.32	5.84	11.11	47.58	8.47	24.84
Mohammedan	9.07	11.81	5.42	3.87	2.93	..	5.59
Buddhist	41.92	37.10	2.27	28.13	6.98	1.57	11.03
Pagan	26.99	65.83	2.75	66.67	6.63	70.00	29.63
Others	40.58	43.12	8.36	55.45	22.39	8.00	29.15
Non-Christian ..	61.22	75.25	10.39	54.34	26.38	27.16	46.46
INDEFINITE—							
Freethinker	42.34	50.67	13.72	44.30	25.32	22.11	35.74
Agnostic	63.27	69.47	28.21	58.38	33.67	43.08	54.99
No Denomination ..	49.04	54.64	34.65	36.63	46.91	15.89	46.75
Others	62.53	72.37	25.27	54.19	41.58	29.32	58.59
Indefinite ..	55.94	64.53	23.48	48.50	35.86	25.23	50.60
NO RELIGION—							
No Religion	52.99	57.93	18.90	50.39	27.00	22.38	43.21
Atheist	55.66	58.71	22.94	45.10	18.67	16.67	44.74
Others	48.05	46.67	42.86	50.00	31.25	..	44.33
No Religion ..	53.05	57.73	19.37	50.14	26.59	21.62	43.32
All Religions ..	38.23	44.77	23.02	46.42	37.85	20.89	38.03

The religion which had the highest proportion of its adherents resident in Metropolitan areas was the Hebrew, while the Mohammedan religion had the lowest proportion so resident. In the former case 82.90 per cent. of the adherents were Metropolitan residents, and in the latter only 5.59 per cent.

Amongst the Christian denominations, four, viz., Unitarian, Congregational, Church of Christ, and Baptist, had more than 50 per cent. of their adherents resident in Metropolitan areas.

Of the four leading denominations, the Church of England had the largest proportion resident in Metropolitan areas, followed in order by the Roman Catholic, the Presbyterian and the Methodist Churches.

11. **State Sub-divisions.**—The number of adherents of each of the classified heads of religion are given in the Detailed Tables for the various State sub-divisions adopted for the purpose of the tabulation. Those relating to New South Wales Counties will be found on pp. 828 to 839 ; to Victorian Counties on pp. 840 to 843 ; to Queensland Census Districts on pp. 844 to 849 ; to South Australian Counties and Divisions on pp. 850 to 853 ; to Western Australian Statistical Districts on pp. 854 to 857 ; to Tasmanian Municipalities on pp. 856 to 861 ; to the Northern Territory on pp. 860 and 861 ; and to the Federal Territory on p. 862.

CHAPTER XVI.

BLINDNESS AND DEAFMUTISM.

1.—**Nature of Inquiry.**—In previous Censuses taken in Australia it has been usual to make a somewhat comprehensive inquiry relative to the sickness and infirmity existing amongst the population at the date of the Census. Thus, at the Census of 1891 the instructions for filling in particulars on the schedule under the heading " Sickness and Infirmity," were as follows :—

" If laid up or unable to follow usual occupation by reason of illness or accident, write '*Sick,*' or '*Accident,*' or if afflicted by any of the following infirmities write *Deaf and Dumb, Blind, Insane, Idiotic, Epileptic, Paralytic, Leprous, Lost a Limb, Lost an Eye,* as the case may be." Owing to the defective nature of the returns received under many of these heads, more particularly in connexion with insanity, idiocy, and epilepsy, it was decided in connexion with the Census of 1901 to omit reference to all the specific infirmities enumerated above, with the exception of blindness and deaf-mutism. The instructions for supplying particulars as to sickness and infirmity on that schedule were accordingly modified as follows :—

" If laid up or unable to follow usual occupation by reason of illness or accident, write '*Sick*' (stating descriptive name of illness), or '*Accident*' (assigning cause), or if *Deaf and Dumb* or *Blind,* state so."

A careful consideration of the results obtained at the Census of 1901 led to the conclusion that in drafting the schedule for the 1911 Census further modification might with advantage be made. The information supplied under the heads of sickness and accident was in many cases vague and ill-defined, notwithstanding the request for distinct specification. Further, it was obvious that a return of sickness taken for a specified date would furnish but an unreliable indication to the annual sickness-experience of the community, owing to the marked seasonal variations which exist both in the nature and range of sickness. Under the circumstances it was believed to be preferable to omit all inquiries of this character, excepting those relative to blindness and deafmutism clearly defined. In accordance therewith the inquiry on the personal card was : " State if blind or deaf and dumb," while the corresponding instruction given was as follows :—" Information is required only as to blindness and deaf-mutism. Enter as blind only persons totally unable to see, and as deaf and dumb only those who are dumb as well as deaf." In spite of these explicit instructions many cards were received containing the statement " partially blind," or " deaf only." Such items of information were ignored in the process of tabulation.

2. **Tabulation of Data.**—At the stage of the general tabulation work at which the consistency of the various replies were being checked and the classification of birthplaces and religions was being carried out, instructions were given that in the case of any card relating to a person stated to be " deaf and dumb " or " blind," a duplicate card should be written out, marked " duplicate," and handed to the officer in charge of the section. At the same time the infirmity item on the original card was required to be ticked, thus furnishing an indication at any later stage of the completeness of the duplicating work. The object of the duplication was to save the labour and inconvenience incidental to a special sorting of the whole of the cards to extract those relating to infirmities. Data concerning blind persons and deaf mutes were tabulated under the heads of States of enumeration according to Sex, Age, Birthplace, Conjugal Condition, and Occupation. Full details are given in Volume II. pp. 865 to 895.

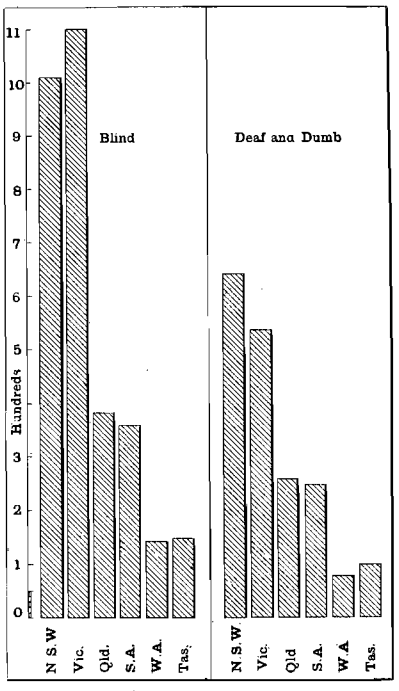
3. **Totals for States of Enumeration.**—Of the total of 3142 persons in the Commonwealth recorded as blind at the date of the Census, 21 were recorded as being also deaf and dumb. The total number of deaf mutes recorded was 1852, including the 21 who were also blind. No blind persons or deaf mutes were recorded in either the Northern Territory or the Federal Territory. The totals for the several States are as follows :—

Blind Persons and Deaf Mutes recorded at Census of 3rd April, 1911.

State of Enumeration.	Blind but not Deaf and Dumb.			Deaf and Dumb but not Blind.			Blind Deaf Mutes.		
	Males.	Females	Persons.	Males.	Females	Persons.	Males.	Females	Persons.
New South Wales ..	590	419	1,009	329	309	638	1	1	2
Victoria	589	504	1,093	274	252	526	6	3	9
Queensland	210	167	377	157	94	251	3	3	6
South Australia ..	192	165	357	134	111	245	..	1	1
Western Australia ..	84	57	141	39	36	75	1	..	1
Tasmania	76	68	144	52	44	96	2	..	2
Total, C'wealth ..	1,741	1,380	3,121	985	846	1,831	13	8	21

For the Commonwealth as a whole, blind persons represented 71 per 100,000 of the total population. In New South Wales the proportion blind was 61 per 100,000 ; in Victoria 84 ; in Queensland 63 ; in South Australia 88 ; in Western Australia 50 ; and in Tasmania 76.

Blind Persons and Deaf Mutes, 1911.



GRAPH No. 69.

In the case of deafmutism the proportion for the Commonwealth as a whole was 42 per 100,000 of total population, whilst for the several States the corresponding proportions were as follows :—New South Wales, 39 ; Victoria, 41 ; Queensland, 42 ; South Australia 60 ; Western Australia, 27 ; and Tasmania, 51.

In the case of both the infirmities dealt with, Western Australia and New South Wales occupy the most favourable positions, and South Australia the least favourable. As the population of the two former States have benefited largely by interstate migration, while that of South Australia has lost heavily from this cause, it is probable that the proportions deduced above are to some extent due to the selective influence of migration, the infirm being less likely to migrate than the more robust.

In the accompanying graph (No. 69) a representation is furnished of the number of persons (sexes combined) in the several States who were blind, or who were deaf and dumb at the Census of 3rd April, 1911.

4. **Infirmity and Age.**—Details respecting the ages of blind persons and deaf mutes were tabulated for each sex in quinquennial age groups for each State of enumeration. Particulars for the Commonwealth are given in the following table after distribution of the number whose ages were unspecified :—

Blindness and Deafmutism according to Age, Commonwealth, 1911.

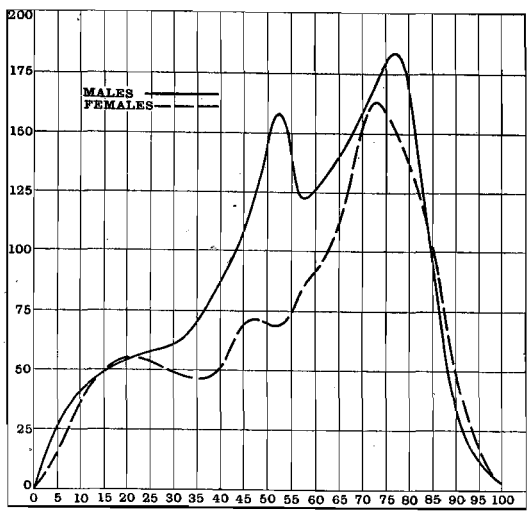
Age Group.	Blind but not Deaf and Dumb.			Deaf and Dumb but not Blind.			Blind Deaf Mutes.		
	Males.	Females	Persons.	Males.	Females	Persons.	Males.	Females	Persons.
0–4	12	13	25	18	17	35	1	..	1
5–9	35	19	54	102	96	198	1	..	1
10–14	40	43	83	169	149	318	3	1	4
15–19	55	51	106	112	74	186	1	1	2
20–24	53	53	106	89	90	179	..	1	1
25–29	59	49	108	82	74	156	..	..	..
30–34	61	50	111	78	70	148	1	1	2
35–39	79	42	121	88	60	148	1	1	2
40–44	95	59	154	58	55	113	2	..	2
45–49	118	72	190	50	44	94	..	..	..
50–54	158	67	225	46	30	76	..	1	1
55–59	125	88	213	33	28	61	..	..	..
60–64	132	96	228	31	18	49	1	..	1
65–69	153	128	281	12	15	27	1	1	2
70–74	160	161	321	6	10	16	..	1	1
75–79	186	147	333	5	7	12	..	..	..
80–84	129	128	257	4	6	10	1	..	1
85–89	65	75	140	1	1	2	..	..	..
90–94	19	32	51	..	1	1	..	..	..
95–99	7	7	14	1	1	2	..	..	..
Total	1,741	1,380	3,121	985	846	1,831	13	8	21

An interesting point brought out by the above table is the marked difference in age distribution between the blind and the deaf mutes. Thus the numbers of blind persons in successive age-groups increases with fair regularity to a maximum of 333 for the age-group 75–80, and then declines rapidly to the oldest ages. On the other hand the numbers of deaf mutes in successive age groups increase rapidly to a maximum of 318 for the age group 10–14, descending thence rapidly to the group 15–19, and thereafter declining gradually to the oldest ages. The age distribution in the case of the blind suggests that blindness is relatively rarely congenital, but that it occurs mainly in the middle and old ages from accident, disease or senility.

The distribution in the case of deaf mutes is not so readily explicable. Deafmutism is usually congenital, and consequently would be expected to be most largely represented in the earliest age groups. Possibly the hope of eventual recovery prevents many parents from recording the fact at the early ages. It is also possible that the fear that some action might be taken by the authorities for the removal of deaf mutes for educational purposes may induce some parents to avoid the disclosure. The rapid falling off in number after age group 10–14 may be due to several causes of which the most probable appears to be that there is fairly complete enumeration at age 10–14, when the majority are receiving specialised education, and the persons responsible for supplying the information are teachers who are not in any way interested in withholding information, and that persons of more advanced years are less inclined to mention their infirmities when filling in their own cards. Another possible explanation would be the immigration of some 130 deaf mutes within recent times aged under 15. Such an explanation taken in conjunction with the deferred-hope explanation given above for age 0–4 would furnish a series diminishing with age from 15 onwards. It is, however, negatived, firstly by absence of record of any such immigration, and secondly, by the record of the birthplaces of the deaf mutes. Another possible but improbable explanation is that there has been a marked increase in deafmutism in comparatively recent times, whilst an equally improbable explanation is, that the death rate amongst deaf mutes is excessive at age 15–19. Under all the circumstances it appears probable that the true explanation is relative completeness of record at age 10–14, and relative incompleteness for earlier and later ages. Probably as the community learns to appreciate the sociological importance of statistic, such returns as these will increase in accuracy.

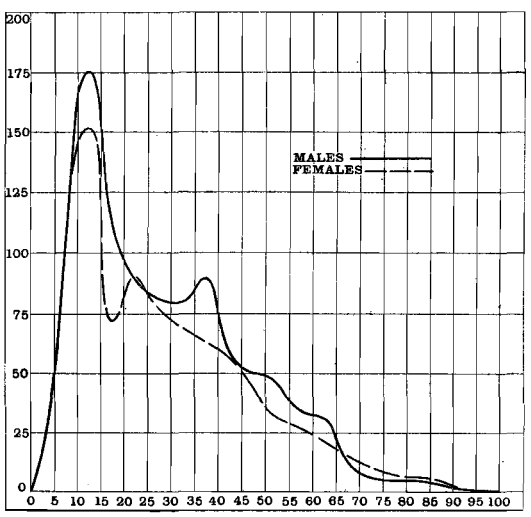
Blindness and Deafmutism according to Age. Commonwealth, 1911

Blindness.



GRAPH No. 70.

Deafmutism.



GRAPH No. 71.

The accompanying graphs (Nos. 70 and 71) furnish a representation of the number of blind persons and deaf mutes of each sex at each age in the Commonwealth at the Census of 3rd April, 1911, The base of each small rectangle represents 5 years of age, and the vertical height represents 25 persons.

The proportions per 100,000 of population for the age groups 0–14, 15–64, and 65 and upwards are shewn in the following table :—

Proportion of Blind Persons and Deaf Mutes per 100,000 of Population, Commonwealth, 1911.

Age Group.	Blind but not Deaf and Dumb.			Deaf and Dumb but not Blind.			Blind Deaf Mutes.		
	Males.	Females	Persons.	Males.	Females	Persons.	Males.	Females	Persons.
0–14	12.2	10.8	11.5	40.4	37.6	39.1	0.7	0.1	0.4
15–64	62.4	46.3	54.8	44.5	40.1	42.4	0.4	0.4	0.4
65 and over	711.9	746.7	728.3	28.7	45.2	36.5	2.0	2.2	2.1
All Ages	75.3	64.4	70.1	42.6	39.5	41.1	0.6	0.4	0.5

These figures accentuate the remarks already made concerning the age incidence of blindness. It will be seen that, taking the blind deaf mutes into account, blind persons represented 11.9 per 100,000 of those aged under 15 ; 55.2 per 100,000 of those between 15 and 65 ; and 730.4 per 100,000 of those aged 65 and over. In other words, of the Australian population under the age of 15, one in every 8400 was blind, as were also one in every 1800 between the ages of 15 and 65, and one in every 137 aged 65 and over.

On the other hand, in the case of deafmutism, the variations with age are not large, and taking into account what has been said above concerning the evidence of defectiveness of the returns at certain ages, it would appear probable that the proportion of deaf mutes is relatively constant at all ages, and is somewhat in excess of 43 per 100,000.

Of blind persons under the age of 15, one in every 28 was also a deaf mute, the corresponding proportion for blind persons between 15 and 65 being one in every 143, and for those aged 65 and over, one in every 350.

5. **Infirmity and Birthplace.**—A summary of the information in respect of the birthplaces of blind persons and deaf mutes, recorded at the Census is given in the following table :—

Blindness and Deafmutism according to Birthplace, Commonwealth, 1911.

Birthplace.	Blind but not Deaf and Dumb.			Deaf and Dumb but not Blind.			Blind Deaf Mutes.		
	Males.	Females	Persons.	Males.	Females	Persons.	Males.	Females	Persons
				NUMBER.					
Australia	827	625	1,452	855	746	1,601	10	6	16
New Zealand ..	8	7	15	5	10	15	..	..	..
United Kingdom ..	758	686	1,444	97	76	173	1	1	2
Germany	50	37	87	13	7	20	..	..	..
United States of America	7	3	10	2	1	3	1	..	1
China	21	..	21	2	..	2	..	..	..
Other Countries ..	70	22	92	11	6	17	1	1	2
Total	1,741	1,380	3,121	985	846	1,831	13	8	21
				PROPORTION PER 100,000 OF POPULATION.					
Australia	44.7	34.0	39.4	46.2	40.6	43.4	0.5	0.3	0.4
New Zealand ..	47.1	46.3	46.7	29.4	66.1	46.7	..	..	..
United Kingdom ..	222.3	266.7	241.4	28.4	29.6	28.9	0.3	0.4	0.3
Germany	227.6	324.3	260.6	59.2	61.4	59.9	..	..	..
United States of America	155.6	135.4	148.9	44.5	45.1	44.7	23.3	..	14.9
China	101.6	..	100.0	9.7	..	9.5	..	..	..
Other Countries ..	122.9	124.0	123.2	19.3	33.8	22.8	1.8	5.6	2.7
Total	75.3	64.4	70.1	42.6	39.5	41.1	0.6	0.4	0.5

The relatively high proportions of blind persons amongst those born in the United Kingdom and Germany, and the relatively low proportions among those born in Australia and New Zealand are due in large measure to the age distribution of those born in the countries specified. The Australian residents born in the United Kingdom or Germany contain a much larger proportion of persons of middle age and old age than do those born in Australia or New Zealand.

6. **Infirmity and Conjugal Condition.**—The conjugal condition of blind persons and deaf mutes is shewn in summary form in the following table :—

Blindness and Deafmutism according to Conjugal Condition, Commonwealth, 1911.

Conjugal Condition.	Blind but not Deaf and Dumb.			Deaf and Dumb but not Blind.			Blind Deaf Mutes.		
	Males.	Females	Persons.	Males.	Females	Persons.	Males.	Females	Persons.
Married	648	366	1,014	140	149	289	..	..	..
Never Married–under 20	142	126	268	401	336	737	6	2	8
,, 20 and over	627	356	983	430	329	759	7	4	11
Widowed	319	531	850	13	31	44	..	2	2
Divorced	5	1	6	1	1	2	..	..	..
Total	1,741	1,380	3,121	985	846	1,831	13	8	21

Of 2866 blind persons above the age of 20, at the date of the Census, 1014, or more than 35 per cent., were married ; 852, or rather less than 30 per cent., were widowed ; while 6, or about 2 per thousand, had been divorced ; and 994, or somewhat less than 35 per cent., had never been married.

Of 1094 deaf mutes above the age of 20, 289, or about 26 per cent., were married ; 44, or about 4 per cent., were widowed ; while 2, or say 2 per thousand, had been divorced ; and 759, or rather less than 70 per cent., had never been married.

7. **Infirmity and Occupation.**—Blind persons and deaf mutes were further tabulated according to the occupations specified on their personal cards. In some cases the occupations so specified were no doubt being followed at the time of the Census, but in other cases it appears probable that the occupation stated, more particularly in the case of the blind, was that followed prior to the occurrence of the infirmity. A summary of the results for the Commonwealth as a whole is furnished in the following table :—

Blindness and Deafmutism according to Occupation, Commonwealth, 1911.

Order	Sub-order	Occupation. Designation.	Blind but not Deaf and Dumb. Males.	Females.	Persons.	Deaf and Dump but not Blind. Males.	Females.	Persons.	Blind Deaf Mutes. Males.	Females.	Persons.
		CLASS I.—PROFESSIONAL.									
1		Engaged in Government, Defence, Law, etc.	10	1	11	1	1	2	..	..	..
2		Ministering to Religion, Charity, Health, Education, etc.	88	26	114	26	9	35	..	..	..
		TOTAL—CLASS I.	98	27	125	27	10	37	..	..	..
		CLASS II.—DOMESTIC.									
3	1	Engaged in supplying Board and Lodging ..	4	5	9	4	5	9	..	..	..
	2	,, Domestic Service and Attendance	15	8	23	14	49	63	..	..	..
		TOTAL—CLASS II.	19	13	32	18	54	72	..	..	..
		CLASS III.—COMMERCIAL.									
4		Dealing in Property and Finance	46	13	59	3	3	6	..	..	..
5		.. Art and Mechanic Productions ..	14	1	15	1	1	2	..	..	..
6		,, Textile Fabrics, Dress and Fibrous Materials	3	..	3	2	..	2	..	..	..
7		,, Food, Drinks, Narcotics, and Stimulants	34	1	35	6	..	6	..	..	..
8		,, Animals, Animal and Vegetable Substances, N.E.I.	1	..	1	1	..	1	..	..	..
9		,, Fuel and Light	5	..	5	2	..	2	..	..	..
10		,, Metals and other Minerals ..	3	..	3	..	..	..	..	..	..
11		General and Undefined Merchants and Dealers	37	4	41	10	..	10	..	..	..
12		Speculators on Chance Events	..	..	..	2	..	2	..	..	..
13		Engaged in Storage	..	..	..	..	..	..	..	..	..
		TOTAL—CLASS III.	143	19	162	27	4	31	..	..	..
		CLASS IV.—TRANSPORT AND COMMUNICATION.									
14	1	Engaged in Railway Traffic	1	..	1	2	..	2	..	..	..
	2	,, Traffic on Roads	10	..	10	3	..	3	..	..	..
	3	,, ,, Seas and Rivers ..	14	..	14	6	..	6	..	..	..
	4 & 5	,, Postal, Telegraph and Telephone Service	1	..	1	1	..	1	..	..	..
	6	Messengers, etc.	..	..	..	..	..	..	..	..	..
		TOTAL—CLASS IV.	26	..	26	12	..	12	..	..	..
		CLASS V.—INDUSTRIAL.									
15		Working in Art and Mechanic Productions	215	59	274	86	3	89	..	1	1
16		,, Textile Fabrics, Dress, and Fibrous Materials	71	3	74	66	39	105	1	..	1
17		,, Food, Drinks, Narcotics, and Stimulants	15	..	15	22	..	22	..	..	..
18		,, Animal and Vegetable Substances, N.E.I.	..	..	..	7	..	7	..	..	..
19		,, Metals and other Minerals ..	10	..	10	28	..	28	1	..	1
20		,, Fuel, Light, and other forms of Energy	2	..	2	..	..	..	..	..	..
21		Engaged in Construction of Buildings, Roads, Railways, etc.	30	..	30	18	..	18	..	..	..
22		,, Disposal of the Dead or of Refuse	3	..	3	..	..	..	..	..	..
23		,, Undefined Industrial Pursuits ..	91	3	94	32	1	33	2	..	2
		TOTAL—CLASS V.	437	65	502	259	43	302	4	1	5
		CLASS VI.—PRIMARY PRODUCERS.									
24	1	Engaged in Agricultural Pursuits	91	4	95	106	1	107	..	..	..
	2	,, Pastoral Pursuits	42	1	43	40	2	42	..	..	..
	3	,, Capture, etc., of Wild Animals and their Produce	..	..	..	3	..	3	..	..	..
	4	,, Fisheries	2	..	2	4	..	4	..	..	..
	5	,, Forestry	3	..	3	9	..	9	..	..	..
	6	,, Water Conservation and Supply	..	..	..	..	..	..	..	..	..
	7	,, Mining and Quarrying	64	..	64	7	..	7	..	..	..
		TOTAL—CLASS VI.	202	5	207	169	3	172	..	..	..
25		CLASS VII.—INDEPENDENT	265	107	372	12	9	21	..	..	..
		TOTAL—BREADWINNERS	1,190	236	1,426	524	123	647	4	1	5
		CLASS VIII.—DEPENDENTS.									
26		Dependent on Natural Guardians	447	1,016	1,463	379	655	1,034	8	4	12
27	1	Supported by Voluntary or State Contributions	104	128	232	82	68	150	1	3	4
	2	Criminal Class (under Legal Detention) ..	..	..	..	..	..	..	..	..	..
		TOTAL—CLASS VIII.	551	1,144	1,695	461	723	1,184	9	7	16
		GRAND TOTAL	1,741	1,380	3,121	985	846	1,831	13	8	21

In the following table is given a summary of the particulars in respect of occupation and age for blind persons and deaf mutes :—

Blindness and Deafmutism according to Occupation and Age, Commonwealth, 1911.

Class.	Occupation. Designation.	Males. Age last Birthday. 0–14	15–64	65 & over.	Males. All Ages.	Females. Age last Birthday. 0–14	15–64	65 & over.	Females. All Ages.	Persons. Age last Birthday. 0–14	15–64	65 & over.	Persons. All Ages.
	BLIND BUT NOT DEAF AND DUMB.												
I.	Professional	..	77	21	98	..	25	2	27	..	102	23	125
II.	Domestic	..	10	9	19	..	8	5	13	..	18	14	32
III.	Commercial	..	79	64	143	..	5	14	19	..	84	78	162
IV.	Transport and Communication	..	10	16	26	..	..	..	..	..	10	16	26
V.	Industrial	..	311	126	437	..	63	2	65	..	374	128	502
VI.	Primary Producers	..	83	119	202	..	3	2	5	..	86	121	207
VII.	Independent	1	88	176	265	..	26	81	107	1	114	257	372
VIII.	Dependents	86	277	188	551	75	497	572	1,144	161	774	760	1,695
	TOTAL	87	935	719	1,741	75	627	678	1,380	162	1,562	1,397	3,121
	DEAF AND DUMB BUT NOT BLIND.												
I.	Professional	..	26	1	27	..	10	..	10	..	36	1	37
II.	Domestic	..	17	1	18	..	53	1	54	..	70	2	72
III.	Commercial	..	25	2	27	..	1	3	4	..	26	5	31
IV.	Transport and Communication	..	12	..	12	..	..	..	..	..	12	..	12
V.	Industrial	1	250	8	259	..	43	..	43	1	293	8	302
VI.	Primary Producers	..	163	6	169	..	3	..	3	..	166	6	172
VII.	Independent	..	8	4	12	..	7	2	9	..	15	6	21
VIII.	Dependents	288	166	7	461	262	426	35	723	550	592	42	1,184
	TOTAL	289	667	29	985	262	543	41	846	551	1,210	70	1,831
	BLIND DEAF MUTES.												
V.	Industrial	..	3	1	4	..	1	..	1	..	4	1	5
VIII.	Dependents	5	3	1	9	1	4	2	7	6	7	3	16
	TOTAL	5	6	2	13	1	5	2	8	6	11	4	21

Classified according to grade of occupation, particulars in respect of blind persons and deaf mutes are as follows :—

Blindness and Deafmutism according to Grade of Occupation, Commonwealth, 1911.

Class.	Occupation. Designation.	Males. Grades. E	O	A	W	N	NA	Males. All Grades.	Females. Grades. E	O	A	W	N	NA	Females. All Grades.	Persons. Grades. E	O	A	W	N	NA	Persons. All Grades.
	BLIND BUT NOT DEAF AND DUMB.																					
I.	Professional	6	32	..	19	..	41	98	1	10	..	11	..	5	27	7	42	..	30	..	46	125
II.	Domestic	4	..	..	1	..	14	19	2	1	1	..	..	9	13	6	1	1	1	..	23	32
III.	Commercial	26	22	..	11	..	84	143	3	2	..	1	..	13	19	29	24	..	12	..	97	162
IV.	Transport & Communication	2	1	..	..	..	23	26	..	..	..	..	..	..	..	2	1	..	..	..	23	26
V.	Industrial	21	16	1	184	10	205	437	..	3	1	54	1	6	65	21	19	2	238	11	211	502
VI.	Primary Producers	37	15	9	..	..	141	202	2	1	1	..	..	1	5	39	16	10	..	..	142	207
VII.	Independent	..	..	..	..	..	265	265	..	..	..	..	..	107	107	..	..	..	..	..	372	372
VIII.	Dependents	..	..	..	..	..	551	551	..	..	..	..	..	1,144	1,144	..	..	..	..	..	1,695	1,695
	TOTAL	96	86	10	215	10	1,324	1,741	8	17	3	66	1	1,285	1,380	104	103	13	281	11	2,609	3,121
	DEAF AND DUMB BUT NOT BLIND.																					
I.	Professional	..	2	..	22	1	2	27	..	1	..	8	..	1	10	..	3	..	30	1	3	37
II.	Domestic	..	..	1	16	..	1	18	..	..	..	47	..	7	54	..	..	1	63	..	8	72
III.	Commercial	..	9	..	13	..	5	27	1	..	..	1	..	2	4	1	9	..	14	..	7	31
IV.	Transport & Communication	1	..	..	10	..	1	12	..	..	..	..	..	..	..	1	..	..	10	..	1	12
V.	Industrial	3	15	1	210	14	16	259	2	7	..	33	..	1	43	5	22	1	243	14	17	302
VI.	Primary Producers	11	25	34	92	5	2	169	..	..	3	..	..	..	3	11	25	37	92	5	2	172
VII.	Independent	..	..	..	..	..	12	12	..	..	..	..	..	9	9	..	..	..	..	..	21	21
VIII.	Dependents	..	..	..	..	..	461	461	..	..	..	..	..	723	723	..	..	..	..	..	1,184	1,184
	TOTAL	15	51	36	363	20	500	985	3	8	3	89	..	743	846	18	59	39	452	20	1,243	1,831
	BLIND DEAF MUTES.																					
V.	Industrial	..	1	..	..	..	3	4	..	1	..	..	..	..	1	..	2	..	..	..	3	5
VIII.	Dependents	..	..	..	..	..	9	9	..	..	..	..	..	7	7	..	..	..	..	..	16	16
	TOTAL	..	1	..	..	..	12	13	..	1	..	..	..	7	8	..	2	..	..	..	19	21

NOTE.—E denotes Employer ; O, working on own account, but not employing labour ; A, assisting but not receiving wages or salary W, in receipt of wages or salary ; N, unemployed ; N A, grade not applicable.

CHAPTER XVII.

NON-EUROPEAN RACES.

1. **Nature and Scope of Inquiry.**—The subject of "race" is not specially mentioned in the Census and Statistics Act 1905, as one of the items of inquiry, but owing to the interest taken by the people of Australia in the question of Non-European population it was deemed advisable to make race one of the "prescribed matters," and to obtain and tabulate particulars in respect of persons of Non-European race. For this purpose a line on the personal card was marked "Race....." and an instruction to the following effect was provided :— "If not of European race, write Aboriginal, Chinese, Japanese, Hindu, Javanese, Manilaman, Negro, Polynesian or Aboriginal half-caste, Chinese half-caste, etc., etc., as the case may be." For all general tabulations, including those relating to Non-European races, the cards relating to full-blooded Australian Aboriginals were eliminated, owing to the provision of Section 127 of the Commonwealth Constitution, that "in reckoning the number of the people of the Commonwealth, or of a State or other part of the Commonwealth, aboriginal natives shall not be counted." In this matter an opinion has been given by the Commonwealth Attorney-General's Department that persons of the half-blood are not "aboriginal natives" for the purposes of the Constitution, and *a fortiori* that persons of less than half aboriginal blood are not aboriginal natives. In the results dealt with in this Chapter, and tabulated in detail on pp. 897 to 1073 of the Detailed Tables, half-caste aboriginal natives have been included, those having Aborignal blood to a less degree than one-half, and European blood to a greater degree than one-half, being included for tabulation as European. A similar proviso applies to those classed as half-castes of other races than aboriginal. In this connexion it may be noted that as the tabulation was essentially one distinguishing between European and Non-European races, those classified as half-caste have European blood in their veins to the degree of one-half. Where the parents of children were both of Non-European race, but not the same race, the children were classed as Non-Europeans of full blood, and tabulated according to the race of the father.

In previous Censuses taken in Australia it has been usual to distinguish, both in the inquiry and in the subsequent tabulation, between Chinese, Aboriginal Natives and the rest of the population, but not to deal extensively with other classes of Non-Europeans.

2. **Tabulation.**—In tabulating the data on the present occasion, the procedure followed has been that of including the Non-European races with the rest of the population for all purposes, and of tabulating and publishing separately the data in respect of Non-Europeans for the more important heads of inquiry.

In this tabulation the sexes have been distinguished, and particulars for full-bloods and half-castes have been shewn separately. The heads under which these particulars have been tabulated are age, nationality, length of residence, education, conjugal condition, birthplace, and occupation.

3. **Number and Distribution.**—The States in which persons of Non-European race were most numerous were New South Wales and Queensland, these two States together accounting for about 60 per cent. of those of full-blood and more than 67 per cent. of the half-caste. A summary of the numbers in each of the States and Territories is furnished in the following table :—

Non-European Races in States and Territories, 1911.

States and Territories.	Australian.	Asiatic.		African.		American.		Polynesian.		Indefinite.		All Non-European Races.	
	Half-caste.	Full blood	Half-caste.	Full blood.	Half-caste.	Full blood.	Half-caste.	Full blood.	Half-caste.	Full blood.	Half-caste.	Full blood.	Half-caste.
						MALES.							
STATES—													
N.S.W. ..	2,335	10,054	705	142	95	10	7	301	35	..	..	10,507	3,177
Vic. ..	237	5,539	571	47	27	6	4	7	2	1	2	5,600	843
Q'land ..	1,361	8,568	465	47	42	29	1	1,782	83	..	..	10,426	1,952
S.A. ..	346	936	84	15	12	4	1	2	2	2	..	959	445
W.A. ..	760	5,400	64	47	12	5	2	22	3	..	..	5,474	841
Tas. ..	123	464	68	4	3	..	..	5	1	..	..	473	195
TERRITORIES													
N.T. ..	117	1,468	18	7	..	..	..	11	..	..	..	1,486	135
F.T. ..	4	7	..	..	..	..	..	..	..	..	..	7	4
C'wealth ..	5,283	32,436	1,975	309	191	54	15	2,130	126	3	2	34,932	7,592

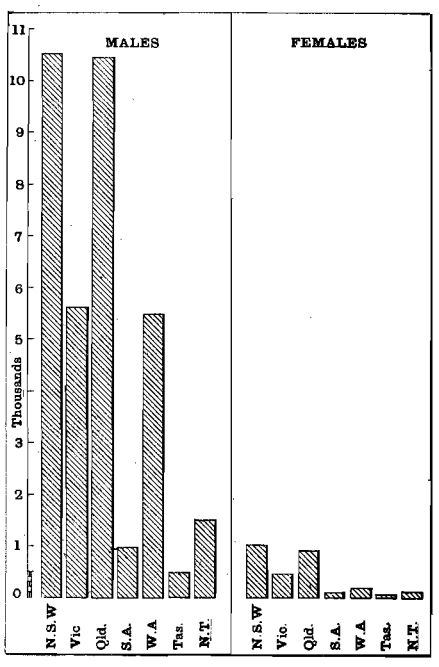
Non-European Races in States and Territories, 1911.—*continued.*

States and Territories.	Australian.	Asiatic.		African.		American.		Polynesian.		Indefinite.		All Non-European Races.	
	Half-caste.	Full blood	Half-caste.	Full blood.	Half-caste.	Full blood.	Half-caste.	Full blood.	Half-caste.	Full blood.	Half-caste.	Full blood.	Half-caste.
FEMALES.													
STATES—													
N.S.W. ..	2,177	929	685	27	71	..	..	42	35	2	..	1,000	2,968
Vic. ..	210	433	485	11	36	..	5	5	3	..	..	449	739
Q'land ..	1,147	555	475	6	23	8	4	341	59	..	..	910	1,708
S.A. ..	346	113	91	3	9	1	..	3	2	..	..	120	448
W.A. ..	715	178	65	1	3	2	..	3	..	..	..	184	783
Tas. ..	104	68	59	..	3	..	..	..	1	..	..	68	167
TERRITORIES													
N.T. ..	127	126	17	..	..	..	..	..	1	..	..	126	145
F.T. ..	4	..	..	..	..	..	..	..	..	..	..	..	4
C'wealth ..	4,830	2,402	1,877	48	145	11	9	394	101	2	..	2,857	6,962
PERSONS.													
STATES—													
N.S.W. ..	4,512	10,983	1,390	169	166	10	7	343	70	2	..	11,507	6,145
Vic. ..	447	5,972	1,056	58	63	6	9	12	5	1	2	6,049	1,582
Q'land ..	2,508	9,123	940	53	65	37	5	2,123	142	..	..	11,336	3,660
S.A. ..	692	1,049	175	18	21	5	1	5	4	2	..	1,079	893
W.A. ..	1,475	5,578	129	48	15	7	2	25	3	..	..	5,658	1,624
Tas. ..	227	532	127	4	6	..	..	5	2	..	..	541	362
TERRITORIES													
N.T. ..	244	1,594	35	7	..	..	..	11	1	..	..	1,612	280
F.T. ..	8	7	..	..	..	..	..	..	..	..	..	7	8
C'wealth	10,113	34,838	3,852	357	336	65	24	2,524	227	5	2	37,789	14,554

Of the total of 37,789 persons of Non-European race (full-blood), no fewer than 34,838, or about 90 per cent., were Asiatics, whilst of the 14,554 half-castes about 70 per cent. were half-caste Australian aboriginals. For the Commonwealth as a whole persons of Non-European race (full-blood) represented 8.48 per 1000 of the population, while half-castes amounted to 3.28 per 1000.

In the accompanying graph (No. 72) a representation is furnished of the number of persons of each sex of Non-European race (full-blood) who were recorded in each of the States and the Northern Territory at the Census of 3rd April, 1911. The figures for the Federal Territory are so small that a representation on the above scale would not be visible. This graph displays in a striking manner the relatively heavy number of such persons in Queensland, Western Australia and the Northern Territory.

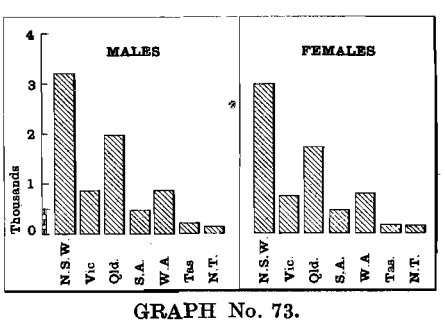
Non-European Races [Full-blood], 1911.



GRAPH No. 72

Graph No. 73 furnishes for half-caste residents of the several States and the Northern Territory a representation of the half-caste Non-Europeans similar to that furnished in graph 72 for those of full-blood. In this case, also, there are relatively large numbers in Queensland and Western Australia, and comparatively few in Victoria, South Australia and Tasmania.

Non-European Races [Half-caste], 1911.



GRAPH No. 73.

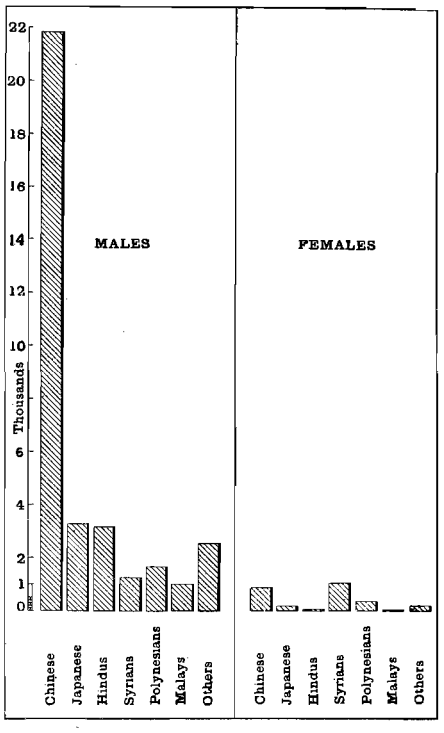
4. **Principal Races Represented.**—Of the various races included in the full-blood total of 37,789, six were represented by upwards of 1000 persons each. These in numerical order were Chinese 22,753, Japanese 3489, Hindus 3299, Syrians 2339, Polynesians 2068, and Malays 1077, which amongst them accounted for 35,025, or upwards of 92½ per cent. of the total. Of males of the full-blood, the Chinese preponderated, Japanese being second, Hindus third, and Polynesians fourth. Of females of the full-blood the race most numerously represented was the Syrian, the Chinese being second, Polynesian third and Japanese fourth. The races most largely represented by half-castes were the Aboriginal, the Chinese, the Hindus, the Negroes, and the Polynesians in the order named. The persons here, and subsequently in this chapter, classed as Polynesians, are those who were so described on their Census cards, and those who were described as Fijians. In the summary tables given on pp. 222 and 223, Papuans and Maoris have, in addition, been included.

For those of the full-blood the figures for the principal races for the several States and Territories are as follows :—

Principal Non-European Races [Full-blood], 1911.

States and Territories.	Chinese.	Japanese.	Hindus.	Syrians.	Polynesians.	Malays.	Others.	Total, Non-European Races.
MALES.								
STATES—								
New South Wales ..	7,939	119	1,119	654	264	28	384	10,507
Victoria	4,491	39	720	244	2	5	99	5,600
Queensland	5,783	1,416	356	156	1,404	300	1,011	10,426
South Australia	241	13	436	178	2	2	87	959
Western Australia ..	1,775	1,609	549	17	17	674	833	5,474
Tasmania	400	..	15	47	4	..	7	473
TERRITORIES—								
Northern	1,224	85	4	..	11	24	138	1,486
Federal	3	..	2	1	..	..	1	7
COMMONWEALTH ..	21,856	3,281	3,201	1,297	1,704	1,033	2,560	34,932
FEMALES.								
STATES—								
New South Wales ..	284	7	63	540	23	1	82	1,000
Victoria	216	8	9	197	3	..	16	449
Queensland	212	65	17	163	335	38	80	910
South Australia ..	14	..	3	94	3	..	6	120
Western Australia ..	37	123	6	7	..	1	10	184
Tasmania	27	..	..	41	..	..	..	68
TERRITORIES—								
Northern	107	5	..	..	..	4	10	126
Federal	..	..	..	..	..	..	..	..
COMMONWEALTH ..	897	208	98	1,042	364	44	204	2,857
PERSONS.								
STATES—								
New South Wales ..	8,223	126	1,182	1,194	287	29	466	11,507
Victoria	4,707	47	729	441	5	5	115	6,049
Queensland ..	5,995	1,481	373	319	1,739	338	1,091	11,336
South Australia	255	13	439	272	5	2	93	1,079
Western Australia ..	1,812	1,732	555	24	17	675	843	5,658
Tasmania	427	..	15	88	4	..	7	541
TERRITORIES—								
Northern	1,331	90	4	..	11	28	148	1,612
Federal	3	..	2	1	..	..	1	7
COMMONWEALTH ..	22,753	3,489	3,299	2,339	2,068	1,077	2,764	37,789

Principal Non-European Races [Full-blood], Commonwealth, 1911.



GRAPH No. 74.

Of the Non-European males, Chinese were most numerous in New South Wales and Queensland, Japanese and Malays in Western Australia and Queensland, Hindus and Syrians in New South Wales and Victoria, Polynesians in Queensland and New South Wales, and other races in Queensland and Western Australia.

Of females, the only instances in which more than 100 were recorded were New South Wales, Victoria, Queensland, and the Northern Territory in the case of Chinese; Queensland in the case of Japanese; New South Wales, Victoria, and Queensland in the case of Syrians, and Queensland in the case of Polynesians.

The accompanying graph (No. 74) furnishes for the Commonwealth as a whole a representation of the number of persons of each sex of the principal Non-European races (full-blood) recorded at the Census of 3rd April, 1911. It furnishes striking evidence of the preponderance of Chinese amongst the male Non-Europeans, and of the relatively large number of Syrians amongst the females.

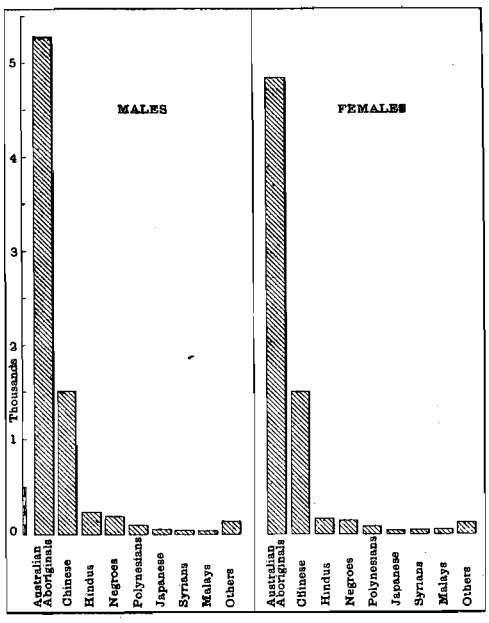
For persons of half-blood the figures for the principal races for the several States and Territories are as follows :—

Principal Non-European Races, 1911 [Half-caste].

States and Territories.	Aust. Abgnls.	Chinese	Hindus	Negroes	Polynesians.	Japanese.	Syrians	Malays.	Others.	Total, Half-caste.
MALES.										
STATES—										
New South Wales ..	2,335	561	72	95	23	19	20	9	43	3,177
Victoria	237	465	73	27	..	13	11	5	12	843
Queensland	1,361	355	42	42	72	12	6	21	41	1,952
South Australia ..	346	50	20	12	1	2	2	2	10	445
Western Australia ..	760	33	17	12	3	5	1	1	9	841
Tasmania	123	50	14	3	..	..	..	..	5	195
TERRITORIES—										
Northern	117	4	1	..	..	..	..	..	13	135
Federal	4	..	..	..	..	..	..	..	..	4
COMMONWEALTH ..	5,283	1,518	239	191	99	51	40	38	133	7,592
FEMALES.										
STATES—										
New South Wales ..	2,177	571	64	71	22	13	25	2	23	2,968
Victoria	210	429	32	36	1	7	5	8	11	739
Queensland	1,147	364	26	23	49	10	1	35	53	1,708
South Australia ..	346	54	15	9	1	..	10	..	13	448
Western Australia ..	715	27	18	3	..	5	2	1	12	783
Tasmania	104	52	5	3	1	1	1	..	..	167
TERRITORIES—										
Northern	127	4	..	..	1	..	..	..	13	145
Federal	4	..	..	..	..	..	..	..	..	4
COMMONWEALTH ..	4,830	1,501	160	145	75	36	44	46	125	6,962
PERSONS.										
STATES—										
New South Wales ..	4,512	1,132	136	166	45	32	45	11	66	6,145
Victoria	447	894	105	63	1	20	16	13	23	1,582
Queensland	2,508	719	68	65	121	22	7	56	94	3,660
South Australia ..	692	104	35	21	2	2	12	2	23	893
Western Australia ..	1,475	60	35	15	3	10	3	2	21	1,624
Tasmania	227	102	19	6	1	1	1	..	5	362
TERRITORIES—										
Northern	244	8	1	..	1	..	..	..	26	280
Federal	8	..	..	..	..	..	..	..	..	8
COMMONWEALTH ..	10,113	3,019	399	336	174	87	84	84	258	14,554

Australian Aboriginal half-castes were most numerous in New South Wales and Queensland; Chinese, Hindu and Syrian half-castes in New South Wales and Victoria; Negro and Japanese half-castes in New South Wales and Queensland; Polynesian half-castes in Queensland and New South Wales; and Malay half-castes in Queensland and Victoria.

Principal Non-European Races [Half-caste], Commonwealth, 1911.



GRAPH No. 75.

Australian Aboriginal half-castes and Chinese half-castes together represented 90 per cent. of the total half-caste population.

The numbers of the principal half-caste Non-Europeans are represented in graph No. 75, which furnishes particulars for both sexes for the Commonwealth as a whole as at the Census of 3rd April, 1911. In both sexes the half-caste Australian Aboriginals preponderated with half-caste Chinese next in order, the half-castes of other races being relatively unimportant.

5. **Ages.**—Particulars respecting the full-blood and half-caste Non-Europeans were tabulated separately in respect of age for quinquennial groups, and the results are given in pp. 906 to 933 of Vol. II. Census Detailed Tables. A summary of the Commonwealth particulars in respect of those of full-blood is as follows :—

Race and Age, Commonwealth, 1911 [Full-blood].

Age.	Chinese.	Japanese.	Hindus.	Syrians.	Polynesians.	Malays.	Others.	Total, Non-European Races.
MALES.								
Under 15	579	22	68	388	227	39	82	1,405
15-44	10,894	3,066	2,464	685	817	852	1,820	20,598
45-64	8,621	188	594	211	617	136	582	10,949
65 and over..	1,762	5	75	13	43	6	76	1,980
TOTAL	21,856	3,281	3,201	1,297	1,704	1,033	2,560	34,932
FEMALES.								
Under 15	499	25	45	425	179	24	82	1,279
15-44	361	177	40	497	148	16	96	1,335
45-64	36	5	11	101	36	2	18	209
65 and over..	1	1	2	19	1	2	8	34
TOTAL	897	208	98	1,042	364	44	204	2,857
PERSONS.								
Under 15	1,078	47	113	813	406	63	164	2,684
15-44	11,255	3,243	2,504	1,182	965	868	1,916	21,933
45-64	8,657	193	605	312	653	138	600	11,158
65 and over..	1,763	6	77	32	44	8	84	2,014
TOTAL	22,753	3,489	3,299	2,339	2,068	1,077	2,764	37,789

In the cases of the Chinese, the Japanese, the Hindus, the Malays, and the "others," persons under the age of 15 represented less than 6 per cent. of the total, while amongst Syrians about 35 per cent., and amongst Polynesians about 20 per cent. of the total were under 15.

Amongst Chinese, Syrians, and Polynesians approximately 50 per cent. were in the age group of 15-44, while in the case of the Japanese no fewer than 93 per cent. were of tha age, the corresponding proportions in the other cases being Hindus 76 per cent., Malays 80 per cent. and "others," 69 per cent.

In the group 45-64 were 38 per cent. of the Chinese, and 31½ per cent. of the Polynesians, but only 5½ per cent. of the Japanese.

The age group 65 and over contained 7¾ per cent. of the Chinese total, but relatively small proportions of the other races, and less than 2 per 1000 in the case of the Japanese.

A similar summary relative to the half-caste population is given in the following table:—

Ages of Non-European Half-castes, Commonwealth, 1911.

Age.	Aust. Abgnls.	Chinese	Hindus.	Negroes	Poly-nesians	Japan-ese.	Syrians.	Malays.	Others.	Total, Half-caste.
MALES.										
Under 15	2,194	691	151	51	63	32	34	19	73	3,308
15-44	2,551	786	68	97	32	13	6	14	44	3,611
45-64	460	41	16	39	4	6	..	5	12	583
65 and over	78	..	4	4	..	..	..	..	4	90
TOTAL	5,283	1,518	239	191	99	51	40	38	133	7,592
FEMALES.										
Under 15	2,255	699	113	52	45	29	39	32	77	3,341
15-44	2,219	748	37	83	28	6	5	14	42	3,182
45-64	298	51	6	9	2	1	..	..	5	372
65 and over	58	3	4	1	..	..	..	..	1	67
TOTAL	4,830	1,501	160	145	75	36	44	46	125	6,962
PERSONS.										
Under 15	4,449	1,390	264	103	108	61	73	51	150	6,649
15-44	4,770	1,534	105	180	60	19	11	28	86	6,793
45-64	758	92	22	48	6	7	..	5	17	955
65 and over	136	3	8	5	..	..	..	..	5	157
TOTAL	10,113	3,019	399	336	174	87	84	84	258	14,554

6. **British Subjects.**—Of the Non-Europeans of full-blood about one-third were returned as being British subjects, whilst of the half-castes practically all were British subjects by birthplace. The figures for persons of full-blood of the principal races are as follows :—

Race and Nationality, Commonwealth, 1911 [Full-blood].

Nationality.	Chinese.	Japan-ese.	Hindus.	Syrians.	Poly-nesians.	Malays.	Others.	Total, Non-European Races.
MALES.								
British Subject by—								
Birthplace	1,168	29	3,003	404	602	625	1,055	6,886
Parentage	65	..	18	11	115	3	60	272
Naturalization	3,259	92	18	406	166	20	161	4,122
Foreign Subject	17,364	3,160	162	476	821	385	1,284	23,652
TOTAL	21,856	3,281	3,201	1,297	1,704	1,033	2,560	34,932
FEMALES.								
British Subject by—								
Birthplace	643	30	92	446	285	39	158	1,693
Parentage	3	1	6	10	7	..	4	31
Naturalization	49	13	..	218	8	4	6	298
Foreign Subject	202	164	..	368	64	1	36	835
TOTAL	897	208	98	1,042	364	44	204	2,857
PERSONS.								
British Subject by—								
Birthplace	1,811	59	3,095	850	887	664	1,213	8,579
Parentage	68	1	24	21	122	3	64	303
Naturalization	3,308	105	18	624	174	24	167	4,420
Foreign Subject	17,566	3,324	162	844	885	386	1,320	24,487
TOTAL	22,753	3,489	3,299	2,339	2,068	1,077	2,764	37,789

Of the total of 37,789 persons of Non-European race, 8579, or 22.7 per cent., were British subjects by birthplace ; 303, or 0.8 per cent., were British subjects by parentage ; and 4420, or 11.7 per cent., were British subjects by naturalization ; the balance of 24,487, or 64.8 per cent., being foreign subjects.

Of the 8579 who were British by birthplace, 3442, or 40 per cent., had been born in the Commonwealth.

Similar particulars in respect of the principal half-caste members of the community were as follows :—

Nationality of Non-European Half-castes, Commonwealth, 1911.

Nationality.	Aust. Abgnls.	Chinese.	Hindus.	Negroes	Poly-nesians.	Japan-ese.	Syrians.	Malays.	Others.	Total, Half-caste.
MALES.										
British Subject by—										
Birthplace	5,283	1,511	231	168	90	46	38	34	122	7,523
Parentage	..	2	5	7	3	..	1	1	2	21
Naturalization ..	..	2	..	8	3	1	..	..	..	14
Foreign Subject ..	..	3	3	8	3	4	1	3	9	34
TOTAL	5,283	1,518	239	191	99	51	40	38	133	7,592
FEMALES.										
British Subject by—										
Birthplace	4,829	1,494	160	142	70	36	41	46	121	6,939
Parentage	..	..	..	1	3	..	..	..	2	6
Naturalization ..	..	..	..	..	..	..	2	..	..	2
Foreign Subject ..	1	7	..	2	2	..	1	..	2	15
TOTAL	4,830	1,501	160	145	75	36	44	46	125	6,962
PERSONS.										
British Subject by—										
Birthplace	10,112	3,005	391	310	160	82	79	80	243	14,462
Parentage	..	2	5	8	6	..	1	1	4	27
Naturalization ..	..	2	..	8	3	1	2	..	..	16
Foreign Subject ..	1	10	3	10	5	4	2	3	11	49
TOTAL	10,113	3,019	399	336	174	87	84	84	258	14,554

Of the total of 14,554 half-castes, no fewer than 14,462, or 99.4 per cent., were British by birthplace. Of those who were British by birthplace, 14,287, or nearly 99 per cent., had been born in the Commonwealth.

7. **Length of Residence.**—In the case of Non-Europeans of the full-blood, 3442, or about 9 per cent. of the total had been born in Australia, while of the remainder, 14,273, or nearly 38 per cent. of the total had been in Australia for 20 years or over. The remaining 20,074, or about 53 per cent. of the total, had consequently arrived in the Commonwealth in 1891 or subsequent years. Particulars for the principal races are as follows :—

Race and Length of Residence, Commonwealth, 1911 [Full-blood].

Length of Residence.	Chinese.	Japan-ese.	Hindus.	Syrians.	Poly-nesians.	Malays.	Others.	Total, Non-European Races
MALES.								
Under 20 Years	9,961	3,148	2,711	633	219	768	1,703	19,143
20 Years and over	11,060	107	405	255	1,161	221	732	13,941
Australian Born	835	26	85	409	324	44	125	1,848
TOTAL	21,856	3,281	3,201	1,297	1,704	1,033	2,560	34,932
FEMALES.								
Under 20 Years	172	175	11	499	30	2	42	931
20 Years and over.. ..	89	4	21	98	69	6	45	332
Australian Born	636	29	66	445	265	36	117	1,594
TOTAL	897	208	98	1,042	364	44	204	2,857
PERSONS.								
Under 20 Years	10,133	3,323	2,722	1,132	249	770	1,745	20,074
20 Years and over.. ..	11,149	111	426	353	1,230	227	777	14,273
Australian Born	1,471	55	151	854	589	80	242	3,442
TOTAL	22,753	3,489	3,299	2,339	2,068	1,077	2,764	37,789

This table furnishes evidence of a relatively heavy influx of Japanese, Hindus, Syrians and Malays during the 20 years preceding the Census, and a marked falling-off in the number of Polynesians during the same period. The latter is largely due to the deportation of Kanakas from Queensland, and the extension of the White Australia principle to the sugar industry of that State. More than 52 per cent. of the immigrant Chinese had been resident in Australia for upwards of 20 years.

For the half-castes the corresponding particulars are as follows :—

Length of Residence of Half-caste Non-Europeans, Commonwealth, 1911.

Length of Residence.	Aust. Abgnls.	Chinese	Hindus.	Negroes	Poly-nesians.	Japan-ese.	Syrians.	Malays.	Others.	Total, Half-caste.
MALES.										
Under 20 Years ..	2	5	41	29	13	3	6	1	17	117
20 Years and over ..	..	3	20	33	5	2	..	5	20	88
Australian Born ..	5,281	1,510	178	129	81	46	34	32	96	7,387
TOTAL	5,283	1,518	239	191	99	51	40	38	133	7,592
FEMALES.										
Under 20 Years ..	1	5	4	3	3	..	2	..	9	27
20 Years and over ..	..	3	12	6	6	..	1	..	7	35
Australian Born ..	4,829	1,493	144	136	66	36	41	46	109	6,900
TOTAL	4,830	1,501	160	145	75	36	44	46	125	6,962
PERSONS.										
Under 20 Years ..	3	10	45	32	16	3	8	1	26	144
20 Years and over ..	..	6	32	39	11	2	1	5	27	123
Australian Born ..	10,110	3,003	322	265	147	82	75	78	205	14,287
TOTAL	10,113	3,019	399	336	174	87	84	84	258	14,554

The total number of immigrant half-castes was only 267, of whom 144, or 54 per cent., had been resident in Australia for less than 20 years, and 123, or 46 per cent., for 20 years and over.

8. **Education.**—Classified according to ability to read and write English or a Foreign language, the education of the Non-Europeans of the full-blood was as follows :—

Race and Education, Commonwealth, 1911 :—Population aged 5 and upwards [Full-blood].

Education.	Chinese.	Japan-ese.	Hindus.	Syrians.	Poly-nesians.	Malays.	Others.	Total, Non-European Races.
MALES.								
English Language—								
Read and Write ..	3,491	621	566	693	462	126	757	6,716
Read only	58	6	14	11	104	..	15	208
Foreign Language only—								
Read and Write ..	12,362	2,260	977	210	45	332	492	16,678
Read only	1,443	170	148	34	6	44	26	1,871
Cannot Read	4,278	209	1,467	184	988	515	1,232	8,873
Total	21,632	3,266	3,172	1,132	1,605	1,017	2,522	34,346
FEMALES.								
English Language—								
Read and Write ..	424	47	49	476	175	15	126	1,312
Read only	2	..	1	10	5	..	..	18
Foreign Language only—								
Read and Write ..	108	118	4	112	6	..	5	353
Read only	8	3	..	22	2	..	2	37
Cannot Read	149	33	18	261	104	23	33	621
TOTAL	691	201	72	881	292	38	166	2,341
PERSONS.								
English Language—								
Read and Write ..	3,915	668	615	1,169	637	141	883	8,028
Read only	60	6	15	21	109	..	15	226
Foreign Language only—								
Read and Write ..	12,470	2,378	981	322	51	332	497	17,031
Read only	1,451	173	148	56	8	44	28	1,908
Cannot Read	4,427	242	1,485	445	1,092	538	1,265	9,494
TOTAL	22,323	3,467	3,244	2,013	1,897	1,055	2,688	36,687

Of 36,687 persons of Non-European race aged 5 years and upwards, 8028, or about 22 per cent., were able to read and write English, and 17,031, or about 46½ per cent. were able to read and write in a Foreign language, but not in English. The number unable to read either English or a Foreign language was 9494, or about 26 per cent. of the total aged 5 and upwards.

The following table furnishes for each of the races specified the percentage of persons aged 5 years and upwards who were recorded as unable to read :—

Percentage of Non-Europeans aged 5 and upwards unable to Read, Commonwealth, 1911 [Full-blood].

Particulars.	Chinese.	Japanese.	Hindus.	Syrians.	Polynesians.	Malays.	Others.	Total, Non-European Races.
	%	%	%	%	%	%	%	%
Males	19.78	6.40	46.25	16.25	61.56	50.64	48.85	25.83
Females	21.56	16.42	25.00	29.63	35.62	60.53	19.88	26.53
PERSONS	19.83	6.98	45.78	22.11	57.56	51.00	47.06	25.88

The Japanese and Chinese furnished the smallest and the Malays and Polynesians the highest proportions of persons above the age of 5 unable to read.

For the half-caste population, the particulars in respect of education were as follows :—

Education of Half-castes aged 5 and upwards, Commonwealth, 1911.

Education.	Aust. Abgnls.	Chinese	Hindus	Negroes	Polynesians	Japanese.	Syrians	Malays	Others	Total, Half-caste.
				MALES.						
English Language—										
Read and Write ..	2,719	1,183	131	154	70	30	20	26	76	4,409
Read only	64	4	..	4	1	..	..	..	1	74
Foreign Language only—										
Read and Write ..	..	4	5	1	1	5	..	1	10	27
Read only	..	1	..	..	..	..	..	..	5	6
Cannot Read	1,692	64	28	14	9	..	1	6	9	1,823
TOTAL	4,475	1,256	164	173	81	35	21	33	101	6,339
				FEMALES.						
English Language—										
Read and Write ..	2,629	1,194	97	125	48	23	22	29	79	4,246
Read only	46	..	1	2	..	..	..	..	..	49
Foreign Language only—										
Read and Write ..	..	1	1	..	1	..	..	..	8	11
Read only	..	..	..	..	..	..	..	..	..	..
Cannot Read	1,330	41	15	4	13	..	..	8	3	1,414
TOTAL	4,005	1,236	114	131	62	23	22	37	90	5,720
				PERSONS.						
English Language—										
Read and Write ..	5,348	2,377	228	279	118	53	42	55	155	8,655
Read only	110	4	1	6	1	..	..	..	1	123
Foreign Language only—										
Read and Write ..	..	5	6	1	2	5	..	1	18	38
Read only	..	1	..	..	..	..	..	..	5	6
Cannot Read	3,022	105	43	18	22	..	1	14	12	3,237
TOTAL	8,480	2,492	278	304	143	58	43	70	191	12,059

Of 12,059 half-castes aged 5 years and upwards, 8655, or nearly 72 per cent., were able to read and write English, while 3237, or nearly 27 per cent , could not read.

The succeeding table shews for each of the races specified the percentage of half-castes aged 5 years and upwards who were recorded as unable to read.

Percentage of Half-castes aged 5 and upwards unable to Read, Commonwealth, 1911.

Particulars.	Aust. Abgnls.	Chinese	Hindus	Negroes	Poly-nesians	Japan-ese.	Syrians	Malays	Others	Total, Half-caste.
	%	%	%	%	%	%	%	%	%	%
Males	37 81	5.10	17.07	8.09	11.11	.00	4.76	18.18	8.91	28.76
Females	33.21	3.32	13.16	3.05	20.97	.00	.00	21.62	3.33	24.72
PERSONS	35.64	4.21	15.47	5.92	15.38	.00	2.33	20.00	6.28	26.84

All the Japanese half-castes above the age of 5 were returned as able to read and write, and only 2.33 per cent. of the Syrian, and 4.21 per cent. of the Chinese half-castes above that age were returned as being unable to read.

9. **Conjugal Condition.**—Particulars in respect of each race were tabulated with regard to conjugal condition. For the Commonwealth the details in respect of full-blood Non-Europeans are as follows :—

Race and Conjugal Condition, Commonwealth. 1911, Population aged 15 and upwards (Full-blood).

Conjugal Condition.	Chinese.	Japan-ese.	Hindus.	Syrians.	Poly-nesians.	Malays.	Others.	Total, Non-European Races.
			MALES.					
Married	8,032	392	1,137	520	371	102	407	10,961
Never Married	12,860	2,837	1,776	369	1,042	870	1,983	21,737
Widowed	374	25	217	18	60	18	84	796
Divorced	11	5	3	2	4	4	4	33
TOTAL	21,277	3,259	3,133	909	1,477	994	2,478	33,527
			FEMALES.					
Married	314	108	36	446	134	17	73	1,128
Never Married	66	70	12	107	43	3	36	337
Widowed	18	4	5	63	7	..	13	110
Divorced	..	1	..	1	1	..	..	3
TOTAL	398	183	53	617	185	20	122	1,578
			PERSONS.					
Married	8,346	500	1,173	966	505	119	480	12,089
Never Married	12,926	2,907	1,788	476	1,085	873	2,019	22,074
Widowed	392	29	222	81	67	18	97	906
Divorced	11	6	3	3	5	4	4	36
TOTAL	21,675	3,442	3,186	1,526	1,662	1,014	2,600	35,105

Of 35,105 persons of Non-European race aged 15 years and upwards, 12,089, or 34½ per cent., were married ; 22,074, or about 63 per cent., had never been married ; 906, or about 2½ per cent., were widowed ; and 36, or about 1 per thousand, were divorced.

The percentage of the full-blood Non-Europeans aged 15 years and upwards who were married at the date of the Census is shewn in the next table, the particulars being given separately for each race and sex :—

Percentage Married amongst those aged 15 and upwards, Commonwealth, 1911 [Full-blood].

Particulars.	Chinese.	Japan-ese.	Hindus.	Syrians.	Poly-nesians.	Malays.	Others.	Total, Non-European Races.
	%	%	%	%	%	%	%	%
Males	37.75	12.03	36.29	57.21	25.12	10.26	16.42	32.69
Females	78.89	59.02	67.92	72.29	72.43	85.00	59.84	71.48
PERSONS	38.51	14.53	36.82	63.30	30.39	11.74	18.46	34.44

The Syrians furnished the highest, and the Malays the lowest proportion of married men, while the Malays furnished the highest, and the Japanese the lowest proportion of married women. In all cases the proportion of women married was very much higher than the proportion of men.

For the half-caste population the particulars in respect of Conjugal Condition were as follows :—

Conjugal Condition of Half-castes aged 15 and upwards, Commonwealth, 1911.

Conjugal Condition.	Aust. Abgnls.	Chinese	Hindus	Negroes	Poly-nesians	Japan-ese.	Syrians	Malays	Others	Total, Half-caste.
MALES.										
Married	1,168	230	41	61	14	6	..	2	24	1,546
Never Married ..	1,800	590	37	72	..	11	6	17	32	2,565
Widowed	115	6	10	7	22	2	..	..	4	166
Divorced	6	1	..	..	..	..	..	..	..	7
TOTAL	3,089	827	88	140	36	19	6	19	60	4,284
FEMALES.										
Married	1,421	373	24	40	13	2	..	8	36	1,917
Never Married ..	1,033	403	18	47	15	5	5	5	8	1,539
Widowed	118	25	5	5	1	..	..	1	4	159
Divorced	3	1	..	1	1	..	..	..	..	6
TOTAL	2,575	802	47	93	30	7	5	14	48	3,621
PERSONS.										
Married	2,589	603	65	101	27	8	..	10	60	3,463
Never Married ..	2,833	993	55	119	15	16	11	22	40	4,104
Widowed	233	31	15	12	23	2	..	1	8	325
Divorced	9	2	..	1	1	..	..	..	..	13
TOTAL	5,664	1,629	135	233	66	26	11	33	108	7,905

Of 7905 half-castes aged 15 and upwards, 3463, or nearly 44 per cent., were married ; 4104, or nearly 52 per cent., had never been married ; while 325, or more than 4 per cent., were widowed ; and 13, or $1\frac{3}{4}$ per thousand, were divorced.

The next table shews the proportion per cent. of the half-castes aged 15 years and upwards who were married at the date of the Census.

Percentage Married amongst those aged 15 and upwards, Commonwealth, 1911 [Half-castes].

Particulars.	Aust. Abgnls.	Chinese	Hindus	Negroes	Poly-nesians	Japan-ese.	Syrians	Malays	Others	Total, Half-caste.
	%	%	%	%	%	%	%	%	%	%
Males	37.81	27.81	46.59	43.57	38.89	31.58	.00	10.53	40.00	36.09
Females	55.18	46.51	51.06	43.01	43.33	28.57	.00	57.14	75.00	52.94
PERSONS	45.71	37.02	48.15	43.35	40.91	30.77	.00	30.30	55.56	43.81

Of the races specified, the Hindus furnished the highest, and the Syrians the lowest proportion of males married, while the Malays furnished the highest, and the Syrians the lowest proportion of females married. The number of Syrian half-castes married was nil.

10. **Birthplace.**—Details respecting the birthplaces of the representatives of the various races are given on pp. 974 to 1013 of Vol. II. Census Detailed Tables. A summary of the data for full-blood Non-Europeans for the Continental divisions of birthplaces is as follows :—

Birthplace and Race, Commonwealth, 1911 [Full-blood].

Birthplace.	Chinese.	Japan-ese.	Hindus.	Syrians.	Poly-nesians.	Malays.	Others.	Total, Non-European Races.
MALES.								
Australasia	835	26	85	404	327	44	181	1,902
Europe	5	..	..	26	..	..	5	36
Asia	21,000	3,253	3,101	854	9	987	1,656	30,860
Africa	..	1	4	9	..	1	97	112
America	13	..	1	4	2	..	247	267
Polynesia	1	1	8	..	1,365	1	374	1,750
At Sea	2	..	2	..	1	..	..	5
TOTAL	21,856	3,281	3,201	1,297	1,704	1,033	2,560	34,932
FEMALES.								
Australasia	636	29	68	446	265	36	139	1,619
Europe	..	2	..	11	..	..	1	14
Asia	260	177	23	578	..	8	29	1,075
Africa	..	..	..	6	..	..	6	12
America	1	..	..	..	..	..	21	22
Polynesia	..	..	7	..	99	..	8	114
At Sea	..	..	..	1	..	..	..	1
Total	897	208	98	1,042	364	44	204	2,857

Birthplace and Race, Commonwealth, 1911 (Full-blood).—*continued.*

Birthplace.	Chinese.	Japanese.	Hindus.	Syrians.	Polynesians.	Malays.	Others.	Total, Non-European Races.
PERSONS.								
Australasia	1,471	55	153	850	592	80	320	3,521
Europe	5	2	..	37	..	..	6	50
Asia	21,260	3,430	3,124	1,432	9	995	1,685	31,935
Africa	..	1	4	15	..	1	103	124
America	14	..	1	4	2	..	268	289
Polynesia	1	1	15	..	1,464	1	382	1,864
At Sea	2	..	2	1	1	..	..	6
TOTAL	22,753	3,489	3,299	2,339	2,068	1,077	2,764	37,789

Of the total of 37,789 persons of Non-European race, 31,935, or 84½ per cent., had been born in Asia; 3521, or 9¼ per cent., in Australasia; and 1864, or 5 per cent., in Polynesia; all other birthplaces accounting for only 469, or 1¼ per cent., of the total.

The race which was proportionately most largely born in Australasia was the Syrian, no fewer than 850 out of a total of 2339 being so born. This represented a proportion of no less than 36 per cent. In the case of the Japanese on the other hand, the proportion born in Australasia was only about 1½ per cent. of the total.

A similar summary in respect of half-castes is furnished in the succeeding table :—

Birthplaces of Half-castes, Commonwealth, 1911.

Birthplace.	Aust. Abgnls.	Chinese	Hindus	Negroes	Polynesians	Japanese.	Syrians	Malays	Others	Total, Half-caste.
MALES.										
Australasia	5,281	1,510	178	131	82	46	38	33	113	7,412
Europe	..	..	1	3	..	..	..	..	2	6
Asia	..	7	56	..	..	4	2	5	5	79
Africa	..	..	..	11	..	..	..	..	4	15
America	..	..	2	44	..	1	..	..	7	54
Polynesia	1	1	..	..	16	..	..	..	2	20
At Sea	1	..	2	2	1	..	..	..	..	6
TOTAL	5,283	1,518	239	191	99	51	40	38	133	7,592
FEMALES.										
Australasia	4,829	1,494	144	137	66	36	41	46	117	6,910
Europe	..	2	1	..	..	..	..	..	..	3
Asia	..	5	15	..	..	..	3	..	4	27
Africa	..	..	..	1	..	..	..	..	1	2
America	..	..	..	6	..	..	..	..	1	7
Polynesia	1	..	..	1	9	..	..	..	2	13
At Sea	..	..	..	..	..	..	..	..	..	..
TOTAL	4,830	1,501	160	145	75	36	44	46	125	6,962
PERSONS.										
Australasia	10,110	3,004	322	268	148	82	79	79	230	14,322
Europe	..	2	2	3	..	..	..	..	2	9
Asia	..	12	71	..	..	4	5	5	9	106
Africa	..	..	..	12	..	..	..	..	5	17
America	..	..	2	50	..	1	..	..	8	61
Polynesia	2	1	..	1	25	..	..	..	4	33
At Sea	1	..	2	2	1	..	..	..	..	6
TOTAL	10,113	3,019	399	336	174	87	84	84	258	14,554

Of the total of 14,554 half-castes, no fewer than 14,322, or about 98½ per cent., were born in Australasia, Asia being represented by only 106, and America by 61.

11. **Occupation—Full-blood Males.**—(i.) *General.* On pp. 1014 to 1071 of Vol. II. Census Detailed Tables, extensive particulars are given concerning the occupations of persons of Non-European race. These particulars are furnished for each sex separately, being given for the Commonwealth in accordance with the extended classification of occupations, and for the States and Territories in accordance with the summarised classification used on the present occasion.

In the summarised form the Commonwealth particulars for males of the full-blood of the principal races are as follows, persons of unspecified occupation having been uniformly distributed.

Commonwealth Census, 1911.—Full-blood Males of Non-European Race, classified according to Occupation.

Occupation.			Race.							
Order	Sub-order	Designation.	Chinese.	Japanese.	Hindus.	Syrians.	Polyn'sians	Malays.	Others.	Total Non-European Races.
		Class I.—Professional.								
1		Engaged in Government, Defence, Law, etc.	19	6	1	1	2	..	5	34
2		Ministering to Religion, Charity, Health, Education, etc.	135	28	33	15	25	2	69	307
		Total—Class I.	154	34	34	16	27	2	74	341
		Class II.—Domestic.								
3	1	Engaged in supplying Board and Lodging..	655	241	21	9	13	12	86	1,037
	2	,, Domestic Service and Attendance	1,312	359	57	3	77	20	111	1,939
		Total—Class II.	1,967	600	78	12	90	32	197	2,976
		Class III.—Commercial.								
4		Dealing in Property and Finance ..	9	..	3	2	3	..	3	20
5		,, Art and Mechanic Productions	16	3	3	9	..	..	11	42
6		,, Textile Fabrics, Dress and Fibrous Materials	115	6	81	141	..	..	9	352
7		,, Food, Drinks, Narcotics, and Stimulants	1,597	9	48	45	5	5	26	1,735
8		,, Animals, Animal and Vegetable Substances, N.E.I.	65	2	18	19	..	1	12	117
9		,, Fuel and Light	6	..	5	1	1	..	..	13
10		,, Metals and Other Minerals ..	2	..	5	3	..	..	4	14
11		General and Undefined Merchants & Dealers	1,717	57	714	455	7	8	72	3,030
12		Speculators on Chance Events	5	..	..	1	..	..	1	7
13		Engaged in Storage	..	..	..	..	..	..	..	..
		Total—Class III.	3,532	77	877	676	16	14	138	5,330
		Class IV.—Transport and Communication.								
14	1	Engaged in Railway Traffic	..	..	..	1	..	..	5	6
	2	,, Traffic on Roads	24	2	111	1	4	1	171	314
	3	,, ,, Seas and Rivers ..	917	130	1,296	2	22	129	221	2,717
	4 & 5	,, Postal, Telegraph & Telephone Service	5	..	1	..	1	..	1	8
	6	Messengers, etc.	..	..	..	..	..	..	..	..
		Total—Class IV.	946	132	1,408	4	27	130	398	3,045
		Class V.—Industrial.								
15		Working in Art and Mechanic Productions	1,955	42	10	16	2	1	22	2,048
16		,, Textile Fabrics, Dress, and Fibrous Materials	80	9	4	48	2	..	10	153
17		,, Food, Drinks, Narcotics, and Stimulants	170	209	34	3	33	16	80	545
18		,, Animal and Vegetable Substances, N.E.I.	3	4	4	1	18	6	15	51
19		,, Metals and Other Minerals ..	14	4	5	18	..	..	12	53
20		,, Fuel, Light and other forms of Energy	1	..	..	2	2	..	1	6
21		Engaged in Construction of Buildings, Roads, Railways, etc. ..	100	28	6	9	4	..	18	165
22		,, Disposal of Dead or of Refuse	2	..	..	..	..	1	..	3
23		,, Undefined Industrial Pursuits	384	20	59	11	117	16	70	677
		Total—Class V.	2,709	316	122	108	178	40	228	3,701
		Class VI.—Primary Producers.								
24	1	Engaged in Agricultural Pursuits	9,125	158	366	47	837	139	228	10,900
	2	,, Pastoral Pursuits	939	41	201	18	113	21	93	1,426
	3	,, Capture, etc., of Wild Animals and their Produce ..	1	..	..	2	3	1	6	13
	4	,, Fisheries	117	1,866	9	1	117	602	1,008	3,720
	5	,, Forestry	25	22	15	..	46	9	36	153
	6	,, Water Conservation & Supply	11	1	..	..	..	2	7	21
	7	,, Mining and Quarrying ..	1,598	10	12	10	13	3	43	1,689
		Total—Class VI.	11,816	2,098	603	78	1,129	777	1,421	17,922
25		Class VII.—Independent.	16	..	5	..	1	..	7	29
		Total—Breadwinners	21,140	3,257	3,127	894	1,468	995	2,463	33,344
		Class VIII.—Dependents.								
26		Dependent on Natural Guardians ..	602	23	62	401	227	38	83	1,436
27	1	Supported by Voluntary or State Contributions	109	1	12	2	8	..	12	144
	2	Criminal Class (under Legal Detention) ..	5	..	..	..	1	..	2	8
		Total—Class VIII.	716	24	74	403	236	38	97	1,588
		Grand Total	21,856	3,281	3,201	1,297	1,704	1,033	2,560	34,932

(ii.) *Chinese.* Of the total of 21,856 Chinese males, 21,140 or nearly 97 per cent., were breadwinners, of whom more than half were employed as primary producers. Agricultural pursuits accounted for 9125, of whom 7315 were market gardeners. The number employed in industrial pursuits was 2709, of whom no fewer than 1926 were engaged in the manufacture of furniture. Merchants, storekeepers, and dealers undefined accounted for 1717, while dealers in food, drinks, narcotics, and stimulants totalled 1597. Included in this latter were 1220 greengrocers and fruiterers, and 217 grocers. The total employed in mining was 1598, of whom by far the greater number were engaged in gold and tin mining. The total engaged in domestic service and attendance was 1312, of whom 622 were laundrymen, and 590 were house servants. In pastoral pursuits 939 were employed, of whom 856 were station hands. Traffic on seas and rivers accounted for 917, mainly employed as seamen, stokers, stewards and ships' servants. The only other large group was that of 655 employed in supplying board and lodging. These consisted mainly of cooks and other servants employed in hotels, coffee palaces, restaurants, boarding houses, etc.

(iii.) *Japanese.* Of the total of 3281 male Japanese of the full-blood, no fewer than 3257, or more than 99 per cent., were breadwinners. The occupation most largely represented was that of pearlshell fisher, the total so employed being 1833, or 56 per cent. of the total. The only other occupations at all extensively represented were those of " domestic service and attendance " 359, mainly laundrymen and house servants, and " supplying board and lodging " 241, mainly hotel, restaurant and boarding house servants.

(iv.) *Hindus.* The term Hindu has been here applied to all native races of India. Of the total of 3201 male Hindus of the full-blood, 3127, or nearly 98 per cent., were breadwinners. The occupations most largely represented were those connected with shipping, the number so employed being 1296, consisting mainly of seamen, stokers, stewards and ship servants. The group of merchants and dealers undefined comprised 714, of whom 554 were hawkers. There were 366 engaged in agricultural pursuits, mainly as farmers and sugar planters' hands, and 201 in pastoral pursuits, mainly in connexion with dairying. The only other group of any extent was that of 111 teamsters, more than half of whom were in Western Australia.

(v.) *Syrians.* The Syrian male population contained a relatively large proportion of dependents, the breadwinners being 894 out of 1297, or only 69 per cent. of the total. The occupation most largely represented was that of merchant and dealer undefined, representing a total of 455, and consisting mainly of general storekeepers and hawkers. The sale and manufacture of textile fabrics and dress accounted between them for 189, mainly drapers and tailors, while agricultural pursuits were represented by 47, and the sale of food and drink by 45, the latter consisting mainly of greengrocers, fruiterers and grocers.

(vi.) *Polynesians.* In the case of the Polynesian males also there was a fairly large proportion of dependents, the breadwinners comprising 1468, or only 86 per cent., of the total of 1704. The occupations most largely represented were those connected with agricultural pursuits, no fewer than 837, or 57 per cent., of the breadwinners being so engaged. Of these 410 were employed as farmers, and farm hands, and 244 in sugar planting, 117 were returned as labourer undefined, while fisheries accounted for 117, pastoral pursuits for 113, and domestic occupations for 90.

(vii.) *Malays.* Of the total of 1033 male Malays of the full-blood, 995, or 96 per cent., were breadwinners. The occupation most largely represented was that of pearlshell fishing, the number so employed being 581, or 58 per cent., of the breadwinners. The only other occupations largely represented were agricultural pursuits with 139, and shipping with 129.

(viii.) *Other Races.* The full-blood males of other Non-European races than those enumerated above totalled 2560, of whom 2463, or 96 per cent., were breadwinners. These were mainly employed (*a*) as pearlshell fishers, principally Papuans, Filipinos, Timorese, and Javanese ; (*b*) in agricultural pursuits, mainly Javanese and Cingalese ; (*c*) in shipping, mainly Timorese and Javanese ; (*d*) as teamsters, mainly Afghans, and (*e*) in domestic occupations, mainly Cingalese and Negroes.

(ix.) *All Races.* Taking all the Non-European males together, it may be said that of the total of 34,932 there were 33,344 breadwinners, or about 95½ per cent. of the total. Of these 10,900 were engaged in agricultural pursuits, mainly market gardening ; 5330 in commercial pursuits, mainly as storekeepers and assistants, and as hawkers ; 3720 in fisheries, mainly as pearlers ; 3701 in industrial pursuits, mainly the manufacture of furniture ; 2976 in domestic occupations, mainly as laundrymen and house servants ; 2717 in connexion with shipping ; 1689 as miners, mainly gold and tin ; and 1426 in pastoral pursuits.

12. **Occupation—Full-blood Females.**—The succeeding table furnishes corresponding figures for females of the full-blood races as specified :—

Commonwealth Census, 1911.—Full-blood Females of Non-European Race, classified according to Occupation.

Order	Sub-order	Occupation. Designation.	Race. Chinese.	Japanese.	Hindus.	Syrians.	Polynesians	Malays.	Others.	Total Non-European Races.
		CLASS I.—PROFESSIONAL.								
1		Engaged in Government, Defence, Law, etc.	1	..	..	..	..	..	..	1
2		Ministering to Religion, Charity, Health, Education, etc.	4	..	1	2	2	..	13	22
		TOTAL—CLASS I.	5	..	1	2	2	..	13	23
		CLASS II.—DOMESTIC.								
3	1	Engaged in supplying Board and Lodging..	1	6	1	1	1	..	8	18
	2	,, Domestic Service and Attendance	19	36	7	13	37	2	22	136
		TOTAL—CLASS II.	20	42	8	14	38	2	30	154
		CLASS III.—COMMERCIAL.								
4		Dealing in Property and Finance ..	..	..	..	..	..	..	..	..
5		,, Art and Mechanic Productions	1	2	..	1	..	..	..	4
6		,, Textile Fabrics, Dress and Fibrous Materials	..	..	..	39	..	..	..	39
7		,, Food, Drinks, Narcotics, and Stimulants	6	5	..	3	..	..	..	14
8		,, Animals, Animal and Vegetable Substances, N.E.I.	..	..	..	1	..	..	..	1
9		,, Fuel and Light	..	..	..	..	..	..	..	..
10		,, Metals and Other Minerals ..	..	..	..	..	..	..	..	..
11		General and Undefined Merchants & Dealers	10	3	1	71	..	..	1	86
12		Speculators on Chance Events	..	..	..	..	..	..	..	..
13		Engaged in Storage	..	..	..	..	..	..	..	..
		TOTAL—CLASS III.	17	10	1	115	..	..	1	144
		CLASS IV.—TRANSPORT AND COMMUNICATION.								
14	1	Engaged in Railway Traffic	..	..	..	..	..	..	..	..
	2	,, Traffic on Roads	..	..	..	..	..	..	..	..
	3	,, ,, Seas and Rivers ..	..	..	..	..	..	..	..	..
	4 & 5	,, Postal, Telegraph & Telephone Service	1	..	..	..	..	..	..	1
	6	Messengers, etc.	..	..	..	..	..	..	..	..
		TOTAL—CLASS IV.	1	..	..	..	..	..	..	1
		CLASS V.—INDUSTRIAL.								
15		Working in Art and Mechanic Productions	1	..	..	..	..	..	..	1
16		,, Textile Fabrics, Dress, and Fibrous Materials	18	21	4	68	..	..	2	113
17		,, Food, Drinks, Narcotics, and Stimulants	1	..	..	1	..	..	1	3
18		,, Animal and Vegetable Substances, N.E.I.	..	..	..	..	..	..	1	1
19		,, Metals and Other Minerals ..	1	..	..	..	..	..	..	1
20		,, Fuel, Light and other forms of Energy	..	..	..	..	..	..	..	..
21		Engaged in Construction of Buildings, Roads, Railways, etc. ..	..	..	..	..	..	..	..	..
22		,, Disposal of Dead or of Refuse	..	..	..	..	..	..	..	..
23		,, Undefined Industrial Pursuits	..	..	..	1	..	..	..	1
		TOTAL—CLASS V.	21	21	4	70	..	..	4	120
		CLASS VI.—PRIMARY PRODUCERS.								
24	1	Engaged in Agricultural Pursuits	1	1	1	2	3	..	..	8
	2	,, Pastoral Pursuits	..	..	1	1	..	..	..	2
	3	,, Capture, etc., of Wild Animals and their Produce ..	..	..	..	..	..	..	..	..
	4	,, Fisheries	..	..	..	..	..	..	..	..
	5	,, Forestry	..	..	..	..	..	..	..	..
	6	,, Water Conservation & Supply	..	..	..	..	..	..	..	..
	7	,, Mining and Quarrying ..	..	..	..	..	..	..	..	..
		TOTAL—CLASS VI.	1	1	2	3	3	..	..	10
25		CLASS VII.—INDEPENDENT.	..	..	..	1	..	..	1	2
		TOTAL—BREADWINNERS	65	74	16	205	43	2	49	454
		CLASS VIII.—DEPENDENTS.								
26		Dependent on Natural Guardians ..	831	133	82	837	319	42	155	2,399
27	1	Supported by Voluntary or State Contributions	..	1	..	..	2	..	..	3
	2	Criminal Class (under Legal Detention) ..	1	..	..	..	..	..	..	1
		TOTAL—CLASS VIII.	832	134	82	837	321	42	155	2,403
		GRAND TOTAL	897	208	98	1,042	364	44	204	2,857

Of the total of 2857 Non-European females of the full-blood, only 454, or about 16 per cent., were breadwinners, the largest number of breadwinners, viz., 205, occurring in the case of the Syrians, and the largest proportion, viz., 36 per cent., in the case of the Japanese. The occupations in which the largest numbers were employed were those of house servants, laundresses, storekeepers, hawkers, and dressmakers.

13. **Occupations.—Male Half-castes.**—(i.) *General.* Similar particulars for the male half-castes are given in the following table for the Commonwealth as a whole :—

Commonwealth Census, 1911.—Half-caste Males of Non-European Race, classified according to Occupation.

Occupation.			Race.									
Order	Sub-order	Designation.	Australian Aboriginals	Chinese.	Hindus.	Negroes.	Polyn'sians	Japanese.	Syrians.	Malays.	Others.	Total Non-European Races.
		Class I.—Professional.										
1		Engaged in Government, Defence, Law, etc.	27	13	1	1	..	1	..	..	..	43
2		Ministering to Religion, Charity, Health, Education, etc.	29	19	..	6	..	1	1	1	5	62
		Total—Class I.	56	32	1	7	..	2	1	1	5	105
		Class II.—Domestic.										
3	1	Engaged in supplying Board and Lodging..	15	13	1	6	..	..	..	..	2	37
	2	,, Domestic Service and Attendance	23	13	7	6	6	1	..	..	3	59
		Total—Class II.	38	26	8	12	6	1	..	..	5	96
		Class III.—Commercial.										
4		Dealing in Property and Finance ..	1	6	..	..	..	..	1	..	1	9
5		,, Art and Mechanic Productions	2	4	..	2	..	1	..	..	..	9
6		,, Textile Fabrics, Dress and Fibrous Materials	..	4	1	..	..	..	..	..	..	5
7		,, Food, Drinks, Narcotics, and Stimulants	23	59	2	4	..	..	..	..	2	90
8		,, Animals, Animal and Vegetable Substances, N.E.I.	11	10	..	4	..	..	..	..	1	26
9		,, Fuel and Light	3	4	..	1	..	..	..	..	1	9
10		,, Metals and Other Minerals ..	..	3	..	..	..	..	..	..	..	3
11		General and Undefined Merchants & Dealers	17	46	3	4	..	1	..	3	..	74
12		Speculators on Chance Events	..	2	..	..	..	..	..	..	..	2
13		Engaged in Storage	..	..	..	..	..	..	..	..	..	..
		Total—Class III.	57	138	6	15	..	2	1	3	5	227
		Class IV.—Transport and Communication.										
14	1	Engaged in Railway Traffic	7	2	..	2	..	..	1	..	1	13
	2	,, Traffic on Roads	24	18	1	4	..	..	..	1	2	50
	3	,, ,, Seas and Rivers ..	25	4	34	25	6	1	..	1	3	99
	4 & 5	,, Postal, Telegraph & Telephone Service	10	4	..	1	..	..	..	..	..	15
	6	Messengers, etc.	1	..	..	..	..	..	..	..	..	1
		Total—Class IV.	67	28	35	32	6	1	1	2	6	178
		Class V.—Industrial.										
15		Working in Art and Mechanic Productions	15	63	4	8	..	2	2	..	2	96
16		,, Textile Fabrics, Dress, and Fibrous Materials	3	17	3	3	..	..	..	..	..	26
17		,, Food, Drinks, Narcotics, and Stimulants	17	30	1	3	..	1	..	1	2	55
18		,, Animal and Vegetable Substances, N.E.I.	32	4	..	..	..	..	..	1	..	37
19		,, Metals and Other Minerals ..	11	16	3	2	1	1	..	..	2	36
20		,, Fuel, Light and other forms of Energy	3	5	..	1	..	..	..	..	..	9
21		Engaged in Construction of Buildings, Roads, Railways, etc. ..	46	30	..	3	..	..	..	..	4	83
22		,, Disposal of Dead or of Refuse	2	1	..	..	..	..	..	..	..	3
23		,, Undefined Industrial Pursuits	385	46	2	9	..	..	..	..	4	446
		Total—Class V.	514	212	13	29	1	4	2	2	14	791

Commonwealth Census.—Half-caste Males of Non-European Race, classified according to Occupation, Commonwealth, 1911.—*continued.*

Occupation.			Race.									
Order	Sub-order	Designation.	Australian Aboriginals.	Chinese.	Hindus.	Negroes.	Polynesians	Japanese.	Syrians.	Malays.	Others.	Total Non-European Races.
		Class VI.—Primary Producers.										
24	1	Engaged in Agricultural Pursuits ..	523	156	9	19	12	2	..	3	7	731
	2	,, Pastoral Pursuits	1,392	97	11	15	4	2	..	4	11	1,536
	3	,, Capture, etc., of Wild Animals and their Produce ..	149	4	..	..	..	..	..	1	..	154
	4	,, Fisheries	106	..	1	3	5	..	..	..	2	117
	5	,, Forestry	105	14	3	1	..	..	..	..	2	125
	6	,, Water Conservation & Supply	11	3	..	1	..	..	..	..	..	15
	7	,, Mining and Quarrying ..	49	124	3	6	1	2	..	1	2	188
		Total—Class VI.	2,335	398	27	45	22	6	..	9	24	2,866
25		Class VII.—Independent.	14	..	..	..	..	..	..	..	1	15
		Total—Breadwinners	3,081	834	90	140	35	16	5	17	60	4,278
		Class VIII.—Dependents.										
26		Dependent on Natural Guardians ..	2,144	683	149	51	64	35	35	21	72	3,254
27	1	Supported by Voluntary or State Contributions	57	..	..	..	..	..	..	..	1	58
	2	Criminal Class (under Legal Detention) ..	1	1	..	..	..	..	..	..	..	2
		Total—Class VIII.	2,202	684	149	51	64	35	35	21	73	3,314
		Grand Total	5,283	1518	239	191	99	51	40	38	133	7,592

(ii.) *Half-caste Australian Aboriginals.* Of the total of 5283 male half-caste aboriginals, 3081, or about 58 per cent., were breadwinners. Of these, 1392 were employed in pastoral pursuits, mainly as station hands, and 523 in agricultural pursuits, mainly as farm hands, while 385 were classed as industrial workers imperfectly defined, and consisted mainly of general labourers. The other occupations which were at all extensively represented were the capture of wild animals and produce 149, fisheries 106, and forestry 105.

(iii.) *Chinese.* Of 1518 male half-caste Chinese, 834, or 55 per cent., were breadwinners. The principal occupations followed were industrial pursuits 212, agricultural pursuits 156, commercial pursuits 138, mining 124, and pastoral pursuits 97.

(iv.) *Other Races.* The Australian aboriginals and the Chinese accounted for 6801 of a total of 7592 males half-castes of non-European race, representing nearly 90 per cent. of the total. The other races comprised 791 males, of whom 363, or about 46 per cent., were breadwinners. The occupations most largely represented were shipping and agricultural and pastoral pursuits.

14. **Occupation.—Female Half-castes.**—Corresponding particulars for female half-castes for the Commonwealth as a whole are furnished in the succeeding table.

Commonwealth Census, 1911.—Half-caste Females of Non-European Race, classified according to Occupation, Commonwealth, 1911.

Occupation.			Race.									
Order	Sub-order	Designation.	Australian Aboriginals	Chinese.	Hindus.	Negroes.	Polyn'sians	Japanese.	Syrians.	Malays.	Others.	Total Non-European Races.
		Class I.—Professional.										
1		Engaged in Government, Defence, Law, etc.	..	..	..	..	..	..	..	..	..	..
2		Ministering to Religion, Charity, Health, Education, etc.	13	11	2	5	..	..	..	..	2	33
		Total—Class I.	13	11	2	5	..	..	..	..	2	33
		Class II.—Domestic.										
3	1	Engaged in supplying Board and Lodging..	44	27	1	5	..	..	..	..	2	79
	2	,, Domestic Service and Attendance	823	123	10	19	12	4	2	5	10	1,008
		Total—Class II.	867	150	11	24	12	4	2	5	12	1,087

Commonwealth Census, 1911.—Half-caste Females of Non-European Race, classified according to Occupation.—*continued.*

Order	Sub-order	Occupation. Designation.	Race. Australian Aboriginals.	Chinese.	Hindus.	Negroes.	Polynesians	Japanese.	Syrians.	Malays.	Others.	Total Non-European Races.
		Class III.—Commercial.										
4		Dealing in Property and Finance ..	1	..	..	..	..	..	..	..	..	1
5		,, Art and Mechanic Productions	..	..	..	..	..	..	..	..	..	..
6		,, Textile Fabrics, Dress and Fibrous Materials	..	1	..	..	..	..	..	..	..	1
7		,, Food, Drinks, Narcotics, and Stimulants	2	13	..	..	..	..	..	..	..	15
8		,, Animals, Animal and Vegetable Substances, N.E.I.	..	..	..	..	..	..	..	..	..	..
9		,, Fuel and Light	..	..	..	..	..	..	..	..	..	..
10		,, Metals and Other Minerals ..	..	..	..	..	..	..	..	..	..	..
11		General and Undefined Merchants & Dealers	..	16	..	..	..	..	1	..	..	17
12		Speculators on Chance Events	..	..	..	..	..	..	..	..	..	..
13		Engaged in Storage	..	..	..	..	..	..	..	..	..	..
		Total—Class III.	3	30	..	..	..	..	1	..	..	34
		Class IV.—Transport and Communication.										
14	1	Engaged in Railway Traffic	1	..	..	..	..	..	..	..	..	1
	2	,, Traffic on Roads	..	..	..	..	..	..	..	..	..	..
	3	,, ,, Seas and Rivers ..	..	..	..	..	..	..	..	..	..	..
	4 & 5	,, Postal, Telegraph & Telephone Service	..	..	..	..	..	..	..	..	..	..
	6	Messengers, etc.	..	..	..	..	..	..	..	..	..	..
		Total—Class IV.	1	..	..	..	..	..	..	..	..	1
		Class V.—Industrial.										
15		Working in Art and Mechanic Productions	8	5	..	1	..	..	..	..	1	15
16		,, Textile Fabrics, Dress, and Fibrous Materials	4	73	2	13	..	1	1	..	5	99
17		,, Food, Drinks, Narcotics, and Stimulants	..	8	1	1	..	..	..	..	..	10
18		,, Animal and Vegetable Substances, N.E.I.	..	..	..	..	..	..	..	..	..	..
19		,, Metals and Other Minerals ..	..	..	..	..	..	..	..	..	..	..
20		,, Fuel, Light and other forms of Energy	..	..	..	..	..	..	..	..	..	..
21		Engaged in Construction of Buildings, Roads, Railways, etc. ..	..	..	..	..	..	..	..	..	..	..
22		,, Disposal of Dead or of Refuse	..	..	..	..	..	..	..	..	..	..
23		,, Undefined Industrial Pursuits	..	1	..	1	..	..	..	..	..	2
		Total—Class V.	12	87	3	16	..	1	1	..	6	126
		Class VI.—Primary Producers.										
24	1	Engaged in Agricultural Pursuits	8	..	..	..	..	..	..	1	1	10
	2	,, Pastoral Pursuits	32	..	..	..	..	..	..	..	..	32
	3	,, Capture, etc., of Wild Animals and their Produce ..	6	..	..	..	..	..	..	..	..	6
	4	,, Fisheries	1	..	..	..	..	..	..	..	..	1
	5	,, Forestry	..	..	..	..	..	..	..	..	..	..
	6	,, Water Conservation & Supply	1	..	..	..	..	..	..	..	..	1
	7	,, Mining and Quarrying ..	1	..	..	..	..	..	..	..	..	1
		Total—Class VI.	49	..	..	..	..	..	..	1	1	51
25		Class VII.—Independent.	4	..	..	1	..	..	..	..	..	5
		Total—Breadwinners	949	278	16	46	12	5	4	6	21	1,337
		Class VIII.—Dependents.										
26		Dependent on Natural Guardians ..	3,816	1218	143	99	63	31	40	39	103	5,552
27	1	Supported by Voluntary or State Contributions	64	5	1	..	..	..	..	1	1	72
	2	Criminal Class (under Legal Detention) ..	1	..	..	..	..	..	..	..	..	1
		Total—Class VIII.	3,881	1223	144	99	63	31	40	40	104	5,625
		Grand Total	4,830	1501	160	145	75	36	44	46	125	6,962

Of the total of 6962 female half-castes, 1337, or about 19 per cent., were breadwinners. The largest number of breadwinners, 949, occurred in the case of the aboriginals, and the heaviest proportion, 32 per cent., in the case of the negroes. The principal occupations for all races were those of house servants, a small proportion of the Chinese and negroes being engaged in dressmaking and of the aboriginals in pastoral pursuits.

15. **Metropolitan.**—The number of Non-Europeans of the full-blood resident in the several metropolitan areas of the Commonwealth at the date of the Census is furnished in the following table, particulars being given for the principal races and for each sex :—

Non-European Metropolitan Population, 1911 [Full-blood].

Metropolitan Area, including suburbs.	Chinese.	Japanese.	Hindus.	Syrians.	Polynesians.	Malays.	Others.	Total, Non-European Races.
MALES.								
Sydney	3,183	63	125	163	86	1	166	3,787
Melbourne	2,388	22	60	163	..	2	46	2,681
Brisbane	421	28	28	26	26	..	38	567
Adelaide	170	2	25	79	..	..	9	285
Perth	766	30	34	10	1	11	73	925
Hobart	78	..	1	3	..	..	..	82
TOTAL	7,006	145	273	444	113	14	332	8,327
FEMALES.								
Sydney	151	6	22	115	11	..	45	350
Melbourne	128	6	9	149	1	..	15	308
Brisbane	38	..	1	40	1	..	13	93
Adelaide	10	..	..	60	..	..	4	74
Perth	19	10	2	3	..	..	4	38
Hobart	1	..	..	2	..	..	..	3
TOTAL	347	22	34	369	13	..	81	866
PERSONS.								
Sydney	3,334	69	147	278	97	1	211	4,137
Melbourne	2,516	28	69	312	1	2	61	2,989
Brisbane	459	28	29	66	27	..	51	660
Adelaide	180	2	25	139	..	..	13	359
Perth	785	40	36	13	1	11	77	963
Hobart	79	..	1	5	..	..	..	85
TOTAL	7,353	167	307	813	126	14	413	9,193

Proportion of Total for State or Commonwealth [Full-blood].

	%	%	%	%	%	%	%	%
MALES.								
Sydney	40.09	52.94	11.17	24.92	32.58	3.57	43.23	36.04
Melbourne	53.17	56.41	8.33	66.80	.00	40.00	46.46	47.88
Brisbane	7.28	1.98	7.87	16.67	1.85	.00	3.76	5.44
Adelaide	70.54	15.38	5.73	44.38	.00	.00	10.34	29.72
Perth	43.15	1.86	6.19	58.82	5.88	1.63	8.76	16.90
Hobart	19.50	..	6.67	6.38	.00	..	.00	17.34
ALL METROPOLITAN AREAS	32.06	4.42	8.53	34.23	6.63	1.36	12.97	23.84
FEMALES.								
Sydney	53.17	85.71	34.92	21.30	47.83	.00	54.88	35.00
Melbourne	59.26	75.00	100.00	75.63	33.33	..	93.75	68.60
Brisbane	17.92	.00	5.88	24.54	.30	.00	16.25	10.22
Adelaide	71.43	..	.00	63.83	.00	..	66.67	61.67
Perth	51.35	8.13	33.33	42.86	..	.00	40.00	20.65
Hobart	3.70	..	..	4.88	..	..	..	4.41
ALL METROPOLITAN AREAS	38.68	10.58	34.69	35.41	3.57	.00	39.71	30.31
PERSONS.								
Sydney	40.54	54.76	12.44	23.28	33.80	3.45	45.28	35.95
Melbourne	53.45	59.57	9.47	70.75	20.00	40.00	53.04	49.41
Brisbane	7.66	1.89	7.77	20.69	1.55	.00	4.67	5.82
Adealide	70.59	15.38	5.69	51.10	.00	.00	13.98	33.27
Perth	43.32	2.31	6.49	54.17	5.88	1.63	9.13	17.02
Hobart	18.50	..	6.67	5.68	.00	..	.00	15.71
ALL METROPOLITAN AREAS	32.32	4.79	9.31	34.76	6.09	1.30	14.94	24.33

Chinese, Japanese, Hindus and Polynesians were more numerous in Sydney than in any other metropolitan area, while Syrians were most numerous in Melbourne, and Malays in Perth.

Of the races specified, the Syrians and Chinese were proportionately the most largely represented in the metropolitan areas of the Commonwealth, 34¾ per cent. of the Syrians, and 32⅓ per cent. of the Chinese being so resident. On the other hand, little more than 1¼ per cent.

of the Malays, or 4¾ per cent. of the Japanese in Australia, were resident in metropolitan areas. For all races specified except Polynesians and Malays, there was a larger proportion of females resident in metropolitan areas than was the case with the males of the same race.

For persons of the half-blood, the figures for the principal races for the several metropolitan areas are as follows :—

Half-caste Metropolitan Population, 1911.

Metropolitan Area including suburbs.	Aust. Abgnls.	Chinese	Hindus	Negroes	Poly-nesians	Japan-ese.	Syrians	Malays	Others	Total, Half-caste.
MALES.										
Sydney	73	209	19	62	5	10	4	2	13	397
Melbourne	7	127	19	13	..	9	11	..	3	189
Brisbane	15	40	12	2	2	6	1	..	2	80
Adelaide	10	26	4	8	..	1	..	..	2	51
Perth	12	18	4	7	1	3	..	..	4	49
Hobart	..	4	4	1	..	..	..	..	..	9
TOTAL	117	424	62	93	8	29	16	2	24	775
FEMALES.										
Sydney	75	232	21	51	2	8	4	1	12	406
Melbourne	14	122	13	17	..	5	5	1	3	180
Brisbane	63	55	11	6	5	8	..	..	6	154
Adelaide	12	35	1	7	..	..	9	..	1	65
Perth	34	17	4	1	..	1	2	..	5	64
Hobart	2	8	..	..	1	..	..	..	..	11
TOTAL	200	469	50	82	8	22	20	2	27	880
PERSONS.										
Sydney	148	441	40	113	7	18	8	3	25	803
Melbourne	21	249	32	30	..	14	16	1	6	369
Brisbane	78	95	23	8	7	14	1	..	8	234
Adelaide	22	61	5	15	..	1	9	..	3	116
Perth	46	35	8	8	1	4	2	..	9	113
Hobart	2	12	4	1	1	..	..	..	..	20
TOTAL	317	893	112	175	16	51	36	4	51	1,655

Proportion of Total for State or Commonwealth, 1911—[Half-caste].

	%	%	%	%	%	%	%	%	%	%
MALES.										
Sydney	3.13	37.25	26.39	65.26	21.74	52.63	20.00	22.22	30.23	12.50
Melbourne	2.95	27.31	26.03	48.15	..	69.23	100.00	.00	25.00	22.42
Brisbane	1.10	11.27	28.57	4.76	2.78	50.00	16.67	.00	4.88	4.10
Adelaide	2.89	52.00	20.00	66.67	.00	50.00	.00	.00	20.00	11.46
Perth	1.58	54.55	23.53	58.33	33.33	60.00	.00	.00	44.44	5.83
Hobart	.00	8.00	28.57	33.33	..	..	..	..	.00	4.62
All Metropolitan Areas	2.21	27.93	25.94	48.69	8.08	56.86	40.00	5.26	18.05	10.21
FEMALES.										
Sydney	3.45	40.63	32.81	71.83	9.09	61.54	16.00	50.00	52.17	13.68
Melbourne	6.67	28.44	40.63	47.22	.00	71.43	100.00	12.50	27.27	24.36
Brisbane	5.49	15.11	42.31	26.09	10.20	80.00	.00	.00	11.32	9.02
Adelaide	3.47	64.81	6.67	77.78	.00	..	.90	..	7.69	14.51
Perth	4.76	62.96	22.22	33.33	..	20.00	100.00	.00	41.67	8.17
Hobart	1.92	15.38	.00	.00	100.00	.00	.00	..	..	6.59
All Metropolitan Areas	4.14	31 25	31.25	56.55	10.67	61.11	45.45	4.35	21.60	12.64
PERSONS.										
Sydney	3.28	38.96	29.41	68.07	15.56	56.25	17.78	27.27	37.88	13.07
Melbourne	4.70	27.85	30.48	47.62	.00	70.00	100.00	7.69	26.09	23.32
Brisbane	3.11	13.21	33.82	12.31	5.79	63.64	14.29	.00	8.51	6.39
Adelaide	3.18	58.65	14.29	71.43	.00	50.00	75.00	.00	13.04	12.99
Perth	3.12	58.33	22.86	53.33	33.33	40.00	66.67	.00	42.86	6.96
Hobart	.88	11.76	21.05	16.67	100.00	.00	.00	..	.00	5.52
All Metropolitan Areas	3.13	29.58	28.07	52.08	9.20	58.62	42.86	4.76	19.77	11.37

With two exceptions all the races specified were more numerously represented in Sydney than in any other Capital. The exceptions were (*a*) Syrians, who were most numerous in Melbourne ; and (*b*) Polynesians, who were as numerous in Brisbane as in Sydney.

Amongst the Half-castes, Japanese and Negroes were proportionately most largely represented in Metropoltian areas, and Australian Aboriginals and Malays proportionately least largely represented.

CHAPTER XVIII.

CONJUGAL CONDITION.

1. **Nature and Scope of Inquiry.**—The expression "Conjugal Condition," or "Condition as to Marriage," is frequently used on the census schedule as a main head of inquiry, but is open to possible objection on the score of not being readily understood by some of the persons responsible for supplying the desired information. On the present occasion no such general head was employed, but item 4 of the personal card comprised the following fourfold direction: "If married, write M. If widowed, write W. If divorced, write D. If never married, write N.M." Possibly, as a result to some extent of this direct and explicit request, the returns in respect of conjugal condition were more complete than for any other inquiry, and this head was the only one under which there appeared a smaller number of unspecified on the present occasion than appeared in the census of 1901. For the purpose of making as full use as possible of the information supplied on the personal cards for deciding whether persons whose conjugal condition was unspecified were or were not married, a code of rules was drawn up for the census tabulators, of which the following were the principal :—

(i.) All males under the age of 14 and females under the age of 12 must be classed as never married, whatever the statement given on the card.

(ii.) Where no reply is furnished and the card relates to a male under the age of 21, or to one who, whatever his age, stands in the relation of son, stepson, grandson, or nephew to the head of the household, insert N.M.

(iii.) Where no reply is furnished and the card relates to a female under the age of 15, or to one who, whatever her age, stands in the relation of daughter, step-daughter, grand-daughter, or niece to the head of the household, insert N.M.

(iv.) In other cases where no reply is furnished, insert N.S. (not stated).

2. **Tabulation.**—Particulars for each conjugal condition were tabulated for each sex according to age, the age classification being as follows :—(i.) A single group under 14; (ii.) single ages from 14 to 20 inclusive; (iii.) a group of four years, 21-24; (iv.) quinquennial groups from 25 onwards. The information was tabulated in full detail in respect of counties, and corresponding subdivisions of the several States, as a necessary preliminary to the computation of data for the whole of the States, but it was considered that the heavy expense of publishing such county details would not be warranted. The results have accordingly been filed in the Census Bureau, particulars in full detail being published only for the Commonwealth as a whole, for States and Territories, and for Metropolitan areas. The total number of males and females of each conjugal condition, irrespective of age, has, in addition, been published for each county, etc., and appears on pp. 1090 to 1095 of the Detailed Tables.

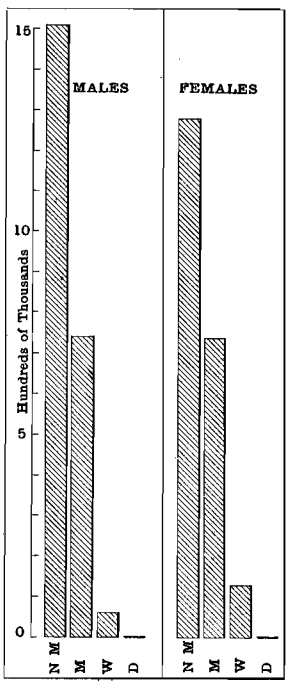
3. **Summary of Results.**—In a summarised form under some of the principal age-groups the data in respect of conjugal condition are as follows :—

Conjugal Condition of Population of the Commonwealth, 1911.

Conjugal Condition.	Age Last Birthday.					All Ages.
	Under 15.	15–44.	45–59.	60–64.	65 and over.	
MALES.						
Never Married ..	714,573	700,328	65,755	9,818	18,224	1,508,698
Married	3	417,844	228,619	35,021	56,621	738,108
Widowed	..	11,015	20,053	6,786	26,007	63,861
Divorced	..	1,134	949	134	151	2,368
Total	714,576	1,130,321	315,376	51,759	101,003	2,313,035
FEMALES.						
Never Married ..	695,907	542,742	30,391	3,582	5,211	1,277,833
Married	19	495,471	181,389	25,031	31,997	733,907
Widowed	..	19,513	39,461	15,590	53,526	128,090
Divorced	..	1,383	627	59	71	2,140
Total	695,926	1,059,109	251,868	44,262	90,805	2,141,970
PERSONS.						
Never Married ..	1,410,480	1,243,070	96,146	13,400	23,435	2,786,531
Married	22	913,315	410,008	60,052	88,618	1,472,015
Widowed	..	30,528	59,514	22,376	79,533	191,951
Divorced	..	2,517	1,576	193	222	4,508
Total	1,410,502	2,189,430	567,244	96,021	191,808	4,455,005

In this and the succeeding tables the figures shewn are those which have been obtained by a proportionate distribution of the numbers unspecified, whether as to age or conjugal condition. In all the age-groups specified in the above table, bachelors exceeded spinsters, but widows exceeded widowers. Married women exceeded married men, and divorced women exceeded divorced men in the age-groups below 45, but the contrary was the case in the groups above that age.

Conjugal Condition of the Commonwealth Population, 1911.



GRAPH No. 76.

For some purposes a statement shewing the numbers in each conjugal condition aged 15 and upwards is more convenient than the totals at all ages including children. Such a statement is furnished in the succeeding table:—

Commonwealth Population Aged 15 and Upwards, 1911.

Conjugal Condition.	Males.	Females.	Persons.
Never Married ..	794,125	581,926	1,376,051
Married	738,105	733,888	1,471,993
Widowed	63,861	128,090	191,951
Divorced	2,368	2,140	4,508
Total	1,598,459	1,446,044	3,044,503

For all conjugal conditions except "widowed," the males aged 15 and upwards exceeded the females. In the case of widowed persons, however, the females were more than twice as numerous as the males.

The accompanying Graph (No. 76) furnishes a representation of the total number of persons of each sex in each conjugal condition at the Census of 3rd April, 1911. In this graph, N.M. denotes persons who had never been married; M denotes persons who were married at the date of the Census; W denotes widowers and widows; and D denotes divorced persons. The scale for females is the same as that for males.

In the following table are given, for each Conjugal Condition, the proportions per 10,000 in each age-group:—

Proportion per 10,000 in each Age-group, Commonwealth, 1911.

Conjugal Condition.	Age Last Birthday.					All Ages.
	Under 15.	15–44.	45–59.	60–64.	65 and over.	
MALES.						
Never Married ..	10,000	6,196	2,085	1,897	1,804	6,523
Married	..	3,697	7,249	6,766	5,606	3,191
Widowed	..	97	636	1,311	2,575	276
Divorced	..	10	30	26	15	10
Total	10,000	10,000	10,000	10,000	10,000	10,000
FEMALES.						
Never Married ..	10,000	5,125	1,206	810	574	5,966
Married	..	4,678	7,202	5,655	3,524	3,426
Widowed	..	184	1,567	3,522	5,894	598
Divorced	..	13	25	13	8	10
Total	10,000	10,000	10,000	10,000	10,000	10,000
PERSONS.						
Never Married ..	10,000	5,678	1,695	1,396	1,222	6,255
Married	..	4,172	7,228	6,254	4,620	3,304
Widowed	..	139	1,049	2,330	4,146	431
Divorced	..	11	28	20	12	10
Total	10,000	10,000	10,000	10,000	10,000	10,000

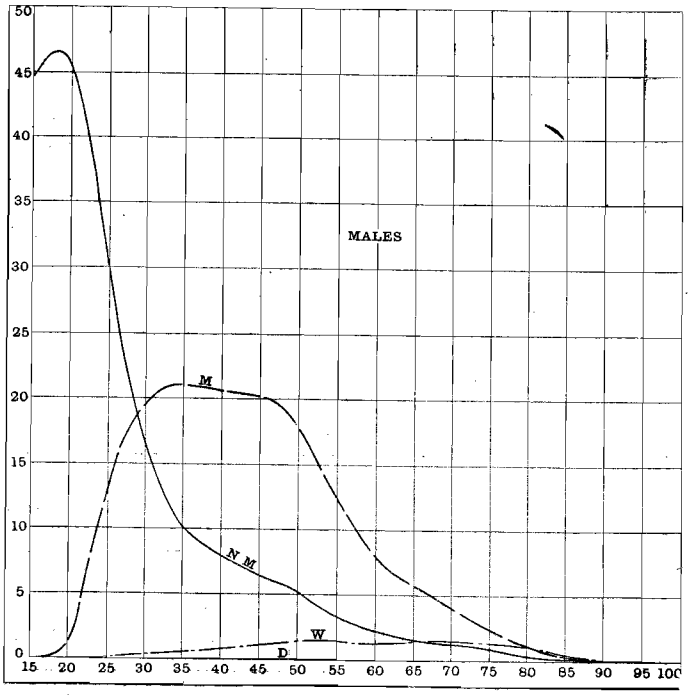
4. **Detailed Results for the Commonwealth.**—The following table furnishes full details in respect of Commonwealth males and females after proportionate distribution of those unspecified as to age or conjugal condition.

Age and Conjugal Condition of Commonwealth Population, 1911.

Age Last Birthday.	Males.					Females.				
	Never Married.	Married.	Widowed.	Divorced.	Total.	Never Married.	Married.	Widowed.	Divorced.	Total.
Under 14 ..	671,283	..	..	..	671,283	653,725	1	..	..	653,726
14 ..	43,290	3	..	..	43,293	42,182	18	..	..	42,200
15 ..	43,977	8	..	..	43,985	43,624	93	1	..	43,718
16 ..	44,868	25	..	..	44,893	43,727	347	2	..	44,076
17 ..	45,995	72	1	..	46,068	43,943	1,067	3	..	45,013
18 ..	47,366	230	2	..	47,598	43,182	2,571	9	1	45,763
19 ..	45,224	558	1	2	45,785	40,159	4,397	12	..	44,568
20 ..	45,673	1,467	11	..	47,151	38,460	7,259	55	7	45,781
21–24 ..	156,030	26,256	238	27	182,551	115,095	58,113	442	64	173,714
25–29 ..	120,063	79,976	1,087	137	201,263	78,390	109,346	1,694	239	189,669
30–34 ..	67,911	102,010	2,069	286	172,276	44,730	112,593	3,223	332	160,878
35–39 ..	46,030	103,421	3,131	321	152,903	30,075	104,392	5,626	374	140,467
40–44 ..	37,191	103,821	4,475	361	145,848	21,357	95,293	8,446	366	125,462
45–49 ..	29,831	97,685	6,053	407	133,976	14,928	82,151	11,844	319	109,242
50–54 ..	22,121	79,155	7,245	338	108,859	9,964	61,388	13,755	229	85,336
55–59 ..	13,803	51,779	6,755	204	72,541	5,499	37,850	13,862	79	57,290
60–64 ..	9,818	35,021	6,786	134	51,759	3,582	25,031	15,590	59	44,262
65–69 ..	7,182	25,830	7,403	76	40,491	2,535	16,742	17,385	38	36,700
70–74 ..	5,684	16,499	7,029	43	29,255	1,422	9,287	15,453	14	26,176
75–79 ..	3,350	9,494	6,095	12	18,951	751	4,253	11,589	16	16,609
80–84 ..	1,397	3,713	3,739	14	8,863	349	1,336	6,053	2	7,740
85–89 ..	466	872	1,311	2	2,651	122	304	2,293	1	2,720
90–94 ..	108	176	354	3	641	21	68	615	..	704
95–99 ..	29	27	59	1	116	9	4	114	..	127
100 and over	8	10	17	..	35	2	3	24	..	29
Total ..	1,508,698	738,108	63,861	2,368	2,313,035	1,277,833	733,907	128,090	2,140	2,141,970

In the case of males, bachelors predominated in all age-groups below 30, married men in all groups between 30 and 80, and widowers in all groups above 80. In the case of females, spinsters predominated in all age-groups below 25, married women in all groups between 25 and 65, and widows in all groups above 65. Comparing males and females, it will be seen that in all age-groups bachelors exceeded spinsters, while widows exceeded widowers. In the case of married persons, females exceeded males in all age-groups below 40, while males were in excess in all groups above that age. In the case of divorced persons, with the exception of an unimportant deviation at age 19, females exceeded males in all age-groups under 45, while males were in excess in all groups above that age.

Commonwealth Males, Conjugal Condition and Age, 1911.



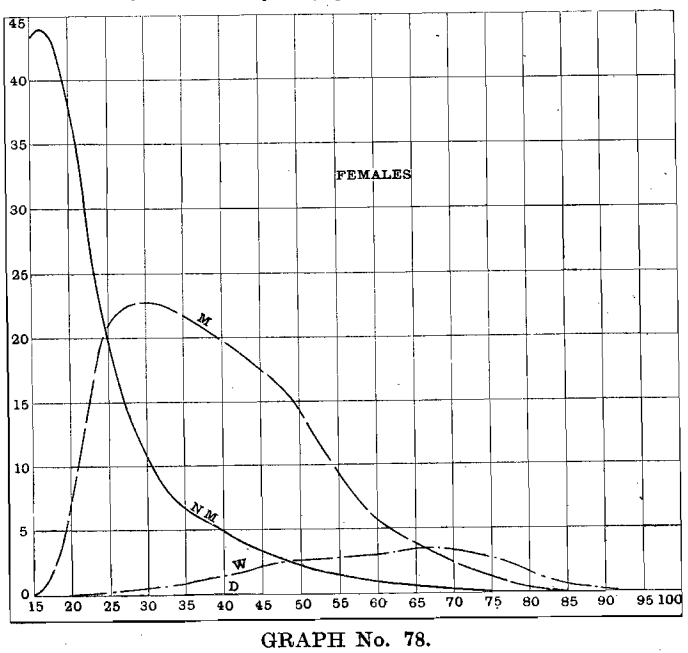
GRAPH No. 77.

For all ages combined from 14 upwards, bachelors exceeded spinsters by 213,307; married men exceeded married women by 4202; and divorced men exceeded divorced women by 228. On the other hand widows exceeded widowers by 64,229. For all conjugal conditions males aged 14 and upwards exceeded females by 153,508.

In the accompanying graph (No. 77) there is furnished a representation of the number of males of each age from 15 upwards, who were of each conjugal condition at the Commonwealth Census of 1911. In this graph N.M. denotes "never married," M denotes married, W denotes widowed, and D denotes divorced. The number of divorced males was so small relatively that the curve representing them does not shew in the reproduction here given. The base of each small rectangle represents five years of age, and the height represents 5000 persons.

Graph No. 78 furnishes for females a representation for females similar to that furnished for males by Graph No. 77 above. The scale employed is identical with that used in the case of males, and the interpretation of the symbols used is also the same. It will be seen, by comparison of Graph 78 with Graph No. 77, that the trend of the several female curves agrees fairly closely with that of the corresponding male curves. In the case of married persons the male curve rises less steeply than the female, and is flatter in the neighbourhood of the maximum point. The maximum for females is at or or about age 30, and for males at or about age 33.

Commonwealth Females, Conjugal Condition and Age, 1911.



GRAPH No. 78.

The succeeding table furnishes the proportion per 10,000 of those in each age-group who belonged to each of the four conjugal conditions:—

Proportionate Distribution, according to Conjugal Condition, of Males and Females in each Age-group. Commonwealth, 1911.

Age Last Birthday.	Males.					Females.				
	Never Married.	Married.	Widowed.	Divorced.	Total.	Never Married.	Married.	Widowed.	Divorced.	Total.
Under 14 ..	10,000	..	..	..	10,000	10,000	..	..	..	10,000
14 ..	9,999	1	..	..	10,000	9,996	4	..	..	10,000
15 ..	9,998	2	..	..	10,000	9,979	21	..	..	10,000
16 ..	9,994	6	..	..	10,000	9,921	78	1	..	10,000
17 ..	9,984	16	..	..	10,000	9,762	237	1	..	10,000
18 ..	9,951	48	1	..	10,000	9,436	562	2	..	10,000
19 ..	9,878	121	..	1	10,000	9,011	986	3	..	10,000
20 ..	9,687	311	2	..	10,000	8,401	1,586	12	1	10,000
21–24 ..	8,547	1,438	13	2	10,000	6,626	3,345	25	4	10,000
25–29 ..	5,965	3,974	54	7	10,000	4,133	5,765	89	13	10,000
30–34 ..	3,942	5,921	120	17	10,000	2,780	6,999	200	21	10,000
35–39 ..	3,010	6,764	205	21	10,000	2,141	7,432	401	26	10,000
40–44 ..	2,550	7,118	307	25	10,000	1,702	7,596	673	29	10,000
45–49 ..	2,227	7,291	452	30	10,000	1,367	7,520	1,084	29	10,000
50–54 ..	2,032	7,271	666	31	10,000	1,167	7,194	1,612	27	10,000
55–59 ..	1,903	7,138	931	28	10,000	960	6,607	2,419	14	10,000
60–64 ..	1,897	6,766	1,311	26	10,000	810	5,655	3,522	13	10,000
65–69 ..	1,774	6,379	1,828	19	10,000	691	4,562	4,737	10	10,000
70–74 ..	1,943	5,640	2,403	14	10,000	543	3,548	5,904	5	10,000
75–79 ..	1,768	5,010	3,216	6	10,000	452	2,561	6,977	10	10,000
80–84 ..	1,576	4,189	4,219	16	10,000	451	1,726	7,820	3	10,000
85–89 ..	1,758	3,289	4,945	8	10,000	448	1,118	8,430	4	10,000
90–94 ..	1,685	2,746	5,522	47	10,000	298	966	8,736	..	10,000
95–99 ..	2,500	2,328	5,086	86	10,000	709	315	8,976	..	10,000
100 and over	2,286	2,857	4,857	..	10,000	690	1,034	8,276	..	10,000
All Ages	6,523	3,191	276	10	10,000	5,966	3,426	598	10	10,000

The maximum proportion of married males for any age-group was 72.91 per cent. for the group 45-49, while the corresponding maximum for females was 75.96 per cent. for the age-group 40-44.

5. **Comparisons with Previous Censuses.**—(i.) *General.*—Statistics of the number of persons of each conjugal condition are available in age-groups for each census from 1881 onwards. The age-grouping, however, has differed considerably in the several States, and in all cases there are fairly large numbers whose age or conjugal condition, or both, were unspecified. The variations in age-grouping consisted mainly in the use of decennial groups in some States where quinquennial groups were used in others, or the use of a quinquennial group in some where single ages were used in others. In these cases a distribution of the larger groups was effected on the basis of the results furnished in those cases where the smaller groups were used, and results

for the Commonwealth as a whole were thus obtained for the age-group under 15, for single ages 15 to 20 inclusive, for the group 21-24, for quinquennial groups from 25-9 to 80-84 inclusive, and for the final group 85 and over. The numbers unspecified, whether as to age or conjugal condition, were proportionately distributed on the basis of the specified.

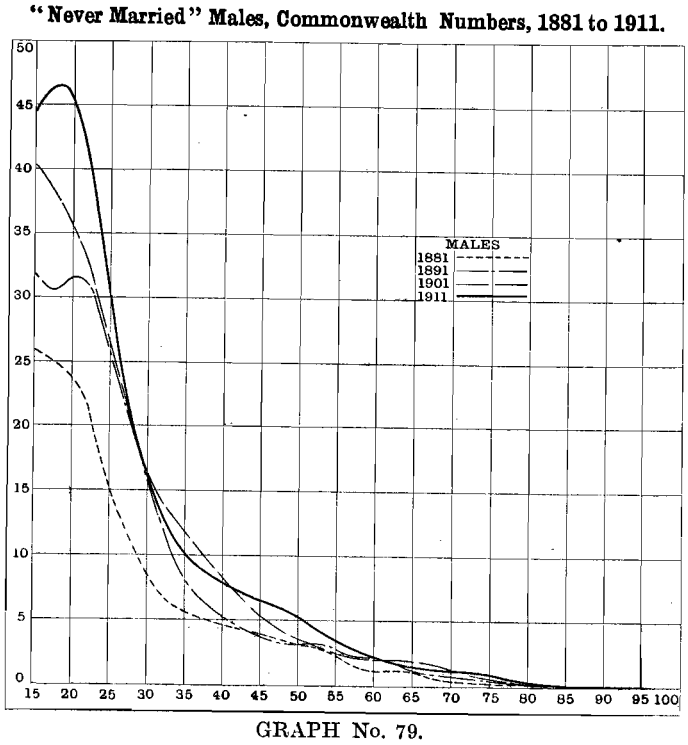
(ii.) *"Never Married" Males.*—The number and proportion of "never married" males in the Commonwealth at each census from 1881 is furnished in the following table :—

Ages of "Never Married" Males.—Commonwealth, 1881 to 1911.

Age Last Birthday.	Number.				Proportion per 10,000 of Total Male Population of the Same Age.			
	Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.	Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.
Under 15 ..	442,651	593,290	670,269	714,573	10,000	10,000	10,000	10,000
15 ..	24,840	31,685	40,310	43,977	10,000	9,997	10,000	9,998
16 ..	24,455	31,277	39,921	44,868	10,000	9,996	9,998	9,994
17 ..	24,062	29,403	37,729	45,995	9,997	9,988	9,993	9,984
18 ..	23,663	30,415	36,469	47,366	9,992	9,976	9,979	9,951
19 ..	23,042	31,053	35,880	45,224	9,891	9,934	9,935	9,878
20 ..	23,694	32,488	34,696	45,673	9,694	9,799	9,785	9,687
21–24 ..	78,615	119,917	124,024	156,030	8,435	8,690	8,857	8,547
25–29 ..	56,453	106,449	106,054	120,063	5,873	6,108	6,493	5,965
30–34 ..	32,175	57,618	69,330	67,911	4,113	4,015	4,412	3,942
35–39 ..	24,410	32,178	49,065	46,030	3,260	3,069	3,210	3,010
40–44 ..	21,808	22,289	33,978	37,191	3,063	2,776	2,682	2,550
45–49 ..	17,123	16,562	21,155	29,831	2,694	2,361	2,374	2,227
50–54 ..	14,290	15,898	15,346	22,121	2,593	2,505	2,271	2,032
55–59 ..	7,517	10,970	10,089	13,803	2,242	2,134	1,907	1,903
60–64 ..	6,493	9,217	9,979	9,818	2,334	2,163	2,157	1,897
65–69 ..	3,076	4,612	8,059	7,182	1,978	1,900	2,082	1,774
70–74 ..	1,936	3,345	5,070	5,684	1,909	1,989	1,949	1,943
75–79 ..	967	1,473	2,264	3,350	1,985	1,768	1,787	1,768
80–84 ..	516	615	1,077	1,397	2,039	1,640	1,776	1,576
85 and over	130	301	334	611	1,736	1,811	1,513	1,775
All Ages	851,916	1,181,055	1,351,098	1,508,698	7,012	6,931	6,831	6,523

Although fluctuations are in evidence, the general tendency indicated by the above table is that of an increase in the number of "never married" males in any age-group at the successive censuses, but a decrease in the proportion of total males in such age-group represented thereby. At all ages below 30, the "never married" males represented considerably more than 50 per cent. of the total males of such ages, while at all ages above 30 they represented considerably less than 50 per cent. For ages above 60 the proportion of "never married" males varied but slightly, and in 1911 was approximately 18 per cent. at all such ages.

"Never Married" Males, Commonwealth Numbers, 1881 to 1911.

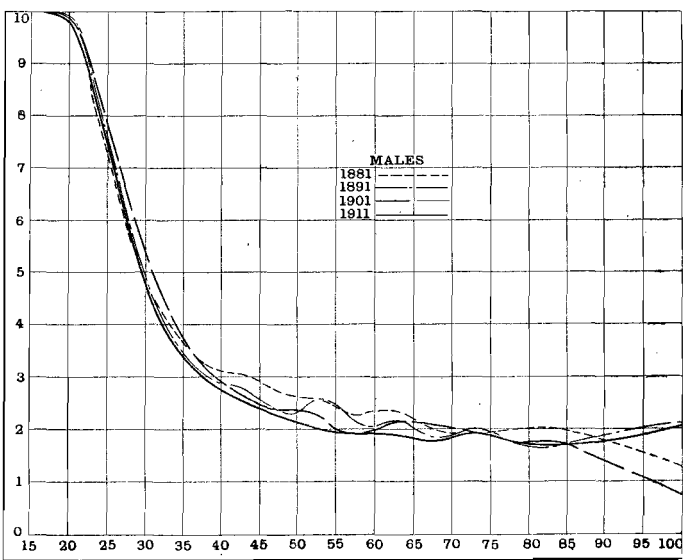


GRAPH No. 79.

Commonwealth "never married" males from age 15 upwards are represented in the attached graph (No. 79) as at each of the Censuses 1881, 1891, 1901 and 1911. In this graph the base of each small rectangle represents 5 years of age, and the height represents 5000 persons. It will be noted that the curves for the last three Censuses coincide at about age 28, and again at about age 62.

Corresponding to Graph No. 79, which represents the numbers of unmarried males at each age, Graph No. 80, furnishes a representation of the proportion of the total Commonwealth males of each age who had never been married at each of the last four censuses. The general indication furnished by the graph is that there is no very marked change in the proportion at any age from one census to another, but that there is a general tendency, from age 40 onwards, for the proportion never married to diminish with successive censuses. At ages under 40 the tendency is less regular, and although at practically all such ages the proportion in 1911 was less than the corresponding proportions in 1891 and 1901, the proportions in 1881 were in several instances less than those for any of the other three censuses. This was especially so between ages 21 and 30. In this graph the base of each small rectangle represents 5 years of age, and the height of each represents 10 per cent. of the male population at the age in question.

"Never Married" Males, Commonwealth Proportions, 1881 to 1911.



GRAPH No. 80.

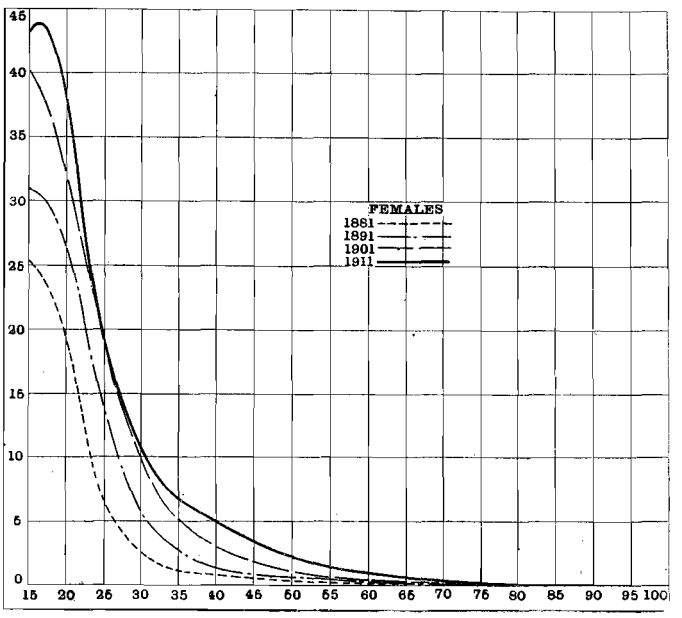
(iii.) *"Never Married" Females.*—The succeeding table shews the number and proportion of "never married" females in the Commonwealth at each census from 1881 onwards :—

Ages of "Never Married" Females.—Commonwealth, 1881 to 1911.

Age Last Birthday.	Number.				Proportion per 10,000 of Total Female Population of the Same Age.			
	Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.	Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.
Under 15 ..	433,883	579,252	655,914	695,907	10,000	10,000	10,000	10,000
15 ..	25,015	30,820	38,962	43,624	9,981	9,990	9,996	9,979
16 ..	24,463	30,647	39,230	43,727	9,934	9,933	9,961	9,921
17 ..	23,521	29,486	37,153	43,943	9,740	9,781	9,858	9,762
18 ..	22,198	29,034	35,346	43,182	9,377	9,404	9,554	9,436
19 ..	20,248	27,267	32,584	40,159	8,745	8,849	9,121	9,011
20 ..	17,942	25,834	30,906	38,460	7,821	8,141	8,501	8,401
21–24 ..	46,995	77,026	96,576	115,095	5,559	6,106	6,866	6,626
25–29 ..	20,194	45,529	67,906	78,390	2,729	3,282	4,324	4,133
30–34 ..	8,207	18,752	33,829	44,730	1,368	1,778	2,480	2,780
35–39 ..	4,882	8,930	19,745	30,075	871	1,193	1,635	2,141
40–44 ..	3,294	5,334	11,736	21,357	658	887	1,230	1,702
45–49 ..	1,847	3,421	6,444	14,928	440	649	978	1,367
50–54 ..	1,309	2,608	4,143	9,964	406	562	786	1,167
55–59 ..	827	1,449	2,611	5,499	402	403	605	960
60–64 ..	754	1,173	1,945	3,582	440	425	523	810
65–69 ..	326	660	1,301	2,535	336	400	427	691
70–74 ..	234	476	746	1,422	370	410	404	543
75–79 ..	109	255	403	751	354	443	415	452
80–84 ..	45	126	213	349	295	476	422	451
85 and over	32	52	83	154	595	416	407	430
All Ages	656,325	918,131	1,117,776	1,277,833	6,340	6,244	6,224	5,966

It will be seen that in the case of females there is a well-marked, though not uniform, tendency for both the number and the proportion of "never married" females in each age-group to increase with the successive censuses, and that for ages from 30 to 65 the proportion "never married" was more than twice as great in 1911 as in 1881. In all age-groups below 25 the "never married" females represented considerably more than 50 per cent. of the total females of such ages, while in all age-groups above 25 they represented considerably less than 50 per cent. For the year 1911 the proportion of "never married" decreased with age throughout life in the case of females, and did not, as in the case of males, attain an approximately stationary position beyond age 60.

"Never Married" Females, Commonwealth Numbers, 1881 to 1911.

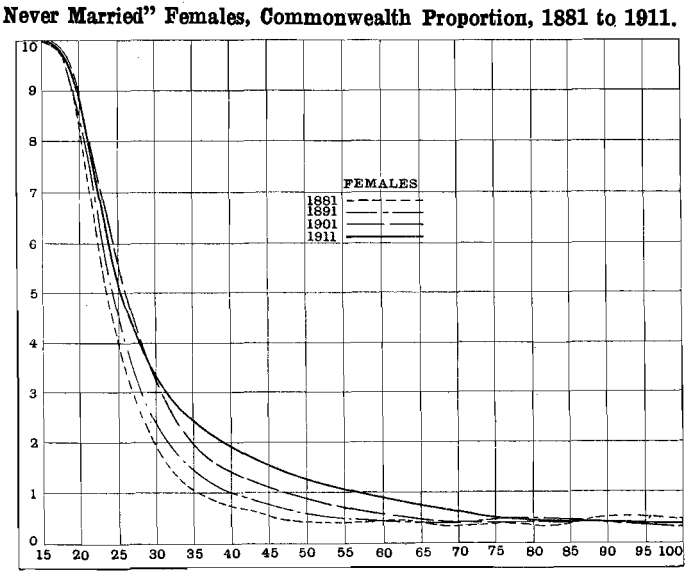


GRAPH No. 81.

In the accompanying Graph (No. 81) a representation is furnished of the numbers of females at each age who at the Australian Censuses of 1881, 1891, 1901 and 1911 were classed as "never married." The base of each small rectangle represents 5 years of age, and the height represents 5000 persons. There is in evidence at successive Censuses a natural tendency for the number of "never married" females at any age to increase.

Graph No. 82 furnishes a representation of the proportion of the Australian female population at each age that belonged to the class of "never married" at each of the last four Censuses. In this graph the base of each small rectangle represents 5 years of age, and the height of each represents 10 per cent. of the female population at the age in question. For ages 15 to 28 the proportion "never married" was greater in 1901 than 1911, but with this exception each successive Census shewed for ages up to 75 a higher proportion "never married" than was shewn for the same age by the preceding Census.

"Never Married" Females, Commonwealth Proportion, 1881 to 1911.



GRAPH No. 82.

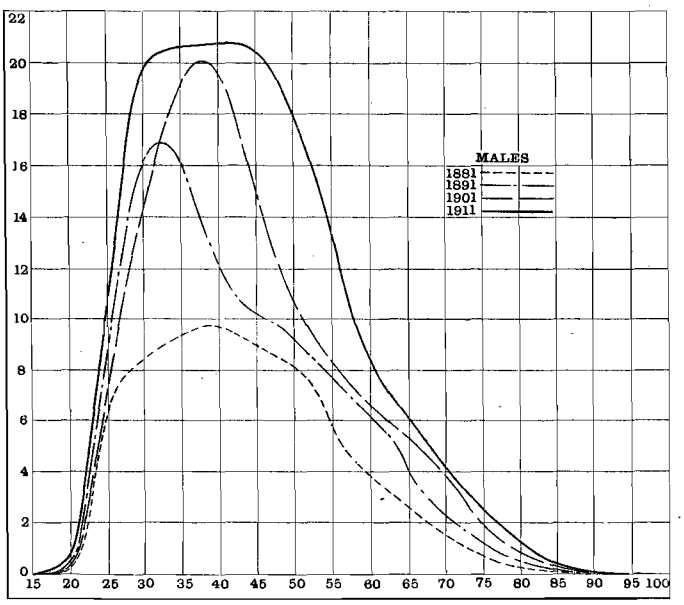
(iv.) *Married Males.*—In the following table are given particulars concerning the number and proportion of married males in the Commonwealth in successive age-groups at the censuses from 1881 onwards:—

Ages of Married Males.—Commonwealth, 1881 to 1911.

Age Last Birthday.	Number.				Proportion per 10,000 of Total Male Population of the Same Age.			
	Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.	Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.
Under 15 ..	..	1	2	3	..	..	..	..
15 ..	..	11	..	8	..	3	..	2
16 ..	..	13	9	25	..	4	2	6
17 ..	7	32	25	72	3	11	7	16
18 ..	20	68	77	230	8	22	21	48
19 ..	254	201	229	558	109	64	64	121
20 ..	736	661	747	1,467	301	199	211	311
21–24 ..	14,385	17,858	15,814	26,256	1,543	1,294	1,129	1,438
25–29 ..	39,019	66,470	56,293	79,976	4,059	3,814	3,447	3,974
30–34 ..	44,892	83,453	85,515	102,010	5,739	5,815	5,442	5,921
35–39 ..	48,584	69,693	99,863	103,421	6,489	6,647	6,532	6,764
40–44 ..	46,776	54,425	87,615	103,821	6,570	6,778	6,916	7,118
45–49 ..	43,028	49,149	62,835	97,685	6,770	7,008	7,052	7,291
50–54 ..	36,529	42,180	46,495	79,155	6,630	6,645	6,882	7,271
55–59 ..	22,462	34,651	37,077	51,779	6,701	6,740	7,007	7,138
60–64 ..	17,202	26,902	29,378	35,021	6,184	6,313	6,351	6,766
65–69 ..	9,326	14,830	23,150	25,830	5,996	6,111	5,982	6,379
70–74 ..	5,470	8,947	13,951	16,499	5,393	5,320	5,363	5,640
75–79 ..	2,198	3,906	6,184	9,494	4,513	4,688	4,882	5,010
80–84 ..	936	1,498	2,444	3,713	3,698	3,995	4,031	4,189
85 and over	306	490	650	1,085	4,085	2,948	2,945	3,151
All Ages	332,130	475,439	568,353	738,108	2,734	2,790	2,874	3,191

With a few exceptions of minor importance the proportion of married males was higher at all ages in 1911 than at either of three preceding censuses. The maximum number married was reached in 1881 and 1901 in the age-group 35-39, in 1891 in the group 30-34, and in 1911 in the group 40-44. On the other hand, the maximum proportion married was reached at all the censuses in the group 45-49, amounting in 1911 to almost 73 per cent. in that group. Married males under 21 years of age totalled 1017, or 3.06 per 1000 married males, in 1881 ; 987, or 2.08 per 1000, in 1891 ; 1089, or 1.92 per 1000, in 1901 ; and 2363, or 3.20 per 1000, in 1911. The decline and subsequent rise in the proportion of husbands who were minors is probably due to the fact that the economic outlook in 1891 and 1901 was less bright than was the case in 1881 and 1911. In 1911 married males represented approximately 32 per cent. of the male population of all ages as compared with little more than 27¼ per cent. in 1881.

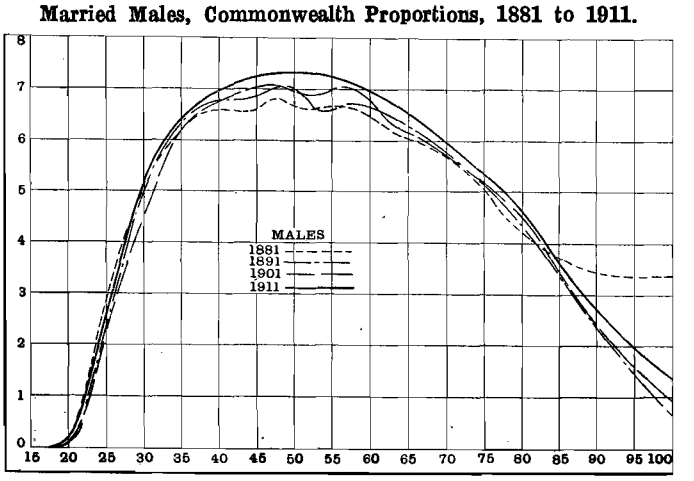
Married Males, Commonwealth Numbers, 1881 to 1911.



GRAPH No. 83.

In the accompanying Graph (No. 83) a representation is given of the number of married males at each age at each of the last four Censuses. The base of each small rectangle represents 5 years of age, and the height represents 2000 persons. Between the ages of 15 and 32 the numbers of married males in 1891 exceeded the corresponding numbers in 1901. With this exception the numbers at any age at each successive Census was greater than the corresponding number at the previous Census.

Married Males, Commonwealth Proportions, 1881 to 1911.



GRAPH No. 84.

Graph No. 84 furnishes for each of the last four Censuses a representation of the proportions of the Australian male population at each age that were married at the dates of the several Censuses. The base of each small rectangle represents 5 years of age, and the height represents 10 per cent. of the Australian male population for the age in question. The general indication furnished by this graph is that with some exceptions the proportion of married men has increased from Census to Census at all the more important ages. The most important of these exceptions occurs in the case of the 1901 Census, where between the ages of 21 and 35 the proportion was lower than for any other of the Censuses. From ages 28 to 85 the proportions for 1911 were higher at all ages than at any other of the Censuses. The upward movement of the 1881 curve after age 85 is based on a very small body of facts, and not being confirmed by the experience of the succeeding Censuses, must be regarded as accidental.

(v.) *Married Females.*—Particulars relative to the number and proportion of married females in the Commonwealth in each age-group at the censuses from 1881 onwards are given in the table on the next page.

This table presents some peculiar features, the most striking of which is that, although with the unimportant exceptions of ages 15 and 16 the proportion of married women in each age-group was lower in 1911 than in 1881, the proportion when the whole female population is taken into account is considerably higher for 1911 than for 1881. Similar observations apply to a comparison of the results for 1891 and 1901 with those for 1881, and also to the comparison of the 1891 and 1911 results. The apparent anomaly is in part due to the difference of the age distribution of married females at the several censuses, but to a greater degree to the fact that

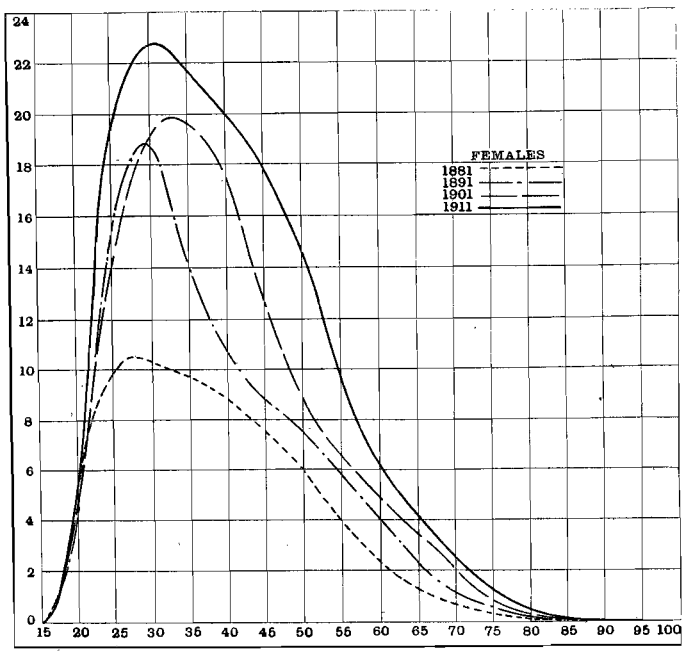
the proportion of females of marriageable age in the population has increased rapidly with successive censuses. Thus in 1881 nearly 42 per cent. of the female population were under the age of 15, as compared with 39¼ per cent. in 1891, 36½ per cent. in 1901, and only 32½ per cent. in 1911. The maximum number of married females was attained in 1881 and 1891 in the age-group 25-29, and in 1901 and 1911 in the group 30-34. The maximum proportion was attained in 1881 and 1891 in the age-group 35-39, and in 1901 and 1911 in the group 40-44. The maxima so attained were approximately 84½ per cent. in 1881, 81¾ per cent. in 1891, 79 per cent. in 1901, and 76 per cent. in 1911. Married females under the age of 21 totalled 10,134, or 30.83 per 1000 married females in 1881 ; 12,094, or 25.56 per 1000 in 1891 ; 10,875, or 19.09 per 1000 in 1901 ; and 15,753, or 21.47 per 1000 in 1911.

Ages of Married Females.—Commonwealth, 1881 to 1911.

Age Last Birthday.	Number.				Proportion per 10,000 of Total Female Population of the Same Age.			
	Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.	Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.
Under 15 ..	19	5	2	19	..	..	..	..
15 ..	47	28	16	93	19	9	4	21
16 ..	158	205	153	347	64	66	39	78
17 ..	617	654	537	1,067	256	217	142	237
18 ..	1,461	1,834	1,642	2,571	617	594	444	562
19 ..	2,893	3,523	3,120	4,397	1,249	1,143	873	986
20 ..	4,939	5,845	5,405	7,259	2,153	1,842	1,487	1,586
21–24 ..	36,891	48,479	43,577	58,113	4,363	3,843	3,098	3,345
25–29 ..	52,221	90,727	86,928	109,346	7,057	6,540	5,536	5,765
30–34 ..	49,267	82,857	98,391	112,593	8,210	7,857	7,214	6,999
35–39 ..	47,341	61,228	94,202	104,392	8,446	8,178	7,802	7,432
40–44 ..	41,240	48,563	75,311	95,293	8,236	8,072	7,895	7,596
45–49 ..	33,980	41,089	50,405	82,151	8,094	7,789	7,650	7,520
50–54 ..	24,512	33,308	37,517	61,388	7,603	7,183	7,121	7,194
55–59 ..	14,114	24,041	27,933	37,850	6,868	6,682	6,476	6,607
60–64 ..	10,188	16,206	20,562	25,031	5,939	5,870	5,533	5,655
65–69 ..	4,903	7,986	13,860	16,742	5,057	4,845	4,546	4,562
70–74 ..	2,592	4,366	6,616	9,287	4,099	3,757	3,586	3,548
75–79 ..	931	1,629	2,529	4,253	3,023	2,831	2,605	2,561
80–84 ..	312	516	852	1,336	2,043	1,951	1,688	1,726
85 and over	89	183	198	379	1,654	1,464	972	1,059
All Ages ..	328,715	473,272	569,756	733,907	3,175	3,219	3,173	3,426

A comparison of the two preceding tables indicates that at three out of the four censuses the number of married males in the Commonwealth has exceeded the number of married females, while at one, that of 1901, the females were in excess, but that in all cases the excess has been proportionately small. Thus in 1881 married males exceeded married females by 3415 ; in 1891 by 2167 ; and in 1911 by 4201 ; while in 1901 married females exceeded married males by 1403.

Married Females, Commonwealth Numbers, 1881 to 1911.



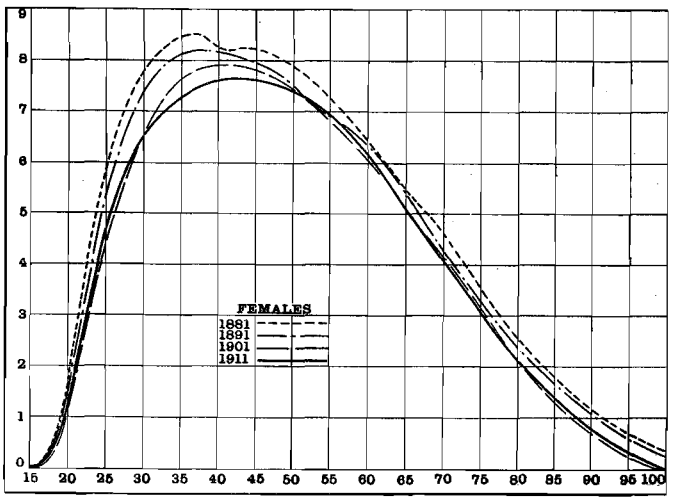
GRAPH No. 85.

The excess of married males is due in large measure to the effects of immigration, and to the inclusion in the census results of shipping population, while the excess of married females noted in 1901 was probably due to the fact that at the date of the census a considerable number of Australian troops was in South Africa.

The accompanying Graph (No. 85) furnishes a representation for each of the last four Censuses of the number of married females at each age. The base of each small rectangle represents 5 years of age, and the height of each represents 2000 persons. In general the number at any age for one Census exceeds the corresponding numbers of previous Censuses, the principal exception being the excess of the 1891 over those for 1901 at ages prior to 29.

In Graph No. 86 is given a representation of the proportions of the Australian females of each age who were married at each of the last four Censuses. The base of each small rectangle represents 5 years of age, and the height represents 10 per cent. of the Australian female population for the age in question. In general it may be said that the graph indicates a decreasing proportion of married women at any age at successive Censuses.

Married Females, Commonwealth Proportions, 1881 to 1911.



GRAPH No. 86.

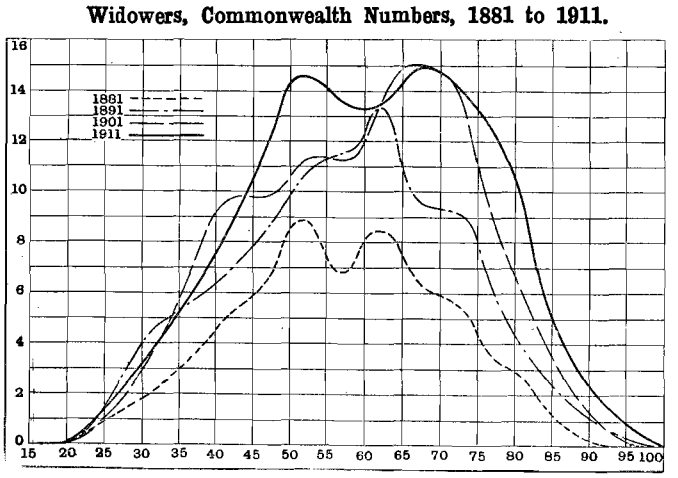
(vi.) *Widowers.*—The number and proportion of widowers in the Commonwealth in each age-group at the censuses from 1881 onwards are shewn in the following table :–

Ages of Widowers.—Commonwealth, 1881 to 1911.

Age Last Birthday.	Number.				Proportion per 10,000 of Total Male Population of the Same Age.			
	Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.	Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.
17 ..	..	2	1	1	..	1	..	..
18 ..	..	6	1	2	..	2	..	1
19 ..	1	5	5	1	..	2	1	..
20 ..	12	5	16	11	5	2	4	2
21–24 ..	200	215	172	238	22	15	12	13
25–29 ..	658	1,335	902	1,087	68	76	55	54
30–34 ..	1,161	2,388	2,117	2,069	148	166	135	120
35–39 ..	1,881	2,908	3,687	3,131	251	277	241	205
40–44 ..	2,615	3,546	4,855	4,475	367	441	383	307
45–49 ..	3,403	4,392	4,967	6,053	536	626	557	452
50–54 ..	4,282	5,372	5,591	7,245	777	846	828	666
55–59 ..	3,543	5,760	5,671	6,755	1,057	1,120	1,072	931
60–64 ..	4,121	6,478	6,845	6,786	1,482	1,520	1,480	1,311
65–69 ..	3,151	4,821	7,459	7,403	2,026	1,987	1,927	1,828
70–74 ..	2,736	4,520	6,980	7,029	2,698	2,688	2,683	2,403
75–79 ..	1,706	2,952	4,213	6,095	3,502	3,543	3,326	3,216
80–84 ..	1,079	1,637	2,539	3,739	4,263	4,365	4,188	4,219
85 and over	313	871	1,222	1,741	4,179	5,241	5,537	5,057
All Ages	30,862	47,213	57,243	63,861	254	277	289	276

The accompanying graph furnishes a representation of the number of widowers in the Australian population at each age at each of the last four Censuses. The base of each small rectangle represents 5 years of age, and the height represents 100 persons.

Widowers, Commonwealth Numbers, 1881 to 1911.



GRAPH No. 87.

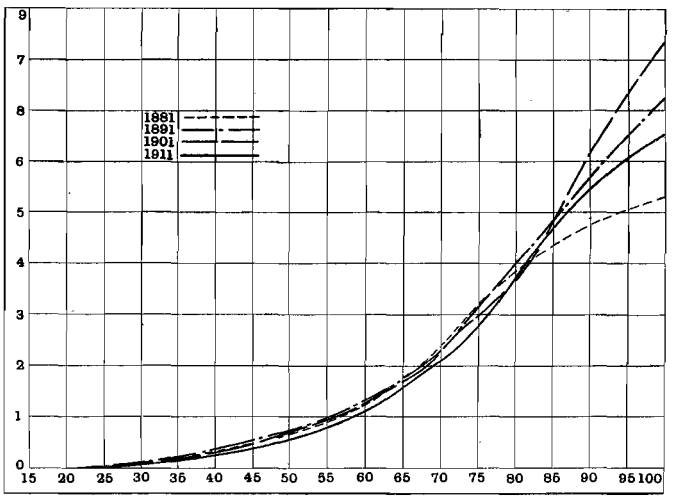
With the exception of minor fluctuations the number of widowers in each age-group has increased with succeeding Censuses, but the proportion has, in general, shewn a tendency to decline. Here again, as in the case referred to on p. 249, in relation to married females, there is shewn a decrease in proportion at practically all ages in 1911 as compared with 1881, combined with an increase in the proportion of total widowers to total population. The cause of this is a marked change in the relative age distribution of widowers, combined with a marked diminution in the proportion of males at the younger ages, there being about 36½ per cent. of the total male population at ages under 15 in 1881, as compared with 30¾ per cent. in 1911. The proportion of widowers in the population increases with age, and at the last three censuses reached 50 per cent. in the final group of 85 and upwards. There were 13 widowers under the age of 21 in 1881; 18 in 1891; 23 in 1901; and 15 in 1911. The maximum number of widowers in any age-group

was reached in 1881 in the group 50-54 ; in 1891 in the group 60-64 ; and in 1901 and 1911 in the group 65-69.

In Graph No. 88 a representation is furnished of the proportions of the Australian male population who were widowers at each of the last four Censuses. The base of each small rectangle represents 5 years of age, and the height represents 10 per cent. of the Australian male population for the age in question.

(vii.) *Widows.*—The number and proportion of widows in the Commonwealth in each age-group at the Censuses from 1881 onwards are shewn in the next table :—

Widowers, Commonwealth Proportions, 1881 to 1911.



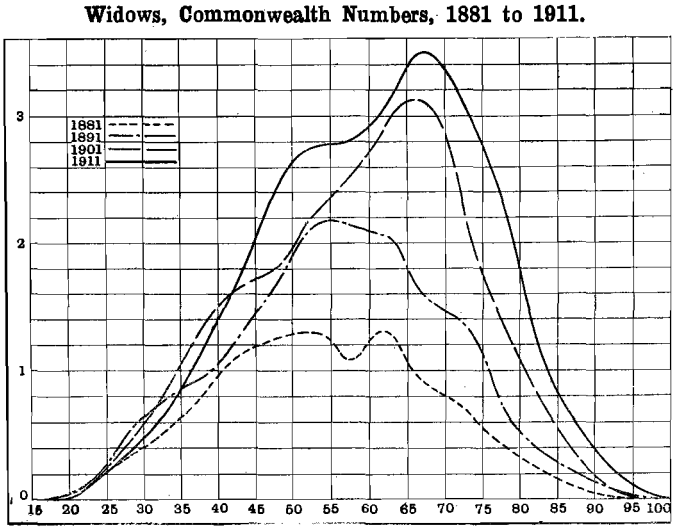
GRAPH No. 88.

Ages of Widows.—Commonwealth, 1881 to 1911.

Age Last Birthday.	Number.				Proportion per 10,000 of Total Female Population of the Same Age.			
	Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.	Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.
15 ..	..	4	..	1	..	1	..	..
16 ..	4	3	..	2	2	1	..	1
17 ..	10	6	..	3	4	2	..	1
18 ..	13	6	7	9	6	2	2	2
19 ..	14	21	19	12	6	7	5	3
20 ..	59	50	40	55	26	16	11	12
21–24 ..	659	625	461	442	78	50	33	25
25–29 ..	1,588	2,414	2,028	1,694	214	174	129	89
30–34 ..	2,536	3,800	3,930	3,223	422	360	288	200
35–39 ..	3,830	4,671	6,510	5,626	683	624	539	401
40–44 ..	5,538	6,236	8,166	8,446	1,106	1,037	856	673
45–49 ..	6,154	8,220	8,932	11,844	1,466	1,558	1,356	1,084
50–54 ..	6,418	10,448	10,974	13,755	1,991	2,253	2,083	1,612
55–59 ..	5,611	10,486	12,564	13,862	2,730	2,914	2,913	2,419
60–64 ..	6,211	10,229	14,648	15,590	3,621	3,705	3,941	3,522
65–69 ..	4,466	7,838	15,314	17,385	4,607	4,755	5,024	4,737
70–74 ..	3,497	6,777	11,083	15,453	5,531	5,832	6,007	5,904
75–79 ..	2,040	3,870	6,778	11,589	6,623	6,726	6,980	6,977
80–84 ..	1,170	2,003	3,981	6,053	7,662	7,573	7,888	7,820
85 and over..	417	1,015	1,757	3,046	7,751	8,120	8,621	8,508
All Ages	50,235	78,722	107,192	128,090	485	535	597	598

The accompanying Graph (No. 89) furnishes a representation of the number of widows of each age who were included in the Australian population at the Censuses of 1881, 1891, 1901 and 1911. The base of each small rectangle represents 5 years of age, while the vertical height represents 200 persons.

Widows, Commonwealth Numbers, 1881 to 1911.

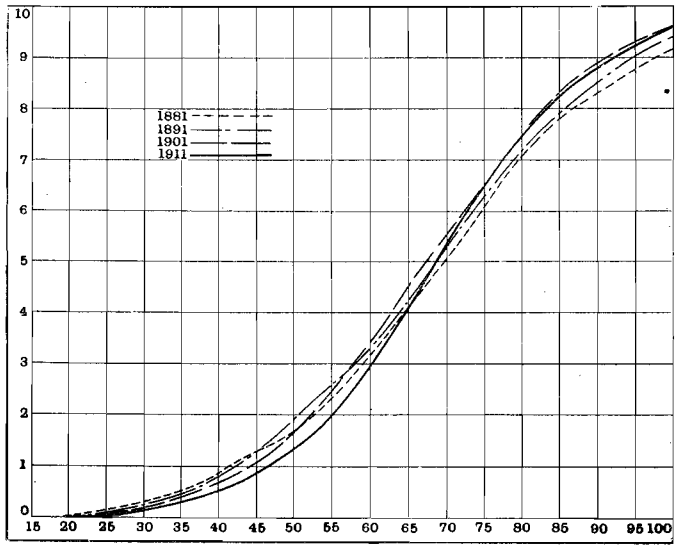


GRAPH No. 89.

The number of widows in each age-group under 40 was, with unimportant exceptions, less in 1911 than 1901. In each age-group under 35 it was less in 1911 than in 1891, and in each age-group under 25 it was less in 1911 than in 1881. In all age-groups above 40 the number of widows was considerably higher in 1911 than at previous Censuses. On the other hand the proportion at practically all ages was lower in 1911 than in 1901, and for age-groups under 65 was also lower than for 1881 and 1891. Notwithstanding this, the

proportion of widows in the total female population was practically identical in 1901 and 1911, and considerably higher in 1911 than in 1881 and 1891. The explanation of this apparent anomaly is similar to that already given on pp. 249 and 251 in connexion with married women and widowers. The maximum number of widows was reached in age-group 50-54 in 1881; in group 55-59 in 1891; and in group 65-69 in 1901 and 1911. The proportion of widows increases continuously with age, and in 1911 was 85 per cent. for the group of females aged 85 and over. There were, at the Census of 1881, 100 widows under the age of 21; 90 in 1891; 66 in 1901, and 82 in 1911.

Widows, Commonwealth Proportions, 1881 to 1911.



GRAPH No. 90.

In Graph No. 90 a representation is furnished for each of the last four Censuses of the proportion of the Australian female population at each age who were widows. The base of each small rectangle represents 5 years of age, and the height represents 10 per cent. of the Australian female population for the age in question.

(viii.) *Divorced Males.*—Age particulars in respect of divorced males in the Commonwealth recorded at the censuses 1881 to 1911 are given in the following table:—

Ages of Divorced Males.—Commonwealth, 1881 to 1911.

Age Last Birthday.	Number.				Proportion per 10,000 of Total Male Population of the Same Age.			
	Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.	Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.
19 ..	..	..	..	2	..	..	..	1
20 ..	..	1	..	..	..	..	..	..
21–24 ..	..	9	21	27	..	1	2	2
25–29 ..	..	37	77	137	..	2	5	7
30–34 ..	2	60	167	286	..	4	11	17
35–39 ..	3	68	262	321	..	7	17	21
40–44 ..	..	41	233	361	..	5	19	25
45–49 ..	..	34	154	407	..	5	17	30
50–54 ..	..	27	131	338	..	4	19	31
55–59 ..	..	28	76	204	..	6	14	28
60–64 ..	..	16	55	134	..	4	12	26
65–69 ..	..	5	33	76	..	2	9	19
70–74 ..	..	5	14	43	..	3	5	14
75–79 ..	..	1	7	12	..	1	5	6
80–84 ..	..	..	3	14	..	..	5	16
85 and over ..	..	..	1	6	..	..	5	17
All Ages	5[1]	332[2]	1,234[2]	2,368	..	2[2]	6[2]	10

[1] Tasmania only. [2] Exclusive of South Australia.

The number and proportion of divorced men in each age-group have increased at successive censuses, owing partly to increasing accuracy in the returns and partly to increased facilities for divorce and increased advantage taken of such facilities. At the census of 1881, Tasmania was the only State which furnished particulars concerning divorce. At the censuses of 1891 and 1901 all the States except South Australia furnished such particulars, while in 1911 the information was obtained for the whole Commonwealth. According to the 1911 figures, divorced men represented 1 per thousand of the male population. The maximum number of divorced men in any age-group in 1911 was that for the group 45-49, while the maximum proportion was that for the group 50-54. One divorced male under 21 years of age was recorded in 1891, and two in 1911.

(ix.) *Divorced Females.*—Tabulated according to age, the particulars for divorced females recorded in the Commonwealth at the censuses of 1881 to 1911 are as follows :—

Ages of Divorced Females.—Commonwealth, 1881 to 1911.

Age Last Birthday.	Number.				Proportion per 10,000 of Total Female Population of the Same Age.			
	Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.	Census of 1881.	Census of 1891.	Census of 1901.	Census of 1911.
18 ..	..	..	..	1	..	..	..	..
19 ..	..	2	2	..	..	1	1	..
20 ..	..	2	5	7	..	1	1	1
21–24 ..	..	14	51	64	..	1	3	4
25–29 ..	..	60	168	239	..	4	11	13
30–34 ..	..	49	244	332	..	5	18	21
35–39 ..	1	40	287	374	..	5	24	26
40–44 ..	2	26	178	366	..	4	19	29
45–49 ..	1	19	107	319	..	4	16	29
50–54 ..	2	10	52	229	..	2	10	27
55–59 ..	..	4	28	79	..	1	6	14
60–64 ..	..	1	11	59	..	..	3	13
65–69 ..	..	..	10	38	..	..	3	10
70–74 ..	..	1	5	14	..	1	3	5
75–79 ..	..	..	..	16	..	..	..	10
80–84 ..	..	..	1	2	..	..	2	3
85 and over ..	..	..	..	1	..	..	..	3
All Ages ..	6[1]	228[2]	1,149[2]	2,140	..	2[2]	6[2]	10

[1] Tasmania only. [2] Exclusive of South Australia.

In the case of divorced females as in that of divorced males the figures for succeeding censuses have become increasingly complete, the omissions to record being the same in the two cases. Curiously, the proportions of total population represented by divorced females recorded at the four censuses was practically identical with the corresponding proportions in the case of males, these proportions being less than a half per 10,000 in 1881 ; 2 per 10,000 in 1891 ; 6 per 10,000 in 1901 ; and 10 per 10,000 in 1911.

The maximum number of divorced females in any age-group was, in 1911, reached in the age-group 35-39, and the maximum proportion in the groups 40-44 and 45-49. Four divorced females under the age of 21 were recorded in 1891 ; 7 in 1901 ; and 8 in 1911.

(x.) *Combined Comparative Results for Males.*—In the succeeding table the number of males of each conjugal condition is shewn for the more important age-groups for each of the censuses 1881 to 1911 :—

Conjugal Condition and Age, Males.—Commonwealth, 1881 to 1911.

Census.	Number whose Age Last Birthday was—						All ages.
	Under 15.	15–44.	45–59.	60–64.	65 & over.	15 & over.	
NEVER MARRIED.							
1881	442,651	357,217	38,930	6,493	6,625	409,265	851,916
1891	593,290	524,772	43,430	9,217	10,346	587,765	1,181,055
1901	670,269	607,456	46,590	9,979	16,804	680,829	1,351,098
1911	714,573	700,328	65,755	9,818	18,224	794,125	1,508,698
MARRIED.							
1881	..	194,673	102,019	17,202	18,236	332,130	332,130
1891	1	292,885	125,980	26,902	29,671	475,438	475,439
1901	2	346,187	146,407	29,378	46,379	568,351	568,353
1911	3	417,844	228,619	35,021	56,621	738,105	738,108
WIDOWED.							
1881	..	6,528	11,228	4,121	8,985	30,862	30,862
1891	..	10,410	15,524	6,478	14,801	47,213	47,213
1901	..	11,756	16,229	6,845	22,413	57,243	57,243
1911	..	11,015	20,053	6,786	26,007	63,861	63,861
DIVORCED.							
1881	..	5	..	..	..	5	5[1]
1891	..	216	89	16	11	332	332[2]
1901	..	760	361	55	58	1,234	1,234[2]
1911	..	1,134	949	134	151	2,368	2,368

[1] Tasmania only. [2] Exclusive of South Australia.

Conjugal Condition and Age, Males.—Commonwealth, 1881 to 1911.—*continued.*

Census.	Number whose Age Last Birthday was—						All Ages.
	Under 15.	15-44.	45-59.	60-64.	65 & over.	15 & over.	
ALL CONJUGAL CONDITIONS.							
1881	442,651	558,423	152,177	27,816	33,846	772,262	1,214,913
1891	593,291	828,283	185,023	42,613	54,829	1,110,748	1,704,039
1901	670,271	966,159	209,587	46,257	85,654	1,307,657	1,977,928
1911	714,576	1,130,321	315,376	51,759	101,003	1,598,459	2,313,035

With two exceptions the number in each age-group and for each conjugal condition increased with successive censuses, the exceptions being "never married" males in the age-group 60-64, where the number in 1911 was less than the number in 1901, and widowed males for the same age-group and censuses. As noted in subsections (viii.) and (ix.) of this section, the figures for divorced persons for censuses prior to 1911 are defective.

The corresponding proportions of total males for each age-group and conjugal condition are as follows:—

Proportionate Age and Conjugal Distribution of Males.—Commonwealth, 1881 to 1911.

Census.	Proportion per 10,000 Males in Age-Group where Age Last Birthday was—						All Ages.
	Under 15.	15–44.	45–59.	60–64.	65 & over.	15 & over.	
NEVER MARRIED.							
1881	10,000	6,397	2,558	2,334	1,957	5,299	7,012
1891	10,000	6,336	2,347	2,163	1,887	5,292	6,931
1901	10,000	6,287	2,223	2,157	1,962	5,206	6,831
1911	10,000	6,196	2,085	1,897	1,804	4,968	6,523
MARRIED.							
1881	..	3,486	6,704	6,184	5,388	4,301	2,734
1891	..	3,536	6,809	6,313	5,412	4,280	2,790
1901	..	3,583	6,986	6,351	5,414	4,346	2,874
1911	..	3,697	7,249	6,766	5,606	4,618	3,191
WIDOWED.							
1881	..	117	738	1,482	2,655	400	254
1891	..	126	839	1,520	2,699	425	277
1901	..	122	774	1,480	2,617	438	289
1911	..	97	636	1,311	2,575	399	276
DIVORCED.							
1881	..	..	..	..	..	..	..
1891	..	2	5	4	2	3	2
1901	..	8	17	12	7	10	6
1911	..	10	30	26	15	15	10

The general result indicated by this table is a well-defined decrease in all the age-groups in the proportion of males who were "never married" at the successive censuses, and also a decrease, though less well-defined in the case of widowers. On the other hand there is a well-defined increase in all age-groups in the proportion of married men at successive censuses. Between the censuses of 1881 and 1911 the proportion of the male population aged 15 and upwards who were "never married" decreased from 53 per cent. to about 49¾ per cent., while the proportion who were married increased from 43 per cent. to about 46¼ per cent., the proportion of widowers being approximately 4 per cent. at the two censuses.

(xi.) *Combined Comparative Results for Females.*—The following table furnishes particulars concerning the number of females of each conjugal condition for the more important age-groups for each of the censuses 1881 to 1911.

Conjugal Condition and Age, Females.—Commonwealth, 1881 to 1911.

Census.	Number whose Age Last Birthday was—						All Ages.
	Under 15.	15–44.	45–59.	60–64.	65 & over.	15 & over.	
NEVER MARRIED.							
1881	433,883	216,959	3,983	754	746	222,442	656,325
1891	579,252	328,659	7,478	1,173	1,569	338,879	918,131
1901	655,914	443,973	13,198	1,945	2,746	461,862	1,117,776
1911	695,907	542,742	30,391	3,582	5,211	581,926	1,277,833

Conjugal Condition and Age, Females.—Commonwealth, 1881 to 1911.—*continued.*

Census.	Number whose Age Last Birthday was—						All Ages.
	Under 15.	15-44.	45-59.	60-64.	65 & over.	15 & over.	
MARRIED.							
1881	19	237,075	72,606	10,188	8,827	328,696	328,715
1891	5	343,943	98,438	16,206	14,680	473,267	473,272
1901	2	409,282	115,855	20,562	24,055	569,754	569,756
1911	19	495,471	181,389	25,031	31,997	733,888	733,907
WIDOWED.							
1881	..	14,251	18,183	6,211	11,590	50,235	50,235
1891	..	17,836	29,154	10,229	21,503	78,722	78,722
1901	..	21,161	32,470	14,648	38,913	107,192	107,192
1911	..	19,513	39,461	15,590	53,526	128,090	128,090
DIVORCED.							
1881	..	3	3	..	..	6	6[1]
1891	..	193	33	1	1	228	228[2]
1901	..	935	187	11	16	1,149	1,149[2]
1911	..	1,383	627	59	71	2,140	2,140
ALL CONJUGAL CONDITIONS.							
1881	433,902	468,288	94,775	17,153	21,163	601,379	1,035,281
1891	579,257	690,631	135,103	27,609	37,753	891,096	1,470,353
1901	655,916	875,351	161,710	37,166	65,730	1,139,957	1,795,873
1911	695,926	1,059,109	251,868	44,262	90,805	1,446,044	2,141,970

[1] Tasmania only. [2] Exclusive of South Australia.

With the exception of married females under 15, and of widows in the age-group 15-44 for the Census of 1911, the number in each age-group and for each conjugal condition increased with successive Censuses. As noted in subsections (viii.) and (ix.) above, the figures for divorced persons for censuses prior to 1911 are defective.

From the standpoint of reproductive efficiency, one of the most important groups in this table is that of married females in the group 15-44. It will be seen that the number in this group increased from 237,075 in 1881 to 495,471 in 1911.

The corresponding proportions of total females for each age-group and conjugal condition are as follows :—

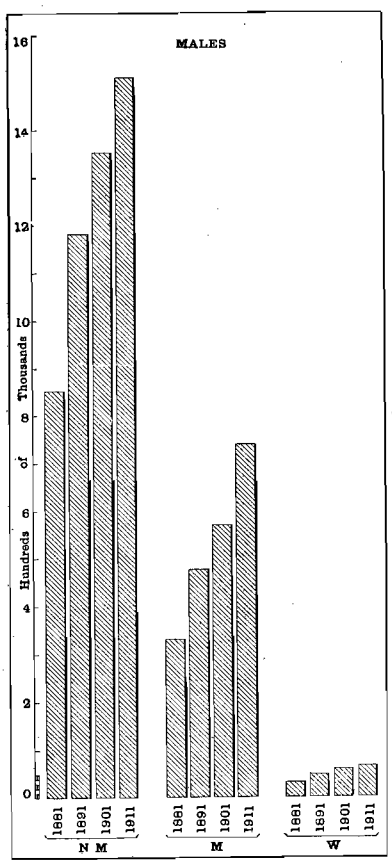
Proportionate Age and Conjugal Distribution of Females.—Commonwealth, 1881 to 1911.

Census.	Proportion per 10,000 Females in Age-Group where Age Last Birthday was—						All Ages.
	Under 15.	15–44.	45–59.	60–64.	65 & over.	15 & over.	
NEVER MARRIED.							
1881	10,000	4,633	420	440	353	3,699	6,340
1891	10,000	4,759	554	425	416	3,803	6,244
1901	10,000	5,072	816	523	418	4,052	6,224
1911	10,000	5,125	1,206	810	574	4,024	5,966
MARRIED.							
1881	..	5,063	7,661	5,939	4,171	5,466	3,175
1891	..	4,980	7,286	5,870	3,888	5,311	3,219
1901	..	4,676	7,164	5,533	3,660	4,998	3,173
1911	..	4,678	7,202	5,655	3,524	5,075	3,426
WIDOWED.							
1881	..	304	1,919	3,621	5,476	835	485
1891	..	258	2,158	3,705	5,696	883	535
1901	..	242	2,008	3,941	5,920	940	597
1911	..	184	1,567	3,522	5,894	886	598
DIVORCED.							
1881	..	..	..	..	..	..	..
1891	..	3	2	..	..	3	2
1901	..	10	12	3	2	10	6
1911	..	13	25	13	8	15	10

In the case of "never married" females above the age of 15, there is a well-defined increase in all the age-groups at successive censuses, the proportion for the important group of 15-44 having risen from about 46¼ per cent. to 51¼ per cent. On the other hand, in the case of married females, there is, with minor fluctuations, a decrease in the proportion in each group, the proportion for 15-44 falling from about 50¾ to 46¾. In the case of widows the proportions for 1891 and 1901 were in most cases higher than for 1881 or 1911, while the proportions for 1911 were, in the main, lower than those for 1881.

Of the female population aged 15 and upwards, the proportion "never married" increased from 37 per cent. to 40¼ per cent.; the proportion married decreased from 54⅔ per cent. to 50¾ per cent., while the proportion who were widows increased from 8⅓ per cent. to rather more than 8¾ per cent.

"Never Married," Married, and Widowed Persons, Commonwealth, 1881 to 1911.

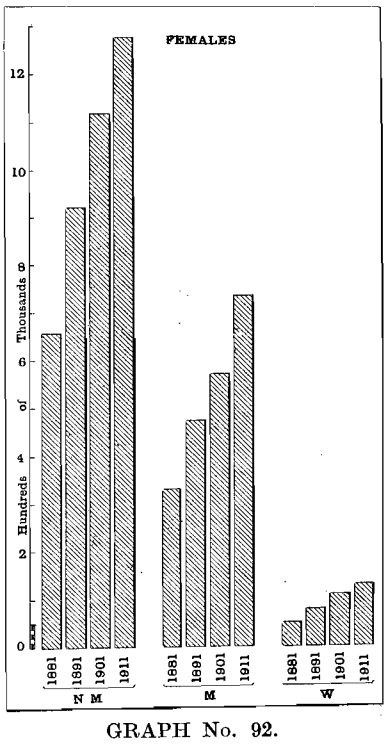


GRAPH NO. 91.

In the accompanying Graphs (Nos. 91 and 92) is furnished a comparative view of the numbers of males and females separately who were "never married," married, or widowed at each of the last four Censuses. The scale is the same for both graphs, and represents the number of persons of each sex and conjugal condition at each Census.

In both sexes there have been considerable increases from Census to Census in the numbers concerned. In the case of the "never married" males and widowed males, this increment was most extensive between the Censuses of 1881 and 1891, and least extensive between 1901 and 1911. On the other hand amongst married males the largest increase in number took place between 1901 and 1911, and the smallest between 1891 and 1901.

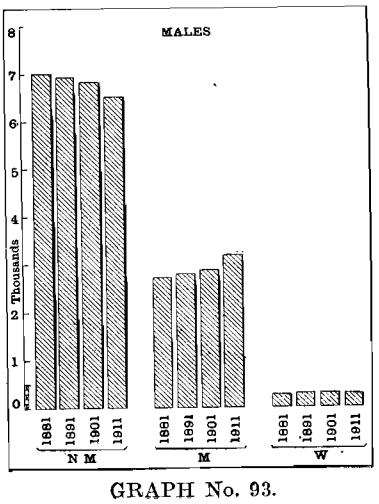
In the case of "never married" females, again the largest increment was between 1881 and 1891, and the smallest between 1901 and 1911, but widows, while shewing the largest increase between 1881 and 1891, shewed the smallest increase between 1891 and 1901.



GRAPH No. 92.

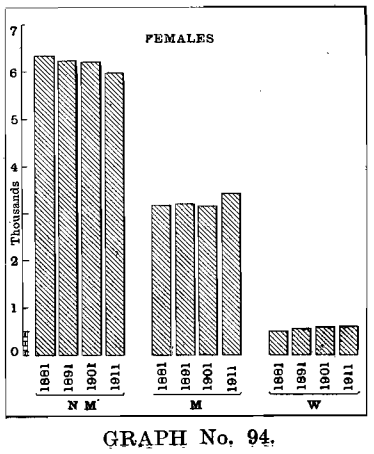
The number of married women differed throughout but slightly from the number of married men, increasing most largely between 1901 and 1911, and least extensively between 1891 and 1901.

Proportions "Never Married," Married, and Widowed, Commonwealth, 1881 to 1911.



GRAPH No. 93.

Graphs Nos. 93 and 94 furnish a representation for each of the last four Censuses of the proportion of the Australian males and females respectively who were "never married," married, or widowed at the dates specified. The scale is the same for both graphs, and represents in each instance the number per 10,000 for the sex and Census in question.



GRAPH No. 94.

6. **Metropolitan and Extra-Metropolitan Statistics.**—The tables contained in this section present a view of the conjugal data according to age, classified under the heads of metropolitan and extra-metropolitan, the former term comprising the six capital cities and their suburbs, and the latter the remainder of the Commonwealth. The following table relates to the numbers within the metropolitan areas mentioned:—

Age and Conjugal Condition of the Metropolitan Population of the Commonwealth, 1911.

Age Last Birthday.	Males.					Females.				
	Never Married.	Married.	Widowed.	Divorced.	Total.	Never Married.	Married.	Widowed.	Divorced.	Total.
Under 15 ..	244,333	2	..	..	244,335	241,362	6	..	..	241,368
15–19 ..	81,784	430	1	1	82,216	87,991	2,964	11	1	90,967
20–24 ..	70,454	12,289	102	13	82,858	72,239	25,444	217	43	97,943
25–29 ..	39,203	32,984	433	80	72,700	39,547	44,309	779	158	84,793
30–34 ..	21,025	39,553	792	140	61,510	23,209	45,494	1,558	228	70,489
35–39 ..	13,357	38,410	1,184	155	53,106	15,741	42,404	2,865	248	61,258
40–44 ..	10,237	39,253	1,632	178	51,300	11,329	40,235	4,486	250	56,300
45–49 ..	7,668	38,368	2,289	187	48,512	7,998	35,790	6,319	222	50,329
50–54 ..	5,464	31,491	2,671	163	39,789	5,487	26,484	7,205	147	39,323
55–59 ..	3,165	20,410	2,517	100	26,192	3,126	16,193	7,102	55	26,476
60–64 ..	2,132	13,356	2,468	62	18,018	2,140	10,630	7,908	40	20,718
65–69 ..	1,505	9,321	2,643	30	13,499	1,542	6,788	8,536	21	16,887
70–74 ..	1,114	5,842	2,531	18	9,505	902	3,595	7,262	8	11,767
75–79 ..	652	3,270	2,128	3	6,053	450	1,553	5,159	7	7,169
80–84 ..	282	1,301	1,339	3	2,925	216	459	2,744	..	3,419
85–89 ..	95	290	477	..	862	69	114	972	..	1,155
90–94 ..	21	63	116	1	201	10	31	257	..	298
95–99 ..	3	9	11	..	23	6	1	43	..	50
100 & over ..	1	1	2	..	4	1	2	9	..	12
Total ..	502,495	286,643	23,336	1,134	813,608	513,365	302,496	63,432	1,428	880,721

In the total metropolitan population of the Commonwealth, females exceeded males by no less than 67,113, this excess being made up of 10,870 in the "never married," 15,853 in the married, 40,096 in the widowed, and 294 in the divorced.

The following table contains similar particulars in respect of the extra-metropolitan population:—

Age and Conjugal Condition of the Extra-Metropolitan Population of the Commonwealth, 1911.

Age Last Birthday.	Males.					Females.				
	Never Married.	Married.	Widowed.	Divorced.	Total.	Never Married.	Married.	Widowed.	Divorced.	Total.
Under 15 ..	470,240	1	..	..	470,241	454,545	13	..	..	454,558
15–19 ..	145,646	463	3	1	146,113	126,644	5,511	16	..	132,171
20–24 ..	131,249	15,434	147	14	146,844	81,316	39,928	280	28	121,552
25–29 ..	80,860	46,992	654	57	128,563	38,843	65,037	915	81	104,876
30–34 ..	46,886	62,457	1,277	146	110,766	21,521	67,099	1,665	104	90,389
35–39 ..	32,673	65,011	1,947	166	99,797	14,334	61,988	2,761	126	79,209
40–44 ..	26,954	64,568	2,843	183	94,548	10,028	55,058	3,960	116	69,162
45–49 ..	22,163	59,317	3,764	220	85,464	6,930	46,361	5,525	97	58,913
50–54 ..	16,657	47,664	4,574	175	69,070	4,477	34,904	6,550	82	46,013
55–59 ..	10,638	31,369	4,238	104	46,349	2,373	21,657	6,760	24	30,814
60–64 ..	7,686	21,665	4,318	72	33,741	1,442	14,401	7,682	19	23,544
65–69 ..	5,677	16,509	4,760	46	26,992	993	9,954	8,849	17	19,813
70–74 ..	4,570	10,657	4,498	25	19,750	520	5,692	8,191	6	14,409
75–79 ..	2,698	6,224	3,967	9	12,898	301	2,700	6,430	9	9,440
80–84 ..	1,115	2,412	2,400	11	5,938	133	877	3,309	2	4,321
85–89 ..	371	582	834	2	1,789	53	190	1,321	1	1,565
90–94 ..	87	113	238	2	440	11	37	358	..	406
95–99 ..	26	18	48	1	93	3	3	71	..	77
100 & over ..	7	9	15	..	31	1	1	15	..	17
Total ..	1,006,203	451,465	40,525	1,234	1,499,427	764,468	431,411	64,658	712	1,261,249

In the total extra-metropolitan population males exceeded females by 238,178, comprising an excess of 241,735 amongst the "never married," 20,054 amongst the married, 522 amongst the divorced, and a defect of 24,133 amongst the widowed.

The proportions per 10,000 of each sex in each age-group belonging to the several conjugal conditions are shewn in the next table, the basic figures being the metropolitan figures for the Commonwealth for the census of 1911:—

Metropolitan Conjugal Condition.—Proportion per 10,000 in each Age-group.

Age Last Birthday.	Males.					Females.				
	Never Married.	Married.	Widowed.	Divorced.	Total.	Never Married.	Married.	Widowed.	Divorced.	Total.
Under 15 ..	10,000	..	..	..	10,000	10,000	..	..	..	10,000
15–19 ..	9,948	52	..	..	10,000	9,673	326	1	..	10,000
20–24 ..	8,503	1,483	12	2	10,000	7,376	2,598	22	4	10,000
25–29 ..	5,392	4,537	60	11	10,000	4,664	5,226	92	18	10,000
30–34 ..	3,418	6,430	129	23	10,000	3,293	6,454	221	32	10,000
35–39 ..	2,515	7,233	223	29	10,000	2,570	6,922	468	40	10,000
40–44 ..	1,995	7,652	318	35	10,000	2,012	7,147	797	44	10,000
45–49 ..	1,581	7,909	472	38	10,000	1,589	7,111	1,256	44	10,000
50–54 ..	1,373	7,915	671	41	10,000	1,396	6,735	1,832	37	10,000
55–59 ..	1,208	7,793	961	38	10,000	1,181	6,116	2,682	21	10,000
60–64 ..	1,183	7,413	1,370	34	10,000	1,033	5,131	3,817	19	10,000
65–69 ..	1,115	6,905	1,958	22	10,000	913	4,020	5,055	12	10,000
70–74 ..	1,172	6,146	2,663	19	10,000	767	3,055	6,171	7	10,000
75–79 ..	1,077	5,402	3,516	5	10,000	628	2,166	7,196	10	10,000
80–84 ..	964	4,448	4,578	10	10,000	632	1,342	8,026	..	10,000
85 & over ..	1,101	3,330	5,560	9	10,000	568	977	8,455	..	10,000
All Ages	6,176	3,523	287	14	10,000	5,829	3,435	720	16	10,000

Corresponding proportions per 10,000 of each sex in each age-group in respect of the extra-metropolitan population are shewn in the next table :—

Extra-Metropolitan Conjugal Condition.—Proportion per 10,000 in each Age-group.

Age Last Birthday.	Males.					Females.				
	Never Married.	Married.	Widowed.	Divorced.	Total.	Never Married.	Married.	Widowed.	Divorced.	Total.
Under 15 ..	10,000	..	..	..	10,000	10,000	..	..	..	10,000
15–19 ..	9,968	32	..	..	10,000	9,582	417	1	..	10,000
20–24 ..	8,938	1,051	10	1	10,000	6,690	3,285	23	2	10,000
25–29 ..	6,289	3,655	51	5	10,000	3,704	6,201	87	8	10,000
30–34 ..	4,233	5,639	115	13	10,000	2,381	7,423	184	12	10,000
35–39 ..	3,274	6,514	195	17	10,000	1,809	7,826	349	16	10,000
40–44 ..	2,851	6,829	301	19	10,000	1,450	7,961	572	17	10,000
45–49 ..	2,593	6,941	440	26	10,000	1,176	7,869	938	17	10,000
50–54 ..	2,412	6,901	662	25	10,000	973	7,586	1,423	18	10,000
55–59 ..	2,295	6,768	914	23	10,000	770	7,028	2,194	8	10,000
60–64 ..	2,278	6,421	1,280	21	10,000	612	6,117	3,263	8	10,000
65–69 ..	2,103	6,116	1,764	17	10,000	501	5,024	4,466	9	10,000
70–74 ..	2,314	5,396	2,277	13	10,000	361	3,950	5,685	4	10,000
75–79 ..	2,092	4,825	3,076	7	10,000	319	2,860	6,811	10	10,000
80–84 ..	1,878	4,062	4,042	18	10,000	308	2,029	7,658	5	10,000
85 & over ..	2,087	3,068	4,824	21	10,000	329	1,119	8,547	5	10,000
All Ages	6,711	3,011	270	8	10,000	6,061	3,420	513	6	10,000

Amongst males the proportion "never married" was considerably higher in all age-groups in the extra-metropolitan than in the metropolitan population, while the reverse was the case amongst females, the metropolitan "never married" being in this case represented by much the higher proportions.

On the other hand, the proportions of married males at the various ages was much higher in the metropolitan than in the extra-metropolitan area. Similarly, the proportions of married females at various ages was much lower in all age-groups in the metropolitan than in the extra-metropolitan area.

Further, the proportion of widowers in each age-group was slightly the higher in the metropolitan area, as was also the case practically throughout for widows, as well as for divorced persons of both sexes.

7. **Average Ages.**—In the following table are given particulars of the average ages of persons of each sex of the several conjugal conditions, who were aged 15 and upwards at the census of 3rd April, 1911. The particulars are shewn separately for the metropolitan areas, the extra-metropolitan areas, and the whole area of the Commonwealth and the several States:

Conjugal Condition and Average Age of Persons Aged 15 and Upwards.

Particulars.	Males.					Females.				
	Never Married	Married	Widowed.	Divorced.	All.	Never Married	Married	Widowed.	Divorced.	All.
METROPOLITAN AREA.										
	years.	years.	years.	years.	years.	years.	years.	years.	years.	years.
Sydney and Suburbs	27.16	43.01	58.53	45.44	36.39	26.56	39.64	58.91	41.10	36.05
Melbourne and Suburbs	26.87	44.29	60.68	45.22	37.06	27.56	41.00	60.72	42.20	37.10
Brisbane and Suburbs	25.76	44.18	59.23	44.13	36.15	25.10	40.83	58.86	40.89	35.64
Adelaide and Suburbs	26.17	44.15	61.50	46.13	37.01	26.91	41.08	61.76	42.50	37.17
Perth and Suburbs ..	28.68	42.34	56.02	45.36	36.83	25.04	38.92	56.52	39.07	35.36
Hobart and Suburbs	26.20	44.46	62.97	43.83	37.49	27.97	41.08	62.71	40.71	37.34
All Metropolitan ..	26.91	43.66	59.68	45.33	36.72	26.80	40.32	59.89	41.41	36.51
EXTRA-METROPOLITAN AREA.										
New South Wales ..	29.26	43.88	60.21	47.43	37.01	24.54	39.45	60.63	41.74	35.36
Victoria..	28.96	45.63	63.11	48.86	37.92	26.36	41.32	63.02	43.24	37.31
Queensland	30.05	43.74	58.66	43.13	36.73	23.17	39.06	58.44	41.97	34.43
South Australia ..	27.09	44.68	60.93	47.01	36.38	24.52	40.64	63.08	45.60	35.97
Western Australia ..	31.44	41.87	53.19	43.92	36.38	24.35	37.44	55.31	37.50	34.66
Tasmania	26.87	43.93	60.16	47.85	36.60	25.04	39.62	61.28	42.50	35.79
Northern Territory ..	43.99	47.60	53.28	52.50	45.01	22.41	36.12	49.87	..	32.34
Federal Territory ..	47.10	47.56	56.83	72.50	37.80	22.59	42.13	61.96	42.50	36.14
All Extra-Metropolitan	29.29	44.23	60.29	46.79	37.09	24.89	39.86	61.13	42.00	35.81
THE WHOLE AREA.										
New South Wales ..	28.55	43.54	59.61	46.45	36.79	25.49	39.53	59.75	41.30	35.67
Victoria..	28.10	45.01	62.04	46.64	37.55	26 98	41.17	61.82	42.50	37.21
Queensland	29.29	43.85	58.78	43.35	36.61	23.78	39.52	58.58	41.62	34.78
South Australia ..	26.72	44.43	61.19	46.52	36.66	25.78	40.86	62.32	43.57	36.59
Western Australia ..	30.74	42.04	54.11	44.41	36.52	24.70	38.07	55.95	38.28	34.98
Tasmania	26.75	44.04	60.78	46.81	36.77	25.89	39.94	61.72	41.76	36.19
Northern Territory ..	43.99	47.60	53.28	52.50	45.01	22.41	36.12	49.87	..	32.34
Federal Territory ..	47.10	47.56	56.83	72.50	37.80	22.59	42.13	61.96	42.50	36.14
Commonwealth ..	28.52	44.01	60.07	46.09	36.96	25.78	40.05	60.52	41.61	36.12

In the case of males for the Commonwealth as a whole, the average age was somewhat lower in each conjugal condition in the metropolitan than in the extra-metropolitan area, and the same was true amongst females in the case of widows and divorcees. On the other hand, the average ages of "never married" and married females was somewhat higher in the metropolitan than in the extra-metropolitan area.

It will be noticed also that the difference in average age of married males and married females is lower in all metropolitan areas than in the corresponding extra-metropolitan areas. In the case of the metropolitan areas this difference ranged between the limits of 3.07 in Adelaide, and 3.42 in Perth, and for the Commonwealth as a whole was 3.34. In the extra-metropolitan areas, leaving the Territories out of account, the range was between the limits of 4.04 in South Australia, and 4.68 in Queensland, with a difference of 4.37 for the Commonwealth as a whole.

CHAPTER XIX.

FAMILIES.

1. **Collection, Tabulation, and Publication of Data.**—The information combined in the present report under the head of Families comprises particulars concerning :—

(i.) Relative ages of husbands and wives ;
(ii.) Relative birthplaces of husbands and wives ;
(iii.) Relative religions of husbands and wives ;
(iv.) Issue of husbands according to age ;
(v.) Issue of wives according to age ;
(vi.) Issue of wives according to birthplace ;
(vii.) Issue of wives according to religion ;
(viii.) Issue of wives according to duration of marriage ;
(ix.) Average issue of husbands according to age ;
(x.) Average issue of wives according to age ;
(xi.) Average issue of wives according to birthplace and age ;
(xii.) Average issue of wives according to religion and age ;
(xiii.) Average issue of wives according to duration of marriage and age ;
(xiv.) Average issue of husbands according to occupation ;
(xv.) Average issue of widowers according to age ;
(xvi.) Average issue of widows according to age ;
(xvii.) Average issue of divorced males according to age ;
(xviii.) Average issue of divorced females according to age.

In all cases the particulars have been published for the Commonwealth as a whole, and also separately for each State and Territory. The only cases in which the details for States and Territories are given less extensively than those for the Commonwealth as a whole is that of the relative birthplaces of husbands and wives, where a condensation of the less important birthplaces was effected in the information relating to States and Territories, and that dealing with the actual size of family, which is given fully in Volume III. for the Commonwealth as a whole, and briefly summarised in the present chapter for States and Territories. The full details published concerning Families are contained in Volume III., pp. 1103 to 1205.

The major portion of the data used in the compilation of the information specified above was that contained on the "Conjugal Condition Card," which, as mentioned in Chapter VIII., p. 82, was written up from the personal cards before the segregation of the latter, according to sex. The form of the card was as shewn hereunder :—

The abbreviations "H.C. No." and "P.C. Nos." stand for "Householder's Card No." and "Personal Card Nos.," and the particulars were given to associate the "Conjugal" cards with the schedules from which the data had been obtained.

TABULATION FORM 24.

Census of the Commonwealth of Australia, 1911.

CONJUGAL CONDITION CARD.

State..... H.C. No.....

Mesh No..... P.C. Nos.....

Particulars.	Husband.	Wife.
Age		
Birthplace		
Religion		
Children,— Existing Marriage		
Children,— All Marriages ...		

Duration of existing Marriage } ..... years.

These cards were written for all married, widowed, and divorced persons. Where a husband and wife were together at the time of the Census the same "Conjugal" card served for both, and furnished the data requisite for the compilation of statistics of relative ages, birthplaces and religions of husbands and wives. Where the personal card of a husband was not associated with that of his wife, the husband's particulars were inserted on a "Conjugal" card, and the word "Absent" was written across the space provided for particulars concerning the wife, a corresponding course being followed where the personal card of a wife was not associated with that of her husband. Similarly in the cases of widowers and divorced males, the words "dead" and "divorced" respectively were written across the spaces provided for particulars concerning the wife, and a corresponding course was followed in the cases of widows and divorced females.

The only information specified above which was not obtainable from the "Conjugal" card was that relating to the average issue of husbands according to occupation. The item of occupation of husband was omitted from the "Conjugal" card because at the stage at which these cards were being written up the occupations had not been classified. The information concerning average issue of husbands according to occupation was accordingly tabulated from the male personal cards, when the general occupation tabulation was in progress.

It will thus be seen that in all cases the fullest information available was used, and whilst in the cases of relative ages, birthplaces and religions of husbands and wives, the information was necessarily restricted to those instances in which husbands and wives were together at the time of the Census, the information in respect of issues and average issues was tabulated in respect of all husbands, wives, etc., who furnished the requisite data.

2. **Relative Ages of Husbands and Wives.**—On pp. 1106 and 1107 of Volume III. are given particulars in single ages to 20, and thereafter in grouped ages, mainly quinquennial, concerning the relative ages of husbands and wives for the Commonwealth as a whole. Similar particulars for the several States and Territories are given on pp. 1112 to 1119 of Volume III.

The following table furnishes, for the Commonwealth as a whole, a summary of these particulars for some important age-groups.

Relative Ages of Husbands and Wives, Commonwealth, 1911.

Ages of Husbands Last Birthday.	Ages of Wives Last Birthday.							Number of Husbands.		
	Under 15	15-19	20-44	45-59	60-64	65 and over.	Unspecified.	Whose Wives were with them.	Whose Wives were absent.	Total.
Under 15 ..	..	..	..	..	..	..	..	..	3	3
15–19	..	356	245	..	..	..	6	607	282	889
20–44	6	6,747	340,271	9,637	75	45	2,157	358,938	54,517	413,455
45–59	..	49	74,941	107,669	3,057	846	1,382	187,944	38,754	226,698
60–64	..	3	1,994	17,191	6,551	1,795	202	27,736	6,980	34,716
65 & over	..	2	1,498	12,100	9,956	21,704	361	45,621	10,548	56,169
Unspecified	..	31	1,559	622	76	80	506	2,874	1,045	3,919
No. of wives whose husbands were with them	6	7,188	420,508	147,219	19,715	24,470	4,614	623,720	112,129	735,849
No. of wives whose husbands were absent	13	1,189	62,372	32,859	5,144	7,315	1,161	110,053	..	..
Total ..	19	8,377	482,880	180,078	24,859	31,785	5,775	733,773	..	..

Of the total of 735,849 males recorded as married, there were 112,129, or 15¼ per cent., whose wives were absent, while in the case of the 733,773 females recorded as married, there were 110,053, or 15 per cent., whose husbands were absent. These cases of absence include of course instances of judicial or other separation of a permanent character, but the majority of cases are merely due to the fact that at the time of the Census the wife was at home and the husband was temporarily absent therefrom for business or other purposes. The proportions absent differed somewhat in the several States and Territories, as will be seen from the following table :—

Proportion of Absentees per cent., Census 1911.

Proportion per cent. of—	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
Married males whose wives were absent	% 15.15	% 12.58	% 18.38	% 11.54	% 26.06	% 13.82	% 69.74	% 27.54	% 15.24
Married females whose husbands were absent	15.39	14.49	16.09	11.90	18.11	14.10	15.94	14.16	15.00

In New South Wales, Victoria, South Australia, and Tasmania, the proportion of married females whose husbands were absent exceeded the proportion of married males whose wives were absent, while the opposite was the case in Queensland, Western Australia, the Territories, and the Commonwealth as a whole. Amongst the States the greatest divergence in this respect occurred in the case of Western Australia and the least in that of New South Wales.

The following table furnishes particulars concerning the relation between absenteeism and age for both husbands and wives :—

Absenteeism and Age.—Commonwealth, 1911.

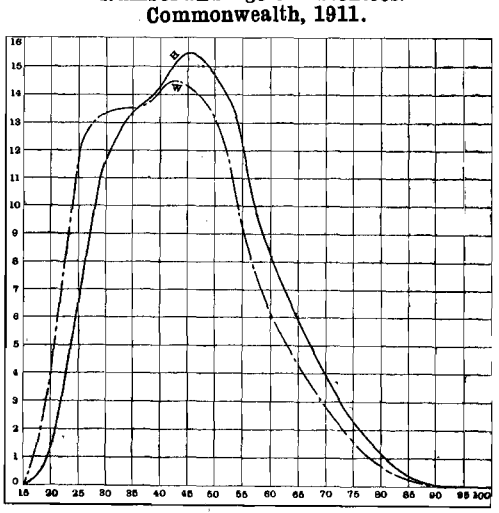
Age-group.	Husbands in each Age-group whose Wives were Absent.		Wives in each Age-group whose Husbands were Absent.	
	Number.	Proportion per cent. of Husbands in Age-group.	Number.	Proportion per cent. of Wives in Age-group.
		%		%
Under 15	3	100.00	13	68.42
15–19	282	31.72	1,189	14.19
20–24	3,677	13.38	7,858	12.15
25–29	9,477	11.95	13,001	12.00
30–34	12,602	12.45	13,456	12.05
35–39	13,753	13.41	13,727	13.25
40–44	15,008	14.58	14,330	15.15
45–49	15,214	15.70	13,838	16.97
50–54	13,825	17.62	11,531	18.92
55–59	9,715	18.92	7,490	19.93
60–64	6,980	20.11	5,144	20.69
65–69	4,943	19.29	3,587	21.57
70–74	2,980	18.21	2,058	22.31
75–79	1,665	17.68	1,073	25.38
80–84	702	19.05	414	31.22
85–89	181	20.90	143	47.35
90–94	60	34.29	34	50.00
95–99	10	37.04	3	75.00
100 and over ..	7	70.00	3	100.00
Unspecified ..	1,045	26.66	1,161	20.10
TOTAL ..	112,129	15.24	110,053	15.00

For both sexes there was in evidence a strikingly regular variation with age in the proportion of absentees. In the case of males the progression was wavelike, descending rapidly from the earliest age to the group 25-29, ascending thence to 60-64, descending from this latter group to 75-79, and ascending thereafter throughout. In the case of females the variation was even simpler, and comprised a descent from the earliest ages to the group 25-29, and an ascent thereafter.

In both sexes the minimum proportion of absenteeism was in the group 25-29, being 11.95 per cent. for husbands in that group, and 12 per cent. for wives in the same group.

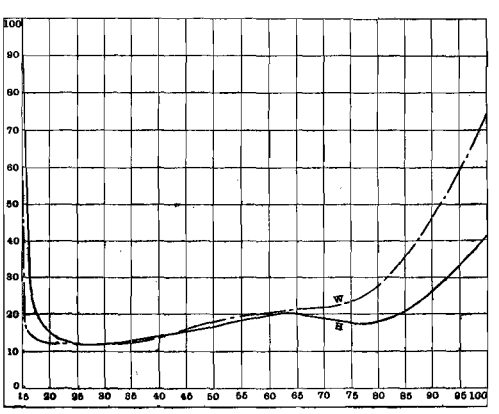
In the accompanying graph, No. 95, is furnished a representation of the number of husbands and wives at each age who were absent from their wives and husbands respectively at the date of the Census. The continuous line marked H represents the number of husbands who were so absent, and the broken line marked W represents the number of absentee wives. The base of each small square represents 5 years of age, and the height represents 200 persons. The number at any age will consequently be found by ascertaining from the marginal scale the vertical height of the curve for the age in question, and multiplying that height by 200.

Number and Age of Absentees. Commonwealth, 1911.



GRAPH No. 95.

Percentage and Age of Absentees. Commonwealth, 1911.



GRAPH No. 96.

In Graph No. 96 is furnished a representation for each age of the proportion per cent. of husbands and wives of such age who were absent from their wives and husbands respectively at the date of the Census. The base of each small rectangle represents five years of age, and the height represents 10 per cent.

In the succeeding table a statement is furnished of the number and proportion of husbands who had wives in the same age-group as themselves, or whose wives belonged to lower or higher groups. The figures relate to the Commonwealth as a whole.

Wives' Ages in Relation to those of their Husbands, Commonwealth, 1911.

Ages of Husbands.	Husbands whose Wives belonged to—						Total Husbands.
	Lower Age-group.		Same Age-group.		Higher Age-group.		
	Number.	Percentage on Total Husbands in Age-group.	Number.	Percentage on Total Husbands in Age-group.	Number.	Percentage on Total Husbands in Age-group.	
		%		%		%	
15–19	..	..	356	59.23	245	40.77	601
20–24	3,564	15.06	14,811	62.60	5,287	22.34	23,662
25–29	27,093	38.98	33,512	48.21	8,905	12.81	69,510
30–34	45,025	51.10	33,771	38.33	9,309	10.57	88,105
35–39	50,490	57.25	29,536	33.48	8,173	9.27	88,199
40–44	52,197	59.79	27,421	31.41	7,687	8.80	87,305
45–49	49,863	61.49	24,721	30.48	6,510	8.03	81,094
50–54	41,336	64.41	18,327	28.56	4,512	7.03	64,175
55–59	28,268	68.46	10,342	25.04	2,683	6.50	41,293
60–64	19,188	69.69	6,551	23.79	1,795	6.52	27,534
65–69	14,592	71.11	4,711	22.96	1,216	5.93	20,519
70–74	9,791	73.66	2,796	21.03	706	5.31	13,293
75–79	6,026	78.46	1,380	17.97	274	3.57	7,680
80–84	2,489	84.06	404	13.64	68	2.30	2,961
85–89	615	91.11	56	8.30	4	0.59	675
90–94	110	97.35	3	2.65	..	..	113
95–99	17	100.00	..	..	..	..	17
100 and over	2	100.00	..	..	..	..	2
All Ages ..	350,666	56.86	208,698	33.84	57,374	9.30	616,738

In this table only those cases have been included in which the husband and wife were enumerated together, and the ages of both were stated. In a tabulation based on a quinquennial grouping, it is not possible to ascertain exactly how many husbands had wives who were older or younger than themselves, or how many were of the same age; the best that can be done is to ascertain how many had wives who were in the same age-group or were in a lower or higher group. Husbands whose wives belong to a lower age-group than themselves are necessarily older than their wives, while those whose wives belong to a higher age-group than themselves are necessarily younger than their wives. Where husbands and wives are in the same age-group, however, some husbands will be older and some younger than their wives.

It will be seen that nearly 41 per cent. of the husbands between 15 and 20 had wives aged 20 or upwards, and about $22\frac{1}{3}$ per cent. of those between 20 and 25 had wives who were aged 25 or upwards.

Items of special interest in this table are the continuous increase with age in the percentage of husbands whose wives belong to lower age-groups than themselves, and the practically continuous decrease with age in the corresponding percentages in the cases where the wives belonged to the same or a higher age-group than their husbands.

The next table contains corresponding particulars in respect of wives, and shews for the Commonwealth as a whole the number and proportion of wives who had husbands in the same age-group as themselves, or whose husbands belonged to lower or higher age-groups.

Husbands' Ages in Relation to those of their Wives, Commonwealth, 1911.

Ages of Wives.	Wives whose Husbands belonged to—						Total Wives.
	Lower Age-group.		Same Age-group.		Higher Age-group.		
	Number.	Percentage on Total Wives in Age-group.	Number.	Percentage on Total Wives in Age-group.	Number.	Percentage on Total Wives in Age-group.	
		%		%		%	
Under 15	..	..	..	..	6	100.00	6
15–19	..	..	356	4.97	6,801	95.03	7,157
20–24	214	.38	14,811	26.18	41,538	73.44	56,563
25–29	4,445	4.68	33,512	35.26	57,072	60.06	95,029
30–34	7,998	8.17	33,771	34.49	56,137	57.34	97,906
35–39	8,869	9.91	29,536	32.99	51,119	57.10	89,524
40–44	8,323	10.41	27,421	34.31	44,183	55.28	79,927
45–49	7,744	11.48	24,721	36.66	34,969	51.86	67,434
50–54	6,865	13.95	18,327	37.25	24,007	48.80	49,199
55–59	4,830	16.12	10,342	34.51	14,792	49.37	29,964
60–64	3,132	15.95	6,551	33.36	9,956	50.69	19,639
65–69	2,132	16.41	4,711	36.25	6,152	47.34	12,995
70–74	1,445	20.21	2,796	39.10	2,910	40.69	7,151
75–79	891	28.35	1,380	43.91	872	27.74	3,143
80–84	365	40.20	404	44.49	139	15.31	908
85–89	90	56.60	56	35.22	13	8.18	159
90–94	30	90.91	3	9.09	..	..	33
95–99	1	100.00	..	..	..	..	1
100 and over	..	..	..	..	..	..	..
All Ages	57,374	9.30	208,698	33.84	350,666	56.86	616,738

This table exhibits a continuous increase with age in the proportion of wives whose husbands belonged to lower age-groups than themselves, and a practically continuous decrease with age in the proportion whose husbands belonged to higher age-groups than themselves, the increase in the one case, and the decrease in the other being most marked beyond age 75. In the case of wives whose husbands belonged to the same age-group as themselves, the proportion was relatively low at the extreme ages, and fluctuated somewhat at intermediate ages, but between ages 25 and 90 did not at any stage diverge very greatly from 35 per cent.

On the assumption that the relative seniority disclosed by the cases in which husbands and wives were in different age-groups is applicable to the cases in which they were in the same age-group, it may be roughly estimated that of 208,698 husbands in the same age-group as their wives, 179,353 were older, and 29,345 were younger than their wives. On this basis it would appear that at the date of the Census 86 per cent. of the husbands were older, and 14 per cent. were younger than their wives.

Another interesting aspect of the relative ages of husbands and wives is that obtained by computing for each group of ages of husbands the average ages of their wives. These have been computed separately for the several States and Territories, and are given in the succeeding table :—

Average Ages of the Wives of Husbands of Specified Ages, 1911.

Ages of Husbands Last Birthday.	Average Ages of Wives Enumerated in—								
	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T	
	Years.	Years.	Years.	Years.	Years.	Years.	Years.	Years.	Years.
15	..	..	..	20.5	..	..	..	..	20.5
16	17.5	16.5	18.5	16.5	..	..	..	..	17.4
17	20.9	19.3	19.2	19.7	23.0	18.5	..	..	20.3
18	19.3	19.7	20.4	18.9	21.6	21.3	..	..	19.7
19	20.1	20.7	21.9	20.8	20.1	20.5	..	..	20.6
20	20.9	21.2	21.7	21.3	20.8	21.4	..	..	21.1
21–24	23.3	23.6	23.4	23.7	23.4	23.4	21.0	23.0	23.4
25–29	26.2	26.6	26.0	26.6	26.3	26.1	26.8	27.0	26.3
30–34	29.9	30.3	29.5	30.2	30.0	29.7	28.9	28.4	30.0
35–39	33.8	34.3	33.5	34.1	34.0	33.7	31.8	33.7	33.9
40–44	38.0	38.7	37.8	38.7	38.1	38.2	34.5	38.1	38.3
45–49	42.6	43.2	42.5	43.1	42.2	42.8	40.8	40.6	42.8
50–54	47.2	47.5	47.0	47.8	46.8	47.6	49.3	46.3	47.3
55–59	51.6	51.5	51.5	52.4	51.3	51.9	43.2	49.8	51.7
60–64	56.0	55.7	55.9	56.8	55.8	56.1	44.4	51.4	56.0
65–69	60.1	59.8	60.5	61.4	59.6	60.0	67.5	57.6	60.2
70–74	64.3	64.2	64.5	65.5	62.9	64.3	55.0	64.6	64.4
75–79	67.8	68.4	68.9	69.5	65.2	67.4	37.5	72.5	68.3
80–84	71.0	71.3	69.9	73.4	68.9	70.3	72.5	62.5	71.2
85–89	72.6	73.7	72.6	74.3	72.8	67.8	..	72.5	73.1
90–94	73.2	73.4	74.6	81.3	72.5	73.2	..	..	73.9
95–99	73.5	77.5	..	75.0	77.5	73.8	..	..	75.2
100 and over ..	67.5	..	..	..	..	57.5	..	..	62.5
All Ages ..	39.1	40.7	39.1	40.5	37.5	39.5	36.5	41.6	39.6

The averages contained in this and the next table are probably, in most cases, slightly in excess of the true average age, since they have been computed on the assumption that the average age for a quinquennial group is the central point of that group, *e.g.*, the average age for group 40-44 last birthday has been taken as $42\frac{1}{2}$. Such error is, however, practically eliminated, when, as is done later, the differences between average ages are taken.

Leaving out of account the Territories, in which cases the circumstances are exceptional, it will be seen that in no instance does the average for any State differ materially from the corresponding average for the Commonwealth, but that there is throughout a tendency for the South Australian averages to rank relatively high, and those for Queensland and Western Australia to be relatively low.

Amongst the States the average age of all wives whose ages were specified, and who were residing at the time of the Census with husbands for whom age statistics were available, ranged between 37.5 in Western Australia, and 40.7 in Victoria, with an average for the whole Commonwealth of 39.6.

The following table furnishes similar information concerning the average ages of the husbands corresponding to successive age-groups for wives :—

Average Ages of the Husbands of Wives of Specified Ages, 1911.

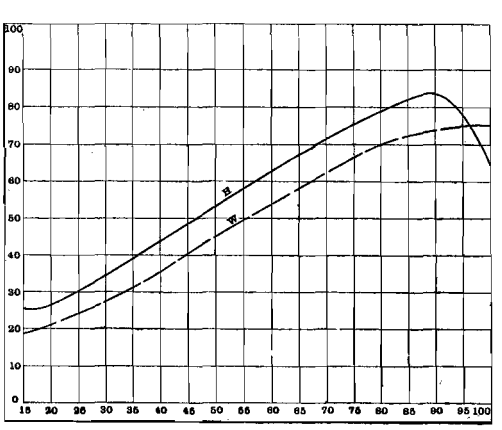
Ages of Wives Last Birthday.	Average Ages of Husbands Enumerated in—								
	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
	Years.	Years.	Years.	Years.	Years.	Years.	Years.	Years.	Years.
14	21.8	24.0	23.0	..	..	..	..	..	22.9
15	24.3	29.3	28.3	26.8	27.5	27.8	..	..	25.9
16	25.7	25.1	25.6	24.1	26.4	26.8	..	..	25.6
17	24.4	24.9	26.5	24.0	27.6	25.5	27.5	..	25.0
18	25.4	25.4	26.6	25.5	27.7	25.6	30.3	..	25.7
19	25.8	25.8	26.9	25.6	27.3	26.4	36.4	27.5	26.1
20	26.3	26.7	27.6	26.5	27.8	27.1	47.5	32.5	26.7
21–24	28.5	28.7	29.2	28.3	29.9	28.9	39.0	34.2	28.7
25–29	32.1	32.3	32.5	31.5	33.2	32.6	37.5	33.6	32.2
30–34	36.9	36.9	37.2	36.2	36.9	37.2	41.6	38.0	36.9
35–39	41.7	41.7	41.8	41.3	40.9	41.6	45.4	44.4	41.6
40–44	46.5	46.1	46.6	46.1	45.4	46.2	48.0	47.1	46.3
45–49	51.1	50.6	51.1	51.2	49.7	50.7	51.9	53.4	50.9
50–54	55.8	55.6	55.8	55.7	54.7	55.5	58.8	57.5	55.6
55–59	60.4	60.9	60.6	60.3	59.4	60.0	58.8	60.8	60.5
60–64	65.1	66.1	64.9	65.1	64.4	65.4	62.5	67.5	65.4
65–69	69.4	70.9	69.3	69.5	68.8	69.5	67.5	70.0	69.8
70–74	73.5	74.7	72.8	73.6	72.1	73.4	82.5	76.1	73.8
75–79	76.8	77.9	75.3	77.2	77.7	76.4	..	..	77.1
80–84	79.4	80.8	80.4	80.8	79.2	81.1	..	..	80.3
85–89	81.5	84.4	81.6	84.5	83.8	78.9	..	..	83.3
90–94	84.2	80.6	80.0	79.2	..	92.5	..	..	81.4
95–99	..	72.5	..	..	..	..	..	..	72.5
100 and over ..	..	..	..	..	..	..	..	..	..
All Ages ..	43.1	44.7	43.4	44.2	41.5	43.6	44.9	47.4	43.7

In this case also the corresponding values for the several States vary within narrow limits, and consequently do not differ largely from the Commonwealth averages.

Amongst the States the average ages of all husbands whose ages were specified, and who were residing at the time of the Census with wives for whom age statistics were available, ranged between 41.5 in the case of Western Australia, and 44.7 in that of Victoria, with a Commonwealth average of 43.7.

The figures for all ages in the preceding tables indicate that on the average the ages of the husbands exceeded those of their wives by 4.3 years in the case of Queensland, 4.1 years in that of Tasmania, 4 years in the cases of New South Wales, Victoria, and Western Australia, and 3.7 years in the case of South Australia. For the Commonwealth as a whole the husbands' average exceeded that for wives by 4.1 years.

Relative Ages of Husbands and Wives. Commonwealth, 1911.



GRAPH No. 97.

The accompanying Graph (No. 97) furnishes a representation of the average age of the wives of husbands of a given age, and also of the average age of the husbands of wives of a given age. The given age, whether for husbands or wives, is shewn on the base line for quinquennial intervals. The corresponding average ages of husbands are represented by the continuous curve marked H, while those for wives are represented by the broken curve marked W. The base of each small rectangle represents 5 years of age, and the height 10 years of age.

The figures given in the two preceding tables enable a computation to be made of the average differences in age of husbands and wives in the various age-groups for which the data have been tabulated. Assuming, as indicated above on p. 265, that the average age for any group is the central point of the group, the following table of average differences has been computed for the Commonwealth as a whole :—

Average Differences of Age between Husbands and Wives, Commonwealth, 1911.

Age-group comprising Persons whose Age last Birthday was—	Estimated Average Age of Group.	Average Age of Wives whose Husbands were in Age-group specified.	[1] Average Excess of Age of Husband in Age-group specified over that of his Wife.	Average Age of Husband whose Wife was in Age-group specified.	[2] Average Excess of Age of Wife in Age-group specified over that of her Husband.
	Years.	Years.	Years.	Years.	Years.
14	14.5	..	..	22.9	— 8.4
15	15.5	20.5	— 5.0	25.9	—10.4
16	16.5	17.4	— .9	25.6	— 9.1
17	17.5	20.3	— 2.8	25.0	— 7.5
18	18.5	19.7	— 1.2	25.7	— 7.2
19	19.5	20.6	— 1.1	26.1	— 6.6
20	20.5	21.1	— .6	26.7	— 6.2
21–24	23.0	23.4	— .4	28.7	— 5.7
25–29	27.5	26.3	1.2	32.2	— 4.7
30–34	32.5	30.0	2.5	36.9	— 4.4
35–39	37.5	33.9	3.6	41.6	— 4.1
40–44	42.5	38.3	4.2	46.3	— 3.8
45–49	47.5	42.8	4.7	50.9	— 3.4
50–54	52.5	47.3	5.2	55.6	— 3.1
55–59	57.5	51.7	5.8	60.5	— 3.0
60–64	62.5	56.0	6.5	65.4	— 2.9
65–69	67.5	60.2	7.3	69.8	— 2.3
70–74	72.5	64.4	8.1	73.8	— 1.3
75–79	77.5	68.3	9.2	77.1	.4
80–84	82.5	71.2	11.3	80.3	2.2
85–89	87.5	73.1	14.4	83.3	4.2
90–94	92.5	73.9	18.6	81.4	11.1
95–99	97.5	75.2	22.3	72.5	25.0
100 and over	102.5	62.5	40.0	..	..

[1] Minus sign (—) denotes average excess of age of wife over that of her husband.

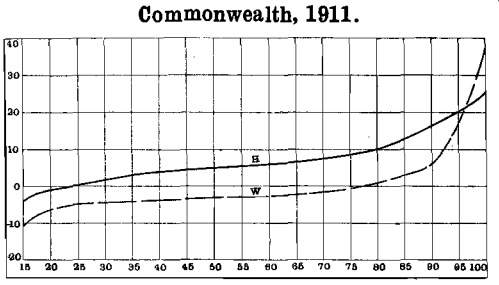
[2] Minus sign (—) denotes average excess of age of husband over that of his wife.

It will be seen that on the average husbands under the age of 25 had wives older than themselves, while husbands age 25 and upwards were on the average older than their wives. Further, leaving out of account husbands under the age of 17, of whom there were only 31 enumerated with their wives, it will be seen that from age 17 to the end of the table, there is a continuous progression with age in the average difference between the ages of husbands and those of their wives.

Similarly, wives in all age-groups under 75 were on the average younger than their husbands, while those above that age were on the average older than their husbands. Leaving out of account wives under the age of 15, of whom there were only 6 enumerated with their husbands, it will be seen that the remarkably regular progression with age in the average age differences noted in the case of husbands, is also in evidence in the case of wives.

It appears, therefore, that although as stated on p. 266, there is an average difference of 4.1 years between the ages of husbands and wives for all ages, when further details of ages are considered, this difference is applicable only (approximately) to the group 40-44 for husbands, and to the group 35-39 for wives.

Average Difference of Age, Husbands and Wives. Commonwealth, 1911.



GRAPH No. 98.

Graph No. 98 furnishes a representation of the average difference between the ages of husband and wife for any given age of the husband or for any given age of the wife. Such given ages are shewn on the base line for quinquennial intervals of age. The continuous curve marked H represents the average difference for any given age of the husband, while the broken curve marked W represents the average difference for any given age of the wife. The scale shewn on the left margin of the graph indicates the excess of the husband's age over that of the wife for the H curve, and the excess of the wife's age for the W curve. Where the wife's age is the greater on the H curve this difference is negative, and is shewn with a minus sign. Similarly, where on the W curve the husband's age is the greater the difference is negative, and is shewn with a minus sign.

3. **Relative Birthplaces of Husbands and Wives.**—Details respecting the relative birthplaces of husbands and wives are given on pp. 1108 to 1111, and 1128 to 1135 of Volume III. A summary of the information for the Commonwealth as a whole is contained in the succeeding table :—

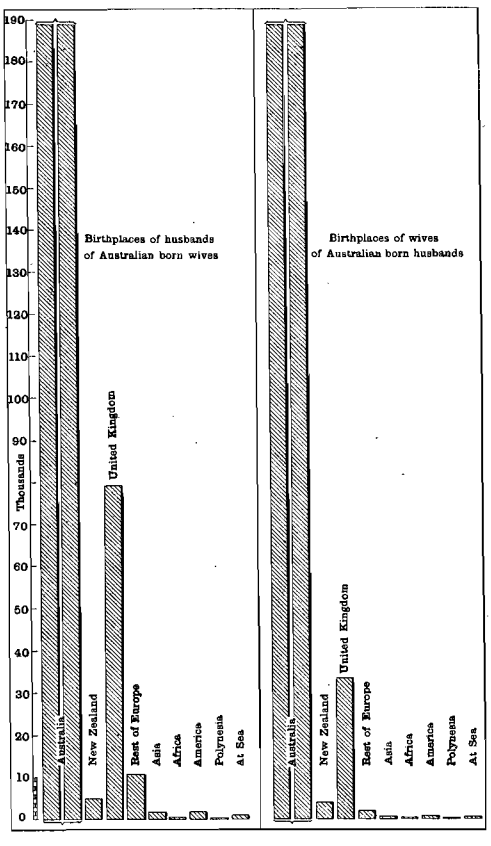
Relative Birthplaces of Husbands and Wives, Commonwealth 1911.

Birthplaces of Husbands.	Birthplaces of Wives.										No. of Husbands.		
	Australia.	New Zealand.	United Kingdom.	Rest of Europe.	Asia.	Africa.	America.	Polynesia.	At Sea.	Unspecified.	Whose Wives were with them.	Whose Wives were absent.	Total.
Australia	377,061	3,813	33,230	1,855	348	260	621	123	497	2,523	420,331	59,435	479,766
New Zealand ..	4,760	708	823	30	17	5	22	7	12	29	6,413	1,193	7,606
United Kingdom ..	79,005	1,652	78,311	1,373	341	250	559	53	378	945	162,867	33,215	196,082
Rest of Europe ..	10,358	200	3,910	7,056	62	42	71	10	62	134	21,905	6,413	28,318
Asia	1,521	40	407	33	616	8	12	7	7	13	2,664	8,685	11,349
Africa	433	10	150	9	6	69	6	1	1	5	690	192	882
America	1,756	51	717	35	10	14	196	6	7	18	2,810	916	3,726
Polynesia	223	6	38	..	2	1	2	68	..	2	342	236	578
At Sea	909	12	252	12	4	3	4	..	6	10	1,212	237	1,449
Unspecified	2,789	43	632	56	10	6	11	2	7	930	4,486	1,607	6,093
No. of Wives: Whose husbands were with them	478,815	6,535	118,470	10,459	1,416	658	1,504	277	977	4,609	623,720	112,129	735,849
No. of Wives: Whose husbands were absent ..	79,439	1,298	24,511	1,972	416	178	398	78	256	1,507	110,053	..	..
No. of Wives: Total	558,254	7,833	142,981	12,431	1,832	836	1,902	355	1,233	6,116	733,773	..	..

Of the total of 623,720 cases in which husbands and wives were enumerated together, there were 615,555 cases in which the birthplaces of husbands and wives were both stated, 3679 in which that of the husbands only was stated, 3556 in which that of the wife only was stated, and 930 in which the birthplace of neither was stated.

Of the 615,555 cases for which full particulars were furnished, 377,061, or 61.3 per cent., were cases in which both parties were Australian born; 79,005, or 12.8 per cent. were cases in which the husband had been born in the United Kingdom, and the wife in Australia; 78,311, or 12.7 per cent., were cases in which both parties were from the United Kingdom; and 33,230, or 5.4 per cent., were cases in which the husband was Australian-born and the wife was from the United Kingdom. It thus appears that intermarriages between parties born in Australia or in the United Kingdom accounted for 567,607, or 92.2 per cent., of the cases for which full particulars were available.

Birthplaces of the Partners of Australian-born Husbands and Wives, 1911.



GRAPH No. 99.

Of the remaining cases there were 12,168 in which one or both of the parties had been born in New Zealand; 18,904 in which one of the parties was Australian-born, and the other had been born elsewhere than in Australasia or the United Kingdom, and 8428 in which one of the parties had been born in the United Kingdom and the other had been born elsewhere than in Australia or the United Kingdom. There were thus, out of 615,555 couples, only 8488 cases, or about 1.4 per cent., in which both parties had been born elsewhere than in Australasia or the United Kingdom.

In Graph No. 99 is furnished a representation of the number of husbands from each specified birthplace who had married Australian-born wives, and also of the number of wives from each specified birthplace who had married Australian-born husbands. Owing to the great preponderance of Australian-born partners in each case, a double column has been given for the Australian-born to obviate the necessity for an excessively high graph.

Another method of presenting this information is that of shewing for each birthplace the number and proportion of cases in which husband and wife were from the same birthplace, *i.e.*, the number and proportion of marriages which from the standpoint of birthplace were unmixed. This information is furnished in detail in the next table :—

Marriages, "Unmixed," in respect of Birthplaces, Commonwealth, 1911.

Birthplace.	Number of Husbands of such Birthplaces residing at time of Census with Wives whose Birthplaces were stated.	Number of Wives of such Birthplaces residing at time of Census with Husbands whose Birthplaces were stated.	Cases in which Husband and Wife residing together at time of Census were from same Birthplaces.		
			Number.	Percentage on total Husbands from such Birthplaces residing with Wives whose Birthplaces were stated.	Percentage on total Wives from such Birthplaces residing with Husbands whose Birthplaces were stated.
AUSTRALASIA—				%	%
Australia	417,808	476,026	377,061	90.25	79.21
New Zealand	6,384	6,492	708	11.09	10.91
EUROPE—					
England	101,886	69,692	39,253	38.53	56.32
Wales	3,657	2,534	753	20.59	29.72
Scotland	25,590	17,381	7,931	30.99	45.63
Ireland	30,789	28,231	13,414	43.57	47.52
Isle of Man	339	149	45	13.27	30.20
Other European British Poss.	694	409	73	10.52	17.85
Austria-Hungary	574	216	134	23.34	62.04
Belgium	84	36	7	8.33	19.44
Denmark	1,975	846	457	23.14	54.02
France	718	344	109	15.18	31.69
Germany	10,671	6,127	3,923	36.76	64.03
Greece	219	50	41	18.72	82.00
Italy	1,316	700	606	46.05	86.57
Netherlands	185	50	21	11.35	42.00
Norway	987	209	82	8.31	39.23
Portugal	81	6	1	1.23	16.67
Russia	1,203	621	446	37.07	71.82
Spain	121	67	32	26.45	47.76
Sweden	1,975	297	151	7.65	50.84
Switzerland	483	205	68	14.08	33.17
Other European Countries	146	71	31	21.23	43.66
ASIA—					
British India	1,064	685	49	4.61	7.15
Ceylon	113	48	3	2.65	6.25
Hong Kong	39	18	2	5.13	11.11
Straits Settlements	47	19	1	2.13	5.26
Other Asiatic British Poss.	19	6	..	..	..
Afghanistan	14	..	..	..	..
Arabia	7	1	..	..	..
China	798	203	181	22.68	89.16
Japan	121	91	72	59.50	79.12
Java	21	13	7	33.33	53.85
Philippine Islands	35	7	1	2.86	14.29
Syria	347	300	265	76.37	88.33
Other Asiatic Countries	26	15	6	23.08	40.00
AFRICA—					
Cape of Good Hope	117	141	3	2.56	2.13
Mauritius	185	101	28	15.14	27.72
Natal	29	39	1	3.45	2.56
Orange Free State	2	3	..	..	..
Transvaal	3	6	..	..	..
South Africa (undefined)	270	325	29	10.74	8.92
Other African British Poss.	17	13	..	..	..
Egypt	21	17	1	4.76	5.88
Other African Countries	41	7	1	2.44	14.29
AMERICA—					
Barbadoes	22	5	1	4.55	20.00
Canada	741	328	45	6.07	13.72
Jamaica	72	24	2	2.78	8.33
Newfoundland	32	13	..	..	..
Other American British Poss.	93	38	2	2.15	5.26
Argentine Republic	7	6	..	..	..
Brazil	26	12	..	..	..
Chile	21	10	..	..	..
Mexico	12	8	1	8.33	12.50
Peru	5	5	..	..	..
United States of America	1,617	985	123	7.61	12.49
Other American Countries	144	59	..	..	..
POLYNESIA—					
Fiji	100	116	2	2.00	1.72
Friendly Islands	21	17	..	..	..
Papua	1	2	..	..	..
Other Polynesian British Poss.	31	8	4	12.90	50.00
New Caledonia	35	54	7	20.00	12.96
New Hebrides	28	11	4	14.29	36.36
Samoa	25	14	5	20.00	35.71
Other Polynesian Islands	22	21	6	27.27	28.57
South Sea Islands (so described)	77	32	26	33.77	81.25
AT SEA	1,202	970	6	.50	.62
ALL BIRTHPLACES	615,555	615,555	446,231	72.49	72.49

Of the 67 birthplaces or birthplace groups dealt with in the above table, there were 14 cases in which no couples were recorded as having both come therefrom. Of the others there were 16 cases in which the number of unmixed marriages recorded amounted to 100 and upwards, and 8 in which they amounted to 500 and upwards. In this latter selection the proportions of males who were parties to unmixed marriages were : Australian, 90.25 per cent. ; Italian, 46.05 per cent. ; Irish, 43.57 per cent. ; English, 38.53 per cent. ; German, 36.76 per cent. ; Scotch, 30.99 per cent. ; Welsh, 20.59 per cent. ; and New Zealand, 11.09 per cent. The corresponding proportions amongst females in the same group of birthplaces were ; Italian, 86.57 per cent. ; Australian, 79.21 per cent. ; German, 64.03 per cent. ; English, 56.32 per cent. ; Irish, 47.52 per cent. ; Scotch, 45.63 per cent. ; Welsh, 29.72 per cent. ; New Zealand, 10.91 per cent.

In the following table are given, for the Commonwealth as a whole, particulars in respect of absenteeism and birthplaces for both husbands and wives :—

Absenteeism and Birthplace, Commonwealth, 1911.

Birthplace.	Husbands of each Birthplace whose Wives were Absent.		Wives of each Birthplace whose Husbands were Absent.	
	Number.	Proportion per cent. of Husbands of each Birthplace.	Number.	Proportion per cent. of Wives of each Birthplace.
AUSTRALASIA—				
Commonwealth of Australia—		%		%
New South Wales	21,945	12.87	29,504	14.79
Victoria	20,050	12.01	26,113	13.79
Queensland	4,492	12.43	7,233	14.84
South Australia	6,858	10.79	8,669	12.22
Western Australia	1,007	15.98	1,484	17.35
Tasmania	4,086	13.54	5,033	15.09
Northern Territory	12	40.00	8	16.33
Australia (undefined)	985	16.17	1,395	17.65
New Zealand	1,193	15.68	1,298	16.57
EUROPE—				
England	20,769	16.84	13,337	15.99
Wales	718	16.34	464	15.43
Scotland	5,443	17.48	3,435	16.44
Ireland	6,285	16.88	7,275	20.40
Isle of Man	72	17.48	28	15.73
Other European British Possessions	174	19.91	81	16.43
Austria-Hungary	549	48.67	36	14.23
Belgium	36	30.00	11	23.40
Denmark	416	17.35	167	16.47
France	273	27.41	94	21.32
Germany	2,049	16.04	1,110	15.28
Greece	270	54.99	15	23.08
Italy	1,096	45.23	121	14.63
Netherlands	67	26.38	11	18.03
Norway	349	25.91	51	19.47
Portugal	14	14.58	2	22.22
Russia	320	20.92	92	12.80
Spain	50	28.90	17	20.24
Sweden	466	18.99	64	17.68
Switzerland	142	22.65	58	21.89
Other European Countries	70	31.96	14	16.47
Asia	8,685	76.53	416	22.71
Africa	192	21.77	178	21.29
America	916	24.58	398	20.93
Polynesia	236	40.83	78	21.97
At Sea	237	16.36	256	20.76
Unspecified	1,607	26.37	1,507	24.64
All Birthplaces	112,129	15.24	110,053	15.00

Of those born in the Australian States the lowest percentages of absenteeism for both husbands and wives occurred in the case of those born in South Australia, being 10.79 per cent. for husbands, and 12.22 per cent. for wives. The highest proportion for the Australian States occurred in the case of those born in Western Australia, the proportions being 15.98 per cent. for husbands, and 17.35 per cent. for wives.

Amongst those born in other countries heavy proportions of absenteeism occurred in the case of husbands born in Asia, 76.53 per cent. ; in Greece, 54.99 per cent. ; in Austria-Hungary, 48.67 per cent. ; in Italy, 45.23 per cent. ; and in Polynesia, 40.83 per cent. Amongst wives there was no case in which the proportion reached 25 per cent., the highest proportion for any birthplace represented by upwards of 1000 wives whose husbands were absent being that of 20.4 per cent. in the case of wives born in Ireland.

4. **Relative Religions of Husbands and Wives.**—Full particulars concerning the relative religions of husbands and wives for the Commonwealth as a whole, and separately for the several States and Territories are given on pp. 1106 and 1107, and on pp. 1120 to 1127 of Volume III. The following table furnishes a summary for the Commonwealth in respect of the denominations and religions most numerously represented :—

Relative Religions of Husbands and Wives, Commonwealth, 1911.

Religions of Husbands.	Religions of Wives—														No. of Husbands		
	Church of England.	Presbyterian.	Methodist.	Baptist.	Congregational.	Lutheran.	Church of Christ.	Salvation Army.	Protestant (undefined).	Roman Catholic.	Catholic (undefined).	Other Christians.	Hebrew.	Others (includ'g Object to State and Unspecified).	Whose Wives were with them.	Whose Wives were Absent.	Total.
Church of England	198,749	10,449	7,438	1,778	1,085	461	700	291	1,230	19,351	2,270	572	193	1,335	245,902	42,233	288,135
Presbyterian ..	12,262	59,837	2,524	723	342	131	231	90	357	4,369	531	217	45	432	82,091	13,243	95,334
Methodist ..	6,131	1,958	68,186	742	270	140	266	206	356	1,521	235	186	12	364	80,573	8,558	89,131
Baptist	1,424	416	720	11,230	144	58	88	42	77	276	41	57	4	105	14,682	1,665	16,347
Congregational ..	1,273	332	404	168	8,813	17	58	18	59	277	35	45	5	62	11,566	1,162	12,728
Lutheran ..	1,558	425	429	114	59	9,099	36	19	91	629	82	33	4	76	12,654	1,874	14,528
Church of Christ ..	320	95	154	57	27	14	4,573	6	22	56	13	35	1	28	5,401	568	5,969
Salvation Army ..	124	52	218	42	6	1	13	3,159	23	26	3	7	..	31	3,705	496	4,201
Protestant (undefined	2,118	567	654	190	125	55	77	34	12,005	1,542	440	66	15	137	18,025	4,911	22,936
Roman Catholic ..	12,688	2,133	1,280	220	159	161	79	27	638	85,187	1,093	70	44	544	104,323	19,766	124,089
Catholic(undefined)	1,620	301	222	41	23	27	14	6	203	1,172	5,444	12	12	80	9,177	1,927	11,104
Other Christians ..	838	208	235	79	62	72	40	15	45	200	23	4,602	1	129	6,549	1,434	7,983
Hebrew	459	66	41	8	9	7	5	1	25	144	27	7	2,210	41	3,050	614	3,664
Others (including Object to State and Unspecified)	6,160	1,627	1,947	540	328	184	300	106	405	3,188	352	341	40	10,504	26,022	13,678	39,700
No. of Wives— Whose Husbands were with them ..	245,724	78,466	84,452	15,932	11,452	10,427	6,480	4,020	15,536	117,938	10,589	6,250	2,586	13,868	623,720	112,129	735,849
No. of Wives— Whose Husbands were Absent ..	45,503	12,803	11,013	2,221	1,392	1,039	938	751	2,684	25,051	2,464	1,098	501	2,595	110,053	..	..
No. of Wives— Total ..	291,227	91,269	95,465	18,153	12,844	11,466	7,418	4,771	18,220	142,989	13,053	7,348	3,087	16,463	733,773	..	..

As would naturally be expected, by far the largest groups shewn in this table are those in which husband and wife were members of the same denomination, *i.e.*, the majority of marriages were " unmixed," and this is more fully indicated in the next table. There are, however, some fairly heavy lists of " mixed" marriages, those most numerously represented being as follows :—

Church of England husbands with Roman Catholic wives, 19,351 ; Roman Catholic husbands with Church of England wives, 12,688 ; Presbyterian husbands with Church of England wives, 12,262; Church of England husbands with Presbyterian wives, 10,449; Church of England husbands with Methodist wives, 7438; Methodist husbands with Church of England wives, 6131.

In each religion and denomination shewn in the above table there were amongst the " mixed" marriages a larger number of husbands who had married wives belonging to the Church of England, and a larger number of wives who had married husbands belonging to the Church of England, than there were of husbands or wives respectively married to members of any other denomination, except in the case of Salvation Army husbands, where Methodist wives predominated amongst mixed marriages.

In the succeeding table are shewn for each religion and denomination the number and proportion of cases in which husband and wife were of the same religious belief, *i.e.*, the number and proportion of marriages which, from the standpoint of religion, were " unmixed":—

Marriages, " Unmixed," in respect of Religion, Commonwealth, 1911.

Religion.	Number of Husbands of such Religion Residing at time of Census with Wives whose Religions were Stated.	Number of Wives of such Religion Residing at time of Census with Husbands whose Religions were Stated.	Cases in which Husband and Wife Residing together at time of Census were of same Religion.		
			Number.	Percentage on total Husbands of such Religion Residing with Wives whose Religions were stated.	Percentage on total Wives of such Religion Residing with Husbands whose Religions were stated.
				%	%
CHRISTIAN—					
Church of England	244,743	241,387	198,749	81.21	82.34
Presbyterian	81,710	77,291	59,837	73.23	77.42
Methodist	80,249	82,932	68,186	84.97	82.22
Baptist	14,584	15,515	11,230	77.00	72.38
Congregational	11,516	11,209	8,813	76.53	78.62
Lutheran	12,585	10,297	9,099	72.30	88 37
Church of Christ	5,376	6,232	4,573	85.06	73.38
Salvation Army	3,678	3,932	3,159	85.89	80.34
Seventh Day Adventist	675	927	603	89.33	65.05
Unitarian	533	279	181	33.96	64.87
Protestant (undefined)	17,898	15,218	12,005	67.07	78.89
Roman Catholic	103,814	115,404	85,187	82.06	73.82
Greek Catholic	272	161	139	51.10	86.34
Catholic (undefined)	9,105	10,298	5,444	59.79	52.86
Others	4,966	4,635	3,652	73.54	78.79
NON-CHRISTIAN—					
Hebrew	3,013	2,564	2,210	73.35	86.19
Confucian	86	60	55	63.95	91.67
Mohammedan	169	62	62	36.69	100.00
Buddhist	92	66	58	71.74	87.88
Pagan	20	5	5	25.00	100.00
Others	263	152	102	38.78	67.11
INDEFINITE—					
Freethinker	712	179	133	18.68	74.30
Agnostic	821	220	189	23.02	85.91
No Denomination	534	315	259	48.50	82.22
Others	1,140	676	489	42.89	72.34
NO RELIGION—					
No Religion	1,837	502	393	21.39	78.29
Atheist	101	18	11	10.89	61.11
Others	51	7	2	39.22	28.57
All Religions	600,543	600,543	474,825	79.07	79.07

Of the 623,720 cases in which husband and wife were enumerated together, there were 23,177 in which one or both of the parties either objected or omitted to state their religious belief, leaving 600,543 cases for which full comparative data in respect of religion were available. Out of these there were 474,825 cases, or 79 per cent., in which the parties professed the same religious belief, leaving 125,718 cases, or 21 per cent., of mixed marriages. There were in all 13 cases in which the number of unmixed marriages exceeded 1000. Amongst these the proportions of males who were parties to such marriages were, in descending order, as follows : Salvation army, 85.89 per cent. ; Church of Christ, 85.06 per cent. ; Methodist, 84.97 per cent. ; Roman Catholic, 82.06 per cent. ; Church of England, 81.21 per cent. ; Baptist, 77 per cent. ; Congregational, 76.53 per cent. ; Other Christians, 73.54 per cent. ; Hebrew, 73.35 per cent. ; Presbyterian, 73.23 per cent. ; Lutheran, 72.30 per cent. ; Protestant (undefined), 67.07 per cent. ; Catholic (undefined), 59.79 per cent. In the case of females the proportions were as follows :—Lutheran, 88.37 per cent. ; Hebrew, 86.19 per cent. ; Church of England, 82.34 per cent. ; Methodist, 82.22 per cent. ; Salvation Army, 80.34 per cent. ; Protestant (undefined), 78.89 per cent. ; other Christians, 78.79 per cent. ; Congregational, 78.62 per cent. ; Presbyterian, 77.42 per cent. ; Roman Catholic, 73.82 per cent. ; Church of Christ, 73.38 per cent. ; Baptist, 72.38 per cent. ; Catholic (undefined), 52.86 per cent.

It appears probable, as already mentioned on p. 200, that the persons enumerated as " Catholic," and tabulated as " Catholic (undefined)" were in the majority of cases members of the Roman Catholic Church. Assuming that all were such members, the figures for unmixed marriages for that church would be 92,896, while the corresponding total for husbands would be 112,919, and for wives 125,702, giving a proportion for husbands who were parties to unmixed marriages of 82.27 per cent., and for wives 73.90 per cent., as against 82.06 per cent. and 73.82 per cent. deduced above.

In the succeeding table particulars are given for both husbands and wives in respect of absenteeism and religion :—

Absenteeism and Religion, Commonwealth, 1911.

Religion.	Husbands of each Religion whose Wives were Absent.		Wives of each Religion whose Husbands were Absent.	
	Number.	Proportion per cent. of Husbands of each Religion.	Number.	Proportion per cent. of Wives of each Religion.
		%		%
CHRISTIAN—				
Church of England	42,233	14.66	45,503	15.62
Presbyterian	13,243	13.89	12,803	14.03
Methodist	8,558	9.60	11,013	11.54
Baptist	1,665	10.19	2,221	12.23
Congregational	1,162	9.13	1,392	10.84
Lutheran	1,874	12.90	1,039	9.06
Church of Christ	568	9.52	938	12.64
Salvation Army	496	11.81	751	15.74
Seventh Day Adventists	106	13.38	246	19.73
Unitarian	106	16.46	50	14.49
Protestant (undefined)	4,911	21.41	2,684	14.73
Roman Catholic	19,766	15.93	25,051	17.52
Greek Catholic	285	50.71	47	22.17
Catholic (undefined)	1,927	17.35	2,464	18.88
Others	937	15.66	755	13.62
NON-CHRISTIAN—				
Hebrew	614	16.76	501	16.23
Confucian	1,604	94.74	8	11.76
Mohammedan	724	80.27	15	19.48
Buddhist	446	81.99	24	26.37
Pagan	500	95.42	4	40.00
Others	1,450	84.11	40	20.30
INDEFINITE—				
Freethinker	343	31.76	58	23.87
Agnostic	281	24.37	32	12.60
No Denomination	116	17.44	46	12.23
Others	357	23.14	171	19.79
NO RELIGION—				
No Religion	879	31.19	103	15.92
Atheist	69	37.91	8	27.59
Others	19	24.05	2	22.22
Object to State	3,767	18.26	1,473	13.68
Unspecified	3,123	50.63	611	21.58
All Religions	112,129	15.24	110,053	15.00

In the case of husbands the lowest proportions of absenteeism were amongst members of the Congregational Church, 9.13 per cent.; the Church of Christ, 9.52 per cent.; and the Methodist Church, 9.60 per cent.; while the highest proportions were amongst "Pagans," 95.42 per cent.; Confucians, 94.74 per cent.; Buddhists, 81.99 per cent.; and Mohammedans, 80.27 per cent.

In the case of wives the lowest proportions of absenteeism were amongst the members of the Lutheran Church, 9.06 per cent.; the Congregational Church, 10.84 per cent.; and the Methodist Church, 11.54 per cent.; whilst the highest proportions amongst those denominations represented by as many as 200 absentees were found in the cases of Seventh Day Adventists, 19.73 per cent.; Catholic (undefined), 18.88 per cent.; and Roman Catholic, 17.52 per cent.

5. **Issue of Husbands.**—As a demographic item expressive of the power of reproduction under given circumstances, statistics relative to issue, whether of husbands or wives, must always be studied in relation to age, and this has been very fully done both in the later sections of the present chapter, and in very great detail in Volume III. of this Report. The frequency statistics of total issue, irrespective of age, are, however, of considerable importance and interest, and those in respect of husbands are as follows for the several States and Territories, as well as for the Commonwealth as a whole :—

Issue of Husbands, 1911.

Total Issue.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
NUMBER OF HUSBANDS.									
0	34,782	26,825	11,474	8,457	7,453	3,587	105	33	92,716
1	40,245	29,191	13,380	9,755	7,908	4,191	134	23	104,827
2	39,250	30,038	13,183	9,470	8,017	4,201	139	28	104,326
3	32,556	26,234	11,103	8,065	6,698	3,751	63	34	88,504
4	26,971	21,637	9,550	6,687	5,431	3,211	41	23	73,551
5	21,499	17,343	7,931	5,380	3,768	2,528	28	31	58,508
6	17,410	13,750	6,659	4,554	2,824	2,180	20	18	47,415
7	14,128	11,003	5,346	3,769	2,020	1,707	6	27	38,006
8	11,531	8,883	4,557	3,214	1,547	1,362	7	20	31,121
9	9,094	7,019	3,633	2,589	1,125	1,246	2	13	24,721
10	7,443	5,517	2,869	2,102	854	970	2	12	19,769
11	5,069	3,681	1,846	1,345	536	684	3	4	13,168
12	3,473	2,610	1,267	1,018	414	524	1	3	9,310
13	2,037	1,530	760	610	205	305	2	3	5,452
14	1,093	841	380	354	108	192	1	1	2,970
15	630	395	208	165	50	109	..	..	1,557
16	333	231	118	89	28	66	..	..	865
17	134	107	56	44	15	29	..	..	385
18	78	67	25	24	11	12	..	..	217
19	43	37	16	13	5	5	..	..	119
20	21	19	6	5	2	7	..	..	60
21 and over	42	30	10	9	8	11	..	..	110
Unspecified	7,566	4,762	2,169	1,384	1,675	592	21	3	18,172
Total	275,428	211,750	96,546	69,102	50,702	31,470	575	276	735,849
PROPORTION PER CENT. OF ALL ISSUES									
0	% 12.98	% 12.96	% 12.16	% 12.49	% 15.20	% 11.62	% 18.95	% 12.09	% 12.92
1	15.02	14.10	14.18	14.41	16.13	13.57	24.19	8.42	14.61
2	14.65	14.51	13.97	13.98	16.35	13.60	25.09	10.26	14.54
3	12.15	12.68	11.76	11.91	13.66	12.15	11.37	12.45	12.33
4	10.07	10.45	10.12	9.88	11.08	10.40	7.40	8.42	10.25
5	8.03	8.38	8.40	7.94	7.69	8.19	5.06	11.35	8.15
6	6.50	6.64	7.06	6.73	5.76	7.06	3.61	6.59	6.61
7	5.27	5.32	5.66	5.57	4.12	5.53	1.08	9.89	5.29
8	4.30	4.29	4.83	4.75	3.16	4.41	1.27	7.33	4.34
9	3.40	3.39	3.85	3.82	2.29	4.04	.36	4.76	3.44
10	2.78	2.67	3.04	3.10	1.74	3.14	.36	4.40	2.75
11	1.89	1.78	1.96	1.99	1.09	2.21	.54	1.47	1.83
12	1.30	1.26	1.34	1.50	.84	1.70	.18	1.10	1.30
13	.76	.74	.80	.90	.42	.99	.36	1.10	.76
14	.41	.41	.40	.52	.22	.62	.18	.37	.41
15	.24	.19	.22	.24	.10	.35	..	..	.22
16	.12	.11	.12	.13	.06	.21	..	..	.12
17	.05	.05	.06	.06	.03	.09	..	..	.05
18	.03	.03	.03	.04	.02	.04	..	..	.03
19	.02	.02	.02	.02	.01	.02	..	..	.02
20	.01	.01	.01	.01	.01	.02	..	..	.01
21 and over	.02	.01	.01	.01	.02	.04	..	..	.02
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

In the case of the Territories the smallness of the figures and the special nature of the circumstances necessarily led to some irregularity in the proportions shewn in the above table. Amongst the States, however, there is marked regularity in the proportions corresponding to the successive total issues. The proportions for any given issue do not, in the case of the States, vary very largely from the corresponding proportion for the Commonwealth, the most marked deviations being in the case of Western Australia, which has a preponderance of instances of issues of 0, 1, 2, 3 and 4 children, and a shortage of issues of 5 and upwards, and in Tasmania, which has a preponderance of issues of 9 and upwards, and exhibits the lowest proportions of any of the States for issues of 0, 1, and 2. It would thus appear that amongst the States, large families are proportionately most numerous in Tasmania, and least numerous in Western Australia. This fact, in respect of Western Australia, is in part, though not entirely, due to the lower average age of the husbands, as may be seen by reference to the table on p. 266.

The proportions of husbands who had issue of less than 5 were as follows :—Western Australia, 72.42 per cent. ; New South Wales, 64.87 per cent. ; Victoria, 64.70 per cent. ; South Australia, 62.67 per cent. ; Queensland, 62.19 per cent. ; and Tasmania, 61.34 per cent. On the other hand, the proportions of husbands who had issue of 10 or more were as follows :—Tasmania, 9.43 per cent. ; South Australia, 8.52 per cent. ; Queensland, 8.01 per cent. ; New South Wales, 7.63 per cent. ; Victoria, 7.28 per cent. ; and Western Australia, 4.56 per cent.

For the Commonwealth as a whole the proportion of husbands who had issue of less than 5 was 64.65 per cent., while the proportion having issue of 10 or upwards was 7.52 per cent.

The figures in the foregoing table relate to total issue of the husbands, and consequently, in the case of husbands who have been married more than once, they include the children of all the marriages. It must also be noted that the issue figures dealt with at the Census were not restricted to relate to issue living at the date of the Census, but comprise all children born alive, whether they had survived or not.

6. **Issue of Wives.**—In the next table are given, according to the States and Territories of enumeration, the number and proportion of wives for each degree of total issue. As in the case of husbands in section 5, the figures relate to total issue, and not merely to the issue of the marriage in existence at the date of the Census.

Issue of Wives, 1911.

Total Issue.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
				NUMBER OF WIVES.					
0	33,277	26,879	10,448	8,478	6,302	3,610	46	24	89,064
1	40,742	30,231	12,825	9,894	7,000	4,274	37	16	105,019
2	39,676	30,865	12,645	9,610	7,133	4,268	30	26	104,253
3	33,102	26,872	11,047	8,243	6,139	3,792	28	33	89,256
4	27,333	22,142	9,490	6,756	5,048	3,233	20	22	74,044
5	21,810	17,758	7,949	5,391	3,493	2,533	17	25	58,976
6	17,740	14,116	6,768	4,549	2,719	2,189	11	11	48,103
7	14,424	11,323	5,427	3,784	1,934	1,674	5	23	38,594
8	11,754	9,066	4,669	3,184	1,506	1,366	2	18	31,565
9	9,484	7,276	3,669	2,580	1,118	1,221	1	13	25,362
10	7,677	5,706	2,942	2,073	843	975	1	12	20,229
11	5,253	3,803	1,870	1,331	522	692	3	4	13,478
12	3,567	2,623	1,252	952	395	538	1	1	9,329
13	2,068	1,475	737	570	206	300	1	1	5,358
14	1,007	764	366	322	99	183	1	1	2,743
15	550	352	187	139	56	96	..	..	1,380
16	276	164	94	65	22	53	..	..	674
17	102	70	42	23	11	23	..	..	271
18	51	33	17	13	6	10	..	..	130
19	25	7	9	5	3	..	..	..	49
20	12	8	1	2	1	3	..	..	27
21 and over ..	20	13	6	3	3	4	..	..	49
Unspecified ..	6,266	4,919	1,454	1,418	1,221	536	3	3	15,820
Total	276,216	216,465	93,914	69,385	45,780	31,573	207	233	733,773

Issue of Wives, 1911—*continued.*

Total Issue.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
	PROPORTION PER CENT. OF ALL ISSUES.								
	%	%	%	%	%	%	%	%	%
0	12.33	12.70	11.30	12.47	14.14	11.63	22.55	10.44	12.40
1	15.09	14.29	13.87	14.56	15.71	13.77	18.14	6.96	14.63
2	14.70	14.59	13.68	14.14	16.01	13.75	14.71	11.30	14.52
3	12.26	12.70	11.95	12.13	13.78	12.22	13.73	14.35	12.43
4	10.13	10.47	10.26	9.94	11.33	10.42	9.80	9.57	10.31
5	8.08	8.39	8.60	7.93	7.84	8.16	8.33	10.87	8.21
6	6.57	6.67	7.32	6.69	6.10	7.05	5.39	4.78	6.70
7	5.34	5.35	5.87	5.57	4.34	5.40	2.45	10.00	5.38
8	4.35	4.29	5.05	4.69	3.38	4.40	.98	7.83	4.40
9	3.51	3.44	3.97	3.80	2.51	3.94	.49	5.65	3.53
10	2.84	2.70	3.18	3.05	1.89	3.14	.49	5.22	2.82
11	1.95	1.80	2.02	1.96	1.17	2.23	1.47	1.74	1.88
12	1.32	1.24	1.35	1.40	.89	1.73	.49	.43	1.30
13	.77	.70	.80	.84	.46	.97	.49	.43	.75
14	.37	.36	.39	.47	.22	.59	.49	.43	.38
15	.20	.17	.20	.20	.13	.31	..	..	.19
16	.10	.08	.10	.10	.05	.17	..	..	.09
17	.04	.03	.05	.03	.02	.07	..	..	.04
18	.02	.02	.02	.02	.01	.03	..	..	.02
19	.01	..	.01	.01	.01	..	..	..	.01
20	.01	..	..	..	..	.01	..	..	..
21 and over ..	.01	.01	.01	..	.01	.01	..	..	.01
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

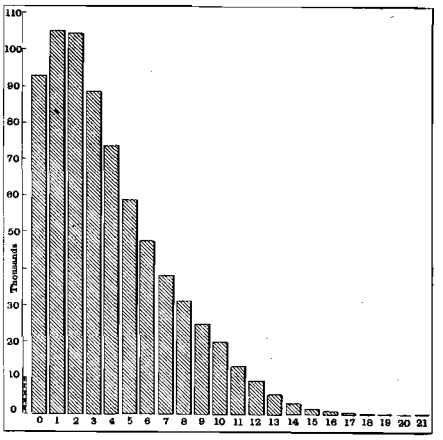
As in the case of husbands in section 5, the Western Australian proportions for issues under 5 are higher than for any other State, and those for issues of 5 and upwards are lower than for any other State. The records for low proportions for issues under 5 and for high proportions for issues of 5 and upwards are shared between Tasmania and Queensland.

The proportions of wives who had issue of less than 5, were as follows :—Western Australia, 70.97 per cent. ; Victoria, 64.75 per cent. ; New South Wales, 64.51 per cent. ; South Australia, 63.24 per cent. ; Tasmania, 61.79 per cent. ; and Queensland, 61.06 per cent. The similar proportions for those who had issue of 10 or more were as follows :—Tasmania, 9.26 per cent. ; Queensland, 8.13 per cent. ; South Australia, 8.08 per cent. ; New South Wales, 7.64 per cent. ; Victoria, 7.11 per cent. ; and Western Australia, 4.86 per cent.

For the Commonwealth as a whole the proportion of wives who had issue of less than 5 was 64.29 per cent., while the proportion having issue of 10 or upwards was 7.49 per cent.

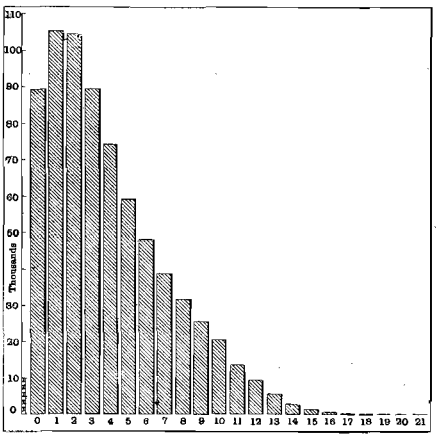
Total Issue of Husbands and Wives, Commonwealth, 1911.

(*a*) HUSBANDS.



GRAPH No. 100.

(*b*) WIVES.



GRAPH No. 101.

The accompanying graphs (Nos. 100 and 101) represent the numbers of cases in which the husbands and wives respectively had had, as issue, children to the number indicated on the base line. The numbers represented relate to total issue in each case, and not merely to the issue of the marriage in existence at the date of the Census. They also relate to total number born alive irrespective of whether they had survived to the date of the Census or not.

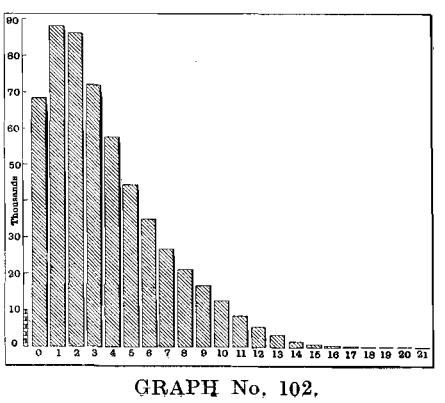
7. **Birthplace and Issue of Wives.**—The succeeding table furnishes for a summarised classification of birthplaces, the number and proportion of wives for each degree of total issue. It will be seen that Australia and the United Kingdom as birthplaces account for more than 95½ per cent. of the wives :—

Birthplaces and Issue of Wives, Commonwealth, 1911.

Total Issue.	Wives Born in—									Birthplace Unspecified.	All Birthplaces.
	Australia.	New Zealand.	United Kingdom.	Rest of Europe.	Asia.	Africa.	America.	Polynesia.	At Sea.		
NUMBER OF WIVES.											
0	68,242	1,300	16,666	1,232	266	119	341	47	120	731	89,064
1	87,969	1,411	13,156	1,027	215	125	248	62	108	698	105,019
2	85,907	1,340	14,440	1,093	203	141	238	56	122	713	104,253
3	71,719	1,060	14,096	1,099	207	106	211	36	124	598	89,256
4	57,463	776	13,537	1,108	208	72	182	33	97	568	74,044
5	44,188	534	12,242	1,046	189	75	132	34	81	455	58,976
6	34,557	423	11,264	1,071	125	35	108	19	109	392	48,103
7	26,643	264	10,126	905	128	31	92	17	93	295	38,594
8	21,119	171	8,837	876	78	30	82	8	85	279	31,565
9	16,512	142	7,456	802	47	25	63	5	77	233	25,362
10	12,569	95	6,593	639	38	17	36	8	66	168	20,229
11	8,454	42	4,282	456	30	11	49	3	47	104	13,478
12	5,670	33	3,110	352	13	6	21	2	36	86	9,329
13	3,225	23	1,813	197	13	5	13	2	22	45	5,358
14	1,647	9	915	113	7	4	4	1	17	26	2,743
15	820	5	463	64	2	2	3	..	9	12	1,380
16	392	1	230	35	3	1	2	1	3	6	674
17	159	3	96	6	..	..	..	..	..	7	271
18	67	1	51	9	..	..	1	..	..	1	130
19	24	..	25	..	..	..	..	..	..	..	49
20	13	1	10	2	1	..	..	..	..	..	27
21 and over ..	22	1	20	3	1	..	..	..	..	2	49
Not stated ..	10,873	198	3,553	296	58	31	76	21	17	697	15,820
Total ..	558,254	7,833	142,981	12,431	1,832	836	1,902	355	1,233	6,116	733,773
PROPORTION PER CENT.											
	%	%	%	%	%	%	%	%	%	%	%
0	12.47	17.03	11.95	10.15	14.99	14.78	18.68	14.07	9.87	13.49	12.40
1	16.07	18.48	9.43	8.46	12.12	15.53	13.58	18.56	8.88	12.88	14.63
2	15.69	17.55	10.36	9.01	11.44	17.51	13.03	16.77	10.03	13.16	14.52
3	13.10	13.88	10.11	9.06	11.67	13.17	11.56	10.78	10.20	11.03	12.43
4	10.50	10.16	9.71	9.13	11.73	8.94	9.97	9.88	7.98	10.48	10.31
5	8.07	7.00	8.78	8.62	10.65	9.32	7.23	10.18	6.66	8.40	8.21
6	6.31	5.54	8.08	8.82	7.05	4.35	5.92	5.69	8.96	7.23	6.70
7	4.87	3.46	7.26	7.46	7.22	3.85	5.04	5.09	7.65	5.44	5.38
8	3.86	2.24	6.34	7.22	4.40	3.73	4.49	2.39	6.99	5.15	4.40
9	3.02	1.86	5.35	6.61	2.65	3.11	3.45	1.50	6.33	4.30	3.53
10	2.30	1.25	4.73	5.27	2.14	2.11	1.97	2.39	5.43	3.10	2.82
11	1.55	.55	3.07	3.76	1.69	1.37	2.68	.90	3.86	1.92	1.88
12	1.04	.43	2.23	2.90	.73	.74	1.15	.60	2.96	1.59	1.30
13	.59	.30	1.30	1.62	.73	.62	.71	.60	1.81	.83	.75
14	.30	.12	.66	.93	.39	.50	.22	.30	1.40	.48	.38
15	.15	.07	.33	.53	.11	.25	.16	..	.74	.22	.19
16	.07	.01	.16	.29	.17	.12	.11	.30	.25	.11	.09
17	.03	.04	.07	.05	..	..	..	..	..	.13	.04
18	.01	.01	.04	.07	..	..	.05	..	..	.02	.02
19	..	..	.02	..	..	..	..	..	..	..	.01
20	..	.01	.01	.02	.06	..	..	..	..	..	..
21 and over ..	..	.01	.01	.02	.06	..	..	..	..	.04	.01
Total ..	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

As between Australia and the United Kingdom as birthplaces, there is a marked excess in the case of Australia in the proportion of cases of total issue below 5, and an equally marked deficit in the proportion of cases of total issue of 5 and upwards. In fact, no less than 67.83 per cent. of the Australian-born wives had a total issue of less than 5, as compared with only 51.56 per cent. of the wives born in the United Kingdom who had a smaller total issue than 5. As will be shewn later, however (see p. 282 hereinafter) this result is entirely due to difference in age distribution, and when the data are classified according to age, the Australian-born women exhibit higher average issues at practically all ages than those born in the United Kingdom.

Total Issue of Australian-born Wives. Commonwealth, 1911.



GRAPH No. 102.

Graph No. 102 furnishes in respect of Australian born wives the same information as was furnished in Graph No. 101 in respect of wives of all birthplaces. As before, the figures on the base line indicate the total live born issue from all marriages, irrespective of whether the children so born were living or dead at the date of the Census.

8. **Religion and Issue of Wives.**—In the next table are given for each degree of total issue the number and proportion of wives for the principal religions and denominations :—

Religion and Issue of Wives, Commonwealth, 1911.

Total Issue.	Wives whose Religion or Denomination was—														All Religions.
	Church of England.	Presbyterian.	Methodist.	Baptist.	Congregational.	Lutheran.	Church of Christ.	Salvation Army.	Protestant (undefined).	Roman Catholic.	Catholic (undefined).	Other Christians.	Hebrew.	Others(incl'ding Object. to State and Unspecified.)	
NUMBER OF WIVES.															
0	35,718	11,498	10,220	2,205	1,522	1,086	873	508	2,464	17,540	1,623	944	443	2,420	89,064
1	44,128	13,195	12,929	2,482	1,793	1,256	1,073	555	2,826	18,792	1,940	904	500	2,646	105,019
2	43,497	13,220	13,347	2,554	1,996	1,275	1,048	561	2,638	18,404	1,765	910	505	2,533	104,253
3	36,224	11,499	11,971	2,260	1,729	1,176	916	554	2,157	15,965	1,632	856	401	1,916	89,256
4	28,964	9,491	10,136	1,927	1,345	1,103	730	468	1,819	14,100	1,286	773	327	1,575	74,044
5	22,746	7,383	8,075	1,530	1,085	970	632	395	1,314	11,796	1,031	609	212	1,198	58,976
6	17,819	5,957	6,670	1,206	910	891	508	361	1,094	10,150	849	534	186	968	48,103
7	14,436	4,652	5,188	1,018	659	741	368	292	839	8,442	690	431	136	702	38,594
8	11,587	3,831	4,375	776	529	720	324	260	733	6,924	516	357	84	549	31,565
9	9,263	2,964	3,561	600	399	630	252	221	593	5,651	441	285	75	427	25,362
10	7,622	2,282	2,887	500	291	496	199	181	456	4,359	331	223	53	349	20,229
11	5,096	1,570	1,847	302	175	325	159	134	287	2,959	199	162	28	235	13,478
12	3,565	936	1,300	253	127	292	108	93	226	1,981	141	124	23	160	9,329
13	2,109	541	760	134	63	150	46	59	121	1,135	90	58	10	82	5,358
14	1,069	254	403	69	34	85	27	26	75	568	57	33	3	40	2,743
15	549	125	181	27	19	45	13	12	39	295	22	21	5	27	1,380
16	260	67	94	13	11	21	5	9	16	136	17	6	6	13	674
17	116	25	34	6	3	3	1	3	5	58	7	4	2	4	271
18	50	12	18	2	3	5	..	2	5	22	..	4	3	4	130
19	22	4	8	3	..	..	..	..	1	9	1	..	1	..	49
20	7	..	2	1	..	1	..	..	1	11	1	2	..	1	27
21 & over	22	3	4	..	..	..	..	..	1	16	..	..	1	2	49
Not stat'd	6,358	1,760	1,455	285	151	195	136	77	510	3,676	414	108	83	612	15,820
Total	291,227	91,269	95,465	18,153	12,844	11,466	7,418	4,771	18,220	142,989	13,053	7,348	3,087	16,463	733,773
PROPORTION PER CENT. OF ALL ISSUES.															
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
0	12.54	12.85	10.87	12.34	11.99	9.64	11.99	10.82	13.91	12.59	12.84	13.04	14.75	15.27	12.40
1	15.49	14.74	13.75	13.89	14.13	11.14	14.74	11.82	15.96	13.49	15.35	12.49	16.64	16.69	14.63
2	15.27	14.77	14.20	14.29	15.72	11.31	14.39	11.95	14.89	13.21	13.96	12.57	16.81	15.98	14.52
3	12.72	12.85	12.73	12.65	13.62	10.43	12.58	11.80	12.18	11.46	12.91	11.82	13.35	12.09	12.43
4	10.17	10.60	10.78	10.78	10.60	9.79	10.03	9.97	10.27	10.12	10.18	10.68	10.88	9.93	10.31
5	7.98	8.25	8.59	8.56	8.55	8.61	8.68	8.42	7.42	8.47	8.16	8.41	7.06	7.56	8.21
6	6.25	6.65	7.10	6.75	7.17	7.91	6.98	7.69	6.18	7.28	6.72	7.37	6.19	6.11	6.70
7	5.07	5.20	5.52	5.70	5.19	6.57	5.05	6.22	4.74	6.06	5.46	5.95	4.53	4.43	5.38
8	4.07	4.28	4.65	4.34	4.17	6.39	4.45	5.54	4.14	4.97	4.08	4.93	2.80	3.46	4.40
9	3.25	3.31	3.79	3.36	3.14	5.59	3.46	4.71	3.35	4.06	3.49	3.94	2.50	2.69	3.53
10	2.68	2.55	3.07	2.80	2.29	4.40	2.73	3.86	2.57	3.13	2.62	3.08	1.76	2.20	2.82
11	1.79	1.75	1.97	1.69	1.38	2.88	2.18	2.86	1.62	2.12	1.57	2.24	.93	1.48	1.88
12	1.25	1.05	1.38	1.42	1.00	2.59	1.48	1.98	1.27	1.42	1.12	1.71	.77	1.01	1.30
13	.74	.60	.81	.75	.50	1.33	.63	1.26	.68	.81	.71	.80	.33	.52	.75
14	.37	.28	.43	.39	.27	.75	.37	.55	.42	.41	.45	.46	.10	.25	.38
15	.19	.14	.19	.15	.15	.40	.18	.26	.22	.21	.17	.29	.17	.17	.19
16	.09	.08	.10	.07	.09	.19	.07	.19	.09	.10	.13	.08	.20	.08	.09
17	.04	.03	.04	.03	.02	.03	.01	.06	.03	.04	.06	.06	.07	.03	.04
18	.02	.01	.02	.01	.02	.04	..	.04	.03	.02	..	.06	.10	.03	.02
19	.01	.01	.01	.02	..	..	..	..	.01	.01	.01	..	.03	..	.01
20	..	..	..	.01	..	.01	..	..	.01	.01	.01	.02	..	.01	..
21 & over	.01	..	..	..	..	..	..	..	.01	.01	..	..	.03	.01	.01
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

A feature of this table is the large proportion of Lutheran wives having a total issue of 5 and upwards, and the small proportion of Hebrew wives having such a total. Thus, while no less than 47.69 per cent. of the Lutheran wives had a total issue of 5 and upwards, only 27.57 per cent. of the Hebrew wives were so represented. The same relative positions are also disclosed when the data are analysed according to age. Of the four denominations most largely represented, the Roman Catholic wives, with 39.13 per cent., furnished the largest proportion of cases of total issue of 5 or upwards. The corresponding proportion for Methodist wives was 37.67 per cent., for Presbyterian wives 34.19 per cent., and for Church of England wives 33.81 per cent.

9. **Duration of Marriage and Issue of Wives.**—Particulars concerning the number and proportion of wives of each degree of total issue of existing marriage are furnished in the following table, classified according to the duration of such marriage :—

Duration of Marriage and Issue of Wives, Commonwealth, 1911.

Total Issue of Existing Marriage	Wives whose Duration of Existing Marriage was—											All Durations.
	Under 5 years.	5–9 years.	10–14 years.	15–19 years.	20–24 years.	25–29 years.	30–34 years.	35–39 years.	40–44 years.	45 years & over.	Not specified.	
NUMBER OF WIVES.												
0 ..	51,446	16,413	11,230	6,729	5,183	3,574	2,074	1,338	743	681	2,513	101,924
1 ..	57,692	20,016	10,586	6,214	4,560	2,686	1,438	855	424	412	2,309	107,192
2 ..	26,444	35,042	16,090	9,234	6,830	3,834	1,879	1,009	548	426	2,531	103,867
3 ..	4,088	32,787	18,972	10,806	8,839	5,404	2,504	1,347	666	575	2,349	88,337
4 ..	325	16,963	18,742	11,311	9,729	6,584	3,279	1,817	845	764	2,132	72,491
5 ..	16	5,393	15,551	10,107	9,239	7,017	3,889	2,143	1,103	1,052	1,925	57,435
6 ..	..	1,225	9,531	9,064	8,377	7,012	4,155	2,414	1,408	1,306	1,643	46,135
7 ..	..	237	4,369	7,054	7,106	6,353	4,397	2,677	1,618	1,644	1,367	36,822
8 ..	..	60	1,561	4,706	5,765	5,565	4,309	3,010	1,740	1,975	1,166	29,857
9 ..	..	5	494	2,598	4,559	4,598	3,963	2,831	1,811	2,109	967	23,935
10 ..	..	1	120	1,199	3,124	3,568	3,345	2,566	1,848	2,389	787	18,947
11 ..	..	..	43	499	1,627	2,379	2,283	1,919	1,432	1,840	543	12,565
12 ..	..	..	7	189	883	1,464	1,518	1,508	1,066	1,580	443	8,658
13 ..	..	..	4	67	413	817	887	842	667	975	259	4,931
14 ..	..	..	..	20	172	407	460	462	354	541	112	2,528
15 ..	..	..	..	6	79	194	218	219	198	289	56	1,259
16 ..	..	..	..	1	27	109	101	119	98	140	22	617
17 ..	..	..	..	..	7	34	45	45	40	59	15	245
18 ..	..	..	..	..	4	12	20	20	16	30	5	107
19 ..	..	..	..	..	..	2	4	16	3	16	2	43
20 ..	..	..	..	..	1	4	3	6	1	1	1	17
21 & over	..	..	..	..	..	4	4	9	6	14	4	41
Not stated	3,018	2,609	1,864	1,232	1,087	847	531	394	207	284	3,747	15,820
Total	143,029	130,751	109,164	81,036	77,611	62,468	41,306	27,566	16,842	19,102	24,898	733,773
PROPORTION PER CENT. OF ALL ISSUES.												
	%	%	%	%	%	%	%	%	%	%	%	%
0 ..	36.74	12.81	10.47	8.43	6.77	5.80	5.09	4.92	4.46	3.62	11.88	14.20
1 ..	41.21	15.62	9.87	7.79	5.96	4.36	3.53	3.15	2.55	2.19	10.92	14.93
2 ..	18.89	27.35	15.00	11.57	8.93	6.22	4.61	3.71	3.29	2.26	11.97	14.47
3 ..	2.92	25.59	17.68	13.54	11.55	8.77	6.14	4.96	4.00	3.06	11.11	12.30
4 ..	.23	13.24	17.47	14.17	12.71	10.68	8.04	6.69	5.08	4.06	10.08	10.10
5 ..	.01	4.21	14.49	12.66	12.07	11.39	9.54	7.89	6.63	5.59	9.10	8.00
6 ..	..	.95	8.88	11.36	10.95	11.38	10.19	8.88	8.46	6.94	7.77	6.42
7 ..	..	.18	4.07	8.84	9.29	10.31	10.78	9.85	9.72	8.74	6.46	5.13
8 ..	..	.05	1.45	5.90	7.53	9.03	10.57	11.08	10.46	10.49	5.51	4.16
9 ..	..	..	.46	3.26	5.96	7.46	9.72	10.42	10.89	11.21	4.57	3.33
10 ..	..	..	.11	1.50	4.08	5.79	8.20	9.44	11.11	12.69	3.72	2.64
11 ..	..	..	.04	.63	2.13	3.86	5.60	7.06	8.61	9.78	2.57	1.75
12 ..	..	..	.01	.24	1.15	2.38	3.72	5.55	6.41	8.40	2.09	1.21
13 ..	..	..	..	.08	.54	1.33	2.17	3.10	4.01	5.18	1.23	.69
14 ..	..	..	..	.02	.22	.66	1.13	1.70	2.13	2.87	.53	.35
15 ..	..	..	..	.01	.10	.31	.53	.81	1.19	1.54	.27	.17
16 ..	..	..	..	..	.04	.18	.25	.44	.59	.74	.10	.09
17 ..	..	..	..	..	.01	.05	.11	.17	.24	.31	.07	.03
18 ..	..	..	..	..	.01	.02	.05	.07	.10	.16	.02	.01
19 ..	..	..	..	..	..	..	.01	.06	.02	.09	.01	.01
20 ..	..	..	..	..	..	.01	.01	.02	.01	.01	..	..
21 & over	..	..	..	..	..	.01	.01	.03	.04	.07	.02	.01
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

As the figures contained in this table relate solely to the issue of existing marriages, they necessarily represent a smaller aggregate issue than is represented by those contained in earlier tables in this chapter. An interesting feature of this table is the varying position of the point of maximum frequency in the different periods of duration. Thus for duration " under 5 years" it is at issue 1 ; for 5-9, at 2 ; for 10-14, at 3 ; for 15-19 and for 20-24, at 4 ; for 25-29, at 5 ; for 30-34, at 7 ; for 35-39, at 8 ; for 40-44, and also for 45 and over, at 10. There were in all 17 cases of a total issue of 20 for a single marriage, and no fewer than 41 cases of issue of 21 or over.

It may be noted that more than 50 per cent. of the cases in which there was no issue, were marriages of less than 5 years' duration, and that amongst the marriages of 15 years' duration and upwards in only $6\frac{1}{3}$ per cent. of the cases was there no issue, while in marriages having a duration of 45 years or over the proportion of cases of no issue was less than $3\frac{2}{3}$ per cent.

10. **Age and Average Issue.**—In the following table are given the average issues of husbands of various ages enumerated in the several States and Territories of the Commonwealth at the Census of 1911 :—

Age and Average Issue of Husbands, 1911.

Ages of Husbands.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
Under 14	..	..	..	..	..	..	..	..	..
14	.00	.00	..	..	..	..	..	..	.00
15	.00	..	.00	.33	..	.00	..	..	.13
16	.56	.25	.17	.00	.00	.00	..	..	.28
17	.48	.33	.75	.33	.13	.20	..	..	.39
18	.52	.60	.62	.50	.36	.38	..	..	.53
19	.61	.60	.50	.60	.30	.75	.00	..	.59
20	.70	.72	.77	.66	.69	.89	..	..	.72
21–24	.96	.94	.91	.90	.85	1.03	.63	2.00	.94
25–29	1.50	1.44	1.44	1.39	1.40	1.69	.90	1.29	1.47
30–34	2.24	2.15	2.26	2.16	2.09	2.53	1.64	2.16	2.21
35–39	3.05	2.87	3.21	3.08	2.80	3.28	1.75	3.41	3.01
40–44	3.85	3.67	4.13	3.88	3.45	4.13	2.39	3.93	3.81
45–49	4.66	4.43	5.00	4.75	4.02	5.02	2.62	5.08	4.61
50–54	5.34	5.09	5.66	5.60	4.64	5.83	2.08	6.42	5.30
55–59	6.03	5.73	6.21	6.32	5.33	6.43	2.42	6.55	5.98
60–64	6.55	6.41	6.54	6.77	6.10	6.49	3.04	4.50	6.50
65–69	7.14	6.73	6.84	7.08	6.67	6 99	3.50	7.13	6.95
70–74	7.27	6.99	7.11	7.31	7.14	7 61	3.10	7.00	7.16
75–79	7.65	7.16	7.03	7.68	7.60	7.71	1.50	5.50	7.39
80–84	7.69	7.42	7.06	8.14	7.70	7.35	6.00	12.00	7.55
85–89	7.65	7.21	6.82	7.89	9.65	7.60	..	4.00	7.45
90 and over ..	8.02	6.83	8.17	7.39	6.60	8.20	..	..	7.38
All Ages ..	3.90	3.90	4.07	4.07	3.34	4.23	2.25	4.60	3.91

In this and succeeding tables relating to average issue, the expression .00 is used in cases where there were husbands or wives in a particular category, but no issue. Where blanks occur there were no husbands or wives. As indicated in section 5 above, age particulars are requisite for any complete study of the question of issues. A good example of this necessity is furnished by the above table, in which the average issue per husband is, for all ages combined, the same for New South Wales as for Victoria, viz., 3.90. When, however, the averages for successive age-groups are taken, it is seen that, with the unimportant exceptions of ages 18 and 20, the averages in the case of New South Wales are throughout markedly higher than in the case of Victoria. Similarly, it will be seen on comparing the particulars for New South Wales and the Commonwealth as a whole, that although the averages for New South Wales slightly exceed those for the Commonwealth at all points except at the unimportant ages of 15, 18 and 20, the Commonwealth average for all ages, viz., 3.91, is slightly higher than that for New South Wales. These apparent anomalies are entirely due to the different age distribution of the several populations. An increase in the proportion of husbands at advanced ages has the effect of increasing the average for all ages combined, while an increase in the proportion at the younger ages has the opposite effect.

The variation of average issue with age is very regular in all the States, and the average issue for any age varies within fairly narrow limits amongst the several States. Thus, in the case of the age-group 30-34, there is a minimum of 2.09 in Western Australia, a maximum of 2.53 in Tasmania, and a Commonwealth average of 2.21. Similarly, for age-group 75-79, there is a minimum of 7.03 in Queensland, a maximum of 7.71 in Tasmania, and a Commonwealth average of 7.39.

Above age 75 the averages fluctuate somewhat, and in the case of the Commonwealth as a whole suggest a maximum for the group 80-84. The numbers involved above age 75 are, however, so small, and the variations are relatively so slight, that the utmost that can be said with certainty is that for age 75 and upwards the total issue is approximately constant. This suggests an age slightly above 75, say 77, as the point of senile sterility. Such a conclusion is, however, not entirely warranted by the facts, since a continued diminution, during a series of years, in the average issue of males who had reached the limits of fertility would produce a series progressing with age without furnishing any indication of the point at which such limits were attained. Further, if there existed a tendency for the more fertile husbands to enjoy a longer life than the less fertile, the same result of an average issue increasing with age would be produced. On the other hand, if there were a tendency for the less fertile to be the longer lived, the effect produced would be a diminution with age after a certain point. The full significance of this comment will be more readily seen by a reference to the next table, which gives the average issue of wives of various ages enumerated in the several States and Territories of the Commonwealth at the Census of 1911 :—

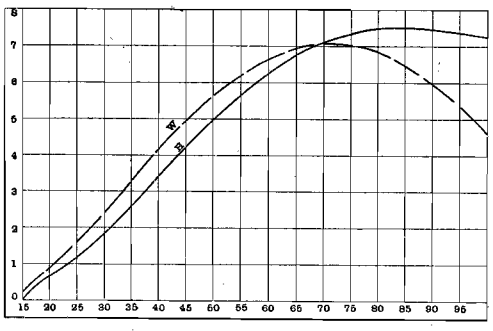
Age and Average Issue of Wives, 1911.

Ages of Wives.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
Under 14	..	..	.00	..	..	..	..	..	.00
14	.17	.33	.67	.00	..	.00	..	..	.28
15	.29	.25	.11	.00	1.00	.80	..	..	.27
16	.46	.43	.51	.61	.81	.60	.00	..	.50
17	.64	.50	.55	.49	.58	.63	.00	..	.58
18	.68	.69	.66	.68	.72	.75	1.67	..	.68
19	.80	.84	.84	.79	.82	.90	1.40	1.00	.82
20	.97	.91	.98	.87	.90	1.05	2.00	1.00	.95
21–24	1.33	1.26	1.34	1.19	1.36	1.48	1.73	1.56	1.31
25–29	2.02	1.89	2.08	1.84	2.03	2.32	2.06	2.25	1.99
30–34	2.87	2.70	3.12	2.76	2.74	3.18	2.14	2.69	2.85
35–39	3.80	3.53	4.19	3.74	3.48	4.00	2.48	4.30	3.75
40–44	4.65	4.33	5.16	4.53	4.10	4.91	4.07	5.75	4.57
45–49	5.38	4.93	5.85	5.32	4.63	5.67	3.75	5.26	5.25
50–54	6.06	5.56	6.40	6.10	5.46	6.11	3.80	6.74	5.92
55–59	6.51	6.24	6.72	6.52	6.08	6.64	2.83	6.63	6.44
60–64	6.90	6.61	6.65	6.76	6.59	6.69	4.67	9.38	6.75
65–69	7.28	6.79	6.74	7.14	6.99	7.15	4.00	7.56	7.03
70–74	7.25	6.86	6.66	7.19	7.00	7.22	6.00	6.14	7.02
75–79	7.13	6.89	6.25	7.28	7.24	7.48	..	..	6.98
80–84	6.79	6.55	5.75	6.94	6.20	6.72	..	..	6.60
85–89	6.99	6.22	5.35	6.13	7.67	6.94	..	..	6.44
90 and over ..	5.35	5.43	4.75	4.50	1.00	8.33	..	..	5.35
All Ages	3.92	3.89	4.15	4.02	3.45	4.18	2.72	4.66	3.93

In this case it will be seen that there is a well-defined maximum point at or about age 70. The decline from this point suggests, as an explanation, that the mothers of large families are not the longest livers, but the fact that the average issue increases with age to age 70, can evidently not be taken as implying that the limit of fertility is only reached at 70. Probably the age limit for fertility in women is in the neighbourhood of 55, and, consequently, the increase in averages from that age to 70 must be due either to a continued diminution in the average issue of wives reaching the limits of fertility or to a higher death rate amongst those having small families. In view of what has been already said above in respect of ages over 70 the latter explanation seems untenable, and it appears that the progression of the averages beyond the limits of fertility is due in large measure to a continued decline, as time goes on, in the size of the family. A measure of this decline can only be furnished by another Census investigation of the same nature as the present.

While the highest and lowest averages for wives for any age fluctuate from State to State more than is the case with the corresponding data for husbands, there is throughout a general tendency for the averages in the case of Western Australia to be low and for those relating to Tasmania to rank high. In general, the averages for Tasmania and New South Wales are above those for the Commonwealth, while the averages for Western Australia and Victoria are below. Queensland and South Australian averages fluctuate, being sometimes above and sometimes below the Commonwealth average.

Age and Average Issue of Husbands and Wives. Commonwealth, 1911.



GRAPH No. 103.

In Graph No. 103 a representation is furnished of the average issue of husbands and wives of each age. The figures on the base line denote ages at quinquennial intervals, those on the left margin denote average issue. The continuous line marked H, represents the average issue of husbands, while the broken line marked W represents the average issue of wives.

11. **Birthplace and Average Issue of Wives.**—In the succeeding table are given the average issues of wives of different birthplaces, enumerated in the several States and Territories of the Commonwealth at the Census of 1911. The figures contained in this table require to be taken with care, since, as before stated, relative fertility can only be studied thoroughly when particulars are given in respect of age. Such particulars are furnished in full detail for States, Territories and the Commonwealth, on pp. 1160 to 1183 of Volume III., and in a summary form on p. 282, hereinafter, for the Commonwealth as a whole.

The figures given in this and other tables of aggregate results not analysed according to age indicate the past experience in respect of the categories involved, but give no indication of the potentialities.

Birthplace and Average Issue of Wives, 1911.

Birthplace.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
AUSTRALASIA—									
New South Wales	3.80	3.59	4.10	2.98	3.12	3.20	1.91	4.44	3.79
Victoria	3.75	3.59	3.92	3.34	2.97	3.47	3.29	5.40	3.56
Queensland ..	3.19	2.95	3.28	2.93	2.86	2.99	2.59	4.00	3.26
South Australia ..	3.68	4.30	3.85	3.70	3.25	3.50	2.69	6.00	3.72
Western Australia	4.06	3.90	3.59	4.31	4.15	3.61	3.00	..	4.14
Tasmania	3.59	3.91	4.02	3.61	3.37	4.18	4.25	..	4.07
Northern Territory	..	4.00	4.29	3.45	6.00	..	1.90	..	3.11
Commonwealth ..	3.77	3.63	3.44	3.67	3.34	4.09	2.50	4.45	3.68
New Zealand ..	2.93	3.00	2.92	3.14	2.72	3.21	.00	..	2.95
Australasia ..	3.76	3.62	3.44	3.67	3.32	4.08	2.48	4.45	3.67
EUROPE—									
England	4.43	4.93	4.76	5.44	3.80	4.69	3.29	4.14	4.66
Wales	4.82	5.38	4.87	6.12	4.12	5.50	.50	..	4.98
Scotland	4.65	5.29	4.88	5.45	3.84	5.31	1.00	6.00	4.90
Ireland	5.06	5.53	5.37	5.74	4.13	6.06	2.80	6.92	5.27
United Kingdom	4.62	5.16	4.96	5.51	3.88	5.00	2.74	5.54	4.86
Isle of Man ..	5.68	5.72	4.38	4.67	3.83	5.00	..	..	5.18
Other European Brit. Possessions ..	4.90	4.73	6.71	6.28	4.69	1.83	..	..	5.21
Austria-Hungary ..	3.12	2.91	5.43	4.60	2.50	8.00	..	..	3.41
Belgium	2.35	1.67	3.00	3.67	1.00	9.00	..	..	2.74
Denmark	4.20	3.77	5.56	5.16	3.07	5.54	..	..	5.12
France	3.45	3.84	3.62	3.41	2.69	4.67	..	..	3.50
Germany	5.05	5.32	6.65	6.23	3.65	6.14	2.50	8.00	6.04
Greece	2.81	2.38	5.50	2.00	1.67	..	..	..	2.98
Italy	4.00	3.71	3.98	4.67	2.86	6.50	..	..	3.72
Netherlands ..	3.50	4.14	2.64	4.00	3.80	3.50	..	..	3.62
Norway	3.70	3.29	5.78	4.50	2.74	1.00	..	..	4.68
Portugal	4.00	4.00	..	..	..	..	..	..	4.00
Russia	4.28	4.42	3.93	5.69	3.96	4.00	..	..	4.26
Spain	5.18	2.88	2.85	5.25	3.49	..	..	..	3.73
Sweden	3.11	3.44	2.12	3.67	2.65	5.45	..	..	4.18
Switzerland ..	3.86	4.51	5.74	5.96	2.74	6.60	..	..	4.76
Other European Countries ..	4.88	3.72	4.63	2.67	4.00	..	..	..	4.32
Europe (exclusive of United Kingdom)	4.47	4.63	6.20	6.00	3.35	5.83	2.50	8.00	5.34
Europe	4.61	5.13	5.13	5.57	3.84	5.06	2.74	6.25	4.89
ASIA—									
British India ..	4.18	3.84	3.84	4.26	3.98	4.10	4.00	..	4.02
Ceylon	4.36	2.37	3.71	6.00	1.86	2.89	..	..	3.11
Hong Kong ..	4.86	4.00	4.67	3.50	..	..	..	..	4.54
Straits Settlements	5.75	4.00	3.00	5.00	2.60	..	.00	..	3.64
Other Asiatic British Possessions ..	4.50	2.25	5.33	..	..	..	..	..	3.91
Arabia	..	..	5.00	..	..	..	..	..	5.00
China	4.38	4.57	4.24	2.75	2.33	7.75	3.76	..	4.19
Japan	2.71	4.00	1.79	2.00	.69	..	.00	..	1.21
Java	2.00	2.50	1.75	..	9.00	..	..	..	2.38
Philippine Islands	4.80	1.00	9.00	..	1.00	..	3.00	..	3.90
Syria	4.55	4.49	4.36	5.09	3.89	4.29	..	..	4.53
Other Asiatic C'tries	2.44	1.67	4.50	.00	.50	..	..	..	2.42
Asia	4.31	3.93	3.76	4.41	2.73	4.17	3.29	..	3.93
AFRICA—									
Cape of Good Hope	3.35	4.13	3.14	7.78	5.80	2.33	..	..	4.01
Mauritius	4.23	4.17	4.83	4.11	3.89	5.50	..	..	4.29
Natal	2.17	3.69	3.00	3.67	2.38	4.50	..	..	3.02
Orange Free State	10.00	3.00	3.00	..	..	..	..	..	5.33
Transvaal	1.33	1.00	..	3.00	..	..	..	..	1.50
S. Africa (undefined)	3.06	3.10	3.24	2.75	3.33	3.28	..	..	3.10
Other African British Possessions	4.33	4.90	7.50	3.00	4.00	..	..	..	4.70
Egypt	2.43	1.60	3.00	.50	2.50	..	..	..	2.10
Other African C'tries	4.25	6.50	7.50	4.00	3.00	1.00	..	..	4.00
Africa	3.29	3.62	3.82	3.72	3.58	3.00	..	..	3.49

Birthplace and Average Issue of Wives, 1911—*continued.*

Birthplace.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
AMERICA—									
Barbadoes	2.67	..	1.00	..	6.00	..	..	..	3.00
Canada	3.11	3.63	4.64	3.88	2.80	4.20	..	..	3.55
Jamaica	3.25	3.00	3.50	3.00	5.00	1.00	..	..	3.44
Newfoundland ..	9.75	3.83	1.67	.00	4.50	..	..	..	4.75
Other Amer. Brit. Poss.	4.80	3.85	4.17	8.25	3.78	12.00	..	..	4.70
Argentine Republic	2.67	..	..	3.00	..	1.00	..	..	2.29
Brazil	7.00	5.13	5.00	2.00	.00	..	..	..	4.79
Chile	3.00	5.00	2.00	..	..	..	..	..	3.50
Mexico	4.17	..	1.50	12.00	.00	..	..	..	4.00
Peru	8.00	3.00	4.50	..	1.00	..	..	..	4.20
United States of Amer.	3.32	3.97	3.90	3.86	3.19	3.07	..	..	3.60
Other Amer. C'tries	4.96	4.48	5.43	5.83	5.29	5.75	..	..	5.04
America	3.40	3.91	4.10	4.10	3.25	3.69	..	..	3.69
POLYNESIA—									
Fiji	2.65	2.76	2.83	3.40	1.00	3.20	..	..	2.69
Friendly Islands ..	4.44	..	2.00	8.75	..	..	..	..	5.09
Papua	7.00	..	1.33	..	..	..	..	..	2.75
Other Pol. Brit. Poss.	6.33	..	4.80	..	..	..	..	..	5.38
New Caledonia ..	3.36	4.29	3.57	1.67	.67	..	..	..	3.27
New Hebrides ..	3.50	5.50	3.13	..	..	..	..	..	3.57
Samoa	3.43	..	4.22	..	6.00	..	..	..	4.00
Other Polynesian Is.	4.18	3.67	4.71	..	6.00	..	..	..	4.45
Sth. Sea Is. (so desc.)	5.66	..	2.89	..	11.00	..	..	..	3.31
Polynesia ..	3.34	3.18	3.36	4.75	2.78	3.20	..	..	3.35
At Sea	5.56	5.48	4.81	5.48	4.57	6.00	2.00	..	5.35
All Birthplaces ..	3.92	3.89	4.15	4.02	3.45	4.18	2.72	4.66	3.93

An interesting item in connexion with this table and the more detailed tables from which it has been compiled, is the fact that although, as pointed out in the preceding pages, wives enumerated in Western Australia have in general been below those enumerated in other States, as regards average issue, this does not apply to the Western Australian-born wives, who, when full details are taken into account, rank remarkably high in this respect, much higher indeed than those born in any other of the States or the United Kingdom. In fact, the only numerously represented birthplace shewing higher average issues for the more important age-groups is Germany.

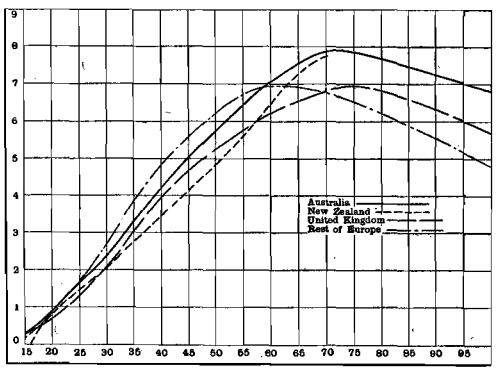
The succeeding table furnishes for the Commonwealth as a whole a summary of the average issues of wives, tabulated according to birthplace and age :—

Age, Birthplace and Average Issue of Wives, 1911.

Ages of Wives.	Average Issue of Wives Born in—									All Birthplaces.
	Australia.	New Zealand.	United Kingdom.	Rest of Europe.	Asia.	Africa.	America	Polynesia.	At Sea.	
Under 14 ..	.00	..	..	..	..	..	..	..	..	.00
14 ..	.29	..	.00	..	..	..	..	..	..	.28
15 ..	.27	..	.00	..	..	..	..	..	..	.27
16 ..	.50	.00	1.00	.50	..	..	..	..	..	.50
17 ..	.59	.40	.29	.60	.50	..	.00	..	..	.58
18 ..	.68	.79	.47	.55	1.00	.00	.00	..	..	.68
19 ..	.83	.71	.50	.55	1.00	.00	.40	1.00	..	.82
20 ..	.95	.82	.72	1.08	1.33	.33	1.13	.67	..	.95
21–24 ..	1.32	1.15	.99	1.20	1.65	1.42	.96	1.22	1.40	1.31
25–29 ..	2.02	1.76	1.71	2.15	2.69	1.88	1.52	1.86	2.06	1.99
30–34 ..	2.89	2.45	2.56	3.23	3.22	2.77	2.10	2.98	2.70	2.85
35–39 ..	3.80	3.13	3.50	4.40	3.82	3.01	3.05	3.15	3.53	3.75
40–44 ..	4.63	3.82	4.34	5.16	4.46	4.18	3.55	3.10	4.36	4.57
45–49 ..	5.33	4.50	4.97	5.97	4.56	5.11	4.09	5.39	5.62	5.25
50–54 ..	6.10	5.13	5.48	6.41	5.03	5.13	4.68	4.48	6.36	5.92
55–59 ..	6.78	6.12	6.01	6.97	4.71	5.66	5.79	3.50	6.82	6.44
60–64 ..	7.28	6.81	6.40	6.70	6.55	6.48	6.36	7.11	7.67	6.75
65–69 ..	7.75	7.69	6.70	6.94	6.4'	5.50	5.64	7.50	8.74	7.03
70–74 ..	7.88	8.88	6.90	6.68	8.93	5.71	6.24	2.00	7.10	7.02
75–79 ..	7.72	..	6.96	6.38	7.29	2.50	8.55	..	3.25	6.98
80–84 ..	7.55	2.00	6.59	5.59	3.00	..	8.50	..	.00	6.60
85–89 ..	7.29	..	6.43	5.69	3.00	..	6.00	..	..	6.44
90 and over	9.00	..	5.47	6.50	..	..	..	..	..	5.35
All Ages	3.68	2.95	4.86	5.34	3.93	3.49	3.69	3.35	5.35	3.93

This table indicates that, contrary to the opinion very generally held, the average issue of Australian-born wives is, for all ages, with the unimportant exception of age 16, considerably higher than that of wives born in the United Kingdom, but resident in Australia. On the other hand, for the important range of ages from 25 to 60, the average issue of Australian wives is decidedly below that of wives resident in Australia who had been born in other parts of Europe than the United Kingdom. This latter is influenced very largely by the preponderance of German-born wives included therein, whose average issues rank highest amongst countries numerously represented.

Age, Birthplace, and Average Issue of Wives. Commonwealth, 1911.



GRAPH No. 104.

Graph No. 104 furnishes a representation of the average issue at each age attained for wives who had been born in (i.) Australia, (ii.) New Zealand, (iii.) the United Kingdom, and (iv.) the rest of Europe, and who were enumerated at the Commonwealth Census of 1911. The figures on the base line denote ages at quinquennial intervals, while those on the left margin denote average issue. The birthplaces represented by the different types of line are indicated on the graph.

Of the four parts of the United Kingdom represented amongst the birthplaces of wives, Wales had in general the highest average issue, England the lowest, and Scotland and Ireland ranked fairly together.

12. **Religion and Average Issue of Wives.**—The next table furnishes particulars concerning the average issue of wives of different religions and denominations irrespective of age. Full details in respect of religion and age for all the States and Territories will be found in Vol. III., pp. 1144 to 1159, and in a summarised form for the Commonwealth as a whole on p. 284 hereinafter :—

Religions and Average Issue of Wives, 1911.

Religion.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
CHRISTIAN—									
Church of England	3.85	3.76	3.96	3.76	3.39	4.14	2.53	4.30	3.82
Presbyterian ..	3.82	3.79	4.01	3.83	3.17	3.89	1.57	4.88	3.80
Methodist	4.15	4.09	4.18	4.12	3.68	4.20	2.83	5.47	4.10
Baptist	3.96	3.81	4.37	3.94	3.60	4.10	2.00	..	3.95
Congregational ..	3.73	3.72	4.06	3.77	3.50	3.92	1.60	..	3.77
Lutheran	4.22	4.65	5.37	4.74	3.38	3.59	2.50	..	4.87
Church of Christ ..	3.93	3.95	4.29	3.90	3.54	5.00	1.00	..	3.95
Salvation Army ..	4.46	4.54	4.76	4.90	4.16	4.17	..	..	4.56
Seventh Day Advent.	4.08	4.46	4.98	4.68	4.30	4.89	..	..	4.43
Unitarian	3.81	4.32	4.96	4.12	4.00	3.73	1.00	..	4.07
Protestant(undefined)	3.58	3.60	4.01	4.09	3.32	4.30	4.00	1.75	3.74
Roman Catholic ..	4.12	4.13	4.29	4.27	3.58	4.46	3.66	5.08	4.14
Greek Catholic ..	4.34	3.85	4.43	5.77	3.43	4.00	..	..	4.30
Catholic (undefined)	3.89	3.78	3.66	3.94	3.40	4.44	.50	5.00	3.85
Others	4.14	3.78	4.51	4.34	3.73	4.40	.00	..	4.15
All Christian ..	3.94	3.90	4.16	4.03	3.47	4.19	2.69	4.66	3.95
NON-CHRISTIAN—									
Hebrew	3.23	3.44	3.47	3.60	3.52	2.56	..	..	3.36
Confucian	6.00	2.50	4.00	..	1.75	..	3.17	..	3.32
Mohammedan ..	1.69	4.29	1.56	4.09	2.00	..	6.00	..	2.34
Buddhist	2.80	..	2.00	..	.70	8.00	.00	..	1.31
Pagan	..	..	4.67	8.00	2.00	..	..	..	3.40
Others	2.62	2.77	3.93	3.07	2.60	1.71	..	..	3.02
All Non-Christian ..	3.19	3.42	3.20	3.61	3.11	2.55	3.02	..	3.27
INDEFINITE—									
Freethinker ..	3.00	2.82	3.39	3.00	2.89	4.00	..	..	3.03
Agnostic	2.56	2.76	4.34	2.76	3.71	2.50	.00	..	3.00
No Denomination	3.83	3.85	3.39	3.13	4.45	4.59	..	..	3.84
Others	3.88	3.80	4.21	3.25	3.59	3.58	..	..	3.80
All Indefinite ..	3.53	3.58	3.91	3.11	3.70	4.04	.00	..	3.59
NO RELIGION—									
No Religion ..	2.71	2.99	3.66	3.69	2.68	5.50	..	..	3.10
Atheist	2.33	2.50	5.50	3.00	4.67	..	..	..	3.31
Others	3.80	4.33	5.00	..	..	..	..	..	4.11
All No Religion ..	2.71	2.99	3.78	3.67	2.75	5.50	..	..	3.13
All Religions ..	3.92	3.89	4.15	4.02	3.45	4.18	2.72	4.66	3.93

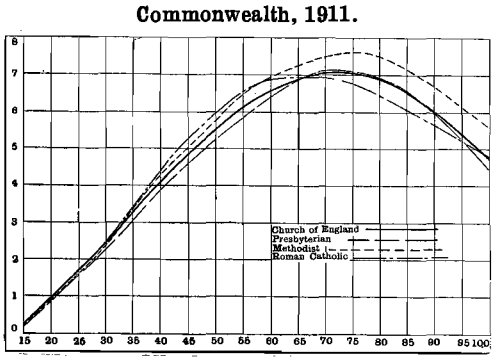
It will be seen that for the Commonwealth as a whole the largest average issue was in the case of the Lutheran Church, and that amongst the denominations and religions which were numerously represented, Hebrew wives had the lowest average issue. A high average on the part of Lutherans was in evidence in the States of New South Wales, Victoria, Queensland, and South Australia, and a low average on the part of the Hebrews was in evidence in the same four States as well as Tasmania. From the succeeding table, which gives for the Commonwealth an analysis of average issues according to religion and age of wives, it will be seen that Lutheran wives had the highest averages for the important range of ages from 25 to 60, and that, with unimportant exceptions, Hebrew wives had the lowest averages for all ages between 19 and 75.

Age, Religion, and Average Issue of Wives, 1911.

Ages of Wives.	Church of England.	Presbyterian	Methodist.	Baptist.	Congregational.	Lutheran.	Church of Christ.	Salvation Army.	Protestant (undefined).	Roman Catholic.	Catholic (undefined).	Hebrew.	All Religions.
Under 14 ..	..	..	..	..	..	..	..	..	..	..	..	..	.00
14 ..	.17	1.00	..	..	..	..	..	..	..	.40	..	..	.28
15 ..	.36	.17	.20	.00	..	..	.50	..	.00	.33	.00	..	.27
16 ..	.48	.41	.46	1.00	1.00	.80	.60	1.50	.44	.45	.75	1.00	.50
17 ..	.62	.52	.61	.61	.90	.50	.33	.33	.44	.54	.61	.50	.58
18 ..	.68	.72	.71	.50	.90	.46	1.11	.82	.63	.68	.60	1.00	.68
19 ..	.83	.86	.85	.74	.88	.72	.69	.70	.64	.81	.81	.46	.82
20 ..	.97	.95	.87	.83	.87	.81	.85	.79	.98	.96	.99	.61	.95
21–24 ..	1.35	1.24	1.23	1.15	1.03	1.24	1.12	1.35	1.31	1.35	1.43	1.04	1.31
25–29 ..	2.04	1.85	1.94	1.80	1.61	2.19	1.82	2.16	1.93	2.03	2.20	1.71	1.99
30–34 ..	2.87	2.65	2.88	2.71	2.54	3.46	2.69	3.08	2.75	2.92	3.03	2.38	2.85
35–39 ..	3.74	3.49	3.86	3.59	3.33	4.70	3.70	4.12	3.50	3.88	3.87	3.06	3.75
40–44 ..	4.52	4.26	4.71	4.42	4.13	5.66	4.59	4.82	4.35	4.84	4.89	3.61	4.57
45–49 ..	5.15	4.95	5.42	5.10	4.50	6.31	5.08	5.96	4.99	5.57	5.67	4.51	5.25
50–54 ..	5.84	5.54	6.17	5.71	5.20	6.97	6.10	6.32	5.61	6.29	6.30	4.99	5.92
55–59 ..	6.37	6.17	6.75	6.05	5.79	7.40	6.57	6.79	6.06	6.76	6.70	5.83	6.44
60–64 ..	6.72	6.59	7.11	6.61	6.13	7.00	6.97	7.22	6.35	6.86	6.64	6.09	6.75
65–69 ..	7.00	7.04	7.38	7.10	6.68	7.17	7.18	7.45	6.90	6.96	6.56	6.72	7.03
70–74 ..	7.05	7.12	7.40	6.68	6.27	6.69	7.77	8.56	7.14	6.76	7.83	6.16	7.02
75–79 ..	6.92	6.82	7.92	6.69	6.48	6.78	6.62	8.92	5.92	6.75	5.98	7.33	6.98
80–84 ..	6.91	7.08	7.16	6.17	6.13	5.28	6.57	8.00	6.51	5.73	5.80	7.86	6.60
85–89 ..	6.15	6.19	6.54	5.87	7.83	5.80	8.50	12.00	7.89	6.30	8.00	1.67	6.44
90 and over ..	5.31	5.00	6.86	2.00	3.50	7.00	..	11.00	..	5.86	3.50	..	5.35
ALL AGES	3.82	3.80	4.10	3.95	3.77	4.87	3.95	4.56	3.74	4.14	3.85	3.36	3.93

Amongst the four denominations most numerously represented, viz., Church of England, Presbyterian, Methodist, and Roman Catholic, the variations at the different ages were not very marked, the most notable being the relatively high average issues in the case of Methodist wives aged 60 and upwards. Of the four mentioned, Roman Catholic wives had the highest average issues for all ages from 30 to 60, and were practically on a par with Church of England wives for highest average between the ages of 20 and 30.

Age, Religion, and Average Issue of Wives. Commonwealth, 1911.



GRAPH No. 105.

In the accompanying Graph (No. 105) is furnished a representation of the average issue of wives of each age whose religions were (i.) the Church of England, (ii.) Presbyterian, (iii.) Methodist, and (iv.) Roman Catholic. The figures on the base line denote ages at quinquennial intervals, while those on the left margin denote the average issue. The religions represented by the different types of line are indicated on the graph. From the fact that the dispersion of the curves in Graph No. 104 is much greater than is the case in Graph No. 105, it follows that the birthplace of the mother exercises greater influence on the number of issue than her religion does.

13. **Duration of Marriage and Average Issue of Wives.**—In the following table is given for each State and Territory of the Commonwealth the average issue of marriages of given duration :

Duration of Existing Marriage and Average Issue of Wives, 1911.

Duration of Existing Marriage.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
Under 5 Years ..	.89	.87	.92	.86	.85	.98	1.04	.95	.89
5–9	2.28	2.22	2.41	2.27	2.22	2.48	1.87	2.89	2.29
10–14	3.34	3.24	3.56	3.32	3.28	3.61	2.91	3.75	3.34
15–19	4.26	4.06	4.63	4.26	4.02	4.52	2.73	5.79	4.24
20–24	5.07	4.81	5.54	5.10	4.85	5.36	3.32	5.45	5.05
25–29	5.86	5.63	6.37	5.95	5.57	6.29	7.25	5.96	5.87
30–34	6.69	6.48	7.04	6.68	6.36	7.00	3.75	7.24	6.67
35–39	7.33	7.07	7.32	7.22	7.13	7.62	5.75	8.18	7.25
40–44	7.97	7.47	7.58	7.72	7.95	7.99	5.50	6.20	7.74
45 and over ..	8.69	8.14	8.08	8.34	8.39	8.55	4.00	7.25	8.37
ALL PERIODS ..	3.77	3.74	3.98	3.88	3.30	4.04	2.50	4.53	3.78

The figures given in this and the succeeding table relate solely to the issue of the marriages which were in existence at the date of the Census, whereas those contained in the other tables relate, unless otherwise indicated, to the total issue of first, second and other marriages. The average issues for the several States are consequently somewhat lower in this table than in preceding ones. These differences, which represent the average issue of marriages prior to that existing at the date of the Census, are as follows :—New South Wales, Victoria, Western Australia and the Commonwealth as a whole, .15 ; Queensland, .17 ; South Australia and Tasmania, .14 ; Northern Territory, .22 ; and Federal Territory, .13. These figures indicate that approximately 96 per cent. of the total issue of wives had arisen from existing, and about 4 per cent. from previous marriages.

The largest average issues for the successive durations are in general found in the cases of Tasmania and Queensland, and the lowest in Victoria and Western Australia.

In the above table the average issue is treated as a function of duration of marriage only. Details for variation with age and duration in combination will be found for the Commonwealth as a whole, and separately for its several component States and Territories in Volume III., pp. 1184 to 1187. A summary of such combined particulars for the Commonwealth as a whole is given in the next table :—

Age, Duration of Existing Marriage, and Average Issue of Wives, 1911.

Ages of Wives.	Duration of Existing Marriage.										All Periods.
	Under 5 years	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45 and over.	
Under 14 ..	.00	..	..	..	..	..	..	..	..	..	.00
14 ..	.28	..	..	..	..	..	..	..	..	..	.28
15 ..	.27	..	..	..	..	..	..	..	..	..	.27
16 ..	.50	..	..	..	..	..	..	..	..	..	.50
17 ..	.58	..	..	..	..	..	..	..	..	..	.58
18 ..	.68	2.00	..	..	..	..	..	..	..	..	.68
19 ..	.82	3.38	..	..	..	..	..	..	..	..	.82
20 ..	.89	2.26	..	..	..	..	..	..	..	..	.95
21–24 ..	.98	2.45	4.92	..	..	..	..	..	..	..	1.30
25–29 ..	.97	2.51	3.76	5.86	..	..	..	..	..	..	1.97
30–34 ..	.89	2.37	3.69	4.84	6.29	..	..	..	..	..	2.80
35–39 ..	.70	2.16	3.47	4.73	5.85	6.88	..	..	..	..	3.65
40–44 ..	.35	1.60	2.96	4.27	5.60	6.89	8.40	..	..	..	4.42
45–49 ..	.07	.66	1.96	3.37	4.85	6.37	7.69	7.57	..	..	5.02
50–54 ..	.00	.09	.80	2.25	3.84	5.54	7.17	8.65	11.22	..	5.62
55–59 ..	.00	.00	.14	.90	2.52	4.32	6.17	7.80	9.19	10.00	6.07
60–64 ..	.00	.00	.00	.07	.93	2.70	4.68	6.42	8.25	9.52	6.31
65–69 ..	.00	.00	.00	.01	.12	.90	2.82	4.78	6.88	8.82	6.53
70–74 ..	.00	.00	.00	.00	.01	.10	1.27	2.93	4.95	8.18	6.48
75–79 ..	.00	.00	.00	.00	.00	.00	.11	1.13	3.32	7.57	6.36
80–84 ..	.00	.00	.00	.00	.00	.00	.00	.04	1.75	6.80	5.97
85–89 ..	.00	.00	.00	.00	.00	.00	.00	.00	.88	6.57	5.84
90 and over	..	..	..	.00	.00	..	.00	.00	.00	4.70	4.28
All Ages ..	.89	2.29	3.34	4.24	5.05	5.87	6.67	7.25	7.74	8.37	3.78

In connexion with the regular progression shewn in the two preceding tables in the average issue in relation to duration of marriage, it appears certain that in the absence of a marked and extensive decline in the average issue at the limiting age of fertility, the average issue could not increase with age to the limits of the table in the manner and to the extent shewn above. If, as appears probable, fertility is practically nil beyond 30 years' duration, and absolutely so beyond 40, the average issue for the duration 30-34, 35-39, 40-44, and 45 and over, would be nearly equal if birth rates had not been subject to a continuous diminution. The only other possible explanation is that parents of small families do not live as long as parents of large families, and for this assumption there is no warrant, statistical or other.

14. **Occupation and Average Issue of Husbands.**—An analysis of the statistics of average issue according to the occupation of the husbands was carried out in connexion with the present Census. The analyses contained in the preceding sections have been based on the birthplace, religion, and duration of marriage of wives, but the same cannot be done in the case of occupation, since the controlling factor is usually the occupation, not of the wife herself, but of her husband. The majority of wives are classed as to occupation under the head of " domestic duties." In the case of wives living with their husbands at the time of the Census, it would be possible, by making provision on the " Conjugal" card for the occupation of the husband, to tabulate issue data according to the age of the wife, and the occupation of her husband. This, however, in addition to involving extra labour and inconvenience as mentioned on p. 261, would have necessitated the abandonment of some 15 per cent. of the data owing to absentees. Even if complete, it did not appear likely to furnish any better evidence of the relation between occupation and issue than was obtainable more readily from the personal card of the husband. Particulars in respect of occupation and issue were consequently tabulated from the personal cards for males at the stage when the tabulation of occupations was in hand.

The tables so compiled have been based on an abridged classification of occupations, and appear according to grades, ages, and States or Territories of enumeration on pp. 1188 to 1203 of Volume III. A summary for all ages combined is given in the succeeding table for the several States and Territories, in accordance with the abridged classification mentioned above :—

Occupation and Average Issue of Husbands, 1911.

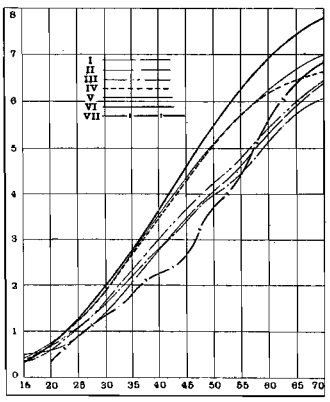
Classification. Order	Sub-Order	Occupation. Description.	States. N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	Territories. N.T.	F.T.	C'wlth
		CLASS I.—PROFESSIONAL.									
1		Engaged in Government, Defence, Law, etc	3.58	3.61	3.85	3.74	3.12	3.85	2.69	3.11	3.60
2		Ministering to Religion, Charity, Health, Education, etc.	3.19	3.29	3.26	3.42	2.78	3.31	1.88	3.60	3.22
		TOTAL—CLASS I.	3.34	3.40	3.49	3.54	2.93	3.53	2.24	3.29	3.37
		CLASS II.—DOMESTIC.									
?	1	Engaged in supplying Board and Lodging	3.34	3.27	3.57	3.37	2.80	3.73	2.40	8.00	3.32
	2	,, Domestic Service & Attendance	3.07	3.05	3.33	3.43	2.79	3.99	1.78	4.00	3.13
		TOTAL—CLASS II.	3.22	3.16	3.49	3.40	2.79	3.83	1.91	5.33	3.24
		CLASS III.—COMMERCIAL.									
4		Dealing in Property and Finance ..	4.02	3.71	4.06	4.32	3.37	4.05	..	8.50	3.91
5		,, Art and Mechanic Productions	2.93	2.94	3.06	3.01	2.71	2.89	..	..	2.94
6		,, Textile Fabrics, Dress and Fibrous Materials ..	2.78	2.92	3.06	2.81	2.59	2.92	.00	..	2.86
7		,, Food, Drinks, Narcotics, and Stimulants	3 28	3.32	3.51	3.65	2.90	3.71	1.95	..	3.34
8		,, Animals, Animal and Vegetable Substances, N.E.I. ..	3.29	3.40	3.59	3.53	3.18	3.46	4.00	4.00	3.38
9		,, Fuel and Light	3.95	4.02	4.02	4.10	3.73	4.09	.00	..	4.00
10		,, Metals and other Minerals ..	2.87	2.99	3.13	3.11	2.60	2.87	..	..	2.95
11		General & Undefined Merchants & Dealers	3.33	3.46	3.62	3.60	3.07	3.77	2.69	2.00	3.43
12		Speculators on Chance Events	2.52	2.58	2.19	5.00	1.69	2.65	..	..	2.48
13		Engaged in Storage	3.52	3.61	5.43	4.21	3.02	6.33	..	..	3.79
		TOTAL—CLASS III.	3.35	3.36	3.56	3.62	3.00	3.63	2.46	4.50	3.39
		CLASS IV.—TRANSPORT & COMMUNICATION									
14	1	Engaged in Railway Traffic	3.67	4.02	4.12	4.08	3.31	4.24	2.94	2.50	3.86
	2	,, Traffic on Roads	3.59	3.58	4.10	3.84	3.26	3.82	3.18	6.33	3.67
	3	,, ,, Seas and Rivers	3.22	3.35	3.65	3.53	2.93	3.88	2.57	4.00	3.35
	4 & 5	,, Postal, Telegraph and Telephone Service	3.20	3.20	3.56	3.01	2.63	3.17	2.07	..	3.18
	6	Messengers, etc.	4.14	3.74	6.75	6.20	3.50	5.25	..	..	4.47
		TOTAL—CLASS IV.	3.48	3.69	3.95	3.77	3.14	3.91	2.68	4.57	3.61
		CLASS V.—INDUSTRIAL.									
15		Working in Art & Mechanic Productions	3.43	3.34	3.75	3.52	3.35	3.59	3.00	.75	3.45
16		,, Textile Fabrics, Dress, and Fibrous Materials ..	3.66	3.62	3.79	4.01	3.58	4.22	1.27	.00	3.70
17		,, Food, Drinks, Narcotics, and Stimulants	3.35	3.41	3.56	3.64	3.20	3.91	2.75	4.50	3.44
18		,, Animal and Vegetable Substances, N.E.I.	3.87	3.73	4.15	4.13	3.35	4.02	..	..	3.86
19		,, Metals and other Minerals	3.68	3.72	3.92	3.90	3.61	4.12	.50	5.00	3.75
20		,, Fuel, Light, and other forms of Energy	3.34	3.28	3.32	3.06	2.63	3.83	2.00	2.00	3.27
21		Engaged in Construction of Buildings, Roads, Railways, etc. ..	4.02	3.98	4.25	4.22	3.93	4.29	3.22	4.40	4.06
22		,, Disposal of the Dead or of Refuse	4.25	4.35	4.94	4.71	4.12	4.92	..	..	4.44
23		,, Undefined Industrial Pursuits	4.26	4.21	4.30	4.47	3.74	4.37	1.95	4.22	4.24
		TOTAL—CLASS V.	3.77	3.73	3.97	3.97	3.60	4.13	2.18	4.00	3.81
		CLASS VI.—PRIMARY PRODUCERS.									
24	1	Engaged in Agricultural Pursuits ..	4.69	4.55	4.57	4.58	3.86	4.84	2.00	4.67	4.57
	2	,, Pastoral Pursuits	4.60	4.46	4.43	4.26	3.18	4.48	2.44	5.06	4.49
	3	,, Capture, etc., of Wild Animals, and their Produce ..	4.24	4.35	3.74	4.62	3.17	4.36	3.00	5.00	4.18
	4	,, Fisheries	4.61	4.51	3.63	3.86	2.74	4.91	2.82	..	4.16
	5	,, Forestry	4.20	4.05	4.14	4.36	3.21	4.07	.00	6.00	3.94
	6	,, Water Conservation & Supply	3.80	4.07	3.98	4.00	2.94	4.03	4.00	3.00	3.87
	7	,, Mining and Quarrying ..	3.99	4.45	3.97	4.38	3.11	3.58	2.08	5.00	3.94
		TOTAL—CLASS VI.	4.46	4.49	4.36	4.51	3.43	4.50	2.19	4.93	4.37
25		CLASS VII.—INDEPENDENT	6.39	5.98	6.34	6.73	6.08	6.57	5.00	3.00	6.27
		TOTAL—BREADWINNERS	3.87	3.87	4.05	4.04	3.32	4.20	2.25	4.61	3.89
		CLASS VIII.—DEPENDENTS.									
26		Dependent on Natural Guardians ..	5.80	6.01	6.44	6.03	5.91	5.96	..	6.00	5.98
27	1	Supported by Voluntary or State Contribution	2.95	4.67	1.69	4.91	2.90	2.93	..	..	3.68
	2	Criminal Class (under Legal Detention)	..	2.14	13.00	..	2.33	..	..	..	2.78
		TOTAL—CLASS VIII.	5.38	5.23	5.28	5.57	4.78	4.95	..	6.00	5.26
		ALL OCCUPATIONS	3.90	3.90	4.07	4.07	3.34	4.23	2.25	4.60	3.91

In this, as in other cases, aggregate results require to be used with caution. Thus the table indicates that Class VII., " Independents," and Class VIII., " Dependents," exhibited the highest average issues. As a mere statement of fact this is correct, but it does not warrant the conclusion that these Classes are the most reproductive, since the largeness of average issue is mainly due to the large proportion of husbands of advanced age contained therein. On the other hand, the husbands of Class VI., " Primary Producers," had for the Commonwealth as a whole, and also for all States except Western Australia, a considerably higher average issue than was exhibited by any other Class except VI. or VII. In this case the analysis of the results according to age indicates that the Class of " Primary Producers" is much more reproductive than any other, including Classes VII. and VIII. A summary for the Commonwealth of particulars in respect of Class of Occupation and Age is given in the next table :—

Occupation, Age and Average Issue of Husbands, Commonwealth, 1911.

Age.	Breadwinners.									
	Class I. Professional.	Class II. Domestic.	Class III. Commercial.	Class IV. Transport & Communication.	Class V. Industrial.	Class VI. Primary Producers	Class VII. Independent.	All Breadwinners	Class VIII. Dependents.	All Occupations.
15–19	.53	.44	.51	.55	.58	.50	..	.54	.75	.54
20–24	.69	.82	.87	.94	.95	.97	.63	.93	.53	.93
25–29	1.12	1.34	1.33	1.51	1.50	1.55	1.13	1.47	1.30	1.47
30–34	1.76	1.89	2.00	2.27	2.28	2.35	1.53	2.21	1.53	2.21
35–39	2.43	2.51	2.66	3.04	3.10	3.25	2.11	3.01	3.00	3.01
40–44	3.13	3.08	3.33	3.88	3.94	4.13	2.40	3.82	2.55	3.81
45–49	3.77	3.73	3.97	4.67	4.71	5.07	3.22	4.61	4.59	4.61
50–54	4.33	4.18	4.48	5.40	5.40	5.88	4.02	5.31	4.30	5.30
55–59	4.99	4.78	5.15	6.08	6.01	6.61	5.13	5.99	4.65	5.98
60–64	5.63	5.47	5.70	6.31	6.46	7.18	6.04	6.51	6.67	6.50
65 and over	6.50	5.93	6.58	6.66	6.98	7.76	6.85	7.14	6.72	7.13
All Ages	3.37	3.24	3.39	3.61	3.81	4.37	6.27	3.89	5.26	3.91

Class of Occupation, Age, and Average Issue of Husbands. Commonwealth, 1911.



GRAPH No. 106.

It will be seen that for every age-group except the unimportant group of 15-19, the average issue for "Primary Producers" was higher than for any other Class, and that husbands in the "Industrial" Class ranked next in respect of reproductivity.

Amongst breadwinners the lowest average issues for the different ages occurred amongst those in the "Independent" Class, the "Domestic" Class and the "Professional" Class. Husbands in the "Commercial" and "Transport" Classes occupied a middle position in this respect, and the average issues for the Transport Class accorded closely at nearly all ages with the average for all occupations combined.

Graph No. 106 furnishes a representation of the average issues of husbands of different occupations and ages. In this graph I. denotes Professional Class, II. Domestic, III. Commercial, IV. Transport and Communication, V. Industrial, VI. Primary Producers, and VII. Independent. The figures on the base line denote ages at quinquennial intervals while those on the left margin denote the average issue.

A further analysis of Class VI., "Primary Producers," into the seven sub-orders for which the issue data were tabulated, furnishes the following result :—

Primary Producers.—Age and Average Issue of Husbands, Commonwealth, 1911.

Age.	Average Issue of Husbands Engaged in—							Average for all "Primary Producers."
	Agricultural Pursuits.	Pastoral Pursuits.	Capture, etc., of Wild Animals, and their Produce.	Fisheries.	Forestry.	Water Conservation and Supply.	Mining and Quarrying.	
15–19 ..	.41	.53	.00	1.00	.18	.50	.67	.50
20–24 ..	.91	.95	1.02	1.17	1.08	.90	1.04	.97
25–29 ..	1.46	1.51	1.88	1.88	1.69	1.48	1.68	1.55
30–34 ..	2.28	2.28	2.59	2.62	2.53	2.10	2.48	2.35
35–39 ..	3.22	3.17	3.53	3.30	3.39	3.11	3.35	3.25
40–44 ..	4.10	4.17	4.14	4.26	4.36	3.79	4.15	4.13
45–49 ..	5.08	5.08	5.37	5.24	5.57	4.59	4.96	5.07
50–54 ..	5.99	5.83	5.92	5.58	6.44	5.15	5.66	5.88
55–59 ..	6.71	6.68	5.89	5.85	6.92	6.35	6.28	6.61
60–64 ..	7.31	7.15	7.16	6.26	7.68	6.94	6.82	7.18
65 and over	7.92	7.85	7.81	6.81	7.62	6.33	6.95	7.76
All Ages	4.57	4.49	4.18	4.16	3.94	3.87	3.94	4.37

It will be seen that the highest average issues for most ages occurred in the case of husbands engaged in Forestry, and that average issues for those engaged in Agricultural pursuits were practically identical with the averages for Pastoral Pursuits. Husbands engaged in Water Conservation and Supply had the lowest average issues at most ages.

The foregoing analyses have been based on a classification of husbands according to class of occupation. A further analysis is possible on the basis of grade of occupation, that is, according to whether the husband is an employer, a wage earner, a worker on his own account, etc. If reproductivity were largely influenced by class distinctions, it might be expected that such an analysis would disclose clearly the effect of this influence.

The following table contains a summarised result for the Commonwealth as a whole, of an analysis of this nature, the figures given being the average issue for each grade and age, irrespective of the class of occupation :—

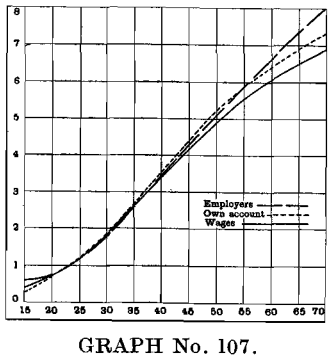
Age, Grade of Occupation, and Average Issue of Husbands, Commonwealth, 1911.

Age.	Grade.						All Grades.
	E. Employers	O. Working on own Account but not Employing Labour.	A. Assisting but not Receiving Wages or Salary.	W. In Receipt of Wages or Salary.	N. Unemployed.	N.A. Not Applicable.	
15–19	.64	.47	.14	.55	.46	.86	.54
20–24	.92	.95	.71	.93	.94	.70	.93
25–29	1.44	1.51	1.06	1.47	1.47	1.22	1.47
30–34	2.19	2.26	1.60	2.22	2.10	1.78	2.21
35–39	3.02	3.12	2.35	3.00	2.72	2.45	3.01
40–44	3.87	3.96	2.73	3.77	3.64	2.94	3.81
45–49	4.68	4.83	4.61	4.54	4.37	3.64	4.61
50–54	5.44	5.58	4.43	5.22	5.00	4.27	5.30
55–59	6.34	6.08	5.05	5.84	5.97	5.16	5.98
60–64	6.98	6.65	7.30	6.32	6.28	5.86	6.50
65 and over	7.76	7.29	7.38	6.78	6.50	6.87	7.13
All Ages	4.32	4.47	3.13	3.46	3.87	5.65	3.91

The three most important groups are the employers, the workers on own account, and the wage-earners. The unemployed are simply wage-earners so unfortunate as to be out of work at the time of the Census, and, as might be expected, the average issue in their case does not differ materially with that for wage-earners. Those to whom grade is not applicable consist largely of dependents and independents, while those graded as assisting but not receiving wages belong in a sense to the category of dependents. These two groups have in the main relatively low average issues.

As regards the three more important grades, it will be seen that up to age 40 there is very little to choose between them, but that thereafter employers and workers on own account preponderate, the latter from 40 to 55, the former from 55 onward. This is contrary to the opinion which appears to be very generally held, viz., that the wage-earners are markedly more reproductive than the other classes in the community. These figures indicate that in respect of reproductive power, the class of occupation exercises a much greater influence than the grade. For example, there is a much more marked difference in degree of reproductiveness between Primary Producers on the one hand and the Professional or the Domestic Class on the other, than there is between employers and wage-earners.

Grade of Occupation, Age, and Average Issue of Husbands. Commonwealth, 1911.



GRAPH No. 107.

The accompanying Graph (No. 107), furnishes a representation of the average issue of husbands of each age according to grade of occupation. The relatively small dispersion of the curves in Graph No. 107 as compared with that of the curves in Graph No. 106 is striking evidence that the class of occupation exercises a much greater influence on the number of issue than does the grade of the occupation.

For the purpose of further analysing the influence of class of occupation, the following table has been prepared, shewing the average issue for each age-group and class of occupation of the husbands who were employers :—

Age, Occupation, and Average Issue of Husbands who were Employers, Commonwealth, 1911.

Age Last Birthday.	Average Issue of Husbands who were Employers in—						
	Class I. Professional.	Class II. Domestic.	Class III. Commercial.	Class IV. Transport and Communication	Class V. Industrial.	Class VI. Primary Producers.	All Classes
15–19	..	..	.67	.67	.88	.50	.64
20–24	.48	.96	.80	1.10	.95	.95	.92
25–29	1.03	1.41	1.38	1.71	1.51	1.44	1.44
30–34	1.65	2.02	2.06	2.54	2.26	2.25	2.19
35–39	2.26	2.58	2.71	3.39	3.18	3.16	3.02
40–44	2.85	3.23	3.45	4.32	3.99	4.11	3.87
45–49	3.25	3.91	4.06	5.08	4.81	5.07	4.68
50–54	3.82	4.37	4.62	5.91	5.51	5.93	5.44
55–59	4.39	5.20	5.40	6.35	6.34	6.88	6.34
60–64	5.21	5.71	6.12	6.97	6.90	7.44	6.98
65 and over	6.50	6.52	6.95	7.37	7.36	8.13	7.76
All Ages	3.02	3.47	3.71	4.40	4.35	4.70	4.32

In this case the Transport Class and the Primary Producers occupy between them the leading positions, the former from 20 to 45, the latter from age 50 onwards, there being practically identity for the group from 45 to 50. Below 20 the Industrial Class predominates, but the age-group is unimportant. At all ages the Professional Class exhibits the lowest averages. At no age does it much exceed 70 per cent. of the average issue for Primary Producers, and at some ages it is considerably below that proportion.

Next to the Professional Class in this respect comes the Domestic and then the Commercial Class. The two latter run closely together to age 40, and do not markedly differ throughout the whole range. In the main the Industrial Class falls but little short of the Primary Producers and Transport Classes. The Industrial Class is that which for the grade of employers runs the most closely throughout with the averages for all classes combined.

The results of a similar analysis in respect of workers on own account is furnished in the succeeding table, which gives the average issue for each group and class of occupation of the husbands who were workers on own account :—

Age, Occupation, and Average Issue of Husbands who were Workers on Own Account, Commonwealth, 1911.

Age Last Birthday.	Average Issue of Husbands who were Workers on Own Account in—						
	Class I. Professional.	Class II. Domestic.	Class III. Commercial.	Class IV. Transport and Communication	Class V. Industrial.	Class VI. Primary Producers.	All Classes.
15–19	1.00	..	.43	.60	.67	.36	.47
20–24	.68	.96	.95	1.03	.94	.95	.95
25–29	1.14	1.48	1.49	1.78	1.54	1.50	1.51
30–34	1.59	1.91	2.17	2.50	2.31	2.35	2.26
35–39	2.08	2.85	2.83	3.55	3.14	3.31	3.12
40–44	2.73	3.33	3.42	4.28	3.88	4.32	3.96
45–49	3.31	4.03	4.05	5.46	4.71	5.29	4.83
50–54	3.73	5.02	4.45	5.97	5.34	6.21	5.58
55–59	4.26	4.58	5.05	6.54	5.93	6.69	6.08
60–64	4.95	6.23	5.58	6.69	6.38	7.25	6.65
65 and over	5.79	5.94	6.28	7.52	6.97	7.79	7.29
All Ages	3.04	3.58	3.78	4.48	4.47	4.92	4.47

Here, as in the case of employers, the Primary Producers and Transport Classes share between them the highest average issues at all ages except 15-19, the latter predominating at the earlier ages, and the former at the later ages. At all ages except 15-19, husbands in the professional class had the lowest average issue, the domestic and commercial classes ranking next in this respect. As in the case of employers, the figures for the two classes last-mentioned run fairly closely together for successive ages, while those for the industrial class furnish throughout a fair approximation to the averages for all classes combined.

Similar results for wage-earners are furnished in the next table, which gives the average issue for each age-group and class of occupation of the husbands who were in receipt of wages or salary at the time of the Census :—

Age, Occupation, and Average Issue of Husbands who were Wage-earners, Commonwealth, 1911.

Age last Birthday.	Average Issue of Husbands who were Wage-earners in—						
	Class I. Professional.	Class II. Domestic.	Class III. Commercial.	Class IV. Transport and Communication	Class V. Industrial.	Class VI. Primary Producers.	All Classes.
15–19	.42	.46	.54	.55	.57	.54	.55
20–24	.72	.79	.88	.94	.95	.98	93
25–29	1.14	1.30	1.30	1.48	1.50	1.61	1.47
30–34	1.83	1.81	1.96	2.24	2.29	2.41	2.22
35–39	2.54	2.43	2.62	2.99	3.09	3.27	3.00
40–44	3.30	2.87	3.29	3.82	3.93	4.04	3.77
45–49	3.97	3.53	3.96	4.59	4.71	4.91	4.54
50–54	4.55	3.94	4.50	5.33	5.42	5.60	5.22
55–59	5.23	4.47	5.22	6.05	5.94	6.27	5.84
60–64	5.85	5.23	5.66	6.12	6.43	6.81	6.32
65 and over	6.50	5.85	6.54	6.28	6.92	7.12	6.78
All Ages	3.32	2.97	2.92	3.44	3.56	3.74	3.46

In this case the Primary Producers exhibited average issues which were markedly in excess of those for other classes at all ages except 15-19, while the figures for the Industrial Class ranked second at all ages except 15-19, for which they were first, and 55-59, for which they were third. As in the cases of employers and workers on own account, the figures for the Industrial Class furnish throughout a fair approximation to the averages for all classes combined.

For ages under 30 the Professional Class exhibited the lowest average issues, while for ages above 30 the figures for the Domestic Class occupied the lowest position. At all ages above 30 the figures for the professional class did not differ materially from those for the commercial class.

The analyses contained in the three preceding tables emphasise the fact noted on p. 288, that as regards influence on number of issue, the class of occupation plays a much greater part than the grade.

15. Age and Average Issue of Widowed and Divorced Persons.—In addition to particulars of issue of husbands and wives, those of widowed and divorced persons were also tabulated. Particulars of the average age and average issue of such persons are given in the next table for the several States and Territories of the Commonwealth.

Average Ages and Issues of Widowed and Divorced Persons, 1911.

States or Territories.	Males.				Females.			
	Widowed.		Divorced.		Widowed.		Divorced.	
	Average Age.	Average Issue.	Average Age.	Average Issue.	Average Age.	Average Issue.	Average Age.	Average Issue.
STATES—	years	years	years	years	years	years	years	years
New South Wales	59.61	4.82	46.45	2.47	59.75	5.75	41.30	2.82
Victoria	62.04	4.94	46.64	2.18	61.82	5.70	42.50	2.75
Queensland ..	58.78	4.67	43.35	2.27	58.58	5.72	41.62	3.84
South Australia ..	61.19	5.30	46.52	2.25	62.32	5.97	43.57	2.73
Western Australia	54.11	3.72	44.41	2.21	55.95	5.38	38.28	2.67
Tasmania	60.78	5.56	46.81	2.47	61.72	6.15	41.76	2.32
TERRITORIES—								
Northern	53.28	2.46	52.50	..	49.87	4.06	..	..
Federal	56.83	4.33	72.50	11.00	61.96	6.06	42.50	6.00
Commonwealth ..	60.07	4.84	46.09	2.35	60.52	5.75	41.61	2.82

Details as to age for the Commonwealth as a whole are furnished in the succeeding table :—

Ages and Average Issues of Widowed and Divorced Persons, Commonwealth, 1911.

Age.	Males.		Females.		Age.	Males.		Females.	
	Widowed.	Divorced.	Widowed.	Divorced.		Widowed.	Divorced.	Widowed.	Divorced.
15 ..	..	..	1.00	..	50–54 ..	4.38	2.86	5.36	4.20
16 ..	..	..	.50	..	55–59 ..	4.77	3.47	6.03	4.74
17 ..	2.00	..	1.67	..	60–64 ..	5.29	3.98	6.41	5.20
18 ..	.50	..	.44	1.00	65–69 ..	5.72	4.43	6.68	4.25
19 ..	.00	.00	1.00	..	70–74 ..	6.05	6.22	6.89	6.54
20 ..	.64	..	1.14	.43	75–79 ..	6.36	4.11	7.01	5.60
21–24 ..	.94	.57	1.45	1.12	80–84 ..	6.51	2.17	6.67	.00
25–29 ..	1.37	1.06	1.90	1.44	85–89 ..	6.76	11.00	6.40	2.00
30–34 ..	1.82	1.26	2.46	1.68	90 and over	6.31	16.50	5.85	..
35–39 ..	2.32	1.44	3.08	2.21					
40–44 ..	3.04	1.63	3.88	2.93	All Ages	4.84	2.35	5.75	2.82
45–49 ..	3.74	2.41	4.62	3.38					

16. **Metropolitan Results.**—The average issues of husbands of each age who were resident in the several metropolitan areas of the Commonwealth are furnished in the succeeding table :—

Age and Average Issues of Husbands in Metropolitan Areas, 1911.

Ages of Husbands.	Average Issue of Husbands Enumerated in—						
	Sydney and Suburbs.	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	All Metropolitan Areas.
14	.00	..	..	..	..	..	.00
15	..	..	..	.50	..	.00	.33
16	.60	.50	..	.00	.00	..	.40
17	.36	.30	..	.33	.00	.33	.29
18	.55	.71	.40	.55	.50	.33	.56
19	.59	.55	.40	.61	.40	.29	.55
20	.74	.68	.79	.67	.70	.60	.71
21–24	.93	.91	.84	.89	.83	.98	.91
25–29	1.42	1.37	1.30	1.37	1.33	1.55	1.38
30–34	2.05	2.03	2.11	2.11	2.05	2.29	2.06
35–39	2.66	2.60	2.93	2.87	2.78	2.82	2.70
40–44	3.31	3.35	3.75	3.59	3.35	3.71	3.40
45–49	4.03	3.98	4.48	4.38	3.91	4.32	4.08
50–54	4.67	4.51	5.10	5.09	4.48	5.25	4.69
55–59	5.22	5.06	5.81	5.89	5.20	5.45	5.31
60–64	5.67	5.62	6.10	6.24	5.64	5.63	5.76
65–69	6.12	5.89	6.28	6.64	6.34	6.40	6.15
70–74	6.55	6.37	6.86	6.67	6.84	6.76	6.55
75–79	6.98	6.74	7.08	7.11	7.15	7.73	6.93
80–84	6.99	7.16	7.01	7.69	7.53	7.35	7.20
85–89	6.51	6.57	6.79	7.36	9.75	7.82	6.84
90 and over	3.80	5.82	13.50	7.09	6.00	5.00	5.95
All Ages	3.36	3.45	3.77	3.75	3.27	3.79	3.47

From age 20 to age 85 the highest average issue for any age will be found in one or other of the three metropolitan areas of Brisbane, Adelaide, or Hobart, while from age 20 to the end of the table the lowest average will, with one exception, be found in the metropolitan areas of Sydney, Melbourne, or Perth.

The next table furnishes similar information for wives, and gives the average issues of wives of each age who were resident in the several metropolitan areas of the Commonwealth :—

Age and Average Issues of Wives in Metropolitan Areas, 1911.

Ages of Wives.	Average Issue of Wives Enumerated in—						
	Sydney and Suburbs.	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	All Metropolitan Areas.
14	.33	.00	..	..	..	..	.17
15	.27	.29	.25	.00	..	1.00	.31
16	.47	.50	.14	.63	.78	1.00	.50
17	.58	.53	.56	.46	.65	.86	.56
18	.63	.59	.56	.63	.59	.53	.61
19	.80	.78	.74	.80	.88	.53	.79
20	.91	.84	.87	.90	.71	.85	.87
21–24	1.18	1.14	1.07	1.12	1.24	1.20	1.16
25–29	1.75	1.70	1.71	1.70	1.91	1.92	1.74
30–34	2.42	2.40	2.63	2.51	2.62	2.72	2.46
35–39	3.19	3.13	3.58	3.37	3.35	3.41	3.24
40–44	3.98	3.83	4.39	4.06	3.90	4.19	3.97
45–49	4.57	4.39	5.01	4.83	4.47	4.72	4.57
50–54	5.18	4.92	5.58	5.53	5.19	5.28	5.16
55–59	5.61	5.57	6.16	5.98	5.86	5.96	5.71
60–64	6.03	5.83	6.18	6.33	6.48	6.02	6.04
65–69	6.49	6.09	6.31	6.52	6.75	6.64	6.36
70–74	6.64	6.38	6.66	6.82	6.92	6.96	6.59
75–79	6.60	6.37	6.44	7.10	6.53	7.16	6.58
80–84	6.05	6.11	6.11	6.03	6.38	7.23	6.12
85–89	6.77	5.90	4.17	5.05	8.25	8.50	6.00
90 and over	4.75	4.19	..	5.50	1.00	..	4.41
All Ages	3.39	3.45	3.78	3.69	3.41	3.74	3.49

For the majority of ages the highest average for any age was found in one or other of the three metropolitan areas of Brisbane, Perth, or Hobart, while at most ages the lowest average issue for any age occurred in the case of Melbourne. Sydney and Adelaide occupied intermediate positions in this respect, the Sydney averages running very closely at all ages with those for all metropolitan areas combined.

The following table, which furnishes a comparative view for each age of the average issues of husbands and wives in the metropolitan and extra-metropolitan areas of the Commonwealth, gives a good indication of the influence of urban residence on size of family. The portion of the Commonwealth classed as extra-metropolitan consists of the whole of Australia exclusive of the Capital cities and their suburbs. It consequently comprises many cities and towns of considerable size, and hence does not truly represent rural Australia in this matter. Separate data for these towns, however, are not available. If they were, it is probable that the difference shewn in the next table between metropolitan and extra-metropolitan average issues would be even more marked in a table distinguishing between urban and rural data.

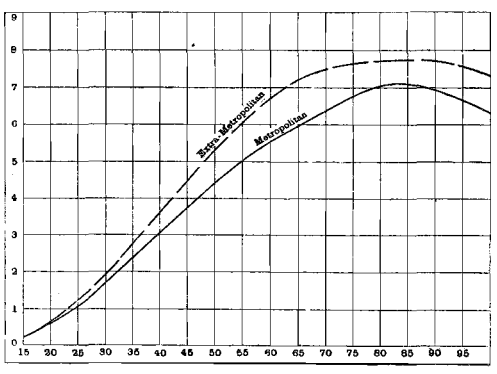
Metropolitan and Extra-Metropolitan Average Issues, 1911.

Ages.	Husbands.—Average Issues of those Enumerated in—			Wives.—Average Issues of those Enumerated in—		
	Metropolitan Areas.	Extra-Metropolitan Areas.	The whole Commonwealth.	Metropolitan Areas.	Extra-Metropolitan Areas.	The whole Commonwealth.
14	..	..	..	.17	.33	.28
15	.33	..	.13	.31	.25	.27
16	.40	.20	.28	.50	.50	.50
17	.29	.46	.39	.56	.59	.58
18	.56	.50	.53	.61	.72	.68
19	.55	.63	.59	.79	.84	.82
20	.71	.72	.72	.87	.99	.95
21-24	.91	97	.94	1.16	1 41	1.31
25-29	1.38	1.53	1.47	1.74	2.16	1.99
30-34	2.06	2.31	2.21	2.46	3.11	2.85
35-39	2.70	3.19	3.01	3.24	4.10	3.75
40-44	3.40	4.06	3.81	3.97	5.01	4.57
45-49	4.08	4.95	4.61	4.57	5.78	5.25
50-54	4.69	5.71	5.30	5.16	6.49	5.92
55-59	5.31	6.42	5.98	5.71	6.99	6.44
60-64	5.76	6.96	6.50	6.04	7.27	6.75
65-69	6.15	7.40	6.95	6.36	7.48	7.03
70-74	6.55	7.50	7.16	6.59	7.30	7.02
75-79	6.93	7.63	7.39	6.58	7.21	6.98
80-84	7.20	7.75	7.55	6.12	6.85	6.60
85-89	6.84	7.76	7.45	6.00	6.72	6.44
90 and over ..	5.95	8.08	7.38	4.41	6.03	5.35
All Ages ..	3.47	4.19	3.91	3.49	4.24	3.93

It will be seen that in the case of husbands at all ages from 19 upwards, and in the case of wives at all ages from 17 upwards, the average issues in extra-metropolitan areas are much in excess of those in metropolitan areas, the excess amounting in certain cases to as much as 20 or 25 per cent.

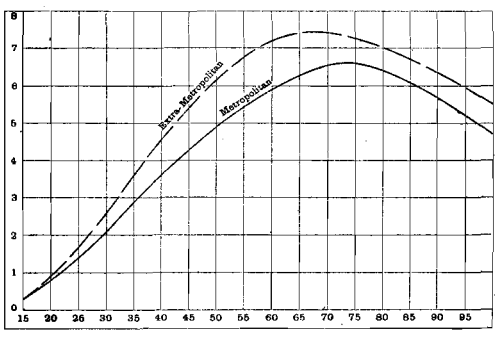
Metropolitan and Extra-Metropolitan Average Issues according to Age, 1911.

(*a*) HUSBANDS.



GRAPH No. 108.

(*b*) WIVES.



GRAPH No. 109.

Graphs Nos. 108 and 109 furnish a representation of the average issues of husbands and wives respectively for Metropolitan and extra-Metropolitan areas of the Commonwealth at the Census of 1911. In each case the figures on the base line denote ages at quinquennial intervals, while those on the left margins denote average issue.

CHAPTER XX.

LIFE TABLES.

1. **Measures of Rate of Mortality.**—(i.) *General.*—For the purpose of measuring the rates of mortality, experienced by any community, various computations have been employed, which differ materially in the labour involved, on the one hand, and on the other, in the degree to which they suitably measure the phenomenon in question, viz., the rate at which the members of the community are dying. In this connexion it may be noted that, as regards the methods indicated hereunder, it is not correct to describe any of them as erroneous, as is occasionally done. So long as these rates are based upon the actual data, one is quite as correct as another; where they differ is that whilst one may be very suitable for comparisons with similar rates for other communities, others may be less suitable, and others again, quite unsuitable. Thus the "crude death rate" which represents the ratio of the deaths of both sexes for a given period to the mean population of both sexes for that period is perfectly *correct* as long as the number of deaths and the mean population are accurately determined, and the division of the former by the latter is correctly performed. It may also be suitable for some purposes, such, for example, as in a question involving the rate of decrement of a given population at a given time. But it is not suitable for a purpose to which it is very frequently applied, viz., to furnish a basis of comparison in respect of mortality between two communities whose populations are differently constituted in respect of sex, age, and other characteristics, or between two experiences of the same community separated by a lapse of time in which the population has characteristically changed.

It must, however, be borne in mind that all methods of determining rates of mortality, whatever degree of refinement may have been introduced into them, consist in ultimate analysis of the determination of ratios of deaths to population. What is done in the more refined cases is to subdivide both the population and the deaths into like categories according to sex, age, occupation, conjugal condition, etc., and then to determine for each category the ratio of deaths to population. Before proceeding to the methods of life table construction adopted at the present Census, and the data employed thereat, it will be convenient to review briefly the methods which have been adopted under various circumstances for measuring the rate of mortality. The principal of these are six in number, as follows :—

(*a*) The computation of a crude rate for the sexes combined.

(*b*) The computation of a death rate for each sex separately.

(*c*) The determination of the average age at death.

(*d*) The calculation of death rate corrected for sex and age.

(*e*) The calculation of an index of mortality.

(*f*) The construction of a life table.

(ii.) *Crude Rate for Sexes Combined.*—Probably the simplest measure of mortality, and that which first suggests itself, is the computation of the proportion of the whole population which has passed away by death during a given period. Where two communities are similarly constituted in respect of sex and age, this crude rate furnishes a useful and simple index to the relative salubrity of their climate and conditions of life. Similarly in a community which had changed little in the sex and age constitution of its population over a series of years, the crude rate would furnish a valuable index to the progress or retrogression of the community from a sanitary point of view. Such conditions, however, rarely exist in practice. Communities usually differ too markedly from each other and from their past selves in respect of sex and age constitution to render comparisons based on crude rates more than rough guides to tendencies which need to be analysed by more refined methods.

(iii.) *Death Rate for each Sex.*—Where data in respect both of deaths and population are available for the sexes separately, one of the disadvantages of the crude rate may be overcome by computing two rates, one for each sex. In practically all communities there is a marked difference not only in the physical constitution of the sexes, but also in the conditions under which they live, in the nature of their ordinary occupations, and in the special risks incurred by them. It is consequently not a matter for surprise that there should usually be a very marked difference between the rates of mortality experienced by them. In most civilised communities longevity is more marked amongst females than amongst males, the female death rate being lower than the male at nearly all ages. Apart, therefore, from the question of a comparison with the experience of other communities, it appears desirable, wherever practicable, to segregate males and females for the calculation of mortality rates. To combine them gives a rate which is

applicable to neither the one nor the other. The subdivision, according to sex, however, eliminates one of the advantages possessed by the crude rate, viz., that being a single number, it is readily quoted and easily compared. A rate for each sex is not so manageable. There are two numbers to quote, and if in a comparison with another community, the rate for one sex predominates in the one community, and the rate for the other sex in the other, it is not always easy to draw a conclusion as to relative salubrity.

(iv.) *Average Age at Death.*—A method of estimating salubrity which at an early date in the history of vital statistics had considerable vogue was that of determining the average age at death. Off-hand it might be thought that a high average age at death was a sure sign of longevity and consequently of salubrity. A little reflection, however, will shew that everything depends on the ages of the living. For example, a community in which there were no births, arrivals or departures would shew, under normal conditions, an increasing average age at death as it gradually wore down, while a thriving community with a high and increasing birth rate would shew a decreasing average age at death ; yet it would be quite possible for the latter to be much more healthy than the former. Here again it may be noted that there is nothing erroneous in computing the average age at death, but an error arises when the conclusion is drawn that a high average age at death necessarily denotes a high degree of salubrity. The method is one which is now practically obsolete as an estimate of salubrity, but, as furnishing, in respect of some disease, the age incidence of death, it may conveniently and legitimately be employed. For example, statistics of the average age at death from phthisis indicate that it is a disease usually fatal in early adult life, while similar statistics of the average age at death from cancer indicate that the victims are usually of more advanced age.

(v.) *Death Rate Corrected for Sex and Age.*—Where a number of communities is concerned, and it is desired to effect comparisons between them in respect of mortality, a mode of operation has been devised which, by providing a correcting factor based on age and sex, for application to the ordinary crude rate, retains the simplicity of the crude rate while eliminating some of its inherent defects. This method has been most extensively employed in England, where the Registrar-General of England and Wales has supplied in his annual summaries since 1883, a series of corrected death rates for the principal English towns. The first step in calculating the desired correction factors, is that of computing for each town a "standard death rate." To obtain this, the average death rates per annum in age-groups for each sex are determined for England and Wales for the whole of an intercensal period. These death rates on being applied to the sex and age distribution for a town as ascertained at the most recent Census, give the total number of deaths that would have arisen in the town if the average rates for England and Wales had operated therein for a year on a mean population distributed as regards sex and age in the same manner as the population of the town was distributed at the date of the Census. The division of this total number of deaths by the total Census population of the town furnishes the "standard death rate" for the town. The ratio of the crude rate for England and Wales for the whole of an intercensal period, to the "standard" death rate of a town, for the terminal Census of the period is the town's "factor for correction" for age and sex contribution, and is applied to the crude rate determined for the town in the ordinary way during the ensuing intercensal period. Since the correction factor for any community is determined once only for each intercensal period, and when determined is applied simply as a multiplier to the crude rate for the community, for any year or other period, it is clear that it furnishes a very convenient means for taking into account the sex and age constitution. Also, if the age groups on which it is based are not too comprehensive, for example, not larger than quinquennial, or at the outside, decennial groups, and if it can safely be assumed that the sex and age distribution of the community does not during the ensuing intercensal period deviate markedly from the Census results, the application of the correction factor supplies a very reliable indication of relative salubrity.

(vi.) *Index of Mortality.*—The method of procedure outlined in (v.) consists in the main in (*a*) the computation of a normal series of death rates for sex and age ; (*b*) the application of such a series successively to the actual sex and age distributions of the various communities under consideration ; (*c*) the calculation of the crude rate resulting from the application mentioned in (*b*) ; and (*d*) the computation from (*c*) of a correction factor. Another method which is much in vogue, and which has been approved by the International Statistical Institute, is in some respects the converse of this. It consists in (*a*) the determination or selection of a population norm, *i.e.*, of a normal scale of distribution of population according to sex and age ; (*b*) the computation for the community under review of death rates for sex and age-groups corresponding to those adopted for the population norm ; (*c*) the application of the rates in (*b*) to the norm in (*a*) ; and (*d*) the calculation of the crude rate resulting from the application mentioned in (*c*). The crude rate so obtained is usually called the "index of mortality," or, in the case of the Registrar General of England and Wales, the "rate in standard population." Where the data for computing the rates of mortality for the appropriate sex and age-groups are readily available, this method furnishes one of the most satisfactory indications of relative salubrity that have yet been described. In essence it consists in computing for a normal population the crude death rate that would arise therein from the operation of the death rates for sex and age-groups ascertained to have operated for the community under review during a given period. From another point of view it is a weighted mean of the death rates for sex and age-groups of the community under review, the weights employed being the appropriate portions of the population

norm. The subject of population norms and their application was discussed in a paper by G. H. Knibbs and C. H. Wickens, presented to the Fifteenth International Congress on Hygiene and Demography, held at Washington, September 23–28, 1912. The paper was published in Volume VI. of the Transactions of the Congress, pp. 352 *et seq.* The matter is also dealt with in Appendix A hereto. The principal difficulty in connexion with the computation of the index of mortality for any postcensal period is that of distributing the population of any community for such period according to sex and age. An assumption usually made is that the scale of distribution is the same as that disclosed at the preceding Census. For some communities such an assumption involves little error, in others the discrepancy may be large, but there are no simple means for obviating it. In any event the indications of relative salubrity furnished by such an index or by the corrected rates dealt with in sub-section (v.) are much more reliable than can be got by crude rates, rates for sexes, or average ages at death. It may be noted here that although the only characteristics which are dealt with in the ordinary course in computing correcting factors or indices of mortality are sex and age, these are by no means the only ones whose neglect may vitiate conclusions as to relative salubrity. For example, the effect of race on death rate has not yet been definitely determined, but there is little doubt that the variation with age of the death rate amongst European races on the one hand, and coloured races on the other, is essentially different. To institute comparisons, therefore, between mixed populations such as those of the United States, the Union of South Africa, and British India, where European and coloured races are associated in such markedly different proportions, it is not sufficient merely to allow for sex and age, race also should be taken into account.

(vii.) *Life Tables.*—In connexion with the measures of mortality dealt with in sub-sections (v.) and (vi.) above, it may be noted that from one point of view each consists in the determination of ratios of deaths to population for sex and age-groups, and the subsequent computation of a weighted mean death rate. From another point of view each consists of the computation of a series of death rates for one population, and the application thereof to another population, the correction factor method involving the computation of standard death rates and the application thereof to variable population distributions while the index of mortality method involves the computation of death rates in sex and age-groups for populations varying in sex and age distribution, and the application thereof to a population norm, or population of standard distribution. A further method for measuring mortality is that of constructing a Life Table for the population in question. Here again the main element is the ratio of deaths to population for sex and age-groups, but in this case there is no adoption of an arbitrary standard either of death rates or of population distribution. What is done is to arbitrarily select any number as the number of children born, and by the successive application thereto of death rates for sex and age derived from the experience of the community under observation, to compute the number who will attain each successive age, on the supposition that the computed rates for each age operate at the appropriate ages throughout the lifetime of the children so selected. A table so constructed, however, shewing the number of each sex surviving at each age out of a given number born, is no more convenient for the purposes of quotation or of ready comparison with other experiences than is the original series of death rates for sex and age on which the table of survivors has been based. The latter, however, presents, in a convenient form, data for the computation of a measure of mortality which is convenient for the purposes of both quotation and comparison. The measure referred to is what is generally known as the "expectation of life," or the "average future lifetime." Of these expressions the former is the more generally used, but the latter expresses the nature of the function in the better way. What is represented by the expectation of life at any age, is the average future life time of the persons who reach that age, and are subject at succeeding ages to the rates of mortality deduced from the experience under review. The expectation of life at age 0, consequently, since it represents the average quantity of life that will be lived by each person born, furnishes as suitable a measure of relative salubrity as could be devised, and one which is entirely free from the introduction of an arbitrary standard whether of death rates or population distribution. It necessarily relates, however, only to a completed period, and consequently will not serve the purpose of providing comparative results for a current period. For this latter purpose the correction factor and the index of mortality furnish the best results.

2. **Life Tables.**—(i.) *General.*—It is not proposed in the present chapter to enter at all fully into either the theory or the practice of the construction and graduation of Life Tables in general, but it appears desirable to review briefly the general principles involved, and to indicate the sources of data and the methods employed in connexion with some of the more important existing tables, more particularly those relating to the general population of a country or some particular portion of it. In a general way mortality investigations may be divided into two classes, viz., (*a*) those concerned with selected data, and (*b*) those relating to the general population. These may be further classed as follows :—

(*a*) Investigations of selected data—
1.—Life assurance experience.
2.—Annuitants' experience.
3.—Benefit societies' experience.
4.—Public or other service experience.

(*b*) Investigations of general population—
1.—National experience.
2.—Local experience.

All such investigations are usually capable of subdivision, one of the most important instances being that of distinguishing between males and females. Other heads of subdivision are frequently of considerable value, such, for example, as duration of assurance and class of policy in the case of life assurance experience, race and conjugal condition in the case of a national experience, and elevation, situation, and density of population in the case of a local experience.

(ii.).—*Selected Data.*—For special purposes, such for example, as the computation of appropriate premiums and the valuation of liabilities under contracts issued by life assurance, annuity and benefit societies, it is desirable that the life tables employed should, if practicable, be those which have been deduced from the experience of the class concerned, that is, from the experience of the policyholders, the annuitants or the benefit members as the case may be. In all such cases what is required is a means of gauging the future for financial purposes, and evidently the best guide to the future experience of any body of persons is an appropriate review of the past experience of a body of persons who have been, as nearly as possible, similarly circumstanced. Such tables are becoming more and more elaborate, and extensive as appropriate records are accumulated, more especially in the field of life assurance which has made such colossal advances in the volume and range of its business during the last half century. In this connexion it will be sufficient to instance the British offices' Mortality Investigation of the experience of assured lives and annuitants during the period of 30 years from 1863 to 1893, the results of which constitute at present the standard tables for life assurance and annuity purposes in the United Kingdom, and also in Australia. These tables were based on the assured lives and annuitants that came under observation during the 30 years, whether as policyholders or annuitants with contracts in force at the commencement of the period or as entrants during its currency, and the deaths which arose therefrom during the period. The data were analysed in detail for the sexes separately, for various classes of policyholders, and for duration of contract as well as for age.

In the case of benefit societies, as there is a considerable amount of difference in the methods of administration in different societies as well as in the constitution of the societies in respect of membership, the adoption of standard tables is not always practicable.

One of the most complete investigations of the experience of a benefit society is that which was carried out by the Manchester Unity Friendly Society, Independent Order of Oddfellows, in connexion with their male experience in the United Kingdom for the five years 1893–1897.

In this investigation, which naturally was largely concerned with the question of sickness, the mortality experience occupied a relatively minor, but still very prominent place. For mortality purposes the data were subdivided into three area groups, and those for each area group were further subdivided into urban and rural data.

As regards widows' funds, pension schemes, superannuation schemes, etc., there is usually so much difference in detail, frequently in important matters, that it would be difficult to obtain a supply of data sufficiently homogeneous to admit of the construction of a standard table that would be of practical value. In such cases mortality is only one of many objects of inquiry, and it is usually desirable, where practicable, in dealing with any such fund or scheme to use the experience of the scheme itself rather than a standard table.

(iii.) *Investigations Concerning General Population.*—In all investigations involving selected data, such as those outlined in subsection (ii.) above, the individual lives concerned are traced from the time they come under observation until their exit therefrom by death, withdrawal, or the close of the observations. Further, there are usually more or less extensive inquiries made in each case to ensure accuracy in the statement of age. Where, however, the subject of investigation is the rate of mortality amongst the general population of a country or of a locality for a given period, the individual method is quite impracticable, and a method has to be devised which deals with population in bulk. There are also not the same facilities for checking the information furnished in respect of age.

In such cases, the information is mainly supplied from one or other or more usually from both of two distinct sources. One of these sources is a population Census taken according to sex and age for one or more epochs, and the other is the registration of deaths according to sex and age for a given period. To construct a satisfactory life table from Census results alone, or from registration returns alone would require a much greater degree of uniformity for a series of years in the constitution of the population in respect of number, sex and age than is in practice obtainable. Notwithstanding the inherent difficulty of the problem, there are two or three celebrated cases in which such tables have been compiled.

In this connexion it is of interest to note that statistics of deaths, or more strictly of burials, were in existence in detailed form, long before the corresponding figures in respect of population were available. On the basis of the burial records of Breslau, Dr. Halley constructed in 1693 what is believed to be the world's first life table, while on the burial records of the parish of All Saints, Northampton, Dr. Price constructed his celebrated Northampton table. Neither table furnished a reliable index to the rate of mortality, as neither was based on a population which had remained unchanged for a long period, and the adjustments that could be made for this want of uniformity were too insecurely grounded to furnish satisfactory results.

On the other hand the construction of life tables based mainly on Census returns has been a feature of the Census reports of India from 1881 onwards. These, although constructed with great ingenuity and with close attention to the conditions of life of the several communities for the respective periods of observation, cannot be regarded as furnishing so satisfactory a series of results as would have been obtained if death registrations as well as Census records had been available.

In view of the fact which has been stated in an earlier part of this chapter, that all measures of mortality are based on ratios of deaths to population, it may be thought that the cases here cited of the construction of life tables from deaths alone, and from Census results alone, are exceptions to the general rule. This, however, is not so. In both cases, although one of the two items is wanting in the original data, it is, in effect, supplied by a process of calculation before the measure of mortality is actually obtained. Thus, both Halley and Price do what is equivalent to constructing, from the death returns, the populations from which they had been derived, while the Indian Census method proceeds largely on the method of estimating the deaths at various ages from the age results for successive censuses.

In the more usual cases in which both Census results and death registrations are available, there are two leading methods of dealing with the matter, besides others which may be regarded as modifications. According to one of these methods the results of a single Census are taken for determining the population basis, and the mean annual deaths at each age for a period extending to an equal distance on either side of the Census date are taken as furnishing the death experience. According to the second method, two Censuses are taken for determining the population basis, and the death registrations for the intervening period furnish the death experience. Where rates of mortality are changing rapidly, and a Census is taken only once in ten years, it is held by some that although the life tables based on the two Censuses and the deaths for the intervening period furnish correct average results for the decennial period, these results may be regarded as relating approximately to the middle of the decennial period, and hence, by the time the table is constructed, as being at least seven or eight years old. On the other hand, it is urged that with a single Census and a relatively short period on either side of it for death experience, a life table could be available within two or three years of the epoch to which it approximately relates. Against these contentions there are two objections. Firstly, for population results a period terminated at each end by a Census is more accurately defined than one in which the Census occupies a middle position ; secondly, a period of ten years furnishes a greater range for the elimination of accidental fluctuations due to epidemics or other causes, than is furnished by a period of two, three or four years surrounding a Census. A consideration of the circumstances indicates that for a permanent record of the progress of a community in the matter of mortality, a series of life tables, each based on two Censuses and the intervening deaths, gives the best results, but that the single Census method is useful as furnishing preliminary information of the trend of events, and also in those cases in which so large a range of death data as that relating to a whole intercensal period, is not available.

It may be pointed out that what is actually done in all these cases, is to determine, or rather to estimate for a given period the number of years of human life that have been spent by the community at each age, and to ascertain the number of deaths that have occurred at each age during the same period, the ratio of the one to the other giving a basis for the construction of a life table. Where one Census only is used, and the death returns for a period of say a year on either side of the date of the Census, the assumption which is frequently made is that the total number of years of life experienced in the two-year period is twice the Census total, and that the sex and age distribution of this number is identical with that of the Census. This assumption is simply applied in practice either by multiplying the Census data by two throughout and dividing by it the aggregate deaths at each age for the period, or more usually by dividing the average number of deaths per annum at each age by the actual Census figures. These two processes, of course, give the same result, since in any fraction the multiplication of the denominator by a given number produces the same result as the division of the numerator by that number.

It is necessary to emphasise the fact that in these cases the Census or Censuses do not actually supply the population basis, but rather furnish a scale of distribution according to age by means of which the life experience for the period of observation may be distributed according to age, and may thus be rendered comparable with the death experience for the same period. The necessity for this is shewn by the fact that a great deal of misconception exists in connexion with the matter, and statements are occasionally made, even by experts, which convey the impression that, in the construction of these tables, deaths are divided by populations to which they are only remotely related. For example, in a paper "On the construction of Mortality Tables from Census Returns and Records of Deaths," by Mr. George King, F.I.A., F.F.A., published in the Journal of the Institute of Actuaries, Vol. XLII., p. 225, the author, in referring to the experience of assurance and annuity societies, says : " We therefore have something approaching to accuracy, and the deaths take place among the lives actually observed, there being close relationship between those who are exposed to risk and those who die. . . . With mortality tables formed from Census returns and death registers the case is different. . . Many of the recorded deaths are not those of persons included in the enumerations. For instance, the English Life Table, No. 2, was based on the population of England and Wales enumerated at the Census of 6th June, 1841, and the deaths recorded in the seven years, 1838 to 1844 ; so that many of the deaths took place before the date of the Census, and could not have been deaths among the population counted." It is quite true, of course, that the deaths before the Census were not

deaths among the population actually *counted*, but it is also true that they were deaths amongst the *population on which the life table was based.* As indicated above, this latter is represented by the total number of years of life experienced in the community during the seven years 1838 to 1844, and the service which the Census performs is that of enabling an estimate to be made of the total volume of this experience and of its distribution according to age. The assumption made in this case is that the total volume is seven times the Census total, and that the distribution of this volume according to age is in accordance with that disclosed by the Census. The process is analogous to estimating the composition of a solid by means of the careful measurement in detail of a vertical cross section made at the middle point of its length. The assumptions to be made, and the validity of such assumptions will vary, of course, with each particular case, but the object aimed at in every case is the same, viz., the estimate in appropriate groups of the life experience for the same period as that for which the death experience is available, and it is only on this basis that the use of Census figures for life table purposes has an interpretable result.

The case of a single Census with an equal range of death experience on either side of it, and that of two Censuses with the intermediate range of death experience have been mentioned as those which usually arise in practice. There is, of course, no reason except those of expediency and appropriateness to the object in view why these should not be varied to any desired extent, and an example of such variation occurs in the case of the English Life Table, No. 3, which was based on the death experience of the 17 years, 1838 to 1854, and the results of the Censuses of 1841 and 1851. It was, in a sense, a combination of the single and dual Census methods.

What has been said in the present sub-section relates equally to National and Local Tables, the main difference between which is the geographical distribution of the experience.

3. **Australian Life Tables.**—(i.). **General.**—Until the Census of 1911, in connexion with which numerous and extensive general life tables have been compiled, the construction of such tables in Australia has in only two previous instances, been carried out by a Government department, one of these being the construction of life tables for New South Wales in connexion with the Census of 5th April, 1891, and the other the construction of a similar table for Western Australia in connexion with the Census of 31st March, 1901. Several other investigations of the mortality experience of an Australian general population have, however, taken place, and have formed the subject of papers read before actuarial and kindred societies, but it was not until the present occasion that complete tables for the whole of Australia were compiled. In addition to the investigation of the mortality of the general population, there have been several investigations of selected data, of which the more important are : (*a*) Assurance Experience, (*b*) Friendly Societies' Experience, and (*c*) Public Service Experience. A brief outline of the more important tables constructed from Australian data is furnished in the succeeding subsections.

(ii.) *New South Wales*, 1856-1866.—What is believed to be the first life table based on Australian experience was constructed by Mr. M. B. Pell, B.A., Professor of Mathematics in the University of Sydney. This table was compiled in 1867 on the basis of the death records of the State of New South Wales for the eleven years, 1856 to 1866 inclusive, and the results of the Censuses of 1856 and 1861. The results of the investigation and deductions drawn therefrom were contained in a paper read before the Royal Society of New South Wales on 6th November, 1867, and published in Volume I., p. 66, of the Transactions of the Society. Death rates are given in the paper for males and females separately, mainly in quinquennial age-groups, but the principal life table results are furnished only for the sexes in combination. No information is given concerning the methods of construction adopted, and nothing is said concerning the graduation, if any, applied to the data.

(iii.) *New South Wales*, 1860-75.—In or about the year 1877, Professor Pell constructed a further table based on the deaths registered in New South Wales during the 16 years, 1860 to 1875 inclusive, and the Censuses of 1861 and 1871, while in the case of the mortality of children under the age of 5, use was made of the birth registrations. This table was published in pamphlet form, and was afterwards included in a paper read before the Institute of Actuaries, London, on 6th January, 1879, and published in Volume XXI. of the Journal of the Institute, p. 257. The methods adopted in constructing the table and graduating the results are very fully shewn in the paper, which, in addition to the values of the elementary functions for each sex separately, furnishes also commutation columns and annuity and assurance values for each sex at 4 per cent. For ages above 75 the values were merged into those of the English Life Table, No. 3, modified by increasing the death rates by a small percentage. The methods of construction and graduation consisted in the computation of death-rates for quinquennial age-groups, and the interpolation for single ages by means of Lagrange's Theorem.

(iv.) *Victoria*, 1871.—On the 27th March, 1882, a paper was read before the Institute of Actuaries, London, by Mr. A. F. Burridge, F. I. A., which contained a life table for the State of Victoria, based on the death experience of 1871, the Census taken in that year and the births registered during the six years, 1866 to 1871 inclusive. The paper was published in the Journal of the Institute, Volume XXIII., p. 309. The method of construction was by means of a graphic process similar to that used by Milne in the construction of the Carlisle Table, the probabilities of surviving a year at each age, when determined, being further graphically graduated. The results are given for males and females separately.

The terminal values of the tables were obtained by taking for males from age 80 onwards the corresponding values from the English Life Tables No. 1—Males, and for females from 70 onwards the values for females from the No. 1 table taken one year younger.

(v.). *New South Wales, Victoria, Queensland,* 1870-1881.—A further paper "On the rates of mortality in Australia" was read by Mr. Burridge before the Institute of Actuaries on the 25th February, 1884, and was published in the Journal of the Institute, Volume XXIV., p. 333. This paper contains life tables based on the death experience of the twelve years, 1870 to 1881 inclusive, the results of the Censuses of 1871 and 1881, and the birth registrations for the twelve years, 1870 to 1881 inclusive. A life table for Victorian males is given separately, as well as tables for each sex for the States of New South Wales, Victoria and Queensland in combination. As in the case of the table mentioned in (iv.) above, the method of construction was based upon the Milne graphic method, supplemented by a graphic graduation of the death rates derived therefrom. For ages above 80 the values employed were obtained by deducting a small percentage from the corresponding death rates shewn by Farr's Healthy English Table.

(vi.) *New South Wales,* 1870-81 ; *Victoria,* 1861-87 ; *Queensland,* 1870-81 ; *Tasmania,* 1876-85.—In a paper read before the Insurance Institute of Victoria, Melbourne, on the 10th July, 1889, and published in the Australasian Insurance and Banking Record, Volume 13, p. 618, Mr. T. W. Bremner, F.F.A., A.I.A., presented a series of tables which he had constructed for several of the Australian States. The tables for New South Wales and Queensland cover the 12 years 1870-81, while for Victoria two tables were constructed, one for the 20 years, 1861-80, the other for the 7 years, 1881-87. In addition a table for Tasmania covering the 10 years, 1876-85, was also constructed. In all cases the tables were for the sexes combined, and related only to the period of life from age 15 to age 70. The methods of construction and graduation consisted in computing death rates per 1000 of population for various age-groups, and in graduating and interpolating for single ages by the graphic method.

(vii.) *New South Wales and Victoria,* 1881-91.—On the 14th June, 1893, a paper was read in Sydney before the Insurance Institute of New South Wales, by Mr. W. R. Dovey, F.F.A., which contained life tables for males and females separately for the States of New South Wales and Victoria combined, the period covered by the investigation being the eleven years, 1881 to 1891 inclusive. The data employed were the death experience for the eleven years mentioned, the results of the Censuses of 1881 and 1891, and the births registered during the ten years, 1881-90. In the construction of the tables, Milne's graphic method was employed, the death rates deduced therefrom being subsequently graphically graduated. For ages above 70 the table was merged into the English Life Table No. 3, taking the probabilities for one year younger in the case of females, and at the same age for males. This paper was published in the Australasian Insurance and Banking Record, Volume 17, p. 832.

(viii.) *New South Wales and Victoria,* 1881-90.—On the 11th July, 1894, a further series of life tables for New South Wales and Victoria was presented to the Insurance Institute of New South Wales in a paper by Mr. A. Duckworth, which was published in the Australasian Insurance and Banking Record, Volume 18, p. 656. These tables were based on the death experience for the decennium 1881-90, the Census results of 1881 and 1891, and the birth registrations for the 9 years, 1881-1889. In constructing the tables, death-rates were computed for age-groups, and then graphically graduated. For ages above 80 the rates of mortality employed were those given for males in Dr. Farr's Healthy Districts Table, with a percentage added. From the paper it appears that separate tables for males and females for each of the States were constructed, but the published results relate only to the combined experience of males and females for the two States combined, supplemented by further tables for Melbourne and suburbs, and for Sydney and suburbs, also for the sexes combined. For each of these three tables annuity values on a 4 per cent. basis were compiled and published.

(ix.) *New South Wales,* 1890-92.—The first life tables officially compiled from Australian data on the basis of Census results and death registrations, were those constructed under the direction of Mr. T. A. Coghlan, Government Statistician of New South Wales, in connexion with the Census of that State taken in 1891. These tables, one for males and the other for females, were based upon the death experience for the two years from 1st April, 1890, to 31st March, 1892, and the results of the Census taken for the 5th April, 1891. The tables were published in the Statistician's Report on the eleventh Census of New South Wales, issued 16th August, 1894 (see pp. 146-153), but no statement is made of the methods employed in obtaining the unadjusted death-rates, though it is stated that these results were graduated by the employment of Woolhouse's method. It is also not clear from the report by what means the rates for infantile ages were computed, but in the absence of any reference to the employment of birth statistics in this connexion it appears probable that the Census results were used throughout. The calculations were made up to age 100, but results were not published beyond age 90, as the number of persons over that age was considered too small to furnish the basis for life table calculations.

(x.) *New South Wales and Victoria,* 1889-93.—On 25th March, 1901, a paper " On the Rates of Mortality in New South Wales and Victoria," by Messrs. E. M. Moors, M.A., F.I.A., and W. R. Day, F.I.A., was read before the Institute of Actuaries, London, and was published in the Journal of the Institute, Vol. XXXVI., p. 151. This paper contained male and female

life tables for New South Wales and Victoria combined, based upon the death experience for the five years, 1889 to 1893 inclusive, the results of the Census of 5th April, 1891, the birth registrations for each of the 9 years, 1884-1892, and the records of migration for each of the 5 years, 1889 to 1893. In the main, the construction of the tables was carried out on the lines of Milne's graphic method, a feature of the process being the use of a specially prepared pine table, 5-feet by 3-feet, cross-ruled into half-inch squares. The numbers dying at each age in the life tables so deduced, were then graduated by Woolhouse's method. Included in the published tables are annuity values at $3\frac{1}{2}$ per cent. for males and females separately.

(xi.) *Western Australia*, 1899-1902.—The second series of official life tables constructed from Australian Census and registration data, were compiled under the direction of Mr. M. A. C. Fraser, Government Statistician of Western Australia, in connexion with the Census of 1901. This investigation was based on the death registrations for the three years from 1st October, 1899, to 30th September, 1902, the results of the Census for the 31st March, 1901, and the birth registrations for the seven years from 1st April, 1895, to 31st March, 1902. Separate compilations were made for males and females. Death rates for ages 5 and upwards were computed by making each age the centre of a group of 5, and assuming that the rate deduced for each such age-group was that applicable to its central age. The numbers dying at each age in the life tables so obtained were then graduated by Woolhouse's method. Owing to the paucity of data for the higher ages, the probabilities of surviving a year at ages 72 and upwards for males, and at ages 64 and upwards for females, were taken from the tables of Messrs. Moors and Day, referred to in subsection (x.) above. The results of the investigation were published in Volume I., p. 208, of the Report on the Seventh Census of Western Australia, 1901, which was issued on the 29th January, 1904.

(xii.) *Australia*, 1881-90, 1891-1900, 1901-10.—An examination of the tables enumerated in the foregoing sub-sections discloses many features, apart from the actual processes of construction and graduation which render them unsuitable for purposes of a comparison made with the object of ascertaining the improvement in respect of mortality, which has been experienced either in Australia as a whole or in its component States. One of the most serious objections on this score is, that no table shews the particulars for the whole of Australia. Further, whilst some of the tables relate to the sexes separately, others furnish particulars only for the sexes combined, and whilst some relate to single States, others furnish tables only for States in combination, with the added complication that such combinations are not the same in all cases. In addition to these drawbacks there are cases in which the tables relate to a portion only of lifetime. In view of these circumstances it was considered desirable in undertaking the construction of life tables for the decennium 1901-10, in connexion with the Census of 1911, to compile also similar tables for the decennia 1881-90 and 1891-1900, thus furnishing suitable bases of comparison with the results obtained for 1901-10. A table for males and one for females were accordingly constructed for each of the three decennia, for the Commonwealth as a whole, and for each of its component States, making in all a total of 42 separate tables. An account of the data employed in the preparation of these tables, and of the methods of construction and graduation adopted are furnished in later sections of the present Chapter.

(xiii.) *Assurance Experience.*—The only extensive investigations of the mortality of assured lives in Australia are those which, on three different occasions, have been undertaken by the Australian Mutual Provident Life Assurance Society. The first of these investigations which was carried out by Mr. M. A. Black, F.I.A., the Actuary to the Society, was completed and published on the 30th December, 1881. It related to the society's experience for the period of about 30 years from 21st February, 1849, to 31st December, 1878, and the tables deduced therefrom were in respect of males and females combined. A similar investigation for the period of about 40 years from 21st February, 1849, to 31st December, 1888, was carried out by Mr. R. Teece, F.I.A., F.F.A., the actuary to the Society, the results, which related to males and females combined, being published on 31st August, 1891. The resulting general mortality table was separately graduated by Woolhouse's method, and by the graphic method. A further investigation for the period of about 55 years from 21st February, 1849, to 31st December, 1903, was carried out by the same actuary, the results being published on 19th July, 1911. In this case separate tables were constructed for males and females, and a distinction was made between whole life and endowment assurance business, and between healthy lives and total lives (including those with loaded premiums). The whole life assurance tables were graduated by Woolhouse's method, the endowment assurance tables by the graphic method. In each case the results of the investigation were fully set forth in a report published by the Society.

(xiv.) *Friendly Societies' Experience.*—Three important investigations of the mortality experience of friendly societies have been made in Australia, dealing respectively with the States of South Australia, New South Wales and Victoria. In each case the investigation was a Government undertaking, the work being carried out by the respective Government Actuaries for friendly societies, and each comprised an extensive analysis of sickness as well as mortality experience. The earliest of these investigations was that carried out by Mr. H. Dillon Gouge, Public Actuary, which covered the male experience of all registered friendly societies in South Australia for the 10 years 1895-1904. The mortality table was graduated by means of Spencer's 21-term formula, and for age 80 and upwards a modification of the values from the Institute of Actuaries H^M table was employed. The tables which, in a complete form, were published on 21st June, 1909, contain monetary values based on interest at $3\frac{1}{2}$ per cent. per annum.

The second investigation of this nature was that concerning the male experience of the registered Friendly Societies of New South Wales for the nine years, 1900-1908. This was carried out by Mr. John B. Trivett, F.S.S., F.R.A.S., in his capacity as Actuary of Friendly Societies, the results being published in 1910. The data were classified into mining and non-mining experience and separate tables were published for each of these, as well as for the two experiences combined. The central death-rates deduced, were graduated by Spencer's 21-term formula, the probabilities obtained thereform being retained for ages 18 to 69. For ages 80 to 102 values of the probability of dying in a year were taken from the British Offices O^M table, and those for ages 70 to 80 were then supplied by interpolation between the two series. The tables contain monetary values based on interest at the rates of $3\frac{1}{2}$ and 4 per cent. per annum. The third Friendly Societies' investigation was that made by Mr. A. M. Laughton, F.I.A., F.F.A., Government Actuary for Friendly Societies in Victoria. For the purpose of this investigation the male experience of three of the largest friendly societies operating in Victoria was selected, the period of observation being the five years, 1903-1907. In selecting the data for tabulation, the experience of lodges which had been in existence for less than five years was excluded, the experience of the remaining lodges being tabulated and published under the head of " Whole Experience," to distinguish it from the results of a further analysis which involves the elimination of all lodges containing a large number of members engaged in the mining industry. The experience obtained from this latter elimination was tabulated under the head of " Non-mining." The Mining experience was not separately published. The whole of the results are contained in a report published in June, 1912. The mortality experience was graduated by Spencer's 21-term formula, the rate of mortality obtained therefrom being retained in the final tables for ages 18 to 69 inclusive. These in the " Whole Experience" table were succeeded for ages 70 to 95 by values from Messrs. Moors and Day's table, mentioned in (x.) above, and for ages 96 to 100 by approximations from Watson's Manchester Unity Experience, 1893-97.—(Whole Society Table). In the case of the " Non-mining" experience, a similar course was followed, with the exception that for ages 70 to 80 inclusive the values employed were taken from the $O^{M(5)}$ Table. The monetary tables published comprise commutation columns and annuity and assurance values based on interest at the rates of 3, $3\frac{1}{2}$ and 4 per cent.

(xv.) *Public Service Experience.*—There have been in Australia two important investigations of the mortality experience of members of the public service carried out in connexion with proposals to establish superannuation and widows' and orphans' funds, of which the results have been published. The first of these was an investigation by the Commonwealth Statistician (Mr. G. H. Knibbs, C.M.G., F.S.S., etc.,) concerning the experience of the Commonwealth Public Service for the six years, 1903 to 1908. Rates of mortality amongst male members of the service were computed and graphically graduated for the Administrative, Professional, and Clerical divisions in one group, and the General Division in another, the range of ages being 17 to 65 in the former, and 14 to 65 in the latter group. The mortality rates so deduced were used in conjunction with other rates in computing the values of various superannuation and other benefits, the rate of interest adopted being $3\frac{1}{2}$ per cent. The results of this investigation were contained in a report to the Minister for Home Affairs, dated 19th October, 1910. The second of the investigations mentioned was made by a committee of actuaries (Messrs. E. M. Moors, M.A., F.I.A. ; T. W. Bremner, F.F.A., A.I.A.; J. B. Trivett, F.R.A.S., F.S.S.) in connexion with superannuation proposals for the State of New South Wales. The experience covered was that of the New South Wales Public Service for the fifteen years, 1896 to 1910 inclusive, and was divided into three groups : (*a*) Males, General Division ; (*b*) Males, other Divisions ; and (*c*) Females. In computing monetary tables for the purposes of the investigation interest at $3\frac{1}{2}$ per cent. was used, but after a review of the data the committee decided not to employ the rates deduced from the actual experience, but employed instead the British Offices' O^M rates of mortality with 25 per cent. off.

4. Australian Life Tables at Census of 1911.—(i.) *Data Employed.*—For the purposes connected with the construction of the series of Australian Life Tables for the three decennia, 1881-90, 1891-1900, and 1901-10, the requisite data involved on the one hand the deaths of each sex registered in each of the States for the 30 years, 1881 to 1910 inclusive, classified according to age, and on the other an estimate for the same period of the life experience from which these deaths had arisen, such life experience being also classified according to age.

(*a*) *Death Statistics.*—The principal source of the statistics of deaths used in the construction of the life tables was for the earlier years the Statistical Registers and Reports on Vital Statistics published by the several States, and for the later years the Demography Bulletins compiled and published by the Commonwealth Bureau of Census and Statistics. For the decennia 1881-90 and 1891-1900, the data for two of the States, viz., Victoria and Queensland, were somewhat defective owing to the fact that the final age-group comprised all ages from 80 upwards. In the other States, as also in these two States for ages prior to 80, the data were available in single ages from 0 to 4 inclusive, and thence forward in quinquennial age-groups. In all the States there was a small proportion of cases of deaths of persons of unspecified age. Such deaths represented about 4 per 1000 of total for the decennium 1881-90, about 1.7 per 1000 for 1891-1900, and about 1.25 per 1000 for 1901-10. For each sex in each State the number unspecified was distributed over the various age-groups in proportion to the number specified. The defect mentioned above in the case of Victoria and Queensland was remedied

by computing in the case of New South Wales for the same decennia the death-rates for each of the quinquennial age-groups involved, and by so adjusting these rates proportionately that when applied to the appropriate life experience of the two States for the ages in question they reproduced the aggregate number of deaths in each case. In other words it was assumed that in Victoria, and Queensland, the death-rates for the several quinquennial age-groups involved had to one another the same ratios as the corresponding rates in the case of New South Wales. These computations were made separately for each sex in each decennium.

In certain cases data which were not available in the published statistics for Western Australia and the Northern Territory were kindly specially prepared by the Registrars-General of Western Australia and South Australia respectively from their death registers.

The death basis of the several life tables is indicated in the following table, which gives the number of deaths of each sex in each State, and in the Commonwealth as a whole, for each of the three decennia, a computation being added to shew the proportion in each case contributed by each State to the aggregate death experience of the Commonwealth. In all the tables contained in this Chapter, New South Wales includes the Federal Territory, and South Australia includes the Northern Territory.

Deaths in Australia, 1881 to 1910.

State.	Males.			Females.		
	1881–90.	1891-1900	1901–10.	1881–90.	1891-1900	1901–10.
	NUMBER.					
New South Wales	80,376	90,064	91,712	57,184	64,521	67,199
Victoria	86,915	92,975	84,411	64,544	70,409	67,044
Queensland	35,032	35,335	35,678	18,739	20,448	21,279
South Australia	22,807	22,812	21,709	18,170	18,906	17,825
Western Australia	4,025	11,941	17,840	2,024	5,494	10,154
Tasmania	11,785	11,609	10,744	8,391	8,829	9,018
Commonwealth	240,940	264,736	262,094	169,052	188,607	192,519
	PROPORTION PER CENT.					
New South Wales	% 33.36	% 34.02	% 34.99	% 33.83	% 34.21	% 34.91
Victoria	36.07	35.12	32.21	38.18	37.33	34.83
Queensland	14.54	13.35	13.61	11.08	10.84	11.05
South Australia	9.47	8.62	8.28	10.75	10.03	9.26
Western Australia	1.67	4.51	6.81	1.20	2.91	5.27
Tasmania	4.89	4.38	4.10	4.96	4.68	4.68
Commonwealth	100.00	100.00	100.00	100.00	100.00	100.00

Two of the States, namely, New South Wales and Western Australia, contributed in a larger proportion to the Commonwealth totals in 1901-10 than in 1881-90 in the cases of both male and female deaths, while the other four States contributed in both sexes in a smaller proportion in 1901-10 than in 1881-90. As will be seen later, these higher proportions for New South Wales and Western Australia were mainly due to the more marked increases in the populations of these States, while the diminution in proportion in the case of Queensland accompanying a heavy increase in population was due in great measure to a marked improvement in the rate of mortality experienced in that State in the later as compared with the earlier decennia.

The succeeding table furnishes for each of the decennia for the Commonwealth as a whole, the number of deaths of each sex in each age-group after the distribution of those in respect of which the particulars as to ages at death were either absent or insufficient :—

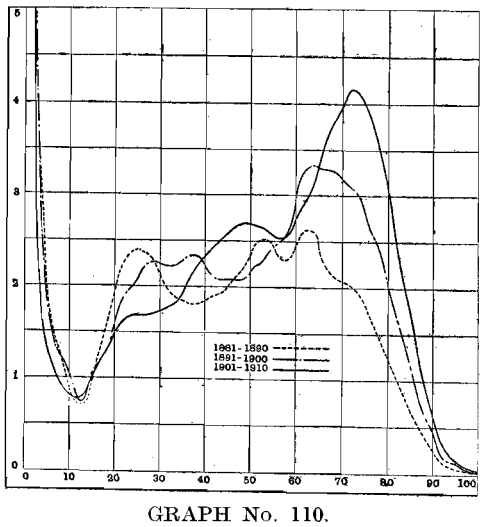
Commonwealth.—Deaths in Age-Groups, 1881 to 1910.

Age Last Birthday.	Males.			Females.		
	1881–90.	1891–1900	1901–10.	1881–90.	1891-1900	1901–10.
0	63,278	63,447	52,000	52,709	51,781	41,364
1	13,980	12,513	8,691	13,017	11,381	7,858
2	4,956	4,463	3,167	4,510	4,155	2,884
3	3,242	2,934	2,045	3,034	2,842	1,856
4	2,544	2,272	1,428	2,314	2,158	1,420
5–9	6,556	6,658	5,066	5,892	6,123	4,496
10–14	3,897	4,272	4,108	3,507	3,668	3,614
15–19	7,254	6,328	6,169	5,524	5,392	5,521
20–24	11,386	9,478	8,119	7,781	7,512	7,219
25–29	11,518	11,143	8,487	8,019	8,677	8,024
30–34	9,664	11,151	8,983	6,535	8,453	7,933
35–39	9,064	11,557	10,788	6,345	8,151	8,672
40–44	9,542	10,546	12,314	6,007	6,412	8,070
45–49	10,793	10,457	13,346	5,936	5,929	7,617
50–54	12,456	11,501	13,149	6,053	6,329	7,076
55–59	11,709	12,946	12,925	5,575	7,099	7,410
60–64	12,882	16,242	14,994	5,885	8,624	9,187
65–69	10,832	16,301	18,436	5,627	8,645	11,975
70–74	9,886	15,177	20,445	5,388	8,493	13,241
75–79	7,594	12,242	17,978	4,296	7,606	12,018
80–84	4,746	7,901	11,700	2,932	5,276	8,297
85–89	2,270	3,733	5,649	1,471	2,693	4,732
90–94	601	1,063	1,579	525	854	1,542
95–99	223	309	413	143	266	402
100 and over	67	102	115	27	88	91
All Ages	240,940	264,736	262,094	169,052	188,607	192,519

A feature of this table for both sexes is the marked diminution in number in evidence at the earlier ages, and the heavy increases shewn in the numbers at the later ages, the former being mainly due to marked improvement in the matter of infant mortality, and the latter to increasing numbers of persons in the population at the more advanced ages.

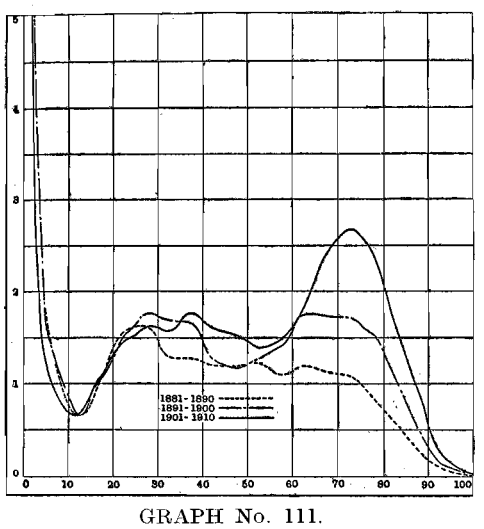
Commonweath Deaths in Age-groups, 1881-1910.

(*a*) MALES.



GRAPH No. 110.

(*b*) FEMALES.



GRAPH No. 111.

The accompanying graphs (Nos. 110 and 111) represent the number of deaths of each sex which occurred at each age during each of the three decennia, 1881-90, 1891-1900, and 1901-10. In both graphs the base of each small square represents 10 years of age, and the vertical height 500 deaths.

In any normally constituted population there is always in evidence a tendency for the number of deaths in quinquennial age-groups to diminish to the group 10-14, to rise thereafter to the group 70-74, or thereabouts, and diminish thereafter throughout. In Australia for the decennium 1901-10, this order of progression operated in the cases of both males and females, with some minor fluctuations. The minimum number at 10-14 was in evidence in both sexes in each of the other decennia, but the late maximum was, in the case of males, at 60-64 in 1891-90, and at 65-69 in 1891-1900. In the case of females the late maximum occurred as early as 25-29 in both of these decennia, but in 1891-1900 was succeeded by a well-defined second maximum in 65-69. These abnormalities are mainly due to the abnormal age constitution of the population from which the deaths for the decennia have been derived, and indicate the impossibility of

obtaining a satisfactory measure of the mortality of such a population from the death returns alone. They also indicate the inherent unsatisfactoriness of crude death rates for many of the purposes to which such rates are applied. To obtain satisfactory results in such cases the deaths at each age must be compared with the life experience at corresponding ages. A similar statement of the number of deaths in New South Wales in each of the decennia is given in the next table :—

New South Wales.—Deaths in Age-Groups, 1881-1910.

Age Last Birthday.	Males.			Females.		
	1881–90.	1891–1900	1901–10.	1881–90.	1891–1900	1901–10.
0	22,645	23,486	19,349	18,891	19,316	15,726
1	5,270	4,678	3,396	5,140	4,246	3,152
2	1,844	1,658	1,267	1,615	1,582	1,129
3	1,144	1,077	788	1,088	1,063	733
4	825	847	546	771	781	549
5–9	2,231	2,298	1,790	1,966	2,147	1,565
10–14	1,323	1,513	1,446	1,136	1,257	1,252
15–19	1,741	1,976	2,185	1,606	1,759	1,915
20–24	2,873	2,683	2,725	2,335	2,450	2,622
25–29	3,483	3,169	2,716	2,529	2,729	2,841
30–34	3,249	3,472	2,881	2,178	2,680	2,637
35–39	3,369	3,945	3,472	2,172	2,776	2,968
40–44	3,430	3,850	4,128	1,966	2,209	2,755
45–49	3,668	3,912	4,613	1,915	2,138	2,632
50–54	3,889	4,193	4,621	1,762	2,058	2,529
55–59	3,288	4,464	4,871	1,621	2,291	2,634
60–64	3,793	5,227	5,541	1,784	2,577	3,222
65–69	3,322	4,893	6,760	1,789	2,454	3,968
70–74	3,328	4,435	6,960	1,761	2,510	4,167
75–79	2,680	3,826	5,627	1,474	2,424	3,612
80–84	1,761	2,592	3,441	977	1,744	2,478
85–89	854	1,302	1,798	465	893	1,436
90–94	243	405	578	167	297	497
95–99	86	117	161	58	109	145
100 and over	37	46	52	18	31	35
All Ages	80,376	90,064	91,712	57,184	64,521	67,199

As in the case of the Commonwealth, the age-group 10-14 exhibited in both sexes, and in each decennium the minimum number of deaths, and the age-group 70-74 exhibited in both sexes in 1901-10 the maximum for ages above 1. For adult ages in the other two decennia the death figures do not conform to the normal type.

The number of deaths which occurred in Victoria in each of the three decennia is given in the next table, tabulated according to sex and age :—

Victoria.—Deaths in Age-Groups, 1881-1910.

Age Last Birthday.	Males.			Females.		
	1881–90.	1891–1900	1901–10.	1881–90.	1891–1900	1901–10.
0	21,619	20,519	15,053	18,057	17,023	11,916
1	4,652	4,321	2,485	4,234	3,851	2,171
2	1,612	1,432	829	1,514	1,293	812
3	1,140	932	589	1,048	823	506
4	918	756	411	841	680	406
5–9	2,449	2,309	1,548	2,313	2,093	1,415
10–14	1,501	1,390	1,266	1,433	1,283	1,167
15–19	2,154	1,914	1,776	2,273	2,019	1,826
20–24	3,311	2,746	2,014	3,075	2,891	2,223
25–29	3,420	3,348	2,237	3,199	3,365	2,575
30–34	2,800	3,374	2,422	2,494	3,396	2,736
35–39	2,751	3,332	3,153	2,483	3,019	3,082
40–44	3,158	3,004	3,646	2,474	2,406	2,890
45–49	4,156	3,102	3,946	2,646	2,218	2,794
50–54	5,434	3,611	3,646	2,819	2,540	2,399
55–59	5,679	4,922	3,593	2,637	2,968	2,608
60–64	6,002	7,073	4,484	2,662	3,963	3,279
65–69	4,732	7,603	6,516	2,408	4,018	4,749
70–74	3,869	6,975	8,431	2,187	3,831	5,714
75–79	2,781	5,228	8,045	1,670	3,142	5,360
80–84	1,625	3,171	5,263	1,189	2,115	3,669
85–89	822	1,430	2,326	608	1,034	1,970
90–94	221	359	543	226	320	592
95–99	89	92	149	50	78	149
100 and over	20	32	40	4	40	36
All Ages	86,915	92,975	84,411	64,544	70,409	67,044

These results are in accord with the normal type in giving a minimum in every case in age-group 10-14, and also in giving in 1901-10 an adult maximum in age-group 70-74, but are abnormal in distribution in adult ages for the decennia 1881-90 and 1891-1900.

The death experience for Queensland classified according to sex and age is given in the following table for each of the three decennia :—

Queensland.—Deaths in Age-Groups, 1881-1910.

Age Last Birthday.	Males.			Females.		
	1881–90.	1891–1900.	1901–10.	1881–90.	1891–1900.	1901–10.
0	8,280	8,267	6,638	6,909	6,609	5,230
1	1,990	1,536	1,035	1,811	1,432	1,040
2	710	670	466	677	637	430
3	448	480	289	426	495	275
4	326	311	212	289	352	213
5–9	759	920	695	594	834	615
10–14	455	562	599	342	416	456
15–19	2,332	1,300	1,011	642	497	618
20–24	3,858	2,108	1,488	1,113	768	846
25–29	3,045	2,320	1,548	1,066	999	931
30–34	2,280	2,143	1,627	800	952	937
35–39	1,690	2,034	1,833	722	900	985
40–44	1,755	1,791	2,000	687	697	965
45–49	1,610	1,685	2,131	515	650	833
50–54	1,556	1,869	2,229	448	710	830
55–59	1,056	1,718	1,991	400	672	854
60–64	1,014	1,668	2,324	350	719	1,048
65–69	684	1,397	2,431	286	625	1,158
70–74	532	1,085	2,179	248	532	1,092
75–79	353	763	1,569	195	447	880
80–84	186	459	883	120	297	585
85–89	80	184	363	66	144	336
90–94	17	43	103	28	42	94
95–99	16	19	29	5	16	22
100 and over	..	3	5	..	6	6
All Ages.	35,032	35,335	35,678	18,739	20,448	21,279

As will be noted later, the State of Queensland has now improved from the most unsatisfactory position amongst the States in 1881-90 in respect of mortality to one of the most satisfactory positions. An indication of this is furnished by the above death figures for males, which shew that for the period under review, the number of deaths increased less than 350 per decennium. The male population in the same period increased from 125,325 on 3rd April, 1881, to 329,506 on 3rd April, 1911.

The number of deaths of each sex recorded in South Australia (including the Northern Territory) for each of the three decennia are given hereunder according to age :—

South Australia.—Deaths in Age-Groups, 1881-1910.

Age Last Birthday.	Males.			Females.		
	1881–90.	1891–1900.	1901–10.	1881–90.	1891–1900.	1901–10.
0	7,192	5,932	4,075	6,008	4,608	3,134
1	1,421	998	658	1,280	1,036	540
2	539	399	256	484	366	204
3	339	265	154	311	255	116
4	338	203	102	297	185	91
5–9	727	654	427	644	583	328
10–14	391	470	387	359	445	343
15–19	634	626	581	621	661	580
20–24	798	724	717	784	747	750
25–29	944	814	656	798	842	780
30–34	890	817	695	688	804	714
35–39	891	989	799	645	830	732
40–44	801	906	900	582	654	663
45–49	874	919	1,086	518	555	728
50–54	913	937	1,244	598	617	702
55–59	905	1,011	1,219	544	721	720
60–64	988	1,213	1,388	621	841	918
65–69	953	1,210	1,462	616	945	1,177
70–74	895	1,282	1,539	640	979	1,350
75–79	690	1,192	1,457	536	971	1,326
80–84	437	749	1,146	347	686	998
85–89	195	367	563	183	385	649
90–94	44	102	161	51	140	223
95–99	7	29	32	13	42	50
100 and over	1	4	5	2	8	9
All Ages	22,807	22,812	21,709	18,170	18,906	17,825

The South Australian death figures for each sex in both the decennia 1891-1900 and 1901-10 accord with the normal experience in exhibiting a minimum number of deaths in the age-group 10-14, and an adult maximum in the group 70-74. For the decennium 1881-90 the age-group 10-14 also exhibits a minimum in each sex, but the adult maximum is at 60-64 for males, and 25-29 for females. It will be seen that the number of male deaths for 1891-1900 was practically identical with that for 1881-90, and that the number for 1901-10 was considerably lower than either, a somewhat similar variation being in evidence in the case of females. During this period the male population increased from 149,530 on 3rd April, 1881, to 210,092 on 3rd April, 1911, while the female population increased from 130,335 on 3rd April, 1881, to 201,776 on 3rd April, 1911.

Western Australian death figures tabulated according to sex and age are given in the succeeding table for each of the three decennia :—

Western Australia.—Deaths in Age-Groups, 1881-1910.

Age Last Birthday.	Males.			Females.		
	1881–90.	1891–1900.	1901–10.	1881–90.	1891–1900.	1901–10.
0	898	2,655	4,319	714	2,186	3,339
1	174	564	820	152	442	694
2	61	124	229	48	129	212
3	50	99	141	46	75	143
4	23	59	97	30	52	87
5–9	75	154	390	67	158	356
10–14	47	118	199	56	85	206
15–19	90	234	307	63	155	242
20–24	155	835	808	92	288	403
25–29	202	1,105	1,027	80	355	546
30–34	162	984	1,052	65	275	609
35–39	117	845	1,160	80	243	562
40–44	154	639	1,230	54	160	447
45–49	198	506	1,141	78	101	337
50–54	283	537	957	67	139	289
55–59	296	471	789	61	136	266
60–64	327	552	749	58	109	304
65–69	235	528	719	84	119	358
70–74	217	420	668	53	99	290
75–79	136	302	532	37	96	257
80–84	79	133	318	23	54	117
85–89	36	51	155	14	25	60
90–94	6	22	23	2	10	24
95–99	2	2	7	..	3	6
100 and over	2	2	3	..	..	..
All Ages	4,025	11,941	17,840	2,024	5,494	10,154

Owing to the abnormal development of Western Australia during recent years, the death statistics differ essentially in appearance from those for the other States. There is, however, the same tendency to a minimum in the group 10-14, and there is an adult maximum, but it is irregularly placed.

The following table gives for each of the three decennia, the Tasmanian death statistics, tabulated according to sex and age.

Tasmania.—Deaths in Age-Groups, 1881-1910.

Age Last Birthday.	Males.			Females.		
	1881–90.	1891–1900.	1901–10.	1881–90.	1891–1900.	1901–10.
0	2,644	2,588	2,566	2,130	2,039	2,019
1	473	416	297	400	374	261
2	190	180	120	172	148	97
3	121	81	84	115	131	83
4	114	96	60	86	108	74
5–9	315	323	216	308	308	217
10–14	180	219	211	181	182	190
15–19	303	278	309	319	301	340
20–24	391	382	367	382	368	375
25–29	424	387	303	347	387	351
30–34	283	361	306	310	346	300
35–39	246	412	371	243	383	343
40–44	244	356	410	244	286	350
45–49	287	333	429	264	267	293
50–54	381	354	452	359	265	327
55–59	485	360	462	312	311	328
60–64	758	509	508	410	415	416
65–69	906	670	548	444	484	565
70–74	1,045	980	668	499	542	628
75–79	954	931	748	384	526	583
80–84	658	797	649	276	380	450
85–89	283	399	444	135	212	281
90–94	70	132	171	51	45	112
95–99	23	50	35	17	18	30
100 and over	7	15	10	3	3	5
All Ages.	11,785	11,609	10,744	8,391	8,829	9,018

With one exception the Tasmanian figures accord with the normal results throughout in giving a minimum number of deaths in the age-group 10-14, and a maximum in the group 70-74, the exception occurring in the male experience for 1901-10 for which the adult maximum occurred in the age-group 75-79. It will be seen that the number of male deaths diminished in succeeding decennia, notwithstanding an increase in the male population during the period from 61,162 on 3rd April, 1881, to 97,591 on 3rd April, 1911.

(*b*) **Life Experience.**—In addition to the data in respect of deaths for the several periods of observation, it is necessary to obtain an estimate, classified according to age, of the number of years of life experienced by the community during each of these periods. The sources of such information are primarily the decennial census results, and secondarily the periodical population estimates, and records of births. The Census results so employed on the present occasion were those for the Censuses taken in the several States on 3rd April, 1881 ; 5th April, 1891 ; 31st March, 1901 ; and 3rd April, 1911. The totals for each sex, exclusive of full-blooded aboriginals, are as follows :—

Australian Census Results, 1881 to 1911 (Exclusive of Full-blooded Aboriginals).

State.	Males.				Females.			
	3rd April, 1881.	5th April, 1891.	31st Mar., 1901.	3rd April, 1911.	3rd April, 1881.	5th April, 1891.	31st Mar., 1901.	3rd April, 1911.
NUMBER.								
New South Wales ..	410,211	608,003	710,005	858,690	339,614	515,951	644,841	789,758
Victoria	451,623	598,089	603,720	655,591	409,943	541,751	597,350	659,960
Queensland	125,325	223,779	277,003	329,506	88,200	169,939	221,126	276,307
South Australia ..	149,530	166,801	184,701	210,092	130,335	153,630	178,456	201,776
Western Australia ..	17,062	29,807	112,875	161,565	12,646	19,975	71,249	120,549
Tasmania	61,162	77,560	89,624	97,591	54,543	69,107	82,851	93,620
Commonwealth ..	1,214,913	1,704,039	1,977,928	2,313,035	1,035,281	1,470,353	1,795,873	2,141,970
PROPORTION PER CENT.								
New South Wales ..	% 33.76	% 35.68	% 35.90	% 37.12	% 32.80	% 35.09	% 35.91	% 36.87
Victoria	37.17	35.10	30.52	28.34	39.60	36.84	33.26	30.81
Queensland	10.32	13.13	14.00	14.25	8.52	11.56	12.31	12.90
South Australia ..	12.31	9.79	9.34	9.08	12.59	10.45	9.94	9.42
Western Australia ..	1.41	1.75	5.71	6.99	1.22	1.36	3.97	5.63
Tasmania	5.03	4.55	4.53	4.22	5.27	4.70	4.61	4.37
Commonwealth ..	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

While all the States have shown substantial increases in population during the thirty years under review, the proportion of each State's contribution to the Commonwealth total, has increased continuously from Census to Census in the case of New South Wales, Queensland, and Western Australia, and has decreased continuously in the case of Victoria, South Australia and Tasmania.

At all the Censuses taken in Australia there has been a somewhat large number of persons concerning whom data as to age were not furnished. The number so unspecified totalled 13,221 for the whole Commonwealth in 1901, and 23,384 in 1911, the former representing 0.35 per cent. of the total population, and the latter 0.52 per cent. In all cases in preparing the data for the construction of the life tables the numbers unspecified were proportionately distributed over the specified ages, regard being taken to the indications, if any, furnished as to whether the unspecified persons were adults or children. Where such distinction was made the " children" were distributed over ages 0 to 14, the " adults" over ages 15 and upwards.

Details in respect of sex and age of the population of Australia at the Censuses of 1881 to 1911 are furnished in the following table, persons of unspecified age being distributed in accordance with the methods indicated above, and ages being stated in quinquennial groups throughout.

Commonwealth Population in Sex and Age-Groups, 1881 to 1911.

Age Last Birthday.	Males.				Females.			
	3rd April, 1881.	5th April, 1891.	31st Mar., 1901.	3rd April, 1911.	3rd April, 1881.	5th April, 1891.	31st Mar., 1901.	3rd April, 1911.
0–4	161,494	226,584	220,204	268,073	157,816	220,988	214,913	258,850
5–9	144,988	196,241	231,368	230,159	143,130	191,179	226,020	224,206
10–14	136,169	170,466	218,699	216,344	132,956	167,090	214,983	212,870
15–19	120,344	154,171	190,656	228,329	120,662	153,540	188,771	223,138
20–24	117,642	171,154	175,490	229,702	107,485	157,875	177,021	219,495
25–29	96,130	174,291	163,326	201,263	74,003	138,730	157,030	189,669
30–34	78,230	143,519	157,129	172,276	60,010	105,458	136,394	160,878
35–39	74,878	104,847	152,877	152,903	56,054	74,869	120,744	140,467
40–44	71,199	80,301	126,681	145,848	50,074	60,159	95,391	125,462
45–49	63,554	70,137	89,111	133,976	41,982	52,749	65,888	109,242
50–54	55,101	63,477	67,563	108,859	32,241	46,374	52,686	85,336
55–59	33,522	51,409	52,913	72,541	20,552	35,980	43,136	57,290
60–64	27,816	42,613	46,257	51,759	17,153	27,609	37,166	44,262
65–69	15,553	24,268	38,701	40,491	9,695	16,484	30,485	36,700
70–74	10,142	16,817	26,015	29,255	6,323	11,620	18,450	26,176
75–79	4,871	8,332	12,668	18,951	3,080	5,754	9,710	16,609
80–84	2,531	3,750	6,063	8,863	1,527	2,645	5,047	7,740
85–89	540	1,201	1,669	2,651	362	923	1,563	2,720
90–94	142	373	409	641	122	263	385	704
95–99	35	67	99	116	42	47	70	127
100 and over ..	32	21	30	35	12	17	20	29
All Ages ..	1,214,913	1,704,039	1,977,928	2,313,035	1,035,281	1,470,353	1,795,873	2,141,970

This table furnishes evidence of the change in age constitution which has taken place in the population of the Commonwealth during the thirty years under review. Thus, whilst in both sexes, the population in the group 20-24 was approximately twice as great in 1911 as in 1881, the 1911 figures for ages under 20 were less than twice the corresponding figures for 1881, and for ages above 25 the 1911 figures were in practically all cases more than twice as great as those for 1881. In some cases they were more than five times as great.

Population figures for New South Wales, classified according to sex and age, are furnished in the following table for the Censuses of 1881, 1891, 1901 and 1911 :—

New South Wales.—Population in Sex and Age-Groups, 1881 to 1911.

Age Last Birthday.	Males.				Females.			
	3rd April, 1881.	5th April, 1891.	31st Mar., 1901.	3rd April, 1911.	3rd April, 1881.	5th April, 1891.	31st Mar., 1901.	3rd April, 1911.
0–4	56,286	83,640	80,398	102,329	54,942	81,354	78,567	99,168
5–9	49,980	72,511	84,283	85,429	49,130	70,977	81,961	83,388
10–14	45,164	61,840	81,675	79,425	43,398	60,867	80,112	78,252
15–19	38,248	53,931	70,772	83,622	37,556	54,160	70,814	81,611
20–24	40,140	57,666	62,758	87,993	34,474	53,133	64,890	83,423
25–29	35,123	59,752	56,552	77,023	25,482	46,673	56,105	72,881
30–34	29,422	51,933	52,858	64,726	21,273	36,424	46,750	60,313
35–39	27,395	40,238	52,593	55,556	19,062	27,110	41,640	51,062
40–44	24,293	31,227	45,153	51,319	15,289	22,003	33,474	43,768
45–49	19,467	26,865	33,504	47,003	11,893	18,491	24,028	37,844
50–54	15,681	22,586	25,742	39,652	8,833	14,662	19,348	30,17
55–59	9,105	16,644	19,732	27,773	5,922	10,721	15,393	21,056
60–64	8,367	12,504	16,816	20,181	5,527	7,677	12,204	16,467
65–69	5,144	6,945	13,070	15,497	3,147	4,865	9,247	13,109
70–74	3,468	4,997	7,810	10,699	2,057	3,658	5,208	8,646
75–79	1,648	2,837	3,595	6,706	992	1,903	2,848	5,277
80–84	984	1,291	1,892	2,740	467	876	1,574	2,241
85–89	210	421	567	778	111	284	511	790
90–94	55	142	174	185	37	79	138	242
95–99	14	21	49	35	13	27	25	34
100 and over ..	17	12	12	19	9	7	4	12
All Ages ..	410,211	608,003	710,005	858,690	339,614	515,951	644,841	789,758

The succeeding table gives the Census data in respect of sex and age for the population of Victoria at the Censuses of 1881, 1891, 1901 and 1911 :—

Victoria.—Population in Sex and Age-Groups, 1881-1911.

Age Last Birthday.	Males.				Females.			
	3rd April, 1881.	5th April, 1891.	31st Mar., 1901.	3rd April, 1911.	3rd April, 1881.	5th April, 1891.	31st Mar., 1901.	3rd April, 1911.
0–4	57,789	75,185	66,954	73,278	56,321	73,471	65,284	70,622
5–9	54,801	65,418	72,220	65,811	54,414	63,529	70,614	64,089
10–14	54,285	58,876	67,539	63,775	53,883	57,757	66,752	62,703
15–19	49,413	57,096	59,188	68,204	51,167	57,691	59,922	68,191
20–24	40,567	63,601	50,841	62,260	43,294	62,381	57,820	65,673
25–29	27,437	63,180	45,693	52,262	26,963	55,220	53,007	56,040
30–34	22,599	47,864	46,870	45,194	21,933	39,840	48,319	49,035
35–39	23,399	31,824	46,956	41,552	21,550	26,508	43,539	44,861
40–44	25,907	24,034	37,304	42,763	21,218	21,430	33,664	42,776
45–49	28,322	22,111	24,251	41,257	19,428	19,651	21,881	38,746
50–54	26,407	22,804	18,432	32,054	15,283	19,386	17,651	29,626
55–59	15,958	22,264	15,416	19,601	9,114	16,220	15,209	18,586
60–64	12,036	20,213	15,050	13,916	6,999	12,915	14,338	14,418
65–69	6,149	11,144	16,162	11,499	3,798	7,181	13,891	12,692
70–74	3,679	7,240	11,839	9,471	2,522	4,803	8,388	10,041
75–79	1,778	3,210	5,762	7,318	1,214	2,267	4,247	6,982
80–84	849	1,389	2,465	3,926	621	1,012	2,073	3,411
85–89	179	463	606	1,140	155	359	588	1,136
90–94	43	145	130	268	47	112	125	266
95–99	15	23	30	34	19	13	27	56
100 and over	11	5	12	8	..	5	11	10
All Ages	451,623	598,089	603,720	655,591	409,943	541,751	597,350	659,960

Queensland Census results in respect of sex and age are furnished in the next table for the Censuses of 1881, 1891, 1901 and 1911 :—

Queensland.—Population in Sex and Age-Groups, 1881-1911.

Age Last Birthday.	Males.				Females.			
	3rd April, 1881.	5th April, 1891.	31st Mar., 1901.	3rd April, 1911.	3rd April, 1881.	5th April, 1891.	31st Mar., 1901.	3rd April, 1911.
0–4	16,182	30,463	31,410	37,804	15,761	29,877	30,808	36,044
5–9	13,638	23,819	32,014	32,135	13,414	23,276	31,069	31,475
10–14	11,704	19,902	29,099	31,521	11,200	19,256	28,670	31,051
15–19	9,666	18,456	24,158	32,903	8,736	17,180	22,922	31,065
20–24	12,631	24,041	25,084	33,864	8,712	18,705	21,307	29,575
25–29	13,234	25,676	24,107	29,280	6,703	15,954	18,388	23,641
30–34	11,241	21,312	23,092	24,637	5,653	12,153	16,050	19,398
35–39	10,853	15,566	22,525	21,578	5,563	8,540	13,783	16,834
40–44	9,917	12,192	18,788	20,243	4,422	6,864	10,772	14,692
45–49	6,419	10,522	13,307	18,916	2,954	6,104	7,444	12,316
50–54	4,319	9,173	10,358	15,321	2,004	4,686	6,054	9,572
55–59	2,240	5,441	8,115	10,352	1,220	2,981	4,927	6,392
60–64	1,668	3,578	6,897	7,532	899	1,990	3,965	4,946
65–69	837	1,784	4,200	5,935	478	1,145	2,405	4,183
70–74	464	1,076	2,268	4,293	267	729	1,385	2,808
75–79	195	512	975	2,119	133	302	706	1,419
80–84	93	195	461	774	56	133	344	601
85–89	18	53	109	236	15	50	94	232
90–94	4	12	27	52	9	11	24	50
95–99	2	6	7	9	1	3	6	10
100 and over	..	..	2	2	..	..	3	3
All Ages	125,325	223,779	277,003	329,506	88,200	169,939	221,126	276,307

The population of South Australia (including the Northern Territory) at the Censuses of 1881, 1891, 1901 and 1911, is given in the following table, classified according to sex and age :—

South Australia.—Population in Sex and Age-Groups, 1881-1911.

Age Last Birthday.	Males.				Females.			
	3rd April, 1881.	5th April, 1891.	31st Mar., 1901.	3rd April, 1911.	3rd April, 1881.	5th April, 1891.	31st Mar., 1901.	3rd April, 1911.
0–4	21,028	23,015	20,295	24,237	20,656	22,266	19,852	23,561
5–9	17,407	21,827	22,796	20,600	17,357	21,267	22,651	19,984
10–14	16,207	19,162	22,232	19,689	16,068	18,641	21,637	19,516
15–19	14,801	15,363	20,041	21,725	14,991	15,617	20,196	21,548
20–24	16,907	15,380	16,669	21,836	13,844	14,923	17,571	20,802
25–29	15,032	14,400	13,795	19,288	10,195	12,937	14,277	18,673
30–34	10,965	13,426	12,967	15,321	7,689	10,690	12,389	14,844
35–39	9,625	10,758	12,033	12,575	6,670	8,290	11,233	12,320
40–44	7,344	8,115	11,390	11,882	6,045	6,339	9,613	11,309
45–49	5,672	6,827	9,048	10,752	4,949	5,517	7,289	10,125
50–54	4,897	5,401	6,770	10,022	3,871	4,931	5,576	8,408
55–59	3,336	4,094	5,336	7,538	2,691	3,837	4,545	6,236
60–64	2,770	3,529	3,992	5,188	2,250	3,251	4,026	4,656
65–69	1,607	2,378	2,872	4,082	1,406	2,169	3,051	3,760
70–74	1,102	1,723	2,282	2,610	904	1,534	2,280	2,734
75–79	537	850	1,290	1,545	447	830	1,262	1,828
80–84	227	404	646	825	232	389	698	977
85–89	52	123	197	289	49	156	240	375
90–94	13	21	43	68	14	40	61	99
95–99	1	5	4	19	6	3	8	19
100 and over ..	..	..	3	1	1	3	1	2
All Ages ..	149,530	166,801	184,701	210,092	130,335	153,630	178,456	201,776

Western Australian results for the Censuses of 1881, 1891, 1901 and 1911 are given in the following table tabulated according to sex and age :—

Western Australia.—Population in Sex and Age-Groups, 1881-1911.

Age Last Birthday.	Males.				Females.			
	3rd April, 1881.	5th April, 1891.	31st Mar., 1901.	3rd April, 1911.	3rd April, 1881.	5th April, 1891.	31st Mar., 1901.	3rd April, 1911.
0–4	2,082	3,442	10,445	17,752	2,071	3,393	10,239	17,276
5–9	1,888	2,787	8,895	14,843	1,847	2,610	8,861	14,438
10–14	1,812	2,402	7,505	11,818	1,744	2,392	7,325	11,668
15–19	1,515	2,252	7,109	11,893	1,547	2,072	5,854	10,887
20–24	1,396	3,312	11,877	14,845	1,223	2,150	7,284	10,662
25–29	1,109	3,824	15,870	15,626	849	1,882	8,683	10,506
30–34	835	2,924	14,890	15,782	686	1,416	7,304	10,661
35–39	1,041	1,984	12,479	15,691	648	977	5,327	9,991
40–44	1,161	1,412	8,749	14,048	617	770	3,395	7,982
45–49	1,239	1,233	5,237	10,855	494	645	2,151	5,690
50–54	1,120	1,213	3,464	7,411	324	566	1,678	3,773
55–59	703	1,031	2,318	4,237	216	437	1,177	2,444
60–64	600	887	1,773	2,813	188	289	908	1,832
65–69	263	524	1,105	1,886	94	155	570	1,330
70–74	183	376	693	1,135	59	130	279	819
75–79	75	133	290	581	25	51	133	379
80–84	31	51	140	256	12	26	56	139
85–89	6	14	30	64	2	10	21	59
90–94	3	5	5	25	..	4	3	10
95–99	..	..	1	3	..	..	1	1
100 and over ..	..	1	..	1	..	..	..	2
All Ages ..	17,062	29,807	112,875	161,565	12,646	19,975	71,249	120,549

The next table contains the results for the Tasmanian Censuses of 1881, 1891, 1901 and 1911, tabulated according to sex and age :—

Tasmania.—Population in Sex and Age-Groups, 1881-1911.

Age Last Birthday.	Males.				Females.			
	3rd April, 1881.	5th April, 1891.	31st Mar., 1901.	3rd April, 1911.	3rd April, 1881.	5th April, 1891.	31st Mar., 1901.	3rd April, 1911.
0–4	8,127	10,839	10,702	12,673	8,065	10,627	10,163	12,179
5–9	7,274	9,879	11,160	11,341	6,968	9,520	10,864	10,832
10–14	6,997	8,284	10,649	10,116	6,663	8,177	10,487	9,680
15–19	6,701	7,073	9,388	9,982	6,665	6,820	9,063	9,836
20–24	6,001	7,154	8,261	8,904	5,938	6,583	8,149	9,360
25–29	4,195	7,459	7,309	7,784	3,811	6,064	6,570	7,928
30–34	3,168	6,060	6,452	6,616	2,776	4,935	5,582	6,627
35–39	2,565	4,477	6,291	5,951	2,561	3,444	5,222	5,399
40–44	2,577	3,321	5,297	5,593	2,483	2,753	4,473	4,935
45–49	2,435	2,579	3,764	5,193	2,264	2,341	3,095	4,521
50–54	2,677	2,300	2,797	4,399	1,926	2,143	2,379	3,783
55–59	2,180	1,935	1,996	3,040	1,389	1,784	1,885	2,576
60–64	2,375	1,902	1,729	2,129	1,290	1,487	1,725	1,943
65–69	1,553	1,493	1,292	1,592	772	969	1,321	1,626
70–74	1,246	1,405	1,123	1,047	514	766	910	1,128
75–79	638	790	756	682	269	401	514	724
80–84	347	420	459	342	139	209	302	371
85–89	75	127	160	144	30	64	109	128
90–94	24	48	30	43	15	17	34	37
95–99	3	12	8	16	3	1	3	7
100 and over ..	4	3	1	4	2	2	1	..
All Ages ..	61,162	77,560	89,624	97,591	54,543	69,107	82,851	93,620

The preceding tables furnish, in respect of the Commonwealth and its component States, the population and its age and sex distribution at the four Censuses specified. In the absence of further population data it would be necessary, for the purpose of determining the years of life experienced in each decennium in each age-group, to make some assumption as to the rate of growth of the population in each case. For example, in the above Tasmanian table the number of males in group 20-24 was 6001 on 3rd April, 1881, and 7154 on 5th April, 1891. If it were assumed that between these points and also for the portion of 1881 prior to the date of the Census the growth of population in this age-group had been linear, that is, had proceeded by means of equal numbers added per annum, the number of years of life experienced in this age-group could readily be determined for each year of the decade 1881-90, and hence by addition or integration for the whole of the decennium. If a similar assumption and calculation were made for each age-group, there would be produced a series of results showing an estimated mean male population for each year of the decade, classified according to age. Such a result is open to the evident objection that, as the mean male population is already known independently by means of the records of births, deaths, arrivals and departures corrected to accord with Census results, it is not warrantable to recast it on the assumption of a linear progression from one Census to the next. A similar objection would apply to an assumption that the number in each age-group increased in geometrical progression instead of linearly. Such an assumption would be further complicated in application by the fact that whilst in the case of assumed linear progressions the totals of the age-groups for each year of the decade will coincide with the corresponding figures for a linear progression of the total population, when a separate geometrical progression is assumed for each age-group and for the total, the aggregate of the computed age-group result will not in practice agree with the separately computed result for the total population. In this case there will be three different estimates of the mean male population for any year of the decade, viz., (*a*) the mean determined from corrected returns of migration and natural increase ; (*b*) the mean determined by aggregating the computed results for age-groups ; and (*c*) the mean determined on the assumption that the male population as a whole increases in geometrical progression, of which the last two take no account of the recorded fluctuations during the decennium. In the construction of life tables based on the data of two Australian Censuses, it has been usual to employ one or other of the assumptions indicated above, that is, to assume that the population in each age-group has increased during the decennium either linearly or else in geometrical progression, thus ignoring intercensal records. Although such records are admittedly defective in certain

respects, it is believed that, when subjected to the post-censal adjustment indicated in Chapter IX. hereinbefore, they furnish valuable data respecting the fluctuations of population, and should not be ignored in the computation of the years of life for life table purposes. In the preparation of the present series of tables the work has proceeded on the basis of taking the adjusted inter-censal record as furnishing the correct aggregate amount of life experienced during the decennium, and the initial and final Censuses as furnishing the scale for distributing that aggregate according to age. If the proportion of the population in each age-group were the same respectively at the two Censuses, it would of course be immaterial which Census results were taken as a scale, but since, as indicated earlier in the present section, there have been marked changes in age distribution, from Census to Census, the scale applicable to any decennium will be neither the one nor the other, but a scale or scales occupying a mean position between them. For the purpose of determining such a scale or series of scales, the ratio of the population in each age-group to the total population was computed for each pair of successive Censuses, and the assumption was made that the change in ratio so disclosed as having taken place during the decennium, had proceeded linearly in each age-group throughout that period. By such means a scale applicable to the mean population of each year of the decennium could readily be determined, and the addition of the allocations so obtained would give the allocation according to age of the aggregate experience of the decennium. In actual application, however, it is not necessary to compute the series of scales described above, as the work may be considerably shortened by mathematical considerations, which are set out in note A, page 345. As shewn there, the life experience during the decennium for any age-group may be represented by the formula

$$\left\{ r_1 - \frac{1}{40}(r_2 - r_1) \right\} \int_0^{10} P_t dt + \frac{1}{10}(r_2 - r_1) \int_0^{10} t P_t dt$$

where r_1 denotes the ratio to total for the particular age-group at the earlier, and r_2 the corresponding ratio at the later Census, P_t denotes the total population at any point of time t during the decennium, so that t may have any value from 0 to 10. To enable this formula to be applied it is necessary to have the population at regular intervals throughout the period of observation.

This is furnished in the following table, which gives the male and female population of the Commonwealth and its component States at 31st December, in each of the years 1880 to 1910 :—

Australian Population, 1880 to 1910.

31st Dec.—	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	C'wlth.
			MALES.				
1880	404,952	450,558	124,013	147,438	16,985	60,568	1,204,514
1881	426,933	457,782	130,080	152,453	17,316	62,495	1,247,059
1882	444,138	466,788	142,489	154,921	17,752	63,804	1,289,892
1883	470,291	477,671	166,545	159,586	18,335	64,995	1,357,423
1884	494,307	490,266	178,482	163,262	19,145	66,534	1,411,996
1885	518,606	504,097	186,866	162,425	20,688	67,712	1,460,394
1886	538,284	523,864	194,749	160,814	23,979	69,264	1,510,954
1887	553,084	541,216	204,817	162,371	26,039	71,591	1,559,118
1888	568,273	571,425	212,078	160,459	25,831	72,482	1,610,548
1889	582,528	582,672	218,697	164,065	26,890	74,242	1,649,094
1890	602,704	595,519	223,252	166,049	28,854	76,453	1,692,831
1891	622,523	606,395	226,759	168,826	32,176	79,938	1,736,617
1892	636,276	608,666	231,167	174,862	36,048	79,753	1,766,772
1893	646,735	609,500	235,975	179,850	40,975	78,780	1,791,815
1894	658,354	609,379	241,905	180,239	55,055	79,285	1,824,217
1895	668,209	607,933	248,865	180,314	69,733	80,485	1,855,539
1896	675,857	599,497	253,112	179,024	96,999	82,685	1,887,174
1897	687,966	599,621	258,662	178,404	107,655	85,152	1,917,460
1898	698,009	598,332	265,644	179,865	107,593	88,186	1,937,629
1899	707,164	599,765	271,891	183,101	106,816	90,337	1,959,074
1900	716,047	601,773	274,684	184,637	110,088	89,763	1,976,992
1901	720,840	608,436	282,291	184,439	117,885	90,945	2,004,836
1902	736,142	604,318	284,215	181,392	128,370	93,571	2,028,008
1903	748,821	599,950	286,871	180,138	134,140	95,224	2,045,144
1904	765,713	597,617	289,785	182,023	141,694	95,951	2,072,783
1905	782,897	598,134	291,807	184,835	146,498	95,947	2,100,118
1906	800,820	600,856	294,063	188,051	148,061	94,879	2,126,730
1907	823,413	605,775	296,670	191,118	146,264	96,973	2,160,213
1908	832,419	614,937	302,370	197,866	148,447	97,942	2,193,981
1909	845,228	631,021	314,481	201,646	151,325	98,514	2,242,215
1910	858,181	646,482	325,513	209,295	157,971	98,866	2,296,308

Australian Population, 1880 to 1910—*continued.*

31st Dec.—	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	C'wealth.
			FEMALES.				
1880	336,190	408,047	87,027	128,955	12,576	54,222	1,027,017
1881	350,092	416,183	91,769	133,518	12,840	55,275	1,059,677
1882	365,265	425,977	99,840	137,171	13,264	56,673	1,098,190
1883	385,107	434,782	114,070	142,321	13,751	58,282	1,148,313
1884	404,896	445,511	123,105	145,685	14,401	60,131	1,193,729
1885	425,261	455,741	129,815	146,888	15,271	61,148	1,234,124
1886	445,234	469,853	137,562	145,896	16,625	61,926	1,277,096
1887	461,523	484,260	147,063	147,667	17,781	63,950	1,322,244
1888	476,017	507,652	155,088	148,994	17,983	65,395	1,371,129
1889	491,612	522,266	162,792	150,524	18,770	67,419	1,413,383
1890	510,571	538,209	168,864	152,898	19,648	68,334	1,458,524
1891	530,647	551,977	173,636	155,895	21,001	71,212	1,504,368
1892	546,881	560,081	178,509	160,530	22,521	70,459	1,538,981
1893	559,762	566,670	183,018	165,066	23,948	71,616	1,570,080
1894	573,401	572,776	188,086	168,535	26,524	73,221	1,602,543
1895	587,294	577,743	194,199	171,654	30,782	74,410	1,636,082
1896	596,507	580,353	199,593	173,043	39,817	76,611	1,665,924
1897	607,623	582,485	204,632	173,933	52,840	78,810	1,700,323
1898	619,436	583,949	209,217	174,948	59,285	80,251	1,727,086
1899	632,050	588,776	214,424	176,197	63,442	82,025	1,756,914
1900	644,258	594,440	219,163	177,470	69,879	83,137	1,788,347
1901	654,615	601,464	224,430	179,564	75,716	84,288	1,820,077
1902	665,801	603,913	228,025	180,089	83,603	85,879	1,847,310
1903	676,362	604,792	230,857	181,129	90,608	87,700	1,871,448
1904	689,745	607,991	235,150	181,551	97,714	89,216	1,901,367
1905	704,987	612,287	239,675	181,832	103,640	90,438	1,932,859
1906	720,798	618,976	244,910	182,366	107,112	90,593	1,964,755
1907	738,159	627,032	249,135	186,282	108,276	92,625	2,001,509
1908	751,504	635,512	254,729	191,537	111,224	93,791	2,038,297
1909	768,671	646,001	263,364	194,754	114,350	94,605	2,081,745
1910	785,674	654,926	273,503	200,874	118,861	94,937	2,128,775

An example of the actual work of computing the years of life will perhaps make the process clearer. For this purpose the figures for New South Wales males for the decennium 1891-1900 have been selected. The first step is that of determining the population integrals, which, was done by means of Simpson's rule, the work being as follows :—

New South Wales.—Males, 1891—1900. Population Integrals.

Year.	t.	P_t.	Integrating Co-efficient.	P_t × Co-efft.	tP_t × Co-efft.
1890	0	602,704	1	602,704	..
1891	1	622,523	4	2,490,092	2,490,092
1892	2	636,276	2	1,272,552	2,545,104
1893	3	646,735	4	2,586,940	7,760,820
1894	4	658,354	2	1,316,708	5,266,832
1895	5	668,209	4	2,672,836	13,364,180
1896	6	675,857	2	1,351,714	8,110,284
1897	7	687,966	4	2,751,864	19,263,048
1898	8	698,009	2	1,396,018	11,168,144
1899	9	707,164	4	2,828,656	25,457,904
1900	10	716,047	1	716,047	7,160,470
				19,986,131	102,586,878

$$\int_0^{10} P_t\,dt = \frac{19,986,131}{3} = 6,662,044 : \qquad \int_0^{10} t P_t\,dt = \frac{102,586,878}{3} = 34,195,626$$

The integral $\int_0^{10} P_t\,dt = 6,662,044$ gives the aggregate number of years of male life experienced in New South Wales during the decennium 1891-1900, and the next step of the process is that of distributing this experience according to age. The other integral has no significance except as a step in this process of distribution. The actual work of distribution is shewn in full in the following table :—

New South Wales.—Males, 1891-1900, Distribution of Years of Life Experienced.

Age Last Birthday. (1)	Population on 5th April, 1891. Number. (2)	Ratio to Total. (3)	Population on 31st March, 1901. Number. (4)	Ratio to Total. (5)	$\frac{1}{10}[(5)-(3)]$ (6)	$\frac{1}{2}(6)$ (7)	(3)–(7) (8)	(8) × $\int_0^{10} P_t dt$ (9)	(6) × $\int_0^{10} t\,P_t dt$ (10)	Age Distribution of experience. (9) + (10) (11)
0–4 ..	83,640	.1375651	80,398	.1132358	−.0024329	−.0006082	.1381733	920,517	—83,195	837,322
5–9 ..	72,511	.1192609	84,283	.1187076	−.0000553	−.0000138	.1192747	794,613	— 1,891	792,722
10–14 ..	61,840	.1017100	81,675	.1150344	+.0013324	+.0003331	.1013769	675,377	+45,562	720,939
15–19 ..	53,931	.0887019	70,772	.0996782	+.0010976	+.0002744	.0884275	589,108	+37,533	626,641
20–24 ..	57,666	.0948449	62,758	.0883909	−.0006454	−.0001613	.0950062	632,935	—22,070	610,865
25–29 ..	59,752	.0982758	56,552	.0796501	−.0018626	−.0004656	.0987414	657,820	—63,693	594,127
30–34 ..	51,933	.0854157	52,858	.0744474	−.0010968	−.0002742	.0856899	570,870	—37,506	533,364
35–39 ..	40,238	.0661806	52,593	.0740741	+.0007893	+.0001973	.0659833	439,584	+26,991	466,575
40–44 ..	31,227	.0513600	45,153	.0635953	+.0012235	+.0003059	.0510541	340,125	+41,838	381,963
45–49 ..	26,865	.0441856	33,504	.0471884	+.0003003	+.0000751	.0441105	293,866	+10,269	304,135
50–54 ..	22,586	.0371479	25,742	.0362561	−.0000892	−.0000223	.0371702	247,630	— 3,050	244,580
55–59 ..	16,644	.0273749	19,732	.0277914	+.0000416	+.0000104	.0273645	182,303	+ 1,423	183,726
60–64 ..	12,504	.0205657	16,816	.0236843	+.0003119	+.0000780	.0204877	136,490	+10,666	147,156
65–69 ..	6,945	.0114227	13,070	.0184083	+.0006986	+.0001746	.0112481	74,935	+23,889	98,824
70–74 ..	4,997	.0082187	7,810	.0109999	+.0002781	+.0000695	.0081492	54,290	+ 9,510	63,800
75–79 ..	2,837	.0046661	3,595	.0050634	+.0000397	+.0000099	.0046562	31,020	+ 1,358	32,378
80–84 ..	1,291	.0021233	1,892	.0026648	+.0000542	+.0000135	.0021098	14,056	+ 1,853	15,909
85–89 ..	421	.0006924	567	.0007986	+.0000106	+.0000026	.0006898	4,595	+ 362	4,957
90–94 ..	142	.0002336	174	.0002451	+.0000012	+.0000003	.0002333	1,554	+ 41	1,595
95–99 ..	21	.0000345	49	.0000690	+.0000035	+.0000009	.0000336	224	+ 120	344
100 and over	12	.0000197	12	.0000169	−.0000003	−.0000001	.0000198	132	— 10	122
Total ..	608,003	1.0000000	710,005	1.0000000	..	..	1.0000000	6,662,044	..	6,662,044

The figures furnished in column (11) give the distribution in quinquennial age-groups of the New South Wales male life experience for 1891-1900. As indicated earlier, the result is the same as would be obtained by separately distributing according to age the mean population for each year of the decennium and adding together the details so obtained. For the purpose of practically testing this equality the figures for New South Wales males for the decennium 1891-1900 were dealt with in the manner stated, and the result compared with that obtained in column (11) above. The deviations were as follows :—

Deviation of Alternative Results from those given in Column (11) above.

Age Last Birthday.	Deviation.	Age Last Birthday.	Deviation.	Age Last Birthday.	Deviation.
0–4	—14	35–39	+3	70–74	+1
5–9	+ 1	40–44	+7	75–79	..
10–14	+ 7	45–49	+1	80–84	+2
15–19	+ 6	50–54	—3	85–89	..
20–24	— 6	55–59	—2	90–94	+1
25–29	—12	60–64	+4	95–99	+3
30–34	— 6	65–69	+5	100—	+2

That is to say the two sets of results were as nearly as practicable identical.

In the manner exemplified above the extent and the age distribution of the life experience of each sex in each decennium were computed for the Commonwealth and each of its component States.

The following table shews the total number of years of life experienced in each State and also the proportion which each contributed to the Commonwealth total.

Years of Life Experienced in Australia, 1881 to 1910.

State.	Males.			Females.		
	1881–90.	1891–1900.	1901–10.	1881–90.	1891–1900.	1901–10.
NUMBER.						
New South Wales ..	5,101,143	6,662,044	7,843,071	4,227,990	5,832,261	7,085,601
Victoria	5,134,838	6,040,632	6,085,658	4,632,390	5,732,524	6,182,818
Queensland	1,810,294	2,483,400	2,943,181	1,289,712	1,939,491	2,416,046
South Australia ..	1,598,666	1,780,215	1,887,100	1,441,006	1,685,153	1,847,891
Western Australia ..	218,775	719,917	1,395,217	156,807	384,624	986,135
Tasmania	681,776	828,267	954,576	611,701	754,949	898,552
Commonwealth ..	14,545,492	18,514,475	21,108,803	12,359,606	16,329,002	19,417,043
PROPORTION PER CENT.						
New South Wales ..	35.07	35.98	37.16	34.21	35.72	36.49
Victoria	35.30	32.63	28.83	37.48	35.11	31.84
Queensland	12.45	13.41	13.94	10.43	11.88	12.44
South Australia ..	10.99	9.62	8.94	11.66	10.32	9.52
Western Australia ..	1.50	3.89	6.61	1.27	2.35	5.08
Tasmania	4.69	4.47	4.52	4.95	4.62	4.63
Commonwealth ..	100.00	100.00	100.00	100.00	100.00	100.00

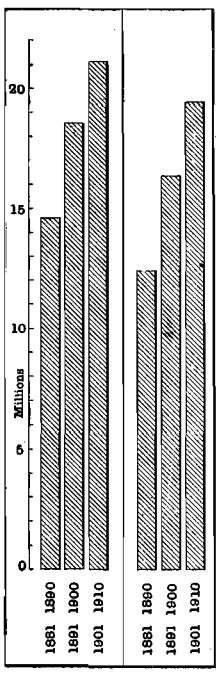
In both sexes, New South Wales, Queensland and Western Australia contributed a higher, and Victoria, South Australia and Tasmania a lower proportion in the decennium 1901-10 than in 1881-90.

From these tables and that given on page 302 it will be seen that the Male Life Tables for the Commonwealth as a whole for 1901-1910 is based upon 21,108,803 years of life and 262,094 deaths, while the corresponding female table has as basis 19,417,043 years of life and 192,519 deaths. These data give a mean male death rate for the decennium of 12.42 per 1000, and a corresponding female rate of 9.91 per 1000.

The accompanying graphs (Nos. 112 and 113) furnish representations of the relative extent of the data on which the Life Tables for the Commonwealth for the three successive decades have been based. Graph No. 112 shews for each decade the number of years of life experienced by persons of each sex, while graph No. 113 shews the number of deaths of each sex experienced during the corresponding periods. It should be noted that the scale for graph No. 113 is a hundred times that for graph No. 112, an inch of the former denoting 80,000, while an inch of the latter denotes 8,000,000.

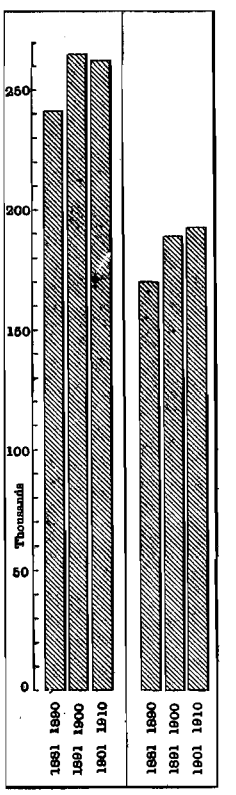
From the above figures it will be seen that the mean population of the Commonwealth for the three decennia under review was as follows :—

Years of Life.
C'wealth, 1881-1910.
MALES. FEMALES.



GRAPH No. 112.

Deaths.
C'wealth, 1881-1910.
MALES. FEMALES.



GRAPH No. 113.

Mean Population of Australia, 1881-1910.

Decennium.	Males.	Females.	Persons.
1881–90	1,454,549	1,235,961	2,690,510
1891–1900	1,851,448	1,632,900	3,484,348
1901–10	2,110,880	1,941,704	4,052,584

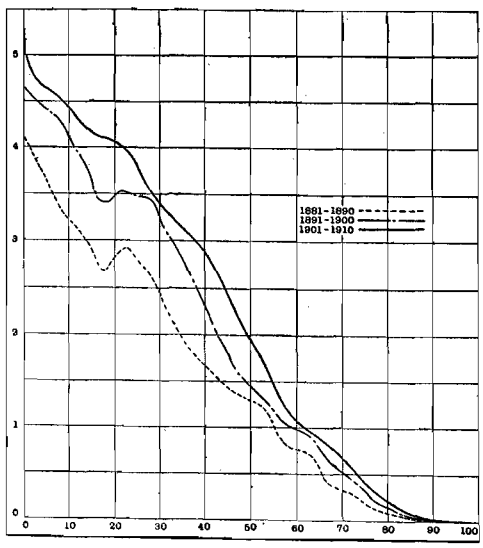
The following table furnishes particulars in respect of the number of years of life in each age-group experienced in the Commonwealth during each of the three decennia, the data being given separately for males and females.

Years of Life Experienced in each Age-Group,—Commonwealth, 1881-1910.

Age Last Birthday.	Males.			Females.		
	1881–90.	1891–1900.	1901–10.	1881–90.	1891–1900.	1901–10.
	Years.	Years.	Years.	Years.	Years.	Years.
0–4	1,934,296	2,266,841	2,404,042	1,873,270	2,207,555	2,341,884
5–9	1,705,111	2,150,204	2,280,879	1,659,732	2,090,313	2,231,771
10–14	1,540,076	1,949,120	2,144,893	1,495,115	1,905,860	2,114,382
15–19	1,373,925	1,729,319	2,054,228	1,362,174	1,712,270	2,027,612
20–24	1,434,694	1,752,316	1,982,643	1,303,923	1,681,510	1,952,613
25–29	1,323,928	1,712,607	1,792,528	1,026,672	1,481,427	1,714,789
30–34	1,086,392	1,513,769	1,626,595	803,454	1,202,868	1,470,499
35–39	900,241	1,280,532	1,511,942	650,402	962,376	1,285,819
40–44	771,665	1,025,074	1,341,240	551,015	766,996	1,081,703
45–49	678,404	797,422	1,091,850	470,505	592,894	855,945
50–54	597,413	662,034	863,934	386,049	497,255	677,631
55–59	417,718	527,481	618,225	273,627	395,964	495,124
60–64	346,543	448,189	484,459	218,410	322,195	400,661
65–69	195,950	313,056	391,584	127,235	230,345	330,929
70–74	132,029	213,646	269,600	86,645	148,884	218,009
75–79	64,474	104,760	151,777	42,637	76,310	128,151
80–84	31,069	48,741	71,124	20,236	37,729	62,352
85–89	8,355	14,335	20,638	6,071	12,263	20,722
90–94	2,437	3,949	5,164	1,845	3,223	5,239
95–99	495	824	1,117	444	579	976
100 and over	277	256	341	145	186	232
All Ages	14,545,492	18,514,475	21,108,803	12,359,606	16,329,002	19,417,043

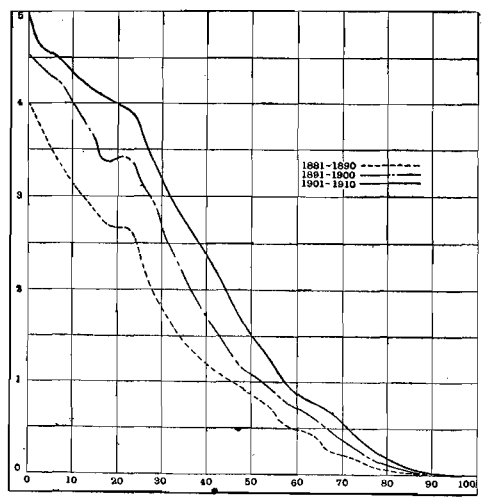
Years of Life at each Age, Commonwealth, 1881-1910.

(*a*) MALES.



GRAPH No. 114.

(*b*) FEMALES.



GRAPH No. 115.

The accompanying graphs Nos. 114 and 115 represent the numbers of years of life experienced at each age, in each of the three decennia, 1881-1890, 1891-1900, 1901-1910, the former relating to males, the latter to females. In each case the base of a small square represents 10 years of age, while the vertical height represents 50,000 years of life experienced.

The life experience for males and females separately in New South Wales in each of the three decennia was as follows :—

Years of Life Experienced in each Age-Group.—New South Wales 1881-1910.

Age Last Birthday.	Males.			Females.		
	1881–90.	1891–1900.	1901–10.	1881–90.	1891–1900.	1901–10.
	Years.	Years.	Years.	Years.	Years.	Years.
0–4	700,851	837,322	911,000	675,147	816,563	876,299
5–9	614,856	792,722	856,901	596,319	772,231	825,599
10–14	539,948	720,939	815,290	519,095	706,050	792,608
15–19	463,899	626,641	772,932	455,437	626,151	755,530
20–24	491,385	610,865	747,573	432,355	593,850	730,456
25–29	469,478	594,127	663,456	350,530	517,655	634,884
30–34	401,267	533,364	587,482	282,008	417,206	527,189
35–39	339,112	466,575	544,810	229,573	341,041	457,829
40–44	281,775	381,963	484,007	185,218	275,362	380,049
45–49	233,629	304,135	399,222	149,830	213,112	301,170
50–54	192,211	244,580	322,624	115,162	170,301	241,188
55–59	126,611	183,726	235,527	80,937	130,080	178,866
60–64	104,484	147,156	185,056	65,798	98,414	140,809
65–69	61,080	98,824	142,985	39,530	69,115	109,482
70–74	42,516	63,800	91,904	27,837	44,188	67,233
75–79	22,171	32,378	50,304	14,005	23,605	39,189
80–84	11,523	15,909	22,929	6,511	12,039	18,679
85–89	3,079	4,957	6,676	1,865	3,906	6,340
90–94	940	1,595	1,807	556	1,068	1,837
95–99	174	344	434	193	265	289
100 and over	154	122	152	84	59	76
All Ages	5,101,143	6,662,044	7,843,071	4,227,990	5,832,261	7,085,601

The next table furnishes the Victorian life experience for each sex and age-group in each of the three decennia :—

Years of Life Experienced in each Age-Group.—Victoria, 1881-1910.

Age Last Birthday.	Males.			Females.		
	1881–90.	1891–1900.	1901–10.	1881–90.	1891–1900.	1901–10.
	Years.	Years.	Years.	Years.	Years.	Years.
0–4	651,264	716,994	677,455	632,349	704,728	668,914
5–9	592,327	690,036	671,927	579,199	674,843	667,923
10–14	561,288	633,073	638,286	551,607	625,334	640,976
15–19	525,968	584,031	614,103	535,919	593,398	629,207
20–24	503,681	579,045	543,832	511,226	609,402	606,564
25–29	427,300	552,408	472,347	388,087	547,880	537,237
30–34	334,014	476,573	447,113	294,067	441,863	480,459
35–39	269,636	391,719	431,374	235,125	346,649	435,991
40–44	250,404	304,562	386,053	211,620	273,150	373,678
45–49	255,859	232,475	310,787	193,889	208,922	292,356
50–54	247,960	208,579	239,311	169,245	187,915	228,470
55–59	186,296	191,413	168,111	120,771	159,264	165,481
60–64	155,208	178,776	140,921	94,697	137,110	141,972
65–69	82,805	135,840	136,018	52,122	103,598	131,775
70–74	52,004	94,599	104,292	34,759	65,116	90,319
75–79	23,892	44,373	62,797	16,540	32,065	54,311
80–84	10,791	19,068	30,399	7,831	15,132	26,522
85–89	3,007	5,335	8,251	2,409	4,688	8,286
90–94	867	1,387	1,876	743	1,193	1,873
95–99	183	264	308	164	196	399
100 and over	84	82	97	21	78	105
All Ages	5,134,838	6,040,632	6,085,658	4,632,390	5,732,524	6,182,818

The Queensland data in respect of life experience in each sex and age-group are as follows:

Years of Life Experienced in each Age-Group.—Queensland, 1881-1910.

Age Last Birthday.	Males.			Females.		
	1881–90.	1891–1900.	1901–10.	1881–90.	1891–1900.	1901–10.
	Years.	Years.	Years.	Years.	Years.	Years.
0–4	240,578	310,189	335,647	228,490	305,806	326,067
5–9	194,557	275,530	314,340	185,793	269,055	307,865
10–14	164,836	240,617	295,753	154,408	235,522	292,722
15–19	144,697	210,625	274,763	129,145	198,546	260,868
20–24	188,758	246,106	283,992	135,127	200,259	245,493
25–29	199,835	250,970	258,759	110,265	171,741	203,766
30–34	167,633	221,955	233,064	87,744	139,731	172,539
35–39	140,601	187,158	216,703	72,565	109,110	148,924
40–44	119,861	151,660	190,483	57,986	86,361	122,994
45–49	88,737	118,019	154,786	44,857	67,491	94,298
50–54	68,583	97,387	123,075	32,627	53,291	74,780
55–59	38,468	66,489	89,256	20,381	38,591	54,846
60–64	26,636	50,630	70,363	14,185	28,709	43,285
65–69	13,318	28,613	48,702	7,892	17,058	31,343
70–74	7,752	16,083	31,022	4,769	10,223	19,766
75–79	3,512	7,193	14,522	2,129	4,812	10,022
80–84	1,465	3,136	5,863	920	2,263	4,494
85–89	348	781	1,620	304	697	1,520
90–94	79	187	372	107	169	349
95–99	40	64	77	18	43	76
100 and over	..	8	19	..	13	29
All Ages.	1,810,294	2,483,400	2,943,181	1,289,712	1,939,491	2,416,046

The number of years of life experienced in South Australia, is given in the next table for each sex and age-group in each of the three decennia :—

Years of Life Experienced in each Age-Group.—South Australia, 1881-1910.

Age Last Birthday.	Males.			Females.		
	1881–90.	1891–1900.	1901–10.	1881–90.	1891–1900.	1901–10.
	Years.	Years.	Years.	Years.	Years.	Years.
0–4	222,756	221,556	212,379	218,871	216,578	210,502
5–9	197,211	226,582	209,663	195,590	223,833	209,633
10–14	178,275	209,213	202,726	176,287	204,396	202,138
15–19	152,942	178,018	200,089	156,368	180,757	203,428
20–24	164,686	162,469	182,849	146,691	164,777	186,085
25–29	149,774	143,712	156,631	116,917	138,452	159,040
30–34	122,944	134,478	134,977	92,437	117,126	131,988
35–39	103,002	115,377	118,090	75,698	98,308	114,629
40–44	78,160	97,763	111,689	63,245	79,881	101,489
45–49	62,950	79,767	94,451	53,272	64,566	83,817
50–54	52,070	61,305	79,293	44,479	53,390	67,052
55–59	37,387	47,417	60,924	32,788	42,492	51,921
60–64	31,483	38,054	43,608	27,610	36,808	42,149
65–69	19,883	26,487	32,898	17,881	26,236	32,967
70–74	14,063	20,124	23,378	12,133	19,118	24,299
75–79	6,901	10,690	13,519	6,326	10,474	14,844
80–84	3,124	5,233	6,993	3,093	5,399	8,060
85–89	857	1,595	2,296	990	1,982	2,945
90–94	169	315	523	262	505	765
95–99	29	47	104	48	54	126
100 and over	..	13	20	20	21	14
All Ages	1,598,666	1,780,215	1,887,100	1,441,006	1,685,153	1,847,891

The Western Australian experience in each sex and age-group for each of the three decennia was as follows :—

Years of Life Experienced in each Age-Group.—Western Australia, 1881-1910.

Age Last Birthday.	Males.			Females.		
	1881–90.	1891–1900.	1901–10.	1881–90.	1891–1900.	1901–10.
	Years.	Years.	Years.	Years.	Years.	Years.
0–4	25,943	73,264	141,179	26,174	59,327	141,514
5–9	22,236	60,991	119,046	21,656	48,810	120,307
10–14	20,288	51,950	97,403	20,154	42,168	98,324
15–19	17,903	48,984	95,274	17,675	34,944	85,164
20–24	21,268	77,459	137,521	16,050	40,158	93,810
25–29	21,499	97,653	165,614	12,721	42,588	102,541
30–34	16,360	85,171	160,217	9,854	34,528	93,941
35–39	13,987	66,845	144,894	7,846	24,750	77,851
40–44	12,509	47,069	114,716	6,821	16,917	56,420
45–49	12,293	31,944	79,208	5,577	11,938	38,414
50–54	11,495	24,992	53,387	4,238	9,799	27,161
55–59	8,253	18,856	32,613	3,067	7,184	18,198
60–64	7,072	15,379	23,101	2,299	5,168	13,814
65–69	3,619	9,305	14,970	1,192	3,039	9,430
70–74	2,564	6,296	9,183	880	1,908	5,324
75–79	969	2,398	4,300	357	825	2,489
80–84	385	1,029	1,969	177	383	961
85–89	90	251	461	52	146	390
90–94	38	67	138	17	41	63
95–99	..	4	19	..	3	11
100 and over	4	10	4	..	..	8
All Ages	218,775	719,917	1,395,217	156,807	384,624	986,135

In Tasmania the number of years of life experienced in each sex and age-group in each of the three decennia was as follows :—

Years of Life Experienced in each Age-Group.—Tasmania, 1881-1910.

Age Last Birthday.	Males.			Females.		
	1881–90.	1891–1900.	1901–10.	1881–90.	1891–1900.	1901–10.
	Years.	Years.	Years.	Years.	Years.	Years.
0–4	92,904	107,516	126,382	92,239	104,553	118,588
5–9	83,924	104,343	109,002	81,175	101,541	100,444
10–14	75,441	93,328	95,435	73,564	92,390	87,614
15–19	68,516	81,020	97,067	67,630	78,474	93,415
20–24	64,916	76,372	86,876	62,474	73,064	90,205
25–29	56,042	73,737	75,721	48,152	63,111	77,321
30–34	44,174	62,228	63,742	37,344	52,414	64,383
35–39	33,903	52,858	56,071	29,595	42,518	50,595
40–44	28,956	42,057	54,292	26,125	35,325	47,073
45–49	24,936	31,082	53,396	23,080	26,865	45,890
50–54	25,094	25,191	46,244	20,298	22,559	38,980
55–59	20,703	19,580	31,794	15,683	18,353	25,812
60–64	21,660	18,194	21,410	13,821	15,986	18,632
65–69	15,245	13,987	16,011	8,618	11,299	15,932
70–74	13,130	12,744	9,821	6,267	8,331	11,068
75–79	7,029	7,728	6,335	3,280	4,529	7,296
80–84	3,781	4,366	2,971	1,704	2,513	3,636
85–89	974	1,416	1,334	451	844	1,241
90–94	344	398	448	160	247	352
95–99	69	101	175	21	18	75
100 and over ..	35	21	49	20	15	..
All Ages	681,776	828,267	954,576	611,701	754,949	898,552

(*c*) *Computation of Death Rates.*—Having obtained the number of deaths in each age-group which occurred during a decennium, and also the years of life experienced during the decennium by the community in which those deaths arose, the division of the former by the latter gives what has been termed the " central death rate" for each age-group, and furnishes a very good rough measure of the rate of mortality of the community. The term " central death rate" has been applied because the rate thus obtained for any age-group represents approximately the instantaneous rate of mortality per annum experienced at the centre of the age-group. In several cases of life table construction this computation has been made use of, and the values so obtained have been taken as representing the death rates for ages at quinquennial intervals, the rates for intermediate ages being supplied by interpolation. For ages between 5 and 65 such a method gives fairly satisfactory results, but for the extremes of infancy and old age where the rates change rapidly with the age, the assumption that the central death rate for an age-group represents the rate for the central age of the group is not warranted. To obviate this difficulty the method originally employed by Milne in the construction of the Carlisle table has been extensively used. The basic principle of this method is that of allocating to single ages, by a graphic process, the data available for deaths and years and life in respect of age-groups. The division of the former series by the latter gives for each age the central death rate, which, for any age x is usually represented by the symbol m_x. From this all the other life table functions can be readily computed. A variation of this method was suggested by Mr. J. M. Allen, F.I.A., in a paper read before the Institute of Actuaries, London, on 25th March, and published in Volume XLI., p. 305, of the Journal of the Institute. A feature of this modified method is that while simple in application it gives directly for each age one of the theoretically most important life table functions, viz., the instantaneous rate of mortality, or as it is more usually called, the " force of mortality." This function, which for any age x is usually denoted by the symbol μ_x, represents the annual rate at which the community under review is dying at the moment of attaining age x. The principle on which Mr. Allen's method is based may be stated briefly as follows :—

As l_x denotes the number of persons attaining the age x and μ_x denotes the death rate to which they are subject at the moment of attainment, the number of deaths between the ages of x and $x + 5$ may be represented by the integral $\int_x^{x+5} l_x \mu_x \, dx$. If, therefore, the statistics of deaths according to age be plotted with ages as abscissæ, and the number of deaths in age-groups as rectangles be erected in the appropriate places thereon, the drawing of an equivalent continuous curve through the upper parts of these rectangles will furnish a convenient basis for determining the value of the product $l_x \mu_x$ at each age, since all that is necessary is to read off for each age the value of the ordinate to the curve so drawn. Similarly, since l_x denotes the number of persons who attain the exact age x, the number of years of life experienced in the community between the ages of x and $x + 5$ may be represented by the integral $\int_x^{x+5} l_x \, dx$. Hence with statistics of years of life in age-groups, a curve representative of the life experience may be readily drawn, the values of the ordinates of which will give the values of l_x. Having thus determined the values of $l_x \mu_x$ and l_x for each integral value of x, the division of the former series by the latter gives the value of μ_x the force of mortality, for each integral age. In practice it will usually be found that though the curves which give $l_x \mu_x$ and l_x have been drawn with every care, the results

obtained by dividing the former series of values by the latter will present minor irregularities, which may readily be removed by a process of graphic graduation before proceeding to the computation of the other life table functions. Owing to rapid changes in the rate of mortality during the first few years of life it is difficult to satisfactorily draw the curves for $l_x\mu_x$ and l_x through the portion relating to these earlier years, and better results may be obtained by making use of statistics of births to compute the rates of mortality for the first five years. The process indicated above may consequently be considered as applying to the period of life from age 5 onwards, that relating to the first five years will be discussed in latter sub-sections. For the construction of the tables contained in pp. 1207 to 1278 of Volume III., the data contained in sub-sections (*a*) and (*b*) above were plotted and graduated, and the values of μ_x were then obtained by division. These values were then subjected to a process of graphic graduation, the graduated results being tested throughout and amended where necessary to give results which combined regularity of progression with goodness of fit. As an example of the change effected by the process of graduation the following table gives for ages 5 to 94 the computed and the adjusted values of μ_x for the Commonwealth Life Tables for males and females for the decennium 1901-1910 :—

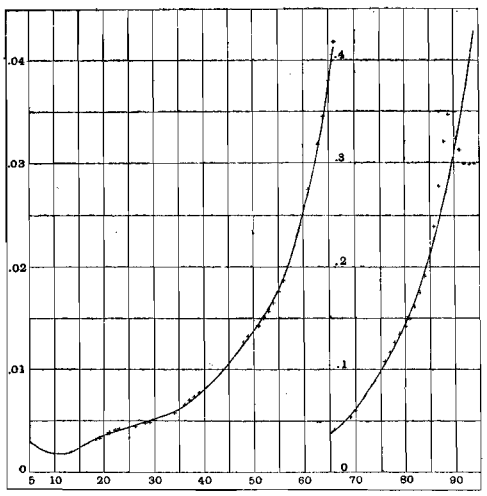
Computed and Adjusted Values of μ_x—Commonwealth, 1901-10.

Age.	Males.		Females.		Age.	Males.		Females.	
	μ_x Computed	μ_x Adjusted.	μ_x Computed	μ_x Adjusted.		μ_x Computed	μ_x Adjusted.	μ_x Computed	μ_x Adjusted.
5	.0029	.0029	.0027	.0027	50 ..	.0138	.0137	.0097	.0094
6	.0025	.0025	.0023	.0023	51 ..	.0143	.0144	.0098	.0098
7	.0022	.0022	.0020	.0020	52 ..	.0150	.0151	.0101	.0103
8	.0021	.0020	.0018	.0018	53 ..	.0157	.0159	.0106	.0109
9	.0019	.0019	.0017	.0017	54 ..	.0165	.0168	.0112	.0116
10	.0018	.0018	.0016	.0016	55 ..	.0175	.0178	.0121	.0124
11	.0018	.0018	.0016	.0016	56 ..	.0187	.0189	.0131	.0133
12	.0018	.0018	.0016	.0017	57 ..	.0201	.0202	.0143	.0143
13	.0019	.0019	.0017	.0018	58 ..	.0216	.0217	.0155	.0155
14	.0021	.0021	.0019	.0019	59 ..	.0234	.0234	.0169	.0169
15	.0024	.0024	.0022	.0021	60 ..	.0255	.0252	.0184	.0185
16	.0027	.0027	.0024	.0023	61 ..	.0275	.0272	.0200	.0203
17	.0029	.0029	.0026	.0026	62 ..	.0294	.0294	.0219	.0222
18	.0031	.0032	.0028	.0028	63 ..	.0317	.0318	.0240	.0243
19	.0033	.0034	.0030	.0030	64 ..	.0344	.0345	.0264	.0266
20	.0036	.0036	.0033	.0032	65 ..	.0380	.0376	.0292	.0291
21	.0039	.0038	.0035	.0034	66 ..	.0418	.0412	.0322	.0318
22	.0041	.0040	.0037	.0036	67 ..	.0457	.0453	.0350	.0348
23	.0042	.0041	.0038	.0038	68 ..	.0496	.0499	.0378	.0381
24	.0043	.0043	.0039	.0040	69 ..	.0539	.0550	.0410	.0419
25	.0044	.0044	.0041	.0042	70 ..	.0592	.0606	.0455	.0464
26	.0045	.0046	.0044	.0044	71 ..	.0662	.0667	.0519	.0516
27	.0047	.0047	.0046	.0046	72 ..	.0737	.0734	.0584	.0575
28	.0048	.0049	.0048	.0048	73 ..	.0812	.0808	.0647	.0639
29	.0049	.0050	.0050	.0050	74 ..	.0892	.0887	.0711	.0706
30	.0051	.0051	.0051	.0051	75 ..	.0981	.0969	.0772	.0775
31	.0053	.0053	.0052	.0053	76 ..	.1071	.1052	.0842	.0845
32	.0054	.0055	.0053	.0055	77 ..	.1165	.1138	.0919	.0917
33	.0056	.0057	.0055	.0057	78 ..	.1256	.1229	.1003	.0992
34	.0058	.0059	.0057	.0059	79 ..	.1343	.1326	.1083	.1072
35	.0062	.0062	.0061	.0061	80 ..	.1423	.1430	.1143	.1157
36	.0066	.0065	.0065	.0063	81 ..	.1492	.1540	.1198	.1250
37	.0070	.0068	.0068	.0065	82 ..	.1606	.1660	.1278	.1350
38	.0073	.0072	.0070	.0067	83 ..	.1749	.1800	.1390	.1460
39	.0077	.0076	.0071	.0069	84 ..	.1902	.1950	.1548	.1580
40	.0081	.0080	.0071	.0071	85 ..	.2109	.2110	.1763	.1720
41	.0085	.0084	.0072	.0073	86 ..	.2397	.2280	.2014	.1880
42	.0089	.0089	.0073	.0075	87 ..	.2782	.2460	.2305	.2060
43	.0094	.0094	.0075	.0077	88 ..	.3206	.2660	.2615	.2250
44	.0100	.0100	.0078	.0078	89 ..	.3469	.2880	.3018	.2450
45	.0106	.0106	.0081	.0080	90 ..	.3494	.3120	.3267	.2660
46	.0112	.0112	.0084	.0082	91 ..	.3132	.3380	.3088	.2890
47	.0119	.0118	.0088	.0084	92 ..	.2995	.3660	.2896	.3140
48	.0126	.0124	.0091	.0087	93 ..	.2992	.3960	.2947	.3410
49	.0132	.0130	.0094	.0090	94 ..	.2998	.4280	.3090	.3700

It will be seen that for all ages up to 85 the deviations of the adjusted from the computed values were small, and tended to counterbalance each other. Beyond 85, however, the computed values being based on data of very limited extent, were marked by considerable irregularity. As there is further much uncertainty concerning the particulars furnished at these higher ages in respect both of the living and the dead, it was deemed advisable to arbitrarily project the curve graphically to age 98 as a reasonable continuation of the curve to 85, and to so determine the final values of q_x, the probability of dying within a year at age x, that from 96 to 104, these values should be a series of the third degree, having the value 1 at age 104. Owing to the small experience at the higher ages, the method of dealing with the data for these ages has little effect on the expectation of life computed for the earlier ages, and the methods employed appear as reasonable and satisfactory as any which could be adopted.

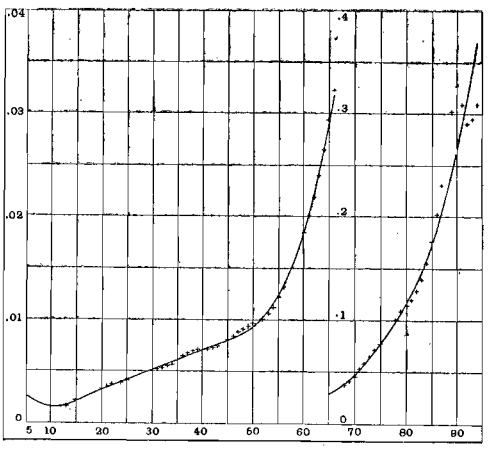
Computed and Adjusted Values of μ_x. Commonwealth, 1901-10.

(*a*) MALES.



GRAPH No. 116.

(*b*) FEMALES.



GRAPH No. 117.

Graphs Nos. 116 and 117 furnish a graphic representation of the nature and extent of the deviation of the adjusted values of μ_x from the computed values of that function for ages 5 to 94. Graph No. 116 relates to the male and No. 117 to the female experience. The base of each small rectangle represents 5 years of age, while the vertical height represents in each graph an increment of .005 in the value of μ, for the left hand curve, and an increment of .05 in the value of μ, for the right hand curve. In each case the continuous line represents the adjusted values, while the series of crosses denote the positions occupied by the computed values where these deviate perceptibly from the adjusted values.

Since $\mu_x = -\frac{1}{l_x} \cdot \frac{d\,l_x}{dx} = -\frac{d \log_e l_x}{dx}$, it follows that $\int_0^1 \mu_{x+t}\,dt = \log_e l_x - \log_e l_{x+1}$ $= -\log_e p_x = \text{colog}_e\, p_x$. Hence, from a series of values of μ_x for successive ages the corresponding values of $\text{colog}_{10}\, p_x$ may readily be computed by a method of approximate summation. In the construction of the tables under review the summation formula employed was

$$\int_1^2 f(x+t)\,dt = \frac{1}{24}\{13[f(x+1)+f(x+2)] - [f(x)+f(x+3)]\}$$

a formula which lends itself readily to application in columnar form, and to appropriate checks at each stage of the work (see note B, p. 346). As the division by 24 indicated in the formula gives the value of $\text{colog}_e\, p_x$, it is necessary to multiply by the logarithmic modulus (.4342945) to obtain $\text{colog}_{10}\, p_x$. Instead of dividing by 24 and then multiplying by .4342945, the simpler course of multiplying at once by .018096 was adopted, the operation being performed by means of the "millionaire" calculating machine. From the values of $\text{colog}_{10}\, p_x$ the values of $\log_{10} p_x$ were at once derived by means of the relation $\text{colog}_{10} p_x = -\log_{10} p_x$, and from the values of $\log_{10} p_x$ those of $\log_{10} l_x$ were derived from the relation $\log l_{x+1} = \log l_x + \log p_x$. The initial value of l_x at age 0 was arbitrarily chosen as 100,000. Having determined the values of l_x from those of $\log l_x$ the values of d_x were computed from the relation $d_x = l_x - l_{x+1}$. The values of p_x were obtained from those of $\log p_x$, and the values of q_x from the relation $q_x = 1 - p_x$. From the values of l_x, the number surviving each age, the values of L_x, the number of years of life experienced between ages x and $x+1$, were computed by means of the relation $L_x = \int_x^{x+1} l_x\,dx$, the formula of approximate summation given above being employed. In practice the application of this formula leaves a term at either end undetermined. To supply this deficiency the following formulas were used, viz. :—

$$\int_0^1 f(x+t)\,dt = \frac{1}{24}\{9f(x) + 19f(x+1) - 5f(x+2) + f(x+3)\}$$

and

$$\int_2^3 f(x+t)\,dt = \frac{1}{24}\{f(x) - 5f(x+1) + 19f(x+2) + 9f(x+3)\}.$$

From L_x, by summing from the highest age backwards, the column of values of T_x was formed, representing, from one point of view the aggregate future lifetime of the l_x persons who reach the age x, and from another point of view the number of persons aged x and upwards in a stationary population maintained by l_0 births annually. The division of T_x by l_x gives the complete expectation of life at age x, which is denoted by $\mathring{e}_x$, and which represents the average future lifetime of the persons who attain age x. As a supplementary check on the

calculations involved in the construction of the tables, the value of what is known as the "curtate" expectation of life was computed by means of the formula $e_x = p_x (1 + e_{x+1})$. Here e_x represents the average number of completed years of life lived by the l_x persons who attain age x, and as each person on the average lives approximately half a year in the year of death, the "complete" expectation of life is approximately equal to the curtate expectation plus half a year. To be strictly accurate the relation between the complete and the curtate expectations is represented by the formula $\overset{\circ}{e}_x = e_x + \frac{1}{2} - \frac{1}{12}\mu_x$. The figures obtained separately for $\overset{\circ}{e}_x$ and e_x were compared and found in close accord with the formula throughout. Finally the central death rate for each age was computed by means of the relation $m_x = d_x \div L_x$. This is a function which is not usually tabulated in life tables, but owing to the increasing tendency amongst actuaries to employ it in investigations concerning complicated benefits, such as those relating to pension funds, superannuation schemes and friendly societies, as well as in other cases where mortality is only one of several decremental forces simultaneously in operation, it has appeared desirable to tabulate it in all cases.

It may further be noted that as the latter portion of each table from age 98 onwards was completed by an arbitrary continuation to age 104 of the curve representing q_x, it became necessary, in order to complete the table of μ_x to the oldest age, to compute for this latter function the values corresponding to those determined for q_x. This was done by means of the approximate relation $\mu_{x+1} = 2 \operatorname{colog}_e p_x - \mu_x$.

The value of μ_x being known for age 98, and the values of $\operatorname{colog}_e p_x$ being determinable for all ages from 98 onwards, the values of μ_x were readily computed for ages 99 to 104.

In the graphic graduation of μ_x the test applied for smoothness was that of securing regularity of progression in the successive differences of the values ascertained. Goodness of fit was tested by computing the values of $l_x \mu_x$ with the adjusted values of μ_x, and ascertaining the successive deviations and accumulated deviations from the values of $l_x \mu_x$ obtained from the death curve. By these means a curve was obtained which, while reasonably smooth throughout, was yet in close accord with the data. As a further test of goodness of fit, the number of years of life experienced at each age during the decennium was roughly computed by means of the approximate relation $L_x = \frac{1}{2}(l_x + l_{x+1})$, the values of L_x so obtained being multiplied by the final values of m_x to obtain for each age the expected deaths in each year of age according to the table under review. A comparison for quinquennial ages of the expected deaths so obtained with those furnished by the actual data, is given in the succeeding table for the Commonwealth Male and Female Life Tables, for the decennium 1901-10, ages 5 to 99.

Expected and Actual Deaths.—Commonwealth Life Tables, 1901-10.

Age Last Birthday.	Males.				Females.			
	Expected Deaths.	Actual Deaths.	Deviation.	Accumulated Deviation.	Expected Deaths.	Actual Deaths.	Deviation.	Accumulated Deviation.
5–9 ..	5,055	5,066	— 11	— 11	4,483	4,496	— 13	— 13
10–14 ..	4,131	4,108	+ 23	+ 12	3,723	3,614	+ 109	+ 96
15–19 ..	6,259	6,169	+ 90	+ 102	5,402	5,521	— 119	— 23
20–24 ..	8,009	8,119	— 110	— 8	7,199	7,219	— 20	— 43
25–29 ..	8,571	8,487	+ 84	+ 76	8,032	8,024	+ 8	— 35
30–34 ..	9,127	8,983	+ 144	+ 220	8,236	7,933	+ 303	+ 268
35–39 ..	10,620	10,788	— 168	+ 52	8,452	8,672	— 220	+ 48
40–44 ..	12,278	12,314	— 36	+ 16	8,169	8,070	+ 99	+ 147
45–49 ..	13,196	13,346	— 150	— 134	7,348	7,617	— 269	— 122
50–54 ..	13,327	13,149	+ 178	+ 44	7,163	7,076	+ 87	— 35
55–59 ..	12,966	12,925	+ 41	+ 85	7,475	7,410	+ 65	+ 30
60–64 ..	14,944	14,994	— 50	+ 35	9,275	9,187	+ 88	+ 118
65–69 ..	18,499	18,436	+ 63	+ 98	12,032	11,975	+ 57	+ 175
70–74 ..	20,459	20,445	+ 14	+ 112	13,169	13,241	— 72	+ 103
75–79 ..	17,705	17,978	— 273	— 161	12,007	12,018	— 11	+ 92
80–84 ..	12,017	11,700	+ 317	+ 156	8,607	8,297	+ 310	+ 402
85–89 ..	5,101	5,649	— 548	— 392	4,226	4,732	— 506	— 104
90–94 ..	1,871	1,579	+ 292	— 160	1,588	1,542	+ 46	— 58
95–99 ..	627	413	+ 214	+ 114	492	402	+ 90	+ 32
Total, 5–99	194,762	194,648	+ 114	..	137,078	137,046	+ 32	..

It will be seen that the changes in sign of the deviation and the accummulated deviation are numerous for both sexes, and that the numerical values are relatively small throughout, thus indicating a closeness of accord between the graduated results and the original data. For the range from 5 to 99 the accumulated deviation represents less than 6 per 10,000 of the observed facts in the case of males and less than $2\frac{1}{2}$ per 10,000 in the case of females.

(*d*) *Infantile Ages.*—As indicated above, the method employed for calculating the rates of mortality for ages under 5 years differed from that applied to ages above 5 years, the basis in this case being the birth experience from which the deaths during the decennium under review resulted. In most statistical publications the death rate of children under one year of age for any given year is obtained by dividing the number of deaths of children under one year of age registered during the year, by the number of births registered during the year, the quotient obtained being expressed as a ratio to 1000. For many purposes the rate so obtained gives the infant mortality with a sufficient degree of approximation, but there are two circumstances involved which tend to vitiate the result to some extent, viz., (i.) a large number of the deaths under one year of age occurring in any year is drawn from children born in the preceding year; (ii.) neither birth nor death registrations for any year represent exactly the occurrences for that year. If the number of births remained fairly constant from year to year no appreciable error would be introduced, but where such constancy is not in evidence, some allowance for the overlapping is desirable. For this purpose, in the construction of the life tables under review, the mean of the number of births for the year of observation and the preceding year was taken as the birth basis for the deaths under one year registered in the year of observation.

It may be noted here, that the rate of infant mortality so obtained represents approximately the probability at date of birth of surviving one year, and consequently differs in nature from the crude death rate, which, being a ratio of deaths to years of life, is a weighted average value of m_x for all ages, whilst the rate of "infant mortality" is the value of q_x at age 0.

In accordance with what has been stated above, the birth basis for, say, the decennium 1901-10, was taken as half the births registered in 1900, all the births registered in the years 1901 to 1909 and half the births registered in 1910. The division of the number of deaths at age 0 during the decennium by the number of births so deduced, gives the rate of mortality at age 0, that is, gives the proportion of children born alive who will fail to survive age 1, on the basis of the experience of the decennium.

To determine the rate of mortality for age 1 a new birth basis is required. This may be obtained from the consideration that the number of deaths of children aged one last birthday represents those who have survived the first year of life, but have failed to survive the second. The birth basis for computation in this case will thus extend a year farther back than in the case of deaths at age 0, and will consequently be obtained by adding to half the births for 1899, the whole of the births for 1900 to 1908 inclusive, and half the births for 1909. A similar procedure is required for each of the other ages at death, the basis for deaths at age 4 last birthday extending as far back as the births for the year 1896. It will thus be seen that for the three decennia from 1881 to 1910, the birth statistics from 1876 to 1910 inclusive were required. These are given in the succeeding table :—

Australian Births Registered, 1876 to 1910.

Year.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	C'wlth.
			MALES.				
1876	11,791	13,759	3,540	4,134	474	1,660	35,358
1877	12,292	13,272	3,702	4,382	459	1,645	35,752
1878	13,082	13,752	3,769	4,801	438	1,798	37,640
1879	13,840	13,727	4,000	5,013	528	1,774	38,882
1880	14,424	13,358	4,171	5,398	448	1,884	39,683
1881	14,891	13,903	4,242	5,522	533	2,029	41,120
1882	15,087	13,612	4,414	5,589	572	2,069	41,343
1883	16,014	14,109	5,093	5,677	541	2,235	43,669
1884	17,417	14,844	5,399	6,051	564	2,327	46,602
1885	17,939	15,455	5,908	6,070	623	2,368	48,363
1886	18,700	15,753	6,369	5,711	787	2,413	49,733
1887	18,901	16,876	6,929	5,666	791	2,444	51,607
1888	19,616	17,617	7,299	5,501	786	2,373	53,192
1889	19,335	18,713	7,449	5,286	825	2,438	54,046
1890	19,887	19,175	7,788	5,222	761	2,466	55,299
1891	20,386	19,598	7,506	5,491	938	2,510	56,429
1892	20,532	19,405	7,738	5,241	959	2,584	56,459
1893	20,822	18,823	7,356	5,455	1,042	2,699	56,197
1894	19,993	17,501	7,207	5,423	1,109	2,470	53,703
1895	19,877	17,372	7,604	5,423	1,192	2,432	53,900
1896	18,691	16,460	7,086	5,110	1,435	2,373	51,155
1897	18,989	16,013	7,277	4,897	2,036	2,485	51,697
1898	18,723	15,435	7,083	4,580	2,574	2,409	50,804
1899	18,613	15,785	7,128	4,852	2,636	2,415	51,429
1900	18,964	15,834	7,599	4,660	2,789	2,494	52,340
1901	19,149	15,876	7,281	4,687	2,946	2,570	52,509
1902	19,322	15,583	7,279	4,587	3,241	2,604	52,616
1903	18,377	15,115	6,427	4,484	3,433	2,570	50,406
1904	19,857	15,313	7,134	4,686	3,666	2,702	53,358
1905	20,206	15,523	6,978	4,514	3,862	2,812	53,895
1906	21,066	15,716	7,280	4,617	4,043	2,792	55,514
1907	21,604	15,986	7,451	4,689	3,962	2,797	56,489
1908	21,605	16,071	7,677	4,949	3,993	2,818	57,113
1909	22,464	16,096	7,954	5,235	3,884	2,849	58,482
1910	23,368	16,412	8,260	5,423	3,855	2,888	60,206

Australian Births Registered, 1876 to 1910—*continued.*

Year.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	C'wlth.
FEMALES.							
1876	11,507	13,010	3,363	4,090	444	1,489	33,903
1877	11,559	12,738	3,467	4,258	453	1,566	34,041
1878	12,246	12,829	3,628	4,481	433	1,704	35,321
1879	13,093	13,112	3,870	4,889	449	1,790	37,203
1880	13,738	12,790	4,025	4,864	485	1,855	37,757
1881	14,102	13,242	3,978	5,186	487	1,889	38,884
1882	14,615	13,135	4,104	5,255	517	1,974	39,600
1883	15,267	13,432	4,797	5,496	517	2,024	41,533
1884	16,529	14,006	5,280	5,796	530	2,251	44,392
1885	17,104	14,520	5,764	5,976	577	2,269	46,210
1886	17,584	15,071	6,213	5,466	679	2,214	47,227
1887	18,335	16,167	6,584	5,165	766	2,292	49,309
1888	18,909	16,886	6,948	5,009	732	2,404	50,888
1889	17,960	17,646	6,952	5,032	769	2,319	50,678
1890	19,073	18,403	7,619	5,142	800	2,347	53,384
1891	19,072	18,907	7,209	5,261	848	2,461	53,758
1892	19,509	18,426	7,165	5,329	889	2,381	53,699
1893	19,520	17,729	7,038	5,251	1,070	2,517	53,125
1894	18,958	16,757	6,770	5,076	1,014	2,382	50,957
1895	18,897	16,334	7,270	5,144	1,181	2,358	51,184
1896	17,815	15,718	6,931	4,938	1,347	2,230	48,979
1897	18,258	15,297	7,036	4,665	1,985	2,199	49,440
1898	17,499	14,737	6,850	4,390	2,394	2,171	48,041
1899	17,848	15,223	6,771	4,570	2,538	2,259	49,209
1900	18,182	14,945	7,202	4,517	2,665	2,370	49,881
1901	18,726	15,132	7,022	4,424	2,772	2,360	50,436
1902	18,513	14,878	6,937	4,360	2,991	2,481	50,160
1903	17,589	14,454	6,194	4,024	3,266	2,510	48,037
1904	18,810	14,450	6,948	4,447	3,510	2,590	50,755
1905	19,295	14,584	6,648	4,354	3,720	2,445	51,046
1906	19,882	15,128	6,739	4,329	3,757	2,541	52,376
1907	20,597	15,379	7,089	4,549	3,750	2,494	53,858
1908	20,853	15,026	7,153	4,841	3,762	2,797	54,432
1909	21,318	15,448	7,598	4,856	3,718	2,651	55,589
1910	22,076	15,025	7,909	5,157	3,730	2,698	56,595

From the birth statistics contained in the preceding table the birth bases for the computation of rates were derived in the manner indicated above. The bases so computed for the Commonwealth and each of its component States are shewn in the following table :—

Birth Bases for Computation of Infantile Rates, 1881-1910.

Age last Birthday to which Birth Basis is applicable.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	C'wlth.
MALES.							
DECENNIUM 1881–90.							
0	175,055	157,148	59,082	56,383	6,627	22,871	477,166
1	169,577	151,747	55,548	56,335	6,321	22,248	461,776
2	163,562	147,322	52,059	55,848	5,999	21,628	446,418
3	156,990	143,587	48,681	54,856	5,659	20,942	430,715
4	150,232	140,788	45,652	53,425	5,337	20,166	415,600
DECENNIUM, 1891–1900.							
0	196,051	173,897	73,679	51,413	15,696	24,857	535,593
1	196,874	177,031	73,933	51,911	13,777	24,855	538,381
2	197,682	179,586	74,202	52,588	11,977	24,848	540,883
3	198,084	181,109	74,136	53,434	10,460	24,809	542,032
4	198,044	181,186	73,604	54,119	9,514	24,809	541,276
DECENNIUM, 1901–10.							
0	204,816	157,402	73,391	47,489	36,352	27,205	546,655
1	200,689	156,958	72,647	46,916	35,195	26,791	539,196
2	197,322	156,484	71,937	46,541	33,862	26,369	532,515
3	194,574	156,179	71,553	46,460	32,189	26,009	526,964
4	192,078	156,565	71,369	46,811	29,922	25,644	522,389

Birth Bases for Computation of Infantile Rates, 1881-1910.—*continued.*

Age last Birthday to which Birth Basis is applicable.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	C'wlth.
			FEMALES.				
			DECENNIUM, 1881–90.				
0	166,811	149,701	56,442	53,384	6,217	21,737	454,292
1	161,709	144,628	53,104	53,174	5,899	21,227	439,741
2	155,945	140,333	49,903	52,838	5,589	20,612	425,220
3	149,225	136,589	46,685	52,120	5,284	19,899	409,802
4	142,798	133,845	43,701	50,979	5,009	19,174	395,506
			DECENNIUM, 1891–1900.				
0	186,003	165,802	70,451	49,453	14,999	23,317	510,025
1	186,505	168,743	70,750	49,997	13,181	23,335	512,511
2	187,266	171,029	70,889	50,538	11,466	23,481	514,669
3	188,009	172,538	70,712	51,097	10,026	23,645	516,027
4	187,933	172,649	70,127	51,611	9,082	23,683	515,085
			DECENNIUM, 1901–10.				
0	195,712	149,464	69,883	45,021	34,444	25,403	519,927
1	192,030	149,311	69,117	44,558	33,321	25,043	513,380
2	188,618	149,055	68,551	44,190	32,047	24,534	506,995
3	185,771	148,869	68,374	44,022	30,480	24,074	501,590
4	183,569	149,123	68,443	44,385	28,393	23,770	497,683

As an example of the calculation of the life table values for infantile ages, the following table is given, shewing the particulars in respect of the Commonwealth as a whole for the decennium 1901-10 :—

Computation of Values for Infantile Ages.—Commonwealth, 1901–10.

Age. (1)	Birth Basis for Computation of Rates. (2)	Deaths Recorded during Decennium. (3)	Probability at Date of Birth of Surviving x Years and Dying in the $(x+1)^{th}$ Year. (4)	Number Surviving at each Age out of 100,000 Born. (5)	Probability of Surviving One Year at each Age. (6)	Probability of Dying within a Year at each Age. (7)
			MALES.			
0 ..	546,655	52,000	.09512	100,000	.90488	.09512
1 ..	539,196	8,691	.01612	90,488	.98219	.01781
2 ..	532,515	3,167	.00595	88,876	.99331	.00669
3 ..	526,964	2,045	.00388	88,281	.99560	.00440
4 ..	522,389	1,428	.00273	87,893	.99689	.00311
			FEMALES.			
0 ..	519,927	41,364	.07956	100,000	.92044	.07956
1 ..	513,380	7,858	.01531	92,044	.98337	.01663
2 ..	506,995	2,884	.00569	90,513	.99371	.00629
3 ..	501,590	1,856	.00370	89,944	.99589	.00411
4 ..	497,683	1,420	.00285	89,574	.99682	.00318

The figures contained in columns (2) and (3) of this table are those given in tables of data on pp. 303, 324, and 325 above, while the division of the items in (3) by the corresponding items in (2) gives the items in column (4). The multiplication of each of these items by 100,000 would give the number dying in each year of age out of 100,000 born, the subtraction of which from an initial 100,000 at age 0 gives the number surviving at each age out of that number born, the results being shewn above in column (5). The division of each value in this column by the preceding value gives the probability of surviving a year at each age, shewn in column (6), while the subtraction of this latter from unity gives the probability of dying within a year at each age shewn in column (7). For the purpose of adjusting these crude results, and also of computing the values of the force of mortality at each age (μ_x), a graduation of the results by Makeham's second modification of Gompertz's formula was applied. For an account of this graduation see a paper on "Investigations concerning a law of infantile mortality," by C. H. Wickens, A.I.A. (Trans. Australasian Association for the Advancement of Science, Vol. XIV., p. 526). On

bringing together the results deduced in respect of the first five years of age, and those in respect of ages 5 and upwards, it was occasionally found that the junction was not quite satisfactory. In such cases the adjusted values for ages 4 and 5 were further adjusted so as to secure the desired smoothness without undue deviation from the recorded data.

(e) *Calculation of Monetary Tables.*—The principal purposes served by the construction of mortality tables for any community are as follows :—

(i.) To furnish a reliable index to the mortality experience of the community for any given period.

(ii.) To furnish a basis for the comparison of the experience of the community for one period with that for another.

(iii.) To furnish a basis for the comparison of the experience of the community with that of other communities.

(iv.) To furnish a basis for the calculation of monetary tables for the valuation of payments dependent on the contingencies of human life.

The purposes indicated in (i.), (ii.) and (iii.) are amply provided for in the extensive series of tables published on pp. 1207 to 1278 of Volume III. of the Census Report, but it was felt that a series of monetary tables would be more servicable if published separately. It was also considered unnecessary in the compilation of monetary tables to use more than one mortality basis for each sex, that adopted being the experience of the Commonwealth as a whole for the decennium 1901-10. A series of single life tables has consequently been published in a royal octavo booklet of 80 pages and a companion series of joint life annuity tables is now in course of compilation. The monetary tables contained in the single life series comprise, for each sex, for the rates of interest 3 per cent., $3\frac{1}{2}$ per cent., 4 per cent., $4\frac{1}{2}$ per cent. and 5 per cent., the usual commutation columns, and the annual and continuous values for life annuities, single premiums, and annual premiums. For each sex a table of elementary values and a table of the values of temporary annuities at $3\frac{1}{2}$ per cent. have also been added. In the joint life annuity tables in course of construction it is intended to include tables on two male lives, two female lives, and a male and female life. In the construction of the monetary tables on single lives the processes employed were briefly as follows :—The values of v^x (the present value of 1 due x years hence) were taken from Oakes's Interest Tables to 5 places of decimals, and were multiplied by the tabulated values of l_x to give for each age the value of $D_x = v^x l_x$, these results being retained true to the fifth significant figure, except that at the extremes of old age not more than five places of decimals were retained, thus cutting down the number of significant figures in such cases to four, three or even two.

The values of D_x were then summed from the oldest age upwards to give the values of $\mathbf{N}_x$, in accordance with the formula $\mathbf{N}_x = D_x + D_{x+1} + \ldots\ \ldots\ \ldots\ \ldots$, this form of the **N** column being adopted to accord with the most recent practice in the publication of actuarial tables. The use of heavy type for **N** instead of the open form frequently used was dictated by typographical considerations, the requisite type for the open form not being available. Similarly the column $\mathbf{S}_x$ was constructed in accordance with the relation $\mathbf{S}_x = \mathbf{N}_x + \mathbf{N}_{x+1} + \ldots\ldots\ldots$ the **N** column being summed from the bottom upwards.

In the same manner the C column was compiled from the relation $C_x = v^{x+1} d_x$, the M column from the relation $M_x = C_x + C_{x+1} + \ldots\ldots\ldots$ and the R column from the relation $R_x = M_x + M_{x+1} + \ldots\ldots\ldots$

In all cases appropriate checks on the accuracy of the computations were applied at successive stages, a closing check being the substantial accordance of the **S** and R columns with the relation $R_x = v\,\mathbf{S}_x - \mathbf{S}_{x+1}$.

The computation of the annuity values was carried out by means of the formula $\mathbf{N}_x/D_x = 1 + a_x$, the calculations being performed in duplicate on the "millionaire." The quotients so obtained were carried to five places of decimals, and eventually cut down to three places for publication. The values of A_x, were computed by means of the relation $A_x = 1 - d\,(1 + a_x)$ where $d = 1 - v$, and v as above denotes the present value of 1 due one year hence. The values of P_x were obtained from the relation $P_x = A_x/(1 + a_x)$. The values in the A column were checked by means of the relation $\Sigma A = n - d\,\Sigma\,(1 + a)$, where n denotes the number of terms in the a column. This and similar addition checks were carried out on the Burroughes Adding Machine. A further check of the A column, and a check of the P column were obtained from the relations $A_x = M_x/D_x$ and $P_x = M_x/\mathbf{N}_x$. A further test of the accuracy of the calculations was made by differencing the successive values of the several functions and observing the smoothness in the progression of the differences so obtained. In the case of the continuous values, those of $\bar{a}_x$ were obtained from the relation $\bar{a}_x = a_x + \frac{1}{2} - \frac{1}{12}(\mu_x + \delta)$, where δ denotes the "force" or instantaneous rate of interest (when i denotes the effective rate of interest per unit per annum, $e^{\delta} = 1 + i$ and consequently $\delta = \log_e(1 + i) = \log_{10}(1 + i)/M$ where $M = .43429..$). The column $\bar{a}$ was checked by addition by means of the relation $\Sigma\bar{a} = \Sigma a + n(\frac{1}{2} - \frac{1}{12}\delta) - \frac{1}{12}\Sigma\mu$. The column $\bar{A}$ was computed by means of the relation $\bar{A}_x = 1 - \delta\bar{a}_x$, and checked by addition by the relation $\Sigma\bar{A} = n - \delta\Sigma\bar{a}$. The column $\bar{P}$ was computed by means of the relation $\bar{P}_x = \bar{A}x/\bar{a}_x$, and checked by performing the calculations in duplicate. The test of smoothness in the progression of differences was also applied in all these cases.

In the case of the temporary annuity tables the relation $a_{x\overline{n}|} = (D_{x+1} + D_{x+2} + \ldots + D_{x+n})/D_x$ furnished a very convenient basis for rapid calculation on the millionaire calculating machine of the successive values required. For this purpose the values of D_x for all ages from 1 upwards were written on a movable slip, and the value of the reciprocal of each value of D_x was written at the head of the column for age x on the working sheet. This reciprocal was set up on the fixed plate of the millionaire, and was multiplied successively by the values of D_{x+1}, D_{x+2}, etc., the product holes being left uncleared after each multiplication. The figures so contained in the product holes were thus the values of $a_{x:\overline{1}|}$, $a_{x:\overline{2}|}$, etc. The process was thus a continued one, and a final check on its accuracy was furnished by the agreement of the final value for age x with that of a_x. As intermediate checks, values for all ages for durations of 20, 40, 60 and 80 years were computed beforehand and inserted in their appropriate places in the working sheets. These values were computed by means of the relation $a_{x\overline{n}|} = (\mathbf{N}_{x+1} - \mathbf{N}_{x+n+1})/D_x$. In these tables also the test of orderly progression of differences was applied throughout. In view of the care that has been taken in testing the various calculations and in reading and checking the proof-sheets, it is hoped that very few errors will have crept in. Information concerning any such that may be discovered will be gratefully received.

5. **Review of Results.**—(*a*) *General.*—In the present section it is proposed to briefly review the results of the investigations outlined in the preceding section. For this purpose the matter may conveniently be divided into four groups.

(i.) A comparison of the results for the Commonwealth as a whole for the three decennia 1881-90, 1891-1900 and 1901-10.

(ii.) A comparison of the results obtained for the several States.

(iii.) A comparison of the Australian results with those for other countries.

(iv.) A comparison of Australian monetary values with those of standard tables.

The functions which have been selected for detailed comparison in the present review are

(i.) The numbers surviving at decennial ages.

(ii.) The probability of surviving ten years at decennial ages.

(iii.) The expectation of life at decennial ages.

(iv.) The age distribution of the average future lifetime for decennial age-groups.

(v.) The " probable lifetime" or " vie probable" at decennial ages.

(vi.) Annuity values at $3\frac{1}{2}$ per cent. interest at decennial ages.

(*b*) *Commonwealth Comparisons.*—Taking first the numbers surviving, the succeeding table shews for each sex separately the number who, out of 100,000 born would be surviving at each decennial age if the mortality experienced in Australia in the three decennia 1881-90, 1891-1900 and 1901-10 respectively had operated throughout the lives of those who came under observation at birth. This table furnishes at one and the same time evidence of the marked improvement in rates of mortality in successive decennia, and of the superior vitality throughout of female as compared with male life. It will be seen that whereas with the 1881-90 experience only 76.63 per cent. of the males born would reach age 20, no fewer than 84.49 per cent. would reach that age with the 1901-10 experience, an improvement of 7.86 in the percentage of survivors. Similarly in the case of females, whereas 79.10 per cent. of the females born would with the mortality of 1881-90, reach the age of 20, 86.46 would do so under the 1901-10 experience, an improvement of 7.36 in the percentage of survivors.

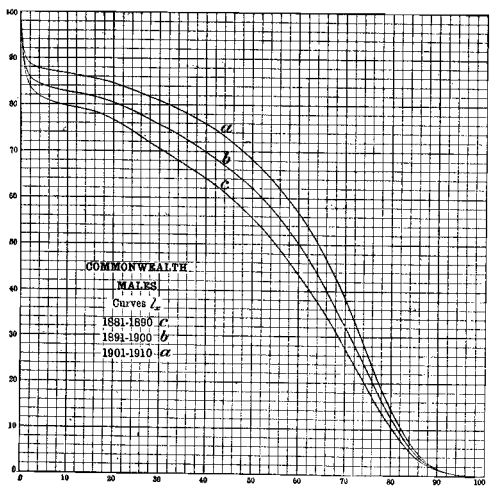
Commonwealth Life Tables.—Number Surviving at Decennial Ages (l_x), 1881-1910.

Age.	Number Surviving at Age Specified.					
	Males.			Females.		
	1881–90.	1891–1900.	1901–10.	1881–90.	1891–1900.	1901–10.
0	100,000	100,000	100,000	100,000	100,000	100,000
10	79,700	82,781	86,622	81,643	84,606	88,395
20	76,630	80,349	84,493	79,099	82,473	86,459
30	70,531	75,706	80,844	73,862	78,329	82,909
40	64,106	69,788	75,887	67,453	72,487	78,001
50	55,606	62,014	68,221	59,978	66,095	71,945
60	43,483	50,205	56,782	50,039	56,617	63,247
70	27,291	32,134	38,275	34,877	40,943	46,793
80	10,438	12,568	14,330	15,691	18,631	21,356
90	1,328	1,501	1,652	2,095	2,833	3,566
100	22	25	15	42	52	56

Again, it may be noted that whilst 10.44 per cent. of the males born, and 15.69 per cent. of the females would reach age 80 under the mortality experience of 1881-90, no less than 14.33 per cent. of the males and 21.36 per cent. of the females born would reach that age under the experience of 1901-10.

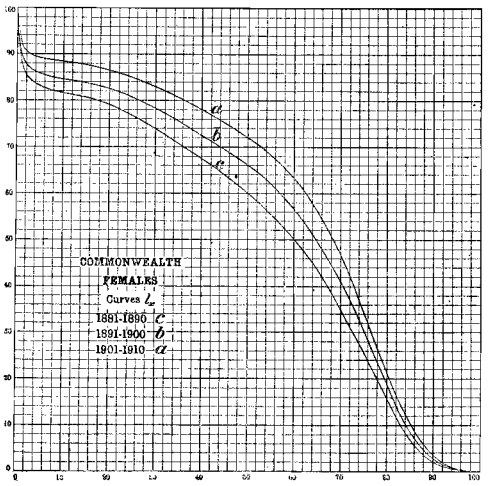
Number Surviving at each Age (l_x), Commonwealth, 1881-1910.

(*a*) MALES.



GRAPH No. 118.

(*b*) FEMALES.

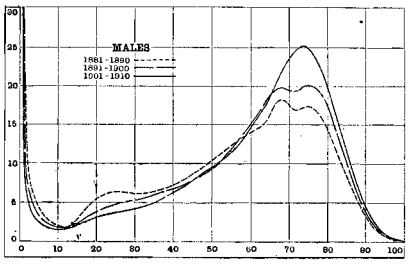


GRAPH No. 119.

In graphs Nos. 118 and 119 are furnished representations of the numbers surviving each age out of 100,000 at birth according to the Commonwealth Life Tables for each of the decennia, 1881-1890, 1891-1900, 1901-1910. Graph No. 118 relates to males, and No. 119 to females. The base of each small square represents 2 years of age, while the vertical height represents 2,000 survivors. Incidentally the area enclosed by the left hand margin, the base line and the curve *c*, represents the quantity of human life that would result from 100,000 births if the mortality rates for the decennium 1881-90 were in operation throughout life. Similarly the area between the same straight lines and the curve *b* represents the quantity of human life that would result from 100,000 births if the mortality rates for the decennium 1891-1900 had operated throughout life. Similarly also for curve *a*. It follows therefore, that the area between the curves *a* and *c*, represents the increase in the quantity of human life resulting from 100,000 births, which is due to the improvement in the rates of mortality between the decennium 1881-90 and the decennium 1901-1910.

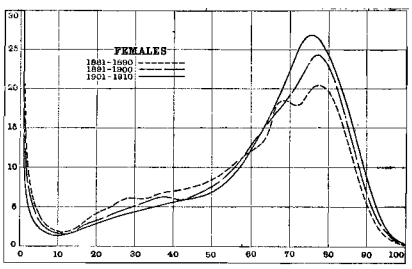
Numbers Dying (d_x) Commonwealth, 1881-1910.

(*a*) MALES.



GRAPH No. 120.

(*b*) FEMALES.



GRAPH No. 121.

The accompanying graphs (Nos. 120 and 121) represent for each of the decennia 1881-1890, 1891-1900, and 1901-1910, the numbers alive at each age who would die before reaching the next higher age out of 100,000 at birth, if the rates of mortality experienced in the Commonwealth during the respective decennia specified, remained in force throughout life. The base of each small square represents 10 years of age, and the vertical height represents 500 deaths.

The next table, which gives another measure of the improvement in vitality, shews the probability at each decennial age of surviving 10 years.

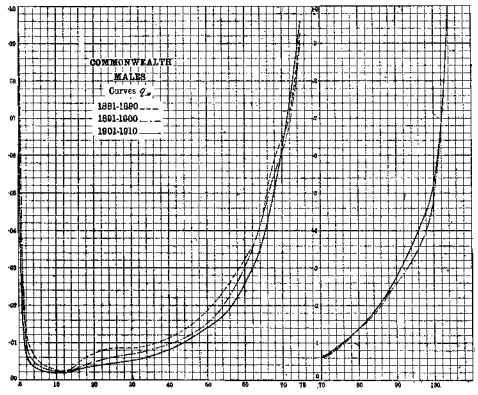
Commonwealth Life Tables.—Probability of Surviving 10 Years, 1881-1910.

Age.	Probability of Surviving 10 Years at Age Specified.					
	Males.			Females.		
	1881–90.	1891–1900.	1901–10.	1881–90.	1891–1900.	1901–10.
0	.79700	.82781	.86622	.81643	.84606	.88395
10	.96148	.97062	.97542	.96884	.97479	.97810
20	.92041	.94221	.95681	.93379	.94975	.95894
30	.90891	.92183	.93868	.91323	.92542	.94080
40	.86741	.88861	.89898	.88918	.91182	.92236
50	.78198	.80958	.83232	.83429	.85660	.87910
60	.62762	.64006	.67407	.69700	.72316	.73985
70	.38247	.39111	.37440	.44990	.45505	.45639
80	.12726	.11943	.11528	.13350	.15206	.16699
90	.01692	.01684	.00894	.02021	.01841	.01580

It will be seen that up to age 60 the probability of surviving 10 years was for both sexes considerably higher in 1901-10, than in 1881-90, and that in the case of females this superiority was in evidence as far as 80. In the case of males at ages 70, 80, and 90, and of females at age 90 the probability of surviving 10 years was less in 1901-10 than in 1881-90. To some extent the continuous improvement of rates of mortality at younger ages through improvement in hygiene and other circumstances will tend to increase the rates of mortality at higher ages by carrying on to those ages larger numbers of persons of delicate constitutions who under the more rigorous early conditions would have died at younger ages. By such means the *average* health of persons of advanced age might be considerably reduced, although the *number* of such persons of sound health and good constitution might be on the increase.

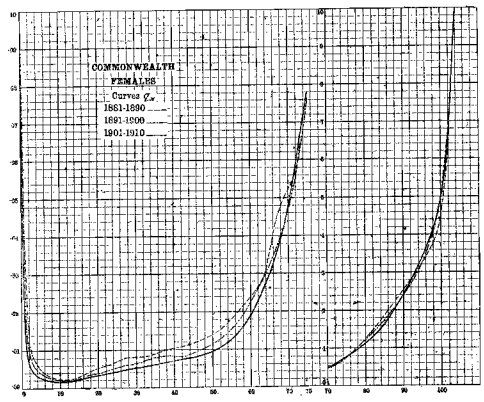
Australian Rates of Mortality (q_x), 1881-1910.

(*a*) MALES.



GRAPH No. 122.

(*b*) FEMALES.



GRAPH No. 123.

A representation of the Australian rates of mortality for each of the decennia 1881-1890, 1891-1900, and 1901-1910 is furnished in graphs Nos. 122 and 123. This rate, usually denoted by the symbol q_x, gives the probability that a person alive at any age x will die before reaching the next higher age $x + 1$. The base of each small square represents two years of age, while the vertical height represents a rate of mortality of .002 in the case of the left hand group of curves in each graph, and .02 in the case of each right hand group.

The next table gives the expectation of life or average future lifetime of persons attaining the successive decennial ages :—

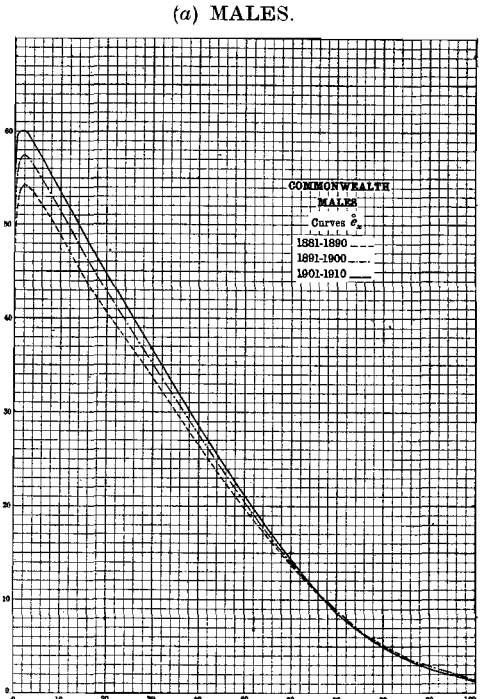
Expectation of Life.—Commonwealth Experience, 1881-1910.

Age.	Expectation of Life at Age Specified.					
	Males.			Females.		
	1881–90.	1891–1900.	1901–10.	1881–90.	1891–1900.	1901–10.
	Years.	Years.	Years.	Years.	Years.	Years.
0	47.20	51.08	55.20	50.84	54.76	58.84
10	48.86	51.43	53.53	51.95	54.46	56.39
20	40.58	42.81	44.74	43.43	45.72	47.52
30	33.64	35.11	36.52	36.13	37.86	39.33
40	26.50	27.65	28.56	29.08	30.49	31.47
50	19.74	20.45	21.16	22.06	22.93	23.69
60	13.77	13.99	14.35	15.39	15.86	16.20
70	8.82	8.90	8.67	9.70	9.89	9.96
80	5.11	5.00	4.96	5.27	5.49	5.73
90	2.91	2.91	2.64	2.98	3.07	2.99
100	1.32	1.29	1.18	1.37	1.23	1.24

The figures given in this table indicate in respect of each specified age the number of years which the persons reaching that age will on the average survive. Thus, for example, according to the Commonwealth experience for 1881-90, males reaching the age of 30 would, on the average, survive 33.64 years, that is, if all the males who reached 30 could be traced to their deaths, their average age at death would be 63.64 years. The corresponding average age at death for the 1891-1900 male experience is 65.11, and for 1901-10, it is 66.52. The table thus indicates an increase of 2.88 years in the average future lifetime of males aged 30, when the experience of 1901-10 is compared with that for 1881-90. The corresponding increase in the case of females was 3.20 years. Taking the expectation of life at birth, the 1891-1900 male experience gave a result higher by 3.88 years than that for 1881-90, while the 1901-10 male experience gave a result higher by 4.12 years than that for 1891-1900. Similarly the female experience shewed an advance of 3.92 years in 1891-1900 over 1881-90, and of 4.08 years in 1901-10 over 1891-1900. The excess of the female expectation at date of birth over the male was remarkably uniform in the three decennia, being 3.64 years in 1881-90, 3.68 years in 1891-1900, and 3.64 years in 1901-10.

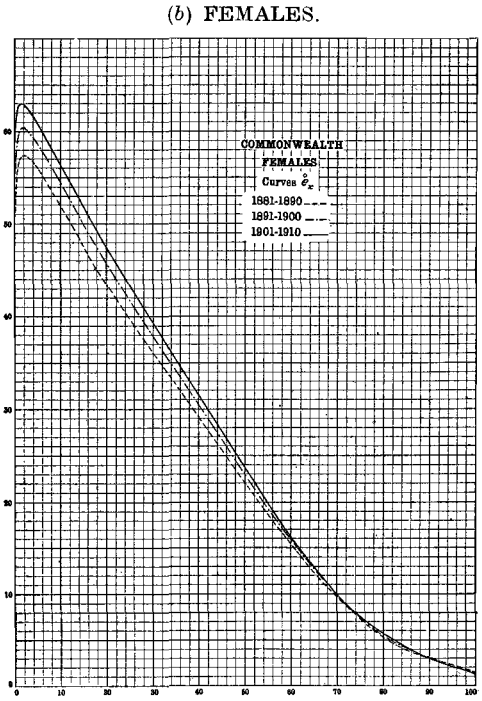
Expectation of Life $\mathring{e}_x$. Commonwealth, 1881 to 1910.

(*a*) MALES.



GRAPH No. 124.

(*b*) FEMALES.



GRAPH No. 125.

The accompanying graphs (Nos. 124 and 125) furnish a representation of the expectation of life at each age for each sex according to the Commonwealth experience of the three decennia 1881-1890, 1891-1900, and 1901-1910. The base of each small square represents two years of age, while the vertical height represents an expectation of life of one year.

A point of great importance in connexion with the expectation of life is the method of its distribution over the lifetime. For example, the male expectation at birth according to the 1881-90 experience was 47.20 years. Such a result would have been obtained if everyone born had lived to the exact age of 47.20, and had then died, but it could also have arisen in an infinity of other ways, one of which was the way in which it actually did arise. It is consequently of importance to know what the exact distribution was, and for this purpose the following table has been prepared, shewing for each experience the distribution in decennial age periods :—

Average Future Duration of Life in Decennial Age Periods.—Commonwealth Experience, 1881-1910.

Age Period.	Average Future Duration (as at Age 0) of Life, In Age Period Specified.					
	Males.			Females.		
	1881–90.	1891–1900.	1901–10.	1881–90.	1891–1900.	1901–10.
	Years.	Years.	Years.	Years.	Years.	Years.
0–10	8.26	8.51	8.83	8.43	8.68	9.00
10–20	7.85	8.18	8.57	8.06	8.37	8.75
20–30	7.36	7.82	8.28	7.67	8.06	8.48
30–40	6.74	7.29	7.85	7.08	7.55	8.06
40–50	6.01	6.61	7.23	6.38	6.94	7.51
50–60	4.99	5.66	6.29	5.53	6.18	6.80
60–70	3.58	4.16	4.83	4.32	4.93	5.58
70–80	1.87	2.23	2.61	2.55	3.03	3.43
80–90	.50	.58	.67	.76	.93	1.12
90–105	.04	.04	.04	.06	.09	.11
0–105	47.20	51.08	55.20	50.84	54.76	58.84

This table may be interpreted in the following manner. In tracing, for example, 100,000 males born at the same moment, and subject to the 1881-90 male experience throughout their lives, it would be found that the aggregate number of years lived by them during the ten years succeeding the date of their birth would be such as to give an average of 8.26 years to each of the original 100,000. Similarly the aggregate number of years lived by them during the 10 years from their 40th to their 50th birthday would be such as to give an average of 6.01 years to each of the original 100,000, and so on. Taking the important period of life from 20 to 60, it will be seen that the expectation of life according to the 1881-90 male experience was 25.10 years, that is to say, in the case of 100,000 males born at the same moment, and subject throughout life to the 1881-90 male experience the aggregate number of years lived between the 20th and 60th birthdays would be such as to give an average of 25.10 years to each of the original 100,000. The corresponding expectations for the 1891-1900 and 1901-10 experiences is 27.38 years and 29.65 years, shewing an increase of 2.28 years for 1891-1900 over 1881-90, and of 2.27 for 1901-10 over 1891-1900. Similar expectations for females are 26.66 years for 1881-90, 28.73 years for 1891-1900, and 30.85 years for 1901-10, giving an increase of 2.07 years and 2.12 years respectively.

Another measure of vitality which bears to the expectation of life a relation analagous to that which a median bears to a mean, is that which has been termed the "*vie probable*" or "probable lifetime." The "probable lifetime" at any given age is the number of years which must elapse before the persons who reach the given age will, by the incidence of death, be reduced to half their number. It is thus an even chance whether any one will exceed or fall short of his "vie probable."

The following table furnishes such results for decennial ages for males and females, separately in accordance with the experiences of the Commonwealth as a whole for the three decennia 1881-90, 1891-1900 and 1901-10 respectively :—

Probable Lifetime (*vie probable*).—**Commonwealth Experience, 1881-1910..**

Age.	Probable Lifetime at Age Specified (*vie probable.*)					
	Males.			Females.		
	1881–90.	1891–1900.	1901–10.	1881–90.	1891–1900.	1901–10.
	Years.	Years.	Years.	Years.	Years.	Years.
0	55.03	60.13	64.25	60.03	64.72	68.45
10	52.55	55.26	57.72	56.74	59.26	61.15
20	43.58	45.91	48.22	47.46	49.84	51.56
30	35.52	37.11	39.06	38.89	40.93	42.30
40	27.37	28.60	30.14	30.63	32.39	33.27
50	19.72	20.58	21.74	22.72	23.90	24.44
60	13.24	13.62	14.04	15.38	15.98	16.06
70	7.96	8.14	7.81	9.13	9.22	9.19
80	4.21	4.10	4.13	4.42	4.62	4.92
90	2.26	2.26	2.05	2.31	2.43	2.39

On comparing the figures in this table with those given above for the expectation of life, it will be seen that at the younger ages the "vie probable" is considerably higher than the expectation, that this excess diminishes with age until in the neighbourhood of 50 or 60 a point of equality is attained, after which the expectation is the higher. The integral age at which the point of equality is most nearly attained in the several experiences is as follows :—

Males, 1881-90 at age 50 ; 1891-1900 at age 52 ; 1901-10 at age 56. Females, 1881-90 at age 60 ; 1891-1900 at age 61 ; and 1901-10 at age 58.

(*c*) *Interstate Comparisons.*—Complete tables for the usual elementary life table functions were computed separately for each sex in each State for each of the three decennia 1881-90 1891-1900, and 1901-10. These are given in extenso in pp. 1219 to 1278 of the Census Detailed Tables (see Volume III.). Material is thus furnished for an extensive survey of the changes in mortality conditions in each State during the thirty years under review, and also for a comparison of the results for one State with the corresponding results for others. It will not be possible, however, in the present review, to do more than touch briefly on a few of the leading features. The following table gives for the decennium 1901-10 the numbers surviving at decennial ages out of 100,000 born, according to the male and female experiences of the several States and the Commonwealth as a whole. In all the State tables the figures given for New South Wales are inclusive of those for the Federal Territory, and the figures for South Australia are inclusive of those for the Northern Territory.

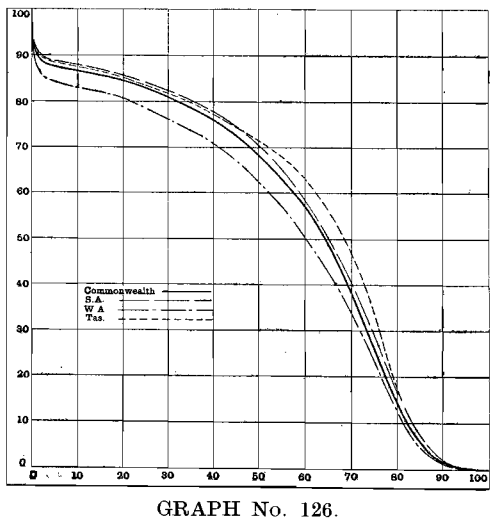
Numbers Surviving at Decennial Ages.—Commonwealth and States, 1901-10.

Age.	Number Surviving at Age Specified.						
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	C'wlth.
MALES.							
0	100,000	100,000	100,000	100,000	100,000	100,000	100,000
10	86,598	86,650	87,179	87,965	82,941	87,583	86,622
20	84,598	84,573	84,723	85,874	80,800	85,241	84,493
30	81,401	81,051	80,111	82,461	76,115	81,799	80,844
40	76,938	76,043	74,157	77,720	70,749	77,268	75,887
50	69,584	68,138	65,640	70,429	62,371	71,456	68,221
60	58,335	56,643	53,421	58,571	50,489	63,167	56,782
70	39,583	38,022	35,290	40,294	33,646	46,993	38,275
80	15,183	13,152	14,283	16,732	12,459	17,503	14,330
90	1,936	1,367	1,980	2,105	1,259	1,464	1,652
100	34	17	25	30	16	11	15
FEMALES.							
0	100,000	100,000	100,000	100,000	100,000	100,000	100,000
10	88,198	88,477	88,767	90,178	85,454	89,033	88,395
20	86,409	86,423	87,054	88,127	83,376	86,511	86,459
30	83,002	82,832	83,641	84,287	79,447	82,905	82,909
40	78,345	77,739	78,694	79,517	74,208	78,292	78,001
50	72,317	71,302	72,377	73,622	68,215	73,042	71,945
60	63,738	62,473	63,388	65,209	60,044	65,522	63,247
70	47,081	46,202	46,242	48,922	44,172	49,215	46,793
80	21,346	20,303	22,780	23,536	21,013	24,133	21,356
90	3,616	3,134	4,005	4,051	3,898	4,020	3,566
100	46	42	67	103	119	55	56

At all the important ages in both sexes the pride of place is held by South Australia and Tasmania ; South Australia at the earlier ages and Tasmania at the later. With few exceptions Western Australia occupied the lowest position throughout. It will be seen that the proportion of those born who reach age 80 according to the several experiences is as follows :—Males, Tasmania, 17.50 per cent. ; South Australia, 16.73 per cent. ; New South Wales, 15.18 per cent. ; Queensland, 14.28 per cent. ; Victoria, 13.15 per cent. ; and Western Australia, 12.46 per cent. Females—Tasmania, 24.13 per cent. ; South Australia, 23.54 per cent. ; Queensland, 22.78 per cent. ; New South Wales, 21.35 per cent. ; Western Australia, 21.01 per cent. ; and Victoria 20.30 per cent.

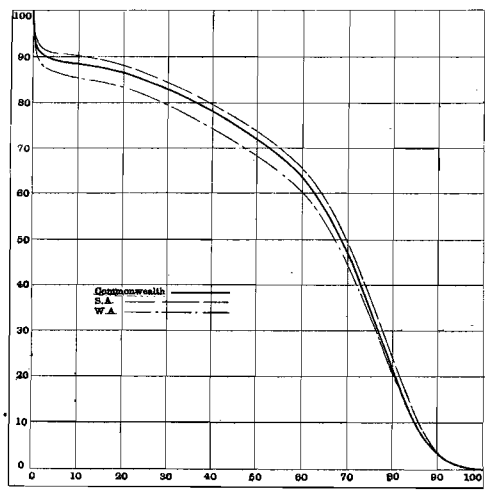
Number Surviving, 1901-10 (l_x), Commonwealth and States.

(*a*) MALES.



GRAPH No. 126.

(*b*) FEMALES.



GRQPH No. 127.

The curves representing the numbers surviving at each age according to the mortality experience of the several States, cross and recross each other to such an extent that a graph containing the whole of these curves would present a somewhat confused view of the position, and would not be readily followed. It was consequently decided to shew, in graphs Nos. 126 and 127, only the maximum and minimum curves and their relation to those for the Commonwealth as a whole. The curves for the States not represented in these graphs lie in general between the inner and the outer of the curves given. In each case the base of a small square represents 10 years of age, while the height represents 10,000 survivors.

The following table furnishes particulars for each State in respect of the probability at decennial ages in each sex of surviving ten years. It will be seen from this table that the favourable positions of South Australia and Tasmania, and the unfavourable position of Western

Australia, which were commented on in connexion with the preceding table, are due in large measure to the effect of the rates experienced during the first 10 years. Thus whilst in South Australia 87.97 per cent. of the males and 90.18 per cent. of the females born reached the age of 10, the corresponding figures in the case of Western Australia were 82.94 per cent. and 85.45 per cent. For ages 10 and upwards the rates for Western Australia compare favourably with those for other States.

Probability of Surviving 10 Years at Decennial Ages.—Commonwealth and States, 1901-10.

Age.	Probability of Surviving 10 Years at Age Specified.						
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	C'wlth.
	MALES.						
0	.86598	.86650	.87179	.87965	.82941	.87583	.86622
10	.97689	.97603	.97183	.97623	.97419	.97326	.97542
20	.96221	.95836	.94556	.96026	.94202	.95962	.95681
30	.94517	.93821	.92568	.94251	.92950	.94461	.93868
40	.90442	.89605	.88515	.90619	.88158	.92478	.89898
50	.83834	.83130	.81385	.83163	.80949	.88400	.83232
60	.67855	.67126	.66060	.68795	.66640	.74395	.67407
70	.38357	.34591	.40473	.41525	.37030	.37246	.37440
80	.12754	.10395	.13863	.12581	.10107	.08363	.11528
90	.01754	.01243	.01243	.01428	.01259	.00748	.00894
	FEMALES.						
0	.88198	.88477	.88767	.90178	.85454	.89033	.88395
10	.97972	.97678	.98070	.97726	.97568	.97167	.97810
20	.96057	.95845	.96079	.95643	.95288	.95832	.95894
30	.94389	.93851	.94085	.94341	.93406	.94436	.94080
40	.92306	.91720	.91973	.92586	.91924	.93294	.92236
50	.88137	.87617	.87580	.88573	.88022	.89705	.87910
60	.73866	.73955	.72951	.75023	.73566	.75112	.73985
70	.45339	.43944	.49263	.48109	.47571	.49036	.45639
80	.16939	.15438	.17580	.17212	.18552	.16656	.16699
90	.01266	.01338	.01662	.02537	.03051	.01376	.01580

It will be seen that, with a few exceptions, the probability of surviving 10 years at the ages specified was greater for females than for males. The exceptional cases in which the probability was greater in the case of males than in that of females were at ages 20, 30 and 90 in New South Wales, at age 20 in South Australia, and at ages 10, 20 and 30 in Tasmania. In most of these cases the male excess was very small. It will also be noted that according to the experience for the Commonwealth as a whole 67.41 per cent. of the males and 73.99 per cent. of the females who reach 60 years of age live to attain their 70th birthday, while 37.44 per cent. of the males and 45.64 per cent. of the females who reach 70 years of age live to attain their 80th birthday.

The expectation of life at decennial ages in accordance with the experience of the decennium 1901-1910, is given in the following table, for each of the States and for the Commonwealth as a whole, the results for the two sexes being shewn separately.

Expectation of Life.—Commonwealth and States, 1901-10.

Age.	Expectation of Life at Age Specified.						
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	C'wlth.
	Years.	Years.	Years.	Years.	Years.	Years.	Years.
	MALES.						
0	55.90	55.06	54.20	56.76	51.44	57.76	55.20
10	54.35	53.35	51.98	54.35	51.75	55.78	53.53
20	45.50	44.52	43.32	45.53	42.97	47.16	44.74
30	37.09	36.22	35.51	37.21	35.30	38.94	36.52
40	28.93	28.25	27.94	29.15	27.58	30.90	28.56
50	21.42	20.91	20.88	21.60	20.57	23.00	21.16
60	14.50	14.07	14.45	14.89	14.16	15.29	14.35
70	8.81	8.31	9.12	9.23	8.62	8.68	8.67
80	5.15	4.73	5.29	5.11	4.71	4.46	4.96
90	2.92	2.74	2.83	2.85	2.70	2.46	2.64
100	1.31	1.26	1.20	1.27	1.29	1.17	1.18

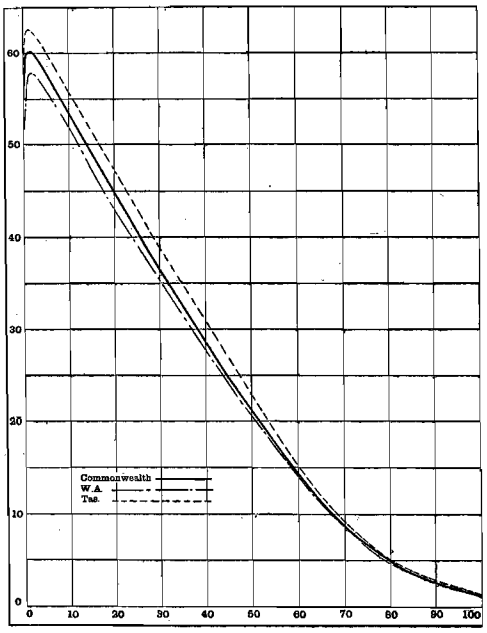
Expectation of Life.—Commonwealth and States, 1901-10—*continued.*

Age.	Expectation of Life at Age Specified.						C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	
	Years.	Years.	Years.	Years.	Years.	Years.	Years.
	FEMALES.						
0	58.97	58.46	59.29	60.39	56.46	59.86	58.84
10	56.69	55.90	56.62	56.83	55.82	57.07	56.39
20	47.74	47.09	47.62	48.02	47.08	48.57	47.52
30	39.49	38.90	39.35	39.96	39.14	40.46	39.33
40	31.52	31.11	31.49	32.05	31.54	32.53	31.47
50	23.71	23.45	23.79	24.20	23.86	24.51	23.69
60	16.17	15.99	16.39	16.62	16.37	16.68	16.20
70	9.93	9.68	10.44	10.30	10.25	10.35	9.96
80	5.73	5.59	5.86	5.79	5.94	5.79	5.73
90	2.95	2.89	3.02	3.20	3.40	2.93	2.99
100	1.15	1.20	1.27	1.39	1.39	1.20	1.24

It will be seen that at all the more important ages the male expectation of life for individual States was above that for the Commonwealth as a whole in the cases of New South Wales, South Australia and Tasmania, and below the Commonwealth expectation in Victoria and Western Australia, while in the case of Queensland the expectation for the earlier ages was below and for the later ages above the Commonwealth results. As regards the female results the expectation for Queensland, South Australia and Tasmania was higher at practically all ages than that for the Commonwealth, while the Victorian expectation was lower throughout than the Commonwealth result. In New South Wales the expectation was higher than the Commonwealth figure at the earlier, and lower than it at the later, the reverse of this being experienced in the case of Western Australia. Throughout the States at practically all ages the expectation was markedly higher in the case of females than in that of males. The difference between male and female expectation at date of birth varied between the limits of 2.10 years in the case of Tasmania, and 5.09 years in that of Queensland. Tasmania had the highest and Western Australia the lowest male expectation at date of birth, the corresponding results for females being South Australia highest and Western Australia lowest.

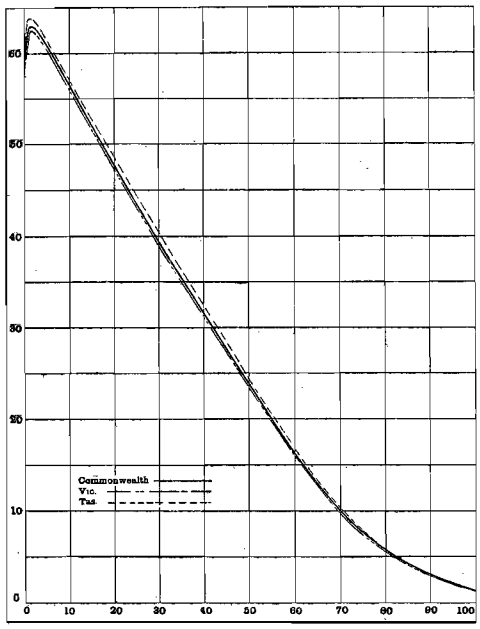
Expectation of Life, 1901-10 (l_x), **Commonwealth and States.**

(*a*) MALES).



GRAPH No. 128.

(*b*) FEMALES.



GRAPH No. 129.

In graph No. 128 is furnished a representation of the expectation of life of males at each age for the States of W.A. and Tas., in comparison with that for the Commonwealth, while a similar representation for females is furnished in graph No. 129 in respect of the States of Victoria and Tasmania. In each case the curves for the other four States fall in general between the inner and the outer of the curves shewn, and have been omitted to avoid confusion. The base of each small square represents 10 years of age, and the height represents an expectation of life of 5 years.

The following table furnishes in respect of each State the expectation of life classified according to the age period in which it was experienced. The particulars given relate to the experience for the decennium 1901-10. For a detailed account of the significance of these results see p. 331 hereinbefore.

Average Future Duration of Life in Decennial Age Periods.—Commonwealth and States, 1901-10.

Age Period.	Average Future Duration (as at Age 0) of Life in Age Period Specified.						
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	C'wlth.
	Years.	Years.	Years.	Years.	Years.	Years.	Years.
MALES.							
0–10	8.83	8.84	8.88	8.95	8.52	8.90	8.83
10–20	8.57	8.57	8.62	8.70	8.20	8.66	8.57
20–30	8.31	8.29	8.25	8.42	7.85	8.35	8.28
30–40	7.93	7.87	7.73	8.03	7.36	7.97	7.85
40–50	7.35	7.24	7.02	7.44	6.69	7.44	7.23
50–60	6.44	6.28	5.98	6.49	5.68	6.78	6.29
60–70	4.97	4.81	4.50	5.01	4.25	5.58	4.83
70–80	2.71	2.54	2.46	2.86	2.31	3.30	2.61
80–90	.73	.58	.70	.80	.55	.74	.67
90–105	.06	.04	.06	.06	.03	.04	.04
0–105	55.90	55.06	54.20	56.76	51.44	57.76	55.20
FEMALES.							
0–10	8.98	9.00	9.04	9.14	8.75	9.05	9.00
10–20	8.74	8.76	8.80	8.93	8.45	8.79	8.75
20–30	8.48	8.47	8.55	8.63	8.16	8.47	8.48
30–40	8.08	8.04	8.13	8.20	7.69	8.07	8.06
40–50	7.54	7.47	7.56	7.67	7.13	7.57	7.51
50–60	6.84	6.73	6.83	6.98	6.45	6.98	6.80
60–70	5.63	5.52	5.56	5.80	5.30	5.83	5.58
70–80	3.45	3.34	3.49	3.68	3.28	3.70	3.43
80–90	1.12	1.04	1.21	1.23	1.12	1.28	1.12
90–105	.11	.09	.12	.13	.13	.12	.11
0–105	58.97	58.46	59.29	60.39	56.46	59.86	58.84

For the period of life from the 20th to the 60th birthday, the expectation of life at date of birth in the several States was as follows :—Males : Tasmania, 30.54 years ; South Australia 30.38 years ; New South Wales, 30.03 years ; Victoria, 29.68 years ; Queensland, 28.98 years ; Western Australia, 27.58 years. Females : South Australia, 31.48 years ; Tasmania, 31.09 years ; Queensland, 31.07 years ; New South Wales, 30.94 years ; Victoria, 30.71 years ; Western Australia, 29.43 years. This result may be otherwise expressed by saying that according to the Tasmanian experience for 1901-10 each male born will on the average contribute to the life of the community 30.54 years between the ages of 20 and 60, and each female 31.09 years. Similarly for each of the other States.

The following table furnishes for each of the States the "*vie probable*" or "probable lifetime" at decennial ages in accordance with the experience of the decennium 1901-1910. For a detailed explanation of the significance of this function see p. 331. As indicated there, in connexion with the experience of the Commonwealth as a whole, the "*vie probable*" exceeds the expectation of life at early ages, and falls short of it at late ages, the crossing point occuring usually between 50 and 60 or thereabouts.

Probable Lifetime (*vie probable*).—**Commonwealth and States, 1901-10.**

Age.	Probable Lifetime at Age Specified (*vie probable*).						
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	C'wlth.
	Years	Years.	Years.	Years.	Years.	Years.	Years.
MALES.							
0	65.06	64.18	62.27	65.20	60.34	68.49	64.25
10	58.37	57.62	55.93	58.27	55.73	61.40	57.72
20	48.82	48.11	46.56	48.77	46.34	51.87	48.22
30	39.52	38.91	37.72	39.57	37.65	42.51	39.06
40	30.46	30.00	29.15	30.65	29.09	33.30	30.14
50	21.93	21.62	21.16	22.26	21.25	24.25	21.74
60	14.11	13.84	14.01	14.76	14.08	15.54	14.04
70	7.89	7.45	8.29	8.53	7.88	8.03	7.81
80	4.29	3.85	4.45	4.24	3.84	3.65	4.13
90	2.27	2.11	2.24	2.23	2.06	1.88	2.05
FEMALES.							
0	68.62	68.17	68.17	69.49	67.03	69.63	68.45
10	61.30	60.86	60.88	61.72	60.68	62.05	61.15
20	51.68	51.28	51.28	52.16	51.16	52.57	51.56
30	42.38	42.02	42.06	42.97	42.05	43.31	42.30
40	33.30	33.00	33.18	33.94	33.21	34.23	33.27
50	24.45	24.20	24.57	25.09	24.50	25.25	24.44
60	16.04	15.81	16.45	16.68	16.23	16.69	16.06
70	9.14	8.87	9.86	9.66	9.55	9.82	9.19
80	4.91	4.81	5.05	4.91	4.98	5.02	4.92
90	2.38	2.29	2.42	2.54	2.73	2.34	2.39

The difference between male and female "*vie probable*" at date of birth varied between the limits of 1.14 years for Tasmania, and 6.69 years for Western Australia. For both males and females Tasmania had the highest and Western Australia the lowest "*vie probable*."

In the following table are given particulars concerning the expectation of life at date of birth in respect of each of the States of the Commonwealth, in accordance with the experience of the three successive decennia 1881-90, 1891-1900, and 1901-10, the figures for males and females being shewn separately :—

Expectation of Life.—Commonwealth and States, 1881-1910.

States.	Expectation of Life at Age 0. $(^{0}e_{0})$					
	Males.			Females.		
	1881–90.	1891–1900.	1901–10.	1881–90.	1891–1900.	1901–10.
	Years.	Years.	Years.	Years.	Years.	Years.
New South Wales ..	48.32	51.77	55.90	51.38	55.07	58.97
Victoria	47.11	51.10	55.06	49.76	54.12	58.46
Queensland	41.33	49.51	54.20	49.75	55.80	59.29
South Australia ..	50.61	53.02	56.76	53.81	56.10	60.39
Western Australia ..	46.45	43.73	51.44	51.49	49.51	56.46
Tasmania	51.10	54.18	57.76	52.34	55.60	59.86
Commonwealth ..	47.20	51.08	55.20	50.84	54.76	58.84

In all the States the experience for 1901-10 shewed a marked improvement over that for 1891-1900, the increase being, most in evidence in the case of Western Australia. Similarly in all the States except Western Australia the experience for 1891-1900 shewed a marked improvement on that for 1881-90, the increase in this case being most in evidence in Queensland. In Western Australia, owing to the large influx of population during the decennium 1891-1900 as a result of the gold discoveries of that period, and to the unsettled conditions resultant thereon, the death rate during the decennium was high, and as a consequence the expectation of life based on the experience of the decennium was lower for both sexes than that for the previous

decennium, 1881-90. In some of the earlier investigations of Australian mortality it has been usual to comment unfavourably on the position of Queensland in this respect in relation to the other States. It will be seen from the above table, however, that although for 1881-90 Queensland occupied the lowest position of any of the States, its death rates improved so considerably during the next twenty years that in 1901-10 its male expectation exceeded that for Western Australia, and fell little short of that for Victoria, while its female expectation exceeded that for New South Wales, Victoria and Western Australia, and fell little short of that for Tasmania. Throughout the period of thirty years 1881-1910, Tasmania has had the highest male, and South Australia the highest female expectation of life at date of birth.

(*d*) *International Comparisons.*—Up to the time of writing, the published life tables which have been received in respect of the decennium 1901-10, comprise those for England and Wales, the United States of America, Sweden and Italy. Comparisons of the results furnished by these investigations with those for Australia are given in the succeeding tables, the first of which contains particulars concerning the numbers surviving at each decennial age out of 100,000 born in, and subject throughout life to the mortality rates ascertained for, the several countries specified.

Number Surviving at Decennial Ages (l_x).—Various Countries, 1901-10.

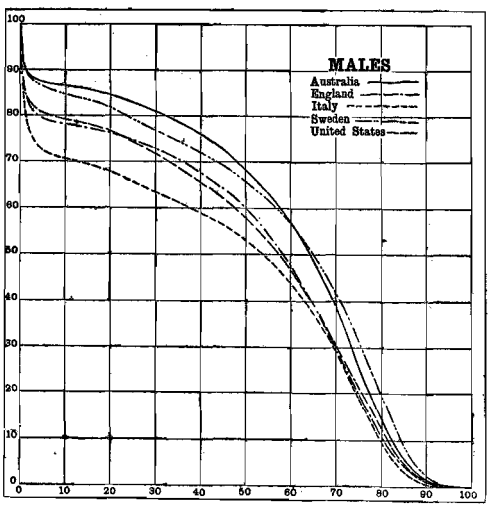
Age.	Number Surviving at Age Specified.				
	Australia.	England and Wales.	U.S.A.	Sweden.	Italy.
MALES.					
0	100,000	100,000	100,000	100,000	100,000
10	86,622	78,083	79,183	84,762	70,459
20	84,493	76,113	76,488	81,671	67,773
30	80,844	72,741	71,678	76,649	63,341
40	75,887	67,668	65,465	71,925	58,904
50	68,221	59,903	57,644	65,727	53,022
60	56,782	47,564	46,640	56,568	43,935
70	38,275	29,898	30,259	41,695	28,798
80	14,330	10,608	12,263	19,357	9,539
90	1,652	1,117	1,362	2,422	632
100	15	13	3	*	11
FEMALES.					
0	100,000	100,000	100,000	100,000	100,000
10	88,395	80,756	82,074	86,520	71,381
20	86,459	78,756	79,467	83,064	68,245
30	82,909	75,779	74,887	78,400	63,575
40	78,001	71,308	69,388	73,519	58,775
50	71,945	64,742	62,730	68,027	53,663
60	63,247	54,157	52,605	60,426	45,975
70	46,793	37,646	36,293	46,974	30,994
80	21,356	15,545	16,045	23,720	10,308
90	3,566	2,158	2,221	3,689	700
100	56	43	17	*	18

* Not available.

It will be seen that at all the ages specified up to and including 60, the number of survivors, both male and female, was greater in Australia than in any other of the countries specified, Sweden ranking second. Beyond age 60, Sweden occupied first place, Australia ranking second. Of the other countries the figures for the United States of America did not differ markedly from those for England and Wales, while the results for Italy were practically throughout the lowest of the group. It will be seen that according to the experience for 1901-10, 84.49 per cent. of the males born in Australia reach age 20, the corresponding results for the other countries being Sweden, 81.67 per cent.; United States America, 76.49 per cent.; England and Wales, 76.11 per cent.; and Italy, 67.77 per cent. In the case of females the proportions born who would reach age 20 were as follows:—Australia, 86.46 per cent.; Sweden, 83.06 per cent.; United States of America, 79.47 per cent.; England and Wales, 78.76 per cent.; and Italy, 68.25 per cent. According to the Swedish experience 19.36 per cent. of the males, and 23.72 per cent. of the females born will reach age 80, the corresponding proportions for the other countries specified being as follows:—Australia, males 14.33 per cent., females 21.36 per cent.; United States of America, males 12.26 per cent.; females 16.05 per cent.; England and Wales, males 10.61 per cent., females, 15.55 per cent.; Italy, males 9.54 per cent., females 10.31 per cent.

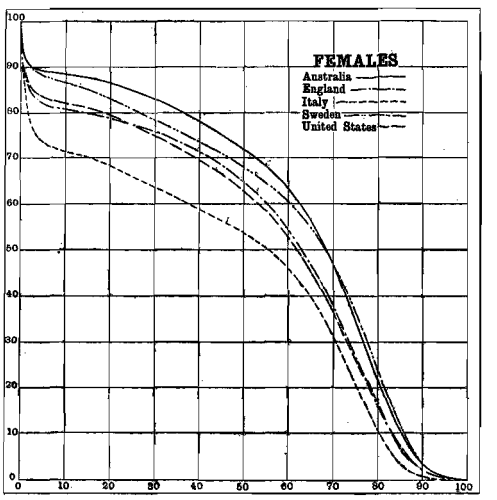
Number Surviving in Various Countries, 1901-10 (l_x).

(*a*) MALES.



GRAPH No. 130.

(*b*) FEMALES.

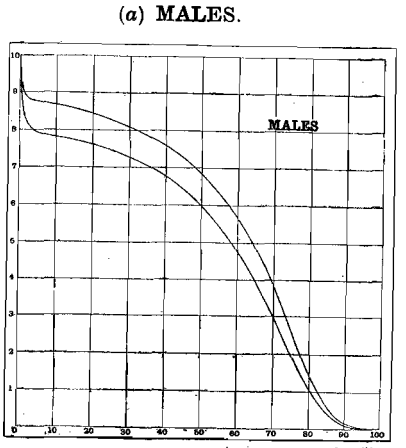


GRAPH No. 131.

The accompanying graphs Nos. 130 and 131 furnish a representation, for each sex, of the number of survivors at each age out of 100,000 born, according to the mortality experiences of the countries specified for the 10 years, 1901-10. Incidentally they also furnish a representation of the larger quantity of human life resulting from 100,000 births in some countries than arises from the same numbers in others. This excess is represented by the area enclosed between the respective curves. The base of each small square represents 10 years of age, while the vertical height represents 10,000 survivors.

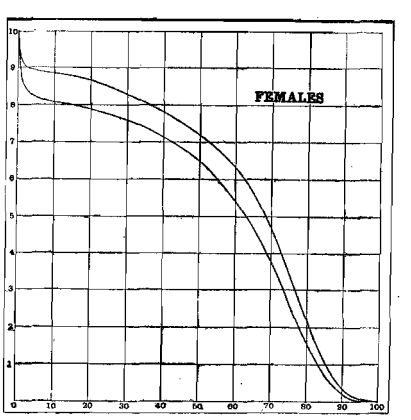
Numbers Surviving (l_x), Australia, and England, and Wales, 1901-1910.

(*a*) MALES.



GRAPH No. 132.

(*b*) FEMALES.



GRAPH No. 133.

Graphs Nos. 132 and 133 are given for the purpose of enabling a closer comparison to be made between the experiences of Australia and of England and Wales. They are constructed for these two countries only, on similar lines to graphs 130, and 131. The base of each small square represents 10 years of age, while the vertical height represents 10,000 survivors. The upper curve in each case represents the Australian experiences, while the lower curve represents that of England and Wales. The area between the curved lines in each graph represents the greater amount of life resulting from 100,000 births, according to the Australian experience (1901-10), than would result fron the same number of births according to the experience of England and Wales for the same decennium.

The next table furnishes for the same countries the probability of surviving ten years at each decennial age, the figures, as before stated, being based on the experience of the decennium 1901-10 :—

Probability of Surviving 10 Years at Decennial Ages.—Various Countries, 1901-10.

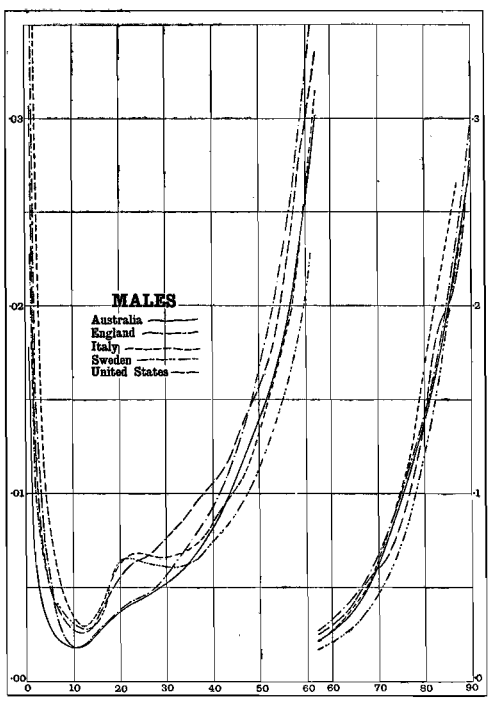
Age.	Probability of Surviving 10 Years at Age Specified.				
	Australia.	England and Wales.	U.S.A.	Sweden.	Italy.
MALES.					
0	.86622	.78083	.79183	.84762	.70459
10	.97542	.97477	.96596	.96353	.96188
20	.95681	.95570	.93711	.93851	.93461
30	.93868	.93026	.91332	.93837	.92995
40	.89898	.88525	.88053	.91383	.90014
50	.83232	.79402	.80910	.86065	.82862
60	.67407	.62858	.64878	.73708	.65547
70	.37440	.35481	.40527	.46425	.33124
80	.11528	.10526	.11103	.12512	.06625
90	.00894	.01119	.00198	*	.01741
FEMALES.					
0	.88395	.80756	.82074	.86520	.71381
10	.97810	.97523	.96824	.96006	.95607
20	.95894	.96220	.94237	.94385	.93157
30	.94080	.94100	.92657	.93774	.92450
40	.92236	.90792	.90405	.92530	.91302
50	.87910	.83650	.83859	.88826	.85674
60	.73985	.69513	.68992	.77738	.67415
70	.45639	.41293	.44210	.50496	.33258
80	.16699	.13882	.13842	.15552	.06791
90	.01580	.01979	.00742	*	.02571

* Not available.

It will be seen that with two exceptions the probability of surviving ten years was, in the case of Australia, greater for both sexes at all the decennial ages to 30 inclusive, than for any other of the countries specified, Sweden ranking second at ages 0 and 30 for males and at age 0 for females, while England and Wales ranked second at 10 and 20 for males, first at 20 and 30 for females, and second at 10 for females. For the decennial ages 40 and upwards Sweden held first place, Australia ranking second in all cases except age 80 for females, for which Australia ranked first and Sweden second.

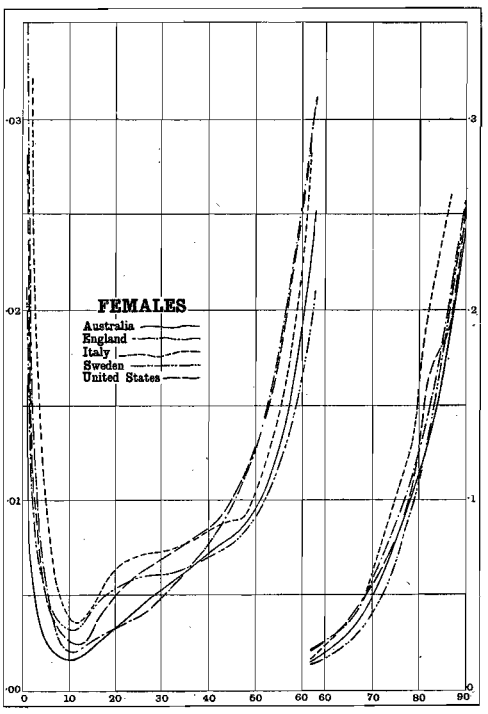
Rates of Mortality (q_x) for Various Countries, 1901-1910.

(a) MALES.



GRAPH No. 134.

(b) FEMALES.

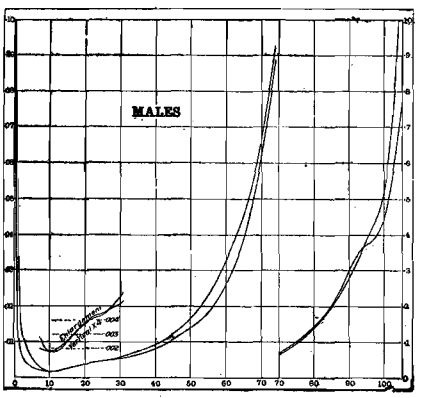


GRAPH No. 135.

The accompanying graphs, Nos. 134 and 135, represent the rate of mortality at each age for the countries specified according to their several experiences for the decennium 1901-1910. The base of each small square represents 10 years of age, while the vertical height represents a rate of mortality of .005 in the case of the left hand group, and of .05 in the case of the right hand group in each graph.

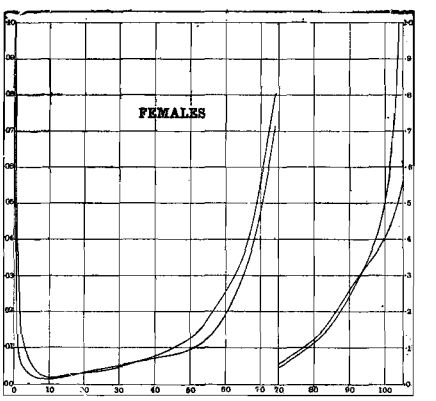
Rates of Mortality (q_x) of Australia and of England and Wales, 1901-10.

(*a*) MALES.



GRAPH No. 136.

(*b*) FEMALES.



GRAPH No. 137.

Graphs Nos. 136 and 137 are given for the purpose of enabling a clearer comparison to be made of the rates of mortality in Australia with those in England and Wales. With the exception of a portion of the female curve between ages 20 and 35 and of both curves, above age 94 or 95 the Australian curve is the lower. The peculiar deflection in the English curves at or about age 95 would appear to be due to defective graduation. The base of each small square represents 10 years of age, and the vertical height represents a rate of .01 in the case of the left hand group in each graph, and a rate of .1 in the case of each right hand group.

In the following table are given particulars concerning the expectation of life at decennial ages according to the experience of Australia, England and Wales, the United States of America, Sweden and Italy for the decennium 1901-10 :—

Expectation of Life ($\mathring{e}_x$).—Various Countries, 1901-10.

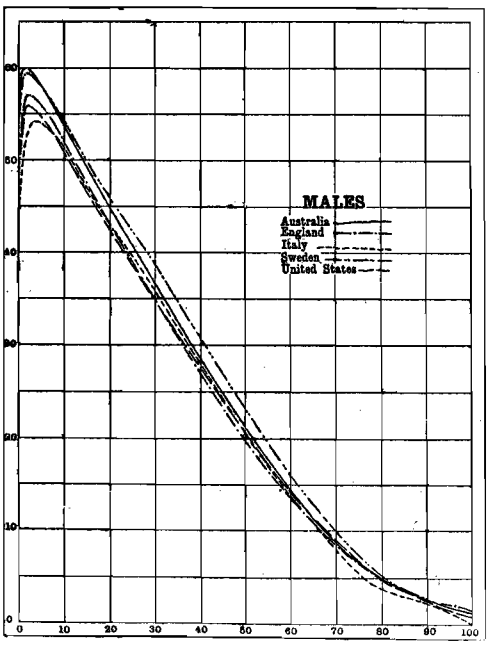
Age.	Expectation of Life at Age Specified.				
	Australia.	England and Wales.	U.S.A.	Sweden.	Italy.
	Years.	Years.	Years.	Years.	Years.
MALES.					
0	55.20	48.53	48.34	54.55	43.58
10	53.53	51.81	50.66	54.05	51.25
20	44.74	43.01	42.25	45.88	43.00
30	36.52	34.76	34.75	38.57	35.67
40	28.56	26.96	27.55	30.77	28.00
50	21.16	19.76	20.59	23.17	20.50
60	14.35	13.49	14.16	16.06	13.67
70	8.67	8.39	8.97	9.86	8.00
80	4.96	4.86	4.79	5.23	4.20
90	2.64	2.56	2.48	2.62	2.66
100	1.18	1.53	.80	*	*
FEMALES.					
0	58.84	52.38	51.92	57.00	44.42
10	56.39	54.53	52.92	55.58	51.50
20	47.52	45.77	44.46	47.67	43.67
30	39.33	37.36	36.86	40.20	36.50
40	31.47	29.37	29.38	32.54	29.00
50	23.69	21.81	21.95	24.75	21.33
60	16.20	15.01	15.12	17.18	13.92
70	9.96	9.25	9.51	10.52	8.00
80	5.73	5.36	5.18	5.64	4.21
90	2.99	2.94	2.82	2.88	2.80
100	1.24	1.80	1.10	*	*

* Not available.

It will be seen that at age 0 for males and at ages 0 and 10 for females the Australian expectation is higher than for any other of the countries specified, the Swedish expectations ranking second. For all other decennial ages to 80 inclusive in the case of males, and to 70 inclusive in the case of females, the Swedish expectations occupy the leading position, the Australian results ranking second.

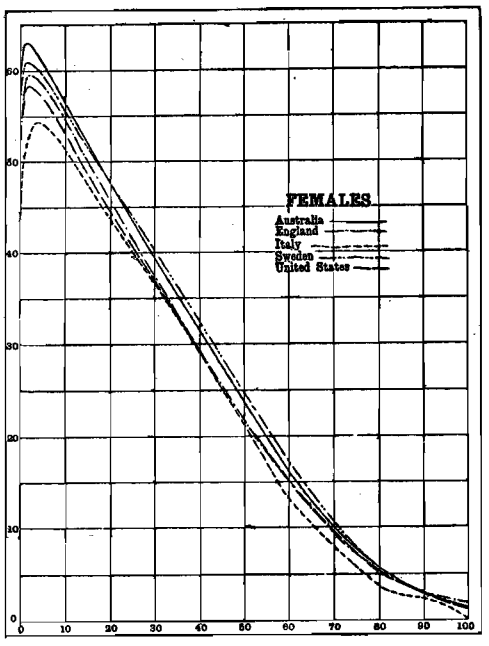
Expectation of Life, 1901-10 ($\mathring{e}_x$).

(*a*) MALES.



GRAPH No. 138.

(*b*) FEMALES.

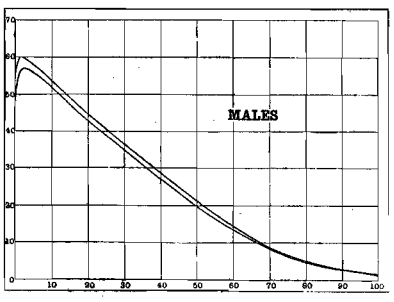


GRAPH No. 139.

A representation is furnished in graphs Nos. 138 and 139 of the expectation of life at each age for the countries specified, the experience in each case being for the decennium 1901-10. The base of each small square represents 10 years of age, and the vertical height represents an expectation of life of 5 years.

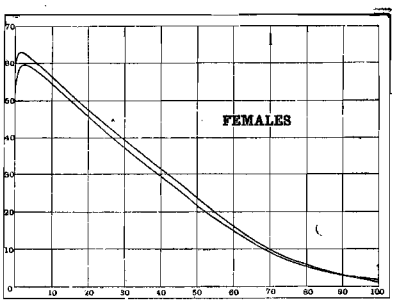
Expectation of Life in Australia and in England and Wales, 1901-10 ($\mathring{e}_x$).

(*a*) MALES.



GRAPH No. 140.

(*b*) FEMALES.



GRAPH No. 141.

Graphs Nos. 140 and 141 are given for the purpose of enabling a clearer view to be obtained of the relative expectation of life in Australia and in England and Wales, according to the several experiences for the decennium 1901–1910. Except for that portion of each graph beyond age 91, the curve for Australia occupies the upper position throughout. The base of each small square represents 10 years of age, while the vertical height represents an expectation of life of 10 years.

The next table furnishes in respect of the 1901-10 mortality experience of Australia, England and Wales, the United States of America, Sweden and Italy, the distribution, according to the age at which it is experienced, of the average future duration of life as at age 0.

Average Future Duration of Life in Decennial Age Periods.—Various Countries, 1901-10.

Age.	Average Future Duration (as at Age 0) of Life, in Age Period Specified.				
	Australia.	England and Wales.	U.S.A.	Sweden.	Italy.
	Years.	Years.	Years.	Years.	Years.
MALES.					
0–10	8.83	8.08	8.23	8.74	7.47
10–20	8.57	7.72	7.80	8.34	6.97
20–30	8.28	7.45	7.41	7.91	6.55
30–40	7.85	7.04	6.87	7.43	6.10
40–50	7.23	6.41	6.17	6.90	5.62
50–60	6.29	5.42	5.26	6.15	4.86
60–70	4.83	3.91	3.89	4.97	3.70
70–80	2.61	1.99	2.13	3.10	1.90
80–90	.67	.48	.55	.95	.39
90 to oldest age	.04	.03	.03	.06	.02
0 to oldest age	55.20	48.53	48.34	54.55	43.58
FEMALES.					
0–10	9.00	8.35	8.49	8.91	7.66
10–20	8.75	7.98	8.10	8.49	6.96
20–30	8.48	7.74	7.73	8.08	6.60
30–40	8.06	7.37	7.22	7.59	6.16
40–50	7.51	6.82	6.62	7.09	5.60
50–60	6.80	5.99	5.81	6.46	5.05
60–70	5.58	4.65	4.50	5.44	3.92
70–80	3.43	2.65	2.62	3.60	2.04
80–90	1.12	.77	.77	1.23	.41
90 to oldest age	.11	.06	.06	.11	.02
0 to oldest age	58.84	52.38	51.92	57.00	44.42

It will be seen that to age 60 for males and to age 70 for females Australia occupies first place, and Sweden second place, whereas after those ages respectively Sweden occupies first, and Australia second place. In considering the effectiveness of births from the standpoint of the life of the community, the figures given by the above table furnish possibly the best measure that can be obtained. For example, taking the important age period from 20 to 60, the results indicated are that according to the Australian experience 1901-10, each male born lives on the average 29.65 years between the 20th and 60th birthdays, that is to say, while the number of years so lived is zero for those who die before 20, is 40 for those who survive 60, and is somewhere between 0 and 40 for those who die between 20 and 60, the average for all those born is 29.65. Similarly the female average for the same period in Australia was 30.85 years. The corresponding figures for the age period 20-60 in the other countries specified was as follows :—Sweden, males 28.39 years, females 29.22 years ; England and Wales, males 26.32 years, females 27.92 years ; the United States of America, males 25.71 years, females 27.38 years ; and Italy, males 23.13 years, females 23.41 years. It will thus be seen in so far as the life of the community between ages 20 and 60 is concerned, that for 1901-10 the Australian conditions were such as to make 1000 male births in Australia equivalent to 1045 male births in Sweden, to 1126 male births in England and Wales, to 1153 male births in the United States of America, and to 1282 male births in Italy. In other words, an Australian male birth rate of 25 per 1000 of population would be equivalent from this point of view to 26.13 in Sweden, 28.15 in England and Wales, 28.83 in United States of America, and 32.05 in Italy.

The following table furnishes the "*vie probable*" for each of the countries specified for the decennium 1901-10 :—

Probable Lifetime (*vie probable*).—Various Countries, 1901-10.

Age.	Probable Lifetime at Age Specified (*vie probable*).				
	Australia.	England and Wales.	U.S.A.	Sweden.	Italy.
	Years.	Years.	Years.	Years.	Years.
MALES.					
0	64.25	58.34	57.43	65.04	53.90
10	57.72	55.13	54.75	59.62	56.30
20	48.22	45.68	45.56	50.44	47.12
30	39.06	36.61	36.95	41.71	38.41
40	30.14	27.97	28.65	32.85	29.64
50	21.74	19.97	20.79	24.28	21.20
60	14.04	13.02	13.88	16.27	13.50
70	7.81	7.53	8.38	9.37	7.31
80	4.13	4.05	3.85	4.50	3.41
90	2.05	1.92	1.97	*	1.93

Probable Lifetime (*vie probable*).—Various Countries, 1901-10—*continued.*

Age.	Probable Lifetime at Age Specified (*vie probable*).				
	Australia.	England and Wales.	U.S.A.	Sweden.	Italy.
	Years.	Years.	Years.	Years.	Years.
FEMALES.					
0	68.45	62.91	61.92	68.24	55.54
10	61.15	58.62	57.49	61.93	57.45
20	51.56	49.14	48.20	52.74	48.34
30	42.30	39.88	39.40	43.80	39.59
40	33.27	30.94	30.81	34.88	30.80
50	24.44	22.41	22.47	26.01	22.04
60	16.06	14.71	14.95	17.50	13.84
70	9.19	8.41	8.96	10.09	7.33
80	4.92	4.53	4.15	4.87	3.43
90	2.39	2.25	2.26	*	2.02

* Not available.

It will be noticed that at all the ages specified for males, and at all the ages specified except 0 and 80 for females, the Swedish "*vie probable*" occupied first position, Australia ranking second except in the female cases quoted, in which it ranked first. In all the countries mentioned the "*vie probable*" exceeded the expectation of life at the earlier ages, and fell short of it at the lower ages, the crossing point being between 60 and 70 in both sexes for Sweden, and between 50 and 60 in both sexes for the other countries.

The following table contains the expectation of life at ages 0, 20, 40, 60 and 80 for some of the leading countries of the world according to the latest available experience. It must be noted, however, that as there had been such a general world-wide improvement in mortality rates during the 30 years or more preceding the end of 1910, the latest date to which the data here given relate, a comparison of expectations for 1901-10 for one country cannot legitimately be made with those of an earlier period for another country:—

Expectation of Life.—Various Countries and Periods.

Country.	Period.	Expectation of Life at Age				
		0.	20.	40.	60.	80.
		Years.	Years.	Years.	Years.	Years.
MALES.						
Australia	1901–1910	55.20	44.74	28.56	14.35	4.96
Sweden	1901–1910	54.55	45.88	30.77	16.06	5.23
Norway	1891–1900	50.41	43.58	30.62	16.39	5.64
Denmark	1895–1900	50.20	44.50	28.90	14.70	4.90
England and Wales	1901–1910	48.53	43.01	26.96	13.49	4.86
United States of America ..	1901–1910	48.34	42.25	27.55	14.16	4.79
Holland	1890–1899	46.20	43.40	28.10	14.00	4.70
France	1898–1903	45.74	41.53	27.15	13.81	4.87
Belgium	1891–1900	45.39	41.83	26.71	13.43	4.56
Italy	1901–1910	43.58	43.00	28.00	13.67	4.20
Finland	1891–1900	42.90	42.00	27.30	13.50	4.30
Germany	1891–1900	40.56	41.23	25.89	12.82	4.23
Austria	1900–1901	37.77	40.08	25.51	12.58	4.39
FEMALES.						
Australia	1901–1910	58.84	47.52	31.47	16.20	5.73
Sweden	1901–1910	57.00	47.67	32.54	17.18	5.64
Norway	1891–1900	54.14	46.54	32.31	17.46	6.14
Denmark	1895–1900	53.20	46.70	31.20	16.00	5.30
England and Wales	1901–1910	52.38	45.77	29.37	15.01	5.36
United States of America ..	1901–1910	51.92	44.46	29.38	15.12	5.18
France	1898–1903	49.13	44.02	29.60	15.08	5.38
Holland	1890–1899	49.00	44.80	29.70	15.00	5.00
Belgium	1891–1900	48.84	44.44	29.46	14.78	4.91
Finland	1891–1900	45.60	44.20	29.50	14.60	4.90
Italy	1901–1910	44.42	43.67	29.00	13.92	4.21
Germany	1891–1900	43.97	43.37	28.14	13.60	4.48
Austria	1900–1901	39.87	40.78	26.64	12.77	4.47

(e) *Comparison of Annuity Values.*—A comparison of the annuity values derived from the Australian mortality experience with those furnished by some of the leading British tables, which either are now or have been in the past regarded as standard, is given for males in the following table, the rate of interest in each case being 3½ per cent.

Comparison of Male Annuity Values, 3½ per cent.

Age.	Australian Experience, 1901-10.	Institute of Actuaries' Experience, 1869.			British Offices' Life Tables, 1893.		British Offices' Life Annuity Tables, 1893.		Government Annuitants' Experience, 1883.		English Life Tables No. 3, 1837-53.
		Healthy Males. H^M		Healthy Males, excluding First Five Years of Assurances.	Whole-Life Participating Assurances.	Whole-Life Participating Assurances, excluding First Five Years of Experience	At Date of Purchase.	After Five Years from Purchase.	At Date of Purchase.	After Four Years from Purchase.	
		Woolhouse's Graduation.	Textbook Graduation.								
x	a_x	a_x	a_x	a_x	a_x	a_x	$a_{[x]}$	$a_{[x-5]+5}$	$a_{[x]}$	$a_{[x-4]+4}$	a_x
0	21.321	..	19.058	..	..	..	..	..	..	..	16.441
10	22.816	21.954	21.940	21.458	22.393	21.563	..	..	..	..	21.070
20	21.102	20.225	20.245	19.520	20.808	20.299	20.499	..	..	..	19.373
30	19.112	18.416	18.441	18.113	18.769	18.542	18.772	18.567	18.936	18.765	17.660
40	16.598	16.103	16.103	15.902	16.298	16.204	16.485	16.276	17.271	17.089	15.466
50	13.634	13.187	13.172	13.028	13.330	13.282	13.651	13.418	15.365	15.182	12.750
60	10.160	9.835	9.823	9.750	9.972	9.953	10.440	10.156	13.103	12.939	9.627
70	6.583	6.470	6.470	6.434	6.616	6.614	7.220	6.861	10.178	10.083	6.423
80	3.870	3.672	3.634	3.655	3.771	3.770	4.446	4.013	7.087	6.623	3.842
90	1.975	1.722	1.667	1.680	1.773	1.773	2.409	1.962	4.463	3.840	2.149
									..	1.958	

It will be seen (i.) that up to age 40 the Australian Male Experience gives higher annuity values than any other of the tables quoted ; (ii.) that at age 50 the Australian annuity value is practically identical with that given by the British Offices' Annuity Tables, 1893, "at date of purchase" ; and (iii.) that for ages 60 and onwards there is close agreement between the Australian results and the Government Annuitants' Experience, 1883, "after four years from purchase."

A similar comparison of the female annuity values derived from the Australian Mortality Experience, 1901-10, with the corresponding female values from some of the leading British standard tables is furnished in the next table. As in the case of male lives, the rate of interest involved is 3½ per cent. in each case.

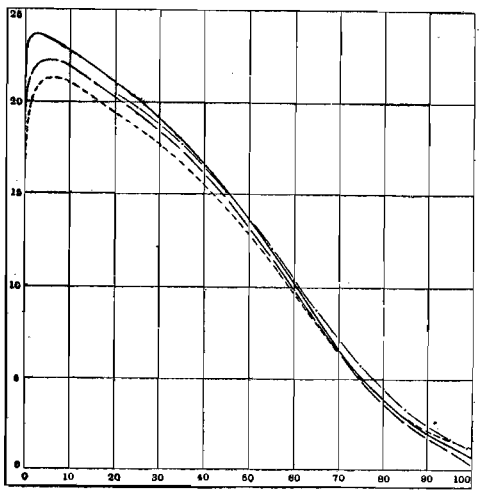
Comparison of Female Annuity Values, 3½ per cent.

Age.	Australian Experience. 1901-10.	Institute of Actuaries' Experience, 1869. Healthy Females.	British Offices' Life Annuity Tables, 1893.		Government Annuitants' Experience, 1883.		English Life Tables, No. 3, 1837-53.
			At Date of Purchase.	After Five Years from Purchase.	At Date of Purchase.	After Four Years from Purchase.	
	A^F	H^F	$O(af)$	$O(af)$			
x	a_x	a_x	$a_{[x]}$	$a_{[x-5]+5}$	$a_{[x]}$	$a_{[x-4]+4}$	a_x
0 ..	22.019	..	..	..	..	..	17.063
10 ..	23.248	21.154	..	..	..	..	21.085
20 ..	21.654	19.558	20.718	..	20.409	20.242	19.482
30 ..	19.863	18.092	19.090	18.881	18.898	18.715	17.927
40 ..	17.682	16.323	17.040	16.788	16.980	16.787	15.961
50 ..	14.823	13.812	14.647	14.349	14.434	14.230	13.361
60 ..	11.207	10.435	11.691	11.378	11.287	11.045	10.102
70 ..	7.454	6.852	8.137	7.785	7.754	7.420	6.809
80 ..	4.469	4.247	4.945	4.512	4.834	4.227	4.101
90 ..	2.274	2.502	2.662	2.204	..	2.029	2.925

It will be seen from the foregoing table (i.) that up to age 50 the Australian Female Experience gives higher annuity values than any other of the tables quoted ; (ii.) that at age 60 the Australian Experience gives a value which approximates to that of the Government Annuitants Experience "at date of purchase" ; (iii.) that at age 70 the Australian Experience gives a value which approximates to that furnished by the Government Annuitants' Experience "after four years from purchase" ; (iv.) that at ages 80 and 90 the Australian values do not differ greatly from those furnished by the British Offices' Life Annuity Tables "after five years from purchase."

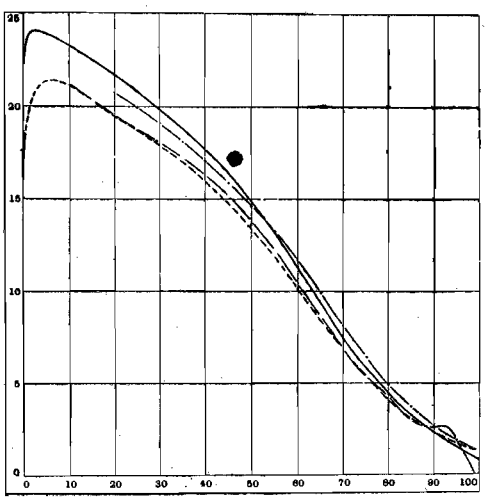
Annuity Values (a_x) at 3½ per cent.

(*a*) MALES.



GRAPH No. 142.

(*b*) FEMALES.



GRAPH No. 143

The accompanying graphs, Nos. 142 and 143, furnish a representation of the annuity values at each age by the Australian Life Tables, and some of the leading British Tables at 3½ per cent.

In graph No. 142 the values by the several tables are shewn as follows :—

Australian Male Experience, A^M ————————————————

Institute of Actuaries H^M Table —— —— —— —— —— —— ——

English Life Table, No. 3 –

British Offices $O^{(am)}$ (at date of purchase) · —— · —— · —— · —— · ——

In graph No. 143 the values by the several tables are shewn as follows :—

Australian Female Experience A^F ————————————————

Institute of Actuaries H^F Table —— —— —— —— —— —— ——

English Life Table, No. 3 –

British Offices $O^{(af)}$ (at date of purchase) · —— · —— · —— · —— · ——

The fluctuation in the H^F curve after age 87 is an indication of defective graduation of the data.

NOTE A (see page 312).

Estimate of Number of Years of Life Experienced by Persons of a Given Age in a Given Period.

Assuming that the total numbers of each sex have been determined in a population at the end of each of the years 0 to n inclusive, and that the distribution in age-groups has been ascertained by a Census at the points of time denoted by $\frac{1}{4}$ and $n + \frac{1}{4}$, it is required to determine the number of years of life of each sex experienced in the community in each of the age-groups during the period of n years from 1 to n inclusive.

In the succeeding investigation it will be assumed that each sex is separately dealt with, and all expressions will relate to one sex only.

Let ${}_{m\bar{s}|}L_t$ denote the number of persons at the end of the year t in the age-group commencing with exact age m and ending with exact age $m + s$, that is, having age last birthday m to $m + s - 1$, and let P_t denote the total population of the sex under consideration at all ages at the end of year t.

Then ${}_{m\bar{s}|}L_t / P_t$ denotes the proportion of this population, in the age-group ${}_{m\bar{s}|}$ at the point of time t.

If it be assumed that this proportion is a function of $t = f(t)$ say, the number of years of life may readily be determined by integration.

Thus, since ${}_{m\bar{s}|}L_t / P_t = f(t)$; therefore ${}_{m\bar{s}|}L_t = P_t f(t)$.

The number of years of life experienced in the age-group $m\bar{s}|$ during the period 0 to n is evidently the integral $\int_0^n {}_{m\bar{s}|}L_t dt = \int_0^n P_t f(t)\, dt$.

If it be assumed that $f(t)$ is a function of t of the first degree $= a + bt$, the values of a and b may readily be determined from the Census results.

Thus, $a + \frac{1}{4}b = {}_{m\bar{s}}|L_{\frac{1}{4}} / P_{\frac{1}{4}} = r_{\frac{1}{4}}$, say $\quad a + (n + \frac{1}{4})b = {}_{m\bar{s}}|L_{n+\frac{1}{4}} / P_{n+\frac{1}{4}} = r_{n+\frac{1}{4}}$, say

$$\therefore nb = r_{n+\frac{1}{4}} - r_{\frac{1}{4}}, \text{ and } b = \frac{1}{n}(r_{n+\frac{1}{4}} - r_{\frac{1}{4}})$$

Hence $a = r_{\frac{1}{4}} - \frac{1}{4n}(r_{n+\frac{1}{4}} - r_{\frac{1}{4}})$ and $f(t) = a + bt = \{r_{\frac{1}{4}} - \frac{1}{4n}(r_{n+\frac{1}{4}} - r_{\frac{1}{4}})\} + \frac{t}{n}(r_{n+\frac{1}{4}} - r_{\frac{1}{4}})$

$$\therefore \int_0^n P_t f(t)\,dt = \int_0^n P_t(a + bt)\,dt = a\int_0^n P_t\,dt + b\int_0^n t\,P_t\,dt$$

$$= \{r_{\frac{1}{4}} - \frac{1}{4n}(r_{n+\frac{1}{4}} - r_{\frac{1}{4}})\}\int_0^n P_t\,dt + \frac{1}{n}(r_{n+\frac{1}{4}} - r_{\frac{1}{4}})\int_0^n t\,P_t\,dt$$

The values of r will, of course, vary with each age-group, but the integrals $\int_0^n P_t\,dt$ and $\int_0^n t\,P_t\,dt$ will remain constant for all age-groups for the period of n years.

From the populations given at the end of the years 0 to n, the values of these integrals can readily be determined by applying an appropriate formula for approximate summation, such, for example, as $\frac{1}{3}$ (1, 4, 2, 4, 2 . . . . 2, 4, 1).

If populations are available for the ends of successive quarters the corresponding formula will be $\frac{1}{12}$ (1, 4, 2, 4, 2 . . . . 2, 4, 1).

The assumption that $f(t) = a + b\,t$, is equivalent to assuming that where the *proportion* of total population which is represented by the number in a given age-group changes from one census to another, this change of *proportion* has taken place by equal increments or decrements for equal durations.

This assumption, while not strictly accurate, is probably in most cases in reasonably close accord with the facts. It has, in addition, the advantage in practice that if, on this assumption the formula ${}_{m\bar{s}}|L_t = P_t f(t)$ be applied to determine the number of persons in the age-group ${}_{m\bar{s}}|$ for the point of time t, the sum of such determinations for all the age-groups comprised in the population will give a total of P_t.

This is evident since $\Sigma_{m\bar{s}}|L_t = \Sigma P_t f(t) = P_t\,\Sigma[\{r_{\frac{1}{4}} - \frac{1}{4n}(r_{n+\frac{1}{4}} - r_{\frac{1}{4}})\} + \frac{t}{n}(r_{n+\frac{1}{4}} - r_{\frac{1}{4}})]$

$= P_t$, since $\Sigma r_{\frac{1}{4}} = \Sigma r_{n+\frac{1}{4}} = 1$.

NOTE B (see page 321).

Definite integrals of a third degree function in terms of equidistant ordinates.

Given four equidistant values of $f(x) = a + bx + cx^2 + dx^3$, viz., $f(x)$, $f(x+1)$, $f(x+2)$, and $f(x+3)$, to find in terms of these four ordinates the integrals for the three successive intervals.

$$\text{Since } \int_x^{x+3} f(x)\,dx = \frac{3}{8}\{f(x) + 3f(x+1) + 3f(x+2) + f(x+3)\}$$

$$\text{and } \int_{x+1}^{x+3} f(x)\,dx = \frac{1}{3}\{f(x+1) + 4f(x+2) + f(x+3)\}$$

$$\text{and since } \int_x^{x+1} f(x)\,dx = \int_x^{x+3} f(x)\,dx - \int_{x+1}^{x+3} f(x)\,dx$$

$$\therefore \int_x^{x+1} f(x)\,dx = \frac{3}{8}f(x) + \frac{19}{24}f(x+1) - \frac{5}{24}f(x+2) + \frac{1}{24}f(x+3)$$

$$= \frac{1}{24}\{9f(x) + 19f(x+1) - 5f(x+2) + f(x+3)\}$$

$$\text{Similarly } \int_{x+2}^{x+3} f(x)\,dx = \frac{1}{24}\{f(x) - 5f(x+1) + 19f(x+2) + 9f(x+3)\}$$

$$\text{But since } \int_x^{x+3} f(x)\,dx = \left\{\int_x^{x+1} + \int_{x+1}^{x+2} + \int_{x+2}^{x+3}\right\} f(x)\,dx$$

$$\therefore \int_{x+1}^{x+2} f(x)\,dx = \left\{\int_x^{x+3} - \int_x^{x+1} - \int_{x+2}^{x+3}\right\} f(x)\,dx.$$

$$= \frac{1}{24}\{-f(x) + 13f(x+1) + 13f(x+2) - f(x+3)\}$$

$$= \frac{1}{24}[13\{f(x+1) + f(x+2)\} - \{f(x) + f(x+3)\}]$$

It thus appears that if four equidistant ordinates to a third degree curve are given, the integral for the central interval may be obtained by subtracting the sum of the two exterior ordinates from thirteen times the sum of the two mean ordinates, and dividing the difference by twenty-four.

CHAPTER XXI.

OCCUPATIONS.

1. **General.**—The field of investigation comprised under the head of "occupations" is one of the most complex of those that come within the ambit of the Census. To the difficulties of classification, which are in themselves numerous and weighty, is added the fact that when the data have been duly classified, the detailed items are so numerous and for purposes of adequate analysis require to be so segregated in respect of sex, age, grade of employment, geographical distribution and epoch, that the mere publication of the results becomes a serious undertaking. This necessary expansiveness renders it a matter of some difficulty to present in review a series of clearly outlined sketches of the leading features of the data, and the indications which they furnish of the trend and development of the population in respect of occupation, since such sketches require a condensation of the material which may, if not appropriately carried out, result in the presentation of aggregates which have little significance. The detailed tabulation of the data is comprised in pp. 1279 to 1848 of Volume III. of the Census Detailed Tables, and although it is necessarily not exhaustive, it is believed that all the more important phases of the question have been there analysed. The principal heads of division selected were eight in number, viz., (i.) Nature of occupation ; (ii.) Grade of occupation ; (iii.) Sex ; (iv.) Age ; (v.) Conjugal Condition of Females ; (vi.) Geographical distribution ; (vii.) Epoch ; (viii.) Duration of unemployment. These heads have been extensively subdivided, and cross tabulations have been carried out as fully as the importance of the various matters appeared to warrant. Tables 18 and 19, covering pp. 1326 to 1527 inclusive, contain the most detailed analysis of the results, and furnish for the Commonwealth as a whole particulars in respect of each sex for 8 classes, 27 orders, 111 sub-orders, and 654 groups of occupations, classified according to 6 grades of occupations and 22 groups of ages. These tables furnish the most complete presentation of occupation data that has ever been attempted in Australia. The very completeness of this presentation necessarily renders these tables unsuitable for the purpose of a comprehensive view of the various aspects such as is proposed in the present chapter, and consequently numerous summaries have been prepared which are presented in the following pages.

2. **Form of Inquiry.**—The form in which the inquiry in respect of occupation was made on the Personal Card was as follows :—

14. Profession or Occupation .....
(If engaged in more than one occupation, underline principal occupation).

(*a*) State if Employer or Employee, etc.....
(See Instructions, page 4, line 14 (*a*) and (*b*))

(*b*) If out of work, state period.....

(*c*) Occupation of Employer (if any).....

In addition, an extensive series of notes was furnished on the instructions, which accompanied the Householders' Schedules. These notes were as follows :—

Instructions for filling in Personal Cards :—

Line 14.—

Army and Navy.—If on actual service, state so. If retired, state present occupation.

Persons in the service of the Federal, State, or Local Governments are to state occupation, position, department, adding F if in Federal, S if in State, and L if in Local Government service ; and if engaged in any other occupation, to specify its nature.

Justices of the Peace, Aldermen, Town Councillors, &c., and other important public officers are to state their ordinary profession or occupation.

Ministers of Religion are to state denomination. The indefinite term "Clerk" must not be used. Local or occasional preachers are to return their ordinary occupation.

Members of the Legal Profession are to state whether in actual practice ; if not practising, to state present occupation. Persons employed in solicitors' offices are to state whether they are articled or other clerks.

Members of the Medical Profession are to state whether they are physicians, surgeons, or general practitioners, and to return themselves as practising or not practising ; if not practising, to state present occupation.

Teachers, Authors, Public Writers, and Artists are to state the particular branch of science, literature, or art in which they are engaged.

Engineers are to state whether civil, mechanical, electrical, mining, marine, &c. ; also the nature of work on which engaged.

Surveyors are to state whether land, mining, marine, &c.

Engine-drivers, Stokers, Firemen, &c., are to state the nature of the business in connexion with which they are occupied, thus :—"Engine-driver at Sawmill," "Stoker at Foundry." "Fireman on Railway," &c. Engine-drivers are not to be entered as engineers.

Miners are to specify the nature of the mineral on which they work, and in respect of metallic ores, to state whether lode or alluvial. A miner working for another is to return himself as "miner," and not as "labourer."

Artisans and Mechanics are to state the particular branch of their trade, thus—" Ship's carpenter," " House carpenter," " Coachsmith," " Locksmith," " Horseshoer," &c.

Carters, Carriers, Labourers, Servants, &c., are to be described in connexion with their usual employment, thus—" Carter to grocer," " Bullock-driver on station," " Labourer making roads," " Omnibus-driver," " Cabman," " Railway porter," " Telegraph messenger," " Domestic servant."

Persons engaged in Trade or Commerce, as Merchants, Manufacturers, Storekeepers, Retailers, Brokers, Agents, Auctioneers, &c., are to state the particular business in which they are engaged, or the principal commodity in which they deal, thus—" Grain merchant," " Hat manufacturer."

Clerks, Bookkeepers, Salesmen, Saleswomen, Shopmen, Commercial Travellers, &c., are to be described according to the business with which they are connected, thus—" Bank clerk," " Railway clerk," " Salesman in soft-goods warehouse," " Shopman to grocer," " Commercial traveller to wine merchant," &c.

Farmer or Market Gardener.—These terms are to be applied to all persons actually in occupation of land and tilling, whether proprietors or tenants ; the term " landowner" is too vague. Market gardeners must not omit the word " Market." The term " Farmer" is understood to mean " Agricultural farmer" ; if " Dairy" or " Poultry farmer," &c., it should be so stated.

Persons not following any Profession, Trade, or Calling, and not holding any public office, but possessed of independent means, are to designate themselves as " Proprietor of land," " Proprietor of houses," " Capitalist," " Annuitant," as the case may be. The term " Householder" is not to be used in place of " Proprietor of houses," nor the words " Gentleman" or " Lady" in place of " No occupation."

Wives, Sons, Daughters, Brothers, and other Relatives habitually helping on farms and stations, or engaged in hotels, shops, or other industrial pursuits, are to be returned as " Wife assisting," " Son assisting," &c., as the case may be.

Women.—The occupations of women who are engaged in any other than domestic duties are to be distinctly recorded, but women are not to be entered as engaged in the occupations of their husbands, fathers, &c., unless they habitually assist them. When only in the capacity of wife, mother, daughter, sister, &c., write, " Domestic duties."

Children being educated are to be designated " Scholar," if not engaged as well in any industrial pursuit ; but if following any such pursuit during portion of their time, as, for instance, delivering or selling newspapers, minding cows, &c., before or after school hours, are to be set down as following that pursuit, the entry on line 13 (*a*) sufficiently showing that they are also receiving education.

Persons in Hospitals, Asylums, Gaols, &c.—The position of officers in the Institution, as " Warder," " Nurse," &c., is to be given, and in the case of inmates, " Prisoner," " Patient," &c. ; their calling (if any) before they entered the institution is to be inserted on line 14.

N.B.—Great care is to be taken in writing the name of an occupation which is common to many kinds or branches of business, to add the name of the employer's trade or business. The following occupations are of this type, and require the additional information suggested within parentheses, thus—Assistant (to draper), Accountant (to ironmonger), Apprentice (to baker), Agent (for shipping company), Cashier (in bank), Clerk (to brewer), Carter (to miller), Engine-driver (on railway), Labourer (on wharf, on roads, &c.), &c., &c. Persons engaged in more than one occupation are requested to state their several occupations, and to underline the principal one.

Line 14 (a) and (b).—Write E if an employer of labour other than household servants ; O if in business on own account but not employing others for salary or wages ; A if assisting head of household in his business but not receiving salary or wages ; W if earning salary or wages ; and (except in cases of leave of absence) add N if out of work for more than a week prior to Census, stating under (*b*) period during which out of work.

Line 14 (c).—If earning salary or wages, state occupation of employer.

In the actual form of inquiry two additions were made to that used in Australia on previous occasions, one being a request for a specification of the period of unemployment of persons who had been out of work for more than a week prior to the Census, the other a request that persons who were in employment should state the occupation of their employers. The object of this latter inquiry was that of effecting an improvement on the degree of definiteness with which many of the occupations had been stated on previous occasions.

3. **Classification.**—Before proceeding to a consideration of the results obtained at the Census, a brief outline of the scheme of classification of occupations adopted for the tabulation of the data may be of service. This scheme is, with minor modifications, that which was used at the Australian Censuses of 1891 and 1901, and differs in some important respects from the scheme of classification adopted in connection with the Census of England and Wales, and also from the scheme of nomenclature recommended by the International Institute of Statistics at its Chicago session in 1893. In view of the progress which has been made in the last 20 years in securing the adoption of an international system of nomenclature for diseases and for causes of death, it is perhaps not too much to hope that a system of nomenclature of occupations will eventually be devised which will meet the requirements of different communities so well that its international adoption will be secured. The task, however, is a difficult one, since in addition to the objection which universally attaches to any such change, viz., the break in continuity of record, and the consequent want of comparability of data for the country making the change, there is the further difficulty that a classification which is eminently suitable for a country in an advanced stage of industrial development may be totally unsuited to the needs of a country whose principal occupations are those associated with the production of raw materials. Extensive detail may thus be requisite in some groups in one class of community, and in quite different ones in other classes, while there is the possibility that an elaboration sufficiently extensive to meet the requirements of all would prove too great for inclusion within the limits of a workable scheme. Notwithstanding the admitted difficulties of the situation it appears desirable that further efforts should be made towards the adoption of a suitable international scheme, and it is proposed before the occasion of the next Census to make an exhaustive investigation of the various schemes of classification in force, with a view to ascertaining the lines on which modifications might be made so as to meet the requirements of all.

The main features of the Australian scheme of classification are indicated in the following statement, which furnishes a definition of the principal classes :—

CLASSIFICATION OF OCCUPATIONS.

DEFINITION OF PRINCIPAL CLASSES.

Section A.—Breadwinners.

Class I. Professional.—Embracing all persons, not otherwise classed, mainly engaged in the government and defence of the country, and in satisfying the moral, intellectual and social wants of its inhabitants.

Class II. Domestic.—Embracing all persons engaged in the supply of board and lodging, and in rendering personal services for which remuneration is usually paid.

Class III. Commercial.—Embracing all persons directly connected with the hire, sale, transfer, distribution, storage, and security of property and materials.

Class IV. Transport and Communication.—Embracing all persons engaged in the transport of persons or goods, or in effecting communication.

Class V. Industrial.—Embracing all persons, not otherwise classed, who are principally engaged in various works of utility, or in specialities connected with the manufacture, construction, modification or alteration of materials so as to render them more available for the various uses of man, but excluding, as far as possible, all who are mainly or solely engaged in the service of commercial interchange.

Class VI. Primary Producers.—Embracing all persons mainly engaged in the cultivation or acquisition of food products, and in obtaining other raw materials from natural sources.

Class VII. Independent.—Embracing all persons of independent means having no specific occupation.

Section B.—Dependents : Non-breadwinners.

Class VIII. Dependents.—Embracing all persons dependent upon relatives or natural guardians, including wives, children, and others not otherwise engaged in pursuits for which remuneration is paid ; and all persons depending upon private charity, or whose support is a burthen on the public revenue.

One of the outstanding differences between the Australian and the English schemes of classification is that whilst the Australian scheme provides for a separation, as far as practicable, of the " commercial" from the " industrial" occupations, the English scheme makes no such provision in its main division, although an analysis of the published detailed results would enable such a separation to be made approximately.

4. **Data Unspecified.**—As was the case with all other subjects of inquiry, a proportion of the people enumerated failed to furnish the desired information in connection with occupations. Amongst the male population there were 7,043 who failed to indicate either the nature or the grade of their occupation, 30,632 who indicated the nature of their occupation but failed to indicate the grade, and 32,343, who indicated the grade of their occupation but failed to indicate its nature ; in all a total of 70,018 males whose specification of occupation was more or less defective. In the case of females there were 823 who furnished no indication as to nature or grade of occupation, 4,313 who indicated nature but not grade, and 3,215 who indicated grade but not nature of occupation, a total of 8,351 females whose specification of employment was incomplete. There were thus about 3 per cent. of the males, and about 4 per thousand of the females whose information in respect of occupations was defective. In the preparation of the material for the purposes of the present chapter these unspecified data have been distributed amongst the various categories in proportion to those specified, care being taken to duly allow as fully as practicable for the specified details in making the allocation of the unspecified items.

5. **Breadwinners and Dependents.**—After allowing for unspecified data the total number of " breadwinners" disclosed by the Census results was 2,004,130, of whom 1,605,478 were males, and 398,652 were females. The remainder of the population, totalling 2,450,875, and comprising 707,557 males and 1,743,318 females, were classed as " dependents." Under this latter general heading have been grouped the following sections of the population :—(i.) Wives, mothers, and others performing domestic duties for which remuneration is not paid ; (ii.) Dependent scholars and students ; (iii.) Dependent relatives and others not stated to be performing domestic duties ; (iv.) Inmates of charitable institutions ; (v.) Inmates of penal establishments. These terms, viz., " breadwinners" and " dependent" require to be used with care as certain of those classed as " dependents" contribute much more largely to the upkeep of the community than certain others who are classed as " breadwinners." For example, all married women engaged in domestic duties for which direct payment is not made, are classed as " dependents," while all pensioners are classed as " breadwinners." There can be no question that as regards the current life of the community the former group contribute the more largely.

The numbers of breadwinners and dependents of each sex and of the two sexes combined in each State and Territory at the date of the Census are shewn in the following table :—

Numbers of Breadwinners and Dependents, 1911.

States and Territories	MALES.			FEMALES.			PERSONS.		
	Bread-winners.	Depend-ents.	Total.	Bread-winners.	Depend-ents.	Total.	Bread-winners.	Depend-ents.	Total.
States—									
N.S.W.	591,756	265,942	857,698	138,536	650,500	789,036	730,292	916,442	1,646,734
Vic. ..	452,895	202,696	655,591	141,161	518,799	659,960	594,056	721,495	1,315,551
Qld. ..	231,102	98,404	329,506	48,585	227,722	276,307	279,687	326,126	605,813
S.A. ..	144,992	62,366	207,358	34,745	166,455	201,200	179,737	228,821	408,558
W.A. ..	117,580	43,985	161,565	20,976	99,573	120,549	138,556	143,558	282,114
Tas. ..	63,941	33,650	97,591	14,436	79,184	93,620	78,377	112,834	191,211
Territories									
Northern	2,498	236	2,734	103	473	576	2,601	709	3,310
Federal	714	278	992	110	612	722	824	890	1,714
C'wealth	1,605,478	707,557	2,313,035	398,652	1,743,318	2,141,970	2,004,130	2,450,875	4,455,005

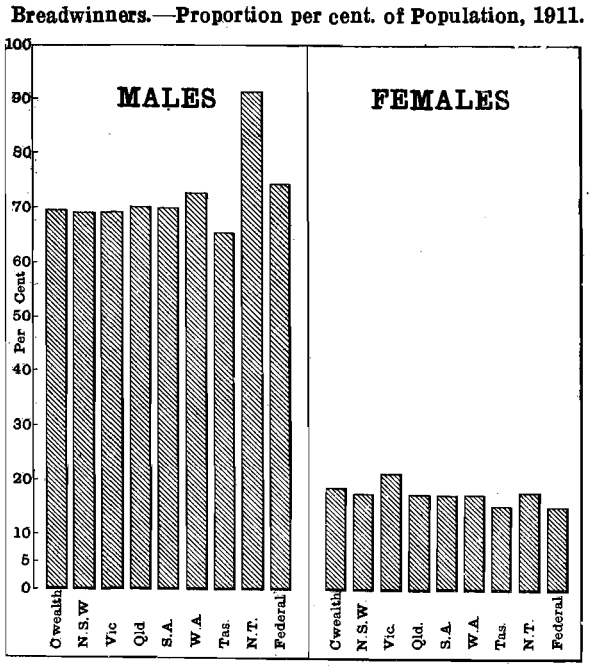
The succeeding table furnishes in each case the proportions per cent of the total male, female or combined population, who were breadwinners or dependents respectively :—

Distribution per cent. of Breadwinners and Dependents, 1911.

States and Territories	MALES.			FEMALES.			PERSONS.		
	Bread-winners.	Depend-ents.	Total.	Bread-winners.	Depend-ents.	Total.	Bread-winners.	Depend-ents.	Total.
States—									
N.S.W.	68.99	31.01	100.00	17.56	82.44	100.00	44.35	55.65	100.00
Vic. ..	69.08	30.92	100.00	21.39	78.61	100.00	45.16	54.84	100.00
Qld. ..	70.14	29.86	100.00	17.58	82.42	100.00	46.17	53.83	100.00
S.A. ..	69.92	30.08	100.00	17.27	82.73	100.00	43.99	56.01	100.00
W.A. ..	72.78	27.22	100.00	17.40	82.60	100.00	49.11	50.89	100.00
Tas. ..	65.52	34.48	100.00	15.42	84.58	100.00	40.99	59.01	100.00
Territories									
Northern	91.37	8.63	100.00	17.88	82.12	100.00	78.58	21.42	100.00
Federal	71.97	28.03	100.00	15.23	84.77	100.00	48.07	51.93	100.00
C'wealth	69.41	30.59	100.00	18.61	81.39	100.00	44.99	55.01	100.00

It will be seen that amongst the States, Western Australia had an exceptionally high, and Tasmania an exceptionally low proportion of male breadwinners, while the proportions for the other four States differed little from each other. In the case of females, Victoria had an exceptionally high, and Tasmania an exceptionally low percentage of breadwinners, the proportions for the other four States being approximately equal to one another.

Breadwinners.—Proportion per cent. of Population, 1911.



GRAPH No. 144.

The accompanying Graph (No. 144) furnishes for the Commonwealth as a whole as well as for each of the component States and Territories, a representation of the proportion per cent. which the breadwinners of each sex were of the total population of that sex. The scale on the left of the Graph shewing percentages relates to both the male and the female portions. This Graph illustrates the approximate equality of percentages for males in New South Wales, Victoria, Queensland and South Australia, and for females in New South Wales, Queensland, South Australia and Western Australia. It will be seen that apart from the Northern Territory males, the deviations for either sex from the Commonwealth percentage for that sex were small.

6. **Classes of Occupation.**—The following table furnishes, for the male population of the several States and Territories, a distribution into the eight Classes defined in Section 3 above (p. 349). The results shewn are both the actual numbers and also the proportion per cent. of the total male population in each case.

Classes of Occupation, Males. Commonwealth, States and Territories, 1911.

Class.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	North-ern.	Federal	
NUMBER.									
I. Professional	37,275	27,305	11,551	6,804	6,815	3,449	73	52	93,324
II. Domestic	19,075	13,877	6,416	3,477	4,362	1,526	127	11	48,871
III. Commercial	89,394	76,203	29,268	22,790	15,522	7,220	196	19	240,612
IV. Transport and Communication	60,796	38,206	22,649	15,722	11,952	4,477	194	13	154,009
V. Industrial	173,725	143,915	57,453	45,064	24,288	15,005	208	213	459,871
VI. Primary Producers	204,708	147,635	101,335	49,958	54,062	31,715	1,691	401	591,505
VII. Independent	6,783	5,754	2,430	1,177	579	549	9	5	17,286
VIII. Dependents	265,942	202,696	98,404	62,366	43,985	33,650	236	278	707,557
Total, Males	857,698	655,591	329,506	207,358	161,565	97,591	2,734	992	2313035
PERCENTAGE ON TOTAL MALES.									
I. Professional	4.35	4.16	3.51	3.28	4.22	3.53	2.67	5.24	4.04
II. Domestic	2.22	2.12	1.95	1.68	2.70	1.56	4.64	1.11	2.11
III. Commercial	10.42	11.62	8.88	10.99	9.61	7.40	7.17	1.92	10.40
IV. Transport and Communication	7.09	5.83	6.87	7.58	7.40	4.59	7.10	1.31	6.66
V. Industrial	20.25	21.95	17.44	21.73	15.03	15.38	7.61	21.47	19.88
VI. Primary Producers	23.87	22.52	30.75	24.09	33.46	32.50	61.85	40.42	25.57
VII. Independent	.79	.88	.74	.57	.36	.56	.33	.50	.75
VIII. Dependents	31.01	30.92	29.86	30.08	27.22	34.48	8.63	28.03	30.59
Total, Males	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

In general the States having the larger total populations had also the larger numbers of males in the several occupation classes, the principal exception being in the case of Western Australia, where the numbers in the Professional, Domestic, and Primary Producing Classes were respectively greater than the corresponding numbers for South Australia.

Amongst the States the Professional Class was proportionately most largely represented amongst males in New South Wales (4.35 per cent.), and least largely in South Australia (3.28 per cent.), the Domestic Class most largely in Western Australia (2.70 per cent.), and least largely in Tasmania (1.56 per cent.); the Commercial Class most largely in Victoria (11.62 per cent.), and least largely in Tasmania (7.40 per cent.); the Transport and Communication Class most largely in South Australia (7.58 per cent.), and least largely in Tasmania (4.59 per cent.); the Industrial Class most largely in Victoria (21.95 per cent.), and least largely in Western Australia (15.03 per cent.); the Primary Producers most largely in Western Australia (33.46 per cent.), and least largely in Victoria (22.52 per cent.); the Independent Class most largely in Victoria (0.88 per cent.), and least largely in Western Australia (0.36 per cent.); the Dependent Class most largely in Tasmania (34.48 per cent.), and least largely in Western Australia (27.22 per cent.). In all the States the most prominent place amongst male breadwinners was taken by Primary Producers (25.57 per cent. for the Commonwealth as a whole), followed in each case successively by the Industrial Class (19.88 per cent. for the Commonwealth as a whole), the Commercial Class (10.40 per cent. for the Commonwealth as a whole), and the Transport and Communication Class (6.66 per cent. for the Commonwealth as a whole).

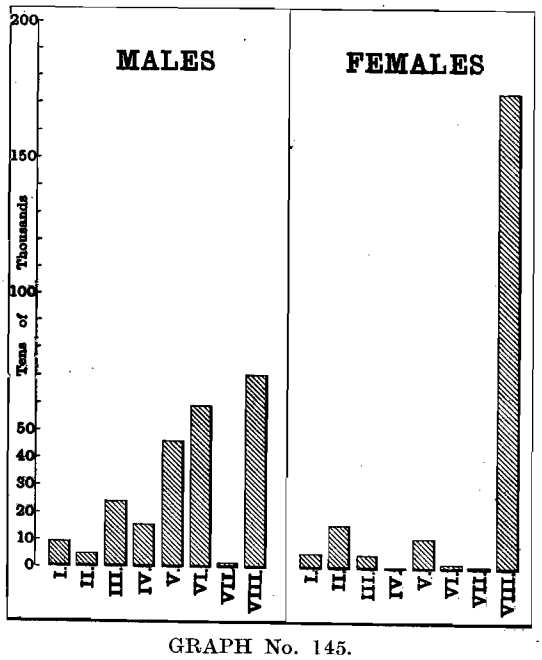
Corresponding particulars in respect of females are furnished in the succeeding table :—

Classes of Occupation, Females. Commonwealth, States and Territories, 1911.

Class.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	Northern.	Federal	
NUMBER.									
I. Professional	19,377	17,322	6,296	4,616	3,476	2,176	13	8	53,284
II. Domestic	54,524	48,839	20,351	14,339	9,376	6,487	74	64	154,054
III. Commercial	18,225	17,355	5,733	4,786	2,941	1,711	..	3	50,754
IV. Transport and Communication ..	1,597	1,611	621	350	327	333	..	6	4,845
V. Industrial	36,115	46,762	11,419	8,344	4,006	2,607	4	4	109,261
VI. Primary Producers ..	5,297	5,765	3,434	1,549	578	679	12	24	17,338
VII. Independent	3,401	3,507	731	761	272	443	..	1	9,116
VIII. Dependents	650,500	518,799	227,722	166,455	99,573	79,184	473	612	1743318
Total, Females ..	789,036	659,960	276,307	201,200	120,549	93,620	576	722	2141970
PERCENTAGE ON TOTAL FEMALES.									
I. Professional	2.46	2.63	2.28	2.29	2.88	2.32	2.26	1.11	2.49
II. Domestic	6.91	7.40	7.37	7.13	7.78	6.93	12.85	8.86	7.19
III. Commercial	2.31	2.63	2.08	2.38	2.44	1.83	..	.42	2.37
IV. Transport and Communication ..	.20	.24	.22	.17	.27	.36	..	.83	.23
V. Industrial	4.58	7.09	4.13	4.15	3.32	2.78	.69	.55	5.10
VI. Primary Producers ..	.67	.87	1.24	.77	.48	.73	2.08	3.32	.81
VII. Independent	.43	.53	.26	.38	.23	.47	..	.14	.42
VIII. Dependents	82.44	78.61	82.42	82.73	82.60	84.58	82.12	84.77	81.39
Total, Females ..	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Amongst the States the Professional Class was proportionately most strongly represented amongst the females in Western Australia (2.88 per cent.) and least strongly in Queensland (2.28 per cent.); the Domestic Class most strongly in Western Australia (7.78 per cent.), and least strongly in New South Wales (6.91 per cent.); the Commercial Class most strongly in Victoria (2.63 per cent.), and least strongly in Tasmania (1.83 per cent.); the Transport and Communication Class most strongly in Tasmania (0.36 per cent.), and least strongly in South Australia (0.17 per cent.); the Industrial Class most strongly in Victoria (7.09 per cent.), and least strongly in Tasmania (2.78 per cent.); Primary Producers most strongly in Queensland (1.24 per cent.), and least strongly in Western Australia (0.48 per cent.); the Independent Class most strongly in Victoria (0.53 per cent.), and least strongly in Western Australia (0.23 per cent.); and the Dependent Class most strongly in Tasmania (84.58 per cent.), and least strongly in Victoria (78.61 per cent.).

Numbers in each Class of Occupation, C'wealth, 1911.



GRAPH No. 145.

In all the States the most prominent place amongst female breadwinners was taken by the Domestic Class (7.19 per cent. for the Commonwealth as a whole), followed in each case by the Industrial Class (5.10 per cent. for the Commonwealth as a whole), and then by the Professional and Commercial Classes (2.49 per cent. and 2.37 per cent. respectively for the Commonwealth as a whole).

A representation is furnished in Graph No. 145. of the number of persons of each sex in each class of occupation, in the Commonwealth as a whole. The Roman numerals at the feet of the several pillars shewn indicate the class of occupation, and have the significance which attaches to them in the two preceding tables. The scale on the left margin applies to both the male and female portions. The figures shewn on this scale denote the number of tens of thousands of persons represented.

7. **Professional Class.**—The occupations which are grouped together for Census purposes, and placed under the general heading of " professional," cover not only the professions of " law, medicine and the church," but include also the army, the navy, and many others, as will be seen from a perusal of the items shewn in the succeeding table. The headings contained therein, constitute what are known in the Census classification, as the sub-orders making up the Professional Class :—

Professional Class. Commonwealth, 1911.

Sub-orders.	Males.		Females.		Persons.	
	No.	Per 1000 of Male Population.	No.	Per 1000 of Female Population.	No.	Per 1000 of Total Population.
General Government	8,818	3.81	608	.28	9,426	2.12
Local Government	3,174	1.37	127	.06	3,301	.74
Defence	5,358	2.32	..	..	5,358	1.20
Law and Order	15,242	6.59	824	.38	16,066	3.61
Religion	6,707	2.90	1,974	.92	8,681	1.95
Charity, exclusive of Hospitals	493	.21	1,254	.59	1,747	.39
Health	14,716	6.36	17,275	8.07	31,991	7.18
Literature	2,477	1.07	341	.16	2,818	.63
Science	1,045	.45	35	.02	1,080	.24
Civil Engineering, Architecture and Surveying	7,899	3.42	99	.05	7,998	1.80
Education	11,469	4.96	20,206	9.43	31,675	7.11
Fine Arts	2,752	1.19	2,074	.97	4,826	1.08
Music	2,296	.99	7,240	3.38	9,536	2.14
Amusements	10,878	4.71	1,227	.57	12,105	2.72
Total, Professional	93,324	40.35	53,284	24.88	146,608	32.91

The occupations included under the head of General Government are those administrative branches of the Public Services of the Commonwealth or the States which do not admit of allocation to the more specific designations included later in the classification. Owing to this arrangement an officer of the Defence Department will be included under " Defence," an officer of the Education Department under " Education," an officer of the Agricultural Department under " Agriculture," an officer of the Railway Department under " Railways," and so on.

Under the heading Defence are included all occupations pertaining to military or naval defence, but exclusive of the manufacture of munitions and the construction of works in connexion with defence.

The occupations included under the heading " Law and Order," are the judicial, the legal, the police and the penal.

The heading " Health" comprises principally medical practitioners, dentists, pharmaceutical chemists and druggists, nurses and veterinary surgeons.

In four of the sub-orders quoted above there was a preponderance of females, viz., Charity, Health, Education and Music.

8. **Domestic Class.**—In the domestic class are grouped all persons engaged in the supply of board and lodging, and in rendering personal service for which remuneration is usually paid. The class has been divided into two sub-orders, of which the former embraces persons engaged in the supply of board and lodging and the latter those engaged in domestic service and attendance. Particulars for the Commonwealth as a whole are as follows :—

Domestic Class. Commonwealth, 1911.

Sub-orders.	Males.		Females.		Persons.	
	No.	Per 1000 of Male Population.	No.	Per 1000 of Female Population.	No.	Per 1000 of Total Population.
Board and Lodging	25,451	11.00	39,579	18.48	65,030	14.60
Domestic Service and Attendance	23,420	10.13	114,475	53.44	137,895	30.95
Total, Domestic Class	48,871	21.13	154,054	71.92	202,925	45.55

In both sub-orders there was a preponderance of females, the ratio of females to males being nearly 3 to 2 in the case of " board and lodging," and nearly 5 to 1 in the case of " domestic service and attendance." The former sub-order comprises the keepers of hotels, coffee palaces, restaurants, boarding houses, lodging houses, &c., and their employees, while the latter includes

all classes of house servants not included under " board and lodging," as well as such other domestic occupations as coachman, groom, and gardener. Hairdressers, barbers, laundrymen, laundresses, washerwomen, and shoeblacks are also included.

9. **Commercial Class.**—The number and proportion of each sex comprised in the Commercial Class, are shewn in the following table :—

Commercial Class. Commonwealth, 1911.

Orders and Sub-orders.	Males.		Females.		Persons.	
	No.	Per 1000 of Male Population.	No.	Per 1000 of Female Population.	No.	Per 1000 of Total Population.
Dealing in Property and Finance—						
Banking and Finance	15,986	6.91	1,456	.68	17,442	3.92
Insurance, Valuation & Protection of Property	10,834	4.68	914	.43	11,748	2.64
Landed and House Property	11,478	4.96	5,155	2.41	16,633	3.73
Property Rights, N.E.I.	554	.24	84	.04	638	.14
Dealing in Art and Mechanic Productions—						
Books, Publications and Advertising	4,224	1.83	1,140	.53	5,364	1.20
Musical Instruments	996	.43	268	.12	1,264	.28
Prints, Pictures and Art Materials	280	.12	98	.05	378	.09
Ornaments and Small Wares	635	.27	762	.36	1,397	.31
Equipment for Sports and Games	100	.04	2	..	102	.02
Designs, Medals, Type and Dies	61	.03	5	..	66	.01
Watches, Clocks, Jewellery, &c.	1,360	.59	337	.16	1,697	.38
Surgical Instruments and Appliances	88	.04	14	.01	102	.02
Arms, Ammunition and Explosives	33	.01	2	..	35	.01
Machines, Tools and Implements	2,630	1.14	331	.15	2,961	.67
Carriages and Vehicles	809	.35	70	.03	879	.20
Harness, Saddlery and Leatherware	360	.16	20	.01	380	.09
Ships and Boats, their Equipment and Supplies	306	.13	13	.01	319	.07
Building Materials and House Fittings	884	.38	77	.04	961	.22
Furniture	2,357	1.02	400	.19	2,757	.62
Chemicals and By-Products	984	.43	273	.13	1,257	.28
Paper, Papermakers' Materials, Stationery	1,709	.74	848	.40	2,557	.57
Dealing in Textile Fabrics, Dress and Fibrous Materials—						
Textile Fabrics	19,131	8.27	12,718	5.94	31,849	7.15
Dress	4,463	1.93	1,543	.72	6,006	1.35
Fibrous Materials	164	.07	10	..	174	.04
Dealing in Food, Drinks, Narcotics & Stimulants—						
Animal Food	30,623	13.24	1,476	.69	32,099	7.21
Vegetable Food	11,386	4.92	4,207	1.96	15,593	3.50
Groceries, Drinks, Narcotics, Stimulants	26,218	11.33	2,976	1.39	29,194	6.55
Dealing in Animals and in Animal and Vegetable Substances, N.E.I.—						
Living Animals	4,239	1.83	94	.04	4,333	.97
Manures and Animal Waste Products	54	.02	1	..	55	.01
Leather, Raw Materials and Manufactures	1,236	.53	36	.02	1,272	.29
Wool and other Animal Matters	3,477	1.50	94	.04	3,571	.80
Seeds, Plants, Flowers, Fodder, &c.	5,576	2.41	583	.27	6,159	1.38
Other Vegetable Matters, N.E.I.	6,883	2.98	154	.07	7,037	1.58
Dealing in Fuel and Light—						
Coal, Firewood, Kerosene, &c.	5,564	2.41	101	.05	5,665	1.27
Dealing in Metals and other Minerals—						
Stone, Clay, Earthenware, Glass, &c.	1,355	.59	225	.11	1,580	.36
Gold, Silver and Precious Stones	106	.05	9	..	115	.03
Metals other than Gold and Silver	7,826	3.38	438	.20	8,264	1.85
General and Undefined Merchants and Dealers—						
Merchants, Dealers (undefined)	43,659	18.88	10,170	4.75	53,829	12.08
Other Mercantile Persons	10,135	4.38	3,601	1.68	13,736	3.08
Speculators on Chance Events—						
Lottery-keepers, Sweep promoters, Bookmakers, &c.	1,291	.56	41	.02	1,332	.30
Engaged in Storage—						
Store proprietors and hands	558	.24	8	..	566	.13
Total, Commercial Class	240,612	104.02	50,754	23.70	291,366	65.40

An unsatisfactory feature of this Class is the relatively large number included under the indefinite order " General and undefined merchants." Included in this order were 53,794 males and 13,771 females, or about 22 per cent. and 27 per cent. of the totals for each sex in the Commercial Class. These persons consisted mainly of those who stated their occupations as " merchant," " importer," " warehouseman," " storekeeper," " dealer," "hawker," "agent," without any specification of the nature of the commodities dealt in. In only one sub-order (" dealing in ornaments and small wares") was there a preponderance of females.

10. **Transport and Communication Class.**—Occupations associated with the transport of passengers and goods by rail, road or water, and with the effecting of communications by post, telegraph or telephone are grouped together under the Class which has been designated " Transport and Communication." The number and proportion of each sex comprised in this class is shewn in the following table :—

Transport and Communication Class. Commonwealth, 1911.

Sub-orders.	Males.		Females.		Persons.	
	No.	Per 1000 of Male Population.	No.	Per 1000 of Female Population.	No.	Per 1000 of Total Population.
On Railways (not construction)	50,416	21.80	891	.42	51,307	11.52
On Roads	43,181	18.67	209	.10	43,390	9.74
On Seas and Rivers and the regulation thereof	43,098	18.63	386	.18	43,484	9.76
On Postal Service	9,044	3.91	2,058	.96	11,102	2.49
On Telegraph and Telephone Service	7,739	3.34	1,297	.60	9,036	2.03
Delivery of Documents, Parcels & Messages by hand	531	.23	4	..	535	.12
Total, Transport and Communication Class	154,009	66.58	4,845	2.26	158,854	35.66

Of the males employed on railways, 9,277, or about 18½ per cent. were engine men, *i.e.*, were engine drivers, firemen, or cleaners. Of the males employed on roads, 9,643 or about 22¼ per cent. were occupied in connexion with tramway services.

In all the sub-orders of this Class the males greatly predominated.

11. **Industrial Class.**—The industrial class comprised 569,132 persons, of whom 459,871 were males and 109,261 were females. The number and proportion in each sub-order of this class are shewn in the following table :—

Industrial Class. Commonwealth, 1911.

Orders and Sub-orders.	Males.		Females.		Persons.	
	No.	Per 1000 of Male Population.	No.	Per 1000 of Female Population.	No.	Per 1000 of Total Population.
Working in Art and Mechanic Productions—						
Books and Publications	16,540	7.15	3,993	1.87	20,533	4.61
Musical Instruments	1,178	.51	54	.03	1,232	.28
Prints, Pictures and Art Materials	1,769	.77	179	.08	1,948	.44
Ornaments and Small Wares	2,155	.93	2,045	.96	4,200	.94
Equipment for Sports and Games	171	.07	44	.02	215	.05
Designs, Medals, Type and Dies	485	.21	43	.02	528	.12
Watches, Clocks and Scientific Instruments	2,513	1.09	82	.04	2,595	.58
Surgical Instruments and Appliances	103	.04	34	.02	137	.03
Arms, Ammunition, and Explosives	289	.12	203	.09	492	.11
Engines, Machines, Tools and Implements	25,078	10.84	132	.06	25,210	5.66
Carriages and Vehicles	16,861	7.29	104	.05	16,965	3.81
Harness, Saddlery and Leatherware	7,122	3.08	435	.20	7,557	1.70
Ships, Boats and their Equipment	3,567	1.54	21	.01	3,588	.80
Furniture	10,753	4.65	562	.26	11,315	2.54
Building materials and other manufactures, mainly of Timber	10,493	4.54	38	.02	10,531	2.36
Chemicals and By-products	2,772	1.20	558	.26	3,330	.75
Working in Textile Fabrics, Dress and Fibrous Materials—						
Textile Fabrics	1,735	.75	1,894	.88	3,629	.81
Dress	31,218	13.50	87,508	40.85	118,726	26.65
Fibrous Materials	1,163	.50	468	.22	1,631	.37
Working in Food, Drinks, Narcotics, & Stimulants						
Animal Food	9,996	4.32	341	.16	10,337	2.32
Vegetable Food	27,533	11.90	3,949	1.84	31,482	7.07
Groceries, Drinks, Narcotics and Stimulants	10,946	4.73	2,213	1.03	13,159	2.95
Working in Animal & Vegetable Substances, N.E.I.						
Animal Matters, N.E.I.	7,397	3.20	261	.12	7,658	1.72
Vegetable Matters, N.E.I.	4,227	1.83	273	.13	4,500	1.01
Vegetable Produce for Fodder	1,147	.50	3	..	1,150	.26
Paper Manufacture	296	.13	76	.04	372	.08
Working in Metals and other Minerals—						
Stone, Clay, Earthenware, Glass, &c.	11,658	5.04	132	.06	11,790	2.65
Jewellery, Precious Stones and Minting	3,211	1.39	242	.11	3,453	.77
Workers in various Metals, N.E.I.	38,854	16.80	203	.09	39,057	8.77
Working in Fuel, Light and other Forms of Energy						
Gas, Electric Light and Power, &c.	10,242	4.43	377	.18	10,619	2.38
Constructing Buildings, Roads, Railways, &c.—						
Houses and Buildings	85,822	37.10	102	.05	85,924	19.29
Roads, Railways, Earthworks, &c.	27,391	11.84	5	..	27,396	6.15
Disposing of the Dead or of Refuse—						
Disposal of the Dead	1,040	.45	34	.02	1,074	.24
Disposal of Refuse	5,176	2.24	1	..	5,177	1.16
Engaged in Undefined Industrial Pursuits—						
Imperfectly Defined	78,970	34.14	2,652	1.24	81,622	18.32
Total, Industrial Class	459,871	198.82	109,261	51.01	569,132	127.75

The imperfectly defined industrial male workers who comprised about 17 per cent. of the total industrial males consisted mainly of persons whose occupation was stated as "labourer," without any indication of the class of industry with which they were connected. The other indefinite designations which contributed most largely to the total were "mechanic," "apprentice," "engine driver," "machinist," "manager," and "foreman." In all the sub-orders except two, viz., "Textile Fabrics," and "Dress," there was a heavy preponderance of males, but in these two females predominated.

The construction of buildings and of roads, railways and earthworks accounted together 113,213 males, being about 4.89 per cent. of the total male population, or 24.62 per cent. of the total industrial males. The metal-working industry ranked next in importance amongst industrial males, a total of 63,932 being obtained by adding the kindred sub-orders, "Workers in various metals, N.E.I.," and "Engines, machines, tools, and implements." This total represents 2.76 per cent. of the male population, and 13.90 per cent. of industrial males. Next in importance as a group of industrial male workers are those engaged in production of food, drink, narcotics and stimulants. These totalled 48,475, representing 2.10 per cent. of the total male population, and 10.54 per cent. of the industrial males. The next group in importance amongst males is that comprised of the workers in textile fabrics, dress and fibrous materials who totalled 34,116, representing 1.48 per cent. of the total male population, and 7.42 per cent. of industrial males. Male workers in carriages and vehicles totalled 16,861; in books and publications, 16,540; in stone, clay, earthenware, glass, &c., 11,658; in furniture, 10,753; in building materials (mainly timber) 10,493; and in the production of light and power 10,242. Amongst the female industrial workers the only sub-order strongly represented was that of "dress" which included 87,508 females, representing 4.09 per cent. of the total female population, and over 80 per cent. of the industrial females. Female workers in food, drink, narcotics and stimulants totalled 6,503, in books and publications 3,993, in ornaments and small wares 2,045, in textile fabrics 1,894, while 2,652, mainly "machinists," were included as "imperfectly defined." It may be noted the item "dress," as used above, covers a wide range of occupations, the principal ones included being tailoring, dressmaking, hat and cap making, millinery and bootmaking.

12. **Primary Producing Class.**—The Class of Primary Producers was that most largely represented in the Australian population and included 608,843 persons, of whom 591,505 were males and 17,338 females. The number and proportion in each sub-order are shewn in the following table:—

Primary Producers. Commonwealth, 1911.

Sub-orders.	Males.		Females.		Persons.	
	No.	Per 1000 of Male Population.	No.	Per 1000 of Female Population.	No.	Per 1000 of Total Population.
Agricultural Pursuits	287,556	124.32	8,154	3.81	295,710	66.38
Pastoral Pursuits	148,938	64.39	9,029	4.21	157,967	35.46
Hunting and similar Pursuits	4,946	2.14	27	.01	4,973	1.11
Fisheries	8,085	3.50	11	..	8,096	1.82
Forestry	25,302	10.94	13	.01	25,315	5.68
Water Conservation and Supply	7,015	3.03	19	.01	7,034	1.58
Mines and Quarries	109,663	47.41	85	.04	109,748	24.63
Total, Primary Producers	591,505	255.73	17,338	8.09	608,843	136.66

In all the sub-orders comprised under the class of primary producers, the males greatly predominated. The females contained in the agricultural and pastoral sub-orders consisted mainly of female proprietors, or of female members of the farmers' families assisting without wages in connexion with the dairy work of the farm. In the other sub-orders the number of females was practically negligible. The principal occupations included under the head of agricultural pursuits are those of farmer, market gardener, fruitgrower, vigneron, sugar planter, nurseryman, and their assistants. The heading, "pastoral pursuits," covers principally station proprietors, dairy farmers, poultry farmers and their assistants. The principal occupation under the head of "hunting" was that of rabbit-trapping. In the mining sub-order, gold, coal, silver, copper and tin in the order mentioned were the minerals which furnished the largest amount of employment.

13. **Commonwealth Comparisons with Previous Censuses.**—The following table furnishes a comparison of the numbers and proportions of each sex in each of the classes of occupation at the Censuses of 1891, 1901 and 1911:—

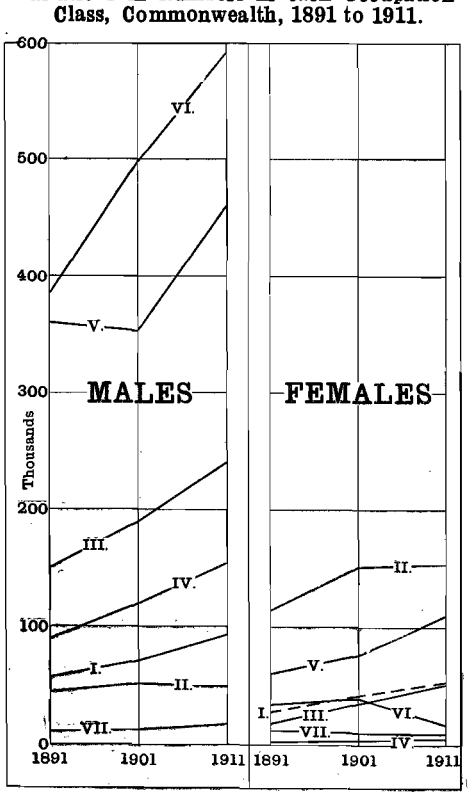
Commonwealth Population in Occupation Classes, 1891, 1901 and, 1911.

Class.	Males.			Females.			Persons.		
	1891.	1901.	1911.	1891.	1901.	1911.	1891.	1901.	1911.
NUMBER.									
I. Professional	57,579	70,702	93,324	27,308	41,654	53,284	84,887	112,356	146,608
II. Domestic	44,677	50,541	48,871	113,974	151,675	154,054	158,651	202,216	202,925
III. Commercial	149,891	189,285	240,612	17,762	34,743	50,754	167,653	224,028	291,366
IV. Transport & Communication	89,903	119,254	154,009	2,729	3,448	4,845	92,632	122,702	158,854
V. Industrial	359,726	352,860	459,871	59,719	76,152	109,261	419,445	429,012	569,132
VI. Primary Producers	385,214	496,654	591,505	34,285	39,112	17,338	419,499	535,766	608,843
VII. Independent	10,766	12,294	17,286	12,360	10,136	9,116	23,126	22,430	26,402
VIII. Dependents	606,283	686,338	707,557	1,202,216	1,438,953	1,743,318	1,808,499	2,125,291	2,450,875
All Classes	1,704,039	1,977,928	2,313,035	1,470,353	1,795,873	2,141,970	3,174,392	3,773,801	4,455,005
PROPORTION PER CENT. ON ALL CLASSES.									
I. Professional	3.38	3.57	4.04	1.86	2.32	2.49	2.67	2.98	3.29
II. Domestic	2.62	2.56	2.11	7.75	8.45	7.19	5.00	5.36	4.55
III. Commercial	8.80	9.57	10.40	1.21	1.93	2.37	5.28	5.94	6.54
IV. Transport & Communication	5.28	6.03	6.66	.19	.19	.23	2.92	3.25	3.57
V. Industrial	21.11	17.84	19.88	4.06	4.24	5.10	13.21	11.37	12.78
VI. Primary Producers	22.60	25.11	25.57	2.33	2.18	.81	13.22	14.20	13.67
VII. Independent	.63	.62	.75	.84	.56	.42	.73	.59	.59
VIII. Dependents	35.58	34.70	30.59	81.76	80.13	81.39	56.97	56.31	55.01
All Classes	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

In the case of males each of the classes of occupation, with the exception of the Industrial Class, contained a larger number in 1901 than in 1891, and each, with the exception of the Domestic Class, contained a larger number in 1911 than in 1901. Amongst females each class except the Independent Class, was numerically stronger in 1901 than in 1891, and each, except Primary Producers and Independent, was numerically stronger in 1911 than in 1901.

An interesting fact brought out by the proportion table is the continuous increase in the proportion of males engaged as primary producers, from 22.60 per cent. in 1891 to 25.11 per cent. in 1901, and 25.57 per cent. in 1911. On the other hand the Industrial males fell from 21.11 per cent. in 1891 to 17.84 per cent. in 1901, but rose again to 19.88 per cent. in 1911. Amongst males the Professional, the Commercial and the Transport and Communication Classes represented increasing proportions of the male population from Census to Census while the Domestics, and the Dependent Classes represented diminishing proportions.

Variations in Numbers in each Occupation Class, Commonwealth, 1891 to 1911.



GRAPH No. 146.

At each of the three Censuses the numerical strength of the several classes of male bread-winners was in the following order :—(i.) Primary Producers; (ii.) Industrial ; (iii.) Commercial ; (iv.) Transport and Communication ; (v.) Professional ; (vi.) Domestic ; and (vii.) Independent.

At each of these Censuses the Domestic Class was numerically the strongest amongst female breadwinners, the Industrial Class ranking second in each case. The proportion of women in the Professional, Commercial, Transport and Communication and Industrial Classes, increased continuously from Census to Census, but the proportions in the other four Classes were lower in 1911 than in 1891.

The accompanying Graph (No. 146) furnishes an indication for each sex of the manner in which the numbers in each class have varied during the twenty years, 1891-1911. For convenience and clearness in representation of the more important classes, the particulars respecting Class VIII., Dependents, have been omitted. The scale on the left of the Graph represents "thousands" of persons, and is applicable to both the male and the female portions. The Roman numerals on the Graph refer to the several occupation classes, and have the significance indicated in the preceding table.

14. **Grades of Occupation.**—As indicated in Section 2 of the present Chapter (p. 347), an inquiry was made in each case concerning the grade of the occupation followed by each person enumerated, each person being asked to indicate such grade by the insertion of a specified letter. Thus *E* was used to denote a person employing labour in the occupation which he stated that he

was following. *O* was used to denote a person working on his own account without employing others in his business. *A* denoted a person assisting the head of the establishment in his business without receiving salary or wages. *W* denoted a person in receipt of salary or wages, while *N* was used to denote a person who was out of work at the date of the Census, and who had been so for more than a week prior to that date. In addition to these cases there were others in which the question of grade was not applicable, as for example in the cases of (i.) certain inmates of religious and charitable institutions; (ii.) persons unable to follow their usual occupations through ill-health; (iii.) persons of independent means not following any occupation; (iv.) dependents. The cards for these and similar persons were marked N A (not applicable) in respect of grade. There were also others concerning whom the grade was not stated on the cards, and the information furnished did not indicate clearly that the grade N A was appropriate. For tabulation purposes these were graded N S (not specified), the data being subsequently distributed pro rata for the purposes of the present Chapter, as mentioned in Section 4 (p. 349). On the occasion of the Census of 1911, very full particulars were tabulated in respect of grade in conjunction with age and nature of occupation. Tables 18 and 19 of Part XII., Occupations, contain complete details of this nature for each sex (see Volume III., pp. 1326-1527). At the Census of 1891 all the States except Queensland and Western Australia published particulars of grade in conjunction with occupation, and at the Census of 1901 similar information was published by all the States except Queensland.

15. **Classes and Grades in 1911.**—In the following table is furnished an analysis of the occupations of males according to class and grade in conjunction, for the Commonwealth as a whole :—

Grade of Occupation of Males in each Class. Commonwealth, 1911.

Class.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
				NUMBER.			
I. Professional	7,658	8,034	127	64,545	1,021	11,939	93,324
II. Domestic	8,887	3,328	661	32,355	1,921	1,719	48,871
III. Commercial	32,890	26,117	2,028	158,686	5,398	15,493	240,612
IV. Transport & Communication	5,563	8,223	767	132,023	3,577	3,856	154,009
V. Industrial	40,834	17,496	1,737	355,215	24,325	20,264	459,871
VI. Primary Producers	108,381	85,229	59,051	313,581	11,755	13,508	591,505
VII. Independent	..	..	..	..	..	17,286	17,286
VIII. Dependents	..	..	..	..	..	707,557	707,557
All Classes	204,213	148,427	64,371	1,056,405	47,997	791,622	2,313,035
				PROPORTION PER CENT. ON ALL GRADES.			
I. Professional	8.21	8.61	.14	69.16	1.09	12.79	100.00
II. Domestic	18.18	6.81	1.35	66.21	3.93	3.52	100.00
III. Commercial	13.67	10.86	.84	65.95	2.24	6.44	100.00
IV. Transport & Communication	3.61	5.34	.50	85.73	2.32	2.50	100.00
V. Industrial	8.88	3.80	.38	77.24	5.29	4.41	100.00
VI. Primary Producers	18.32	14.41	9.98	53.02	1.99	2.28	100.00
VII. Independent	..	..	..	..	..	100.00	100.00
VIII. Dependents	..	..	..	..	..	100.00	100.00
All Classes	8.83	6.42	2.78	45.67	2.08	34.22	100.00
				PROPORTION PER CENT. ON ALL CLASSES.			
I. Professional	3.75	5.41	.20	6.11	2.13	1.51	4.04
II. Domestic	4.35	2.24	1.03	3.06	4.00	.22	2.11
III. Commercial	16.11	17.60	3.15	15.02	11.25	1.96	10.40
IV. Transport & Communication	2.72	5.54	1.19	12.50	7.45	.49	6.66
V. Industrial	20.00	11.79	2.70	33.63	50.68	2.56	19.88
VI. Primary Producers	53.07	57.42	91.73	29.68	24.49	1.70	25.57
VII. Independent	..	..	..	..	..	2.18	.75
VIII. Dependents	..	..	..	..	..	89.38	30.59
All Classes	100.00	100.00	100.00	100.00	100.00	100.00	100.00

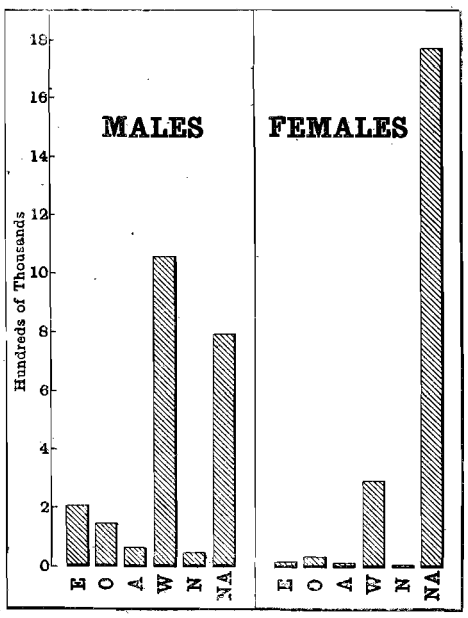
In each class of occupation, wage earners were more numerous than any other grade. Employers ranked second, and workers on own account third in the Domestic, the Commercial, and the Primary Producers Classes. Workers on own account ranked second, and employers third in the Transport and Communication Class. In the Industrial Class employers ranked second and the unemployed third, while in the Professional Class, those to whom grade was not applicable ranked second and workers on own account third.

Corresponding particulars concerning the class and grade of female occupations are furnished in the following table :—

Grade of Occupation of Females in each Class. Commonwealth, 1911.

Class.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
	NUMBER.						
I. Professional	878	12,726	205	31,926	726	6,823	53,284
II. Domestic	5,343	5,214	2,248	133,262	4,656	3,331	154,054
III. Commercial	2,875	5,605	2,435	33,375	865	5,599	50,754
IV. Transport & Communication	98	11	14	4,682	16	24	4,845
V. Industrial	4,349	10,715	668	90,597	2,017	915	109,261
VI. Primary Producers ..	5,110	2,463	8,486	1,193	5	81	17,338
VII. Independent	..	..	..	..	..	9,116	9,116
VIII. Dependents	..	..	..	..	..	1,743,318	1,743,318
All Classes	18,653	36,734	14,056	295,035	8,285	1,769,207	2,141,970
	PROPORTION PER CENT. ON ALL GRADES.						
I. Professional	1.65	23.88	.38	59.92	1.36	12.81	100.00
II. Domestic	3.47	3.39	1.46	86.50	3.02	2.16	100.00
III. Commercial	5.67	11.04	4.80	65.76	1.70	11.03	100.00
IV. Transport & Communication	2.02	.23	.29	96.64	.33	.49	100.00
V. Industrial	3.98	9.81	.61	82.92	1.84	.84	100.00
VI. Primary Producers ..	29.47	14.21	48.94	6.88	.03	.47	100.00
VII. Independent	..	..	..	..	..	100.00	100.00
VIII. Dependents	..	..	..	..	..	100.00	100.00
All Classes	.87	1.71	.66	13.77	.39	82.60	100.00
	PROPORTION PER CENT. ON ALL CLASSES.						
I. Professional	4.71	34.64	1.46	10.82	8.76	.39	2.49
II. Domestic	28.64	14.19	15.99	45.17	56.20	.19	7.19
III. Commercial	15.41	15.26	17.33	11 31	10.44	.32	2.37
IV. Transport & Communication	.53	.03	.10	1.59	.19	..	.23
V. Industrial	23.32	29.17	4.75	30.71	24.35	.05	5.10
VI. Primary Producers ..	27.39	6.71	60.37	.40	.06	..	.81
VII. Independent	..	..	..	..	..	.51	.42
VIII. Dependents	..	..	..	..	..	98.54	81.39
All Classes	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Numbers in each Grade of Occupation. Commonwealth, 1911.



GRAPH No. 147.

Amongst breadwinners, in each class except that of Primary Producers, wage earners were most numerous, those assisting without wages ranking first in the case of Primary Producers. Workers on own account ranked second in the Professional, the Commercial and the Industrial Classes, while employers ranked second in the Domestic, the Transport and Communication and the Primary Producers Classes.

Graph No. 147 furnishes for each sex a representation of the number of persons in each grade of occupation in the Commonwealth as a whole. The scale on the left margin of the Graph denotes the numbers of "hundreds of thousands" of persons represented, and applies to both male and female portions. The letters shewn beneath the pillars have the significance indicated in Section 14 above.

Of the whole male population those in receipt of wages and salary represented 45.67 per cent., while of the whole female population those in receipt of salary and wages represented 13.77 per cent. Those to whom grade was not applicable represented 34.22 per cent. in the case of males, and 82.60 per cent. in the case of females.

16. **Geographical Distribution of Professional Class in Grades.**—A classification of the males in the Professional Class in 1911, according to grade, and also according to State or Territory of enumeration is furnished in the following table :—

Grade of Occupation of Males. 1911.

CLASS I. PROFESSIONAL.

State or Territory.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
	NUMBER.						
States—							
New South Wales	3,069	3,365	55	26,062	406	4,318	37,275
Victoria	2,316	2,475	26	18,061	320	4,107	27,305
Queensland	914	868	26	8,303	160	1,280	11,551
South Australia	535	540	7	4,627	38	1,057	6,804
Western Australia	521	520	5	5,011	72	686	6,815
Tasmania	301	260	8	2,376	23	481	3,449
Territories—							
Northern	2	6	..	56	1	8	73
Federal	..	..	..	49	1	2	52
Commonwealth	7,658	8,034	127	64,545	1,021	11,939	93,324
	PROPORTION PER CENT.						
States—							
New South Wales	8.23	9.03	.15	69.92	1.09	11.58	100.00
Victoria	8.48	9.06	.10	66.15	1.17	15.04	100.00
Queensland	7.91	7.51	.23	71.88	1.39	11.08	100.00
South Australia	7.86	7.94	.10	68.00	.56	15.54	100.00
Western Australia	7.64	7.63	.07	73.53	1.06	10.07	100.00
Tasmania	8.73	7.54	.23	68.89	.67	13.94	100.00
Territories—							
Northern	2.74	8.22	..	76.71	1.37	10.96	100.00
Federal	..	..	..	94.23	1.92	3.85	100.00
Commonwealth	8.21	8.61	.14	69.16	1.09	12.79	100.00

Leaving the Territories out of account, the highest proportion of employers amongst the professional males was found in Tasmania (8.73 per cent.), the lowest in Western Australia (7.64 per cent.) ; the highest proportion on own account in Victoria (9.06 per cent.), the lowest in Queensland (7.51 per cent.) ; the highest proportion assisting but not receiving salary or wages in Queensland and Tasmania (.23 per cent.), the lowest in Western Australia (.07 per cent.) ; the highest proportion wage earning in Western Australia (73.53 per cent.), the lowest in Victoria (66.15 per cent.) ; the highest proportion unemployed in Queensland (1.39 per cent.), the lowest in South Australia (.56 per cent.) ; the highest proportion to whom grade is not applicable in South Australia (15.54 per cent.), the lowest in Western Australia (10.07 per cent.).

The succeeding table furnishes a similar classification in respect of females in the professional class at the Census of 1911 :—

Grade of Occupation of Females. 1911.

CLASS I.—PROFESSIONAL.

State or Territory.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
	NUMBER.						
States—							
New South Wales	326	4,679	63	11,325	271	2,713	19,377
Victoria	322	4,356	35	10,239	263	2,107	17,322
Queensland	66	1,221	57	4,177	64	711	6,296
South Australia	73	1,124	30	2,899	39	451	4,616
Western Australia	56	877	6	1,882	50	605	3,476
Tasmania	35	467	14	1,388	39	233	2,176
Territories—							
Northern	..	2	..	9	..	2	13
Federal	..	..	..	7	..	1	8
Commonwealth	878	12,726	205	31,926	726	6,823	53,284

Grade of Occupation of Females. 1911.—*continued.*

CLASS I. PROFESSIONAL.

State or Territory.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
PROPORTION PER CENT.							
States—							
New South Wales	1.68	24.15	.32	58.45	1.40	14.00	100.00
Victoria	1.86	25.15	.20	59.11	1.52	12.16	100.00
Queensland	1.05	19.39	.91	66.34	1.02	11.29	100.00
South Australia	1.58	24.35	.65	62.80	.85	9.77	100.00
Western Australia	1.61	25.23	.17	54.14	1.44	17.41	100.00
Tasmania	1.61	21.46	.64	63.79	1.79	10.71	100.00
Territories—							
Northern	..	15.38	..	69.24	..	15.38	100.00
Federal	..	..	..	87.50	..	12.50	100.00
Commonwealth	1.65	23.88	.38	59.92	1.36	12.81	100.00

Leaving out of account the Territories for which the figures are unimportant, the highest and lowest percentages for the several grades were as follows :—(i.) Employers, Victoria (1.86 per cent.), Queensland (1.05 per cent.); Workers on own account, Western Australia (25.23 per cent.), Queensland (19.39 per cent.); Assisting but not receiving wages, Queensland (.91 per cent.), Western Australia (.17 per cent.); Wage earners, Queensland (66.34 per cent.), Western Australia (54.14 per cent.); Unemployed, Tasmania (1.79 per cent.), South Australia (.85 per cent.); Grade not applicable, Western Australia (17.41 per cent.), South Australia (9.77 per cent.).

17. **Geographical Distribution of Domestic Class in Grades.**—The next table furnishes an analysis of males in the domestic class in each of the States and Territories of the Commonwealth classified according to Grade of occupation. :—

Grade of Occupation of Males. 1911.

CLASS II.—DOMESTIC.

State or Territory.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
NUMBER.							
States—							
New South Wales	3,345	1,180	226	12,826	725	773	19,075
Victoria	2,472	997	150	9,168	590	500	13,877
Queensland	1,226	484	158	4,059	288	201	6,416
South Australia	654	232	73	2,352	75	91	3,477
Western Australia	843	280	27	2,909	191	112	4,362
Tasmania	339	144	26	928	48	41	1,526
Territories—							
Northern	7	11	1	103	4	1	127
Federal	1	..	..	10	..	..	11
Commonwealth	8,887	3,328	661	32,355	1,921	1,719	48,871
PROPORTION PER CENT.							
States—							
New South Wales	17.54	6.19	1.18	67.24	3.80	4.05	100.00
Victoria	17.81	7.19	1.08	66.07	4.25	3.60	100.00
Queensland	19.11	7.54	2.46	63.27	4.49	3.13	100.00
South Australia	18.81	6.67	2.10	67.64	2.16	2.62	100.00
Western Australia	19.32	6.42	.62	66.69	4.38	2.57	100.00
Tasmania	22.21	9.44	1.70	60.81	3.15	2.69	100.00
Territories—							
Northern	5.51	8.66	.79	81.10	3.15	.79	100.00
Federal	9.09	..	..	90.91	..	..	100.00
Commonwealth	18.18	6.81	1.35	66.21	3.93	3.52	100.00

Exclusive of the Territories the highest and lowest percentages for the several grades were as follows :—(i.) Employers, Tasmania (22.21 per cent.), New South Wales (17.54 per cent.) ; (ii.) Workers on own account, Tasmania (9.44 per cent.), New South Wales (6.19 per cent.) ; (iii.) Assisting but not receiving salary or wages, Queensland (2.46 per cent.), Western Australia (.62 per cent.) ; (iv.) Receiving salary or wages, South Australia (67.64 per cent.), Tasmania (60.81 per cent.) ; (v.) Unemployed, Queensland (4.49 per cent.), South Australia (2.16 per cent.) ; (vi.) Grade not applicable, New South Wales (4.05 per cent.), Western Australia (2.57 per cent.).

A similar analysis of the data relative to females in the Domestic Class is furnished in the succeeding table :—

Grade of Occupation of Females. 1911.

CLASS II.—DOMESTIC.

State or Territory.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
NUMBER.							
States—							
New South Wales	1,605	1,815	812	47,791	1,499	1,002	54,524
Victoria	2,076	1,722	356	41,829	1,605	1,251	48,839
Queensland	734	679	454	17,274	704	506	20,351
South Australia	360	406	385	12,742	268	178	14,339
Western Australia	461	456	133	7,739	405	182	9,376
Tasmania	105	135	107	5,753	175	212	6,487
Territories—							
Northern	2	..	..	72	..	..	74
Federal	..	1	1	62	..	..	64
Commonwealth	5,343	5,214	2,248	133,262	4,656	3,331	154,054
PROPORTION PER CENT.							
States—							
New South Wales	2.94	3.33	1.49	87.65	2.75	1.84	100.00
Victoria	4.25	3.52	.73	85.65	3.29	2.56	100.00
Queensland	3.61	3.34	2.23	84.88	3.46	2.48	100.00
South Australia	2.51	2.83	2.69	88.86	1.87	1.24	100.00
Western Australia	4.92	4.86	1.42	82.54	4.32	1.94	100.00
Tasmania	1.62	2.08	1.65	88.68	2.70	3.27	100.00
Territories—							
Northern	2.70	..	..	97.30	..	..	100.00
Federal	..	1.56	1.56	96.88	..	..	100.00
Commonwealth	3.47	3.39	1.46	86.50	3.02	2.16	100.00

Amongst the States the highest and lowest percentages for the several grades were as follows :—(i.) Employers, Western Australia (4.92 per cent.), Tasmania (1.62 per cent.) ; (ii.) Workers on own account, Western Australia (4.86 per cent.), Tasmania (2.08 per cent.) ; (iii.) Assisting but not receiving salary or wages, South Australia (2.69 per cent.), Victoria (.73 per cent.) ; (iv.) Receiving salary or wages, South Australia (88.86 per cent.), Western Australia (82.54 per cent.) ; (v.) Unemployed, Western Australia (4.32 per cent.), South Australia (1.87 per cent.) ; (vi.) Grade not applicable, Tasmania (3.27 per cent.), South Australia (1.24 per cent.).

18. **Geographical Distribution of Commercial Class in Grades.**—In the next table is given an analysis of the data concerning the Commercial Class for the males in each State and Territory, classified according to grade of occupation :—

Grade of Occupation of Males. 1911.

CLASS III.—COMMERCIAL.

State or Territory.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
NUMBER.							
States—							
New South Wales	12,196	10,363	734	58,240	1,996	5,865	89,394
Victoria	10,684	8,116	491	49,773	1,763	5,376	76,203
Queensland	3,701	2,995	386	19,821	824	1,541	29,268
South Australia	2,939	2,335	257	15,424	293	1,542	22,790
Western Australia	2,211	1,560	86	10,656	396	613	15,522
Tasmania	1,118	708	72	4,646	124	552	7,220
Territories—							
Northern	38	35	2	119	2	..	196
Federal	3	5	..	7	..	4	19
Commonwealth	32,890	26,117	2,028	158,686	5,398	15,493	240,612
PROPORTION PER CENT.							
States—							
New South Wales	13.65	11.59	.82	65.15	2.23	6.56	100.00
Victoria	14.02	10.65	.64	65.32	2.31	7.06	100.00
Queensland	12.65	10.23	1.32	67.72	2.82	5.26	100.00
South Australia	12.90	10.24	1.13	67.68	1.28	6.77	100.00
Western Australia	14.25	10.05	.55	68.65	2.55	3.95	100.00
Tasmania	15.48	9.81	1.00	64.35	1.72	7.64	100.00
Territories—							
Northern	19.39	17.86	1.02	60.71	1.02	..	100.00
Federal	15.79	26.32	..	36.84	..	21.05	100.00
Commonwealth	13.67	10.86	.84	65.95	2.24	6.44	100.00

Omitting the Territories the greatest and least proportions for the several grades were as follows :—(i.) Employers, Tasmania (15.48 per cent.), Queensland (12.65 per cent.) ; (ii.) Workers on own account, New South Wales (11.59 per cent.), Tasmania (9.81 per cent.) ; (iii.) Assisting but not receiving salary or wages, Queensland (1.32 per cent.), Western Australia (.55 per cent.) ; (iv.) Receiving salary or wages, Western Australia (68.65 per cent.), Tasmania (64.35 per cent.) ; (v.) Unemployed, Queensland (2.82 per cent.), South Australia (1.28 per cent.) ; (vi.) Grade not applicable, Tasmania (7.64 per cent.), Western Australia (3.95 per cent.).

Corresponding particulars respecting females in the Commercial Class are given in the next table :—

Grade of Occupation of Females. 1911.

CLASS III.—COMMERCIAL.

State or Territory.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
NUMBER.							
States—							
New South Wales	884	1,789	894	12,212	324	2,122	18,225
Victoria	1,192	2,133	577	10,932	301	2,220	17,355
Queensland	237	618	391	3,952	101	434	5,733
South Australia	266	520	337	3,183	35	445	4,786
Western Australia	150	340	122	2,050	81	198	2,941
Tasmania	146	205	112	1,046	23	179	1,711
Territories—							
Northern	..	..	..	..	..	..	..
Federal	..	..	2	..	..	1	3
Commonwealth	2,875	5,605	2,435	33,375	865	5,599	50,754
PROPORTION PER CENT.							
States—							
New South Wales	4.85	9.82	4.90	67.01	1.78	11.64	100.00
Victoria	6.87	12.29	3.33	62.99	1.73	12.79	100.00
Queensland	4.13	10.78	6.82	68.94	1.76	7.57	100.00
South Australia	5.56	10.86	7.04	66.51	.73	9.30	100.00
Western Australia	5.10	11.56	4.15	69.71	2.75	6.73	100.00
Tasmania	8.53	11.98	6.55	61.13	1.35	10.46	100.00
Territories—							
Northern	..	..	..	..	..	..	..
Federal	..	..	66.67	..	..	33.33	100.00
Commonwealth	5.67	11.04	4.80	65.76	1.70	11.03	100.00

Amongst the States the highest and lowest percentages for the several grades were as follows :—(i.) Employers, Tasmania (8.53 per cent.), Queensland (4.13 per cent.) ; (ii.) Workers on own account, Victoria (12.29 per cent.), New South Wales (9.82 per cent.) ; (iii.) Assisting but not receiving salary or wages, South Australia (7.04 per cent.), Victoria (3.33 per cent.) ; (iv.) Receiving salary or wages, Western Australia (69.71 per cent.), Tasmania (61.13 per cent.) ; (v.) Unemployed, Western Australia (2.75 per cent.), South Australia (.73 per cent.) ; (vi.) Grade not applicable, Victoria (12.79 per cent.), Western Australia (6.73 per cent.).

19. **Geographical Distribution of Transport and Communication Class in Grades.**—An analysis of the number of males in the Transport and Communication Class in each State and Territory is furnished in the following table, according to Grade of Occupation :—

Grade of Occupation of Males. 1911.

CLASS IV.—TRANSPORT AND COMMUNICATION.

State or Territory.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
NUMBER.							
States—							
New South Wales	2,285	3,679	328	51,513	1,477	1,514	60,796
Victoria	1,371	1,552	160	32,958	934	1,231	38,206
Queensland	868	1,779	182	18,638	606	576	22,649
South Australia	438	524	42	14,266	230	222	15,722
Western Australia	368	465	17	10,681	241	180	11,952
Tasmania	216	210	38	3,808	77	128	4,477
Territories—							
Northern	16	13	..	148	12	5	194
Federal	1	1	..	11	..	..	13
Commonwealth	5,563	8,223	767	132,023	3,577	3,856	154,009
PROPORTION PER CENT.							
States—							
New South Wales	3.76	6.05	.54	84.73	2.43	2.49	100.00
Victoria	3.59	4.06	.42	86.26	2.45	3.22	100.00
Queensland	3.83	7.86	.80	82.29	2.68	2.54	100.00
South Australia	2.79	3.33	.27	90.74	1.46	1.41	100.00
Western Australia	3.08	3.89	.14	89.36	2.02	1.51	100.00
Tasmania	4.82	4.69	.85	85.06	1.72	2.86	100.00
Territories—							
Northern	8.25	6.70	..	76.29	6.18	2.58	100.00
Federal	7.69	7.69	..	84.62	..	..	100.00
Commonwealth	3.61	5.34	.50	85.73	2.32	2.50	100.00

Omitting the Territories, the highest and lowest percentages for the several grades were as follows :—(i.) Employers, Tasmania (4.82 per cent.), South Australia (2.79 per cent.) ; (ii.) Workers on own account, Queensland (7.86 per cent.), South Australia (3.33 per cent.) ; (iii.) Assisting but not receiving salary or wages, Tasmania (.85 per cent.), Western Australia (.14 per cent.) ; (iv.) Receiving salary or wages, South Australia (90.74 per cent.), Queensland (82.29 per cent.) ; (v.) Unemployed, Queensland (2.68 per cent.), South Australia (1.46 per cent.) ; (vi.) Grade not applicable, Victoria (3.22 per cent.), South Australia (1.41 per cent.).

Corresponding data in respect of females in the Transport and Communication Class are furnished in the succeeding table :—

Grade of Occupation of Females. 1911.

CLASS IV.—TRANSPORT AND COMMUNICATION.

State or Territory.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
NUMBER.							
States—							
New South Wales	40	5	7	1,536	5	4	1,597
Victoria	35	2	4	1,552	5	13	1,611
Queensland	6	2	2	610	..	1	621
South Australia	11	..	..	336	2	1	350
Western Australia	2	1	..	321	1	2	327
Tasmania	4	1	1	321	3	3	333
Territories—							
Northern	..	..	..	..	..	..	..
Federal	..	..	..	6	..	..	6
Commonwealth	98	11	14	4,682	16	24	4,845
PROPORTION PER CENT.							
States—							
New South Wales	2.51	.31	.44	96.18	.31	.25	100.00
Victoria	2.17	.12	.25	96.34	.31	.81	100.00
Queensland	.97	.32	.32	98.23	..	.16	100.00
South Australia	3.14	..	..	96.00	.57	.29	100.00
Western Australia	.61	.31	..	98.16	.31	.61	100.00
Tasmania	1.20	.30	.30	96.40	.90	.90	100.00
Territories—							
Northern	..	..	..	..	..	..	..
Federal	..	..	..	100.00	..	..	100.00
Commonwealth	2.02	.23	.29	96.64	.33	.49	100.00

In this case the numbers in any group other than that of wage earners is so small that the institution of comparisons furnishes little useful result. It will be seen that in all cases, the wage earners account for upwards of 96 per cent. of the total, and in two of the States for upwards of 98 per cent.

20. **Geographical Distribution of Industrial Class in Grades.**—The next table furnishes particulars concerning males in the Industrial Class in each State and Territory, classified according to grade of occupation :—

Grade of Occupation of Males. 1911.

CLASS V.—INDUSTRIAL.

State or Territory.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
NUMBER.							
States—							
New South Wales	14,900	6,216	531	135,968	8,072	8,038	173,725
Victoria	13,450	5,436	412	109,455	8,609	6,553	143,915
Queensland	4,440	2,317	389	43,976	3,752	2,579	57,453
South Australia	4,025	1,629	241	36,223	1,617	1,329	45,064
Western Australia	2,583	1,237	63	17,869	1,380	1,156	24,288
Tasmania	1,422	638	96	11,446	809	594	15,005
Territories—							
Northern	11	21	2	82	78	14	208
Federal	3	2	3	196	8	1	213
Commonwealth	40,834	17,496	1,737	355,215	24,325	20,264	459,871

Grade of Occupation of Males, 1911,—*continued.*

CLASS V.—INDUSTRIAL.

State or Territory.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
	PROPORTION PER CENT.						
States—							
New South Wales	8.58	3.58	.30	78.26	4.65	4.63	100.00
Victoria	9.34	3.78	.29	76.06	5.98	4.55	100.00
Queensland	7.73	4.03	.68	76.54	6.53	4.49	100.00
South Australia	8.93	3.62	.53	80.38	3.59	2.95	100.00
Western Australia	10.64	5.09	.26	73.57	5.68	4.76	100.00
Tasmania	9.48	4.25	.64	76.28	5.39	3.96	100.00
Territories—							
Northern	5.29	10.10	.96	39.42	37.50	6.73	100.00
Federal	1.41	.94	1.41	92.02	3.75	.47	100.00
Commonwealth	8.88	3.80	.38	77.24	5.29	4.41	100.00

Apart from the Territories the highest and lowest percentages in each grade were as follows :—(i.) Employers, Western Australia (10.64 per cent.), Queensland (7.73 per cent.),; (ii.) Workers on own account, Western Australia (5.09 per cent.), New South Wales (3.58 per cent.) ; (iii.) Assisting but not receiving salary or wages, Queensland (.68 per cent.), Western Australia (.26 per cent.) ; (iv.) Receiving salary or wages, South Australia (80.38 per cent.), Western Australia (73.57 per cent.) ; (v.) Unemployed, Queensland (6.53 per cent.), South Australia (3.59 per cent.) ; (vi.) Grade not applicable, Western Australia (4.76 per cent.), South Australia (2.95 per cent.).

Corresponding particulars in respect of females in the Industrial Class are furnished in the succeeding table :—

Grade of Occupation of Females. 1911.

CLASS V.—INDUSTRIAL.

State or Territory.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
	NUMBER.						
States—							
New South Wales	1,619	4,152	196	29,211	614	323	36,115
Victoria	1,699	3,314	178	40,303	867	401	46,762
Queensland	385	1,370	126	9,197	236	105	11,419
South Australia	309	1,095	127	6,692	89	32	8,344
Western Australia	159	438	21	3,233	124	31	4,006
Tasmania	177	341	20	1,960	86	23	2,607
Territories—							
Northern	1	1	..	1	1	..	4
Federal	..	4	..	..	..	..	4
Commonwealth	4,349	10,715	668	90,597	2,017	915	109,261
	PROPORTION PER CENT.						
States—							
New South Wales	4.48	11.50	.54	80.88	1.70	.90	100.00
Victoria	3.63	7.09	.38	86.19	1.85	.86	100.00
Queensland	3.37	12.00	1.10	80.54	2.07	.92	100.00
South Australia	3.70	13.12	1.52	80.20	1.07	.39	100.00
Western Australia	3.97	10.93	.53	80.70	3.10	.77	100.00
Tasmania	6.79	13.08	.77	75.18	3.30	.88	100.00
Territories—							
Northern	25.00	25.00	..	25.00	25.00	..	100.00
Federal	..	100.00	..	..	..	..	100.00
Commonwealth	3.98	9.81	.61	82.92	1.84	.84	100.00

Leaving the Territories out of account, the highest and lowest percentages in each grade were as follows :—(i.) Employers, Tasmania (6.79 per cent.), Queensland (3.37 per cent.) ; (ii.) Workers on own account, South Australia (13.12 per cent.), Victoria (7.09 per cent.) ; (iii.) Assisting but not receiving salary or wages, South Australia (1.52 per cent.), Victoria (.38 per cent.) ; (iv.) Receiving salary or wages, Victoria (86.19 per cent.), Tasmania (75.18 per cent.) ; (v.) Unemployed, Tasmania (3.30 per cent.), South Australia (1.07 per cent.) ; (vi.) Grade not applicable, Queensland (.92 per cent.), South Australia (.39 per cent.).

21. **Geographical Distribution of Primary Producers Class in Grades.**—In the succeeding table is furnished an analysis of the data in respect of males in the Primary Producers Class in each State and Territory, classified according to grade of occupation.

Grade of Occupation of Males. 1911.

CLASS VI.—PRIMARY PRODUCERS.

State or Territory.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
NUMBER.							
States—							
New South Wales	35.440	26,848	18,938	114,422	3,741	5,319	204,708
Victoria	32,834	21,319	18,671	67,853	3,004	3,954	147,635
Queensland	15,542	16,218	9,003	55,917	2,501	2,154	101,335
South Australia	12,122	6,990	6,423	22,801	664	958	49,958
Western Australia	7,208	8,422	2,299	34,080	1,367	686	54,062
Tasmania	5,081	4,782	3,676	17,351	411	414	31,715
Territories—							
Northern	82	602	13	913	62	19	1,691
Federal	72	48	28	244	5	4	401
Commonwealth	108,381	85,229	59,051	313,581	11,755	13,508	591,505
PROPORTION PER CENT.							
States—							
New South Wales	17.31	13.12	9.25	55.89	1.83	2.60	100.00
Victoria	22.24	14.44	12.65	45.96	2.03	2.68	100.00
Queensland	15.34	16.00	8.88	55.18	2.47	2.13	100.00
South Australia	24.26	13.99	12.86	45.64	1.33	1.92	100.00
Western Australia	13.33	15.58	4.25	63.04	2.53	1.27	100.00
Tasmania	16.02	15.08	11.59	54.71	1.30	1.30	100.00
Territories—							
Northern	4.85	35.60	.77	53.99	3.67	1.12	100.00
Federal	17.95	11.97	6.98	60.85	1.25	1.00	100.00
Commonwealth	18.32	14.41	9.98	53.02	1.99	2.28	100.00

Apart from the Territories, the highest and lowest percentages for each grade were as follows :—(i.) Employers, South Australia (24.26 per cent.), Western Australia (13.33 per cent.) ; (ii.) Workers on own account, Queensland (16.00 per cent.), New South Wales (13.12 per cent.) ; (iii.) Assisting, but not receiving salary or wages, South Australia (12.86 per cent.), Western Australia (4.25 per cent.) ; (iv.) Receiving salary or wages, Western Australia (63.04 per cent.), South Australia (45.64 per cent.) ; (v.) Unemployed, Western Australia (2.53 per cent.), Tasmania (1.30 per cent.) ; (vi.) Grade not applicable, Victoria (2.68 per cent.), Western Australia (1.27 per cent.).

The corresponding particulars in respect of female primary producers is furnished in the next table :—

Grade of Occupation of Females. 1911.

CLASS VI.—PRIMARY PRODUCERS.

State or Territory.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
NUMBER.							
States—							
New South Wales	1,346	687	2,988	261	..	15	5,297
Victoria	2,469	1,028	1,943	276	3	46	5,765
Queensland	431	345	2,460	189	1	8	3,434
South Australia	505	208	648	178	..	10	1,549
Western Australia	176	91	279	30	1	1	578
Tasmania	175	100	157	247	..	..	679
Territories—							
Northern	1	..	..	11	..	..	12
Federal	7	4	11	1	..	1	24
Commonwealth	5,110	2,463	8,486	1,193	5	81	17,338
PROPORTION PER CENT.							
States—							
New South Wales	25.41	12.97	56.41	4.93	..	.28	100.00
Victoria	42.83	17.83	33.70	4.79	.05	.80	100.00
Queensland	12.55	10.05	71.64	5.50	.03	.23	100.00
South Australia	32.60	13.43	41.83	11.49	..	.65	100.00
Western Australia	30.45	15.75	48.27	5.19	.17	.17	100.00
Tasmania	25.77	14.73	23.12	36.38	..	..	100.00
Territories—							
Northern	8.33	..	..	91.67	..	..	100.00
Federal	29.16	16.67	45.83	4.17	..	4.17	100.00
Commonwealth	29.47	14.21	48.94	6.88	.03	.47	100.00

The female group in the Primary Producers Class is relatively unimportant, and consists very largely of female proprietors of farms, etc., and of females assisting without receiving wages in connexion with dairying and other primary pursuits. It will be seen that for the Commonwealth as a whole, less than 7 per cent. of the females in the class were wage earners, while more than 29 per cent. were employers, and nearly 49 per cent. were returned as assisting but not receiving wages or salary.

22. **Grades for all Occupations, according to States and Territories.**—In the following table is furnished for each of the States and Territories of the Commonwealth a summary for males of all occupations (including dependents), classified according to grade :—

Grade of Occupation, Males. Commonwealth, States and Territories, 1911.

Grade.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.	F.	
NUMBER.									
E. ..	71,235	63,127	26,691	20,713	13,734	8,477	156	80	204,213
O. ..	51,651	39,895	24,661	12,250	12,484	6,742	688	56	148,427
A. ..	20,812	19,910	10,144	7,043	2,497	3,916	18	31	64,371
W. ..	399,031	287,268	150,714	95,693	81,206	40,555	1,421	517	1,056,405
N. ..	16,417	15,220	8,131	2,917	3,647	1,492	159	14	47,997
N.A. ..	298,552	230,171	109,165	68,742	47,997	36,409	292	294	791,622
Total	857,698	655,591	329,506	207,358	161,565	97,591	2,734	992	2,313,035
PROPORTION PER CENT.									
E. ..	8.31	9.63	8.10	9.99	8.50	8.68	5.71	8.06	8.83
O. ..	6.02	6.08	7.48	5.91	7.73	6.91	25.16	5.65	6.42
A. ..	2.43	3.04	3.08	3.39	1.54	4.01	.66	3.12	2.78
W. ..	46.52	43.82	45.74	46.15	50.26	41.56	51.97	52.12	45.67
N. ..	1.91	2.32	2.47	1.41	2.26	1.53	5.82	1.41	2.08
N.A. ..	34.81	35.11	33.13	33.15	29.71	37.31	10.68	29.64	34.22
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

A feature of this table, when the relatively unimportant experience of the Territories is left out of account, is the comparatively slight divergence from the Commonwealth average of the proportions per cent. shewn for any given grade under the several States. The most striking of the divergences shewn occur in the case of Western Australia, which State, owing to its rapid development in the last twenty years, is in a much less normal position than the others. In the case of this State, the grades of "workers on own account," and of "persons receiving salary or wages" each gave a higher percentage than in any other of the States, while the grades " assisting" and " not applicable" (mainly dependents), each gave a lower percentage than in any other State. Even in this case, however, the proportions for " Employers" and " unemployed" occupied a middle position amongst those for the other States. Amongst the States the highest proportion of " employers" was shewn by South Australia (9.99 per cent.), the smallest by Queensland (8.10 per cent.). In the case of "workers on own account," Western Australia with 7.73 per cent. had the highest, while South Australia with 5.91 per cent. had the lowest proportion. In the case of those " assisting but not receiving salary or wages," Tasmania with 4.01 per cent. shewed the highest, and Western Australia with 1.54 per cent. the lowest proportion. In the case of " persons receiving salary or wages," Western Australia (50.26 per cent.) shewed the highest, and Tasmania (41.56 per cent.) the lowest proportion. In the case of the " unemployed," Queensland (2.47 per cent.), gave the highest, and South Australia (1.41 per cent.) gave the lowest proportion. Finally the highest proportion in the case of those to whom grade was not applicable occurred in the case of Tasmania (37.31 per cent.), the lowest in that of Western Australia (29.71 per cent.).

Corresponding particulars for the grades of females of all occupations in the several States and Territories are furnished in the next table :—

Grade of Occupation, Females. Commonwealth, States and Territories, 1911.

Grade.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.	F.	
				NUMBER.					
E. ..	5,820	7,793	1,859	1,524	1,004	642	4	7	18,653
O. ..	13,127	12,555	4,235	3,353	2,203	1,249	3	9	36,734
A. ..	4,960	3,093	3,490	1,527	561	411	..	14	14,056
W. ..	102,336	105,131	35,399	26,030	15,255	10,715	93	76	295,035
N. ..	2,713	3,044	1,106	433	662	326	1	..	8,285
N.A. ..	660,080	528,344	230,218	168,333	100,864	80,277	475	616	1,769,207
Total	789,036	659,960	276,307	201,200	120,549	93,620	576	722	2,141,970
				PROPORTION PER CENT.					
E. ..	.74	1.18	.67	.76	.83	.69	.69	.97	.87
O. ..	1.66	1.90	1.53	1.67	1.83	1.33	.52	1.25	1.71
A. ..	.63	.47	1.27	.76	.47	.44	..	1.94	.66
W. ..	12.97	15.93	12.81	12.94	12.66	11.44	16.15	10.52	13.77
N. ..	.34	.46	.40	.21	.55	.35	.17	..	.39
N.A. ..	83.66	80.06	83.32	83.66	83.66	85.75	82.47	85.32	82.60
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Amongst females, Victoria exhibited a higher proportion in the case of " employers," " workers on own account," and " persons receiving salary or wages," than was the case with any other of the States. The highest proportion for those " assisting" occurred in Queensland, for the " unemployed" in Western Australia, and for those to whom " grade was not applicable" in Tasmania. On the other hand Tasmania exhibited amongst the States the lowest proportions for " workers on own account," for those " assisting," and for the " persons receiving salary or wages." The lowest proportion for " employers" occurred in the case of Queensland, for " unemployed" in the case of South Australia, and for " grade not applicable" in Victoria.

23. **Grades for Males at Successive Censuses.**—Unfortunately full information respecting grades is not available in all the States for the last three Censuses, Queensland being deficient in respect of 1891 and 1901, and Western Australia in respect of 1891. The numbers available for males adjusted to allow for the unspecified, are furnished in the following table :—

Grade of Occupation of Males in each State. Comparison of Numbers, 1891, 1901 and 1911.

Year.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
NEW SOUTH WALES.							
1891	53,589	49,664	8,970	246,365	19,526	229,889	608,003
1901	49,077	65,798	17,674	291,322	21,177	264,957	710,005
1911	71,315	51,707	20,843	399,548	16,431	298,846	858,690
VICTORIA.							
1891	40,013	59,031	20,787	246,536	18,523	213,199	598,089
1901	43,288	66,811	26,889	233,211	12,183	221,338	603,720
1911	63,127	39,895	19,910	287,268	15,220	230,171	655,591
QUEENSLAND.							
1911	26,691	24,661	10,144	150,714	8,131	109,165	329,506
SOUTH AUSTRALIA.							
1891	16,475	11,186	7,372	65,031	2,997	63,740	166,801
1901	14,369	16,082	5,536	79,490	3,384	65,840	184,701
1911	20,869	12,938	7,061	97,114	3,076	69,034	210,092
WESTERN AUSTRALIA.							
1901	7,792	10,322	1,920	61,848	3,195	27,798	112,875
1911	13,734	12,484	2,497	81,206	3,647	47,997	161,565
TASMANIA.							
1891	5,215	8,071	4,008	29,937	1,328	29,001	77,560
1901	6,213	9,100	4,098	36,063	1,810	32,340	89,624
1911	8,477	6,742	3,916	40,555	1,492	36,409	97,591

The experience of the several States in respect of numbers in the several grades at successive Censuses has been far from uniform. Thus, whilst in the case of " employers," Victoria and Tasmania shewed continuous increases from Census to Census, New South Wales and South Australia shewed a diminution between 1891 and 1901, and a marked increase between 1901 and 1911. Similar variations may be noticed in other cases. In the four States for which data for the three Censuses are available, there is in evidence in each case an increase in the number of workers on own account between 1891 and 1901 and a marked decrease between 1901 and 1911.

The succeeding table shews the ratio per cent. which the numbers in each grade in each State bore to the number for all grades for that State :—

Grade of Occupation of Males in each Class. Centesimal Comparison, 1891, 1901 and 1911.

Year.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
NEW SOUTH WALES.							
1891	8.81	8.17	1.48	40.52	3.21	37.81	100.00
1901	6.91	9.27	2.49	41.03	2.98	37.32	100.00
1911	8.31	6.02	2.43	46.53	1.91	34.80	100.00
VICTORIA.							
1891	6.69	9.87	3.47	41.22	3.10	35.65	100.00
1901	7.17	11.07	4.45	38.63	2.02	36.66	100.00
1911	9.63	6.08	3.04	43.82	2.32	35.11	100.00
QUEENSLAND.							
1911	8.10	7.48	3.08	45.74	2.47	33.13	100.00
SOUTH AUSTRALIA.							
1891	9.88	6.70	4.42	38.99	1.80	38.21	100.00
1901	7.78	8.71	3.00	43.04	1.83	35.64	100.00
1911	9.93	6.16	3.36	46.23	1.46	32.86	100.00
WESTERN AUSTRALIA.							
1901	6.90	9.15	1.70	54.79	2.83	24.63	100.00
1911	8.50	7.73	1.54	50.26	2.26	29.71	100.00
TASMANIA.							
1891	6.72	10.41	5.17	38.60	1.71	37.39	100.00
1901	6.93	10.15	4.57	40.24	2.02	36.09	100.00
1911	8.69	6.91	4.01	41.55	1.53	37.31	100.00

From the trend of the percentages in the above table in those States for which data are available for the last three Censuses, it is clear that there has been a general tendency amongst males for the proportions of " employers" and " wage or salary earners" to increase, and for the proportions " on own account," " assisting," " unemployed," and " not applicable" (dependent) to diminish.

24. **Grades for Females at Successive Censuses.**—The two succeeding tables furnish in respect of females information corresponding to that given for males in Section 23. The numbers, where available, for the last three Censuses are as follows :—

Grade of Occupation of Females in each State. Comparison of Numbers, 1891, 1901 and 1911.

Year.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
NEW SOUTH WALES.							
1891	2,643	14,141	7,534	54,943	2,867	433,823	515,951
1901	4,939	16,848	6,084	72,386	3,649	540,935	644,841
1911	5,827	13,136	4,974	102,412	2,713	660,696	789,758
VICTORIA							
1891	3,072	15,942	5,899	73,014	3,270	440,554	541,751
1901	5,007	20,556	30,111	84,171	2,731	454,774	597,350
1911	7,793	12,555	3,093	105,131	3,044	528,344	659,960
QUEENSLAND.							
1911	1,859	4,235	3,490	35,399	1,106	230,218	276,307
SOUTH AUSTRALIA.							
1891	1,013	1,851	1,578	18,989	419	129,780	153,630
1901	1,095	3,566	2,252	23,492	692	147,359	178,456
1911	1,528	3,356	1,527	26,123	434	168,808	201,776
WESTERN AUSTRALIA.							
1901	651	1,814	951	9,173	479	58,181	71,249
1911	1,004	2,203	561	15,255	662	100,864	120,549
TASMANIA.							
1891	323	1,421	1,935	8,059	418	56,951	69,107
1901	462	2,434	2,071	10,229	356	67,299	82,851
1911	642	1,249	411	10,715	326	80,277	93,620

In the four States for which information for three Censuses is available, there is in evidence a continuous increase in the numbers of "employers," of "wage and salary earners," and of those to whom grade was "not applicable" (mainly dependents). In each of these cases also the number working "on own account" increased from 1891 to 1901, and diminished from 1901 to 1911. In the "assisting" group it is evident that the classification in Victoria in 1901 differed essentially from that in the other States for the same Census, and also from that of the other Censuses for the same State. Presumably women engaged in domestic duties were in many cases in the Victorian Census of 1901 wrongly classed as "assisting," instead of under the head of "dependents."

The proportion per cent. of females in each grade at each Census is shewn in the next table for each of the States of the Commonwealth.

Grade of Occupation of Females in each Class. Centesimal Comparison, 1891, 1901 and 1911.

Year.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
NEW SOUTH WALES.							
1891	.51	2.74	1.46	10.65	.56	84.08	100.00
1901	.77	2.61	.94	11.22	.57	83.89	100.00
1911	.74	1.66	.63	12.97	.34	83.66	100.00
VICTORIA.							
1891	.57	2.94	1.09	13.48	.60	81.32	100.00
1901	.84	3.44	5.04	14.09	.46	76.13	100.00
1911	1.18	1.90	.47	15.93	.46	80.06	100.00
QUEENSLAND.							
1911	.67	1.53	1.27	12.81	.40	83.32	100.00
SOUTH AUSTRALIA.							
1891	.66	1.20	1.03	12.36	.27	84.48	100.00
1901	.61	2.00	1.26	13.16	.39	82.58	100.00
1911	.76	1.66	.76	12.95	.21	83.66	100.00
WESTERN AUSTRALIA.							
1901	.91	2.55	1.34	12.87	.67	81.66	100.00
1911	.83	1.83	.47	12.65	.55	83.67	100.00
TASMANIA.							
1891	.47	2.06	2.80	11.66	.60	82.41	100.00
1901	.56	2.94	2.50	12.34	.43	81.23	100.00
1911	.68	1.33	.44	11.45	.35	85.75	100.00

As in the case of males, there is in evidence amongst females a general tendency for the proportions of "employers" and of "those receiving salary or wages" to increase and for the proportions in the other grades to diminish. The increase in the proportions of females who are "receiving salary or wages" is most marked from Census to Census in the cases of the two most populous States, New South Wales and Victoria. At all three Censuses there was a higher proportion of Victorian females in receipt of wages or salary than was the case in any other of the States. In the case of those "receiving salary or wages," in South Australia and Tasmania there was an increase in the proportion between 1891 and 1901, and a decrease between 1901 and 1911.

25. **Class of Occupation and Age of Males.**—In the following table is given a classification of the number of males in the Commonwealth according to class of occupation and age, the ages being given in quinquennial groups throughout. The Census of 1911 was the first occasion on which such a detailed analysis according to age has been undertaken in conjunction with nature and grade of occupation at an Australian Census. At previous Censuses the occupational age classification was usually restricted to the seven groups of ages, 0-4, 5-14, 15-19, 20-24, 25-44, 45-59, and 60 and upwards.

Class of Occupation and Age. Number of Males. Commonwealth, 1911.

Age.	Class of Occupation. I. Professional.	II. Domestic.	III. Commercial.	IV. Transport and Communication.	V. Industrial.	VI. Primary Producers.	VII. Independent.	VIII. Dependents.	All Classes.
0–4 ..	..	..	..	..	..	..	..	268,073	268,073
5–9 ..	3	3	11	3	19	109	..	230,011	230,159
10–14 ..	1,227	847	6,913	1,909	9,664	14,221	..	181,563	216,344
15–19 ..	7,990	4,417	34,652	16,731	67,034	76,340	24	21,141	228,329
20–24 ..	12,439	5,938	34,033	23,841	68,941	82,023	126	2,361	229,702
25–29 ..	12,494	5,782	29,496	23,139	59,049	70,591	138	574	201,263
30–34 ..	10,605	5,540	26,485	18,984	47,773	62,284	189	416	172,276
35–39 ..	10,061	5,238	22,704	16,174	41,332	56,814	192	388	152,903
40–44 ..	9,527	5,018	21,402	14,835	40,102	54,290	255	419	145,848
45–49 ..	8,932	4,564	18,736	13,994	37,781	49,289	314	366	133,976
50–54 ..	7,174	3,779	14,844	10,535	31,341	40,464	415	307	108,859
55–59 ..	4,673	2,635	9,596	6,302	20,849	27,661	575	250	72,541
60–64 ..	3,149	2,018	7,094	3,546	13,893	20,644	1,111	304	51,759
65–69 ..	2,262	1,540	5,745	2,006	9,694	15,950	3,025	269	40,491
70–74 ..	1,373	869	4,152	1,103	6,376	10,702	4,323	357	29,255
75–79 ..	822	468	2,868	621	3,673	6,389	3,752	358	18,951
80–84 ..	436	151	1,415	190	1,718	2,721	1,981	251	8,863
85–89 ..	125	55	368	77	475	805	640	106	2,651
90–94 ..	28	6	88	15	126	161	183	34	641
95–99 ..	4	1	9	..	28	36	31	7	116
100 and over	..	2	1	4	3	11	12	2	35
Total	93,324	48,871	240,612	154,009	459,871	591,505	17,286	707,557	2,313,035

With the exception of Class VIII., Dependents, each of the classes commences at zero at the younger ages, and after rising to a maximum declines regularly to zero at the oldest age. The point at which the maximum number occurs varies with the different classes. Thus the maximum for the professional class is in age-group 25-29 ; for the domestic, the transport and communication, the industrial and the primary producers in age-group 20-24 ; for the commercial in the age-group 15-19 ; and for the independent in the age-group 70-74. With minor fluctuations the numbers in the Dependent Class may be said to decline with age throughout.

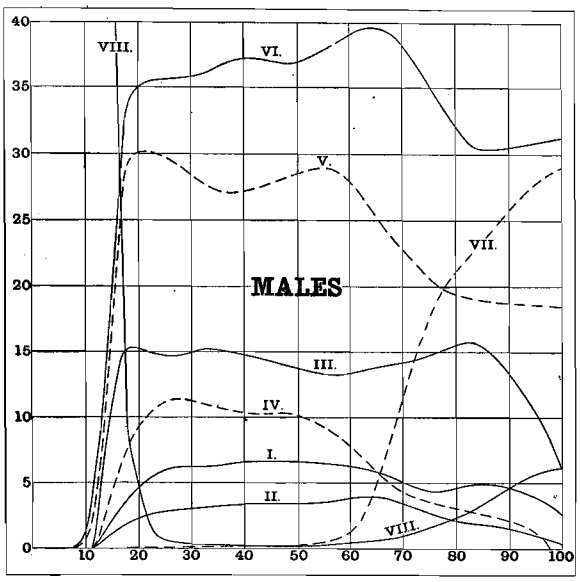
The next table furnishes for each age-group the proportion of the Commonwealth males therein who were included in each Class of Occupation :—

Class of Occupation and Age. Proportion per cent. of Males. Commonwealth, 1911.

Age.	Class of Occupation. I. Professional.	II. Domestic.	III. Commercial.	IV. Transport and Communication.	V. Industrial.	VI. Primary Producers.	VII. Independent.	VIII. Dependents.	All Classes.
0–4 ..	..	..	..	..	..	..	..	100.00	100.00
5–9 ..	..	..	..	..	.01	.05	..	99.94	100.00
10–14 ..	.57	.39	3.20	.88	4.47	6.57	..	83.92	100.00
15–19 ..	3.50	1.93	15.18	7.33	29.36	33.43	.01	9.26	100.00
20–24 ..	5.42	2.58	14.82	10.38	30.01	35.71	.05	1.03	100.00
25–29 ..	6.21	2.87	14.66	11.50	29.34	35.07	.07	.28	100.00
30–34 ..	6.16	3.22	15.37	11.02	27.73	36.15	.11	.24	100.00
35–39 ..	6.58	3.42	14.85	10.58	27.03	37.16	.13	.25	100.00
40–44 ..	6.53	3.44	14.67	10.17	27.50	37.22	.18	.29	100.00
45–49 ..	6.67	3.41	13.98	10.45	28.20	36.79	.23	.27	100.00
50–54 ..	6.59	3.47	13.64	9.68	28.79	37.17	.38	.28	100.00
55–59 ..	6.44	3.63	13.23	8.69	28.74	38.13	.79	.35	100.00
60–64 ..	6.08	3.90	13.71	6.85	26.84	39.88	2.15	.59	100.00
65–69 ..	5.59	3.80	14.19	4.95	23.94	39.39	7.47	.67	100.00
70–74 ..	4.69	2.97	14.19	3.77	21.80	36.58	14.78	1.22	100.00
75–79 ..	4.34	2.47	15.13	3.28	19.38	33.71	19.80	1.89	100.00
80–84 ..	4.92	1.70	15.97	2.14	19.39	30.70	22.35	2.83	100.00
85–89 ..	4.72	2.07	13.88	2.90	17.92	30.37	24.14	4.00	100.00
90–94 ..	4.37	.93	13.73	2.34	19.66	25.12	28.55	5.30	100.00
95–99 ..	3.45	.86	7.76	..	24.14	31.03	26.72	6.04	100.00
100 and over	..	5.71	2.86	11.43	8.57	31.43	34.29	5.71	100.00
Total	4.04	2.11	10.40	6.66	19.88	25.57	.75	30.59	100.00

An interesting feature of this table is the relatively small change with age exhibited by several of the classes through important ranges of ages. Thus in the professional class between the limits of 25 and 65 years of age the proportion varies from 6.08 per cent. for group 60-64, to 6.67 per cent. for group 45-49. In the domestic class between ages 30 and 70, the variation is from 3.22 per cent. for group 30-34, to 3.90 per cent. for group 60-64. In the commercial class the range for sensibly uniform proportion is very great, for between the ages of 15 and 95 the limits of variation are only from 13.23 per cent. for the group 55-59, to 15.97 per cent. for the group 80-84. In the transport and communication class the range of relatively uniform proportion is less extensive, but is well marked between ages 20 and 50, varying over this range between the limits of 10.17 per cent. for group 40-44, and 11.50 per cent. for group 25-29. In the industrial class, between the ages of 15 and 65 the proportion varies from 26.84 per cent. in group 60-64, to 30-01 per cent. in group 20-24. In the class of primary producers the range from 15 to 80 years of age exhibits proportions varying between the limits of 33.43 per cent. for group 15-19, and 39.88 per cent. for group 60-64. The classes of independents and dependents are essentially different in their age distribution from the other classes. Thus the independent class exhibits a continuous upward trend from zero, while the dependent class after diminishing rapidly to a minimum for the age-group 30-34 increases practically continuously thereafter.

Proportional Distribution of Males according to Class of Occupation and Age, Commonwealth, 1911.



GRAPH No. 148.

The accompanying Graph (No. 148) furnishes a representation of the proportional age distribution of Australian males according to classes of occupation. The base of each small rectangle represents 10 years of age, while the vertical height represents 5 per cent. The Roman numerals shewn on the Graph refer to the several classes of occupation, and have the significance indicated in the preceding table.

26. **Class of Occupation and Age of Females.**—The next table contains a classification of the number of females in the Commonwealth according to class of occupation and age :—

Class of Occupation and Age. Number of Females. Commonwealth, 1911.

Age.	Class of Occupation.								All Classes.
	I. Professional.	II. Domestic.	III. Commercial.	IV. Transport and Communication.	V. Industrial.	VI. Primary Producers.	VII. Independent.	VIII. Dependents.	
0–4 ..	..	..	..	..	..	..	..	258,850	258,850
5–9 ..	14	29	3	..	10	18	..	224,132	224,206
10–14 ..	274	5,088	916	21	4,284	805	2	201,480	212,870
15–19 ..	5,955	35,820	12,450	625	40,665	2,931	38	124,654	223,138
20–24 ..	11,198	36,135	11,463	943	28,491	1,686	189	129,390	219,495
25–29 ..	9,323	21,369	5,960	647	12,850	1,023	232	138,265	189,669
30–34 ..	6,613	13,502	3,626	503	6,813	949	233	128,639	160,878
35–39 ..	5,322	10,801	2,963	472	5,036	993	222	114,658	140,467
40–44 ..	4,248	9,069	2,645	481	3,967	1,256	297	103,499	125,462
45–49 ..	3,397	7,817	2,444	435	2,929	1,504	380	90,336	109,242
50–54 ..	2,641	5,678	2,032	320	1,917	1,511	448	70,789	85,336
55–59 ..	1,754	3,821	1,538	192	1,001	1,172	469	47,343	57,290
60–64 ..	1,189	2,490	1,392	103	602	1,114	852	36,520	44,262
65–69 ..	752	1,423	1,217	51	402	1,001	1,495	30,359	36,700
70–74 ..	365	609	989	33	164	709	1,689	21,618	26,176
75–79 ..	155	277	650	13	86	434	1,346	13,648	16,609
80–84 ..	57	80	325	5	35	167	778	6,293	7,740
85–89 ..	23	35	106	1	6	51	329	2,169	2,720
90–94 ..	4	8	29	..	2	10	93	558	704
95–99 ..	..	2	5	..	1	4	17	98	127
100 and over	..	1	1	..	..	..	7	20	29
Total	53,284	154,054	50,754	4,845	109,261	17,338	9,116	1,743,318	2,141,970

As in the case of males referred to in Section 25, each class except that of dependents exhibits a variation with age, rising rapidly from zero to a maximum and diminishing thereafter more slowly. In the case of the professional, the domestic and the transport and communication classes, this maximum is attained in the age-group 20-24; in the commercial, the industrial, and the primary producers classes it is reached in the group 15-19; while in the independent class it is reached in the group 70-74. The dependent class diminishes rapidly from the commencement of life to group 15-19, thence increases to group 25-29, and thereafter diminishes throughout.

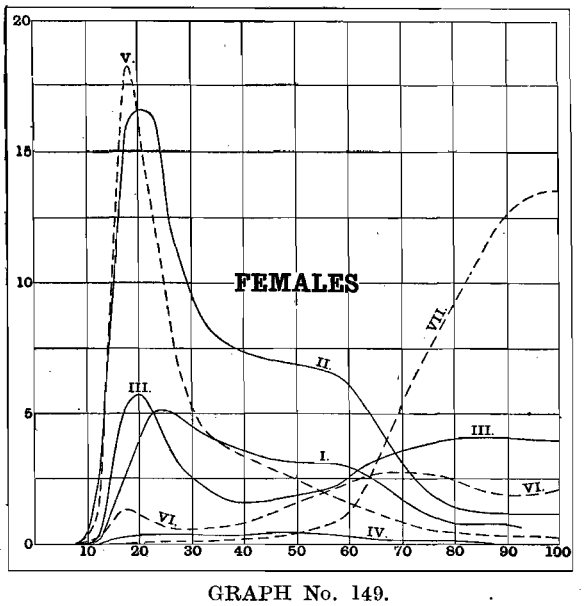
Corresponding to the numbers shewn in the preceding table, the following table furnishes the proportions for each age-group which the number in each class of occupation was of the total for the age-group :—

Class of Occupation and Age. Proportion per cent. of Females. Commonwealth, 1911.

Age.	Class of Occupation.								All Classes.
	I. Professional.	II. Domestic.	III. Commercial.	IV. Transport and Communication.	V. Industrial.	VI. Primary Producers.	VII. Independent.	VIII. Dependents.	
0–4 ..	..	..	..	..	..	..	..	100.00	100.00
5–9 ..	.01	.01	..	..	..	.01	..	99.97	100.00
10–14 ..	.13	2.39	.43	.01	2.01	.38	..	94.65	100.00
15–19 ..	2.67	16.05	5.58	.28	18.22	1.31	.02	55.87	100.00
20–24 ..	5.10	16.46	5.22	.43	12.98	.77	.09	58.95	100.00
25–29 ..	4.92	11.27	3.14	.34	6.77	.54	.12	72.90	100.00
30–34 ..	4.11	8.39	2.25	.31	4.24	.59	.15	79.96	100.00
35–39 ..	3.79	7.69	2.11	.33	3.58	.71	.16	81.63	100.00
40–44 ..	3.39	7.23	2.11	.38	3.16	1.00	.24	82.49	100.00
45–49 ..	3.11	7.15	2.24	.40	2.68	1.38	.35	82.69	100.00
50–54 ..	3.09	6.65	2.38	.38	2.25	1.77	.53	82.95	100.00
55–59 ..	3.06	6.67	2.68	.34	1.75	2.04	.82	82.64	100.00
60–64 ..	2.69	5.63	3.14	.23	1.36	2.52	1.92	82.51	100.00
65–69 ..	2.04	3.88	3.32	.14	1.10	2.73	4.07	82 72	100.00
70–74 ..	1.39	2.32	3.78	.13	.63	2.71	6.45	82.59	100.00
75–79 ..	.93	1.67	3.91	.08	.52	2.61	8.11	82.17	100.00
80–84 ..	.74	1.03	4.20	.07	.45	2.16	10.05	81.30	100.00
85–89 ..	.85	1.29	3.90	.04	.22	1.87	12.09	79.74	100.00
90–94 ..	.57	1.14	4.12	..	.28	1.42	13.21	79.26	100.00
95–99 ..	..	1.57	3.94	..	.79	3.15	13.39	77.16	100.00
100 and over	..	3.45	3.45	..	..	..	24.14	68.96	100.00
Total	2.49	7.19	2.37	.23	5.10	.81	.42	81.39	100.00

The proportions amongst females exhibit much greater variation with age than is the case amongst males. The professional and domestic classes exhibit well-defined maximum points in the age-groups 20-24, and the commercial and industrial classes in group 15-19. The transport and communication class exhibits two maximum points, one in age-group 20-24, the second in age-group 45-49. Similarly the primary producers class exhibits one well-defined maximum in group 15-19, and another in group 65-69, with a minimum between them in group 25-29. The Commercial class also attains a minimum at about 40, and a second maximum in the group 80-84. The Independent class increases with age throughout, while the dependent class fluctuates somewhat.

Proportional Distribution of Females according to Class of Occupation and Age, Commonwealth, 1911.



GRAPH No. 149.

In Graph No. 149 a representation is furnished of the distribution per cent. of the females, at each age according to class of occupation. For convenience in representation, Class VIII. (Dependents), which at all ages amongst females accounts for more than 55 per cent. of the total, and at most ages for upwards of 75 per cent., has been omitted from the Graph. The base of each small rectangle represents 10 years of age, and the vertical height five per cent. The Roman numerals shewn on the Graph refer to the several classes of occupation, and have the significance indicated in the preceding table.

27. **Grade of Occupation and Age of Males.**—A classification of the data for males in respect of grades of occupation according to age, furnishes the particulars contained in the next table :—

Grade of Occupation and Age. Number of Males. Commonwealth, 1911.

Age.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
0–4	..	..	..	..	..	268,073	268,073
5–9	..	..	62	86	..	230,011	230,159
10–14	3	83	7,846	26,174	483	181,755	216,344
15–19	824	2,545	28,284	167,896	5,860	22,920	228,329
20–24	9,544	9,388	14,968	182,420	8,048	5,334	229,702
25–29	19,947	14,378	6,431	150,682	6,064	3,761	201,263
30–34	26,231	16,704	2,941	117,839	4,918	3,643	172,276
35–39	28,063	16,976	1,457	98,625	4,045	3,737	152,903
40–44	29,585	18,232	795	88,759	4,052	4,425	145,848
45–49	27,597	18,228	463	79,014	3,835	4,839	133,976
50–54	22,190	16,140	260	61,343	3,642	5,284	108,859
55–59	14,104	11,550	177	38,692	2,690	5,328	72,541
60–64	9,974	8,880	166	23,200	2,180	7,359	51,759
65–69	7,529	7,029	183	12,887	1,544	11,319	40,491
70–74	4,575	4,600	192	5,796	490	13,602	29,255
75–79	2,656	2,548	80	2,265	132	11,270	18,951
80–84	1,065	909	53	575	14	6,247	8,863
85–89	269	206	10	132	..	2,034	2,651
90–94	47	28	3	17	..	546	641
95–99	10	3	..	3	..	100	116
100 and over	..	..	..	..	..	35	35
Total	204,213	148,427	64,371	1,056,405	47,997	791,622	2,313,035

The variation with age of the numbers in the several grades is clearly brought out in this table. In each case except that in which grade is not applicable (mainly dependents), the numbers increase with age from zero to a maximum, and then regularly diminish. In the case of " employers" and of " workers on own account," the maximum is reached in the age-group 40-44 ; in the " assisting" grade it is reached in the group 15-19 ; and in the case of those earning wages or salary, and of the unemployed, in the group 20-24. The group containing those to whom grade is not applicable diminishes with age from the earliest age to group 30-34, then increases to a maximum point in the group 70-74, diminishing thereafter. It may be noted that out of the total of 64,371 in the " assisting" class, no fewer than 51,160 or nearly 80 per cent. were under the age of 25.

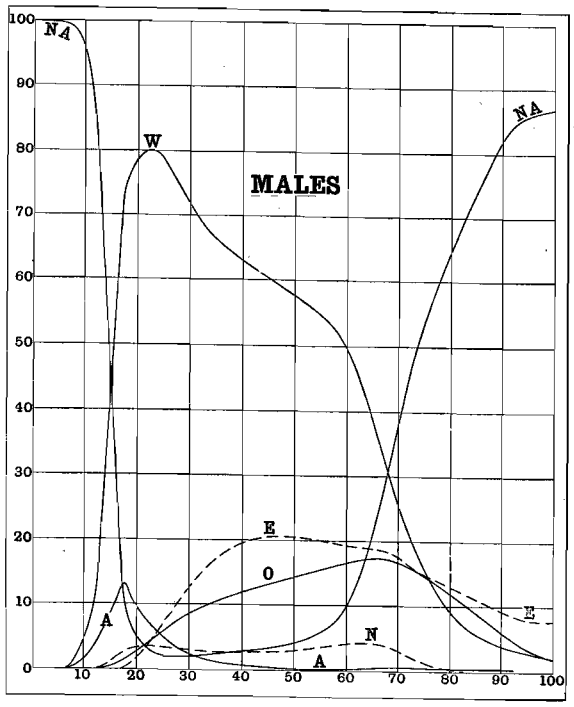
The proportions for each age-group which the number of males in each grade bore to the total for the age-group is shewn in the succeeding table :—

Grade of Occupation. Proportion per cent. of Males in each Age-group. Commonwealth, 1911.

Age.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
0–4	..	..	..	..	..	100.00	100.00
5–9	..	..	.03	.04	..	99.93	100.00
10–14	..	.04	3.63	12.10	.22	84.01	100.00
15–19	.36	1.11	12.39	73.53	2.57	10.04	100.00
20–24	4.15	4.09	6.52	79.42	3.50	2.32	100.00
25–29	9.91	7.14	3.20	74.87	3.01	1.87	100.00
30–34	15.23	9.70	1.71	68.40	2.85	2.11	100.00
35–39	18.35	11.10	.95	64.50	2.65	2.45	100.00
40–44	20.28	12.50	.55	60.86	2.78	3.03	100.00
45–49	20.60	13.60	.35	58.98	2.86	3.61	100.00
50–54	20.38	14.83	.24	56.35	3.35	4.85	100.00
55–59	19.44	15.92	.24	53.34	3.71	7.35	100.00
60–64	19.27	17.16	.32	44.82	4.21	14.22	100.00
65–69	18.59	17.36	.45	31.83	3.81	27.96	100.00
70–74	15.64	15.72	.66	19.81	1.67	46.50	100.00
75–79	14.01	13.45	.42	11.95	.70	59.47	100.00
80–84	12.02	10.25	.60	6.49	.16	70.48	100.00
85–89	10.15	7.77	.38	4.98	..	76.72	100.00
90–94	7.33	4.37	.47	2.65	..	85.18	100.00
95–99	8.62	2.59	..	2.59	..	86.20	100.00
100 and over	..	..	..	..	..	100.00	100.00
All Ages	8.83	6.42	2.78	45.67	2.08	34.22	100.00

A comparison of the above table with the corresponding table given in Section 25, indicates that the proportionate distribution of grades of occupation varies much more markedly with age than is the case with class of occupation. In the case of "employers," "workers on own account," "assisting" and "wage or salary earners," there is an increase to a well-defined maximum and regular decline thereafter, the maximum being attained in the case of "employers" in the age-group 45-49; in the case of "workers on own account" in group 65-69; in the case of those "assisting" in group 15-19; and in the case of "wage or salary earners" in group 20-24. The "unemployed" figures furnish two maximum points, one in group 20-24, the other in group 60-64. The figures for those to whom grade is not applicable furnish a scale of rapidly diminishing proportions to a minimum in group 25-29, and a continuous rise thereafter.

Proportional Distribution of Males according to Grade of Occupation and Age, Commonwealth, 1911.



GRAPH No. 150.

A representation of the proportion per cent. of the males at each age who were comprised in each of the several grades of occupation is shewn in Graph No. 150. The base of each small rectangle represents 10 years of age, and the vertical height 10 per cent. The letters shewn on the Graph denote the several grades of occupation, and have the significance indicated in Section 14 of the present Chapter.

28. **Grade of Occupation and Age of Females.**—The succeeding table furnishes a classification of the numbers of females according to grade of occupation and age :—

Grade of Occupation and Age. Number of Females. Commonwealth, 1911.

Age.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
0–4	..	..	..	..	..	258,850	258,850
5–9	..	1	7	64	..	224,134	224,206
10–14	..	22	872	10,235	144	201,597	212,870
15–19	99	1,468	3,711	89,493	2,288	126,079	223,138
20–24	765	4,207	2,358	78,602	2,251	131,312	219,495
25–29	1,250	3,939	1,425	41,751	1,239	140,065	189,669
30–34	1,694	3,755	1,254	23,271	645	130,259	160,878
35–39	2,108	3,969	1,094	16,495	494	116,307	140,467
40–44	2,460	4,164	1,080	12,207	358	105,193	125,462
45–49	2,629	4,273	815	9,305	285	91,935	109,242
50–54	2,167	3,810	611	6,074	221	72,453	85,336
55–59	1,581	2,616	376	3,661	152	48,904	57,290
60–64	1,365	1,971	231	2,125	105	38,465	44,262
65–69	1,088	1,363	127	1,131	81	32,910	36,700
70–74	753	683	67	412	18	24,243	26,176
75–79	447	343	22	155	4	15,638	16,609
80–84	178	113	6	44	..	7,399	7,740
85–89	54	34	..	10	..	2,622	2,720
90–94	11	3	..	..	..	690	704
95–99	4	..	..	..	..	123	127
100 and over	..	..	..	..	..	29	29
Total	18,653	36,734	14,056	295,035	8,285	1,769,207	2,141,970

With the exception of those to whom grade is not applicable, the numbers in each grade exhibit a variation with age consisting in a rise from zero to a maximum and regular decline thereafter. This maximum point is reached in the age-group 45-49 in the case of "employers," and "workers on own account," and in the group 15-19 in the case of the other three grades. The numbers for those to whom grade is not applicable diminish to a minimum in group 15-19, then rise to a maximum in group 25-29, and decline regularly thereafter.

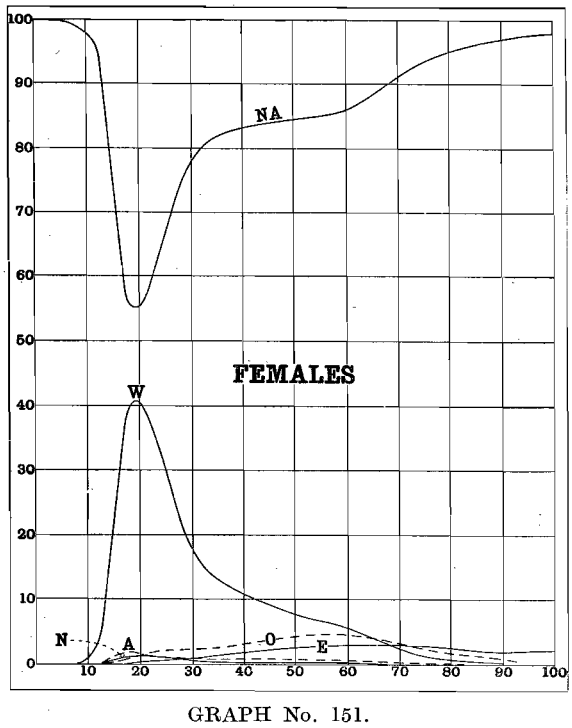
The following table furnishes for each age-group the proportion which the number of females in each grade bore to the total for the age-group :—

Grade of Occupation. Proportion per cent. of Females in each Age-group. Commonwealth, 1911.

Age.	Grade of Occupation.						All Grades.
	E.	O.	A.	W.	N.	N.A.	
0–4	..	..	..	..	..	100.00	100.00
5–9	..	..	..	.03	..	99.97	100.00
10–14	..	.01	.41	4.81	.07	94.70	100.00
15–19	.04	.66	1.66	40.11	1.03	56.50	100.00
20–24	.35	1.92	1.07	35.81	1.03	59.82	100.00
25–29	.66	2.08	.75	22.01	.65	73.85	100.00
30–34	1.05	2.33	.78	14.47	.40	80.97	100.00
35–39	1.50	2.83	.78	11.74	.35	82.80	100.00
40–44	1.96	3.32	.86	9.73	.29	83.84	100.00
45–49	2.41	3.91	.74	8.52	.26	84.16	100.00
50–54	2.54	4.46	.72	7.12	.26	84.90	100.00
55–59	2.76	4.57	.66	6.39	.26	85.36	100.00
60–64	3.08	4.46	.52	4.80	.24	86.90	100.00
65–69	2.97	3.71	.35	3.08	.22	89.67	100.00
70–74	2.88	2.61	.25	1.57	.07	92.62	100.00
75–79	2.69	2.07	.13	.93	.03	94.15	100 00
80–84	2.30	1.46	.08	.57	..	95.59	100.00
85–89	1.98	1.25	..	.37	..	96.40	100.00
90–94	1.56	.43	..	..	..	98.01	100.00
95–99	3.15	..	..	..	..	96.85	100.00
100 and over	..	..	..	..	..	100.00	100.00
All Ages	.87	1.71	.66	13.77	.39	82.60	100.00

In this case the maximum proportion for " employers" is in age-group 60-64 ; for " workers on own account" in group 55-59 ; for those " assisting" and for " wage or salary earners" in group 15-19 ; while the " unemployed " shew equality of proportion for the groups 15-19 and 20-24. Those to whom grade is not applicable exhibit a decline to a minimum in group 15-19, and a practically continuous rise thereafter.

Proportional Distribution of Females according to Grade of Occupation and Age, Commonwealth, 1911.



GRAPH No. 151.

The accompanying Graph (No. 151) furnishes a representation of the proportion per cent. of females at each age who belonged to the several grades of occupation. The base of each small rectangle represents 10 years of age, and the vertical height 10 per cent. The letters shewn on the Graph relate to the grades of occupation involved, and have the significance indicated in Section 14 of the present Chapter.

29. **Occupation and Conjugal Condition of Females.**—In certain of the preliminary investigations made in the United Kingdom in connexion with the National Insurance scheme it was found necessary to obtain estimates of the distribution of women workers according to, conjugal condition. With a view to providing the basis for such estimates in the case of Australia, the Census material in respect of females was tabulated according to nature and grade of occupation in conjunction with conjugal condition, the particulars in respect of the Commonwealth and separately for each State and Territory being published in Volume III. of this Report, pp. 1648 to 1679. A summary of the information for the Commonwealth as a whole is furnished in the next table in respect of classes of occupation and conjugal condition :—

Class of Occupation and Conjugal Condition of Females. Commonwealth Numbers, 1911.

Class of Occupation.	Never Married.	Married.	Widowed.	Divorced.	Total.
I. Professional	44,163	5,185	3,803	133	53,284
II. Domestic	120,034	19,646	13,698	676	154,054
III. Commercial	38,018	5,846	6,776	114	50,754
IV. Transport and Communication	3,070	1,175	594	6	4,845
V. Industrial	100,385	5,257	3,408	211	109,261
VI. Primary Producers	7,422	4,639	5,252	25	17,338
VII. Independent	2,116	1,384	5,579	37	9,116
VIII. Dependents	962,625	690,775	88,980	938	1,743,318
Total, All Classes	1,277,833	733,907	128,090	2,140	2,141,970

Leaving dependents out of account, the Domestic Class furnished the largest number in each conjugal condition, the Industrial Class ranking second for the "never married," and the "divorced," while the Commercial Class ranked second in the case of the "married" and the "widowed."

The proportion per cent. of the total in each class of occupation who belonged to each conjugal condition is shewn in the next table :—

Class of Occupation and Conjugal Condition of Females. Commonwealth Proportions per cent., 1911.

Class of Occupation.	Never Married.	Married.	Widowed.	Divorced.	Total.
	%	%	%	%	%
I. Professional	82.88	9.73	7.14	.25	100.00
II. Domestic	77.92	12.75	8.89	.44	100.00
III. Commercial	74.91	11.52	13.35	.22	100.00
IV. Transport and Communication	63.37	24.25	12.26	.12	100.00
V. Industrial	91.88	4.81	3.12	.19	100.00
VI. Primary Producers	42.81	26.76	30.29	.14	100.00
VII. Independent	23.21	15.18	61.20	.41	100.00
VIII. Dependents	55.22	39.63	5.10	.05	100.00
TOTAL, ALL CLASSES	59.66	34.26	5.98	.10	100.00

In all classes except the Independent, the "never married" predominated, and accounted for upwards of 60 per cent. in all classes except those of Primary Producers, Independent and Dependents. The "never married" ranked second in the Independent Class. "Widows" predominated in the Independent Class, and ranked second in the Commercial and the Primary Producers Classes. "Married women" ranked second in the Professional, the Domestic, the Transport and Communication, the Industrial and the Dependents Classes.

A classification of the same data according to grade of occupation and conjugal condition is furnished in the next table.

Grade of Occupation and Conjugal Condition of Females. Commonwealth Numbers, 1911.

Grade of Occupation.	Never Married.	Married.	Widowed.	Divorced.	Total.
Employer	5,808	5,316	7,394	135	18,653
Working on own account	18,428	9,323	8,767	216	36,734
Assisting but not receiving salary or wages ..	8,591	5,325	135	5	14,056
Receiving salary or wages	261,780	19,706	12,825	724	295,035
Unemployed	7,167	596	485	37	8,285
Grade not applicable	976,059	693,641	98,484	1,023	1,769,207
TOTAL, ALL GRADES	1,277,833	733,907	128,090	2,140	2,141,970

Leaving out of account those to whom grade was not applicable, the largest number in each conjugal condition was furnished by the class "receiving salary or wages," those "working on own account" occupying second place in each instance.

The proportion per cent. of the total in each grade who belonged to each conjugal condition is shewn in the succeeding table :—

Grade of Occupation and Conjugal Condition of Females. Commonwealth Proportions per cent., 1911.

Grade of Occupation.	Never Married.	Married.	Widowed.	Divorced.	Total.
	%	%	%	%	%
Employer	31.14	28.50	39.64	.72	100.00
Working on own account	50.16	25.38	23.87	.59	100.00
Assisting but not receiving salary or wages ..	61.12	37.88	.96	.04	100.00
Receiving salary or wages	88.73	6.68	4.35	.24	100.00
Unemployed	86.51	7.19	5.85	.45	100.00
Grade not applicable	55.17	39.21	5.57	.05	100.00
TOTAL, ALL GRADES	59.66	34.26	5.98	.10	100.00

"Never married" females predominated in all grades except that of employers, in which they ranked second, widows predominating. In all grades except that of employers married women ranked second.

The next table furnishes for each class of occupation the number of females of each grade who were in each conjugal condition :—

Class and Grade of Occupation and Conjugal Condition of Females. Commonwealth Numbers, 1911.

Conjugal Condition.	Grade of Occupation.						All Grades.
	Employers.	Working on own Account.	Assisting but not Receiving Salary or Wages.	Receiving Salary or Wages.	Unemployed.	Grade not Applicable.	
CLASS I.—PROFESSIONAL.							
Never Married	634	7,634	151	28,864	566	6,314	44,163
Married	152	2,839	52	1,757	94	291	5,185
Widowed	89	2,184	2	1,253	63	212	3,803
Divorced	3	69	..	52	3	6	133
Total, Class I.	878	12,726	205	31,926	726	6,823	53,284
CLASS II.—DOMESTIC.							
Never Married	1,016	1,038	1,255	110,310	3,888	2,527	120,034
Married	2,382	2,087	954	13,420	405	398	19,646
Widowed	1,878	2,035	36	9,020	336	393	13,698
Divorced	67	54	3	512	27	13	676
Total, Class II.	5,343	5,214	2,248	133,262	4,656	3,331	154,054
CLASS III.—COMMERCIAL.							
Never Married	710	1,431	1,168	32,134	840	1,735	38,018
Married	970	2,219	1,239	736	12	670	5,846
Widowed	1,180	1,917	28	470	13	3,168	6,776
Divorced	15	38	..	35	..	26	114
Total, Class III.	2,875	5,605	2,435	33,375	865	5,599	50,754
CLASS IV.—TRANSPORT AND COMMUNICATION.							
Never Married	5	1	5	3,032	13	14	3,070
Married	22	4	7	1,136	2	4	1,175
Widowed	71	6	2	508	1	6	594
Divorced	..	..	..	6	..	..	6
Total, Class IV.	98	11	14	4,682	16	24	4,845
CLASS V.—INDUSTRIAL.							
Never Married	2,796	8,005	509	86,518	1,856	701	100,385
Married	901	1,574	150	2,437	82	113	5,257
Widowed	616	1,091	8	1,523	72	98	3,408
Divorced	36	45	1	119	7	3	211
Total, Class V.	4,349	10,715	668	90,597	2,017	915	109,261
CLASS VI.—PRIMARY PRODUCERS.							
Never Married	647	319	5,503	922	4	27	7,422
Married	889	600	2,923	220	1	6	4,639
Widowed	3,560	1,534	59	51	..	48	5,252
Divorced	14	10	1	..	..	..	25
Total, Class VI.	5,110	2,463	8,486	1,193	5	81	17,338
CLASS VII.—INDEPENDENT.							
Never Married	..	..	..	..	..	2,116	2,116
Married	..	..	..	..	..	1,384	1,384
Widowed	..	..	..	..	..	5,579	5,579
Divorced	..	..	..	..	..	37	37
Total, Class VII.	..	..	..	..	..	9,116	9,116
CLASS VIII.—DEPENDENTS.							
Never Married	..	..	..	..	..	962,625	962,625
Married	..	..	..	..	..	690,775	690,775
Widowed	..	..	..	..	..	88,980	88,980
Divorced	..	..	..	..	..	938	938
Total, Class VIII.	..	..	..	..	..	1,743,318	1,743,318
Total, All Classes	18,653	36,734	14,056	295,035	8,285	1,769,207	2,141,970

The proportion per cent. of the total of each grade in each class who belonged to each conjugal condition is shewn in the following table :—

Class and Grade of Occupation and Conjugal Condition of Females. Commonwealth Proportions per cent. 1911

Conjugal Condition.	Grade of Occupation.						All Grades.
	Employers.	Working on own Account.	Assisting but not Receiving Salary or Wages.	Receiving Salary or Wages.	Unemployed.	Grade not Applicable.	
CLASS I.—PROFESSIONAL.							
Never Married	72.21	59.99	73.66	90.41	77.96	92.54	82.88
Married	17.31	22.31	25.37	5.50	12.95	4.26	9.73
Widowed	10.14	17.16	.97	3.93	8.68	3.11	7.14
Divorced	.34	.54	..	.16	.41	.09	.25
Total, Class I. ..	100.00	100.00	100.00	100.00	100.00	100.00	100.00
CLASS II.—DOMESTIC.							
Never Married	19.02	19.91	55.83	82.78	83.50	75.86	77.92
Married	44.58	40.03	42.44	10.07	8.70	11.95	12.75
Widowed	35.15	39.03	1.60	6.77	7.22	11.80	8.89
Divorced	1.25	1.03	.13	.38	.58	.39	.44
Total, Class II. ..	100.00	100.00	100.00	100.00	100.00	100.00	100.00
CLASS III.—COMMERCIAL.							
Never Married	24.70	25.53	47.97	96.28	97.11	30.99	74.91
Married	33.74	39.59	50.88	2.21	1.39	11.97	11.52
Widowed	41.04	34.20	1.15	1.41	1.50	56.58	13.35
Divorced	.52	.68	..	.10	..	.46	.22
Total, Class III.	100.00	100.00	100.00	100.00	100.00	100.00	100.00
CLASS IV.—TRANSPORT AND COMMUNICATION.							
Never Married	5.10	9.09	35.71	64.76	81.25	58.33	63.37
Married	22.45	36.36	50.00	24.26	12.50	16.67	24.25
Widowed	72.45	54.55	14.29	10.85	6.25	25.00	12.26
Divorced	..	..	..	.13	..	..	.12
Total, Class IV.	100.00	100.00	100.00	100.00	100.00	100.00	100.00
CLASS V.—INDUSTRIAL.							
Never Married	64.29	74.71	76.20	95.50	92.02	76.61	91.88
Married	20.72	14.69	22.45	2.69	4.06	12.35	4.81
Widowed	14.16	10.18	1.20	1.68	3.57	10.71	3.12
Divorced	.83	.42	.15	.13	.35	.33	.19
Total, Class V. ..	100.00	100.00	100.00	100.00	100.00	100.00	100.00
CLASS VI.—PRIMARY PRODUCERS.							
Never Married	12.66	12.95	64.85	77.28	80.00	33.33	42.81
Married	17.40	24.36	34.44	18.44	20.00	7.41	26.76
Widowed	69.67	62.28	.70	4.28	..	59.26	30.29
Divorced	.27	.41	.01	..	..	..	.14
Total, Class VI.	100.00	100.00	100.00	100.00	100.00	100.00	100.00
CLASS VII.—INDEPENDENT.							
Never Married	..	..	..	..	..	23.21	23.21
Married	..	..	..	..	..	15.18	15.18
Widowed	..	..	..	..	..	61.20	61.20
Divorced	..	..	..	..	..	.41	.41
Total, Class VII.	..	..	..	..	..	100.00	100.00
CLASS VIII..—DEPENDENTS.							
Never Married	..	..	..	..	..	55.22	55.22
Married	..	..	..	..	..	39.63	39.63
Widowed	..	..	..	..	..	5.10	5.10
Divorced	..	..	..	..	..	.05	.05
Total, Class VIII.	..	..	..	..	..	100.00	100.00

30. **Occupations of Metropolitan Population.**—(i.) *General.*—The distribution of the occupations of a community in the urban and rural sections thereof is an item of considerable importance in the study of the social make-up of the population. In the case of the Australian results, those relating to the six capital cities and their suburbs may be regarded as furnishing a representation of the purely urban portion of the population, while the balance of the population, although not exclusively rural, contains so large a rural element that in the absence of a detailed analysis into urban and rural, the division available, viz., into metropolitan and extra-metropolitan, will serve many of the purposes that would be served by the more detailed classification. Particulars in respect of the several metropolitan centres for occupations classified according to the sex, age and grade of occupation of the population are given in Volume III. of this report, pp. 1680 to 1715.

(ii.) *Metropolitan Males in Classes of Occupation.*—A summary of the data for males in respect of classes of occupation is furnished in the succeeding table for the metropolitan centres of each of the six states :—

Occupations of Metropolitan Males. 1911.

Class of Occupation.	Sydney. and Suburbs.	Melb. and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total Metro-politan.
I. Professional	18,683	16,009	4,110	4,497	3,815	1,314	48,428
II. Domestic	9,146	7,998	1,541	2,036	1,841	482	23,044
III. Commercial	52,303	48,301	11,709	15,717	8,752	2,668	139,450
IV. Transport & Communication	30,174	22,188	6,710	7,894	4,710	1,506	73,182
V. Industrial	92,796	89,681	18,665	26,741	13,094	4,900	245,877
VI. Primary Producers ..	9,400	9,424	3,260	5,414	2,854	1,355	31,707
VII. Independent	2,484	2,669	507	571	316	166	6,713
VIII. Dependents	90,742	81,686	21,126	27,708	17,849	6,096	245,207
ALL CLASSES	305,728	277,956	67,628	90,578	53,231	18,487	813,608

The next table shews for each metropolitan centre the proportion per cent. of its male population in each class of occupation :—

Proportion of Metropolitan Males in each Class of Occupation. 1911.

Class of Occupation.	Sydney. and Suburbs.	Melb. and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total Metro-politan.
	%	%	%	%	%	%	%
I. Professional	6.11	5.76	6.08	4.96	7.17	7.11	5.95
II. Domestic	2.99	2.88	2.28	2.25	3.46	2.61	2.83
III. Commercial	17.11	17.38	17.31	17.35	16.44	14.43	17.14
IV. Transport & Communication	9.87	7.98	9.92	8.72	8.85	8.15	8.99
V. Industrial	30.35	32.26	27.60	29.52	24.60	26.50	30.22
VI. Primary Producers ..	3.08	3.39	4.82	5.98	5.36	7.33	3.90
VII. Independent	.81	.96	.75	.63	.59	.90	.83
VIII. Dependents	29.68	29.39	31.24	30.59	33.53	32.97	30.14
ALL CLASSES	100.00	100.00	100.00	100.00	100.00	100.00	100.00

The highest and lowest percentages in the several classes were furnished as follows :— I. Professional, Perth (7.17 per cent.), Adelaide (4.96 per cent.) ; II. Domestic, Perth (3.46 per cent.), Adelaide (2.25 per cent.); III. Commercial, Melbourne (17.38 per cent.), Hobart (14.43 per cent.) ; IV. Transport and Communication, Brisbane (9.92 per cent.), Melbourne (7.98 per cent.) ; V. Industrial, Melbourne (32.26 per cent.), Perth (24.60 per cent.) ; VI. Primary Producers, Hobart (7.33 per cent.), Sydney (3.08 per cent.) ; VII. Independent, Melbourne (.96 per cent.), Perth (.59 per cent.) ; VIII. Dependents, Perth (33.53 per cent.), Melbourne (29.39 per cent.). Leaving dependents out of account the Industrial Class predominated amongst the males of each metropolis, and in the cases of Sydney and Melbourne were even more numerous than the Dependents. In each case also the Commercial Class ranked next numerically to the Industrial, and was immediately succeeded by the Transport and Communication Class.

The next table shews the proportion which the metropolitan males in each class of occupation were of the total number of males in the State in question belonging to that class of occupation :—

Proportion of Males in each Class Resident in Metropolis. 1911.

Class of Occupation.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	C'wlth.
	%	%	%	%	%	%	%
I. Professional	50.12	58.63	35.58	66.09	55.98	38.10	51.89
II. Domestic	47.95	57.63	24.02	58.56	42.21	31.59	47.15
III. Commercial	58.51	63.38	40.01	68.96	56.38	36.95	57.96
IV. Transport & Communication	49.63	58.07	29.63	50.21	39.41	33.64	47.52
V. Industrial	53.42	62.32	32.49	59.34	53.91	32.66	53.47
VI. Primary Producers ..	4.59	6.38	3.22	10.84	5.28	4.27	5.36
VII. Independent	36.62	46.39	20.86	48.51	54.58	30.24	38.83
VIII. Dependents	34.12	40.30	21.47	44.43	40.58	18.12	34.66
ALL CLASSES	35.65	42.40	20.52	43.68	32.95	18.94	35.17

The percentages given for the Commonwealth represent the ratio per cent. of the total for each class in the six capital cities to the total for such class in the Commonwealth as a whole. A comparison of the percentages shewn in this table for any class of occupation, with the corresponding percentage shewn on the last line for " all classes," furnishes evidence of the degree to which the class of occupation in question is relatively more strongly represented in the metropolitan than in the extra metropolitan area or vice versa. Thus in all the States except Western Australia there is little difference between the metroplitan proportion of dependents, and that of all classes, nor, except in the cases of Western Australia and Tasmania, is there a marked difference between the metropolitan proportion of independent class and that of all classes. In all the States the Professional, the Domestic, the Commercial, the Transport and Communication, the Industrial and the Independent Classes were relatively more numerous in the metropolitan than in the extra metropolitan areas, as was also the case with Dependents in Queensland, South Australia and Western Australia. Naturally in all the States the proportion of the Primary Producers resident in metropolitan areas was much less than the proportion for all classes. In New South Wales, Victoria and Tasmania the proportion of dependents resident in metropolitan areas was also somewhat less than the corresponding proportions for all classes.

(iii.) *Metropolitan Males in Grades of Occupation.*—The following table furnishes particulars concerning the number of males in each metropolitan area who belonged to each grade of occupation :—

Occupation Grades of Metropolitan Males. 1911.

Grade of Occupation.	Sydney. and Suburbs.	Melb. and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total Metropolitan.
Employer	18,022	17,351	3,506	5,612	3,240	1,342	49,073
Working on own account ..	12,881	11,305	2,963	3,725	2,125	766	33,765
Assisting but not receiving salary or wages	570	788	490	554	115	160	2,677
Receiving salary or wages ..	162,801	144,259	34,998	47,736	25,986	8,678	424,458
Unemployed	7,890	9,235	1,897	1,563	1,420	440	22,445
Grade not applicable	103,564	95,018	23,774	31,388	20,345	7,101	281,190
ALL GRADES. ..	305,728	277,956	67,628	90,578	53,231	18,487	813,608

In the following table is shewn for each metropolitan centre the proportion per cent. of its male population in each grade of occupation. :—

Proportion of Metropolitan Males in each Grade. 1911.

Grade of Occupation.	Sydney. and Suburbs.	Melb. and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total Metropolitan.
	%	%	%	%	%	%	%
Employer	5.89	6.24	5.18	6.20	6.09	7.26	6.03
Working on own account ..	4.21	4.07	4.38	4.11	3.99	4.14	4.15
Assisting but not receiving salary or wages	.19	.28	.73	.61	.21	.87	.33
Receiving salary or wages ..	53.25	51.90	51.75	52.70	48.82	46.94	52.17
Unemployed	2.58	3.32	2.81	1.73	2.67	2.38	2.76
Grade not applicable	33.88	34.19	35.15	34.65	38.22	38.41	34.56
ALL GRADES. ..	100.00	100.00	100.00	100.00	100.00	100.00	100.00

The highest and lowest percentages in the several grades were furnished as follows :— Employer, Hobart (7.26 per cent.), Brisbane (5.18 per cent.) ; Working on own account, Brisbane (4.38 per cent.), Perth (3.99 per cent.) ; Assisting but not receiving salary or wages, Hobart (.87 per cent.), Sydney (.19 per cent.) ; Receiving salary or wages, Sydney (53.25 per cent.),

Hobart (46.94 per cent.); Unemployed, Melbourne (3.32 per cent.), Adelaide (1.73 per cent.) Grade not applicable, Hobart (38.41 per cent.), Sydney (33.88 per cent.). In all the metropolitan areas the grades ranked in order of numerical importance as follows :—1. Receiving salary or wages ; 2. Grade not applicable ; 3. Employer ; 4. Working on own account ; 5. Unemployed ; 6. Assisting but not receiving salary or wages.

The next table shews the proportion which the metropolitan males in each grade of occupation were of the total number of males in the State in question belonging to that grade :—

Proportion per cent. of Males in each Grade Resident in Metropolis. 1911.

Grade of Occupation.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	C'wlth.
	%	%	%	%	%	%	%
Employer	25.30	27.49	13.14	27.09	23.59	15.83	24.03
Working on own account ..	24.94	28.34	12.01	30.41	17.02	11.36	22.75
Assisting but not receiving salary or wages	2.74	3.96	4.83	7.87	4.61	4.09	4.16
Receiving salary or wages ..	40.80	50.22	23.22	49.88	32.00	21.40	40.18
Unemployed	48.06	60.68	23.33	53.58	38.94	29.49	46.76
Grade not applicable	34.69	41.28	21.78	45.66	42.39	19.50	35.52
ALL GRADES. ..	35.65	42.40	20.52	43.68	32.95	18.94	35.17

The percentages given in the case of the Commonwealth represent the ratio per cent. of the total for each grade in the six capital cities, to the total for such grade in the Commonwealth as a whole.

In all the States the grades (*a*) Employer ; (*b*) Working on own account ; (*c*) Assisting, were relatively less strongly represented in the metropolitan than in the corresponding extra-metropolitan areas, while the reverse held good in the case of the unemployed. In the case of those receiving salary or wages the metropolitan section was relatively the stronger in all cases except Western Australia, while with regard to those to whom grade was not applicable the metropolitan section was relatively the stronger in all cases except New South Wales and Victoria.

(iv.) *Metropolitan Females in Classes of Occupation.*—The next table furnishes a summary of the data for females in respect of classes of occupation for each of the six metropolitan centres and for these six combined :—

Occupations of Metropolitan Females. 1911.

Class of Occupation.	Sydney. and Suburbs.	Melb. and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total Metro-politan.
I. Professional	10,080	9,837	2,153	2,921	1,930	715	27,636
II. Domestic	25,253	24,553	5,301	7,061	3,983	2,067	68,218
III. Commercial	12,080	11,287	2,462	3,404	1,925	718	31,876
IV. Transport & Communication	673	771	230	174	159	57	2,064
V. Industrial	26,481	36,516	6,603	6,241	2,933	1,154	79,928
VI. Primary Producers ..	145	195	98	98	61	17	614
VII. Independent	2,093	2,081	321	461	153	179	5,288
VIII. Dependents	246,970	225,775	54,684	78,708	42,417	16,543	665,097
ALL CLASSES	323,775	311,015	71,852	99,068	53,561	21,450	880,721

Corresponding to the above, the succeeding table furnishes for each metropolitan area the proportion per cent. of its female population in each class of occupation.

Proportion of Metropolitan Females in each Class of Occupation. 1911.

Class of Occupation.	Sydney. and Suburbs.	Melb. and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total Metro-politan.
	%	%	%	%	%	%	%
I. Professional	3.11	3.16	3.00	2.95	3.60	3.33	3.14
II. Domestic	7.80	7.90	7.38	7.13	7.44	9.64	7.74
III. Commercial	3.73	3.63	3.43	3.44	3.59	3.35	3.62
IV. Transport & Communication	.21	.25	.32	.17	.30	.27	.23
V. Industrial	8.18	11.74	9.19	6.30	5.48	5.38	9.08
VI. Primary Producers ..	.04	.06	.13	.10	.11	.08	.07
VII. Independent	.65	.67	.45	.46	.29	.83	.60
VIII. Dependents	76.28	72.59	76.10	79.45	79.19	77.12	75.52
ALL CLASSES	100.00	100.00	100.00	100.00	100.00	100.00	100.00

The highest and lowest percentages in each class of occupation were furnished as follows : —I. Professional, Perth (3.60 per cent.), Adelaide (2.95 per cent.) ; II. Domestic, Hobart (9.64 per cent.), Adelaide (7.13 per cent.) ; III. Commercial, Sydney (3.73 per cent.), Hobart

(3.35 per cent.); IV. Transport and Communication, Brisbane (.32 per cent.), Adelaide (.17 per cent.); V. Industrial, Melbourne (11.74 per cent.), Hobart (5.38 per cent.); VI. Primary Producers, Brisbane (.13 per cent.), Sydney (.04 per cent.); VII. Independent, Hobart (.83 per cent.), Perth (.29 per cent.); VIII. Dependents, Adelaide (79.45 per cent.), Melbourne (72.59 per cent.). In all the metropolitan areas there was naturally a very large preponderance of dependents. Leaving these out of account, the Industrial Class ranked first numerically in Sydney, Melbourne and Brisbane, the Domestic Class ranking second in each of these cases. This order was, however, reversed in Adelaide, Perth and Hobart, in which the Domestic Class ranked first and the Industrial Class second. In all cases except that of Perth, the Commercial Class ranked third, and the Professional Class fourth, if dependents are omitted from consideration. In Perth, the Commercial and Professional were practically identical in number.

The next table shews the proportion which the metropolitan females in each class of occupation were of the total number of females in the State in question belonging to that Class of occupation.

Proportion of Females in each Class Resident in Metropolis. 1911.

Class of Occupation.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	C'wlth.
	%	%	%	%	%	%	%
I. Professional	52.02	56.79	34.20	63.31	55.52	32.86	51.87
II. Domestic	46.32	50.27	26.05	49.24	42.48	31.86	44.28
III. Commercial	66.28	65.04	42.94	71.12	65.45	41.96	62.80
IV. Transport & Communication	42.14	47.86	37.04	49.71	51.38	17.12	42.60
V. Industrial	73.32	78.09	57.82	74.80	73.22	44.27	73.15
VI. Primary Producers ..	2.74	3.38	2.85	6.33	10.55	2.50	3.54
VII. Independent	61.54	59.34	43.91	60.58	56.25	40.41	58.01
VIII. Dependents	37.97	43.52	24.01	47.28	42.60	20.89	38.15
ALL CLASSES	41.03	47.13	26.00	49.24	44.43	22.91	41.12

The percentages given for the Commonwealth represent the ratio per cent. of the total for each class in the six capital cities to the total for such class in the Commonwealth as a whole.

In New South Wales, Victoria and Queensland, Classes I., II., III., IV., V. and VII. were relatively more strongly represented in the metropolitan than in the extra-metropolitan areas, and the same is also true of the other three States, with the exception of Class II. for South Australia and Western Australia, and Class IV. for Tasmania. In all cases Classes VI. and VIII. were relatively less strongly represented in the metropolitan than in the extra-metropolitan areas.

(v.) *Metropolitan Females in Grades of Occupation.*—The succeeding table gives the number of females in each metropolitan area who belonged to each grade of occupation :—

Occupation Grades of Metropolitan Females. 1911.

Grade of Occupation.	Sydney. and Suburbs.	Melb. and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total Metro-politan.
Employer	2,573	3,147	421	647	350	214	7,352
Working on own account ..	6,466	6,543	1,259	1,917	1,107	316	17,608
Assisting but not receiving salary or wages	801	619	238	284	147	60	2,149
Receiving salary or wages ..	59,937	67,093	13,888	15,927	8,427	3,628	168,900
Unemployed	1,736	1,986	424	285	360	119	4,910
Grade not applicable	252,262	231,627	55,622	80,008	43,170	17,113	679,802
ALL GRADES	323,775	311,015	71,852	99,068	53,561	21,450	880,721

In the next table is shewn for each metropolitan area the proportion per cent. of its female population in each grade of occupation.

Proportion of Metropolitan Females in each Grade. 1911.

Grade of Occupation.	Sydney. and Suburbs.	Melb. and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total Metro-politan.
	%	%	%	%	%	%	%
Employer	.79	1.01	.59	.65	.65	1.00	.83
Working on own account ..	2.00	2.10	1.75	1.93	2.07	1.47	2.00
Assisting but not receiving salary or wages	.25	.20	.33	.29	.28	.28	.24
Receiving salary or wages ..	18.51	21.57	19.33	16.08	15.73	16.91	19.18
Unemployed	.54	.64	.59	.29	.67	.56	.56
Grade not applicable	77.91	74.48	77.41	80.76	80.60	79.78	77.19
ALL GRADES	100.00	100.00	100.00	100.00	100.00	100.00	100.00

The highest and lowest percentages in the several grades were furnished as follows:—Employer, Melbourne (1.01 per cent.); Brisbane (.59 per cent.); Working on own account, Melbourne (2.10 per cent.), Hobart (1.47 per cent.); Assisting but not receiving salary or wages, Brisbane (.33 per cent.), Melbourne (.20 per cent.); Receiving salary or wages, Melbourne (21.57 per cent.), Perth (15.73 per cent.); Unemployed, Perth (.67 per cent.), Adelaide (.29 per cent.); Grade not applicable, Adelaide (80.76 per cent.), Melbourne (74.48 per cent.).

The succeeding table shews the proportion which the metropolitan females in each grade of occupation were of the total number of females in the State in question, belonging to that grade :—

Proportion per cent. of Females in each Grade Resident in Metropolis. 1911.

Grade of Occupation.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	C'wlth.
	%	%	%	%	%	%	%
Employer	44.21	40.38	22.65	42.45	34.86	33.33	39.41
Working on own account	49.26	52.11	29.73	57.17	50.25	25.30	47.93
Assisting but not receiving salary or wages	16.15	20.01	6.82	18.60	26.20	14.60	15.29
Receiving salary or wages	58.57	63.82	39.23	61.19	55.24	33.86	57.25
Unemployed	63.99	65.24	38.34	65.82	54.38	36.50	59.26
Grade not applicable	38.22	43.84	24.16	47.53	42.80	21.32	38.42
ALL GRADES	41.03	47.13	26.00	49.24	44.43	22.91	41.12

The percentages given for the Commonwealth represent the ratio per cent. of the total for each grade in the six capital cities, to the total for such grade in the Commonwealth as a whole. In all the States (*a*) Workers on own account, (*b*) those receiving salary or wages, and (*c*) the unemployed, were relatively more strongly represented in the Metropolitan than in the corresponding extra-metropolitan areas, while the reverse held good in the case of (*a*) those assisting but not receiving salary or wages, and (*b*) those to whom grade was not applicable. In the case of employers the metropolitan section was relatively the stronger in New South Wales and Tasmania, while the reverse held good in the other four States, and in the Commonwealth as a whole.

31. **Occupations of Extra-Metropolitan Population.**—(i.) *Extra-metropolitan Males in Classes of Occupation.*—The next table furnishes particulars concerning the number and proportion of males in each class of occupation in the extra-metropolitan areas of the Commonwealth :—

Occupation of Extra-metropolitan Males. 1911.

Class of Occupation.	Extra-metropolitan Male Population of—								Total Extra Metropolitan Males.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
	NUMBER.								
I. Professional	18,592	11,296	7,441	2,307	3,000	2,135	73	52	44,896
II. Domestic	9,929	5,879	4,875	1,441	2,521	1,044	127	11	25,827
III. Commercial	37,091	27,902	17,559	7,073	6,770	4,552	196	19	101,162
IV. Transport and Communication	30,622	16,018	15,939	7,828	7,242	2,971	194	13	80,827
V. Industrial	80,929	54,234	38,788	18,323	11,194	10,105	208	213	213,994
VI. Primary Producers	195,308	138,211	98,075	44,544	51,208	30,360	1,691	401	559,798
VII. Independent	4,299	3,085	1,923	606	263	383	9	5	10,573
VIII. Dependents	175,200	121,010	77,278	34,658	26,136	27,554	236	278	462,350
TOTAL, ALL CLASSES	551,970	377,635	261,878	116,780	108,334	79,104	2,734	992	1,499,427
	PERCENTAGE ON TOTAL, ALL CLASSES.								
	%	%	%	%	%	%	%	%	%
I. Professional	3.37	2.99	2.84	1.98	2.77	2.70	2.67	5.24	2.99
II. Domestic	1.80	1.56	1.86	1.23	2.33	1.32	4.64	1.11	1.72
III. Commercial	6.72	7.39	6.71	6.06	6.25	5.76	7.17	1.92	6.75
IV. Transport and Communication	5.55	4.24	6.09	6.70	6.68	3.76	7.10	1.31	5.39
V. Industrial	14.66	14.36	14.81	15.69	10.33	12.77	7.61	21.47	14.27
VI. Primary Producers	35.38	36.60	37.45	38.14	47.27	38.38	61.85	40.42	37.33
VII. Independent	.78	.82	.73	.52	.24	.48	.33	.50	.71
VIII. Dependents	31.74	32.04	29.51	29.68	24.13	34.83	8.63	28.03	30.84
TOTAL, ALL CLASSES	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

The highest and lowest percentages in the several classes were, apart from the territories, furnished as follows :—I. Professional, New South Wales (3.37 per cent.), South Australia (1.98 per cent.); II. Domestic, Western Australia (2.33 per cent.), South Australia (1.23 per cent.); III. Commercial, Victoria (7.39 per cent.), Tasmania (5.76 per cent.); IV. Transport and Communication, South Australia (6.70 per cent.), Tasmania (3.76 per cent.); V. Industrial South Australia (15.69 per cent.), Western Australia (10.33 per cent.); VI. Primary Producers, Western Australia (47.27 per cent.), New South Wales (35.38 per cent.); VII. Independent, Victoria (.82 per cent.), Western Australia (.24 per cent.); VIII. Dependents, Tasmania (34.83 per cent.), Western Australia (24.13 per cent.).

In the extra-metropolitan areas of all the States, leaving dependents out of account, Primary Producers were the most numerous class, followed in each case by the Industrial Class. The Commercial Class ranked third, and the Transport and Communication Class fourth in New South Wales, Victoria, Queensland and Tasmania, while the positions of these two classes were transposed in the case of South Australia and Western Australia. Owing to the smallness of the numbers involved, the territory figures are necessarily irregular.

(ii.) *Extra-metropolitan Males in Grades of Occupation.*—The number and proportion of males in each grade of occupation in the extra-metropolitan areas of the Commonwealth are shewn in the following table :—

Occupation Grades of Extra-metropolitan Males. 1911.

Grade of Occupation.	Extra-metropolitan Male Population of—								Total Extra Metropolitan Males.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
NUMBER.									
Employer	53,213	45,776	23,185	15,101	10,494	7,135	156	80	155,140
Working on own account	38,770	28,590	21,698	8,525	10,359	5,976	688	56	114,662
Assisting but not receiving salary or wages	20,242	19,122	9,654	6,489	2,382	3,756	18	31	61,694
Receiving salary or wages	236,230	143,009	115,716	47,957	55,220	31,877	1,421	517	631,947
Unemployed	8,527	5,985	6,234	1,354	2,227	1,052	159	14	25,552
Grade not applicable	194,988	135,153	85,391	37,354	27,652	29,308	292	294	510,432
Total, All Grades	551,970	377,635	261,878	116,780	108,334	79,104	2,734	992	1,499,427
PERCENTAGE ON TOTAL, ALL GRADES.									
Employer	% 9.64	% 12.12	% 8.85	% 12.93	% 9.69	% 9.02	% 5.71	% 8.06	% 10.35
Working on own account	7.02	7.57	8.29	7.30	9.56	7.55	25.16	5.65	7.65
Assisting but not receiving salary or wages	3.67	5.06	3.69	5.56	2.20	4.75	.66	3.12	4.11
Receiving salary or wages	42.80	37.87	44.19	41.07	50.97	40.30	51.98	52.12	42.15
Unemployed	1.54	1.59	2.38	1.16	2.06	1.33	5.81	1.41	1.70
Grade not applicable	35.33	35.79	32.60	31.98	25.52	37.05	10.68	29.64	34.04
Total, All Grades	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Leaving the Territories out of account, the highest and lowest percentages in the several grades were as follows :—Employer, South Australia (12.93 per cent.), Queensland (8.85 per cent.); Working on own account, Western Australia (9.56 per cent.), New South Wales (7.02 per cent.) ; Assisting but not receiving salary or wages, South Australia (5.56 per cent.), Western Australia (2.20 per cent.) ; Receiving salary or wages, Western Australia (50.97 per cent.) , Victoria (37.87 per cent.) ; Unemployed, Queensland (2.38 per cent.), South Australia (1.16 per cent.) ; Grade not applicable, Tasmania (37.05 per cent.), Western Australia (25.52 per cent.).

Leaving out of account those for whom grade was not applicable, and omitting the Territories, the grades occupy the following order in the extra-metropolitan portion of each State :—i. Receiving salary or wages ; ii. Employer ; iii. Working on own account ; iv. Assisting but not receiving salary or wages ; v. Unemployed.

(iii.) *Extra-metropolitan Females in Classes of Occupation.*—Particulars are furnished in the next table concerning the number and proportion of females in each class of occupation in the several extra-metropolitan areas of the Commonwealth :—

Occupations of Extra-metropolitan Females. 1911.

Class of Occupation.	Extra-metropolitan Female Population of—								Total Extra Metropolitan Females.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
NUMBER.									
I. Professional	9,297	7,485	4,143	1,695	1,546	1,461	13	8	25,648
II. Domestic	29,271	24,286	15,050	7,278	5,393	4,420	74	64	85,836
III. Commercial	6,145	6,068	3,271	1,382	1,016	993	..	3	18,878
IV. Transport and Communication	924	840	391	176	168	276	..	6	2,781
V. Industrial	9,634	10,246	4,816	2,103	1,073	1,453	4	4	29,333
VI. Primary Producers	5,152	5,570	3,336	1,451	517	662	12	24	16,724
VII. Independent	1,308	1,426	410	300	119	264	..	1	3,828
VIII. Dependents	403,530	293,024	173,038	87,747	57,156	62,641	473	612	1,078,221
Total, All Classes	465,261	348,945	204,455	102,132	66,988	72,170	576	722	1,261,249
PERCENTAGE ON TOTAL, ALL CLASSES.									
I. Professional	% 2.00	% 2.14	% 2.03	% 1.66	% 2.31	% 2.02	% 2.26	% 1.11	% 2.03
II. Domestic	6.29	6.96	7.36	7.13	8.05	6.12	12.85	8.86	6.81
III. Commercial	1.32	1.74	1.60	1.35	1.52	1.38	..	.42	1.50
IV. Transport and Communication	.20	.24	.19	.17	.25	.38	..	.83	.22
V. Industrial	2.07	2.94	2.36	2.06	1.60	2.01	.69	.55	2.33
VI. Primary Producers	1.11	1.60	1.63	1.42	.77	.92	2.08	3.32	1.32
VII. Independent	.28	.41	.20	.29	.18	.37	..	.14	.30
VIII. Dependents	86.73	83.97	84.63	85.92	85.32	86.80	82.12	84.77	85.49
Total, All Classes	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Amongst the breadwinners the females belonging to the Domestic Class were the most numerous. In all the States with the exception of Western Australia and Tasmania the classes next in order were the Industrial and the Professional. The two States mentioned differed in this respect only in the transposition of the Industrial and the Professional Classes. The Commercial and the Primary Producers Classes ranked next in order in New South Wales, Victoria, Western Australia and Tasmania, and in reversed order in Queensland and South Australia.

(iv.) *Extra-metropolitan Females in Grades of Occupation.*—The next table furnishes particulars in respect of the number and proportion of females in each grade of occupation in the extra-metropolitan areas of the Commonwealth.

Grades of Occupation of Extra-Metropolitan Females. 1911.

Grade of Occupation.	Extra-metropolitan Female Population of—								Total Extra Metropolitan Females.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
NUMBER.									
Employer	3,247	4,646	1,438	877	654	428	4	7	11,301
Working on own account	6,661	6,012	2,976	1,436	1,096	933	3	9	19,126
Assisting but not receiving salary or wages	4,159	2,474	3,252	1,243	414	351	..	14	11,907
Receiving salary or wages	42,399	38,038	21,511	10,103	6,828	7,087	93	76	126,135
Unemployed	977	1,058	682	148	302	207	1	..	3,375
Grade not applicable	407,818	296,717	174,596	88,325	57,694	63,164	475	616	1,089,405
Total, All Grades	465,261	348,945	204,455	102,132	66,988	72,170	576	722	1,261,249
PERCENTAGE ON TOTAL, ALL GRADES.									
Employer	% .70	% 1.33	% .70	% .86	% .98	% .59	% .69	% .97	% .90
Working on own account	1.43	1.72	1.46	1.41	1.64	1.29	.52	1.25	1.52
Assisting but not receiving salary or wages	.89	.71	1.59	1.22	.62	.49	..	1.94	.94
Receiving salary or wages	9.11	10.90	10.52	9.89	10.19	9.82	16.15	10.52	10.00
Unemployed	.21	.31	.33	.14	.45	.29	.17	..	.27
Grade not applicable	87.66	85.03	85.40	86.48	86.12	87.52	82.47	85.32	86.37
Total, All Grades	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Amongst the breadwinners those earning salary or wages were by far the most numerous, averaging ten per cent. for the whole Commonwealth, and varying only between the limits of 9.11 per cent. (New South Wales) and 10.90 per cent. (Victoria) in the several States. Those working on their own account ranked second in all the States.

32. **Metropolitan and Extra-metropolitan Comparisons.**—(i.) *Classes of Occupation.*—The following table furnishes a comparison of the number and proportion of persons of each sex in each class of occupation for the Commonwealth as a whole.:—

Occupations in Classes. Commonwealth. 1911.

Class of Occupation.	Metropolitan.			Extra-Metropolitan.			Commonwealth.		
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.
NUMBER.									
I. Professional	48,428	27,636	76,064	44,896	25,648	70,544	93,324	53,284	146,608
II. Domestic	23,044	68,218	91,262	25,827	85,836	111,663	48,871	154,054	202,925
III. Commercial	139,450	31,876	171,326	101,162	18,878	120,040	240,612	50,754	291,366
IV. Transport & Communication	73,182	2,064	75,246	80,827	2,781	83,608	154,009	4,845	158,854
V. Industrial	245,877	79,928	325,805	213,994	29,333	243,327	459,871	109,261	569,132
VI. Primary Producers	31,707	614	32,321	559,798	16,724	576,522	591,505	17,338	608,843
VII. Independent	6,713	5,288	12,001	10,573	3,828	14,401	17,286	9,116	26,402
VIII. Dependents	245,207	665,097	910,304	462,350	1,078,221	1,540,571	707,557	1,743,318	2,450,875
Total All Classes	813,608	880,721	1,694,329	1,499,427	1,261,249	2,760,676	2,313,035	2,141,970	4,455,005
PERCENTAGE ON TOTAL ALL CLASSES.									
I. Professional	% 5.95	% 3.14	% 4.49	% 2.99	% 2.03	% 2.56	% 4.04	% 2.49	% 3.29
II. Domestic	2.83	7.74	5.39	1.72	6.81	4.04	2.11	7.19	4.55
III. Commercial	17.14	3.62	10.11	6.75	1.50	4.35	10.40	2.37	6.54
IV. Transport & Communication	8.99	.23	4.44	5.39	.22	3.03	6.66	.23	3.57
V. Industrial	30.22	9.08	19.23	14.27	2.33	8.81	19.88	5.10	12.78
VI. Primary Producers	3.90	.07	1.91	37.33	1.32	20.88	25.57	.81	13.67
VII. Independent	.83	.60	.71	.71	.30	.52	.75	.42	.59
VIII. Dependents	30.14	75.52	53.72	30.84	85.49	55.81	30.59	81.39	55.01
Total All Classes	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Amongst metropolitan breadwinners the Industrial Class was numerically the strongest, followed in succession by the Commercial, the Domestic, and the Professional. Amongst extra-metropolitan breadwinners Primary Producers are naturally the most numerous, and are followed in succession by the Industrial, the Commercial, the Domestic and the Professional Classes, the relative order of these four classes being the same as in the case of the metropolitan population.

(ii.) *Grades of Occupation.*—In the following table is furnished for the Commonwealth as a whole a comparison of the metropolitan and extra-metropolitan sections of the populations classified according to grades of occupation :—

Commonwealth Grades of Occupation. 1911.

Grade of Occupation.	Metropolitan.			Extra-Metropolitan.			Commonwealth.		
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.
NUMBER.									
Employer	49,073	7,352	56,425	155,140	11,301	166,441	204,213	18,653	222,866
Working on own account	33,765	17,608	51,373	114,662	19,126	133,788	148,427	36,734	185,161
Assisting but not receiving salary or wages	2,677	2,149	4,826	61,694	11,907	73,601	64,371	14,056	78,427
Receiving salary or wages	424,458	168,900	593,358	631,947	126,135	758,082	1,056,405	295,035	1,351,440
Unemployed	22,445	4,910	27,355	25,552	3,375	28,927	47,997	8,285	56,282
Grade not applicable	281,190	679,802	960,992	510,432	1,089,405	1,599,837	791,622	1,769,207	2,560,829
Total, All Grades	813,608	880,721	1,694,329	1,499,427	1,261,249	2,760,676	2,313,035	2,141,970	4,455,005
PERCENTAGE ON TOTAL ALL GRADES.									
Employer	% 6.03	% .83	% 3.33	% 10 35	% .90	% 6.03	% 8.83	% .87	% 5.00
Working on own account	4.15	2.00	3.03	7.65	1.52	4.84	6.42	1.71	4.16
Assisting but not receiving salary or wages	.33	.24	.28	4.11	.94	2.67	2.78	.66	1.76
Receiving salary or wages	52.17	19.18	35.02	42.15	10.00	27.46	45.67	13.77	30.34
Unemployed	2.76	.56	1.62	1.70	.27	1.05	2.08	.39	1.26
Grade not applicable	34.56	77.19	56.72	34.04	86.37	57.95	34.22	82.60	57.48
Total, All Grades	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Amongst breadwinners the order in numerical importance of the three principal grades was the same for metropolitan as for extra-metropolitan population, being as follows :—(i.) Receiving salary or wages ; (ii.) Employer ; (iii.) Working on own account. In the metropolitan population the Unemployed ranked next with the " Assisting" last, while the reverse was the case in the Extra-metropolitan population.

33. Unemployment.—(i.) *Males in States and Classes.*—Although it is true that the ranks of the unemployed are supplied from all grades of occupation, persons who have previously been employers and workers on own account being found side by side with salary and wage earners, much the larger portion of the unemployed are undoubtedly those who normally rank as salary and wage earners. For this reason it is most serviceable to compile rates of unemployment from a comparison of the persons unemployed with the total obtained by adding the salary and wage earners to the unemployed, the number so obtained being approximately the number subject to the risk of unemployment. In the following table is given the number of males so exposed to risk in each class of occupation in each State and Territory, and the corresponding number and proportion unemployed. :—

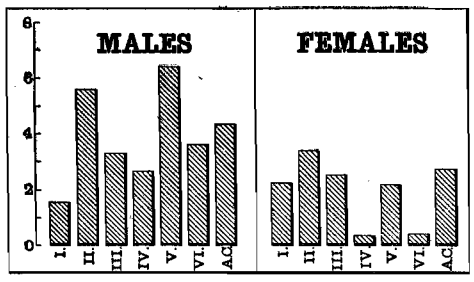
Male Unemployment in Classes. 3rd April, 1911.

Class of Occupation.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
SALARY AND WAGE EARNERS AND UNEMPLOYED COMBINED.									
I. Professional	26,468	18,381	8,463	4,665	5,083	2,399	57	50	65,566
II. Domestic	13,551	9,758	4,347	2,427	3,100	976	107	10	34,276
III. Commercial	60,236	51,536	20,645	15,717	11,052	4,770	121	7	164,084
IV. Transport and Communication	52,990	33,892	19,244	14,496	10,922	3,885	160	11	135,600
V. Industrial	144,040	118,064	47,728	37,840	19,249	12,255	160	204	379,540
VI. Primary Producers	118,163	70,857	58,418	23,465	35,447	17,762	975	249	325,336
Total	415,448	302,488	158,845	98,610	84,853	42,047	1,580	531	1,104,402
UNEMPLOYED.									
I. Professional	406	320	160	38	72	23	1	1	1,021
II. Domestic	725	590	288	75	191	48	4	..	1,921
III. Commercial	1,996	1,763	824	293	396	124	2	..	5,398
IV. Transport and Communication	1,477	934	606	230	241	77	12	..	3,577
V. Industrial	8,072	8,609	3,752	1,617	1,380	809	78	8	24,325
VI. Primary Producers	3,741	3,004	2,501	664	1,367	411	62	5	11,755
Total	16,417	15,220	8,131	2,917	3,647	1,492	159	14	47,997
UNEMPLOYMENT RATE.*									
I. Professional	% 1.53	% 1.74	% 1.89	% 0.81	% 1.42	% 0.96	% 1.75	% 2.00	% 1.56
II. Domestic	5.35	6.05	6.63	3.09	6.16	4.92	3.74	..	5.60
III. Commercial	3.31	3.42	3.99	1.86	3.58	2.60	1.65	..	3.29
IV. Transport and Communication	2.79	2.76	3.15	1.59	2.21	1.98	7.50	..	2.64
V. Industrial	5.60	7.29	7.86	4.27	7.17	6.60	48.75	3.92	6.41
VI. Primary Producers	3.17	4.24	4.28	2.83	3.86	2.31	6.36	2.01	3.61
Total	3.95	5.03	5.12	2.96	4.30	3.55	10.06	2.64	4.35

* Percentage of number unemployed on total salary and wage earners and unemployed combined.

In all classes the rates of unemployment were higher for Queensland than for any other State, while in all classes except that of Primary Producers they were lower for South Australia than for any other State. The lowest rate for any State in the case of Primary Producers was that experienced in Tasmania. In all the States the highest rates of unemployment were those experienced in the Industrial Class, and the lowest those ascertained for the Professional Class. With but slight variations amongst the States the arrangement of the several Classes in a descending order of unemployment rates was as follows :—(i.) Industrial ; (ii.) Domestic ; (iii.) Primary Producers ; (iv.) Commercial ; (v.) Transport and Communication ; (vi.) Professional.

Unemployment Rates in Classes of Occupation. Commonwealth, 3rd April, 1911.



GRAPH No. 152.

A representation of the rates of unemployment in each class of occupation for the Commonwealth as a whole is furnished in the accompanying Graph (No. 152). The Roman numerals at the foot of the several pillars denote the classes of occupation concerned, and have the significance indicated in the preceding table. The letters A. C. denote all classes. The rate shewn is the percentage of the number of unemployed on the total salary and wage earners and unemployed combined. The scale on the left represents percentages, and is applicable to both the male and the female portions of the Graph.

(ii.) *Females in States and Classes.*—A corresponding return of the unemployment of females according to class of occupation in each State and Territory is furnished in the succeeding table :—

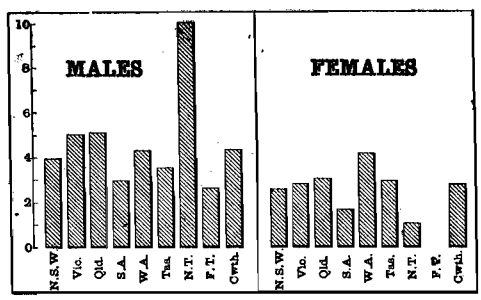
Female Unemployment in Classes. 3rd April, 1911.

Class of Occupation.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
SALARY AND WAGE EARNERS AND UNEMPLOYED COMBINED.									
I. Professional	11,596	10,502	4,241	2,938	1,932	1,427	9	7	32,652
II. Domestic	49,290	43,434	17,978	13,010	8,144	5,928	72	62	137,918
III. Commercial	12,536	11,233	4,053	3,218	2,131	1,069	..	..	34,240
IV. Transport and Communication	1,541	1,557	610	338	322	324	..	6	4,698
V. Industrial	29,825	41,170	9,433	6,781	3,357	2,046	2	..	92,614
VI. Primary Producers	261	279	190	178	31	247	11	1	1,198
Total	105,049	108,175	36,505	26,463	15,917	11,041	94	76	303,320
UNEMPLOYED.									
I. Professional	271	263	64	39	50	39	..	..	726
II. Domestic	1,499	1,605	704	268	405	175	..	..	4,656
III. Commercial	324	301	101	35	81	23	..	..	865
IV. Transport and Communication	5	5	..	2	1	3	..	..	16
V. Industrial	614	867	236	89	124	86	1	..	2,017
VI. Primary Producers	..	3	1	..	1	..	..	..	5
Total	2,713	3,044	1,106	433	662	326	1	..	8,285
UNEMPLOYMENT RATE.*									
I. Professional	% 2.34	% 2.50	% 1.51	% 1.33	% 2.59	% 2.73	% ..	% ..	% 2.22
II. Domestic	3.04	3.70	3.92	2.06	4.97	2.95	..	..	3.38
III. Commercial	2.58	2.68	2.49	1.09	3.80	2.15	..	..	2.53
IV. Transport and Communication	0.32	0.32	..	0.59	0.31	0.93	..	..	0.34
V. Industrial	2.06	2.11	2.50	1.31	3.69	4.20	50.00	..	2.18
VI. Primary Producers	..	1.08	0.53	..	3.23	..	..	..	0.42
Total, All Classes	2.58	2.81	3.03	1.64	4.16	2.95	1.06	..	2.73

* Percentage of number unemployed on number of salary and wage earners and unemployed combined.

In all classes except that of Transport and Communication the unemployment rate was higher in Western Australia and lower in South Australia than in any other State. For the Commonwealth as a whole the arrangement of the classes in descending order of unemployment was as follows :—(i.) Domestic ; (ii.) Commercial ; (iii.) Professional ; (iv.) Industrial ; (v.) Primary Producers ; (vi.) Transport and Communication.

Unemployment Rates in States, 3rd April, 1911.



GRAPH No. 153.

The accompanying Graph (No. 153) furnishes a representation of rate of unemployment in each State disclosed by the Census returns. The rate shewn is the percentage of the number of unemployed on the total salary and wage earners and unemployed combined. The scale on the left represents percentages and is applicable to both the male and the female portions of the Graph.

(iii.) *Duration of Unemployment of Males.*—As indicated in Section 2, (p. 348), persons were treated as being unemployed if they had been out of work for more than a week prior to the Census, cases of leave of absence not being so treated. In the returns received, about 75 per cent. of those shewn as unemployed were recorded as having been out of work for periods under three months. Of the remainder the greater number fell between 3 and 7 months, but there were cases of one, two, and even three years. It appears probable that in many of these cases of long duration, it is not a question of unemployment in the ordinary acceptation of the term, but rather one of permanent incapacity. In view of this, it was decided to ignore all cases shewing durations of a year or upwards. Possibly some of the cases under twelve months which have been retained come under the same category. The number of unemployed males in each class of occupation, classified according to the duration of unemployment as at the date of the Census is given in the succeeding table :—

Unemployed Males, according to Class of Occupation and Duration of Unemployment. Commonwealth, 1911.

Duration of Unemployment.	Class I. Professional.	Class II. Domestic.	Class III. Commercial.	Class IV. Transport and Communication.	Class V. Industrial.	Class VI. Primary Producers.	All Classes.
1 and under 2 weeks	94	269	548	559	3,641	1,527	6,638
2 ,, 3 ,, ...	116	311	671	579	3,581	2,028	7,286
3 ,, 4 ,, ...	85	215	532	461	2,674	1,290	5,257
4 ,, 5 ,, ...	137	286	823	518	3,132	1,500	6,396
5 ,, 6 ,, ...	28	49	153	112	694	288	1,324
6 ,, 7 ,, ...	51	89	249	173	1,864	607	3,033
7 ,, 8 ,, ...	15	16	97	47	812	171	1,158
8 ,, 9 ,, ...	102	183	553	279	2,060	1,045	4,222
9 ,, 10 ,, ...	1	3	36	17	93	70	220
10 ,, 11 ,, ...	12	11	42	43	134	67	309
11 weeks and under 3 months ..	4	2	9	6	34	21	76
3 and under 4 months ..	164	236	748	387	2,622	1,406	5,563
4 ,, 5 ,, ..	59	79	251	117	898	510	1,914
5 ,, 6 ,, ..	28	39	119	72	411	275	944
6 ,, 7 ,, ..	69	82	329	121	1,088	630	2,319
7 ,, 8 ,, ..	10	16	55	23	137	61	302
8 ,, 9 ,, ..	9	11	58	20	148	90	336
9 ,, 10 ,, ..	20	13	74	33	174	93	407
10 ,, 11 ,, ..	8	10	38	4	82	48	190
11 ,, 12 ,, ..	9	1	13	6	46	28	103
ALL DURATIONS ..	1,021	1,921	5,398	3,577	24,325	11,755	47,997

It will be seen that these results exhibit the usual tendency for accumulation at round numbers. Thus, the duration " 4 and under 5 weeks," which necessarily includes those returned as " a month," is much higher than either " 3-4 weeks" on the one hand, or " 5-6 weeks" on the other. Similar accumulations are in evidence in connexion with durations of 8 weeks, 3 months and 6 months.

The ratio per cent. of the number for each duration on the total for all durations for each class of occupation is given for males in the following table :—

Distribution per cent. of Unemployed Males according to Duration of Unemployment. Commonwealth, 1911.

Duration of Unemployment.	Class I. Professional.	Class II. Domestic.	Class III. Commercial.	Class IV. Transport and Communication.	Class V. Industrial.	Class VI. Primary Producers.	All Classes.
	%	%	%	%	%	%	%
1 and under 2 weeks	9.21	14.00	10.15	15.63	14.97	12.99	13.83
2 ,, 3 ,, ...	11.36	16.19	12.43	16.19	14.72	17.25	15.18
3 ,, 4 ,, ...	8.33	11.19	9.86	12.89	10.99	10.97	10.95
4 ,, 5 ,, ...	13.42	14.89	15.25	14.48	12.88	12.76	13.33
5 ,, 6 ,, ...	2.74	2.55	2.83	3.13	2.85	2.45	2.76
6 ,, 7 ,, ...	5.00	4.63	4.61	4.84	7.66	5.16	6.32
7 ,, 8 ,, ...	1.47	.83	1.80	1.31	3.34	1.45	2.41
8 ,, 9 ,, ...	9.99	9.53	10.25	7.80	8.47	8.89	8.80
9 ,, 10 ,, ...	.10	.16	.67	.48	.38	.60	.46
10 ,, 11 ,, ...	1.17	.57	.78	1.20	.55	.57	.64
11 weeks and under 3 months ..	.39	.10	.17	.17	.14	.18	.16
3 and under 4 months ..	16.06	12.29	13.86	10.82	10.78	11.96	11.59
4 ,, 5 ,, ..	5.78	4.11	4.65	3.27	3.69	4.34	3.99
5 ,, 6 ,, ..	2.74	2.03	2.20	2.01	1.69	2.34	1.97
6 ,, 7 ,, ..	6.76	4.27	6.09	3.38	4.47	5.36	4.83
7 ,, 8 ,, ..	.98	.83	1.02	.64	.56	.52	.63
8 ,, 9 ,, ..	.88	.57	1.07	.56	.61	.77	.70
9 ,, 10 ,, ..	1.96	.68	1.37	.92	.72	.79	.85
10 ,, 11 ,, ..	.78	.52	.70	.11	.34	.41	.39
11 ,, 12 ,, ..	.88	.06	.24	.17	.19	.24	.21
ALL DURATIONS ..	100.00	100.00	100.00	100.00	100.00	100.00	100.00

The proportionate distribution of unemployed males according to duration of unemployment was markedly similar in the cases of the Professional and Commercial Classes on the one hand, and in the cases of the other four classes on the other hand. The former group furnished evidence of larger proportions in the more advanced durations than were furnished by the latter group. For all classes durations from one week to three months accounted for 74.84 per cent. of the unemployed males. The corresponding percentages furnished by the several classes were as follows :— (i.) Professional (63.18 per cent.) ; (ii.) Domestic (74.64 per cent.) ; (iii.) Commercial (68.80 per cent.) ; (iv.) Transport and Communication (78.12 per cent.) ; (v.) Industrial (76.95 per cent.) ; (vi.) Primary Producers (73.27 per cent.).

(iv.) *Duration of Unemployment of Females.*—The number of females shewn in each class of occupation as unemployed is given in the following table, classified according to duration of unemployment, as well as the proportion of each class in each duration :—

Unemployed Females according to Class of Occupation and Duration of Unemployment. Commonwealth, 1911.

Duration of Unemployment.	Class I. Professional.	Class II. Domestic.	Class III. Commercial.	Class IV. Transport and Communication.	Class V. Industrial.	Class VI. Primary Producers.	All Classes.
NUMBER.							
1 and under 2 weeks	59	664	78	3	173	..	977
2 ,, 3 ,, ...	70	739	96	3	207	..	1,115
3 ,, 4 ,, ...	61	529	95	2	177	..	864
4 ,, 5 ,, ...	85	721	117	..	227	..	1,150
5 ,, 6 ,, ...	7	133	21	..	47	..	208
6 ,, 7 ,, ...	32	221	48	..	100	..	401
7 ,, 8 ,, ...	6	85	11	..	22	1	125
8 ,, 9 ,, ...	64	456	98	1	209	..	828
9 ,, 10 ,, ...	3	21	6	..	6	..	36
10 ,, 11 ,, ...	1	27	4	..	14	..	46
11 weeks and under 3 months ..	4	8	1	..	2	..	15
3 and under 4 months ..	169	507	140	3	390	4	1,213
4 ,, 5 ,, ..	39	162	44	1	123	..	369
5 ,, 6 ,, ..	22	91	17	..	49	..	179
6 ,, 7 ,, ..	53	212	57	2	169	..	493
7 ,, 8 ,, ..	14	17	9	..	19	..	59
8 ,, 9 ,, ..	16	17	8	..	25	..	66
9 ,, 10 ,, ..	11	28	10	..	37	..	86
10 ,, 11 ,, ..	9	10	5	..	16	..	40
11 ,, 12 ,, ..	1	8	..	1	5	..	15
ALL DURATIONS ..	726	4,656	865	16	2,017	5	8,285
PERCENTAGE ON ALL DURATIONS.							
	%	%	%	%	%	%	%
1 and under 2 weeks	8.13	14.26	9.02	18.75	8.58	..	11.79
2 ,, 3 ,, ...	9.64	15.87	11.10	18.75	10.26	..	13.46
3 ,, 4 ,, ...	8.40	11.36	10.98	12.50	8.78	..	10.43
4 ,, 5 ,, ...	11.71	15.49	13.53	..	11.25	..	13.88
5 ,, 6 ,, ...	.96	2.86	2.43	..	2.33	..	2.51
6 ,, 7 ,, ...	4.41	4.75	5.55	..	4.96	..	4.84
7 ,, 8 ,, ...	.83	1.83	1.27	..	1.09	20.00	1.51
8 ,, 9 ,, ...	8.81	9.79	11.33	6.25	10.36	..	9.99
9 ,, 10 ,, ...	.41	.45	.69	..	.30	..	.44
10 ,, 11 ,, ...	.14	.58	.46	..	.69	..	.56
11 weeks and under 3 months ..	.55	.17	.11	..	.10	..	.18
3 and under 4 months ..	23.28	10.89	16.18	18.75	19.34	80.00	14.64
4 ,, 5 ,, ..	5.37	3.48	5.09	6.25	6.10	..	4.45
5 ,, 6 ,, ..	3.03	1.95	1.97	..	2.43	..	2.16
6 ,, 7 ,, ..	7.30	4.55	6.59	12.50	8.38	..	5.95
7 ,, 8 ,, ..	1.93	.37	1.04	..	.94	..	.71
8 ,, 9 ,, ..	2.20	.37	.92	..	1.24	..	.80
9 ,, 10 ,, ..	1.52	.60	1.16	..	1.83	..	1.04
10 ,, 11 ,, ..	1.24	.21	.58	..	.79	..	.48
11 ,, 12 ,, ..	.14	.17	..	6.25	.25	..	.18
ALL DURATIONS ..	100.00	100.00	100.00	100.00	100.00	100.00	100.00

As in the case of males, accumulations at the round durations of one month, two months, three months and six months were strongly in evidence.

For all classes combined durations from one week to three months accounted for 69.59 per cent. of the unemployed females. The corresponding percentages furnished by the several classes were as follows :—Class I., 53.99 per cent. ; Class II., 77.41 per cent. ; Class III., 66.47 per cent. ; Class IV., 56.25 per cent. ; Class V., 58.70 per cent. ; Class VI., 20 per cent.

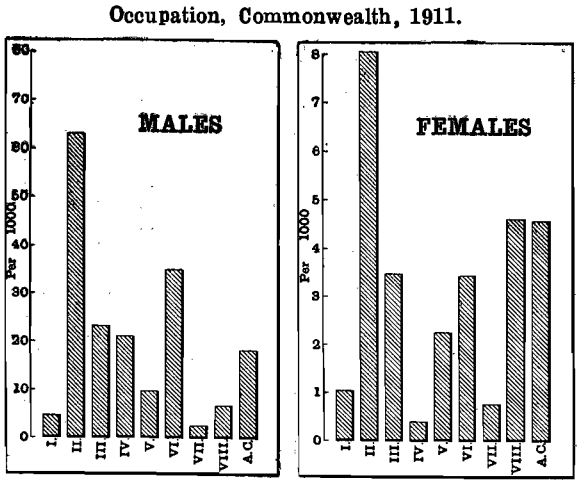
34. **Occupation and Race.**—On pages 1014 to 1073 of Volume II. of this Report, details are furnished concerning the occupations of persons of Non-European Race (exclusive of full-blooded aboriginals) enumerated at the Census of 3rd April, 1911. The following table furnishes a comparative summary for males of European and Non-European race, and indicates the relation of the number of persons of non-European races in each class of occupation to the total number of males in such class :—

Occupation and Race, Males. 3rd April, 1911. (Exclusive of full-blood Aboriginals).

Class.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
EUROPEAN RACE.									
I. Professional	37,100	27,189	11,450	6,791	6,783	3,446	66	52	92,877
II. Domestic	18,261	13,247	5,604	3,424	3,717	1,489	34	10	45,786
III. Commercial	87,005	75,092	27,980	22,580	15,172	7,129	55	17	235,030
IV. Transport and Communication	59,813	37,745	22,209	15,273	11,101	4,451	154	13	150,759
V. Industrial	172,016	142,756	56,385	44,927	23,990	14,992	95	213	455,374
VI. Primary Producers	199,014	145,326	94,072	49,677	50,289	31,354	609	397	570,738
VII. Independent	6,752	5,750	2,427	1,177	577	548	6	5	17,242
VIII. Dependents	264,053	202,043	97,001	62,105	43,621	33,514	94	274	702,705
Total, All Classes	844,014	649,148	317,128	205,954	155,250	96,923	1,113	981	2,270,511
NON-EUROPEAN RACE.									
I. Professional	175	116	101	13	32	3	7	..	447
II. Domestic	814	630	812	53	645	37	93	1	3,085
III. Commercial	2,389	1,111	1,288	210	350	91	141	2	5,582
IV. Transport and Communication	983	461	440	449	851	26	40	..	3,250
V. Industrial	1,709	1,159	1,068	137	298	13	113	..	4,497
VI. Primary Producers	5,694	2,309	7,263	281	3,773	361	1,082	4	20,767
VII. Independent	31	4	3	..	2	1	3	..	44
VIII. Dependents	1,889	653	1,403	261	364	136	142	4	4,852
Total, All Classes	13,684	6,443	12,378	1,404	6,315	668	1,621	11	42,524
NUMBER OF NON-EUROPEAN MALES PER 1000 OF THE TOTAL MALE POPULATION IN EACH CLASS.									
I. Professional	4.69	4.25	8.74	1.91	4.70	.87	95.89	..	4.79
II. Domestic	42.67	45.40	126.56	15.24	147.87	24.25	732.28	90.90	63.13
III. Commercial	26.72	14.58	44.01	9.21	22.55	12.60	719.39	105.26	23.26
IV. Transport and Communication	16.17	12.07	19.43	28.56	71.20	5.81	206.19	..	21.10
V. Industrial	9.84	8.05	18.59	3.04	12.27	.87	543.27	..	9.78
VI. Primary Producers	27.82	15.64	71.67	5.62	69.79	11.38	639.86	9.98	35.11
VII. Independent	4.57	.70	1.23	..	3.45	1.82	333.33	..	2.55
VIII. Dependents	7.10	3.22	14.26	4.18	8.28	4.04	601.69	14.39	6.86
Total, All Classes	15.95	9.83	37.57	6.77	39.09	6.84	592.90	11.09	18.38

In all the States except South Australia, Non-European males were most numerous in the Class of Primary Producers. These were made up mainly of Chinese market gardeners and other agriculturists ; Polynesian agriculturists ; Chinese and half-caste aboriginal pastoral labourers ; Japanese, Malay, Filipino, Japanese, Timorese and Papuan pearlers ; and Chinese miners. In all the States except South Australia, the Non-European males represented a larger proportion of the males in the Domestic Class than was the case in any other class of occupation. Rather more than $6\frac{1}{4}$ per cent. of the males in Domestic Class were Non-European, as were also slightly more than $3\frac{1}{2}$ per cent. of the male Primary Producers.

Non-European Proportion per 1000 in each Class of Occupation, Commonwealth, 1911.



GRAPH No. 154.

A representation of the proportion per 1000 which the Non-European members of the community of each sex employed in each class of occupation were of the total numbers of males and females respectively so employed is furnished in Graph 154. The Roman numerals at the feet of the several pillars denote the classes of occupation and have the significance indicated in the preceding table. The letters A. C. denote " All Classes." The scales on the left of the male and female portions of the Graph represent the proportions per 1000 for each sex. Owing to the smallness of the female proportions, the scale for females has been made ten times as great as that for males.

A return in respect of females, similar to that given on the preceding page for males, is furnished in the next table :—

Occupation and Race, Females, 3rd April, 1911. (Exclusive of full-blood Aboriginals).

Class.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
EUROPEAN RACE.									
I. Professional	19,361	17,311	6,273	4,613	3,474	2,175	13	8	53,228
II. Domestic	54,133	48,739	19,897	14,289	9,190	6,480	21	64	152,813
III. Commercial	18,144	17,333	5,687	4,774	2,935	1,701	..	3	50,577
IV. Transport and Communication	1,596	1,610	621	350	327	333	..	6	4,843
V. Industrial	36,009	46,715	11,353	8,335	3,996	2,599	2	4	109,013
VI. Primary Producers	5,284	5,764	3,421	1,540	567	677	1	24	17,278
VII. Independent	3,396	3,505	731	761	272	443	..	1	9,109
VIII. Dependents	647,145	517,795	225,706	165,970	98,821	78,977	268	608	1,735,290
Total, All Classes	785,068	658,772	273,689	200,632	119,582	93,385	305	718	2,132,151
NON-EUROPEAN RACE.									
I. Professional	16	11	23	3	2	1	..	..	56
II. Domestic	391	100	454	50	186	7	53	..	1,241
III. Commercial	81	22	46	12	6	10	..	..	177
IV. Transport and Communication	1	1	..	..	..	..	..	..	2
V. Industrial	106	47	66	9	10	8	2	..	248
VI. Primary Producers	13	1	13	9	11	2	11	..	60
VII. Independent	5	2	..	..	..	..	..	..	7
VIII. Dependents	3,355	1,004	2,016	485	752	207	205	4	8,028
Total, All Classes	3,968	1,188	2,618	568	967	235	271	4	9,819
NUMBER OF NON-EUROPEAN FEMALES PER 1000 OF THE TOTAL FEMALE POPULATION IN EACH CLASS.									
I. Professional	.83	.64	3.65	.65	.58	.46	..	..	1.05
II. Domestic	7.17	2.05	22.31	3.49	19.84	1.08	716.22	..	8.06
III. Commercial	4.44	1.27	8.02	2.51	2.04	5.84	..	..	3.49
IV. Transport and Communication	.63	.62	..	..	..	..	..	..	.41
V. Industrial	2.94	1.01	5.78	1.08	2.50	3.07	500.00	..	2.27
VI. Primary Producers	2.45	.17	3.79	5.81	19.03	2.95	916.67	..	3.46
VII. Independent	1.47	.57	..	..	..	..	..	..	.77
VIII. Dependents	5.16	1.94	8.85	2.91	7.55	2.61	433.4	6.54	4.61
Total, All Classes	5.03	1.80	9.47	2.82	8.02	2.51	470.49	5.54	4.58

Of the total number of females of Non-European race more than 80 per cent. were dependents, the balance belonging mainly to the domestic class.

CHAPTER XXII.

DWELLINGS.

1. **General.**—At every Census taken in Australia, with the exception of the New South Wales Censuses of 1833 and 1836, provision has been made for the enumeration of occupied habitations, and in most cases particulars have also been collected concerning the number of houses which were unoccupied or being built at the time of the Census. In all cases, however, it appears doubtful whether complete information has been collected concerning the number of houses which are unoccupied or being built. Particulars have also usually been collected concerning the materials of which the dwellings were built, and in most recent cases, concerning the number of rooms contained. Owing, however, to differences in classification of materials, and to differences in the grouping of the number of rooms, the published returns for the several States furnish results which it is by no means easy to aggregate or to compare.

2. **Form of inquiry.**—At the Australian Censuses prior to that of 1911, the inquiry concerning dwellings was usually made in the two outer columns of the householder's schedule, which was generally a large sheet making provision for full particulars concerning twenty inmates. At the Census of 1911, with the introduction of the card system of collection, a special card was provided for a record of the names of the members of the household, and for the desired particulars concerning the dwellings.

Provision for these latter were made in the following form :—

1. Nature of Buildings.....
2. Material of which outer walls are built.....
3. Number of Rooms.....
4. Owner, Tenant or Rent Purchaser.....
5. Weekly Rent payable, or Rent Value per week.....

In the instructions which accompanied the cards the following directions were given :—

BUILDINGS.—Line 1.—State whether a private house ; a tenement in a private house ; an hotel, boarding, or lodging house ; a religious or educational institution ; a military establishment ; a charitable institution ; or a penal establishment.

Line 2.—State whether the outer walls are built of stone, brick, concrete, wood, iron, canvas, or any other material.

Line 3.—State number of rooms, including kitchen, but excluding shop, office, store, bathroom, pantry, or outhouses, unless some one sleeps therein. In the case of a tenement, give number of rooms in tenement only. In case of a building the only resident whereof is a caretaker, give number of rooms in caretaker's quarters only.

Line 4.—Write O if owner ; T if tenant ; or R P if rent purchaser.

The only buildings enumerated were those which were either used or intended for use as dwellings. Shops, offices, stores, churches, schools, etc., in which no one resided were not enumerated. In all cases dwellings occupied or usually occupied solely by full-blooded aboriginals have been excluded from the tabulation.

3.—**Dwellings, occupied, unoccupied and being built.**—At the Census of 1911 the total number of dwellings recorded for the Commonwealth as a whole was 960,783, of which 924,259 were occupied dwellings, 33,473 were dwellings, which at the date of the Census were unoccupied, while 3,051 dwellings in course of erection were also recorded at that date. As the returns received from certain districts furnished indications of defective collection in respect of unoccupied dwellings, and those being built the figures for these classes are below the truth, but the extent of the deficiency cannot be readily estimated. In the detailed analysis of the information concerning dwellings, occupied dwellings only have been treated. The complete tabulation of the data in respect of dwellings is contained in Volume III. of the Census Report, pp. 1849-2047. Ships, boats and other craft, the occupants of which were enumerated at the Census, are not included as dwellings in the present chapter, nor in the tables quoted.

The number and proportion of dwellings recorded as occupied, unoccupied and being built in each of the States and Territories at 3rd April, 1911, were as follows :—

Dwellings Occupied, Unoccupied and Being Built, 1911.

State or Territory.	Number.				Proportion per cent.			
	Occupied.	Unoccupied.	Being Built.	Total.	Occupied.	Unoccupied.	Being Built.	Total.
States—					%	%	%	%
New South Wales	330,976	10,217	1,191	342,384	96.67	2.98	.35	100.00
Victoria	272,683	11,246	921	284,850	95.73	3.95	.32	100.00
Queensland	125,836	3,684	354	129,874	96.89	2.84	.27	100.00
South Australia	84,179	3,062	420	87,661	96.03	3.49	.48	100.00
Western Australia	68,870	3,158	74	72,102	95.52	4.38	.10	100.00
Tasmania	40,025	2,077	87	42,189	94.87	4.92	.21	100.00
Territories—								
Northern Territory	1,248	23	4	1,275	97.88	1.80	.32	100.00
Federal Territory	442	6	..	448	98.66	1.34	..	100.00
Total, Commonwealth ..	924,259	33,473	3,051	960,783	96.20	3.48	.32	100.00

For the Commonwealth as a whole the number of unoccupied dwellings recorded represented about 3½ per cent. of the total, while the number being built represented about 3¼ per thousand. Amongst the States, Tasmania, with 4.92 per cent. furnished the largest proportion of unoccupied, followed in succession by Western Australia, with 4.38 per cent., and Victoria with 3.95 per cent. Queensland, with 2.84 per cent., had the lowest proportion of unoccupied dwellings. In the case of houses being built, South Australia with .48 per cent., had the highest and Western Australia with .10 per cent. had the lowest proportion.

4. **Unspecified data.**—Amongst occupied dwellings the extent of the unspecified data was not great in so far as nature of dwellings, materials of outer walls, and number of rooms is concerned, but in the case of the inquiry as to rental value a very large proportion was unspecified. As regards nature of dwellings there were 492 unspecified cases, while there were 4,552 cases of failure to specify the number of rooms, and 5010 cases in which the materials were not stated. Of these the largest represented little more than 5 per 1000 of the total cases. On the other hand, in the case of rental values no fewer than 158,453, or about 17 per cent of the total, failed to specify the rental value of the dwelling.

5. **Nature of dwelling.**—The first classification made of the data in respect of occupied dwellings, was one according to the nature of the dwelling, that is, according to whether it was a private house, hotel, boarding house, etc. A tabulation according to this classification of the number of occupied dwellings in each State and Territory is furnished in the following table :—

Nature of Occupied Dwellings, 1911.

Nature of Dwelling.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
Private House	317,462	261,977	121,062	80,990	66,199	38,730	1,194	431	888,045
Tenement in Private House	2,304	1,657	691	1,118	354	220	..	..	6,344
Caretaker's Quarters in Store, Offices, &c	237	280	49	26	31	28	1	..	652
Hotel	2,795	2,932	1,610	643	732	383	10	1	9,106
Boarding House, Lodging House, Coffee Palace	5,966	4,390	1,400	945	1,041	436	4	5	14,187
Educational Institution	229	173	67	31	41	20	..	..	561
Religious Institution (non-Educational)	135	39	18	29	22	20	1	..	264
Hospital	479	317	242	97	144	44	3	..	1,326
Charitable Institution (other than Hospital)	159	100	55	62	36	18	1	..	431
Penal Establishment	132	35	17	14	29	9	1	..	237
Military and Naval Establishment ..	112	28	7	2	5	4	..	4	162
Police Barracks..	28	14	23	1	3	..	..	..	69
Police Station and Quarters	534	318	256	119	98	69	11	1	1,406
Fire Station	65	56	14	16	22	4	..	..	177
Unspecified	68	221	104	50	18	30	1	..	492
Wagons, Trains, etc.	250	145	171	18	15	10	..	..	609
Aboriginal Camps in which Whites or Half-castes were Living	21	1	50	18	80	..	21	..	191
Total Dwellings	330,976	272,683	125,836	84,179	68,870	40,025	1,248	442	924,259
Other Camps without Dwellings ..	1,865	812	998	258	1,449	86	60	2	5,530

In all States the class most numerously represented was naturally that of private houses. Boarding houses, &c., occupied second place, hotels third place, and tenements in private houses occupied fourth place in the Commonwealth as a whole, as well as in the States of New South Wales, Victoria, Western Australia, and Tasmania. In Queensland, hotels occupied second place, and in South Australia this position was occupied by tenements in private houses. For he purposes of detailed tabulations according to number of rooms and materials of which outer

walls were built, taken in conjunction, as well as for certain other purposes, it was deemed advisable to summarise the classification according to nature of dwelling so as to furnish a main division into "private dwellings" and "dwellings other than private." For this purpose "private houses" and "tenements in private houses" were combined and designated "private dwellings," while all the other classes were grouped together as "dwellings other than private." The percentage which "dwellings other than private" were of the total dwellings in the several States and Territories, and in the Commonwealth as a whole, was as follows:—Commonwealth, 3.23 per cent.; New South Wales, 3.39 per cent.; Victoria, 3.32 per cent.; Queensland, 3.24 per cent.; South Australia, 2.46 per cent.; Western Australia, 3.36 per cent.; Tasmania, 2.69 per cent.; Northern Territory, 4.33 per cent.; Federal Territory, 2.49 per cent.

In addition to the inmates of 924,259 dwellings there were enumerated 5,530 parties of campers out without dwellings.

In the next table is furnished a classification of the occupied dwellings in the Commonwealth, according to nature of dwelling and number of rooms.

Nature of Dwelling and Number of Rooms. Commonwealth, 1911.

Nature of Dwelling.	Number of Dwellings Containing Rooms to the Number of—										
	1	2	3	4	5	6	7	8	9	10	11
Private House	64,886	44,139	70,188	204,687	190,229	147,549	75,325	40,623	19,243	12,057	4,896
Tenement in Private House	1,633	1,326	1,132	1,007	636	303	124	52	16	14	5
Caretaker's Quarters in Store, Offices, etc.	126	101	113	110	90	23	18	6	1	2	..
Hotel	3	1	..	8	15	38	92	195	278	460	508
Boarding House, Lodging House, Coffee Palace	6	42	125	395	1,014	2,131	1,957	1,904	1,481	1,137	740
Educational Institution	..	..	..	4	8	14	14	19	26	27	38
Religious Institution (non-Educational)	..	1	6	9	10	25	28	21	16	16	19
Hospital	..	2	12	34	80	139	185	120	98	91	59
Charitable Institution (other than Hospital)	21	29	14	29	17	16	17	16	19	21	13
Penal Establishment	6	3	8	16	21	31	21	18	10	8	7
Military and Naval Establishment	95	7	3	4	9	12	7	3	1	1	..
Police Barracks	2	4	6	5	14	9	5	4	3	3	1
Police Station & Quarters	22	33	51	195	369	331	208	83	45	30	10
Fire Station	19	15	17	37	25	19	11	11	5	4	3
Unspecified	3	2	3	9	6	22	7	17	17	18	12
Wagons, Trains, etc.	..	..	..	..	..	..	..	..	..	..	..
Aboriginal Camps in which Whites or Half-castes were Living	..	..	..	..	..	..	..	..	..	..	..
Total	66,822	45,705	71,678	206,549	192,543	150,662	78,019	43,092	21,259	13,889	6,311
Other Camps without Dwellings	..	..	..	..	..	..	..	..	..	..	..

Nature of Dwelling.	Number of Dwellings Containing Rooms to the Number of—										Total.
	12	13	14	15	16	17	18	19	20 and over.	Unspecified.	
Private House	4,043	1,677	1,600	794	651	350	277	127	861	3,843	888,045
Tenement in Private House	3	..	2	..	..	..	..	..	1	90	6,344
Caretaker's Quarters in Store, Offices, etc.	..	1	..	..	1	..	1	..	..	59	652
Hotel	731	587	739	554	561	415	362	238	3,196	125	9,106
Boarding House, Lodging House, Coffee Palace	674	414	428	277	214	159	140	73	798	78	14,187
Educational Institution	28	9	29	14	30	10	20	12	256	3	561
Religious Institution (non-Educational)	15	8	12	11	8	3	7	3	44	2	264
Hospital	66	39	46	33	36	19	20	17	171	59	1,326
Charitable Institution (other than Hospital)	16	12	25	11	9	8	13	4	99	22	431
Penal Establishments	15	5	5	4	2	..	..	2	27	28	237
Military and Naval Establishment	1	1	1	..	..	..	1	..	8	8	162
Police Barracks	4	..	2	1	..	..	2	1	3	..	69
Police Station and Quarters	13	1	3	..	2	..	1	..	..	9	1,406
Fire Station	1	1	..	..	..	1	1	..	5	2	177
Unspecified	17	10	23	10	12	8	6	4	62	224	492
Wagons, Trains, etc.	..	..	..	..	..	..	..	..	..	609	609
Aboriginal Camps in which Whites or Half-castes were Living	..	..	..	..	..	..	..	..	..	191	191
Total	5,627	2,765	2,915	1,709	1,526	973	851	481	5,531	5,352	924,259
Other Camps without Dwellings	..	..	..	..	..	..	..	..	..	..	5,530

More than half of the " private houses" contained 5 rooms or less, while more than half of the " tenements in private houses" contained 3 rooms or less. Similarly, more than half of the caretaker's quarters contained 3 rooms or less. On the other hand more than half of the " hotels" contained 16 rooms or more, and more than half of the " boarding houses, &c.," contained 8 rooms or more.

The total of 5,531 dwellings enumerated with 20 rooms and over, was made up as follows :

Dwellings containing 20 Rooms and Over. Commonwealth, 1911.

Number of Rooms.	Private Dwellings.	Dwellings other than Private.	Total.	Number of Rooms.	Private Dwellings.	Dwellings other than Private.	Total.
20 and under 25 ..	636	1,921	2,557	60 and under 70 ..	1	91	92
25 „ 30 ..	129	879	1,008	70 „ 80 ..	..	49	49
30 „ 35 ..	53	711	764	80 „ 90 ..	..	25	25
35 „ 40 ..	11	283	294	90 „ 100 ..	..	16	16
40 „ 45 ..	22	334	356	100 and over ..	..	63	63
45 „ 50 ..	3	114	117				
50 „ 60 ..	7	183	190	TOTAL	862	4,669	5,531

The following table furnishes for the Commonwealth as a whole as well as for each State and Territory the number of private and other dwellings, the aggregate number of inmates, and the average number of inmates per dwelling :—

Dwellings and Inmates according to Nature of Dwellings. 1911.

State or Territory.	Number of Dwellings.			Number of Inmates.			Average Number of Inmates per Dwelling.		
	Private.	Other than Private.	Total.	In Private Dwellings.	In Dwellings other than Private.	In all Dwellings.	In Private Dwellings.	In Dwellings other than Private.	In all Dwellings.
STATES—									
N.S.W. ..	319,766	11,210	330,976	1,494,504	140,149	1,634,653	4.67	12.50	4.94
Vic. ..	263,634	9,049	272,683	1,207,716	101,300	1,309,016	4.58	11.19	4.80
Q'land ..	121,753	4,083	125,836	545,814	53,703	599,517	4.48	13.15	4.76
S.A. ..	82,108	2,071	84,179	379,622	25,506	405,128	4.62	12.32	4.81
W.A. ..	66,553	2,317	68,870	245,160	27,767	272,927	3.68	11.98	3.96
Tas. ..	38,950	1,075	40,025	178,775	11,688	190,463	4.59	10.87	4.76
TERRITORIES—									
N.T. ..	1,194	54	1,248	2,682	266	2,948	2.25	4.93	2.36
F.T. ..	431	11	442	1,653	55	1,708	3.84	5.00	3.86
Total, C'wlth	894,389	29,870	924,259	4,055,926	360,434	4,416,360	4.53	12.07	4.78

For the Commonwealth as a whole the average number of inmates per private dwelling was 4.53, and the average number per dwelling (other than private) was 12.07. All the States except Western Australia agreed closely with the Commonwealth average in respect of private houses, and all of the States accorded fairly well with the Commonwealth average in respect of other houses. The small average in the case of Western Australian private houses is due in large measure to the relatively large proportion of temporary residences of canvas and iron which there were in Western Australia at the date of the Census.

In addition to the 4,416,360 persons shewn above as inmates of dwellings there were enumerated 11,409 occupants of camps without dwellings, and a shipping population of 27,236, making with the inmates of dwellings the total population of 4,455,005. Details concerning the campers out and the shipping population of the several States and Territories are as follows :—

Campers-out and Shipping Population. 1911.

Particulars.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	C'wlth.
Occupants of Camps without dwellings	4,030	1,730	2,428	691	2,171	172	181	6	11,409
Shipping Population	8,051	4,805	3,868	2,739	7,016	576	181	..	27,236
TOTAL	12,081	6,535	6,296	3,430	9,187	748	362	6	38,645

6. **Number of rooms.**—(i.) *Private Dwellings.*—A classification of the occupied private dwellings of the several States and Territories, according to the number of rooms contained, is furnished in the following table as well as the proportionate distribution, according to number of rooms :—

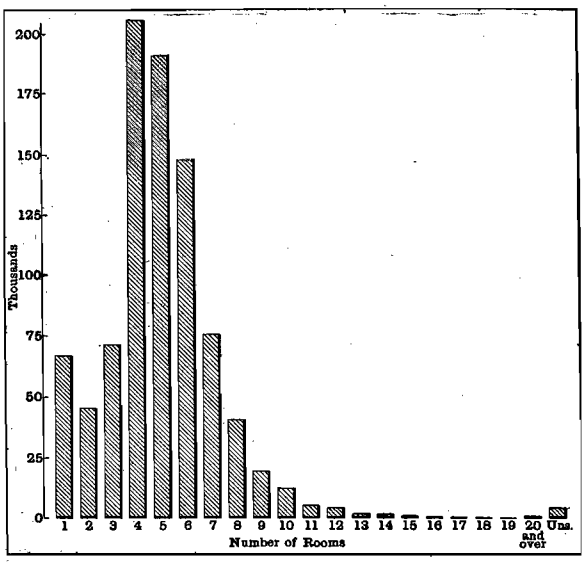
Occupied Private Dwellings according to Number of Rooms, 1911.

Number of Rooms.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
NUMBER OF DWELLINGS.									
1	20,321	9,679	16,198	3,248	13,893	2,431	613	136	66,519
2	14,596	9,429	7,656	4,119	6,418	2,939	283	25	45,465
3	24,288	18,054	7,601	9,630	8,316	3,301	111	19	71,320
4	70,241	61,913	22,979	21,151	17,656	11,613	81	60	205,694
5	75,063	58,107	24,648	16,821	9,680	6,444	45	57	190,865
6	54,369	48,927	19,366	14,048	5,620	5,442	31	49	147,852
7	26,993	26,452	10,779	6,364	2,215	2,603	13	30	75,449
8	14,766	14,307	5,650	3,149	1,149	1,626	9	19	40,675
9	7,016	6,688	2,812	1,387	536	812	1	7	19,259
10	4,487	4,115	1,710	829	336	585	1	8	12,071
11	1,987	1,595	665	307	124	217	..	6	4,901
12	1,626	1,270	509	299	129	211	..	2	4,046
13	684	543	178	115	56	101	..	..	1,677
14	643	517	183	117	46	94	..	2	1,602
15	324	250	98	60	19	43	..	..	794
16	293	182	74	44	23	34	..	1	651
17	157	100	29	29	13	22	..	..	350
18	138	71	23	25	7	13	..	..	277
19	52	40	18	6	3	7	..	1	127
20 and over	382	276	91	57	23	30	..	3	862
Unspecified	1,340	1,119	486	303	291	382	6	6	3,933
Total	319,766	263,634	121,753	82,108	66,553	38,950	1,194	431	894,389
PERCENTAGE ON TOTAL SPECIFIED.									
	%	%	%	%	%	%	%	%	%
1	6.38	3.69	13.36	3.97	20.97	6.30	51.60	32.00	7.47
2	4.58	3.59	6.31	5.04	9.69	7.62	23.82	5.88	5.11
3	7.63	6.88	6.27	11.77	12.55	8.56	9.34	4.47	8.01
4	22.06	23.58	18.95	25.86	26.65	30.11	6.82	14.12	23.10
5	23.57	22.13	20.32	20.56	14.61	16.71	3.79	13.41	21.43
6	17.08	18.64	15.97	17.17	8.48	14.11	2.60	11.53	16.60
7	8.48	10.08	8.89	7.78	3.34	6.75	1.09	7.06	8.47
8	4.64	5.45	4.66	3.85	1.73	4.21	.76	4.47	4.57
9	2.20	2.55	2.32	1.70	.81	2.11	.09	1.65	2.16
10	1.41	1.57	1.41	1.01	.51	1.52	.09	1.88	1.36
11	.62	.61	.55	.38	.19	.56	..	1.41	.55
12	.51	.48	.42	.36	.19	.55	..	.47	.46
13	.22	.21	.15	.14	.08	.26	..	..	.19
14	.20	.20	.15	.14	.07	.24	..	.47	.18
15	.10	.09	.08	.07	.03	.11	..	...	.09
16	.09	.07	.06	.05	.03	.09	..	.24	.07
17	.05	.04	.02	.04	.02	.06	..	..	.04
18	.04	.03	.02	.03	.01	.03	..	..	.03
19	.02	.01	.01	.01	.00	.02	..	.24	.01
20 and over	.12	.10	.08	.07	.04	.08	..	.70	.10
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

In four of the States, viz., New South Wales, Victoria, South Australia, and Tasmania, private dwellings having 4, 5 and 6 rooms represented more than 60 per cent. of the total private dwellings, the respective percentages being as follows :—New South Wales, 63.71 per cent. ; Victoria, 64.35 per cent. ; South Australia, 63.59 per cent.; Tasmania, 60.93 per cent. In the case of Queensland the corresponding percentage was 55.24 per cent., while in Western Australia it was as low as 49.74 per cent. In the two last mentioned States the number of single roomed dwellings was large, representing 13.36 per cent. of the total in the case of Queensland, and 20.97 per cent. of the total in the case of Western Australia. Two and three-roomed private dwellings were also proportionately more numerous in Western Australia than

in the other States. The relatively heavy number of small dwellings in Queensland and Western Australia is largely due to the comparative recency of the settlement and development of considerable areas of each of these States. In all the States the number of private dwellings containing more than eight rooms is relatively small. Thus in Commonwealth as a whole the number of private dwellings containing 9 rooms or upwards is only 5.24 per cent. of the total private dwellings. The corresponding percentages for the several States are as follows :—New South Wales, 5.58 per cent. ; Victoria, 5.96 per cent.; Queensland, 5.27 per cent. ; South Australia, 4.00 per cent. ; Western Australia, 1.98 per cent. ; Tasmania, 5.63 per cent.

Number of Occupied Private Dwellings according to Number of Rooms, Commonwealth, 1911.



GRAPH No. 155.

The accompanying graph (No. 155) furnishes a representation of the number of private dwellings recorded as containing the number of rooms specified. The figures at the feet of the pillars denote the number of rooms contained, while the scale on the left margin indicates the number of thousands of such private dwellings recorded. The pillar marked "Uns." represents the number of private dwellings for which the number of rooms was unspecified.

(ii.) *Dwellings other than private.*—A similar classification of the occupied dwellings other than private in the several States and Territories is furnished in the next table :—

Occupied Dwellings (other than Private) according to number of Rooms, 1911.

Number of Rooms.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
NUMBER OF DWELLINGS.									
1	171	62	39	10	13	5	1	2	303
2	84	60	40	19	26	5	5	1	240
3	119	80	61	17	62	16	3	..	358
4	280	173	95	82	154	66	5	..	855
5	677	424	203	146	172	52	1	3	1,678
6	1,340	769	231	219	169	77	4	1	2,810
7	1,117	824	264	166	142	57	..	..	2,570
8	900	860	254	151	159	90	2	1	2,417
9	763	712	212	111	139	61	2	..	2,000
10	637	656	228	96	139	61	1	..	1,818
11	507	529	157	81	98	37	1	..	1,410
12	509	569	214	99	112	78	..	..	1,581
13	404	350	154	63	70	44	1	2	1,088
14	483	389	206	109	85	41	..	..	1,313
15	318	301	135	66	62	32	1	..	915
16	300	244	142	85	65	38	1	..	875
17	215	190	102	39	48	29	..	..	623
18	186	173	92	49	47	27	..	..	574
19	108	96	76	26	33	15	..	..	354
20 and over	1,637	1,229	836	349	393	221	3	1	4,669
Unspecified	184	213	121	52	34	13	2	..	619
Wagons, Trains, etc.	250	145	171	18	15	10	..	..	609
Aboriginal Camps in which Whites or Half-castes were Living	21	1	50	18	80	..	21	..	191
TOTAL	11,210	9,049	4,083	2,071	2,317	1,075	54	11	29,870

Occupied Dwellings (other than Private) according to Number of Rooms, 1911—*continued.*

Number of Rooms.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
	PERCENTAGE ON TOTAL SPECIFIED.								
	%	%	%	%	%	%	%	%	%
1	1.59	.71	1.04	.50	.59	.48	3.23	18.18	1.06
2	.78	.69	1.07	.96	1.19	.48	16.13	9.09	.84
3	1.11	.92	1.63	.86	2.83	1.52	9.68	..	1.26
4	2.60	1.99	2.54	4.14	7.04	6.27	16.13	..	3.01
5	6.30	4.88	5.43	7.36	7.86	4.94	3.23	27.28	5.90
6	12.46	8.85	6.17	11.04	7.72	7.32	12.90	9.09	9.88
7	10.39	9.48	7.06	8.37	6.49	5.42	..	..	9.03
8	8.37	9.90	6.79	7.61	7.27	8.56	6.45	9.09	8.50
9	7.09	8.19	5.67	5.60	6.35	5.80	6.45	..	7.03
10	5.92	7.55	6.09	4.84	6.35	5.80	3.23	..	6.39
11	4.71	6.09	4.20	4.08	4.48	3.52	3.23	..	4.96
12	4.73	6.55	5.72	4.99	5.12	7.41	..	..	5.56
13	3.76	4.03	4.12	3.18	3.20	4.18	3.22	18.18	3.82
14	4.49	4.48	5.51	5.50	3.89	3.90	..	..	4.61
15	2.96	3.46	3.61	3.33	2.84	3.04	3.22	..	3.22
16	2.79	2.81	3.79	4.29	2.97	3.61	3.22	..	3.07
17	2.00	2.19	2.72	1.97	2.19	2.76	..	..	2.19
18	1.73	1.99	2.46	2.47	2.15	2.57	..	..	2.02
19	1.00	1.10	2.03	1.31	1.51	1.42	..	..	1.24
20 and over	15.22	14.14	22.35	17.60	17.96	21.00	9.68	9.09	16.41
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	10.000	10.000

It will be seen from the above table that amongst dwellings other than private there is no strongly-marked tendency to concentrate in a limited group such as is shewn in the case of private dwellings for the group comprising dwellings of 4, 5 and 6 rooms. For the Commonwealth as a whole, and also for most of the States, the dwellings other than private of 6, 7, 8, and 9 rooms preponderate, but for the Commonwealth such dwellings represent only 34.44 per cent. of the total. The corresponding percentages for the several States are as follows :—New South Wales, 38.31 per cent. ; Victoria, 36.42 per cent. ; Queensland, 25.69 per cent. ; South Australia, 32.62 per cent. ; Western Australia, 27.83 per cent. ; and Tasmania, 27.10 per cent. In all the States a large proportion of the dwellings other than private contains 20 rooms or more, the proportion of such being 16.41 per cent. for the Commonwealth, and varying in the several States between the limits of 14.14 per cent. in the case of Victoria, and 21 per cent. in that of Tasmania.

(iii.) *All Dwellings.*—A combination of the results concerning private and other dwellings that were occupied is furnished in the succeeding table :—

Occupied Dwellings (Private and Other), according to Number of Rooms. 1911.

Number of Rooms.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
	NUMBER OF DWELLINGS								
1	20,492	9,741	16,237	3,258	13,906	2,436	614	138	66,822
2	14,680	9,489	7,696	4,138	6,444	2,944	288	26	45,705
3	24,407	18,134	7,662	9,647	8,378	3,317	114	19	71,678
4	70,521	62,086	23,074	21,233	17,810	11,679	86	60	206,549
5	75,740	58,531	24,851	16,967	9,852	6,496	46	60	192,543
6	55,709	49,696	19,597	14,267	5,789	5,519	35	50	150,662
7	28,110	27,276	11,043	6,530	2,357	2,660	13	30	78,019
8	15,666	15,167	5,904	3,300	1,308	1,716	11	20	43,092
9	7,779	7,400	3,024	1,498	675	873	3	7	21,259
10	5,124	4,771	1,938	925	475	646	2	8	13,889
11	2,494	2,124	822	388	222	254	1	6	6,311
12	2,135	1,839	723	398	241	289	..	2	5,627
13	1,088	893	332	178	126	145	1	2	2,765
14	1,126	906	389	226	131	135	..	2	2,915
15	642	551	233	126	81	75	1	..	1,709
16	593	426	216	129	88	72	1	1	1,526
17	372	290	131	68	61	51	..	..	973
18	324	244	115	74	54	40	..	..	851
19	160	136	94	32	36	22	..	1	481
20 and over	2,019	1,505	927	406	416	251	3	4	5,531
Unspecified	1,524	1,332	607	355	325	395	8	6	4,552
Wagons, Trains, etc.	250	145	171	18	15	10	..	..	609
Aboriginal Camps in which Whites or Half-castes were Living ..	21	1	50	18	80	..	21	..	191
Total	330,976	272,683	125,836	84,179	68,870	40,025	1,248	442	924,259

Occupied Dwellings (Private and Other) according to Number of Rooms, 1911—*continued.*

Number of Rooms.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
PERCENTAGE ON TOTAL SPECIFIED.									
	%	%	%	%	%	%	%	%	%
1	6.23	3.59	12.99	3.89	20.32	6.15	50.37	31.65	7.27
2	4.46	3.50	6.16	4.94	9.41	7.43	23.63	5.96	4.97
3	7.41	6.69	6.13	11.51	12.24	8.37	9.35	4.36	7.80
4	21.42	22.89	18.46	25.34	26.02	29.48	7.05	13.76	22.48
5	23.01	21.58	19.88	20.25	14.39	16.40	3.77	13.76	20.95
6	16.92	18.33	15.68	17.03	8.46	13.93	2.87	11.47	16.40
7	8.54	10.06	8.83	7.79	3.44	6.71	1.07	6.88	8.49
8	4.76	5.59	4.72	3.94	1.91	4.33	.90	4.59	4.69
9	2.36	2.73	2.42	1.79	.99	2.20	.25	1.60	2.31
10	1.56	1.76	1.55	1.10	.69	1.63	.17	1.83	1.51
11	.76	.78	.66	.46	.33	.64	.08	1.38	.69
12	.65	.68	.58	.48	.35	.73	..	.46	.61
13	.33	.33	.27	.21	.18	.37	.08	.46	.30
14	.34	.33	.31	.27	.19	.34	..	.46	.32
15	.20	.20	.19	.15	.12	.19	.08	..	.19
16	.18	.16	.17	.15	.13	.18	.08	.23	.17
17	.11	.11	.10	.08	.09	.13	..	..	.11
18	.10	.09	.09	.09	.08	.10	..	..	.09
19	.05	.05	.07	.04	.05	.06	..	.23	.05
20 and over	.61	.55	.74	.49	.61	.63	.25	.92	.60
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Owing to the preponderance of private dwellings the proportions shewn in the above table differ but slightly from those shewn on p. 400 for private dwellings only. The principal difference is that in practically all cases in the above table the proportions for dwellings of 6 rooms and under are somewhat less, and the proportions for dwellings containing more than 6 rooms are somewhat greater than is the case with private dwellings only. Dwellings of 4, 5 and 6 rooms represent 59.83 per cent. of the Commonwealth total, the corresponding totals for the several States being as follows :—New South Wales, 61.35 per cent. ; Victoria, 62.80 per cent. ; Queensland, 54.02 per cent.; South Australia, 62.62 per cent.; Western Australia, 48.87 per cent. ; Tasmania, 59.81 per cent.

(iv.) *Inmates of private dwellings.*—The next table furnishes a classification according to size of dwelling of the population that was enumerated as residing in private dwellings, at the date of the Census. The figures are given separately for each State and Territory, and the proportionate distribution of such residents according to size of dwelling is also shewn.

Inmates of Occupied Private Dwellings, according to Number of Rooms. 1911.

Number of Rooms.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
NUMBER OF INMATES.									
1	28,656	13,015	24,619	5,094	18,623	3,546	783	192	94,528
2	38,541	23,582	21,394	11,926	15,899	8,555	643	55	120,595
3	88,295	63,728	28,500	36,677	28,731	13,075	400	82	259,488
4	303,967	260,270	101,707	93,192	74,813	53,326	327	225	887,827
5	366,640	272,491	119,958	81,072	46,912	31,934	193	269	919,469
6	295,975	248,934	103,776	74,860	30,124	29,320	167	301	783,457
7	155,418	142,659	62,426	35,663	12,663	14,530	67	191	423,617
8	89,280	80,882	34,945	18,818	7,049	9,366	57	120	240,517
9	44,352	39,241	18,262	8,572	3,457	4,815	15	31	118,745
10	29,588	25,036	11,758	5,157	2,282	3,563	4	55	77,443
11	13,539	10,090	4,790	2,033	853	1,328	..	36	32,669
12	11,718	8,363	4,022	1,989	921	1,362	..	13	28,388
13	5,210	3,694	1,358	806	434	664	..	..	12,166
14	5,007	3,662	1,556	818	352	652	..	21	12,068
15	2,681	1,869	1,031	398	178	299	..	..	6,456
16	2,360	1,367	797	312	210	268	..	13	5,327
17	1,427	812	267	205	136	141	..	..	2,988
18	1,260	621	275	168	76	97	..	..	2,497
19	506	372	209	68	26	45	..	4	1,230
20 and over	4,172	2,565	1,842	454	265	214	..	31	9,543
Unspecified	5,912	4,463	2,322	1,340	1,156	1,675	26	14	16,908
Total	1,494,504	1,207,716	545,814	379,622	245,160	178,775	2,682	1,653	4,055,926

Inmates of Occupied Private Dwellings, according to Number of Rooms, 1911—*continued.*

Number of Rooms.	States.						Territories.		C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
	PERCENTAGE ON TOTAL SPECIFIED.								
	%	%	%	%	%	%	%	%	%
1	1.93	1.09	4.53	1.35	7.63	2.00	29.48	11.71	2.34
2	2.59	1.96	3.94	3.15	6.51	4.83	24.21	3.36	2.99
3	5.93	5.30	5.24	9.69	11.77	7.38	15.06	5.00	6.42
4	20.42	21.63	18.71	24.64	30.66	30.11	12.31	13.73	21.98
5	24.63	22.65	22.07	21.43	19.23	18.03	7.27	16.41	22.76
6	19.88	20.69	19.09	19.79	12.35	16.56	6.29	18.37	19.40
7	10.44	11.86	11.49	9.43	5.19	8.20	2.52	11.65	10.49
8	6.00	6.72	6.43	4.97	2.89	5.29	2.15	7.32	5.96
9	2.98	3.26	3.36	2.27	1.42	2.72	.56	1.89	2.94
10	1.99	2.08	2.16	1.36	.94	2.01	.15	3.36	1.92
11	.91	.84	.88	.54	.35	.75	..	2.20	.81
12	.79	.69	.74	.53	.38	.77	..	.79	.70
13	.35	.31	.25	.21	.18	.37	..	..	.30
14	.34	.30	.29	.22	.14	.37	..	1.28	.30
15	.18	.15	.19	.11	.07	.17	..	..	.16
16	.16	.11	.15	.08	.09	.15	..	.79	.13
17	.09	.07	.05	.05	.05	.08	..	..	.07
18	.08	.05	.05	.04	.03	.06	..	..	.06
19	.03	.03	.04	.02	.01	.03	..	.25	.03
20 and over	.28	.21	.34	.12	.11	.12	..	1.89	.24
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Of the total of 4,039,018 persons recorded as inmates of private dwellings of which the number of rooms was stated, no fewer than 2,590,753, or 64.14 per cent., were resident in dwellings of 4, 5 or 6 rooms. The corresponding percentages for the several States were as follows:—New South Wales, 64.93 per cent.; Victoria, 64.97 per cent.; Queensland, 59.87 per cent.; South Australia, 65.86 per cent.; Western Australia, 62.24 per cent.; Tasmania, 64.70 per cent. The inmates of private dwellings in the Commonwealth may be divided into four fairly well defined groups as follows :—

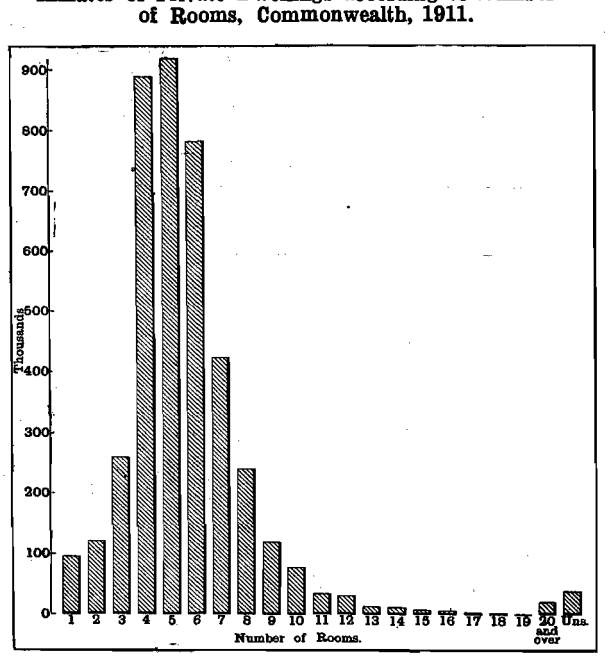
Inmates of dwellings of less than 4 rooms 11.75 per cent.

Inmates of dwellings of 4 to 6 rooms 64.14 per cent.

" " 7 to 9 rooms 19.39 per cent.

" " 10 rooms and more 4.72 per cent.

Inmates of Private Dwellings according to Number of Rooms, Commonwealth, 1911.



GRAPH No. 156.

A representation of the number of inmates of private dwellings of different sizes is furnished in Graph No. 156. The figures at the feet of the pillars denote the number of rooms contained, while the scale on the left margin indicates the number of thousands of inmates resident in such dwellings. The pillar marked "Uns." represents the number of inmates of private dwellings for which the number of rooms was unspecified.

(v.) *Inmates of dwellings other than private.*—A similar tabulation in respect of dwellings other than private is furnished in the next table ;—

Inmates of Dwellings other than Private, according to Number of Rooms, 1911.

Number of Rooms.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
NUMBER OF INMATES.									
1	695	149	63	12	16	9	1	4	949
2	247	133	159	94	95	10	8	6	752
3	506	251	330	68	200	53	7	..	1,415
4	1,291	881	418	388	669	326	17	..	3,990
5	3,909	2,311	1,170	898	962	278	1	21	9,550
6	9,132	4,934	1,492	1,755	1,161	490	23	6	18,993
7	8,528	6,149	1,962	1,397	1,059	391	..	..	19,486
8	8,178	6,696	2,037	1,458	1,366	630	17	4	20,386
9	7,510	5,889	1,959	989	1,246	467	8	..	18,068
10	6,892	6,266	2,231	1,032	1,555	516	3	..	18,495
11	5,249	4,335	1,624	942	971	299	4	..	13,424
12	5,294	4,788	2,623	1,093	1,185	657	..	..	15,640
13	4,239	3,171	1,825	739	1,021	436	15	11	11,457
14	5,951	3,581	2,538	1,157	934	475	..	..	14,636
15	3,865	3,037	1,707	671	729	324	13	..	10,346
16	3,743	2,536	1,789	971	905	348	23	..	10,315
17	2,897	2,260	1,306	444	508	308	..	..	7,723
18	2,564	2,131	1,223	659	780	288	..	..	7,645
19	1,639	1,657	1,008	485	603	223	..	..	5,615
20 and over	45,442	34,006	23,793	7,365	9,862	4,762	65	3	125,298
Unspecified	11,067	5,851	1,872	2,758	1,714	379	14	..	23,655
Wagons, Trains, etc.	1,160	287	354	37	21	19	..	..	1,878
Aboriginal Camps in which Whites or Half-castes were Living	151	1	220	94	205	..	47	..	718
Total	140,149	101,300	53,703	25,506	27,767	11,688	266	55	360,434
PERCENTAGE ON TOTAL SPECIFIED.									
1	% .54	% .16	% .12	% .05	% .06	% .08	% .49	% 7.27	% .28
2	.19	.14	.31	.42	.37	.09	3.90	10.91	.23
3	.40	.26	.64	.30	.77	47	3.42	..	42
4	1.01	.93	.82	1.72	2.59	2.89	8.29	..	1.19
5	3.06	2.43	2.28	3.97	3.73	2.46	.49	38.18	2.86
6	7.15	5.18	2.91	7.76	4.50	4.34	11.22	10.91	5.68
7	6.67	6.46	3.83	6.18	4.10	3.46	..	..	5.83
8	6.40	7.04	3.97	6.45	5.29	5.58	8.29	7.27	6.10
9	5.88	6.19	3.82	4.37	4.82	4.14	3.90	..	5.41
10	5.39	6.58	4.35	4.56	6.02	4.57	1.46	..	5.53
11	4.11	4.56	3.17	4.17	3.76	2.65	1.95	..	4.02
12	4.14	5.03	5.12	4.83	4.59	5.82	..	..	4.68
13	3.32	3.33	3.56	3.27	3.95	3.86	7.32	20.00	3.43
14	4.66	3.76	4.95	5.12	3.62	4.21	..	..	4.38
15	3.02	3.19	3.33	2.97	2.82	2.87	6.34	..	3.10
16	2.93	2.67	3.49	4.29	3.50	3.08	11.22	..	3.09
17	2.27	2.37	2.55	1.96	1.97	2.73	..	..	2.31
18	2.01	2.24	2.39	2.91	3.02	2.55	..	..	2.29
19	1.28	1.74	1.97	2.14	2.33	1.97	..	..	1.68
20 and over	35.57	35.74	46.42	32.56	38.19	42.18	31.71	5.46	37.49
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

In all the States the inmates of dwellings other than private which contain 20 rooms or more represent a large proportion of the total inmates of non-private dwellings. For the Commonwealth the percentage was 37.49, and amongst the States it varied between the limits of 32.56 per cent. in South Australia, and 46.42 per cent. in Queensland. For smaller dwellings the maximum for the Commonwealth as a whole was attained by those containing 8 rooms, but the distribution over the long range from 5 to 18 rooms does not present any marked tendency towards concentration.

(vi.) *Inmates of all dwellings (private and other).*—A combination of the information respecting inmates for all dwellings (private and other) is furnished in the succeeding table, the dwellings being classified as before according to the number of rooms in each.

Inmates of all Dwellings (Private and Other), Classified according to Number of Rooms in Dwellings. 1911.

Number of Rooms.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
NUMBER OF INMATES.									
1	29,351	13,164	24,682	5,106	18,639	3,555	784	196	95,477
2	38,788	23,715	21,553	12,020	15,994	8,565	651	61	121,347
3	88,801	63,979	28,830	36,745	28,931	13,128	407	82	260,903
4	305,258	261,151	102,125	93,580	75,482	53,652	344	225	891,817
5	370,549	274,802	121,128	81,970	47,874	32,212	194	290	929,019
6	305,107	253,868	105,268	76,615	31,285	29,810	190	307	802,450
7	163,946	148,808	64,388	37,060	13,722	14,921	67	191	443,103
8	97,458	87,578	36,982	20,276	8,415	9,996	74	124	260,903
9	51,862	45,130	20,221	9,561	4,703	5,282	23	31	136,813
10	36,480	31,302	13,989	6,189	3,837	4,079	7	55	95,938
11	18,788	14,425	6,414	2,975	1,824	1,627	4	36	46,093
12	17,012	13,151	6,645	3,082	2,106	2,019	..	13	44,028
13	9,449	6,865	3,183	1,545	1,455	1,100	15	11	23,623
14	10,958	7,243	4,094	1,975	1,286	1,127	..	21	26,704
15	6,546	4,906	2,738	1,069	907	623	13	..	16,802
16	6,103	3,903	2,586	1,283	1,115	616	23	13	15,642
17	4,324	3,072	1,573	649	644	449	..	..	10,711
18	3,824	2,752	1,498	827	856	385	..	..	10,142
19	2,145	2,029	1,217	553	629	268	..	4	6,845
20 and over	49,614	36,571	25,635	7,819	10,127	4,976	65	34	134,841
Unspecified	16,979	10,314	4,194	4,098	2,870	2,054	40	14	40,563
Wagons, Trains, etc.	1,160	287	354	37	21	19	..	..	1,878
Aboriginal Camps in which Whites or Half-castes were Living	151	1	220	94	205	..	47	..	718
Total Inmates of Dwellings	1,634,653	1,309,016	599,517	405,128	272,927	190,463	2,948	1,708	4,416,360
PERCENTAGE ON TOTAL SPECIFIED.									
1	% 1.82	% 1.01	% 4.15	% 1.27	% 6.91	% 1.89	% 27.40	% 11.57	% 2.18
2	2.40	1.83	3.62	3.00	5.93	4.55	22.75	3.60	2.78
3	5.49	4.93	4.85	9.17	10.72	6.97	14.23	4.84	5.97
4	18.89	20.11	17.17	23.34	27.97	28.48	12.02	13.28	20.39
5	22.92	21.16	20.37	20.45	17.74	17.10	6.78	17.12	21.24
6	18.88	19.55	17.70	19.11	11.59	15.82	6.64	18.12	18.35
7	10.14	11.46	10.83	9.24	5.09	7.92	2.34	11.28	10.13
8	6.03	6.74	6.22	5.06	3.12	5.31	2.59	7.32	5.97
9	3.21	3.48	3.40	2.38	1.74	2.80	.80	1.83	3.13
10	2.26	2.41	2.35	1.54	1.42	2.17	.25	3.25	2.19
11	1.16	1.11	1.08	.74	.68	.86	.14	2.12	1.05
12	1.05	1.01	1.12	.77	.78	1.07	..	.77	1.01
13	.58	.53	.54	.39	.54	.58	.53	.65	.54
14	.68	.56	.69	.49	.48	.60	..	1.24	.61
15	.40	.38	.46	.27	.34	.33	.46	..	.38
16	.38	.30	.43	.32	.41	.33	.80	.77	.36
17	.27	.24	.26	.16	.24	.24	..	..	.25
18	.24	.21	.25	.21	.32	.20	..	..	.23
19	.13	.16	.20	.14	.23	.14	..	.24	.16
20 and over	3.07	2.82	4.31	1.95	3.75	2.64	2.27	2.00	3.08
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

The inmates of all dwellings may conveniently be divided into four groups as follows :—

Inmates of dwellings of less than 4 rooms 10.93 per cent.
" " 4 to 6 rooms 59.98 "
" " 7 to 9 rooms 19.23 "
" " 10 rooms and more 9.86 "

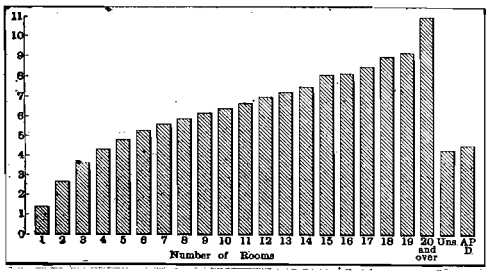
(vii.) *Inmates per private dwelling.*—The next table furnishes for each size of dwelling, the average number of inmates per private dwelling in the Commonwealth and the several States and Territories :—

Average Number of Inmates per Private Dwelling, 1911.

Number of Rooms.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
1	1.410	1.345	1.520	1.568	1.340	1.459	1.277	1.412	1.421
2	2.641	2.501	2.794	2.895	2.477	2.911	2.272	2.200	2.652
3	3.635	3.530	3.750	3.809	3.455	3.961	3.604	4.316	3.638
4	4.327	4.204	4.426	4.406	4.237	4.592	4.037	3.750	4.316
5	4.884	4.689	4.867	4.820	4.846	4.956	4.289	4.719	4.817
6	5.444	5.088	5.359	5.329	5.360	5.388	5.387	6.143	5.299
7	5.758	5.393	5.791	5.604	5.717	5.582	5.154	6.367	5.615
8	6.046	5.653	6.185	5.976	6.135	5.760	6.333	6.316	5.913
9	6.322	5.867	6.494	6.180	6.450	5.930	15.000	4.429	6.166
10	6.495	6.084	6.876	6.221	6.792	6.091	4.000	6.875	6.416
11	6.814	6.326	7.203	6.622	6.879	6.120	..	6.000	6.666
12	7.207	6.585	7.902	6.652	7.140	6.455	..	6.500	7.016
13	7.617	6.803	7.629	7.009	7.750	6.574	..	..	7.255
14	7.787	7.083	8.503	6.991	7.652	6.936	..	10.500	7.533
15	8.275	7.476	10.520	6.633	9.368	6.953	..	..	8.131
16	8.055	7.511	10.770	7 091	9.130	7.882	..	13 000	8.183
17	9.089	8.120	9.207	7.069	10.462	6.409	..	..	8.537
18	9.130	8.746	11.957	6.720	10.857	7.462	..	..	9.014
19	9.731	9.300	11.611	11.333	8.667	6.429	..	4.000	9.685
20 and over	10.921	9.293	20.242	7.965	11.522	7.133	..	10.333	11.071
Unspecified	4.412	3.988	4.778	4.422	3.973	4.385	4.333	2.333	4.299
All Private Dwellings	4.674	4.581	4.483	4.623	3.684	4.590	2.246	3.835	4.535

In all the States the average number of inmates increases with the number of rooms. In each State this average is greater than the number of rooms for dwellings up to and including those containing 4 rooms, but is less than the number of rooms for dwellings of 5 rooms and upwards.

Average Number of Inmates per Private Dwelling, Commonwealth, 1911.



GRAPH No. 157.

In the accompanying graph (No. 157) a representation is furnished of the average number of persons per dwelling for private dwellings of different sizes. The figures at the feet of the pillars denote the number of rooms contained, while the scale on the left denotes the average number of inmates per dwelling. The pillar marked "Uns" represents the average number of inmates per dwellling in the case of private dwellings for which the number of rooms was unspecified, while that marked "A.P.D." represents the average number of inmates per dwelling when all private dwellings are considered irrespective of size.

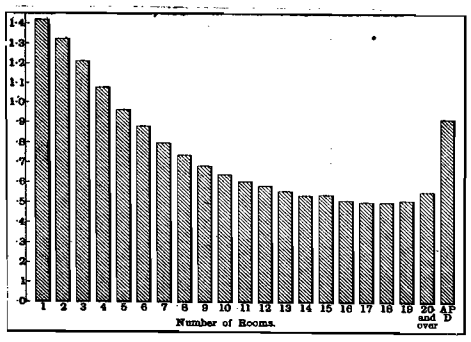
(viii.) *Inmates per room in private dwellings.*—A further analysis of the data relative to the number of inmates, gives the average number of inmates per room in each class of dwelling. Particulars in respect of private dwellings for the Commonwealth and each of the States and Territories are furnished in the succeeding table :—

Average Number of Inmates per Room, Private Dwellings. 1911.

Number of Rooms in Dwelling.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
1	1.410	1.345	1.520	1.568	1.340	1.459	1.277	1.412	1.421
2	1.321	1.251	1.397	1.448	1.239	1.456	1.136	1.100	1.326
3	1.212	1.177	1.250	1.270	1.152	1.320	1.201	1.439	1.213
4	1.082	1.051	1.107	1.102	1.059	1.148	1.009	.938	1.079
5	.977	.938	.973	.964	.969	.991	.858	.944	.963
6	.907	.848	.893	.888	.893	.898	.898	1.024	.883
7	.823	.770	.827	.801	.817	.797	.736	.910	.802
8	.756	.707	.773	.747	.767	.720	.792	.787	.739
9	.702	.652	.722	.687	.717	.659	1.667	.492	.685
10	.659	.608	.688	.622	.679	.609	.400	.688	.642
11	.619	.575	.655	.602	.625	.556	..	.545	.606
12	.601	.549	.659	.554	.595	.538	..	.542	.585
13	.586	.523	.587	.539	.596	.506	..	..	.558
14	.556	.506	.607	.499	.547	.495	..	.750	.538
15	.552	.498	.701	.442	.625	.464	..	..	.542
16	.503	.469	.673	.443	.571	.493	..	.813	.511
17	.535	.478	.542	.416	.615	.377	..	..	.502
18	.507	.486	.664	.373	.603	.415	..	..	.501
19	.512	.489	.611	.596	.456	.338	..	.211	.510
20 and over	.546	.465	1.012	.398	.576	.357	..	.517	.554
All Private Dwellings for which No. of Rooms was Specified	.928	.872	.948	.950	1.004	.961	1.098	.913	.920

The average number of inmates per room in private dwellings decreases in each of the States with a fair degree of regularity as the number of rooms increases, and for the Commonwealth as a whole varies between the limits of 1.4 persons per room for private dwellings of one room, and .5 persons per room for private dwellings of 17 or more rooms. Somewhat similar limits of variation are in evidence for each of the States.

Average Number of Inmates per Room, Private Dwellings, Commonwealth, 1911.



GRAPH No. 158.

Graph No. 158 furnishes a representation of the average number of inmates per room for private dwellings of different sizes. The figures at the feet of the pillars denote the number of rooms contained in the dwellings, while the scale on the left denotes the average number of inmates per room in such dwellings. The pillar marked "A.P.D." represents the average number of inmates per room for private dwellings of all sizes combined.

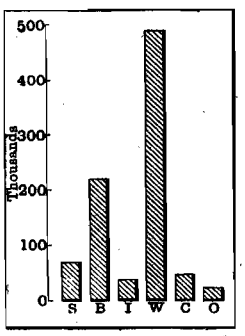
7. **Materials of outer walls.** (i.) *Private dwellings.*—A classification of occupied private dwellings according to the materials of which the outer walls were built, is furnished in the next table :—

Occupied Private Dwellings, Classified according to Materials of Outer Walls. 1911.

Materials of which Outer Walls were Built.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
NUMBER OF DWELLINGS.									
Stone	9,020	5,905	242	51,052	4,063	1,575	38	30	71,925
Brick	114,679	69,537	2,201	13,388	14,854	6,787	1	31	221,478
Concrete	865	555	42	1,951	84	78	2	3	3,580
Iron	8,851	2,619	9,969	5,367	10,109	475	506	12	37,908
Wood	162,493	175,122	95,348	7,073	20,611	28,948	188	183	489,966
Sun-dried Bricks	1,875	2,203	36	636	1,530	10	2	3	6,295
Pisé	1,741	54	50	46	17	3	..	29	1,940
Lath and Plaster	791	619	12	88	86	44	..	..	1,640
Wattle and Dab	744	335	2	210	58	..	..	..	1,349
Bark	1,290	671	1,149	2	52	22	175	2	3,363
Bushes, Rushes, Spinnifex, etc.	15	7	266	9	390	2	178	..	867
Calico, Canvas, Hessian	15,706	4,762	11,692	1,875	14,216	621	93	133	49,098
Ruberoid & other Compositions	130	41	81	23	56	6	..	..	337
Unspecified	1,566	1,204	663	388	427	379	11	5	4,643
Total	319,766	263,634	121,753	82,108	66,553	38,950	1,194	431	894,389
PERCENTAGE ON TOTAL SPECIFIED.									
	%	%	%	%	%	%	%	%	%
Stone	2.83	2.25	.20	62.47	6.14	4.08	3.21	7.04	8.08
Brick	36.04	26.50	1.82	16.38	22.46	17.60	.09	7.28	24.89
Concrete	.27	.21	.03	2.39	.13	.20	.17	.70	.40
Iron	2.78	1.00	8.23	6.57	15.29	1.23	42.77	2.82	4.26
Wood	51.07	66.73	78.74	8.66	31.17	75.05	15.89	42.96	55.07
Sun-dried Bricks	.59	.84	.03	.78	2.31	.03	.17	.70	.71
Pisé	.55	.02	.04	.06	.03	.01	..	6.81	.22
Lath and Plaster	.25	.24	.01	.11	.13	.11	..	..	.18
Wattle and Dab	.23	.13	.00	.26	.09	..	..	..	.15
Bark	.41	.26	.95	.00	.08	.06	14.79	.47	.38
Bushes, Rushes, Spinnifex, etc.	.00	.00	.22	.01	.59	.01	15.05	..	.10
Calico, Canvas, Hessian	4.94	1.81	9.66	2.29	21.50	1.61	7.86	31.22	5.52
Ruberoid & other Compositions	.04	.01	.07	.02	.08	.01	..	..	.04
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

In all the States except South Australia wooden private dwellings were more numerous than those constructed of any other material specified, and in all except South Australia and Western Australia, wooden private dwellings represented more than 50 per cent. of the total private dwellings. In South Australia no less than 62½ per cent. of the private dwellings were built of stone, while in Western Australia dwellings of iron, and of calico, canvas or hessian were very numerous. Brick occupied second place in all the States except Queensland, where "canvas, calico, hessian" ranked second. As indicated above, stone was proportionately more largely employed for private dwellings in South Australia than in any other State. Similarly brick was proportionately preponderant in New South Wales, wood in Queensland, iron and also calico, canvas or hessian in Western Australia. The other materials were proportionately unimportant in any of the States, and represented in combination less than 2¼ per cent. of the total.

Materials of Occupied Private Dwellings, Commonwealth, 1911.



GRAPH No. 159.

A representation of the number of occupied private dwelling of each class of material is furnished in Graph No. 159 for the Commonwealth as a whole. The letters at the feet of the several pillars have the following significance:—S, stone; B, brick; I, iron; W, wood; C, calico, canvas, hessian; O, other materials. The scale on the left of the graph indicates the number of thousands of dwellings of each class of material.

(ii.) *Dwellings other than private.*—The succeeding table furnishes a similar classification in respect of occupied dwellings other than private :—

Occupied Dwellings other than Private, Classified according to Materials of Outer Walls. 1911.

Materials of which Outer Walls were Built.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
NUMBER OF DWELLINGS.									
Stone	960	664	56	1,548	255	149	6	2	3,640
Brick	6,462	5,064	621	304	1,078	452	..	1	13,982
Concrete	42	42	8	8	2	11	..	..	113
Iron	152	43	263	61	332	15	22	1	889
Wood	3,022	2,937	2,798	74	422	427	3	4	9,687
Sun-dried Bricks	7	5	1	3	24	..	..	..	40
Pisé	22	..	11	..	..	..	..	..	33
Lath and Plaster	4	12	..	1	..	1	..	..	18
Wattle and Dab	3	..	..	1	..	..	..	..	4
Bark	8	..	1	..	..	..	..	..	9
Bushes, Rushes, Spinnifex, etc.	..	..	4	..	..	..	1	..	5
Calico, Canvas, Hessian	156	8	18	3	89	..	..	3	277
Ruberoid & other Compositions	2	1	..	..	3	..	..	..	6
Unspecified	99	127	81	32	17	10	1	..	367
Wagons, Trains, etc.	250	145	171	18	15	10	..	..	609
Aboriginal Camps in which Whites or Half-castes were Living	21	1	50	18	80	..	21	..	191
Total	11,210	9,049	4,083	2,071	2,317	1,075	54	11	29,870
PERCENTAGE ON TOTAL SPECIFIED.									
Stone	% 8.86	% 7.57	% 1.48	% 77.28	% 11.56	% 14.12	% 18.75	% 18.18	% 12.68
Brick	59.61	57.70	16.42	15.18	48.89	42.84	..	9.09	48.71
Concrete	.39	.48	.21	.40	.09	1.04	..	..	.39
Iron	1.40	.49	6.96	3.05	15.06	1.42	68.75	9.09	3.10
Wood	27.88	33.46	74.00	3.69	19.14	40.48	9.38	36.37	33.75
Sun-dried Bricks	.06	.06	.03	.15	1.09	..	..	..	.14
Pisé	.20	..	.29	..	..	..	..	..	.12
Lath and Plaster	.04	.14	..	.05	..	.10	..	..	.06
Wattle and Dab	.03	..	..	.05	..	..	..	..	.01
Bark	.07	..	.03	..	..	..	..	..	.03
Bushes, Rushes, Spinnifex, etc.	..	..	.11	..	..	..	3.12	..	.02
Calico, Canvas, Hessian	1.44	.09	.47	.15	4.04	..	..	27.27	.97
Ruberoid & other Compositions	.02	.01	..	..	.13	..	..	..	.02
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Brick, wood and stone in the order named, were the materials most largely used in the construction of non-private dwellings, these three materials accounting between them for upwards of 95 per cent. of the total number of dwellings of this class. Amongst the States, brick occupied first and wood second place in New South Wales, Victoria, Western Australia and Tasmania ; wood first and brick second in Queensland ; with stone first and brick second in South Australia.

(iii.) *All dwellings.*—The following table furnishes particulars for all occupied dwellings (private and other), classified according to materials of outer walls, for the Commonwealth and the several States and Territories :—

Occupied Dwellings (Private and Other), Classified according to Materials of Outer Walls. 1911.

Materials of which Outer Walls were Built.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
NUMBER OF DWELLINGS.									
Stone	9,980	6,569	298	52,600	4,318	1,724	44	32	75,565
Brick	121,141	74,601	2,822	13,692	15,932	7,239	1	32	235,460
Concrete	907	597	50	1,959	86	89	2	3	3,693
Iron	9,003	2,662	10,232	5,428	10,441	490	528	13	38,797
Wood	165,515	178,059	98,146	7,147	21,033	29,375	191	187	499,653
Sun-dried Bricks	1,882	2,208	37	639	1,554	10	2	3	6,335
Pisé	1,763	54	61	46	17	3	..	29	1,973
Lath and Plaster	795	631	12	89	86	45	..	..	1,658
Wattle and Dab	747	335	2	211	58	..	..	..	1,353
Bark	1,298	671	1,150	2	52	22	175	2	3,372
Bushes, Rushes, Spinnifex, etc.	15	7	270	9	390	2	179	..	872
Calico, Canvas, Hessian	15,862	4,770	11,710	1,878	14,305	621	93	136	49,375
Ruberoid & other Compositions	132	42	81	23	59	6	..	..	343
Unspecified	1,665	1,331	744	420	444	389	12	5	5,010
Wagons, Trains, etc.	250	145	171	18	15	10	..	..	609
Aboriginal Camps in which Whites or Half-castes were Living	21	1	50	18	80	..	21	..	191
Total	330,976	272,683	125,836	84,179	68,870	40,025	1,248	442	924,259
PERCENTAGE ON TOTAL SPECIFIED.									
Stone	% 3.03	% 2.42	% .24	% 62.83	% 6.32	% 4.35	% 3.62	% 7.32	% 8.23
Brick	36.82	27.51	2.26	16.35	23.32	18.27	.08	7.32	25.64
Concrete	.28	.22	.04	2.34	.13	.22	.16	.69	.40
Iron	2.74	.98	8.19	6.48	15.28	1.24	43.46	2.97	4.22
Wood	50.30	65.66	78.60	8.54	30.78	74.13	15.72	42.79	54.40
Sun-dried Bricks	.57	.81	.03	.76	2.27	.02	.16	.69	.69
Pisé	.54	.02	.05	.06	.02	.01	..	6.64	.21
Lath and Plaster	.24	.23	.01	.11	.13	.11	..	..	.18
Wattle and Dab	.23	.12	.00	.25	.08	..	..	..	.15
Bark	.39	.25	.92	.00	.08	.05	14.41	.46	.37
Bushes, Rushes, Spinnifex, etc.	.00	.00	.22	.01	.57	.01	14.73	..	.09
Calico, Canvas, Hessian	4.82	1.76	9.38	2.24	20.93	1.57	7.66	31.12	5.38
Ruberoid & other Compositions	.04	.02	.06	.03	.09	.02	..	..	.04
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Briefly stated the proportions for the Commonwealth for all occupied dwellings were as follows :—

Particulars.	Wood.	Brick.	Stone.	Calico, Canvas, Hessian.	Iron.	All other Materials	Total.
Percentage of total occupied dwellings	% 54.40	% 25.64	% 8.23	% 5.38	% 4.22	% 2.13	% 100.00

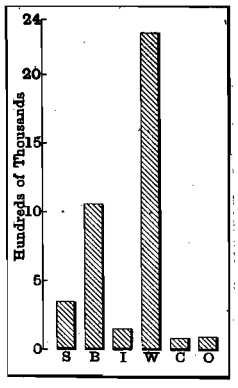
(iv.) *Inmates of private dwellings.*—In the next table is given the number of inmates of each class of occupied private dwelling, the classification being based upon the materials of which the outer walls were built :—

Inmates of Occupied Private Dwellings, Classified according to Materials of Outer Walls of Dwellings, 1911.

Materials of which Outer Walls were Built.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
NUMBER OF INMATES.									
Stone	46,213	29,707	1,370	246,399	19,963	7,987	174	146	351,959
Brick	557,993	328,362	10,491	60,151	68,521	32,388	6	205	1,058,117
Concrete	4,431	2,840	209	9,154	399	365	11	8	17,417
Iron	37,013	11,002	41,949	23,113	36,319	1,687	1,380	72	152,535
Wood	783,484	806,687	464,577	31,586	82,124	133,496	428	885	2,303,267
Sun-dried Bricks	9,360	10,593	183	2,769	7,424	41	10	6	30,386
Pisé	10,023	310	361	165	65	15	..	133	11,072
Lath and Plaster	3,835	2,697	67	384	372	213	..	..	7,568
Wattle and Dab	3,391	1,341	8	819	258	..	..	..	5,817
Bark	3,317	1,565	2,761	2	127	40	227	9	8,048
Bushes, Rushes, Spinnifex, etc.	48	8	744	30	605	2	295	..	1,732
Calico, Canvas, Hessian	28,562	7,842	20,294	3,319	27,368	942	121	178	88,626
Ruberoid & other Compositions	516	132	294	109	204	22	..	..	1,277
Unspecified	6,318	4,630	2,506	1,622	1,411	1,577	30	11	18,105
Total	1,494,504	1,207,716	545,814	379,622	245,160	178,775	2,682	1,653	4,055,926
PERCENTAGE ON TOTAL SPECIFIED.									
Stone	% 3.11	% 2.47	% .25	% 65.18	% 8.19	% 4.51	% 6.56	% 8.89	% 8.72
Brick	37.49	27.29	1.93	15.91	28.11	18.28	.23	12.48	26.21
Concrete	.30	.24	.04	2.42	.16	.21	.41	.49	.43
Iron	2.49	.91	7.72	6.12	14.90	.95	52.04	4.38	3.78
Wood	52.65	67.05	85.51	8.36	33.69	75.34	16.14	53.90	57.04
Sun-dried Bricks	.63	.88	.03	.73	3.05	.02	.38	.37	.75
Pisé	.67	.03	.07	.04	.03	.01	..	8.10	.27
Lath and Plaster	.26	.23	.01	.10	.15	.12	..	..	.19
Wattle and Dab	.23	.11	.00	.22	.11	..	..	..	.14
Bark	.22	.13	.51	.00	.05	.02	8.56	.55	.20
Bushes, Rushes, Spinnifex, etc.	.00	.00	.14	.01	.25	.00	11.12	..	.04
Calico, Canvas, Hessian	1.92	.65	3.74	.88	11.23	.53	4.56	10.84	2.20
Ruberoid & other Compositions	.03	.01	.05	.03	.08	.01	..	..	.03
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Two interesting features of the above table are (i.) the large proportion of the Queensland population who lived in wooden houses, and (ii.) the large proportion of the South Australian population who lived in houses built of stone.

Inmates of Private Dwellings, Commonwealth, 1911.



GRAPH No. 160.

The accompanying Graph (No. 160) furnishes a representation of the number of inmates of private dwellings, the outer walls of which were built of the materials specified. The letters at the feet of the several pillars have the following significance :—S, stone ; B, brick ; I, iron ; W, wood ; C, calico, canvas, hessian ; O, other materials. The scale on the left of the graph indicates the number of hundreds of thousands of inmates resident in dwellings of the several classes of material indicated.

Taking the leading materials separately for the States, the inmates of stone private dwellings were proportionately most numerous in South Australia, and least numerous in Queensland. The inmates of brick private dwellings were proportionately most numerous in New South Wales and least numerous in Queensland. The inmates of iron private dwellings were proportionately most numerous in Western Australia and least numerous in Victoria. The inmates of wooden private dwellings were proportionately most numerous in Queensland and least numerous in South Australia. The inmates of canvas, calico and hessian private dwellings were proportionately most numerous in Western Australia and least numerous in Tasmania.

(v.) *Inmates of dwellings other than private.*—Corresponding particulars for the inmates of dwellings other than private is furnished in the following table :—

Inmates of Dwellings other than Private, Classified according to Materials of Outer Walls of Dwellings. 1911.

Materials of which Outer Walls were Built.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
NUMBER OF INMATES.									
Stone	18,992	9,597	817	18,281	4,581	1,401	63	12	53,744
Brick	80,151	63,111	13,675	5,409	14,976	6,011	..	9	183,342
Concrete	396	418	180	85	60	131	..	..	1,270
Iron	1,763	354	2,205	514	2,557	146	133	4	7,676
Wood	33,586	24,452	35,169	673	3,837	3,833	7	20	101,577
Sun-dried Bricks	69	84	15	19	175	..	..	..	362
Pisé	263	..	127	..	..	..	..	..	390
Lath and Plaster	40	39	..	6	..	7	..	..	92
Wattle and Dab	23	..	..	4	..	..	..	..	27
Bark	74	..	2	..	..	..	..	..	76
Bushes, Rushes, Spinnifex, etc.	..	..	69	..	..	..	12	..	81
Calico, Canvas, Hessian	965	51	294	25	425	..	..	10	1,770
Ruberoid & other Compositions	28	7	..	..	16	..	..	..	51
Unspecified	2,488	2,899	576	361	914	140	4	..	7,382
Wagons, Trains, etc.	1,160	287	354	35	21	19	..	..	1,876
Aboriginal Camps in which Whites or Half-castes were Living	151	1	220	94	205	..	47	..	718
Total	140,149	101,300	53,703	25,506	27,767	11,688	266	55	360,434
PERCENTAGE ON TOTAL SPECIFIED.									
Stone	% 13.93	% 9.78	% 1.56	% 73.08	% 17.20	% 12.15	% 29.30	% 21.82	% 15.34
Brick	58.78	64.32	26.02	21.62	56.24	52.14	..	16.36	52.31
Concrete	.29	.43	.34	.34	.23	1.14	..	..	.36
Iron	1.29	.36	4.20	2.05	9.60	1.27	61.86	7.27	2.19
Wood	24.63	24.92	66.92	2.69	14.41	33.24	3.26	36.37	28.98
Sun-dried Bricks	.05	.09	.03	.08	.66	..	..	..	.10
Pisé	.19	..	.24	..	..	..	..	..	.11
Lath and Plaster	.03	.04	..	.02	..	.06	..	..	.03
Wattle and Dab	.02	..	..	.02	..	..	..	..	.01
Bark	.06	..	.00	..	..	..	..	..	.02
Bushes, Rushes, Spinnifex, etc.	..	..	.13	..	..	..	5.58	..	.02
Calico, Canvas, Hessian	.71	.05	.56	.10	1.60	..	..	18.18	.51
Ruberoid & other Compositions	.02	.01	..	..	.06	..	..	..	.02
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

In this case also the preponderance of wood in the case of Queensland, and of stone in the case of South Australia are in evidence.

(vi.) *Inmates of all dwellings.*—The succeeding table furnishes a classification of the population resident in all dwellings according to the materials of which the outer walls of the dwellings were built :—

Inmates of All Dwellings (Private and Other). 1911.

Materials of which Outer Walls were Built.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
NUMBER OF INMATES.									
Stone	65,205	39,304	2,187	264,680	24,544	9,388	237	158	405,703
Brick	638,144	391,473	24,166	65,560	83,497	38,399	6	214	1,241,459
Concrete	4,827	3,258	389	9,239	459	496	11	8	18,687
Iron	38,776	11,356	44,154	23,627	38,876	1,833	1,513	76	160,211
Wood	817,070	831,139	499,746	32,259	85,961	137,329	435	905	2,404,844
Sun-dried Bricks	9,429	10,677	198	2,788	7,599	41	10	6	30,748
Pisé	10,286	310	488	165	65	15	..	133	11,462
Lath and Plaster	3,875	2,736	67	390	372	220	..	..	7,660
Wattle and Dab	3,414	1,341	8	823	258	..	..	..	5,844
Bark	3,391	1,565	2,763	2	127	40	227	9	8,124
Bushes, Rushes, Spinnifex, etc.	48	8	813	30	605	2	307	..	1,813
Calico, Canvas, Hessian	29,527	7,893	20,588	3,344	27,793	942	121	188	90,396
Ruberoid & other Compositions	544	139	294	109	220	22	..	..	1,328
Unspecified	8,806	7,529	3,082	1,983	2,325	1,717	34	11	25,487
Wagons, Trains, etc.	1,160	287	354	35	21	19	..	..	1,876
Aboriginal Camps in which Whites or Half-castes were Living	151	1	220	94	205	..	47	..	718
Total Inmates of Dwellings	1634653	1309016	599,517	405,128	272,927	190,463	2,948	1,708	4,416,360

Inmates of All Dwellings (Private and Other), 1911—*continued.*

Materials of which Outer Walls were Built.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
	PERCENTAGE ON TOTAL SPECIFIED.								
Stone	4.01	3.02	.37	65.68	9.08	4.97	8.27	9.31	9.25
Brick	39.28	30.09	4.06	16.27	30.88	20.35	.21	12.61	28.29
Concrete	.30	.25	.07	2.29	.17	.26	.38	.47	.43
Iron	2.39	.87	7.41	5.86	14.38	.97	52.77	4.48	3.65
Wood	50.30	63.88	83.87	8.00	31.79	72.77	15.17	53.33	54.80
Sun-dried Bricks	.58	.82	.03	.69	2.81	.02	.35	.35	.70
Pisé	.63	.02	.08	.04	.02	.01	..	7.84	.26
Lath and Plaster	.24	.21	.01	.10	.14	.12	..	..	.17
Wattle and Dab	.21	.10	.00	.20	.10	..	..	..	.13
Bark	.21	.12	.46	.00	.05	.02	7.92	.53	.19
Bushes, Rushes, Spinnifex, etc.	.00	.00	.14	.01	.22	.00	10.71	..	.04
Calico, Canvas, Hessian	1.82	.61	3.45	.83	10.28	.50	4.22	11.08	2.06
Ruberoid & other Compositions	.03	.01	.05	.03	.08	.01	..	..	.03
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

The proportionate distribution of Commonwealth occupants of dwellings of all kinds may be summarised as follows in respect of the materials of which the outer walls of their dwellings were built :—

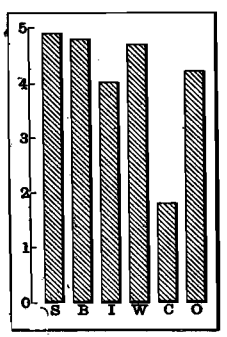
Particulars.	Wood.	Brick.	Stone.	Iron.	Calico, Canvas, Hessian.	All other Materials	Total.
Percentage of total inmates	% 54.80	% 28.29	% 9.25	% 3.65	% 2.06	% 1.95	% 100.00

(vii.) *Inmates per private dwelling.*—The average number of inmates per occupied private dwelling of each class of material is shewn in the following table for the Commonwealth and each State and Territory :—

Average Number of Inmates per Private Dwelling, 1911.

Materials of which Outer Walls were Built.	States.						Territories.		C'wlth
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
Stone	5.12	5.03	5.66	4.83	4.91	5.07	4.58	4.87	4.89
Brick	4.87	4.72	4.77	4.49	4.61	4.77	6.00	6.61	4.78
Concrete	5.12	5.12	4 97	4.69	4 75	4.68	5.50	2.67	4.87
Iron	4.18	4.20	4.21	4.31	3.59	3.55	2.73	6.00	4.02
Wood	4.82	4.61	4.87	4.47	3.98	4.61	2.28	4.84	4.70
Sun-dried Bricks	4.99	4.81	5.08	4.35	4.85	4.10	5.00	2.00	4.83
Pisé	5.76	5.74	7.22	3.59	3.82	5.00	..	4.59	5.70
Lath and Plaster	4.85	4.36	5.58	4.36	4.33	4.84	..	..	4.61
Wattle and Dab	4.56	4.00	4.00	3.90	4.45	..	..	..	4.31
Bark	2.57	2.33	2.40	1.00	2.44	1.82	1.30	4.50	2.39
Bushes, Rushes, Spinnifex, etc.	3.20	1.14	2.80	3.33	1.55	1.00	1.66	..	2.00
Calico, Canvas, Hessian	1.82	1.65	1.74	1.77	1.93	1.52	1.30	1.34	1.80
Ruberoid & other Compositions	3.97	3.22	3.63	4.74	3.64	3.67	..	..	3.79
Unspecified	4.03	3.85	3.78	4.18	3.30	3.90	2.73	2.20	3.90
All Classes of Material	4.67	4.58	4.48	4.62	3.68	4.59	2.25	3.84	4.53

Average Number of Inmates per Private Dwelling, Commonwealth, 1911.



GRAPH No. 161.

Dealing with the materials most largely used, stone private dwellings for the Commonwealth as a whole contained 4.89 inmates per dwelling, while those built of brick averaged 4.78, of wood 4.70, of iron 4.02, and of calico, canvas or hessian only 1.80. In all the States except Queensland the same relative order was maintained in respect of the materials specified, wood taking precedence of brick in the case of Queensland.

A representation of the average number of inmates per private dwelling is furnished in Graph No. 161 for various classes of materials, the particulars given relating to the Commonwealth as a whole. The letters at the feet of the pillars have the following significance :—S, stone ; B, brick ; I, iron ; W, wood ; C, calico, canvas, hessian ; O, other materials. The scale on the left indicates the number of inmates per dwelling for each class of material indicated.

(viii.) *Number of rooms.*—Full details for the Commonwealth and each State and Territory in respect of materials and number of rooms taken in combination are contained in Vol. III., pp. 1870 to 1885. A brief summary for the Commonwealth as a whole is given in the following table :—

No. of Dwellings according to Materials and Rooms. Commonwealth, 1911.

Number of Rooms.	Wood.	Brick.	Stone.	Calico, Canvas, Hessian.	Iron.	All other Materials	Unspecified.	Total.
PRIVATE DWELLINGS.								
1 to 3	79,282	21,272	10,275	46,900	17,302	7,351	922	183,304
4 to 6	327,557	141,243	44,163	2,114	18,784	9,843	707	544,411
7 to 9	72,009	46,483	13,435	41	1,519	1,791	105	135,383
10 and over	10,591	12,154	3,959	6	253	367	28	27,358
Unspecified	527	326	93	37	50	19	2,881	3,933
TOTAL	489,966	221,478	71,925	49,098	37,908	19,371	4,643	894,389
DWELLINGS OTHER THAN PRIVATE.								
1 to 3	246	286	82	171	93	10	13	901
4 to 6	1,995	2,399	588	79	214	55	13	5,343
7 to 9	2,275	3,649	793	13	188	50	19	6,987
10 and over	5,104	7,452	2,129	11	383	112	29	15,220
Unspecified	67	196	48	3	11	1	1,093	1,419
TOTAL	9,687	13,982	3,640	277	889	228	1,167	29,870
ALL DWELLINGS.								
1 to 3	79,528	21,558	10,357	47,071	17,395	7,361	935	184,205
4 to 6	329,552	143,642	44,751	2,193	18,998	9,898	720	549,754
7 to 9	74,284	50,132	14,228	54	1707	1,841	124	142,370
10 and over	15,695	19,606	6,088	17	636	479	57	42,578
Unspecified	594	522	141	40	61	20	3,974	5,352
TOTAL	499,653	235,460	75,565	49,375	38,797	19,599	5,810	924,259

It will be seen that for each of the various kinds of material specified, with the exception of " calico, canvas, hessian," the number of dwellings of 4 to 6 rooms was greater than for any other of the room groups shewn. In the case of wooden dwellings, those containing 4 to 6 rooms comprised 66 per cent. of the total wooden dwellings, the corresponding percentages in the case of the other materials for dwellings of 4 to 6 rooms being as follows :—Brick, 61 per cent. ; stone, 59 per cent. ; calico, canvas, hessian, 4½ per cent. ; iron, 50 per cent. ; and " all the other materials," 51 per cent. In the case of calico, canvas and hessian dwellings more than 95 per cent. contained less than 4 rooms.

(ix.) *Number of inmates.*—Particulars in respect of the numbers of dwellings of each class of material containing inmates ranging in number from 1 to 20 and over is given for the Commonwealth, and for each State and Territory in Vol. III., pp. 1886 to 1901. A summary for the Commonwealth as a whole is contained in the following table :—

No. of Dwellings according to Materials and Inmates. Commonwealth, 1911.

Number of Inmates.	Wood.	Brick.	Stone.	Calico, Canvas, Hessian.	Iron.	All other Materials	Unspecified.	Total.
PRIVATE DWELLINGS.								
1 to 3	176,624	73,557	23,769	43,869	18,659	8,842	2,482	347,802
4 to 6	204,104	101,146	31,188	4,093	13,041	6,374	1,378	361,324
7 to 9	87,356	38,155	13,304	948	4,946	3,147	586	148,442
10 and over	21,882	8,620	3,664	188	1,262	1,008	197	36,821
TOTAL	489,966	221,478	71,925	49,098	37,908	19,371	4,643	894,389
DWELLINGS OTHER THAN PRIVATE.								
1 to 3	1,070	1,162	347	77	226	44	791	3,717
4 to 6	2,437	3,096	748	106	242	49	146	6,824
7 to 9	2,328	3,415	828	63	157	44	77	6,912
10 and over	3,852	6,309	1,717	31	264	91	153	12,417
TOTAL	9,687	13,982	3,640	277	889	228	1,167	29,870
ALL DWELLINGS.								
1 to 3	177,694	74,719	24,116	43,946	18,885	8,886	3,273	351,519
4 to 6	206,541	104,242	31,936	4,199	13,283	6,423	1,524	368,148
7 to 9	89,684	41,570	14,132	1,011	5,103	3,191	663	155,354
10 and over	25,734	14,929	5,381	219	1,526	1,099	350	49,238
TOTAL	499,653	235,460	75,565	49,375	38,797	19,599	5,810	924,259

Of the inmate groups specified in the above table, dwellings, of which the outer walls were built of wood, brick or stone, were most numerously represented in the group of 4 to 6 inmates ; while dwellings of the other materials shewn were most numerous in the 1 to 3 inmates group. For all classes of materials the number of dwellings containing 4 to 6 inmates was about 5 per cent. more than the number containing 1 to 3 inmates, while these groups together accounted for 719,667 dwellings, or nearly 78 per cent. of the total.

8. **Weekly rental values.** (i.) *Number of rooms.*—Details concerning the weekly rental values of dwellings for the Commonwealth and the several States and Territories are furnished in Vol. III., pp. 1920 to 1961. The following table gives a brief summary of the number of houses of different sizes in certain rental value groups.

No. of Rooms and Weekly Rental Values. Commonwealth, 1911.

Weekly Rental Value.	No. of Dwellings containing Rooms to the No. of					Total.
	1 to 3	4 to 6.	7 to 9.	10 & over	Unspecified.	
PRIVATE DWELLINGS.						
Under 5s.	63,051	50,176	2,536	102	87	115,952
5s. and under 10s.	48,761	199,978	21,463	1,254	180	271,636
10s. „ 15s.	9,106	162,192	30,227	2,984	108	204,617
15s. „ 20s.	825	45,944	21,521	2,293	50	70,633
20s. „ 25s.	315	16,284	19,899	3,885	38	40,421
25s. „ 30s.	57	3,903	10,677	2,507	11	17,155
30s. „ 35s.	31	1,280	5,768	2,729	9	9,817
35s. „ 40s.	10	232	1,309	885	5	2,441
£2 „ £3	..	307	2,094	3,335	13	5,749
£3 „ £4	..	35	229	1,112	5	1,381
£4 „ £5	..	..	41	427	3	471
£5 and over	..	..	26	481	3	510
Unspecified	61,148	64,080	19,593	5,364	3,421	153,606
Total	183,304	544,411	135,383	27,358	3,933	894,389
DWELLINGS OTHER THAN PRIVATE.						
Under 5s.	103	124	18	6	2	253
5s. and under 10s.	131	959	385	140	4	1,619
10s. „ 15s.	57	1,633	1,130	509	5	3,334
15s. „ 20s.	13	1,136	1,448	670	3	3,270
20s. „ 25s.	15	480	1,639	1,451	11	3,596
25s. „ 30s.	4	120	921	958	2	2,005
30s. „ 35s.	2	62	451	1,319	8	1,842
35s. „ 40s.	..	15	134	481	1	631
£2 „ £3	..	38	239	2,532	10	2,819
£3 „ £4	..	2	80	1,792	12	1,886
£4 „ £5	..	..	36	1,120	9	1,165
£5 and over	..	..	33	2,541	29	2,603
Unspecified	576	774	473	1,701	1,323	4,847
Total	901	5,343	6,987	15,220	1,419	29,870
ALL DWELLINGS.						
Under 5s.	63,154	50,300	2,554	108	89	116,205
5s. and under 10s.	48,892	200,937	21,848	1,394	184	273,255
10s. „ 15s.	9,163	163,825	31,357	3,493	113	207,951
15s. „ 20s.	838	47,080	22,969	2,963	53	73,903
20s. „ 25s.	330	16,764	21,538	5,336	49	44,017
25s. „ 30s.	61	4,023	11,598	3,465	13	19,160
30s. „ 35s.	33	1,342	6,219	4,048	17	11,659
35s. „ 40s.	10	247	1,443	1,366	6	3,072
£2 „ £3	..	345	2,333	5,867	23	8,568
£3 „ £4	..	37	309	2,904	17	3,267
£4 „ £5	..	..	77	1,547	12	1,636
£5 and over	..	..	59	3,022	32	3,113
Unspecified	61,724	64,854	20,066	7,065	4,744	158,453
Total	184,205	549,754	142,370	42,578	5,352	924,259

Of the total of 924,259 dwellings recorded there were 765,806, or about 83 per cent., concerning which the rental values were specified. Of this specified number no fewer than 597,411, or about 78 per cent., belonged to the three rental value groups under 15 shillings per week, the predominating group being that from 5 to 10 shillings.

(ii.) *States and Territories.*—The succeeding table furnishes for certain groupings of weekly rental values the number of dwellings recorded in each State and Territory of the Commonwealth at the Census of 3rd April, 1911 :—

Number of Dwellings at Different Weekly Rental Values. 1911.

Weekly Rental Value.	Number of Dwellings.								C'wlth.
	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	F.T.	
PRIVATE DWELLINGS.									
Under 5s.	35,978	29,562	17,947	11,870	9,329	10,629	585	52	115,952
5s. and under 10s.	90,254	88,265	39,861	26,123	14,407	12,549	105	72	271,636
10s. ,, 15s.	76,689	61,999	25,740	19,182	14,679	6,237	61	30	204,617
15s. ,, 20s.	28,122	20,786	7,357	7,385	4,976	1,989	14	4	70,633
20s. ,, 25s.	16,040	11,193	4,362	4,481	3,277	1,050	12	6	40,421
25s. ,, 30s.	7,372	4,980	1,558	1,757	1,154	328	3	3	17,155
30s. ,, 35s.	4,449	2,605	954	917	681	210	..	1	9,817
35s. ,, 40s.	1,175	727	164	181	144	50	..	..	2,441
£2 ,, £3	2,760	1,567	486	444	374	117	..	1	5,749
£3 ,, £4	700	366	88	107	92	28	..	..	1,381
£4 ,, £5	242	124	31	44	24	6	..	..	471
£5 and over	244	196	26	32	12	..	..	..	510
Unspecified	55,741	41,264	23,179	9,585	17,404	5,757	414	262	153,606
Total ..	319,766	263,634	121,753	82,108	66,553	38,950	1,194	431	894,389
DWELLINGS OTHER THAN PRIVATE.									
Under 5s.	89	41	41	32	17	31	1	1	253
5s. and under 10s.	537	461	217	141	127	132	4	..	1,619
10s. ,, 15s.	1,214	1,161	446	225	162	120	3	3	3,334
15s. ,, 20s.	1,376	1,119	337	174	157	106	1	..	3,270
20s. ,, 25s.	1,430	1,149	382	247	249	135	4	..	3,596
25s. ,, 30s.	809	664	190	156	127	59	..	..	2,005
30s. ,, 35s.	720	545	220	139	156	61	1	..	1,842
35s. ,, 40s.	271	189	51	44	53	23	..	..	631
£2 ,, £3	1,041	879	421	183	213	79	2	1	2,819
£3 ,, £4	721	586	285	123	100	68	3	..	1,886
£4 ,, £5	415	349	187	85	79	50	..	..	1,165
£5 and over	879	600	401	227	431	64	1	..	2,603
Unspecified	1,708	1,306	905	295	446	147	34	6	4,847
Total ..	11,210	9,049	4,083	2,071	2,317	1,075	54	11	29,870
ALL DWELLINGS.									
Under 5s.	36,067	29,603	17,988	11,902	9,346	10,660	586	53	116,205
5s. and under 10s.	90,791	88,726	40,078	26,264	14,534	12,681	109	72	273,255
10s. ,, 15s.	77,903	63,160	26,186	19,407	14,841	6,357	64	33	207,951
15s. ,, 20s.	29,498	21,905	7,694	7,559	5,133	2,095	15	4	73,903
20s. ,, 25s.	17,470	12,342	4,744	4,728	3,526	1,185	16	6	44,017
25s. ,, 30s.	8,181	5,644	1,748	1,913	1,281	387	3	3	19,160
30s. ,, 35s.	5,169	3,150	1,174	1,056	837	271	1	1	11,659
35s. ,, 40s.	1,446	916	215	225	197	73	..	..	3,072
£2 ,, £3	3,801	2,446	907	627	587	196	2	2	8,568
£3 ,, £4	1,421	952	373	230	192	96	3	..	3,267
£4 ,, £5	657	473	218	129	103	56	..	..	1,636
£5 and over	1,123	796	427	259	443	64	1	..	3,113
Unspecified	57,449	42,570	24,084	9,880	17,850	5,904	448	268	158,453
Total ..	330,976	272,683	125,836	84,179	68,870	40,025	1,248	442	924,259

In each State and Territory except Western Australia and the Northern Territory the predominant rental value group was that of 5s. to 10s. In Western Australia the group of 10s. to 15s. was slightly in excess of that of 5s. to 10s., while in the Northern Territory the group under 5s. predominated.

(iii.) *Average rental per private dwelling.*—The average weekly rental values for those cases in which the particulars were supplied, have been computed in respect of the different sizes of dwellings and are furnished in the following table for each State and Territory as well as for the Commonwealth as a whole :—

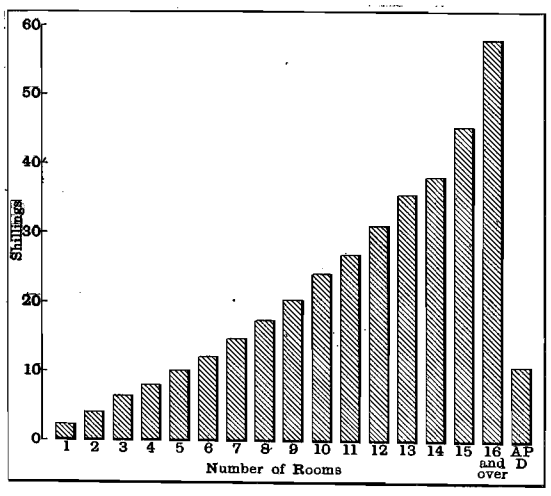
Average Weekly Rental Value of Occupied Private Dwellings. 3rd April, 1911.

No. of Rooms.	N.S.W.		Vic.		Q'land.		S.A.		W.A.		Tas.		N.T.		F.T.		C'wlth.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
1	2	5	2	2	2	4	2	8	2	6	2	2	1	8	1	7	2	4
2	4	2	3	11	4	3	4	6	4	11	3	6	3	3	3	9	4	2
3	6	10	6	7	5	8	6	10	7	10	4	11	5	1	3	11	6	8
4	8	4	7	10	7	3	8	2	9	11	6	4	7	11	5	0	8	1
5	10	6	9	9	9	1	10	7	12	10	8	7	9	5	6	10	10	2
6	13	0	11	5	10	10	12	7	15	9	9	11	11	3	7	0	12	2
7	16	2	13	11	13	2	15	5	19	8	12	3	16	8	11	0	14	10
8	19	1	16	10	15	5	18	2	23	2	14	1	19	11	13	8	17	7
9	22	6	19	4	17	7	20	11	26	6	16	3	..		9	6	20	5
10	26	8	23	1.	20	9	24	11	29	1	19	5	17	6	23	8	24	2
11	28	11	26	7	22	10	29	1	31	11	20	10	..		16	0	27	0
12	34	4	30	3	25	10	31	3	34	2	22	9	..		..		31	1
13	39	10	34	6	30	1	39	5	34	2	22	4	..		..		35	8
14	40	6	38	9	31	9	41	2	42	4	27	3	..		..		38	3
15	47	1	48	4	36	7	48	5	44	0	33	2	..		..		45	5
16 and over	60	0	64	6	41	7	58	10	70	3	28	4	..		10	6	58	0
All Private Dwellings	11	7	10	9	9	6	10	8	10	7	8	2	3	11	7	6	10	9

It will be seen that the average rental value for all private dwellings, in the cases of the Commonwealth as a whole, New South Wales, Victoria, Queensland and South Australia, fell between the averages for dwellings of 5 and those of 6 rooms, being nearer in each case to the 5 room average. In the cases of Western Australia and Tasmania the average for all fell between those for 4 and 5 rooms, being nearer the former in the case of Western Australia and nearer the latter in the case of Tasmania. The average for all dwellings in the Northern Territory was slightly in excess of that for 2 room dwellings, while that for the Federal Territory was slightly in excess of the average for 6 room dwellings. Owing to paucity of data the figures for the Territories are very irregular in comparison with those for the States.

This table furnishes striking evidence of the necessity for complete analysis of data, and the misapprehension that may arise in certain cases from the use of comprehensive averages. Thus the Commonwealth as a whole, Victoria, South Australia and Western Australia give averages for all dwellings, which are respectively 10s. 9d., 10s. 9d., 10s. 8d., and 10s. 7d. Notwithstanding this, it is clear from a consideration of the details that the rental values for dwellings of any given size above one room up to and including 12 room dwellings, are considerably higher in Western Australia, and lower in Victoria than in the other cases quoted. Taking dwellings of 4, 5 and 6 rooms the arrangement of the States in order of rental values from highest to lowest is as follows :—(1) Western Australia, (2) New South Wales, (3) South Australia, (4) Victoria, (5) Queensland, (6) Tasmania.

Average Weekly Rental Value per Dwelling. Private Dwellings, Commonwealth, 1911.



GRAPH No. 162.

A representation of the average weekly rental value per dwelling of private dwellings of various sizes is furnished in the accompanying graph (No. 162) for the Commonwealth as a whole as at 3rd April, 1911. The figures shewn at the feet of the pillars denote the number of rooms contained, while the scale on the left of the graph indicates the average weekly rental values in shillings of private dwellings of the several sizes indicated. The letters "A.P.D." at the foot of the final pillar signify "all private dwellings."

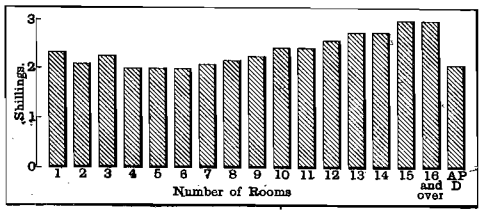
(iv.) *Average rental per room.*—The presentation of this information may be varied by computing the average weekly rental value per room. This has been done in the following table, which shews such details for the Commonwealth as a whole as well as for its component States and Territories :—

Average Weekly Rental Value per Room in Occupied Private Dwellings. 3rd April, 1911.

No. of Rooms.	N.S.W.		Vic.		Q'land.		S.A.		W.A.		Tas.		N.T.		F.T.		C'wlth.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
1	2	5	2	2	2	4	2	8	2	6	2	2	1	8	1	7	2	4
2	2	1	1	11	2	2	2	3	2	6	1	9	1	7	1	11	2	1
3	2	3	2	2	1	11	2	3	2	7	1	8	1	8	1	4	2	3
4	2	1	1	11	1	10	2	0	2	6	1	7	2	0	1	3	2	0
5	2	1	1	11	1	10	2	1	2	7	1	9	1	11	1	4	2	0
6	2	2	1	11	1	10	2	1	2	8	1	8	1	10	1	2	2	0
7	2	4	2	0	1	11	2	2	2	10	1	9	2	5	1	7	2	1
8	2	5	2	1	1	11	2	3	2	11	1	9	2	6	1	8	2	2
9	2	6	2	2	1	11	2	4	2	11	1	10	..		1	1	2	3
10	2	8	2	4	2	1	2	6	2	11	1	11	1	9	2	4	2	5
11	2	8	2	5	2	1	2	8	2	11	1	11	..		1	5	2	5
12	2	10	2	6	2	2	2	7	2	10	1	11	..		..		2	7
13	3	1	2	8	2	4	3	0	2	8	1	9	..		..		2	9
14	2	11	2	9	2	3	2	11	3	0	1	11	..		..		2	9
15	3	2	3	3	2	5	3	3	2	11	2	3	..		..		3	0
16 and over	3	1	3	4	2	2	3	2	3	10	1	7	..		6	0	3	0
All Private Dwellings	2	3	2	0	1	10	2	2	2	7	1	8	1	9	1	5	2	1

The average rental per room for all private dwellings is a much better index to relative rental level than is the average per dwelling commented upon on p. 417. From the above table it will be seen that this average gives for the several States the same arrangement in order of rental values as was indicated on p. 417 for dwellings of 4, 5 and 6 rooms. It may also be noted that the average rental per room for all dwellings differs but slightly in each case from the corresponding average in the case of 5 room dwellings.

Average Weekly Rental Value per Room, Private Dwellings, Commonwealth, 1911.



GRAPH No. 163.

The accompanying graph (No. 163) furnishes a representation of the average weekly rental value per room in private dwellings for the Commonwealth as a whole as at 3rd April, 1911. The figures shewn at the feet of the several pillars denote the number of rooms contained, while the scale on the left of the graph indicates the average weekly rental value in shillings per room in occupied private dwellings of the sizes indicated. The pillar marked "A.P.D." represents the average weekly rental value in shillings per room for "all private dwellings."

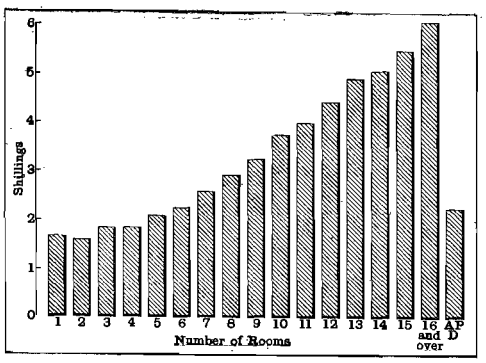
(v.) *Average rental per inmate.*—A further computation on the basis of rental values may be made in respect of the inmates occupying dwellings of varying sizes, thus giving the average weekly rental value per inmate for each specified size of dwelling. Such a result for the Commonwealth as a whole and for each State and Territory is given in the following table :—

Average Weekly Rental Value per Inmate in Occupied Private Dwellings. 3rd April, 1911.

No. of Rooms.	N.S.W.		Vic.		Q'land.		S.A.		W.A.		Tas.		N.T.		F.T.		C'wlth.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
1	1	9	1	7	1	6	1	8	1	10	1	6	1	4	1	1	1	8
2	1	7	1	6	1	7	1	7	2	0	1	2	1	5	1	9	1	7
3	1	10	1	10	1	6	1	9	2	3	1	3	1	5	0	11	1	10
4	1	11	1	10	1	8	1	10	2	4	1	5	2	0	1	4	1	10
5	2	2	2	1	1	11	2	2	2	8	1	9	2	3	1	5	2	1
6	2	5	2	3	2	1	2	4	3	0	1	10	2	0	1	2	2	3
7	2	10	2	7	2	4	2	8	3	6	2	2	3	3	1	9	2	7
8	3	2	2	11	2	6	3	0	3	10	2	5	3	2	2	1	2	11
9	3	7	3	4	2	8	3	5	4	1	2	9	..		2	2	3	3
10	4	1	3	10	3	0	4	0	4	4	3	2	4	5	3	5	3	9
11	4	4	4	2	3	2	4	5	4	8	3	5	..		2	7	4	0
12	4	9	4	7	3	4	4	8	4	9	3	7	..		..		4	5
13	5	3	5	1	4	0	5	7	4	6	3	6	..		..		4	11
14	5	3	5	5	3	8	5	10	5	6	3	10	..		..		5	1
15	5	9	6	6	3	5	7	4	4	8	4	10	..		..		5	6
16 and over	6	4	7	7	3	0	8	1	6	10	4	1	..		1	4	6	1
All Private Dwellings	2	5	2	4	1	11	2	3	2	7	1	9	1	7	1	7	2	3

It will be seen that in the case of the Commonwealth and New South Wales the average for all private dwellings coincides with that for 6 room dwellings; and in Queensland and Tasmania with that for 5 room dwellings. In South Australia it lies between the averages for 5 and 6 rooms, while in Victoria it is slightly in excess of the 6 room average, and in Western Australia slightly below the five room average. For the Commonwealth as a whole it may be said that the average weekly value per head of population of the housing accommodation provided at the Census of 3rd April, 1911, was 2s. 3d., representing an annual value of approximately £27,000,000, or a capital value of £405,000,000 on the assumption that the capital value represents 15 years' purchase.

Average Weekly Rental Value per Inmate Private Dwellings, Commonwealth, 1911.



GRAPH No. 164.

A representation of the average weekly rental value per inmate for private dwellings of various sizes is furnished in the accompanying graph (No. 164) for the Commonwealth as a whole as at 3rd April, 1911. The figures shewn at the feet of the pillars denote the number of rooms contained, while the scale on the left of the graph indicates the average weekly rental value in shillings per inmate in private dwellings of the sizes indicated. The pillar marked "A.P.D." represents the average weekly rental value in shillings per inmate for "all private dwellings."

9. **Method of Occupancy.** (i.) *General.*—As previously indicated, statistics of method of occupancy were collected at the Census of 1911 for the first time in the history of Census taking in Australia. The data in respect of method of occupancy were classified under the four heads: (*a*) Occupied by owners, (*b*) Occupied by rent purchasers, (*c*) Occupied by tenants, (*d*) Other and unspecified methods of tenancy. The indefinite group (*d*) comprised less than 5½ per cent. of the total private dwellings. The data were tabulated in respect of private dwellings only.

(ii.) *According to States.*—The number of private dwellings classed under each occupancy group in each State and Territory is shewn in the following table :—

Private Dwellings.—Methods of Occupancy in States and Territories. 1911.

States and Territories.	Occupied by Owners.	Occupied by Rent Purchasers.	Occupied by Tenants.	Other and Unspecified Methods of Occupancy.	Total.
STATES—					
New South Wales	129,423	11,322	160,314	18,707	319,766
Victoria	118,716	13,973	119,562	11,383	263,634
Queensland	65,951	5,632	43,552	6,618	121,753
South Australia	37,387	4,294	37,431	2,996	82,108
Western Australia	34,335	2,534	23,623	6,061	66,553
Tasmania	15,848	1,558	19,457	2,087	38,950
TERRITORIES—					
Northern	772	2	321	99	1,194
Federal	205	3	111	112	431
TOTAL, COMMONWEALTH ..	402,637	39,318	404,371	48,063	894,389

For the Commonwealth as a whole the number of private dwellings returned as occupied by owners was approximately equal to the number returned as occupied by tenants. A similar condition of approximate equality for these two methods of occupancy also existed in the cases of Victoria and South Australia. On the other hand, in the cases of New South Wales and Tasmania the dwellings returned as occupied by tenants exceeded the number returned as occupied by owners by upwards of 20 per cent., while in the remaining States (Queensland and Western Australia) the number returned as occupied by owners was markedly in excess of the number returned as occupied by tenants. Occupancy by rent purchasers was more in evidence in Victoria than in any other State.

Combining dwellings occupied by rent purchasers with those occupied by owners, and ignoring the indefinite group of "other and unspecified methods of occupancy," it may be said that, for the Commonwealth as a whole, approximately 52 per cent. of the private dwellings are occupied by owners or prospective owners, and 48 per cent. by tenants. A similar computation for the several States and Territories gives the following percentages for dwellings occupied by owners or prospective owners :—New South Wales, 47 per cent.; Victoria, 53 per cent.; Queensland, 62 per cent.; South Australia, 53 per cent.; Western Australia, 61 per cent.; Tasmania, 47 per cent.; Northern Territory, 71 per cent.; Federal Territory, 65 per cent.

(iii.) *According to number of rooms.*—The tabulation of the data relative to method of occupancy inconjunction with number of rooms, furnishes the following results for the Commonwealth as a whole ;—

Private Dwellings.—Methods of Occupancy and Number of Rooms. Commonwealth. 1911.

Number of Rooms.	Occupied by Owners.	Occupied by Rent Purchasers.	Occupied by Tenants.	Other and Unspecified Methods of Occupancy.	Total.
1	34,920	708	13,715	17,176	66,519
2	22,178	1,673	18,487	3,127	45,465
3	25,030	3,340	40,086	2,864	71,320
4	78,289	11,206	109,341	6,858	205,694
5	78,235	11,093	96,422	5,115	190,865
6	71,865	7,101	64,851	4,035	147,852
7	40,508	2,578	30,280	2,083	75,449
8	23,179	912	15,301	1,283	40,675
9	11,258	349	6,900	752	19,259
10	7,270	178	4,057	566	12,071
11	3,015	65	1,568	253	4,901
12	2,542	48	1,196	260	4,046
13	1,045	11	496	125	1,677
14	1,013	9	474	106	1,602
15	513	4	216	61	794
16	425	6	161	59	651
17	222	3	95	30	350
18	178	1	69	29	277
19	87	..	28	12	127
20 and over	558	3	192	109	862
Unspecified	307	30	436	3,160	3,933
TOTAL	402,637	39,318	404,371	48,063	894,389

In the case of dwellings of 3, 4 and 5 rooms the numbers occupied by tenants considerably exceeded the numbers occupied by owners and prospective owners. On the other hand for all dwellings of less than 3 or more than 5 rooms the numbers occupied by owners or prospective owners largely exceeded the numbers occupied by tenants.

(iv.) *According to weekly rental value.*—The next table furnishes for the Commonwealth as a whole a tabulation of the data relative to private dwellings according to method of occupancy and weekly rental value :—

Private Dwellings.—Method of Occupancy and Weekly Rental Value. Commonwealth, 1911.

WEEKLY RENTAL VALUE.	Occupied by Owners.	Occupied by Rent Purchasers.	Occupied by Tenants.	Other and Unspecified Methods of Occupancy.	TOTAL.
Under 5s.	57,437	3,797	49,800	4,918	115,952
5s. and under 10s.	113,166	11,762	139,852	6,856	271,636
10s. ,, 15s.	81,848	12,759	105,786	4,224	204,617
15s. ,, 20s.	29,983	4,293	35,038	1,319	70,633
20s. ,, 25s.	20,333	2,432	16,787	869	40,421
25s. ,, 30s.	9,212	670	6,918	355	17,155
30s. ,, 35s.	5,765	261	3,564	227	9,817
35s. ,, 40s.	1,228	56	1,093	64	2,441
£2 ,, £3	3,401	124	2,038	186	5,749
£3 ,, £4	842	19	463	57	1,381
£4 ,, £5	306	4	143	18	471
£5 and over	331	5	149	25	510
Unspecified	78,785	3,136	42,740	28,945	153,606
TOTAL	402,637	39,318	404,371	48,063	894,389

In the case of dwellings having weekly rental values (i.) from 5s. to 10s., (ii.) from 10s. to 15s., (iii.) from 15s. to 20s., the numbers occupied by tenants exceeded the numbers occupied by owners and prospective owners. On the other hands, for dwellings having a weekly rental value of less than 5s. or more than 20s., the numbers occupied by owners and prospective owners considerably exceeded the numbers occupied by tenants.

11. **Metropolitan.** (i.) *Dwellings, occupied, unoccupied and being built.*—The following table furnishes for each metropolitan area the number of dwellings recorded as occupied, unoccupied or being built at the date of the Census.

Metropolitan Dwellings Occupied, Unoccupied or Being Built. 1911.

METROPOLITAN AREA.	NUMBER.				PROPORTION PER CENT.			
	Occupied.	Unoccupied.	Being Built.	Total.	Occupied.	Unoccupied.	Being Built.	Total.
					%	%	%	%
Sydney and Suburbs	123,234	2,491	751	126,476	97.43	1.97	.60	100.00
Melbourne and Suburbs ..	119,562	2,418	682	122,662	97.47	1.97	.56	100.00
Brisbane and Suburbs ..	27,532	627	175	28,334	97.17	2.21	.62	100.00
Adelaide and Suburbs	38,742	1,090	312	40,144	96.51	2.71	.78	100.00
Perth and Suburbs	21,897	1,070	37	23,004	95.19	4.65	.16	100.00
Hobart and Suburbs	8,082	368	37	8,487	95.23	4.34	.43	100.00
TOTAL METROPOLITAN AREAS	339,049	8,064	1,994	349,107	97.12	2.31	.57	100.00

As previously noted the returns received in respect of dwellings which were unoccupied or were being built were not entirely satisfactory, there being evidence that in some instances there had been failure to record such dwellings. It is of course impossible to determine the extent to which such omissions occurred, but it is believed that the metropolitan returns were fairly complete, and that in consequence the above table furnishes a fair approximation to the condition of the several metropolitan areas in respect of dwellings which were unoccupied or were being built.

(ii.) *Dwellings and Inmates.*—The following table furnishes, for each metropolitan area and for the whole in combination, a statement of the number of private and other dwellings and of their inmates, as well as of the number of inmates per dwelling.

Occupied Metropolitan Dwellings and Inmates. 3rd April, 1911.

Metropolitan Area.	No. of Dwellings.			No. of Inmates			Average No. of Inmates per Dwelling.		
	Private.	Other than Private.	Total.	Private.	Other than Private.	Total.	In Private Dwellings.	In Dwellings other than Private.	In all Dwellings.
Sydney and Suburbs	118,427	4,807	123,234	567,590	61,676	629,266	4.79	12.83	5.11
Melbourne & Suburbs	114,988	4,574	119,562	535,250	53,604	588,854	4.65	11.72	4.93
Brisbane and Suburbs	26,645	887	27,532	127,053	12,418	139,471	4.77	14.00	5.07
Adelaide and Suburbs	37,776	966	38,742	174,930	14,708	189,638	4.63	15.23	4.89
Perth and Suburbs	21,129	768	21,897	94,070	12,714	106,784	4.45	16.55	4.88
Hobart and Suburbs	7,737	345	8,082	35,941	3,986	39,927	4.65	11.55	4.94
Total Metropolitan Areas	326,702	12,347	339,049	1,534,834	159,106	1,693,940	4.70	12.89	5.00

In addition to the above there were recorded in the metropolitan areas 140 camps without dwellings, and these camps were occupied by 389 persons of whom 237 were recorded in Sydney, 117 in Melbourne, 9 in Brisbane, 8 in Adelaide, 8 in Perth, and 10 in Hobart.

(iii.) *Number of rooms.*—As in the case of the statistics for the whole of each State, the data in respect of the number of rooms in metropolitan dwellings indicates the following as a suitable grouping according to rooms, viz., 1 to 3 rooms, 4 to 6 rooms, 7 to 9 rooms, and 10 rooms and over. Grouped in this manner the figures for the metropolitan areas are as follows :—

Occupied Metropolitan Dwellings according to Number of Rooms. 3rd April, 1911.

No. of Rooms.	Number of Dwellings.						
	Sydney and Suburbs.	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total Metropolitan Areas.
PRIVATE DWELLINGS.							
1 to 3	12,923	12,579	1,920	6,409	3,992	872	38,695
4 to 6	81,434	76,922	17,837	24,582	14,620	4,880	220,275
7 to 9	19,744	20,814	5,870	5,579	2,037	1,475	55,519
10 and over	3,832	4,171	963	1,078	352	427	10,823
Unspecified	494	502	55	128	128	83	1,390
Total	118,427	114,988	26,645	37,776	21,129	7,737	326,702
DWELLINGS OTHER THAN PRIVATE.							
1 to 3	127	142	24	17	17	7	334
4 to 6	1,187	820	184	180	179	45	2,595
7 to 9	1,586	1,528	253	252	197	100	3,916
10 and over	1,828	1,931	402	492	361	192	5,206
Unspecified	79	153	24	25	14	1	296
Total	4,807	4,574	887	966	768	345	12,347
ALL DWELLINGS.							
1 to 3	13,050	12,721	1,944	6,426	4,009	879	39,029
4 to 6	82,621	77,742	18,021	24,762	14,799	4,925	222,870
7 to 9	21,330	22,342	6,123	5,831	2,234	1,575	59,435
10 and over	5,660	6,102	1,365	1,570	713	619	16,029
Unspecified	573	655	79	153	142	84	1,686
Total	123,234	119,562	27,532	38,742	21,897	8,082	339,049

For the combined metropolitan areas private dwellings of 4 to 6 rooms represented about 68 per cent. of the total number of private dwellings for which the number of rooms was specified. The corresponding percentages in the case of the several metropolitan areas are as follows :— Sydney, 69 per cent. ; Melbourne, 67 per cent. ; Brisbane, 67 per cent. ; Adelaide, 65 per cent. ; Perth, 70 per cent. ; Hobart, 64 per cent.

(iv.) *Materials of outer walls.*—In the construction of the outer walls of metropolitan dwellings in Australia the materials employed are mainly brick, wood and stone. These three materials account for more than 98 per cent. of the dwellings, the only other materials represented to any appreciable extent being iron and concrete, which together accounted for about $1\frac{1}{3}$ per cent. of the total. The following table furnishes particulars for each metropolitan area in respect of the principal materials used :—

Materials of Outer Walls of Metropolitan Dwellings. 3rd April, 1911.

Materials of which Outer Walls were Built.	Number of Dwellings.						
	Sydney and Suburbs.	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total Metropolitan Areas.
PRIVATE DWELLINGS.							
Stone	4,553	1,730	81	20,679	1,933	643	29,619
Brick	87,768	55,683	1,300	11,996	11,168	3,547	171,462
Wood	24,648	56,219	24,932	2,193	6,859	3,381	118,232
Other Materials	833	859	282	2,741	990	61	5,766
Unspecified	625	497	50	167	179	105	1,623
TOTAL	118,427	114,988	26,645	37,776	21,129	7,737	326,702
DWELLINGS OTHER THAN PRIVATE.							
Stone	619	409	34	663	106	85	1,916
Brick	3,986	3,521	327	264	615	214	8,927
Wood	137	504	511	14	36	39	1,241
Other Materials	20	45	4	14	5	4	92
Unspecified	45	95	11	11	6	3	171
TOTAL	4,807	4,574	887	966	768	345	12,347
ALL DWELLINGS.							
Stone	5,172	2,139	115	21,342	2,039	728	31,535
Brick	91,754	59,204	1,627	12,260	11,783	3,761	180,389
Wood	24,785	56,723	25,443	2,207	6,895	3,420	119,473
Other Materials	853	904	286	2,755	995	65	5,858
Unspecified	670	592	61	178	185	108	1,794
TOTAL	123,234	119,562	27,532	38,742	21,897	8,082	339,049

For the combined metropolitan areas brick dwellings predominated, exceeding the number of wooden dwellings by about 50 per cent. This predominance of brick dwellings held in all the capitals except Brisbane and Adelaide, wooden dwellings occupying the leading position in Brisbane, and stone dwellings in Adelaide. In the case of Melbourne wooden private dwellings slightly exceeded those built of brick, but amongst dwellings other than private the brick were considerably in excess of the wooden.

(v.) *Weekly rental values.*—Particulars concerning the number of occupied private dwellings in the metropolitan areas of the several States classified according to grouped weekly rental values are furnished in the following tables :—

Metropolitan Occupied Dwellings according to Weekly Rental Value. 3rd April, 1911.

Weekly Rental Value	Number of Dwellings.						
	Sydney and Suburbs.	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total Metropolitan Areas.
PRIVATE DWELLINGS.							
Under 5s.	1,054	1,290	925	1,151	708	277	5,405
5s. and under 10s. ..	20,736	29,430	7,942	9,825	4,917	2,314	75,164
10s. ,, 15s. ..	42,393	37,933	8,946	11,296	6,655	2,401	109,624
15s. ,, 20s. ..	19,138	15,299	3,462	5,852	2,766	958	47,475
20s. ,, 25s. ..	9,563	7,897	1,810	3,485	1,657	445	24,857
25s. ,, 30s. ..	5,217	4,010	795	1,531	759	171	12,483
30s. ,, 35s. ..	3,055	2,046	463	779	447	94	6,884
35s. ,, 40s. ..	942	657	100	167	117	28	2,011
£2 ,, £3 ..	1,948	1,314	226	390	252	54	4,184
£3 ,, £4 ..	555	334	49	95	71	18	1,122
£4 ,, £5 ..	211	113	23	41	15	3	406
£5 and over	205	166	7	28	11	..	417
Unspecified	13,410	14,499	1,897	3,136	2,754	974	36,670
Total	118,427	114,988	26,645	37,776	21,129	7,737	326,702
DWELLINGS OTHER THAN PRIVATE.							
Under 5s.	5	7	4	..	..	1	17
5s. and under 10s. ..	73	112	33	11	21	17	267
10s. ,, 15s. ..	296	528	141	61	47	36	1,109
15s. ,, 20s. ..	808	709	139	91	84	47	1,878
20s. ,, 25s. ..	764	629	104	129	87	51	1,764
25s. ,, 30s. ..	510	444	60	120	79	34	1,247
30s. ,, 35s. ..	373	227	49	80	71	26	826
35s. ,, 40s. ..	177	123	18	26	30	12	386
£2 ,, £3 ..	381	375	51	96	74	30	1,007
£3 ,, £4 ..	312	301	44	55	27	21	760
£4 ,, £5 ..	195	187	12	49	21	11	475
£5 and over	455	353	119	135	132	16	1,210
Unspecified	458	579	113	113	95	43	1,401
Total	4,807	4,574	887	966	768	345	12,347
ALL DWELLINGS.							
Under 5s.	1,059	1,297	929	1,151	708	278	5,422
5s. and under 10s. ..	20,809	29,542	7,975	9,836	4,938	2,331	75,431
10s. ,, 15s. ..	42,689	38,461	9,087	11,357	6,702	2,437	110,733
15s. ,, 20s. ..	19,946	16,008	3,601	5,943	2,850	1,005	49,353
20s. ,, 25s. ..	10,327	8,526	1,914	3,614	1,744	496	26,621
25s. ,, 30s. ..	5,727	4,454	855	1,651	838	205	13,730
30s. ,, 35s. ..	3,428	2,273	512	859	518	120	7,710
35s. ,, 40s. ..	1,119	780	118	193	147	40	2,397
£2 ,, £3 ..	2,329	1,689	277	486	326	84	5,191
£3 ,, £4 ..	867	635	93	150	98	39	1,882
£4 ,, £5 ..	406	300	35	90	36	14	881
£5 and over	660	519	126	163	143	16	1,627
Unspecified	13,868	15,078	2,010	3,249	2,849	1,017	38,071
Total	123,234	119,562	27,532	38,742	21,897	8,082	339,049

In all the capitals the predominant rental value groups were (i.) 10s. to 15s., (ii.) 5s. to 10s., (iii.) 15s. to 20s., in the order quoted. These three groups comprising all weekly rental values between 5s. and 20s. were represented by 232,263 private dwellings, or 80 per cent. of a total of 290,032 private dwellings for which the rental values were stated.

(vi.) *Method of occupancy.*—The succeeding table shews the number of occupied private dwellings in each metropolitan area classified according to the method of occupancy. Details in respect thereto in conjunction with weekly rental values will be found in Volume III., pp. 1969-1972.

Method of Occupancy of Metropolitan Private Dwellings. 1911.

Method of Occupancy.	Number of Dwellings.						
	Sydney and Suburbs.	Melbourne and Suburbs.	Brisbane and Suburbs.	Adelaide and Suburbs.	Perth and Suburbs.	Hobart and Suburbs.	Total Metropolitan Areas.
Occupied by owner ..	31,211	32,089	10,239	13,400	7,400	2,286	96,625
,, by Rent Purchaser	5,663	8,070	2,199	2,228	1,284	239	19,683
,, by Tenant ..	78,492	72,253	13,514	21,272	11,639	4,965	202,135
Other and unspecified Occupancy ..	3,061	2,576	693	876	806	247	8,259
Total	118,427	114,988	26,645	37,776	21,129	7,737	326,702

Omitting the group " other and unspecified occupancy," it will be seen that for the combined metropolitan areas, dwellings occupied by owners represented about 30 per cent. of the total, while those occupied by rent purchasers represented 6 per cent., and those occupied by tenants about 64 per cent. For the several metropolitan areas the percentages of total dwellings which were occupied by tenants were as follows :—Sydney, 68 per cent. ; Melbourne, 64 per cent.; Brisbane, 52 per cent. ; Adelaide, 58 per cent. ; Perth, 57 per cent. ; Hobart, 66 per cent.

12. **Metropolitan and extra-metropolitan .**—The next table furnishes in respect of dwellings an interesting comparison between the metropolitan and extra-metropolitan areas of the several States and exhibits each in comparison with the State and Commonwealth totals. :—

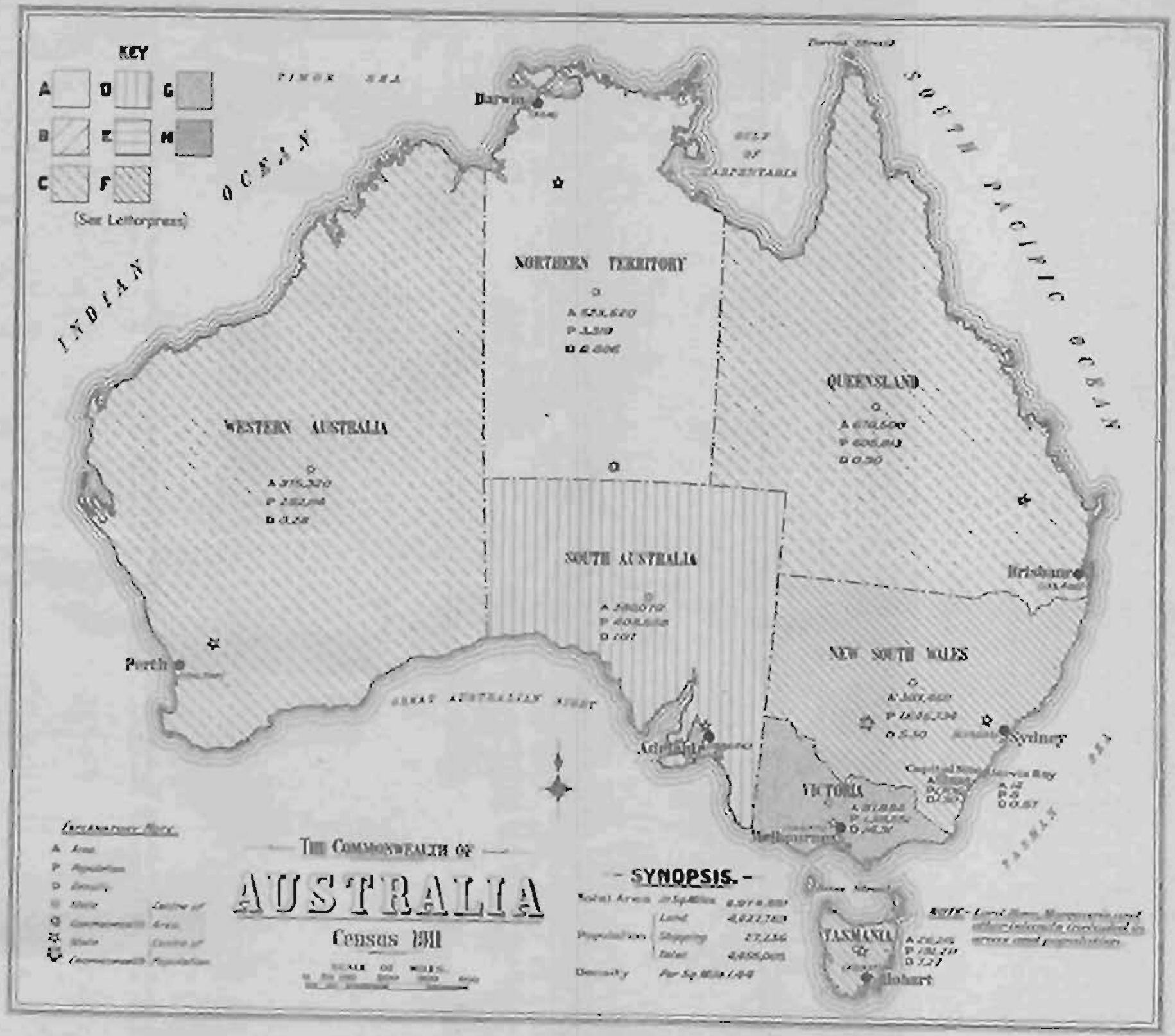
Metropolitan and Extra-Metropolitan Dwellings, 1911.

Commonwealth States and Territories.	Area in Acres or Square Miles.	Occupied Dwellings.			Occupied Dwellings per Acre or Square Mile.	No. of Inmates per Occupied Dwelling.	No. of Rooms per Occupied Dwelling.	No. of Inmates per Room in Occupied Dwellings.	Average Weekly Rental Value of Private Houses.	
		Private Houses and Tenements therein.	Other than Private.	Total.						
METROPOLITAN.										
	acres.				per acre.				*s.*	*d.*
Sydney and Suburbs	118,299	118,427	4,807	123,234	1.042	5.11	5.61	.90	15	7
Melbourne and Suburbs	166,739	114,988	4,574	119,562	.717	4.93	5.65	.87	14	1
Brisbane and Suburbs	199,369	26,645	887	27,532	.138	5.07	5.88	.86	12	9
Adelaide and Suburbs	150,596	37,776	966	38,742	.257	4.89	5.32	.91	13	11
Perth and Suburbs ..	85,835	21,129	768	21,897	.255	4.88	5.04	.95	13	9
Hobart and Suburbs	58,687	7,737	345	8,082	.138	4.94	5.88	.84	12	6
	779,525	326,702	12,347	339,049	.435	5.00	5.57	.89	14	5
REMAINDER OF STATES.										
	sq. miles.				p.sq.m.				*s.*	*d.*
New South Wales ..	309,275	201,339	6,403	207,742	.672	4.84	5.10	.94	8	10
Victoria	87,623	148,646	4,475	153,121	1.747	4.70	5.40	.87	8	0
Queensland	670,188	95,108	3,196	98,304	.147	4.68	4.78	.98	8	5
South Australia ..	379,835	44,332	1,105	45,437	.120	4.74	4.84	.98	7	9
Western Australia ..	975,786	45,424	1,549	46,973	.048	3.54	3.47	1.02	8	8
Tasmania	26,123	31,213	730	31,943	1.223	4.71	4.81	.98	7	0
	2,448,830	566,062	17,458	583,520	.238	4.67	4.96	.94	8	4
WHOLE STATES AND TERRITORIES.										
	sq.miles.				p. sq.m.				*s.*	*d.*
New South Wales ..	309,460	319,766	11,210	330,976	1.070	4.94	5.29	.93	11	7
Victoria	87,884	263,634	9,049	272,683	3.103	4.80	5.51	.87	10	9
Queensland	670,500	121,753	4,083	125,836	.188	4.76	5.02	.95	9	6
South Australia ..	380,070	82,108	2,071	84,179	.221	4.81	5.06	.95	10	8
Western Australia ..	975,920	66,553	2,317	68,870	.071	3.96	3.97	.99	10	7
Tasmania	26,215	38,950	1,075	40,025	1.527	4.76	5.03	.95	8	2
Northern Territory ..	523,620	1,194	54	1,248	.002	2.36	2.20	1.07	3	11
Federal Territory ..	912	431	11	442	.485	3.86	4.37	.89	7	6
COMMONWEALTH	2,974,581	894,389	29,870	924,259	.311	4.78	5.18	.92	10	9

It will be seen that although in each State the number of inmates per occupied dwelling was greater in the metropolitan than in the extra-metropolitan area, the number of rooms per occupied dwelling was also greater, the outcome being that the average number of persons per room in occupied dwellings in the metropolis was less than was the case in the corresponding extra-metropolitan areas in all the States except Victoria, where the averages per room were equal.

Extensive details relative to the metropolitan areas of the several States, and in some instances to the extra-metropolitan areas also, are given in Vol. III., pp. 1962-77.

13. **Geographical subdivisions.**—Particulars in respect of the dwellings in the counties of New South Wales and Victoria, the counties and divisions of South Australia and the Northern Territory, the Census Districts of Queensland, the Statistical Districts of Western Australia, as well as the Local Government areas of all the States are contained in Vol. III., pp. 1978-2047.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(See Letterpress)
TIMOR SEA
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SOUTH PACIFIC OCEAN
Darwin
GULF OF CARPENTARIA
NORTHERN TERRITORY
WESTERN AUSTRALIA
QUEENSLAND
SOUTH AUSTRALIA
NEW SOUTH WALES
VICTORIA
TASMANIA
Perth
Adelaide
Brisbane
Sydney
Melbourne
Hobart
GREAT AUSTRALIAN BIGHT
TASMAN SEA
THE COMMONWEALTH OF
AUSTRALIA
Census 1911
SCALE OF MILES
- SYNOPSIS. -
Total Area in Sq. Miles
Land
Population
Shipping
Total
Density
NOTE- Land Area, Population and other Statistics for each State or Territory

CHAPTER XXIII.

GEOGRAPHICAL DISTRIBUTION.

1. **General.**—For practically all tabulations full details of the data derived from the Census Cards have been published for each State and Territory. This division into six States and two Territories constitutes the primary geographical distribution of the data. For the purpose of ascertaining the distribution according to areas less than States that would be most useful in each case, inquiries were made from the several State Statisticians, and on the basis of the advice tendered by them the following secondary geographical distribution was adopted :—New South Wales and Victoria into Counties ; South Australia into Counties and Divisions ; Queensland into Census Districts (approximately Registration Districts) ; Western Australia into Statistical Districts ; and Tasmania into Municipalities. This distribution is that which is adopted in most cases in the several States for the publication of detailed local statistics. In most cases, in the compilation of Census data for the several States, the full details for the several sub-divisions indicated above have been compiled as a necessary step in the ascertainment of the aggregates for the States, but usually only a brief summary of the results has been published for each sub-division. In addition to these summary sub-divisional tables, somewhat more extensive data have been published in respect of the Metropolitan area of each State. In this case again the limits of the Metropolitan areas were adopted after consultation with the several State Statisticians concerned. In the cases of Melbourne and Brisbane, a circle of ten miles radius from the G.P.O. in each case was adopted, whilst in the other cases local government areas or parts thereof were pieced together to make up the Metropolitan area. With the object of presenting a key to the geographical distribution of data thus achieved, and also for the purpose of indicating graphically the density of population in the various areas the series of maps contained in the present chapter has been prepared. The initial map facing p. 425 is that of the Commonwealth of Australia, which shews graphically the density of population of the several States and Territories regarded as units. The density so shewn has been obtained by dividing the total population by the total area expressed in square miles. The degrees of density represented by the different varieties of hatching in the maps relating to the Commonwealth, the States and the Northern Territory are as follows :—

A Averaging less than 1 person on 16 square miles.
B Averaging from 1 person on 16 square miles to less than 1 on 4 square miles.
C ,, ,, 1 ,, 4 ,, ,, 1 ,, 1 square mile.
D ,, ,, 1 ,, 1 square mile to ,, 2 ,, 1 ,,
E ,, ,, 2 ,, 1 ,, ,, 4 ,, 1 ,,
F ,, ,, 4 ,, 1 ,, ,, 8 ,, 1 ,,
G ,, ,, 8 ,, 1 ,, ,, 16 ,, 1 ,,
H ,, 16 persons and upwards in 1 square mile.

2. **Density of Population.**—One of the striking features of the population of Australia is its extreme attenuation in relation to the extensive area over which it is spread. Speaking generally it may be said that little more than a coastal fringe is well populated, and even that mainly on the East and South East. Over a large part of the country there are scattered sheep and cattle stations with enormous distances between them. In other places small mining camps of prospectors, and in others, persons employed in the maintenance of rabbit proof fences and similar works. This wide scattering of population makes the collection of census data a work of an arduous nature, and one requiring a considerable amount of initiative and energy in the persons actually employed in collecting.

The area, population, and density of population of the several States and Territories, is shewn in the following table :—

Area, Population and Density of Population, 1911.

States and Territories.	Area in square miles.	Population.			Density (Number of Persons per Square Mile).
		Males.	Females.	Persons.	
States—					
New South Wales	309,460	850,221	788,462	1,638,683	5.30
Victoria	87,884	651,509	659,237	1,310,746	14.91
Queensland	670,500	326,210	275,735	601,945	.90
South Australia	380,070	204,906	200,913	405,819	1.07
Western Australia	975,920	155,719	119,379	275,098	.28
Tasmania	26,215	97,031	93,604	190,635	7.27
Territories—					
Northern	523,620	2,553	576	3,129	.006
Federal	912	992	722	1,714	1.88
Commonwealth	2,974,581	2,289,141	2,138,628	4,427,769	1.49

In addition to the population shewn in the preceding table, there were also enumerated 27,236 who were resident on shipping, of whom 23,894 were males, and 3,342 were females.

It will be seen that the most densely-populated States were the three situated in the South East, viz., Victoria (14.91), Tasmania (7.27), and New South Wales (5.30), the figures in parentheses denoting the average number of persons per square mile.

A defect which is present in any graphical representation of density is the uniformity of hatching or shading which is necessarily applied to the whole of the unit of area adopted for the purposes of the representation. Thus, when the unit is a State or a Territory, the hatching is the same for the whole State, notwithstanding the fact that some parts of the State may be uninhabited, while other part are densely populated. To remedy this defect more detailed maps may be prepared in which smaller units of area are adopted, but in practice it is impossible to entirely obviate it. In the present case, the maps of the several States shewing the average density of the subsidiary areas adopted therein furnish an indication of the distribution for the State concerned, while the maps furnished later for the metropolitan areas indicate approximately the distribution of the several metropolitan populations in respect of density.

3. **Centre of area and centre of population.**—On the present occasion, for the first time in connexion with an Australian Census, a determination was made of the centre of area and centre of population for each State and the Northern Territory, as well as for the Commonwealth as a whole. In respect of the centre of population such a determination is of considerable value when obtained for a series of censuses, as furnishing a measure of the trend which has taken place between Census and Census in the relative distribution of the population. The determination of the several points on the present occasion was effected by computations based upon the areas and populations of the counties of each of the States and the Northern Territory.

The latitude and longitude of the several centres of area and population are shewn in the following table :—

Latitude and Longitude of Centres of Area and Population, 1911.

Particulars.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	C'wlth.
Centre of Area—								
Latitude	32° 31′	37° 25′	23° 35′	29° 56′	25° 30′	41° 56′	19° 20′	25° 39′
Longitude	147° 0′	144° 20′	144° 10′	135° 45′	122° 6′	146° 39′	133° 2′	134° 2′
Centre of Population—								
Latitude	33° 40′	37° 40′	25° 15′	34° 36′	31° 22′	42° 2′	15° 20′	33° 57′
Longitude	150° 15′	144° 35′	150° 41′	138° 15′	117° 27′	146° 58′	131° 37′	145° 34′

As indicated above, the computation at future Censuses of centres of population for the several States and for the Commonwealth as a whole, will furnish a measure of the trend of population as regards geographical distribution. It is of interest to note in connexion with the centres determined on the present occasion for the several States and the Northern Territory, that in three cases, viz., New South Wales, South Australia, and the Northern Territory, the metropolis, the centre of population and the centre of area, are approximately in a straight line. In the cases of Victoria and Western Australia the centre of population lies slightly to the south of the straight line, joining the metropolis to the centre of area, while in Queensland and Tasmania the centre of population lies slightly to south of the corresponding line in these States. The centre of population is much nearer to the centre of area in Tasmania than in any other State. Similarly the centre of population is nearer the metropolis in Victoria than in any other State. As regards the Commonwealth as a whole, it may be noted that the centre of population lies slightly to the south of the straight line joining the centre of area to the Federal Capital site. The Commonwealth centre of population occupies approximately the same latitude as Sydney and the same longitude as Melbourne, and is on the straight line joining the New South Wales and South Australian centres of population.

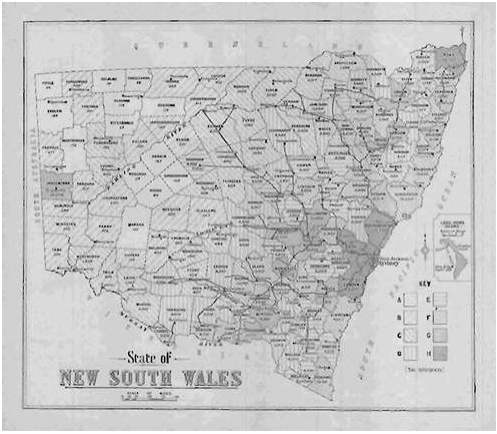
The distances of the centres of area and of population of the Commonwealth and of the several States and the Northern Territory from their respective metropolitan areas are approximately as follows :—

Distances of Centres of Area and Population from Metropolitan Areas, 1911.

Particulars.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	C'wlth.
	miles.	miles.	miles.	miles	miles.	miles.	miles.	miles.
Centre of area	258	70	656	380	586	76	492	1,130
Centre of population	50	24	232	25	100	66	202	235

The distances shewn in the above table represent approximately the distances from the centre of the metropolitan area in each case, the distance being measured from the centre of the Federal Capital Territory in the case of the Commonwealth.

4. **Census Maps.** (i.) *The Commonwealth of Australia.*—The map facing p. 425 shews the average densities of the several States and the Northern Territory, and also indicates the positions of the various centres of area and population discussed in the preceding section. The significance of the various grades of hatching will be seen on reference to the description on p. 425. The areas, populations, and densities are given in Section 2 above.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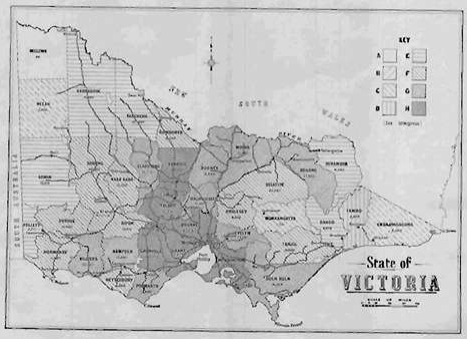
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(ii.) *New South Wales.*—Facing p. (426) is given the map of New South Wales, shewing the boundaries of the counties comprised therein, and in most cases the principal town in each county. The principal rivers and railway lines are also shewn. In each case the total population of the county is shewn and the density is indicated in accordance with the scale given on p. 425.

The area, population, and occupied dwellings of the several counties is given in the accompanying table :—

Area, Population and Occupied Dwellings of New South Wales Counties, 1911.

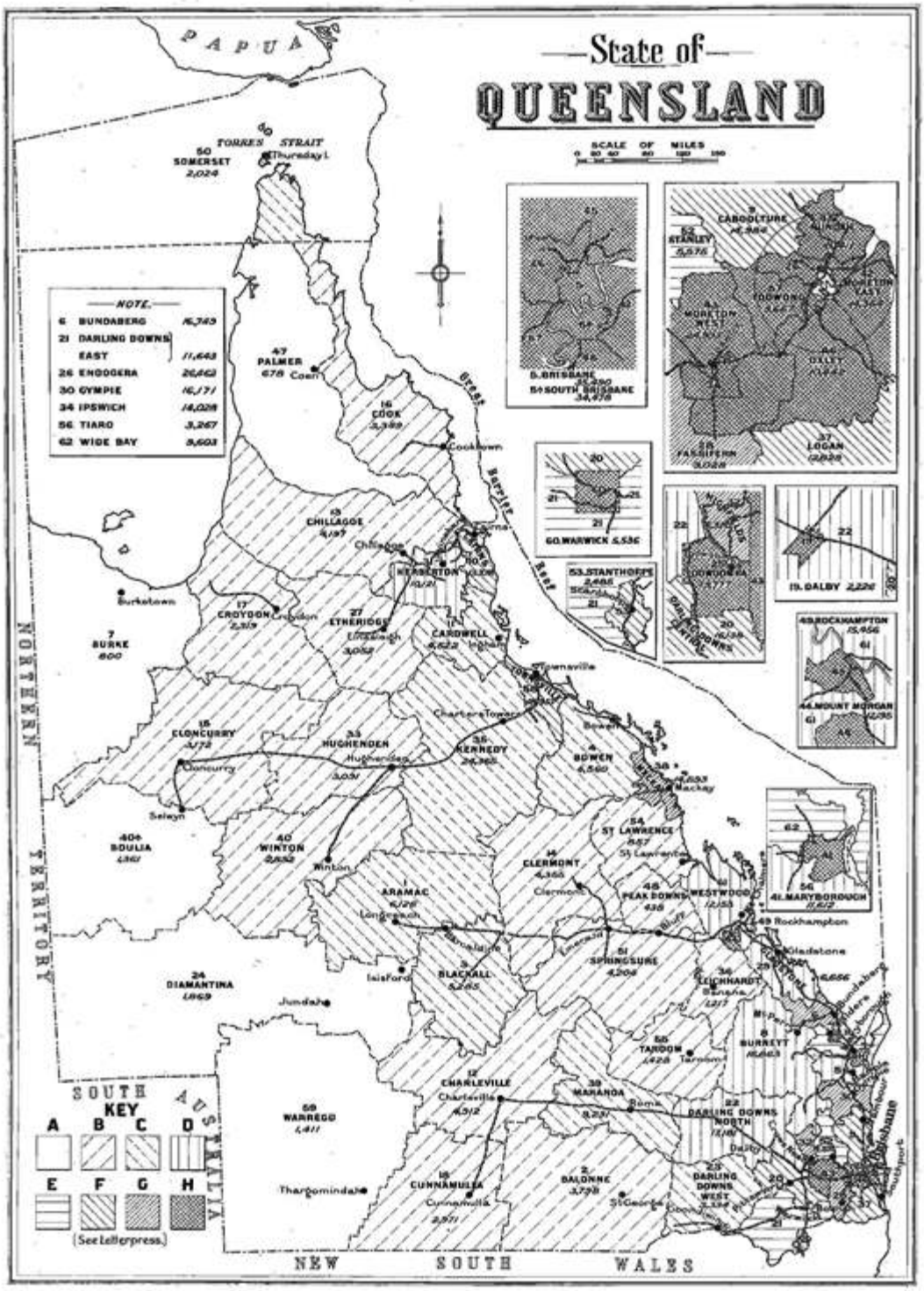
County.	Area.	Population.			Persons per Square Mile.	Occupied Dwellings.	Occupied Dwellings per Square Mile.	Population per Occupied Dwelling.
	Square Miles.	Males.	Females.	Persons.				
Argyle	1,876	8,999	8,817	17,816	9.50	3,351	1.786	5.31
Arrawatta	2,297	2,304	1,625	3,929	1.71	795	346	4.92
Ashburnham	2,179	9,683	8,638	18,321	8.41	3,688	1.693	4.95
Auckland	2,050	5,315	4,833	10,148	4.95	2,030	.990	4.99
Baradine	2,513	1,394	1,035	2,429	.97	476	.189	5.05
Barrona	2,572	90	22	112	.04	50	.019	2.22
Bathurst	1,982	16,097	14,855	30,952	15.62	6,278	3.168	4.91
Benarba	3,260	1,501	816	2,317	.71	404	.124	5.53
Beresford	1,482	2,374	2,050	4,424	2.99	857	.578	5.16
Bland	2,423	6,014	4,398	10,412	4.30	2,133	.880	4.86
Blaxland	3,994	369	198	567	.14	101	.025	5.48
Bligh	1,672	2,559	2,105	4,664	2.79	962	.575	4.83
Booroondarra ..	2,066	72	31	103	.05	13	.006	7.69
Bourke	2,230	5,977	4,063	10,040	4.50	2,003	.898	4.97
Boyd	1,534	519	328	847	.55	188	.123	4.28
Brisbane	2,281	5,329	4,657	9,986	4.38	1,870	.820	5.29
Buccleuch	1,370	1,499	1,082	2,581	1.88	555	.405	4.61
Buckland	1,565	4,183	3,483	7,666	4.90	1,471	.940	5.12
Buller	1,482	1,427	997	2,424	1.64	580	.391	4.18
Burnett	1,845	1,993	1,472	3,465	1.88	655	.355	5.18
Cadell	885	1,402	1,191	2,593	2.93	542	.612	4.71
Caira	2,590	813	550	1,363	.53	319	.123	4.22
Camden	2,231	22,035	21,062	43,097	19.32	8,767	3.930	4.91
Canbelego	2,109	490	310	800	.38	177	.084	4.50
Clarence	1,377	9,338	8,823	18,161	13.19	3,608	2.620	5.03
Clarendon	1,200	5,259	4,244	9,503	7.92	1,867	1.556	5.08
Clarke	1,574	1,496	1,144	2,640	1.68	582	.370	4.51
Clive	1,726	2,973	2,712	5,685	3.29	1,225	.710	4.60
Clyde	2,777	935	647	1,582	.57	357	.129	4.34
Cook	1,735	14,023	13,863	27,886	16.07	5,938	3.422	4.69
Cooper	2,880	3,155	2,207	5,362	1.86	1,248	.433	4.29
Courallie	1,964	2,810	2,115	4,925	2.51	933	.475	5.27
Cowley*	634	212	133	345	.54	76	.120	4.54
Cowper	4,681	1,229	989	2,218	.47	551	.118	3.97
Culgoa	2,538	267	155	422	.17	127	.050	3.27
Cumberland	1,673	352,990	367,716	720,706	430.79	141,275	84.444	5.10
Cunningham	2,594	2,465	1,861	4,326	1.67	861	.332	5.01
Damier	1,658	3,029	2,627	5,656	3.41	1,192	.719	4.73
Darling	1,540	3,319	2,836	6,155	4.00	1,137	.738	5.39
Delalah	2,290	32	7	39	.02	17	.007	2.29
Denham	1,482	466	260	726	.49	141	.095	5.03
Denison	1,145	2,791	1,925	4,716	4.12	912	.797	5.15
Dowling	1,833	408	245	653	.36	144	.079	4.53
Drake	1,336	704	469	1,173	.88	329	.246	3.57
Dudley	1,054	3,403	3,171	6,574	6.24	1,252	1.188	5.25
Durham	2,117	9,748	8,764	18,512	8.74	3,620	1.710	5.11
Evelyn	3,902	124	65	189	.05	53	.014	3.51
Ewenmar	2,070	1,811	1,120	2,931	1.42	622	.300	4.68
Farnell	2,921	188	89	277	.09	65	.022	4.11
Finch	4,226	1,453	639	2,092	.50	601	.142	3.39
Fitzgerald	2,214	24	3	27	.01	4	.002	6.25
Fitzroy	1,540	3,920	2,951	6,871	4.46	1,484	.964	4.61
Flinders	2,717	471	228	699	.26	172	.063	3.90
Forbes	1,429	2,818	2,052	4,870	3.41	1.016	.711	4.77
Franklin	1,439	166	97	263	.18	54	.038	4.87
Georgiana	1,923	3,165	2,679	5,844	3.04	1,247	.648	4.67
Gipps	2,791	2,710	1,874	4,584	1.64	988	.354	4.60
Gloucester	3,047	10,818	8,741	19,559	6.42	4,665	1.531	4.18
Gordon	1,455	2,254	1,598	3,852	2.65	865	.595	4.42
Gough	1,991	9,125	8,320	17,445	8.76	3,584	1.800	4.85
Goulburn	1,347	5,802	5,369	11,171	8.29	2,296	1.705	4.85
Gowen	1,788	3,093	2,408	5,501	3.08	1,080	.604	5.06
Gregory	3,080	1,042	543	1,585	.51	335	.109	4.69
Gresham	1,086	488	289	777	.72	198	.182	3.92
Gunderbooka ..	2,401	215	102	317	.13	73	.030	4.32
Harden	1,680	7,168	5,972	13,140	7.82	2,670	1.589	4.91
Hardinge	1,719	3,935	3,205	7,140	4.15	1,507	.877	4.71
Hawes	1,591	342	207	549	.35	127	.080	4.32
Hume	1,575	5,456	3,911	9,367	5.95	1,896	1.204	4.91
Hunter	2,153	1,250	1,012	2,262	1.05	444	.206	5.09

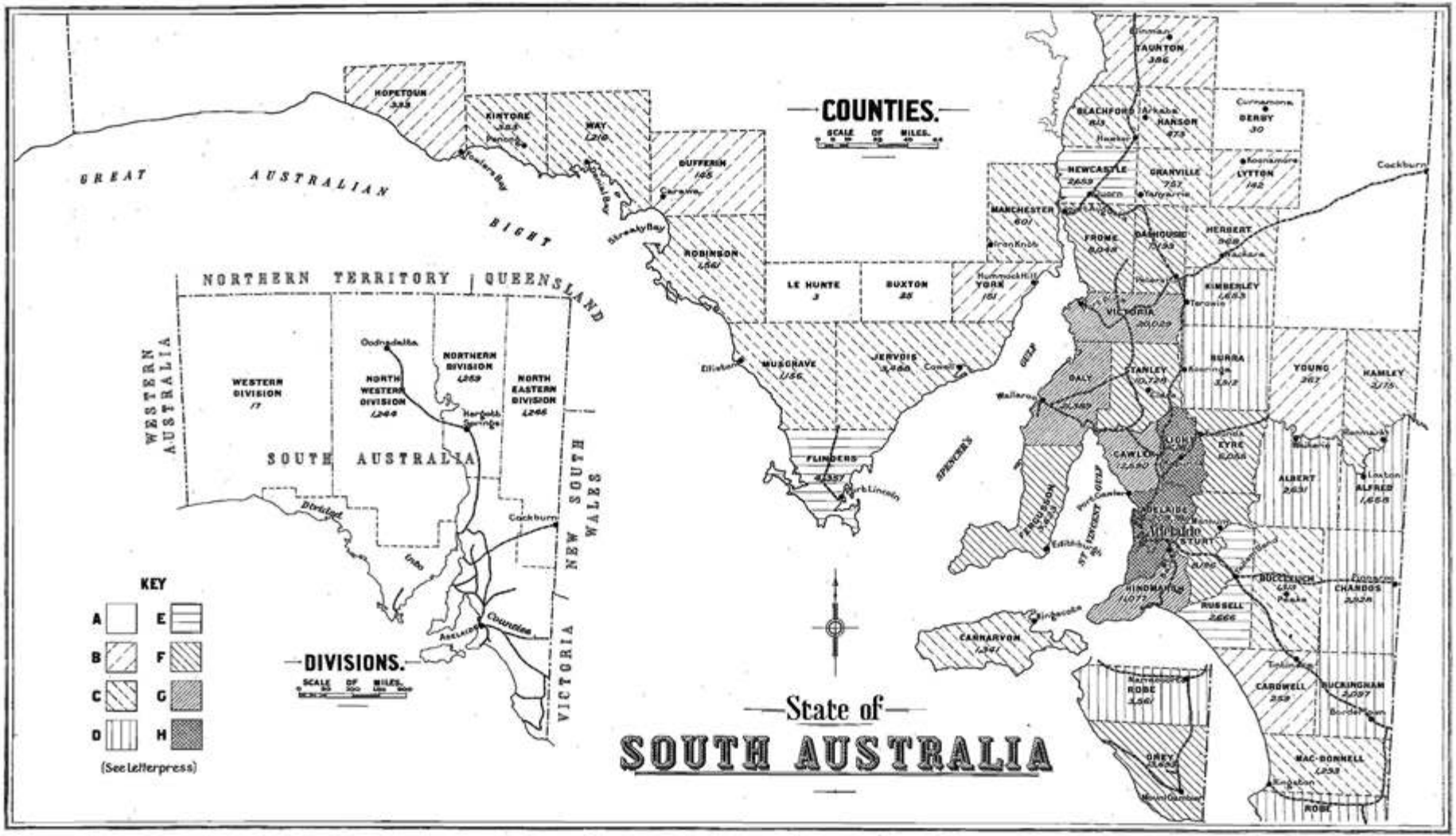
* Exclusive of Territory transferred to Commonwealth.

Area, Population, and Occupied Dwellings in New South Wales Counties, 1911—*continued.*

County.	Area.	Population.			Persons per Square Mile.	Occupied Dwellings.	Occupied Dwellings per Square Mile.	Population per Occupied Dwelling.
	Square Miles.	Males.	Females.	Persons.				
Inglis	872	4,572	4,308	8,880	10.18	1,713	1.964	5.18
Irrara	4,271	220	83	303	.07	61	.014	4.74
Jamison	2,185	1,574	760	2,334	1.07	554	.254	4.03
Kennedy	2,338	1,490	877	2,367	1.01	511	.219	4.52
Kilfera	1,618	105	43	148	.09	30	.019	4.93
Killara	2,820	105	54	159	.06	43	.015	3.67
King	1,831	4,838	4,315	9,153	5.00	1,809	.988	5.05
Landsborough ..	2,057	87	33	120	.06	34	.017	3.53
Leichhardt	3,664	2,617	1,926	4,543	1.24	905	.247	5.01
Lincoln	1,902	5,336	4,618	9,954	5.23	2,034	1.069	4.88
Livingstone	3,872	168	52	220	.06	61	.016	3.38
Macquarie	2,523	10,072	8,582	18,654	7.39	3,844	1.524	4.85
Manara	3,959	151	42	193	.05	57	.014	3.35
Menindie	2,357	202	92	294	.12	70	.030	4.17
Mitchell	1,465	2,978	1,901	4,879	3.33	1,002	.684	4.85
Monteagle	1,299	6,163	5,373	11,536	8.88	2,409	1.855	4.78
Mootwingee	3,580	151	27	178	.05	35	.010	4.83
Mossgiel	3,886	134	91	225	.06	43	.011	5.12
Mouramba	2,447	343	283	626	.26	170	.069	3.66
Murchison	1,808	2,917	2,300	5,217	2.89	987	.546	5.24
Murray*	1,829	3,652	3,451	7,103	3.88	1,474	.806	4.80
Nandewar	1,241	3,718	2,852	6,570	5.29	1,277	1.029	5.05
Napier	1,021	876	594	1,470	1.44	310	.304	4.67
Narran	3,668	689	377	1,066	.29	188	.051	5.53
Narromine	1,880	3,702	2,897	6,599	3.51	1,281	.681	5.13
Nicholson	2,229	840	621	1,461	.66	316	.142	4.57
Northumberland ..	2,524	63,595	58,798	122,393	48.49	25,842	10.239	4.73
Oxley	1,457	1,922	1,586	3,508	2.41	726	.498	4.79
Parry	1,356	4,512	3,464	7,976	5.88	1,668	1.230	4.78
Perry	2,978	177	101	278	.09	56	.019	4.95
Phillip	1,617	3,291	2,840	6,131	3.79	1,309	.810	4.64
Poole	2,016	35	9	44	.02	14	.007	2.93
Pottinger	2,810	5,107	3,879	8,986	3.20	1,809	.644	4.93
Raleigh	1,053	5,107	4,017	9,124	8.66	1,832	1.740	4.96
Rankin	2,431	96	31	127	.05	40	.016	3.18
Richmond	1,148	4,165	3,490	7,655	6.67	1,561	1.360	4.88
Robinson	2,193	4,822	3,544	8,366	3.81	1,727	.788	4.83
Rous	2,281	26,534	22,023	48,557	21.29	9,428	4.133	5.14
Roxburgh	1,579	5,180	4,279	9,459	5.99	2,231	1.413	4.24
St. Vincent*	2,616	6,185	5,632	11,817	4.52	2,582	.987	4.57
Sandon	1,322	6,894	6,886	13,780	10.42	2,617	1.980	5.25
Selwyn	1,747	1,355	1,057	2,412	1.38	535	.306	4.50
Stapylton	2,401	1,058	541	1,599	.67	340	.142	4.62
Sturt	1,596	431	223	654	.41	164	.103	3.91
Taila	2,297	187	133	320	.14	80	.035	3.95
Tandora	2,376	144	73	217	.09	65	.027	3.28
Tara	3,005	164	95	259	.09	47	.016	5.51
Thoulcanna	1,670	32	11	43	.03	6	.004	6.17
Tongowoko	2,339	193	127	320	.14	87	.037	3.61
Townsend	3,619	2,539	1,935	4,474	1.24	1,000	.276	4.45
Ularara	2,693	82	33	115	.04	25	.009	4.28
Urana	3,082	3,718	2,390	6,108	1.98	1,270	.412	4.75
Vernon	1,715	1,659	1,458	3,117	1.82	584	.341	5.34
Wakool	2,997	1,486	839	2,325	.78	443	.148	5.00
Waljeers	2,635	282	168	450	.17	97	.037	4.55
Wallace	2,214	2,259	1,818	4,077	1.84	787	.355	5.15
Waradgery	2,821	1,637	1,527	3,164	1.12	723	.256	4.36
Wellesley	1,600	2,508	2,192	4,700	2.94	995	.622	4.69
Wellington	1,921	11,096	10,573	21,669	11.28	4,618	2.404	4.68
Wentworth	3,276	713	526	1,239	.38	272	.083	4.40
Werunda	2,254	69	28	97	.04	26	.012	3.54
Westmoreland ..	1,616	2,516	2,108	4,624	2.86	975	.603	4.71
White	1,869	1,631	1,214	2,845	1.52	562	.301	4.99
Windeyer	3,245	196	113	309	.10	74	.023	3.95
Woore	2,264	68	17	85	.04	19	.008	4.32
Wynyard	1,725	8,592	7,793	16,385	9.50	3,249	1.883	5.03
Yancowinna	2,636	17,624	14,454	32,078	12.17	6,978	2.647	4.59
Yanda	2,838	156	115	271	.10	53	.019	5.09
Yantara	2,915	160	41	201	.07	40	.014	4.83
Young	2,575	456	394	850	.33	181	.070	4.54
Yungnulgra	3,130	504	281	785	.25	295	.094	2.58
Outside Counties—								
Lord Howe Island	5	56	49	105	21.00	23	4.600	4.57
Whole State ..	309,460	850,221	788,462	1,638,683	5.30	330,976	1.070	4.94
Shipping	..	7,477	574	8,051	..	..	..	..
Total Population	..	857,698	789,036	1,646,734	..	..	..	..

* Exclusive of Territory transferred to Commonwealth.


State of
QUEENSLAND
SCALE OF MILES
PAPUA
TORRES STRAIT
Thursday I.
50 SOMERSET 2,024
NOTE.
6 BUNDABERG 16,749
21 DARLING DOWNS EAST 11,643
26 ENOGGERA 20,462
30 GYMPIE 16,171
34 IPSWICH 14,028
56 TIARO 3,267
62 WIDE BAY 8,603
47 PALMER 678 Coen
16 COOK 2,389
Cooktown
GREAT BARRIER REEF
43 CHILLAGOE 4,197
Chillagoe
10 KERSBROOM 10,121
Burketown
7 BURKE 800
17 CROYDON 2,319
Croydon
27 ETHERIDGE 3,052
Einasleigh
CARDWELL 4,622
Ingham
Townsville
Charters Towers
15 CLONCURRY 4,772
Cloncurry
33 HUGHENDEN 3,031
Hughenden
36 KENNEDY 24,365
4 BOWEN 4,560
Bowen
38 2,853 Mackay
Selwyn
40A BOULIA 1,361
40 WINTON 2,852
Winton
54 ST LAWRENCE 857
St Lawrence
14 CLERMONT 4,366
Clermont
ARAMAC 6,126
Longreach
48 PEAK DOWNS 436
WESTWOOD 12,153
49 Rockhampton
Emerald
51 SPRINGSURE 4,206
Gladstone
24 DIAMANTINA 1,869
Isisford
3 BLACKALL 5,265
34 LEICHHARDT 1,217
Banana
Jundah
55 TAROOM 1,428
Taroom
BURNETT 16,663
17 CHARLEVILLE 4,512
Charleville
38 MARANOA 9,231
Roma
22 DARLING DOWNS NORTH 18,161
Dalby
59 WARREGO 1,411
Thargomindah
CUNNAMULLA 2,971
Cunnamulla
18 BALONNE 3,778
St George
23 DARLING DOWNS WEST 2,334
Goondiwindi
Toowoomba
Brisbane
Southport
SOUTH AUSTRALIA
NORTHERN TERRITORY
NEW SOUTH WALES
KEY
A B C D
E F G H
(See Letterpress.)
5. BRISBANE 141,290
54 SOUTH BRISBANE 34,478
9 CABOOLTURE 4,388
52 STANLEY 5,576
8 TOOWONG 18,672
MORETON WEST 21,832
MORETON EAST 19,348
46 OXLEY 11,942
35 FASSIFERN 9,058
37 LOGAN 12,928
60. WARWICK 5,536
53. STANTHORPE 2,486
Stanthorpe
Warwick
19. DALBY 2,226
43 ROCKHAMPTON 15,956
44. MOUNT MORGAN 12,195
41. MARYBOROUGH 11,612
56
62


COUNTIES.
SCALE OF MILES.
DIVISIONS.
SCALE OF MILES.
KEY
A
B
C
D
E
F
G
H
(See Letterpress)
GREAT AUSTRALIAN BIGHT
NORTHERN TERRITORY
QUEENSLAND
NEW SOUTH WALES
VICTORIA
WESTERN AUSTRALIA
SOUTH AUSTRALIA
WESTERN DIVISION 17
NORTH WESTERN DIVISION 1244
NORTHERN DIVISION 1259
NORTH EASTERN DIVISION 1246
HOPETOUN 385
KINTORE 387
MAY 1218
DUFFERIN 195
ROBINSON 1561
LE HUNTE 3
BUXTON 25
YORK 161
MUSGRAVE 1156
JERVOIS 2,966
FLINDERS 4357
TAUNTON 386
BEACHPORT 813
HANSON 473
DERBY 30
NEWCASTLE 2669
GRANVILLE 757
LYTTON 142
MANCHESTER 601
FROME 8,044
DALHOUSIE 2,193
HERBERT 368
KIMBERLEY 1,683
VICTORIA 30,029
STANLEY 10,729
BURRA 3,812
YOUNG 267
HAMLEY 2,175
EYRE 6,058
ALBERT 263
ALFRED 1,668
RUSSELL 2,666
CHANDOS 3,524
CARNARVON 1,241
ROBE 3,561
CARDWELL 259
BUCKINGHAM 2,097
GREY 3,422
MAC-DONNELL 1,253
ROBE
Cockburn
Oodnadatta
Hergott Springs
Strzelecki Creek
Birdsville
Cockburn
Adelaide
Coorong
Lake Eyre
Lake Torrens
Spencers Gulf
St Vincent Gulf
Gulf St Vincent
Port Lincoln
Port Augusta
Port Pirie
Port Broughton
Port Germein
Port Wakefield
Port Adelaide
Encounter Bay
Kingston
Mount Gambier
Robe
Naracoorte
Tarcoola
Streaky Bay
Ceduna
Elliston
Wallaroo
Kadina
Moonta
Burra
Kooringa
Clare
Gawler
Tanunda
Nuriootpa
Angaston
Mannum
Murray River
Darling
Barrier Ranges
Broken Hill
Menindie
Wentworth
Mildura
Swan Hill
Kerang
Echuca
Deniliquin
Albury
Corowa
Tocumwal
Moama
Echuca
Kyneton
Castlemaine
Bendigo
Maryborough
Ararat
Hamilton
Portland
Port Fairy
Warrnambool
Colac
Geelong
Melbourne
Williamstown
Sandridge
Brighton
Hobson's Bay
Port Phillip Bay
Western Port
Dandenong
Gippsland
Lakes Entrance
Sale
Bairnsdale
Orbost
Mallacoota Inlet
Cape Howe
Eden
Twofold Bay
Cape Everard
Cape Otway
Apollo Bay
Lorne
Queenscliff
Portsea
Cape Schanck
Phillip Island
Wilsons Promontory
Port Albert
Port Welshpool
Port Franklin
Port Anderson
Port Sorell
Port Dalrymple
George Town
Launceston
Tamar River
Tasman Peninsula
Hobart
Derwent River
Storm Bay
Bruny Island
Recherche Archipelago
Esperance Bay
Israelite Bay
Eucla
Fowlers Bay
Denial Bay
Venus Bay
Smoky Bay
Port Lincoln
Boston Island
Thistle Island
Spencer Gulf
Gulf St Vincent
Kangaroo Island
Backstairs Passage
Encounter Bay
Lake Alexandrina
Lake Albert
Lake Victoria
Lake Bonney
Lake Hawdon
Lake Frome
Lake Callabonna
Lake Gregory
Lake Blanche
Lake Torrens
Lake Eyre
Lake Gairdner
Lake Macdonnell
Lake Acraman
Lake Everard
Lake Labatt
Lake Hart
Lake Wangary
Lake Wangary
Lake Hamilton
Lake Bonney
Lake Hawdon
Lake Frome
Lake Callabonna
Lake Gregory
Lake Blanche
Lake Torrens
Lake Eyre
Lake Gairdner
Lake Macdonnell
Lake Acraman
Lake Everard
Lake Labatt
Lake Hart
Lake Wangary
State of
SOUTH AUSTRALIA

(iii.) *Victoria.*—The Census map of Victoria facing p. 427 shews the boundary of each county as well as the principal town contained therein, wherever there is a settlement of sufficient importance to warrant its being so classed. The principal railway lines are also shewn. In each case the population of the county is given and the degree of the density of population is indicated in accordance with the scale shewn on p. 425.

The area, population, and occupied dwellings of the several counties are contained in the following table :—

Area, Population and Occupied Dwellings of Victorian Counties, 1911.

County.	Area.	Population.			Persons per Square Mile.	Occupied Dwellings.	Occupied Dwellings per Square Mile.	Population per Occupied Dwelling.
	Square Miles.	Males.	Females	Persons.				
Anglesey	1,647	4,772	4,180	8,952	5.44	1,886	1.145	4.72
Benambra	2,749	3,625	2,957	6,582	2.39	1,374	.500	4.77
Bendigo	1,949	26,771	27,729	54,500	27.96	12,239	6.280	4.45
Bogong	3,069	14,681	13,224	27,905	9.09	5,706	1.859	4.89
Borung	4,293	16,289	14,562	30,851	7.19	6,242	1.454	4.93
Bourke	1,721	295,309	327,502	622,811	361.89	126,430	73.463	4.92
Bulla Buln	3,739	22,283	18,774	41,057	10.98	8,811	2.357	4.65
Croajingolong ..	3,396	1,510	1,190	2,700	.80	617	.182	4.37
Dalhousie	1,310	8,917	8,724	17,641	13.47	3,946	3.012	4.45
Dargo	1,744	3,077	2,441	5,518	3.16	1,307	.749	4.22
Delatite	3,240	11,491	10,574	22,065	6.81	4,558	1.407	4.83
Dundas	2,028	5,298	5,152	10,450	5.15	2,117	1.044	4.92
Evelyn	1,172	9,026	8,265	17,291	14.75	3,917	3.342	4.41
Follett	1,103	1,372	1,339	2,711	2.46	550	.499	4.92
Gladstone	1,802	8,752	7,961	16,713	9.27	3,739	2.075	4.46
Grant	1,834	34,991	36,486	71,477	38.97	15,300	8.342	4.66
Grenville	1,465	20,503	22,567	43,070	29.40	9,445	6.447	4.55
Gunbower	1,348	5,083	4,181	9,264	6.87	1,852	1.374	4.98
Hampden	1,561	6,707	6,188	12,895	8.26	2,572	1.648	5.01
Heytesbury	920	3,705	3,261	6,966	7.57	1,404	1.526	4.94
Kara Kara	2,290	8,265	7,274	15,539	6.79	3,229	1,410	4.81
Karkarooc	5,935	9,618	6,562	16,180	2.73	3,298	.556	4.88
Lowan	4,971	7,082	6,231	13,313	2.68	2,526	.508	5.27
Millewa	3,572	56	28	84	.02	19	.005	4.42
Moira	3,104	16,814	15,028	31,842	10.26	6,296	2.028	5.04
Mornington	1,625	19,034	16,279	35,313	21.73	7,861	4.838	4.49
Normanby	2,013	5,900	6,007	11,907	5.92	2,517	1.250	4.72
Polwarth	1,225	7,367	6,533	13,900	11.35	2,832	2.312	4.89
Ripon	1,759	7,464	6,448	13,912	7.91	2,738	1.557	5.07
Rodney	1,699	10,399	9,089	19,488	11.47	4,146	2.440	4.69
Talbot	1,621	23,567	24,364	47,931	29.57	10,733	6.621	4.46
Tambo	1,958	1,650	1,329	2,979	1.52	632	.323	4.71
Tanjil	2,818	10,130	9,562	19,692	6.99	4,190	1.487	4.70
Tatchera	3,339	6,318	4,519	10,837	3.25	2,131	.638	5.08
Villiers	1,637	11,430	11,297	22,727	13.88	4,537	2.772	5.00
Weeah	4,004	1,255	697	1,952	.49	549	.137	3.54
Wonnangatta ..	2,224	998	733	1,731	.78	437	.196	3.91
Whole State ..	87,884	651,509	659,237	1,310,746	14.91	272,683	3.103	4.80
Shipping	..	4,082	723	4,805	..	..	..	..
Total Population	..	655,591	659,960	1,315,551	..	..	..	..

(iv.) *Queensland.*—The Census map of Queensland, which is given facing p. 428, shews the boundary of each Census District, and where practicable the name and situation of the principal town therein. The principal railway lines are also shewn. In each case the population of the district is given, and the density of the population is indicated by hatching in accordance with the scale given on p. 425. Owing to the relatively small area of some of the more populous of the Census Districts, it has been impracticable to furnish adequate representation of all on the same scale. A number of insets has consequently been prepared to which reference should be made in the case of the districts in question. The numbers shewn before the name of the District in each case is the Census District number, which was used for reference in connexion with the collection and tabulation of the data.

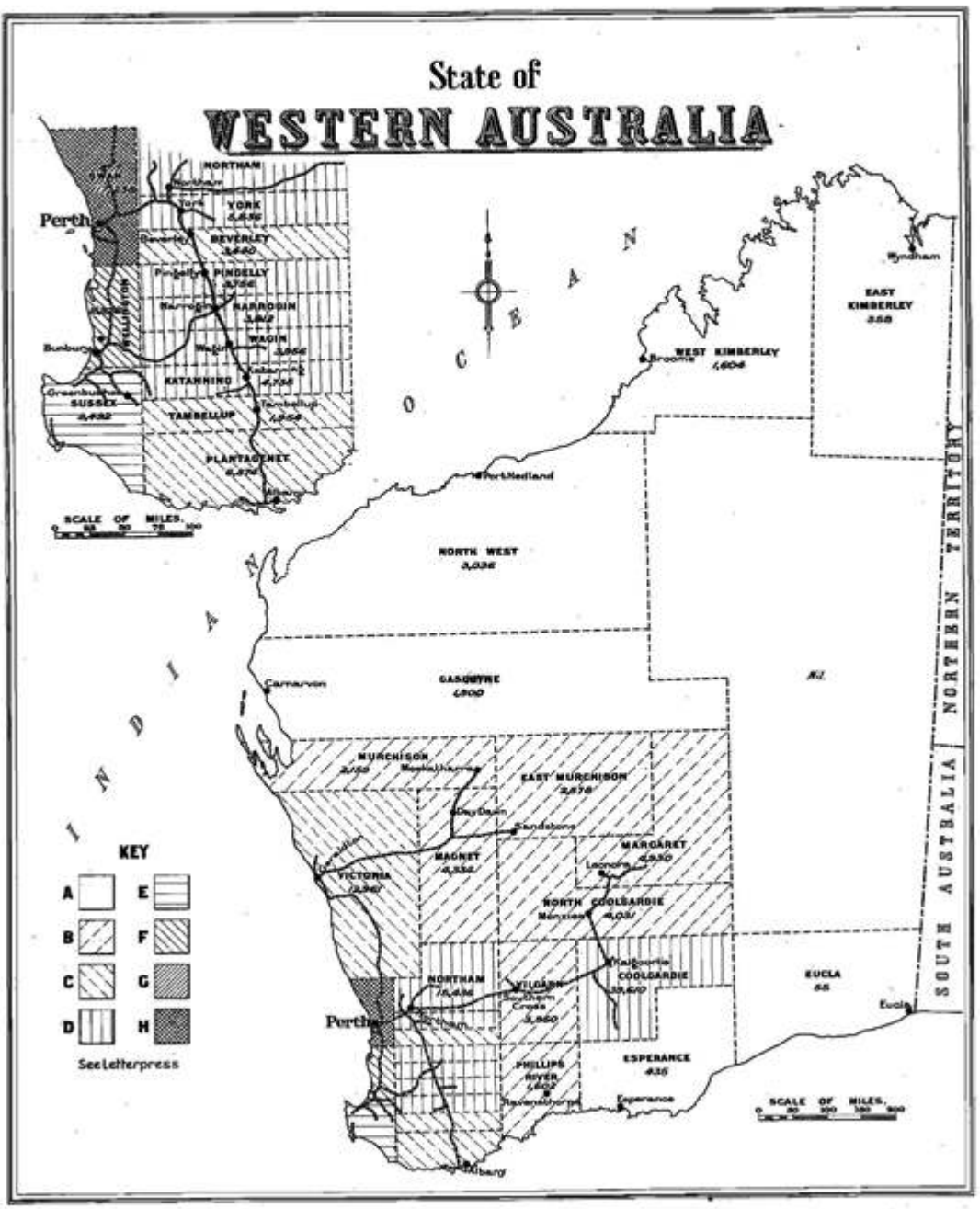
In certain cases, where there was sufficient space to indicate the density but not sufficient to give also the name of the district and the population, this district Census number only has been inserted on the map, the missing particulars being given in a note on the upper left side of the map.

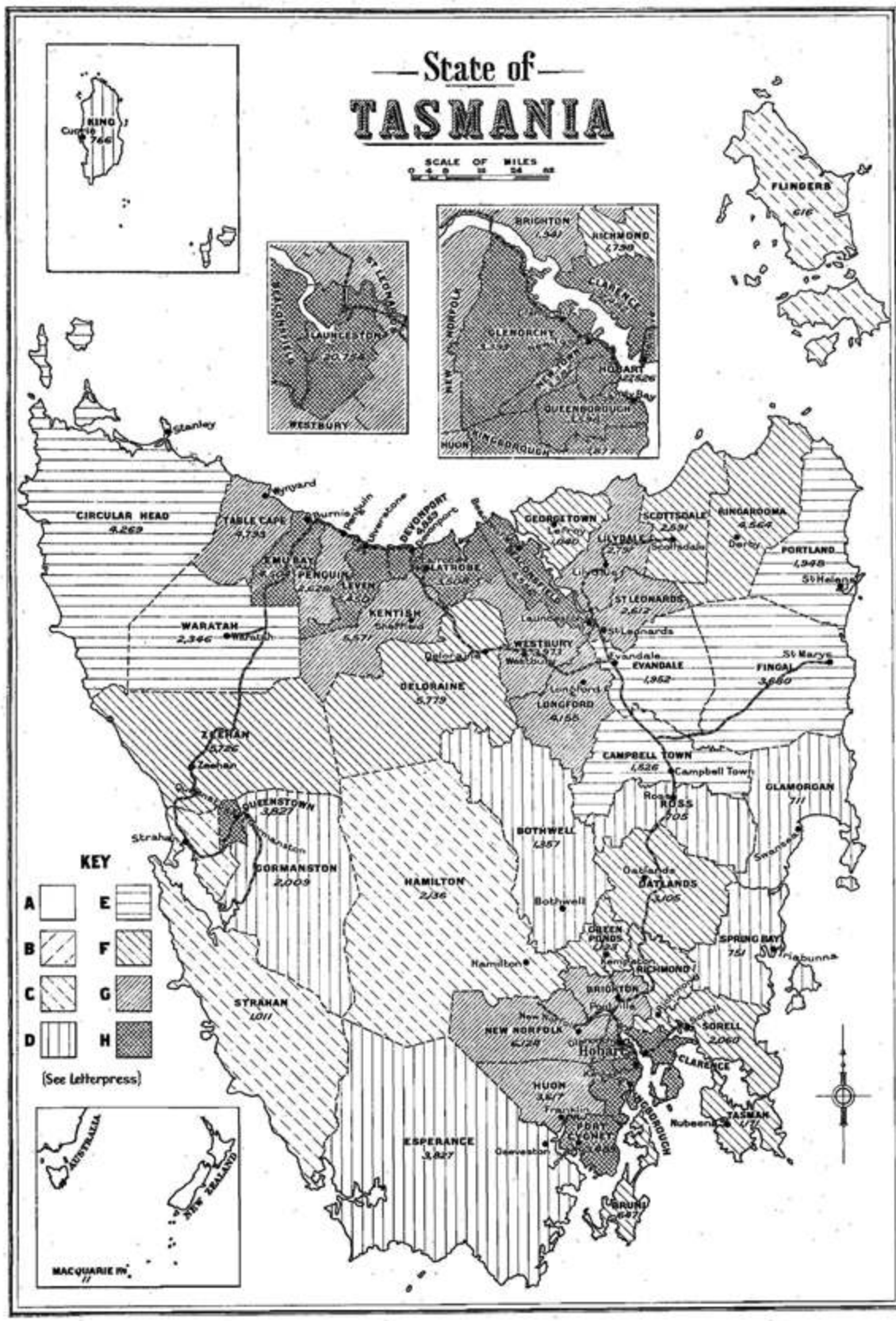
The area, population, and occupied dwellings of the several Census Districts of Queensland are given in the succeeding table :—

Area, Population, and Occupied Dwellings of Queensland Census Districts, 1911.

Census District.	Area.	Population.			Persons per Square Mile.	Occupied Dwellings.	Occupied Dwellings per Square Mile.	Population per Occupied Dwelling.
	Square Miles.	Males.	Females.	Persons.				
Aramac	20,467	3,979	2,147	6,126	.30	1,236	.060	4.84
Balonne	26,247	2,630	1,168	3,798	.14	950	.036	3.96
Blackall	14,539	3,241	2,044	5,285	.36	1,054	.072	4.95
Boulia	30,320	980	381	1,361	.04	247	.008	5.11
Bowen	11,642	2,684	1,876	4,560	.39	1,059	.091	4.30
Brisbane, North ..	5.5	17,542	17,948	35,490	6452.73	6,384	1160.727	5.56
Brisbane, South ..	4.5	16,396	18,082	34,478	7661.78	6,916	1536.889	4.99
Bundaberg	1,843	9,238	7,511	16,749	9.09	3,414	1.852	4.90
Burke	38,866	579	221	800	.02	168	.004	4.62
Burnett	12,436	9,757	7,106	16,863	1.36	3,910	.314	4.30
Caboolture	2,020	8,261	6,723	14,984	7.42	3,157	1,563	4.74
Cairns	2,289	8,380	4,998	13,378	5.84	2,938	1.284	4.52
Cardwell	6,761	3,007	1,515	4,522	.67	1,010	.149	4.46
Charleville	22,305	3,183	1,729	4,912	.22	1,015	.046	4.80
Chillagoe	25,319	2,559	1,638	4,197	17	1,163	.046	3.60
Clermont	19,110	2,661	1,694	4,355	.23	1,178	.062	3.67
Cloncurry	28,747	2,211	961	3,172	.11	840	.029	3.61
Cook	17,139	2,016	1,333	3,349	.20	858	.050	3.90
Croydon	20,153	1,261	1,058	2,319	.12	593	.029	3.89
Cunnamulla	19,424	1,996	975	2,971	.15	674	.035	4.38
Dalby	2.5	1,071	1,155	2,226	890.40	413	165.200	5.38
Darling Downs, Central	2,537	9,052	7,086	16,138	6.36	3,037	1.197	5.29
Darling Downs, East	4,564	6,684	4,959	11,643	2.55	2,476	.543	4.69
Darling Downs, North	10,593	9,851	7,330	17,181	1.62	3,675	.347	4.66
Darling Downs, West	7,716	2,114	1,220	3,334	.43	803	.104	4.11
Diamantina	56,697	1,371	498	1,869	.03	418	.007	4.12
Enoggera	30	12,631	13,831	26,462	882.07	5,450	181.667	4.86
Etheridge	14,428	2,042	1,010	3,052	.21	1,083	.075	2.81
Fassifern	975	4,733	4,295	9,028	9.26	1,647	1.689	5.48
Gladstone	3,923	3,676	2,980	6,656	1.70	1,475	.376	4.51
Gympie	1,848	8,282	7,889	16,171	8.75	3,412	1.846	4.74
Herberton	5,614	6,423	3,698	10,121	1.80	3,093	.551	3.27
Highfields	707	3,394	2,926	6,320	8.94	1,346	1.904	4.69
Hughenden	17,503	2,055	1,036	3,091	.18	695	.040	4.30
Ipswich	40	6,981	7,047	14,028	350.70	2,672	66.800	5.25
Kennedy	30,453	12,688	11,677	24,365	.80	5,632	.185	4.32
Leichhardt	6,458	800	417	1,217	.19	329	.051	3.68
Logan	1,682	6,729	6,100	12,829	7.63	2,509	1.492	5.11
Mackay	1,802	8,656	6,237	14,893	8.26	3,090	1.715	4.81
Maranoa	13,330	5,198	4,033	9,231	.69	1,913	.144	4.79
Maryborough ..	339	5,655	5,957	11,612	34.25	2,334	6.885	4.97
Moreton, East ..	210	7,672	6,692	14,364	68.40	2,824	13.448	5.07
Moreton, West ..	1,390	13,135	11,858	24,993	17.98	4,891	3.519	5.10
Mount Morgan ..	432	6,622	5,573	12,195	28.23	2,614	6.051	4.66
Nundah	80	8,900	9,511	18,411	230.14	3,501	43.763	5.26
Oxley	204	5,258	5,184	10,442	51.19	1,913	9.377	5.46
Palmer	30,734	499	179	678	.02	313	.010	2.17
Peak Downs ..	5,398	280	158	438	.08	99	.018	4.41
Rockhampton ..	55	7,376	8,080	15,456	281.02	2,859	51.982	5.41
St. Lawrence ..	8,893	530	327	857	.10	184	.021	4.65
Somerset	4,482	1,386	638	2,024	.45	451	.101	3.75
Springsure	18,066	2,556	1,648	4,204	.23	1,105	.061	3.78
Stanley	1,691	3,117	2,458	5,575	3.30	1,105	.653	5.03
Stanthorpe	318	1,259	1,226	2,485	7.81	532	1.673	4.66
Taroom	10,201	883	545	1,428	.14	288	.028	4.89
Tiaro	1,757	1,805	1,462	3,267	1.86	716	.408	4.56
Toowong	85	4,565	5,102	9,667	113.73	2,012	23.671	4.80
Toowoomba	81.5	9,389	10,388	19,777	242.66	3,586	44.000	5.51
Townsville	2,927	10,500	8,453	18,953	6.48	3,570	1.220	5.30
Warrego	50,208	1,012	399	1,411	.03	256	.005	4.92
Warwick	24	2,657	2,879	5,536	230.67	1,077	44.875	5.14
Westwood	6,107	6,557	5,596	12,153	1.99	2,710	.444	4.48
Wide Bay	2,532	5,490	4,113	9,603	3.79	2,183	.862	4.38
Winton	23,746	2,115	777	2,892	.12	781	.033	3.51
Whole State ..	670,500	326,210	275,735	601,945	.90	125,836	.188	4.76
Shipping	..	3,296	572	3,868	..	..	..	..
Total Population	..	329,506	276,307	605,813	..	..	..	..

(v.) *South Australia.*—The Census map of South Australia, facing p. 429, shews the boundaries of each of the counties into which the more populous parts of that State is divided. The portion of the State not divided into counties is divided for statistical and certain other purposes, into four sections known as (i.) the North Eastern Division, (ii.) the Northern Division,


State of
WESTERN AUSTRALIA
NORTHAM
Northam
Perth
York
YORK
BEVERLEY
Beverley
PINDELLY
NARROGIN
WAGIN
Bunbury
KATANNING
Katanning
Greenbushes
SUSSEX
TAMBELLUP
Tambellup
PLANTAGENET
Albany
SCALE OF MILES.
INDIAN OCEAN
Wyndham
EAST KIMBERLEY
WEST KIMBERLEY
Broome
Port Hedland
NORTH WEST
Carnarvon
GASCOYNE
MURCHISON
Meekatharra
EAST MURCHISON
Day Dawn
Sandstone
MAGNET
Leonora
MARGARET
VICTORIA
NORTH COOLGARDIE
Menzies
Kalgoorlie
COOLGARDIE
NORTHAM
YILGARN
Southern Cross
Perth
Fremantle
PHILLIPS RIVER
Ravensthorpe
ESPERANCE
Esperance
EUCLA
Eucla
Albany
SOUTH AUSTRALIA
NORTHERN TERRITORY
KEY
A
B
C
D
E
F
G
H
See Letterpress


State of
TASMANIA
SCALE OF MILES
0 4 8 16 24 32
KING
Currie
766
FLINDERS
616
LAUNCESTON
20,794
WESTBURY
BRIGHTON
1,541
RICHMOND
1,739
CLARENCE
GLENORCHY
HOBART
22,526
QUEENBOROUGH
1,394
HUON
KINGBOROUGH
Stanley
CIRCULAR HEAD
9,269
TABLE CAPE
4,735
Wynyard
Burnie
DEVONPORT
8,845
Ulverstone
GEORGETOWN
1,040
LILYDALE
2,791
SCOTTSDALE
2,591
RINGAROOMA
3,564
Derby
PORTLAND
1,948
St Helens
EMU BAY
PENGUIN
3,628
LEVEN
4,430
LATROBE
1,608
WARATAH
2,346
Waratah
KENTISH
5,671
ST LEONARDS
2,612
St Leonards
WESTBURY
1,973
EVANDALE
1,962
FINGAL
3,680
St Marys
DELORAINE
5,779
LONGFORD
6,158
ZEEHAN
3,726
Zeehan
CAMPBELL TOWN
1,526
Campbell Town
GLAMORGAN
711
QUEENSTOWN
3,827
Strahan
ROSS
905
BOTHWELL
1,857
GORMANSTON
2,009
HAMILTON
2,136
OATLANDS
3,105
Oatlands
Bothwell
GREEN PONDS
1,128
SPRING BAY
751
Triabunna
Hamilton
RICHMOND
BRIGHTON
New Norfolk
NEW NORFOLK
6,128
Hobart
SORELL
2,060
CLARENCE
STRAHAN
1,011
HUON
3,617
Franklin
TASMAN
1,172
Nubeena
KINGBOROUGH
Oyster Cove
ESPERANCE
3,827
BRUNY
647
KEY
A
B
C
D
E
F
G
H
(See Letterpress)
AUSTRALIA
NEW ZEALAND
MACQUARIE IN.

(iii.) the North Western Division, and (iv.) the Western Division. These latter Divisions are very sparsely populated, and their boundaries are shewn in the small inset entitled Divisions. For convenience in presentation, the two counties of Robe and Grey in the extreme south east corner of the State are also shewn as an inset on the same scale as the remaining counties. Where practicable the name and position of the principal town has been given, and the principal lines of railway have been shewn. The population of each county and division is also shewn, and the density of each is indicated in accordance with the scale given on p. 425.

The area, population, and occupied dwellings of the counties and divisions of South Australia are shewn in the following table :—

Area, Population and Occupied Dwellings of South Australian Counties and Divisions, 1911.

County or Division.	Area.	Population.			Persons per Square Mile.	Occupied Dwellings.	Occupied Dwellings per Square Mile.	Population per Occupied Dwelling.
	Square Miles.	Males.	Females.	Persons.				
Adelaide	1,141	100,659	109,122	209,781	183.86	43,111	37.784	4.87
Albert	2,174	1,633	998	2,631	1.21	592	.272	4.44
Alfred	1,503	1,070	588	1,658	1.10	358	.238	4.63
Blachford	1,135	427	386	813	.72	183	.161	4.41
Buccleuch	2,330	845	468	1,313	.56	317	.136	4.14
Buckingham	1,791	1,086	1,011	2,097	1.17	452	.252	4.64
Burra	2,080	2,032	1,880	3,912	1.88	841	.404	4.65
Buxton	1,550	17	8	25	.02	3	.002	3.67
Cardwell	1,670	160	99	259	.16	61	.037	4.25
Carnarvon	1,680	729	612	1,341	.80	309	.184	4.34
Chandos	2,620	1,828	1,100	2,928	1.12	575	.219	4.98
Dalhousie	1,230	3,741	3,452	7,193	5.85	1,431	1.163	5.03
Daly	1,658	10,837	10,552	21,389	12.90	4,383	2.644	4.88
Derby	1,484	25	5	30	.02	7	.005	4.29
Dufferin	2,623	105	40	145	.06	42	.016	3.40
Eyre	1,415	3,191	2,864	6,055	4.28	1,223	.864	4.95
Ferguson	1,858	5,275	4,348	9,623	5.18	2,046	1.101	4.70
Flinders	1,850	2,400	1,957	4,357	2.36	893	.483	4.88
Frome	1,508	4,251	3,797	8,048	5.34	1,615	1.071	4.98
Gawler	928	6,447	6,143	12,590	13.57	2,587	2.788	4.86
Granville	1,168	426	331	757	.65	148	.127	5.10
Grey	2,044	6,825	6,868	13,693	6.70	2,846	1.392	4.80
Hamley	2,194	1,267	908	2,175	.99	519	.237	4.04
Hanson	1,259	275	198	473	.38	86	.068	5.50
Herbert	1,532	534	434	968	.63	208	.136	4.65
Hindmarsh	1,025	5,289	5,788	11,077	10.81	2,387	2.329	4.64
Hopetoun	2,400	226	107	333	.14	58	.024	5.03
Jervois	3,686	2,177	1,311	3,488	.95	710	.193	4.75
Kimberley	1,388	876	777	1,653	1.19	362	.261	4.57
Kintore	1,418	223	130	353	.25	82	.058	4.21
Le Hunte	1,650	2	1	3	.002	1	.001	3.00
Light	839	8,214	8,067	16,281	19.41	3,501	4.173	4.65
Lytton	1,381	100	42	142	.10	43	.031	3.30
MacDonnell	1,845	672	621	1,293	.70	279	.151	4.63
Manchester	1,930	340	261	601	.31	130	.067	4.58
Musgrave	2,450	635	521	1,156	.47	229	.093	5.05
Newcastle	1,221	1,370	1,289	2,659	2.18	533	.437	4.99
Robe	1,962	1,836	1,725	3,561	1.81	800	.408	4.44
Robinson	2,674	930	631	1,561	.58	299	.112	5.21
Russell	1,323	1,483	1,183	2,666	2.02	593	.448	4.50
Stanley	1,574	5,690	5,038	10,728	6.82	2,201	1.398	4.87
Sturt	1,328	4,349	3,847	8,196	6.17	1,712	1.289	4.79
Taunton	2,147	225	161	386	.18	104	.048	3.63
Victoria	1,431	10,517	9,512	20,029	14.00	4,047	2.828	4.95
Way	2,610	784	432	1,216	.47	290	.111	4.18
York	1,320	89	62	151	.111	35	.027	4.09
Young	2,076	161	106	267	.13	61	.029	4.38
Outside Counties—								
Northern Division	297,967	791	468	1,259	.01	289	.003	4.03
North Eastern Div.		907	338	1,245		327		3.62
North Western Div.		920	324	1,244		266		4.50
Western Division		15	2	17		4		3.00
Whole State	380,070	204,906	200,913	405,819	1.07	84,179	.221	4.81
Shipping	..	2,452	287	2,739	..	..	..	..
Total Population	..	207,358	201,200	408,558	..	..	..	..

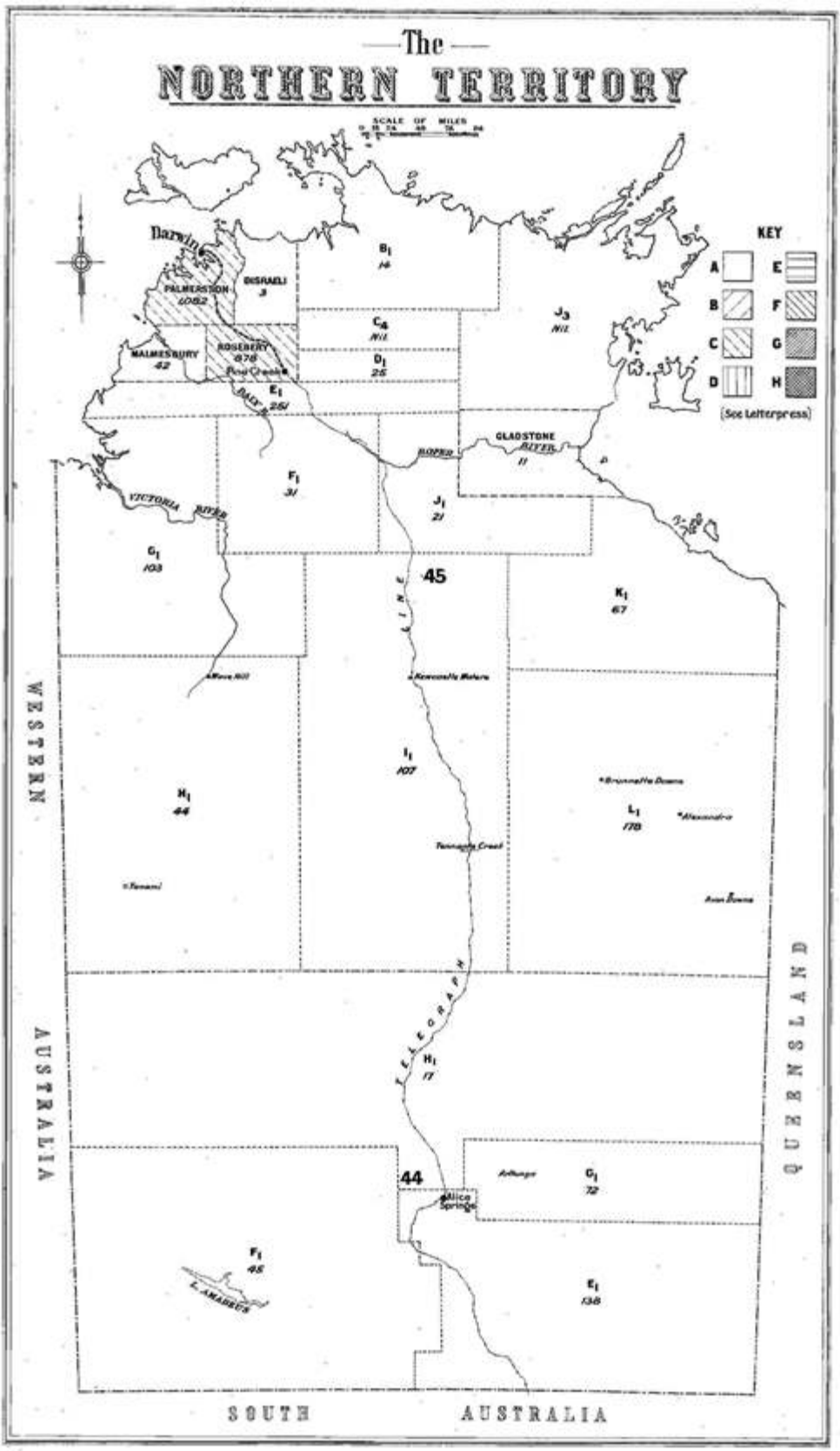
(vi.) *Western Australia.*—The Census map of Western Australia facing p. 430 shews the boundary of each of the districts which have been adopted in that State for statistical purposes, and are hence known as statistical districts. The position and name of the principal town in each District is shewn on the map, and also the principal lines of railway. The population of each district is also shewn in each case, and the density of each is indicated in accordance with the scale shewn on p. 425. Owing to the restricted space available on the map of the whole State for display of particulars relative to the South West Division, an inset of this Division has been given in the upper left margin on twice the scale used for the whole State.

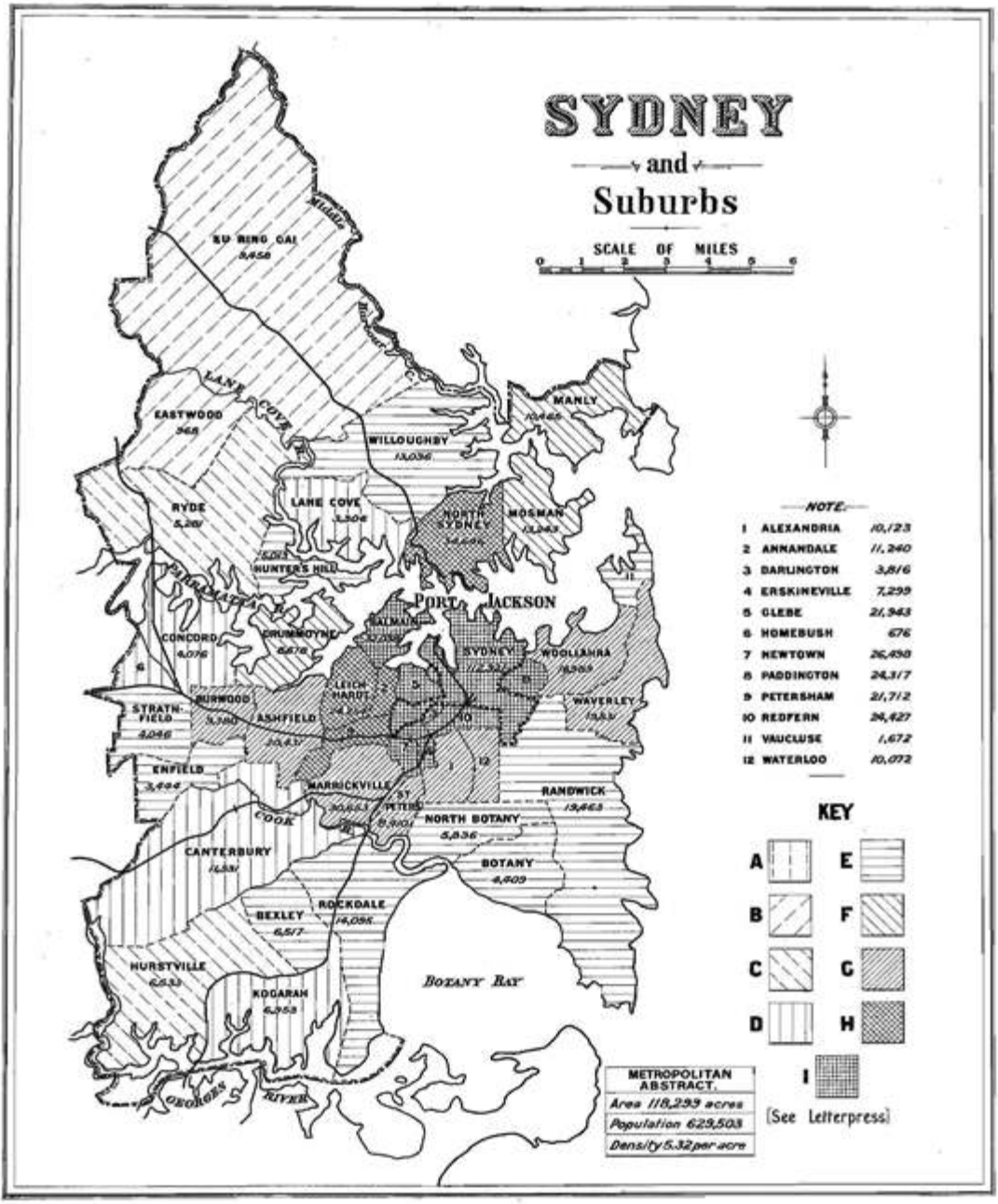
The area, population, and occupied dwellings of the several Statistical Districts of Western Australia are shewn in the following table :—

Area, Population and Occupied Dwellings of Western Australian Statistical Districts, 1911.

Statistical District.	Area.	Population.			Persons per Square Mile.	Occupied Dwellings.	Occupied Dwellings per Square Mile.	Population per Occupied Dwelling.
	Square Miles.	Males.	Females.	Persons.				
Beverley	3,750	2,160	1,280	3,440	.92	888	.237	3.83
Coolgardie	25,312	22,285	17,325	39,610	1.56	11,221	.443	3.53
Coolgardie, North ..	33,750	2,636	1,395	4,031	.12	1,438	.043	2.76
Esperance	29,840	271	164	435	.01	128	.004	3.27
Eucla	41,152	38	17	55	.001	15	.0004	3.47
Gascoyne	92,900	1,092	408	1,500	.02	320	.003	4.21
Katanning	3,750	2,822	1,913	4,735	1.26	1,110	.296	4.22
Kimberley, East ..	78,414	324	34	358	.005	135	.002	2.28
Kimberley, West ..	58,880	1,173	431	1,604	.03	433	.007	3.60
Magnet	25,312	2,794	1,540	4,334	.17	1,371	.054	3.09
Margaret	33,750	3,303	1,627	4,930	.15	1,855	.055	2.62
Murchison	24,480	1,591	568	2,159	.09	714	.029	2.84
Murchison, East ..	33,750	1,847	731	2,578	.08	1,100	.033	2.25
Narrogin	3,750	2,366	1,446	3,812	1.02	1,063	.283	3.57
Northam	13,125	9,730	5,706	15,436	1.18	4,250	.324	3.59
North West	117,344	2,557	479	3,036	.03	953	.008	2.60
Phillips River ..	13,375	1,022	580	1,602	.12	544	.041	2.91
Pingelly	3,750	2,263	1,493	3,756	1.00	912	.243	4.10
Plantagenet	7,289	3,383	2,991	6,374	.87	1,489	.204	4.27
Sussex	4,746	5,642	3,850	9,492	2.00	2,703	.570	3.51
Swan	4,052	59,238	58,000	117,238	28.93	24,549	6.058	4.77
Tambellup	3,750	1,224	730	1,954	.52	533	.142	3.64
Victoria	40,118	7,915	5,046	12,961	.32	2,894	.072	4.39
Wagin	3,750	2,439	1,517	3,956	1.05	1,063	.283	3.71
Wellington	2,716	9,059	6,867	15,926	5.86	4,232	1.558	3.75
Yilgarn	16,875	2,968	982	3,950	.23	1,708	.101	2.27
York	3,750	3,577	2,259	5,836	1.56	1,249	.333	4.62
Outside Statistical Districts	252,490	..	..	..	..	..	..	..
Whole State ..	975,920	155,719	119,379	275,098	.28	68,870	.071	3.96
Shipping	..	5,846	1,170	7,016	..	..	..	..
Total Population	..	161,565	120,549	282,114	..	..	..	..

(vii.) *Tasmania.*—The Census map of Tasmania facing p. 431 shews the boundaries of each of the municipalities into which that State is divided. The position and name of the principal town is also shewn in each case, as well as the principal lines of railway in the State. The population of each municipality is given on the map, and the density is indicated in accordance with the scale on p. 425. The more densely populated municipalities of Hobart and Launceston and those in their immediate vicinity are shewn on a larger scale as insets, owing to the insufficiency of space for appropriate display of particulars on the map of the whole State. King Island and the Macquarie Islands, owing to their remoteness, are also shewn as insets, with other points necessary for indicating their relative positions. The following table gives the area, population, and occupied dwellings of each of the Municipalities of Tasmania :—


The
NORTHERN TERRITORY
SCALE OF MILES
Darwin
PALMERSTON
GOSS
BISRAELI
3
MALMESBURY
42
ROSEBERY
878
Pine Creek
B1
14
C4
NIL
D1
25
E1
251
J3
NIL
KEY
A
B
C
D
E
F
G
H
(See Letterpress)
GLADSTONE
RIVER
11
ROPER
VICTORIA RIVER
F1
31
J1
21
G1
103
45
LINE
K1
67
Roper Bar
Mount Hill
Roper River Mission
I1
107
H1
44
Brunette Downs
L1
178
Alexandria
Tennants Creek
Avon Downs
TELEGRAPH
H1
17
44
Alice Springs
G1
72
F1
45
L. AMADEUS
E1
138
WESTERN AUSTRALIA
QUEENSLAND
SOUTH AUSTRALIA


SYDNEY
and
Suburbs
SCALE OF MILES
0 1 2 3 4 5 6
NOTE.
1 ALEXANDRIA 10,123
2 ANNANDALE 11,240
3 DARLINGTON 3,816
4 ERSKINEVILLE 7,299
5 GLEBE 21,943
6 HOMEBUSH 676
7 NEWTOWN 26,450
8 PADDINGTON 24,317
9 PETERSHAM 21,712
10 REDFERN 26,427
11 VAUCLUSE 1,672
12 WATERLOO 10,072
KEY
A
B
C
D
E
F
G
H
I
(See Letterpress)
METROPOLITAN ABSTRACT.
Area 118,293 acres
Population 629,503
Density 5.32 per acre
PORT JACKSON
BOTANY BAY
RU RING GAI 5,456
EASTWOOD 568
RYDE 5,281
LANE COVE
LANE COVE 3,506
WILLOUGHBY 13,036
MANLY 10,465
NORTH SYDNEY 14,449
MOSMAN 13,243
HUNTER'S HILL
PARRAMATTA
CONCORD 4,076
DRUMMOYNE 6,678
BALMAIN 32,288
SYDNEY 12,331
WOOLLAHRA 18,565
WATERLOO
WAVERLEY 19,611
BURWOOD 5,380
ASHFIELD 10,431
LEICHHARDT 41,
STRATHFIELD 4,096
ENFIELD 3,494
MARRICKVILLE 30,663
ST PETERS 8,901
RANDWICK 19,465
COOK
NORTH BOTANY 5,836
CANTERBURY 15,511
BOTANY 4,409
BEXLEY 6,517
ROCKDALE 14,096
HURSTVILLE 6,533
KOGARAH 6,953
GEORGES RIVER

Area, Population and Occupied Dwellings of Tasmanian Municipalities, 1911.

Municipality.	Area.	Population.			Persons per Square Mile.	Occupied Dwellings.	Occupied Dwellings per Square Mile.	Population per Occupied Dwelling.
	Square Miles.	Males.	Females.	Persons.				
Beaconsfield	214.06	2,323	2,233	4,556	21.28	981	4.583	4.64
Bothwell	990.63	738	619	1,357	1.37	308	.311	4.40
Brighton	179.69	998	943	1,941	10.80	423	2.354	4.57
Bruni	140.62	347	300	647	4.60	138	.981	4.69
Campbell Town ..	543.75	745	781	1,526	2.81	339	.623	4.50
Circular Head ..	1818.75	2,458	1,811	4,269	2.35	964	.530	4.41
Clarence	110.16	1,200	1,282	2,482	22.53	533	4.838	4.66
Deloraine	1245.31	3,053	2,726	5,779	4.64	1,116	.896	5.17
Devonport	42.66	2,321	2,538	4,859	113.90	994	23.301	4.89
Emu Bay	208.59	2,307	2,197	4,504	21.59	858	4.113	5.25
Esperance	2235.94	2,130	1,708	3,838	1.72	793	.355	4.81
Evandale	512.19	991	961	1,952	3.81	381	.744	5.12
Fingal	1031.41	1,925	1,755	3,680	3.57	784	.760	4.69
Flinders Island	814.06	366	250	616	.76	143	.176	4.31
George Town ..	239.06	521	519	1,040	4.35	250	1.046	4.15
Glamorgan	615.62	376	335	711	1.15	155	.252	4.59
Glenorchy	43.75	1,650	1,743	3,393	77.55	730	16.685	4.64
Gormanston	1114.06	1,217	792	2,009	1.76	498	.447	4.03
Green Ponds	172.66	550	573	1,123	6.50	242	1.402	4.64
Hamilton	2240.62	1,153	983	2,136	.95	452	.202	4.72
Hobart	4.19	12,806	14,720	27,526	6569.45	5,504	1313.604	5.00
Huon	306.25	1,930	1,687	3,617	11.81	761	2.485	4.75
Kentish	451.56	2,963	2,608	5,571	12.34	1,045	2.314	5.33
Kingborough	106.25	970	907	1,877	17.67	441	4.151	4.25
King Island	425.00	482	284	766	1.80	197	.464	3.87
Latrobe	210.47	1,777	1,731	3,508	16.67	698	3.316	5.02
Launceston	8.91	9,606	11,148	20,754	2329.29	4,221	473.737	4.92
Leven	187.50	2,844	2,606	5,450	29.07	1,047	5.584	5.20
Lilydale	332.81	1,478	1,313	2,791	8.39	609	1.830	3.32
Longford	398.00	2,060	2,095	4,155	10.44	841	2.113	6.81
New Norfolk ..	510.94	3,208	2,916	6,124	11.99	1,270	2.486	4.82
New Town	9.06	1,532	1,850	3,382	373.29	658	72.627	5.14
Oatlands	587.50	1,650	1,455	3,105	5.29	629	1.071	4.89
Penguin	189.06	1,398	1,230	2,628	13.90	511	2.703	5.14
Port Cygnet	131.25	1,832	1,657	3,489	26.58	727	5.539	4.80
Portland	607.81	1,131	817	1,948	3.20	425	.699	4.58
Queenborough ..	15.47	1,561	2,037	3,598	232.58	757	46.348	4.75
Queenstown	59.38	2,158	1,669	3,827	64.45	915	15.409	4.18
Richmond	225.00	944	854	1,798	7.99	386	1.716	4.66
Ringarooma	631.25	2,605	1,959	4,564	7.23	1,060	1.679	4.30
Ross	487.50	360	345	705	1.45	148	.304	4.76
St. Leonards	221.09	1,291	1,321	2,612	11.81	539	2.438	4.84
Scottsdale	404.69	1,337	1,254	2,591	6.40	541	1.337	4.79
Sorell	295.00	1,117	943	2,060	6.98	443	1.502	4.64
Spring Bay	442.19	415	336	751	1.70	161	.364	4.65
Strahan	1468.75	526	485	1,011	.69	235	.160	4.30
Table Cape	337.50	2,530	2,263	4,793	14.20	981	2.907	4.89
Tasman	193.75	644	527	1,171	6.04	248	1.280	4.72
Waratah	892.19	1,413	933	2,346	2.63	558	.625	4.20
Westbury	360.16	2,013	1,960	3,973	11.03	841	2.335	4.72
Zeehan	1201.56	3,081	2,645	5,726	4.77	1,546	1.287	3.70
Whole State ..	26,215.63	97,031	93,604	190,635	7.27	40,025	1.527	4.76
Shipping	..	560	16	576	..	..	..	..
Total Population	..	97,591	93,620	191,211	..	..	..	..

(viii.) *Northern Territory.*—The Census map of the Northern Territory facing p. 432 shews the boundaries of the five counties which have been constituted. The boundary lines shewn in the remainder of the Territory are those of the several Census Sub-districts into which this portion was divided for the purposes of collection. The populations of the counties and other sub-divisions are shewn on the map, and the densities are indicated by hatching in accordance with the scale shewn on p. 425.

Area, Population and Occupied Dwellings of Northern Territory Counties, 1911.

County.	Area.	Population.			Persons per Square Mile.	Occupied Dwellings.	Occupied Dwellings per Square Mile.	Population per Occupied Dwelling.
	Square Miles.	Males.	Females.	Persons.				
Disraeli	3,500	2	1	3	001	2	.001	1.50
Gladstone	7,800	7	4	11	.001	6	.001	1.83
Malmesbury	2,800	37	5	42	.015	25	.009	1.40
Palmerston	4,000	785	297	1,082	.271	391	.098	2.76
Rosebery	3,500	768	110	878	.251	409	.117	2.12
Remainder of Territory	502,020	954	159	1,113	.002	415	.001	2.30
Whole Territory	523,620	2,553	576	3,129	.006	1,248	.002	2.36
Shipping	..	181	..	181	..	..	..	..
Total Population	..	2,734	576	3,310	..	..	..	..

(ix.) *Sydney and Suburbs.*—In the maps relating to the Metropolitan areas of the several States, the hatching to indicate density has been based on the number of persons per acre, or number of acres per person as the case may be, in accordance with the following scale :—

A	Averaging	less	than	1	person	on	4	acres.				
B	Averaging	from	1	person	on	4	acres	to	less	than	1	on 2 acres.
C	,,	,,	1	,,	2	,,		,,	1	,,	1	acre.
D	,,	,,	1	,,	1	acre		,,	2	,,	1	,,
E	,,	,,	2	persons	on	1	,,	,,	4	,,	1	,,
F	,,	,,	4	,,	1	,,		,,	8	,,	1	,,
G	,,	,,	8	,,	1	,,		,,	16	,,	1	,,
H	,,	,,	16	,,	1	,,		,,	32	,,	1	,,
I	,,	32 persons and upwards on 1 acre.										

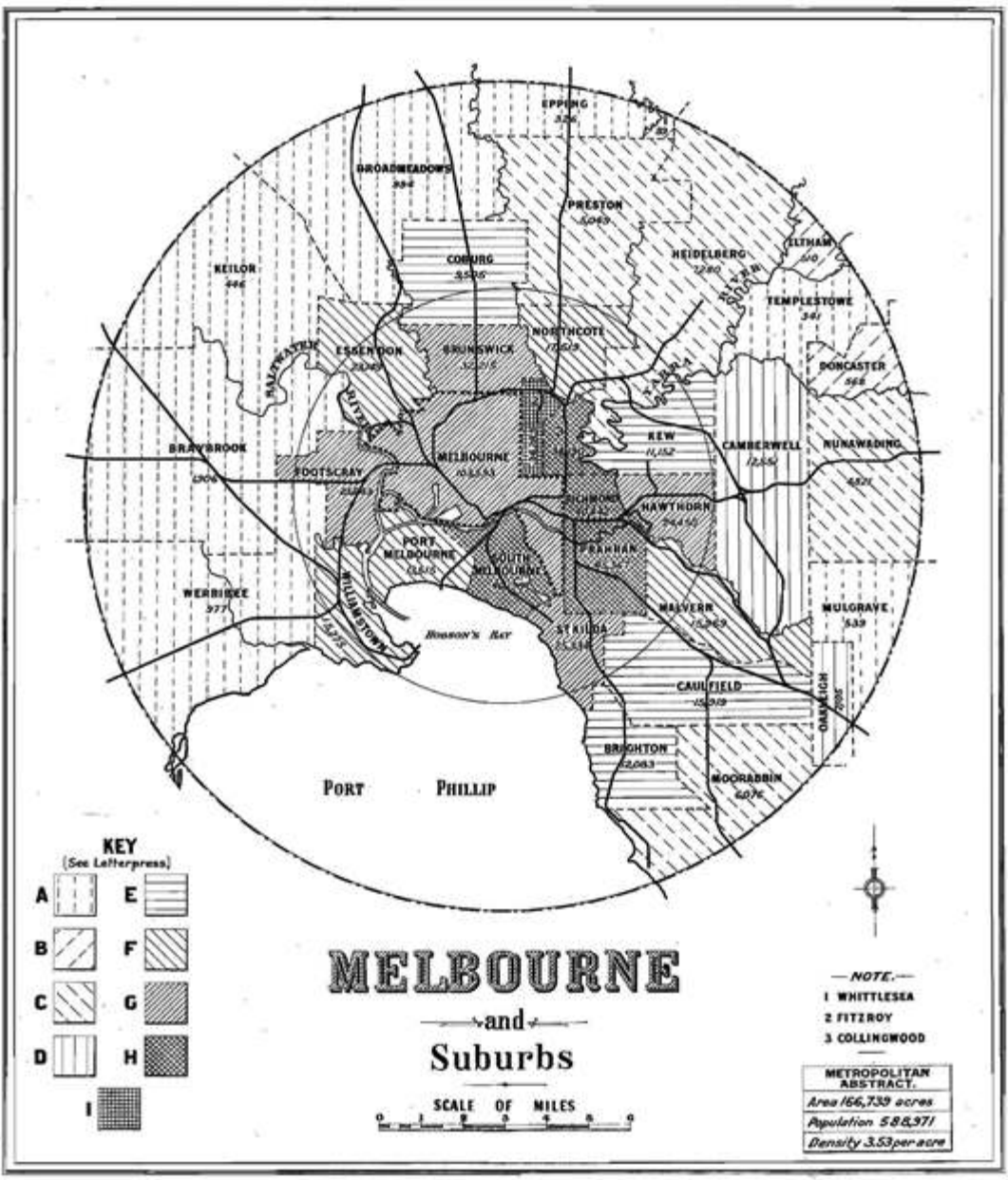
The Census map for Sydney and suburbs facing p. 433 shews the boundaries of the several municipalities and the shire included in the district which for Census purposes has been classed as the " Metropolitan Area" of New South Wales. The population of each is shewn on the map, and each is hatched to indicate density of population in accordance with the above scale. The principal railway lines are also shewn.

The area, population and occupied dwellings in each of the local government areas included in the metropolitan area are given in the following table :—

Area, Population and Occupied Dwellings of Metropolitan Local Government Areas of New South Wales, 1911.

Local Government Area.		Area.	Population.			Persons per Acre.	No. of Occupied Dwellings.	Occupied Dwellings per Acre.	Population per Occupied Dwelling.
		Acres.	Males.	Females.	Persons.				
Alexandria ..	(M)	1,024	5,260	4,863	10,123	9.89	2,244	2.191	4.51
Annandale ..	(M)	360	5,413	5,827	11,240	31.22	2,363	6.564	4.76
Ashfield ..	(M)	2,081	9,212	11,219	20,431	9.82	4,189	2.013	4.88
Balmain ..	(M)	932	15,907	16,131	32,038	34.38	6,464	6.936	4.96
Bexley ..	(M)	1,920	3,096	3,421	6,517	3.39	1,405	.732	4.64
Botany ..	(M)	2,163	2,355	2,054	4,409	2.04	896	.414	4.92
Botany, North	(M)	2,256	3,083	2,753	5,836	2.59	1,271	.563	4.59
Burwood ..	(M)	1,050	4,001	5,379	9,380	8.93	1,843	1.755	5.09
Canterbury ..	(M)	8,384	5,628	5,707	11,335	1.35	2,329	.278	4.87
Concord ..	(M)	2,666	2,009	2,067	4,076	1.53	844	.317	4.83
Darlington ..	(M)	44	1,863	1,953	3,816	86.73	745	16.932	5.12
Drummoyne ..	(M)	1,920	4,182	4,496	8,678	4.52	1,902	.991	4.56
Eastwood ..	(M)	2,931	521	447	968	.33	219	.075	4.42
Enfield ..	(M)	1,696	1,695	1,749	3,444	2.03	718	.423	4.80
Erskineville ..	(M)	166	3,583	3,716	7,299	43.97	1,551	9.343	4.71
Glebe	(M)	521	10,450	11,493	21,943	42.12	4,202	8.065	5.22
Homebush ..	(M)	640	355	321	676	1.06	137	.214	4.93
Hunters' Hill ..	(M)	1,325	2,605	2,408	5,013	3.78	693	.523	7.23
Hurstville ..	(M)	6,750	3,187	3,346	6,533	.97	1,434	.212	4.56
Kogarah ..	(M)	4,448	3,429	3,524	6,953	1.56	1,524	.343	4.56
Ku Ring Gai ..	(S)	23,040	4,347	5,111	9,458	.41	1,884	.082	5.02
Lane Cove ..	(M)	2,496	1,639	1,667	3,306	1.32	656	.263	5.04
Leichhardt ..	(M)	1,170	11,828	12,426	24,254	20.73	4,909	4.196	4.94
Manly	(M)	2,426	4,716	5,749	10,465	4.31	1,853	.764	5.65
Marrickville ..	(M)	2,016	14,338	16,315	30,653	15.20	6,514	3.231	4.71
Mosman ..	(M)	2,067	5,836	7,407	13,243	6.41	2,687	1.300	4.93
Newtown ..	(M)	442	12,887	13,611	26,498	59.95	5,377	12.165	4.93
Paddington ..	(M)	403	11,494	12,823	24,317	60.34	4,666	11.578	5.21
Petersham ..	(M)	1,254	9,846	11,866	21,712	17.31	4,479	3.572	4.85
Randwick ..	(M)	8,064	9,294	10,169	19,463	2.41	3,913	.485	4.97
Redfern ..	(M)	435	12,422	12,005	24,427	56.15	4,436	10.198	5.51
Rockdale ..	(M)	5,022	6,739	7,356	14,095	2.81	2,931	.584	4.81
Ryde	(M)	7,110	2,562	2,719	5,281	.74	1,151	.162	4.59
St. Peters ..	(M)	896	4,220	4,190	8,410	9.39	1,678	1.873	5.01
Strathfield ..	(M)	1,792	1,709	2,337	4,046	2.26	809	.451	5.00
Sydney ..	(M)	3,327	59,685	53,236	112,921	33.94	18,463	5.549	6.12
Sydney North	(M)	2,067	15,625	19,021	34,646	16.76	7,200	3.483	4.81
Vaucluse ..	(M)	768	768	904	1,672	2.18	324	.422	5.16
Waterloo ..	(M)	806	5,206	4,866	10,072	12.50	2,073	2.572	4.86
Waverley ..	(M)	1,965	9,107	10,724	19,831	10.09	4,211	2.143	4.71
Willoughby ..	(M)	5,530	6,211	6,825	13,036	2.36	2,623	.474	4.97
Woollahra ..	(M)	1,926	7,415	9,574	16,989	8.82	3,424	1.778	4.96
Total Metropolitan Area		118,299	305,728	323,775	629,503	5.32	123,234	1.042	5.11

In the foregoing table those areas marked (M) are Municipalities, while that marked (S) is a Shire. In the case of New South Wales the area adopted for Census and Statistical purposes as " Metropolitan," comprises the whole area of the municipalities and the shire specified. In all the other States the " Metropolitan Area" boundary crosses the boundaries of several of the constituent Local Government Areas.


EPPING
BROADMEADOWS
PRESTON
KEILOR
COBURG
HEIDELBERG
ELTHAM
TEMPLESTOWE
DONCASTER
NORTHCOTE
ESSENDON
BRUNSWICK
MARIBYRNONG RIVER
YARRA RIVER
BRAYBROOK
MELBOURNE
KEW
CAMBERWELL
HAWTHORN
FOOTSCRAY
RICHMOND
PORT MELBOURNE
SOUTH MELBOURNE
PRAHRAN
WERRIBEE
WILLIAMSTOWN
HOBSON'S BAY
STKILDA
MALVERN
MULGRAVE
CAULFIELD
OAKLEIGH
BRIGHTON
MOORABBIN
PORT PHILLIP
KEY
(See Letterpress)
A
B
C
D
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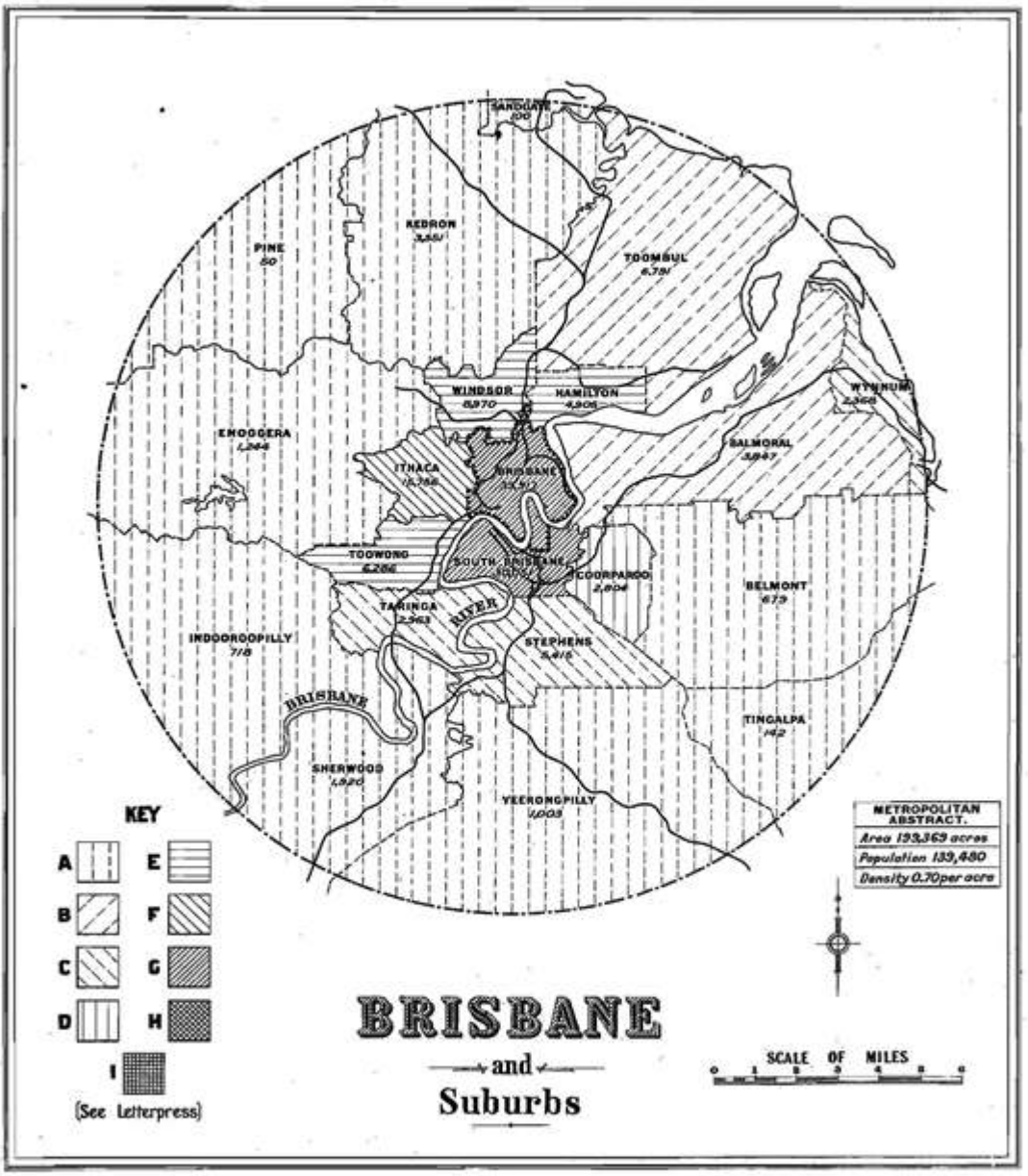
G
H
I
MELBOURNE
and
Suburbs
SCALE OF MILES
0 1 2 3 4 5 6
NOTE.
1 WHITTLESEA
2 FITZROY
3 COLLINGWOOD
METROPOLITAN ABSTRACT.
Area 166,739 acres
Population 588,971
Density 3.53 per acre



BRISBANE

and

Suburbs

(x.) *Melbourne and Suburbs.*—The Census map of Melbourne and Suburbs facing p. 434 shews the boundaries of the several Cities, Towns, Boroughs, Shires or parts thereof of which constitute the "Metropolitan Area" adopted in Victoria for Census and Statistical purposes. The population of each Local Government area or part thereof so included is shewn on the map, and the density of the population of each is indicated thereon in accordance with the scale shewn on p. 434. The principal railway lines are also shewn. In this case the Metropolitan Area is a circle of ten miles radius, having the General Post Office, Melbourne, as its centre.

The area, population and occupied dwellings in each of the local government areas which are wholly or in part included in the metropolitan area are shewn in the following table. In each case the total area, population and occupied dwellings for the local government area are given, an indication being made in the table of those cases in which a part only of such total is used in compiling the "Metropolitan" total given at the foot of the table. Similarly in the Census map the hatching relates to the density of population of the whole of the Local Government area in question not to that portion of it included in the map.

Area, Population and Occupied Dwellings of Metropolitan Areas of Victoria, 1911.

Local Government Area.	Area.	Population.			Persons per Acre.	No. of Occupied Dwellings.	Occupied Dwellings per Acre.	Population per Occupied Dwelling.
	Acres.	Males.	Females.	Persons.				
Braybrook[1] .. (S)	58,880	1,269	1,104	2,373	.04	491	.008	4.83
Brighton .. (M)	3,288	5,405	6,678	12,083	3.67	2,508	.763	4.82
Broadmeadows[1] (S)	47,360	1,037	1,063	2,100	.04	388	.008	5.41
Brunswick .. (M)	2,722	15,426	16,789	32,215	11.84	6,696	2.460	4.81
Camberwell .. (M)	8,320	5,635	6,916	12,551	1.51	2,631	.316	4.77
Caulfield .. (M)	6,080	7,246	8,673	15,919	2.62	3,393	.558	4.69
Coburg .. (M)	4,800	4,753	4,752	9,505	1.98	1,871	.390	5.08
Collingwood .. (M)	1,139	15,986	18,204	34,190	30.02	7,160	6.286	4.78
Doncaster[1] .. (S)	8,640	651	544	1,195	.14	245	.028	4.88
Eltham[1] .. (S)	138,240	1,756	1,667	3,423	.02	812	.006	4.22
Epping[1] .. (S)	51,840	683	615	1,298	.03	238	.005	5.45
Essendon .. (M)	4,000	11,037	12,712	23,749	5.94	4,952	1.238	4.80
Fitzroy .. (M)	923	16,085	18,198	34,283	37.14	6,787	7.353	5.05
Footscray .. (M)	2,577	11,906	11,737	23,643	9.17	4,757	1.846	4.97
Hawthorn .. (M)	2,400	10,731	13,719	24,450	10.19	5,210	2.171	4.69
Heidelberg[1] .. (S)	26,240	4,094	4,516	8,610	.33	1,567	.060	5.49
Keilor[1] .. (S)	33,920	502	420	922	.03	210	.006	4.39
Kew .. .. (M)	3,553	5,064	6,088	11,152	3.14	2,045	.576	5.45
Malvern .. (M)	4,000	6,807	9,162	15,969	3.99	3,329	.832	4.80
Melbourne .. (M)	7,658	51,958	51,635	103,593	13.53	19,449	2.540	5.33
Melbourne, South (M)	2,311	22,060	24,130	46,190	19.99	9,327	4.036	4.95
Moorabbin[1] .. (S)	20,480	6,113	6,644	12,757	.62	2,535	.124	5.03
Mulgrave[1] .. (S)	16,320	1,226	1,197	2,423	.15	494	.030	4.90
Northcote .. (M)	2,850	8,431	9,088	17,519	6.15	3,654	1.282	4.79
Nunawading[1] (S)	15,040	3,413	3,707	7,120	.47	1,543	.103	4.61
Oakleigh[1] .. (M)	2,178	1,024	1,127	2,151	.99	486	.223	4.43
Port Melbourne (M)	2,366	6,768	6,747	13,515	5.71	2,720	1.150	4.97
Prahran .. (M)	2,320	19,469	25,898	45,367	19.55	9,880	4.259	4.59
Preston .. (S)	8,800	2,457	2,592	5,049	.57	1,006	.114	5.02
Richmond .. (M)	1,430	19,354	21,088	40,442	28.28	8,686	6.074	4.66
St. Kilda .. (M)	2,049	10,877	14,457	25,334	12.36	5,040	2.460	5.03
Templestowe[1] (S)	13,120	544	457	1,001	.08	230	.018	4.35
Werribee[1] .. (S)	176,000	2,030	1,703	3,733	.02	761	.004	4.91
Whittlesea[1] .. (S)	85,760	1,160	1,049	2,209	.03	419	.005	5.27
Williamstown .. (M)	2,775	7,572	7,703	15,275	5.50	3,196	1.152	4.78
Total Metropolitan Area[2]	166,739	277,956	311,015	588,971	3.53	119,562	.717	4.93

[1] A part only of the figures here shewn is included in the Metropolitan total below.
[2] Exclusive of certain portions of the figures in respect of Local Government areas marked 1 above.

In the above table the areas marked (M) are Cities, Towns, or Boroughs, and correspond with the areas classed as "Municipalities" in the case of New South Wales. The areas marked (S) are Shires. It will be noticed that with the exception of Oakleigh all the cities, towns, and boroughs included in this table are wholly within the "Metropolitan Area." On the other hand, with the exception of Preston, all the shires are included in part only.

(xi.) *Brisbane and Suburbs.*—The Census map of Brisbane and Suburbs facing p. 435 shews the boundaries of the several Cities, Towns, Shires, or parts thereof which are combined to form the "Metropolitan Area" as used in the case of Queensland for Census and Statistical purposes. The population of each Local Government area or part thereof so included is shewn on the map, and the density of population of each is indicated by hatching in accordance with the scale given on p. 434. In cases where a part only of a district is included in the map, the density indicated by the hatching relates to the whole area of the district. The area represented is a circle of ten miles radius from the General Post Office, Brisbane. The principal railway lines are shewn in the map.

The area, population and occupied dwellings in each of the local government areas which are wholly or in part included in the Queensland Metropolitan area are given in the following table, and an indication is made of those cases in which the particulars are included in part only in the metropolitan total:—

Area, Population and Occupied Dwellings of Metropolitan Local Government Areas of Queensland, 1911.

Local Government Area.	Area.	Population.			Persons per Acre.	No. of Occupied Dwellings.	Occupied Dwellings per Acre.	Population per Occupied Dwelling.
	Acres.	Males.	Females.	Persons.				
Balmoral .. (S)	15,360	1,974	1,873	3,847	.25	846	.055	4.55
Belmont [1] .. (S)	17,280	385	319	704	.04	179	.010	3.93
Brisbane .. (M)	3,520	19,612	20,305	39,917	11.34	6,384	1.814	6.25
Brisbane, South (M)	2,880	14,326	15,725	30,051	10.43	6,916	2.401	4.35
Coorparoo .. (S)	2,560	1,385	1,419	2,804	1.13	613	.239	4.57
Enoggera [1] .. (S)	26,240	661	597	1,258	.05	268	.010	4.69
Hamilton .. (M)	1,920	2,334	2,571	4,905	2.55	985	.513	4.98
Indooroopilly [1] (S)	35,200	466	431	897	.03	176	.005	5.10
Ithaca .. (M)	2,880	7,546	8,210	15,756	5.47	3,206	1.113	4.91
Kedron [1] .. (S)	27,520	1,999	1,664	3,663	.13	703	.026	5.21
Pine [1] .. .. (S)	151,680	1,414	1,217	2,631	.02	480	.003	5.48
Sandgate [1] .. (M)	3,840	1,323	1,728	3,051	.79	557	.145	5.48
Sherwood [1] .. (S)	12,800	1,729	1,596	3,325	.26	393	.031	8.46
Stephens .. (S)	5,760	2,642	2,773	5,415	.94	1,165	.202	4.65
Taringa .. (S)	3,520	1,355	1,608	2,963	.84	614	.174	4.83
Tingalpa [1] .. (S)	76,800	665	597	1,262	.02	261	.003	4.84
Toombul .. (S)	17,920	3,243	3,548	6,791	.38	1,255	.070	5.41
Toowong .. (M)	2,880	2,949	3,337	6,286	2.18	1,306	.453	4.81
Windsor .. (M)	2,560	4,219	4,751	8,970	3.50	1,892	.739	4.74
Wynnum [1] .. (S)	3,840	1,506	1,715	3,221	.84	611	.159	5.26
Yeerongpilly [1] (S)	112,000	680	633	1,313	.01	283	.025	4.64
Total, Metropolitan Area [2]	199,369	67,628	71,852	139,480	.70	27,532	.138	5.07

[1] A part only of the figures here shewn is included in the Metropolitan total below.
[2] Exclusive of certain portions of the figures in respect of Local Government areas marked 1 above.

In the above table, Cities and Towns are marked (M), while Shires are marked (S). With the exception of Sandgate, all the Cities and Towns in the table are wholly within the "Metropolitan Area." In the case of the Shires, five are wholly within the area, while nine are included in part only.

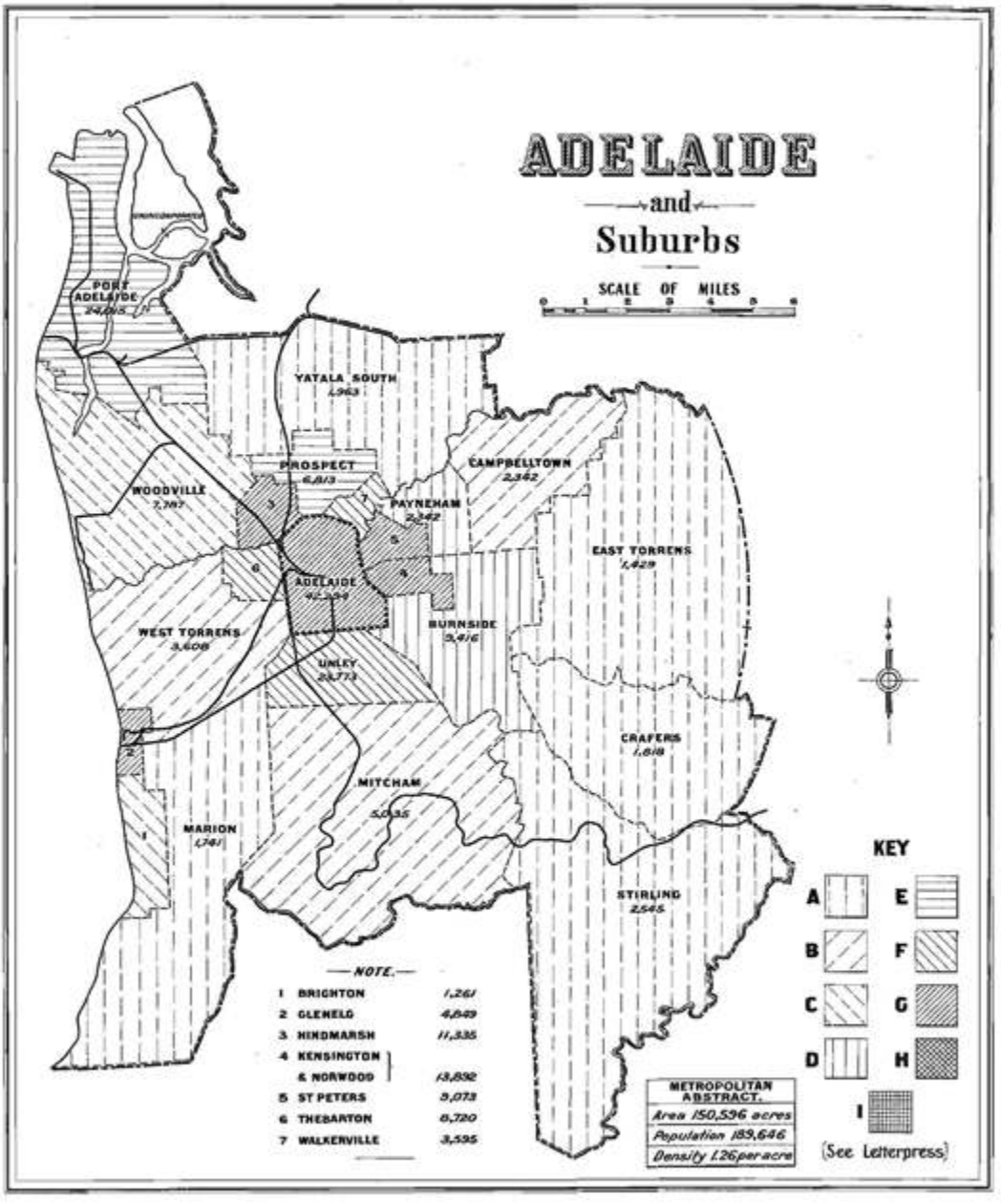
(xii.) *Adelaide and Suburbs.*—The Census map of Adelaide and Suburbs facing page 436 shews the boundaries of the several local government areas or parts thereof which are grouped together to form the "Metropolitan Area" of South Australia for Census purposes. In South Australia the districts which are known as Municipalities, Cities, Towns or Boroughs in certain other States are officially referred to as "Corporations," while the local governing authorities corresponding to "Shire Councils" in other States are here known as "District Councils." The population of each such area or part thereof is shewn on the map, and the density of population is indicated by a system of hatching in accordance with the scale on p. 434. Where a part only of a district is included the hatching relates to the density of the whole district.

The area, population and occupied dwellings in each local government area included wholly or in part in the metropolitan total for South Australia are given in the following table. Cases of partial inclusion are indicated by note :—

Area, Population and Occupied Dwellings of Metropolitan Local Government Areas of South Australia, 1911.

Local Government Area.	Area.	Population.			Persons per Acre.	No. of Occupied Dwellings.	Occupied Dwellings per Acre.	Population per Occupied Dwelling.
	Acres.	Males.	Females.	Persons.				
Adelaide .. (M)	3,778	20,680	21,614	42,294	11.19	8,182	2.166	5.17
Brighton .. (M)	1,970	588	673	1,261	.64	359	.131	4.87
Burnside .. (D C)	6,080	4,441	4,975	9,416	1.55	1,782	.293	5.28
Campbelltown (D C)	5,760	1,184	1,158	2,342	.41	515	.089	4.55
Crafers .. (D C)	10,560	881	937	1,818	.17	400	.038	4.55
Glenelg .. (M)	532	2,110	2,739	4,849	9.11	923	1.735	5.25
Hindmarsh .. (M)	1,208	5,676	5,659	11,335	9.38	2,338	1.935	4.85
Kensington and Norwood .. (M)	980	6,351	7,541	13,892	14.18	3,003	3.064	4.63
Marion .. (D C)	13,766	864	877	1,741	.13	360	.026	4.84
Mitcham .. (D C)	17,600	2,401	2,634	5,035	.29	1,045	.059	4.82
Payneham .. (D C)	1,760	1,121	1,221	2,342	.13	516	.293	4.54
Port Adelaide (M)	8,870	11,974	12,041	24,015	2.71	4,861	.548	4.94
Prospect .. (D C)	2,240	3,163	3,650	6,813	3.04	1,486	.663	4.58
St. Peters .. (M)	922	4,099	4,974	9,073	9.84	1,884	2.043	4.82
Stirling .. (D C)	19,840	1,143	1,402	2,545	.13	571	.029	4.46
Thebarton .. (M)	1,112	4,264	4,456	8,720	7.84	1,805	1.623	4.83
Torrens, East [1] (D C)	25,920	951	813	1,764	.07	364	.014	4.85
Torrens, West (D C)	8,320	1,813	1,795	3,608	.43	731	.088	4.94
Unley .. .. (M)	3,525	10,791	12,982	23,773	6.74	5,038	1.429	4.72
Walkerville .. (D C)	602	1,552	2,043	3,595	5.98	781	1.298	4.60
Woodville .. (D C)	10,240	3,735	4,052	7,787	.76	1,556	.151	5.00
Yatala, South (D C)	11,200	1,070	893	1,963	.18	406	.036	4.83
Total, Metropolitan Area [2]	150,596	90,578	99,068	189,646	1.26	38,742	.257	4.89

[1] A part only of the figures here shewn is included in the Metropolitan total below.
[2] Exclusive of certain portions of the figures in respect of Local Government areas marked [1] below.


ADELAIDE
and
Suburbs
SCALE OF MILES
PORT ADELAIDE 24,695
YATALA SOUTH 1,963
PROSPECT 6,813
WOODVILLE 7,787
CAMPBELLTOWN 2,362
PAYNEHAM 2,342
EAST TORRENS 1,429
ADELAIDE 92,369
WEST TORRENS 3,608
BURNSIDE 5,916
UNLEY 23,773
CRAFERS 1,618
MITCHAM 5,035
MARION 1,781
STIRLING 2,545
NOTE.
1 BRIGHTON 1,261
2 GLENELG 4,849
3 HINDMARSH 11,535
4 KENSINGTON & NORWOOD 13,892
5 ST PETERS 3,073
6 THEBARTON 6,720
7 WALKERVILLE 3,595
METROPOLITAN ABSTRACT.
Area 150,596 acres
Population 189,646
Density 1.26 per acre
KEY
A
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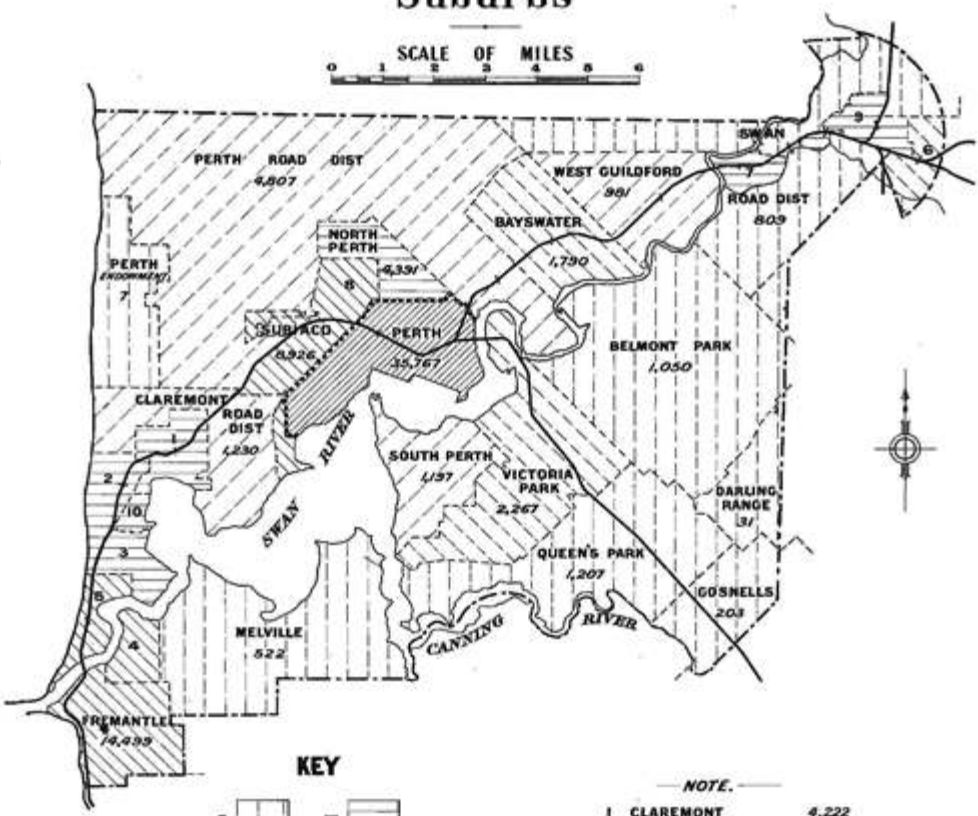
(See Letterpress)

PERTH
and
Suburbs



KEY

A E
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(See Letterpress)

NOTE.

1	CLAREMONT	4,222
2	COTTESLOE	2,704
3	COTTESLOE BEACH	1,704
4	FREMANTLE EAST	3,017
5	FREMANTLE NORTH	3,331
6	GREENMOUNT	484
7	GUILDFORD	1,669
8	LEEDERVILLE	5,457
9	MIDLAND JUNCTION	3,484
10	PEPPERMINT GROVE	1,043

METROPOLITAN ABSTRACT.
Area 85,835 acres
Population 106,792
Density 1.24 per acre

In the above table the areas marked (M) are under the control of municipal "corporations," while those marked (D C) are controlled by " District Councils." In all cases except that of East Torrens the whole of local government area specified has been included in the metropolitan area.

(xiii.) *Perth and Suburbs.*—The Census map of Perth and Suburbs facing p. 437 shews the boundaries of each of the municipalities and road districts or parts thereof combined to form the " Metropolitan" Area of Western Australia for Census purposes. The population of each of these areas or parts is shewn on the map, and the density of population is indicated by hatching in accordance with the scale given on p. 434. Where a part only of a district is shewn the hatching relates to the density of population of the whole district.

The area, population, and occupied dwellings in each local government area included wholly or in part in the metropolitan total for Western Australia are given in the following table. Cases of partial inclusion are indicated by note :—

Area, Population, and Occupied Dwellings of Metropolitan Local Government Areas of Western Australia, 1911.

Local Government Area.	Area.	Population.			Persons per Acre.	No. of Occupied Dwellings.	Occupied Dwellings per Acre.	Population per Occupied Dwelling.
	Acres.	Males.	Females.	Persons.				
Bayswater .. (R D)	2,880	924	866	1,790	.62	417	.145	4.29
Belmont Park [1] (R D)	8,320	601	487	1,088	.13	271	.033	4.01
Claremont .. (M)	1,164	1,919	2,303	4,222	3.63	860	.739	4.91
Claremont .. (R D)	3,520	773	457	1,230	.35	184	.052	6.68
Cottesloe .. (M)	992	1,261	1,443	2,704	2.73	541	.545	5.00
Cottesloe Beach (R D)	800	807	897	1,704	2.13	381	.476	4.47
Darling Range [1] (R D)	147,200	561	477	1,038	.01	245	.002	4.24
Fremantle .. (M)	2,755	7,545	6,954	14,499	5.26	2,988	1.085	4.85
Fremantle East (M)	755	1,464	1,553	3,017	4.00	673	.891	4.48
Fremantle North (M)	794	1,662	1,669	3,331	4.20	691	.870	4.82
Gosnells [1] .. (R D)	27,680	375	362	737	.03	191	.007	3.86
Greenmount [1] (R D)	154,880	1,487	1,229	2,716	.02	688	.004	3.95
Guildford .. (M)	579	796	873	1,669	2.88	366	.632	4.56
Guildford, West (R D)	3,200	489	492	981	.31	211	.066	4.65
Leederville .. (M)	1,042	2,524	2,933	5,457	5.24	1,246	1.196	4.38
Melville [1] .. (R D)	12,800	292	273	565	.04	123	.010	4.59
Midland Junction (M)	1,378	1,763	1,721	3,484	2.53	739	.536	4.71
PeppermintGrove(R D)	320	427	616	1,043	3.26	204	.638	5.11
Perth .. (M)	3,575	18,118	17,649	35,767	10.00	6,858	1.918	5.22
Perth [1] .. (R D)	26,880	2,654	2,412	5,066	.19	854	.031	5.93
Perth North .. (M)	1,296	2,110	2,281	4,391	3.39	1,018	.785	4.31
Perth South .. (M)	2,501	600	597	1,197	.48	272	.109	4.40
Queen's Park.. (M)	7,130	668	539	1,207	.17	251	.035	4.81
Subiaco .. (M)	1,420	4,163	4,763	8,926	6.29	2,055	1.447	4.34
Swan [1] .. (R D)	224,640	1,082	747	1,829	.01	378	.002	4.84
Victoria Park (M)	3,942	1,083	1,184	2,267	.58	546	.139	4.15
Total, Metropolitan Area [2]	85,835	53,231	53,561	106,792	1.24	21,897	.255	4.88

[1] A part only of the figures here shewn is included in the Metropolitan total below.

[2] Exclusive of certain portions of the figures in respect of Local Government areas marked 1 above.

In the above table, municipalities are marked (M), and road districts, which correspond to Shires in certain other States, are marked (R D). All of the municipalities mentioned are wholly included in the metropolitan total. Of the twelve road districts mentioned five are wholly included, while seven are included in part only.

(xiv.) *Hobart and Suburbs.*—In the Census map of Hobart and Suburbs facing p. 438 are shewn the boundaries of the municipalities and parts thereof which go to make up the area adopted for Census purposes as the " Metropolitan Area" of Tasmania. The population of each district or part is shewn on the map, and the density of population of each is indicated by hatching in accordance with the scale shewn on p. 434. Where a part only of a municipality is shewn the density hatching relates to the whole municipality. In Tasmania all the local government areas whether urban or rural are now known as " Municipalities."

The area, population and occupied dwellings in each municipality included wholly or in part in the metropolitan total for Tasmania are given in the following table. Cases of partial inclusion are indicated by note :—

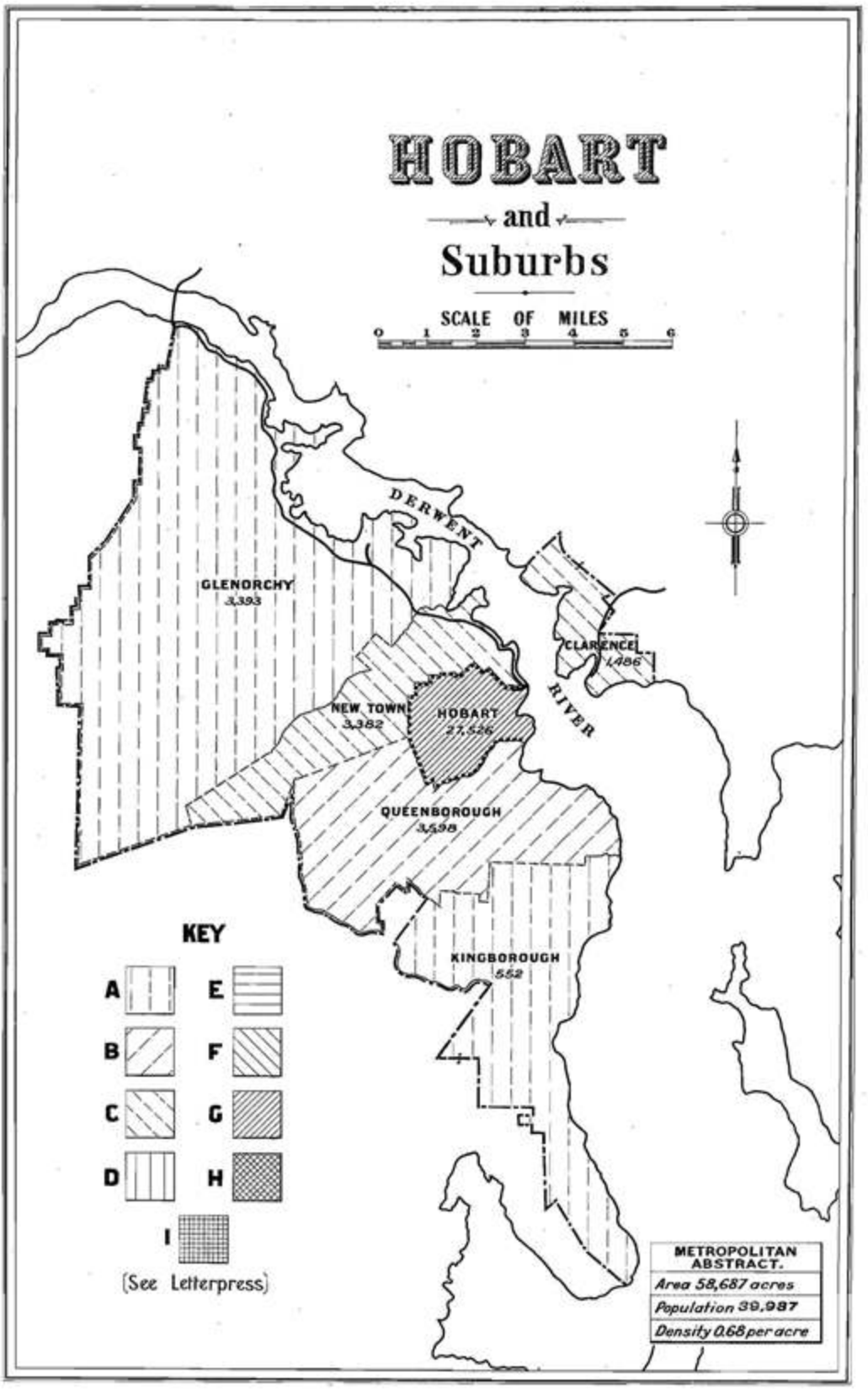
Area, Population and Occupied Dwellings of Metropolitan Municipalities of Tasmania, 1911.

Municipality.	Area.	Population.			Persons per Acre.	No. of Occupied Dwellings.	Occupied Dwellings per Acre.	Population per Occupied Dwelling.
	Acres.	Males.	Females.	Persons.				
Clarence [1]	70,502	1,200	1,282	2,482	.04	533	.008	4.66
Glenorchy	28,000	1,650	1,743	3,393	.12	730	.026	4.64
Hobart	2,682	12,806	14,720	27,526	10.26	5,504	2.053	5.00
Kingborough [1] ..	68,000	970	907	1,877	.03	441	.006	4.25
New Town	5,798	1,532	1,850	3,382	.58	658	.113	5.14
Queenborough ..	9,901	1,561	2,037	3,598	.36	757	.072	4.75
Total Metropolitan Area [2]	58,687	18,487	21,450	39,937	.68	8,082	.138	4.94

[1] A part only of the figures here shewn is included in the Metropolitan total below.

[2] Exclusive of certain portions of the figures in respect of Local Government areas marked [1] above.

Of the six municipalities mentioned above, four were wholly and two partially included in the metropolitan area.


HOBART
and
Suburbs
SCALE OF MILES
0 1 2 3 4 5 6
DERWENT
RIVER
GLENORCHY
3,393
NEW TOWN
3,382
HOBART
27,426
CLARENCE
1,486
QUEENBOROUGH
3,598
KINGBOROUGH
552
KEY
A
B
C
D
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(See Letterpress)
METROPOLITAN ABSTRACT.
Area 58,687 acres
Population 39,987
Density 0.68 per acre

APPENDIX 1.

CENSUS AND STATISTICS ACT 1905.

No. 15 of 1905.

An Act relating to the Census and Statistics of the Commonwealth.

[Assented to 8th December, 1905]

Be it enacted by the King's Most Excellent Majesty, the Senate, and the House of Representatives of the Commonwealth of Australia as follows :—

PART I.—INTRODUCTORY.

SHORT TITLE.

1. This Act may be cited as the *Census and Statistics Act* 1905.

PARTS.

2. This Act is divided into parts, as follows :—

Part I.—Introductory.
Part II.—Administration.
Part III.—The Census.
Part IV.—Statistics.
Part V.—Miscellaneous.

DEFINITIONS.

3. In this Act, unless the contrary intention appears—

"Commissioner for Affidavits" means a person authorised under the law of the Commonwealth or of a State to take affidavits or declarations.

"Dwelling" means a building, erection, or tenement, whether permanent or temporary, which is wholly or partly used for the purpose of human habitation and includes any ship or other vessel in any port of the Commonwealth or in any inland waters thereof, or any ship or vessel registered in Australia on a passage between any two Commonwealth ports.

"Factory" means any work, mill, or establishment used for the purpose of manufacturing, treating, or preparing any article.

"Occupier" includes every governor, superintendent, officer in charge, or keeper, of any gaol, prison, hospital, lunatic asylum, or public or charitable institution.

"The Statistician" means the Commonwealth Statistician.

PART II.—ADMINISTRATION.

APPOINTMENT OF STATISTICIAN.

4. The Governor-General may appoint a Commonwealth Statistician, who shall have such powers and perform such duties as are conferred or imposed on him by this Act or the regulations.

POWER OF STATISTICIAN TO DELEGATE.

5.—(1.) The Statistician, in relation to any particular matters or class of matters or to any particular State or part of the Commonwealth, with the approval of the Minister, may, by instrument under his hand, delegate any of his powers under this Act (except this power of delegation) so that the delegated powers may be exercised by the delegate with respect to the matters or class of matters or the State or part of the Commonwealth specified in the instrument of delegation.

(2.) Every delegation shall be revocable in writing, at will, and no delegation shall affect the exercise or performance by the Statistician of any power or duty.

ARRANGEMENTS WITH STATE GOVERNMENTS AS TO EXECUTION OF ACT.

6.—(1) The Governor-General may enter into any arrangement with the Governor of any State providing for any matter necessary or convenient for the purpose of carrying out or giving effect to this Act and in particular for all or any of the following matters :—

(*a*) The execution by State Officers of any power or duty conferred or imposed on any officer under this Act or the regulations ;

(*b*) The collection by any State Department or officer of any statistical or other information required for the purpose of carrying out this Act ; and

(*c*) The supplying of statistical information by any State Department or officer to the Statistician.

(2.) All State Officers executing any power or duty conferred or imposed on any officer under this Act or the regulations, in pursuance of any arrangement entered into under this section, shall for the purposes of the execution of that power or duty be deemed to be officers under this Act.

DECLARATION OF SECRECY BY OFFICERS.

7. Every officer executing any power or duty conferred or imposed on any officer under this Act or the regulations, shall, before entering upon his duties or exercising any power under this Act, make before a Justice of the Peace or Commissioner for Affidavits a declaration in accordance with the prescribed form.

PART III.—THE CENSUS.

TAKING OF CENSUS.

8.—(1.) The Census shall be taken in the year One thousand nine hundred and eleven, and in every tenth year thereafter.

(2.) The Census Day shall be a day appointed for that purpose by proclamation.

STATISTICIAN TO TAKE STEPS FOR COLLECTION OF CENSUS.

9. It shall be the duty of the Statistician, subject to the regulations and to the directions of the Minister, to prepare and issue forms and instructions, and take all necessary steps for the taking and collection of the Census.

FORMS TO BE LEFT AT DWELLINGS.

10.—(1.) For the purpose of taking the Census, a form called the Householder's Schedule shall be prepared, and left, in accordance with the regulations, at every dwelling throughout the Commonwealth.

(2.) Where a dwelling is let, sublet, or held in different apartments and occupied by different persons or families, each part so let, sublet, or held and used for the purpose of human habitation shall be deemed a dwelling house.

OCCUPIERS TO FILL UP HOUSEHOLDERS' SCHEDULES.

11. Every occupier of a dwelling, with or for whom a Householder's Schedule has been left, shall to the best of his knowledge and belief, fill up and supply therein, in accordance with the instructions contained in or accompanying the Schedule, all the particulars specified therein, and shall sign his name thereto and shall deliver the Schedule so filled up and signed to the Collector authorized to receive it.

Penalty: Ten pounds.

PARTICULARS IN SCHEDULE.

12. The particulars to be specified in the Householder's Schedule shall include the particulars following:—

(*a*) the name, sex, age, condition as to, and duration of, marriage, relation to head of the household, profession or occupation, sickness or infirmity, religion, education, and birthplace, and (where the person was born abroad) length of residence in Australia and nationality of every person abiding in the dwelling during the night of the Census Day;
(*b*) the material of the dwelling and the number of rooms contained therein;
(*c*) any other prescribed matters.

COLLECTORS TO ASSIST IN FILLING UP SCHEDULES.

13. It shall be the duty of each Collector if requested to assist occupiers of dwelling houses in filling up the Householder's Schedule, and to satisfy himself by inquiries from occupiers of dwellings or other persons that the Householder's Schedule has been correctly filled up.

DUTY OF PERSONS TO SUPPLY INFORMATION TO COLLECTORS.

14. Every person shall, to the best of his knowledge and belief, answer all questions asked him by a Collector necessary to obtain any information required to be filled up and supplied in the Householder's schedule.

Penalty: Ten pounds.

RETURNS OF PERSONS NOT ABIDING IN DWELLINGS.

15.—(1) The Statistician shall obtain such returns and particulars as are prescribed with respect to persons who, during the night of the Census Day were not abiding in any dwelling.

(2.) Every person shall, on being required by the Statistician so to do, furnish to the best of his knowledge and belief any prescribed particulars relating to persons who were not abiding on the night of the Census Day in any dwelling.

Penalty: Ten pounds.

PART IV.—STATISTICS.

STATISTICS TO BE COLLECTED.

16. The Statistician shall, subject to the regulations and the directions of the Minister, collect, annually, statistics in relation to all or any of the following matters:—

(*a*) Population;
(*b*) Vital, social, and industrial matters;
(*c*) Employment and non-employment;
(*d*) Imports and exports;
(*e*) Inter-State trade;
(*f*) Postal and telegraphic matters;
(*g*) Factories, mines, and productive industries generally;
(*h*) Agricultural, horticultural, viticultural, dairying, and pastoral industries;
(*i*) Banking, insurance, and finance;
(*j*) Railways, tramways, shipping, and transport;
(*k*) Land tenure and occupancy; and
(*l*) Any other prescribed matters.

FORMS TO BE FILLED UP.

17. For the purpose of enabling the statistics referred to in this part of this Act to be collected, all prescribed persons shall, to the best of their knowledge, when required by the Statistician so to do, fill up and supply, in accordance with the instructions contained in or accompanying the prescribed form, the particulars specified in that form.

Penalty : Ten pounds.

DUTY OF PERSONS TO ANSWER QUESTIONS.

18. Every person shall, to the best of his knowledge and belief, answer all questions asked him by the Statistician or an officer authorized in writing by the Statistician, necessary to obtain any information required for the purposes of any statistics authorized by this Act to be collected. Provided that no prosecution for contravention of this section shall be instituted without the consent of the Minister.

Penalty : Ten pounds.

POWERS OF ENTRY AND INSPECTION.

19.—(1.) For the purpose of making any inquiries or observations necessary for the proper carrying out of this Act, the Statistician or any officer authorized in writing by him may, at any time during working hours enter any factory, mine, workshop, or place where persons are employed, and may inspect any part of it, and all plant and machinery used in connexion with it, and may make such inquiries as are prescribed or allowed by the regulations.

(2.) No person shall hinder or obstruct the Statistician or any officer authorized in writing by him in the execution of any power conferred by this section.

Penalty : Ten pounds.

PUBLICATION OF STATISTICS.

20.—(1.) The Statistician shall compile and tabulate the statistics collected pursuant to this Act and shall publish such statistics or abstracts thereof, as the Minister directs, with observations thereon.

(2.) All statistics or abstracts prepared for publication and the Statistician's observations thereon (if any) shall be laid before both Houses of the Parliament.

PART V.—MISCELLANEOUS.

PERSON NOT BOUND TO STATE HIS RELIGION.

21. No person shall be liable to any penalty for omitting or refusing to state the religious denomination or sect to which he belongs or adheres.

DESERTION BY OFFICERS.

22. No officer, after having taken the prescribed declaration, shall desert from his duty, or shall refuse or wilfully neglect, without just excuse, to perform the duties of his office.

Penalty : Twenty pounds.

UNTRUE RETURNS BY OFFICERS.

23. No officer shall wilfully or without lawful authority alter any document or form under this Act or shall wilfully sign any untrue document or form.

Penalty : Fifty pounds.

OFFICERS TO OBSERVE SECRECY.

24. No officer shall, except as allowed by this Act or the regulations, divulge the contents of any form filled up in pursuance of this Act, or any information furnished in pursuance of this Act.

Penalty : Fifty pounds.

FORGERY OF FORMS.

25. Any person who forges, or utters knowing it to be forged, any form or document under this Act, shall be guilty of an indictable offence, and liable to imprisonment for a term not exceeding three years.

PENALTY FOR FALSE RETURNS OR ANSWERS.

26. No person shall knowingly make in any form or document filled up or supplied in pursuance of this Act or in answer to any question asked him under the authority of this Act any statement which is untrue in any material particular.

Penalty : Fifty pounds.

REGULATIONS.

27. The Governor-General may make regulations, not inconsistent with this Act, prescribing all matters and things which, by this Act, are required or permitted to be prescribed, or which are necessary or convenient to be prescribed for carrying out or giving effect to this Act.

APPENDIX 2.

CENSUS REGULATIONS.

STATUTORY RULES, 1910. No. 96.

PROVISIONAL REGULATIONS UNDER THE CENSUS AND STATISTICS ACT 1905.

I, The Governor-General in and over the Commonwealth of Australia, acting with the advice of the Federal Executive Council, do hereby certify that, on account of urgency, the following regulations under the *Census and Statistics Act* 1905 should come into immediate operation, and make the regulations to come into operation forthwith as Provisional Regulations.

Dated the 27th day of October, One thousand nine hundred and ten.

DUDLEY, Governor-General.

By His Excellency's Command,
KING O'MALLEY,
Minister of State for Home Affairs.

CENSUS REGULATIONS.

SHORT TITLE.

1. These Regulations may be cited as the Census Regulations 1910.

STATE SUPERVISORS.

2.—(1.) For each State there shall be an officer called the State Supervisor who shall, subject to the directions of the Commonwealth Statistician, be charged with the duty of taking all necessary steps for the taking and collection of the Census in the State in which he acts.

(2.) The State Supervisor shall be appointed by the Minister on the recommendation of the Commonwealth Statistician, and shall hold office during the pleasure of the Minister.

CENSUS DISTRICTS.

3.—(1.) The Commonwealth Statistician shall divide each State into as many Census Districts as he thinks necessary.

(2.) It shall not be necessary to define specifically the boundaries of any Census District, but a general indication of the locality intended to be included in a Census District shall be sufficient.

ENUMERATORS.

4.—(1.) For each Census District there shall be an officer called an Enumerator who shall, in relation to that District, carry out such duties in connexion with the taking and collection of the Census as are imposed on him by the *Census and Statistics Act* 1905 or these regulations, or as are assigned to him by his instructions or by the State Supervisor.

(2.) Each Enumerator shall be appointed by the State Supervisor for the State, but his appointment shall be subject to confirmation by the Minister.

(3.) Each Enumerator shall hold office during the pleasure of the Minister, but not for longer than is necessary to finish the work for which he is appointed.

(4.) Each Enumerator shall be paid such remuneration as the Minister approves.

UNDERTAKING BY ENUMERATOR.

5. Each Enumerator shall, before his appointment or before he commences duty, sign, in the presence of a witness, an undertaking in accordance with the following form :—

COMMONWEALTH OF AUSTRALIA.

The Census and Statistics Act 1905.

UNDERTAKING BY ENUMERATOR.

I, of , undertake, in connection with the taking of the Census in the year 1911, that I will faithfully perform the duties of Enumerator under the Census Regulations within the Census District in the State of , and will carry out in every particular, all instructions supplied to me by the Commonwealth Statistician or by the State Supervisor for the said State, and that I will not desert from my duty, and will not refuse or neglect, without just excuse, to perform the duties of the office of Enumerator.*

Signature.....

Date.....

Witness.....

Address of witness.....

.....

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* NOTE.—Under Section 22 of the *Census and Statistics Act* 1905, an officer who, after having taken the prescribed declaration, deserts from his duty or refuses or wilfully neglects, without just excuse, to perform the duties of his office, is liable to a penalty not exceeding Twenty pounds.

COLLECTORS.

6.—(1.) For each Census District there shall be so many Collectors as the Commonwealth Statistician thinks necessary.

(2.) Each Collector shall be appointed by the Enumerator for the Census District, subject to the approval of the Commonwealth Statistician.

(3.) Each Collector shall hold office during the pleasure of the Commonwealth Statistician, but not longer than is necessary to finish the work for which he is appointed.

(4.) Each Collector shall be paid such renumeration as the Minister approves.

(5.) If in an emergency an Enumerator appoints any person to act as a Collector, such person shall be deemed a Collector if the appointment is ratified by the Commonwealth Statistician.

(6.) Each Collector shall act under the directions of the Enumerator for the Census District, and shall carry out such duties as are imposed on him by the *Census and Statistics Act* 1905 and the Regulations thereunder, and shall obey all lawful directions and instructions given him by or through such Enumerator.

UNDERTAKING BY COLLECTOR.

7. Each Collector shall, before his appointment, or before he commences duty, sign, in the presence of a witness, an undertaking in accordance with the following form :—

COMMONWEALTH OF AUSTRALIA.

The Census and Statistics Act 1905

UNDERTAKING BY COLLECTOR.

I, of , undertake, in connection with the taking of the Census in the year 1911, that I will faithfully perform the duties of Collector under the Census Regulations within the Census District in the State of , and will carry out, in every particular, all instructions supplied to me by the Commonwealth Statistician, or by the State Supervisor for the said State, or by the Enumerator for the Census District, and that I will not desert from my duty, and will not refuse or neglect, without just excuse, to perform the duties of the office of Collector.*

Signature.....

Date.....

Witness.....

Address of witness.....

.....

* NOTE.—Under Section 22 of the *Census and Statistics Act* 1905, an officer, who, after having taken the prescribed declaration, deserts from his duty or refuses or wilfully neglects, without just excuse, to perform the duties of his office, is liable to a penalty not exceeding Twenty pounds.

HOUSEHOLDER'S SCHEDULE.

8.—(1.) The Householder's Schedule shall consist of a Householder's Card, and a Personal Card for each person of the household.

(2.) The Householder's Card and the Personal Card shall be in accordance with such forms as the Commonwealth Statistician thinks fit.

(3.) The Householder's Schedule shall, in addition to the particulars specified in section 12 of the Act, include the following :—

(*a*) in relation to buildings—the nature of the building, whether the occupier is the owner, tenant, or rent purchaser, the amount of weekly rent payable or rental value per week ;

(*b*) in relation to persons—the race to which they belong, the number of their children living or dead from any existing or previous marriage, the dates of their arrivals in Australia.

LEAVING OF HOUSEHOLDER'S SCHEDULE.

9.—(1.) Each Collector shall, in accordance with his instructions, leave a Householder's Schedule at each dwelling-house within the portion of the Census District for which he acts.

(2.) The Householder's Schedule shall be left not earlier than seven days (except when in the discretion of the Enumerator for the Census District a longer period is required) and not later than two days before Census Day.

(3.) The Householder's Schedule should be left with the occupier of the dwelling-house, but, if he or she is not in, with the person apparently in charge of the house. If no person is in, the Householder's Schedule may be placed in a letter box, put under the door, or put in some other place where it is likely to come to the notice of the occupier.

DUTY OF PERSON (OTHER THAN OCCUPIER) RECEIVING HOUSEHOLDER'S SCHEDULE.

10. It shall be the duty of every person (other than the occupier) who receives a Householder's Schedule, or to whose hands or notice a Householder's Schedule has come, to deliver it or bring it to the notice of the occupier for whom it is intended.

Penalty : Five pounds.

Dwelling-house Let in Separate Parts.

11. Where a dwelling-house is let, sub-let, or held in different apartments, and occupied by different persons or families, a Householder's Schedule shall be left for each occupier.

Duty to Fill in Required Particulars in the Householder's Schedule.

12.—(1.) Under section 12 of the Act, it is the duty of the occupier of every dwelling to fill in the Householder's Schedule, and to sign it, and deliver it to the Collector, and if he fails to carry out this duty he is liable to a penalty of Ten pounds.

(2.) It shall be the duty of each person who abides in a dwelling-house on the night of Census Day to fill in the particulars required on the Personal Card so far as relates to himself or herself, or to supply to the occupier all information necessary to enable him to fill in such particulars.

Penalty: Ten pounds.

Householders' Schedules for Ships.

13.—(1.) Householders' Schedules in the case of ships shall be delivered to the Captain of the ship, who shall be deemed the occupier.

(2.) Where a ship is on a passage between any two Australian ports on Census Day, and no Householder's Schedule was left with the Captain before Census Day, a Householder's Schedule shall be left with the Captain forthwith after the arrival of the ship at a port.

(3.) The Captain shall, to the best of his knowledge, fill in the particulars required to be filled in in the Householder's Schedule, and return it so filled in to the Collector or other person from whom he received it.

Penalty for breach of paragraph (3): Ten pounds.

(4.) It shall be the duty of each person who abides in a ship on the night of Census Day to fill in the particulars required on the Personal Card so far as relates to himself, or herself, or to supply to the Captain of the ship all information necessary to enable him to fill in such particulars.

Penalty for breach of paragraph (4): Ten pounds.

Householder's Schedules for Persons not Abiding in Dwelling-houses.

14.—(1.) The Householder's Schedule shall be left with each person who does not on the night of Census Day abide in any dwelling-house.

(2.) Every such person shall thereupon fill in in the Schedule such particulars as are applicable to him, and shall sign the Schedule, and deliver it to the Collector or other person from whom he received it.

Penalty for breach of paragraph (2): Ten pounds.

Duty of Persons not Receiving a Householder's Schedule to Apply for It.

15.—(1.) Every person who does not abide in a dwelling-house on the night of Census Day, and who does not receive a Householder's Schedule before that day, shall, within five days after Census Day, apply to the nearest Postmaster for a Householder's Schedule.

(2.) If the Postmaster has a Householder's Schedule, he shall deliver one to the applicant, and, if he has not, he shall take the name and postal address of the applicant, and forward it to the Enumerator for the District.

(3.) Every person who receives a Householder's Schedule in pursuance of this regulation shall fill in in the Schedule such particulars as are applicable to him, and shall sign it and return it to the Postmaster or Enumerator, as the case requires.

Penalty: Five Pounds.

Collector to Call for Householder's Schedules.

16. A Collector shall, forthwith after Census Day, call at each dwelling-house in the portion of the Census District for which he acts, and ask for and obtain the Householder's Schedule.

Particulars under Section 15 of the Act.

17. The particulars required under section 15 of the Act shall be such of the particulars specified in the Householder's Schedule (other than the particulars relating to the dwelling-house) as are applicable to the person from whom the information is required.

Penalties.

18. The penalty at the foot of any regulation or paragraph indicates that any contravention of the regulation or paragraph is punishable upon conviction by a penalty not exceeding the penalty mentioned.

APPENDIX 3.

INSTRUCTIONS FOR FILLING IN THE HOUSEHOLDERS' SCHEDULES, CONSISTING OF THE PERSONAL CARDS "A" AND THE HOUSEHOLDERS' CARDS "B."

Information given on a Census Card is strictly confidential, and is used only for statistical purposes.

1.—GENERAL.

The householder or person in charge of the dwelling is required to fill in the personal cards and the householder's card (forming together a householder's schedule) contained in this envelope (or is to see that each person who abode in the dwelling on the night of Sunday, 2nd April, 1911, himself or herself fills in one of the personal cards). The householder or person in charge of the dwelling is further required to furnish on personal cards particulars regarding those persons travelling or out at work during that night (and not included elsewhere), and who returned to this house or dwelling on Monday, 3rd April. If the house is occupied by different families on separate floors or in separate tenements, each such floor or tenement must be treated as a separate dwelling, and the occupier or person in charge of each must make a return upon a separate householder's card. In the case of large pastoral and other similar establishments the proprietor or superintendent may fill in the returns of his complete establishment, but a separate householder's card must, in this case, be used for each of the out-station dwelling-houses or huts in which a distinct family or person resides in addition to that for the home station; and if any out-station is in a different collector's district from that of the home station, the schedule (householder's and personal cards) for it must be delivered to the Collector of the district in which such dwelling is situated.

Particular attention is drawn to the fact that Section 26 of the *Census and Statistics Act* 1905 imposes a penalty of Fifty pounds on any person who, in any form supplied under the Act, or in reply to any question asked him under the authority of the Act, shall knowingly make any statement which is untrue in any material particular.

2.—PERSONAL CARDS.

Line 2.—Write M for Males and F for Females. This is necessary, as the names do not always form a sure indication of the sex.

Line 3.—It is important that this information be given with perfect accuracy.

Line 4.—Write M for married, W for Widower or Widow, D for Divorced, and NM for Never Married, except in the case of children under 12 years of age.

Line 5.—Write here the year of existing marriage.

Line 6.—Write here the number of children born to the existing marriage, whether now living or not; if none, write "None."

Line 6 (a).—Write here the number of children born to any previous marriage (or marriages), whether now living or not; if none, write "None."

Line 7.—State whether head, wife, son, daughter, or other relative, visitor, lodger, or servant; and, in the case of public institutions, whether officer, inmate, prisoner, &c.

Line 8.—Information is required only as to blindness and deafmutism. Enter as blind only persons totally unable to see, and as deaf and dumb only those who are dumb as well as deaf.

Line 9.—If born in Commonwealth, enter the name of the State of birth; if born elsewhere, enter the name of the country of birth.

Line 10.—If a British subject by parentage, whether born in the United Kingdom, in a British possession, in a foreign country, or at sea, write P; if a British subject by naturalization, write N. If not of European race, write Aboriginal, Chinese, Japanese, Hindu, Javanese, Manilaman, Negro, Polynesian, or Aboriginal half-caste, Chinese half-caste, &c., &c., as the case may be.

Line 11.—If not born in Commonwealth, state length of residence therein in years, and also state date of arrival in Commonwealth.

Line 12.—Do not use general terms that include more than one religious denomination or sect.

In the case of children enter the name of the religion in which it is intended they shall be brought up.

If you object to state to what religious denomination you belong, write "Object."

Line 13.—Write CR for cannot read, R for read only, and RW for read and write. If not able to read English, but able to read a foreign language, write RF, and if not able to read and write English, but able to both read and write a foreign language, write RWF.

If the person to whom the card relates has obtained a University degree, state the degree, and give the name of the University and country in which it was obtained.

Line 13 (a).—Write U if at University; S if at State School; P if at any other school; and H if being educated at home. Give name of school.

Line 14.—

Army and Navy.—If on actual service, state so. If retired, state present occupation.

Persons in the Service of the Federal, State, or Local Governments are to state occupation, position, department, adding F if in Federal, S if in State, and L if in Local Government service; and if engaged in any other occupation, to specify its nature.

Justices of the Peace, Aldermen, Town Councillors, &c., and other important public officers are to state their ordinary profession or occupation.

Ministers of Religion are to state denomination. The indefinite term "Clerk" must not be used. Local or occasional preachers are to return their ordinary occupation.

Members of the Legal Profession are to state whether in actual practice; if not practising, to state present occupation. Persons employed in solicitors' offices are to state whether they are articled or other clerks.

Members of the Medical Profession are to state whether they are physicians, surgeons, or general practitioners, and to return themselves as practising, or not practising; if not practising, to state present occupation.

Teachers, Authors, Public Writers, and Artists are to state the particular branch of science, literature, or art in which they are engaged.

Engineers are to state whether civil, mechanical, electrical, mining, marine, &c.; also the nature of work on which engaged.

Surveyors are to state whether land, mining, marine, &c.

Engine-drivers, Stokers, Firemen, &c., are to state the nature of the business in connexion with which they are occupied, thus :—" Engine-driver at Sawmill," " Stoker at Foundry," " Fireman on Railway," &c. Engine-drivers are not to be entered as engineers.

Miners are to specify the nature of the mineral on which they work, and in respect of metallic ores, to state whether lode or alluvial. A miner working for another is to return himself as " miner," and not as " labourer."

Artisans and Mechanics are to state the particular branch of their trade, thus—" Ship's carpenter," " House carpenter," " Coachsmith," " Locksmith," " Horseshoer," &c.

Carters, Carriers, Labourers, Servants, &c., are to be described in connexion with their usual employment thus :—" Carter to grocer," " Bullock-driver on station," " Labourer making roads," " Omnibus-driver," " Cabman," " Railway porter," " Telegraph messenger," " Domestic servant."

Persons engaged in Trade or Commerce, as Merchants, Manufacturers, Storekeepers, Retailers, Brokers, Agents, Auctioneers, &c., are to state the particular business in which they are engaged, or the principal commodity in which they deal, thus :—" Grain merchant," " Hat manufacturer."

Clerks, Bookkeepers, Salesmen, Saleswomen, Shopmen, Commercial Travellers, &c., are to be described according to the business with which they are connected, thus :—" Bank clerk," " Railway clerk," " Salesman in softgoods warehouse," " Shopman to grocer," " Commercial traveller to wine merchant," &c.

Farmer or Market Gardener.—These terms are to be applied to all persons actually in occupation of land and tilling, whether proprietors or tenants; the term " landowner" is too vague. Market gardeners must not omit the word " Market." The term " Farmer" is understood to mean " Agricultural farmer"; if " Dairy" or " Poultry farmer," &c., it should be so stated.

Persons not following any Profession, Trade, or Calling, and not holding any public office, but possessed of independent means, are to designate themselves as " Proprietor of land," " Proprietor of houses," " Capitalist," " Annuitant," as the case may be. The term " Householder" is not to be used in place of " Proprietor of houses," nor the words " Gentleman" or " Lady" in place of " No occupation."

Wives, Sons, Daughters, Brothers, and other Relatives habitually helping on farms and stations, or engaged in hotels, shops, or other industrial pursuits, are to be returned as "Wife assisting," " Son assisting," &c., as the case may be.

Women.—The occupations of women who are engaged in any other than domestic duties are to be distinctly recorded, but women are not to be entered as engaged in the occupations of their husbands, fathers, &c., unless they habitually assist them. When only in the capacity of wife, mother, daughter, sister, &c., write " Domestic duties."

Children being educated are to be designated " Scholar," if not engaged as well in any industrial pursuit; but if following any such pursuit during portion of their time, as, for instance, delivering or selling newspapers, minding cows, &c., before or after school hours, are to be set down as following that pursuit, the entry on line 13 (*a*) sufficiently showing that they are also receiving education.

Persons in Hospitals, Asylums, Gaols, &c.—The position of officers in the Institution, as " Warder," " Nurse," &c., is to be given, and in the case of inmates, " Prisoner," " Patient," &c.; their calling (if any) before they entered the institution is to be inserted on line 14.

N.B.—Great care is to be taken in writing the name of an occupation which is common to many kinds or branches of business, to add the name of the employer's trade or business. The following occupations are of this type, and require the additional information suggested within parentheses, thus:—Assistant (to draper), Accountant (to ironmonger), Apprentice (to baker), Agent (for shipping company), Cashier (in bank), Clerk (to brewer), Carter (to miller), Engine-driver (on railway), Labourer (on wharf, on roads, &c.), &c., &c. Persons engaged in more than one occupation are requested to state their several occupations, and to underline the principal one.

Line 14 (a) and (b).—Write E if an employer of labour other than household servants; O if in business on own account but not employing others for salary or wages; A if assisting head of household in his business but not receiving salary or wages; W if earning salary or wages; and (except in cases of leave of absence) add N if out of work for more than a week prior to Census, stating under (b) period during which out of work.

Line 14 (c).—If earning salary or wages, state occupation of employer.

3.—HOUSEHOLDERS' CARDS.

BUILDINGS.—Line 1.—State whether a private house; a tenement in a private house; a hotel, boarding, or lodging house; a religious or educational institution; a military establishment; a charitable institution; or a penal establishment.

Line 2.—State whether the outer walls are built of stone, brick, concrete, wood, iron, canvas, or any other material.

Line 3.—State number of rooms, including kitchen, but excluding shop, office, store, bathroom, pantry, or outhouses, unless some one sleeps therein. In the case of a tenement, give number of rooms in tenement only. In case of a building the only resident whereof is a caretaker, give number of rooms in caretaker's quarters only.

Line 4.—Write O if owner; T if tenant; or R P if rent purchaser.

NOTE.—Every answer, except where abbreviations are suggested in these directions, should be written in full.

APPENDIX 4.

ARRANGEMENTS CONCERNING EMPLOYMENT OF STATE OFFICERS UNDER THE CENSUS AND STATISTICS ACT 1905.

I.—NEW SOUTH WALES.

DEPARTMENT OF HOME AFFAIRS,

MELBOURNE, 31ST OCTOBER, 1910.

Arrangement between the Governor-General of the Commonwealth of Australia and the Governor of the State of New South Wales; making provision for the execution by certain State officers of powers and duties under the *Census and Statistics Act* 1905.

Pursuant to the *Census and Statistics Act* 1905, and to all other enabling powers, His Excellency the Governor-General-in-Council has approved of an arrangement in the following terms, being made between His Excellency the Governor-General-in-Council and His Excellency the Governor-in-Council of the State of New South Wales, for the facilitating of the taking of the Census in the year 1911, that is to say :—

(1) That JOHN BURT TRIVETT, Esq., F.S.S., F.R.A.S., an officer of the State of New South Wales, may be appointed to and may execute the powers and duties of the Supervisor of Census for that State under the *Census and Statistics Act* 1905, and the regulations thereunder.

(2) That the services of State officers of the State of New South Wales shall, so far as the exigencies of the State service will allow, be available in connexion with the taking of the Census, and any such officers may, with the concurrence of the Head of the State Department in which they are employed, be appointed to any office or position in connexion with the taking of the Census, and may execute the powers and duties of such office or position accordingly.

(3) That any State officer appointed in pursuance of such arrangement to any office or position in connexion with the taking of the Census shall be subject to the direction of the Commonwealth authorities in relation to the carrying out of the powers and duties attaching to his office or position.

(4) That such arrangement shall be deemed to have taken effect on and from the 1st day of July, 1910.

KING O'MALLEY,

Minister of State for Home Affairs.

G.10/4389.

II.—VICTORIA.

DEPARTMENT OF HOME AFFAIRS,

MELBOURNE, 31ST OCTOBER, 1910.

Arrangement between the Governor-General of the Commonwealth of Australia and the Governor of the State of Victoria, making provision for the execution by certain State officers of powers and duties under the *Census and Statistics Act* 1905.

Pursuant to the *Census and Statistics Act* 1905, and to all other enabling powers, His Excellency the Governor-General-in-Council has approved of an arrangement in the following terms, being made between His Excellency the Governor-General-in-Council and His Excellency the Governor-in-Council of the State of Victoria, for the facilitating of the taking of the Census in the year 1911, that is to say :—

(1) That ALEXANDER MILLAR LAUGHTON, Esq., F.I.A., F.F.A., an officer of the State of Victoria, may be appointed to and may execute the powers and duties of the Supervisor of Census for that State under the *Census and Statistics Act* 1905, and the regulations thereunder.

(2) That the services of State officers of the State of Victoria shall, so far as the exigencies of the State service will allow, be available in connexion with the taking of the Census, and any such officers may, with the concurrence of the Head of the State Department in which they are employed, be appointed to any office or position in connexion with the taking of the Census, and may execute the powers and duties of such office or position accordingly.

(3) That any State officer appointed in pursuance of such arrangement to any office or position in connexion with the taking of the Census shall be subject to the direction of the Commonwealth authorities in relation to the carrying out of the powers and duties attaching to his office or position.

(4) That such arrangement shall be deemed to have taken effect on and from the 1st day of July, 1910.

KING O'MALLEY,

Minister of State for Home Affairs.

G.10/4387.

III.—QUEENSLAND.

DEPARTMENT OF HOME AFFAIRS,

MELBOURNE, 31ST OCTOBER, 1910.

Arrangement between the Governor-General of the Commonwealth of Australia and the Governor of the State of Queensland, making provision for the execution by certain State officers of powers and duties under the *Census and Statistics Act* 1905.

Pursuant to the *Census and Statistics Act* 1905, and to all other enabling powers, His Excellency the Governor-General-in-Council has approved of an arrangement in the following terms, being made between His Excellency the Governor-General-in-Council and His Excellency the Governor-in-Council of the State of Queensland, for the facilitating of the taking of the Census in the year 1911, that is to say :—

(1) That THORNHILL WEEDON, Esq., F.S.S., an officer of the State of Queensland, may be appointed to and may execute the powers and duties of the Supervisor of Census for that State under the *Census and Statistics Act* 1905, and the regulations thereunder.

(2) That the services of State officers of the State of Queensland shall, so far as the exigencies of the State service will allow, be available in connexion with the taking of the Census, and any such officers may, with the concurrence of the Head of the State Department in which they are employed, be appointed to any office or position in connexion with the taking of the Census, and may execute the powers and duties of such office or position accordingly.

(3) That any State officer appointed under such arrangement shall, so far as it does not conflict with his duties as a State officer, be subject to the direction of the Commonwealth authorities as regards the taking of the Census.

(4) That such arrangement shall be deemed to have taken effect on and from the 1st day of July, 1910.

KING O'MALLEY,

Minister of State for Home Affairs.

G.10/4385.

IV.—SOUTH AUSTRALIA.

DEPARTMENT OF HOME AFFAIRS,

MELBOURNE, 31ST OCTOBER, 1910.

Arrangement between the Governor-General of the Commonwealth of Australia and the Governor of the State of South Australia, making provision for the execution by certain State officers of powers and duties under the *Census and Statistics Act* 1905.

Pursuant to the *Census and Statistics Act* 1905, and to all other enabling powers, His Excellency the Governor-General-in-Council has approved of an arrangement in the following terms, being made between His Excellency the Governor-General-in-Council and His Excellency the Governor-in-Council of the State of South Australia, for the facilitating of the taking of the Census in the year 1911, that is to say :—

(1) That LIONEL HENRY SHOLL, Esq., I.S.O., J.P., an officer of the State of South Australia, may be appointed to and may execute the powers and duties of the Supervisor of Census for that State under the *Census and Statistics Act* 1905, and the regulations thereunder.

(2) That the services of State officers of the State of South Australia shall, so far as the exigencies of the State service will allow, be available in connexion with the taking of the Census, and any such officers may, with the concurrence of the Head of the State Department in which they are employed, be appointed to any office or position in connexion with the taking of the Census, and may execute the powers and duties of such office or position accordingly.

(3) That any State officer appointed in pursuance of such arrangement to any office or position in connexion with the taking of the Census shall be subject to the direction of the Commonwealth authorities in relation to the carrying out of the powers and duties attaching to his office or position.

(4) That such arrangement shall be deemed to have taken effect on and from the 1st day of July, 1910.

KING O'MALLEY,

Minister of State for Home Affairs.

G.10/4388.

V.—WESTERN AUSTRALIA.

DEPARTMENT OF HOME AFFAIRS,

MELBOURNE, 24TH NOVEMBER, 1910.

Arrangement between the Governor-General of the Commonwealth of Australia and the Governor of the State of Western Australia, making provision for the execution by certain State officers of powers and duties under the *Census and Statistics Act* 1905.

Pursuant to the *Census and Statistics Act* 1905, and to all other enabling powers, His Excellency the Governor-General-in-Council has approved of an arrangement in the following terms, being made between His Excellency the Governor-General-in-Council and His Excellency the Governor-in-Council of the State of Western Australia, for the facilitating of the taking of the Census in the year 1911, that is to say :—

(1) That MR. E. G. STENBERG, an officer of the State of Western Australia, may be appointed to and may execute the powers and duties of the Supervisor of Census for that State under the *Census and Statistics Act* 1905, and the regulations thereunder.

(2) That the services of State officers of the State of Western Australia shall, so far as the exigencies of the State service will allow, be available in connexion with the taking of the Census, and any such officers may, with the concurrence of the Head of the State Department in which they are employed, be appointed to any office or position in connexion with the taking of the Census, and may execute the powers and duties of such office or position accordingly.

(3) That police inspectors and other senior police officers may act as enumerators where convenient.

(4) That other State officials may act as enumerators where convenient.

(5) That the services of police constables may be made available where practicable for positions of collectors.

(6) That in all cases an agreement is to be arrived at beforehand as to rate to be charged for such services.

(7) That in all cases the officer concerned is to receive special remuneration in respect of Census work.

(8) That the Census printing is to be done when convenient by the Government Printer at cost price.

(9) That all plans available for distribution are to be supplied by Survey Department at cost price.

(10) That all drafting work required to be done is, when convenient, to be done by the Survey Department at cost price.

(11) That the Census collection is to be carried out entirely at the Commonwealth expense. The State Government to be free of all expense or responsibility.

(12) That the State is to have the first claim on the services of its officers undertaking Census work.

(13) That this arrangement shall be deemed to have taken effect on and from the 1st day of July, 1910.

KING O'MALLEY,

Minister of State for Home Affairs.

G.10/4784.

VI.—TASMANIA.

DEPARTMENT OF HOME AFFAIRS,

MELBOURNE, 31ST OCTOBER, 1910.

Arrangement between the Governor-General of the Commonwealth of Australia and the Governor of the State of Tasmania, making provision for the execution by certain State officers of powers and duties under the *Census and Statistics Act* 1905.

Pursuant to the *Census and Statistics Act* 1905, and to all other enabling powers, His Excellency the Governor-General-in-Council has approved of an arrangement in the following terms, being made between His Excellency the Governor-General-in-Council and His Excellency the Governor-in-Council of the State of Tasmania, for the facilitating of the taking of the Census in the year 1911, that is to say :—

(1) That ROBERT MACKENZIE JOHNSTON, Esq., I.S.O., F.S.S., an officer of the State of Tasmania, may be appointed to and may execute the powers and duties of the Supervisor of Census for that State under the *Census and Statistics Act* 1905, and the regulations thereunder.

(2) That the services of State officers of the State of Tasmania shall, so far as the exigencies of the State service will allow, be available in connexion with the taking of the Census, and any such officers may, with the concurrence of the Head of the State Department in which they are employed, be appointed to any office or position in connexion with the taking of the Census, and may execute the powers and duties of such office or position accordingly.

(3) That any State officer appointed in pursuance of such arrangement to any office or position in connexion with the taking of the Census shall be subject to the direction of the Commonwealth authorities in relation to the carrying out of the powers and duties attaching to his office or position.

(4) That such arrangement shall be deemed to have taken effect on and from the 1st day of July, 1910.

KING O'MALLEY,

Minister of State for Home Affairs.

G.10/4386.

APPENDIX 5.

INSTRUCTIONS TO STATE SUPERVISORS OF CENSUS.

1. *Appointment.*—A copy of the *Commonwealth Gazette* containing a notice of your appointment as State Supervisor of Census is forwarded herewith.

2. *Census Act.*— A copy of the *Census and Statistics Act* 1905, is also forwarded for your information. The provisions of this Act relating to Census collection should be carefully perused by you, and any queries, comments, or suggestions in connexion therewith which you may desire to make should be forwarded without delay to the Commonwealth Statistician.

3. *Division of State.*—As early as practicable, maps will be forwarded to you, setting out the partition of your State into Census Districts.

4. *Emolument of Enumerators.*—As soon as practicable after the receipt of these maps, it will be your duty to forward to the Commonwealth Statistician for his approval a statement, on Census Form No. 10, shewing what, in your opinion, would be a fair rate of emolument for the person undertaking the duties of enumerator in each Census District. For your general guidance, it may be stated that a retaining fee of £10 10s., together with a further payment based on the work involved, should be provided. In estimating this further payment, the area and probable population of the Census District should be taken into account.

5. *Selection of Enumerators.*—On receipt of the Commonwealth Statistician's approval of your scale of emolument for enumerators, it will be your duty to select for each Census District a duly qualified person willing to undertake the duties of enumerator at the rate of emolument specified.

6. *Qualifications of Enumerators.*—The person selected to act as enumerator for any Census District should possess the following qualifications :—

(*a*) Accurate knowledge of his Census District ;

(*b*) Administrative capacity ;

(*c*) Integrity ;

(*d*) Fair education.

7. *Suitable Persons for Employment.*—Where obtainable, the following persons will usually be found suitable for appointment :—

(*a*) Resident Magistrates or Police Magistrates ;

(*b*) Town Clerks ;

(*c*) Shire Secretaries ;

(*d*) Clerks of Courts ;

(*e*) Mining Registrars ;

(*f*) Electoral Returning Officers ;

(*g*) Persons who have satisfactorily performed similar duties on a previous occasion.

8. *Inquiry for Enumerators.*—Where suitable persons, such as those referred to in paragraph 7, are not available, it will be your duty to take such steps as the circumstances may require to secure a person in each case having the requisite qualifications. For this purpose, inquiry from a Stipendiary, Resident, or Police Magistrate, or an Inspector of Police, may effect the desired result. Failing that, it may be necessary as a last resource to advertise in a newspaper circulating in the district.

9. *Submission for approval by Commonwealth Statistician.*—On the completion of your list of enumerators, which should be expedited as much as possible, the list must be forwarded to the Commonwealth Statistician for approval, on Census Form No. 10, which should be accompanied by any comments or suggestions which you may desire to make in connexion therewith.

10. *Appointment of Enumerators.*—On receipt of approval of the list of enumerators submitted by you, it will be your duty to formally notify the persons approved of their appointment, at the same time obtaining from each a declaration of secrecy and fidelity, and a contract of service, special forms for which will be forwarded to you. A duplicate of the contract of service shall be retained by the enumerator.

11. *Gazetting of Enumerators.*—On receipt by you of all the declarations of fidelity and secrecy, and contracts of service, it will be your duty to forward a notification to that effect to the Commonwealth Statistician, in order that the appointment of enumerators may be duly published in the *Commonwealth Gazette.*

12. *Retention of Declarations.*—All declarations and contracts of service made by enumerators are to be carefully retained by you until the completion of your duties as Supervisor of Census, and are then to be forwarded to the Commonwealth Statistician.

13. *Emergency Appointment of Enumerators.*—In case of accident, sickness, death, or other cause preventing an enumerator from carrying out the duties of his office, it will be necessary for you, with as little delay as possible, to appoint a suitable substitute to act in a temporary capacity pending the formal approval of his appointment.

14. *Enumerators' Maps.*—On receipt from you of the notification of appointment of enumerators, the Commonwealth Statistician will forward to each enumerator a list of instructions, and also a map of his Division on a large scale, for subdivision into Collectors' Districts. These Districts will require to be of such size that the work of distributing and collecting Census Forms therein can be readily carried out in the prescribed time.

15. *Approval of Enumerators' Subdivision.*—On the completion of this work of subdivision, it will be the duty of each enumerator to forward his map to you, accompanied by a rough description of the boundaries proposed by him, and a name for each proposed district. In certain cases these maps and descriptions may require to be returned to the enumerators for explanation or amendment. After satisfying yourself that the districts proposed are suitable, and are in accordance with the instructions in connection therewith issued to the enumerator, it will be your duty to forward the maps and descriptions to the Commonwealth Statistician.

16. *Maps.*—On approving the subdivisional scheme submitted, the Commonwealth Statistician will cause to be prepared sets of maps shewing Collectors' Districts. A list of these will be forwarded to you for your information and guidance, and a map of his Census District, shewing the boundaries of the Collectors' Districts which it comprises, will be forwarded to each enumerator, and a set of maps, each dealing with one collector's District, will be forwarded for the use of the collectors themselves. A general map will also be forwarded for your guidance.

17. *Selection of Collectors.*—As early as possible after the approval of his scheme of subdivision, it will be the duty of each enumerator to nominate for each of the Collectors' Districts comprised in his Division, a person whom he considers suitable to act as collector.

18. *Qualifications of Collectors.*—Any person selected to act as collector should possess the following qualifications :—

(*a*) Accurate knowledge of his district ;
(*b*) Fair elementary education ;
(*c*) Ability to write neatly and legibly ;
(*d*) Integrity ;
(*e*) Sobriety ;
(*f*) Absence of physical incapacity.

19. *Approval of Appointment of Collectors nominated.*—On completing his list of collectors, it will be the duty of each enumerator to submit the list for your revision.

20. *Appointment of Collectors.*—After revising the list of collectors, it will be your duty to transmit same to the Commonwealth Statistician.

On receipt of a letter from the Commonwealth Statistician that the revision is considered satisfactory you should transmit to the enumerator the necessary forms of agreement between the enumerator and the collector, together with the letter of authority to act as collector.

This letter must not be delivered to the collector by the enumerator until the collector has made a declaration of fidelity and secrecy, and has executed the agreement for service on forms which will be duly forwarded to the enumerators for that purpose.

21. *Retention of Declarations.*—It will be the duty of the enumerators to forward to you all declarations and, on the satisfactory completion of service, also the agreements for service made by the collectors. These are to be carefully retained by you until the completion of your duties, when they must be forwarded to the Commonwealth Statistician.

22. *Instructions to Enumerators and Collectors.*—It will be your duty to make yourself familiar with the instructions issued to enumerators and collectors, so as to be in a position to promptly advise these officers on any points which may arise in the performance of their respective duties. In the event of doubt on your part as to the exact significance of any instructions, or as to the course of action to be taken in any matter not provided for in the instructions, you should communicate immediately with the Commonwealth Statistician, if time will permit. In certain cases, however, such matters will have to be decided at once, and it will be necessary for you to act on your own responsibility, basing your decision, as far as practicable, on the tenor of the instructions relating to allied matters.

23. *Emergency Appointment of Collectors.*—In certain cases, owing to accident, sickness, death, or other causes, a duly appointed collector may be prevented from carrying out his duties.

If time will admit, any such vacancy should be filled in the ordinary way, a letter of appointment being delivered to the collector by the enumerator after the requisite declaration of fidelity and secrecy and agreement for service have been made. If time will not admit of this procedure, the enumerator will be authorised to fill the vacancy on his own responsibility.

24. *Census Posters.*—During the month of January, 1911, a supply of posters, relative to the forthcoming Census will be forwarded to you. These will require to be transmitted to each Post Office, Police Station, Police Court, Railway Station, State School, Mechanics', Miners', or Agricultural Institute, or School of Arts, or other suitable place in your State, with a request to the Officer-in-charge that they be affixed in a conspicuous place, and allowed to remain there until after the taking of the Census. These posters will set forth the date of the Census, the nature of the information required, and the penalties attaching to a failure to comply with the requirements of the Act.

25. *Final Revision of Census Arrangements.*—During the month of March, 1911, it will be necessary for you to assure yourself that all preparations for the Census have been duly made, and that all enumerators and collectors are ready to carry out the work of collection expeditiously. Care must be taken that no islands lying off the coast, or in bays, rivers, or elsewhere, have been omitted from the scheme of collection.

26. *Preliminary Count.*—It will be the duty of each enumerator, as soon as he receives a preliminary count from a collector, to forward it to you. As soon as the whole of the preliminary counts for any Census District is complete, it will be your duty to forward the results to the Commonwealth Statistician. It is hoped that the preliminary count for the whole of the Commonwealth will, by these means, reach the Commonwealth Statistician not later than the 30th April, 1911. Unless specially instructed to the contrary, the results of these preliminary counts should be forwarded by letter, not by telegraph.

27. *Transmission of Forms.*—On satisfying himself that the whole of his Census District has been duly accounted for, it will be the duty of each enumerator to forward to you the boxes or parcels containing the schedules, &c., representing his Census District. On satisfying yourself that all of the Collector's Districts within the Census District have been accounted for, and that the work has the appearance of having been carefully done (detailed examination of the individual forms is not required), the forms should be securely repacked in the boxes or parcels, with a label attached, indicating the State and Census District to which they relate and the number of forms included, and forwarded to the Commonwealth Statistician.

28. *Enumerator's Vouchers.*—Each of the enumerators in forwarding the Census Forms relating to his Census District, will submit a voucher for the amount for which he has himself contracted to act as enumerator, and setting out in detail the amounts due to each individual collector in his District. On approving the manner in which the work has been performed, it will be your duty to transmit the voucher to the Commonwealth Statistician, with a certification that the duties of the enumerator and of the collectors have been satisfactorily performed.

29. *Postal and Telegraphic Arrangements* :—

(*a*) State Supervisors will be allowed a stamp advance of £10, and will stamp outgoing letters, and pay for telegrams and incoming letters by stamps.

(*b*) Enumerators will be allowed a preliminary stamp advance of £3, and will stamp outgoing letters, and pay for telegrams and incoming letters by stamps.

(*c*) Collectors will send all letters and telegrams to enumerators and State Supervisors unstamped, and marked " collect," and the enumerator or State Supervisor, as the case may be, will pay for them by stamps on receipt.

(*d*) In the few cases where a collector will have to send a letter on Census business to a private person, he will have to stamp the letter, make a note of the circumstances, and recover the amount from his enumerator.

(*e*) Any amounts thus refunded will be included by the enumerator in the voucher to be forwarded by him on completion of his work to the State Supervisor.

(*f*) All communications or parcels on Census business passing through the Post or Telegraph Offices must be marked " Census."

(*g*) With a view to minimising the cost of the Census, you are requested to send as "Printed Papers" or "Commercial Papers," as the case may be, such wholly or partly printed documents as may under the Postal Act be sent under those designations.

30. *Printing.*—It is intended to have the personal cards A, householders' cards B, instruction C, and envelopes D, required for the taking of the Census in your State printed by your Government Printer. It will, therefore, be your duty to exercise such supervision over the printing thereof as may be necessary, and to arrange for the packing and transmission to the enumerators of the requisite numbers of cards and other documents.

31. *Period of Appointment.*—Your appointment as State Supervisor of Census will date from 1st July, 1910, and will terminate on 30th June, 1911, unless arrangements are made for retaining your services for a longer period.

32. *General Census Provisions.*—All matters connected with the advertisement of the Census through the press, the contribution of articles to the press relating to Census matters, the giving of lessons on Census matters in State and other schools, will be dealt with by the Commonwealth Bureau of Census and Statistics, but any suggestions which you may wish to make in reference to any of these matters will be much appreciated and carefully considered.

(Signed) G. H. KNIBBS,
Commonwealth Statistician.

Commonwealth Bureau of Census and Statistics,
Melbourne, 30th June, 1910.

APPENDIX 6.

INSTRUCTIONS TO RECORD CLERKS ASSISTING STATE SUPERVISORS OF CENSUS.

1. *Records the Property of Commonwealth Bureau.*—The Census Records of the State Supervisor's office are the property of the Commonwealth Bureau of Census and Statistics, and when the work of Census collection has been completed, they must be forwarded to the Bureau.

2. *Necessity for Uniformity.*—It is necessary, therefore, that the system adopted for conducting the correspondence and keeping the records in the several States should be carried out on uniform lines. With this end in view, the following instructions have been drafted.

3. *Date of Receipt of "Correspondence Inwards."*—All "Correspondence Inwards" must, as soon as practicable after it is received, be stamped with the date of receipt by means of the dating machine provided for the purpose. This is of considerable importance as an item of record, and must never be omitted.

4. *Appropriate Files to be Prepared.*—For the purposes of classification and ready reference, a series of files must be prepared, in which all correspondence inwards, and copies of all correspondence outwards must be placed. Each file must relate to a separate subject, which must be distinctly shewn on the file cover. Files must be numbered from 1 upwards in the order in which the occasion for their preparation arises.

5. *Order and Numbering of Papers in File.*—Each file must, as regards date of papers contained, be built upwards, the most recent communication appearing on top. All papers contained in file must receive the file number, and must, in addition, be numbered from 1 upwards, following the order in which the file is built up. Where any single communication on a file extends to more than one sheet, the consecutive numbering must be continued on the several sheets comprised in the communication, and must not be restricted to the first sheet only. Each sheet will thus bear two numbers, the former of which will relate to the file, and the latter to the consecutive number of the sheet on its file. The marking 3/6 for example, would indicate that the document in question was the sixth page of File No. 3. These numbers must be recorded in red ink in the right hand upper corner of the paper.

6. *Size and Attachment of Papers.*—All papers placed on a file must be of foolscap size. If communications are received of a smaller size than foolscap, they must be pasted on foolscap sheets before inclusion on the file. Documents of a larger size than foolscap must be folded to that size, and, if practicable, must be so attached to the file that they can be opened out and their contents seen without being detached from the file. Wherever practicable, the papers comprised in any file are to be fastened together by means of a paper fastener, on the upper left-hand corner.

7. *File Covers.*—A supply of file covers (see Form A herewith) for the use of the record clerk will be furnished, and early application for additional supply, as required, must be made from time to time.

8. *Précis Sheets to be kept.*—In connexion with each file, a Prècis Sheet, in Form B hereto, must be kept, on which all papers belonging to the file must be duly recorded. In the column provided for "Nature of communication," a very brief statement of the object or purport of communication must be given. When a Précis Sheet relating to any file has been filled, a fresh one must be added above the completed one, and the appropriate Précis Sheet No. must be inserted in the upper right-hand corner of the new sheet. The fact must also be noted at the foot of the completed sheet as follows :—"Continued on Précis Sheet No....." Where a communication extends to more than one page, the fact must be noted on the Précis Sheet by including in the column for "No. of Paper," a reference to all the pages comprised in the communication. Thus 7—12 would indicate a communication extending from pages 7 to 12 inclusive of the file in question. As the Précis Sheet is intended to furnish a complete record of the contents of the file, it must be kept strictly up to date.

9. *Correspondence Inwards to be recorded promptly.*—As soon as practicable after any communication has been received, it must be marked with its appropriate file and consecutive numbers, and must be promptly recorded on the Précis Sheet of the file to which it belongs. Unless the circumstances are very exceptional, the communication should in all cases be recorded on the appropriate Prècis Sheet, before being dealt with by the Census Supervisor.

10. *Correspondence Outwards on Précis Sheets to be specially marked.*—In entering on Prècis Sheets particulars concerning correspondence outwards contained in the file, it will be desirable to make the necessary entries in red ink so as to distinguish them readily from entries relating to Correspondence Inwards.

11. *Relation between Documents on File.*—In attaching any communication to a file, care must be taken to note whether it is in reply to any other communication already on the file. In such case the fact must be noted on the document to which it is in reply, by the note "Replied to by.....of .....", means of the communication, *i.e.*, by letter, telegram, &c., and date being inserted.

12. *File Indexes.*—All papers contained in a file must be briefly indexed in the Index Book provided for the purpose. In all cases the indexing must be done according to the name or designation of the person by, to, or concerning whom the communication was sent, and also according to the subject of correspondence. Where a communication deals with several phases of a subject, it must be indexed under such subject headings as will enable these phases to be readily traced. Where it is anticipated that the correspondence with any person or on any subject will be extensive, sufficient space should be reserved in the Index Book to meet probable requirements under that heading.

The File No., as well as the consecutive No. of the paper, must always be quoted against an index entry.

13. *Cross References.*—When a paper on one file contains reference to the subject of another file, a copy of such reference should be attached to the latter file, or a reference thereto should be made on its Précis Sheet duly indexed.

14. *Detached Papers.*—Only under very exceptional circumstances should papers once placed on a file be detached therefrom. If such detachment takes place, a slip of paper must invariably be inserted in the place from which the paper has been removed, stating the number of the paper, and by whom, and why, it was detached.

15. *List of Files.*—A list of files, arranged in numerical order, should be kept in a conspicuous place for convenience of reference. When a new file has been made, its number and subject must be promptly entered on this list, which will thus be kept always up to date.

16. *Précis Sheets to be kept clean and neat.*—As it is proposed to bind the Prècis Sheets into book form on the completion of the Census collection, it is necessary that they should be prepared as neatly and kept as clean as possible. The left hand margin of the Prècis Sheet is to be left blank, so as to facilitate binding.

17. *Correspondence Outwards.*—Each letter should, as far as practicable, be restricted to one subject, and should be on one side of the paper only. All letters must be typed in triplicate, one copy (on stout paper) to be attached to the file to which it refers (numbered consecutively), and the other copy (on flimsy paper) to be pasted in the Letter Book provided for the purpose.

18. *Letter Book Index.*—The Letter Book must be kept indexed up to date. An index, shewing the names of the persons to whom communications are addressed, together with a brief précis of the subject-matter, will be sufficient for this purpose.

19. *Letter Number.*—It is always desirable to quote on a letter outwards the file and consecutive number of the document (if any) to which it is in reply, as such a course facilitates subsequent reference.

20. *Postage Book.*—All correspondence outwards, whether by telegraph, by post, or by messenger must be carefully recorded in the Postage Book provided for the purpose. In this book must be inserted the name and address of the addressee, the means of communication, and the postal or telegraphic charge (if any) involved.

21 *Stamps.*—All letters, telegrams, and other matters on which postal charges are payable must have the requisite amount affixed in " O.S." stamps. To enable this to be done, a stamp advance of £10 will be made to the Census Supervisor.

It will be the duty of the Record Clerk, acting under the instructions of the Census Supervisor, to keep an account of the stamps received from time to time for Census purposes, and to balance such account with the Postage Book. It will also be his duty when the supply of stamps runs low, to call the attention of the Supervisor to the fact, so that a further advance may be obtained. It will also be his duty to keep a record of any postage or telegraph debit dockets, with the amounts involved, issued by the Supervisor in lieu of stamps.

22. *Stationery.*—A supply of file covers, précis sheets, letter heads, and envelopes, together with a letter book, an index book, and a postage book, will be forwarded for use in connection with the work of Census collection. In the event of further supplies being required, early application must be made.

(Signed) G. H. KNIBBS,
Commonwealth Statistician.

Commonwealth Bureau of Census and Statistics,
Melbourne, 30th June, 1910.

FORM A. (See Clause 7).

File No.	STATE.	SUBJECT.	Prècis Sheet No.

FORM B. (See Clause 8).

No. of Paper.	Date of Communication.	From or to Whom.	Nature of Communication.

APPENDIX 7.

FINANCIAL INSTRUCTIONS.

A.—STATE SUPERVISORS.

1.—SUB-ADVANCE.

A sub-advance will be made to each State Supervisor, to be operated on by him for the purpose of paying accounts for incidental and petty cash expenditure. Any single disbursement from this sub-advance must not exceed £1.

An acquittance must be obtained for the payment of any sum over 5s.

The sub-advance will be recouped periodically as the necessity arises in the following manner, viz. :— Each State Supervisor will prepare an account, on Form 9, in his favour and official capacity for the disbursements made, attach thereto the acquittances obtained, sign account as claimant, and forward to the Accountant, Department of Home Affairs, Melbourne.

Accounts for amounts over £1 must be rendered on Commonwealth Contingencies Form No. 9.

2.—BANKING ACCOUNT.

For the purpose of the sub-advance an account to be designated " Commonwealth Census Account" will be opened in an approved bank.

This account may be operated on by cheques signed by the State Supervisor in his official capacity only.

The account must not under any circumstances be overdrawn.

A cash book will be furnished for the purpose of recording the operations on the account.

3.—TRAVELLING EXPENSES AND COST OF CONVEYANCE.

Each State Supervisor will be paid travelling expenses at the rates applying to him in his State official capacity.

State Supervisors will have authority to travel or to order their officers to travel, but each such case must be reported to the Commonwealth Statistician.

Conveyance.—A book of 25 orders will be issued to each State Supervisor for authorised travelling (rail, coach, or steamer).

Cost of Conveyance.—The following rates will be allowed :—

(1) If by railway or sea, the actual fare.

(2) If by road, where public conveyances are available, the actual fare only will be allowed. Where it is requisite to hire a special conveyance, 6d. per mile each way will be allowed, or, where this rate is insufficient, special representation should be made to the Commonwealth Statistician.

4.—POSTAGE STAMPS.

Each State Supervisor will be furnished with a supply of postage stamps for letters and telegrams for himself and his Enumerators.

Each State Supervisor shall, when necessary, requisition the Commonwealth Statistician for a supply of postage stamps. On receipt of advice of approval, the State Supervisor shall make application to the Deputy Postmaster-General for the supply.

Each State Supervisor shall keep a " Stamp Account" in a book as per Appendix.

Issues shall be checked daily by the State Supervisor, who shall initial against the daily total as evidence of the correctness of the credit claimed.

5.—EXPENDITURE SUCH AS PRINTING, CLERICAL ASSISTANCE, ETC.

The authority of the Minister for Home Affairs, through the Commonwealth Statistician, must be obtained for expenditure, such as printing, clerical assistance, &c., prior to any liability being incurred.

Cases of Emergency.—In cases of extreme urgency, where it may not be practicable to obtain the authority of the Minister for Home Affairs for an expenditure which is requisite for the proper and efficient conduct of the Census, the State Supervisor may incur the expenditure in anticipation of Ministerial approval ; but in each such case he must at once forward to the Commonwealth Statistician an application for authority, and attach thereto a concise report of the circumstances.

Clerical Assistance.—Persons engaged for clerical assistance must be selected from the Register in the office of the Public Service Inspector ; and the Secretary for Home Affairs, through the Commonwealth Statistician, must at once be advised of the names of such persons and the dates of their commencing duty.

Orders for services other than those paid for by petty cash will be issued by the Commonwealth Statistician.

B.—ENUMERATORS.

1.—REMUNERATION.

Each Enumerator will be paid a retaining fee of £10 10s., and such other remuneration as may by the Minister for Home Affairs be authorised.

2.—TRAVELLING EXPENSES.

Each Enumerator travelling under authority from a State Supervisor will be paid personal expenses at the rate of 12s. per diem of 24 hours.

When travelling by steamer or other vessel in which the fare paid includes subsistence, one-fourth of the ordinary rate (viz., 12s. per diem), that is to say, 3s. per diem will be allowed.

3.—COST OF CONVEYANCE.

The following rates will be allowed :—

1. If by railway or sea, the actual fare.
2. If by road, where public conveyances are available, the actual fare only will be allowed. Where it is requisite to hire a special conveyance, 6d. per mile each way will be allowed, or where this rate is insufficient, special representation should be made to the State Supervisor.

4.—POSTAGE STAMPS.

Each Enumerator will be furnished by the State Supervisor with a supply of postage stamps for outward letters and telegrams, and for payment for letters and telegrams received from the Collectors.

Each Enumerator shall, when necessary, requisition the State Supervisor for a supply of postage stamps, and on the receipt of the supply shall forward an acknowledgement to the State Supervisor.

Each Enumerator shall keep a " Stamp Account" in a book as per Appendix.

C.—COLLECTORS.

1.—CONTRACT FOR SERVICE.

The Enumerator will obtain from each Collector engaged by him an agreement in writing to serve in that capacity in connection with the Census at the rates prescribed therein.

2.—LETTERS AND TELEGRAMS.

Each Collector shall forward all correspondence with the Enumerator, or State Supervisor, in envelopes supplied for that purpose. Postage stamps for these will not be required, since the postage will be paid by the Enumerator or State Supervisor on receipt.

Telegrams sent by the Collector to the Enumerator or State Supervisor must be marked " Collect," and he must produce to the Telegraph Officer his letter of authorisation as evidence of his appointment.

D.—APPENDIX.

POSTAGE STAMP ACCOUNT.

Date.		Particulars.		Dr.			Cr.		
1910.				£	s.	d.	£	s.	d.
July	6	To Advance from State Supverisor		3	..	..			
,,	13	By State Supervisor—Report Collector at					..	..	2
,,	14	,, Collector at.....*re* Instruction ..					..	..	4
,,	21	,, State Supervisor—*re* Collector at					..	..	2
to									
Sept.	30	,, &c., &c., &c., say					1	2	4
,,	,,	,, Balance					1	17	..
				3	..	..	3	..	..
Oct.	1	To Balance		1	17	..			

APPENDIX 8.

INSTRUCTIONS TO CENSUS ENUMERATORS.

A.—PRELIMINARY.

CENSUS COLLECTION ON CARDS.

1. Your attention is specially drawn to the fact that on the present occasion the collection of the Census data will be effected on cards, instead of on schedules, as on former occasions. For every dwelling there will be one or more "Householders' Cards" (B), containing a description of the dwelling and a summary of the inmates; and one "Personal Card" (A) for each inmate. Each personal card will be accompanied by a printed list of "Instructions" (C) for guidance in filling in the cards. The cards and instructions are enclosed in one or more "Envelopes" (D), and throughout these instructions, where a "Householder's Schedule" is referred to, that term signifies the number of householders' cards and personal cards which are required for a dwelling. The "Instructions" and "Envelopes" are supplementary to the Schedule, and have been adopted for the greater convenience of householders and collectors. (See section 22 hereinafter).

POLICE ASSISTANCE.

2. Due notice will be forwarded to you later of the number of police constables (if any) which the Government of your State may have made available for the work of collection in your Census District.

B.—DEFINITION OF COLLECTORS' DISTRICTS.

BOUNDARIES OF CENSUS DISTRICTS.

3. The boundaries of your Census District, shewn on the plans forwarded to you, are those that have been agreed upon between the Commonwealth Statistician and the Supervisor of your State.

CENSUS REQUISITES FORWARDED.

4. To enable you to commence your duties, the Census Supervisor of your State will forward to you—

(*a*) Copies of Enumerator's Schedule (A).

(*b*) Copies of Enumerator's Schedule (B).

(*c*) Form of Receipt (Census Form No. 24), to be signed and at once returned to your Supervisor.

BOUNDARIES SHEWN ON PLAN.

5. The boundaries of your Census District will be found clearly defined in the map in broad red coloured lines.

The boundaries of the Commonwealth Electoral Divisions are marked in green, those of the State Electorate Districts in blue, those of the State Electoral Provinces in broken blue lines, those of Counties in yellow, those of Municipalities or other Local Government areas in neutral tint, and those of Municipal Subdivisions (Wards or Ridings) in neutral tint, broken line.

MAPS TO BE CAREFULLY STUDIED.

6. Your first duty as an Enumerator will be to make a careful study of your maps, so as to enable you to suggest a scheme for the division of your district into Collectors' Districts. This should be done without delay, so that your proposals may be duly considered and approved, and maps of each Collector's District prepared for the use of Collectors.

INSTRUCTIONS TO BE FOLLOWED.

7. In performing this duty you will kindly bear in mind the following points, and adhere as closely as possible to the principles here laid down for your guidance.

DIVISION INTO COLLECTORS' DISTRICTS.

8. The whole of your Census District is to be divided into Collectors' Districts in such a manner as to allow of the duties of distribution and collection of the Census Schedules being performed by one Collector in each district within the time allotted to him for such purpose.

SUBDIVISION NOT DEPENDENT ON NUMBER OF POLICE AVAILABLE.

9. In the first instance, when considering the subdivisions of your district, you are in no way restricted by the number of police (if any) who may be available to act as Collectors, as the appointment of Collectors will be separately dealt with after the Collectors' Districts have been defined.

NO PART OF CENSUS DISTRICT TO BE UNACCOUNTED FOR.

10. You will bear in mind that the various Collectors' Districts into which you divide your Census District, must together form the whole of that district, and that no part is to be left unaccounted for on the assumption that it is uninhabited or for other reasons, and also that a Collector's District should, wherever practicable, consist of one continuous portion of the State, and should not, except in the case of an island or islands, be made up of two or more detached parts.

POINTS TO BE PARTICULARLY CONSIDERED IN ALLOTTING COLLECTORS' DISTRICTS.

11. The Census District must be so divided in regard to all municipalities and towns, and also to other populous centres, as to admit of all schedules being distributed during the four days preceding Sunday, 2nd April, and collected during the eight working days following on that date. In the scattered country districts more time may be allowed, but the subdivisions should be such that it must be possible, even in the most remote part, to collect all the returns by the 24th of April, at the very latest.

The number of days that, in your opinion, should be allowed each Collector as sufficient for the distribution and collection of his schedules must be carefully considered and entered by you in the Enumerator's Schedule (A) before that document is returned for approval. The actual Census day (2nd April) should not be taken into account, as the distribution should be completed *before* and the collection commenced *after* that day.

Except under special circumstances, payment to collectors will be allowed only for the number of days thus allotted for distribution and collection in each case.

In the plan of the Census District which has been allotted to you, the boundaries of various electoral and other divisions are shewn, and must be taken into account in fixing the boundaries of your Collectors' Districts. These boundaries comprise those of Counties, Parishes or Hundreds, Commonwealth Electoral Divisions, State Electoral Districts, State Electoral Provinces, Municipalities, and in certain cases, Municipal Wards. Wherever practicable, it is desirable that the boundary of a Collector's District should not cross any of the boundaries thus shewn. Where in any case strict compliance with this provision would, in your opinion, result in unduly small Collectors' Districts being allotted, it may be departed from, but the number of such boundaries crossed in any single instance should be as small as practicable.

DISTINGUISHING LETTER TO BE GIVEN TO EACH COLLECTOR'S DISTRICT.

12. A distinguishing letter must be given by you to each Collector's District, and duly recorded in the Enumerators' Schedule (A), the lettering of the Collectors' Districts to run from A onwards.

DENSITY OF POPULATION TO BE TAKEN INTO ACCOUNT.

13. In apportioning Collectors' Districts you must consider the distance to be traversed by the Collector in going from dwelling to dwelling, and a district may therefore comprise more dwellings when they lie near together, and fewer when they lie far apart.

NUMBER OF INHABITED HOUSES TO BE ALLOTTED TO A COLLECTOR.

14. Thus, in a town where the houses adjoin or are only a few yards apart, from 150 to 200 inhabited houses may be included in each sub-district, whilst in suburban districts and villages or townships where the dwellings are moderately contiguous, although farther apart than in a closely-built town, the number may be from 100 to 150; in the more settled agricultural districts where there is occasionally a distance of more than half-a-mile between one dwelling and the one nearest to it, the number may be from 50 to 100; and in the more scattered districts where intervals of 2 miles or upwards occasionally intervene between the dwellings, less than 50 may be included in a sub-district. Due consideration must, however, also be given to the collector's method of travelling.

SPECIAL ARRANGEMENTS FOR SCATTERED POPULATION.

15. As regards the arrangements for collecting in scattered country districts, or enumerating small bodies of miners engaged in prospecting, &c., the special circumstances of each locality must be taken into account, both as regards the time to be allowed and the number of habitations to be allotted to each collector.

COLLECTION OF SHIPPING POPULATION.

16. In coastal districts where it will be necessary to collect Census Schedules from vessels in the various ports, you must remember, when subdividing your Census District, to make the necessary arrangements for providing one or more Collectors' Districts for the shipping in port, fishing fleets, pearling fleets, &c., according to requirements.

ENUMERATION OF ISLANDS OFF COAST.

17. Arrangements must also be made for the enumeration of the inhabitants on any of the islands off the coast of your district, and suggestions as to best way of so doing should be submitted to your Supervisor as soon as possible for consideration and approval.

RAILWAY TRAVELLERS.

18. Special arrangements will be made by your Supervisor for the collection of particulars relative to persons travelling on the railways.

CARE TO BE TAKEN IN DEFINITION OF BOUNDARIES.

19. It is essential to the accuracy of the enumeration that the boundaries of the Collector's Districts be well defined and clearly described, so that there may be no room left for doubt as to the Collector's District to which any one portion belongs.

It is therefore impressed upon you that, wherever possible, well-marked, natural or artificial boundaries, such as rivers or creeks, roads, lines of railways, telegraph lines, &c., should be adopted. In cases where streets, roads, or rivers, are used as boundaries, the boundary-line must invariably be understood to run in the centre of the street, road, or river, so that the houses on one side will be in one Collector's District, and those on the other side in the Collector's District adjoining. Imaginary lines drawn from point to point on maps are not readily followed, and should only be adopted in cases where no others are available, or where such lines form the boundaries of existing divisions as mentioned in Instruction No. 11, above.

ENUMERATION IN MUNICIPALITIES AND WARDS.

20. It is intended to show separately in the Census Report the population of all the municipalities, and, in certain cases, of the wards into which they may be divided, therefore the population actually living within their declared boundaries must be accurately ascertained. It is desirable that, wherever possible, each municipality or ward, if not too large, be constituted a Collector's District.

SUBMISSION OF SUBDIVISION FOR THE STATE SUPERVISOR'S APPROVAL.

21. Having carefully thought out and drawn up your scheme for this subdivision of your Census District in conformity with the foregoing instructions, you will then cause the boundaries of and letter given to each Collector's District to be clearly marked in pencil lines on the map or maps forwarded to you. A written description of the boundary lines of such Collector's Districts, and all other details of information required to complete Enumerator's Schedule (A) should also be made out in duplicate. This having been done, the maps, and one copy of Enumerators' Schedule (A), must be at once transmitted to your Supervisor for consideration and approval, one copy of the Enumerator's Schedule (A) being retained by you for reference. Upon the receipt of the above-mentioned documents, your suggestions will receive immediate consideration, and after approval the necessary maps of your district and of each Collector's District, &c., will be prepared and forwarded to you.

LIST OF SCHEDULES REQUIRED.

22. It will be necessary for you when completing Enumerator's Schedule (A), to give in the columns provided for such purpose a definite statement as to the number of Householders' Schedules you will require for the enumeration in each sub-district. This number can be approximately gauged from the fact that a Householder's Schedule will be required for each separate household, and that, under Section 10 of the Census and Statistics Act 1905, "where a dwelling is let, sub-let, or held in different apartments and occupied by different persons or families, each part so let, sub-let, or held and used for the purpose of human habitation, shall be deemed a dwelling-house."

In estimating, however, the number required, due allowance must of course be made for a certain percentage of Schedules being spoilt, lost, &c., and therefore a fairly liberal quantity should, in the first instance, be asked for to prevent any possibility of the supply running short during the progress of the distribution or collection, as it must be borne in mind that it may be impossible to furnish a second supply in time, should such a necessity arise.

NECESSITY FOR PROMPT COMPLIANCE WITH INSTRUCTIONS.

23. In view of the great importance of the forthcoming Census, and considering also the urgent necessity for an early and satisfactory completion of all preliminary arrangements, reliance is confidently placed in your ready compliance with all instructions which may be issued, with the object of making this national undertaking an unqualified success. Later on, the requisite cards and other forms will be forwarded in good time.

C.—SELECTION AND APPOINTMENT OF COLLECTORS.

RETURN OF APPROVED MAPS.

24. When your Enumerator's Schedule (A) and the maps of your Census District with the proposed divisions of same into Collectors' Districts marked on them have been examined, the transcript of the Schedule, containing such alterations or additions as it has been considered either desirable or necessary to make, will be returned to you. The maps, with the approved boundaries of Collectors' Districts marked on them in narrow red lines, will be returned under separate cover, which will also contain additional sectional maps to enable you to provide each of your collectors with a separate map of his own district (a list of maps sent will be attached).

SELECTION OF COLLECTORS.

25. On receipt of the maps, you will proceed with the selection of persons qualified and in other respects suitable for the position of collectors, bearing in mind that it will be necessary to obtain the services of as many collectors as there are districts in your Census District.

SERVICES OF POLICE.

26. A list giving the names and addresses, &c., of those police officers (if any) who will be available for Census work in your district, will also be sent to you.

ALLOTMENTS OF DISTRICTS TO POLICE COLLECTORS.

27. With a view to selecting the Collectors' Districts most suitable and convenient for each of the police collectors, it is suggested that you at once place yourself in communication with the officer commanding the police in your district, and obtain his views and suggestions at an early date. This will, of course, be necessary only in connection with the allocation of Collectors' Districts so far as the police collectors are concerned.

ALLOTMENT OF DISTRICTS TO CIVILIAN COLLECTORS.

28. For the remaining Collectors' Districts the services of civilians must be obtained, and in selecting the most suitable persons for the appointment, the principal fact to be borne in mind is the absolute necessity of your being able to place implicit reliance on their strict adherence to the instructions contained in the following paragraphs.

QUALIFICATIONS OF COLLECTORS.

29. To enable him to fulfil his duties satisfactorily in every respect the collector must be a person of intelligence and activity, must neither be too young nor yet too old, must read and write well, and must be sufficiently healthy and strong to undergo the exertion of performing his task with promptness. He must be of temperate habits and of sufficiently good address to convey all the requisite information concerning the Census in a manner calculated to command the goodwill and co-operation of all concerned. It will be necessary that he should be thoroughly acquainted with the Collector's District in which he is required to act, and he should therefore, by preference, all other qualifications being equal, be selected from among those applicants who have resided in the district for some time, and whose business has brought them into frequent and direct personal contact with its inhabitants.

RESIDENCE OF COLLECTORS.

30. It is further desirable that each collector should live in or near his own Collector's District, so that he may not have the additional labour of going far from home before he can begin his duties. This rule, however, is not one to which a rigid adherence is necessary, but you will in this respect exercise your own discretion, remembering that character and fitness are qualities to be considered of paramount importance.

INTERPRETERS.

31. Should there be any large number of Asiatics or other foreigners in your district who, in your opinion, are likely to be ignorant of the English language, you will endeavour, with the sanction of your Supervisor, to obtain, where necessary, the services of persons qualified to act as interpreters to accompany the collectors. There is, of course, nothing to prevent a person able to interpret, if in other respects suitable, being appointed a collector.

RATES OF REMUNERATION.

32. Except where otherwise specially authorised, it is proposed to remunerate collectors acting on foot at the rate of 10s. per diem, collectors acting on bicycles at the rate of 15s. per diem, and collectors acting on horseback at the rate of 20s. per diem; bicycles, horses, vehicles, petrol, and fodder to be provided by the collectors. Should it be found impossible to obtain suitable collectors in some of the remoter districts at the above-mentioned rates, and if it is absolutely necessary to offer higher rates to secure competent men, it will be your duty to state fully the reasons for so doing when sending in your "Enumerator's Schedule" (B).

This will also apply in cases where it will be necessary for a collector to hire camel or boat, or where any exceptional circumstances occur.

TIME TO BE ALLOWED.

33. In making arrangements with the civilian collectors, you will understand that no payment is to be allowed them for any time which may be occupied in receiving instructions from you or in giving up returns after the Census is over. An additional sum of 5s. will, however, be allowed to each collector for the work of completing and summarizing the entries in the Collector's Compilation Book.

Before submitting the name of any person for appointment as collector, it must be ascertained whether he will agree to perform the work of the distribution and collection of the Schedules within the number of days you have already suggested in "Enumerator's Schedule" (A) as being sufficient for the performance of the duties in the district for which he is recommended for appointment. He must be given to understand that the maximum payment which will be made to him will be for that number of days, with the additional 5s. mentioned above.

LIST OF PROPOSED COLLECTORS TO BE SENT TO STATE SUPERVISOR.

34. Having obtained a sufficient number of persons willing to serve as collectors in your district, and having satisfied yourself as to their fitness by making the requisite inquiries, you should, as soon as possible, prepare and send in a list for the consideration of the State Supervisor of Census on the form headed "Enumerator's Schedule" (B), stating the name, age, and occupation of such person, and the letter denoting the Collector's District to which it is proposed to appoint him, and other required particulars.

NECESSITY FOR PROMPT ATTENTION TO INSTRUCTIONS.

35. Kindly give this matter your earliest possible attention, and return to the State Supervisor Schedule (B) duly completed, so as to allow of all details being attended to without loss of time.

D.—FINAL INSTRUCTIONS.

GENERAL.

36. While the preceding instructions to Census Enumerators, namely (B) Definition of Collector's Districts, and (C) Selection and Appointment of Collectors, are being complied with, it will be your duty to make yourself thoroughly conversant with all the requirements connected with the actual taking of the Census, as set forth and indicated by the provisions of the Census and Statistics Act 1905, and in all instructions issued by the Commonwealth Statistician for the guidance of Enumerators and Collectors, and also in the instructions contained in the Householder's Schedule, &c.

PRELIMINARY WORK TO BE COMPLETED IN GOOD TIME BEFORE CENSUS DAY.

37. As the Census is to be taken as on the night of Sunday, 2nd April, 1911, you are required to take the preliminary steps pointed out in these instructions as long beforehand as possible, and to cause all necessary preparations to be completed in good time, so that nothing will remain unsettled or undecided on Census day.

APPLICATION TO BE MADE TO STATE SUPERVISOR WHERE DOUBT EXISTS AS TO DUTIES

38. If you are in doubt as to any part of your own or a collector's duties, or should not thoroughly understand the various forms or instructions, it will be necessary for you to at once communicate with your State Supervisor for advice, taking care to make use of the telegraph only when time will not permit of communicating by letter.

NEIGHBOURING ENUMERATORS TO BE CONSULTED WHERE DOUBT EXISTS AS TO EXACT BOUNDARIES.

39. In case of any doubt as to the exact boundary-line between your own and an adjoining district, you are recommended to communicate with the Enumerator of that district, and to enter into such arrangements as will enable the collectors acting on either side to locate the common boundary-line, and to act together, so that neither omissions nor overlapping may occur. You are also requested to take proper precaution that your collectors act in concert with each other, and with the collectors of adjoining districts.

PRECAUTION TO BE TAKEN TO AVOID OMISSIONS OF LOCALITIES OR INHABITANTS.

40. Prior to the commencement of the actual enumeration, you should take every precaution, and make use of the knowledge you possess or are able to gain from others relating to each Collector's District, so that the instructions you issue will effectively prevent any localities or inhabitants being overlooked by the collectors.

ENUMERATOR TO MAKE HIMSELF FAMILIAR WITH COLLECTORS' DUTIES.

41. The principal duties of the collectors are defined in Sections 8 to 15 of the Census and Statistic Act 1905, copies of which will be sent to you for your own use, and for the use of your collectors, and in the more detailed instructions to collectors, which have been drawn up for their guidance, and with these sections and instructions you should make yourself thoroughly familiar.

CENSUS SCHEDULE, BOUNDARIES OF SUB-DISTRICTS, AND DUTIES TO BE EXPLAINED TO COLLECTORS.

42. You should, some time before the actual distribution of Schedules commences, explain to such of your collectors as it is practicable for you to see, their duties, and go over the map of each Collector's District with them, carefully pointing out and explaining the boundaries of the district, so as to prevent any misconception on their part, either in connexion with the details of their duties or in regard to the exact boundaries of the districts assigned to them. You should not only fully explain to your collectors the Householder's Schedule and the manner in which the enumeration is to be performed, so that they may adopt a uniform system in carrying out their duties, but you should also take the opportunity of ascertaining whether the instructions to collectors are properly understood by each, and of giving any explanation they may require with regard to any matters which may have been left unexplained or doubtful. Where the district allotted by you to any collector comprises portions of two or more of the divisions shewn on the plan of your Census district, such as portions of two Commonwealth Electoral Divisions, portions of two Counties, &c., care must be taken to impress upon the collector the necessity for carefully ascertaining the position of the boundary between these two divisions, and for correctly inserting the name of such division in the cards delivered by him.

FORMS, ETC., TO BE SUPPLIED TO COLLECTORS IN GOOD TIME.

43. Every collector must, within four days next preceding Sunday, 2nd April, 1911, except in cases where a longer time has been approved and directed by the State Supervisor of the Census, cause to be left at every dwelling as defined by Section 10 of the Act, within his Collector's District, a copy of the Householder's Schedule to be filled up. It is therefore necessary that you should in ample time give to each collector a sufficient supply of cards, instructions, and envelopes to enable him to leave a Householder's Schedule at each dwelling in his Collector's District, together with some spare ones to provide against miscalculations or any losses or defacements. You should also see that each collector is supplied with :—

(1) His certificate of appointment.

(2) A copy of Instructions to Collectors.

(3) A complete map of his district.

(4) A copy of Collector's Compilation Book.

(5) A copy of Collector's Record.

(6) Necessary articles of stationery.

(7) A bag for holding Schedules (if required).

(8) An Enumerator's Schedule (C) specifying the number of Schedules and other things you hand over to the collector for use in connection with the Census.

On a duplicate of the Schedule (C) you should obtain a receipt from the collector for all cards and other things he has received. After the work has been completed, you are to obtain from each collector an account of the disposal of these cards and other things, and to take over from him any balance remaining with him.

CARDS AND ENVELOPES TO BE MARKED AND NUMBERED PREVIOUS TO BEING HANDED OVER TO HOUSEHOLDERS.

44. Every envelope and every Householder's and Personal Card will have the name of the State printed on it, while the number of the Census District will have to be stamped thereon by you. It will be the duty of your collectors to see that every Householder's Card before being left at the dwelling, has the name of the County, Parish, or Hundred, Federal Electoral Division, State Electoral Province, State Electoral District, Municipality or Ward, the letter of Collector's District, and the mesh number written or stamped in the place provided for that purpose. The envelope must be filled in, the Householder's Card numbered, and the name of town, &c., and street, with number and name of dwelling written on card by the collector on delivery. If the Personal Card has not been numbered by the householder, this must be done by the collector when he is collecting the Schedules. He must also at that time complete the entries on the envelope as to the number of cards.

TERMS OF ENGAGEMENT TO BE IMPRESSED UPON COLLECTORS BEFORE COMMENCEMENT OF THE WORK.

45. Before the collector commences his actual duties, you should take care to impress upon him the following, viz. :—

(*a*) That having once accepted the office of collector and signed the agreement, he will not, under Section 22 of the Census and Statistics Act 1905, be subsequently at liberty to refuse the position or neglect the performance of his duties without just cause, the penalty for refusal being £20 according to the Act cited.

(*b*) That no person employed on the Census will be entitled to payment unless he shall have faithfully performed his duties.

(*c*) That no payment in excess of five shillings will be allowed for the time taken in making up Compilation Books and Schedules after the Census is over.

(*d*) That under Section 24 of the Census and Statistics Act 1905, the Householders' Schedules and all other Census forms are confidential documents, and that any officer employed under the Commonwealth Statistician divulging the whole or any part of the contents of any form filled up in pursuance of the Act, or any information furnished in pursuance of the Act, renders himself for every such offence liable to a penalty of £50.

VESSELS ARRIVING IN PORT AFTER CENSUS NIGHT.

46. In addition to obtaining Census Schedules from all vessels in port in the Commonwealth on Census night, it will be also necessary for you to make arrangements for collecting the requisite Census information regarding all persons on board any vessel other than a warship, which on Census night was on a voyage from any port *within* the Commonwealth, and of which the first port of call after sunrise on Monday, the 3rd of April, is in your district, such vessel to be treated in the same manner as if it had been in port on Census night. In case of a vessel arriving after sunrise on Monday, 3rd of April, from any port *outside* the Commonwealth, Census Schedules will not be required. You should also cause the master of each vessel leaving any port in your district for any other port in the Commonwealth during the week preceding Sunday, the 2nd April, to be supplied with Census Schedules, so as to admit of a return being furnished without delay at the next port reached subsequent to Census night.

The collection on board any warships which may be in port in your district will be arranged for by your Supervisor.

VACANCIES IN POSITIONS OF COLLECTORS.

47. Should you deem it advisable for any reason to recommend the removal of a collector after his appointment, you should at once submit your reasons to the Supervisor of your State, who, if he concurs, will then cause such collector to be removed. If any collector should be incapacitated from acting, you must at once take the necessary steps to procure a substitute, whom you may appoint temporarily, pending the approval of the Supervisor. You should report any vacancy, by telegram if necessary, to the Supervisor, and submit a proposal how to fill it, in order that such appointment may be duly approved without delay.

VACANCIES IN POSITIONS OF ENUMERATORS.

48. Should you be prevented by sudden illness or other unavoidable cause from carrying out your duties in connection with the Census, you are requested to at once communicate the fact to the Supervisor of your State, by telegram if possible, but should there not be sufficient time to enable the Supervisor to appoint a successor, you should at once depute some fit and proper person to act for you, who, if approved of, will be subsequently appointed in the ordinary course.

CENSUS SCHEDULES AND OTHER FORMS TO BE EXAMINED BY ENUMERATORS.

49. You should bear in mind that you are required to receive the Householders' Schedules from your collectors as early as practicable after each of them has completed his work of collection. As they are received, you must examine them separately and see that they are properly filled in and that the collectors have faithfully performed their duties, and in case of mistakes or omissions of any kind, you must insist on their being rectified or supplied, as the case may be. You must examine and satisfy yourself that the special distinguishing letter of the Collector's District, as well as the requisite names of County, Electoral Division, &c., are duly and properly filled in, and that the number of Personal Cards in each envelope agrees with the summary shewn on the Householder's Card. Any defect must be rectified before the Schedules are sent on to the Supervisor. You will also examine the Collectors' Compilation Books so as to ascertain that they have been correctly filled in before you forward them on. Each Collector's Compilation Book must be signed by you on the last page, and the correctness of the entries certified. As you have the selection of your civilian collectors, you will naturally take upon yourself the responsibility for their being competent to perform their work properly.

PRECAUTIONS CONCERNING POSSIBLE OMISSION OF TRAVELLERS.

50. In all cases where you have reason to believe that travellers or others have camped out in any part of your Census District on the night of Sunday, the 2nd of April, and where you have received no returns respecting them, you must be particular to inquire carefully into the matter. You must also examine the returns of travellers, &c., sent in by the different collectors, and if you have reason to believe that all have not been taken into account, you should forward your estimate of the possible omissions, together with the data on which such estimate is founded.

INQUIRY TO BE MADE OF ALL VESSELS REACHING PORT WITHIN A WEEK FOLLOWING CENSUS DAY.

51. The arrival of every vessel in any port of your district from any port within the Commonwealth is to be closely watched for the first week after the night of the Census, and inquiries immediately made in each case as to whether a Census Schedule has been filled in, and if so, to whom it has been delivered. If not, the Schedule must be filled in with all the requisite particulars before passengers or others leave.

TRANSMISSION OF PRELIMINARY RETURNS TO COMMONWEALTH STATISTICIAN AND TO STATE SUPERVISOR.

52. Immediately upon receipt of the complete returns from each Collector's District, you will make arrangements for checking the summary in the Collector's Compilation Book, so far as the number of males and females is concerned, and at the earliest possible moment you will send by letter (or by telegraph, if specially instructed to do so) both to the Supervisor of your State and the Commonwealth Statistician, the total number of males and females respectively in each Collector's District, exclusive of aboriginals, to enable a preliminary statement of the population to be issued as early as possible. These letters or telegrams should be sent as the returns for each Collector's District come to hand, and should not be kept back until the whole Census District is complete.

TRANSMISSION OF COMPLETE RETURNS TO STATE SUPERVISOR.

53. You will carefully attend to the instructions respecting the time for the transmission of the Schedules and other documents to the Supervisor of your State, taking care that every parcel has clearly recorded on it the number of the Census District and the letter of the Collector's District to which it belongs. The returns should include Collector's Compilation and Record Books, the former of which should be certified to by you, on the last page, as to their correctness, and should also be accompanied by a summary for the district on Enumerator's Schedule, and a statement as to the number of cards, &c., made out on Enumerator's Schedule.

UNUSED FORMS TO BE RETURNED TO STATE SUPERVISOR.

54. After the whole of the work connected with the Census is completed, you should cause to be returned to the Supervisor all unused forms, schedules, or any other articles supplied in connection with the work.

LETTERS NOT TO BE INCLUDED IN PARCELS.

55. Letters are not to be enclosed in the parcels of Schedules or other documents, as such parcels may occasionally not be opened for some days after their arrival at the Census Bureau.

ENUMERATOR NOT TO INCUR EXPENDITURE EXCEPT UNDER AUTHORITY OF STATE SUPERVISOR.

56. Except in cases of extreme emergency, you are not to incur any liability on behalf of the Government, nor commit the Government to any expenditure, without having first referred to your State Supervisor on the subject, and having through him obtained the necessary authority.

SENDING IN OF VOUCHERS.

57. When forwarding the Census Schedules to the State Supervisor, you will at the same time send in a voucher on Commonwealth Form No. 9 for the amount for which you have yourself contracted to act as Enumerator. Each of your collectors, on completion of his work, will forward to you on Commonwealth Form No. 9, an account for the amount due to him. On receipt of these accounts, you will carefully examine them and certify them as correct. You will then forward them to the postmaster, at the post office previously notified to you, for payment, and notify the collectors when the accounts have gone forward for payment.

In examining the collectors' accounts you will have to be particularly careful to ascertain that where collectors have been employed to act otherwise than on foot, and where an increased remuneration per diem is allowed on that account, the modes of conveyance stipulated for were actually used, and that the Government is not improperly charged with the extra allowance when the work has been performed on foot.

ARRANGEMENTS WITH POSTAL AUTHORITIES.

58. You will be furnished by your State Supervisor with a supply of postage stamps for outward letters and telegrams, and for payment for letters and telegrams received from the collectors. You will, when necessary, requisition the State Supervisor for a supply of postage stamps, and on the receipt of the supply forward an acknowledgement to the State Supervisor. You will keep a "Stamp Account" in the form shewn in the Appendix to "Financial Instructions," of which a copy is forwarded to you, together with the present Instructions.

NO PARTICULARS AS TO RESULTS TO BE DIVULGED BY ENUMERATORS.

59. It must be clearly understood that no summary or abstract of the information collected in your district is to be supplied by you to the press, or to any individual whatsoever, excepting the Commonwealth Statistician or the State Supervisor of the Census, but that any information with regard to the result of the Census which it may be considered desirable to publish will be furnished by the State Supervisor of the Census, to whom all inquiries should be referred.

(Signed) G. H. KNIBBS,
Commonwealth Statistician.

Commonwealth Bureau of Census and Statistics,
Melbourne, 30th September, 1910.

APPENDIX 9.

INSTRUCTIONS TO COLLECTORS.

UNDERTAKING AND DECLARATION TO BE SIGNED BY COLLECTOR ON APPOINTMENT.

1. When your appointment as a collector has been approved by the State Supervisor, you will be required to give an undertaking which will be submitted to you by the Enumerator. That document, Census Form No. 16, contains in specific terms the conditions under which you are engaged. Under Section 7 of the Census and Statistics Act 1905, you will also have to make a declaration of secrecy before a Justice of the Peace or a Commissioner for Affidavits. This declaration will be made on Census Form No. 11.

COLLECTOR TO MAKE HIMSELF THOROUGHLY ACQUAINTED WITH HIS DUTIES AND TO CONSULT ENUMERATOR IN CASE OF DOUBT.

2. You will receive from the Enumerator a copy of these instructions, which you must read over and thoroughly master before you commence your duties. You must also make yourself thoroughly acquainted with the instructions accompanying the Householders' Schedules, and with those sections of the Census and Statistics Act, principally sections 8 to 15, which particularly pertain to you. A copy of the Act is forwarded to you with these instructions. You should also make yourself acquainted with the manner in which the entries should be made by the householder and others, and if the directions given are not absolutely clear to you, you should, without delay, consult your Enumerator, whose duty it is to afford you the requisite explanation.

CENSUS COLLECTION ON CARDS.

3. Your attention is specially drawn to the fact that on the present occasion the collection of the Census data will be effected on Cards, instead of on Schedules, as on former occasions. For every dwelling there will be one or more "Householders' Cards" (B), containing a description of the dwelling and a summary of the inmates, and one "Personal Card" (A) for each inmate. Each Personal Card will be accompanied by a printed list of "Instructions" (C) for guidance in filling in the cards. The cards and instructions are enclosed in one or more "Envelopes" (D), and throughout these instructions where a "Householder's Schedule" is referred to, that term signifies the number of Householders' Cards and Personal Cards which are required for a dwelling. The "Instructions" and "Envelopes" are supplementary to the Schedule, and have been adopted or the greater convenience of householders and collectors.

MAP OF COLLECTOR'S DISTRICT TO BE SUPPLIED TO COLLECTOR.

4. You will be supplied with a map of your Collector's District to assist you in thoroughly comprehending its boundaries, and in ascertaining whether you have visited all parts of it. Should you, however, still entertain any doubt about the boundaries, you should confer with your Enumerator, and so arrange that you neither omit any portion of your own district nor enter that of any other collector.

The names of the various electoral and other divisions in which the district allotted to you is situated are shewn on the plan of your district, and are to be carefully inserted by you on all the Householders' Cards delivered. These divisions comprise counties, parishes, or hundreds, Commonwealth electoral divisions, State electoral districts, State electoral provinces, municipalities, and, in certain cases, municipal wards. Where the district allotted to you consists of portions of two or more of these divisions, such as portions of two or more counties, or portions of two or more Commonwealth electoral divisions, &c., care must be taken by you to ascertain the exact position of the boundary between such divisions, so as to insure the correct entry by you on the cards delivered. In every case the mesh number must be carefully inserted.

HOUSEHOLDERS' SCHEDULES, COMPILATION AND RECORD BOOKS, STATIONERY, ETC., TO BE SUPPLIED TO COLLECTOR.

5. The Enumerator will supply you, for use in connection with the Census, with the following forms and other articles to aid you in the performance of your duties :—

(1) The requisite number of Householders' Schedules, comprising (*a*) Householders' Cards and (*b*) Personal Cards, with the addition of (*c*) Instructions, and (*d*) Envelopes.

(2) A copy of Collector's Compilation Book.

(3) A copy of Collector's Record Book.

(4) A list of Schedules and other things to be accounted for by you to the Enumerator on Enumerator's Schedule (*c*).

(5) Necessary articles of Stationery.

(6) Bag for holding Schedules (if required).

(7) Your Certificate of Appointment.

(8) A complete Map of your District.

NUMBERING OF HOUSEHOLDERS' SCHEDULES.

6. The name of the State will be printed, and the number of the Census District will be stamped on all cards and envelopes issued to you. The name of county, parish, or hundred, Federal electoral division, State electoral district, State electoral province, municipality, and ward, the letter of Collector's District, the number of the Householder's Schedule, the name of town, &c., and street, with number or name of dwelling must be written on each Householder's Card prior to delivery. The blank spaces on Personal Cards and envelopes, with the exception of those referring to the number of cards, must be filled in by you when delivering the Schedules. The number of the Personal Card, if it has not been filled in by the householder, must be filled in by you when you are collecting the Schedules. At the same time, you must make entries on the envelope relating to the number of cards which it contains. Do not put blank cards or returned instructions in the envelopes when collecting the Schedules, and in all cases, when collecting, see that the number of completed Personal Cards agrees with the summary on the Householder's Card.

DISTRIBUTION OF SCHEDULES ON OR BEFORE 2ND APRIL.

7. On the four days preceding Sunday, 2nd April, or at such time prior thereto as the Enumerator, on behalf of the Supervisor, may direct, you are to leave within your district at every dwelling (as defined in Section 3 of the Census and Statistics Act) one or more Schedules as required, care being taken to ascertain in each case the number of Householders' and Personal Cards and of envelopes which will be needed. Each such Schedule must contain one or more Householders' Cards, and as many Personal Cards as the householder estimates will at most be required. Each Personal Card must be accompanied by a set of the instructions for filling in the Householder's Schedule. When distributing the Schedules, you should explain the nature and importance of the returns required, and the obligation imposed by law upon each occupier to give a complete and accurate statement. You should also state that the Schedule will be called for on Monday, 3rd April, or as early as possible after that date, by which time it must be completed and ready to be delivered. You should strongly impress upon the householder the necessity for complying with this provision, informing him of the penalty incurred by non-compliance, and urging that special care should be taken to prevent the loss or defacement of the returns. You should also specially inform and impress upon persons in charge of hotels, lodging-houses, &c., that they will be required to give full particulars respecting every person who slept or abode on the premises under their control on the night of Sunday, 2nd April, and that they are similarly subject to penalty for non-compliance.

A number of births and deaths will, of course, occur during the night of the Census. As the hour of midnight is the exact time at which the population is to be determined, children born before twelve o'clock on the night of 2nd April should be *included*, and those born after twelve o'clock, that is, in the early hours of 3rd April, should be *excluded*. Persons who died before twelve o'clock on the night of 2nd April should be *excluded*, while those who were still alive at midnight, but died in the early hours of 3rd April, should be *included*.

SCHEDULES FOR OUT-STATIONS TO BE FURNISHED BY PROPRIETOR OR PERSON IN CHARGE OF STATION.

8. Proprietors or persons in charge of pastoral holdings should be asked to furnish for every out-station in your Collector's District such particulars as would have been required of the occupier of such out-station if a Schedule had been left with him.

You should make careful inquiries at each station as to the number of Schedules needed for out-stations, and leave them, with instructions for their use, with the proprietor or person in charge. Where there is a separate tenement of any kind, either on the station or at out-stations occupied by any member of the establishment, full particulars relative to each such tenement and its occupants must be supplied in a separate Householder's Schedule.

ENTRIES TO BE MADE IN RECORD BOOK.

9. When distributing the Schedules, the name of each householder with whom a Schedule has been left, together with the locality, the number of the Schedule, and the date of delivery, must be *immediately* entered in your Record Book, and the date when collected must be inserted when the Schedule is received duly completed. By doing this, you will be able to ascertain when all the Schedules delivered have been collected. In the event of a Schedule being lost or defaced "Lost, Schedule No.....substituted" (No. to be given) must be written in the remarks column.

COLLECTION OF SCHEDULES ON OR AFTER 3RD APRIL.

10. On the morning of Monday, 3rd April, taking with you some blank cards and envelopes for the purpose of supplying any possible omissions in the distribution, or for use in place of any that may have been lost or defaced, you will proceed to revisit every dwelling or other place in your district at which you have left a Schedule, and you must continue your work on the following day or days until the whole of the forms which were distributed have been recovered. If you cannot complete the collection in your district within the time allowed by your Enumerator, you are still bound to continue until you have completed your work.

RETURNS TO BE CAREFULLY EXAMINED AND COMPLETED WHERE NECESSARY.

11. At each place visited, the Schedules previously left must be asked for, and when they are given up, you must ascertain if they contain all the particulars required, and if not, you must endeavour to obtain such further information as is necessary. You must be careful to ask if all the persons are accounted for who, on the night of the 2nd April, slept or abode in the dwelling or in the part thereof which is occupied by the person making the return.

PERSONS RETURNING ON 3RD APRIL TO BE INCLUDED IN SCHEDULE IF NOT ELSEWHERE ENUMERATED.

12. Inquiries should also be made whether any one who was travelling or out at work during the night of the 2nd April returned to the dwelling on Monday, the 3rd April. If such is the case, and the person has not been elsewhere included, a Personal Card must be inserted in the same manner as if the person had slept or abode in the dwelling during the Census night, and the person must be duly noted in the summary on the Householder's Card.

ABSENTEES NOT RETURNING ON 3RD APRIL.

13. If any member of the household was absent on the night of the 2nd April, and did not return on Monday, 3rd April, inquiry must be made whether there is reason to suppose that in consequence of his having been travelling in the bush, out camping, fishing, or otherwise engaged, he is likely not to have been recorded on any Schedule. If this is considered probable, you should enter on a Personal Card and on a Householder's Card the full particulars concerning such person as far as they can be ascertained, with a note stating as definitely as possible the locality in which the absent person spent the night of 2nd April.

TWO OR MORE SCHEDULES TO BE IN SOME CASES OBTAINED FROM THE SAME BUILDING.

14. You must notice whether a Householder's Schedule is a return for the *whole* building or for a *part* of it only, and in case the building is occupied by more than one family, you must obtain returns for the other part or parts of it upon separate Schedules. In large households, such as hotels, &c., more than one Householder's Card will often be required. These must be pinned together in the upper left-hand corner, and marked in the proper place "Householder's Card No.....(A), (B), &c." In such a case, the description of the building should be given on the top card only. Similarly, a sufficient supply of envelopes to contain the cards should be left, such envelopes to be marked "No.....(A), (B), &c."

SCHEDULE TO BE PLACED UNDER DOOR IF INMATES ARE ABSENT.

15. If in the case of a dwelling in which someone resides or appears to be residing, you find no one at home when you call, a Schedule should be placed under the door or left with a neighbour. If, on returning for the Schedule, you should again find no one at home, and if the papers have not been left out for you, you should call again and endeavour to meet the occupier. Should you be unable to do so after two or three attempts, you should fill in the Schedule from information obtained from the neighbours or from some other person acquainted with the inmates, in which case the dwelling may be considered as properly visited.

CIVILIZED AND SEMI-CIVILIZED ABORIGINALS ONLY TO BE ENUMERATED.

16. All aboriginals and half-caste aboriginals who are civilized or semi-civilized, and who are either in employment or living in proximity to settlements are to be enumerated, care being taken that in every case a distinguishing abbreviation "Ab." (aboriginal) or "Ab. H.C." (aboriginal half-caste) as the case may be, is inserted after the word "Race" on line 10 of the Personal Card. You should ascertain the various particulars required as fully as possible, although it is probable that in many instances very little information will be obtainable. In every case, however, the sex must be stated. No attempt need be made to obtain any particulars concerning aboriginals in your district who are living in a purely wild state.

COLLECTOR TO ASSIST HOUSEHOLDER, WHERE NECESSARY, IN COMPLETING RETURN.

17. If on inquiry for the Householder's Schedule it is delivered to you not filled in, or in an incomplete state, you must yourself fill in the requisite particulars after asking all the necessary questions. You should, if possible, see the head of the household for that purpose and obtain the details. In the absence of the head of the household, any other member possessing the requisite intelligence may supply the particulars required. It is also your duty to help those who, through being illiterate or from other causes, are unable to personally fill in their Schedule, and you may fill in any part or, if necessary, all the particulars for such persons. The informant, however, must, in each case, personally sign his name or attach his mark (which is to be witnessed by you) on the Householder's Card, as a guarantee that the particulars are authentic.

SCHEDULE TO BE SUBSTITUTED FOR ANY LOST OR DEFACED.

18. If you are unable to receive certain of the Schedules you distributed by reason of their having been defaced or lost, you must put the requisite questions to the inmates, and from the answers given fill in the information required on one of the spare Schedules you have with you for the purpose. The substituted Schedule should be marked "Substituted for Schedule, No....." (giving the number of the Schedule lost or defaced).

EVERY EFFORT TO BE MADE TO ASCERTAIN REQUIRED PARTICULARS.

19. In every possible instance, the full particulars required under each heading should be obtained, and you may enter "not stated" on any line only after every effort has, without success, been made to secure the required information. This rule must be observed as regards all omissions in the Schedule.

PARTIAL INFORMATION TO BE SUPPLIED WHEN FULL INFORMATION IS NOT AVAILABLE.

20. You must not, however, omit to fill in a Personal Card and to enter persons on the Householder's Card, if you cannot obtain all the information respecting them. If, for instance, you obtain information that a person, who has since gone away and whose name is unknown, slept in a dwelling or camped out in a certain place on the night of the 2nd April, you should fill in a Householder's and a Personal Card for such person, writing "not known" on line 1 of the Personal Card, but stating the sex and adding such other particulars as to age, &c., as can be ascertained or estimated.

REFUSAL TO SUPPLY INFORMATION.

21. Should any person refuse to make either returns or to answer any of the questions you are authorized to put, you should remind them that under Section 11 of the Act the penalty for not filling in the Schedule is £10, and under Section 14 the penalty for not answering a collector's necessary question is £10, and under Section 15 the penalty for not giving the required information as to absent persons is £10. You should also warn persons whom you may suspect of giving false information, that under Section 26 of the Act "any person who shall knowingly make in any form or document filled up or supplied in pursuance of this Act, or in answer to any question asked him under the authority of this Act, any statement that is untrue in any material particular is liable to a penalty of £50."

Should such person still persist in refusing to supply information or in supplying it untruly, you should at once report the matter to the Enumerator, so that the requisite steps may be taken to enforce compliance with the law. You should also point out that the information sought is confidential and is asked for, not out of mere curiosity, but for general use, and if necessary you should draw attention to Section 24 of the Census and Statistics Act, under which any officer who, except as allowed by this Act, divulges the contents of any form filled up in pursuance of this Act or any information furnished in pursuance of this Act, is liable to a penalty of £50.

HOUSES "UNINHABITED" AND "BEING BUILT."

22. You should fill in a separate Householder's Card relative to each house intended for a residence which may be uninhabited or in course of erection at the date of the Census, giving the particulars required on the Householder's Card as far as it is possible for you to do so. The word "uninhabited" or "being built," as the case may be, should be written across the card. No account is to be taken of buildings such as churches, stores, &c., in which nobody sleeps, and which are not used nor intended to be used either wholly or in part as dwellings.

CERTAIN COMPARTMENTS NOT TO BE CONSIDERED AS ROOMS.

23. Unless some one sleeps therein, shops, offices, stores, bathrooms, pantries, and outhouses, are not to be considered as "rooms." In the case of public offices, banks, stores, &c., in which a person or family resides in order to take care of the premises, only the number of rooms occupied by such person or family is to be given, and not the total number in the building.

PERSONS CAMPING OUT ON CENSUS NIGHT TO BE DULY ENUMERATED.

24. You are required to fill in one or more Schedules with particulars respecting any travellers or persons you may find camping out or sleeping in the open on the Census night. You should also make inquiry and furnish an estimate respecting the number, sex, &c., of any such persons whom you may ascertain were in your district on that night, but whom you did not succeed in meeting, so as to insure that every person who was in your district on the night of the 2nd April, with the exception of aborigines living in the wild state, has been duly accounted for. In such cases enter in the line "Street, &c.," the word "Camper-out," "Travelling," &c., as the case may be.

INK TO BE USED BY COLLECTORS IN MAKING ENTRIES.

25. All entries made in the Schedules by you must be made in ink.

ERRORS TO BE STRUCK OUT, NOT ERASED.

26. In case of a correction having to be made, the incorrect information must be carefully struck out, *not erased*, and every alteration thus made must be initialled by you.

COLLECTOR TO INITIAL ENVELOPE.

27. When satisfied as to the correctness of all the cards contained in an envelope, you should initial each envelope in the left-hand lower corner.

SCHEDULES TO BE EXAMINED AND OMITTED INFORMATION SUPPLIED.

28. When you have collected the Schedules you must examine them to ascertain that all those distributed have been returned to you, and that each card is properly filled in. In case of omissions in either respect, you should, with the utmost promptness, take steps to obtain the information omitted.

SCHEDULES TO BE ARRANGED, CERTIFIED, AND RETURNED TO ENUMERATOR.

29. The filled-in cards are to be left in their envelopes and the envelopes stacked to a convenient height in their proper numerical order so as to make a suitable parcel, each such parcel having the number of the district and the letter of the Collector's District marked on the outside. The Collector's Compilation and Record Books, duly completed, should also be enclosed, together with a declaration on Census Form 25, signed by you before a Justice of the Peace. These parcels must be delivered to the Enumerator as early as possible after all the forms have been completed and received by you.

SURPLUS SCHEDULES TO BE RETURNED TO ENUMERATOR.

30. After the work has been completed, all surplus cards, instructions, and envelopes, and any other things used in connexion with the Census are to be forwarded to the Enumerator, together with a list of the same in duplicate, one copy of which will be duly signed by the Enumerator and returned to you as a receipt.

ENTRIES IN COMPILATION BOOK TO BE MADE DAILY.

31. After completing the outdoor portion of each day's work, you should, whilst the distribution is progressing, proceed during the evening to make entries in your Compilation Book, concerning the Householders' Schedules which you have distributed or collected during the day, and thus keep the compilation in a forward state so as to enable you to deliver your returns to the Enumerator as early as possible after the collection has been completed. The additional information required in the Compilation Book relative to the number of persons recorded on each Schedule should, whilst the collection is going on, be entered every evening from the Householder's Schedules collected that day.

DISTRICT AND COLLECTOR TO BE SPECIFIED ON FRONT PAGE.

32. The distinguishing letter of your district must be stated on the first page in addition to your own name; if the Enumerator should omit to insert these particulars, you are to enter them yourself.

SCHEDULE LOST OR DEFACED TO BE ACCOUNTED FOR.

33. The number of every Schedule must be entered consecutively in the proper column. If a Schedule should be lost or defaced at the dwelling where it was left, and another substituted, the words "Lost, Schedule No.....substituted" (No. to be given) must be added after the number of the lost Schedule, and a note made of the circumstances in the column headed " Remarks," so that the missing Schedule may be accounted for.

ABORIGINALS.

34. The only persons not legally forming part of the population of the Commonwealth are Full-blooded Aboriginals. Any such enumerated must be included in the first two columns headed " Total Number of Persons," &c., but they must subsequently be shown separately according to their sex in the following columns. Half-caste Aboriginals, Chinese, and other Asiatics, whether full or half-caste, are *not* to be shown separately, but care must be taken that they are distinguished as such on line 10 of the Personal Card.

CASES OF MORE THAN ONE SCHEDULE TO A BUILDING TO BE NOTED.

35. In every case where a building is subdivided between different householders, the fact is to be recorded in the column headed " Remarks" in your Compilation Book, so as to shew the number of houses as distinguished from the number of Schedules.

SCHEDULES AFFECTED BY REMOVALS TO BE NOTED.

36. If, owing to removals or other causes, you cannot recover certain Schedules distributed by you, you must note the circumstances opposite the numbers of such Schedules respectively. If, on the other hand, you receive Schedules distributed in other districts, you should enter them after your own and make a note that they were distributed by other collectors.

TOTALS NOT TO BE CARRIED FORWARD TO NEXT PAGE.

37. The totals at the bottom of each page are not to be carried on to the next page, but are to be copied into the Summary Form at the end of the book. This Summary is then to be added up so as to show upon one line the required particulars respecting your whole Collector's District.

ESTIMATE TO BE MADE OF DISTANCE TRAVELLED.

38. At the end of each day's work a careful estimate should be made of the number of miles travelled by you during the day, and the total distance travelled in the work of distributing and collecting the Schedules in your district should be inserted in the space provided for the purpose at the foot of the Summary in your Compilation Book.

ACCOUNT OF HOUSEHOLDERS' SCHEDULES AND " CERTIFICATE OF COLLECTOR."

39. All cards, instructions, and envelopes received by you are to be duly accounted for in the form provided for that purpose at the beginning of the book. All completed cards contained in each envelope must be duly accounted for in the space provided for that purpose on the envelope. No blank cards or returned instructions should be included in the envelope together with the completed cards. The " Certificate of Collector" on the last page of the book must be signed by you before the book is returned to the Enumerator.

CERTIFICATE OF APPOINTMENT AND INSTRUCTIONS TO BE CARRIED BY COLLECTOR.

40. You should carry your certificate of appointment and a copy of these instructions with you in case your authority to carry out the provisions of the Act should be questioned.

CENSUS RETURNS STRICTLY CONFIDENTIAL.

41. You will remember that by Section 24 of the Census and Statistics Act 1905 all Census returns are confidential documents, and that any officer divulging their contents is liable to a penalty of £50. You are not therefore either directly or indirectly to divulge or make use of any information collected or acquired by you in connection with your duty as collector.

STATE SUPERVISOR TO BE COMMUNICATED WITH ONLY IN CASES OF EXTREME URGENCY.

42. In a general way, and in all questions regarding your duties, you are to address your Enumerator. In urgent cases, however, as, for instance, if a further supply of Schedules should be wanted at the last moment, you may, when the Enumerator is not conveniently at hand, write or telegraph direct to your State Supervisor.

ARRANGEMENTS WITH POSTAL AUTHORITIES.

43. Each collector shall forward all correspondence with the Enumerator or State Supervisor in envelopes supplied for that purpose. Postage stamps for these will not be required, since the postage will be paid by the Enumerator or State Supervisor on receipt.

TELEGRAMS TO BE SENT IN URGENT CASES ONLY.

44. You will understand that, wherever possible, communications are to be made by letter in preference to telegrams, the latter being sent only in urgent cases not admitting of the delay incident on the transmission of a letter. When telegrams are sent, the matter is to be condensed into as few words as possible. All telegrams sent by a collector to the Enumerator or State Supervisor must be marked "Collect," and the collector, when sending a telegram, must produce to the telegraph officer his certificate of appointment as evidence thereof.

HOUSEHOLDERS' SCHEDULES TO BE DISTRIBUTED ON BOARD SHIPS WHERE SUB-DISTRICT INCLUDES SHIPPING.

45. No special shipping Schedules have been printed, and in the event of your sub-district consisting either wholly or in part of shipping, you will receive from the Enumerator a sufficient number of ordinary Householders' Schedules, which should be distributed by you on or before Saturday, 1st April, to the masters or persons in charge of all vessels in port in your sub-district.

You are required, on all Householders' Cards used for shipping, to strike, out the three lines—

(1) Nature of building;

(2) Material of which outer walls are built;

(3) Number of rooms;

and to substitute therefor—

(1) Kind of vessel;

(2) Material of which built;

(3) Net registered tonnage.

No reply will, of course, be required to questions (4) and (5).

COLLECTION OF SCHEDULES ON BOARD SHIPPING.

46. On Monday, 3rd April, you will proceed to collect the Schedules previously distributed, and in the case of any vessel, which has arrived in the port on Sunday, the 2nd April, without a Census Schedule on board, you will furnish the master or person in charge with such a Schedule to be filled in.

ALL PERSONS ON BOARD TO BE ACCOUNTED FOR.

47. Every person who slept or abode on board during the night of Sunday, 2nd April, whether officer, member of crew, passenger, or visitor, should be accounted for on the Schedule; but no person should be included who was absent from the vessel on that night, unless such person returns on Monday, 3rd April, and has not been elsewhere accounted for.

VESSELS ARRIVING IN PORT WITHIN A WEEK OF CENSUS NIGHT.

48. Inquiry must also be made of every vessel which arrives at the port within a week of Census night, whether its last port of call was in the Commonwealth, and if it was, whether a Census Schedule has already been supplied elsewhere. If no Schedule has been supplied, one must be duly filled in, giving the requisite particulars relative to every individual on board that vessel at the time of arrival, in the same manner as if it had been in port during Census night. In the case of a vessel arriving after sunrise on Monday, the 3rd April, from a port outside the Commonwealth, a Census Schedule will not be required.

RECORD AND COMPILATION BOOKS TO BE USED.

49. When distributing and collecting Schedules on board ships, entries should be made in your Record and Compilation Books similar to those made in connection with Schedules distributed on land. As far as the circumstances of the case will permit, all instructions herein given apply also to Schedules distributed on board ship.

HOUSEHOLDERS' SCHEDULES TO BE PLACED ON BOARD VESSELS LEAVING FOR OTHER COMMONWEALTH PORTS WITHIN A WEEK PREVIOUS TO CENSUS.

50. Every vessel leaving any port in your Collector's District for any other port in the Commonwealth on any date within a week prior to the 2nd April must have a supply of cards, instructions, and envelopes placed on board, so as to admit of a return being furnished without delay at the next port reached subsequent to Census night.

(Signed) G. H. KNIBBS,
Commonwealth Statistician.

Commonwealth Bureau of Census and Statistics,
Melbourne, 30th September, 1910.

APPENDIX 10.

REPORTS OF STATE SUPERVISORS ON THE COLLECTION OF DATA FOR THE CENSUS OF 3rd APRIL, 1911.

I.—NEW SOUTH WALES.

Having completed the period for which I was appointed Supervisor of the Census for New South Wales, I desire to make the following remarks on some of the features of the past Census.

Neither floods nor drought interfered with the distribution and collection of the returns. The only districts affected at all were Bourke, Brewarrina, and Walgett, and no delay was occasioned, as the enumerators anticipated any possibility thereof by allowing the collectors extra time to carry out their work.

I am not aware of any special difficulties suffered by, nor were special arrangements made for the conveyance of, the collectors.

In respect of the enumeration of travellers on trains, some difficulty was experienced in making arrangements with the Chief Commissioner. My first suggestion, that guards or other railway employees should collect, was not approved, and not until the Saturday preceding the Census Day would the Commissioner suggest an alternative, and then only after very strong personal representations had been made by me as to the liability of the railway authorities to assist the Commonwealth in the work of collecting the Census on the trains. This delay on the part of the Commissioners probably contributed to the loss of some travellers on the trains. Cards were handed to each passenger travelling on Sunday night, April 2nd, with a pamphlet instructing him to hand the filled-in cards to the Station Master on arrival at his destination. Lists of travellers not receiving cards from the railway officials were received at this office from the railway authorities. Those persons were promptly communicated with, and in this way a number of travellers were enumerated who otherwise would have been missed.

Special arrangements were not made for the enumeration of shipping and vessels in ports other than Port Jackson, beyond those given in the " Instructions," but each enumerator was directed to take every precaution to avoid missing any people on board or travelling by ships.

The services of the police were not available until strong representations had been made by me as to the absolute necessity of their employment in districts where the enumerators stated it was impossible to obtain civilian collectors. Police were employed in the districts—Patrick's Plains, Nyngan and Wyalong, the last district being, with the exception of one sub-district, collected entirely by police officers. Without their assistance the enumerator at Wyalong would have fared badly. Their assistance was also given to two collectors in the City of Sydney in obtaining particulars of "Domain Dwellers " and others of the" outdoor" dwelling type. In North Sydney, Pittwater, and Manly the police assisted the collectors in obtaining particulars of "week-end campers."

Chinese Interpreters were employed in the following districts :—City of Sydney, Marrickville, Deniliquin, Hay, and Narrandera, and it was expected a Syrian Interpreter would be necessary in Broken Hill.

In the City of Sydney also a small fee was paid to a collector who had a knowledge of French and Italian, to collect particulars of a few families who did not understand the English language.

Strong representations by circular were made to each enumerator to be very careful in the collection of "migratory" people, such as rabbitters, gum-getters and others whose occupation causes them to be continually on the move.

As regards the correspondence and other papers, some of the files have not been written up, and the indexing is not done. All letters, except those from the enumerators asking for Census material, have been put into the files, but the majority of the prècis sheets have not been written up. The pressure of work at a critical time caused these matters to get into arrears, which have never been overtaken. Mr. Aland is aware of all the conditions of these matters.

(Signed) JOHN B. TRIVETT,
State Supervisor of Census, New South Wales.

6th *October*, 1911.

II.—VICTORIA.

Referring to your letters of 19th May and 10th June last, I have the honour to submit a report on the main features of the recent Census in this State.

In accordance with your request I beg to give information in regard to the special points detailed by you, as follows :—

DESPATCH OF CENSUS MATERIALS TO COLLECTORS.

I am unable to state the exact dates on which the Census materials were sent to collectors, as these were issued by the enumerators. I think it probable, however, that the earliest date would be not more than three weeks prior to the Census date.

The first batch of letters of appointment to enumerators was issued from this office on 31st December, 75 letters being despatched on that date. In each letter was enclosed a copy of the form " Instructions to Enumerators," and forms of Declaration and Undertaking to be signed. On 13th January each of the enumerators who had been appointed received copies of the forms "Instructions to Collectors," "Financial Instructions," and "Census Act." The other enumerators received forms containing instructions as they were appointed.

The first materials despatched to enumerators were O.S. Postage Stamps, Envelopes, Foolscap for stamp account and Contingency Forms. On 27th January a supply of stamps was sent to each of the enumerators whose appointments had been approved, and in the same packet were enclosed the envelopes, etc., mentioned above. The packets were sent by parcel post for safety. Originally, £3 in O.S. stamps were sent to each of the country, and £2 to each of the town enumerators. Further supplies were issued as desired.

Postage Stamps.—A great deal of work was thrown on the State Supervisor and his staff, also on the enumerators, through it being necessary to stamp all letters. A great saving of time would be effected if an arrangement could be made with the Post Office, that all Census material should be carried by it without stamps being affixed thereto. I understand that this arrangement was in operation in Victoria in 1901.

Supplies of schedules, cards, etc., were sent to the outlying country districts first, the earliest issue being on 21st February to Districts Nos. 32, 38, 45, 73, and 89. The last districts to receive supplies were Nos. 24, 25, 26, and 27, the papers for which were issued on 14th March. Supplementary cards, forms, etc., were issued at the request of the enumerators. A considerable amount of correspondence with enumerators was entailed through the latter overestimating the number of cards required. The personal cards actually issued by the State Supervisor exceeded the estimated number of persons in the districts by over 30 per cent. The number asked for by enumerators was much greater.

The cards for the country districts were packed in boxes of convenient size obtained principally from dealers. The schedules of instructions, bags and other light material were in many cases enclosed in sacks. In the case of town districts, the materials were despatched by van, and an officer accompanied the carrier to see that each enumerator received the supply allotted to him. In a few instances boxes were lent to the enumerators for storage purposes and for use when returning the cards.

The bulk of the country despatch work was carried out through the agency of Messrs. Permewan, Wright and Company, through whom also most of the completed cards were returned by the enumerators. The firm of carriers which attended to the town delivery was Mayne, Nickless and Company, their van being employed by the day. With the office records of the Census are included despatch sheets shewing the number of cards, forms, etc., forwarded to each enumerator.

The district maps and Schedules A and B were sent to the enumerators at the same time. The first packets were despatched on 21st January to Districts Nos. 44, 46, 51, 63, 64, 65, 66, 69, 71, 73, 74, 88, and 89, the last on 27th February to Nos. 8, 13, 15, 16, 23, 25, 26, and 27. The proposed collectors' districts were marked on these maps by the enumerators, and the maps were then returned along with Schedule A. This schedule contained an estimate by the enumerator of the number of days required by each collector. In some instances great difficulty was experienced in obtaining the maps and schedules from the enumerators, and many hastening letters and telegrams had to be sent. The first collectors' maps were issued on 7th March to Districts Nos. 31, 39, 41, 46, 50, 59, 60, 63, 67, 68, 70, 71, 79, 82, 86, 89, and 90, the last on 25th March to No. 42.

WEATHER.

The earlier part of 1911 was exceptionally wet in Victoria, but during the actual Census period the weather was favourable, and I have no reason to believe that the distribution and collection were interfered with by either droughts or floods. There were places which, though usually dry, were under water on account of recent heavy rains, but the enumerators were aware of these, and made the necessary arrangements beforehand. This caused an increase of cost in the districts affected.

There were, of course, many places where the collectors had to traverse very rough ground, but I know of no instance where a collector was unable on account of the nature of the country to ride a horse. The only means of conveyance in Victoria were bicycles, horses, buggies and (in a few instances) boats.

SPECIAL ARRANGEMENTS FOR ENUMERATION OF TRAVELLERS.

Travellers in Trains.—Enquiries were made from the Railway Department a few days before the Census date, as to what trains would be carrying passengers during the early hours of Monday morning. A list was supplied from which it appeared that there were very few of such trains. The Department used every effort to facilitate the collection by issuing instructions to its officers who might be on duty on the Census night to see that their Census cards were filled up, and by issuing an order that no passengers would be allowed to travel on the Census night except Members of Parliament, who would be specially recorded. Only three persons were returned as having travelled on the trains.

Travellers on Ships.—The shipping was divided into three portions : (1) that at the port of Melbourne, (2) that at the port of Geelong, and (3) that in Port Phillip Bay and in the various ports and inlets around the Victorian coast. Persons living in certain lighthouses were included in the third portion.

The great bulk of persons on ships were included in the first section. As practically the whole of the shipping at the port of Melbourne is under the jurisdiction of the Melbourne Harbour Trust, the work of enumeration was entrusted to that body, the Harbour Master (Captain Vincent) being in charge. He utilised the services of employees of the Harbour Trust as collectors, and there is every reason to believe that the work was efficiently carried out. Some of the collectors did the work on foot, others used boats belonging to the Harbour Trust. No charge was made for the boats, but an allowance was made to the boatmen. The enumerator received a fee of £10 10s., and the collectors received payment according to the time occupied, the basis of calculation being 10s. per day.

At the port of Geelong there was very little shipping, and the work was carried out under the supervision of the enumerator for the district of Geelong, his collectors including in their ordinary duties the collection from the ships.

The collection in Port Phillip Bay (outside the port of Melbourne), and in vessels in other ports and inlets around the coast was attended to by Mr. Maclean, Engineer of Ports and Harbours for Victoria, who received a fee of £10 10s. The work was carried out by the employees of his branch, who, except in a few special cases, received no payment.

Shipping on the Murray and other rivers was attended to by the enumerators of the adjoining districts.

The collection of the shipping presented no special difficulties, chiefly on account of the zeal shewn by Captain Vincent and Mr. Maclean, and to the fact that each of these enumerators had a well-organised staff to assist him. Both of these officers appeared to be quite satisfied with the remuneration paid to enumerators and collectors. Every care was taken to see that the instructions issued by the Commonwealth Statistician in regard to shipping were complied with.

POLICE.

The police were not used as ordinary collectors, but they rendered assistance in other ways.

Shortly before the Census date—on 7th March—enumerators in the metropolis and large towns were asked to state whether they desired the services of the police for purpose of protection in parks and other camping grounds in their districts. Lists of gardens and other resorts of the migratory class were furnished by the enumerators, and were sent to the Chief Commissioner of Police, who deputed constables to attend the collectors engaged in the special duty of searching those places on Census night.

Immediately before the Census date the Commissioner of Police was asked to issue instructions to the police to make enquiries from vagrants, campers, and any other persons having no fixed place of abode whom they might meet as to whether they had filled up a Census card. If they had not, their names and approximate ages were to be taken and forwarded to the State Supervisor, and they were to be referred to the nearest post office for cards. As the result of this instruction about 100 names were received from the police.

The police were also asked to report any case which might come under their notice where persons had not received Census cards.

In a few instances reports reached this office of a number of persons having been omitted. Instructions were at once issued by me to the enumerators that the omissions must be rectified. The publicity which was given to any defects of this nature leads me to believe that only in isolated instances would it have been possible for persons to be omitted without the Department becoming aware of it.

INTERPRETERS.

The following interpreters were employed :—Melbourne and Suburbs—6 Chinese, 1 Indian, 1 Russian. Other towns and country districts—10 Chinese.

This matter gave rise to a considerable amount of trouble, chiefly on account of the difficulty experienced in obtaining particulars regarding Chinese. The bulk of these are located in Melbourne East, the enumerator for which district was Mr. E. H. Clarke. As there was some difficulty in getting reliable interpreters, I availed myself of a suggestion made by Mr. Clarke, that he should be asked by enumerators to obtain suitable men for Melbourne and Suburbs. Three interpreters were employed in Melbourne East, and one in Brighton and Malvern, one undertook the collection of the Chinese in the three Districts of Brunswick, Essendon and Coburg, and Moonee Ponds and Flemington, and one acted as interpreter for any portion of Melbourne or Suburbs for which he might be wanted. The chief difficulty in the outlying districts was that the collectors did not know beforehand what Chinese there might be in their sub-districts, and in consequence of this no arrangement could be made in anticipation. To get over this difficulty the metropolitan enumerators were instructed to supply Mr. Clarke with the names and addresses of any Chinese they might find in their districts for whom an interpreter was wanted, and that gentleman undertook to supply an interpreter for all these scattered cases. I am of opinion that by this means everything possible was done to secure an accurate enumeration of the Chinese.

In isolated country districts the Chinese can usually speak English, and can be relied on to give correct information. In the event of difficulty arising, collectors were instructed to obtain as accurate information as possible from inquiry and observation.

Chinese interpreters in the metropolis were paid £1 1s. per day, in some of the country districts the remuneration was only 10s. 6d. per day. The Russian and Indian interpreters had very little work to do, and received only 10s. 6d. each. As it was impossible to gauge the amount of work beforehand, it appeared that the only course that could be adopted consistently with the obtaining of accurate information was to pay a fixed sum for each day occupied. An endeavour was made to keep a check on the time of the interpreters in the metropolitan area, but it was explained that great difficulty was experienced in obtaining the requisite particulars from the Chinese, and frequent calls had to be made at the same address. The collectors were required to certify to the time occupied by these interpreters. Collectors accompanying interpreters received similar remuneration to those employed in other sub-districts.

VESSELS IN PORT.

See above, under heading "Travellers on Ships."

DISTRIBUTION AND COLLECTION.

The range of time taken by the various collectors is shewn in the Collectors' Record Books. Owing to the varying sizes of the districts and the special difficulties encountered in many of them, a statement of the longest and shortest periods will not give much indication of the average time required.

The first complete return was received on the Tuesday afternoon from a metropolitan collector. The sub-district had a population of about 1200 persons, and the time occupied was about a week. The longest period reported to me was 26 days in the case of a collector in one of the Mallee districts. I should say that most of the town collectors took from 6 to 9 days. In the country the time varied considerably, but in the more settled districts it was rarely less than 5 or more than 12 days. In the outlying districts a period of from 13 to 18 days appears to have been taken in a number of cases. Speaking generally the time occupied seems to have been from a week to a month. This does not take account of a few cases where the collectors' districts were below the average in size, or of the time occupied by collectors in dealing with queries submitted to them after the ordinary work of collection had been finished.

The first complete return of population for a district was received from the enumerators of Districts Nos. 46 and 75 on 10th April. There were 95 districts, and the following statement shows the number of complete returns which had been received by various dates :—Monday, 10th April, 2 returns ; Monday, 17th April, 15 returns ; Monday, 24th April, 37 returns ; Monday, 1st May, 56 returns ; Monday, 8th May, 71 returns ; Monday, 15th May, 80 returns ; Monday, 22nd May, 85 returns ; Wednesday, 31st May, 92 returns ; Tuesday, 13th June, 94 returns ; Monday, 3rd July, 95 returns.

It was not necessary to delay the publication of the population results for the State until the last three returns were received, as a close approximation to the populations of those districts had been received before the complete returns were available. An estimate of the population of the whole State was sent to the Commonwealth Statistician on 27th May.

The first districts from which completed cards were received were Nos. 10, 15 and 46. The dates of receipt of the completed cards are shewn in the next statement :—Wednesday, 12th April, 3 ; Monday, 24th April, 14 ; Monday, 1st May, 37 ; Monday, 15th May, 73 ; Wednesday, 31st May, 86 ; Thursday, 13th July, 95.

The degree of care exercised in the examination of the completed cards varied considerably with different enumerators, and it is probable that the delay which occurred in forwarding these cards in certain cases was due to the pains taken by enumerators to ensure compliance with instructions.

GENERAL REMARKS.

The experience which I have gained as the result of my connexion with the Census work leads me to offer certain suggestions.

Districts.—One of the most important points to be decided at the commencement of the work is the mode of division of the States into enumerators' districts. In Victoria the districts adopted at the recent Census corresponded (except in a few cases) with the Census and State Electoral Districts of 1901. By this means the trouble of remodelling the districts was avoided, but there was the objection that owing to changes having taken place since 1901, the Census districts of 1911 did not usually correspond with any recognised divisions—Municipality, Federal or State Electorate, etc. An examination of the boundaries, however, shewed that great care had been exercised when they were originally fixed. Wherever possible these were represented by natural features such as mountains, rivers, &c. In Victoria there were 93 enumerators' districts, apart from the two relating to shipping, a larger number, I believe, than in any of the other States. The larger the number of districts the greater the amount of work involved in correspondence and supervision, and if one could rely upon getting competent enumerators at short notice, I would certainly recommend a material reduction in the number, say to 50. An advantage of such reduction would be that the enumerators could be offered a larger remuneration, and there would be less difficulty in obtaining good men than at present. On the other hand, if any hitch occurred in the arrangements shortly before the Census date, there would be greater difficulty in obtaining a substitute for an enumerator than if the district were a small one. The work thrown on the draughtsmen would be reduced in the event of the system of large districts being adopted.

If it were considered advisable to have small districts, the most suitable division would be according to municipalities, which, for convenience, may be called the municipal method. This method has various advantages. The districts would be clearly defined, and the population records for municipalities would be obtained without any trouble. My experience has led me to believe that municipal officials are generally the best enumerators obtainable. They must possess certain educational qualifications before receiving their positions, and the nature of their work is more akin to Census work than that of persons engaged in business such as auctioneers and estate agents or commission agents. As a rule electoral inspectors are also good enumerators. Persons engaged in business in a small way may not be of sufficient standing to enable them to obtain collectors of a good class, while those with a large business usually have expensive ideas, and are apt to leave the work to subordinates. This course is unsatisfactory, as the nature of the work is such that the enumerator must devote to it a great deal of personal attention. Municipal and electoral officers are accustomed to details, and are likely to give more attention to them, and to follow more closely the instructions received, than persons in other occupations. They are also well acquainted with their districts.

A distinct advantage of the municipal method of division is that there would be little difficulty in regard to the appointment of enumerators. The Town Clerk or Shire Secretary or some other municipal officer would be expected to act in every instance unless he had an unsatisfactory record. In such cases it might be possible to employ an electoral officer. When the appointments of enumerators were made for the recent Census there were many complaints from disappointed applicants. There would be no excuse for such complaints if it were known that the municipal officer received the appointment by virtue of his official position.

There are 208 municipalities in Victoria. If there were 208 instead of 93 Census districts, the work devolving on the Supervisor and his staff and on the draughtsmen would be greatly increased, and the cost of supervision would consequently be greater.

After considering the relative advantages of the two methods—the division of the State into large districts and the municipal method—I am of opinion that the latter, though more costly than the other, is the safer and more convenient one. Under this method the enumerators should have less difficulty in getting collectors, and it should be possible to obtain results from them more promptly than when the districts are large. The close supervision of collectors by enumerators would also be facilitated.

In the recent Census the staff of the State Supervisor consisted of a records clerk, a typist, and three ordinary clerks, also, during three or four months, a senior clerk and a typist working in the evenings. The records clerk was really Assistant Supervisor, as he had the supervision of all details. The pressure of work was so great during the two months preceding and the month following the Census, that it was only by working till a very late hour each day that the skilled officers were able to cope with it.

If the system of making the Census districts correspond with municipalities be adopted, I would suggest that an Assistant Supervisor be appointed from six to nine months before the Census is taken, the exact date of his commencing duty to depend on the amount of preliminary work to be performed, also that a senior clerk be engaged before the issue of the enumerators' appointments, say four months before the Census date. One advantage of having two such officers instead of one is that in case of need it would be possible to send one of them to any part of the country in which a difficulty might arise, which could not be dealt with satisfactorily by correspondence. There were several occasions during the recent Census when there was reason to fear a serious hitch, and a personal call would have relieved the tension at once., Of course, strict economy would have to be exercised in incurring travelling expenses of this nature, but there is every likelihood that such expenses would be more than compensated by reduction in the cost of collection.

For the Assistant Supervisor a suitable remuneration would probably be 15s., and for the senior clerk 12s. a day. It might be necessary within three months of the Census date to appoint in addition to these two officers a second experienced clerk at 12s. per day. Two typists would be required, one to be appointed at the same time as the first senior clerk referred to, i.e., about four months before the Census date, and the other a month or two later. There would also be ordinary clerks to prepare the material for despatch, and to do the routine work.

If the work is to proceed smoothly during the critical months—about two months before, and one after the Census—it is necessary to have a sufficient amount of skilled assistance, and the skilled officers must have been engaged so long beforehand that they have become thoroughly accustomed to their duties.

If it were decided to have large districts it would be necessary to invite applications from persons suitable for the position of enumerator and to make inquiries in regard to such persons. If the boundaries of districts had been tentatively fixed, the State Supervisor might find it desirable to recommend alterations so as to meet the wishes of enumerators. These and other matters of a preparatory nature would occupy a good deal of time, and under the " large districts" system, therefore, it would be desirable that the Assistant Supervisor should be appointed at least nine months before the Census date. Under the " municipal system" the appointment might be made a month or two later, as the preparatory work would be much less. The boundaries of districts would not be subject to material alteration, but it would be necessary to make inquiries regarding municipal officers, and in some cases to invite applications from outsiders. The Assistant Supervisor would have to make himself familiar with the methods previously employed, as well as with the official instructions in regard to the current Census. He would also need to familiarise himself with all details, so as to be in a position to instruct the enumerators and the staff in regard to their duties at a later date.

Remuneration of Enumerators.—Under the " municipal system" the districts would be much smaller than at present, and the remuneration to individual enumerators would be less. It is probable, however, that there would be an increase in the total remuneration.

Remuneration of Collectors.—This matter gave rise to probably more difficulty than any other during the recent Census. The position had altered in certain aspects since 1901. On that occasion schedules were used, while in 1911 the collection was made through the medium of cards. Also, there was an industrial depression in 1901, while ten years later there was a brisk demand for labour. The remuneration fixed for collectors at the later date was, I think, in the majority of cases more than the equivalent of that paid in 1901. There was, however, more difficulty in obtaining collectors, and there was a tendency on the part of those employed to institute comparisons with the wages paid in occupations for which a special training was required.

The greatest difficulty was with the collectors who performed the work on foot and received remuneration at the rate of 10s. per day. It was first assumed that for a full town district of 200 houses 5 days would be required, the remuneration being £2 10s. + 5s. When extra payments were subsequently granted, a minimum of 6 days was allowed for these districts.

One method of reducing the difficulty in regard to payments to collectors which has arisen at recent Censuses would be to increase the scale of payment to those on foot. In many cases they had to make calls in the evening as well as during the day, and it was necessary therefore that they should work for more than the usual hours. This is unavoidable, as the householders are often absent during the day, and do not trouble to prepare cards until they see the collector. For this reason it might be well to consider the advisability of making the scale of payment 12s. instead of 10s. per day. By increasing the rate of payment it would, I think, be possible to obtain a better class of men than at the recent Census. Collectors might also be allowed 8s. for making up their books, as the work would usually occupy the time of the average town collector for a full day. It would take less time in many of the country districts, but it would probably be found injudicious to make a distinction.

Of course, the rate of payment would depend largely on the wages ruling at the date of the Census.

I would not suggest any increase in the size of the collectors' districts. Such increase would lead to delay in the completion of the work, and unless the collectors were very competent it would interfere with the efficiency of the work.

A statement relating to expenditure has been prepared, and is being submitted separately. This shows the remunerations of the enumerators, their travelling and other expenses, and the payments to collectors, also the amount spent in postage by the State Supervisor and the enumerators, the petty cash expenditure, and the other disbursements made by the State Supervisor, such as cost of collectors' bags, rubber stamps, and stationery, cost of transmitting Census material to enumerators, etc. It has not been possible to prepare a complete statement owing to the fact that, in addition to the paying of accounts certified by me, the Accounts Branch of the Home Affairs Department made a number of payments of which I have no official knowledge. I have, moreover, reason to believe that some of the accounts which I had certified were altered, so as to conform with the practice of the Department, without advice being sent me.

Police.—The police were not employed as collectors in Victoria, but except in one or two remote districts I do not think any inconvenience was caused by this. I doubt, moreover, whether the police would be satisfactory as Census collectors. I have had considerable experience of them as collectors of agricultural and other statistics, and my opinion is that while the work would be done with great care, it would occupy much too long a time. In some cases enumerators and collectors made enquiries from the police as to the time that should be allowed to collectors. The periods mentioned by them were much in excess of what were considered reasonable by me.

There is the further difficulty that there might be urgent public need for the services of these officers for the detection of crime during the Census week. If the Australian Census were taken over an extended period as in the United States, and not at a fixed date, the police might be very suitable, but under present conditions I do not think they would do the work as efficiently as ordinary citizens.

Hotels.—A weak point in the recent Census collection was, in my opinion, the manner of dealing with large hotels. A number of cards were left at the hotel a few days before the Census date, and the collector called shortly after that date for the completed cards. It rested with the proprietor to take steps to obtain the information from each resident of the house. If he omitted to do so there was often no means of getting it afterwards. At the next Census it might be advisable to adopt more stringent means than hitherto to ensure that hotelkeepers are not to allow persons living in the house on Census night to depart without obtaining from them the required particulars.

Interpreters.—The general plan adopted in regard to interpreters was found to be satisfactory, and I would suggest its continuance. Where there are many foreigners living in one district special interpreters will be required; in the case of the suburban districts of Melbourne, where there are few foreigners, and these are at considerable distances from each other, a special interpreter should be sent from headquarters at a time arranged beforehand; in remote country districts the collectors should obtain as accurate information as possible by inquiry and observation. The great difficulty in dealing with Chinese is there may be collusion between the interpreter and the persons of his race with a view to prolonging the work. One may suspect this, but it is very difficult to get proof.

Collectors' Agreements.—Unless there is a legal difficulty, I would suggest that collectors should in the agreements undertake to carry out their duties, including the making-up of the return, for a remuneration specified therein. If possible, the maps for collectors should be ready long enough before the Census date to enable them to have an opportunity of examining these before undertaking the work, and of thus getting exact information in regard to the extent of the duties which it is proposed to allot them.

The work of collection was greatly increased as compared with 1901, through the introduction of the card system. The principal increases in the State Supervisors' office occurred in the despatch work, and the correspondence. The official instructions issued by the Commonwealth Statistician gave full information as to the general procedure to be followed, but there were numerous matters of detail in regard to which it was found necessary to instruct enumerators from time to time. This was done principally by means of circulars, of which a large number were issued. Copies of these have been placed with the Census papers. The fixing of the periods to be allowed to the collectors in each district proved an arduous task, and it occupied much of my time during the two months immediately preceding the Census. There was considerable doubt as to what extra work would be entailed by the use of cards. The experience which has now been gained should be of great use at the next Census in connexion with this portion of the work. I would suggest that the instructions in regard to travelling expenses be given in more detail when the Financial Instructions are next being prepared. At the time most of the journeys were undertaken in connexion with the recent Census, it was not known that the exact times of departure and arrival had to be stated in the accounts, also, it was not clearly shewn in the Instructions what would be allowed when the enumerator used his own vehicle.

In conclusion, I would like to say that I consider the Victorian enumerators were, with a few exceptions, very suitable men for the work that they had to perform. My duties did not include a careful scrutiny of the returns received from collectors, and I am unable to express an opinion, therefore, as to the degree of care exercised by the enumerators in the checking of these.

(Signed) A. M. LAUGHTON,

State Supervisor of Census, Victoria.

14*th March*, 1912.

III.—QUEENSLAND.

As requested in your letters of 19th May and 10th June, I have the honour to submit a few remarks on the subject of the recent enumeration. As the most convenient method to adopt I propose to deal with the Act, Regulations and Forms seriatim, making such comments on each as experience dictates.

Act.—Much too vague and indefinite. One great blot: No offence to refuse to take cards or schedule, or to block and annoy collector in distributing. A few prompt prosecutions for this early in the work would greatly have facilitated enumeration. Essential that enumerator should have power to prosecute on his own initiative. Collector should also be able to prosecute with approval of enumerator. It is not always possible for an enumerator to be present at the site of offence to conduct prosecution. A collector, much less an enumerator, is, on an average, a superior class of man to an average policeman, and yet the latter has full powers of prosecution in a large number of offences. Any other conditions absurd for a country so extensive as Queensland. Citizens should be compelled to state where they were on Census night. A number gave much trouble refusing to do so, stating they had been returned, but not where, and no doubt some escaped enumeration in consequence. In many instances, without assistance of detectives, impossible to prove, and even with them difficult.

SUPERVISOR'S INSTRUCTIONS.

General.—These, as all the regulations, were evidently drafted from standpoint of settled country and then modified slightly but not sufficiently. This quite unsuited for much of Queensland.

Clause 4.—Method adopted for fixing payment most unfair both to Supervisor and enumerator, several incongruities have arisen in this State. Although payment by results would perhaps be open to objection for collectors, I consider it the only proper method for enumerators. The old State system is much to be perferred.

The words " Retaining Fee" used here and elsewhere most misleading and untrue, and when compared with the practice adopted caused much heartburning, as in many instances enumerators have been out of pocket for months, having to pay for clerical assistance.

Clause 24.—Expense of posters might have been saved as far as Queensland was concerned. They were received so late as only to be of very limited use. Practically all were destroyed.

Clause 28.—Either Supervisor's Certificate unnecessary, or enumerators should be paid on it.

Clause 29 (b).—Enumerators should have a petty cash provision. Many advanced up to several pounds for freights, and then had to wait months for reimbursement. Why should public officers finance the Commonwealth ? Supposing many, as some did, declined to do so, serious failure might have resulted, as my cash credit would have been quite inadequate to meet many such demands. I certainly should not have advanced out of my own pocket, and as to wiring Melbourne ? ? ?

FINANCIAL INSTRUCTIONS (A).

Clause 1.—£1 limit absurd and an insult, and £25 cash credit equally so. Junior audit inspectors here, not much more than lads, have a £50 advance. At least £250 should be allowed.

Clause 3, Paragraph 2.—If Supervisors not to be trusted to this extent, unfit for position.

Paragraph 4.—Should be left to Supervisor.

Clause 4, Paragraph 2.—In practice this was modified, as it well needed to be.

B.—ENUMERATORS.

Clause 1.—" Retaining Fee." This not being carried out caused much dissatisfaction, and has been a point made by Kellett in his " Statement of Claim."

Clause 2.—Exact requirements of the Treasury as to the filling of vouchers, such as the hour of arrival and departure, &c., &c., should have been clearly, fully, and definitely explained. I prophesy the effect will be felt at the next Census. Temporary Commonwealth employees cannot be expected to know all the red-tape demands of Headquarters, and in a State so distant from Melbourne, the consequent delay following the rejection of vouchers for trivial omissions caused much irritation.

Clause 4, Paragraph 3.—Books were not provided as promised.

C.—COLLECTORS' FINANCIAL INSTRUCTIONS.

Clause 1.—Insert after "obtain from each collector engaged by him" the words : "on the blank form provided for the purpose."

ENUMERATORS' INSTRUCTIONS.

Clause 1, Lines 5 and 6.—No provision made for formal notification to enumerators of their appointment. Each Personal Card, &c., absurd waste. No good to children. For private house one each, 5 cards ample. More for hotels, &c.

Clause 2.—Printing this caused much trouble, and in two cases nearly led to serious upset of Census. Enumerators relied on getting police until almost too late to obtain a private collector.

B—Clause 3.—Much trouble was given by method adopted in preparing collectors' maps. The fact that no outside features were shewn, and the scale at times being totally inadequate, and not always the best procurable, was taken much exception to by both enumerators and collectors. It will be fortunate if as a consequence no undetected over-lapping or omitting proves to have occurred. In several instances it took place, and trouble unnecessarily was given in correcting it. I believe a little more spent in mapping would have been well worth the money.

Clause 4.—All forms should have been specified and provided at the outset to enable the enumerator to see what he would have to do. The method adopted was most unfair, and much exception has since been taken. If the enumerators were now asked to re-engage, I think many of them, and these of the best type, would promptly refuse.

Clause 5.—Illustrates the difficulty and practically the impossibility of satisfactorily drawing one set of regulations to properly cover an enormous country like Australia. No end of confusion and trouble was caused by the inclusion of terms unknown to Queensland.

Clause 6.—The departure from the first intention to supply maps in duplicate caused much delay, enumerators, being without a map whilst collectors' maps were in preparation, were unable to proceed with the appointment of collectors. Not only did this in some instances imperil the securing of men, but no doubt by delaying matters prevented the making of best bargains, as time being then too short to negotiate, men had to be taken on their own terms. I should in some instances have refused approval to the time asked for only I dare not, as we were then too near Census day.

Clause 11.—Designed for a populous centre, ridiculous for all the rural parts of this State. In country districts payment must count from leaving home and returning. It has had to be done, and in the way it was done, has proved more costly than if the bargain were left to Supervisor to carry out.

Clause 12.—Should define what to do when alphabet is exhausted, so as to secure uniformity of practice.

Clauses 16 and 17.—The provisions here made for shipping and island population might be extended to embrace all or most outlying groups such as lighthouses, lightships (which are hardly ships), and even very outlying stations. The system of appointing one resident a special collector to send in schedules by mail or other usual route works well, and might be extended. To send a collector to one station for a journey of 200 to 300 miles twice at a cost of anything up to £50 or more, just to collect one or two schedules, is extravagant on the face of it. To my mind their count had better be lost, if a special collector system is objected to.

Clause 18.—Special instructions should be printed for the collector, who should have more power to compel attention. Much trouble was given in some instances, and I am satisfied that leakage occurred here.

Clause 20.—In a country so vast as Queensland the ascertaining of the population of divisions of shires as well as wards of municipalities most necessary. Some of these have the proportions of a Principality.

Clause 21.—Impossible to supply Schedules "A" in duplicate, supply being insufficient for the purpose.

The term Mesh caused much confusion amongst both enumerators and collectors. Some explanation of the term and why these subdivisions are required, that collectors may see the reason for the extra trouble involved, otherwise they comply grudgingly.

Clause 22, Line 2.—" Definite" is not a good term. Has been taken exception to by several enumerators as impossible. Perhaps due in part to a misconception of the meaning of the word. Many people look at it as implying accuracy.

C—Clause 25.—If selection of collectors left till then many districts would have been unprovided for. Indeed, as stated elsewhere, great risk was run, and the best men not secured, because enumerators were without maps whilst collectors' maps in preparation, their own not being supplied in duplicate.

Clause 26.—Gave much trouble ; received lots of applications for these.

Clause 30.—Often impossible to carry out. Where an absentee imperatively employed, travelling should be directly provided for. It has to be done, and when indirectly, much more costly. In my own case for West Moreton we broke up the Rosewood Ring by employing Ipswich men. Saved much money. The Ipswich men had to be paid for travelling indirectly.

Clause 32.—No provision for motor bicycle, but there was for petrol.

Cause 33.—This and Form 27 contain between them one of the most serious of all the errors through which a large saving that might have been effected was rendered impossible.

Clause 43.—Excise ink bottles must be provided in all rural districts at least, or else pencil will be much employed.

D.—Clause 44.—The additional amount of clerical work involved by the employment of cards instead of schedules is so great that I am sure much more would have to be paid, both to the enumerators and collectors, if this had been as fully realised as it has since become. Of course, if the Commonwealth is prepared to " take men down " when they agree to do the work for less than it is worth, and not to pay extra claims though just, why, then, well and good, but they will have to put up with odium and be worried on account of it otherwise.

Clause 57.—I am satisfied that much more economical results would be secured by giving the Supervisor power to pay by time reasonably taken as shewn by diary, and with advice of enumerators. When collectors knew they were to be bound down they fixed the days at long enough in many cases to cover all contingencies, and where this was not done, extra claims have been made, and if not met in some instances a great injustice will be done. So the Commonwealth pays in both ways.

Clause 58.—Copy promised not furnished, would have been worth the printing to have the record kept uniformly.

COLLECTORS' INSTRUCTIONS.

Clause 3.—One instruction for each personal card too many, (See remarks Clause 1, Instructions to Enumerators.)

Clause 4.—Features surrounding district should be shewn.

Clause 6.—Consider carefully the clerical work involved in all this. Only collectors and enumerators, or those who have themselves sat down and written say at least 100 cards against time, can properly realise the work involved in dealing with 400 or 500 full schedules averaging 6 cards and an envelope to each. All evidence goes to shew, moreover, that a much larger proportion of cards have to be filled in by the collectors, as compared with the old schedules.

Clause 25.—I would add the words " Indelible lead pencils must not be used under any circumstances, as the writing smears and becomes illegible." Whilst it is desirable to require ink to be used, circumstances may arise, particularly in the bush, where it is not possible to insist on its use. Cards or records written with "Indelible" pencil would be nearly valueless. I speak from experience, and yet this class of pencil would be picked by many as being nearer to ink than the ordinary lead. I had many suggestions to use them, but I absolutely prohibited it for reasons given.

Clauses 31 and 37.—Some reference as to keeping figures for meshes separate should be inserted.

Census Form No. 27.—Should have agreed with the Regulations. There was much money lost from this difference.

Instructions to Public.—Too verbose. Few took the trouble to read them, and to the mass of the people they were unintelligible. If thought necessary in present form, it would be well to commence with a précis in black letter, setting out briefly say five or six of the chief points. Collectors stated that people on many occasions left the cards to be filled in by them, because they were confused by the voluminous instructions.

Cards.—I rather wonder whether the cards will be found suitable to sort without a lot of re-writing. I consider that they may suit for collection in towns, but have grave doubts as to rural districts. I am sure that from the facility with which they may be lost, and from the impossibility of tracing each card issued, as was done with the old schedules, that the collection was, on this occasion, less complete than formerly. I do not mean that any large population was missed, but that the leakage was somewhat greater. No Census is ever complete, of course. Another inherent defect leading to the same end, and causing increased work to collectors, was the impossibility of gauging how many cards (Personal) to leave at a house. As it was, we printed nearly 1,000,000, or 40 per cent. of waste, and these were really insufficient, as it was often found impracticable to have a card just where it was wanted, and there were innumerable instances in which collectors had to hunt all over the place for casual visitors only recorded on the Householder's Card, and for whom no personal card was forthcoming. On collecting, the householder said : " We had no card." It never seemed to strike any of them to fill in a card for the stranger, and to leave one of their own people to be supplied on the return of the collector. It was always the visitor who was omitted, and he had to be searched for.

As to difficulties with the public interpretation placed on designation attached to each line, you will, in the process of tabulation, become fully seized, but as regards three lines I would take exception to your rendering of them in your letter to me of 14th November, 1910, paragraph 3, Previous Marriages. If children of widower to go on 6a, is line 5 to be left blank ? Otherwise you have an inconsistency between treatment of lines 5 and 6. How, moreover, would you treat line 6 in a case of person twice widowed with children by both marriages ?

In conclusion, I have thought it well to obtain reports from four enumerators of districts typical of the great industries or conditions of the State, as follows :—Mr. Beak, Brisbane North (Urban); Mr. Bryce, Caboolture (Agricultural); Mr. Schulte, Springsure (Pastoral); Mr. Lee-Bryce, Herberton (Mineral). With regard to Mr. Bryce I would add that he is an enumerator of exceptional experience, having acted in that capacity in 1876 and for every subsequent Census.

(Signed) THORNHILL WEEDON,

State Census Supervisor, Queensland.

IV.—SOUTH AUSTRALIA.

PART I.

South Australia proper is divided into forty-seven counties, which in turn are, with few exceptions, divided again into hundreds, numbering in all 437. For Local Government purposes all the country within counties, with the exception of the areas devoted to pastoral purposes, is divided into 32 corporate towns (three being cities) and 146 district councils. The total area of the counties is 82,103 square miles.

The detail work of mapping out the vast area of South Australia proper and the Northern Territory into suitable Census districts was commenced early in June, 1910, and the boundaries completed and submitted to the Commonwealth Statistician on the 3rd August, 1910. No previous Census in this State having been undertaken with the aid of enumerators, this work of division was absolutely new, and involved an immense amount of original and expert research to secure the most satisfactory results. It is pleasing to reflect that when put to the test under actual working conditions, adjustments were found necessary in only two or three of the 45 divisions.

It might be mentioned that every care was exercised in making these divisions to avoid dissecting the boundaries of Electoral Divisions, both Commonwealth and State, and also the boundaries of the various Local Government areas. Thus in mapping out the Census Districts all these boundaries were so effectually taken into consideration that in only a few minor instances has a district crossed one of the boundary lines, thus materially reducing the number of Mesh Districts.

SELECTION OF ENUMERATORS.

All other qualifications being equal, in my opinion Town Clerks and Clerks of District Councils, whose location in the district is sufficiently central, are the best persons for the Census work, whether as enumerator or collector. Some splendid men had to be passed over owing to their location in the district not being suitable for exercising a proper supervision of the whole area. The local knowledge, possessed by these officers, of the people and boundaries of the districts, is of immense value to them in Census work.

After an exhaustive enquiry as to the capabilities of all likely applicants, those who were considered likely to give good results were communicated with, and eventually a selection made. I was impressed with the importance of making no avoidable mistake in this selection, for if a Census is taken by the aid of enumerators the most capable men must be obtained, otherwise much additional anxiety and detailed supervision would be added to the work of the central office. To this end the fees should be calculated on a liberal basis.

In several districts outside business men were appointed. Many of the gentlemen selected performed their arduous duties in a very able manner, and with none of them have I been disappointed. During the progress of the work several were released from their duties from various causes, and substitutes appointed.

The vast area of sparsely-populated country encroaching upon the more populous centres will always present a difficulty in securing enumerators thoroughly acquainted with the whole area of a district.

VALUATION OF ENUMERATORS' DISTRICTS.

In the absence of any previous experience in this State with Census enumerators, and any definite instructions upon which to base the valuations of the work to be done by them, it was a matter of some difficulty to decide upon equitable fees and fix the same with confidence of having dealt with fairness both to the men and the Government.

While I succeeded in securing the necessary number of gentlemen for the position, on the terms approved, I have to report that a number of them have expressed themselves as dissatisfied with the fee allotted.

There is no doubt that the detailed duties prescribed in the instructions involved work of such great magnitude as is only possible of realisation by those who have actually attempted to faithfully carry them out.

From a review of the enumerators' fees on the completion of the work, I am, however, satisfied that generally speaking (with the exception of several districts), the valuations made were fairly reasonable, though by no means excessive. In valuing again I should be disposed to increase most of the districts by 10 per cent., and about three of the outlying ones, which proved fairly difficult, by about 30 per cent. I trust that some concession on these lines may be approved as regards this undertaking. A representation on this matter has already been made. The City of Adelaide was made one district, and supervised by an officer intimately acquainted with the work. Had it not been for his appointment it would have been absolutely necessary to subdivide the City into two districts of at least £50 each.

SUBDIVISION OF CENSUS DISTRICTS.

Before the enumerators began the work of subdividing their districts, they were furnished with all available information as to the boundaries of collectors' districts at the previous Census, and many of them also called at the Central Office for personal instruction as to the duties required. Those at a distance were fully instructed by letter, and thus a fairly uniform method of procedure was secured in all districts. In some cases the boundaries were only settled after lengthy personal interviews. Men who had had experience as collectors for the 1901 Census, and given satisfaction, and district clerks were engaged as collectors where available.

PRINTING AND DESPATCH OF PAPERS.

The printing of the necessary supply of Census cards and envelopes was undertaken by the State Printing Department, and the orders completed expeditiously. The first consignment of parcels left the Census Office on 9th January, and the last on the 22nd February; the outlying districts with an irregular mail service were first attended to, and the districts nearer the metropolis last.

The boxes containing the papers were all packed at the Government Printing Office, under the direction of a Census clerk.

I advised every enumerator to stamp all the cards, so far as possible, before despatching them to the collectors. For this purpose I designed a rubber stamp for each enumerator, with interchangeable headings, so that it could be adjusted for each district. These were made in the city by one manufacturer and despatched with the parcels of Census material. A gauge box was also made to secure uniformity in stamping.

THE HEADQUARTERS STAFF.

A large room attached to the Statistical Department was secured and fitted up for the Census without cost to the Commonwealth, and in the general supervision of the whole Census campaign, I was assisted by the Chief Clerk of the State Statistical Office, who also personally mapped out all the enumerators' districts. From July to December, 1910, the Record Clerk was the only clerk on the Census pay-sheet, though both he and my Chief Clerk worked a considerable amount of overtime to meet the occasional rushes of work.

As the time for despatch of parcels arrived, the staff was increased to a total of three clerks, and eventually to four when the papers were being returned.

Two additional rooms were obtained in another building on a ground floor as a receiving centre for Census papers. Two clerks were located there, and they checked all the papers on receipt, and repacked them for transmission to the Commonwealth Bureau.

PRELIMINARY COUNT.

The last of the preliminary counts was received on 8th June, 1911, the total preliminary count for the whole State being: Males, 208,822; Females, 202,339; Total, 411,161.

TRANSMISSION OF FORMS.

As the boxes from completed districts were received, the contents were examined. The cards were not individually scrutinised, but the collectors' books were examined, and the totals checked, and where irregularities appeared, the cards were examined and queried back to the enumerator where necessary. The parcels for each sub-district of a Census District were examined and uniformly labelled and repacked in accordance with Clause 27 of Form No. 8. The first consignment of cases was despatched on the 15th May, 1911, and the final consignment on 25th July, 1911.

UNINHABITED HOUSES.

There were many houses described as "Uninhabited" which, without explanation, might cause a wrong impression. As a matter of fact there are not enough houses for the people as strongly indicated by the large number of tenements—several families occupying the same house. In nearly all cases the houses were inhabited again within a day or two of Census night. Others again were marked " Uninhabited" because the family had gone away for a holiday though, as a matter of fact they were not " To Let." Houses are very scarce in most of the populous centres of this State, the rents are very high, and in a large number of cases several families divide a house.

REFUSAL TO SUPPLY INFORMATION.

It is pleasing to report that no necessity arose for an appeal to the law. Numerous difficulties were encountered chiefly in the City of Adelaide, where the collectors received absolute refusals. These were due mainly to the ignorance of the parties concerned, and in other cases to boarders objecting to pass their cards through their landlady. By the exercise of considerable tact and the intervention of the enumerator every such objection was overcome. In only a few cases was it necessary for the Supervisor to send warning letters to troublesome people.

WEATHER.

Generally speaking, throughout the whole settled portion of the State, ideal weather prevailed during the whole process of distributing and collecting. The prevalence of droughty conditions throughout the Far Northern Division of the State, and the presence of floods produced by monsoonal rains in the Northern Territory, were the only disturbing climatic conditions reported.

SPECIAL ARRANGEMENTS FOR ENUMERATION OF TRAVELLERS.

Travellers on Trains.—With the exception of the railway service from Broken Hill to Adelaide, and a Sunday-night train from Port Pirie to Petersburg (to meet the Broken Hill express), the entire railway service in South Australia is suspended between midnight on Sunday and 5.30 a.m. on Monday, consequently the only arrangements necessary to be made were in these two cases, the exigencies of the occasion being met by the appointment of the guards of the respective trains as collectors.

Travellers on Ships.—As regards coastal shipping within the State, the various enumerators instructed their collectors to deal with same in accordance with the printed instructions—the enumerator in each case personally interesting himself to see that the steps taken were effective ; this he also did as regards shipping generally. With respect to the River Murray traffic, the several enumerators of the area through which the river passes conferred with each other so as to ensure travellers on all vessels up and down being recorded.

POLICE.

It was not considered necessary to make any special arrangements with the police respecting persons who may have been travelling or camping out on the night of the Census. The various collectors were instructed to make careful enquiry as to these, and further, the advertisement which appeared later directing all who had not furnished Census cards to apply to the nearest Post Office appeared to meet all requirements. Of course, it must be admitted, that it is impossible to prevent a percentage of such persons from being missed, and hence it might be advisable to make a small allowance for them.

INTERPRETERS.

At Port Adelaide it was necessary to employ three interpreters, all being officers of ships in harbour ; they being one Chinese, one Swede, and one Manilaman. At Palmerston two Chinese interpreters were employed in the Chinese quarter of the town.

VESSELS IN PORT.

The enumeration of persons aboard vessels in South Australian ports was carried out according to instructions by the collectors under the special supervision of the enumerators, no hitch whatever occuring. Only in one case was any trouble experienced, that of a Swedish vessel at Port Adelaide, the Captain of which declined to supply the necessary information. A remonstrance from the Swedish Consul, however, had a salutary effect. The enumerator for the Northern Territory reported that he had no difficulty whatever in obtaining Census particulars from all craft lying at Port Darwin.

DISTRIBUTING AND COLLECTING.

Approximately the range of time taken by collectors in distributing and collecting the returns was as follows :—In the Cities of Adelaide, Port Adelaide and Unley from 12 to 23 days on foot ; in the large Corporations from 9 to 19 days on foot ; in scattered areas from 10 to 27 days, with use of horse and motor ; in the outside country from 10 to 29 days, and in the Northern Territory from 14 to 56 days were taken with horse, motor, or camel.

In one special case 68 days were taken by a collector to do his work. In this instance the enumerator (District No. 39) found it impossible to find a second collector to traverse the country which was rough and uninviting, and on the collector for sub-district " R" volunteering to do the work, in addition to that of his own sub-district, his offer was accepted.

The difficult and arduous task of distributing and collecting in the Far Northern Division was overcome by the appointment of the Police Inspector as enumerator, and his staff of police officers as collectors—a body of men who know all the country thoroughly. Throughout droughty conditions, scarcity of water, and the presence of poison plant prevailed, causing death and disablement of horses. The work these police officers did as collectors cannot well be overestimated, in all they traversed 13,191 miles, or an average of 694 miles per man.

The Northern Territory was also served by the Inspector of Police as enumerator, and his subordinates as collectors. The vast area of difficult country to be traversed by collectors, with rivers swollen by monsoonal rains, and the necessity of carrying rations with them, made the work of Census collecting in this portion of the Commonwealth a matter of great difficulty. Several horses were lost. The average distance traversed per collector was 640 miles, the aggregate being 7677 miles.

Had the police not been available, the cost of collecting would have been a costly item, therefore these collectors merit a fair bonus.

I wish to acknowledge the splendid assistance rendered by the Metropolitan press, which at all times was ready and willing to publish readable matter on the Census, with the object of educating the people up to a sense of their responsibilities and public duties, a result which undoubtedly they were successful in attaining.

PART II.

The immense difficulty of framing a set of instructions for the guidance of supervisors, enumerators, collectors and householders appplicable to each State of a vast Continent, such as the Commonwealth of Australia, must be readily recognised.

Speaking generally, they met the requirements of this State, being, with few exceptions, easy of interpretation. Still, experience has marked out a number of clauses which might with advantage be either altered or rendered with greater clearness.

In supervising the work in this State, I endeavoured, in the first place, to interpret the spirit of the instructions, and then administer as near to the letter as circumstances admitted with reasonableness. I had no hesitation in advising my enumerators to act contrary to the letter in such cases as in my opinion the ends of the Census could be better achieved.

GENERAL INSTRUCTIONS.

Enumerators' Sub-divisions.—It would be an advantage to supply each enumerator with a plan showing his district as sub-divided into collectors' districts for the previous Census, with the population for each sub-district, and the amount of remuneration paid to each collector. For, unless development or retrogression has materially altered local conditions, much is to be gained by adhreing to former boundaries.

So far as possible I made a special point of advising my enumerators of these details as they related to the 1901 Census

The Maps, Clause 16, Form 8.—It is not quite clear to me from this clause whether or not it was intended to supply the Supervisor with a map shewing each of the subdivisions of the various Census Districts. At any rate I often experienced considerable inconvenience through not having in my possession a large map shewing not only the enumerators' districts, but also the subdivisions. The key maps of enumerators' districts supplied to me were very useful, but on too small a scale. If prepared on a larger scale the subdivisions could be shewn, and the whole mounted.

EMOLUMENT OF ENUMERATORS.

Clause 4, Form 8.—In order to secure uniformity throughout the States, it might be advisable to draw up a scale of fees for general guidance in estimating the fees of enumerators. It should not be made arbitrary, because some localities would need special consideration. A minimum might be fixed, and a scale prepared for closely populated centres and for scattered districts.

The instructions very properly indicated that a retaining fee would be paid to each enumerator, but in this State the payment was not made, causing general dissatisfaction. In my opinion an advance should be paid *as a right* when the subdivisions and selection of collectors have been satisfactorily completed, but the amount should be, say 20 per cent. or 25 per cent. of the total fee, as in some cases £10 10s. would be too much.

In the absence of such advance some enumerators who had to pay for clerical assistance were out of pocket for months. They were practically under engagement for six months, and received nothing until sometime after completion of their work.

It is of great importance that the very best men obtainable should be secured as enumerators, and therefore, in the interest of an accurate Census, the fees paid should be liberal—sufficiently liberal in the larger districts to enable the enumerator to provide himself with the indispensable clerical assistance for speedily checking the returns on delivery after collection. It is an absolute impossibility for an enumerator of a district embracing more than 12,000 to 15,000 persons to effectively do the work of checking and querying back to collectors without assistance, and in my opinion this assistance should either be specially paid for or provided for in the fee. When fixing the remuneration for the enumerators in this State, I took this matter into consideration, and endeavoured to make a slight provision for it.

The detailed checking indicated in Clause 49 of Form 7, if conscientiously attended to involves a lot of work. In my opinion it is of the utmost importance; in fact the accuracy of the Census depends largely upon it, but in order to do it speedily, assistance must be available in the large districts. Therefore, I think the words in Clause 52, Form 7, "You will make arrangements for checking," should be transferred to Clause 49, as the work outlined in Clause 52 is too insignificant to need special arrangements, but perhaps it was intended to read this Clause in conjunction with Clause 49.

FINANCIAL ARRANGEMENTS.

Rendering Accounts.—To secure uniformity and to comply with audit requirements, the method of rendering accounts for enumerators' travelling and incidental expenses, collectors' fees, &c., should be illustrated. Through the absence of such detail, accounts often had to be queried, causing delay and inconvenience both to the claimant and the Paying Department.

Further, when accounts are sent forward for payment, a list of such accounts, when passed for payment, should be sent to the Supervisor, for otherwise he is entirely in the dark as to the treatment of accounts after leaving his hands. On a number of occasions the absence of such knowledge proved most inconvenient. No doubt a speedier method of settling accounts will be devised in future. The delay in paying small amounts and expenses out of pocket was most annoying to me, as the claimants were constantly beseiging me for payment. I can quite understand, however, that the immensity of the work might have been underrated on this, the first occasion of the Commonwealth Census.

The method of making accounts payable at only one Post Office in an enumerators' district proved a serious source of trouble in outlying centres. Authority might be given to the particular Post Office to forward claims and money, free of exchange, to the Post Office nearest to each of the claimants.

ALLOTTING COLLECTORS' DISTRICTS AND PAYMENT.

Clauses 11 and 32, Form 7.—This clause makes 12 days the maximum of time to be allotted to each collector in populous centres. I was unable to adhere to this instruction. Good reliable men could not be secured to take up special work of this kind for only £6, and the inferior class would ruin the reputation of any enumerator, however capable in himself. Therefore, I advised my enumerators to make the districts a little larger, pay more money, and thus be in a position to secure the services of the best class of men. I made a special point of seeing that each enumerator dealt fairly with the collectors as regards the days allowed, and did not hesitate to increase as well as to reduce the number of days if my judgment differed from the enumerator. As a result, very few claims for increased remuneration were entertained by me, and recommended to you.

In my opinion, the best results are obtainable by dividing populous centres into districts of 200 to 250 houses, and allotting 12 to 16 days' time for the work at say 12s. 6d. per diem ; 10s. per diem (a shilling more than many a labourer receives), is too low, and will not tempt the right class of men, at least in this State. Many recalls are necessary, and much time is lost in giving information, filling up cards and checking and correcting errors. The work intelligently done is far more than simply delivering and collecting, and 50 houses delivered and less collected in a day of 7 or 8 hours would be an excellent average, and too high for some localities.

Clause 44, Form 7, Stamping Cards.—Had there been sufficient time I could have arranged with the Government Printer to print the headings for all the large enumerators' districts, as the stamping process is very tedious, but nevertheless unavoidable as regards many districts which happen to embrace more than one Local Government area, Hundred and Electoral District.

The system adopted by me for stamping proved eminently satisfactory, as far as I could judge, though your compilers will be in a better position to speak on that point.

MESH NUMBERS.

A clear definition of the meaning of these numbers would be helpful in future, and save the Supervisor from replying to many queries.

TENEMENTS.

The clauses dealing with these cannot be sufficiently clear, for both enumerators and collectors misinterpreted them. I suggest a special clause with illustrations.

Clause 14, Form 14.—This Clause confused many well-educated enumerators. Many interpreted the last paragraph relating to hotels and large boarding establishments as illustrating the method of numbering tenements. I suggest that in this case, and in all other similar cases, very full illustrations be printed shewing the method of numbering expected to be adopted, by which means uniformity would be secured.

CENSUS CARDS.

In the distribution of cards a number of collectors confused the Personal and Householders' Card, the latter being left in lieu of Personal Cards. The printing on the face being so different, it seems strange they should make the error, but the fact is that they did so, and it occurs to me that it might be prevented by having the cards of different colours, which also would be of assistance in checking and probably in compiling.

SIZE OF CARDS.

Many criticisms appeared in the papers as to the space for replies on the cards being insufficient, and I was also inclined to think the same, but from an examination of the cards as they came in, I came to the conclusion that very little inconvenience was experienced. The more space available, of course, the better.

On the Householders' Cards the two columns for total might be omitted, and the space given to the columns for names.

(Signed) L. H. SHOLL,
Supervisor of Census.

30*th September*, 1911.

V.—WESTERN AUSTRALIA.

Referring to previous correspondence *re* the result of the Census, I beg to submit for your information the following views held by myself in connexion with certain matters which came under my notice in my capacity of Supervisor of the Census of Western Australia taken early in the year.

(1) SUBDIVISION OF THE STATE INTO DISTRICTS AND SUB-DISTRICTS.

On account of the generally prosperous condition of the State at the time of the Census, it did not appear at all likely that a large number of suitable individuals could be obtained at the rate of pay offered for the positions of Census collectors, particularly in districts outside the Metropolitan, and the Central Goldfields area around Boulder and Kalgoorlie, and on that account it became a necessity to adopt in the country districts larger areas as collectors' districts than what might have been thought desirable under other circumstances. As a matter of fact, the alternatives were, on the one hand, to appoint a larger number of collectors, amongst whom there would probably, under the circumstances, have been included men who might not be entirely satisfactory, and to cut the districts up into smaller collectors' areas, or, on the other hand, to cut the districts up into larger areas and select only the best men. As you are aware, the latter alternative was adopted, *but experience has taught me that at a future Census, in order to arrive at more satisfactory results*, an effort should be made, even if the selection of collectors and the distribution of sub-districts were to commence at an earlier date, to provide for a correspondingly larger number of collectors and smaller areas as collectors' districts. It is apparent that, *if good men can be obtained for certain localities* which are well-known to them, it is difficult to find individuals who would know a larger area as much in detail as they would know a smaller one, and there is a danger therefore of the Census enumeration in one portion of a large district being done more efficiently than in another ; in addition to which a large district has the disadvantage of the Census being spread over a longer period, and consequently more danger arising from the fact of individuals moving to and fro in the district whilst the Census is being taken, which might result in omissions that could be ascribed neither to a dereliction of duty on the part of the collector, nor to any fault on the part of the individual.

Moreover, in a State containing such a large area as Western Australia, it would appear necessary that the *authority of supervision should in some way or other be divided,* as it is nearly impossible for one man to shoulder the responsibility of the whole of the vast area referred to. Whether such object would be easier arrived at by dividing the State up into several Supervisors' Districts, or by appointing Deputy-Supervisors for certain portions of the State, I am not prepared to say; possibly the latter suggestion would be the more practical. I am aware, of course, that the enumerators' districts should be sufficient as subdivisions under the Supervisor, but under the special circumstances in this State, I think an officer holding authority between the Supervisor and the enumerators in the Northern portions, and the far Eastern portions of the State would be an acquisition to the enumeration.

(2) TIME FOR COMMENCING PRELIMINARY WORK.

Although I claim to have a fairly extensive local knowledge of the various portions of the State, I think it would be well to consider at the next Census whether it would not be in the interest of an efficient subdivision that the preliminary work be taken in hand nearly two years ahead of Census day, and that in many instances the Supervisor should be placed in a position to make personal inspection of the distribution which was being suggested, not only by himself, but by the enumerators in each district. Since this work was completed, I have often felt that if I had had to do the work over again, not only time but expense would be saved had I the opportunity of visiting certain portions of the State for the purpose of arriving at the most efficient and economical subdivision.

(3) ADVERTISING THE CENSUS.

No doubt the means taken for advertising the Census proved of great value, but a matter which I desire to remark on is the fact of the poster issued by the Department for exhibition only containing the proclamation issued by His Excellency the Governor, setting out the time fixed for the taking of the Census. In my opinion, backed up by the experience gained in advertising electoral canvasses, and the preparation of new rolls for the Legislative Council and Legislative Assembly, another poster containing more particulars should have been prepared and exhibited. In order to show what I mean, I attach hereto copy of a poster exhibited in this State at the time of the preparation of the rolls for the late Legislative Assembly Election, from which you will observe that particulars are given which would enable the individuals concerned to get a fuller grasp of what is required. Such a poster, if exhibited freely, would meet the eye of persons whom the collector had missed, and directions would be given on the poster to such persons where to procure and how to fill in and transmit the particulars asked for by the Authorities. I am aware that this was done at the Census in a different way, viz., by means of advertising in the local newspapers, but it should not be forgotten that the country people, more particularly the individuals who roam about from place to place, very seldom obtain or read newspapers, and that probably the advertisements would, therefore, not come under their notice. If, on the other hand, these posters were exhibited freely all over the State, it is more likely that attention would be drawn to the requirements of the authorities, and possibly a distribution of cards for the purpose of enabling individuals to voluntarily supply particulars might be lodged for the convenience of the public, not only at Post Offices, but at many other public and semi-public offices.

(4) THE CENSUS CARDS.

With reference to the Census Cards (" Householders' and Personal"), I think there would be an improvement if these were printed on differently-tinted cardboard, as some trouble was met with in drawing the attention of the public to the fact that the cards were to be used for different purposes; in fact, a large number of forms were returned to the Supervisor either on the " Personal" Card only, or on a " Householder's" Card only. I think that the difference in colour of the two cards would draw the attention of the public to the distinction between the one and the other more readily than is at present the case.

It would also be desirable to set out on the two cards in the same manner as set out on the " Householder's" Card by a side-note, what portion should be filled in by the individual, and what portion should be filled in by the Census officials. This advice is prompted by the fact that a large number of cards were received in this office, and the information, on the " Householder's" Card for instance, was filled in by the individual, as regards " County," " Federal Electoral Division," " State Electoral Province," " State Electoral District," &c., &c., and was found in nearly every case to be inaccurate. This matter entailed alterations which made the card very difficult to decipher and deal with when finally completed.

(5) PERSONAL CARD.

So far as the Personal Card is concerned, I would say that one item, viz., No. 7, " Relation to head of household," is one which seems to be misunderstood in very many cases. As a matter of fact, I think the general view taken of the headline was that it required to indicate what relation the individual held *to the head of his own family,* whether he was living with them or not. I am not sure whether the Census Returns would lose considerably by the line being eliminated, but I certainly think that some other wording should be substituted.

(6) MAPS.

The maps used at the recent Census in Western Australia were, as you are no doubt aware, unsatisfactory, as the Survey Office, at the time when the maps were required, had unfortunately not completed a new set of maps then in hand, containing the most recent and up-to-date particulars of land settlement, mining leases, &c., &c., and the lithographs, which were finally adopted by the Census Office were, therefore, to a very large extent, at least for certain portions of the State, out of date. This matter, in conjunction with the scale of maps adopted for the use of collectors, viz., 240 chains to the inch, militated against a complete enumeration in certain districts, as the collectors had not at their disposal the necessary details they would have had if the new maps had been ready for use. At a future Census, I should think, therefore, it would be extremely desirable that either special Census Maps be prepared, or arrangements made by the local Survey Office for the supply of maps more up-to-date than those used in this State at the 1911 Census. It is also very doubtful whether the scale of 240 chains to the inch, or 300 chains to the inch, is sufficiently detailed for a collector. The adoption of maps on the scale of say 80 chains to the inch would, of course, very considerably enlarge the maps to be carried by the collectors, but from experience gained, I have no hesitation in stating that expense and the inconvenience of carrying a larger map would be more than compensated by the better results that would be obtained.

(7) THE RESULT OF THE CENSUS OF 1911.

The result of the Census of 1911, so far as this State is concerned, has already been referred to by myself in my letter to you of the 13th June last, to which I beg to refer you. There is one point I desire to again dwell upon, viz., the discrepancy which was found to exist in this State between the Census results and the estimate made by the Government Statistician of this State. After having still further considered the matter, *I am of opinion that the 4½ per cent. which was allowed for unrecorded departures from this State between the Census of* 1901 *and the year* 1908, *when it was discontinued by the local Statistician, was altogether an insufficient allowance.* My reason for making this assertion is based upon the well-known admission, that during the previous

intercensal period, 1891 to 1901, a very large number of unrecorded arrivals occurred in this State, on account of the great inrush of population, particularly during 1895 and 1896, these incomplete records of *arrivals* being accounted for by the fact that admittedly the Steamship Companies carried more passengers than they were entitled to, and that consequently the official record of arrivals may be looked upon with suspicion, which fact was not taken into account when the 4½ per cent. allowance was fixed by the Conference. I beg to draw your attention to the fact that if the average experience of Australia, say about 9 per cent., had been applied during the intercensal period of 1901 to 1911, the difference between the estimate and the actual Census result would have been very small indeed. Should an investigation at any time be decided upon with regard to this particular subject, I would suggest that the *actual corrections* of the departure returns should be compared with the result that would have obtained if the 4½ per cent. allowance had been continued.

(8) CONCLUSION.

The above suggestions are placed on record only with the object of drawing attention to these matters, which may at a future Census be found to be of some assistance, and are not actuated by any desire on my part to criticise the provisions made for the taking of the 1911 Census, nor the results arrived thereat. I have endeavoured to confine myself to the main features only, which, in my opinion, may be looked upon as important.

(Signed) E. G. STENBERG,
State Supervisor of Census, Western Australia

7th December, 1911.

VI.—TASMANIA.

In your letter dated 19th May last, you ask that I should furnish you with a brief report on the main features of the recent Census in Tasmania, and to include therein an indication of any special difficulties met with, and any features which I might regard as specially appertaining to the State of Tasmania.

You also stated that you would be glad to receive suggestions for obviating such difficulties as may have been experienced, or suggestions for the better conduct or organisation of future Censuses, or counts of the population.

In accordance with such request, I have now the honour to submit the following report :—

DIVISION OF THE STATE INTO PRIMARY CENSUS DIVISIONS.

In previous Censuses of Tasmania the primary Census Divisions were invariably based upon, and coincided with, the Electoral Districts of the House of Assembly as constituted at the time. These Electoral Districts of the House of Assembly prior to year 1881 varied from 30 to 35 in number, and, outside of the two cities Hobart and Launceston, formed, in a rough, mountainous, and densely-wooded country like Tasmania, a convenient, and a fairly manageable size or boundary limit for the effective supervision of any single person, with local knowledge, acting as enumerator. Since the taking of the 1901 Census, the Electoral Districts of the House of Assembly in Tasmania were reduced to five, and, consequently being too large, were no longer suitable as a base for determining the primary Census Divisions. The newly-organised municipalities, 51 in number, with their well-defined ward subdivisions, now presented the most suitable base in Tasmania, for determining the primary and other Census subdivisions of the State, for the enumeration of the people in 1911.

It was such considerations which induced me to suggest for your approval my original scheme for the creation of 35 Census Districts, 19 of which were identical with the respective boundary limits of 19 independent municipalities, and each of the remaining 16 Census Divisions were made, in each case, of the area covered exactly by every adjacent pair of the remaining municipalities, of which there would be 32 so grouped. On further consideration, the original scheme was modified, and finally reduced to 23 primary Census Divisions by a further combination and amalgamation of distinct municipalities, in order to conform more closely to the magnitude of Census Districts then contemplated for adoption throughout the other States of the Commonwealth.

SELECTION AND APPOINTMENT OF ENUMERATORS.

Much greater difficulty was experienced in securing and obtaining the consent of suitable persons to act as enumerators for the Census of 1911, than was experienced at the two previous Censuses (1891 and 1901), for which I also acted as Supervisor.

To facilitate and ensure the selection and appointment of suitable persons to act as enumerators, I addressed a circular to the Wardens of the various municipalities throughout Tasmania as early as the 15th July, 1910, briefly specifying the nature and extent of an enumerator's functions, and of the qualifications requisite to efficiently fulfil the duties of enumerator ; and also soliciting the kindly assistance and co-operation of each Warden and his Councillors in the selection of a suitable person to act as enumerator in their immediate Census District. The circular also solicited the consent of the municipal authorities to the appointment of any Council clerk who might be chosen as the most suitable person for the office.

For many reasons it was very desirable to give preference to Council clerks in such appointments.

Eventually, the consent of 14 Council clerks was obtained, and in due course, with one exception, they discharged their prescribed duties in a satisfactory manner.

For nine of the Census Divisions I failed to secure the services of any of the Council clerks located within the particular Census Division, and much difficulty, and unfortunately much loss of time, occurred before I could obtain the consent of suitable persons to act, who were, at the same time, sufficiently acquainted with the topography of the particular Census District concerned.

Apart from the size or extent of an enumerator's Census District as affecting the powers of an enumerator to judiciously and effectively break up his district into as many subdivisions as would enable one collector to carry out the duties of collector within the limits of time prescribed in the printed instructions, it is of the utmost importance that each enumerator of a Census District should have an intimate acquaintance with the topographical character of the district under his charge ; especially so as regards the rivers, roads, and bush-tracks of the larger pastoral areas, and of the sparsely-populated, and sometimes almost impenetrable and densely-wooded parts of Tasmania's principal mining and timber regions. It is also desirable that he should have resided sufficiently long within his district to be able from personal knowledge to make judicious choice of each one of his assistant collectors, and to allocate them to the particular subdivision with which each has given evidence of being best acquainted. It is only in such way that the proper number of collectors' subdivisions can be safely determined, and only with such knowledge can a fair allowance of time and mode of travel be approximately fixed prior to the time when the work of the collector is actually engaged upon.

DIFFICULTIES EXPERIENCED IN THE SELECTION OF SUITABLE PERSONS TO ACT AS LOCAL CENSUS COLLECTORS.

In densely populated countries, closely intersected by railways, roadways, and with every facility for transport and communication, especially so where a more or less perfectly-trained staff of permanent officers can be engaged as local distributors and collectors of Census schedules, the duties may be most speedily and efficiently carried out, even where the range or extent of particulars relating to individuals, households, and even special industries, are extended far beyond the usual limits of Census enquiries; but practical experience, gained in the work of Supervisor of three succeeding Censuses in Tasmania, has convinced me that, when, in a large measure, a staff of officers has to be suddenly engaged temporarily at a given point of time (and even then only for a period of from 7 to 12 days), the standard of efficiency in a number of cases cannot be expected to be of a very high order, expecially when we consider that the majority, of necessity, has to be drawn from such limited local persons as may have spare leisure time or from those in such a neighbourhood who, from various causes, may happen to be temporarily out of employment. The range of Census enquiries, and the work imposed upon collectors selected in this haphazard way cannot be incautiously extended without either the danger of unduly increasing the number of days engaged in the work, or having the duties carried out in a careless and unsatisfactory way. Unfortunately this experience was in a number of instances too closely verified in several of the enumerators' Census Districts of Tasmania at the latest Census.

It is only after the work is practically engaged in that the defects of those appointed as collectors on the nomination of local enumerators are discovered, and then, it is often impossible or too late to replace them with a more suitable officer. In one or two cases the whole work of the collector had to be covered by a proved officer when the work of the originally appointed collector had been discovered to be altogether untrustworthy.

EXTENT AND COST OF ENUMERATION AS COMPARED WITH THAT OF THE PREVIOUS CENSUS.

Compared with the previous Census of 1901, the time taken in the work of enumeration alone, and the estimated cost in connection therewith, has considerably increased, both in relation to population, and to the extent of area covered by the enumerating staff. This is indicated in the following brief abstract:—

Particulars.		Census 1901.	Census 1911.	Increase or Decrease.
Area in square miles	No.	26,215	26,215	..
Estimated population	„	172,475	190,972	+ 18,497
Census Districts	„	31	23	— 8
Collectors	„	390	346	— 44
Average persons enumerated per collector	„	442	552	+ 110
Average square miles per collector	„	67	76	+ 9
Time taken by collectors—Days	„	2,178	3,418	+ 1,240
Ditto. per collector	„	5.58	9.88	+ 4.30
Estimated cost of enumeration	£	1,888	3,500	+ 1,612
Per square mile	..	1s. 5d.	2s. 8d.	+ 1s. 3d.
Per head of population	..	2.62d.	4.40d.	+ 1.78d.

OBSERVATIONS REGARDING COMPARATIVE INCREASE IN COST AND INCREASE IN TIME OCCUPIED BY COLLECTORS IN THE WORK OF CENSUS ENUMERATION IN 1911, AS CONTRASTED WITH THE RESULTS OF PREVIOUS CENSUS.

The larger amount of time occupied by collectors in the work of enumeration of Census in 1911, and the consequent greater cost, as compared with the results of the previous Census, have arisen from several causes, the principal of which are more fully analysed in the following comments:—

(1) By direction the majority of enumerators were selected, in preference to others, from one or other of two or three Council Clerks of the municipalities grouped to form the primary Census Division, or Enumerator's District. Although in every other respect well-fitted for the duties of an enumerator of Census, they were nearly all new to such special work. Being comparatively new residents in recently organised Municipal Districts, and having no direct official relationship with the one or two adjacent municipalities, which, for Census administration, were amalgamated with their own respective municipalities, they were not quite so familiar with the topography and local matters of the more distant parts of the Census District, as were the older resident Wardens and Police District Inspectors of the older local administrative bodies, from whom the enumerators were mainly selected at the previous Census.

As a consequence, it was afterwards discovered that a considerable number of them lacked that precision of local knowledge which would enable them, beforehand, to fix the number, boundary limits, and time of collectors, in such a way as to bring about the best practical and economical results.

From this cause alone, a great deal of trouble arose afterwards, when the collectors, selected by the enumerator for a particular subdivision, either objected to the time for emolument originally allowed for the work of distribution and collection of schedules, or stubbornly insisted, in some cases, upon reducing the limits of the original collecting area mapped out for them.

In such cases of emergency submitted to me by the enumerator of the Census District at the very last moment, I had often no option but to consent to the slight modifications of either time or boundary limits commended by him. This course had, perforce, to be decided at once, as a single day's delay might, in some cases, jeopardise the success of the Census in that particular district.

(2) Apart from the additional cost of enumeration due to the increase of population over the previous Census (increase, 18,947 persons, or 10.73 per cent. greater), there was another important increase in cost due to the fact that, at the previous Census of 1901, a larger number of the mounted police of country districts were employed as collectors than so employed at the last Census of 1911; and as the former, for the most part, were allowed by the Police Department a Forage Allowance, they were only paid for Census work at the rate of collectors on foot, viz., 10s. per day.

Had the collectors on horseback and others been paid for Census work at collectors' foot-rate, viz., 10s. per day, the same as the horseback collector in 1911, it would have had the effect of raising the amount of collectors' emoluments in 1901, from £1641 to about £1991, representing a difference of £350, or nearly ½d. per head of population.

The total amount of collectors' emoluments, and the time taken by collectors, as well as the percentage of the work of collection by means of foot, horse, and otherwise, at the Census of 1901 and 1911 respectively, are contrasted in the following abstract:—

TIME ABSORBED AND COST OF COLLECTION AT THE CENSUSES OF 1901 AND 1911 RESPECTIVELY.

Particulars.		1901.		1911.	
			%		%
Collectors engaged	No.	390	—	346	—
Population	„	172,475	—	190,972	—
Collecting—					
On foot	Days	999	48.56	848	24.82
On horse	„	1,100	50.54	2,351	68.67
Other	„	79	3.40	219	6.41
Total	„	2,178	100.00	3,418	100.00

ESTIMATED COST OF COLLECTION, EXCLUSIVE OF ENUMERATORS' PRESCRIBED FEES AND OTHER INCIDENTAL EXPENSES.

Cost of Collection—			%		%
On foot	£	499	30.41	424	13.94
On horse	„	1,142	69.59	2,351	77.26
Other	„			182	5.98
Special allowance of 5s. for entries Col. Book	..	—	—	86	2.82
Total	£	1,641	100.00	3,043	100.00
Cost per collector	£	4.21	—	9.79	—
Cost per head	..	2.28d.	—	3.82d.	—

The adoption of the separate personal and householder card system of emuneration has added greatly to the work and responsibilities of Census collectors.

Beyond the influence which increase in population and the other causes, referred to previously, may have had in augmenting cost, and time occupied in the work of collection and distribution of Census forms at the last enumeration, the primary cause of increased cost and time occupied by collectors, is undoubtedly due to the much greater work and responsibility imposed upon the latter by the new method adopted in 1911, in collecting information by the separate personal and householder card system.

Prior to the actual Census day each collector on the Tasmanian Census of 1901, had only to deliver to each household or dwelling one schedule combining all particular queries relating to dwelling and to each person who abode therein on Census night. As a single collector might have to arrange for the distribution of 300 schedules relating to say 1500 persons prior to Census day, it is very desirable where there are so many schedules to number specifically for after-identification, that the work of the collector in writing out particulars beforehand, as to locality or district boundary names, should be restricted as far as possible. For this reason it was absolutely necessary to devise a systematic index to every possible concatenation or "Mesh," formed on map of Tasmania by the separate and distinct boundary lines of all the various kinds of divisions or districts to be taken into consideration in the process of enumeration. As this ultimate unit "Mesh" is simple and common to every kind of division or district, its Index No. (e.g., 10/3a.) alone would suffice for tabulation purposes, to identify every form of geographical division or locality. Accordingly the Tasmanian Census Schedule of 1901 only required the collector to fill in particulars relating to four items or queries prior to distribution on Census day, viz.: (1) Schedule No.; (2) Mesh No.; (3) Locality; (4) Road or Street.

If we now contrast the above with the additional preliminary writing on covering envelope and householder and personal cards by collector, as required by the Census of 1911, in relation, for example, to a household of ten persons, as illustrated in the following tabular comparison of the two different methods, we find, that while in the 1901 schedule only four preliminary entries had to be written in prior to delivery, the requirement of the 1911 Census involved the writing in before delivery of cards, &c., of not less than seventy distinct entries by the collector. By experiment at central office and from inquiries made among collectors, I found that the average collector took two hours per hundred cards to write up the preliminary query answers. I estimate that this alone would add two extra eight-hour days to the distributing part of the work of each collector employed on the Census of 1911, in Tasmania.

TABULAR ILLUSTRATION SHEWING THE ADDITIONAL WORK IMPOSED UPON COLLECTORS PRIOR TO CENSUS DAY, 1911, BY THE SEPARATE HOUSEHOLDER AND PERSONAL CARD SYSTEM, AS CONTRASTED WITH THE CORRESPONDING REQUIREMENTS BY THE TASMANIAN CENSUS OF 1901.

(For One Household of 10 Persons.)

Item.	Particulars.	Single Schedule System. Census 1901.	Card System, Census 1911.		
			Schedule Envelope.	Householder's Card.	Personal Cards, 1 x 10 =10
					each one.
1.	Schedule .. .. .. No.	27	nil	27	27
2.	Mesh .. .. „	20	20	20	20
		1	1	1	1
3.	Locality .. .. .. Name	Derby	nil	Derby	nil
4.	Street, Road, &c.	Main-road	nil	Main-road	nil
5.	Envelope .. .. .. No.	nil	27	nil	nil
6.	Blank Forms (A)—delivered .. „	nil	10	nil	nil
7.	Blank Forms (B)—delivered .. „	nil	1	nil	nil
8.	Envelope .. .. ..Address	nil	Mr. Miller	nil	nil
9.	Envelope—Instruction (A) .. No.	nil	10	nil	nil
10.	Envelope—Instruction (B) .. „	nil	1	nil	nil
11.	Collectors' Districts .. Index No.	nil	" B"	" B"	" B"
12.	Census District .. .. „	nil	VIII.	VIII.	VIII.
13.	County .. .. .. Name	nil	nil	Dorset	nil
14.	Electoral District .. .. „	nil	nil	Bass	nil
15.	Legislative Council District .. „	nil	nil	South Esk	nil
16.	Municipality .. .. .. „	nil	nil	Ringarooma	nil
17.	Ward .. .. „	nil	nil	Moorina	nil
18.	Personal Card .. .. ..No. (X.)	nil	nil	nil	10
		..	9	11	5 x 10=50
	Total Written Entries	4	70		

REFERENCE KEY TO THE VARIOUS INDICES AND NAMES OF DISTRICT DIVISIONS MUST BE CONSTRUCTED FOR, AND CAREFULLY CONSULTED BY COLLECTOR WHEN ENGAGED IN WRITING UP PRESCRIBED PARTICULARS ON SCHEDULES, CARDS, ETC., PRIOR TO HOUSEHOLD DELIVERY.

The collector chosen by the Census enumerator of a Census District may find that his collector's district embraces, and is composed of, from three to five distinct " Meshes." Take, for illustration, an actual case in the Census District of Franklin at the last Census enumeration in Tasmania :—

Mr. T. E. Bentick, appointed to the care of Collectors' District (H), found, on reference to his Boundary Map, that his district embraced, and was composed of five specific " Meshes," viz., 51/1a, 51/1b, 51/1c, 51/1d, 51/1e of Strahan East Ward (51/1); and of Strahan Municipality (51).

The separate card system required Collector Bentick, of District " H," writing certain prescribed particulars, in different places, upon one or more of either envelope, household card, or personal card, and shewing against person or house the appropriate index-number, or letter, or name, as the case may be, relating to the different divisions recognised, and to all of which the adopted specific " Mesh" is an ultimate root-unit, common to all divisions.

For such an officer with little or no previous training to such work, and only engaged temporarily for about 12 days, to write down correctly, in different places, answers to 70 queries relating to the localities, indices, and names of different kinds of divisional boundaries, to which any particular " Mesh" may commonly be related, would be practically impossible, unless a Key had been previously carefully prepared for his guidance.

Such Key must be so prepared as to shew at a glance, against each " Mesh" separately, all the information required to answer the particular queries prescribed in the various cards and envelopes to be delivered.

Such a Key was prepared beforehand, by the State Supervisor. A copy of the form of the Key transmitted to Collector Bentick, along with his District Map and other equipment, is here given by the way of more satisfactory illustration :—

TASMANIA.

Schedule to accompany Collector's Plan or District Map.

COLLECTOR'S DISTRICT, "H.', $\frac{51}{(1a,\ 1b,\ 1c,\ 1d,\ 1e.)}$

CENSUS DISTRICT—FRANKLIN (XXI.). MUNICIPAL DISTRICT—STRAHAN (51).

Mesh.	County.		Index or Name of—					
			Electoral Division, Federal and State.*		State Legislative Council District.		Municipal Ward.	
	Name.	Index No.	Name.	Index No.	Name.	Index No.	Name.	Index No.
$\frac{51}{1a}$	Montagu	XVII.	Darwin	II.	Gordon	VIII.	Strahan E.	$\frac{51}{1a}$
$\frac{51}{1b}$	Franklin	XV.	,,	,,	,,	,,	,,	$\frac{51}{1b}$
$\frac{51}{1c}$	Montgomery	XVI.	,,	,,	,,	,,	,,	$\frac{51}{1c}$
$\frac{51}{1d}$	,,	,,	Franklin	IV.	,,	,,	,,	$\frac{51}{1d}$
$\frac{51}{1e}$	Arthur	XIV.	,,	,,	,,	,,	,,	$\frac{51}{1e}$

* State and Federal Electoral Districts are identical in Tasmania.

OBSERVATIONS RELATING TO EFFICIENCY OF CHECK AND TIMELY CORRECTION OF OMISSIONS AND INACCURACIES THAT MAY OCCUR IN THE ANSWERS TO THE VARIOUS QUERIES AS RECORDED ON CENSUS SCHEDULES AND CARDS.

It is obvious that unless omissions or inaccuracies are discovered and corrected by the collector of Household and Personal Census Cards at the moment of final call, the discovery afterwards, either by Enumerator or State Supervisor, or Tabulator, would only be of negative value. At this important stage, therefore, the greater the facility given to collectors for the immediate discovery of defects, the more perfect will be the results of the Census enumeration. The general consensus of opinion in Tasmania among those who have had practical experience of the operation of the older single comprehensive Householder Schedule, and the new separate Householder and Personal Card system, is greatly favourable to the older method, because of the much greater facility it affords to the collector to discover omissions and defects by contiguity and comparison of the same category, for all persons of the same household, and unerringly guided aright by the vertical column arrangement of categories and instructions.

OTHER ADVANTAGES OF THE OLDER SINGLE HOUSEHOLDER CENSUS SCHEDULE.

Of several advantages which the older schedule possessed the following may be noted :—

(1) It greatly reduced the number of printed forms required for Census enumeration.

(2) It required no additional summary of names and sex of inmates of household.

(3) There being provision for the enumeration of at least twenty persons on every schedule there was little chance of omissions.

(4) While the separate Personal Card system possesses the advantage of securing greater privacy to travellers from home, and to occupants of hotels, lodging houses, public institutions, and such like, it lacked the security and greater assurance of freedom from age-inaccuracy and other defects, by the older mode of making the head of the household responsible for the accuracy of the information recorded on schedule in relation to the members of his own family, and to other inmates of the household, if any.

(5) The vertical column arrangement of categories, for all inmates of the same household, as in the Tasmanian schedule of 1901, gave greater facilities than the separate Personal Card system, for checking omissions, inconsistencies, and inaccuracies. To do this work properly required much greater care and concentration of attention on the part of the collector by the card system ; a single glance along the vertical column of the particular category would at once easily disclose omission, inconsistency, or other defect, by the older single schedule method.

(6) One of the disadvantages of the older single schedule was that only for certain purposes could it be used for purposes of tabulation. With the Personal Card, as adopted in the last Census of the Commonwealth, tabulation, under all categories, can be directly proceeded with.

It was necessary by the single householder schedule to appoint a staff of trained officers to prepare from the original entries, all the information required for tabulating purposes, on cards specially devised for facility of handling, and for the rapid combinations and analysis involved in the intricate work of tabulation.

OBSERVATIONS REGARDING THE PREPARATION AND USE OF TABULATING CARDS.

The preparation of Tabulating Cards by trained officers at the Central Bureau has the advantage of having this important work more carefully and correctly prepared with all conveniences and references at the quiet of the office desk, and undistracted by the unfavourable conditions under which the temporarily employed travelling Census collector worked.

Moreover, the trained officer, at this more favourable stage, would also do the work of scrutineer of schedule entries, and correcting and making good omissions and mistakes as far as possible, while engaged in the work of extracting the abbreviated details required for tabulating the various categories on the specially printed cards.

These cards, at the Tasmanian Census of 1901, were far more convenient for the speedy and accurate tabulation of the various categories, in many respects, than the more cumbrous form used at the last Census, thus :—

(1) The size was only about one-seventh that of the card used at the last Census ; was stiffer, smoother, and could be more easily shuffled and counted under the various permutations under some constant or other category.

(2) With such a constant to work upon as a base, the number, under the various categories conjoined could be readily determined without disturbing the basal constant common to the various categories concerned.

(3) The cards used at the Tasmanian Census of 1901 greatly assisted the tabulator in having the sexes and the great distinction of breadwinners and dependents and other important divisions distinguishable to the eye by particular colours and cross bars.

TABULATING RESULTS OF CENSUS ENUMERATION.

MERITS OF THE SYSTEM ADOPTED IN TASMANIA OF ASCERTAINING THE SIMPLE ENUMERATION OF POPULATION WITH SPEED AND ACCURACY, UNDER THE VARIOUS GEOGRAPHICAL AND OTHER DIVISIONS BY THE DIRECT REFERENCE TO THE SYSTEMATICALLY ARRANGED TOTALS SUMMARISED IN THE STATE SUPERVISOR'S " MESH" INDEX RECORD BOOK.

The minute and complex analysis regarding age, birthplace, conjugal condition, education, occupation, and other prescribed Census categories, which are determined by reference to specifically arranged combinations of the householder and personal tabulating cards, need only be carried out in all their fulness, in relation to only one of the complete divisions (the Basal) into which a State may be most conveniently divided. In Tasmania the Municipal were so chosen.

The tabulation of the mere numbers and sex of the people inhabiting any subdivision such as Ward, County, Electoral District, Municipal District, Legislative Council District, or Census District, does not necessitate the very laborious compilation from the units of each personal or householder card. The numbers of such divisions can be determined, quickly and accurately, with even less than one-five-hundredth of the labour and risk of error, by the direct compilation of specific " Mesh" totals contained in State Supervisor's Record Book summaries.

For particular illustration let us take the case of determining the population of the County of Buckingham.

If we wish to determine the population of this county we may readily obtain it from the summation of only 22 distinct totals, abstracted readily from 11 places in State Supervisor's " Mesh" Record Book.

To obtain the same information from the separate tabulating card process, would—apart from the great risk of the importation of a fresh source of error—involve the handling and shuffling of at least 10,000 separate householders' cards.

Again, take for illustration the case of the simple determination of the population of the Legislative Council District Huon (xii.). By direct reference to State Supervisor's " Mesh" Summary Record Book, and to this officer's Legislative Council " Mesh" Compilation Book, we perceive that the total population of the Legislative Council District of the Huon, may be readily obtained from the summation of only eight distinct totals, taken from six places in State Supervisor's " Mesh" Record Book.

To obtain the same information by the fresh combinations of the individual cards, would, apart from the risk of introducing a fresh source of error, involve the hand-shuffling and counting of about 3000 householders' cards.

DESCRIPTION OF STATE SUPERVISOR'S METHOD FOR PROMPTLY AND SYSTEMATICALLY RECORDING AND SUMMARISING THE ROUGH RESULTS OF THE CENSUS ENUMERATION AS RECEIVED FROM THE VARIOUS DISTRICT ENUMERATORS DURING THE ACTUAL PROCESS OF CENSUS-TAKING.

At the outset of the work of Census taking in the State of Tasmania in 1911, I was very anxious regarding the primary compilations of the results of collectors and enumerators as they came to hand in the office of the State Census Supervisor, and accordingly I took charge of this particular duty personally.

To ensure the greatest measure of accuracy possible I took the following precautions :—

As soon after fixing definitely the details of the " Mesh" or " Meshes" forming each separate Collector's District, as finally determined by local enumerators of Census Districts, I prepared, in triplicate, special compilation Record Books. These books (State Supervisor's " Mesh" Record Book) were specially designed and ruled off to shew connectedly for each " Mesh" the enumeration details and totals of the following :—

(1) Details and totals of each Municipal Ward.

(2) Details and totals of each Municipality.

(3) Details and totals of each Census District.

(4) Details and totals of each Collector's District.

Under particular vertical columns were also shewn the following additional information in respect of each " Mesh" :—

(1) Name and Index-Number of Electoral District.

(2) Name and Index-Number of State Legislative Council District.

(3) Name and Index-Number of County.

From these again were compiled the first rough results of the population of each of the principal subdivisions relating to each class of district respectively.

One of the Triplicate Compilation Record Books was used, in the first place, to record at once the earliest telegrams and reports of population from the enumerators, in accordance with printed instructions. Each particular was at once entered separately in its systematically arranged place. Later additions or amendments were at once made good, as they were reported.

When all such entries and amendments were finally completed, I at once prepared clean copies of all the Compilation Record Books referred to, which were despatched to you on 30th May last. I am confident that these Compilation Record Books, based directly upon "Mesh" totals, will be of some help hereafter to tabulators and compilers in your department in comparing and checking results obtained by independent compilations from the individual Householder and Personal Cards.

CONCLUSION.

In concluding my report on the working of the recent Census in Tasmania, I have the honour to state that I have endeavoured, as far as I was able, to comply with your request as set forth in your communication of 19th May, 1911, viz. :—To report on the main features of the recent Census of Tasmania; to indicate the nature of special difficulties met with in the processes of Census-taking by means of the separate Householder and Personal Card system, used for the first time in Australia; and to make such suggestions as might occur to me for securing "better conduct or organisation of future Censuses, or counts of the population."

My report has greatly exceeded the limits I had originally intended, but the importance of the subjects dealt with, and the difficulties of compression, must be my excuse.

Attached to this report I transmit the latest figures relating to the distribution of population under the following divisions :—

(1) Municipalities and Wards.

(2) Electoral Districts.

(3) State Legislative Council Districts.

(4) Counties.

As regards the additional questions referred to in your communication of 10th June last, I thought it advisable to deal with them separately in an accompanying supplementary report.

(Signed) R. M. JOHNSTON,
State Census Supervisor, Tasmania.

15*th July*, 1911.

SUPPLEMENTARY REPORT.

WEATHER.

For about three weeks prior to Census night the weather in Tasmania was the worst experienced for many years, especially in the North-east and Eastern part of the Island. This interfered to some extent in the distribution of Census Cards, inasmuch as in these parts nearly all bridges, etc., were completely swept away, or made impassable. The first part of the week immediately preceding Census day, the weather was very bad indeed, and it caused a good deal of hardship amongst the collectors in the larger areas.

The only difficulties outside those experienced by collectors in obtaining information for schedules were in regard to the Islands, Lighthouses, etc., but with the cheerfully-rendered assistance of the Secretary of the Marine Board, Hobart; Messrs. Holyman and Son, Launceston; Head Lighthouse-keepers, etc., these were easily overcome.

The Government Statistician of New Zealand kindly obtained schedules relating to Macquarie Island. Other islands off the coast were accounted for by the most convenient and cheapest methods available, principally by fishing boats. For such service small sub-collectors' fees were paid.

SPECIAL ARRANGEMENTS FOR ENUMERATION OF TRAVELLERS.

Travellers on Trains.—So far as Tasmania was concerned, no trains were on the lines during the specified Census hours; all arrangements for enumerating were made, had there been any.

Travellers on Ships.—Cards were left on all vessels leaving Tasmania and collected on arrival, as per instruction 46 to enumerators, and collectors' instructions 45, 46, etc.

Some little trouble was caused to the Hobart shipping collector owing to a misunderstanding in regard to vessels leaving other States after Census night without leaving cards. In each case the collection was satisfactorily made, and cards forwarded to proper destination.

POLICE.

Only in isolated cases were the services of police officers used. Any fees paid those officers appointed collectors being paid into the Police Provident Fund.

INTERPRETERS.

There is no record of the services of any interpreters having been necessary.

VESSELS IN PORT.

As per instructions quoted above (Shipping).

DESPATCH OF CENSUS MATERIALS TO COLLECTORS.—DISTRIBUTION AND COLLECTION.

Table dealing with these features is attached hereto :—

Census District. Name.	Range of time actually taken by Collectors in different Districts. Shortest.	Longest.	Despatch and completion of Census Materials. Despatched.	Completed.
1. Wellington	6 days	12 days	8th March	9th May
2. West Devon	12 ,,	15 ,,	6th ,,	5th ,,
3. East Devon	6 ,,	13 ,,	3rd ,,	26th April
4. Westmoreland	6½ ,,	12 ,,	20th ,,	10th June
5. Tamar	6 ,,	11 ,,	21st ,,	1st May
6. Launceston	5 ,,	8 ,,	4th ,,	10th May
7. Cornwall	12 ,,	20 ,,	8th ,,	25th April
8. Devon	2 ,,	12 ,,	6th ,,	15th May
9. Fingal	6 ,,	12 ,,	7th ,,	17th ,,
10. Cumberland	1½ ,,	13 ,,	6th ,,	3rd ,,
11. Somerset	6 ,,	11 ,,	6th ,,	25th April
12. Monmouth	3 ,,	12 ,,	13th ,,	6th June
13. Glamorgan	2 ,,	10 ,,	20th ,,	4th May
14. Pembroke	8 ,,	12 ,,	17th ,,	25th April
15. Buckingham	8 ,,	16 ,,	14th ,,	27th ,,
16. Hobart	9 ,,	12 ,,	1st ,,	24th ,,
17. Kingborough	6 ,,	12 ,,	7th ,,	20th ,,
18. Huon	8 ,,	15 ,,	7th ,,	23rd ,,
19. Esperance	6 ,,	12 ,,	16th ,,	26th ,,
20. Montagu	8 ,,	21 ,,	17th ,,	9th May
21. Franklin	6 ,,	12 ,,	9th ,,	15th ,,
22. King Island	6 ,,	7 ,,	18th ,,	24th April
23. Furneaux	2 ,,	4 ,,	21st Feb.	23rd May.

(Signed) R M JOHNSTON,
State Supervisor of Census, Tasmania.

15*th July*, 1911.

INDEX.

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APPENDIX A.

VOL. I.

CENSUS OF THE COMMONWEALTH OF AUSTRALIA.

The Mathematical Theory of Population, of its Character and Fluctuations, and of the Factors which influence them,

BEING AN

Examination of the general scheme of Statistical Representation, with deductions of necessary formulae; the whole being applied to the data of the Australian Census of 1911, and to the elucidation of Australian Population Statistics generally.

BY

G. H. KNIBBS, C.M.G., F.S.S., F.R.A.S., etc.,

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COMMONWEALTH STATISTICIAN.

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FOREWORD.

The following monograph on the Mathematical Theory of Population, in form an appendix to the Report on the Australian Census of 1911, is intended to serve a double purpose. It aims on the one hand at supplying the elements of a mathematical technique, such as are needed for the analysis of the various aspects of vital phenomena that come under statistical review, and, on the other, at interpreting material made available by the first Census of Australia which has been carried out upon uniform lines and by a central authority. The earlier portion of the appendix has consequently been almost wholly devoted to the creation of the requisite technique. Later technical solutions are introduced only when required by way of application to any statistical analysis under immediate review.

In the realm of official statistics there is an enormous amount of accumulated material, which, decade after decade, remains unanalysed and uninterpreted. This is due to several things, viz., to the fact that routine tabulations largely occupy the energies of the staffs of statistical bureaux; to the fact that much of the mass of material itself is defective and its correction involves more time than is available; and perhaps still more to the fact that appropriate schemes of mathematical analysis have as yet either not been developed, or are regarded as inapplicable.

The present analyses and interpretations have yielded many results which, it is believed, will be seen to be of value. They have brought into clearer relief the necessity for recognising that the variation of any one statistical element affects all other statistical elements, so that the satisfactory reduction of " crude data" to a common system is by no means an easy undertaking, and the comparability of the statistic of two communities can never be rigorously exact in all particulars. It is fortunate, however, that practically exactitude means merely " a precision sufficient for any particular purpose in view."

In substance this monograph consists of two elements, viz., (i.) a technical one, and (ii.) an interpretative one. Formulæ essential for the purposes of interpretation have been deduced, and their use has been illustrated by application to the data of the Australian Censuses, or to intercensal statistical data which, subject otherwise to considerable uncertainty, could be adjusted only by means of information derived from the Census. Thus results of immediate value are obtained simultaneously with an exposition of the theory and technique of the subject.

The various formulæ developed have been carefully checked throughout, but it is too much to hope that among so many results error has been completely avoided. The author will, therefore, be grateful if any discoverer of errors or misprints will communicate with him.

As a rule corrections to data have been pushed as far as seemed to be desirable; theoretically it is often possible to push them even still farther. It is doubted, however, whether the precision of the data would justify this. An example will illustrate the point. In determining the ratios which reveal the age of maximum fecundity, if the number of women at risk be taken as the total of the same age-group, the denominator will be too large and the derived ratio too small. Hence allowances must be made for the diminution of risk for prior cases of child-birth. But there is no well-defined time-limit at which these allowances should stop. In general, however, their applicability becomes more questionable as they become smaller.

A synopsis shews the general treatment of the subject, and an index, at the end of this appendix, makes reference thereto easy. Where it has been deemed necessary to coin technical expressions their derivation has been indicated.

Finally it may be mentioned that many of the formulæ developed will be found serviceable in other investigations in which statistical methods are called into requisition.

G. H. KNIBBS.

Commonwealth Bureau of Census and Statistics.
Melbourne, March 1917.

CORRIGENDA.

Page 3.—Under figures in footnote: after "small figures" read "in brackets."

Page 4.—§ 4, line 8: for "an" read "on."

Page 7.—Line 3; for "acurately" read "accurately."
Line 3, footnote, for "Gesellschaftsehre" read "Gesellschaftslehre."

Page 8.—Sub-heading (iv.). For "interpolation" read "interpolations."
Line 7, last paragraph, insert "the" after "given."

Page 40.—Line 11 from bottom, after log x, insert "and κ being log k."
Line 9 from bottom, for "k," "$2k$," "$3k$," read "κ," "2κ," "3κ."

Page 55.—Line 1, for "of a curve" read "of the curve."

Page 68.—Formula (197d), for ("1—" read "(i—."
Line 13, after "above" add "the numerical coefficients remaining, of course, the same."

Page 72.—In formula (211), the y should follow the sign of integration.

Page 81.—Line 4 from bottom, for ("n" read ("h."

Page 104.—Line 5, for "difference" read "the differences."
Line 27, for "the comparison of" read "comparisons among."

Page 144.—Lines 10 and 11, for "section" and "sections," read "Part" and "Parts," and for XII., read XI.

Page 163.—Line 4, for "M" read "M."
Line 7, for "$2Mr +$" read "$2Mr_1$."

Page 213.—Line 3 from bottom, for "occupying" read "occurring."

Page 233.—Line 4 of paragraph, for "in part of the" read "in part the."

Page 240.—Line 4, § 8, add after "maternity," "each birth being regarded a case of maternity."

Page 242.—Throughout table read "births" for "maternity."

Page 277.—Table LXXXVIII., in "Duration," for 251-160, read "251-260," and for "251-170" read "261-270."

Page 306.—Add to end of paragraph:—"Twins produced from one ovum have been called 'univitellins' and those from two ova 'bivitellins'."

Page 307.—Line 3 from bottom, for "uniovulate" read "uniovular."

Note. Formulæ 374, and 396 are omitted.

SYNOPSIS.

THE MATHEMATICAL THEORY OF POPULATION, OF ITS CHARACTERS AND FLUCTUATIONS, AND THE FACTORS WHICH INFLUENCE THEM.

APPENDIX A.

THE MATHEMATICAL THEORY OF POPULATION, OF ITS CHARACTER AND FLUCTUATIONS, AND OF THE FACTORS WHICH INFLUENCE THEM.

I.—INTRODUCTORY.

1. **General.**—The fundamental elements of social statistics are the fluctuations of the numbers and constitution of the population and of its various characteristics. These fluctuations are profoundly affected by many factors, only some of which are susceptible of physical expression. For example, the extraordinary development, characteristic in the last few decades, of every branch of science and technology, and the skill with which acquired knowledge has been applied to the exploitation of Nature's resources, have probably created the possibility of developing a considerably *larger population* than the world has yet carried, at least in historic times. On the other hand, the social standards have been so profoundly altered as to strongly counteract the effect indicated. Thus *the raising of the standard of living*, and an increased complexity in social organisation have held in check, more or less, that increase of population which might otherwise have been possible.

The opposition of tendency involved by the coëxistence of these two factors necessarily reinforces the interest, while it increases the difficulty of the problems which depend for solution on an evaluation of the degree of influence exerted by particular factors. The interest of any theory is evident when we ask : " What, on the whole, is indicated by past statistical history as to the future populations of the various races of the world ? " This is a question, the correct answer to which is a necessary guide for national policy, and one which involves not only the accumulation of statistical facts that have now become available, but also a theory by means of which a forecast can be made as to what the immediate future has in store for each community.

An interesting illustration of this may be drawn from the history of the United States. In the year 1815, Elkanah Watson predicted with extraordinary accuracy the population of the United States up to the year 1860, by some method which, though not absolutely doing so, was sensibly equivalent to simply assuming a constant rate of increase. As a matter of fact, had Watson actually assumed that the rate of increase from 1790 to 1800 would remain constant till 1860, he would have predicted the population with still greater accuracy than he actually did. This will be made apparent hereinafter ; see also Figs. 3 and 4.

The more complex conditions of the world to-day and the rapidity of the development of the arts and sciences, make the accuracy of prediction for so lengthy a period extremely doubtful; nevertheless an attempt to forecast the affairs of any country, to be well founded, must be based upon the results of a review, among other things, of all the facts of its population development, and upon a study of this development in all other parts of the world.

Of no less interest is the constitution of a population in respect of age, sex and race, and the influence of birth-rates and death-rates thereupon. The effect of age at marriage, the reproductivity as measured by frequency of childbirth, and the age at which it occurs, the probability of living at every age, and the variation of this probability with increasing scientific, hygienic and economic knowledge, are problems of the first order of importance.

The attempt is here made to give a rough outline of the theory of the subject, elucidating that theory where it seemed desirable by quantitative examples.

2. **Significance of analysis.**—The fluctuations in the number and constitution and other characters of populations present, in general, complex and dissimilar changes, and depend upon elements which will not readily lend themselves to prediction. They would thus appear at first sight not to be amenable to mathematical analysis. Nevertheless, when the fluctuations are analysed and expressed in mathematical form, *their trend often becomes much more definite*, and their true significance is more clearly revealed.[1]

[1] An example will illustrate what is meant. The populations in the United States in 1790 and 1820 were respectively 3.93 and 9.64 millions of people. If the number were supposed to increase at each instance at a uniform rate so as to give these numbers in the years mentioned, the deduced populations would be very nearly the actual ones, not only for the intermediate decades, but even up to the year 1860, as is evident from the following table, viz. :—

Year	1790	1800	1810	1820	1830	1840	1850	1860
Population supposed to increase at uniform rate (millions)	3.93	5.30	7.15	9.64	13.00	17.53	23.65	31.89
Actual population (millions) ..	3.93	5.31	7.24	9.64	12.87	17.07	23.19	31.44
Difference (millions)	.00	.01	.09	.00	.13	.46	.46	.45

A remarkable prediction by Elkanah Watson is referred to later: see Figs. 3 and 4.

This fact, viz., that the supposition made is approximately true, throws light on the other facts. Thus, that to accord with this supposition the figures for 1800 and 1810 are very slightly too small, while those for 1830 to 1860 are somewhat in excess; and the excess is constant for 1840, 1850, and 1860; illustrate the value of the scheme of analysis by means of which the fundamental idea is ascertained. The deviations of the actual values from those computed on the assumption of uniform rate of increase may thus, indeed, become in turn the starting point of a further analysis undertaken with a view to the interpretation of the departure from the law of uniform increase, arbitrarily adopted as the norm of the phenomena.

For this reason it is proposed to develop the mathematical conceptions which may serve as the foundation of definite analyses of the fluctuation of any population ; to express these conceptions by formulæ ; to so develop and resolve the formulæ that they may be readily applied ; and, where necessary, to illustrate their application.

3. **The nature of the problem.**—An ideal theory of population is one which would enable the statistician not only to determine definitely the influences thereupon of the various elements of human development, and of the phenomena of Nature, but also to examine all facts of interest to mankind, as they stand in relation to population. And however hopeless may be the expectations of establishing such a theory with meticulous precision and in all detail, it nevertheless remains true that fluctuations of population can often be adequately understood only when they are analysed by means of definite mathematical conceptions. Moreover, since all important facts concerning population are susceptible of numerical expression, analytical conceptions formulated for the purpose of giving exactitude to a knowledge of its variations, should be ultimately cast, if possible, in a mathematical mould.[1]

The total population-aggregates of some countries have been found to increase almost exactly at a uniform rate ; in general, however, the rate fluctuates. "Can the characteristics of such fluctuations be subsumed under any conception ?" is a question which naturally presents itself.

---

[1] To revert to a previous illustration, for example, if we ask : "What uniform rate of increase would cause a population of 3.93 millions to become 9.64 millions in 30 years ?" the answer is that it would be necessary that each million persons should receive *at each instant* an addition at the rate of 29,910 persons *per annum*, that is to say, the rate of continuous increase would have to be 0.02991 per annum. More exactly, this would give the following figures, viz. :—

$$3{,}930{,}000\ ;\ (+\ 1{,}370{,}173)\ =\ 5{,}300{,}173\ ;\ (+\ 1{,}847{,}877)\ =\ 7{,}148{,}050\ ;$$
$$(+\ 2{,}492{,}128)\ =\ 9{,}640{,}178.$$

The differences, shewn by the small figures, do not in themselves disclose the fact that the increase is at a uniform rate, but *on dividing each by the preceding population figures* it is seen to be equivalent to adding 348,644 persons per million per decennium. Hence, obviously, the *rate* of increase was constant. This rate will be found to be equal to an increase of 30,361.8 annually per million of the population at the beginning of each year.

The facts just indicated, viz., that starting with a population of 3,930,000, and uniform increases at the rate of 0.02991 per annum, gives a population of 5,300,173 in ten years, etc. ; that an equivalent figure is given for the population if, at the end of each year, there is added to it an absolute increment of the amount of 0.0303618 of the population at its beginning ; that the figures at the end of a decennium are given by adding an increment of 0.348644 of the population at the beginning of the decennium—can be elucidated only by formulating a definite conception of rate, and studying the consequences that flow therefrom. It is, for example, by no means immediately obvious that, used with the limitations above indicated, the three sets of figures will give identical results. The last will accurately give only decennial results ; the middle value only annual ; the rate of continuous increase is the only one which is appropriate to furnish correct results for any moment during the whole period under review : see Fig. 4.

Such answer as may be given must, if it is to be explicit, obviously be in the form of a mathematical theory of the subject. Such a theory will be found to involve two elements, viz. :—

(*a*) The appropriation of suitable conceptions of a mathematical character, and

(*b*) The development of a scheme of using them.

The propriety of the application of such conceptions is to be measured by the extent to which they are capable of illuminating the actual facts, and of reducing them to system.

What has been said regarding total population, applies equally to each constituent part, viz., to the totals for each sex, to the number of both sexes or of either sex at birth or at a particular age, to the ratio of the sexes, to the fluctuations in the rates of birth or death, and to all the circumstances of migration.

In other words, any fact, either of the condition or constitution of population at any moment, or of the relation of these at different moments can be readily subsumed under appropriate mathematical conceptions with sufficient precision for practical purposes.

Again, in dealing with the co-ordination of population with other related facts susceptible of statistical statement, the question often arises : " How can the nature of the relation be best defined or best disclosed ? " The selection of appropriate mathematical conceptions, and the means of bringing the facts under them, also constitute phases of the theory to be considered.

4. **Necessity for the mathematical expression of the conditions of the problem.**—Although, in the nature of the case, the population of any territory necessarily changes through births and deaths by whole units, and in instances of immigration and emigration sometimes by relatively large groups of units, no appreciable error will ordinarily be committed, at least where the aggregate population is large, if all its fluctuations be supposed to take place continuously and by infinitesimal increments. This supposition, which might appear an insufficient consideration to be physically invalid, very fairly represents, after all, the actual facts in their totality.[1]

[1] For, when all the circumstances are taken into account, it is obvious that the extent or degree to which the individuals of a community participate in its economic and general life, or in territorial occupation, passes through a wide range of values. These considerations have application even to the circumstances of birth and death, and even moreover to those of immigration and emigration. The ordinary involvement of a community by each individual through the circumstances preceding birth and following upon death, shew clearly that in many important respects the introduction and disappearance of a unit of the population is, *virtually*, not quite instantaneous.

It is obvious, too, that this consideration would apply even if registration, or rather the statistical recognition of that fact, were contemporaneous with birth and death, which, however, it is not, since ordinarily it follows these events by a period of varying length. In cases of birth it also stretches over a longer period. It

Thus the fluctuations of population therein may at least in ordinary cases, be represented with precision by an *imaginary* or *fictitious population*, the ideal fluctuations of which, varying with time, conform to all the laws of infinitesimal increment or decrement, in this way rendering those fluctuations amenable to a rigorous analysis by the methods of the infinitesimal calculus. Such an imaginary population, changing continually by infinitesimal amounts, not only accurately represents the totality of facts, but is amenable to mathematical treatment.

It is nevertheless important to bear in mind that actual population-changes may be oscillatory, as will later be shewn.

5. **Conception applies equally to a population "de facto" or a population "de jure."**—Population may be related to territory in two ways, viz., by actual presence, and by legal relationship therewith; that is to say, the relationship may be "*de facto*" or "*de jure*"; and official statements regarding population are of each kind. In some countries, as where the floating population is large, or where citizens are under special obligations (*e.g.*, military service, etc.), the main concern may be to ascertain the population which may be said to belong to, or to be domiciled in the place, the foreign migratory element, whatever its magnitude, being regarded as of relatively little moment. Again, where communal rights are explicit and of an important character, the general reasons for deciding to adopt the "*de jure*" relationship for the official enumeration of population may be very cogent.[1]

The association of a human being, however, with any particular territory, delimited by frontiers of any type whatever, is, after all, only one of degree, so that any criterion (*e.g.*, nationality, domicile, etc.), other than that of mere presence in the territory, however necessary for certain purposes, is more or less indeterminate for others, particularly in countries where the freedom of movement of the individual is practically unrestricted. The actual presence of an individual in any territory involves, in varying degree,[2] the whole scheme of general relationship which every unit has to the general community in which he finds himself, and which that community has to the territory it is occupying. He is

is considerably influenced by legal prescriptions in regard thereto, as well as by the traditions and circumstances of the community. Thus the registration of death must perforce quickly follow on its occurrence; not so the registration of birth. In a sparsely-populated district, the registration of birth may be very late as compared with registration in a densely-populated area.

We may remark in passing, that official estimates of population, at least when based upon accurate vital and migration records, as ordinarily kept and reported, are usually slightly in error as regards actual populations, viz., to an extent corresponding to the want of balance between inclusions at the beginning of a period of record, really belonging to a previous record, and exclusions at the end of the period owing to complete information not being to hand. In an increasing population the error tends on the whole to be one of defect.

[1] As, for example, in some of the Cantons in Switzerland.

[2] The economics and general relationship of individual with a community passes through a wide range of values, and in each individual the value varies with his age.

subject to the laws and to the same extent also the general civic and other responsibilities of the place, while the community, on the other hand, is concerned with his protection and well-being. Hence the "*de facto*" population may often be statistical desideratum. For other purposes obviously the "*de jure*" population is a necessity.

For the general purposes of economics there are features characteristic of population which may be considered either in the "*de jure*" or the "*de facto*" relationship, which may call for specialisation in any mathematical treatment. For mere enumeration, however, the mathematical conception as above defined will apply with equal rigour to either.

6. **Nature of population fluctuations.**—The fluctuations of the entire population of the earth, if available for long periods, would probably disclose in their most general aspect the secular characteristics of its increase, which must have greatly varied. Merely local effects would to a large extent disappear in the total; opposite periodicities, dependent on seasons, would be balanced by the inclusion of results from both hemispheres; by taking quinquennial, decennial, or longer means or averages, the effect of minor fluctuations would be correspondingly eliminated; and the broad outlines of the facts of the growth of the world's population would be brought into relief. Were the curve of secular increase of population for the entire earth available, it would obviously constitute the most suitable *norm* for general comparative purposes. Statistic unfortunately, has, however, not yet attained to this. All we can assert with certainity is that the present rate of increase can have existed for a relatively short time only.

Limiting the consideration to particular countries, changes will be found exhibiting the following features, viz.:—

(i.) The rate of appearance of individuals by birth, and disappearance by death is not, in general, uniform throughout the year, but shews more or less definitely an annual period.

(ii.) The movement of floating population is also non-uniform, disclosing, in many instances, definite annual periodicity.

(iii.) Improvements of natural conditions are in general followed by changed rate of increment to the population, which may have a period of a considerable number of years, or may be brief.

(iv.) Variations of social and economic traditions profoundly affect the rate of increase of population.

For the larger purposes of statistic, elements of the type (i.) and (ii.) are ordinarily negligible; while those of the type (iii.) and (iv.) are of the first order of importance. For minor purposes the converse may be true. Hence, the scheme of any investigation must be adapted to the element under consideration.

In general, secular and long-period changes must be eliminated in order to accurately study minor and short-period changes; and conversely, minor periodic changes must be eliminated in order to acurately ascertain the characteristics of the secular changes.

7. **Changes in the constitution of populations.**—The ratio of the total numbers of each sex, the proportion of the sexes at each age, the relative birth, marriage, and death rates, the circumstances affecting fecundity, the consequences upon all of these of migration, of disease, of war, and of economic and social traditions and developments, as well as their fluctuations with the lapse of time, are necessarily matters of statistical concern. Such changes may be called "*constitutive changes*," or perhaps "*organic changes*," and their analysis and subsumption under mathematical expressions are often of importance and are essential in various statistical analyses.

8. **Organic adjustments of populations.**—In reviewing the constitution of population as a whole, it is obvious that organic adjustments occur.[1]

The nature and drift of such adjustment as has been indicated, or of the deviations of the actual constitution of a population at any moment from *some norm adopted for comparison*, and the changes in such deviations, can be effectively studied only by the establishment of a system of suitable mathematical relations. For such deviations to be made the subject of prediction, the law of their fluctuation with time, must, of course, be ascertained. The principles guiding the constitution of a norm will be illustrated hereinafter.

9. **Continuous and finite fluctuations.**—The scope of the mathematical theory of the fluctuation of population reveals its fundamental importance. Every form of fluctuation, whether of total population, or of its constitutive elements, of its characters, or of the influences to which these are subject, may ordinarily be regarded as changing continuously by infinitesimal increments or decrements within the period during which it is assumed to vary. In special cases the fluctuations may even be discontinuous.

[1] In Europe, for example, of those born living, there are about 105 male births to every 100 female births: of those still-born the proportion is about 133 (see "Die Geborenen nach dem Geschlecht," in "Statistik und Gesellschaftsehre," by Prof. Dr. Georg von Mayr. Bd. II., § 56, p. 189), and the deviation from these figures for different countries is, in general, small. Nevertheless, in the total population of Europe there is a ratio of only about 97.6 males to 100 females. To war and unhealthy occupation, and accident, the death of a considerable number of males is directly attributed. Thus there are no less than about 108 deaths of males to 100 deaths of females, for a number of countries. Nevertheless, because of the larger number of male births, the percentage does not materially change.

The aim of any definitive consideration of the subject is to express the fluctuations of population or of its constituent elements, and of its characters, in forms which will serve—

(i.) To render intelligible the characteristics of such fluctuations.

(ii.) To assist attempts at tracing the cause and effect of fluctuations.

(iii.) To determine means and averages, etc.

(iv.) To make all required interpolation of values.

(v.) To make prediction by extrapolation possible, or to make it possible by the result of a general analysis.

(vi.) To bring into clear relief the various characters of a population.

10. **Curves required to represent various fluctuations and the solution of the same.**—When a curve or "graph" representing a series of statistical results can be defined with sufficient accuracy by some form which is susceptible of geometrical or algebraical representation, such definition constitutes an advance as regards the understanding of the essential nature of the facts: a clearer conception of the statistical results is attained. For example, if the rate at which a population is growing be constant, then the curve passing through the terminals of the ordinates (whose length represents the successive values of the population) plotted against distances along an axis representing time, is a curve which is concave upward. This curve is of character such that, if, instead of plotting the ordinates on the natural scale, their logarithms be plotted, the terminals will be found to lie upon a straight line. Thus, if when the logarithms of the numbers of any population at different dates are plotted as ordinates, and the times as abscissæ, the points are found to lie on a straight line, we know that the rate of increase is constant.

To thoroughly represent and to analyse the nature of the changes in the size of any population or the changes in its constituent elements or characters, a considerable command of schemes of curve-representation is a desideratum. For the mathematical representation of fluctuation, therefore, it is, in general, necessary to know the geometrical form or graph of various algebraic or other mathematical expressions; in order that, given geometrical form or *graph* of a series of results, the mathematical expression appropriate to represent it will be recognised. For this reason a considerable number of type-curves and a knowledge of their graphs must be at the disposal of the statistical analyst, so that the appropriate expression may be selected. As soon as it is decided upon, the mode of solving for the constants of the representative expression becomes of importance. With this in view, it has been found desirable to give a considerable number of formulæ, and to indicate the methods by means of which the constants that make the expression definitive can be found.

This has been the more necessary, because, after all, the scheme of statistical representation, or the "*fitting of curves*," is an art of much difficulty, and one which is only in its infancy.

The fluctuations of the numbers representing population and its various characters make considerable demands in regard to knowledge of this kind, and consequently not only are formulæ given herein from time to time, but their "graphs" are also drawn. These exhibit the character of the curves represented. It will be seen that the interpretation of statistical results therefore make considerable demands of what is called *curve-tracing*.[1]

[1] The "Spezielle algebraische und transzendente ebene Kurven, Theorie und Geschichte," of Dr. Gino Loria, 2 vols., Teubner, Leipzig, 1910-1911; the "Sammlung von Formeln der reinen und angewandten Mathematik," by Dr. W. Laska, Fr. Vieweg und Sohn, Braunschweig, 1888-1894; and Frost's well-known "Curve Tracing," give much valuable information in regard to the possibility of representing certain important forms. These works, however, are neither adequate nor exhaustive. The work of Felix Auerbach on "Physik in graphischen Darstellungen," Teubner, Leipzig, 1912, has also a large number of forms of importance to statisticians.

II.—VARIOUS TYPES OF POPULATION FLUCTUATIONS.

1. **Mathematical conception of rate of increase.**—Whether diminishing or gaining, any actual population may be replaced by a "representative population," assumed to change at every moment by infinitesimal amounts at some *rate* (ρ say) per unit of time. That is to say, ρ will denote the fraction of a unit which, at the instant under consideration, measures the rate of change of the population for a unit of time. Hence, if P_t be the population at the time t, and $P_{t+\delta t}$ that at the time $t + \delta t$, then where δt is small we shall have

$$(1).....P_{t+\delta t} = P_t(1 + \rho\delta t) = P_t\, e^{\rho\delta t}$$

as the fundamental expression for its fluctuation. In other words- $P_t\,\rho\delta t$ is the absolute change in the time δt. If ρ be positive, the change is an increase ; if negative, it is a decrease.

The rate ρ may be either constant, in which case we shall denote it by r, or it may on the other hand vary in some determinate way with time, in which case we shall retain the Greek letter. If the rate be regarded as a function of time, then we should have

$$(1a).....P_{t+\delta t} = P_t\{\rho\,(1 + \phi t)\,dt\}$$

We shall consider initially the case where it is constant.

2. **Determination of a population for any instant when the rate is constant.**[1] If increments of population be supposed to be added at N uniform intervals of time, extending over the period t, at the uniform rate r per unit of population per unit of time, then, putting P_0 for the initial population and P_t for that at the end of the time t, we shall have,

$$(2).....P_t = P_0\left(1 + \frac{r}{N}\right)^{Nt}; = P_0\, e^{rt}$$

when N becomes finite.

As usual e denotes the base of Napierian logarithms, viz. :— 2.7182818284590, etc.

It is sometimes convenient to put this expression in the form of a series : thus, by the exponential theorem, we have

$$(2a).....P_t = P_0\,(1 + rt + \frac{r^2t^2}{2!} + \frac{r^3t^3}{3!} + \text{etc.})$$

Taking logarithms of both sides of (2), we notice that

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[1] When ρ is constant the investigation is analogous to that for determining the increase in a sum of money when interest is supposed to accrue at every instant of time. For a development of the theory of continuous interest and a kindred investigation of population, see a paper by J. M. Allen, *Journ. Inst. Actuaries*, Vol. XLI., p. 305.

$$(3).....\log P_t = \log P_0 + (r \log e)\, t$$

hence, if r be constant, the *graph* obtained by passing a line through the points formed by plotting as ordinates the logarithms of the population for successive years, quinquenniums or decenniums, opposite the corresponding values of t as abscissæ, will be a *straight line*, the tangent of whose angle with the axis of abscissæ is $r \log e$. We shall call this graph the partial[1] *logarithmic homologue* of the graph of equation (2).

The value of $\log_{10} e$ is 0.4342944819032, etc., and of $\log_{10} (\log_{10} e)$ is 9.6377843113005, etc.[2] Both are required in practical calculation, to, however, only few places of decimals.

To find the *constant rate of increase*, we have

$$(4).....r = (\log P_t - \log P_0) / (t \log e)$$

3. **Relation of instantaneous rate to the ratio of increase for various periods.**—We may call the constant r the *constant* rate of continuous increase, and similarly the variable ρ the instantaneous rate of continuous increase. It is often necessary, however, to substitute for r the equivalent rate for a year, or for five or ten years, that is to say, to measure the ratio at which the population at the beginning of the period must be increased in order to give it its proper value at the end thereof. Calling this r_t, we have

$$(5).....r_t = (P_t - P_0) / P_0 = e^{rt} - 1 \text{ ; or } e^{rt} = 1 + r_t$$

4. **Determination of the mean population for any period: rate constant.**—Let P_0 denote the population at the beginning of any period and P_t the population after the time t: then, since $\int e^{rt} dt = e^{rt}/r$, the mean population P_m is obviously

$$(6).... \frac{1}{t}\int_0^t P_t\, dt = \frac{P_0}{t}\int_0^t e^{rt} dt = \frac{P_0 (e^{rt} - 1)}{rt} = P_0 \left(1 + \frac{rt}{2!} + \frac{r^2 t^2}{3!} + \text{etc.}\right)$$

a formula which is suitable for determining the mean from the initial population. This expression may be put also in the form, see (5)

$$(7).....(P_t - P_0) / rt \text{ ; or } P_0 e^r{}_t / rt$$

by means of which, when the rate is constant and known, the mean population can be calculated, either from the absolute increase for a given period, or from the ratio of the increase for a given period to the initial population for that period.

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[1] Partial, because the values of t and not of the logarithms of t are not used as the abscissæ.

[2] 9 is used instead of ɪ.

5. **Error of the arithmetical mean: rate constant.**—The arithmetical mean of the population at the beginning and end of any finite period differs, of course, from the true mean. The magnitude of this difference is sometimes required. From (2a) and (6) we obtain—

$$(8)\ldots\ldots P_m = \tfrac{1}{2}(P_0 + P_t) - P_0\left(\frac{r^2t^2}{2.3!} + \frac{2r^3t^3}{2.4!} + \frac{3r^4t^4}{2.5!} + \text{etc.}\right)$$

which may also be written—

$$(8a)\ldots\ldots P_m = \tfrac{1}{2}(P_0 + P_t) - P_t\left(\frac{r^2t^2}{2.3!} - \frac{2r^3t^3}{2.4!} + \frac{3r^4t^4}{2.5!} - \text{etc.}\right)$$

When expressed in terms of the arithmetical mean itself, the odd powers of r and t disappear, thus

$$(8b)\ldots\ldots P_m = \tfrac{1}{2}(P_0 + P_t)\left(1 - \frac{r^2t^2}{2.3!} + \frac{2r^4t^4}{2.5!} - \frac{17r^6t^6}{2^2.7!} - \text{etc.}\right)$$

This last is the most convenient formula. The values of the coefficients are $\frac{1}{12}$, $\frac{1}{120}$, $\frac{17}{2^5.180}$, etc.

Remembering that the maximum value of r is about 0.03, all these series converge with sufficient rapidity.

6. **Empirical expression for any population-fluctuation.**—If the population of a country be determined at $n + 1$ different dates, then a curve of the n^{th} degree can be arbitrarily drawn, passing through the graph of the coordinates. In the absence of any information as to the magnitude of the population between the given dates, the ordinate to the curve drawn from the terminal of the abscissa corresponding to the date may be assumed to be a probable value for the population at that date.

The curve in question may be written[1]—

$$(9)\ldots\ldots P_t = P_0\,(1 + at + bt^2 + ct^3 + \text{etc.})$$

which, for purposes of practical calculations or computational check, may be found convenient in the form :—

$$(9a)\ldots. P_t = P_0\,\{1 + t\,[a + t\,(b + tc + \text{etc.})]\}$$

7. **Mean population for any period: rate not constant.**—Using the same notation as in II., 4, equation (6), we have—

$$(10)\ldots. P_m = \frac{1}{t_2 - t_1}\int_{t_1}^{t_2} P_t\,dt =$$

$$P_0\left\{1 + \frac{a}{2}(t_2 + t_1) + \frac{b}{3}(t_2^2 + t_2t_1 + t_1^2) + \frac{c}{4}(t_2^3 + t_2^2t_1 + t_2t_1^2 + t_1^3) + \text{etc.}\right\}$$

Since, in the majority of calculations, t_1 is 0, in which case t_2 becomes simply t, we may write the result thus :—

$$(10a)\ldots. P_m = P_0\,(1 + \tfrac{1}{2}at + \tfrac{1}{3}bt^2 + \tfrac{1}{4}ct^3 + \text{etc.})\,;\ \text{or}$$

$$P_0\left\{1 + t\left[\frac{a}{2} + t\left(\frac{b}{3} + t\frac{c}{4} + \text{etc.}\right)\right]\right\}$$

the latter form being sometimes the more convenient for practical calculation.

[1] See equation (45a) hereinafter. The fitting-efficiency of equation (9) is not equal to that indicated later, but it is more convenient to use.

8. **Change, with change of epoch, of the coefficients expressing rate.**—If the coefficients a, b, etc., have been determined for P_0 at a particular date, and it be desired to make the population, P_t the origin P'_0 for new computations, so that—

$$(11)\quad P'_\tau = P'_0 (1 + a\tau + \beta\tau^2 + \gamma\tau^3 + \text{etc.})$$

in which τ denotes the interval of time after the new epoch ; that is to say, $P'_\tau = P_{t+\tau}$ and $P'_0 = P_t$

On putting $P_t / P_0 = 1 + r'$, we shall then have

$$(12)\ldots\ldots \begin{cases} a = (a + 2bt + 3ct^2 + 4dt^3 + \text{etc.})/(1 + r') \\ \beta = (b + 3ct + 6dt^2 + \text{etc.})/(1 + r') \\ \gamma = (c + 4dt + \text{etc.})/(1 + r') \end{cases}$$

which is perhaps the best form for computation. If the quantity enclosed in brackets in equation (9) be denoted by $y = \phi t$, the several quantities in the brackets in (12) are dy/dt ; $(d^2y/dt^2)/2!$; $(d^3y/dt^3)/3!$; etc., and the coefficients can be written out by a reference to Pascal's triangle. They are, of course, simple "figurate numbers" of the second, third, fourth, etc., orders.

That the coefficients must be altered when a new origin for t is selected, exposes one of the inherent limitations of the empirical equation.

9. **Error of the arithmetical mean : rate not constant.**—The arithmetical mean will always be in excess with either a uniform or a growing rate of increase. From (9) and (10a) we obtain—

$$(13)\ldots\ldots P_m = \tfrac{1}{2}(P_0 + P_t) - P_0 \left(\frac{bt^2}{2.3} + \frac{2ct^3}{2.4} + \frac{3dt^4}{2.5} + \text{etc.} \right)$$

which may also be readily expressed in terms of the mean itself, as in (8b), thus—

$$(13a)\ldots P_m = \tfrac{1}{2}(P_0 + P_t)\left\{1 - \frac{b}{3!}t^2 + \frac{2ab - 6c}{4!}t^3 - \frac{5a^2b - 10b^2 - 15ac - 36d}{5!}t^4 - \text{etc.}\right\}$$

This, however, is more tedious to use than (13).

10. **Expression of the coefficients in the empirical formula for rate in terms of the constant rate.**—If in equation (9), viz. :—

$$P_t = P_0 (1 + at + bt^2 + ct^3 + \text{etc.})$$

$$a = r\ ;\quad b = r^2/2!\ ;\quad c = r^3/3!\ ;\ \text{etc.}$$

the equation would express a constant rate, that is to say, it would be simply another form of equation (2a) ; and if a, b, c, etc., have not these values, the rate of increase is variable.

By substituting the corresponding values of r in (13a), it may easily be seen to be identical with (8b); and similarly as regards (13) and (8).

11. **Investigation of rate is complete only when its variations are ascertained.**—Reverting to II., 1, equation (1) may be written—

$$(14).....\delta P = P\rho\delta t = P\phi(t)\delta t$$

which may be regarded as the fundamental differential form for increase of population, the final form being required, since the rate ρ is rarely if ever, constant, even for short periods of time. Hence in its theoretical form, an investigation of the fluctuations of population cannot be complete till all variations of its rate of growth are definitively ascertained, in other words, $\phi(t)$ must be ascertained.

12. **Rate is a function of elements that vary with time.**—The rate at which population increases is dependent upon elements external to and beyond the control of man, as well as upon elements within him, more or less under control. Both change with the lapse of time. In Fig. 3, § 32, hereinafter, examples are given shewing the curve of population of different countries, and in Fig. 4, of the same section, the corresponding logarithmic homologues of the populations. As already pointed out, the latter would be straight lines, if the rates of increase were constant. Hence, in the sense that it is dependent upon elements that vary with time, and may thus be directly related to the latter, the rate $\rho = \phi(t)$ may be investigated as a function of the elapsed time.

13. **Factors which secularly influence the rate of increase.**—Where not otherwise expressed, the rate of increase will be assumed to refer to total population. Let us consider primarily a community which grows by natural increase alone. This increase will be profoundly affected by four types of things, viz.:—

(i.) The material natural resources of the occupied territory.
(ii.) The various cosmic energies which facilitate man's development.
(iii.) Knowledge which increases the power of utilising natural resources.
(iv.) Sociological and other analogous standards, which react upon human activities, particularly upon man's productiveness, and the magnitude and character of his consumption of what he has produced.

Regarding (i.), it may be said that the *natural resources* of the territory occupied may be either *actual* or *potential*. Even without human intervention, a territory may be prodigal of those forms of animal and vegetable life, for example, which provide immediately for human wants. Its climate and meteorology may be propitious. It may possess large stores of readily available wealth, or of energy convertible into wealth.

Or yet, again, though in the state of Nature infertile, it may respond to well-directed efforts to make it so. It may have large hidden resources which can be recognised, and can become available only through a considerable development of scientific and technical knowledge, and through practical ability in applying the same. Lastly, it may contain types of wealth, as for example mineral wealth generally, which, though valueless *per se* to sustain life, may be made contributory to the growth of population through the part they play in the world-economy.

All these may be summed up under two headings, viz. :—

(i.) Natural fertility and resources of the territory independent of human action.

(ii.) Wealth or resources dependent on human action.

Both, however, are potentialities rather than actualities in regard to population : how they eventuate in respect thereto depends upon other and very subtle factors inhering in that order of things which concerns the general sociological and economic beliefs and in the traditions and activities of the people. For example, the general attitude of a people in respect to the question of *fecundity* and the prevailing view as to what should constitute a reasonable *standard of living*, profoundly affect the rapidity of the increase of the population, and the reaching of the time when natural limitations of fecundity operate severely.

There is still another factor of an analogous nature that plays a part, the significance of which is each year becoming more manifest, viz. :— The attitude of a people toward the development of the intellectual powers of man, and toward the application of such powers to the availment of the resources of Nature. Indeed, in general, the great advantages of the human being over the larger mammals is due to the efficiency in this direction of his intellectual endowment, and his power by systematising to store and apply acquired knowledge.

If we denote natural fertility or wealth of resources of the territory, say, by w ; what may be called its geographical and climatic advantages by g ; its other available resources when better scientific knowledge is applied, or even when new wants are created by advancing civilisation, by u ; the factors expressing themselves in the matter of fecundity by f ; through standard of living, including hygiene, by l ; through intellectual knowledge and its range, energy, and wisdom of application by i ; then we must regard the increased population as really a function of all these, that is to say—

$$(15)\ldots\ldots P = P_0\ \phi\ (w, g, u, f, l, i, \ldots . t)$$

The influences of these elements are, in general, secular in character, *i.e.*, they produce slow changes, some being manifest in the years of a decade, others only in many decades. They are all determining factors of the possibilities of population, but do not necessarily express its actuality.

Their specific character is such that ordinarily they produce gradual and more or less remote effects, rather than effects which are instantaneous and immediately of great magnitude. Such effect may tend towards a constant value, may increase, or diminish, but in all cases the consequent changes will be gradual. It is to be noted, however, that some of the factors may acquire for a short time an importance which, locally at any rate, may lead to rapid changes.

Factors of the kind considered are probably either non-periodic, or if periodic their period is secular.

A general solution, if it were possible, would presuppose that the way in which w, g, u, f, l and i, varied with elapsed time was determinable. This variation, however, is not susceptible of exact definition: nevertheless, the *form* of the functions expressing their effect on the rate of increase ρ is not always wholly indeterminable.

14. **Variations which depend on natural resources, irrespective of human intervention.**—This may include both periodic and non-periodic elements. The natural wealth of a territory, as unaffected by the intervention of man, is, in general though not invariably, a maximum initially,[1] though its values may oscillate between very wide limits, owing to variations of meteorological or climatological factors. Where natural wealth is of a type that is subject to steady decline, its effect on the rate of increase may be represented for all practical cases probably by a very simple function of the elasped time.

15. **Variations of rate of long periods.**—Any periodicity in meteorological and other factors, affecting the natural wealth of a territory, however much their influence may be masked by other factors, will in most cases cause a collateral periodicity in rate of increase. This can be represented by such a formula as the following, viz.:—

$$(16)\ldots \rho_t/\rho_0 = 1 + [a_0 + a_1 \sin (a_1 + \frac{t}{T_1}) + a_2 \sin (a_2 + \frac{t}{T_2}) + \text{etc.}] + Q$$

in which T_1, T_2, etc., will represent the lengths of the various periods to which the elapsed time t is related; a_1, a_2, etc., are intervals determining the epochs of T_1, T_2, etc.; and finally a_1, a_2, etc., are the amplitudes of the variation from the mean value. Thus necessarily—

$$(17)\ldots\ldots a_0 = -(a_1 \sin a_1 + a_2 \sin a_2 + \text{etc.})$$

and Q will of course represent the effect of the other elements influencing the rate of increase to which reference will be made later. Equation (16) is specially suitable for representing fluctuations of long period, which are expressible in terms of a sine series.

[1] Examples could be drawn in recent times from America or Australia. It may, however, even in regions which nevertheless can be made habitable, be actually zero, as for example, in the Sahara, in Arizona, and in some parts of Australia.

16. **Representation of periodic elements in non-periodic form.**—Where T is *exceedingly long* as compared with t, the numerator of the expression (16) may take a much more simple form, available probably for all practical cases. For putting—

$$(18)\quad \begin{cases} A_1 = \Sigma\,[(a_i \cos\ \alpha_i)/T_i\,]\,; \quad A_2 = -\dfrac{1}{2\,!}\,\Sigma\,[(a_i \sin \alpha_i)\,/\,T_i^2\,]\,; \\ A_3 = -\dfrac{1}{3\,!}\,\Sigma\,[(a_i \cos \alpha_i)/T_i^3]; \quad A_4 = +\dfrac{1}{4\,!}\,\Sigma[(\,(a_i \sin \alpha_i)/T_i^4]; \\ \text{etc., etc.,} \qquad\qquad ; \quad \text{etc., etc.} \end{cases}$$

the limits of the summation being from $i = 1$ to $i = n$, and n being the number of periodic terms. Then remembering that

$$a_0 + \Sigma\,(a_i\ \sin \alpha_i\,) = 0$$

with the same limits, we can express (16) in the form

$$(19)\ldots \rho_t/\rho = 1 + a_0 + a_1 \sin\,(\alpha_1 + \frac{t}{T_1}) + \text{etc.} = 1 + A_1 t + A_2 t^2 + \ldots + \text{etc.}$$

which, with (18), connects the coefficients with the amplitude and epoch of the periodic fluctuations.

The values of A_1, A_2, etc., may be either positive, negative, or zero.

17. **Influence of natural resources disclosed by advancing knowledge.**—Turning now to the question of the various terms in Q, viz., those representing in equation (15) the effect of u, f, l, and i on the rate of increase, we remark first of all that increased scientific knowledge, especially in physics and chemistry, suggests that possibly the available resources of Nature are practically without limit, (that is $u = \infty$). This being so, the rate of increase may be regarded as dependent, not so much upon Nature's limitations as upon the extent and character of our knowledge, and of our energy and wisdom in applying it; that is, in the formula, it depends upon i, not upon u. We shall find, however, that Nature's limitations are very real, for rates of increase of population which characterise many countries at the present time cannot be maintained for several thousand years.

18. **Influences of resources dependent upon human intervention.**—There is a narrower sense, however, in which u may represent specific and finite quantities, which can be sufficiently indicated by two or three illustrations. Territories like portions of the Sahara in Africa, and of Arizona in America, apparently hopeless waste, may in response to the application of artesian water, become fertile and habitable. In ordinary agriculture, land, practically valueless in the state of Nature, may become valuable by the application of suitable fertilisers. The infertility of land which is due to the absence of the necessary micro-organisms, may, when once such organisms are introduced, quite disappear, and the potential wealth in the territory existing may have been quite undreamt of. Or yet again, the value to man of a natural product, utilisable in

the natural state, or after being treated technically, may be wholly unknown; the discovery of its real value may so change the economic conditions of a territory as to greatly facilitate increase of population. In these and many other similar ways, natural resources reacting to man's operation may be found to be very great, though at first apparently non-existent. It would obviously therefore be very difficult to assign a form to the function which is in any way to represent the effect of natural resources.

19. **Effects of migration.**—Migration operates in several ways on the rate of increase of population, viz.: (i.) By the actual addition or withdrawal of the migrants; (ii.) by the change of the constitution of the population, thus affecting its rate of fecundity; (iii.) by consequential economic changes which favour or impair the rate of increase. A complete expression for its effects would therefore be elaborate in form. Since, however, the community changed by migration tends to adjust itself to the economic condition of the country, the real elaboration into each component element is unnecessary, and the resultant of all the elements operating may take a relatively simple form.

Migration itself is of two forms—periodic and non-periodic. The population of countries, for example, which at certain seasons are visited by large numbers of tourists, or from which large numbers depart, may be taken as affording illustrations of periodic migration. The rate of influx or efflux is usually slow initially; it then increases, becoming a maximum; when it declines much in the same way. In form, the curve of absolute increase or decrease is somewhat similar to the probability curve, but the curve is probably rarely symmetrical with respect to the maximum ordinate.

Non-periodic migration may, in addition to the effect of its absolute amount, change the final rate of increase or leave it as it was originally. Although both periodic and non-periodic migration may be actually discontinuous, no material error will ordinarily be committed if it be assumed to be continuous, provided that in amount it be negligibly small for the part of the year when it has actually ceased. So that there is no serious objection to the use of an essentially continuous function.

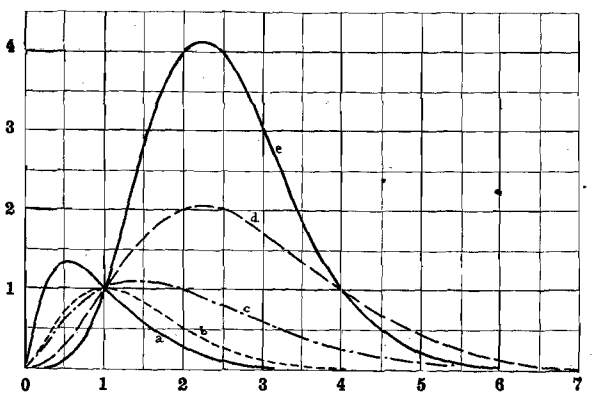
20. **Simple variation of rate, returning asymptotically to original value.**—Non-periodic migration of population, frequent in new countries, may produce a simple variation of rate which ultimately disappears. Owing to the reputation the territory acquires in respect of some real or supposed advantage, immigration sets in, increasing in rate till a maximum is reached, and declining again till the original rate is restored. For the territory or territories from which the emigration takes place, the converse effect may be true. If the rate can be ascertained at several periods, the total effect on the population can then be deduced with fair accuracy.

The simplest variation of this type, and one which will probably represent most instances with sufficient precision, may be expressed in the form—

$$(20)\ldots\ldots \rho_t/\rho_0 = 1 + \eta t^{m-nt}$$

η being positive for cases of immigration, and negative for those of emigration. This form would be suitable for deductions as to population based on the determination of rate of increase at various times.

By suitably selecting the unit of t, the parameter η and the index-numbers m and n, equation (22) may be made to represent the very different circumstances which may obtain at the commencement, and during the development and passing away of the effect of migration on the original rate of increase. For example, it will express that type of migration in which the increments per unit of time to the rate of increase, though initially slow, grow and decrease with continually changing velocity, till the original rate is restored; or, on the other hand, it will express that type where the migration effect on the rate is sudden. This is illustrated by the curves in Fig. 1., viz. :—



Curve ηt^{m-nt}

Curves graphed $\eta = 1$

	m	n
a	$= \frac{1}{12}$	$= 1$
b	1	1
c	1	$\frac{1}{2}$
d	2	$\frac{1}{2}$
e	4	1

$t_{max} = 1 / e^{1-m/nt}$

Fig. 1.

Curves $y = \eta t^{m} + nt$

in which the parameter η is unity throughout. The possible varieties of change of rate of increase are obvious from the figure, when it is remembered also that the horizontal proportions can be maintained, and the vertical changed at pleasure by simply altering the value of η.

21. **Examination of exponential curves expressing variation of rate.**—The curve of equation (20) demands special consideration. For brevity put R for $(\rho_t - \rho_0) / \rho_0$, then we can re-express (20) in the form[1]

[1] An expression of still greater fitting power is $y = At^m e^{nt^2}$. See a paper on the curve by G. H. Knibbs. Journ. Roy. Soc. N.S. Wales, Vol. XLIV., pp. 341-367.

(20a) ..... $R = \eta t^{m} - nt$

therefore

(21)....$dR / dt = \frac{\eta t^{m-nt}}{t} \{m - nt\,(1 + \log_e t)\}$

(21a)..... $\frac{dy}{dt} = \eta t^{m+nt}(n \log_e t + \frac{m}{t} + n)$

(21b)..... $\frac{d^2y}{dt^2} = \eta t^{m+nt} \{(n \log_e t + \frac{m}{t} + n)^2 + \frac{nt - m}{t^2}\}$

and hence the value of t, which gives the maximum value for R, is found by solving the equation—

(22)..... $m/n = t_{\max}\ (1 + \log_e t_{\max})$

For the maximum to correspond to a value of t less than unity and greater than $1/e$, the equation will be of the form t^{m-nt} (m and n being positive); or less than $1/e$ the equation will be of the form $t^{-(m+nt)}$
This equation can be solved by inspection, by means of the following table :—

TABLE I.

Argument t. Values of $t \log_e t$, $t\,(1 + \log_e t)$, and $t\,(-1 + \log_e t)$

t	$t \log_e t$	$t\,(1+\log_e t)$	$t\,(-1+\log_e t)$	t	$t \log_e t$	$t\,(1+\log_e t)$
0.1	0.2303n	0.1303n	—	1	0.0000	1.0000
0.2	0.3219n	0.1219n	—	2	1.3863	3.3863
0.3	0.3612n	0.0612n	—	3	3.2958	6.2958
0.4	0.3665n	0.0335n	—	4	5.5452	9.5452
0.5	0.3466n	0.1534	—	5	8.0472	13.0472
0.6	0.3065n	0.2935	—	6	10.7506	16.7506
0.7	0.2497n	0.4503	—	7	13.6214	20.6214
0.8	0.1785n	0.6215	—	8	16.6355	24.6355
0.9	0.0948n	0.8052	—	9	19.7750	28.7750
1.0	0.0000	1.0000	9.0000	10	23.0259	33.0259
1.1	0.1048	1.2048	9.0048	11	26.3768	37.3768
1.2	0.2188	1.4188	9.0188	12	29.8189	41.8189
1.3	0.3411	1.6411	9.0411	13	33.3443	46.3443
1.4	0.4711	1.8711	9.0711	14	36.9444	50.9444
1.5	0.6082	2.1082	9.1082	15	40.6208	55.6208
1.6	0.7520	2.3520	9.1520	16	44.3614	60.3614
1.7	0.9021	2.6021	9.2021	17	48.1646	65.1646
1.8	1.0580	2.8580	9.2580	18	52.0267	70.0267
1.9	1.2195	3.1195	9.3195	19	55.9443	74.9443
2.0	1.3863	3.3863	9.3863	20	59.9146	79.9146
2.1	1.5581	3.6581	9.4581	21	63.9350	84.9350
2.2	1.7346	3.9346	9.5346	—	—	—
2.3	1.9157	4.2157	9.6157	—	—	—
2.4	2.1011	4.5011	9.7011	—	—	—
2.5	2.2907	4.7907	9.7907	—	—	—
2.6	2.4843	5.0843	9.8843	—	—	—
2.7	2.6818	5.3818	9.9818	—	—	—
2.8	2.8829	5.6829	10.0829	—	—	—
2.9	3.0877	5.9877	10.1877	—	—	—
3.0	3.2958	6.2958	10.2958	—	—	—

NOTE.—The n denotes that the quantity is negative. In the column for $t \log_e t$ and $t\,(-1+\log_e t)$, the whole number 9 has been used in preference to the more awkward form 1 : in these cases the values given therefore exceed the true values by 10.

The suitability of the assumption of a curve of the type in question may be fairly well ascertained in the following way. For $t = 1$, $R = \eta$ in (20a) (the unit of t may be 1 week, 1 month, 1 quarter, or 1 year, say, according to the character of the migration under review).

Taking the logarithm of both sides of (20a) we have—

$$(23)\ldots\ldots \log R = \log \eta + (m - nt) \log t$$

From the observed values of R, the values of $\mathfrak{R}$

$$(24)\ldots\ldots \mathfrak{R} = (\log R - \log \eta) / \log t = m - nt$$

may be formed. These are plotted as ordinates, with the corresponding values of t as abscissæ; then if the points $\mathfrak{R}$ lie on a straight line, m will be the intercept on the axis of ordinates, and n will be the tangent of the negative angle which the line of points makes with the axis of abscissæ. If they do not lie on a straight line, the assumption is invalid.

If, moreover, we have the epoch at which the rate was a maximum, we have also from (22) the ratio of m/n, and obviously the two should be in agreement. This is a further test of the validity of the assumption.

22. **Determination of constants of such exponential curves.**—The constants η, m and n in equation (20) may be found from three observations at any suitable intervals, say at the times t_1, t_2, and t_3, the commencements of the fluctuation being therefore also known. If the value of R for $t = 1$ is not known, put—

$$(25)\quad \begin{cases} S_{2.1} = \log R_2 - \log R_1\,; \; S_{3.2} = \log R_3 - \log R_2 \\ u_{2.1} = \log t_2 - \log t_1\,; \; v_{2.1} = t_2 \log t_2 - t_1 \log t_1 \\ u_{3.2} = \log t_3 - \log t_2\,; \; v_{3.2} = t_3 \log t_3 - t_2 \log t_2 \end{cases}$$

then we shall have—

$$(26)\ldots\ldots m = (S_{3.2}v_{2.1} - S_{2.1}v_{3.2}) / (u_{3.2}v_{2.1} - u_{2.1}v_{3.2})$$

and

$$(27)\ldots\ldots n = (S_{3.2}u_{2.1} - S_{2.1}u_{3.2}) / (u_{3.2}v_{2.1} - u_{2.1}v_{3.2})$$

The values of m and n being found, η is best found from.

$$(28)\ldots\ldots \log \eta = \log R - (m - nt) \log t.$$

the suffixes of R and t being identical.

If, however, the rate for $t = 1$ be known, then η is $R_{t=1}$; and, see (24), the suffixes of $\mathfrak{R}$, R and t being identical, we shall have—

$$(29)\ldots\ldots m = (\mathfrak{R}_2 t_3 - \mathfrak{R}_3 t_2)/(t_3 - t_2)$$

and

$$(30)\ldots\ldots n = (\mathfrak{R}_2 - \mathfrak{R}_3)/(t_3 - t_2)$$

a solution much less tedious than the former. The values of t_2 and t_3 must be well selected.

Obviously, if more than three values of R are taken, the application of the test indicated by equation (24) is necessary.

23. **Case of total non-periodic migration represented by an exponential curve.**—Where migration adds or subtracts its quota to the population only temporarily, as in cases of temporary migrations to or from a country, the exponential curve of equation (20) will often represent with exactitude, not merely the variations of the rate of increase, but of the absolute population. The complete expression put into non-periodic form would thus be, for the case in question—

$$(31)\ldots\ldots P_t = P_0\{e^{\rho t} + \eta\,(qt)^{m} - {}^{nt}\}$$

the factor q depending upon the value of the unit of t used in (20) (*i.e.*, if η, m and t be determined for months, then $q = 12$, t in $e^{\rho t}$ being in years). This formula would represent a single migration effect, vanishing asymptotically. If the migration be itself proportioned to the magnitude of the population at each instant, as may often be the case, then the preceding equation (31) will become—

$$(31a)\ldots\ldots P_t = P_0\, e^{\rho t}\ \{1 + \eta\,(qt)^{\,m\,-\,nt}\}$$

In using either (31) or (31a), it is of course necessary that P_0 be the population at the commencement of the migration effect; *i.e.*, the origin of t must be identical in both parts of the complete expression.

Yet again, if the expression represents only the variation of the rate, we shall have—

$$(31b)\ldots\ldots P_t = P_0\, e^{\rho t\,(1\,+\,\eta t^{m}\,-\,{}^{nt})}$$

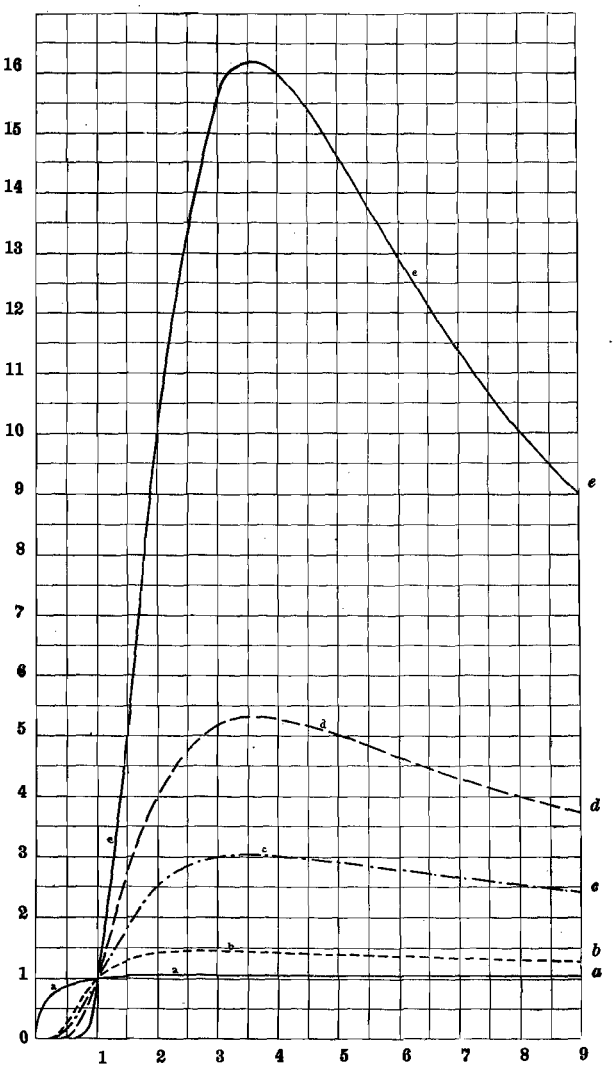
which, however, will be considered in a more general form hereinafter.

24. **Simple variation of rate, returning asymptotically to a particular value.**—A variation of rate may tend to return to some new value, greater say than the original. Such a variation can be expressed in the following way, viz. :—

$$(32)\ldots\ldots \rho_t/\,\rho_0 = 1 + \eta t^{\pm\frac{1}{m+nt}}$$

m and n being positive.

Since this curve becomes asymptotic to a line parallel to the t axis at the distance η, and has the ordinate value η for $t = 1$, the unit by which t is measured must give an abscissa of unity for the first value η of the ordinate. This somewhat limits the convenience of its application. Some of the forms of the curve are illustrated by Fig. 2.



Curves $\eta t^{\frac{1}{m+nt}}$

Curves graphed

$\eta = 1$

a	$m = 4$;	$n = 4$,
b	0	1
c	$\frac{1}{4}$	$\frac{1}{4}$
d	$\frac{1}{6}$	$\frac{1}{6}$
e	$\frac{1}{10}$	$\frac{1}{10}$

$t_{max} = e^{1 + \frac{m}{nt}}$

Fig. 2.

25. **Examination of the preceding curve.**—As in section (21), put

$$(32a)\ldots\ldots R' = \eta t^{\frac{1}{\pm m + nt}}$$

then

$$(33)\ldots\ldots dR'/dt = \frac{\eta t^{\frac{1}{\pm m + nt}}}{m + nt}\left(\frac{1}{t} - \frac{n \log_e t}{\pm m + nt}\right)$$

and consequently the value of t which gives the maximum value for R' is found by solving the equation $\frac{1}{t} = \frac{n \log_e t}{\pm m + nt}$ which leads to—

$$(34)\ldots\ldots \frac{\pm m}{n} = t(\log_e t - 1)$$

For a maximum to correspond to a value of t greater than e, the equation will be of the form $t^{\frac{1}{m+nt}}$ (m and n being positive); or less than e, equation will be of the form $t^{\frac{1}{-m+nt}}$
This may be solved for the series of values already given in Table I. for $t(\log_e t - 1)$: see section 21 hereinbefore.

Similarly to the preceding case we take the logarithm of both sides of (32a), we have—

$$(35)\ldots\ldots \log R' = \log \eta + \log t / (\pm m + nt)$$

Hence as before, finding $\mathfrak{R}'$ from observed values of R' we have—

$$(36)\ldots\ldots \mathfrak{R} = \log t / (\log R' - \log \eta) = \pm m + nt$$

which enables us to examine the validity of the assumption, since it is the equation of a straight line of which the values of $\mathfrak{R}'$ and t are respectively ordinates and abscissæ.

For the point of inflexion the second differential will be required: the sign of m being positive, it is—

$$(33a)\ldots\ldots \frac{d^2R^2}{dt^2} = \frac{\eta t^{\frac{1}{m+nt}}}{(m+nt)^2}\left\{\left[\frac{1}{t} - \frac{n}{m+nt}\log_e t\right]^2 - \left[\frac{1}{t} - \frac{n}{m+nt}\log_e t\right] - \left[\frac{m}{t^2} + \frac{2n}{t} - \frac{n^2}{m+nt}\log_e t\right]\right\}$$

26. **Determination of the constants of the curve.**—In this case the rate for $t = 1$ is known, and $\eta = R_1' = 1$; thus formula (29) holds when $\mathfrak{R}$ is changed for $\mathfrak{R}'$, and similarly in regard to (30) changing the sign, that is—

$$(37)\ldots\ldots m = (\mathfrak{R}'_2 t_3 - \mathfrak{R}'_3 t_2) / (t_3 - t_2)$$

$$(38)\ldots\ldots n = (\mathfrak{R}'_3 - \mathfrak{R}'_2) / (t_3 - t_2)$$

The test of (36) is necessary if there be more than three values of $\mathfrak{R}'$.
For the case of immigration η is positive, for emigration negative.

27. **Total non-periodic migration resulting in permanent increase but returning to original rate.**—Where the migration effect on total population adds or subtracts its quota, but leaves the original rate practically undisturbed, the result may be expressed similarly to (31), *i.e.*,

$$(39)\ldots\ldots P_t = P_0\left\{e^{\rho t} + \eta (qt)^{\pm\frac{1}{m+nt}}\right\}$$

and if as supposed in section 23 the migration be itself influenced at every moment by the magnitude of the population, (39) will become—

$$(39a)\ldots\ldots P_t = P_0 e^{\rho t}\left\{1 + \eta (qt)^{\pm\frac{1}{m+nt}}\right\}$$

28. **The utility of the exponential curve of migration.**—Formulæ (20) to (31b) are serviceable, when the population has to be determined by taking into account the rate of migration determined only at several suitable occasions, the intermediate migration being supposed to conform to the exponential curve assumed to represent all values intermediate to those determining it, and all future values so long as it is applied.

29. **Fluctuation of annual periodicity.**—The instantaneous rate of increase of the population of any country, at least where the population is at all numerous, must, during the course of the year, indicate a yearly period, since both the migration rate and the birth and death rates have, in general, a characteristic annual fluctuation. There is sometimes a difference, however, between the migration fluctuation, and that due to births and deaths, for the former, owing to local circumstances, is sometimes confined to a part of the year only, while the two latter extend over the entire year. The scheme of expressing long periodic fluctuations has already been indicated, viz., in equations (16) to (19). Continuous fluctuations of short periods may with advantage be put in the form—

$$(40)\ldots\ldots \rho_t/\rho_0 = 1 + a_0 + a_1 \sin(\alpha_1 + \mu_1 t) + a_2 (\sin \alpha_2 + \mu_2 t) + \text{etc.}$$

where μ_1 and μ_2 are whole numbers or proper or improper fractions, defining definitely ascertained periods, and where, as before, we must necessarily have—

$$(41)\ldots\ldots a_0 = -\Sigma a \sin \alpha\ ;$$

see section (17); or yet again, if the true period is not known and a curve known by experience is to be empirically reproduced, then we may put

$$(42)\ldots \rho_t/\rho_0 = 1 + a_0 + a_1 \sin(\alpha_1 + \frac{2\pi}{n} t) + a_2 \sin 2(\alpha_2 + \frac{2\pi}{n} t) +$$

$$a_3 \sin 3(\alpha_3 + \frac{2\pi}{n} t) + \text{etc.},$$

the unit of t being the period (*e.g.*, one year) embracing all the fluctuations to be reproduced in the period following.

30. **Discontinuous periodic variations of rate.**—We may assume that the continuous rate is any function of t, *i.e.*, $\rho_t = \phi(t)$ say. Suppose that superimposed on this curve, there is a migration effect existing for parts of the year only, reappearing at the corresponding times in each following year. Let us suppose further that in the intervals, there is no variation of rate through migration, the fluctuation being fully expressed by $\phi(t)$ above. Then, provided that suitable values are given to the constant a_0 to the amplitudes a_1, a_2, etc., and to the epochal angles α_1, α_2, etc., the fluctuation of rate may be represented by such an expression as—

$$(43)\ldots\ldots \rho_t/\rho_0 = \phi(t) \pm \sqrt{\{a_0 + a_1 \sin(\alpha_1 + \frac{2\pi}{n} t) + \text{etc.}\}}$$

the + sign denoting immigration effects, and the — sign emigration effects. For the final term will have no *real* values when the quantity under the radical sign becomes negative: a_0 must of course satisfy the conditions expressed by equation (17) hereinbefore.

Similarly, fluctuations of other character may be represented by—

$$(43a)\ldots\ \rho_t/\rho_0 = \phi(t) \pm \sqrt{\{a_0 + a_1 \sin(a_1 + t/T_1) + \text{etc.}\}}$$

or again by—

$$(43b)\ldots\ \rho_t/\rho_0 = \phi(t) \pm \sqrt{(at + bt^2 + ct^3 + \text{etc.})}$$

Since only real values can have any meaning the expressions under the radical sign in (43), and (43a) and (43b) are discontinuous, the discontinuity extending from each value of t where the value of the expression changes from + to —, to where it changes from — to + again.

31. **Empirical expression for secular fluctuations of rate.**—For the purpose of prediction it is usual to deal either with mean population or the population at a particular date, say the end of the year. The fluctuations of rate may be empirically determined from past records and put in the exponential form, viz.,

$$(44)\ldots\ \rho_t/\rho_0 = 1 + \eta t^{k + mt + nt^2 + \text{etc.}}$$

η, k, m, n, etc., being integral or fractional, positive or negative. Or again, it may be expressed in the form—

$$(45)\ldots\ \rho_t/\rho_0 = 1 + at + \beta t^2 + \gamma t^3 + \text{etc.}$$

or yet again in the form—

$$(45a)\ldots\ \rho_t/\rho_0 = 1 + \alpha t^p + \beta t^q + \gamma t^r + \text{etc.}$$

in which p, q, r, etc., are in ascending order of magnitude, but not restricted to integral values. The fitting efficiency of this latter form is much greater than where the indices are restricted to integral values,[1] but the determination of the constants α, β, γ, etc., and p, q, r, etc., are not so convenient.

32. **Growth of various populations.**—Populations increase when the additions by birth and immigration together exceed the deductions through death and emigration together. The rate of increase differs greatly as between country and country, and differs from decade to decade, so that *it cannot be regarded as in any sense uniform* even for short periods of time. This is evident from Fig. 3, in which the growth of the populations of a larger number of countries is shewn by their progression every decade, and is still more obvious in Fig. 4 (shewing their logarithmic homologues) by the changes in the slope of the lines. In the following table, the populations, given in millions and decimals of a million, are those shewn on Fig. 3.

[1] Obviously, since both the coefficients and indices are at our disposal, it is easy to see that attempts to apply (45) to the curve $y = at^p$, where p is a proper or improper fraction, are invalid. It is also invalid for the curve $y = at^p + bt^{p+q} + \text{etc.}$

The Populations of Various Countries from 1790 to 1910.

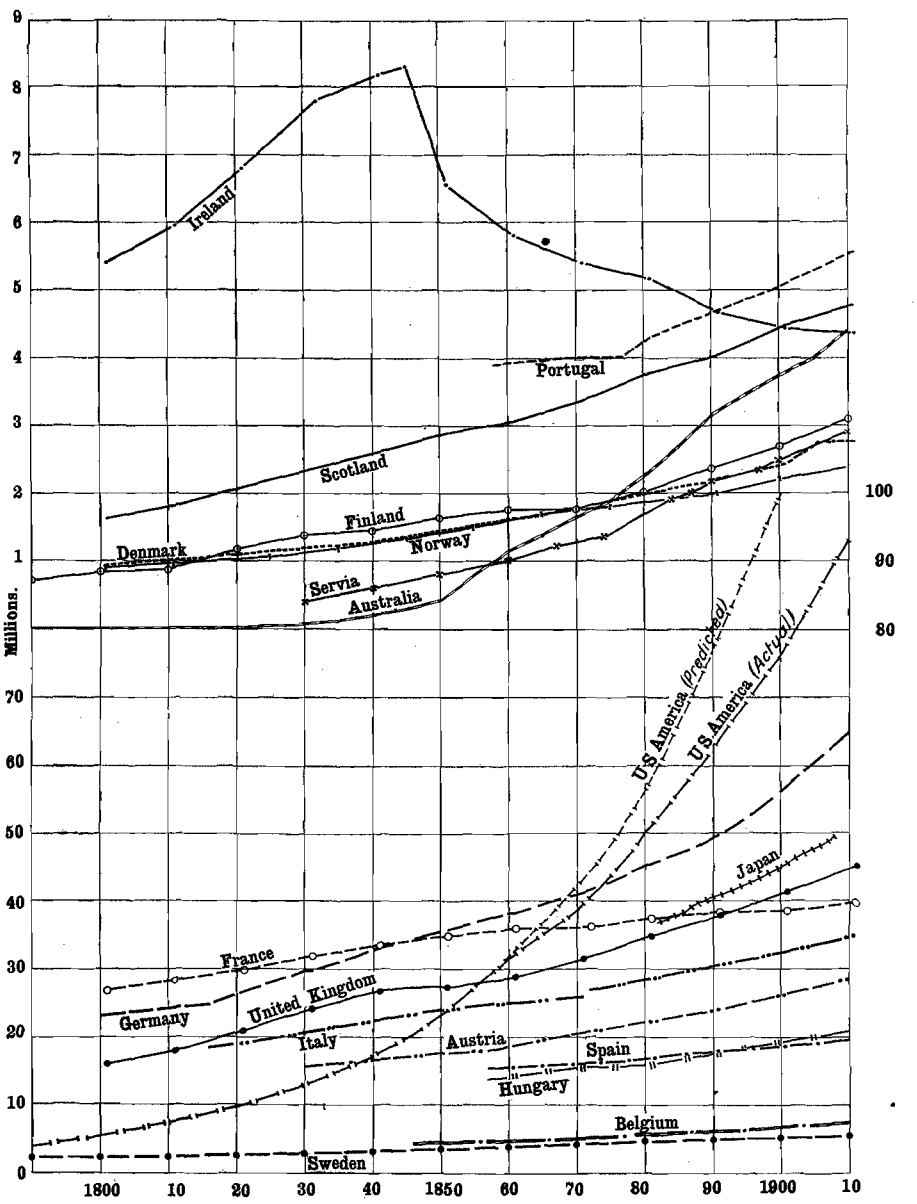


FIG. 3.

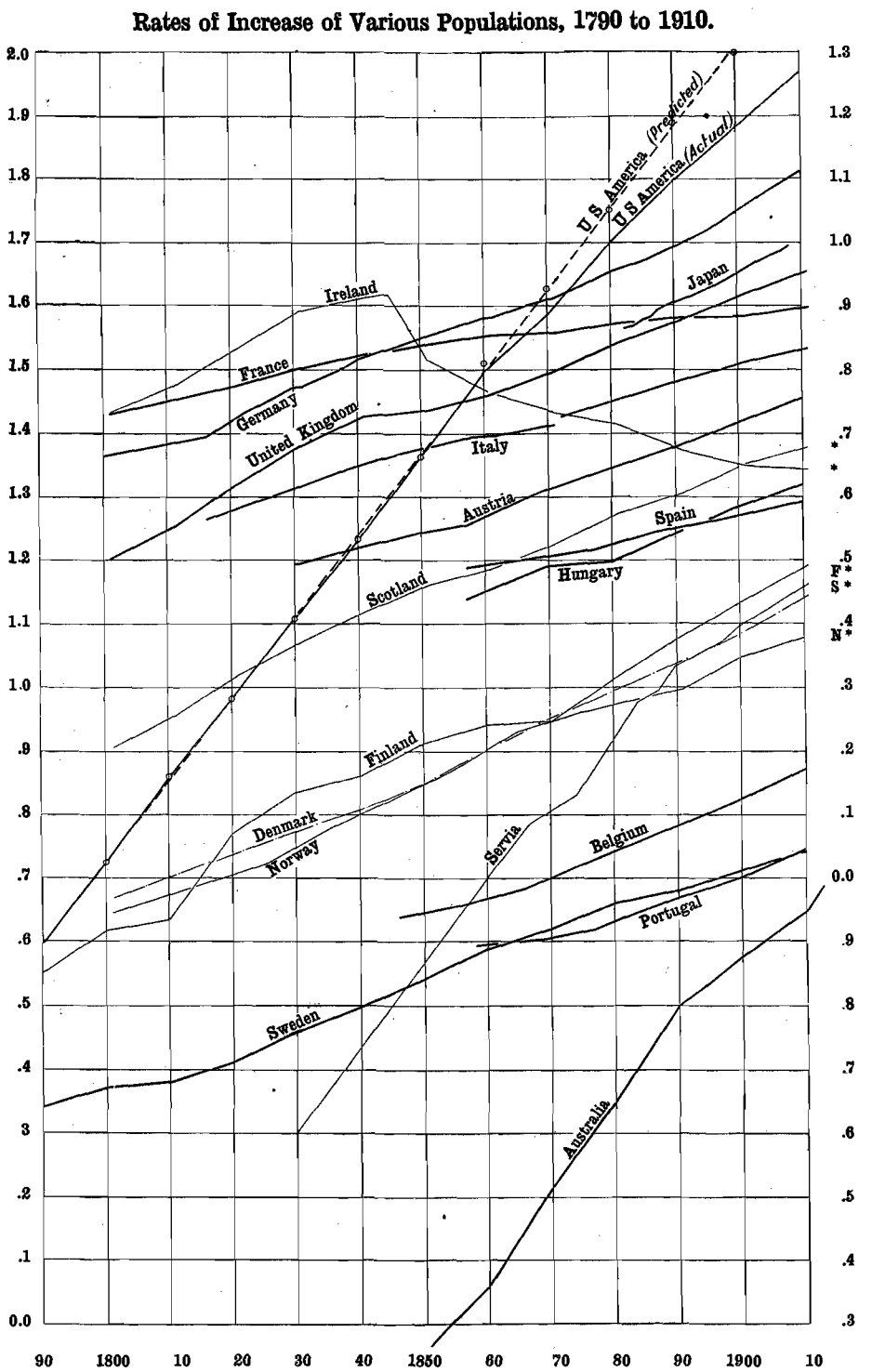
The scale for the lower part of the figure denotes ten times the numbers of the scale for the higher part. The predicted population for the United States was based on the assumption that the rate for 1790 to 1800 would be maintained constant. On the scale of the figure this curve substantially agrees with the prediction by Elkanah Watson in 1815.

Table II.—Populations in Millions, of Various Countries.

Country.	Years.													
	1790-9.		1800-9.		1810-9.		1820-9.		1830-9.		1840-9.		1850-9.	
Commonwealth	0	.002	0	.005	0	.01	0	.03	0	.07	0	.19	0	.41
United Kingdom	..	..	1	15.90	1	17.91	1	20.89	1	24.03	1	26.71	1	27.37
Scotland	..	..	1	1.61	1	1.81	1	2.09	1	2.36	1	2.62	1	2.89
Ireland	..	..	1	5.40	1	5.94	1	6.80	1	7.77	1	8.18	1	6.55
Austria	..	..	..	..	..	..	..	..	0	15.59	0	16.58	0	17.53
Belgium	..	..	..	..	..	..	..	..	..	..	6	4.34	6	4.53
Denmark	..	..	1	.93	..	..	..	..	4	1.22	0	1.28	0	1.41
France	..	..	1	26.93	..	..	1	29.87	1	31.89	1	33.40	1	34.71
Germany	..	..	0	23.18	6	24.83	2	27.04	1	29.77	0	32.79	2	35.96
Hungary	..	..	..	..	..	..	..	..	..	..	..	..	7	13.77
Italy	..	..	..	..	6	18.38	5	19.73	8	21.98	8	23.62	8	24.86
Norway	..	..	1	.88	..	..	5	1.05	5	1.19	5	1.33	5	1.49
Portugal	..	..	..	..	..	..	..	..	..	..	..	..	8	3.92
Spain	..	..	..	..	..	..	..	..	..	..	..	..	7	15.46
Sweden	0	2.19	0	2.35	0	2.40	0	2.58	0	2.88	0	3.14	0	3.48
Finland	0	.71	0	.83	0	.86	0	1.18	0	1.37	0	1.45	0	1.64
Servia	..	..	..	..	..	..	..	..	0	.40	..	..	..	..
U.S. America	0	3.93	0	5.31	0	7.24	0	9.64	0	12.87	0	17.07	0	23.19

Country.	Years.											
	1860-9.		1870-9.		1880-9.		1890-9.		1900-9.		1910-9.	
Commonwealth	0	1.15	0	1.65	0	2.23	0	3.65	0	3.77	0	4.43
United Kingdom	1	28.93	1	31.49	1	34.88	1	37.73	1	41.46	1	45.22
Scotland	1	3.06	1	3.36	1	3.74	1	4.03	1	4.47	1	4.76
Ireland	1	5.80	1	5.41	1	5.17	1	4.70	1	4.46	1	4.39
Austria	9	20.39	..	..	0	22.14	0	23.90	0	26.15	0	28.57
Belgium	6	4.83	..	..	0	5.52	0	6.07	0	6.69	0	7.42
Denmark	0	1.60	0	1.78	0	1.97	0	2.17	1	2.45	1	2.78
France	1	35.84	2	36.10	1	37.41	1	38.13	1	38.45	1	39.60
Germany	1	38.14	1	41.06	0	45.23	0	49.43	0	56.37	0	64.93
Hungary	7	1.22	0	15.51	0	15.74	0	17.46	0	19.25	0	20.89
Italy	2	25.00	1	25.96	1	28.46	1	30.46	1	32.48	0	34.67
Japan	..	..	..	..	2	36.70	0	40.45	0	44.83	0	50.50
Norway	5	1.70	5	1.82	..	..	1	1.99	0	2.22	0	2.39
Portugal	8	4.00	7	4.16	1	4.31	0	4.66	0	5.02	1	5.55
Spain	..	..	7	16.43	7	17.55	7	18.32	0	18.61	0	19.59
Sweden	0	3.86	0	4.17	0	4.57	0	4.78	0	5.14	0	5.52
Finland	0	1.75	0	1.77	0	2.06	0	2.38	0	2.71	0	3.12
Servia	0	1.00	4	1.35	4	1.90	0	2.16	0	2.49	0	2.91
U.S. America	0	31.41	0	38.56	0	50.16	0	62.62	0	76.21	0	93.35

33. Rate of increase of various populations.—Fig. 3 and the accompanying table reveal directly only the relative magnitude of the populations, but not their exact *rate* of growth. The latter is displayed on Fig. 4, in which (the scale being constant) the *steepness of slope of the line represents the rapidity of the rate of increase.* As before mentioned, this rate is very irregular from decade to decade, as would be revealed by dividing the population at the end of each decade by that at the beginning thereof and comparing the numbers ; *i.e.*, by finding and comparing, for example, the values of P_n/P_0 giving those of $1+r$. The rates tabulated hereunder are the *annual rates* which, if maintained constant, would produce the populations at the end of the decades ; that is, they are the values of r found from $\log(1+r) = (\log P_n - \log P_0)/n$, where n is the intervening number of years.



F denotes Finland; N, Norway; S, Servia.

* The logarithms for Australia, Denmark, Finland, Ireland, Norway, Scotland, and Servia are shewn on the right of the figure; for the others, on the left.

FIG. 4.

Table III.—Annual Rate of Increase per 10,000 of Population of Various Countries.

Country.	Approximate Decade.											
	1790 to 1799	1800 to 1809	1810 to 1819	1820 to 1829	1830 to 1839	1840 to 1849	1850 to 1859	1860 to 1869	1870 to 1879	1880 to 1889	1890 to 1899	1900 to 1909
C'wealth ..	976	829	1124	764	1052	785	1095	370	308	351	180	163
U. K'dom*	—	120	155	141	106	24	56	85	103	79	95	87
Scotland*	—	118	145	122	105	99	57	94	108	75	104	63
Ireland* ..	—	96	136	134	52	−225	−122	−70	−45	−96	−53	−16
Austria ..	—	—	—	—	62	56	152	41‡	41‡	77	90	89
Belgium† ..	—	—	—	—	—	43	64	96**	96**	96	98	104
Denmark*	—	—	—	—	80§	97	127	107	102	97	122	127
France* ..	—	52‡	52‡	66	46	39	32	7	36	19	8	30
Germany ..	—	43(*a*)	143	114	108	77	66	74	108	89	132	142
Hungary ..	—	—	—	—	—	—	—	86**	17	104	64	51
Italy ..	—	—	—	79(*b*)	83(*c*)	72	41**	42	92	68	64	58
Norway* ..	—	74(*d*)	74(*d*)	126	112	114	133	69	56(*a*)	56(*a*)	122	74
Portugal ..	—	—	—	—	—	—	—	20	58(*c*)	87	75	92
Spain ..	—	—	—	—	—	—	—	30‡	30‡	66	33(*c*)	67
Sweden ..	71	21	73	111	87	103	104	77	92	45	73	71
Finland ..	157	36	321	150	57	124	65	12	153	145	131	142
Servia ..	—	—	—	—	—	—	—	190**	348	216	143	157
Japan* ..	—	—	—	—		—	—	—	—	116	110	118
U. States ..	306	315	291	293	286	311	309	206	267	224	198	205

* Add 1 year to date for proper decade. † Add 6 years up to 1860 inclusive. ‡ Rate for 20 years. ** Rate for 14 years. § Rate for 6 years. (*a*) Rate for 16 years. (*b*) Rate for 9 years. (*c*) Rate for 13 years. (*d*) Rate for 24 years.

34. **The population of the world and the rate of its increase.**—In dealing with the magnitude of the population of any country and the rate of its growth, the most general comparison is that made with the entire population of the world and its rate of growth. This, however, is not well ascertained. Recently, for example, the estimate for China's population has been reduced over 100 millions. The following table gives results of different estimates :—

Table IV.—Estimates of World's Population.*

Year.	Authority.	Estimate (Millions).	Year.	Authority.	Estimate (Millions).
1660	Riccioli	1,000	1813	Graberg v. Hemsö	686
1685	Isaak Vossius	500	1816	A. Balbi	704
1740	Nic. Struyck	500	1822	Reichard	732
1672	Riccioli	1,000	1824	G. Hassel	938
1742	J. P. Sussmilch	950 to 1,000	1828	G. Hassel	850
1753	Voltaire	1,600	1828	I. Bergius	893
1761	J. P. Sussmilch	1,080	1828	A. Balbi	737
1789	W. Black	800 to 1,000	1828	Balbi*	847
1804	Malte-Brun*	640	1833	Stein	872
1804	Volney	437	1838	Fränzl	950
1805	Pinkerton	700	1838	V. Rougemont	850
1805	Fabri	700	1840	Omalius d'Halloy	750
1809	G. Hassel	682	1840	Bernoulli	764
1810	Almanach de Gotha*	682	1840	v. Roon	864
1812	Morse	766	1843	Balbi	739

Table IV.—Estimates of World's Population*—*continued.*

Year.	Authority.	Estimate (Millions).	Year.	Authority.	Estimate (Millions).
1843	H. Berghaus	1,272	1880	Behm & Wagner	1,456
1845	Michelot*	1,009	1882	Behm & Wagner	1,434
1854	v. Reden	1,135	1883	Behm & Wagner*	1,433
1889	Dieterici	1,288	1886	Levasseur*	1,483
1866	E. Behm	1,350	1891	Ravenstein*	1,467
1868	Kolb	1,270	1896	Statesman's* Year	1,493
1868	E. Behm	1,375	1903	Juraschek* [Book	1,512
1870	E. Behm	1,359	1906	Juraschek*	1,538
1872	Behm & Wagner	1,377	1910	Annuaire Statistique	
1873	Behm & Wagner	1,391		d. l. Rep. Française*	
1874	Behm & Wagner*	1,391		Juraschek*	1,610
1878	Levasseur*	1,439	1913	Knibbs*	1,632
1878	Levasseur	1,439	1914	Knibbs	1,649

* These will be found on the graph, Fig. 5.

This table shews, for the period 1804 to 1914, rates of annual increase ranging between 0.0015 and 0.0121[1] and averaging about 0.00864.

We may obtain some idea of the present rate of growth by taking the weighted mean of the rate for the known countries; that is, each rate of increase is weighted according to the population. In this way, it is found for the quinquennium 1906 to 1911, and for the group of countries in the Table V. hereinafter, that the general result is a rate of increase of 0.01159 per annum, or 1.159 per cent. of the population.

Table V.—Annual Increase per 10,000 Population for the quinquennium 1906-1911.

Country.	Rate	Years†	Country.	Rate.	Years†
Ireland	— 6	..	Switzerland	+121	57.6
France	+16	436	Netherlands	122	57.2
Jamaica	28	248	Denmark	126	55.4
Scotland	55	126	German Empire ..	136	51.3
Norway	66	105	Finland	143	48.8
Belgium	69	101	Rumania	148	47.2
Italy	80	87	Servia	155	45.1
Sweden	84	82.9	Chile	156	44.8
Hungary	84	82.9	United States	182	38 4
Austria	86	80.9	Commonwealth ..	203	34.5
Spain	87	80.0	New Zealand	256	27.4
England and Wales ..	104	67.0	Canada	298	23.6
Japan	108	64.5			
Ceylon	120	58.1	Weighted Average* ..	+115.9	60.1

* Weighted average according to population. † Years necessary for the population to be doubled in value at the rate indicated.

The number of years n in which a population, increasing at the rate r, is doubled, may be very readily computed thus:—

$$(1+r)^n = 2\text{; therefore } n \log_e (1+r) = \log_e 2 = 0.693147$$

consequently $$n = \frac{0.69315}{\log_e (1+r)} = \frac{0.69315}{r\left(1 - \frac{r}{2} + \frac{r^2}{3} - \ldots\right)}$$

but when r is very small we may neglect powers higher than the second (that is $\frac{1}{2}r$ in the brackets); hence

$$n = \frac{0.69315}{r}\left(1+\tfrac{1}{2}r\right), \text{ sensibly, } = \frac{0.693}{r} + 0.347.$$

[1] On taking the mean of Levasseur and Behm & Wagner, and again of Levasseur and Ravenstein.

Either this rate of increase must be enormously greater than has existed in the past history of the world or enormous numbers of human beings must have been blotted out by catastrophes of various kinds from time to time. For, putting the present population at 1,649,000,000, at the average rate of increase this number would be produced from a single pair of human beings in about 1782 years,* that is to say, since A.D. 132, or since Salvius Julianus revised under Hadrian the Edicts of the Prætors. Even the rate given by the world-populations 1804 and 1914, viz. (0.0086) gives only 2397 years, carrying us back only to B.C. 483, or since the days of Darius I. of Persia.

The profound significance of this fact, accentuated also by the extraordinary increase in the length of life (expectation of life at age 0), which has revealed itself of recent years, is obvious when the correlative food requirements are taken into account. The resources of Nature will have to be exploited in the future more successfully than in the past to maintain this rate of increase (0.01159), which doubles the population every 60.15 years, and would give for 10,000 years the colossal number 22,184, with 46 noughts (10^{46}) after it.

This number is so colossal that it is difficult to appreciate its magnitude. Assuming the earth to be a globe of 3960 miles radius, of a density 5.527 compared with water, that water weighs about 62½ lbs. per cubic foot, and that a human being weighs on the average, say, 100 lbs. (7 st. 2 lbs.), the actual mass of the earth would be equivalent only to, say, 132,265 x 10^{18} persons; that is, it would require 16,771 x 10^{23} times as much "matter" as there is in the earth. Or, to consider it as a question of surface, allowing 1½ square feet per person, the earth's entire surface area would provide standing room for only 36,625 x 10^{11} persons. That is, the population would be 60,570 x 10^{30} times as great as there would be standing room if the whole earth's surface were available. It is evident from this that the rate of increase of human beings must have been more approximate to the rate for France at the present time, if the earth has been peopled for 10,000 years: the French rate, 0.0016, would require 12,842 years to give the present population from a single pair. This rate, however, would give a population of only 17.55 millions in 10,000 years.

The foregoing analysis of the effect of the rate of increase, with which we are familiar, *establishes* the fact that the rate must have passed through great changes, and could not have been maintained for any long period, either at its present average, or that characteristic of the last century. (See II. § 12, 13, 14 and 15.) It is not improbable that the rate of the last quinquennium will not be long maintained; and it is

* Thus dividing by 2, we have 824,500,000 = $(1.01159)^n$ where n is the number of years, that is, $n = 1.782$.

certain that however great human genius or effort may be, in enlarging the world's food supplies, that rate cannot possibly be maintained for many centuries. The contention of Malthus is thus placed beyond question, from a different point of view.

The analysis also *suggests* that there are probably great oscillations of the rate of increase, but since accurate records date back for so comparatively short a time, no general indication of their character can be given.

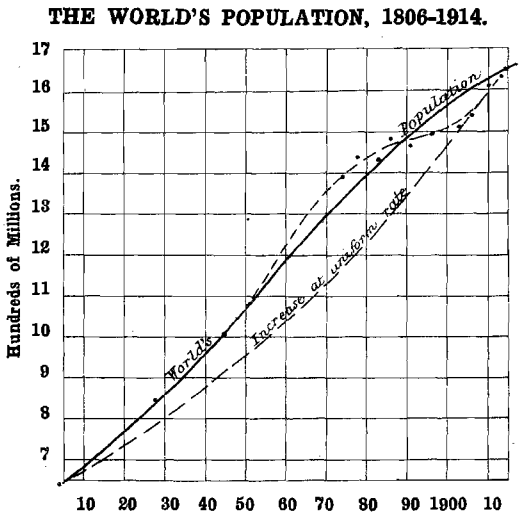


FIG. 5.

In Fig. 5 some of the estimates are shewn by black dots. The firm line drawn among these dots is intended to represent the probable development of the world's population. The thin broken line among the dots, though adhering more closely to the various estimates, is, however, of doubtful probability. The lower broken line represents a population increasing at a uniform rate from 640 millions in 1804 to 1649 millions in 1914; *i.e.*, 110 years. From the figure it is evident that the rate of increase in the early part of last century has fallen off, and the world's population increase will continue at a less rapid rate. Thus it is beyond question that there have been oscillations of rate, but their period has not yet been determined, and is perhaps not determinable, owing to lack of data. One thing is assured, viz., that the present rate of increase cannot be maintained for any lengthy period.

III.—DETERMINATION OF CURVE-CONSTANTS AND OF INTERMEDIATE VALUES WHEN THE DATA ARE INSTANTANEOUS VALUES.

1. **General.**—The data of statistics are usually to hand in two essentially different forms, viz., (*a*) *instantaneous values* or numbers which are true at a given moment; as, for example, the population of a country at a given instant; and (*b*) *group values* or numbers belonging to some particular interval of time, as the number of births per month, or per annum, for a population of given magnitude. Some indications have already been given of suitable formulæ for instantaneous values, and in one or two instances the mode of deducing their constants was also furnished. We proceed to consider the solution for the constants of equations which are appropriate for representing instantaneous values. In mathematical language, if $y = f(x)$, then having chosen the form of the function, it remains to determine its constants from the data. In the case of group values, the equations must denote the value of the integral of the function between given limits, and the problem has special features, the study of which will be undertaken later (IV.) There are a considerable number of cases of importance, some of which are *aperiodic*, and others *periodic*.

2. **Determination of constants where a fluctuation is represented by an integral function of one variable.**—When, as is ordinarily the case, the data consist of values corresponding to equal intervals of time, as, for example, the population at the end of each quarter, at the end of each year, or at the end of each ten years, etc., the fluctuation may be empirically represented by the equation.

$$(46)\ldots\ldots y \text{ (or } \frac{1}{y}\text{)} = a + bx + cx^2 + dx^3 + \text{etc.},$$

in which, in the above illustration, x represents *time*. In this case the number of constants to be determined will depend upon the number of instants for which we have data. Two classes of cases arise, viz., (i.) cases in which the data furnish the initial value; (y_0), that is, a in the equation above, and (ii.) cases in which the initial value is not furnished, but is for a unit interval of time before the first result available. In other words, in the equation above, we require a series of solutions for the cases where a has a fixed value, including zero, and when it is undetermined; or what is the same thing, when we have either y_0 or y_1 as the

initial datum. If we have the value of y_0, then n subsequent points will require an integral equation of the nth degree. If not, n points, including y_1, necessitate an integral equation of the $(n-1)$th degree.[1]

If k denote the common interval of time (represented by distance between the ordinates), the values of y in the preceding expression are :—

$$(47)\ldots y_0=a\ ;\ y_1=a+bk+ck+\text{etc.}\ ;\ y_2=a+2bk+4ck^2+\text{etc., etc.}$$

If a be *known*, then by subtracting a from the values of y we have a series of equations identical with the above in which—

$$(48)\ldots y_0=0\ ;\ y_1=bk+ck+\text{etc.}\ :\ y_2=2bk+4ck^2+\text{etc.}$$

We deal first with the cases where a is known and assume that the *ordinates* y_1, y_2, etc., are the values computed from the axis X, *so taken that* $a=0$. Then the following formulæ, in which y_1 is denoted by i, y_2 by ii., etc., may be readily deduced :—

Formulae when $y_0 = 0 = a$.

Formula.	Data.	Value of b.	Value of c.
(49)	y_1	$\frac{1}{k}$ (i.)	
(50)	y_1 and y_2	$\frac{1}{2k}$ (4i.—ii.)	$\frac{1}{2k^2}$ (—2i.+ii.)
(51)	y_1 to y_3	$\frac{1}{6k}$ (18i.—9ii.+2iii.)	$\frac{1}{2k^2}$ (—5i.+4ii.—iii.)
52)	y_1 to y_4	$\frac{1}{12k}$ (48i.—36ii.+16iii.—3iv.)	$\frac{1}{24k^2}$ (—104i.+114ii.—56iii.+11iv.)
(53)	y_1 to y_5	$\frac{1}{60k}$ (300i.—300ii.+200iii.—75iv.+12v.)	$\frac{1}{24k^2}$ (—154i.+214ii.—156iii.+61iv.—10v.)

Formula.	Data.	Value of d.	Value of e.
(51a)	y_1 to y_3	$\frac{1}{6k^3}$ (3i.—3ii.+iii.)	
(52a)	y_1 to y_4	$\frac{1}{12k^3}$ (18i.—24ii.+14iii.—3iv.)	$\frac{1}{24k^4}$ (—4i.+6ii.—4iii.+iv.)
(53a)	y_1 to y_5	$\frac{1}{24k^3}$ (+71i.—118ii.+98iii.—41iv.+7v.)	$\frac{1}{24k^4}$ (—14i.+26ii.—24iii.+11iv.—2v.)
(53b)	y_1 to y_6	Value of $f=\frac{1}{120k^5}$ (+5i.—10ii.+10iii.—5iv.+1v.)	

Instead of using the value of the ordinates it is often convenient to form the successive differences, and then the coefficients b to f can be expressed very briefly in terms of the leading differences of the ordinates, corresponding to the values 0, k, $2k$, etc., of the abscissa. In the following results, D_1, D_2, etc., represent the successive *leading differences*, that is, remembering that $y_0=0$; $D_1=y_1$; $D_2=y_2-2y_1$; $D_3=y_3-3y_2+3y_1$; etc. ; etc.

[1] See II., § 6, formulæ (9) to (13a).

Formula.	Data.	Value of b.	Value of c.
(54)	y_1	$\frac{1}{k} D$	
(55)	y_1 & y_2	$\frac{1}{2k}(2D_1 - D_2)$	$\frac{1}{2k^2} D_2$
(56)	y_1 to y_3	$\frac{1}{6k}(6D_1 - 3D_2 + 2D_3)$	$\frac{1}{2k^2}(D_2 - D_3)$
(57)	y_1 to y_4	$\frac{1}{12k}(12D_1 - 6D_2 + 4D_3 - 3D_4)$	$\frac{1}{24k^2}(12D_2 - 12D_3 + 11D_4)$
(58)	y_1 to y_5	$\frac{1}{60k}(60D_1 - 30D_2 + 20D_3 - 15D_4 + 12D_5)$	$\frac{1}{24k^2}(12D_2 - 12D_3 + 11D_4 - 10D_5)$.

Formula.	Data.	Value of d	Value of e	Value of f
(56a)	y_1 to y_3	$\frac{1}{6k^3} D_3$		
(57a)	y_1 to y_4	$\frac{1}{12k^3}(2D_3 - 3D_4)$	$\frac{1}{24k^4} D_4$	
(58a)	y_1 to y_5	$\frac{1}{24k^3}(4D_3 - 6D_4 + 7D_5)$	$\frac{1}{24k^4}(D_4 - 2D_5)$	$\frac{1}{120k^5} D_5$

Secondly, when a is not known, and the ordinates y_1, y_2, etc., are distant k, $2k$, etc., from the Y-axis, we may readily extrapolate a by means of the differences. For the coefficients are simply the numbers of Pascal's triangle (the binomial coefficients) with the first omitted. Thus, the small Roman figures denoting suffixes only, we have—

(59)....a = 2i. − ii.; or 3i. − 3ii. + iii.; or 4i. − 6ii. + 4iii. − iv.; or 5i. − 10ii. + 10iii. − 5iv. + v.; or 6i. − 15ii. + 20iii. − 15iv. + 6v. − vi.

for two, three, etc., ordinates given. When a is found, the problem resolves itself into that for which solutions have already been given, or it may be directly solved. For five ordinates given, *not* including a, we have, for example :—

Formulæ.

(60).....a = 5i. − 10ii. + 10iii. − 5iv. + v.

(61).....$b = \frac{1}{12k}$ (− 77i. + 214ii. − 234iii. + 122iv. − 25v.)

(62).....$c = \frac{1}{24k^2}$ (71i. − 236ii. + 294iii. − 164iv. + 35v.)

(63).....$d = \frac{1}{12k^3}$ (− 7i. + 26ii. − 36iii. + 22iv. − 5v.)

(64).....$e = \frac{1}{24k^4}$ (i. − 4ii. + 6iii. − 4iv. + v.)

The values of the coefficients in terms of the leading differences (D) are :—

$$(65).....a = y_1 - D_1 + D_2 - D_3 + D_4$$

$$(66).....b = \frac{1}{12k}(12D_1 - 18D_2 + 22D_3 - 25D_4)$$

$$(67).....c = \frac{1}{24k^2}(12D_2 - 24D_3 + 35D_4)$$

$$(68).....d = \frac{1}{12k^3}(2D_3 - 5D_4)$$

$$(69).....e = \frac{1}{24k^4} D_4$$

3. **Evaluation of the differences from the coefficients.**—When the coefficients of an integral function, viz., one of the form (46), are known, and it is desired to ascertain the values of the ordinates y_0, y_1, y_2, etc., the common interval between which is k, they may be rapidly computed from differences, viz., from $x=0$ and $y=a$, together with the following leading differences :—

(70) ....

Differences.	Factor into numerical coefficient below— bk	$+ ck^2$	$+ dk^3$	$+ ek^4$	$+ fk^5$.
D_1	1	1	1	1	1
D_2		2	6	14	30
D_3			6	36	150
D_4				24	240
D_5					120

For equations of less degree than the fifth the table still serves since f, e, etc., may be put equal to 0.

4. **Subdivision of intervals.**—When the ordinates are to hand for a series of intervals, those for a subdivision of these into m parts may readily be determined by computing a new series of lesser leading differences, d say, using those, D say, of the original intervals, as a basis, as follows :—

(71)

Differ- ence.	$\frac{D_1}{m}$	$\frac{D_2}{m^2}$	$\frac{D_3}{m^3}$	$\frac{D_4}{m^4}$	$\frac{D_5}{m^5}$
$d_1 =$	$1 - \frac{m-1}{2}$	$+ \frac{2m^2-3m+1}{6}$	$- \frac{6m^3-11m^2+6m-1}{24}$	$+ \frac{24m^4-50m^3+35m^2-10m+1}{120}$	
$d_2 =$	1	$- (m-1) + \frac{11m^2-18m+7}{12}$	$- \frac{10m^3-21m^2+14m-3}{12}$		
$d_3 =$	..	1	$- \frac{3m-3}{2}$	$+ \frac{7m^2-12m+5}{4}$	
$d_4 =$	..	..	1	$- 2(m-1)$	
$d_5 =$	..	..	..	1	

That is, we divide the nth difference by m^n, and this factor is multiplied into the expression opposite d with the proper suffix. The sum of the terms gives the leading difference in the corresponding d in the first column.[1]

When an interval is divided into 2, 4, 8 or 16, etc., parts, the ordinates may be found by successive "*interpolations into the middle.*"

5. **Evaluation of constants of periodic fluctuations.**—The general empirical formula for a periodic curve which may be made to fit given data is—

$$(72)..y\,(\text{or } \frac{1}{y}\,)=a+b\sin(\beta+x)+c\sin 2(\gamma+x)+d\sin 3(\delta+x)+\text{etc.}$$

in which the number of terms to be taken depends upon the given data, and is sufficiently illustrated hereunder.

When the values of y are given only for the beginning of the recurring period of the total fluctuation and at the end of the first half period, we have—

$$(73).....y = a + b\sin(\beta + x)$$

$$(74).....a = \tfrac{1}{2}(y_0 + y_1)\,;\;\; b\sin\beta = \tfrac{1}{2}(y_0 - y_1)$$

Hence if any definite value be assigned to b, β becomes determinate; or if to β, b becomes determinate.

When there are values of y for the beginning of the total period, and for the instants one-third and two-thirds of the period, then we have, writing—

$$y_0 - a = r_0\,;\;\; y_1 - a = r_1\,;\;\text{etc.}$$

$$(75).....a = \tfrac{1}{3}(y_0 + y_1 + y_2)\,;\;\tan\beta = \frac{\sqrt{3}\,r_0\,;}{r_1 - r_2}$$

a and β being found, we have—

$$(76).....b = r_0\,\text{cosec}\,\beta$$

Using r_n throughout to denote $y_n - a$, where n is 0, 1, 2, etc., we have for four values, viz., at the beginning of a period and at one-fourth, two-fourths, and three-fourths of the period, from the beginning—

$$(77)....a = \tfrac{1}{4}(y_0 + y_1 + y_2 + y_3);\;\tan\beta = \frac{y_0 - y_2}{y_1 - y_3}$$

and in the expression for $\tan\beta$, we may write r for y.

These quantities being found, we then have—

$$(78)....b = r_0\,\text{cosec}\,\beta = r_1\,\sec\beta.$$

For fifth periods, that is, for equidistant ordinates 0 to 4, the formulæ for the constants are :—

$$(79).....y=a+b\sin(\beta+x)+c\sin 2(\gamma+x)$$

[1] See Text Book Institute of Actuaries, Pt. II., Ed. 1902, p. 443.

and the solution gives—

$$(80)\ldots\ldots a = \tfrac{1}{5}\,\Sigma_0^4\, y.$$

$$(81)\ldots \tan\beta = \frac{2\sin 36^0\,\{r_0 - 2\cos 36^0\,(r_3 + r_3)\}}{r_2 - r_3 + 2\cos 36^0\,(r_1 - r_4)}$$

$$(82)\ldots\ldots b = \frac{\operatorname{cosec}\beta\,\{r_0 - 2\cos 36^0\,(r_2 + r_3)\}}{3 + 2\cos 72^0.}$$

$$(83)\ldots\ldots \tan 2\gamma = \frac{2\sin 36^0\{r_0(2 + 2\cos 72^0) + 2\cos 36^0\,(r_2 + r_3)\}}{r_1 - r_4 - 2\cos 36^0\,(r_2 - r_3)}$$

$$(84)\ldots\ldots c = \operatorname{cosec} 2\gamma.\ \frac{r_0(2 + 2\cos 72^0) + 2\cos 36^0\,(r_2 + r_3)}{3 + 2\cos 72^0.}$$

The values of sin 36°, cos 36°, sin 72°, and cos 72° are respectively :— $\frac{1}{4}\sqrt{(10-2\sqrt{5})} = 0.5877853$; $\frac{1}{4}(\sqrt{5}+1) = 0.8090170$; $\frac{1}{4}\sqrt{(10+2\sqrt{5})} = 0.9510565$; and $\frac{1}{4}(\sqrt{5}-1) = 0.3090170$.

For sixth periods, that is, for equidistant ordinates 0 to 5 the formulæ for the constants are :—

$$(85)\ldots\ldots\ldots a = \tfrac{1}{6}\,\Sigma_0^5\, y.$$

$$(86)\ldots\ldots \tan\beta = \frac{\sqrt{3}\,(r_1 - r_2 - r_4 + r_5)}{r_1 + r_2 - r_4 - r_5}$$

$$(87)\ldots\ldots\ldots b = \tfrac{1}{2}\operatorname{cosec}\beta\,(r_1 - r_2 - r_4 + r_5)$$

$$(88)\ldots\ldots \tan 2\gamma = \frac{\sqrt{3}\,(r_0 + r_3)}{r_1 - r_2 + r_4 - r_5}$$

$$(89)\ldots\ldots\ldots c = \frac{\sec 2\gamma}{2\sqrt{3}}\,(r_1 - r_2 + r_4 - r_5)$$

The solution for twelfth periods is sometimes required as, for example, when values are to hand for the beginning of each month. Denoting as before the remainders $y_n - a$ by r_n we have—

$$(90)\ldots\ldots a = \frac{1}{12}\,\Sigma_0^{11}\, y.$$

Then making the following additions for brevity of working, viz.—

$$(91)\ldots\begin{cases} L_0 = r_0 + r_3 + r_6 + r_9\,; & N_0 = r_0 + r_6 - r_3 - r_9 \\ L_1 = r_1 + r_4 + r_7 + r_{10}\,; & N_1 = r_1 + r_7 - r_4 - r_{10} \\ L_2 = r_2 + r_5 + r_8 + r_{11}\,; & N_2 = r_2 + r_8 - r_5 - r_{11} \\ M_0 = r_0 + r_4 + r_8\,; & R_0 = r_0 + r_2 - r_6 - r_8 \\ M_1 = r_1 + r_5 + r_9\,; & R_1 = r_1 + r_3 - r_7 - r_9 \\ M_2 = r_2 + r_6 + r_{10}\,; & R_2 = r_2 + r_4 - r_8 - r_{10} \\ M_3 = r_3 + r_7 + r_{11}\,; & R_3 = r_3 + r_5 - r_9 - r_{11} \end{cases}$$

$$(92)\ldots\ldots \tan\beta = \frac{2R_0 + \sqrt{3}R_1 - R_2 - \sqrt{3}R_3}{R_1 + \sqrt{3}R_2 + R_3}$$

$$(93)\ldots\ldots\ldots b = \tfrac{1}{12}\operatorname{cosec}\beta\,(2R_0 + \sqrt{3}R_1 - R_2 - \sqrt{3}R_3)$$

$$(94)\ldots\ldots \tan 2\gamma = \frac{N_1 + 2N_0 - N_2}{\sqrt{3}\,(N_1 + N_2)}$$

$$(95)\ldots\ldots\ldots c = \frac{1}{4\sqrt{3}} \sec 2\gamma\,(N_1 + N_2)$$

$$(96)\ldots\ldots \tan 3\delta = \frac{M_0 - M_2}{M_1 - M_3}$$

$$(97)\ldots\ldots\ldots d = \tfrac{1}{6} \operatorname{cosec} 3\delta\,(M_0 - M_2)$$

$$(98)\ldots\ldots \tan 4\epsilon = \frac{\sqrt{3}\,L_0}{L_1 - L_2}$$

$$(99)\ldots\ldots\ldots e = \tfrac{1}{4} \operatorname{cosec} 4\epsilon L_0$$

$$(100)\ldots\ldots \tan 5\zeta = \frac{2R_0 - \sqrt{3}R_1 - R_2 + \sqrt{3}R_3}{R_1 - \sqrt{3}R_2 + R_3}$$

$$(101)\ldots\ldots\ldots f = \tfrac{1}{12} \operatorname{cosec} 5\zeta\,(2R_0 - \sqrt{3}R_1 - R_2 + \sqrt{3}R_3)$$

6. **Constants of exponential curves.**—The case of a curve of the type

$$(102)\ldots\ldots y = 1 \pm \eta t^{\pm m \pm nt}$$

see equation (20), has already been sufficiently considered : its constants can be found as shewn by formulæ (23) to (30) ; and also that of the type, see equation (32)

$$(103)\ldots\ldots y = 1 + \eta t^{\frac{1}{\pm m \pm nt}};$$

see formulæ (35) to (38). In general, curves of this type may be solved by forming the equations $y' = y - 1$ and taking logarithms when we get such forms as—

$$(104)\ldots\ldots u = \epsilon + \log t\,(\pm m \pm nt) \text{ and } u = \epsilon \frac{\log t}{\pm m \pm nt}$$

solutions for which have already been sufficiently indicated. As this process of taking logarithms is the key to many solutions, we now refer more fully to the matter. The essence of this method of solving is that if a series of values on the axis of abscissæ be taken in *geometrical progression*, their logarithms are in *arithmetical progression*. Thus, χ being $\log x$, we have—

Quantities $= x\,;\ kx\,;\ k^2x\,;\ k^3x\,;$ etc. ;

Logarithms of same $= \chi\,;\ \chi + k\,;\ \chi + 2k\,;\ \chi + 3k\,;$ etc.

Hence the problems of solution are reduced to those of the examples illustrated by formulæ (46) to (71).

7. **Evaluation of the constants of various curves representing types of fluctuation.**—The evaluation of the constants of various curves can often be effected by taking suitable ordinates to the curve and solving from their logarithms. This is illustrated in the following series of equations :—

$$(105)\ldots\ldots \mathfrak{Y} = \mathfrak{C}e^{A X^m} = \mathfrak{C}e^{A M^x} = \mathfrak{C}\mathfrak{A}^{X^m} = \mathfrak{C}\mathfrak{A}^{M^x}$$

We have on taking napierian logarithms—

$$(106)\ldots\ldots Y = AX^m + C = AM^x + C$$

in which $\log \mathfrak{Y} = Y$; $\log \mathfrak{C} = C$; $\log \mathfrak{A} = A$; $\log X = x$; and $\log M = m$.

The second curve may be called the first *logarithmic homologue* of the first, and the first the first *anti-logarithmic generatrix* of the second. Subsequent curves may be similarly defined as the second logarithmic homologue, etc.

Yet again, if C be zero, we have on taking the logarithm of this last expression—

$$(107)\ldots\ldots y = a + mx,$$

in which $\log Y = y$; and $\log A = a$.

This will sufficiently illustrate the matter. Several examples of solution will be given of important curves for representing fluctuation.

In the curve

$$(108)\ldots\ldots y = A + Bx^m$$

If $A = 0$; then the solution is found at once from any two values of y and of x. For we have—

$$(109)\ldots\ldots \log y = \log B + m \log x.$$

On Fig. 21 hereinafter, these curves are shewn by thick lines for positive values of m, and by thin lines for negative values.

If, however, A be *not* zero, then we must take three values of y for abscissæ of the value x, xk, xk^2, when it may easily be shewn that—

$$(110)\ldots\ldots \frac{y_3 - y_2}{y_2 - y_1} = k^n; \text{ or } n = \frac{\log (y_3 - y_2) - \log (y_2 - y_1)}{\log k}$$

The curve

$$(111)\ldots\ldots y = B + Ce^{ax}$$

can be solved by taking the values of y for x, $x + k$, $x + 2k$, for

$$(112)\ldots\ldots \frac{y_3 - y_2}{y_2 - y_1} \equiv \frac{C\ [e^{a(x+2k)} - e^{a(x+k)}]}{C\ [e^{a(x+k)} - e^{ax}]} = e^{ak}$$

Consequently putting Y_{321} for the left-hand expression, and writing 2.3025851 for the modulus for changing common into Napierian logarithms

$$(113)\ldots\ldots a = \frac{2.3026}{k} \log_{10} Y_{321}$$

When a is found the solutions for B and C are obvious. Curves of the equation e^x are shewn by thick lines on Fig. 22 hereinafter, and those of equation $1 / e^x$ by thin lines.

The exponential curve—

$$(114)\ldots\ldots y = A + Be^{nx^p}$$

can be solved if A be zero, or if A be known, and a new series of $y' = y - A$ be formed. Thus A being zero,

$$(114a)\ldots\ldots \log y = \log B + nx^p \log e.$$

Hence, as before, taking three values of y for x, xk, xk^2, the solution is—

$$(115)\ldots\ldots p = \frac{1}{\log k} \cdot \log \left\{ \frac{\log y_3 - \log y_2}{\log y_2 - \log y_1} \right\}$$

$$(116)\ldots\ldots n = \frac{\log y_2 - \log y_1}{x^p (k^p - 1) \log e}$$

$$(117)\ldots\ldots \log B = \log y_1 - nx^p \log e.$$

These curves are shewn for Fig. 23 hereinafter, for various values of n *and* p.

The curve—

$$(118)\ldots\ldots y = Ax^m e^{nx^p}$$

is solved by taking four ordinates, viz., for x, xk, xk^2, xk^3, when the solution becomes[1]—

$$(119)\ldots\ldots p = \frac{1}{\log k} \cdot \log \left\{ \frac{\log y_2 - 2 \log y_3 + \log y_4}{\log y_1 - 2 \log y_2 + \log y_3} \right\}$$

using common logarithms. Then M denoting log e, we have also—

$$(120)\ldots n = \frac{(\log y_1 - 2 \log y_2 + \log y_3)}{Mx^p (k^p - 1)^2} = \frac{(\log y_2 - 2 \log y_3 + \log y_4)}{Mx^p k^p (k^p - 1)^2}$$

$$(121)\ldots\ldots m = \frac{(\log y_2 - \log y_1) - Mnx^p (k^p - 1).}{\log k}$$

There are obviously two other possible formulæ for m.

$$(122)\ldots \log A = \log y_1 - m \log x_1 + Mnx^p$$

the value of M being 0.4342945. Three other formulæ are also possible for A. For further formulæ see (150) to (153) later; see also Figs. 21 to 27, hereinafter, for the forms of the curve.

8. **Polymorphic and other fluctuations.**—*Monomorphic* or rather *unimodal* curves disclose a single maximum (or minimum) value. But there are fluctuations which are *polymorphic* or *multimodal*. These may be regarded as compounded of monomorphic curves. Practically their dissection is best effected by the graphic methods of analysis. In general any curve can be represented with great accuracy by either

$$(123)\ldots\ldots y = a + bx^p + cx^q + dx^r + \text{etc., or by}$$

$$(124)\ldots\ldots Y = e^{a + bx^p + cx^q + \text{etc.}}$$

where p, q, r, etc., are not restricted to integral values.

The latter curve is reduced to the former by taking the logarithm; thus, $y = \log_e Y$. To solve for the constants we must have six points besides the origin. If the value of a be known, the curve can be reduced to one passing through the origin by subtracting a. Then we take values of y for x, xk, xk^2, xk^3, etc. For the case for terms in p and q only, we can proceed as follows:—

[1] For a more complete study of the curve, see "Studies in Statistical Representation. On the Nature of the Curve," above given, viz. (118), by G. H. Knibbs, Journ. Roy. Soc., Vol. XLIV., pp. 341-367, 1910.

By writing L for bx^p and M for cx^q, and α for k^p and β for k^q; we have—

(125).. $y_1 = L + M$; $y_2 = L\alpha + M\beta$; $y_3 = L\alpha^2 + M\beta^2$; $y_4 = L\alpha^3 + M\beta^3$.

Hence by eliminating L and M from the first three and from the last three equations, we have respectively—

$$(126a).. \begin{vmatrix} 1 & 1 & y_1 \\ \alpha & \beta & y_2 \\ \alpha^2 & \beta^2 & y_3 \end{vmatrix} = 0 ; \quad \begin{vmatrix} 1 & 1 & y_2 \\ \alpha & \beta & y_3 \\ \alpha^2 & \beta^2 & y_4 \end{vmatrix} = 0 \; .. \; (126b)$$

Consequently α and β are the roots of—

$$(127)..... \begin{vmatrix} 1 & y_1 & y_2 \\ \xi & y_2 & y_3 \\ \xi^2 & y_3 & y_4 \end{vmatrix} = 0$$

Thus the two values of ξ in the equation—

(128).. $\xi^2 - \xi(\alpha + \beta) + \alpha\beta = \xi^2(y_1y_3 - y_2^2) + \xi(y_2y_3 - y_1y_4) + (y_2y_4 - y_3^2) = 0$

are the values of k^p and k^q. And since k is known, the solution is to hand by taking logarithms.

The solution for three indices is similar. The six equations can be written—

(129)..... $y_{m+1} = L\alpha^m + M\beta^m + N\gamma^m$

and α, β, and γ; that is k^p, k^q, and k^r, are the roots of the equation.

$$(130)..... \begin{vmatrix} 1 & y_1 & y_2 & y_3 \\ \xi & y_2 & y_3 & y_4 \\ \xi^2 & y_3 & y_4 & y_5 \\ \xi^3 & y_4 & y_5 & y_6 \end{vmatrix} = 0$$

which may be expanded in the form—

(130a)..... $A_1\xi^3 - 3A_2\xi^2 + 3A_3\xi - A_4 = 0$

where A_1, $3A_2$, $3A_3$ and A_4 are the minors respectively of ξ^3, ξ^2, ξ and 1 in the determinant.

If the constant a is included in (123) or (124), the solution is more tedious. We must then have seven values of y. Thus—

(131)..... $y_{m+1} = a + L\alpha^m + M\beta^m + R\gamma^m$

(131a)..... $y_{m+2} - y_{m+1} = L'\alpha^m + M'\beta^m + R'\gamma^m$

the accented values being $L' = L(\alpha - 1)$; $M' = M(\beta - 1)$; etc.

Thus α, β, and γ are the roots of—

$$(132)..... \begin{vmatrix} 1 & y_2 - y_1 & y_3 - y_2 & y_4 - y_3 \\ \xi & y_3 - y_2 & y_4 - y_3 & y_5 - y_4 \\ \xi^2 & y_4 - y_3 & y_5 - y_4 & y_6 - y_5 \\ \xi^3 & y_5 - y_4 & y_6 - y_5 & y_7 - y_6 \end{vmatrix} = 0$$

Writing Y_3, Y_2, Y_1, Y_0 for the minors of ξ^3, ξ^2, ξ, and 1 in the determinant, the equation becomes

(133)..... $\xi^3 Y_3 - \xi^2 Y_2 + \xi Y_1 - Y_0 = 0$.

It will be seen from the preceding examples that when, as regards their indices, the equations are not restricted to integral values, the fitting power of the curve is enormously increased. To fit seven points with integral indices we should have to have an equation of the sixth degree.[1]

Figures 6 and 7 furnish graphs for simple cases with two indices only. From these graphs, which also are for integral values of the index only, it is immediately evident that the loci of curves with fractional values must lie between the curves drawn. The forms of the curves may, of course, be modified also by varying the coefficients : hence the fitting power of expressions of the type considered obviously becomes very great when the limitation imposed by restricting the indices solely to integral values is abandoned.[2]

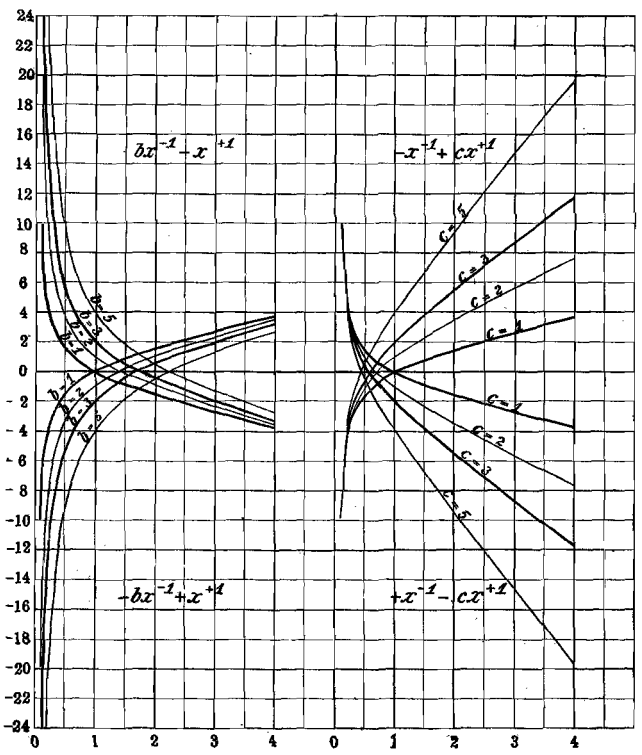


Fig. 6.

[1] See "Studies in Statistical Representation, III., Curves, their Logarithmic Homologues," etc., by G. H. Knibbs and F.W. Barford, Journ. Roy. Soc. N.S.Wales, Vol. XLVIII., pp. 473-496

[2] The limitations of the fitting power of the curve are discussed in the paper referred to in the preceding footnote. These limitations, in general, are of no moment in statistical results.

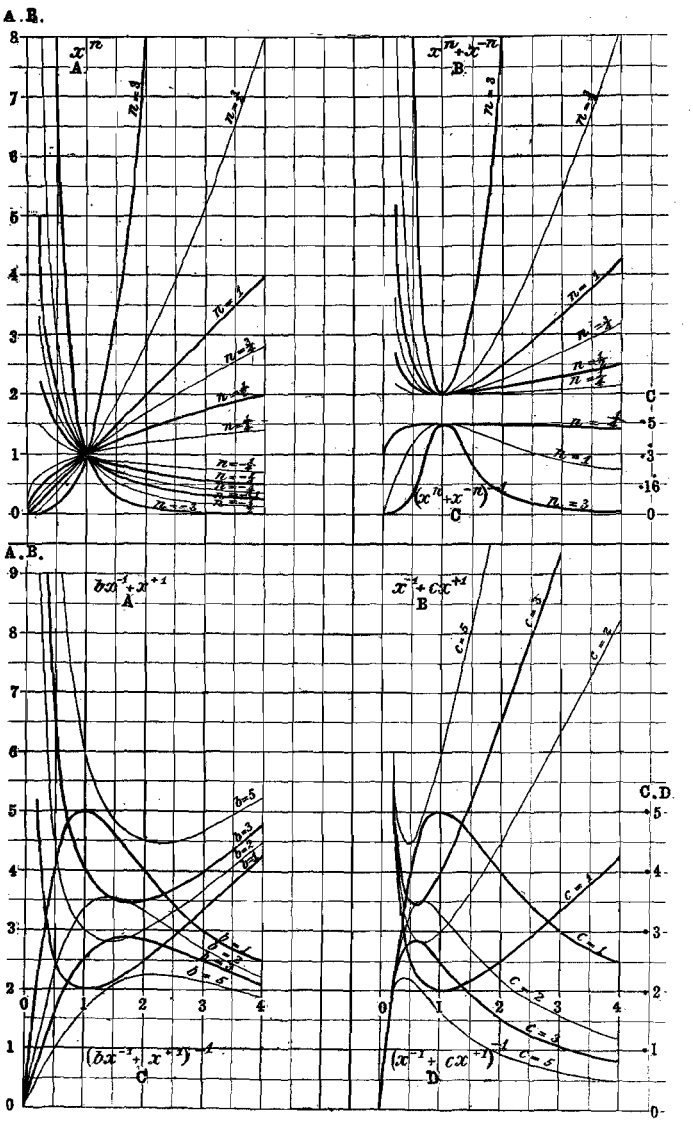


FIG. 7.

Some special cases of fluctuation will now be treated in dealing with problems treating of fluctuating elements that directly or indirectly influence the aggregate or constitution of the population.

9. **Projective anamorphosis.**—A symmetrical curve of frequency (or symmetrical distribution) may become asymmetrical by the elements being projectively varied by means of different types of projection (plane or other). This change may be called *projective anamorphosis*. Any character of a population may be regarded as subject to influence acting

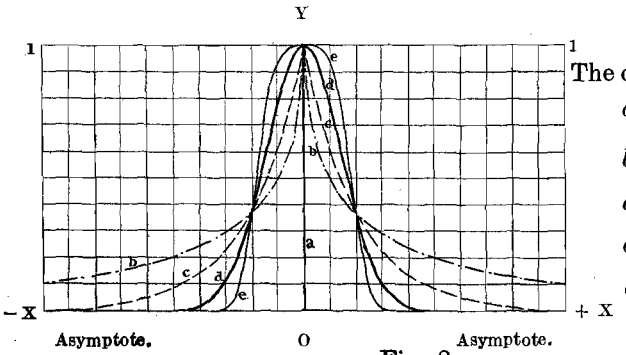
progressively (or retrogressively) with increase of the measure of the character in question, as for example, if the influence tending to increase weight (or height) acted more or less powerfully with increase of that character. This would lead to an asymmetric or *skew* frequency. Thus if a normal frequency be denoted by $y = \phi(x)$; a specialised frequency conceived to originate therefrom would be given by $y' = f(x)\,\phi(x)$. This expression may also be skew, dimorphic, polymorphic, or in fact, what we please, according to the character of $f(x)$. If $f(x) = mx$ or m/x, a symmetrical curve is converted into a skew curve. If $f(x)$ have a mode such that it is *not* identical with that of $\phi(x)$ the latter will be dimorphic. From this it is seen that the ordinates to a dimorphic curve may be the *sum* or *product* of the ordinates to two monomorphic curves. It is not proposed to elaborate just here, however, the general theory of anamorphosis by plane or other projection. It may be easily seen, however, that a skew curve may be readily derived from a symmetrical one, while retaining the general algebraical properties of the latter, by a projection, from a line parallel to the axis of the given symmetrical curve, through the curve and on to a plane passing through the axis but inclined to the plane of the given curve. This will be more fully considered hereinafter.

IV.—SPECIAL TYPES OF CURVES AND THEIR CHARACTERISTICS.

1. **General.**—When the characters of a population have a tendency to deviate in either direction equally, and the number of the population is P, the characters will be distributed as the coefficients $(\frac{1}{2} + \frac{1}{2})^m$ *i.e.*, as the numbers in Pascal's triangle, which, when m is infinite, becomes the curve

$$(134).....y = Pe^{-(\frac{x}{k})^2} \text{ ; or say } Pe^{-(\frac{x}{k})^n}$$

the first form (viz., that when the power $n = 2$) being the ordinary probability curve, in which k is the modulus. This type of distribution is but one case of the more general expression which, interpreted in a certain way,[1] has a cusp for the vertex for values of n equal to or less than unity, and a curve convex upwards for all values greater than unity, the vertex however becoming more flat as n is increased.



The curves graphed are

a	=	axis
b		$e^{-x^{\frac{1}{4}}}$
c		e^{-x}
d		e^{-x^2}
e		e^{-x^4}

Fig. 8.

The curve $y = e^{-x^{\frac{1}{\infty}}}$ is coincident with a from the point Y to a point $y = 0.3678781$; it is then parallel to the X axis. All the curves intersect at this point.

Such a distribution is symmetrical, and takes the form in the figure hereunder, Fig. 7, in which curve 'a' shews its form for $n = 0$; 'b' for $n = \frac{1}{2}$; 'c' for $n = 1$; 'd' for $n = 2$; 'e' for $n = 4$.

When the probabilities of distribution are not equal for possible alternatives, and the probabilities of these alternatives are as p and q, the sum of p and q being unity, then the distribution will be the coefficients of $(p + q)^m$. If q and p are not equal the curve is *not* symmetrical, but is of a form like Fig. 9 hereinafter. Whether results can be made to conform to a particular type or not depends on the form of the curve, and

[1] That is, so that e^{-x^n} and $e^{-x^{(n+\delta n)}}$ are in the same spatial region, or on the same side of an axis, and are not allocated to different regions according to whether the number $(n+\delta n)$ is even or odd.

in particular on the position of its vertex ; on whether its sides meet the axis of the variable more or less sharply or asymptotically, on whether it is *monomorphic* or *polymorphic*, or has one " mode" (*is unimodal*) or more modes than one (*is multimodal*). Various types of unimodal fluctuations, commencing and ending with zero values or otherwise, have been given by Prof. Pearson. These are intended to reproduce the group-values of statistical data, under appropriate forms of curves, by a method which has been called the method of moments, the forms of the curves being derived from the normal curve of probability. We shall later refer to these, but remark first of all that the critical elements of the curves representing distributions or fluctuations are as follows, viz. :—

(*a*) the value of the ordinate when the variable is zero ;
(*b*) the values of the variable for which the ordinates become zero ;*
(*c*) or, if they do not become zero, the value of the ordinate when the variable is infinity ;
(*d*) the abscissa of the *mode*, or greatest ordinate, and the value of that ordinate ;
(*e*) the abscissa of the ordinate which equally divides the curve area (as, for example, the abscissa which corresponds to the average value, or the *centroid vertical*) ;
(*f*) the distance between these two ordinates (*d*) and (*e*) (the numerator of the quantity defining the *skewness*) ;
(*g*) the *mean-deviation* of the curve (or denominator of the skewness) ;
(*h*) the abscissa of the point where the curvature changes its sign, (point of inflexion) ;
(*i*) the abscissa of the point of most rapid change of direction of the curve.

(*a*).....$y = f(0)$; (*b*).....$f(x) = 0$; (*c*).....$f(\infty) = k$ or 0 ;
(*d*).....x_m when $df(x) / dx = 0$; and $y_m = f(x_m)$;
(*e*).....x_a when the value of $\int xf(x)\,dx \div \int f(x)\,dx$ for the range of the variable up to x_a is equal to that for x_a onward ;
(*f*).....$(x_a \sim x_m)$
(*g*).....$m_2 = \sqrt{[x^2 f(\chi)\,d\chi \div \int f(\chi)\,dx]}$, in which χ is measured from the position of the mean (x_a).
(*h*).....x_i when $d^2 f(x) / dx^2 = 0$;
(*i*).....x_p when $d^3 f(x) / dx^3 = 0$.

* The approach of statistical curves to the axis of abscissæ or to the axis of ordinates is, in general, not determined by mathematical considerations, but by a knowledge of the nature of the data itself. For example, the terminals of the curve of fertility (discussed hereinafter) deduced from ex-nuptial births, shews a diminution which may be represented very closely by the numbers 1078, 154, 22, 3¼, for the ages 16, 15, 14 and 13 respectively, *i.e.*, each number is one-seventh of the number preceding it. Merely mathematically, therefore, it is more probable that these should continue for the ages 12, 11, 10, 9, etc., as 0.45 ; 0.064 ; 0.009 ; 0.0013, etc. Even at age 0 there would, of course, be still a positive value though small. But physiological knowledge indicates that the earliest arrival of puberty is probably over 10 years, hence 11 would be the earliest age for birth, and the ordinate must be zero.

2. **Curves of generalised probability.**—Prof. Pearson proposes to reduce forms of distribution of statistical facts under a series of seven type-forms of curves, representing what may be called curves of generalised probability,[1] and much work has been reduced on this system.

Fig. 9
Type I. (i.).

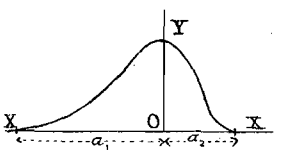


Fig. 10.
Type I. (ii.).

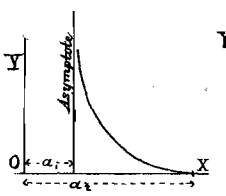
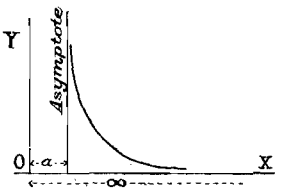


Fig. 11.
Type I. (ii.a).



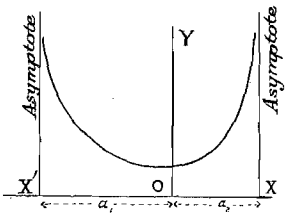


Fig. 12.
Type I. (iii.).

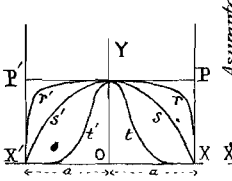


Fig. 13.
Type II. (i.).

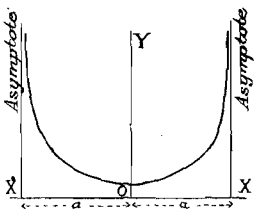


Fig. 14.
Type II. (ii.)

His first type (Type I.) is :—

$$(135)\ldots\ldots y_0 = y\,(1 + \frac{x}{a_1})^{\nu a_1}\,(1 - \frac{x}{a_2})^{\nu a_2}$$

which may take two other fundamental sub-forms, viz.,

$$(136)\ldots\ldots y = y_0\,(\frac{x}{a_1} - 1)^{-\nu a_1}(1 - \frac{x}{a_2})^{\nu a_2};\ \text{and}$$

$$(137)\ldots\ldots y = y_0\,(1 - \frac{x}{a_1})^{-\nu a_1}(1 + \frac{x}{a_2})^{-\nu a_2}$$

which are represented respectively by the forms in Figs. 9 to 12.[2] When ν, a_1 and a_2 are positive the curve meets the X axis at the distances a_1 and a_2, see the figures. The abscissa of the mode is 0 and the curve is skew.

[1] See his "Contributions to the Mathematical Theory of Evolution." Phil. Trans., Vol. 185 (1894) A, pp. 71-110; Vol. 186 (1895) A, pp. 343-414; Vol. 187 (1896) A, pp. 253-318; Vol. 191 (1898) A, pp. 229-311; Vol. 192 (1898) A, pp. 169-244; Vol. 192 (1899) A, pp. 257-330; Vol. 195 (1900) A, pp. 1-47; Vol. 195 (1900) A, pp. 79-150; Vol. 197 (1901) A, pp. 285-379; Vol. 197 (1901) A, pp. 443-459.

[2] See Phil. Trans., Vol. 186 A, pp. 364-5.

If, in the formula for Type I., a_2 be made equal to a_1, then the formula becomes that of Type II.,[1] shewn by Figs. 13 and 14, viz.—

$$(138)\ldots\ldots\ y = y_0\left(1 - \frac{x^2}{a^2}\right)^{\nu a}$$

the *basic form* of which, when y_0 is unity, is an ellipse with semiaxes a and 1. The figure becomes a circle when ν is $\frac{1}{2}$ and a is 1. In general, any form can be deduced from the basic form which, when νa is unity, is a parabola (the quantity within the brackets) in (138). If this quantity be infinite and positive the figure becomes X′ P′ Y P X: see Fig. 13. If positive and greater than unity, it is the curve $r'r$; if unity it is the parabola $s's$; if less than unity, the curve $t't$ in Fig. 13. The abscissa of the mode is 0, and the curve is of course symmetrical.

If ν be made negative in (138) the formula becomes

$$(139)\ldots\ldots y = y_0 \frac{1}{\left(1 - \frac{x^2}{a^2}\right)^{a}}$$

and is shewn by Fig. 14. The abscissa of the mode (of mediocrity) is at the origin.

If in the second sub-form of Type I. we make a_2 infinity, then

$$(140)\ldots\ldots y = y_0\left(\frac{x}{a} - 1\right)^{-\nu a} e^{-\nu x}$$

the form of which is shewn in Fig. 11; that is, the curve is asymptotic to the ordinate whose abscissa is distant $+a$ from the origin, and asymptotic also to the axis OX.

Fig. 15.
Type III.

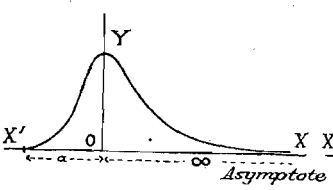


Fig. 16.
Type IV.

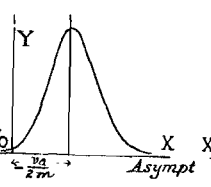
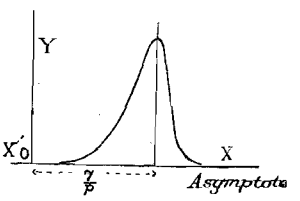
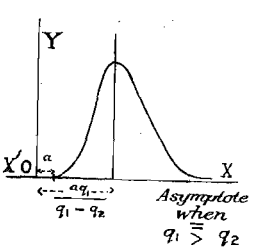
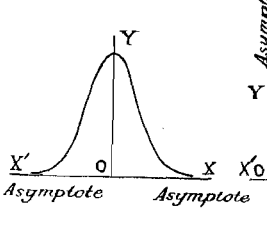


Fig. 17.
Type V.







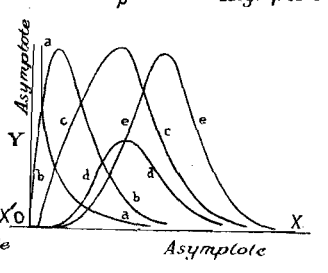


Fig. 18.
Type VI.

Fig. 19.
Type VII.

Fig. 20.
Various.

[1] Op. cit., pp. 364-5.

When in formula (135) a_2 is infinity, then its form becomes Type III., viz.,

$$(141)\ldots\ldots y = y_0 \left(1 + \frac{x}{a}\right)^{\nu a} e^{-\nu x}$$

and is of the form shewn in Fig. 15. The abscissa of the mode is at the origin, and the curve is skew.

Type IV. is of the form shewn in Fig. 16; its equation being :—

$$(142)\ldots\ldots y = \left(1 + \frac{x^2}{a^2}\right)^{-m} e^{-\nu \tan^{-1} x/a} \text{ ; or } = y_0 \cos^{2m}\theta . e^{-\nu\theta}$$

θ being the angle the tangent of which is x/a. The curve is asymptotic to the X axis on both branches; its mode is at the distance $-\nu a/2m$ from the origin, and it is skew : see Fig. 16.

Type V., is of the form shewn in Fig. 17, and its equation is :—

$$(143)\ldots\ldots y = y_0\ x^p e^{-\frac{\gamma}{x}}$$

The curve is limited on one side at the axis X, *i.e.*, for $x = 0$, and is asymptotic thereto at the other; its mode being at the distance γ/p. The curve is skew. The *mean* is at the distance $\gamma / (p-2)$ from the origin.

Type VI. is of the form shewn in Fig. 18. Its equation is :—

$$(144)\ldots\ldots y = y_0 (x - a)^{q_2}\ x^{-q_1}$$

The curve is limited on one side only, viz., when $x = a$. The mode is at $aq_1 / (q_1 - q_2)$.

Type VII. is the ordinary probability curve: see Fig. 19, viz. :—

$$(145)\ldots\ldots y = y_0\ e^{-\frac{x^2}{c}}$$

the mode being at the origin and the curve unlimited in either direction, and of course symmetrical.

Curves *a* to *e*, Fig. 20, are typical forms of the following characteristics in a population, viz. :—

(*a*) Infantile mortality, income, probates, value of houses, etc. ;

(*b*) Mortality from scarlet fever, diphtheria, etc. ;

(*c*) Pauper frequency, divorce frequency with respect to duration of marriage, frequency of scarlet fever with age, of typhus, etc. ;

(*d*) Senile mortality, mortality from enteric at different ages, frequency of marriage of wives corresponding to age of husbands at marriage, etc. ;

(*e*) Height, weight, strength frequency, anthropometric measurements, etc.

3. **The method of evaluating the constants of the curves of generalised probability.**—Two things are requisite in using the Pearson curves, viz. (i.) to select the appropriate type of curve; and (ii.) to evaluate the constants of the selected curve. The selection of a curve which can be made to fit the given group-data depends upon relationships among the moments calculated about the *mean*. These relationships determine three criteria, which, after the necessary computations have been made, indicate the appropriate selection.[1]

Solutions can also be effected by means of a combination of graphical and numerical methods. The numerical solutions can be effected by taking logarithms, that is,

$$(146)\ldots\ldots \log y = \log y_0 + \log f(x).$$

The process in detail can readily be followed from the examples in III. (See in particular § 7). In general the solution must be tentative, and it is important to notice that the type-curve selected is not valid if the data have to be altered larger amounts than they are probably in error. The principle which should be employed is the following :—The adoption of a type-curve can be regarded as satisfactory only when it represents the data within the limits of their probable errors. In other words the geometric form and the algebraic processes should be subordinated to the data and not *vice versa*.

4. **Flexible curves.**—Although the type-curves just considered fulfil their general purpose fairly well, experience shews that their "*fitting power*" is somewhat limited. To overcome this, other types are necessary, the "fitting power" of which is greater. In order to embrace as many forms as possible under cover of a single formula a curve may be so taken that its limiting forms shall include all parabolas, all hyperbolas (or parabolas with negative indices), all exponentials with positive or negative indices, and all curves of the normal probability type. Such a curve will necessarily include all intermediate forms. I have called this type of curve a *flexible curve*.

Formula (149) in the next section is a curve of the type in question. Its graph depends fundamentally upon the values of the indices m, n, and p, and its vertical scale depends upon the constant A. The mode of solving to determine its constants depends upon taking a series of values of the abscissa in geometrical ratio, and is indicated in the next section.

[1] See the article by Professor Pearson already referred to, also "Frequency Curves and Correlation," by W. Palin Elderton (C. and E. Layton, London, 1906); and "Statistical Methods with special reference to Biological Variation," by C. B. Davenport (Chapman and Hall Ltd., London, 1904).

The curves indicated on p. 57 and p. 81 of Mr. W. Palin Elderton's work do not satisfactorily represent the data, forasmuch as the curves chosen were insufficiently flexible.

5. **Determination of the constants of a flexible curve.**—The probability curve, see (134) hereinbefore, viz.,

$$(147)\ldots\ldots y = Ce^{-\frac{x^2}{k^2}} \quad \text{or } e^{-\frac{x^2}{k^2}+c}$$

in which $c = \log_e C$, may be put in a more general form, viz.—

$$(148)\ldots\ldots y = e^{-\frac{x^2}{f(x)}+F(x)+c}$$

that is, its modulus k and constant C may be assumed to be functions of x.

If we suppose that

$$F(x) = \alpha + \beta \log(\pm x);\ f(x) = \gamma x^s;\ c = 0;$$

and write $p = 2 - s$; $n = -1/\gamma$; $\log A = \alpha$; $m = \beta$, the expression (148) can be written

$$(149)\ldots\ldots y = Ax^m e^{nx^p}$$

see (118) in III. 7. This curve can fit a great variety of forms, viz., such as are shewn on Figs. 21 to 27, referred to later.

In practice it is not quite satisfactory to depend on four points. A better fit can be secured by taking several, say r, series of ordinates for values of the abscissa x_a, $k_a x_a \ldots\ldots k_a^3 x_a$;$\ldots\ldots x_r$, $k_r x_r \ldots\ldots k_r^3 x_r$. Each set will give a value for p, say p_a, p_b, etc., and a mean (geometric, arithmetic, or other) can be taken, p say. Or writing Y_{pqr} for $\log y_p - 2\log y_q + \log y_r$, we have

$$(150)\ldots\ldots p \log(k_a.k_b\ldots\ldots k_r) = \log\{\Pi_1^r(Y_{234}/Y_{123})\};$$

$\Pi_1{}^r$ denoting the product of r different sets of the quantities in the brackets.

The use of this mean value of p, being inconsistent with each set of four ordinates, gives for each set two solutions for n, three for m, and four for A, that is in all $2r$, $3r$ and $4r$ solutions respectively for these constants. Having found the mean value for p we use it, in solving for a mean value of n, thus:—[1]

$$(151)\ldots r\log n = \log\frac{\Pi_1^r(\log y_1 - \log y_2 - \log y_3 + \log y_4)}{\Pi_1^r\{Mx^p(k^{2p}-1)(k^p-1)\}};\ \text{or}$$

$$(151a)\ldots\ldots n = \frac{\Sigma_1^r \log(y_1 y_4/y_2 y_3)}{\Sigma_1^r\{Mx^p(k^p+1)(k^p-1)^2\}}$$

[1] By comparing this with (120) it will be seen that the mean is taken of two quantities each of which give n, on the principle that if $a/b=c/d$ approximately $(a+c)/(b+d)$ is sensibly the arithmetic mean, or having two equations which give n, we assign an equal weight to each. The geometric mean, however, is taken in obtaining a mean result from the different sets. Of course $(n_1+\ldots\ldots n_r)/r$ would also be a satisfactory value, n here denoting the value obtained by using the mean value of p. Although the two formulæ are not identical, practically there is no cogent reason for preferring one to the other.

Adopting the mean values, thus found, for p and n, we have three different values for m given by each set. Reverting to formula (121), if we give double weight to the value found from the intermediate term we get[1]

(152).....

$$m = \frac{-\Sigma_1^r(\log y_1 + \log y_2) + \Sigma_1^r(\log y_3 + \log y_4) - Mn\Sigma_1\{x^p(k^{2p}-1)(k^p+1)\}}{4\Sigma_1^r \log k.}$$

Mean values for p, n and m being to hand, we have for A four values from each set of ordinates, see (122) hereinbefore, the general formula being

$$(153).....\log A = \log y_h - \log (k^{h-1}x) - Mn\,(k^{h-1}x)^p.$$

hence for a mean of $4r$ values of A we have

$$(153a)..\log A = \frac{1}{4r}\{\Sigma_1^r \log (y_1 y_2 y_3 y_4) - 4m\Sigma_1^r (\log x + \frac{3}{2}\log k) - Mn\,\Sigma_1^r[x^p(k^{3p} + k^{2p} + k^p + 1)]\}$$

M denotes throughout 0.434..etc., if common logarithms are employed, or unity if Napierian.

Ignoring the coefficient A the first and second derivatives of the curve (149) are respectively

$$(154).... dy/dx = x^{m-1}e^{nx^p}(m + npx^p);\ \text{and}$$

$$(155)..d^2y/dx^2 = x^{m-2}e^{nx^p}\{m(m-1) + npx^p(2m+p-1) + n^2p^2x^{2p}\}$$

hence the mode (maximum or minimum value) is given by

$$(156).....x = (-m/np)^{\frac{1}{p}}$$

which becomes, for $p = 1$, simply $-m/n$. The point of inflection is given by solving the equation

$$(157).....P^2 + P(2m + p - 1) + m(m - 1) = 0$$

in which P denotes npx^p; this gives:

$$(158).....x_i = \left\{-\frac{2m + p - 1 \pm \sqrt{[4mp + (p-1)^2]}}{2np}\right\}^{\frac{1}{p}}$$

which, when $m = 1$ gives the value

$$(159).....x_i = -\left(\frac{1+p}{np}\right)^{\frac{1}{p}} \text{ and also } x_m - (1/np)^{\frac{1}{p}}$$

for the abscissa of the mode.

[1] The principle indicated in the preceding note applies, viz., if $(a+b+c)/d$ equals $(\alpha + \beta + \gamma)/\delta$ approximately, then $(a + \alpha + b + \beta + c + \gamma)/(d + \delta)$ is sensibly the arithmetic mean.

The integral of a curve can take a number of forms as follows, viz :—

$$(160)..\int y dx = \int x^m e^{nx^p}\,dx =$$
$$\frac{x^{m+1}}{m+1}\left\{1+\frac{nx^p(m+1)}{(m+p+1)\,1!}+..+\frac{n^r x^{rp}(m+1)}{(m+rp+1)\,r!}+..\text{etc.}\right\};\ \text{or}$$

$$(161)..\ \frac{x^{m+1}}{m+1}\,e^{nx}\left\{1-\frac{npx^p}{m+p+1}+\frac{(npx^p)^2}{(m+p+1)\,(m+2p+1)}-..\right.$$
$$\left.+\frac{(-1)^r\,(npx^p)^r}{(m+p+1)....(m+rp+1)}\pm\text{etc.}\right\};\ \text{or}$$

$$(162)..\ \frac{x^{m-p+1}}{np}\,e^{nx^p}\left\{1-\frac{m-p+1}{npx^p}+\frac{(m-p+1)\,(m-2p+1)}{(npx^p)^2}-..\right.$$
$$\left.+(-1)^r\,\frac{(m-p+1)....(m-rp+1)}{(npx^p)^r}\pm\text{etc.}\right\}$$

Between the limits 0 and ∞ the integral may be put into the forms of the second Eulerian integral, and is

$$(163).....\int_0^\infty x^m e^{-nx^p}\,dx=\frac{\Gamma\left(\frac{m+1}{p}\right)}{(pn^{\frac{m+1}{p}})}$$

which, when $m = o$, gives

$$(164).....\int_0^\infty e^{-nx^p}\,dx=\Gamma\left(\frac{1}{p}\right)/(pn^{\frac{1}{p}})$$

The abscissa, x_c say, of the *centroid vertical*, or mean of the distribution, is

$$(165).....x_c=\frac{\int x^{m+1}\,e^{-nx^p}\,dx}{\int x^m\,e^{-nx^p}\,dx}=\frac{\Gamma\left(\frac{m+2}{p}\right)}{\Gamma\left(\frac{m+1}{p}\right)n^{\frac{1}{p}}}$$

It is sometimes necessary to make the definite integral (163) when multiplied by the coefficient A, equal to unity. In such a case we must have the value of this constant the reciprocal of that given in the value of the integral mentioned, viz. (163); that is

$$(166).....\text{A}=pn^{\frac{m+1}{p}}/\Gamma\left(\frac{m+1}{p}\right)$$

Simplications of these general formulæ are often possible.[1]

[1] For a fuller study of this curve, see "Studies in Statistical Representation," by G. H. Knibbs.. Jour. Roy. Soc. N.S.W., Vol. XLIV., pp. 341-367; 1910.

The forms of the curves are as shewn on the Figs. 21 to 27. If n in e^{nx^p} be zero, the curve degrades to Ax^m, and we have the forms in Fig. 21, in which the capital letters shew the curves when m is positive, and the small letters when m is negative.

Fig. 21.

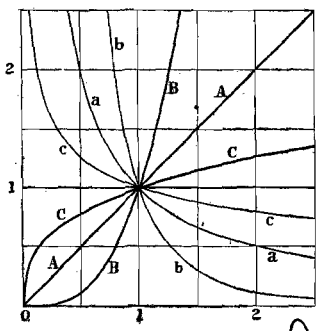
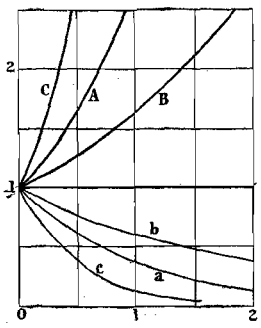


Fig. 22.



If m be zero, x^m will be unity, and if p also be unity, the curves become e^{nx}, the forms of which are shewn on Fig. 22, the upper lines denoting the values when n is positive and the lower when n is negative.

If p, however, be not unity, and p and n be positive, we shall have such forms as A, B, and C on Fig. 23. If p be negative and n positive, the forms become those shewn by the curves D, E, and F in the same figure.

Fig. 23.

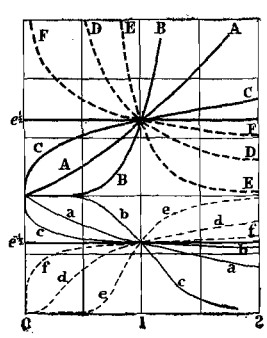
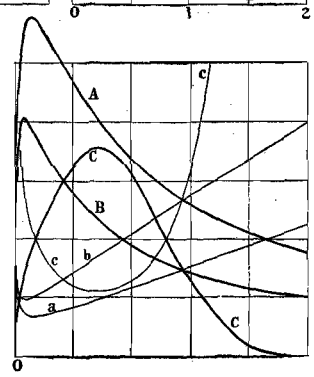


Fig. 24.



If n be negative and p be positive, the forms become a, b, and c, the reciprocals respectively of curves A, B, and C; and if both n and p be negative, the curves are such as d, e, and f, viz., the reciprocals respectively of curves D, E and F in the same figure, viz., Fig. 23.

Figs. 24 to 27 give values of the curves when both m, n, and p have values other than zero, the light lines denoting the reciprocals of the curves shewn by the heavy lines, and the curves being the following, viz.:

			Values of—						Values of—		
			m	n	p				m	n	p
Fig. 24	.. A	=	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{3}$	Fig. 26	.. A	=	1	$-\frac{1}{4}$	6
,,	.. B	=	$\frac{1}{2}$	$-\frac{1}{2}$	3	,,	.. B	=	-6	$-\frac{1}{4}$	-6
,,	.. C	=	$\frac{1}{2}$	-1	$\frac{1}{3}$	,,	.. C	=	6	$-\frac{1}{4}$	6
Fig. 25	.. A	=	$\frac{1}{2}$	-2	1	,,	.. D	=	6	$-\frac{1}{4}$	1
,,	.. B	=	$\frac{1}{2}$	-1	1	Fig. 27	.. A	=	-1	$\frac{1}{4}$	6
,,	.. C	=	$\frac{1}{2}$	$-\frac{1}{2}$	1	,,	.. B	=	-6	$\frac{1}{4}$	6
,,	.. D	=	2	-1	1	,,	.. C	=	1	-1	1
,,	.. E	=	2	-2	1	,,	.. D	=	1	-2	1

In the reciprocal curves, viz., a, b, c, d, etc., the signs of m and n are changed, but not that of p.[1] These will sufficiently illustrate the possible forms of the curve.

Fig. 26.

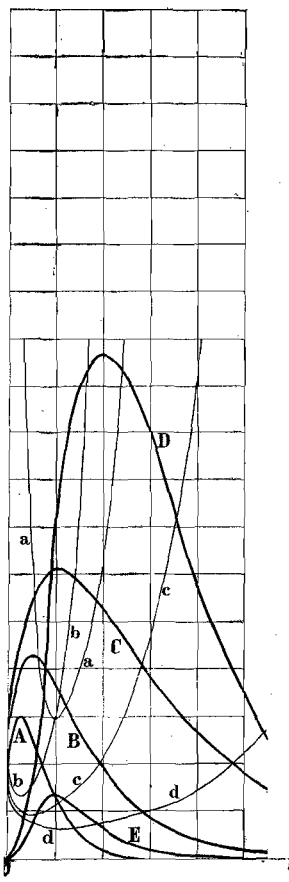


Fig. 25.

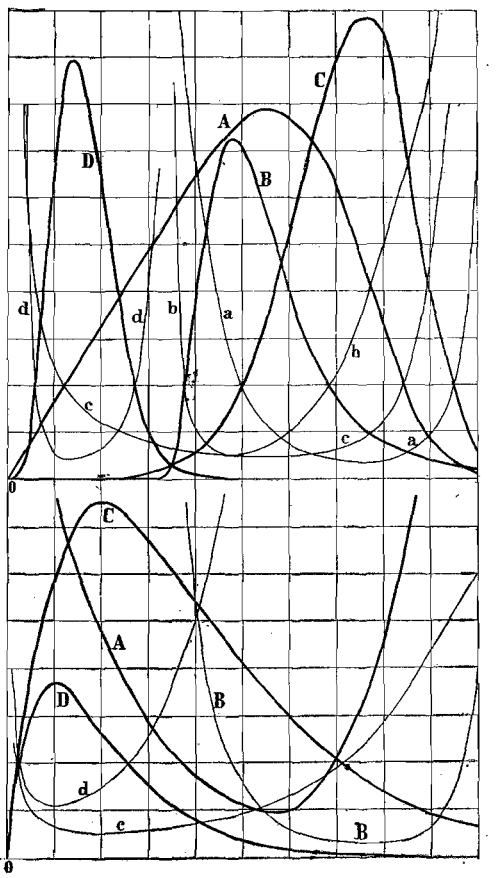


Fig. 27.

6. **Generalised probability curves derived from projections of normal curve.**—In Fig. 28 let bYa denote a normal "error" (or probability) curve, the ordinates of b and a being denoted by corresponding suffixes. If a line be drawn the distance l above OY and parallel thereto (and parallel therefore also to the plane of the curve), it may be represented by the point O′ in any plane at right angles to the plane of the curve.

[1] It may be mentioned that H. Pélabon, in dealing with the influence of temperature on chemical reactions, developed a relation in the form

$$\log y = a + b / x + c \log x ;$$

which, of course, may be written in the form $y = ab^{-x} x^c$, which is merely a simple case of formula (149). See Mém. d.l. Soc. des Sciences physiques et naturelles de Bordeaux [5]. 3, pp. 141, 257 ; 1898 : Compt. Rend. 124, pp. 35, 360, 686 ; 1897.

Let a line be drawn from any point, on the curve, viz., a, at right angles to O′. This will be the line O′Q, which, when produced to q on a line VOqU, making the angle θ with the line PO, gives the point corresponding to a. The abscissa then may be taken either as Oq or as its orthogonal projection on OP. The latter is more simple. If it be produced to q′ on a plane making the angle θ' with the axis OY, it will give a result of greater skewness, see the points a_1 and a_2 in the figure. The scheme of projection will be obvious from the figure, and need not be described in detail.

Let ξ denote any abscissa on the curve derived by projection, and x the corresponding abscissa on the original curve. Then by similar triangles we have at once the relation of x and ξ in terms of l and θ, inasmuch as

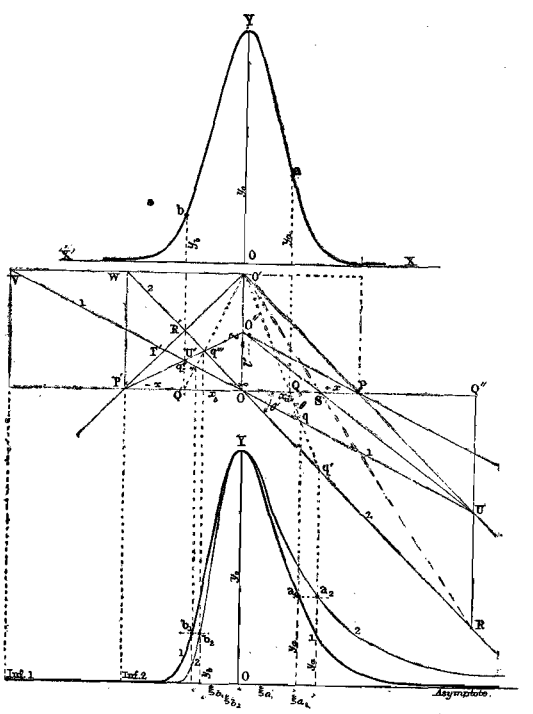
$$(167)\ldots\ldots x / l = (\xi - x) / \xi \tan \theta.$$

This gives, on writing m for $(\tan \theta) / l$,

$$(168)\ldots\ldots \xi = x / (1 - mx)\,;\quad x = \xi / (1 + m\xi)$$

from which it is at once evident that the same result may be obtained by any values of l and θ whatsoever, which give the same value of m.

Fig. 28.



Thus, the point S with the projecting height $OO'' = l'$ gives the point U, the orthogonal projection of which Q″ is identical with the result with the projecting height $OO' = l$, viz., R, as is evident from the figure.

Fig. 29 shews by a heavy line the curve derived from the curve in Fig. 28 by projection on to the plane VOU, and by a thin line the curve similarly derived by projection on to the plane WOR in that figure.

Fig. 29.

Hence, if for x in the probability-curve equation, we substitute its numerical equivalent, we obtain

$$(169)\ldots\ldots y = 1\Big/e^{\frac{\xi^2}{c + 2cm\xi + c\xi^2}} = 1\Big/e^{\frac{\xi^2}{\kappa(\xi+\mu)^2}};$$

κ in the second expression being cm^2, and μ being the reciprocal of m. The curve is asymmetric, since the denominator differs in value according as ξ is negative or positive. Incidentally we notice that if l be relatively large or θ relatively small, m is small, and the asymmetry is not marked; and when l is infinite or θ zero, the asymmetry vanishes, as is seen by the projection. In this last expression when ξ is negative and equal to μ, $y = 0$, so that there is a terminal of the curve on the negative side corresponding to $x = -\infty$. When $\tan\theta = l/x$, then $mx = 1$, and ξ is infinity; that is to say, the projecting line is parallel to the plane O through the axis. When $-\xi$ is one-half of $-x$, then the point with the same ordinate on the positive side is at infinity. This can also be seen on the figure.[1]

This indicates the limitation of the method of projecting onto a plane, namely, that if there is to be a corresponding point at a finite distance on one side of the axis, the abscissæ on the other side cannot be reduced to a greater amount than one-half. This, however, can be overcome by projection on a curved surface. Thus, if projected from the intersections with an equilateral hyperbola orthogonally on to the X axis, from a line parallel to and distant the height l from the Y axis, the Y axis O″H of the hyperbola being the distance p on the negative side, and the X axes, being identical (see Fig. 30) we have

$$(170)\ldots\ldots x = \frac{\xi}{1 - \lambda(p + \xi)}\ ;\ \text{or}\ \xi = x.\frac{1 - \lambda p}{1 + \lambda x}$$

λ denoting p^2/l. Hence, substituting the former expression in the ordinary probability curve equation, we obtain

$$(171)\ldots\ldots y = 1/e^{\frac{\xi^2}{c\,[1 - \lambda(p + \xi)^2]}}$$

This gives a terminal to the curve on one side, and an asymptotic relation to the axis on the other, and may be made as skew as we please, as is evident from Fig. 30 and from Fig. 32 giving a projection so derived. A similar scheme of projection using a surface whose right section is a parabola, the abscissa of whose vertex is p (from the origin), and whose equation is $\eta = g(\xi - p)^2$, gives the result

$$(172)\ldots\ldots x = \frac{\xi}{1 + \gamma(\xi - p)^2}$$

in which γ denotes g/l: see Fig. 31. The value of ξ, therefore, is

$$(173)\ldots\ldots \xi = p + \frac{1}{2\gamma x}\{1 \pm \sqrt{[4\gamma x(p - x) + 1]}\}$$

[1] That is, when OQ′ is one-half of OP′, the corresponding point on the positive side is at infinity.

This gives terminals for both branches of the curve, viz. :—

$$(174)\ldots\ldots \xi_\infty = p \pm \frac{1}{\sqrt{\gamma}}$$

Since both p and γ may be arbitrarily determined, the position of the terminals of the curve, in relation to the mode, may be made whatsoever we please. Although this leads to a somewhat complicated expression for ξ, it discloses the character of the curve obtained by projection. Its equation is

$$(175)\ldots\ldots y = 1/e^{\frac{\xi^2}{\sigma^2[1+\gamma(\xi-p)^2]^2}}$$

the asymmetry of which is evident. Fig. 30 illustrates the projection on to a surface whose right section is an equilateral hyperbola, and the type of resultant curve with one asymptote is shewn on Fig. 32 : see curve a_1, b_1,...a_1', b_1'..., thereon in a thin firm line, the thick curve A, B,...A′, B′... etc., being the probability curve from which it is derived. Fig. 31 is similarly an example of a projection on to a surface whose right section is a parabola, and is shewn on Fig. 32 by a broken line : see curve a_2, b_2...a_2', b_2'... etc. The scheme of projection is sufficiently evident from the figures.

Reverting to projection on a plane, it may be noted also the projections may be varied by making l a function of y instead of a constant, as, for example, $l = ky^n$, which, writing κ for $(\tan\theta)/k$, would give

$$(176)\ldots\ldots y = 1/e^{\frac{\xi^2}{\sigma^2(1+\kappa\xi/y^n)^2}}$$

This does not lead, however, to any simple expression for y in terms of ξ only. We may notice that since $l = 0$ for $y = 0$, both branches are unlimited (that is to say, the asymptotic relation of the basic curve remains) and the curve is more distant from the X axis than is the basic curve ; the curve most closely approaches the type of that with l constant if n be less than unity. If n be negative and numerically greater than unity, we shall have ξ sensibly equal to x for very small values of y, or $x = \xi(1 - \kappa y^n)$ approximately, and the branches are unlimited.

These projections shew that though initially a *frequency* may be distributed according to the ordinary probability curve, yet the final circumstances may be such that the "frequency is altered in several of its characters," viz., its symmetry, asymptotic relations, etc.

Fig. 30.

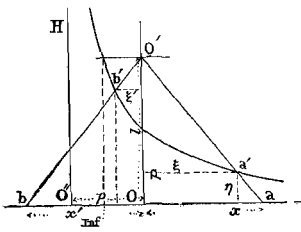
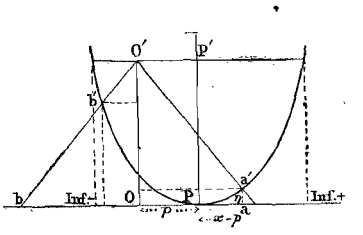


Fig. 31.



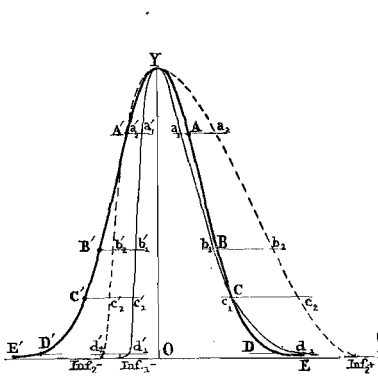


Fig. 32.

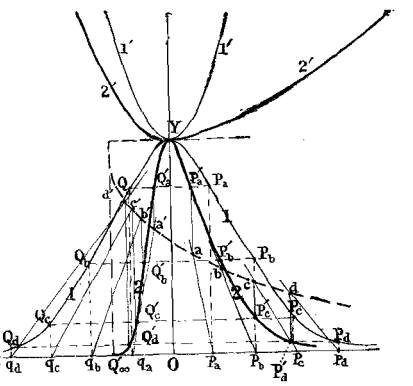


Fig. 33.

7. **Development of type-curves.**—A consideration of the form of the equations derived from projections shews that if we put as the fundamental form

$$(177)\ldots\ldots y, \text{ or } 1/y = y_0/e^{\frac{x^p}{k(1+x/a)^{ma}(1-x/b)^{mb}}}$$

we may include all cases by variations of p, m, k, a and b. When $x = 0$, the value is y_0, that is to say, the *mode is at the axis*. If a and b, each supposed to be positive, are finite, then for a negative value of x equal to a, or a positive value equal to b, we have $y = 0$, that is the branches of the curve terminate at the axis of abscissa for the negative value of $x = a$; and for the positive value of $x = b$. If b be infinite, the curve, which is skew, becomes

$$(178)\ldots\ldots y = y_0/e^{\frac{x^p}{k(1+x/a)^{ma}e^{-mx}}}$$

and if a be infinite and b finite, the curve is skew, and its equation is

$$(179)\ldots\ldots y = y_0/e^{\frac{x^p}{ke^{mx}(1-x/b)^{mb}}}$$

If both a and b are infinite, then the preceding curves (178) (179) become

$$(180)\ldots\ldots y = y_0/e^{\frac{x^p}{k}}$$

and is symmetric, but if b (or a) be negative, then the curve is

$$(181)\ldots\ldots y = y_0/e^{\frac{x^p}{ke^{mx}}}$$

This curve is asymmetric[1] and both branches are asymptotic to the axis. The reciprocals of these curves give the other forms required.

8. **Evaluation of the constants of the preceding type-curves.**—The value of y_0 is assumed to be derived from the data. When all the quantities are divided by the ordinate of the mode, viz., by y_0, we have a series of *reduced values of the ordinates*, η say. Then, as a rule, by taking the logarithm twice we can obtain the necessary solution. Thus—

$$(182)..\eta = e^{f(x)};\ \text{hence}\ \log \eta = \eta' = f(x);\ \text{and}\ \log \eta' = \log f(x)$$

which gives a linear equation. Thus, with the necessary number of values of the ordinate and the corresponding values of the abscissa, a solution of the constants is to hand. If more than the necessary number are given, the least-square method of forming normal equations may be employed. This method will not solve, however (177), (178), or (179), where

$$(183)..\log \eta' = p \log x - \left\{\log k + ma \log\left(1 + \frac{x}{a}\right) + mb \log\left(1 + \frac{x}{b}\right)\right\}$$

These, however, are very readily solved by expanding the logarithms, and sometimes a and b can be estimated from the graph of the curve.

9. **To determine the surface on which the projection of a normal probability-curve will result in a given skew-curve.**—From what has preceded, and from Figs. 28 to 32, it is evident that the form and equation of the curved surface, on which the projection of a normal probability-curve will furnish any given skew curve, may readily be determined. The problem more generally stated is :—Given two curves to find the surface on which the projection of one will furnish the other. On Fig. 33 let Y..P_d and Y..Q_d be the branches of a normal probability curve, and $YQ'_a \ldots Q'_\infty$, and $YP'_a \ldots P'_d \ldots$ be the branches of a skew-curve, the axis OY being identical for each. Draw radial lines from Y to the orthogonal projections on to the X axis of various points on the normal probability curve, viz., to the points q_a, q_b, etc., and p_a, p_b, etc., and from the points Q'_a, etc., P'_a, etc., whose ordinates to the skew-curve are identical with those of the corresponding points on the normal curve ; and draw lines parallel to the axis OY. Then the intersections a, b, etc., a′, b′, etc., are points on the projection surface. Reference to the figure

[1] p is to be understood merely as an *operator* raising the number in numerical value, but not affecting its sign.

makes the proposition obvious. Thus, the equation to the normal curve being known, that of the skew-curve can be found in the form $y = 1/e^{f(\xi)}$, as soon as the equation of the curve of the projection surface is ascertained.

In finding an equation to fit any series of groups the skew-curve may, in practice, be drawn freehand: a suitable normal probability-curve may then be drawn with the same mode and vertical height: the points on the surface found by the method indicated. In general, this will give a somewhat irregular projection-surface, which, however, may ordinarily be so modified as to conform to some geometrical form easily expressible algebraically, from which the requisite formula may then be found. From Figs. 30, 31, and 33 it will be evident how the equation may be ascertained.

10. **Reciprocals of curves of the probability-type.**—The curve $\eta = 1/y$, also of type of practical importance, may similarly be derived by projection from the normal probability-curve: thus

$$(184)\ldots\ldots \eta = 1/y = e^{\frac{x^2}{c}}, \text{ or more generally, } \eta = e^{(\frac{x}{k})^p}$$

that is, its logarithmic homologue is the parabola $\eta' = \mu x^p$, in which $\eta' = \log \eta$, and $\mu = 1/k^p$. Thus in Fig. 33 the reciprocal of the normal probability-curve (curve 1) is shewn by the curve marked 1′, 1′, while the curve 2′, 2′, is the reciprocal of the curve marked 2, 2. The lateral scale in the figure, however, for curve 2, is four times greater than for curve 1. It will be seen that the type is somewhat similar to the curve of instantaneous rate of mortality according to age.

11. **Dissection of multimodal fluctuations into a series of unimodal elements.**—It is obvious that any multimodal fluctuation may be analysed into a series of unimodal elements; for example, a series of the form

$$(185)\ldots\ldots y = A_0 + A_1 e^{\pm (x-a_1)/\sigma} + \ldots A_r e^{\pm (x-a^r)/c^r} + \ldots$$

may, with a sufficient number of terms, be made to fit any continuous curve whatsoever to any assigned degree of accuracy,[1] There is no complete general solution of the problem, however, of dissection. We have already shewn that a dimorphic curve may be the sum or product of two monomorphic curves (see III., § 9, Projective anamorphosis). The difficulties of dissection, however, are not unduly great with graphic methods.

[1] See "Contributions to the Mathematical Theory of Evolution" (on the dissection of Asymmetrical and Symmetrical frequency curves, etc.), Prof. Karl Pearson, Phil. Trans., Vol. 185-A, pp. 71-110; 1894.

"Sui massime delle curve dimorfiche," Dr. F. de Helguero, Biometrika, Vol. III., pp. 84-98, 1904; and also his "Per la risoluzione delle curve dimorfiche," Biometrika, Vol. IV., pp. 230, 231; 1905-6.

"Sulla statura degli Italiani," R. Livi, Firenze, 1883. "Die natürliche Auslese beim Menschen," O. Ammon, Jena, 1893.

V.—GROUP-VALUES, THEIR ADJUSTMENT AND ANALYSIS.

1. **Group-values and their limitations.**—The data of population statistic are ordinarily given in the form of *group-values*. For example, in the age-distribution of a population the data are ordinarily in the form of the numbers of persons between the ages x and $x+k$, $x+k$ and $x+2k$, and so on, where k may be a month, a year, 5 years, 10 years, etc. Hence, when the number for any group of smaller limits is required, some curve must be assumed which will give the same group-values if the latter are to be regarded as correct.

In other words, if we suppose the numbers between the ages x and $x + dx$ to be $P\phi(x)\,dx$, then the number in the group between the ages x and $x + k$ is

$$(186)\ldots\ldots {}_xN_{x+k} = P\int_x^{x+k} \phi\,(x)\,dx$$

in which, if P denote the total population of all ages, the value of the integral between the limits 0 and the end of life, say 105 (or ∞) is necessarily unity. This is the fundamental conception of the use of group-values. Thus, omitting the coefficient P, the value of the integral between any limits, when its total value is unity, is the proportion of the whole population which lies between the limits in question.

When *group-values* are known to be *subject to error*, each group can be modified in amount so as to conform to some distribution regarded as more probable than that furnished by the crude data. Thus, if in the numbers according to age a census return gave for " ages last birthday " 29, 30 and 31, the numbers 20,000 ; 24,000 ; 18,000 ; we should know ordinarily that the number 24,000 was in excess, since the numbers must fall off as the ages increase unless immigration prevent. We deal primarily with the case where the groups are assumed to be correct ; having either been corrected, or having been taken accurately.

2. **Adjustment of group-values.**—In cases where group-values are properly regarded as subject to appreciable error, they should either be first adjusted before the constants of mathematical formulæ representing them are determined, or the computation should be so effected as to automatically make the adjustment a minimum.

The limitations under which group-results are obtained are of two kinds. The results furnished may be either—

(*a*) actually subject to large errors ; or

(*b*) insufficient in number to furnish a truly representative example.

For example, misapprehensions as to one's exact age must necessarily have the effect of causing numbers of persons to be attributed to the wrong age-group, thus diminishing some groups and increasing others.

A certain tendency to misstatement is confirmed by census-results, which reveal the fact that ages ending in 0 are characterised by excessively large numbers, and that the numbers for ages ending in 5 are also somewhat excessive, while the numbers for the adjoining years are in defect.

In the other case, limitations in the numbers available prevent one knowing exactly what would have been given had the numbers been indefinitely large. In these latter cases, however, it is often possible to surmise what the curve would have been had the numbers been large, and the actual data may be redistributed so as to conform therewith. In both instances the principle to be followed is that some groups should be so increased, while others should be so diminished as to conform to the most probable distribution which may, for convenience, be called the "*ideal distribution.*"

In effecting these changes in the numbers furnished by the data for individual groups, the alterations should not only be as small as possible, but also the accumulation of the alterations (that is, their algebraic sum) should be alternately plus and minus, and should never become large in amount.

Various considerations may serve as a guide in effecting the alteration: for example, excluding the consideration of deliberate misstatement of age and tendency to uniform error in one direction, the number of cases in which the misstatement of age is one year only is, in general, larger than the number in which the misstatement is two years; and so on. Experience shews also that large positive errors are likely to be made for ages ending in 0; for example, 30, 40, 50, etc.; and lesser positive errors are likely to be made for ages ending in 5; for example, 35, 45, 55, etc., while errors of defect are to be expected in ages 29 and 31, etc., and 34 and 36, etc.

Adjustments are, as a rule, preferably made in the light of a full consideration of all the circumstances affecting the case, and not merely by purely mechanical or merely arithmetical methods.

A redistribution of values may be regarded as excellent when the curve giving the values of the groups is, in the nature of the case, probable, and when at all points it deviates from the successive values of the groups in such wise that the deviation is always relatively small, and the aggregate alternately plus and minus.

3. Representation of group-values by equations with integral indices.—Any curve representing a series of statistical data may be represented by the following expression, viz.,—

$$(187)\ldots\ldots y = a + bx^p + cx^q + dx^r + \text{etc.}$$

and, if p, q, r, etc., be not necessarily integral, with a small number of terms. Integrating this we shall have

$$(188)\ldots\ldots \int y\,dx = x(A + Bx^p + Cx^q + Dx^r + \text{etc.})$$

in which $A = a$; $B = \frac{b}{p+1}$; $C = \frac{c}{q+1}$; $D = \frac{d}{r+1}$; etc.

When p, q, r, etc., are the successive integers 1, 2, 3, we have for $x=0$, k, $2k$, $3k$, etc.

(189)..

Group.	Range of the Abscissæ.				Factors into a	$\frac{1}{2}bk$	$\frac{1}{3}ck^2$	$\frac{1}{4}dk^3$	$^1ek^4$
I.	0	– k	$= k($	1	1	1	1	1	1)
II.	k	– $2k$	$= k($	1	3	7	15	31)	
III.	$2k$	– $3k$	$= k($	1	5	19	65	211)	
IV.	$3k$	– $4k$	$= k($	1	7	37	175	781)	
V.	$4k$	– $5k$	$= k($	1	9	61	369	2101)	

It is easily seen that with integral indices, the above expression of $n+1$ groups can be fitted by an arbitrary equation of the nth degree. Denoting the *heights* of the groups by the small Roman letters i. to v., the heights being found by dividing the group-values by the base k, and the successive differences of height by h_0, h_1, etc., the simplest scheme of solution is to hand in the following series of equations, which are readily obtained by differencing and substitution.

4. **Formulæ depending on successive differences of group-heights.**— We give first formulae depending merely on the difference of heights, viz., the differences i.– 0 ; ii. – i. ; iii. – ii. ; etc. ; that is, if we denote the successive heights of the groups by

$$(190)\ldots\ldots h_0\ ;\ h_0 + h_1\ ;\ h_0 + h_1 + h_2\ ;\ \text{etc.},$$

the successive differences of height will be

$$(191)\ldots\ldots h_0\ ;\ h_1\ ;\ h_2\ ;\ h_3\ ;\ \text{etc.}$$

h_0 = i., denoting the height of the first group from the X axis, see Fig. 36.[1]

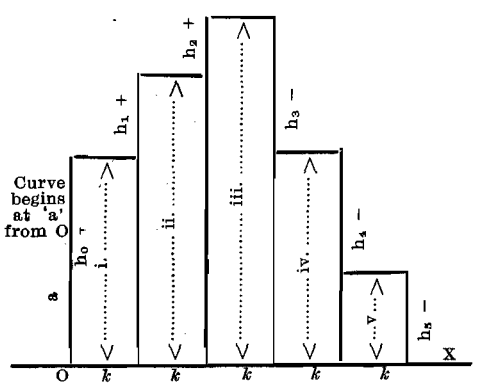


Fig. 34.

[1] These (191), are the first column of differences if the groups be divided by their base-values viz., by k.

The following, as convenient formulæ for the coefficients a, b, etc., in equation (187), can be deduced, viz. :—

For three groups :—

(192)..$a = h_0 - \frac{1}{6}(5h_1 - 2h_2)$; $b = \frac{1}{k}(2h_1 - h_2)$; $c = \frac{1}{2k^2}(-h_1 + h_2)$

For four groups :—

(193)..... $a = h_0 - \frac{1}{12}(13h_1 - 10h_2 + 3h_3)$

(193a).... $b = \frac{1}{12k}(35h_1 - 34h_2 + 11h_3)$

(193b).... $c = \frac{1}{4k^2}(-5h_1 + 8h_2 - 3h_3)$

(193c).... $d = \frac{1}{6k^3}(h_1 - 2h_2 + h_3)$.

For five groups :—

(194) .... $a = h_0 - \frac{1}{2}h_1 + \frac{1}{60}(-47h_1 + 86h_2 - 51h_3 + 12h_4)$

(194a).... $b = \frac{1}{k}\left\{h_1 + \frac{1}{12}(33h_1 - 64h_2 + 41h_3 - 10h_4)\right\}$

(194b).... $c = \frac{1}{8k^2}(-17h_1 + 37h_2 - 27h_3 + 7h_4)$

(194c).... $d = \frac{1}{6k^3}(3h_1 - 8h_2 + 7h_3 - 2h_4)$

(194d).... $e = \frac{1}{24k^4}(-h_1 + 3h_2 - 3h_3 + h_4)$.

If instead of heights we use group-values, the quantities found, say a', b', c', etc., will be k times those above given, and must be reduced accordingly

5. **Formulæ depending on the group-heights themselves.**—Instead of using the difference of the group-heights, the coefficients of the equation may be expressed in terms of the successive group-heights themselves, found by dividing the group-numbers by the value of the common interval along the abscissa ; that is, by dividing the integrals between the successive limits having a common interval k, by that quantity. It will be sufficient to give the results for from three to five groups. These results are :—

For three groups :—

(195) ..... $a = \frac{1}{6}$(11i. − 7ii. + 2iii.)

(195a)..... $b = \frac{1}{k}$(− 2i. + 3ii. − iii.)

(195b)..... $c = \frac{1}{2k^2}$(i. − 2ii. + iii.)

For four groups :—

$$(196) \ldots\ldots a = \frac{1}{12}(25\text{i.} - 23\text{ii.} + 13\text{iii.} - 3\text{iv.})$$

$$(196a) \ldots\ldots b = \frac{1}{12k}(-35\text{i.} + 69\text{ii.} - 45\text{iii.} + 11\text{iv.})$$

$$(196b) \ldots\ldots c = \frac{1}{4k^2}(5\text{i.} - 13\text{ii.} + 11\text{iii.} - 3\text{iv.})$$

$$(196c) \ldots\ldots d = \frac{1}{6k^3}(-\text{i.} + 3\text{ii.} - 3\text{iii.} + \text{iv.})$$

For five groups :—

$$(197) \ldots\ldots a = \frac{1}{60}(137\text{i.} - 163\text{ii.} + 137\text{iii.} - 63\text{iv.} + 12\text{v.})$$

$$(197a) \ldots\ldots b = \frac{1}{12k}(-45\text{i.} + 109\text{ii.} - 105\text{iii.} + 51\text{iv.} - 10\text{v.})$$

$$(197b) \ldots\ldots c = \frac{1}{8k^2}(17\text{i.} - 54\text{ii.} + 64\text{iii.} - 34\text{iv.} + 7\text{v.})$$

$$(197c) \ldots\ldots d = \frac{1}{6k^3}(-3\text{i.} + 11\text{ii.} - 15\text{iii.} + 9\text{iv.} - 2\text{v.})$$

$$(197d) \ldots\ldots e = \frac{1}{24k^4}(1 - 4\text{ii.} + 6\text{iii.} - 4\text{iv.} + \text{v.})$$

If the *aggregate numbers* or *group-values* are used, instead of the *heights*, the denominators will be $1/k$, $1/k^2 \ldots\ldots 1/k^5$ instead of those above.

6. **Formulæ depending upon the leading differences in the groups or in group-heights.**—It is often convenient in practice to work with differences instead of the group-values or of heights. In the latter case the coefficients are similarly given by the following equations :—

The coefficients of equation (187) expressed in terms of successive leading differences of the group-heights are :—

$$(198) \ldots\ldots a = \frac{1}{1}\left(\text{i.} - \frac{1}{2}D_1 \middle| + \frac{1}{3}D_2 \middle| - \frac{1}{4}D_3 \middle| + \frac{1}{5}D_4\right)$$

$$(198a) \ldots\ldots b = \ldots\ldots \frac{1}{k}\left(D_1 \middle| - D_2 \middle| + \frac{11}{12}D_3 \middle| - \frac{5}{6}D_4\right)$$

$$(198b) \ldots\ldots c = \ldots\ldots\ldots\ldots \frac{1}{k^2}\left(\frac{1}{2}D_2 \middle| - \frac{3}{4}D_3 \middle| + \frac{7}{8}D_4\right)$$

$$(198c) \ldots\ldots d = \ldots\ldots\ldots\ldots\ldots\ldots \frac{1}{k^3}\left(+\frac{1}{6}D_3 \middle| - \frac{1}{3}D_4\right)$$

$$(198d) \ldots\ldots e = \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \frac{1}{k^4}\left(\frac{1}{24}D_4\right)$$

In the above D_1, D_2, D_3, and D_4 are the *leading differences* of the *heights* only, viz., of i., ii.....v. As before, if the group values are subtracted, without first dividing by k, the denominators should be $1/k$, $1/k^2$.....$1/k^5$, instead of those above given. Formulæ (198) to (198d) are correct for any number of groups up to five, the division lines on the right hand side shewing the results for two, three, four and five groups.

7. **Determination of differences for the construction of curves.** — When the equation of the curve is to hand, it is often required to find values of the ordinates corresponding to a series of values of the abscissa. This is most conveniently effected by obtaining the successive leading differences: from these the required values can be obtained. These are :—

$$(199)..... f(x) = a + bx + cx^2 + dx^3 + ex^4$$

$$(199a).... D_1 f(0) = .. b + c + d + e$$

$$(199b).... D_2 f(0) = ... 2c + 6d + 14e$$

$$(199c).... D_3 f(0) = ... 6d + 36e$$

$$(199d).... D_4 f(0) = ... 24e$$

It may be remarked that when $k=1$ these difference values become

$$(200) .....D_1 f(0) = D_1 \text{i.} - \frac{1}{2} D_2 \text{i.} + \frac{1}{3} D_3 \text{i.} - \frac{1}{4} D_4 \text{i.}$$

$$(200a).....D_2 f(0) = D_2 \text{i.} - \frac{1}{2} D_3 \text{i.} + \frac{1}{3} D_4 \text{i.}$$

$$(200b).....D_3 f(0) = D_3 \text{i.} - \frac{1}{2} D_4 \text{i.}$$

$$(200c)..... D_4 f(0) = D_4 \text{i.}$$

in which the symbol D_1i., D_2i., etc., denotes the *leading differences* derived from the series from i., ii., iii., etc.

8. **Cases where position of curve on axis of ordinates has a fixed value.** —In the equation (187) it may happen that the curve is required to pass through the intersection O of the axes OX, OY; or at a fixed distance therefrom on the Y-axis. In this instance the solutions given are invalid, inasmuch as a is initially given, not determined from the group-values. The most convenient procedure is to subtract this value a from the heights i., ii., iii., etc., of the ordinates, or the value ka from the

group-values (or areas) I., II., III., etc. This procedure gives new values, viz., $y' = y - a$, and the solution required is then of the successive integrals (group values) divided by k.

$$(201)\ldots\ldots \frac{1}{k}\int y'dx = \frac{1}{k}\int (bx + cx^2 + \text{etc.})\,dx$$

that is, of $\frac{1}{2}bx + \frac{1}{3}cx^2 + \text{etc.}$

It is obvious that in this instance n groups will require an equation of the nth degree, instead of, as before, of the $(n-1)$th, the imposed condition of a fixed value for a involving this limitation.

The following formulæ give the value of the constants in terms of the heights.

For two groups, curve passing through origin.

$$(202)\ldots\ldots b = \frac{1}{2k}\,(7\text{i} - \text{ii})\,; \quad c = \frac{1}{4k^2}\,(-9\text{i} + 3\text{ii})$$

For three groups, curve passing through origin,

$$(203)\ldots\ldots b = \frac{1}{18k}\,(85\text{i} - 23\text{ii} + 4\text{iii})$$

$$(203\text{a})\ldots\ldots c = \frac{1}{2k^2}\,(-10\text{i} + 5\text{ii} - \text{iii})$$

$$(203\text{b})\ldots\ldots d = \frac{1}{9k^3}\,(11\text{i} - 7\text{ii} + 2\text{iii})$$

For four groups, curve passing through origin,

$$(204)\ldots\ldots b = \frac{1}{72k}\,(415\text{i} - 161\text{ii} + 55\text{iii} - 9\text{iv})$$

$$(204\text{a})\ldots\ldots c = \frac{1}{96k^2}\,(-755\text{i} + 493\text{ii} - 191\text{iii} + 33\text{iv})$$

$$(204\text{b})\ldots\ldots d = \frac{1}{36k^3}\,(119\text{i} - 97\text{ii} + 47\text{iii} - 9\text{iv})$$

$$(204\text{c})\ldots\ldots e = \frac{1}{288k^4}\,(-125\text{i} + 115\text{ii} - 65\text{iii} + 15\text{iv})$$

For five groups, curve passing through origin,

$$(205)\ldots b = \frac{1}{1800k}\,(12019\text{i} - 5981\text{ii} + 3019\text{iii} - 981\text{iv} + 144\text{v})$$

$$(205\text{a})\ldots c = \frac{1}{32k^2}\,(-343\text{i} + 273\text{ii} - 155\text{iii} + 53\text{iv} - 8\text{v})$$

$$(205\text{b})\ldots d = \frac{1}{360k^3}\,(2149\text{i} - 2111\text{ii} + 1429\text{iii} - 531\text{iv} + 84\text{v})$$

$$(205\text{c})\ldots e = \frac{1}{96k^4}\,(-133\text{i} + 147\text{ii} - 113\text{iii} + 47\text{iv} - 8\text{v})$$

$$(205\text{d})\ldots f = \frac{1}{1200k^5}\,(137\text{i} - 163\text{ii} + 137\text{iii} - 63\text{iv} + 12\text{v}.)$$

The constants in the terms of the leading differences of the heights are :—[1]

For two groups, curve passing through origin,

$$(206)\ldots\ldots b = \frac{1}{k}\left(3\mathrm{i} - \frac{1}{2} D_1\mathrm{i}\right)$$

$$(206a)\ \ldots. c = \frac{1}{k^2}\left(-\frac{3}{2}\mathrm{i} + \frac{3}{4} D_1\mathrm{i}\right)$$

For three groups, curve passing through origin,

$$(207)\ldots\ldots b = \frac{1}{k}\left(\frac{11}{3}\mathrm{i} - \frac{5}{6} D_1\mathrm{i} + \frac{2}{9} D_2\mathrm{i}\right)$$

$$(207a)\ldots. c = \frac{1}{k^2}\left(-3\mathrm{i} + \frac{3}{2} D_1\mathrm{i} - \frac{1}{2} D_2\mathrm{i}\right)$$

$$(207b)\ldots. d = \frac{1}{k^3}\left(\frac{2}{3}\mathrm{i} - \frac{1}{3} D_1\mathrm{i} + \frac{2}{9} D_2\mathrm{i}\right)$$

For four groups, curve passing through origin,

$$(208)\ldots\ldots b = \frac{1}{k}\left(\frac{25}{6}\mathrm{i} - \frac{13}{12} D_1\mathrm{i} + \frac{7}{18} D_2\mathrm{i} - \frac{1}{8} D_3\mathrm{i}\right)$$

$$(208a)\ \ldots. c = \frac{1}{k^2}\left(-\frac{35}{8}\mathrm{i} + \frac{35}{16} D_1\mathrm{i} - \frac{23}{24} D_2\mathrm{i} + \frac{11}{32} D_3\mathrm{i}\right)$$

$$(208b)\ \ldots. d = \frac{1}{k^3}\left(\frac{5}{3}\mathrm{i} - \frac{5}{6} D_1\mathrm{i} + \frac{5}{9} D_2\mathrm{i} - \frac{1}{4} D_3\mathrm{i}\right)$$

$$(208c)\ \ldots. e = \frac{1}{k^4}\left(-\frac{5}{24}\mathrm{i} + \frac{5}{48} D_1\mathrm{i} - \frac{5}{72} D_2\mathrm{i} + \frac{5}{96} D_3\mathrm{i}\right)$$

For five groups, curve passing through origin,

$$(209)\ldots. b = \frac{1}{k}\left(\frac{137}{30}\mathrm{i} - \frac{77}{60} D_1\mathrm{i} + \frac{47}{90} D_2\mathrm{i} - \frac{9}{40} D_3\mathrm{i} + \frac{2}{25} D_4\mathrm{i}\right)$$

$$(209a)\ \ldots c = \frac{1}{k^2}\left(-\frac{45}{8}\mathrm{i} + \frac{45}{16} D_1\mathrm{i} - \frac{11}{8} D_2\mathrm{i} + \frac{21}{32} D_3\mathrm{i} - \frac{1}{4} D_4\mathrm{i}\right)$$

$$(209b)\ \ldots d = \frac{1}{k^3}\left(\frac{17}{6}\mathrm{i} - \frac{17}{12} D_1\mathrm{i} + \frac{17}{18} D_2\mathrm{i} - \frac{13}{24} D_3\mathrm{i} + \frac{7}{30} D_4\mathrm{i}\right)$$

$$(209c)\ \ldots e = \frac{1}{k^4}\left(-\frac{5}{8}\mathrm{i} + \frac{5}{16} D_1\mathrm{i} - \frac{5}{24} D_2\mathrm{i} + \frac{5}{32} D_3\mathrm{i} - \frac{1}{12} D_4\mathrm{i}\right)$$

$$(209d)\ \ldots f = \frac{1}{k^5}\left(\frac{1}{20}\mathrm{i} - \frac{1}{40} D_1\mathrm{i} + \frac{1}{60} D_2\mathrm{i} - \frac{1}{80} D_3\mathrm{i} + \frac{1}{100} D_4\mathrm{i}\right)$$

[1] i denotes the height of the first group-result; $D_1\mathrm{i} = \mathrm{ii} - \mathrm{i}$; $D_2\mathrm{i} = \mathrm{iii} - 2\mathrm{ii} - \mathrm{i}$; $D_3\mathrm{i} = \mathrm{iv} - 3\mathrm{iii} + 3\mathrm{iii} - \mathrm{i}$; etc.; that is, they are the *leading* differences.

9. **Determination of group-values when constants are known.**—When the equation is in the form (187), p, q, r, etc., being 1, 2, 3, etc., the most ready way to compute a series of values of groups 0 to k, k to $2k$, $2k$ to $3k$, etc., is to form the leading differences, and from these the successive values of the groups can be readily formed. The following formulæ give the required result :—[1]

$$(210)\ldots\ \text{I.} = ak + \frac{1}{2}bk^2 + \frac{1}{3}ck^3 + \frac{1}{4}dk^4 + \frac{1}{5}ek^5 + \frac{1}{6}fk^6$$

$$(210a)\ldots D_1\text{I.} = \ldots\ldots bk^2 + 2ck^3 + 3\tfrac{1}{2}dk^4 + 6ek^5 + 10\tfrac{1}{3}fk^6$$

$$(210b)\ldots D_2\text{I.} = \ldots\ldots\ldots\ldots 2ck^3 + 9dk^4 + 30ek^5 + 90fk^6$$

$$(210c)\ldots D_3\text{I.} = \ldots\ldots\ldots\ldots\ldots 6dk^4 + 48ek^5 + 260fk^6$$

$$(210d)\ldots D_4\text{I.} = \ldots\ldots\ldots\ldots\ldots\ldots\ldots 24ek^5 + 300fk^6$$

$$(210e)\ldots D_5\text{I.} = \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 120fk^6$$

When the equation is of a less degree than the fifth, zeros can be substituted for the coefficients ; thus for a fourth degree, $f=0$; for a third degree $f=0$ and $e=0$; and so on ; and the formulæ still hold good.

10. **Curve of group-totals for equal intervals of the variable expressed as an integral function of the central value of the interval.**—If we have a series of group-totals for equal intervals of the abscissa, as, for example, for 0 to k, k to $2k$, etc., and if those values divided by the common interval are represented by the ordinates at $\frac{1}{2}k$, $1\frac{1}{2}k$, $2\frac{1}{2}k$, etc., to a curve the equation of which is an integral function of the type of formula (187), then, whatever be the value of x in this equation, the ordinate for the point x will give very approximately the group-total for $x - \frac{1}{2}k$ to $x+\frac{1}{2}k$. That is to say, denoting the ordinate to the curve representing the groups $x \pm \frac{1}{2}k$ by Y, and that to the curve representing the original function by y, if

$$(211)\ldots\ Y = F(x + \frac{1}{2}k) = y\int_x^{x+k}dx = \int_x^{x+k}f(x)\,dx$$

for the values $x=0$, 1, 2, etc., then it follows that very approximately

$$(212)\ldots\ F(x + \frac{1}{2}k + q) = \int_{x+q}^{x+k+q}f(x)\,dx$$

provided that the forms of F and f are the same, that is, that they are both integral functions of a single variable. This result is important, and may be established by the following consideration.

If we compute $F(x) = \int f(x)\,dx$ so that the two are in agreement for $x=\frac{1}{2}k$, $1\frac{1}{2}k$ and $2\frac{1}{2}k$, in the first function, with the limits 0 to k, k to $2k$, and $2k$ to $3k$ in the second, then it is easy to establish that if the original

[1] D_1I., D_2I., etc., denote the series of *leading* differences, viz. (II.—I.) ; (III. — 2II. + I.) ; (IV. — 3III. + 3III. — I.) ; etc.

equation be $a+bx+cx^2$, and if the equation for the group-total, divided by the common interval, be $A+Bx+Cx^2$, when x is the value of the abscissa for the middle of the interval, then

$$(213)\ldots\ldots A = a + \frac{1}{12}ck^2;\quad B = b;\quad C = c.$$

If we extend the solution to the third power of x, that is, extend the limits to $3\frac{1}{2}k$ and $3k$ to $4k$ respectively, we have

$$(214)\ldots\ldots A = a + \frac{1}{12}ck^2;\ B = b + \frac{1}{4}dk^2;\ C = c;\ D = d.$$

If we further extend the solution to the fourth power of x, and the limits to $4\frac{1}{2}k$ and $4k$ to $5k$ respectively, we obtain

$$(215)..\ A=a+\frac{1}{12}ck^2+\frac{1}{80}ek^4;\ B=b+\frac{1}{4}dk^2;\ C=c+\frac{1}{2}ek;\ D=d;\ E=e.$$

If the fifth power of the variable be included, that is, the limits be $5\frac{1}{2}k$ and $5k$ to $6k$ respectively, then

$$(216)..\ A=a+\frac{1}{12}ck^2+\frac{1}{80}ek^4;\ B=b+\frac{1}{4}dk^2+\frac{1}{16}fk^4;\ C=c+\frac{1}{2}ek^2;$$

$$D = d + \frac{5}{6}fk^2;\ E = e;\ F = f.$$

It will be observed that up to the second power of the variable, the effect is that A differs from a only by a constant, consequently the function F gives rigorously the correct result, viz., that given by integrating the function f. For powers higher than the second, the result is true only for $k=\frac{1}{2}$, $1\frac{1}{2}$, etc., in F, and for any other values is more or less in error. This error cannot, in general, however, attain appreciable magnitude, because it is repeatedly reduced to zero at intervals of k, viz., at the values of the abscissa, $\frac{1}{2}k$, $1\frac{1}{2}k$, etc.

In practical statistical examples the coefficients b, c, d, e, f, etc., are generally in diminishing order of magnitude, and we see from the equations (213) to (216) that the corresponding numerical factors also rapidly diminish; hence the difference between the rigorous value $\int f(x)\,dx$ and the approximate value $F(x)$ must generally be very small, and, by the formulæ given, can be readily tested in any numerical examples.

11. **Average values of groups.**—An average value y_r of a group is the quantity

$$(217)\ldots\ldots y_r = \frac{1}{x_2 - x_1}\int_{x_1}^{x_2} y\,dx$$

in which y denotes the value of the ordinate, and x_1 to x_2, the range of the variable. Reverting to formulæ (187) and (188), and retaining the same meaning for the constants, the mean value of the range x to $x + k$ is

$$(218)..\ y_r = A + \frac{1}{k}[B\{(x+k)^{p+1} - x^{p+1}\} + C\{(x+k)^{q+1} - x^{q+1}\} + \text{etc.}]$$

which takes a simpler form if p, q, r, etc., are 1, 2, 3, etc. Where x has a series of values 0, k, $2k$, etc., as in (189) the averages are given by omitting the factor k in the formulæ. More generally, that is, for any value of x and k we have

$$(219)\ldots\ldots y_r = a + b\left(x + \frac{k}{2}\right) + c\left(x^2 + xk + \frac{1}{3}k^2\right) + d\left(x^3 + 1\tfrac{1}{2}x^2k + xk^2 + \frac{1}{4}k^3\right) + e\left(x^4 + 2x^3k + 2x^2k^2 + xk^3 + \frac{1}{5}k^4\right)$$

For groups bounded by curves of the exponential type we may note that

$$(220)\ldots\ldots a^x = e^{x \log a} = e^{mx}$$

Thus, the rate of change at any point of the curve $y = ne^{mx}$ is

$$(221)\ldots\ldots \frac{dy}{dx} = d\left(ne^{mx}\right)/dx = mne^{mx}$$

and the mean rate y_m is

$$(222)\ldots\ldots y_m = mne^{mx}.\ \frac{e^{mk}-1}{mk}$$

that is, this is the mean ordinate to the curve.

If the ordinates for the beginning, middle, and end of any range of values of the abscissa, that is, if the ordinates corresponding to the values x, $x+\frac{1}{2}k$, and $x+k$, are to hand, and the group-values are the integral of an equation of the type (199), then the value of y_r is

$$(223)\ldots y_r = \frac{1}{6}(y_x + 4y_m + y_{x+k}) - \frac{1}{24}k^4\left\{\frac{1}{5}e + f\left(x + \frac{1}{2}k\right) + 3g\left(x^2 + xk + \frac{23}{84}k^2\right) + \text{etc.}\right\}$$

The negative term (in braces) is absolutely negative, x being positive, if e, f and g are positive, and it is usually so small as to be negligible. When $x=0$ and $k=1$, the value of (223) takes the very simple form

$$(224)\ldots\ldots y_r = \frac{1}{6}\left(y_0 + 4y_m + y_k\right) - \frac{1}{24}\left(\frac{1}{5}e + \frac{1}{2}f + \frac{23}{28}g\right)$$

y_m denotes, of course, the middle ordinate.

This result is important, because it shews that group-values can be calculated with considerable precision by the "prismoidal formula" if we have middle as well as terminal instantaneous values of each group.

VI.—SUMMATION AND INTEGRATION FOR STATISTICAL AGGREGATES.

1. **General.**—In effecting statistical summations, regard is to be had to two elements, viz.:—

(i.) Order of accuracy significant in the case in point;

(ii.) Arithmetical consistency of results.

Curves drawn freehand among data, that represent either groups or instantaneous results, and which shew *visible* variations, can, for some purposes, be integrated with sufficient precision by careful graphing and the use of a planimeter.[1] When arithmetical smoothing has followed graphic, in order to enhance the accuracy, numerical calculations are virtually required as being of corresponding precision. As a rule group values (or the total area between any ordinates, the curve, and the axis of abscissæ) can, if the ordinates are relatively near each other, be computed by means of the prismoidal, Simpson's, Weddle's and similar rules. Finally, for work of the highest precision, actual integrations by the method of the infinitesimal calculus are required. In general, however, the precision then far transcends that of the data.

The extension of *implied* precision far beyond that of the data is seen in all actuarial tables: this matter is referred to later, since the year change in probability of life is a quantity of a much larger order than that to which results are expressed.

2. **Areal and volumetric summation formulæ.**—Statistics relating to population involve both *areal and volumetric summations*. The latter can, however, always be represented by an areal graph. If the curve represent instantaneous and not group-values[2] about a particular value of the variable, then the *areal* value can be computed without computing the equation of the curve and integrating it.

It has been shewn[3] that if an axis be equally divided, that is, if $x=0,\ k,\ 2k \ldots nk$, and the curve passing through the terminals of the ordinates (y) from these points is assumed to be represented by an integral function of x, then suitable multipliers or weights may be determined, which, applied to the ordinates, will give the area. If there be an

[1] Amsler's Integrator will cover a considerable area, and gives in the one operation (on four cylinders and discs) the values of following integrals, viz.:—

$$\int y dx\ ;\ \tfrac{1}{2}\int y^2 dx\ ;\ \tfrac{1}{3}\int y^3 dx\ ;\ \tfrac{1}{4}\int y^4 dx$$

that is, the *area*, the statical moment, the moment of inertia, and the cubic moment about the axis x. No mechanical integrator, however, can possibly approximate to the precision attainable by arithmetic.

[2] That is, represents the frequency y, for a given value x of the variable and not the group-mean for $x-\frac{1}{2}k$ to $x+\frac{1}{2}k$. See V., 10.—Curves representing group-totals, formulæ (211) to (216).

[3] See "Volumes of solids as related to transverse sections," by G. H. Knibbs, Journ. Roy. Soc. N.S.W., Vol. XXXIV., pp. 36-71, 1900. See Prop. (O), p. 70.

odd number of equidistant ordinates the curve may be of the same degree as the number of ordinates, viz., $(n+1)$; if the number of ordinates be *even*, the degree of the curve must be one less than that number (n).

It has been shewn also that if the curve bounding the area is of a *less* degree than that satisfied by the number of ordinates, then there is one-fold, two-fold,.... k-fold infinity of multipliers which will exactly give the area, according as the degree of the curve is 1, 2,.... k less than the number of ordinates.[1]

The formulæ can be readily constructed, and are exhibited in the table hereunder.[2] The significance of this table may be indicated as follows :—

When $n+1$ equidistant ordinates are given for a curve of the nth degree, there is only one system of weights that will give the integral correctly between the limits 0 and n. In the table this system is indicated in each case above by an asterisk (*). Further, when n is even, the unique series of weights, applicable to $n+1$ equidistant ordinates, is also applicable to a curve of the $(n+1)$th degree, but this is not true when n is odd.

When $n+2$ equidistant ordinates are given for a curve of the nth degree, any value whatever may be assigned to one of the weights (say w_0), and the corresponding values of the other weights may be expressed in terms of w_0. In this case there is evidently an infinite number of possible systems of weights, each of which will give the integral accurately for a curve of the nth degree. In the foregoing table the systems of this nature are indicated by a dagger (†), the coefficient (*i.e.*, 1) of the arbitrarily selected weight being shewn in heavy type. As an example, there may be taken the case in which seven equidistant ordinates of a fifth degree curve are given. Here the weightings shewn by the table are $w_0 = w_0$; $w_1 = 3.3 - 6w_0$; $w_2 = -4.2 + 15w_0$; $w_3 = 7.8 - 20w_0$; $w_4 = -4.2 + 15w_0$; $w_5 = 3.3 - 6w_0$; $w_6 = w_0$.

If w_0 be given the value 0.3 this series becomes $\frac{3}{10}\left(1, 5, 1, 6, 1, 5, 1\right)$, which will be recognised as Weddle's rule.

Similarly, when $n+3$ equidistant ordinates are given for a curve of nth degree, two weights may be arbitrarily selected and the remaining $n+1$ may be computed in terms thereof, thus admitting of a two-fold infinity of systems of weighting. In the foregoing table systems of this nature are indicated by a double dagger (‡).

Similarly, when $n+4$ ordinates are given for a curve of the nth degree there is a three-fold infinity of systems, when $n+5$ ordinates are given, a four-fold infinity, or, in general, when r ordinates are given for a curve of the nth degree there is an $(r-n-1)$-fold infinity of systems of weighting.

[1] Ibid, § 16, pp. 60-71. Examples of the development of k-fold infinity of multipliers are given on pp. 64-67.

[2] Prepared by Mr. C. H. Wickens, A.I.A.

TABLE VI.

Weights to be applied to a Series of Equidistant Ordinates, $y_0, y_1, \ldots y_n$, in order to determine the Value of the Integral $\int_{x=0}^{x=n} y\,dx$, that is, between the Limits covered by the Ordinates.

Series of Weights for Ordinates with same Suffix	Value of the Weights when the curve passing through their Terminals is a function of the—					
	2nd degree.	3rd degree.	4th degree.	5th degree.	6th degree.	7th degree.
3 Ordinates	*					
w_0	1	1				
w_1	4	4				
w_2	1	1				
	$\times \frac{1}{3}$	$\times \frac{1}{3}$				
4 Ordinates	†	*				
w_0	**1**	1				
w_1	9	3				
w_2	3	3				
w_3	−1	1				
	$\times \frac{1}{4}$	$\times \frac{3}{8}$				
5 Ordinates	‡	†	*			
w_0	**1**	**1**	7	7		
w_1	**1**	−4	32	32		
w_2	−6	6	12	12		
w_3	8	−4	32	32		
w_4	−3	1	7	7		
	$\times \frac{1}{3}$	$\times \frac{1}{3}$	$\times \frac{2}{45}$	$\times \frac{2}{45}$		
6 Ordinates		‡	†	*		
w_0	**1**	**1**	**1**	19		
w_1	**1**	**1**	−5	75		
w_2	**1**	−10	10	50		
w_3	−10	20	−10	50		
w_4	15	−15	5	75		
w_5	−6	4	−1	19		
	$\times \frac{1}{12}$	$\times \frac{1}{24}$	$\times \frac{1}{144}$	$\times \frac{5}{288}$		
7 Ordinates			‡	†	*	
w_0	**1**	**1**	**1**	**1**	41	41
w_1	**1**	**1**	**1**	−6	216	216
w_2	**1**	**1**	−15	15	27	27
w_3	**1**	**1**	40	−20	272	272
w_4	−15	−20	−45	15	27	27
w_5	24	45	24	−6	216	216
w_6	−10	10	−5	1	41	41
	$\times 1$	$\times 1$	$\times \frac{1}{10}$	$\times \frac{1}{10}$	$\times \frac{1}{140}$	$\times \frac{1}{140}$

The significance of the *, †, and ‡ is referred to in the text.

3. **The value of groups in terms of ordinates.**—It is often convenient to ascertain the value of groups between certain limits of a variable. If the ordinates be supposed to conform to the equation $a+bx$; or $a+bx+cx^2$, etc., etc., we can construct a series of equations which are rigorously true under the particular supposition, and may be regarded as approximations in the general case. By comparing the expression for the integral between assigned limits with the values of the ordinates, we deduce the following expressions for the *heights of the groups* in terms of the ordinates.

TABLE VII.

Values of Group Heights for Different Ranges of the Variable in Terms of the Ordinates to the Curve.

1st Approximation. Formulæ (225) to (228).

Ranges of Integral	0-½	½-1	1-1½	1½-2
Semi-group-heights	$\frac{1}{4}(3y_0+y_1)$;	$\frac{1}{4}(y_0+3y_1)$;	$\frac{1}{4}(-y_0+5y_1)$;	$\frac{1}{4}(-3y_0+7y_1)$

2nd Approximation. Formulæ (229) to (232).

Ranges of Integral	0-½	½-1
Semi- group-heights	$\frac{1}{12}(8y_0+5y_1-y_2)$;	$\frac{1}{12}(2y_0+11y_1-y_2)$

Ranges of Integral	1-1½	1½-2
Semi-group-heights	$\frac{1}{12}(-y_0+11y_1+2y_2)$;	$\frac{1}{12}(-y_0+5y_1+8y_2)$

3rd Approximation. Formulæ (233) to (236).

Ranges of Integral	0-½	½-1
Semi-group-heights	$\frac{1}{192}(119y_0+107y_1-43y_2+9y_3)$;	$\frac{1}{192}(25y_0+197y_1-37y_2+7y_3)$

Ranges of Integral	1-1½	1½-2
Semi-group-heights	$\frac{1}{192}(-9y_0+155y_1+53y_2-7y_3)$;	$\frac{1}{192}(-7y_0+53y_1+155y_2-9y_3)$

4th Approximation. Formulæ (237) to (240).

Ranges of Integral.	Semi-group-heights.
(237)..... 0–½ =	$\frac{1}{2880}(1694y_0+1969y_1-1191y_2+499y_3-91y_4)$
(238)..... ½–1 =	$\frac{1}{2880}(314y_0+3199y_1-921y_2+349y_3-61y_4)$
(239)..... 1–1½ =	$\frac{1}{2880}(-91y_0+2149y_1+1059y_2-281y_3+44y_4)$
(240)..... 1½–2 =	$\frac{1}{2880}(-61y_0+619y_1+2589y_2-311y_3+44y_4)$

1st Approximation. Formulæ (241) to (243).

Ranges of Integral	0–1	$\frac{1}{2}$–$1\frac{1}{2}$	1–2
Group-heights	$\frac{1}{2}(y_0+y_1)$	y_1	$\frac{1}{2}(-y_0+3y_1)$

2nd Approximation. Formulæ (244) to (246).

Ranges of Integral	0–1	$\frac{1}{2}$–$1\frac{1}{2}$	1–2
Group-heights	$\frac{1}{12}(5y_0+8y_1-y_2)$;	$\frac{1}{24}(y_0+22y_1+y_2)$;	$\frac{1}{12}(-y_0+8y_1+5y_2)$

3rd Approximation. Formulæ (247) to (249).

Ranges of Integral. Group-heights.

(247).....0–1 $= \frac{1}{24}(9y_0+19y_1-5y_2+y_3)$

(248).....$\frac{1}{2}$–$1\frac{1}{2}$ $= \frac{1}{24}(y_0+22y_1+y_2+0y_3)$

(249).....1–2 $= \frac{1}{24}(-y_0+13y_1+13y_2-y_3)$.

4th Approximation. Formulæ (250) to (252).

Ranges of Integral. Group-heights.

(250)..... 0–1 $= \frac{1}{720}(251y_0+646y_1-264y_2+106y_3-19y_4)$

(251)..... $\frac{1}{2}$–$1\frac{1}{2}$ $= \frac{1}{5760}(223y_0+5348y_1+138y_2+68y_3-17y_4)$

(252).....$1\frac{1}{2}$–2 $= \frac{1}{720}(-19y_0+346y_1+456y_2-74y_3+11y_4)$

In applying these formulæ the actual common-range of the interval on the axis of abscissæ is immaterial; that is, we may read throughout 0 to $\frac{1}{2}k$; $\frac{1}{2}k$ to k etc.; instead of 0 to $\frac{1}{2}$; $\frac{1}{2}$ to 1; etc.; the ordinates y_0, y_1, etc., being taken of course 0, k, $2k$, $3k$, etc. By these formulæ, therefore, we may halve groups.

It will be noticed that the coefficients are always symmetrically opposed for semi-groups standing in the same relation to the ordinates; for example, with two ordinates, 0 to $\frac{1}{2}$ is the same form as $\frac{1}{2}$ to 1; with three, 0 to $\frac{1}{2}$ agrees with $1\frac{1}{2}$ to 2, and $\frac{1}{2}$ to 1 with 1 to $1\frac{1}{2}$; with four ordinates, the only symmetrically opposed pair are 1 to $1\frac{1}{2}$ and $1\frac{1}{2}$ to 2. From this it is evident that, for the third and fourth approximations the formulæ for the remaining group-heights within the limits of the ordinates

used can be written down by inspection. Thus for the 3rd and 4th approximations the group-heights of the various semi-groups are as follow :—

3rd Approximation.

The ordinates for the semi-group $2\frac{1}{2}$ to 3 are the inverse of those for 0 to $\frac{1}{2}$
" " " 2 to $2\frac{1}{2}$ " " " $\frac{1}{2}$ to 1
" " " $1\frac{1}{2}$ to 2 " " " 1 to $1\frac{1}{2}$
(as already given).

4th Approximation.

The ordinates for the semi-group $3\frac{1}{2}$ to 4 are the inverse of those for 0 to $\frac{1}{2}$
" " " 3 to $3\frac{1}{2}$ " " " $\frac{1}{2}$ to 1
" " " $2\frac{1}{2}$ to 3 " " " 1 to $1\frac{1}{2}$
" " " 2 to $2\frac{1}{2}$ " " " $1\frac{1}{2}$ to 2

4. **The value of group-subdivisions in terms of groups.**—It is often required to divide a group. Practically we may always halve a group and halve again if necessary. If we divide groups with a common interval (k) on the axis of abscissæ we may, with advantage, use the *group-height* (g) instead of the group number G; that is, we may use $g=G/k$. Then we obtain the following series of formulæ, which, like the last, are rigorously accurate if the groups are given by the integrals of the equation $a+bx$; $a+bx+cx^2$; etc.; etc. They may therefore be regarded, as in the previous instance, either as a series of approximations, or as rigorously accurate, according as they represent exactly or approximately the subdivisions of groups given by the integral equations referred to.

TABLE VIII.

Values of Group-heights for different half-ranges of the variable in terms of the heights of successive whole groups.

1st Approximation. Formulæ (253) to (256).

Ranges of integral	0–$\frac{1}{2}$	$\frac{1}{2}$–1	1–$1\frac{1}{2}$	$1\frac{1}{2}$–2
Semi-group-heights	$\frac{1}{4}(5g_1-g_2)$;	$\frac{1}{4}(3g_1+g_2)$;	$\frac{1}{4}(g_1+3g_2)$;	$\frac{1}{4}(-g_1+5g_2)$

2nd Approximation. Formulæ (257) to (260).

Ranges of integral	0–$\frac{1}{2}$	$\frac{1}{2}$–1
Semi-group-heights	$\frac{1}{8}(11g_1-4g_2+g_3)$;	$\frac{1}{8}(5g_1+4g_2-g_3)$
Ranges of integral	1–$1\frac{1}{2}$	$1\frac{1}{2}$–2
Semi-group-heights	$\frac{1}{8}(g_1+8g_2-g_3)$;	$\frac{1}{8}(-g_1+8g_2+g_3)$.

3rd Approximation. Formulæ (261) to (264).

Ranges of integral	0–$\frac{1}{2}$	$\frac{1}{2}$ to 1
Semi-group-heights	$\frac{1}{64}(93g_1 - 47g_2 + 23g_3 - 5g_4)$;	$\frac{1}{64}(35g_1 + 47g_2 - 23g_3 + 5g_4)$
Ranges of integral	1–$1\frac{1}{2}$	$1\frac{1}{2}$–2
Semi-group-heights	$\frac{1}{64}(5g_1 + 73g_2 - 17g_3 + 3g_4)$;	$\frac{1}{64}(-5g_1 + 55g_2 + 17g_3 - 3g_4)$

4th Approximation. Formulæ (265) to (268).

Ranges of integral.	Semi-group-heights.
(265)..... 0–$\frac{1}{2}$	$= \frac{1}{128}(193g_1 - 122g_2 + 88g_3 - 38g_4 + 7g_5)$
(266)..... $\frac{1}{2}$–1	$= \frac{1}{128}(63g_1 + 122g_2 - 88g_3 + 38g_4 - 7g_5)$
(267)..... 1–$1\frac{1}{2}$	$= \frac{1}{128}(7g_1 + 158g_2 - 52g_3 + 18g_4 - 3g_5)$
(268)..... $1\frac{1}{2}$–2	$= \frac{1}{128}(-7g_1 + 98g_2 + 52g_3 - 18g_4 + 3g_5)$

The opposite symmetry of the coefficients for semi-groups in symmetrically opposed positions, having regard to the total number of groups in question, is obvious, as in the case for ordinates. The same remarks apply, *mutatis mutandis*, as those made regarding the coefficients of the ordinates.

5. **Approximate computation of various moments.**—In connection with the application of the method of moments in statistical investigations of distribution (population and other) it is often necessary to compute moments from available data. This can also be done from the available ordinates in the following manner :—

It is obvious that the curved boundary of any group, covering a limited range of the variable, can be represented with considerable precision by a curve of the second degree : see V., § 11, formulæ (217) to (224). Let the *group-height* be denoted by g, that is, let g denote the group-area divided by k, that is, the group-range on the axis of abscissæ. If y' and y'' are the ordinates to the curve for $a-\frac{1}{2}k$ and $a+\frac{1}{2}k$ respectively, and y_a be the central ordinate, viz., at the distance a from the intersection of the axes, and if h be the distance of the mean of the terminals y' and y'' from the terminal of this central ordinate, that is, if $n=y_a-\frac{1}{2}(y'+y'')$, then the group-height is given by the equation

$$(269)\ldots\ldots g=\frac{1}{2}(y'+y'')+\frac{2}{3}h=\frac{1}{6}(y'+4y_a+y'')$$

and the equation to the curve is—

$$(270)\ldots y=y_a+\frac{y''-y'}{k}(x-a)+\frac{4h}{k^2}(x-a)^2=y_a+b(x-a)+c(x-a)^2$$

the origin being at the distance a from the ordinate y_a. This curve is regarded as valid only for the group to which it applies, and not for adjoining groups. From this last equation we can compute the successive moments, M_0 denoting the area, M_1 the statical moment, M_2 the moment of inertia, and M_3 the moment of the fourth order.

It is important to attend to the signs of b and c. If $y''-y'$ is positive, that is, if the ordinate is increasing in the direction of $a+\frac{1}{2}k$, then b is plus; and c is plus if the curve is convex upward: that is, if h is positive.

Thus the several moments are :—

$$(271)\ldots\ldots M_0 = k\,(y_a + \frac{1}{12}\,ck^2) = k\,(y_a + \frac{1}{3}\,h)$$

$$(272)\ldots\ldots M_1 - aM_0 = \frac{1}{12}\,bk^3 = \frac{1}{12}\,k^2\,(y'' - y')$$

$$(273)\ldots\ldots M_2 - 2aM_1 + a^2M_0 = \frac{1}{60}\,k^3\,(5y_a + 3h)$$

$$(274)\ldots\ldots M_3 - 3aM_2 + 3a^2M_1 - a^3M_0 = \frac{1}{80}\,k^4\,(y'' - y')$$

and may be very readily computed from these formulæ, which are rigorously exact on the supposition made, and will be sensibly correct generally.

6. **Statistical integrations.**—Ordinarily, statistical data are subject to considerable error and uncertainty, and meticulous precision in regard thereto is, therefore, usually unmeaning. The approximations of statistical technique itself, should, however, aim at a somewhat higher order of accuracy than that characteristic of the data, in order that the error should not prejudicially accumulate through mere computational vitiation. The great majority of cases of integration occurring in ordinary statistical practice will be found to have been solved. Valuable tables of integrals are available.[1]

[1] (i.) Sammlung von Formeln der reinen und angewandten Mathematik. W. Láska, Braunschweig, 1888-1894, pp. 1-1071.

(ii.) Tafeln unbestimmter Integrale. G. Petit-Bois, Leipzig, 1906.

(iii.) Een Aanhangsel tot de Tafels van onbepaalde Integralen. D. Bierens de Haan.

(iv.) Exposé de la théorie des propriétés, des formules de transformation, et des méthodes d'évaluation des Intégrales définies, partie 1, pp. 1-82; partie 2, pp. 83-181; partie 3, pp. 183-698. Bierens de Haan, Amsterdam, 1860.

(v.) Nouvelles Tables d'intégrales définies. Bierens de Haan, 5 parties, pp. 1-733. Engels, Leide, 1867.

The integrals of curves of the type of (20), II., § 19, are sometimes required: that is,—

$$(275)\ldots\ldots \int a\,(bx)^{\pm m\pm nbx}\,dx = \frac{a}{b}\int y^{\pm m\pm ny}\,dy = A\int y^{m}e^{ny\log y}\,dy$$
$$= A\int e^{(\pm m\pm ny)\log y}\,dy$$

in which $A = a/b$; and $y = bx$. This last form may be expressed by an exponential series. Or

$$(276)\ldots \int y^{m+ny}\,dy = \int y^{m}\left\{1 + ny\log y + \frac{1}{2}(ny\log y)^2 + \ldots\right\}dy$$

which may be integrated term by term. Again

$$(277)\ldots \int x^{nx}dx = x\left\{1-\frac{nx}{2^2}+\frac{n^2x^2}{3^3}-\frac{n^3x^3}{4^4}+\ldots\right\}+\frac{nx^2\log x}{1\,!}\left\{\frac{1}{2}-\frac{nx}{3^2}+\frac{n^2x^2}{4^3}-\ldots\right\}$$
$$\frac{n^2x^3(\log x)^2}{2\,!}\left\{\frac{1}{3}-\frac{nx}{4^2}+\frac{n^2x^2}{5^3}+\ldots\right\}+\text{etc.}$$

Similarly, forms of the type of formula (32a), see II., § 23

$$(278)\ldots\ldots \int x^{\frac{1}{(\pm m\pm nx)^p}}\,dx = \int e^{\frac{\log x}{(\pm m\pm nx)^p}}\,dx$$

can, if m and n be regarded as positive, be put in the form

$$(279)\ldots\ldots \int\left\{1+\frac{\log x}{(m+nx)^p}+\frac{(\log x)^2}{2!\,(m+nx)^{2p}}+\ldots+\frac{(\log x)^k}{k!\,(m+nx)^{kp}}+\ldots\right\}dx$$

which can be integrated term by term. The integrals, however, are tedious. For example:—

$$(280)\ldots \int\frac{\log x}{(m+nx)^p}\,dx = \frac{\log x}{(p-1)n\phi^{p-1}}+\frac{1}{(p-1)mn}\left\{\frac{1}{(p-2)\phi^{p-2}}+\right.$$
$$\left.\frac{1}{(p-3)\,m\phi^{p-3}}+\frac{1}{(p-4)m^2\phi^{p-4}}+\ldots+\frac{1}{2m^{p-4}\phi^2}+\frac{1}{m^{p-5}\phi}\right\}$$
$$+\frac{1}{(p-1)m^{p-1}n}\log\frac{x}{\phi}$$

ϕ denoting $(m+nx)^p$.

If $p = 1$, and n is positive, this takes the simpler form—

$$(281)\ldots \int x^{\frac{1}{m+nx}} = \frac{1}{n}\log x\log(m+nx)-\frac{1}{2n}(\log nx)^2 \quad \frac{m}{n^2x}$$
$$-\frac{m^2}{2^2n^3x^2}+\frac{m^3}{3^2n^4x^3}+\text{etc.}$$

Owing to the very great elaboration of the terms of many of the integrals, practically it is preferable to compute a sufficient number of ordinates, and integrate by any suitable summation-formula (given hereinbefore).

7. **The Eulerian integrals or Beta and Gamma functions.**—The Beta and Gamma functions are of special importance in statistical integrations. They are :—

$$(282)\ldots\ldots \int_0^1 x^{l-1}(1-x)^{m-1}dx = \int_0^1 z^{m-1}(1-z)^{l-1} = \int_0^\infty \frac{y^{l-1}\,dy}{(1+y)^{l+m}} = \int_0^\infty \frac{y^{m-1}\,dy}{(1+y)^{l+m}}$$

that is, in the more brief notation—

$$(283)\ldots\ldots \mathrm{B}(l, m) = \mathrm{B}(m, l) = \frac{\Gamma(l)\,\Gamma(m)}{\Gamma(l+m)}$$

Further—

$$(284)\ldots \int_0^\infty e^{-x}x^{n-1}\,dx = \int_0^1 \left(\log\frac{1}{y}\right)^{n-1} dy = (n-1)\int_0^\infty e^{-x}x^{n-2}\,dx = \Gamma(n)$$

respectively, from which it is evident that :—[1]

$$(285)\ldots\ldots \Gamma(1) = 1\,;\quad \Gamma(n+1) = n!\ = n\,\Gamma(n)$$

Thus, in order to calculate $\Gamma(n)$ we have, if it be an integer, it is equal to $(n-1)!$, if not an integer, it can be readily found, since its logarithms have been tabulated for the range 1 to 2 to two places of decimals and to 9 places of figures.[2] Thus—

$$(286)\ldots\ldots n\,(n+1)\,(n+2)\ldots(n+k-1)\,\Gamma(n) = \Gamma(n+k)$$

which, logarithmically, is perfectly convenient to use.

By putting $kz = x$, in (284), it becomes obvious that

$$(287)\ldots\ldots \int_0^\infty e^{-kx}x^{n-1}\,dx = \frac{\Gamma(n)}{k^n}$$

$$(288)\ldots\ldots \frac{d}{dn}\Gamma(n) = \Gamma'(n) = \int_0^\infty e^{-x}x^{n-1}\log x\,dx.$$

Examples of the application of these formulæ have already been given: see IV., § 5, formulæ (150) to (166).

8. **Table of indefinite and definite integrals and limits.**—In an addendum small tables are given, for convenience, of indefinite integrals ; of definite integrals, for example, between limits such as zero and unity ; zero and infinity ; etc., and of limiting values. These embrace those which more frequently occur in statistical investigations.

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[1] $\Gamma(\frac{1}{2}) = \sqrt{\pi}$.

[2] Traité des Fonctions Elliptiques, Legendre, Paris 1825-8 (logarithms to 12 places). Sammlung von Formeln, W. Láska, pp. 290-1. Braunschweig (logarithms to 9 places). Biometrika, J. H. Duffell, Vol. VII., 1909-10, pp. 43-7 (logarithms to 7 places).

VII.—THE PLACE OF GRAPHICS AND SMOOTHING, IN THE ANALYSIS OF POPULATION-STATISTICS.

1. **General.**—Graphs of the data are necessary in any analysis of population-statistics purporting to aim at thoroughness. A graph indicates not only the general trend of the data, but also whether the individual items conform with great exactitude to that trend, or whether they deviate considerably therefrom. The criticism of deviations ordinarily depends upon whether *numbers* or *ratios* are being analysed. Where figures are of the nature of ratios, if, on the working-graphs the numbers be written, it is possible to see at a glance whether changes in any part of the graph of the crude data are significant or otherwise. Thus a ratio resulting from 30,000 divided by 10,000 would be materially changed so far as the numerical data are concerned by an alteration, say, of one-thousandth. To change the ratio say from 3 to 2.997 would mean an alteration of 30 in the numerator or of 10 in the denominator ; whereas, if the original data were the numbers 3 and 1, an alteration of a single unit would greatly disturb the ratio.

In general, we are concerned with two kinds of alteration ; one may be called the "*redistribution of the data without alteration of their aggregate* ;" and the other may be called the "*alteration of data to coincide with what is deemed the most probable result,*" having regard to all the facts. It is, for example, sometimes desirable to keep the aggregate of the smoothed results identical with that of the data. In other cases this is less essential, and it may be said that probably much time is often wasted in making re-distributed data agree with the original as to the aggregate of units represented.

As to general method it may be noted that when the original facts have been plotted, a curve may be drawn freehand by anyone familiar with the characteristics of the various type-curves, and especially those of probability-curves. By means of sets of curves, French curves, and splines of various kinds,* the freehand curves may then be improved so as to be really smooth and conform to what might be called the probable indication of the data. When the numbers represented are large, limitations of scale may operate to limit the smoothness as deduced by scaled values, from the graphs, but a little simple *differencing* will suggest necessary adjustments, or the differences may be graphed. The adjustments having been made, the aggregate can be formed by adding together the scaled or properly differenced ordinates thus adjusted.

If this operation has been well done the total will be so nearly in agreement with the original data that a common *factor of correction* can be used throughout, that is, all the ordinates may be increased or diminished in the same ratio, and the finally deduced ordinates will then agree

* Splines of transparent celluloid are most convenient.

with the data, and at the same time form a smooth curve. If the data when plotted are visibly irregular, meticulous precision in adjustment is obviously but a waste of time. For this reason one of the great merits of the graphic method is that, not only can the analyst see at a glance the conformity or otherwise of the data to a particular type of curve, but he can also judge whether the data yield results of a high order of precision.

It has already been mentioned (see IV., § 1) that the initial and terminal characters of the curve and its mode (maximum and minimum) are important. It may be added, that if the curve is not drawn as unimodal in type, the reason for the adoption of a particular form must really depend on the character of the data, and may not be decided merely upon mathematical considerations.

2. **The theory of smoothing statistical data.**—It may often be known *a priori* that phenomena should exhibit a regular progression, and that data, when graphed, shewing as zig-zag lines, do not really represent the ideal fact, owing either to the paucity of the data, or to unavoidable error therein.

In a series of *group-values*, *i.e.*, totals or aggregates between a series of limits of a variable, it is important to bear in mind that—assuming the counts on which they depend to be correct—what is *known* is merely the series of aggregates themselves: the probable distribution yielding these aggregates has to be *conjectured*. When the totals or aggregates are themselves regarded as subject to error, then the distribution may be modified within the limits of probable uncertainty, some groups being diminished and others, particularly adjoining ones, increased.

There are four principal classes of data to which the process of curve-smoothing is applicable. These may be indicated as follows:—

(i.) Frequencies of a phenomenon at successive epochs or during successive periods of time; as, for example, population estimates at given dates and numbers of deaths occurring during successive years.

(ii.) Rates of occurrence of a phenomenon per unit of reference during successive periods; as, for example, birth-rates per thousand of population per annum for successive years.

(iii.) Frequencies in respect of successive values of characters capable of continuous variation; as, for example, the number of persons at each age recorded at a given census.

(iv.) Rates of occurrence of a phenomenon per unit of reference in respect of successive values of characters susceptible of continuous variation; as, for example, rates of mortality per unit per annum during a given decennium in respect of each age.

In all these cases the characteristic of continuous variation[1] is assumed to exist either actually or virtually. Where statistical results are *discontinuous* such a process is, strictly speaking, inapplicable; as, for

[1] See I., § 9.

example, in the tabulation of census population according to birthplace, occupation, or religion. In some cases, however, although the data are strictly speaking discontinuous, the principle may be applied partially; for example, in the case of a tabulation of dwellings according to number of rooms or according to number of inmates. In such cases the character possessed is *progressive without being continuous*; nevertheless, with proper qualifications, the smoothing principle may be applied even to these.

Another example, more nearly approaching but not attaining continuous variation, is the representation of dwellings according to rental value.

3. **Object of smoothing.**—From the foregoing it will be seen that the data to which the smoothing process is strictly applicable are those which may be regarded as functions of a continuous variable. But whether such functions are readily expressible by means of algebraic formulæ or not, is, of course, really immaterial. The essence of the matter is that in any instance the data are in the main such as admit of representation by means of a continuous line, or a continuous surface or solid in relation to continuous units of reference. When such representation has been made of the crude results of observation, it is ordinarily found that the line surface or solid exhibits evidences of marked irregularities as between adjacent points or series of points, their general trend, however, suggesting an underlying basis of orderly progression. This progression is, of course, affected by minor influences operating at individual points, and is more or less masked by the paucity of the data on which the representation has been based; thus, suggesting further that were it possible to obtain data of unlimited extent, these irregularities would become negligible. For this reason the object of the smoothing process may be said to be that of removing these apparently accidental irregularities, and of thus disclosing the basic or ideal uniformity which may be presumed to represent the facts in all their generality.

4. **Justification for smoothing process.**—The justifications for the smoothing process may thus be said to be:—

(*a*) That the irregularity does not represent the phenomenon in its generality, since much of the observed irregularity is known *a priori* to be due only to paucity of data;

(*b*) or that it is known that the phenomenon subject to observation is really regular;

(*c*) or, again, that the observed data suggest that regularity of trend will not efficiently represent them.

It has been objected that any system of smoothing is, strictly speaking, unwarrantable, since such a process virtually attempts to make the facts accord with more or less questionable preconceptions regarding them. To this view it may be rejoined that if the process were such as to produce results which, though smooth, differed systematically and materially in their distribution from the original observations, the objection would be valid. Where, however, due consideration is given to the

relative magnitudes of the original data, and the smoothed results accord therewith as closely as the data will allow when these exhibit a general trend, then the only preconception that can be regarded as operative is the justifiable one that ordinarily natural phenomena do not progress *per saltum*. In this connection it must be noted that where there is distinct evidence at any stage of a cataclysmic disturbance of results, the smoothing process for such points or periods will usually be invalid or not properly applicable. Examples of such cataclysmic disturbances of statistical data are war, famine, pestilence, earthquake, etc. Even in these cases, however, it appears admissible under certain circumstances to apply a smoothing process; as, for example, in cases where the disturbances referred to are of more or less frequent occurrence, and are not merely isolated instances.

One of the most cogent justifications for the smoothing process has its warrant in the fact that the recorded results of any statistical observations are necessarily approximative, and hence that the value of the function *recorded* for any given value of the variable is probably not usually more accurate than an estimate based on the recorded values in respect of preceding and succeeding values of the variable. This consideration suggests the idea of weighting successive observations to obtain most probable values, which idea forms the basis of one of the leading methods of adjustment. Again, where the results of the observations are to be employed as guides to future action, it is clear that these results should, as far as practicable, be freed from all fluctuations which may be considered merely accidental, and thus unlikely to be reproduced in future experience. This is of considerable importance in connection with the construction of mortality and sickness, superannuation, and similar tables to be used in the computation of rates of premium, and for the conduct of valuations.

5. **Mode of application of smoothing processes.**—It has already been indicated that one of the main objects of the smoothing process is the discovery of a smooth series which presumably underlies the irregular data furnished by a limited number of observations, and it has been implied that a process to be justifiable must, in addition to smoothness, be characterised also by what has been called "goodness of fit"; that is, within reasonable limits it must reproduce the *characteristic* features of the original data.

The methods of applying the smoothing process which have up to the present been employed, may conveniently be grouped in three classes, viz.:—(*a*) Graphic Methods; (*b*) Summation Methods; and (*c*) Methods of Functional Conformity.

These methods have been employed in connection with observations in many fields of research; as, for example, general statistics, actuarial science, physics and chemistry, astronomy, tidal theory, biology, etc. In the actuarial field, an extensive and systematic use of the process has been made, and a most detailed examination of the underlying principles has been carried out.

(*a*) **Graphic method.**—As its name indicates, this method is based on the attainment of the desired smoothness by means of a graphical representation and adjustment of the observed data. For example, the subject of observation being the infantile mortality experienced in a community during a given period, and the periods of observation being calendar years, a base line is taken and divided into equal parts, each of which represents a year. On these parts as bases a series of rectangles is constructed, the area of each rectangle being proportional to the rate of infantile mortality averaged for the corresponding year. The upper parts of these rectangles will present in the case supposed the appearance of flights of steps with uniform treads and unequal rises. The necessary smoothing may be effected by drawing a continuous free-hand curve through the upper portions of these rectangles in such a manner as to include *between certain limits* the same area *approximately* as is contained in the rectangles covering the same range.[1] The area enclosed by the part of the base line relating to any year, the ordinates drawn from the extremities of this part, and the portion of the curve between these ordinates will represent the smoothed result for the year under review. Whether, as in the example just given, the data should be represented by areas, or, as is sometimes more suitable, by ordinates, is a matter which is determined agreeably to the appropriate interpretation of the result to be attained. It may be noted that the method of representation by rectangular areas is specially applicable to cases where the data are functions not of single values of the variable, but of *ranges* of such values. For instance, in the above example, the rate of infantile mortality stated for any year is a function not of any one point of time in that year, but of the range of values representing the whole of the year. In most cases, however, the system of representation by means of ordinates would be equally valid, and sometimes more convenient.[2] Referring again to the above example, from a point on the base line representing the end of each year an ordinate could be drawn representing the rate of infantile mortality for that year, and a free-hand curve being drawn amongst the upper points of these ordinates, the ordinate to any point on the curve would represent the rate of infantile mortality for the year ending on the date corresponding to the foot of the ordinate. Similarly, the ordinate for smoothing might be drawn from the beginning or the middle of the line for each year, or, indeed, from any point uniformly selected in each, and a corresponding interpretation of any point taken on the curves drawn amongst the upper points of such ordinates would be applicable.

6. **On smoothing by differencing.**—A curve continually convex (or continually concave) upward might possibly be drawn with a single difference. We have, by the theory of differentiation—

$$(289)\ldots dy/dx = d(a+bx^p+cx^q+\text{etc.})/dx = pbx^{p-1}+qcx^{q-1}+\text{etc.};$$

[1] In practical examples it is rarely possible to make the curve such that the adjusted areas are continually identical with the rectangles on the same base.

[2] See, however, V., § 10, formulæ (212) to (216).

hence, if p, or q, etc., should happen to be *integers*, at some stage of differentiation, this particular term of the expression will be $x^0=1$, and hence that difference will vanish. Probably in no case are population-statistical results actually representable by integral values of p, q, etc., hence, strictly, there is no limit to the series of differences. These, however, ultimately become high negative powers of x, and consequently when x is large their value is small; they must ultimately become of negligible amount.

Again, statistical data often involve exponential forms, particularly those of the type ae^{-nx}, the differential of which is $-nae^{-nx}$, from which it is evident the successive differences are interminable. Since, however, $de^{-x}/dx=1/e^x$, the higher differences for large values of x become insensible. Hence, we shall always be justified in taking differences only to the stage where they are appreciable. Thus if at any stage of smoothing we make the second difference a constant, we are making the curve one which the equation $y=a+bx+cx^2$ will reproduce; if we go on then with a constant third difference, we add a stretch of a new curve, viz., $y'=a'+b'x+c'x^2+d'x^3$; and so on. Such methods are unobjectionable when the tangents to the curve at the point of junction may be regarded as sensibly identical.

7. **Effect of changing the magnitude of the differences.**—It is often useful to be able to recognise instantly the consequence of changing the magnitude of a difference. This can be indicated at once by a table.

Table IX.—Effect on the value of a function of a change of a unit in a leading difference.

Difference in which the change takes place.	Effect on the value of y where its suffix is—										
	0	1	2	3	4	5	6	7	8	9	10
1st difference ..	0	1	2	3	4	5	6	7	8	9	10
2nd difference ..	0	0	1	3	6	10	15	21	28	36	45
3rd difference ..	0	0	0	1	4	10	20	35	56	84	120
4th difference ..	0	0	0	0	1	5	15	35	70	126	210
5th difference ..	0	0	0	0	0	1	6	21	56	126	252

It will be recognised that these are the figures of Pascal's triangle taken diagonally, or the diagonal series in this are the figures of Pascal's triangle taken vertically. By means of such a table one can see at a glance the effect on any value of the function of changing a leading difference.

8. **Smoothing, by operations on factors.**—The smoothing of a succession of ordinates or of group-values may often advantageously be effected not by operating upon these numbers themselves, but upon their *ratios* to each other. This may be called *factorial smoothing*. Let A, B, C, D, etc., be the series of quantities to be smoothed. The ratios B/A, C/B, D/C, etc., are formed, and denoted by b, c, d, etc. These are graphed and smoothed by any process.[1] The smoothed values, denoted by b', c', d', etc., are then used to form a new series of quantities; thus $A=A$, $Ab'=B''$; $B''C'=C''$, etc. The sum of these is then made equal to the sum of the original series of quantities by a common factor k, thus—

$$(290)..k=\frac{A+B+C+D+\text{ etc.}}{A+Ab+Abc+Abcd+\text{etc.}}=\frac{A\left\{1+b\left[1+c\{1+d(1+..)\}\right]\right\}}{A\left\{1+b'\left[+c'\{1+d(1+..)\}\right]\right\}}$$

then the smoothed values A', B', etc., are $A'=kA$; $B'=kAb'$; $C'=kAb'c'$; $D'=kAb'c'd'$; etc.

Sometimes, on taking out the ratios, it becomes evident that they should have a common value, since they shew no systematic progression. In such a case, let m denote the mean value, then the denominator $A+Ab+Abc+$ etc. in (290) becomes $A+Am+Am^2+$ etc.

Smoothing of this kind is serviceable for initial and terminal values.

9. **Logarithmic smoothing.**—In a similar manner quantities may sometimes be advantageously smoothed by smoothing their logarithms. In this connection we bear in mind that if a series of numbers are in geometrical progression their logarithms are in arithmetical progression. Let log A, log B, etc., be denoted by α, β, etc., which are graphed, and when smoothed denoted by α', β', etc. If the sum of A'', B'', etc., corresponding to the smoothed values, do not agree with that of the original values, k will be the factor of correction, and may be found as before, that is, by (290). This process may be called *logarithmic smoothing*, and like factorial smoothing, is often useful for initial and terminal values.

10. **On the difference between instantaneous and grouped results.**—When instantaneous results are smoothed the resulting smooth curve represents the equation which reproduces the values of y corresponding to given values of the abscissæ. When, however, group-results are smoothed by differencing, the resultant curve strictly represents the value of a group of the same base (supposed, of course, constant) with any central value throughout the range smoothed: see V., § 10. When, however, group results are few in number (that is, have relatively large bases) the graph must be drawn upon a different principle, viz., it must, as far as the probabilities of the case will admit, make the areas between bounded by the curve, the abscissæ, and the ordinates identical with the

[1] Arithmetically, *i.e.*, by difference, or mechanically, by splines, etc.

area of the group, or, in other words, the mean height of all the ordinates to the curve in any given range of the abscissa must be equal to the height of the group. That is, if h is the height of the group, then :—

$$(291).....h = \frac{1}{x_2 - x_1} \int_{x_1}^{x_2} f(x)\,dx.$$

$f(x)$ denoting the smoothed curve drawn.

This method may be called "*the method of equivalent group-values*," and it will, in general, either not depend on differencing at all, or depend thereon to a less extent than when the bases are relatively smooth and the groups numerous.

11. **Determination of the exact position and height of the mode.**— It is often desirable to ascertain with such precision as is possible the abscissa and height of the mode. Two approximate solutions are desirable, viz. :—(a) when the graph shews that *three groups* should be taken into consideration ; and (b) when *four* groups. In the former case (a) the formulæ are extremely simple ; in the latter (b) they are much less so. If more than four groups are to be taken into consideration it is better to determine the general equation of the curve and solve to obtain that value of x which makes $dy/dx=0$. As an approximate solution will be available from the graph, there is usually very little difficulty in obtaining an exact value of x. Then the corresponding value of y can be found from the equation: see V., §§ 3 to 7.

Case (a). In Fig. 35 let K denote the mean of the heights of the groups on either side of the maximum group and the height of this last, and let k be half the difference of the height of the groups on either side. Let also α denote the difference of the height of one group and the greatest group, and β similarly the difference of the height of the other group and the greatest group. Then

$$(292)..... K = \frac{1}{2}(\alpha+\beta);\ \text{and}\ k = \frac{1}{2}(\alpha \sim \beta).$$

Then a second degree curve, giving the same group values, gives the abscissa of the mode:—

$$(293).....\mu = \frac{\alpha}{\alpha+\beta};\ \text{and}\ \mu' = \frac{\beta}{\alpha+\beta}$$

and the height λ, of the mode, above the maximum group is

$$(294).....\lambda = \frac{1}{12}K + \frac{1}{4}\frac{k^2}{K}$$

If f, g, and h denote the heights of the rectangles we should have for the constants of the curve—

$$(295).....a = \frac{1}{6}(11f + 2h - 7g)$$

$$(295a)\ ....b = 3g - 2f - h$$

$$(295b)\ ....c = \frac{1}{2}(h+f) - g$$

the base of the curve being considered unity.

In the case (*b*), differences of height being as shewn in Fig. 36 the constants of the curve which must now contain dx^3 will be

$$(296)..a = \frac{1}{12}(\gamma + \gamma'); \; b = \frac{1}{12}(15\beta - \delta'); \; c = -\frac{3}{12}(\gamma + \gamma');$$

$$d = -\frac{2}{12}(3\beta - \delta')$$

a being reckoned from the point K, half-way between A and B to the point L, that is, to the curve.

The value of the abscissa of the mode is given by

$$(297)..x_m = -\frac{\gamma + \gamma'}{2(3\beta - \delta')}\left\{1 \pm \sqrt{\left(1 + \frac{2}{3}\cdot\frac{(15\beta - \delta')(3\beta - \delta')}{(\gamma + \gamma')^2}\right)}\right\}$$

The sign of the term under the radical can readily be determined in a practical example. The general expression for y_m is lengthy. In cases practically occurring we may compute it from x_m when that value is found: that is, it is

$$(298)..y_m = \frac{1}{12}\left\{\gamma + \gamma'(1 - 3x_m^2) + (15\beta - \delta')x_m - 2(3\beta - \delta')x_m^3\right\}$$

the ordinate being reckoned from the line parallel to the axis of abscissæ and half-way between the points A and B in Fig. 36, *i.e.*, the line MJ in the figure.

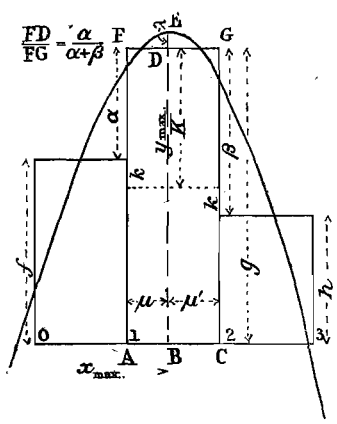


Fig. 35

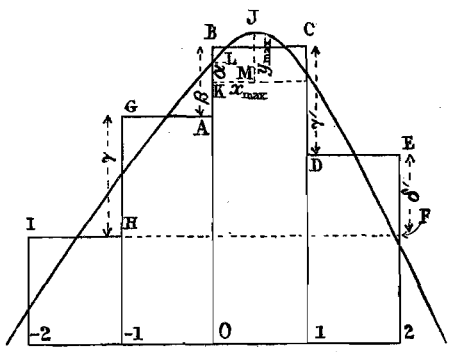


Fig 36.

The formulæ (293) and (294) and (297) and (298) are not quite satisfactory, and in general it is better to compute the coefficients of the equation which fits a considerable stretch of the curve, and find the position of the maximum by $dy/dx = 0$, if very great precision be required.

12. The testing of smoothed or graphic results.—When smoothed graphed results are obtained they will, in general, need, as already indicated, to be arithmetically tested. The fundamentals of arithmetical testing are the following :—

(i.) The sum of the graphed results should be sensibly (or exactly) equal to the sum of the original data ;

(ii.) The deviations, positive and negative, between the aggregate of the smoothed results and the data up to each given value of the argument should, consistently with the type of curve adopted, be a minimum ;

(iii.) The position and ordinate of the mode should be carefully fixed, and as well as the data will permit ;

(iv.) The position of the terminals should conform to the probabilities of the type of data so far as that can be determined.[1]

[1] In general, they cannot be determined mathematically. For example, the frequency of births of given ages, so far as mathematical relations are concerned, might be continued to start at the age 0, but in view of physiological considerations we should not be justified in starting at 0, but at, say, the age 11 ; similarly in regard to the terminal, which may be made to meet the axis of abscissæ for age 60 (or such later age as may be indicated as occurring, should satisfactory information be to hand).

VIII.—CONSPECTUS OF POPULATION-CHARACTERS.

1. **General.**—Thus far the consideration of the theory of population has been concerned only with its numerical aspect, and with the mathematical form of expressions under which it may be necessary to subsume the facts. These constitute an essential preliminary only. It remains now to consider in detail some of the various characters of importance.

Not only are population-statistics, in the narrower sense, significant both (i.) in themselves, and (ii.) in comparison, but so also are all facts that may properly be regarded as expressions of the various characteristics of a population. Following the nomenclature of biology, these may be called more briefly its *characters*. Such characters may relate to—

(*a*) *Vital phenomena*, that is, to birth, life and death, to reproduction in all its aspects, to disease and all the modes of its incidence ;

(*b*) *Anthropometry*, that is, may relate merely to the human form and its variations, or to its growth and decrepitude ,

(*c*) *Anthropology*, that is, they may refer to man's general evolution, both physical and psychical ;

(*d*) *Sociology*, that is, they may concern man in respect of his social life, an important element in which is his economic evolution, and they may concern also the reaction of this upon his numbers and the density of his aggregation.

(*e*) *Migration, aggregation, segregation, or wide dispersion, colonisation, etc.*, that is, the direction and velocity of movement of populations, the tendency to live in more or less dense groups (large cities or villages) or to spread over the earth, etc.

All these have significance in regard to the rate of development of the world's people. It is well to bear in mind, also, that population-characters may be in two forms, viz., either actual or potential.

The *importance* of the subject is seen in the impossibility of maintaining the present rate of increase for any great length of time (see II., § 34) ; and its range of subjects is best seen through a conspectus. Characters may be simple or complex, their manifestation may be instantaneous or durational ; and the evidence of their nature direct or derivative. The greatness of the range of population-characters, and the number of significant relations subsisting among them is so vast that *no statistical presentation of them can be exhaustive*. Thus important questions are continually arising involving demands for new statistical compilation, for human affairs can be properly analysed only with the aid of a well-founded and technically satisfactory statistic. The simplest population-characters are expressible in regard to units, as, for example, the numbers in a population ; the wealth possessed, etc. The complex

are those which involve multiple *fields* of comparison, for example, the number of one sex, who, being between given limits of age, and belonging to a given occupation, die of a particular disease.

That the number of comparisons possible is very great is obvious from the fact that n things considered in their mutual instantaneous relations, that is, n things considered each in relation to $1 \ldots\ldots n-1$ other things, are 2^n-1. The following table will shew the number possible up to $n=10$.

TABLE X.

No. of Elements in Combination	Elements of Original Statistical Data.									
1	1	2	3	4	5	6	7	8	9	10
2	..	1	3	6	10	15	21	28	36	45
3	..	..	1	4	10	20	35	56	84	120
4	..	..	..	1	5	15	35	70	126	210
5	..	..	..	..	1	6	21	56	126	252
6	..	..	..	..	..	1	7	28	84	210
7	..	..	..	..	..	..	1	8	36	120
8	..	..	..	..	..	..	..	1	9	45
9	..	..	..	..	..	..	..	..	1	10
10	..	..	..	..	..	..	..	..	..	1
Total possible combinations of elements	1	3	7	15	31	63	127	255	511	1023

The total possible for 12 is 4095, for 20 is 1,048,575.

There were, for example, 17 main questions to be answered in the Australian Census; thus there would be $2^{17}-1$ (viz., 131,071) possible tables by combinations of these results, and a considerable proportion of these would be of real significance.

2. **Characters directly given or derivative.**—Important characters are not always immediately yielded by the data: they are often to be ascertained only by analysis. Thus, as in the case of statistics generally, population statistics may be either

A. Direct, viz.:—		(or) B. Derivative, viz.:—	
A (i.) Instantaneous (numbers at a given moment). (Examples): No. of persons living; wealth possessed by them at a particular instant; etc., or	A (ii.) Durational (or number of occurrences during a unit of time). (Examples): Number of persons born, married, or deceased during a day, month, or year; etc.	B (i.) Instantaneous (numbers deduced representing a state of things for a given moment or epoch). (Examples): Masculinity at birth, or at a census; wealth possessed, per individual; expectation of life; etc., or	B (ii.) Durational (numbers deduced of occurrences during a unit of time). (Examples): Birth, marriage, or death-rates per day, month, or year; average wealth deduced from probate returns; etc.

The above indication of the nature of population statistic reveals the reason of its extent, which is much greater than is implied in the

number of mere combinations of different fields of statistic considered in their instantaneous relations alone.

3. **Characters in their instantaneous and progressive relations.**— The characters of a population are fully studied only when examined both in their instantaneous relations, and in the progression of these with time. Suppose, for example, that characters A and B both vary with time, and that such variation can be expressed by rational integral functions thereof; then the constant relation of the characters is given by

$$(299)\ldots\ldots \frac{B}{A} \equiv \frac{F_2(t)}{F_1(t)} \equiv \frac{a_2(1 + b_2 t + c_2 t^2 + \text{etc.})}{a_1(1 + b_1 t + c_1 t^2 + \text{etc.})}$$

$$= \frac{a_2}{a_1}\left[1 + (b_2 - b_1)t - \{b_1(b_2 - b_1) - (c_2 - c_1)\}t^2 + \text{etc.}\right]$$

approximately; or including the term in t^3, and writing

$$(300)\ldots\ldots \beta = b_2 - b_1;\quad \gamma = \frac{c_2 - c_1}{b_2 - b_1};\quad \delta = \frac{d_2 - d_1}{b_2 - b_1}$$

a result of greater precision is given by :—

$$(301)\ldots \frac{B}{A} = \frac{a_2}{a_1}\left[1 + \beta t\left\{1 - (b_1 - \gamma)t + \left[b_1(b_1 - \gamma) - c_1 + \delta\right]t^2 + \text{etc.}\right\}\right]$$

The successive coefficients, in nearly all practical examples, converge with sufficient rapidity to admit of the employment of the formula for even large values of t.[1]

Derived characters involve, as a rule, a greater complexity of change of relation with the lapse of time. Thus, for example, suppose a rate for *persons* is to be deduced from the rates for *males* and *females*, and suppose also that these do not change identically with the lapse of time (as, for example, a death or morbidity-rate for a particular disease). Suppose then that these rates for males and females are respectively :—

$$(302)\ldots\ldots m_t = m_0(1 + b_m t + c_m t^2 + \text{etc.});\ \text{and}$$

$$(303)\ldots\ldots f_t = f_0(1 + b_f t + c_f t^2 + \text{etc.})$$

Let us suppose that the ratio of the difference of the sexes to their sum, that is $(\text{M} - \text{F})/(\text{M} + \text{F}) = \mu$; or $(\text{F} - \text{M})/(\text{F} + \text{M}) = \phi$; and that the variation of this function with time is expressed by

$$(304)\ldots\ldots \mu_t = \mu_0(1 + \beta' t + \gamma' t^2 + \text{etc.});\ \text{and}\ \phi_t = -\mu_t;$$

then it will follow that the ratio p for persons will be

$$(305)\ldots p = \left(\frac{1}{2} + \frac{\mu}{2}\right)m + \left(\frac{1}{2} - \frac{\mu}{2}\right)f = \frac{1}{2}(m+f) + \frac{1}{2}\mu(m-f)$$

[1] Say, ordinarily at least to $t = 100$.

that is, it will be the mean weighted according to the relative numbers of males and females. The result may at once be written out from (302) and (303), and re-expressed is

$$(306)..p_t = \frac{1}{2}\Big\{\big[m_0+f_0+\mu_0(m_0-f_0)\big]+\big[m_0\{b_m(1+\mu_0)+\mu_0\beta'\}+f_0\{b_0(1-\mu_0)-\mu_0\beta'\}\big]t+\big[m_0\{c_m(1+\mu_0)+\mu_0(b_m\beta'+\gamma')\}+f_0\{c_f(1-\mu_0)-\mu_0(b_f\beta'+\gamma')\}\big]t^2+\text{etc.}\Big\}$$

From this it is obviously impossible to secure consistency among formulæ for persons, males, and females, where the variation with time of those for the two last is not identical, without complexity of expression. Moreover, when variations with time have to be considered, as well as many fields of comparison, not only do *general formulæ* become too involved to be of practical value, but also the number of relations necessary to exhaust the statistic becomes hopelessly large. For this reason it is often desirable to compute the coefficients for males, females and persons independently: if this be done with care *the involved inconsistency may be regarded as negligible.*

4. **Conspectus of the population-characters with which the ordinary census is concerned.**—In Section 1 of Chapter II. of the general Census Report, a classified statement and a brief review of the objects and uses of a census are given. These present, however, only one aspect of some of the leading characters of population. In the following conspectus a somewhat different and more extensive sketch of such of these characters as are capable of statistical measurement, and which constitute normal bases for comparisons, is furnished:—

A.—Numerical constitution of population at a given epoch in regard to

(i.) Sex, and (ii.) age;
(iii.) birthplace; and (iv.) length of residence in country of enumeration;
(v.) nationality; and (vi.) race;
(vii.) conjugal condition; (viii.) duration of marriage; and (ix.) size of family;
(x.) infirmity;
(xi.) degree of education; and (xii.) school attendance;
(xiii.) religion;
(xiv.) occupation—(*a*) designation; and (*b*) grade;
(xv.) dwellings—(*a*) material; and (*b*) number of rooms; (*c*) mode of occupancy; and (*d*) rental;
(xvi.) localisation.

In each case the statistical data initially represent the number of persons possessing the character or group of characters specified, as, for example, the number of persons having a family of a given size, the number of persons having a given duration of marriage.

In the case of dwellings the enumeration is twofold, and comprises, for example, the number of dwellings of a given material, as well as the number of persons living in dwellings of a given material.

B.—Relative constitution of population in respect of characters enumerated in A.

In this section are comprised *the ratios of the numbers possessing a given character or group of characters to the numbers possessing a wider range of such characters*, as, for example, the ratio of males under 21 years of age to the total population of all ages and of both sexes.

C.—Variations of population at different epochs.

This may involve merely variations in aggregate population, or may comprise variations in the numbers possessing any combination of the characters enumerated in A, or in the relative constitutions deduced under B.

D.—Mean population at a given period.

As in the case of C, this may involve merely the aggregate population or may comprise the mean population possessing any combination of the characters enumerated in A. The mean population for any unit of time represents the number of such units of human life lived by the population or section thereof under observation.

E.—Fluctuations of population during a given period.

These arise from :—(i.) Births (see F) ; (ii.) deaths (see G) ; (iii.) migration (see H).

F.—Births.

(*a*) The statistical data initially represent the number of births classed according to the following categories, taken either singly or in combination.

(i.) Whether live or still birth ; (ii.) sex of child ;
(iii.) whether born in wedlock or not ;
(iv.) age of father ; and (v.) age of mother ;
(vi.) birthplace of father ; and (vii.) birthplace of mother ;
(viii.) occupation of father ;
(ix.) duration of parents' marriage (see I.) ;
(x.) locality ; and (xi.) date of birth ;
(xii.) date of registration ; and (xiii.) position of child in family, *i.e.*, whether first, second, etc.
(xiv.) single or multiple birth.

(*b*) The derivative statistical results comprise, *inter alia*, particulars concerning the relations between

(i.) Live and still births ; and (ii.) nuptial and ex-nuptial births ;
(iii.) male and female births ;
(iv.) number of births and population from which derived,

These may involve merely the relation between total births and total population, or the relation between the number of births possessing any character or group of characters enumerated in F (*a*) and the appropriate subdivision of population from which derived. In the one case the result would be the crude birth-rate, or ratio of total births to total population, in the other it would comprise such results as, say, the nuptial birth-rate in a given area amongst fathers of a given age, birthplace, and occupation, who had been married for a given period. Similarly (i.), (ii.) and (iii.) may involve merely totals possessing the characters specified, or may relate to subdivisions possessing any character or group of characters enumerated in E: as, for example, the relation between live and still births amongst the nuptial male births of women of a given age and birthplace, who had been married for a given period.

G.—Deaths.

(*a*) The statistical data initially represent the number of deaths classed according to the following categories, taken either singly or in combination :—

(i.) Sex of deceased; (ii.) age; and (iii.) birthplace;
(iv.) cause of death, (*a*) primary, and (*b*) secondary;
(v.) occupation; (vi.) length of residence; and (vii.) locality;
(viii.) age at marriage and re-marriage;
(ix.) number of issue, according to sex, and whether living or dead;
(x.) date of registration.

(*b*) The derivative statistical results consist mainly of particulars concerning the relations between the number of deaths possessing any character or group of characters enumerated in G (*a*) and the appropriate subdivision of population from which derived, such, for example, as the death rate from a specified cause in a given locality amongst males of a given age, birthplace and occupation.

(*c*) As derivative results of the second degree may be classed such particulars as

(i.) Index of mortality; and (ii.) corrected death-rates;
(iii.) expectation of life; and (iv.) detailed mortality tables.

H.—Migration.

Complete statistical data would initially represent an enumeration of migrants classed according to the characters specified in A, with the exception of (xi.) length of residence; and (xv.) dwellings. Such detail is quite impracticable, and the main characters available in Australia are :—

(*a*) For traffic by sea :—

(i.) Sex; and (ii.) whether adult or child, or preferably exact age;
(iii.) port of embarkation; and (iv.) port of disembarkation;
(v.) nationality or race; and (vi.) date of migration.

(*b*) For land-traffic by rail :—

(i.) Sex ;

(ii.) state in which arrived ; and (iii.) from which departed ;

(iv.) date of migration.

(*c*) For land-traffic by road :—

Similar details as in (*b*).[1]

I.—Marriage.

(*a*) The statistical data initially represent the number of marriages granted in a given period classed according to the following categories taken either singly or in combination :—

(i.) Age of bridegroom ; and (ii.) of bride ;

(iii.) conjugal condition of bridegroom ; and (iv.) of bride ;

(v.) birthplace of bridegroom ; and (vi.) of bride ;

(vii.) occupation of bridegroom ; (viii.) locality ; and (ix.) date of registration ;

(x.) by whom celebrated ;

(xi.) ability of bridegroom to sign register ; and (xii.) of bride.

(*b*) The principal derivative statistical results are those concerning the relations between the number of persons married during a given period and possessing any character or group of characters enumerated in I (*a*) and the appropriate subdivision of the population from which derived, such, for example, as the marriage rate amongst bachelors of a given age, birthplace and occupation.

J.—Divorce.[2]

(*a*) Satisfactory statistical data would initially represent the number of divorces granted in a given period classed according to the following categories taken either singly or in combination :—

(i.) Age of husband ; and (ii.) of wife ;

(iii.) duration ; and (iv.) issue of marriage (*a*) males ; (*b*) females ;

(v.) locality ; and (vi.) birthplace of husband ; and (vii.) of wife ;

(viii.) occupation of husband ;

(ix.) sex of petitioner ; and (x.) cause of petition ;

(xi.) date of rule *nisi* ; (xii.) and of making rule absolute ;

(xiii.) by whom marriage was celebrated.

(*b*) The principal statistical results derivative from the foregoing would be relations between the numbers of persons divorced during a given period and possessing any character or group of characters enumerated in J (*a*), and the appropriate subdivision of the population from which derived, as, for example, the proportion of husbands of a given age, birthplace and occupation, who had been petitioners in granted divorce cases.

[1] In Australia this last information is not available.

[2] Complete statistics not available in Australia.

K.—Sickness and Accident.[1]

(*a*) Satisfactory statistical data initially represent the cases of disablement by sickness or accident occurring in a given period classed according to the following categories taken singly or in combination :—

(i.) Sex ; (ii.) age ; and (iii.) birthplace of person disabled ;
(iv.) cause of disablement ;
(v.) occupation ; and (vi.) locality ;
(vii.) date ; and (viii.) duration of disablement ;
(ix.) conjugal condition of person disabled ; and (x.) number of issue :
(xi.) whether or not disablement terminated by death.

(*b*) Derivative statistical results would consist mainly of relations between :—

(i.) cases and appropriate population ;
(ii.) cases of deaths.

(*c*) Derivative results of a second degree consist of sickness tables constructed from initial data.

5. **The range of the wider theory of population.**—The conspectus just given has obviously been limited to matters with which the census and ordinary vital statistics are more directly concerned. In a wide consideration of population, however, the characters of importance include a much larger range, embracing what has already been indicated in § 1, hereinbefore, viz., the anthropometric, anthropological, and sociological, including the economic. This has already been referred to : see I., § 6, iii. and iv., and II., §§ 13-18. Because of this fact, a complete theory of population must take account of (*a*) the reactions of eugenic facts and arrangements upon the numbers and mode of growth of the population of the entire world and of its constituent peoples, and (*b*) even of the reactions thereupon of all economic and social conditions, including those arising from mobility. This is seen when one contemplates the part played by modern facilities in transport and communication. Nor are the physical and psychical characters of the population less foreign to a complete theory. For the same reason there are aspects of subjects not directly enumerable as population facts, which have immediate touch therewith ; such, for example, as national, municipal and private wealth and their fluctuation, concentration and dispersion ; the productivity of such wealth, the economics of national and municipal revenues, expenditures, and administrations ; the productivity of private wealth, and, indeed, of wealth of all kinds ; the correlations between population-fluctuations and such financial characters as national liabilities ; the quantity and velocity of the circulation of currency ; the relations between primary and secondary production and population development ; the growth of institutions expressive of a deepening recognition of social solidarity in co-operative effort, and in the nationalisation of the greater public services, etc. And finally, it may be said

[1] Complete statistics are not available in Australia.

that all facts which throw any light whatever on the possibility of world-production of food supplies and the fluctuations of population with abundance or want belong to the wider theory of population, and demand appropriate mathematical investigation.

These wider facts are, of course, beyond the range of the narrow limits of ordinary official statistic, but no comprehensive view of the significance of a study of population is possible, which excludes the study of the reaction of material, psychical, or social conditions upon its growth and fluctuation.

6. **The creation of norms.**—The significance of statistical results is fully recognised only by comparisons with the similar results for other populations. Such comparisons are effected in the most general way by the creation of norms for each population-character. The principle which governs the constitution of a norm is that it shall represent the character selected on the widest possible basis. Thus, if statistical data existed for every population in the world, world-norms would be possible for every character statistically recorded. Western civilisation is fairly homogeneous and statistical data are available for many characters. Thus it should be practicable in the near future to create a series of norms for the greater part of the western world. These might be regarded as the *normal* or *usual* value of any character in question, with which the same character in any particular population may be compared. It is obvious in order to compare a series of populations the best basis is the average value of any character: furthermore, if a compared character is affected by the deviation of any other from the average the value of the norm and of the deviation therefrom furnish the best basis for necessary corrections.

The essential nature of a norm is perhaps best seen by regarding it as representing the characters of all the populations included, considered as a single population. Thus the deviation of the characters and any particular population about the secular changes therein of this great aggregate gives the most informative presentment of the position of the population in question, that can possibly be had: in short, it makes the scheme of comparison as broad as is possible.

7. **Homogeneity as regards populations.**—Two communities may be said to be homogeneous with regard to any series of characters, when those characters are identical. In comparisons between communities in regard to any one character, it is necessary, in order that the comparison should be a just one, that all other characters which have any influence thereupon should be identical; or, to put this more generally, the comparisons of any selected characters in a community are legitimate only when these communities are homogeneous with respect to all other characters which may have any influence on the comparison. For example, the birth-rates of two communities are immediately comparable if the relative numbers of married and single at each age are the same, because the birth-rate then (presumably) reveals the fertility under identical physiological conditions.

Since, however, different communities are more or less heterogeneous, appropriate schemes must be developed through which rigorous comparisons can be effected. Thus, for example, corrections may be applied in such a way that any character compared or contrasted will not be affected by difference of other characters.

The most convenient way of securing such a result is to adopt, as a basis for all comparisons, a population so characterised as to represent all others to be compared as nearly as possible. Such a population may be called a " normal " or a " standard" population, and any character in regard to which it has been standardised may be called a " norm."

8. **Population norms.**—In order that any character of a number of populations or communities may be conveniently compared, it will be necessary that whatever population be adopted as basis, it shall represent *each* as nearly as possible. It is easy to see that, in regard to any character under review, such a basis must be a *weighted mean*, so that the character adopted as basic shall be the character of the population formed by aggregating all populations which may have to enter into comparison. Thus if P, Q, R, etc., be populations, and p, q, r, etc., be the values of some one character in each, then the best basis of comparison is :—

$$(307)\ldots\ldots \frac{Pp + Qq + Rr + \text{etc.}}{P + Q + R + \text{etc.}} = \frac{Ss}{S} = s$$

S being the sum of $P + Q + R +$ etc., and s the *norm*.

It is immediately obvious that, in general, the secular changes of norms will be less marked than the secular changes in respect of the same character of the individual populations from which the norm is determined. For this reason it will be necessary for the progress of exact statistic to establish a *series of norms* for all elements the comparison of which are important. That is, we must adopt a standard or normal population of definite characters, or, in other words, create a series of population norms to serve as a basis for comparisons. The scheme then of com parison is to apply the ascertained attributes of each existing population to the standard population. This process will reveal what would have been manifested had each population been similarly constituted to the standard population.

9. **Variations of norms.**—Inasmuch as, in the present development of statistics, norms have not been created, except perhaps as regards the constitution of population of each sex according to age, it will suffice to indicate the outlines of a general method of studying the variation of norms. Since necessarily they can vary only slowly, a decennial determination will be probably always sufficient, and when a number of decennial changes are to hand, the investigation of their variation will become possible. Whether such variation will reveal any sign of periodicity or not it is at present impossible to say. It is not unlikely that periodic elements of variation will be found superimposed upon slow secular changes. This, however, must be left for the future to determine, and the appropriate method of analysis will depend upon the character of the data.

10. **Norm representing constitution of population according to age.**—A norm for males and one for females of European race is of importance for properly comparing death, marriage, birth and other rates. The use of such a norm was proposed by Dr. Ogle at the meeting of the "Institut International de Statistique," in Vienna, 1891, and the *index of mortality* at present used is based upon such a norm, though not a properly constituted one. The aggregation of the populations of a considerable group of countries between which also there is migration, removes the specialising influence of this latter element, and secures the general advantages of large numbers. The following results were obtained from combining the populations of England and Wales, Scotland, Ireland, the United States, the German Empire, Norway, Sweden, Italy, Canada, Australia, and Newfoundland generally for the censuses of 1900 or 1901.[1] The numbers are given in each age-group, and above a given age :—

TABLE XI.

Population Norms for 1900.

Age.	**European (1900).** Numbers in Age-Group in total of 10,000.			**India (1901).** Numbers in Age-Group in total of 10,000.			Age.	**European (1900).** Numbers at and above age indicated.		
	Males.	Females.	Persons.	Males.	Females.	Persons.		Males.	Females.	Persons.
0	270	263	266	266	276	271	0	10,000	10,000	10,000
1–4	971	953	962	988	1,063	1,025	1	9,730	9,737	9,734
5–9	1,139	1,119	1,129	1,394	1,382	1,388	5	8,759	8,784	8,772
10–14	1,057	1,038	1,047	1,264	1,081	1,174	10	7,620	7,665	7,643
15–19	975	980	977	866	835	851	15	6,563	6,627	6,596
20–24	915	931	923	787	892	838	20	5,588	5,647	5,619
25–29	808	813	810	879	894	887	25	4,673	4,716	4,696
30–34	715	705	710	848	851	850	30	3,865	3,903	3,886
35–39	640	624	632	609	557	583	35	3,150	3,198	3,176
40–44	563	550	557	648	652	650	40	2,510	2,574	2,544
45–49	470	463	467	370	339	355	45	1,947	2,024	1,987
50–54	413	417	415	437	452	445	50	1,477	1,561	1,520
55–59	331	344	337	177	169	173	55	1,064	1,144	1,105
60–64	272	290	281	254	303	278	60	733	800	768
65–69	197	212	205	66	79	72	65	461	510	487
70–74	136	150	143	76	91	84	70	264	298	282
75–79	79	88	84	27	32	29	75	128	148	139
80–84	36	43	39	30	35	33	80	49	60	55
85–89	10	13	12	5	6	5	85	13	17	16
90–94	3	3	3	6	7	6	90	3	4	4
95–	1	1	1	3	4	3	95	1	1	1
Total ..	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000

[1] See "The determination and uses of population norms representing the constitution of populations according to age and sex, and also according to age only." By G. H. Knibbs, and C. H. Wickens, Trans. 15th, Int. Congr. Hygiene and Demography, Washington. Vol. VI., pp. 352-378.

11. **Mean age of population.**—The mean age, x_m, of a population is given by the formula

$$(308)\ldots\ldots x_m = \frac{\int_0^\omega x l_x dx}{\int_0^\omega l_x dx} = \frac{1}{2} + \frac{\Sigma_0^\omega x L_x}{\Sigma_0^\omega L_x}, \text{ approximately.}$$

l_x denoting the relative frequency at the age x, ω the greatest age attained or considered, and L_x the number of age x last birthday, it being assumed that this number may, on the average, be regarded as of age $x + \frac{1}{2}$. Omitting the $\frac{1}{2}$, this last expression really gives the correct *mean age last birthday*. The *mean age next birthday*, x_n, of a population under the age n is

$$(309)\ldots\ldots x_n = \frac{nL_{n-1} + (n-1)\,L_{n-2} + \ldots\ldots + L_0}{L_{n-1} + L_{n-2} + \ldots\ldots\ldots + L_0}$$

From this formula it is evident that, with a table giving the number at and above each integral age, all that is requisite to obtain the mean age next birthday is to divide the total population into the sum of the numbers from the youngest to the oldest ages. Deducting $\frac{1}{2}$ gives the usual approximation to the mean exact age, while a deduction of unity gives the mean age last birthday.

The mean age in years of the normal or standard population is, for 1901 :—

Males.	*Females.*	*Persons.*
26.934 years.	27.341. years.	27.148. years.

This mean age is, of course, *not* what is known actuarially as the *expectation of life at age* 0, but is the average age of all persons living at a given moment, or, in other words, it is the average past lifetime of the population at a given moment. On the other hand, the expectation of life at age 0 is the average future lifetime of all persons born. In the case of a *stationary population*, however, with rates of mortality varying with age, but remaining constant for each age through a great length of time, the average past lifetime of the population at a given moment is equal to its average future lifetime, that is, the average age of the population is equal to the average "expectation of life" of the population as a whole.[1] Thus for the population of Europe in 1901 persons had lived on

[1] The expectation of life e_x° of the $l_x\,dx$ persons of the exact age x is the future lifetime T_x of these, divided by their number, that is—

$$e_x^\circ = \int_x^\omega l_x\,dx \,/\, l_x = T_x \,/\, l_x$$

and consequently the total future lifetime of these $l_x\,dx$ persons is

$$e_x^\circ\, l_x\,dx = l_x\,dx\, T_x \,/\, l_x = T_x\,dx$$

Hence the total future lifetime of the whole existing population between 0 and ω is

$$\int_0^\omega e_x^\circ\, l_x\,dx = \int_0^\omega T_x\,dx$$

and as a whole existing population is $\int_0^\omega T_x\,dx$, the average future lifetime or expectation of life of the whole existing population is $\int_0^\omega T_x\,dx \,/\, \int_0^\omega l_x\,dx$, which may be shewn to be equivalent to $\int_0^\omega x l_x\,dx / \int_0^\omega l_x\,dx$, or the mean age.

the average about 27 years. The expectation of life changes with the lapse of time, and is appreciably lengthening. Thus the secular change of the norm will be the weighted average of the changes of the constituent populations.

12. **Population norm as a function of age.**—The number of persons, Y, at and above the age x may be closely represented by

$$(310)\ldots. \quad Y = k\alpha^{\alpha^x}\beta^{b^x} = 52674\,(0.99961)^{1.10808^x}\,(0.18998)^{1.01495}$$

which is a development of the Gompertz-Makeham type of formula. The constants indicated fit very closely the values of the norm given in preceding table.[1] This matter will be dealt with more fully hereinafter.

[1] For solution, vide op. cit. pp. 364-7.

IX.—POPULATION IN THE AGGREGATE, AND ITS DISTRIBUTION ACCORDING TO SEX AND AGE.

1. **A Census and its results.**—A well-conducted Census furnishes results which are substantially correct so far as the aggregate number of persons and the aggregate number of each sex is concerned. That is, if p, m and f denote the *errors* of the numbers of persons, males and females respectively, and P, M and F their respective aggregates, then p/P, m/M and f/F are all extremely small quantities, which can have no important bearing upon the general theory, or upon any deductions flowing from it. Unfortunately this is not true regarding the numbers of either sex between given age-limits.

In Chapter X of the Census Report, it has been shewn that for Australia the Census results bear intrinsic evidence of great improvement in regard to accuracy of statement respecting age ; see §§ 3 and 5. The nature of this is shewn in the tables given of numbers and percentages for the ages 28, 29 . . . . 32, and 48, 49 . . . . 52. The excessive statements, for example, for the ages 30 and 50, became markedly less. The results were as follow :—

Census	Age.	1891.	1901.	1911.	1911(adjusted).
Percentage of age-quinquennium including two years on either side ..	30	23.35	22.98	20.90	19.96
	50	29.06	25.77	21.75	20.16

A glance at Figs. 37 and 38 hereinafter will shew that the curves of numbers according to age for ages 30 and 50 do not depart very much from a straight line. For the former age the curves are concave upward ; for the latter, convex upward. Hence at 30 the mean should be somewhat less, and at 50 somewhat more, than 20 per cent. The ratio determined from the smoothed results are shewn in the final column. We shall consider the question of smoothing the results later.

For each it is seen that the numbers for the ages in question were excessive, enormously so for 50 years of age, in the 1891 Census. The error, however, was diminished for the Census of 1911, probably largely in

consequence of a special attempt to ensure the population appreciating the necessity for accuracy.[1] It may be said, however, that statements of age leave much to be desired.

2. **Causes of misstatement of age.**—Many people are so indifferent as regards their age that they are really unaware what it is, and for this reason tend to assign round numbers (viz., ages ending with the figure 0 or the figure 5), as roughly expressing about their ages. In the case of persons approaching 21 years of age, what may be called "matrimonial reasons" exist for an overstatement, and this may continue to operate for a year or two. In the case of females the tendency to overstate the age is, on the whole, negative for a considerable period of life.[2] For the older ages, however, there is probably a distinct tendency in the opposite direction.[3]

3. **Theory of error of statement of age.**—Assuming both a tendency to express in round numbers ending in 0 and 5, an age not accurately known, and also particularly in the case of females some tendency to understate age, except for ages above, say, 60, we ought in general to find the following characters in the crude results of a Census, viz. :—

(i.) In smoothing the crude results so as to conform to the general trend, the results for ages ending in 0 have to be considerably reduced ; while those ending in 5 have to be reduced a somewhat smaller amount.

(ii.) The amounts of the corrections for ages above and below the round numbers on the whole shew some asymmetry, though at the same time, owing to the masking effect operating in ages so close as $x + 0$ and $x + 5$, this character is not definite.

(iii.) The curves for males and females exhibit systematic differences of form due to systematic misstatement.

Figs. 37 and 38 shew the graphs of the numbers for each year from 0 to 100, for the Australian Commonwealth. It will be seen from these that, for a population profoundly affected by migration, no systematic difference of form actually exists of sufficient magnitude to unmistakably indicate systematic misstatement of age. The marked tendency to give ages ending with the figure 0 is, however, very evident, so also that to give ages ending with the figure 5 is also fairly clear.

[1] Where the official administration of a community is sufficiently systematic to require every one to keep a *card of identification*, it is easy to get correct answers to this and similar questions. The public appreciation of the importance of correct answers is regrettably deficient.

[2] For matrimonial and economic reasons, and even reasons not entirely dissociated with personal vanity ; the two latter reasons also operate in the case of males, but to an appreciably lesser extent.

[3] Certain investigations shew that vanity concerning longevity is not wholly absent in either sex.

AUSTRALIA, 1911.

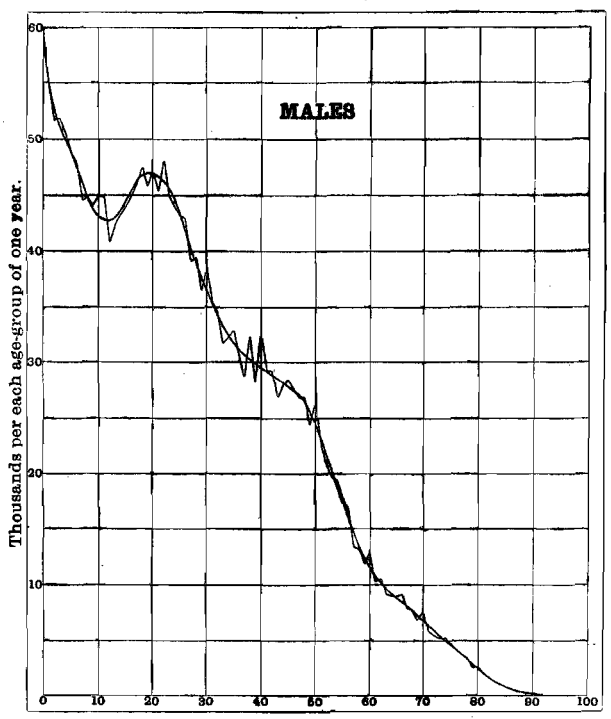


Fig. 37.

AUSTRALIA, 1911.

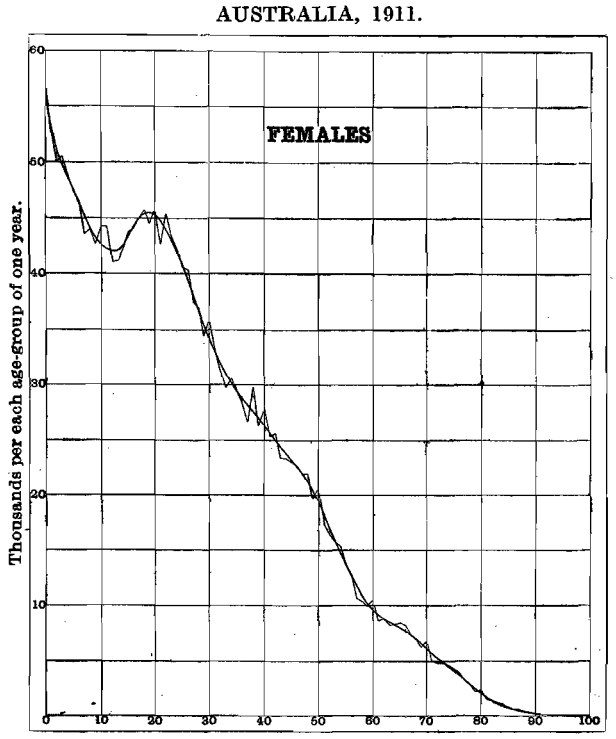


Fig. 38.

The curves in Figs. 37 and 38 are interpreted in the following way, viz. :—The ordinate or vertical distance to the curve at any point represents in thousands the number of males (or females) in the age-group of one year, commencing at the age in question. The zig-zag line denotes the results furnished immediately by the Census, and the curve the smoothed (and more probably correct) results.

4. **Characteristics of accidental misstatements, and their fluctuations.**—The Censuses of the various States of Australia never having been combined, it was desirable to compile the three preceding Censuses, viz., those for 1881, 1891, 1901, in order to deal thoroughly with that of 1911. The results were not in age-groups for single years for 1881, but were for the later Censuses. In doing this it was found on inspecting the graphs for 1891, 1901 and 1911, of the numbers enumerated for each age, that in the statements of age there were tendencies to concentrate on certain ages, and to avoid certain others. In order to definitely examine these tendencies a tabulation was made of the data in respect of the unit figure in the year of age stated in Australia at the Censuses of 1891, 1901 and 1911. To enable an estimate to be made of the degree of error involved in these statements of age, the smoothed results were similarly tabulated according to the unit figure in the year of age, and the ratio of the former set of results to the latter was obtained for each sex and each unit figure. The results should, of course, be unity if the errors balanced, or had no tendency in any direction.

The ratios so obtained are as follows :—

Table XII.—Ratio of Number Recorded to Adjusted Number, Censuses 1891, 1901, 1911, Australia.

Year of Census	Unit Figure in Age Last Birthday—									
	0	1	2	3	4	5	6	7	8	9
MALES.										
1891 ..	1.1388	.9167	1.0088	.9545	.9969	1.0366	1.0207	.9513	1.0055	.9532
1901 ..	1.1044	.9369	1.0072	.9677	.9809	1.0343	1.0134	.9636	1.0144	.9667
1911 ..	1.0485	.9956	.9944	.9787	.9990	1.0085	1.0097	.9691	1.0191	.9695
FEMALES.										
1891 ..	1.1251	.9288	.9978	.9848	.9943	1.0077	1.0117	.9640	1.0125	.9558
1901 ..	1.0926	.9270	1.0039	.9861	.9979	1.0106	1.0128	.9708	1.0165	.9738
1911 ..	1.0367	.9895	.9935	.9895	1.0056	1.0050	1.0066	.9770	1.0148	.9760

The outstanding indications furnished by this table are for both sexes

(i.) A marked tendency to concentrate on ages ending in 0.
(ii.) A less marked but persistent tendency to concentrate on ages ending in 5, 6 and 8.
(iii.) A marked tendency to avoid ages ending in 1, 3, 7 and 9.
(iv.) A tendency to state ages ending in 2 and 4 with fair accuracy, concentrations and avoidances being in evidence, but relatively small in respect of these ages.

The table also furnishes an indication of the *increasing accuracy of statement of age* at successive Censuses, the excess at ages ending in 0 having fallen from 13.88 per cent. in 1891, to 4.85 per cent. in 1911, in the case of males, and from 12.51 per cent. in 1891, to 3.67 per cent. in 1911, in the case of females.

Another interesting feature of the results is the evidence furnished that *inaccuracy of statement is more marked amongst males than amongst females*. Thus, for the Census of 1891 the mean deviation from unity (irrespective of sign) of the above ratios was .0438 for males, as against .0332 for females. The corresponding figures in 1901 were .0358 for males, as against .0281 for females, and in 1911 they were .0181 for males, as against .0143 for females.

ENGLAND AND WALES, 1911.

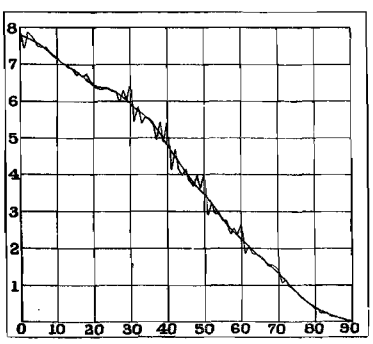


Fig. 39.

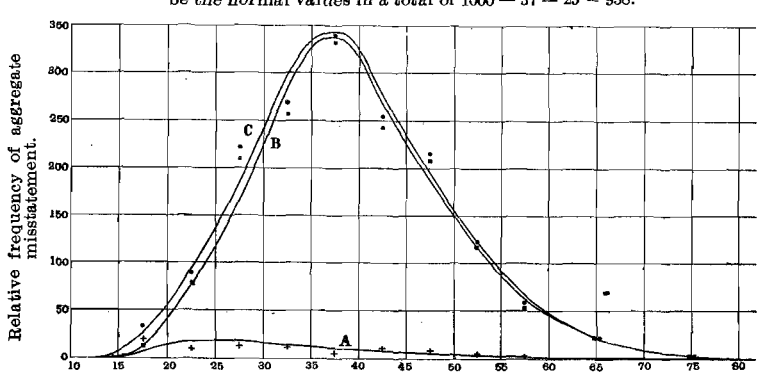
Another remarkable feature, worthy of attention, in the population-graphs for Australia, as compared with those of England and Wales, is the similarity of the features for ages 37, 38, 39, and 40, viz., in the graphs for "males" and for "females" of the former, with that for "persons" for the latter country. There is also some similarity at ages 50 and 60, due to excessive numbers for the ages ending in 0; see Fig. 39.

5. **Characteristics of systematic misstatement.**—It having been ascertained that in some cases the ages given in the Census cards were not correct, notwithstanding the explicit directions, persons who made misstatements were invited to send in corrections. Out of over 7000 received, 1660, containing definite information as to the age given and the amount of misstatement of age in the case of females, were tabulated in age-groups, and according to the number of years the age had been misstated. Of these, one-half (830) were for the State of Victoria, and the balance of 830 for the State of New South Wales. The tabulated results were as follows :—

Table XIII.—Analysis of 1660 Cases of Misstatements of Age at Census of 1911, Australia.

Correction in Years.		Correct Age.												No. per 1000.	
		Under 20	21 to 25	26 to 30	31 to 35	36 to 40	41 to 45	46 to 50	51 to 55	56 to 60	61 to 70	Over 70	Total.	% Crude.	Smoothed.
Over-statements	Over 5 ..	2	—	—	1	1	2	1	—	—	—	—	7	79	19
	5 ..	1	—	1	—	—	—	—	2	—	—	—	4	45	64
	4 ..	3	1	—	1	—	1	1	—	—	—	—	7	79	96
	3 ..	5	3	2	1	1	2	1	2	—	—	—	17	191	146
	2 ..	4	—	1	4	1	1	1	1	1	—	—	14	157	226
	1 ..	5	6	8	5	3	5	4	1	2	1	—	40	449	449
Total ..		20	10	12	12	6	11	8	6	3	1	—	89	1000	1000
Smoothed ..		5	17	18	14	11	8	6	4	3	2	1	89	=53.6	
Understatements	1 ..	10	55	80	56	72	49	41	22	9	6	1	401	255	255
	2 ..	2	21	62	62	87	48	54	22	5	9	—	372	237	193+37*
	3 ..	1	4	36	48	45	37	27	17	11	5	—	231	147	145
	4 ..	—	—	18	26	49	23	19	11	9	9	1	165	105	107
	5 ..	—	—	8	30	23	26	23	9	3	4	—	126	80	79
	6 ..	—	—	5	13	21	20	13	11	6	3	3	95	60	58
	7 ..	—	—	1	7	10	8	9	4	1	1	1	42	27	41
	8 ..	—	—	1	6	7	8	8	3	4	—	—	37	24	27
	9 ..	—	—	—	2	4	4	1	5	2	2	—	20	13	18
	10 ..	—	—	—	6	13	16	9	10	3	6	—	63	40	11+25*
	11–15	—	—	—	—	2	2	5	3	1	1	—	14	9	3
	Over 15	—	—	—	1	—	2	—	—	1	—	1	5	3	1
Total ..		13	80	211	257	333	243	209	117	55	46	7	1571	1000	1000
Smoothed ..		13	77	168	284	337	268	189	120	64	44	7	1571	=946.4	
Grand Total ..		33	90	223	269	339	254	217	123	58	47	7	1660		
Smoothed ..		18	94	186	298	348	276	195	124	67	46	8	1660	=1000	

* The abnormality is about 37 in the one case, and 25 in the other. The 193 and 11 would be the normal values in a total of 1000 — 37 — 25 = 938.



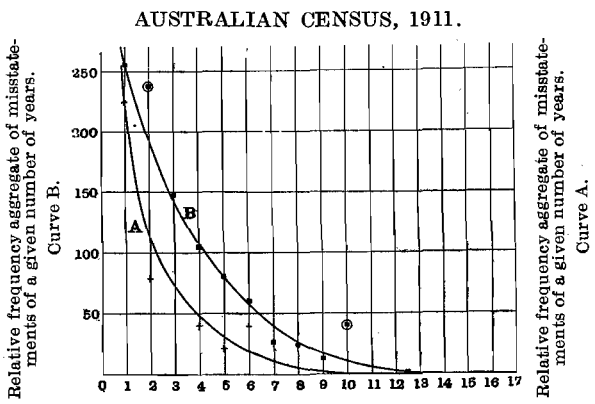
Relative frequency of Overstatements (A) and Understatements (B) of age with females according to true age.

Fig. 40.

In the above table, the results of which are shewn in Figs. 40, 41 and 42, the "smoothed" figures for the *aggregate number of overstatements according to age* probably very closely represent the tendency in general: the results, however, for under 20 years of age appear to be unduly large. The smoothed results for the *aggregate of understatements according to age* indicate the probable tendency in general. The smoothed result for the *total number of misstatements* (over and under) *according to age* are merely the sum of the preceding. The crosses, squares and circles

represent the age-group aggregates for overstatements, understatements and total misstatements, respectively. These results are shewn respectively by curves A, B and C in Fig. 40.

The smoothed results of the *aggregate number of overstatements according to the amount of overstatement* (see the vertical column at the right hand side of the table) probably represent the distribution, but the aggregate 89 is so small that it can be regarded only as a rough indication. The graph of this is curve A of Fig. 41.



Curve A denotes overstatement; curve B denotes understatement.

Fig. 41.

The smoothed result of the *number of understatements according to the amount of understatement*, is probably represented by the final column in the table. In this, however, the abnormality of understatements of 2 and 10 years is very striking. The graph is curve B of Fig. 41, and the abnormal position for 2 and 10 year understatements is shewn by the small squares with circles surrounding. This abnormality is probably on the whole real; that is to say, misstatements of 2 and 10 years had a real predominance over the number which might have been expected according to a probable law of frequency based upon misstatements of other amounts (say, a frequency varying inversely as some power of the magnitude of the misstatement).[1] At the same time it is also possible that in part it represents defects in the *allegation* as the amount of misstatement.

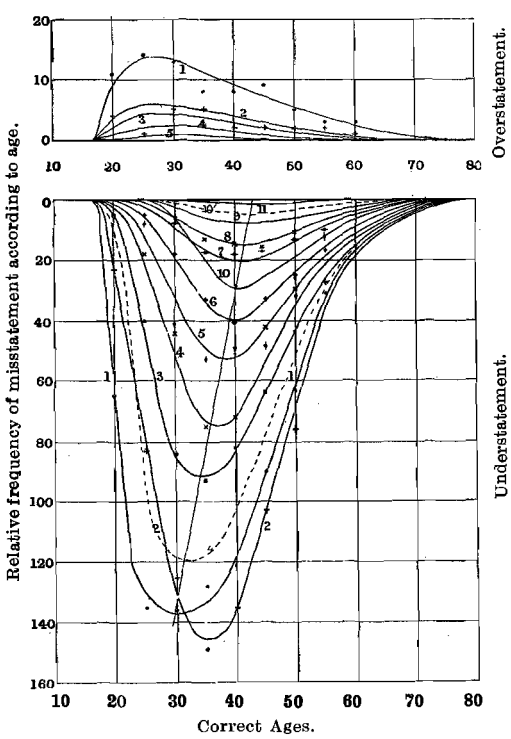
6. **Distribution of misstatement according to amount and age of persons.**—By forming a series of 10-year groups from Table XIII., with the central ages 20, 25, 30, etc. (completed years), and plotting these as ordinates, some idea is obtained of the form of the function representing the *relative* frequency of misstatement according to both age and magnitude of misstatement. Curves are then drawn among these positions, the results shewn on Fig. 42 being thus obtained. The families of curves are obviously fairly regular, and are skew. The positions of the ordinate-terminals, obtained as described, are shewn in the following way. The

[1] In a Census the frequency is for integral amounts of misstatement only.

character of the mark denoting the terminal of the ordinate for a misstatement of 1 year is a dot ; for 2 years a vertical cross ; 3, a square ; 4, a slanting cross ; 5, a circle and vertical line ; 6, a lozenge ; 7, a circle and horizontal line ; and 8, a slanting cross. After the age 55 the results are rather irregular.

The broken lines for understatements of 2 years and 10 years shew what may be regarded as the "normal" positions. That is, had there been no peculiar predominance in the adoption of ages differing by these amounts from the true age, the frequency curve would have been found in about the position of these broken lines. They are numbered with light-faced figures.

The frequency of misstatement according to age, as indicated in Table XIII. and Fig. 42, refers to the number actually existing in the age-groups, for which Table 18 of Part I. of the Australian Census may be consulted (pp. 32-33). To ascertain the frequency for equal numbers of females a correction is necessary, viz., division of each result by the number in the age-group to which it refers.



The figures on the curves denote the amount of misstatements in years.

Fig. 42.

Although over 7000 acknowledgments of misstatements of age were received, mostly from women, the proportion these bore to the aggregate number of misstatements was not ascertainable, and after a study of other errors revealed by the zigzag character of the enumerated age-groups, it was decided to regard the characteristic misstatement as sensibly negligible. The absolute scale of the frequency is not known, since the total number of misstatements could not be inferred. Nevertheless its form is important as throwing light upon the relative frequency of misstatements of different amounts by women of different ages. The result may be summed up as follows :—

The analysis of acknowledged misstatements shewn in the table gives the following indications (of course for females only) :—

(i.) Understatement of age constitutes 94.64 per cent., and overstatement 5.36 per cent. of the aggregate cases of misstatement.

(ii.) Excepting in the case of understatements of 2 years and 10 years, which are evidently abnormal, the frequency of misstatement diminishes with the number of years misstated, at first very rapidly and later more slowly.

(iii.) The greatest frequency of understatement of all amounts corresponds to the age of about $37\frac{1}{2}$ years.

(iv.) The age corresponding to the greatest frequency of understatement of a given number of years increases with the amount of understatement approximately in the ratio of about $1\frac{1}{4}$ years for every year of understatement, except in the case of 2 and 10 years.

(v.) The frequency of understatements of 2 years is about 1.2 times that which would accord with the general tendency to understatement ; and the maximum is for the age of about 35 years.

(vi.) The frequency of understatement of 10 years is about 3.3 times that which would accord with the general tendency to understatement ; and its maximum is for the age of about 30 years.

While these indications, being based upon only 1660 investigated cases, have limited validity, they are probably substantially correct. An insufficient number of returns were received from males to draw any deductions as to the frequency of misstatement according to age and amount of misstatement.

For *correction* purposes misstatements regarding age are best tabulated according to the *age declared* ; on the other hand, for the expression of the measurement of misstatement they are better tabulated according to the *true age*. Since probably by far the greater number of persons give their age correctly, it is probably desirable to regard the curves for overstatement and understatement as discontinuous at the value zero.

7. **The smoothing of enumerated populations in age-groups.**—The generalities of smoothing have been partially dealt with in VII., hereinbefore ; see particularly §§ 1–9. Figs. 37 and 38 shew the graphs of the enumeration in age-groups of the Australian Census of 1911 ; obviously these are not the true results. It is obvious that the " smoothed" curve must be of higher accuracy than the zig-zag results, since there are strong reasons for believing that the numbers are sufficiently large to give a " smooth curve." The following principles may be taken as a guide in smoothing :—

(i.) Any smoothed curve so drawn as to equalise the zig-zag results (doubtless) better represents the facts than the original data.

(ii.) The drawing of the smoothed curve can be assisted by arithmetical and algebraic devices.

(iii.) The adoption of a particular position for the smoothed curve must be governed not only by mathematical considerations, but by the probabilities of each particular case.

(iv.) If arithmetic or algebraic methods are employed, they should be such as do not involve systematic error.

(v.) The accumulations of error at all ages should be as small as possible, and therefore should frequently change in sign, and the grand total should be approximately (or exactly) the enumerated total.[1]

The method of smoothing by drawing a curve fulfilling the conditions indicated is known as the *graphic method*. Before considering it further, we shall examine the essential character of smoothing by grouping, and the limitations of smoothing by grouping methods. First, we consider the error introduced by mere means of aggregates.

8. **The error of linear grouping.**—If a series of points lie on a curve say, *convex upwards*, their mean, weighted or otherwise, will obviously lie *below* the curve, that is, x'_m, y'_m, denoting the mean of the co-ordinates, and w the weight assigned to any point, the point having these co-ordinates, viz. :—

$$(311)\ldots\ldots x'_m = \frac{\Sigma(wx)}{\Sigma w}\ ;\quad y'_m = \frac{\Sigma(wy)}{\Sigma w}$$

will, in the case supposed, be below the curve. If the original points lie on a straight line, the point will, of course, be on that line. Graphically, the point may be determined for equal weights thus :—

Let P, Q, R, S, etc., be any points : the point midway between P and Q is the mean of P, Q ; the point one-third of the distance of this mean from R, towards R, is the mean of P,Q,R ; and, similarly, that one-fourth of the distance of this last toward S, is the mean of P,Q,R,S ; and, in general, the mean of n points is $1/n$th of the distance of the mean of $(n-1)$ points towards the nth point.

It follows from this that when n values are taken of any quantities, which, being graphed, are found to lie, not upon a straight, but upon a curved line, then the mean of the independent variable (or argument) does not correspond to the mean of the dependent variable (or value of the function) unless the points representing them are all symmetrically situated about the middle point. Thus, if we have the numbers in a population at, say, ages 50 to 55, the mean does not correspond to the age 52. We proceed to consider the magnitude of the systematic error involved.

[1] Exact correspondence is neither essential nor extremely desirable, but as it is easy to secure, there is no reason why it should not be insisted upon. A simple way of securing it is to multiply each group-result by a correcting factor, viz., in VII., § 7, herein.

If we suppose the results to be representable by the equation $y = A + Bx + Cx^2 +$ etc., and take points on either side of the middle so that the correct value of y is A, we readily derive the following expressions shewing the errors of ternary, quinary, and larger groupings:—

$$(312)\ldots\ \frac{1}{3}\Sigma y = A + \tfrac{2}{3}\ Ck^2 + \tfrac{2}{3}\ Ek^4 + \text{etc. (ternary).}$$

$$(313)\ldots\ \frac{1}{5}\Sigma y = A + 2\ Ck^2 + 6\tfrac{4}{5}\ Ek^4 + \text{etc. (quinary).}$$

$$(314)\ldots\ \frac{1}{7}\Sigma y = A + 4\ Ck^2 + 28\ Ek^4 + \text{etc. (septenary)}$$

$$(315)\ldots\ \frac{1}{9}\Sigma y = A + 6\tfrac{2}{3}\ Ck^2 + 78\tfrac{2}{3}\ Ek^4 + \text{etc. (nonary).}$$

$$(316)\ldots\ \frac{1}{11}\Sigma y = A + 10Ck^2 + 178\ Ek^4 + \text{etc. (undecenary).}$$

If the number of terms in the groups be denoted by n, the law of increase in the numerical coefficients, γ say, of C and ϵ of E is as shewn hereunder:—

$$(317)\ldots\ldots\ldots \gamma C = \frac{1}{12}(n^2 - 1)\ C.$$

$$(318)\ldots \epsilon E = \left\{-\frac{1}{30}(n-1) + \frac{1}{30}(n-1)^2 + \frac{1}{20}(n-1)^3 + \frac{1}{80}(n-1)^4\right\} E$$

The latter may be put in the more concise form in (319) hereunder. Hence the error of a simple mean is shewn in the most general form by the following expression, viz.:—

$$(319)\ldots\ \frac{1}{n}\Sigma y = A + \frac{1}{12}(n^2-1)Ck^2 + \frac{1}{240}\left\{(n^2-1)(3n^2-7\right\} Ek^4 + \text{etc.}$$

The values of Ck^2, Ek^4, etc., can be very readily expressed in terms of the ordinates to say the roughly smoothed curve. Thus, using accents to denote ordinates symmetrically situated on either side of the middle (unaccented) ordinate, we have—

$$(320)\ldots\ldots\ \frac{1}{3}(\eta_{,} - 2\eta + \eta') = Ck^2 + Ek^4 + \text{etc.}$$

$$(321)\ldots\ldots\ \frac{1}{5}(\eta_{,,} + \eta_{,} - 4\eta + \eta' + \eta'') = 2Ck^2 + 6\frac{4}{5}\ Ek^4 + \text{etc.}$$

We may therefore from the above equations obtain the value of y, free from the systematic error due to curvature. Thus

$$(322)\ldots\ldots y_0 = \frac{1}{3}\left\{\Sigma y - (\eta_{,} - 2\eta + \eta')\right\}$$

and from (313) and (321)

$$(323)\ldots\ldots y_0 = \frac{1}{5}\left\{\Sigma y - (\eta_{,,} + \eta_{,} - 4\eta + \eta' + \eta'')\right\}$$

for ternary and quinary groupings respectively. These correction-terms in the inner brackets are, as a rule, very small.[1]

[1] To reduce the arithmetical work any one number may be taken from each of the values of η.

The repeated application of any system of grouping leads to more highly smoothed results, but is unobjectionable only if freed from systematic error. It, however, even then, *never* wholly removes the vitiating influence of a value which is seriously defective or excessive.

It is easy to build up from the preceding formulæ a system of coefficients by means of which the repeated groupings can be performed in one operation. Thus, each ordinate being assumed to have equal weight, we have for repetitions of ternary groupings—

Table XIV.—Coefficients for Repeated Grouping.

No. of Repetitions.	Factor.	Resulting Grouping.	Weights to be Applied to Co-ordinates.										
0	$\frac{1}{3}$	Ternary					1	1	1				
1	$\frac{1}{9}$	Quinary				1	2	3	2	1			
2	$\frac{1}{27}$	Septenary			1	3	6	7	6	3	1		
3	$\frac{1}{81}$	Nonary		1	4	10	16	19	16	10	4	1	
4	$\frac{1}{243}$	Undecenary	1	5	15	30	45	51	45	30	15	5	1

The scheme of deriving these is evident.[1] In the same way it is necessary to build up also the scheme of corrections from (314), (315), etc.

9. **Graphic process of eliminating systematic error.**—A simple approximate method of graphically eliminating the systematic error indicated in the preceding section is based on the fact that the distance k between the mean of a series of n ordinates on a parabolic curve and the vertex of the curve is given in Table XV hereunder.

Table XV.—Position of Mean of n Points.

Number (n) of points on curve .. n =	3	4	5	6	7	9	11
Proportional distance of mean of the ordinates from centre of chord towards vertex of curve: k =	$\frac{1}{3}h$	$\frac{4}{9}h$	$\frac{1}{2}h$	$\frac{8}{15}h$	$\frac{5}{9}h$	$\frac{7}{12}h$	$\frac{3}{5}h$
k =	$.33h$	$.44h$	$.50h$	$.53h$	$.55h$	$.58h$	$.60h$

the height h being the distance from the middle of the chord to the vertex. Thus, if a series of means of n ordinates are plotted, and a curve be drawn through them, this series can be taken to give an approximate guide to

[1] Thus, $1 \cdot 2 \cdot 3 \cdot 2 \cdot 1 = \dfrac{1 \cdot 1 \cdot 1}{1 \cdot 1 \cdot 1}; \dfrac{1 \cdot 1 \cdot 1}{1 \cdot 1 \cdot 1}$

the shape of the true curve. A section of double the stretch being then taken[1] the interval between the chord and curve along the ordinate is assumed to be four times the similar distance for the central ordinate of the original stretch. Hence in this case the points defined by the means should be moved the following amounts, viz., those in Table XVI.

Table XVI.—Distance of Vertex from Mean of n Points.

Number of ordinates for which a mean is taken	$n =$	3	4	5	6	7	9	11
Proportion of vertex-distance of the *double stretch* to be taken as a correction	$k =$	$\frac{1}{6}H$	$\frac{5}{36}H$	$\frac{1}{8}H$	$\frac{7}{60}H$	$\frac{4}{36}H$	$\frac{5}{48}H$	$\frac{1}{10}H$
	$k =$	$.167H$	$.139H$	$.125H$	$.117H$	$.111H$	$.104H$	$.100H$

H denoting the height of the vertex above the chord double stretch. This correction will eliminate the greater part of the systematic error, but not the whole, inasmuch as the curve has been flattened by taking the series of means: hence the corrections having been applied to the mean points a new curve may be drawn, and the process repeated if necessary. A smooth curve is then drawn among the points ultimately defined.

This process, however, yields results which, after all, are but little better than a direct attempt to draw a smooth curve among the points given by the ordinate-terminals; it is tedious, and its probability is but little greater than that obtained by directly drawing the smoothed curve and correcting it by arithmetical (or algebraic) methods ("hand polishing"). To avoid its tedium of drawing and hand-polishing, what are called *summation methods* have been used. In these a weighted mean is obtained, the weight factors having *opposite* signs in order to eliminate the systematic error indicated in formulæ (312) to (316).

10. **Summation methods.**—Summation methods in so far as they are rigorous, eliminate the systematic error involved in weighted means where the weights have no change of sign. Rigorously devised algorithms, applied to a series of ordinates strictly conforming to a curve of the nth degree, will reconstitute the given ordinates, whereas mere means of a series of ordinates will not only *not* do so, but will increase the error with every repetition of the grouping. The taking of the means of a series of ordinates is therefore valid only where the general trend is either linear, or so nearly linear as to make the corrections referred to negligible. Suppose, then, we have a series of ordinates, the terminals of which O, P, Q, R . . . . Z, are to be smoothed. Evidently we can draw an

[1] That is, if $n + 1$ be the number of ordinates, a curve defined by $2n + 1$ ordinates is taken; thus, if 3 points are originally taken, the curve of double stretch will be that defined by five points.

integral curve of the nth degree through any $n+1$ such points. Geometrically, the summation smoothing process is the following:—Draw a curve of the nth degree through the points O, O+i; O+2i; .....O+ni: a similar curve through the points P,.....P+ni: a third through the points Q,.....Q+ni; and so on.[1]

This will give a series of curves of the nth degree, usually close to one another, and sometimes intersecting. The mean position of their intersections on the ordinates (or ordinates produced) is the smoothed curve required. The flexibility, or *fitting power*, of the curve depends, other things being equal (*a*) on the degree of the curve; and (*b*) on the nearness of the points O, O+i, etc.; and consequently of P, P+i, etc., to each other.

It may readily be demonstrated, graphically or otherwise, that *as the value of i is increased, minor fluctuations are more and more obliterated.* The whole range being limited, the larger the value of n the more points on the curve are fitted by one stretch: hence the smaller i will be; and the fitting power will consequently be increased.

Since the mean position of the intersection of the curves and the ordinates defines the position of their terminals at the smoothed curve; and since each point O, P, etc., is the start of one of the component curves, any abnormality in its position (*i.e.*, deviation from the general trend) is reflected in the mean result; that is, *it produces a deviation of a smaller amount in the direction of the abnormal point.*

The defect of all summation methods is seen, from their geometrical representation, to be the following:—

(i.) The degree of obliteration of minor fluctuations is quite arbitrary and depends upon the character of the summation-system.

(ii.) The result is vitiated by all abnormalities: the method, in fact, does not lead to real smoothing, but to the reduction of the magnitude of the oscillations of the curve.

This may be shewn analytically in the following way. We observe first that if there are $q+1$ points in the total range of q intervals of any component curve taken, then in a *complete*[2] series there will be $q+1$ intersection-points on the ordinates. The mean of these is to be taken. The first complete term arranged according to the powers of the common distance (k) between the ordinates, and the second term will be respectively:—

$$(324)\ldots\ldots y_q = \frac{1}{q+1}\{(a_q + a_{q-1} + \ldots a_0) + (b_{q-1} + 2b_{q-2} + 3b_{q-3} + \ldots)k$$
$$+ (c_{q-2} + 2^2 c_{q-3} + 3^2{}_{q-4} + \ldots)k^2 + (d_{q-3} + 2^3 d_{q-4} + 3^3 d_{q-5} + \ldots)k^3 + \ldots\}$$

[1] Where k is the common interval on the axis of abscissæ between ordinates, the common interval i between the points will always be an integral multiple of k greater than 1; that is $i = 2k$, or $3k$, or $4k$, etc.

[2] It is, of course, not *essential* that the series should be what has been called here *complete*, and in Woolhouse's method it was not complete. A complete series may be defined as one where, $q + 1$ being the number of points including the terminal ones ranged over by any curve, the initial point of the $(q + 1)$th curve is on the same ordinate as the final point of the initial range, viz., the zero (or first) curve.

$$(325)\ldots\ldots\ldots y_{q+1} = \frac{1}{q+1}\{(a_{q+1}+..a_0)+(b_q+..)k+(c_{q-1}+...)k^2+ (d_{q-2}+....)k^3+....\}$$

Thus the coefficients of the powers of x are changing every term, and consequently the equation of the smoothed curve of, say, $s+1$ points will be of the degree s, that is, it has no relationship whatever to the degree of the originating equations of the nth degree passed through the points 0 ; $0+i$; $0+2i$, etc.

It is thus seen that results of a "smoothing" by "summation" methods are in principle *toto cœlo* different from those obtained by methods which ensure conformity to some function adopted for considerations of the nature of the case.[1]

Numerous papers on the summation method have appeared from time to time in the Journal of the Institute of Actuaries by various investigators, of whom the principal are the following :—J. A. Higham, W. S. B. Woolhouse, G. F. Hardy, J. Spencer, T. G. Ackland, G. J. Lidstone, G. King, R. Todhunter. Some of these have contributed several papers on the subject. A specially valuable one, on "The rationale of formula for graduation by summation," by G. J. Lidstone, appeared in the Journal of the Institute of Actuaries, Vol. XLI., pp. 348 *et seq.*, and XLII., pp. 106 *et seq.* An important paper on the subject by Dr. J. Karup will also be found in the Transactions of the Second Actuarial Congress, p. 31 *et seq.*

The subject of graduation of summation has also quite recently been re-examined by Mr. C. H. Wickens,[2] and formulæ based on ranges of *three* determined points (0, $0+i$, and $0+2i$) and *four* determined points (*i.e.*, including also $0+3i$) are discussed for the developments of quinary formulæ and formulæ other than quinary, the adjective denoting the number of spaces into which i is divided. That is, if $i=rk$ then the formula derived is an r-ary formula. It is shewn that there are great advantages in making the series complete, and that in taking the mean it is advantageous to allow only half-weight to the terminal points of intersection on any ordinate.[3]

The following weights (Table XVII.) have been deduced by Mr. Wickens for the different ordinates about the middle ordinates, th

[1] Prof. Karl Pearson's scheme, adopted by many biometricians, is to resolve the data under a suitable type-form derived from a generalised theory of probability, certain criteria being used to decide which form should be preferred. A single Pearsonian curve, however, will not apply to population-enumerations, although the population-curve may be *empirically* considered to be a combination either of Pearsonian or of other curves.

[2] An extension of the principle underlying Woolhouse's method of graduation, read 30th October, 1911, Trans. Act. Soc., N.S.W., Session 1912, pp. 243-7.

[3] There are many physical analogies for this process. For example, if a physical property be measured at equidistant points along a line including the terminals the mean value is $(a + 2b + 2c + \ldots + 2y + z)/2N$, where N is the number of spaces into which the points divide the line.

marked (3) and (4) being deduced from curves passed through 3 points and 4 points respectively. The similarity is obvious. Other formulæ may be obtained from the paper in question.

Table XVII.—Summation-formula-coefficients to be applied to a Series of r Ordinates Deduced on the Basis of (3), and on a Basis of (4) Determined Points.

Ordinates $q+1$ (x/k)	Binary $i=2k$		Ternary $i=3k$		Quarternary $i=4k$		Quinary $i=5k$		Senary $i=6k$	
	(3)	(4)	(3)	(4)	(3)	(4)	(3)	(4)	(3)	(4)
− 12	..	..	..	..	..	..	..	..	0	0
− 11	..	..	..	..	..	..	..	..	−5	$-3\frac{8}{9}$
− 10	..	..	..	..	..	..	0	0	−8	$-7\frac{1}{9}$
− 9	..	..	..	..	..	..	−2	$-1\frac{3}{5}$	−9	−9
− 8	..	..	..	..	0	0	−3	$-2\frac{4}{5}$	−8	$-8\frac{8}{9}$
− 7	..	..	..	..	−3	$-2\frac{1}{2}$	−3	$-3\frac{1}{5}$	−5	$-6\frac{1}{9}$
− 6	..	..	0	0	−4	−4	−2	$-2\frac{2}{5}$	0	0
− 5	..	..	−1	$-\frac{8}{9}$	−3	$-3\frac{1}{2}$	0	0	29	$25\frac{2}{3}$
− 4	0	0	−1	$-1\frac{1}{9}$	0	0	12	$10\frac{4}{5}$	56	$53\frac{1}{3}$
− 3	−1	−1	0	0	19	$17\frac{1}{2}$	23	$22\frac{2}{5}$	81	81
− 2	0	0	7	$6\frac{2}{3}$	36	36	33	$33\frac{3}{5}$	104	$106\frac{2}{3}$
− 1	9	9	13	$13\frac{1}{3}$	51	$52\frac{1}{2}$	42	$43\frac{1}{5}$	125	$128\frac{1}{3}$
0	16	16	18	18	64	64	50	50	144	144
1	9	9	13	$13\frac{1}{3}$	51	$52\frac{1}{2}$	42	$43\frac{1}{5}$	125	$128\frac{1}{3}$
2	0	0	7	$6\frac{2}{3}$	36	36	33	$33\frac{3}{5}$	104	$106\frac{2}{3}$
3	−1	−1	0	0	19	$17\frac{1}{2}$	23	$22\frac{2}{5}$	81	81
4	0	0	−1	$-1\frac{1}{9}$	0	0	12	$10\frac{4}{5}$	56	$53\frac{1}{3}$
5	..	..	−1	$-\frac{8}{9}$	−3	$-3\frac{1}{2}$	0	0	29	$25\frac{2}{3}$
6	..	..	0	0	−4	−4	−2	$-2\frac{2}{5}$	0	0
7	..	..	..	..	−3	$-2\frac{1}{2}$	−3	$-3\frac{1}{5}$	−5	$-6\frac{1}{9}$
8	..	..	..	..	0	0	−3	$-2\frac{4}{5}$	−8	$-8\frac{8}{9}$
9	..	..	..	..	..	..	−2	$-1\frac{2}{5}$	−9	−9
10	..	..	..	..	..	..	0	0	−8	$-7\frac{1}{9}$
11	..	..	..	..	..	..	..	..	−5	$-3\frac{8}{9}$
12	..	..	..	..	..	..	..	..	0	0
Sum of Coefficients	32	32	54	54	256	256	250	250	864	864

For the mode of obtaining the values given by these formulæ by processes of *summation*, reference should be made to the paper, in which also the smoothing coefficient is given as follows :—

Table XVIII.—Smoothing Coefficients.

Interval s	No. of Terms or Ordinates $4s-1$	Series (3) $\sqrt{(7s^2+1)/4s^3}$	Series (4) $\sqrt{7(s^2-1)\ (s^2+5)+36s}/6s^4$
2	7	.1683	.1683
3	11	.0741	.0615
4	15	.0415	.0316
5	19	.0265	.0193
6	23	.0184	.0130
7	27	.0135	.0094
8	31	.0103	.0071
9	35	.0082	.0056
10	39	.0066	.0045

The smallness of the smoothing coefficient is a measure of the efficiency in smoothing.[1]

11. **Advantages of graphic smoothing over summation and other methods.**—This graphing of the group-results of an enumeration (numbers according to years of age in the instance immediately under review) yields a succession of rectangles, or, if we prefer, points denoting their heights. Smoothing in such a case consists essentially in transferring numbers of those who alleged they were a given age to some other nearly identical age, the reason for this transfer being that it is judged *a priori* (and justly so) that the irregular distribution indicated by the data does not accord with the real facts. To do this there is no better way than to draw among the tops of the rectangles (or the points representing them) a smoothed curve following every variation of their general trend, which, *in the judgment of the analyst,*[2] is regarded as probably conforming to the facts. This can be done, and the result scaled and smoothed arithmetically, that is, by differencing. The aggregates as by enumeration and by the smoothed curve can be formed, and the accumulated differences examined to see that they are kept within probable limits ; that is, are alternately positive and negative, and are never great (see VII., §12). The initial curve can then be amended whenever improvement seems possible ; thus in its final form the grand total can be made identical with the enumeration, and the difference between the enumerated and smoothed aggregates up to any value of the variable (age) can be made the least possible *for the form of curve deemed to be best on examining the graph of the enumerated results.*[3]

The logic of this process has been admirably expressed by Whewell, and before him again by Sir John Herschel, in the following passages :—

> "This curve once drawn must represent . . . . the law . . . . much better than the individual raw observations can possibly . . . . do. . . . . The series of lines joining the consecutive points . . . cannot possibly represent reality. . . . . If, however, we thus take the whole mass of the facts . . . . by making the curve which expresses the supposed observations regular and smooth . . . . we are put in possession . . . . of something more true than any (one) fact by itself."—Sir J. Herschel, Trans. Astr. Soc., Vol. V., pp. 1–4.

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[1] See G. F. Hardy, Journ. Inst. Act., Vol. xxxii., p. 376.

[2] Any attempt to dispense with the element of judgment is really illusive. The adoption, for example, of a summation method will yield appreciably different results according to the range taken. Thus a real undulation in a population curve may be virtually obliterated by the process.

[3] There is a tendency to forget that technical processes are but instruments in the hands of the user, and formulæ employed confer no validity to the elements depending upon judgment.

> " The peculiar efficacy of the Method of Curves depends upon this . . . . that order and regularity are more clearly recognised when thus exhibited to the eye as a picture (and) not only enables us to obtain laws of Nature from *good* observations, but . . . . from observations which are very *imperfect*. . . . . We draw our main regular curve not *through* the points given by . . . . observations, but *among* them."—Whewell[1], Novum Organon Renovatum, Bk. III., Chap. vii., p. 204, 3rd Edit., 1858.

Finally, it may be remarked that by adopting the graphic method of smoothing, minor and unmeaning fluctuations are avoided. The invalidity of merely mechanically applying various summation formulæ has been shewn by G. J. Lidstone ; he has indicated how, by the summation method, unmeaning fluctuations are introduced into what may be known *a priori* to be a straight line.[2]

12. **Graphs of Australian population distributed according to age and sex for various Censuses.**—Adopting the principles indicated, the graphs of the enumerated population of Australia for the Census of 1911 distributed according to age, shewed that, both for females and for males, the adoption of any function to which the results should be conformed was out of the question. It was evident also that a " summation method" was quite unsuitable. In the results for 1911 there was a sharp increase in the numbers for ages 13 to 18 ; then a zig-zag result up to age 22 before a decided decrease appeared. It was thus evident that results must be examined, and the smoothing based upon considerations as to the possibility of misstatement. The data therefore were simply graphically smoothed by drawing first a freehand curve among them, the changes of direction of this curve being made a minimum, so far as that was possible, while following all fluctuations deemed to represent the actual facts. This curve was then carefully drawn with the aid of splines, French curves, etc., the ordinates scaled off and adjusted arithmetically.[3] The result of this smoothing is shewn on Figs. 37 and 38

As has been shewn in § 10 and formulæ (324) and (325) hereinbefore, this is obvious from either geometrical or analytical considerations. For that reason the graphic process has been preferred to summation processes, which latter are regarded as theoretically invalid for the reasons indicated.[4]

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[1] See also T. B. Sprague, Journ. Inst. Act., Vol. XXX., pp. 161–3, 1892 ; James Sorley, Journ. Inst. Act., Vol. XXII., pp. 309–340, in particular 3 : The Graphical Method, pp. 321–8 ; T. B. Sprague's works on " The Graphic Method, etc.," Journ. Inst. Act., Vol. XLI., p. 182.

[2] On the rationale of the Formulæ for graduation by summation. Journ. Inst. Act., Vol. XLI., 1907, p. 360, and diagrams A, B and C.

[3] Identical methods were also applied to the data of the earlier Censuses.

[4] In the summation methods, as we have seen, fluctuations are introduced into curves in order to conform to a convenient algorithm, rationally deduced. But a little reflection will convince any mathematician that the minute oscillations in the directions of the tangents, involved in the process, would be better eliminated, when that can conveniently be done ; and in any case, in the presence of large departures of individual results from the smoothed curve, these small fluctuations have neither real significance nor validity.

Graphs shewing the distribution according to sex and age have been prepared for the Australian Census of 1881, that of 1891 and 1901, as well as that of 1911. The results for 1881 were deduced from quinquennial groups ; those for the latter Censuses from year-groups ; and they are shewn on Figs. 43 and 44. It will be seen that intervals of ten years cause considerable differences in the forms of the curves ; these differences are due of course to migration and to fluctuations in the birth and mortality rates.

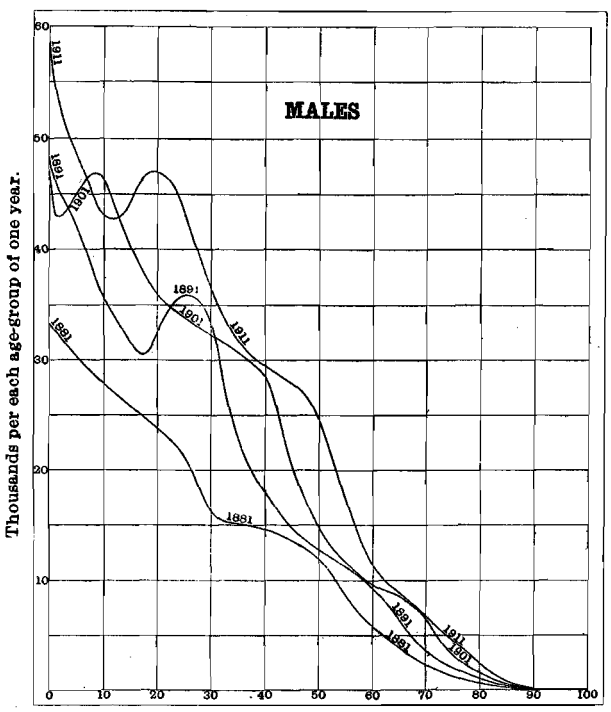


Fig. 43.

The curves in Figs. 43 and 44 are interpreted in the following way, viz. :—The ordinate or vertical distance to the curve at any point represents in thousands the number of males (or females) in the age-group of one year commencing at the age in question.

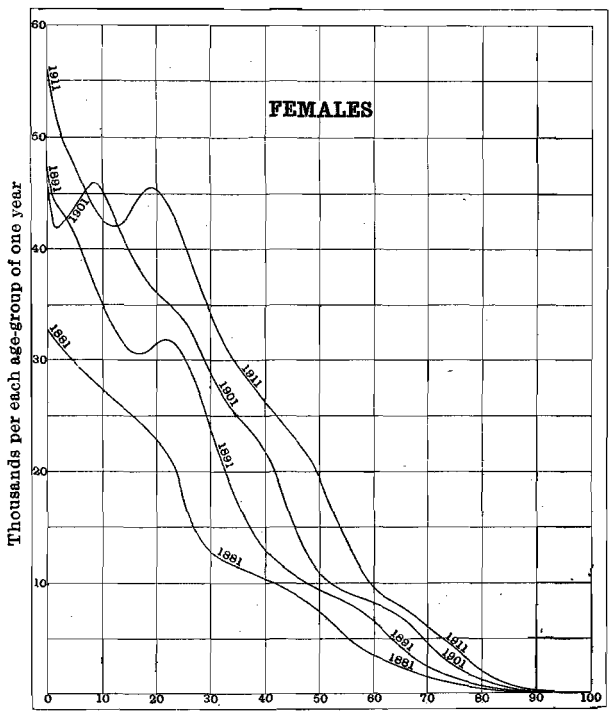


Fig. 44.

13. **Growth of population when rate is identical for all ages.** A population P_0 increasing at the instantaneous rate ρ per unit of time becomes, if that rate be constant, as we have seen, $P_t = P_0\, e^{\rho t}$ see II., §§ 1–10, formulæ (1) to (14). Hence, if the numbers between the ages x and $x+dx$ for the epoch $t = 0$, are represented by $P_0 f(x)dx$, in which case

$$(326)\ldots\ldots \int_0^\omega f\,(x)\,dx = 1$$

and *the rate of increase be the same for all ages*, then the numbers between the ages x and $x + dx$ at any later date t, must be

$$(327)\ldots\ldots P_t\,dx = P_0\, e^{\rho t}\, f\,(x)\,dx.$$

the aggregate being $P_0\, e^{\rho t}$; that is to say $f\,(x)$ *remains constant*. Hence, if the age-groups be divided by the total population, the results will be identical, *i.e.*, the *relative* numbers will be seen to remain the same and *their graphs will be identical*. If, however, the aggregate numbers, denoted by $F\,(x)$, are graphed, *the graphs will not be identical*. For we have in the latter case

$$(328)\ldots\ldots F_t\,(x)\,dx = e^{\rho t} F_0\,(x)\,dx\,;$$

and by hypothesis ρ is not a function of x; hence

$$(329)\ldots\ldots \frac{dF_t(x)}{dx} = e^{\rho t} \cdot \frac{dF_0(x)}{dx}\,;\ \text{or}\ \tan\theta_t = e^{\rho t}\ \tan\theta_0$$

that is, the *slopes* of the tangents to the graph of the population are increased in the proportion $1 : e^{\rho t}$. In the absence of all information of "migration" and "natural increase" (increase by excess of births over deaths) the rate of increase of the preceding period must be assumed to continue not only for the population as a whole, but also for each age; which is expressed by

$$(330)\ldots\ldots P_t = P_0\, e^{\rho t} \int_{x_1}^{x_2} f(x)\, dx.$$

and (327) hereinbefore.

14. **Growth of population where migration element is known.** If the ages and numbers of migrants be known, as well as the ages and numbers of the dying, then it is possible to determine the numbers in each age-group by remembering that survivors after t years have increased their age by t years.

Except for very small communities, this method of estimating populations according to age (and sex), is, however, perhaps impracticable. We shall, however, later consider it. Here it may be noted that the estimation may be most conveniently treated in single year age-groups, *i.e.*, not by infinitesimal methods. The value of the method is that it would enable all rates to be finally made up intercensally, whereas, after a Census has rendered the intercensal adjustments possible, they have always to be corrected.

15. **Growth of population when rate of increase varies from age to age.** Changes in the birth-rate (= rate of immigration at age 0), in the death-rate for various ages (= rate of emigration at age x), in the rapidity of migration and age of migrants (= rate of immigration or of emigration at age x) causes a change to take place in the form both of $f(x)$ and $F(x)$ referred to in the previous section. The graphs of $f(x)$, *i.e.*, of *relative* numbers, at different epochs all give an area of unity between the limits 0 and ω (= end of the longest life); hence the curves for different epochs necessarily intersect; those of $F(x)$, *i.e.*, of *absolute* numbers, give the areas P_t, and may or may not intersect. We consider the consequence of those variations which change the form of $f(x)$; see Figs. 43 and 44.

Where we have to interpolate to obtain intercensal populations, or to extrapolate to predict a population, we may assume that the tangents to the curve $f_0(x)$ change uniformly with time; that is, they become those of $f_T(x)$ by a linear change with time, T denoting the intercensal period. Thus

$$(331)\ldots \frac{df_t(x)}{dx} = \frac{df_0(x)}{dx} + \sigma\,\frac{t}{T}\,;\ \text{where}\ \sigma = \frac{df_T(x)}{dx} - \frac{df_0(x)}{dx}$$

that is, σ is the total change in the tangent in the intercensal period T. Hence, given the total population at the time t, we can effect its distribution according to age by determining merely $f_t(x)$ on the supposition indicated.

This supposition (i) is of a more general character than that of supposing that the number at any age changes linearly: supposition (ii.). Graphically, the difference between the two is that, according to supposition (i.), the intercept on any ordinate between the graphs of $f_0(x)$ and $f_T(x)$, divided in the ratio t/T, gives the position of $f_t(x)$, while according to supposition (ii.) it is the intercept between $F_0(x)$ and $F_T(x)$ which is uniformly divided. The advantage of supposition (i.) is that only the *form* of $f_t(x)$ is fixed; the graph of $F_t(x)$ can then be made to agree with any intercensal estimate of population.[1]

16. **The prediction of future population and its distribution.**—The graphs of population of various countries for the years 1790 to 1910, Fig. 3 hereinbefore, discloses no general law. All shew what may be called oscillatory development. The graph of the population of Australia from 1788 to 1914 (see Official Year Book No. 8 of the Commonwealth of Australia, p. 127) shews also this feature in a fairly well marked degree, and those of the individual States exhibit more striking oscillations. Hence accurate predictions even of total population of any precision are not possible. Figs. 43 and 44 shew that accurate predictions for age-groups are not only *not* possible, but may be even more misleading than the assumption of an unchanged distribution according to sex and age. It may be noted, however, that there is a general similarity, though there is by no means identity, in the forms of the graphs for males and females. The great fluctuation in the masculinity of the population according to age is also evident from a comparison of the results shewn on Figs. 43 and 44. This, however, will be discussed later.

[1] See Census Report, Vol. I., Chap. IX., post-censal adjustment of population estimates for the intercensal period 1901–11.

X.—THE MASCULINITY OF POPULATION.

1. **General.**—The ratio between males and females in any population has been called its *masculinity*, and the fluctuations of such a ratio are obviously important. The following ratios of the aggregate number of males to the aggregate number of females in various populations will give an idea of how closely the number approximates to unity.

Table XIX.—Masculinity of Various Populations (about Year 1900).

Norway ..	1891	.932	Ireland ..	1901	.974	Australia ..	1901	1.101
Sweden ..	1895	.944	Italy ..	1901	.990	C. of G.Hope	1904	1.024
Scotland ..	1901	.946	United States	1900	1.044	India ..	1901	1.038
Eng. & Wales	1901	.954	Canada ..	1901	1.050	Ceylon ..	1901	1.140
Germany ..	1900	.969	Newfoundl'd	1901	1.053			

The results given hereinbefore, viz., in VIII., § 9, Table XI., shew that even when the total numbers for all ages for males is made equal to that for females, there are easily discerned differences between Eastern and Western populations.

In the following Table, viz., XX., the aggregate number of males in the different age-groups in the first eleven countries are divided by the aggregate number of females in the same age-groups, the results being shewn on line W ; for the last three countries the similar quotients are shewn on line E.

Table XX.—Change of Masculinity with Age ; Aggregate of Various Populations, about 1900.

Countries.	0	1–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49
W ..	1.024	1.016	1.014	1.015	.992	.979	.991	1.005	1.021	1.020	1.012
E ..	1.003	.966	1.047	1.212	1.073	.919	1.022	1.037	1.135	1.035	1.131

Countries.	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85–89	90–94	95–100	All Ages.
W ..	.988	.962	.934	.927	.906	.895	.847	.784	.674	.588	.9964
E ..	1.005	1.095	.870	.882	.873	.885	.873	.905	.880	.880	1.0390

The figures in the table shew the relatively large range of "masculinity" for different age-groups, and indicate the desirableness of the determination of a norm for purposes of comparison. We proceed to consider this aspect of the question.

2. **Norms of masculinity and femininity.**—The variations with the lapse of time, of the norm of distribution according to age for the male population of any community, and the same norm for the female population of the same community will not, in general, be identical. The progressive changes, which may have both periodic and aperiodic elements, are best studied by observing the fluctuation of the *masculinity* or of the *femininity* of the population. These characters as ordinarily defined are the number of males to one female (or in practice usually to 100 females), and the number of females to one male, respectively. Thus if m = the number of males, f the number of females, and $p = m + f$ the number of persons of any age, the masculinity μ_1 and femininity ϕ_1 for that age will be expressed by the formulæ :—

$$(332)\ldots\ldots \mu_1 = \frac{m}{f};\ \phi_1 = \frac{f}{m}$$

with suffixes to denote the age. When these quantities and their variations are known, the changes taking place in the relative numbers of the sexes are determined as soon as the variations in the norm for the entire population (persons) are ascertained ; see VIII., §§ 8 to 10. The curve shewing the variations of the norms for both sexes at each age from epoch to epoch is not an essential, for their fluctuation is determinable from the fluctuation of the norm for persons, and the fluctuation of either the masculinity or the femininity. For this purpose a somewhat different definition of masculinity is desirable ; this we shall now consider.

3. **Various definitions of masculinity and femininity.**—For many purposes definitions other than that mentioned above have advantages. Both of the functions referred to for ordinary populations approximate to unity. But other functions may be adopted which hover either about $\frac{1}{2}$ or about zero. For example, the ratio of males (or of females) to the whole population, is a quantity which ordinarily approximates to $\frac{1}{2}$; or yet again the ratio of the *difference* of the number of males and females to the total population is a number which ordinarily approximates to zero. Algebraically, the three methods and their interrelations are as follows :—

1*st Method* :—

$$(333)..\text{Masculinity} = \mu_1 = \frac{m}{f};\ \text{Femininity}\ \phi_1 = \frac{f}{m} = \frac{1}{\mu_1}$$

Possible range 0 to $+\infty$; ordinary value about 1.

2nd Method :=

(334)..Masculinity $=\mu_2=\dfrac{m}{m+f}=\dfrac{\frac{m}{f}}{\frac{m}{f}+1}=\dfrac{\mu_1}{1+\mu_1}$;

Femininity $=\phi_2=\dfrac{f}{m+f}=\dfrac{\phi_1}{1+\phi_1}=\dfrac{1}{1+\mu_1}$

Possible range 0 to + 1 ; ordinary value about $\frac{1}{2}$.

3rd Method :=

(335)..Masculinity $=\mu_3=\dfrac{m-f}{m+f}=\dfrac{\frac{m}{f}-1}{\frac{m}{f}+1}=\dfrac{\mu_1-1}{\mu_1+1}$;

Femininity $=\phi_3=\dfrac{f-m}{f+m}=\dfrac{\frac{f}{m}-1}{\frac{f}{m}+1}=\dfrac{\phi_1-1}{\phi_1+1}$

Possible range − 1 to + 1 ; ordinary value about zero.

The mutual relations subsisting among these several quantities are set out in the following table :—

Table XXI.—Relations subsisting between Masculinity and Femininity according to Various Definitions.

Function.	Expressed in terms of—					
	μ_1	μ_2	μ_3	ϕ_1	ϕ_2	ϕ_3
μ_1	μ_1	$\dfrac{\mu_2}{1-\mu_2}$	$\dfrac{1+\mu_3}{1-\mu_3}$	$\dfrac{1}{\phi_1}$	$\dfrac{1}{\phi_2}-1$	$\dfrac{1-\phi_3}{1+\phi_3}$
μ_2	$\dfrac{\mu_1}{1+\mu_1}$	μ_2	$\frac{1}{2}(1+\mu_3)$	$\dfrac{1}{1+\phi_1}$	$1-\phi_2$	$\frac{1}{2}(1-\phi_3)$
μ_3	$\dfrac{\mu_1-1}{\mu_1+1}$	$2\mu_2-1$	μ_3	$\dfrac{1-\phi_1}{1+\phi_1}$	$1-2\phi_2$	$-\phi_3$
ϕ_1	$\dfrac{1}{\mu_1}$	$\dfrac{1}{\mu_2}-1$	$\dfrac{1-\mu_3}{1+\mu_3}$	ϕ_1	$\dfrac{\phi_2}{1-\phi_2}$	$\dfrac{1+\phi_3}{1-\phi_3}$
ϕ_2	$\dfrac{1}{1+\mu_1}$	$1-\mu_2$	$\frac{1}{2}(1-\mu_3)$	$\dfrac{\phi_1}{1+\phi_1}$	ϕ_2	$\frac{1}{2}(1+\phi_3)$
ϕ_3	$\dfrac{1-\mu_1}{1+\mu_1}$	$1-2\mu_2$	$-\mu_3$	$\dfrac{\phi_1-1}{\phi_1+1}$	$2\phi_2-1$	ϕ_3

4. **Use of norms for persons and masculinity only.**—Instead of having *three* norms, viz., one each for males, females and persons, it will often suffice to have one for persons, and one for masculinity. Thus in the norm of population the masculinity, by method 3, viz. $(m-f)/(m+f)$ is as follows for Europe (i.) and for India (ii.).

Table XXII.—Change of Masculinity with Age.

Age Group.	0	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49
(i.)	+ .013	+ .009	+ .008	+ .009	— .003	— .009	— .003	+ .007	+ .013	+ .012	+ .008
(ii.)	— .018	— .037	+ .004	+ .078	+ .018	— .063	— .008	— .002	+ .045	— .003	+ .044

Age Group.	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 105
(i.)	+ .008	— .005	— .019	— .032	— .037	— .049	— .054	— .089	— .130	— .000	— .000
(ii.)	+ .044	— .017	+ .023	— .088	— .090	— .090	— .085	— .077	— .090	— .077	— .143

5. **Relation between masculinity at birth and general masculinity of population.**—It has been suggested that some *tendency* exists which, while not very strongly expressing itself, is nevertheless sufficiently evident to equate the numbers of the sexes in the population of any country, or at least that the masculinity at birth is in some way affected by the masculinity of the population.[1] Masculinity here denotes merely the ratio of males to females, that is, M/F.

The population of Australia has enormously changed in its masculinity in a few decades, and consequently affords an opportunity of examining this supposition. The masculinity at birth is compared with that of the population for the years 1829–1913, the latter passing through a wide range of falling values. The results are shewn in the following table :—

Table XXIII.—Average Masculinity of Population and of Births, New South Wales, over Various Periods.

Period.	Average for Years.	Masculinity of Population.	Masculinity of Live Births.	Period.	Average for Years.	Masculinity of Population.	Masculinity of Live Births.
1829–34 ..	6	2.961	1.016	1840–49	10	1.625	1.034
1835–39 ..	5	2.436	1.031	41–50	10	1.560	1.035
40–44 ..	5	1.752	1.026	42–51	10	1.510	1.036
45–49 ..	5	1.498	1.038	43–52	10	1.412	1.036
50–54 ..	5	1.309	1.031	44–53	10	1.433	1.033
55–59 ..	5	1.281	1.033	45–54	10	1.404	1.035
1830–39 ..	10	2.680	1.026	46–55	10	1.375	1.032
31–40 ..	10	2.568	1.018	47–56	10	1.352	1.033
32–41 ..	10	2.443	1.021	48–57	10	1.325	1.029
33–42 ..	10	2.314	1.020	49–58	10	1.308	1.032
34–43 ..	10	2.205	1.029	50–59	10	1.295	1.032
35–44 ..	10	2.094	1.028	60–69	10	1.233	1.058
36–45 ..	10	1.979	1.028	70–79	10	1.196	1.045
37–46 ..	10	1.877	1.026	80–89	10	1.209	1.050
38–47 ..	10	1.784	1.027	90–99	10	1.147	1.054
39–48 ..	10	1.698	1.030	1900–13	13	1.186	1.058

[1] Düsing, Das Geschlechtverhältniss im Königreich Preussen.

This table seems to shew that, on the whole, the masculinity of birth μ_b can be expressed approximately by such an equation, for example, as

$$(336)\ldots\ldots\mu_b = \frac{M_0}{F_0} = 1.06 - 0.0325\ (\mu_p - 1) + 0.0333\ (\mu_p - 1)^{\frac{5}{4}};$$

μ_p denoting the total number of males divided by the total number of females in the population over the period considered. The tabulated mean values of the masculinity of the population, and the position of the curve which represents the formula, are shewn on Fig. 45. The result may, of course, not be *directly* due to the masculinity of the population: both may have varied through some condition itself varying with time. Fig. 46 shews such a variation. This, too, implies an opposite progression; that is, it indicates clearly that while the masculinity of the population was, on the whole, diminishing, that of the birth was, on the whole, increasing.

The results for Victoria point less decisively in the same direction. They are as follows :—

Table XXIV.—Masculinity in Victoria.

Period	1851–60	1861–70	1871–80	1881–90	1891–1900
Of Population ..	1.765	1.303	1.142	1.108	1.049
Of Births	1.046	1.047	1.044*	1.049	1.050

* In conflict with the general indication.

These shew that as the masculinity of the population was diminishing, that of birth was increasing, with the exception of the decennium 1871-1880.

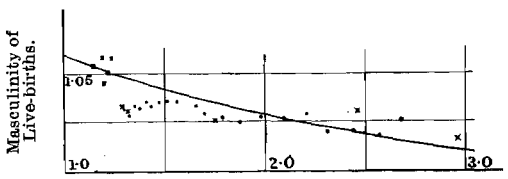
For the Commonwealth of Australia the results for the masculinity of the population at the *beginning* of a year compared with that of the births in the same year, set out in the order of the masculinities of the population, are :—

Table XXV.—Masculinity in Australia.

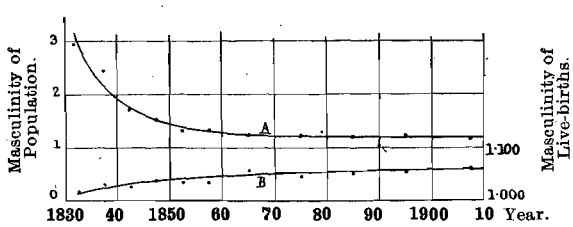
Masculinity ..	1909	1910	1911	1908	1907	1912	1913
Of Population	1.0764	1.0771	1.0787	1.0793	1.0824	1.0854	1.0885
Of Birth ..	1.0520	1.0638	1.0473	1.0493	1.0489	1.0454	1.0476

The *trends* are again in opposite directions, but not markedly.

Fig. 45.



The curve is that given by formula (386) above. The dots are individual results.



The curve A denotes masculinity of population, B masculinity of live-births. The dots are individual results.

Masculinity of Population and of Live-births, New South Wales, 1829-1913.

Fig. 46.

In the following table is set out the masculinity of the births, and in decreasing order of the population of a number of countries; these give no definite indication:—

Table XXVI.—Masculinity of Various Countries, Arranged in Order of Masculinity of Population.

Country.	Year of Estimation	Masculinity of Population $M \div F$	Period for which Determined.	Masculinity of all Births.	Masculinity of Ex-nuptial Births only
Greece	1889	1.1037	1881–85 ..	1.118	1.059
Australia ..	1907	1.0793	1901–13 ..	1.051	1.042
Servia	1890	1.0548	1885–89 ..	1.047	1.035
Rumania ..	1889	1.0373	1886–90 ..	1.077	1.034
Italy	1881	1.0050	1887–91 ..	1.058	1.044
Belgium ..	1890	.9950	1887–91 ..	1.045	1.022
France	1891	.9930	1887–91 ..	1.046	1.029
Hungary ..	1890	.9852	1887–91 ..	1.050	1.029
Netherlands ..	1889	.9766	1887–91 ..	1.055	1.047
Ireland	1891	.9713	1887–91 ..	1.055	1.048
Finland	1890	.9690	1886–90 ..	1.050	1.052*
German Empire	1890	.9615	1886–90 ..	1.052	1.047
Spain	1887	.9615	1878–82 ..	1.083	1.079
Austria	1890	.9578	1887–91 ..	1.058	1.055
Denmark ..	1890	.9515	1885–89 ..	1.048	1.050*
Switzerland ..	1888	.9461	1887–91 ..	1.045	1.016
England & Wales	1891	.9399	1887–91 ..	1.036	1.044*
Sweden	1890	.9389	1887–91 ..	1.050	1.043
Scotland	1891	.9330	1887–91 ..	1.055	1.059*
Norway	1891	.9157	1887–91 ..	1.058	1.059*
Aver.(unweighted)	—	.9838	—	1.0568	1.0446

* The masculinity of ex-nuptial births is greater in these instances than that of all births; in the other instances it is less.

6. **Masculinity of still and live nuptial and ex-nuptial births.**—J. N. and C. J. Lewis[1] studied the " variations of masculinity under different conditions" in 1906. Omitting seven of their quoted cases, in which the information is incomplete, they shew that still-births disclose a masculinity of 2 to 4 per centum greater than that for live-births. The unweighted averages of their cases with the omission mentioned (see p. 162), viz., 17, give for the masculinity of live-births (M/F), 1.0504, and for that of still-births 1.3032 ; that is, a masculinity 1.2407 greater than that of live-births. Results have been tabulated for *Western Australia* for the years 1897 to 1913 for live and still-births, and from 1908-1913 for ex-nuptial and nuptial still and live-births. These give the same general indication. The results are as follows :—

Table XXVII.—Masculinity-ratios for Nuptial, Ex-nuptial and Still-births, Western Australia,* 1897 to 1913.

	Masculinity.								
	1897–1902.			†1902–1907.			1908–1913.		
	M.	F.	M÷F	M.	F.	M÷F	M.	F.	M÷F.
Nuptial still-births	—	—	—	—	—	—	804	641	1.254
Ex-nuptial still-births	—	—	—	—	—	—	49	37	1.325
All still-births ..	507	373	1.359	672	528	1.273	853	678	1.258
Ex-nuptial live-births	759	687	1.1048	982	884	1.1109	1116	1037	1.0762
Nuptial live-births	15457	14658	1.0545	21226	20108	1.0556	23941	22882	1.0463
All live-births ..	16216	15345	1.0508	22208	20992	1.0579	25057	23919	1.0476
All births‡ ..	16723	15718	1.0639	22880	21520	1·0632	25910	24597	1.0534

* See Statistical Register, Western Australia, 1906 ; p. 12, 1914, Pt. I., p. 14.
† 1902 has been included twice in order to have 3 six-year periods.
‡ Including, that is, still-births.

The experience in Australia from 1901 to 1913 gave an unweighted average of the masculinities determined for each year, for all births, and for ex-nuptial births, the following results, viz. :—

		Average Masculinity.	Range of Masculinity.
Australia ..	All live-births	1.0508	1.0411 to 1.0638
,, ..	Ex-nuptial births ..	1.0417	1.0098 to 1.0621
Various Countries (See Table XXV.)	All live-births	1.0568	1.036 to 1.118
	Ex-nuptial births ..	1.0446	1.016 to 1.079

The unweighted average ratio of the " ex-nuptial" to all live-births was 5.954 per centum for Australia.

[1] See Journ. Inst. Act., Vol. xl., pp. 154-188, April, 1906.

It was stated by R. Mayo-Smith in his " Statistics and Sociology,"[1] that " among illegitimate" (*i.e.*, ex-nuptial) " children the excess of boys is less than among legitimate" (*i.e.*, nuptial). William Farr, however, pointed out in his " Vital Statistics,"[2] that he believed that " it is assumed in the French returns that foundling children are illegitimate," but that such an assumption is probably invalid, and he considered the matter to be in doubt. The Australian results, however, tend to confirm those for Europe given in Table XXVI.

7. **Coefficients of ex-nuptial and still-birth masculinity.**—It is a somewhat remarkable fact that ex-nuptial and still-births shew increased masculinity, and that among still-births the ex-nuptial shew a somewhat different masculinity to the nuptial. For the analysis of this the following notation will be convenient :—

Live male and female births,			total	$= m + f = b$
,,	,,	,,	nuptial	$= m_0 + f_0 = b_0$
,,	,,	,,	ex-nuptial	$= m_1 + f_1 = b_1$
Still male	,,	,,	nuptial	$= m_2 + f_2 = b_2$
,,	,,	,,	ex-nuptial	$= m_3 + f_3 = b_3$
,,	,,	,,	total	$= m' + f' = b'$

If we call the ratio of the masculinity in the one case (say the ex-nuptial) to that in the other (say the nuptial) the *masculinity intensification-coefficient k*, its significance will vary according as we use μ_1, μ_2, μ_3; see Table XXI. It may easily be shewn that

$$(337)\ldots\ldots\text{For } \mu_1 ; \quad k_n = \frac{m_n}{m} \div \frac{f_n}{f} ;$$

$$(338)\ldots\ldots\text{For } \mu_2 ; \quad k_n = \frac{m_n}{m} \div \frac{b_n}{b} ;$$

$$(339)\ldots\ldots\text{For } \mu_3 ; \quad k_n = \frac{m_n - f_n}{m - f} \div \frac{b_n}{b} ;$$

that is, in regard to any character in the first case it is the relative number of males born *divided* by the relative number of females born ; in the second case it is the relative number of males born *divided* by the relative number of births ; in the third case it is the ratio of the differences of the males and females, divided by the relative number of births. The coefficient intended can be indicated by suffixes and accents ; thus the intensification-coefficient of ex-nuptial still-births on total still-births would be k'_3 ; of ex-nuptial on nuptial live-births, k_{10} ; and so on ; see the preceding scheme of notation in the beginning of this section.

[1] Macmillan, London, 1895, p. 77. [2] E. Stanford, London, 1885 p. 104.

The coefficients for Western Australia are as in the following table :—

Table XXVIII.—Masculinity Intensification-Coefficients, Western Australia, 1897–1913.

Ratio of Masculinity of	To the Masculinity of	1897–1902	1902–1907	1908–1913
All still-births ..	All live-births ..	1.293	1.203	1.201
Ex-nuptial still-births	Ex-nuptial live-births	—	—	1.057*
Ex-nuptial live-births	Nuptial live-births ..	1.049	1.052	1.029

* Depends upon limited numbers ; see Table XXVII.

For Western Australia for 1897 to 1913 inclusive, the ratio of masculinity of all still-births, 1.287, on all live-births, 1.054, is 1.221. This agrees excellently with the result of a series of values for Europe shewn in Table XXVIII., the mean of which is 1.2397.

Table XXIX.—Ratio of Masculinity of Still-Births to that of Live-Births, in various Countries.

	Years.	Ratio.		Years.	Ratio.		Years	Ratio
Paris	8	1.157	Germany ..	5	1.220	Austria	5	1.249
Paris	10	1.179	**W. Australia**	17	1.221	Belgium	5	1.264
Livonia	10	1.205	Prussia ..	10	1.225	Switzerland ..	5	1.292
Montpellier ..	—	1.208	Hungary ..	5	1.238	Sweden + Finland	9	1.299
Alsace-Lorraine	10	1.208	Italy ..	5	1.239	Sweden	—	1.300
Netherlands ..	5	1.210	Amsterdam	12	1.241	France	5	1.360
Mean	..	1.195	Mean ..	..	1.231	Mean	..	1.294

8. **Masculinity of First-born.**—It has been supposed that masculinity has some relation to primogeniture. For the six years 1908 to 1913 inclusive, there were in Australia 111,545 births, of which 25,708 were first births. The number of males and females gave the following results, viz. :—

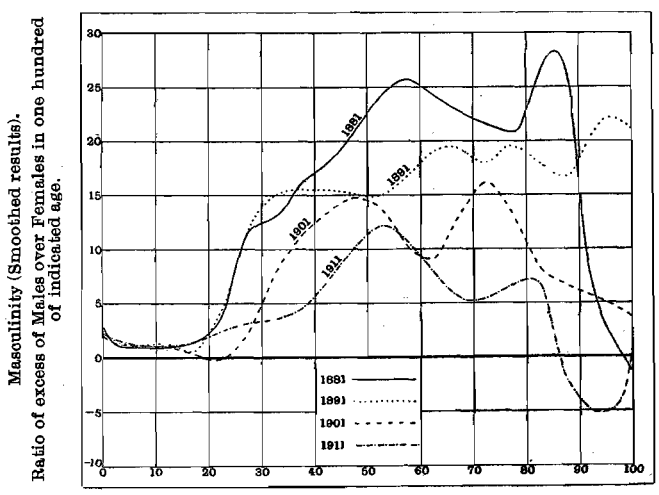
Period.	Masculinity of Australian		
	First-births.	Other births.	All births.
1908–1913 ..	1.05260	1.05001	1.05066

Tabulated according to ages between marriage and birth, the results were :=

Period	Masculinity of Australian First-births, the Interval after Marriage being—			
	Under 1 year	1 year	2–5 years	5–25 years
1908–13	1.0534	1.0514	1.0578	1.0091
Difference from Masculinity of all live-births for same period, viz., 1.0507	+.0027	+.0007	+.0071	−.0416

The numbers, however, are relatively small for the last group, in which there were only 3490 births. The difference between the different groups and the masculinity of all live-births for the whole period is not more remarkable than the difference between the masculinity of all live-births between one year and another. Bertillon's result from 1,140,860 births in Austria was 1.086 for first, and 1.054 for subsequent births; while Geissler's result for Saxony for 4,794,304 births was 1.054. Lewis for Scotland obtained from 85,964 births, for first births, 1.054; for subsequent births, 1.048; Streda for Alsace-Lorraine, from 47,198 births, for first births, 1.058; for subsequent births, 1.059.[1]

9. **Masculinity of populations according to age, and its secular fluctuation.**—In any country where migration has a large influence, and especially where also the migration is of a somewhat specialised character, the masculinity is likely to shew considerable changes. In the following Table, viz., XXX., are given the masculinities (μ_3) in age-groups, for four Censuses, viz., 1881 to 1911, the masculinities in this case being $(M-F)/(M+F)$. This character is strikingly different from that of England. The significance of the fluctuations of the masculinity are best seen in Fig. 47.



Variation of Masculinity of Australian population according to age.

Fig. 47.

[1] See Journ. Inst. Act., vol. xl., 1906, p. 164.

Table XXX.—Masculinity* in Age-groups at Censuses 1881, 1891, 1901, 1911, Australian Commonwealth, and England, 1911. Computed from Smoothed Results.

Age-Group.	Australian Commonwealth.				England.
	1881.	1891.	1901.	1911.	1911.
0–4 ..	.01018	.01374	.01227	.01588	+.00463
5–9 ..	.00898	.00975	.01105	.01064	−.00060
10–14 ..	.00943	.01195	.00981	.00869	−.00126
15–19 ..	.01332	.00389	.00223	.01485	−.00804
20–24 ..	.03493	.04192	.00157	.02472	−.05266
25–29 ..	.12482	.11802	.02183	.03155	−.05440
30–34 ..	.12489	.15534	.07807	.03485	−.04359
35–39 ..	.15176	.14833	.11272	.04356	−.03459
40–44 ..	.17886	.16100	.13292	.07038	−.03693
45–49 ..	.20734	.14761	.14744	.10160	−.03811
50–54 ..	.24498	.15267	.13833	.12294	−.04132
55–59 ..	.25546	.16233	.10217	.10885	−.04883
60–64 ..	.23988	.19446	.08809	.07725	−.06437
65–69 ..	.22504	.19310	.13194	.05274	−.09299
70–74 ..	.22228	.17717	.16770	.05417	−.14419
75–79 ..	.20038	.19886	.13247	.06685	−.17745
80–84 ..	.26350	.17799	.07707	.07253	−.21752
85–99 ..	.28955	.12313	.06902	−.02107	−.27160
90–94 ..	.03175	.25424	.05306	−.05164	−.35311
95–99 ..	−.05263	.23967	.06215	−.04651	−.40237
100 ..	+.20000	.17647	—	+.05263	−.43750
Masculinity of total Population	.07983	.07362	.04824	.03840	−.03269

* (Males − Females) ÷ Persons.

An examination of these results shews that where there is a considerable migration element, predictions as to the future movement of the masculinity, by extrapolation, are somewhat uncertain both for any age-group and for all ages. Moreover, interpolations will lead to results which can be regarded only as fairly accurate.

10. **Theories of Masculinity.**—The results given shew that the masculinity of still-births is considerably higher than that of live-births, roughly in the proportion of about 1.15 to about 1.35 greater; and that masculinity at birth generally is about 1.05 or 1.06. These facts are remarkable, and have given rise to various attempted explanations. J. A. Thomson in his "Heredity"[1] says that, according to Blumenbach, Drelincourt in the 18th century brought together 262 groundless hypotheses as to the determination of sex, and that Blumenbach regarded

[1] Murray, London, 1908, p. 477.

Drelincourt's theory as being the 263rd. Blumenbach postulated a "Bildungstrieb" (formative impulse), but this was regarded as equally groundless. It has been suggested that war, cholera, epidemics, famine, etc., are followed by increase in the masculinity. These will have to form the subject of later investigations. At present it would seem that the first necessity is a sufficiently large accumulation of accurate statistic, as a basis for study. The one point which is clear is that death *in utero* (at least in the later stages) is marked by much greater masculinity than that which characterises live-births. This will be referred to later in dealing with infantile mortality.

That the effect of *war* is not apparently discernible in existing statistics, is evident from the following table, viz., Table XXXI, shewing the experience of France from 1865 to 1876. It will be seen that the war-years, 1870 and 1871, and subsequent years reveal no change in the masculinity.

Table XXXI.—Experience of France, 1865 to 1876.

Year.	Rates per 1000 of Mean Population.			Deaths of Children under 1 year of age per 1000 births.	Excess of Males over Females in each 1000 births.
	Marriage.	Birth.	Death.		
1865 ..	7.85	26.5	24.3	191	2.5
1866 ..	8.00	26.4	23.2	162	2.6
1867 ..	7.85	26.4	22.7	170	2.1
1868 ..	7.85	25.7	24.1	192	2.3
1869 ..	8.25	25.7	23.5	176	2.4
1870 ..	6.05	25.5	28.4	191	2.3
1871 ..	7.25	22.9	35.1	240	2.4
1872 ..	9.75	26.7	22.0	152	2.3
1873 ..	8.85	26.0	23.3	180	2.4
1874 ..	8.30	26.2	21.4	158	2.6
1875 ..	8.20	25.9	23.0	170	2.4
1876 ..	7.90	26.2	22.6	165	2.3

XI.—NATALITY.

1. **General.**—The phenomena of human reproduction, as affecting population, and the whole system of relations involved therein, may be subsumed under the term "natality." In one aspect they measure the reproductive effort of a population; in another they disclose the rate at which losses by death are made good; in a third they focus attention upon social phenomena of high importance (*e.g.*, nuptial and ex-nuptial natality); in yet another they bring to light the *mode* of the reproductive effort (*e.g.*, the varying of fecundity with age, the fluctuation of the frequency of multiple-birth, etc.) In this section we shall deal with the questions which relate more directly to birth-rate, and shall treat of those which relate more directly to nuptiality in section XII, and to fecundity in section XIII.

Birth-rates are not immediately comparable. The physical and social development of two communities being identical, their birth-rates become roughly comparable only when the relative numbers of married and of single women at each age are identical. In regard to the initial qualification, it may be pointed out that any of the races of Western Europe, for example, may be immediately compared on the basis of identical numbers at the same ages; but a population of the natives of India would not be comparable to one of Western Europe because of earlier physical development and earlier marriage. Comparisons of this special character, however, may sometimes be founded on principles indicated by the theory of "corresponding states" in physical investigations. This matter will be referred to later.

Populations similarly characterised in respect of features, material to any question at issue, may be called homogeneous in that respect. In order to compare the birth-rates of populations, otherwise homogeneous, but differently constituted in regard to age, it is necessary to take account at least of three things, viz., (i.) the numbers at each age; (ii.) the relative fecundity at each age; and (iii.) the relative numbers of married and single women. In other words, a convenient and strict comparison can be made satisfactorily only on the basis of what may be called a "standard" or "normal" female population. This normal population should represent the mean of the whole series of populations proposed to be compared (*i.e.*, the relative numbers of married and of single females at each age should be their ratio to the entire aggregate). Comparison is then effected by attributing to this population-norm the nuptial and ex-nuptial birth-rates actually existing in the populations to be compared with one another. Such a comparison is free from the effect of accidental differences in constitution as to age; thus the relative magnitude

of the birth-rates and populations compared are revealed. The principles of developing norms of this type have already been considered; see VIII., §§ 8 to 12.

We consider first the nature of a birth-rate.

2. **Crude birth-rates.**—While the total number born in any population during any period, divided by the average number of the population during the period, *i.e.*, the *crude birth-rate*, is one element of the rate at which the population is reconstituted, its nature and limitations are important from certain points of view. We propose to consider these. Since both births and population vary with time, we may regard their variations of rate as represented by the functions $f(t)$ and $F(t)$. Thus if B_m denote the number of births occurring in a unit period (say 1 year), and P_m be the mean population during that period, the average period-rate (annual rate in the case supposed), which may appropriately be referred to the middle of the period, is :—

$$(340)\ldots\ldots\ldots \beta_m = \frac{B_m}{P_m} = \frac{B}{P}\frac{\int_{-\frac{1}{2}}^{+\frac{1}{2}} f(t)\,dt}{\int_{-\frac{1}{2}}^{+\frac{1}{2}} F(t)\,dt}$$

the instantaneous value passing through the range of values which determine the form of the functions f and F. P is the population as at the middle of the year, and B the rate per annum at which births are occurring at that moment.

In general, no serious error will be introduced in the value of β if, instead of P_m, the population at the middle of the year is used, though more accurate results will be to hand if population-determinations at the end of each half-year, or each quarter, or better still each month, are used to ascertain the mean. The necessary formulæ would be respectively

$$\begin{aligned}(341)\ldots P_m &= \tfrac{1}{2}(P_0+P_1)\,;\ \text{or} = \tfrac{1}{6}\,(P_0 + 4P_{\frac{1}{2}} + P_1)\,;\ \text{or}\\ &= \tfrac{1}{12}\,(P_0+4P_{\frac{1}{2}}+2P_{\frac{1}{2}}+4P_{\frac{3}{2}}+P_1)\,;\ \text{or}\\ &= \tfrac{1}{24}\,(P_0 + 2P_{\frac{1}{12}} + 2P_{\frac{2}{12}}+\ldots.2P_{\frac{11}{12}} + P_1\,;\ \text{or}\\ &= \tfrac{1}{40}\,\{(P_0 + P_{\frac{2}{12}} + P_{\frac{6}{12}} + P_{\frac{10}{12}} + P_1) + 2P_{\frac{6}{12}} +\\ &\qquad 5\,(P_{\frac{1}{12}}+ P_{\frac{5}{12}} + P_{\frac{7}{12}}+ P_{\frac{11}{12}}) + 6\,(P_{\frac{3}{12}} + P_{\frac{6}{12}})\}\,;^{1}\end{aligned}$$

or any of these indicated in VI., § 2, Table VI.

[1] The question of the formulae to be preferred was discussed for quarterly results in the Population and Vital Statistics Bulletin for Australia, No. 1, pp. 20, 21, and the coefficients adopted were 1, 4, 2, 4, 1, though previously 1, 2, 2, 2, 1 had been used. The use of formulae based upon integral functions supposes that the recorded population at the moment of record is substantially free from large deviations from the number represented by the functional change. If the functional change is small, and the "accidental" deviation is large, the use of the functional formulae does not yield the advantages expected, and has the disadvantage of multiplying the "accidental" deviation possibly by a very large or a very small factor (as the case may be); if the former, the result is not satisfactory.

Such formulae are, of course, more than abundantly accurate for all statistical purposes.

Birth-rate is influenced by—

(*a*) the sex and age constitution of the population ;

(*b*) all forces restricting the fecundity of a population (*e.g.*, frequency of, and the age of, marriage ; social tradition and habits; etc.);

(*c*) the frequency of multiple-births ;

(*d*) infantile mortality (since mothers who lose their offspring are again exposed to the risk of maternity), etc.

These influencing factors will be considered either in this section, viz., XII., or in later sections.

3. **Influence of the births upon the birth-rate itself.**—Let it be supposed that the population of two communities be initially P and that in the same period B births occur in one and 2 B in the other, of which in each case the proportion s survive ; the numbers being thus sB and $2sB$ at the end of the period. If there were no migration, and no deaths, other than those arising from the births, the deduced birth-rates would be

$$(342)..\beta_1 = \frac{B}{P + \frac{1}{2}sB} \quad \text{and} \quad \beta_2 = \frac{2B}{P + sB} \; ; \; \text{but } 2\beta_1 = \frac{2B}{P + \frac{1}{2}sB}$$

a larger quantity. Hence the effect of an increase of a birth-rate, when a proportion of the births is incorporated in the population, is to somewhat diminish that ratio of births to population, which really represents the relative frequency of birth, unless at least the population is increasing in some manner which counteracts this. The preceding result is more obvious if put in the form—

$$(342a)..2\beta_1 = \frac{2B}{P + sB}\left\{1 + \frac{1}{2}\,s\frac{B}{P} - \frac{1}{4}\left(s\frac{B}{P}\right)^2 + \text{etc.}\right\} \; ; \; \beta_2 = \frac{2B}{P + sB}$$

More generally we have—

$$(342b)\ldots\ \beta_1 : \beta_2 :: \frac{B_1}{P_1(1 + \frac{1}{2}r_1)} : \frac{B_2}{P_2(1 + \frac{1}{2}r_2)}$$

(r denoting the increase, supposed linear); shewing that the birth-rates and births are in the same ratio only if the *mean* populations are identical. Hence as measures of fecundity birth-rates need some slight correction, owing to their influence on the magnitude of the population. They are strictly comparable in this respect only when two populations are homogeneous, and differences of birth-rate themselves disturb the homogeneity and thus involve the application of some correction.[1]

[1]There is an analogous case in connection with the computation of interest earned on assurance and similar funds. Thus if I denote the interest earned in the course of a year, A and B the funds at the beginning and end of the year respectively, and i the *effective* rate of interest earned on the funds during the course of the year, then the value of i is approximately given by the following formula, now generally adopted in practice :—

$$i = I/\left\{\tfrac{1}{2}(A + B) - \tfrac{1}{2}I\right\}$$

4. **Influence of infantile mortality on birth-rate.**—Denoting the number of births by B, and of infantile deaths by M, and the number of women of child-bearing age by P, we shall have for the birth-rate β, attributed not to the whole population but to the P women, and for μ the rate of infantile mortality—

$$(343)\ldots\ldots \beta = B/P\,;\ \mu = M/B\,;\ \beta\mu = M/P.$$

Suppose μ to change to some other value $\mu' = M'/B'$; M' being the number of deaths and B' the number of births under the changed state of things, assumed to have become constant. Then, since mothers who lose their children are exposed to an increased risk of maternity, the ratio of which is only the proportion q (a proper fraction) of the full risk, we shall have for the number at risk as originally, viz., N, and also after a change in the prevailing rate of infantile mortality, N'.

$$(344)\ldots\ldots N = P - B + qM\,;\ \text{and}\ N' = P - B' + qM'.$$

If the reproductivity of these two groups is the same, then $B/N = B'/N'$; from which it follows that—

$$(345)\ldots\ldots \frac{P + qM}{B} - 1 = \frac{P + qM'}{B'} - 1$$

and consequently, discarding the unit from each side and writing in the values of the quantities as by (343) above, we have—

$$(346)\ldots\ldots \frac{1}{\beta} + q\mu = \frac{1}{\beta'} + q\mu'\,;$$

that is—

$$(347)\ldots\ldots \beta' = \beta\ \{\ 1 + q\beta'\ (\mu' - \mu)\ \}$$

It will be found that this change is sensibly a linear one, or any increment in the rates of mortality will cause a sensibly constant but small proportional increase in the birth-rate. If we call the birth-rate, freed from the influence of infantile mortality, the *normal birth-rate* β_0, then—

$$(348)\ldots\ldots \beta_0 = \beta\ (1 + k\mu).$$

in which k may be regarded as a constant for a particular community, and a particular epoch. The value of k was found on the average for Europe to be about $+ 0.033\ \mu$, or $\beta_0 = \beta + 0.033\ \mu$, the birth-rate β being expressed per 1000 of the population, and the infantile mortality rate μ expressed per 1000 births. An examination of the data for different countries gave the following results :—

TABLE XXXII.—Influence of the Rate of Infantile Mortality on the Crude Birth-rate for Various Countries, about Year 1900.

Country.	Period.		Value of β_0 and k in $\beta = \beta_0 + k\mu$.†	
	Birth.	Mortality.		
			β_0	k
New Zealand	1881–1905	1882–1906	13.2	+ 0.191
Commonwealth	1887–1905	1888–1906	16.8	+ 0.118
Sweden	1881–1904	1882–1905	17.1	+ 0.100
Norway	1881–1905	1882–1906	20.5	+ 0.100
Prussia	1881–1905	1882–1906	19.1	+ 0.085
Various Countries* ..	1901	1902	19.4	+ 0.083
Netherlands	1881–1905	1882–1906	22.6	+ 0.063
France	1881–1905	1882–1906	12.7	+ 0.061
Denmark	1881–1905	1882–1906	22.4	+ 0.060
Japan	1881–1904	1882–1905	22.3	+ 0.053
Ceylon	1881–1905	1882–1906	26.4	+ 0.042
Jamaica	1881–1905	1882–1906	34.3	+ 0.022
Switzerland	1881–1904	1882–1905	25.3	+ 0.018
Ireland	1881–1905	1882–1906	25.8	— 0.026
England and Wales ..	1881–1905	1882–1906	38.6	— 0.058
Scotland	1881–1905	1882–1906	38.9	— 0.068

* For one year only. † The birth-rate being expressed per 1000 of the population, and the infantile mortality per 1000 births.

The infantile mortality rate (μ) in the table is expressed by the number of infants dying per 1000 of infants born.

The crude birth-rate (β) is the number of births per 1000 of the total population.

It will be seen that the magnitudes of k, and therefore of q, have no general relation to the magnitude of the birth-rate ; that is, a particular value of the risk-factor is characteristic of a particular country.

In an investigation made in 1908[1] it was shewn that the influence of infantile mortality was very irregular in its operation, and the following deductions were stated, viz. :—[2]

(i.) When either all mothers of deceased infants, or any constant proportion thereof, may be regarded as subject to equal risk of fecundity (*i.e.*, equally likely to bear children) then equal increases in the rate of infantile mortality tend to be followed by equal though relatively small increases in the birth-rate.

(ii.) The influence of infantile mortality on the birth-rate must always be very small. (The contrary proposition is not, of course, necessarily true).

This type of investigation aims rather at ascertaining the form of the function expressing the correction, so that the form being determined, the constants can then be ascertained from the data. It would appear that yearly irregularities of birth-rate are so great as compared with the influence of infantile mortality that the latter is virtually masked by the former. Probably in any rigorous investigation of a measure of the fecundity of a population the birth-rate should be corrected in some such way as has been indicated.

[1] By the writer. See Journ. Roy. Soc., N.S.W., Vol. xlii., pp. 238-250, particularly Fig. 1 on p. 243 therein.

[2] Loc. cit. pp. 241-2.

5. **World-relation between infantile mortality and birth-rate.**—In order to ascertain whether in a world-wide survey of infantile mortality and birth-rates any correlation manifested itself we may extend the purview of all countries where fairly accurate statistics are available, viz., the following :—

Australia, Austria, Belgium, Chili, Ceylon, Denmark, England and Wales, France, Ireland, Italy, Jamaica, Japan, Netherlands, New South Wales, New Zealand, Norway, Queensland, Russia, Scotland, South Australia, Spain, Sweden, Switzerland, Tasmania, Victoria, West Australia.

The populations are, of course, repeated with different rates, and are *equivalent* to 8776 millions,[1] the results forming groups of available results ; according to the magnitude of the infantile mortality we get the results shewn in Table XXXIII. hereunder, the ranges of infantile mortality being shewn therein.[2]

In Fig. 48, graph A denotes the relative frequency of the given ranges of infantile mortality.[3] It will be observed that the graph is dimorphic, that is, that while the characteristic rate of infantile mortality is about .0150 (150 as usually expressed), there is also a second mode for the rate of about .0255. The corresponding crude birth-rates are about .029 and .048 respectively (or residual birth-rates, see hereinafter, about .025 and .035). It will be seen that there can be a very high rate of infantile mortality with low birth-rate, but it would appear, only for very limited populations.[4]

TABLE XXXIII.—Relations of Infantile Mortality and Birth-rate, various Countries, about Year 1900.

Population Represented (millions)	Ranges of Infantile Mortality for Individual Populations.	Mean of Infantile Mortalities.	Mean of Crude Birth-rates.	Infantile Mortality of Aggregate.	Crude Birth-rate of Aggregate.	12 Months Residual of Birth-rate.
344	.0688–.0959	.0821	.0291	.0911	.02692	.02447
479	.1018–.1232	.1120	.0291	.1119	.02889	.02566
2035	.1276–.1474	.1371	.0288	.1387	.02865	.02468
2172	.1519–.1724	.1618	.0291	.1598	.02904	.02440
1116	.1762–.1974	.1872	.0340	.1880	.03391	.02753
851	.2032–.2179	.2098	.0367	.2085	.03365	.02663
297	.2213–.2372	.2286	.0380	.2279	.03808	.02940
696	.2406–.2559	.2490	.0480	.2491	.04757	.03572
668	.2601–.2771	.2688	.0479	.2710	.04763	.03472
189	.2800–.2920	.2870	.0446	.2845	.04885	.03495
105	.3040–.3290	.3133	.0385	.3075	.04549	.03150
147	.3325–.3490	.3406	.0366	.3392	.03701	.02446
91	.3660–.4120	.3890	.0372	.3800	.03681	.02282

[1] The method is, of course, not perfectly satisfactory ; for, as pointed out by the writer (on p. 245), loc. cit. the populations are not homogeneous, and doubtless if more moderate-sized districts could be analysed the material would give a clearer indication of the true nature of the relation.

[2] See also loc. cit., p. 246, and Fig. 2, p. 247, in the same paper.

[3] See page 150 hereinafter.

[4] Similar indications are given by the analysis before referred to. See loc. cit. p. 248, Fig. 3.

This more general result shews that propositions (i.) and (ii.) in the preceding section can be regarded as true only for individual populations and probably for very limited periods of time ; the effects are readily masked by more potent influences.

In the table hereunder (XXXIV.), of results in the present century, the following countries have been included, viz., *in column* (i.) New Zealand, 1913 ; Norway, 1912 ; Australia, 1913 ; Sweden, 1911 ; France, 1912 ; Netherlands and Denmark, 1913 ; Switzerland, 1913 ; Ireland, England and Wales, and United Kingdom, 1913 ; Finland, 1912 ; Scotland and Ontario, 1913 ; Belgium, Italy and Prussia, 1912 ; Serbia, 1911 ; German Empire, 1912 ; Spain, 1907 ; Bulgaria and Japan, 1910 ; Jamaica, 1913 ; Austria and Hungary, 1912 ; Ceylon and Roumania, 1913 ; Russia (European), 1909 ; Chile, 1911 ; and *in column* (iv.) France and Belgium, 1912 ; Ireland, England and Wales, and Ontario, 1913 ; Sweden, 1911 ; United Kingdom, 1913 ; Switzerland, 1912 ; Scotland and Denmark, 1913 ; Norway, 1912 ; New Zealand, Netherlands, and Australia, 1913 ; German Empire, Prussia, Finland, Austria and Italy, 1912 ; Spain, 1907 ; Japan, 1910 ; Jamaica, 1913 ; Serbia, 1911 ; Hungary, 1912 ; Chile, 1911 ; Ceylon, 1913 ; Bulgaria, 1910 ; Roumania, 1913 ; Russia (European), 1909. The results are the weighted means (or what is the same thing, the values are for the population-aggregates) of the populations, combined in successive groups of ten, arranged (in ascending order) according to infantile mortality in the one case, and according to birth-rate in the other.

These results shew unequivocally that there is, *in general*, a relation between birth-rate and infantile mortality. The calculated results are as follows ; β denoting birth-rate per unit of population, and μ denoting infantile mortality rate per birth :—

Determined from groupings in the order of infantile mortality :—

(349)..$\beta = 0.00956 + 0.1405\ \mu$; (which gives $\mu = 0.06804 + 7.117\ \beta$) ;

and determined from grouping in the order of birth-rate :—

(350)....$\mu = -0.03661 + 5.970\ \beta$; (which gives $\beta = 0.06132 + 0.1675\mu$).

The mean of these results is expressed with sufficient precision by—

(351)..$\beta = 0.00785\ (1 + 19.6\ \mu)$; $\mu = 0.0510\ (1 - 127\ \beta)$

β being the rate per unit of population, and μ per birth.

TABLE XXXIV.—General Relation between Infantile Mortality and Birth-rate, Aggregates of various Countries, 1907 to 1913.

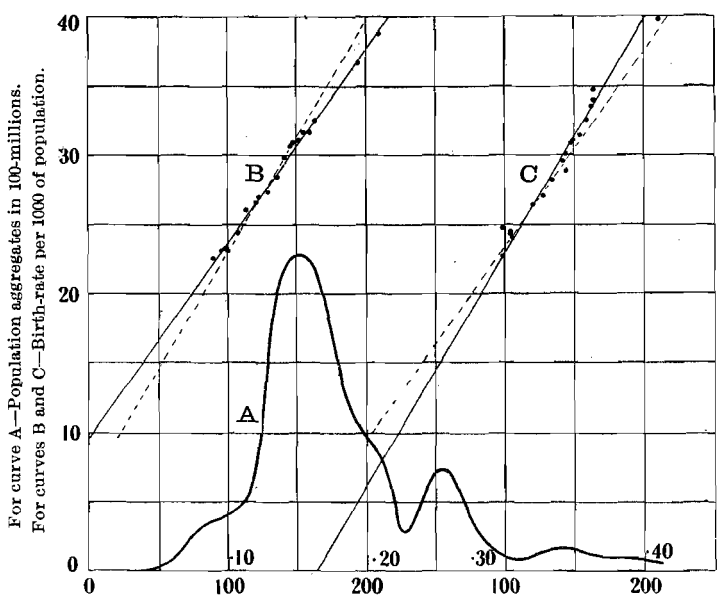
Infantile Mortality and Birth-rate.					Birth-rate and Infantile Mortality.				
Population in Millions.	Infantile Mortality.*	Birth-rate.†	Calculated.‡	Reduced Birth-rate.†	Population in Millions.	Birth-rate.†	Infantile Mortality.*	Calculated.§	Reduced Birth-rate.*
(i.)	(ii.)	(iii.)			(iv.)	(v.)	(vi.)		
107.6	90	22.6	22.2	20.6	154.2	22.7	99	99	20.5
152.5	96	23.0	23.1	20.8	116.9	24.0	105	107	21.5
153.3	96	23.1	23.1	20.9	110.4	24.1	104	107	21.6
153.2	97	23.0	23.2	20.8	112.2	24.4	103	109	21.9
150.4	99	23.0	23.5	20.7	80.1	24.8	99	111	22.3
118.3	107	24.3	24.6	21.7	143.5	26.4	121	121	23.2
147.2	113	26.1	25.4	23.2	179.1	27.1	128	125	23.6
185.4	121	26.7	26.6	23.5	136.2	28.2	134	142	24.4
184.5	122	26.9	26.7	23.6	161.3	28.8	144	135	24.7
246.3	129	27.3	27.7	23.8	191.6	29.6	142	140	25.4
228.6	135	28.4	28.5	24.6	208.0	30.0	144	132	25.7
186.9	142	29.8	29.5	25.6	256.1	30.8	148	147	26.2
234.2	146	30.7	30.1	26.2	255.9	30.8	148	147	26.2
230.4	147	30.8	30.2	26.3	252.7	31.0	150	148	26.4
256.6	151	31.0	30.8	26.3	269.0	31.4	154	151	26.6
270.1	155	31.6	31.3	26.7	206.3	32.5	159	157	27.3
239.3	159	31.6	31.9	26.6	169.5	33.6	163	164	28.1
205.6	163	32.5	32.5	27.2	170.6	33.9	164	166	28.3
319.2	194	36.7	36.8	29.6	149.1	34.8	163	171	29.1
256.5	208	38.9	38.8	30.8	230.6	39.8	211	201	31.4

* Per 1000 births. † Per 1000 population. ‡ By formula (349).
§ By formula (350).

From these the lines B and C respectively are plotted and the calculated values in columns (iii.) and (vi.) are computed. The dotted lines shew the positions of the other graph for the purpose of comparison, and the line which represents formula (351) is between the two.

That these results, though not identical, are very similar, is seen from the graphs B and C, shewing the two series of values. What they establish is that, on the whole, the birth-rate and infantile mortality increase together. Moreover, when the birth-rate is reduced to its effective value twelve months later (that is, for one year of age), it is much more uniform on the whole. Since, as shewn, the increase of risk of maternity is relatively small (348), it follows that, on the whole, the social conditions which characterise a large birth-rate are those associated with a high rate of infantile mortality. This, of course, is not necessarily so, but expresses the general fact. In short, a high birth-rate is usually associated with a high rate of infantile mortality, but high infantile mortality will, *per se*, not appreciably affect the birth-rate. The importance of this result is obvious.

GENERAL RELATION BETWEEN INFANTILE MORTALITY AND BIRTH-RATE.



For curve A.—Infantile mortality rate per birth.
For curves B and C.—Infantile mortality rate per 1000 births.
Fig. 48.

6. **Residual birth-rates.**—Owing to the very high death-rate of infants, the crude birth-rate, taken alone, is not a satisfactory expression of the effective recuperative force of a population against the ravages of death. It is not practicable, however, to assign any particular age as specially appropriate for estimating the *virtual efficiency of birth-rate*, and as we have seen high birth-rates, however, are ordinarily associated with a high rate of infantile mortality.

For example, New Zealand and Australia had birth-rates in 1912 of 26.5 and 28.7 per thousand population, and *infantile death-rates* (*i.e.*, deaths under 12 months per 1000 born) of 51 and 72, while Ceylon and Chile, in 1911, had birth-rates of 37.9 and 38.5, and infantile death-rates of 218 and 332. This question will be referred to later.

Birth-rates corrected so as to represent the number living after a given period may be called *residual birth-rates*, and the quantity multiplied into a birth-rate to give its residual value may be called the *survival coefficient, or survival factor*. We shall consider these. Owing to the fact that of all the deaths which occur in 12 months, about 42 per cent. occur in the first month, the infantile mortality may be referred to the same calendar year as the births without sensible error, or we may correct

it as explained hereinafter. Let β be the birth-rate and γ the rate of infantile mortality, the first expressed per unit of the population, the latter per birth. Then the residual birth-rate β_r is[1]—

$$(352)\ldots\ldots \beta_r = \beta\ (1 - \gamma)$$

The quantity in brackets is the "survival-factor" and β_r is the "residual birth-rate." For a population in which the number of births was constant and the rate of mortality for the first twelve months was constant, the probability of persons of age 0 living to age 1, viz., ${}_0p_1$, would be the same as the survival factor, since under these conditions it would denote the ratio of those surviving one year, viz., l_1 to the number born, viz., l_0. Consequently, subject to this limitation—

$$(353)\ldots\ldots (1 - \gamma) = {}_0p_1 = l_1 / l_0.$$

For a population in which the number of births is *increasing*, say, at the rate rt, and the rate of infantile mortality *diminishing*,[2] say, at the rate $r't$, these quantities become functions of time and are affected by the interval of time between the year for which the births are recorded and the somewhat later year for which the infantile deaths *ought to be recorded*, in order to properly refer to the birth-group. As, however, the error arising is of a small order as compared with the accidental deviations from year to year, it is questionable whether a correction is worth applying. It may be mentioned that in Australia it was found by an investigation for the years 1909 and 1910, that all children who die in the first year of life live on the average 99.3 days, and children are registered on the average 38.2 days after birth.[3] The difference, 61.1 days, or say two months, is regarded as the difference between the years. Thus the infantile mortality in the following table was calculated on the births occurring one-sixth of a year earlier. Similarly the birth-rate given for the equivalent year to n, say β_e, is—

$$(354)\ldots\ldots \beta_e = \tfrac{1}{6}\,\beta_{n-1} + \tfrac{5}{6}\,\beta_n .$$

It may also be noted that an investigation of the question shewed that of the deaths in Australia under 1 year of age occurring in any calendar year, 0.72 to 0.74 per cent.—average about 0.73—arose from births which occurred within that calendar year, and 0.27 from those which occurred in the preceding year. This proportion is doubtless approximately true also for other countries.

---

[1] These rates are commonly expressed per 1000 of the population, and per 1000 born respectively, in which case the formulæ will be $\beta_r' = \beta'\ (1 - \frac{\gamma'}{1000})$; β' and γ being 1000 times greater than β and γ.

[2] Infantile mortality has for years past been steadily diminishing in many countries.

[3] This has ceased to be true because of the "maternity bonus."

This would suggest that the coefficients in the above equation (354), should be $\frac{1}{4}$ and $\frac{3}{4}$ instead of $\frac{1}{6}$ and $\frac{5}{6}$, but, only if the average lateness of the registration of births and deaths were the same, which, however, was not the case. The practical result of the difference is not great. It will appear from a rigorous investigation in the next two sections, that with the rate of infantile mortality as it stood during the years 1909 to 1913, the proper proportion is about 0.731, a proportion which will be modified only by the difference in the registration interval. This interval, owing to the payment of the maternity bonus, resulting in earlier registration of births, has now become smaller.

TABLE XXXV.—Residual Birth-rates, Australia, 1904-14.

Year.	Crude Birth-rate, for Calendar Year.*	Infantile Death-rate† Calendar Year.	Crude Birth-rate for Equivalent Year.	Survival Factor.	Residual Birth-rate
1903 ..	25.29				
1904 ..	26.41	81.77	26.073	.91823	23.94
1905 ..	26.23	81.76	26.260	.91824	24.11
1906 ..	26.57	83.26	26.497	.91674	24.29
1907 ..	26.76	81.06	26.728	.91894	24.61
1908 ..	26.59	77.78	26.618	.92222	24.54
1909 ..	26.69	71.58	26.673	.92842	24.76
1910 ..	26.73	74.81	26.723	.92519	24.72
1911 ..	27.21	68.49	27.297	.93151	25.43
1912 ..	28.65	71.74	28.410	.92826	26.37
1913 ..	28.25	72.71	28.317	.92729	26.26
1914 ..	28.05	71.47	28.083	.92853	26.08

* Per 1000 population. † Per 1000 births.

The final column is the efficient birth-rate, the end of the first year of life being taken as an appropriate point of time for determining the efficiency, since the larger death toll from infantile troubles may be regarded as then past.

7. **Determination of proportion of infantile deaths arising from births in the year of record, number of births constant.**—Births, and infantile and other deaths, are recorded as occurring during successive equal periods of time, usually calendar years, half-years, quarters, months, etc.; and the deaths during such periods are distributed according to a series of age-limits, for adults usually whole years, 0–1, 1–2, etc. In the case of "infantile deaths" or deaths of children under one year of age, they are distributed according to age-limits of weeks, months, quarters, etc. Consequently the infantile deaths occurring in any year are drawn from the births [and immigrants] both in the year of record

and in the previous year. More generally deaths of persons between the ages x_1, and x_2 recorded in any period of time, say $-t_z$ to 0, are drawn [where there is no immigration] from those born [in the country] during the period $-(x_2+t_z)$ to $-(x_1+0)$.[1] In the same way deaths recorded in any period $-t_{2z}$ to $-t_z$ would be drawn from those born [either in the country or from migrants entering it] during the period $-(x_2+t_{2z})$ to $-(x_1+t_z)$.

If the frequency of births be denoted by $k' F_1(t)$; the number of survivors after any period of time, x, of persons born at the moment t, will, so long as the death rates at each age remain constant, also be this function multiplied by the probability of surviving to the age x. Thus if this probability be denoted by λ_x, or that of dying be denoted by δ_x, $= 1 - \lambda_x$, then the survivors of age x, say S_x, and those who have not attained that age, say D_x, will be—

$$(355)\ldots\ldots S_x = \lambda_x F_1(t)\,; \text{ and } D_x = \delta_x F_1(t)$$

for we may make $k' = 1$ if ratios only are needed.[2]

With births increasing, the successive records of the dying of any given age will also shew a similar progressive increase, proportional to that of the births, the death-rates at each age being constant. Thus the aggregate of births between the times t_1 and t_2, will be—

$$(356)\ldots\ldots {}_{t_1}B_{t_2} = k\int_{t_1}^{t_2} F_1(t)\,dt.$$

which would give merely $B = K(t_2 - t_1)$ if the frequency of births were constant, K being the number per annum when t is expressed in years. If the frequency be not constant, but of the form indicated hereinafter, viz., that in equation (359), then it will be [see also II., §6, (10)]—

$$(357)\ldots {}_{t_1}B_{t_2} = K(t_2 - t_1)\left\{1 + \frac{1}{2}a(t_2 - t_1) + \frac{1}{3}b(t_2^2 + t_2t_1 + t_1^2)\right.$$
$$\left. + \frac{1}{4}c(t_2 + t_1)(t_2^2 + t_1^2) + \text{etc.}\right\}$$

which, when t_1 is 0, takes the simpler form—

$$(358)\ldots\ldots {}_0B_t = Kt\left\{1 + \frac{1}{2}at + \frac{1}{3}bt^2 + \frac{1}{4}ct^3 + \text{etc.}\right\}$$

[1] The words in square brackets may be omitted, if proper care be taken in the practical computations in regard to the influence of migration.

[2] That is $\lambda_x = l_x/l_0$ in an "actuarial population"; or is l_x if l_0 be made unity. Similarly $\delta_x = (l_0 - l_x)/l_0$.

With respect to survivors to age x, it may be noted that, in the earliest stages of life, λ_x decreases with the greatest rapidity, hence of the deaths occurring in any year the greatest number is contributed by those of the smallest age ; at least in the case of all aged less than 10 or 11 years,[1] and therefore for ages less than 10 years the greater number is contributed by what may be called the *ordinary year of reference*, viz., in the case of infantile deaths, the year of observation [or year of record] itself.[2] We may obtain an exact measure of this if we have the values of λ_x or δ_x For perfect rigour we must put these quantities $= F_2(x, t)$ for at the present time the value λ_x is sensibly increasing every year, and thus δ_x decreasing every year, for nearly all ages. It will, however, simplify the solution, and lead to no sensible error, if we omit the t and assume that either quantity is simply a function of x, say $\lambda_x = F_2(x)$ and $\delta_x = F_3(x)$.

Before envisaging the pertinent questions in their practical form, rather than in their more general and theoretical form, it may be pointed out that both these probabilities may readily be expressed as the sum of a series of exponential terms in the form (360) hereunder. Moreover, as has already been shewn, see II., §§ 2 to 10, formula (2a), (6), (9) to (13), the birth-frequency [and if desired this may include the migration element], may be put in the form—

$$(359)\ldots\ldots b_t = F_1(t) = K\ (1 + at + bt^2 + \ldots\text{etc.})$$

in which a, b, c, etc., may of course be positive, negative, or zero. As above-stated, either—

$$(360)\ldots\ldots \lambda_x, \text{ or } \delta_x, = F_2(x) \text{ or } F_3(x) = (k_1 e^{-n_1 x} + k_2 e^{-n_2 x} + \text{etc.})$$

in which, for values of x not greater than 10 or 11, n is numerically a diminishing quantity. On expanding the exponential terms we have—

$$(361)\ldots\ldots \lambda_x \text{ or } \delta_x = A\ (1 - \alpha x + \beta x^2 - \text{etc.})$$

in which it may be easily seen that—

---

[1] The instantaneous rate of mortality, or the so-called "*force* of mortality" in actuarial terminology, is, in Australia, a minimum between the ages 11 and 12 years of age for males, and between 10 and 11 for females.

[2] The "ordinary" rate of infantile mortality is the ratio of the number of infants dying under one year of age, in any year of observation, to the number of infants born in the same year. This ratio is usually multiplied by 1,000, to avoid decimals.

$$(362)\ldots\ldots A = \Sigma k\,;\quad \alpha = \frac{\Sigma(kn)}{\Sigma k\,.\,1\,!}\,;\,\beta = \frac{\Sigma(kn^2)}{\Sigma k\,.\,2\,!}\,;\ \text{etc.}$$

Incidentally, it may be repeated that the function b_t may be made to embody all complications arising from migration, forasmuch as birth may be regarded mathematically, merely as a case of immigration at age 0, and the constant can be so determined as to represent birth and [net] immigration combined for a succession of ages.

8. **Equivalent year of birth in cases of infantile mortality.**—In order to avoid circumlocution and to simplify the statement of the problem, we shall assume the period of observation of infantile mortality to be successive calendar years; and the record of births to be also according to calendar years. The necessary variation of this statement for other equal periods is self-evident. From what has been indicated in the preceding section it is clear that the infantile deaths in any year can be referred to a birth-year, which precedes the calendar year by some period less than a half-year. We proceed to evaluate this interval, which obviously depends upon:—(*a*) the rate at which the cases come under initial observation, that is upon the frequency of birth [or of birth and migration]; and (*b*) upon the decrease in the rapidity of death in the first year of life. The birth-*rate* in the ordinary sense is, of course, immaterial. For so limited a period as one year, we can, for the purpose in view, assume that $1 + rt$ expresses the increase with time of the frequency of births. If we make the origin of the variable, *i.e.*, time, the *end* of the year of observation, we have to consider the deaths of persons between the age-limits 0 and 1, occurring during the period -1 to 0, drawn obviously from births [and immigration] during the period -2 to 0, inasmuch as survivors born at the time $-2 + t'$ will be within the age-limits up to the time $-1 + t'$, which also is in the year of observation. Consequently also deaths among these must be taken into account. Thus at the time $-t$, the ages of persons, the deaths among whom will be included in the category of infantile deaths, will be between 0 and $x = 1 + t$. *This connects the time-limits with the age-limits.* The range of relative frequency extends from 1 for $t = 0$, to $1 - 2r$ for $t = -2$, (coming under observation, however, only for $t = -1$, whenever infantile deaths are observed for the same year as births). The question for resolution then is:—

Given the form and constants of the function expressing the variation in the frequency of births, and the form and constants of the function expressing the probability of living to age x, where x is less than 1, what proportion of the infantile deaths in any calendar year is drawn from the year of observation, and what proportion is drawn from the year preceding that of observation. The nature of the problem is illustrated by Figs. 49 to 52, p. 157, which illustrate either the case of deaths, or

that of births and survivors. The deaths occurring in a small unit of time, Δt say, arising from births in the same unit, is represented by the height of the first parallelepiped HA. It embraces all persons of age 0 to age $0 + \Delta x$, the period of observation being 0 to $0 + \Delta t$, the number being the height HA, and Δt being equal to Δx, these quantities being thus dx and dt when indefinitely small. The number of deaths at the end of a period, say a year, from the survivors of those born at its beginning, is represented by the height BI, and after a second period, say two years, by the height CM, Fig. 49. The succession of deaths are thus represented by the parallelepipeds 1.1 , 1.2 , 1.3 , etc. They are followed by deaths occurring among those born during the period Δt to $2\Delta t$, represented by 2.1 , 2.2 , etc., and so on, these, in an increasing population, being somewhat larger than the former series, since the births from which they are drawn are greater in number. The parallelepiped F E, or $12._1$, represents the deaths in the last period, viz., $2 - \Delta t$ to 2 ; 7.1 represents those in the period 1 to $1 + \Delta t$, the deaths among the survivors in the successive elementary periods being 7.2 , 7.3 , etc. Thus, from Figs. 49 and 50, it is at once evident that A'_0, the deeper shaded figure BIKLDB, represents deaths from survivors from the previous period. The medium shaded figure, B_0, represents deaths in the period under consideration born in that period, since G to L is contemporaneous with G to F. The broken shaded figure A_0, or AHGKIBA, represents the deaths occurring in the preceding periods from births in that period ; they are similar to B_0. The black shaded figure, A_1 ,or BILDCB, represents deaths at ages outside the limit, that is, at ages greater than one year (exactly). In short, A_0, B_0,.....D_0 represent deaths within the year of record of persons less than one year old ; A'_0 to C'_0, represent deaths of survivors from the preceding year. Similarly in regard to the other figures, A_1 to C_1 represent deaths of persons of age 1 to 2, attaining that age in the year previous to the year of record ; while A'_1 to B'_1 represent deaths of persons of age 1 to 2 who attain that age during the year of record. Similarly, *mutatis mutandis*, in regard to A_2, B_2, and A'_2, etc.

The figures of the type A_0, B_0,....A_1, B_1, etc., are represented by the solid Fig. 52, those of the type A_1, B_1,....A_2, B_2, etc., are represented by the solid Fig. 51.

If the origin for $x + 0$, $t + 0$, be the point A in Figs. 49, 50, 52 then the lengths of an element of volume in areas A_0, A'_0, and B_0, taken parallel to A G Q V, Fig. 52, are respectively $t - x = 1 - x$, x, and $2t - (t + x) = 1 - x$.

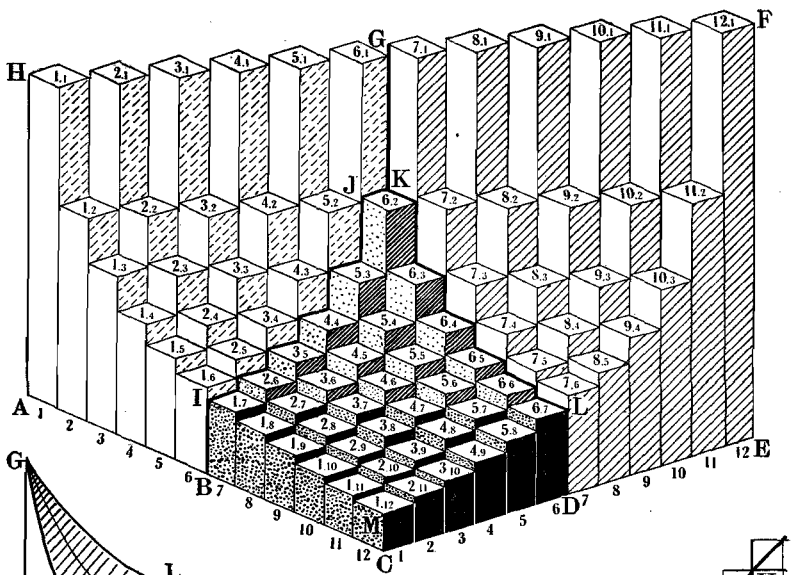


Fig. 49.

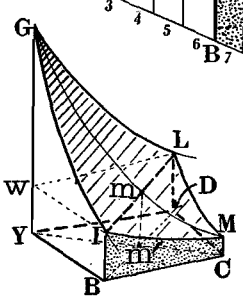


Fig. 51.

Fig. 52.

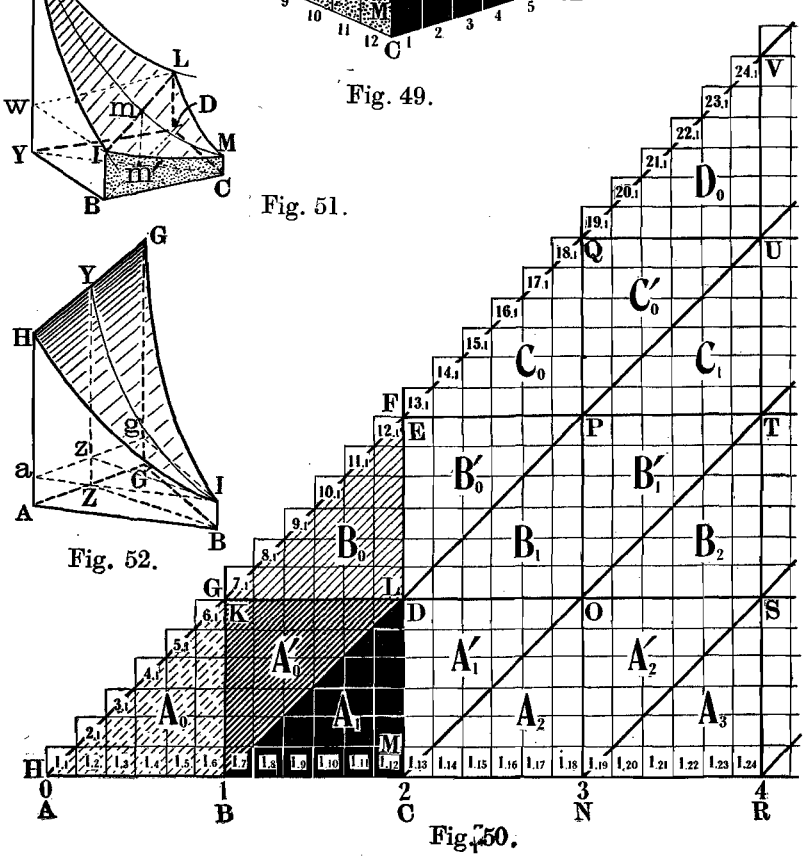


Fig. 50.

If the number of births in successive units of time be *constant*, it is obvious that $A_k = B_k = C_k$, etc.; $A'_k = B'_k = C'_k$, etc.; k being any suffix, and that we have also—

$$(363)\ldots\ldots A_0 = B_0 = \ldots\ldots \int_0^1 (1 - x)\ F_3(x)\,dx$$

$$(364)\ldots\ldots A'_0 = B'_0 = \ldots\ldots = \int_0^1 x\ F_3(x)\,dx$$

Consequently the ratio B_0 / A'_0 is found by dividing the value of (363) by that of (364).

9. **Proportion of infantile deaths arising from births in year of record, number of births increasing.**—If the number of births be *increasing*, and the increase be assumed to be at the rate of $e^{rt} = 1 + rt + \frac{1}{2} r^2 t^2 +$ etc.; the quantities will increase, that is, with any common suffix A<B<C. Since the maximum value of r is about 0.03, the effect of the omission of the term t^2, where it is one year, is of the order of a two-thousandth, and may be ignored. Consequently, the increase in the number of births may, with abundant precision, be taken to vary as $1 + rt$. We may take the origin for t as at the point G in Fig. 50, hence an element of the volume of B_0, and of A'_0 will be respectively—

$$(1 - x)\ F_3(x)\ \delta x\ (1 + \frac{1}{2} r - rx);\ \text{and}\ x\ F_3(x)\ \delta x\ (1 - rx);$$

the element being taken parallel to H G F. The terms in brackets, containing r, represent the mean heights of the volume-elements taken along the lines Y I and G M respectively in Figs. 51 and 52. Hence, multiplying out, the relative values of the volumes representing B_0 and A'_0 are respectively as follows :—

$$(365)\ldots B_0 = \int_0^1 \{(1 + \frac{1}{2} r)\ F_3(x) - (1 + \frac{3}{2} r)\ x\ F_3(x) + r\ x^2\ F_3(x)\}\ dx$$

$$(366)\ldots A'_0 = \ldots\ldots\ldots\ldots\ldots \int_0^1 \{x\ F_3(x) - r\ x^2\ F_3(x)\}\ dx$$

From an analysis of the deaths of infants during four years, viz., 1909, 1910, 1912 and 1913, the relative values of the functions to be integrated were found to be as in the following table, viz., XXXVI., in which the figures in the first column represent the number of deaths out of 1,000,000 births, occurring up to the time after birth indicated in the first column, that is up to age x.

TABLE XXXVI.— Values of above Integrals for Various Periods, Basis 1,000,000 Births, Australia, Years 1909-10; 1911-12.

Period, or Age x.	$\int_0^x F_3(x)\,dx$	$\int_0^x x\ F_3(x)\,dx$.		$\int_0^x x^2\ F_3(x)\,dx$.	
	Number.	Number.	Proportion. *	Number.	Proportion *
1 day	9,360	11	.0012	0	.0000
2 ,, ...	14,032	27	.0019	0	.0000
4 ,, ...	17,257	57	.0033	0	.0000
5 ,, ...	18,500	73	.0039	1	.0001
10 ,, ...	22,573	154	.0068	2	.0001
15 ,, ...	25,335	247	.0097	5	.0002
20 ,, ...	27,497	350	.0127	10	.0004
25 ,, ...	29,228	457	.0156	17	.0006
30 ,, ...	30,645	563	.0184	25	.0008
30.437 ,, or 1 mth.	30,757	564	.0184	26	.0008
60.874 ,, 2 ,,	37,231	1,362	.0366	128	.0034
91.311 ,, 3 ,, ..	42,796	2,517	.0588	370	.0086
121.747 ,, 4 ,, ..	47,735	3,953	.0828	790	.0165
152.181 ,, 5 ,, ..	52,165	5,612	.1076	1,413	.0271
182.621 ,, 6 ,, ..	56,128	7,424	.1323	2,246	.0400
213.058 ,, 7 ,, ..	59,688	9,349	.1566	3,289	.0551
243.495 ,, 8 ,, ..	62,920	11,367	.1807	4,551	.0723
273.932 ,, 9 ,, ..	65,871	13,455	.2043	6,030	.0915
304.368 ,, 10 ,, ..	68,563	15,585	.2273	7,716	.1125
334.805 ,, 11 ,, ..	71,045	17,755	.2499	9,615	.1353
365.242 ,, 12 ,, ..	73,366	19,973	.2722	11,736	.1600

* Proportion of number in second column.

From these results, the values given in the next table, viz., XXXVII., have been computed, agreeably to formulæ (365) and (366). The results shew that with quarterly records, over 94 per cent. of the recorded deaths are referable to births in that quarter; with half-yearly about 87 per cent., and with yearly records about 73 per cent., provided the intervals between occurrence and record are the same in both cases.

TABLE XXXVII.—Proportion of Deaths under One Year of Age, born during the Year in which the Death is Recorded. Australia, 1909, 1910, 1912, 1913.

Interval of Time Considered.	Rate of Increase of Births.				
	1.00 (constant).	1.01	1.02	1.03	1.04
15 days	.9903	.9903	.9904	.9905	.9906
1 month	.9816	.9817	.9818	.9820	.9821
2 ,, ...	.9634	.9636	.9639	.9641	.9644
3 ,, ...	.9412	.9415	.9418	.9422	.9425
4 ,, ...	.9172	.9176	.9181	.9185	.9190
5 ,, ...	.8924	.8930	.8936	.8942	.8949
6 ,, ...	.8677	.8685	.8693	.8701	.8709
7 ,, ...	.8434	.8444	.8454	.8465	.8475
8 ,, ...	.8193	.8204	.8216	.8227	.8239
9 ,, ...	.7957	7970	.7983	.7996	.8009
10 ,, ...	.7727	.7742	.7756	.7771	.7786
11 ,, ...	.7501	7517	.7534	.7550	.7567
12 ,, ...	.7278	.7296	.7314	.7332	.7351

It will be seen from the above table that, for any ordinary increase of birth-rate the effect thereof upon the proportions given may be ignored for ordinary purposes ; that is, with the infantile-death rates experienced in Australia, it may be assumed that 0.73 of the deaths recorded in any year occur in that year, whatever the increase of the birth-rate, and this will be approximately true generally.

10. **Secular fluctuation in birth-rates.**—The birth-rates since 1860 for Australia are as shewn in the following table :—

TABLE XXXVIII.—Crude Birth-rates, and Marriage-rates, Australia, 1860 to 1914.

Year of Decade.	Rates per 100,000 of the Population.											
	1860.		1870.		1880.		1890.		1900.		1910.	
	B	M	B	M	B	M	B	M	B	M	B	M
0 ..	4,256	842	3,866	712	3,525	717	3,498	764	2,733	724	2,673	837
1 ..	4,228	864	3,800	694	3,526	760	3,447	747	2,716	732	2,721	879
2 ..	4,327*	876	3,707	696	3,448	810	3,365	674	2,671	726	2,865	907
3 ..	4,166	837	3,744	740	3,482	836	3,279	619	2,529†	667	2,825	866
4 ..	4,291	861	3,679	720	3,560	828	3,083	608	2,641	702	2,805	880
5 ..	4,210	834	3,588	728	3,569	816	3,038	623	2,623	725		
6 ..	3,979	762	3,592	714	3,537	788	2,843	655	2,657	749		
7 ..	4,042	751	3,499	731	3,560	759	2,821	668	2,676	787		
8 ..	4,046	755	3,539	737	3,550	798	2,715	672	2,659	776		
9 ..	3,865	733	3,577	716	3,465	767	2,727	703	2,669	790		

* The highest value was in 1862. † The lowest value was in 1903.

These rates shew a fairly steady decrease till 1903, and then an inconspicuous rise. Their significance will be dealt with later, viz., in the part treating of " fecundity."

Secular as well as any other fluctuations in the birth-rate are of course influenced by the marriage-rate. This rate is also shewn in the above table. The figures in the columns denoted by B are birth-rates, and in those denoted by M are marriage-rates. Fig. 53 shews both results by dots, the general trends—ignoring small oscillations—being indicated by the broken lines among the dots. The scale of values for the marriage curve is ten times as much enlarged as that for the birth-rate curve : see p. 165.

The long-continued fall in the birth-rate, which has been characteristic of Australia, is characteristic also of the countries of the western world. The rates for as many years as are available for various countries are as shewn in the table hereunder. These are also graphed in Fig. 53. They afford unmistakable evidence of what may be called the Malthusian

drift of the world during the last 50 years, which drift, however, is on the whole contemporaneous with a conspicuous reduction of infantile mortality, so that the "residual birth-rates" would shew a much less marked effect. It is after all the residual rate which is of greater importance.

TABLE XXXIX.

Crude Birth-rates for Various Countries—1860-1914—per 10,000 of the Population.

Year.	Australia.	England and Wales.	Scotland.	Ireland.	France.	Prussia.	Italy	Switzerland.	Norway.	Sweden.	Denmark.	Netherlands.	Belgium.	Austria.	Hungary.	Mean.
1860..	426	343	356	..	262	386	..	..	..	348	..	319	306	379	..	381
1861..	423	346	349	..	269	377	..	..	..	326	318	354	308	372	..	344
1862..	433	350	346	..	265	372	..	..	..	334	310	332	301	379	..	242
1863..	417	353	350	..	269	395	..	..	..	336	311	364	318	403	..	352
1864..	429	354	356	240	266	397	379	..	..	336	303	357	315	403	..	345
1865..	421	354	355	257	265	393	385	..	..	328	314	361	314	378	..	344
1866..	398	352	354	262	264	393	390	..	..	331	322	354	327	379	421	350
1867..	404	354	351	260	264	371	367	..	..	308	305	354	321	366	388	340
1868..	405	358	353	268	257	369	354	..	..	275	312	349	325	379	424	341
1869..	387	348	343	267	257	379	372	..	..	282	295	343	316	393	426	339
1870..	387	352	346	277	255	383	369	298	..	288	305	361	323	396	417	339
1871..	380	350	345	281	229	338	370	291	292	304	302	354	310	389	430	331
1872..	371	356	349	278	267	397	379	300	297	300	303	360	323	391	410	339
1873..	374	354	348	271	260	396	363	299	299	308	308	362	325	399	422	339
1874..	368	360	356	266	262	401	349	305	307	309	309	364	326	397	427	334
1875..	359	354	352	261	259	407	377	320	312	312	319	366	325	399	450	345
1876..	360	363	356	264	262	407	392	330	318	308	326	371	332	400	463	350
1877..	350	360	353	262	255	399	370	323	318	311	324	366	323	387	436	343
1878..	354	356	349	251	252	387	362	316	311	298	317	361	315	386	431	337
1879..	358	347	343	252	251	390	378	308	320	305	320	367	315	392	458	340
1880..	352	342	336	247	246	378	339	298	307	294	318	355	311	380	428	323
1881..	353	339	337	245	249	370	380	300	300	291	323	350	314	377	429	351
1882..	345	338	335	240	248	367	371	291	309	294	324	353	312	391	438	331
1883..	348	335	328	235	248	371	372	288	309	289	318	343	305	382	448	328
1884..	356	336	337	239	247	376	390	285	310	300	334	349	305	387	456	334
1885..	357	329	327	235	243	377	386	280	313	294	326	344	299	376	448	328
1886..	354	328	329	232	239	377	370	280	309	298	326	346	296	380	456	328
1887..	356	319	317	231	235	377	389	280	308	297	320	337	294	382	442	326
1888..	355	312	313	228	231	374	375	278	308	288	317	337	291	379	438	322
1889..	346	311	309	227	230	371	383	276	297	277	313	332	295	379	437	313
1890..	350	302	304	223	218	366	358	264	303	280	306	329	287	367	403	311
1891..	345	314	312	231	226	377	372	278	309	283	309	337	296	370	423	319
1892..	337	304	307	225	223	363	362	274	296	270	295	320	289	362	404	309
1893..	328	307	308	230	228	375	365	277	307	274	305	338	295	379	426	316
1894..	308	296	299	230	223	366	355	273	298	271	301	327	290	367	415	307
1895..	304	303	300	233	217	369	349	273	306	275	300	328	285	381	418	310
1896..	284	296	304	237	225	369	348	281	304	272	305	327	290	380	405	309
1897..	282	296	300	235	222	365	347	283	300	267	298	325	290	375	403	306
1898..	271	293	301	233	218	367	335	285	303	271	302	319	286	363	377	302
1899..	273	291	298	231	219	363	339	290	309	264	297	321	288	373	393	303
1900..	273	287	296	227	214	361	330	286	301	270	297	316	289	373	393	301
1901..	272	285	295	227	220	362	326	290	296	270	297	323	294	366	378	300
1902..	267	285	293	230	217	355	334	285	289	265	292	318	284	371	389	298
1903..	253	285	294	231	211	344	317	274	288	257	287	316	275	353	369	290
1904..	264	280	291	236	209	347	329	273	281	258	289	314	271	356	374	290
1905..	262	273	286	234	206	335	327	269	274	257	284	308	261	339	363	285
1906..	266	272	286	235	206	337	321	269	267	257	285	304	257	350	365	285
1907..	268	265	277	232	197	330	317	262	264	255	282	300	253	340	367	281
1908..	266	267	281	233	201	227	337	264	263	257	285	297	249	337	369	282
1909..	267	258	273	234	195	317	327	255	263	256	282	291	237	334	377	278
1910..	268	251	262	233	196	305	333	250	261	247	275	286	237	325	357	273
1911..	272	244	256	232	187	294	315	242	259	240	267	278	229	314	350	265
1912..	286	238	259	230	190	289	324	241	256	237	267	281	226	313	363	247
1913..	282	239	255	228	190	..	..	..	252	231	256	281	..	..	..	246
Mean	354	335	338	243	235	366	357	284	296	287	304	335	296	374	411	

This curve of birth-rate averages, convex upwards, discloses a continuous and accelerating decrease with time, *i.e.*, the Malthusian gradient shews an accelerating increase. This fact is significant, and is worthy of special notice. If the tendency to reduction of the birth-rate were one which bore a constant ratio to the rate itself we should have—

$$(367)\ldots\ldots d\beta/dt = -\kappa\beta\,;\ \text{or}\ d\beta/\beta = -\kappa\,dt\,;$$

β denoting the birth-rate, and κ a constant. In this case we should have by integrating—

$$(368)\ldots\ldots \log.\beta = -\kappa t + c\,;\ \text{or}\ \beta = Ce^{-\kappa t}$$

in which log. $C = c$, or $C = e^c$, a curve which of course is concave upwards, not convex. Again, a linear diminution of the birth-rate, viz., one of the form—

$$(369)\ldots\ldots \beta = \beta_0(1 - kt)$$

is an accelerating reduction of the relative increase of the population by births, consequently the convexity upwards of the curve implies a still more rapid reduction than a linear one.

11. **The Malthusian law.**—The question naturally arises whether the birth-rate phenomena may properly be considered as conformable to the law enunciated by Malthus, which may be stated thus:—If, as time goes on, food-production increases in an arithmetical, while population increases in a geometrical, ratio, the latter must inevitably overtake and surpass the former.

Let us suppose that from any given moment (*i.e.*, for $t = 0$) the (possible) increase of food-production is continually in the ratio $1 + qt$, and that the population increase is continually e^{rt}. Both expressions are unity for $t = 0$. Let $q = Mr$. The factor M, we may suppose to be considerably greater than unity. Thus for small values of t, the value of $1 + qt$ is greater than e^{rt}. To determine the value for t, when the two expressions become equal, we put—

$$(370)\ldots\ldots 1 + qt = 1 + Mrt = e^{rt}.$$

By expanding, subtracting unity from each side of the equation, transposing and dividing by $\frac{1}{2}r$, we get for Y, the number of years when the population will overtake the food supply.

$$(371)\ldots Y = \frac{2(M-1)}{r} = t\left(1 + \frac{1}{3}rt + \frac{1}{3.4}r^2t^2 + \frac{1}{3.4.5}r^3t^3 + \text{etc.}\right.$$

The ratio r being very small, this equation may be solved for t by successive approximations, for which purpose the equation is preferably written in the form—

$$(371a)\ldots\ Y = \frac{2(M-1)}{r} = t\{1 + \frac{1}{3}rt[1 + \frac{1}{4}\ t(1 + \frac{1}{5}rt + \ldots)]\}$$ [1]

The values of r range up to about 0.03. The solution of this leads to a remarkable result, viz., that if the food-supply can be increased in the ratios $1, 1 + Mr, 1 + 2Mr + \ldots 1 + tMr$, as the years pass, then after a relatively small number of years there will be a shortage, though in the interim there will be an excess. The interval of time necessary, with population increasing continually at any given rate, and the food-production increasing by uniform amounts per annum, may be called the "Malthusian equivalent interval."

12. **Malthusian equivalent interval.**—These intervals have been computed, here, for the cases where the annual increase of food supply is either 2, 4, 8, or 16 times that at which the population is continually increasing.

TABLE XL.—Malthusian Equivalent Intervals corresponding to various Rates of Increase.

Number of Times Food Supply Exceeds Needs of Population.*	Number of Years (t) Before Population Overtakes Food-Supply, the former increasing as e^{rt}, the latter as $(1 + Mrt)$.				
M.	rt.	$r = 0.01$	$r = 0.015$.	$r = 0.02$	$r = 0.03$.
2	1.2564	125.6	83.8	62.8	41.9
4	2.3370	233.7	155.8	116.8	77.9
8	3.3150	331.5	221.0	165.7	110.5
16	4.2290	422.9	281.9	211.4	141.0

* Initially.

The above table shews that even if the possibility of increasing the food supply was initially larger, the interval of time elapsing before the increase of population would overtake that of food supply is small compared with historical or geological periods. Thus it will be seen that the conclusions of II., § 34, pp. 30-32 hereinbefore, are supported from a somewhat different point of view; in other words, the general truth of Malthus' proposition is certain. In short, the ordinary rates of population increase, small as they may appear to some investigators, are sufficient

[1] If a table of values of e^x be available, we may rewrite (371) in the form $Mx = e^x - 1$, consequently $M = (e^x - 1)/x$ and this can be solved by trial. The following values will serve for most cases required.

x =	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0	2.	3.	4.	5.
M =	1.052	1.107	1.166	1.255	1.297	1.370	1.448	1.532	1.622	1.718	3.195	6.362	13.400	29.483

to bring about, in a relatively short time, trouble from over population, at least in countries where the population density is already appreciable. In this connection it may be of interest to mention that the rates for Australia deduced from the populations determined as at the censuses of 1901, 1911, and from the deaths for that intercensal period, shew that for the number of males and females at birth to be each constantly 100,000 per annum the constant populations would have to be as follows—

		For Males.	For Females.
Population	(T_0) ..	5,520,030 ;	5,883,742 ;
Number born	(l_0) ..	100,000 ;	100,000 ;
Expectation of life	(e°_0)	55,200 ;	58,837 ;
Death-rate	$\frac{l_0}{T_0} = \frac{1}{e^\circ_0}$ =	0.01812 ;	0.01700

Thus if the death-rates and birth-rates were equal, a constant population of 5,701,886, with a crude masculinity of 0.938184, would give 100,000 births, in which the numbers of the sexes would be initially equal. The masculinity of the actual population based on the aggregates for the years 1901 to 1910 inclusive was actually 1.115600. The ascertained increases of population due to excess of births over deaths and of immigrants over emigrants were, however, as follows :—

Population at 31st December, 1900—
Males 1,976,992 ; Females 1,788,347 ; Total 3,765,339
Population at 31st December, 1910—
Males 2,296,308 ; Females 2,128,775 ; Total 4,425,083
Decennial Increase of Population—
Males, 319,316 ; Females, 340,428 ; Total, 659,744.
Rate of continuous increase—
$r_m = 0.0149726$; $r_f = 0.017426$; $r_p = 0.0161435$.

As already shewn this rate of increase could not, of course, possibly be maintained over many centuries.

13. **The Malthusian coefficient and Malthusian gradient.**—Let us suppose that in any community unrestricted fecundity would give a birth-rate B, the actual birth-rate, however, being $\beta = \mathfrak{m}B$. The value of $\mathfrak{m}$ is necessarily less than unity, and is a coefficient of reduction which diminishes in the ratio that the birth-rate diminishes. This coefficient may be called the *Malthusian Coefficient*, since it measures the degree of the restriction of fecundity which characterises the community in question.[1] Thus—

$$(372)\ldots\ldots \mathfrak{m} = \beta/B.$$

[1] See the Essay on the Principle of Population ; or a view of its past and present effects on human happiness ; etc., by T. R. Malthus, A.M. ; Professor of History and Political Economy, East India College. In particular Chap. IX. pp. 506-536, 4° Edit., 1807.

BIRTH-RATES OF VARIOUS COUNTRIES, 1860 to 1913.

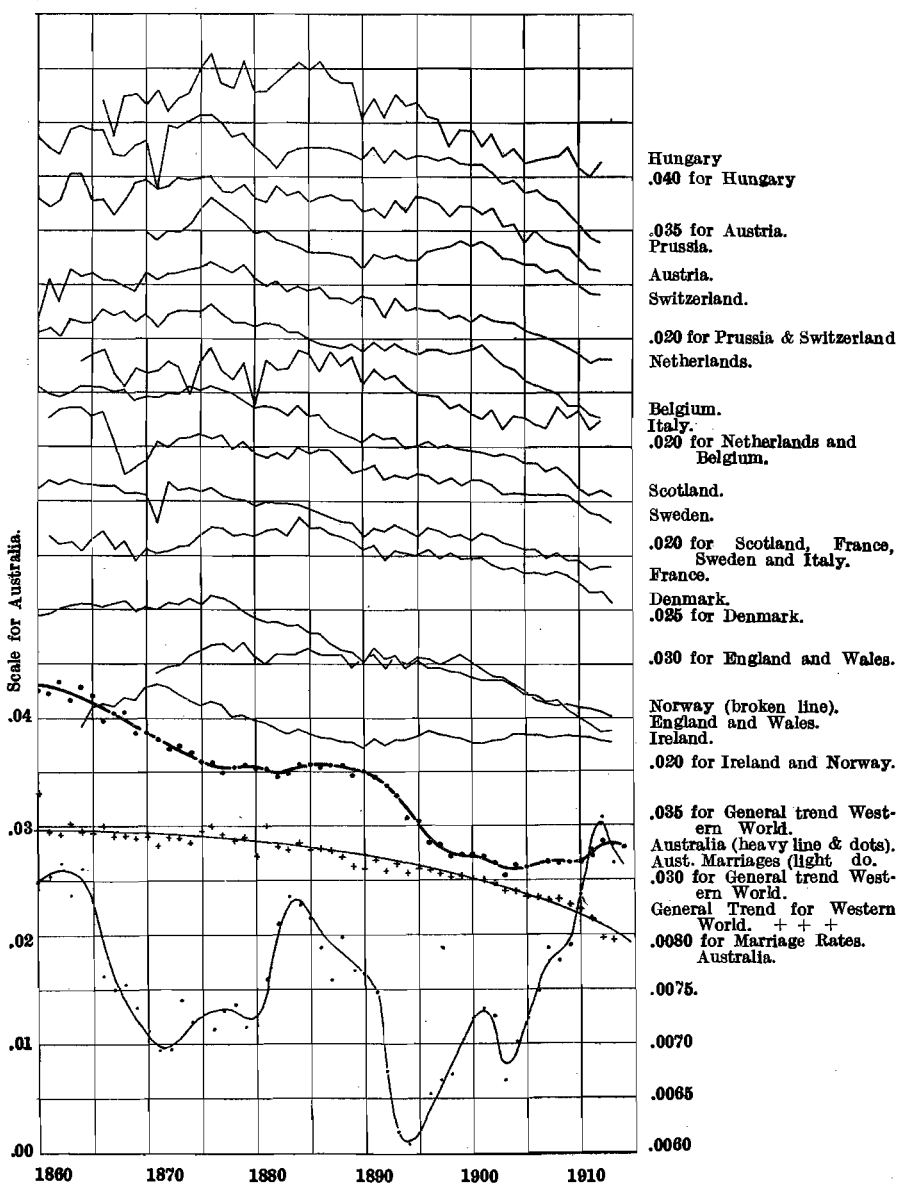


Fig. 53.

The heavy curve with heavy dots is the general trend of the Australian birth-rates, the dots denoting the individual annual rates. The light curve with light dots is the general trend of the Australian marriage-rates in Australia, the dots denoting the individual annual rates. The light curve with vertical crosses + + + is the unweighted average of the various birth-rate curves, the crosses denoting the mean of the annual values.

If $\beta = f(t)$, we shall have also $\mathrm{B}\mathfrak{m} = f(t)$, that is the graphs of the two are of the same form and differ only in scale. The question of the determination of this coefficient will be later considered.

The general change in the values either of the birth-rate or of the Malthusian coefficient, if regarded as characteristic of any country, is best found by taking the means *irrespective of the magnitude of the populations*. A mean so found does not, of course, apply to the aggregate of the populations; a weighted mean would do so however.

The *Malthusian gradient* ($\mathfrak{g}$) may be defined either as the rate of fall of the curve representing the birth-rate, or as the rate of fall of the curve representing the Malthusian coefficient. Until B is determined, see above, the former definition is the more practical. Thus—

$$(373)\ldots\ldots \mathfrak{g} = \frac{d\beta}{dt} = \frac{df(t)}{dt}\ ;\ \text{or} = \frac{d\beta}{\mathrm{B}dt} = \frac{df(t)}{\mathrm{B}dt}$$

of which the former is, at present, to be preferred.

14. **Reaction of the marriage-rate upon the birth-rate.**—If the marriage-rates were constant in all communities, or were constant at different periods in the one community, the birth-rates would be properly comparable as measures of fecundity. The effect of the marriage-rates depends, however, upon the degree of fecundity characteristic of different ages of life; hence exact comparisons of the fecundity are possible only after a correction is applied depending upon its variation with age and the age distribution of the marriages. This question will be considered hereinafter. It will suffice to observe that there is some slight indication of the correlation of the facts exhibited by the curves representing the birth and marriage rates, Fig. 53, though the effect is easily masked by the economic factors which influence human affairs: see p. 165.

15. **Annual periodic fluctuation of births.**—In order to see whether there was any distinct evidence of a seasonal fluctuation among births, the numbers of births have been compiled, according to the actual date of birth, for the three years 1911-1913, in equalised half-months, and, assuming the rate of increase of population to be uniform, these numbers were corrected for its general increase during the period. The results are as follow:—

TABLE XLI.—Seasonal Fluctuations in the Corrected Frequency of Births. Australia, 1911-1913.

Equalised Months.	January.		February.		March.		April.		May.		June.	
Nuptial ..	14,444	14,350	15,045	14,893	15,766	15,058	15,098	15,218	15,132	15,202	15,347	15,445
Ex-nuptial..	893	806	831	835	896	870	872	857	912	887	905	1,003
Totals ..	15,337	15,156	15,876	15,728	16,662	15,928	15,970	16,075	16,044	16,089	16,252	16,448
Ratio of total to Aggregate for the Year	.9604	.9491	.9942	.9849	1.0434	.9974	1.0001	1.0066	1.0047	1.0075	1.0177	1.0300

Equalised Months.	July.		August.		September.		October.		November.		December.	
Nuptial ..	15,542	15,513	15,367	15,216	15,514	15,715	15,183	14,323	14,787	14,398	14,352	14,773
Ex-nuptial	975	949	986	961	946	903	955	902	872	849	846	867
Totals ..	16,517	16,462	16,353	16,177	16,460	16,618	16,138	15,225	15,659	15,247	15,198	15,640
Ratio of total to aggregate for the year	1.0343	1.0309	1.0241	1.0130	1.0308	1.0406	1.0106	.9534	.9806	.9548	.9517	.9794

The semi-monthly means for nuptial, ex-nuptial and total births were 15,070,899, and 15,969 respectively. An examination of the results shews that *a fluctuation certainly exists*, and although the number of ex-nuptial births is both relatively and absolutely very small, the agreement of the fluctuation of nuptial with that of ex-nuptial births is fairly definite. The results for the totals are shewn by curve A, Fig. 54, the curved line denoting the general trend of the fluctuation.

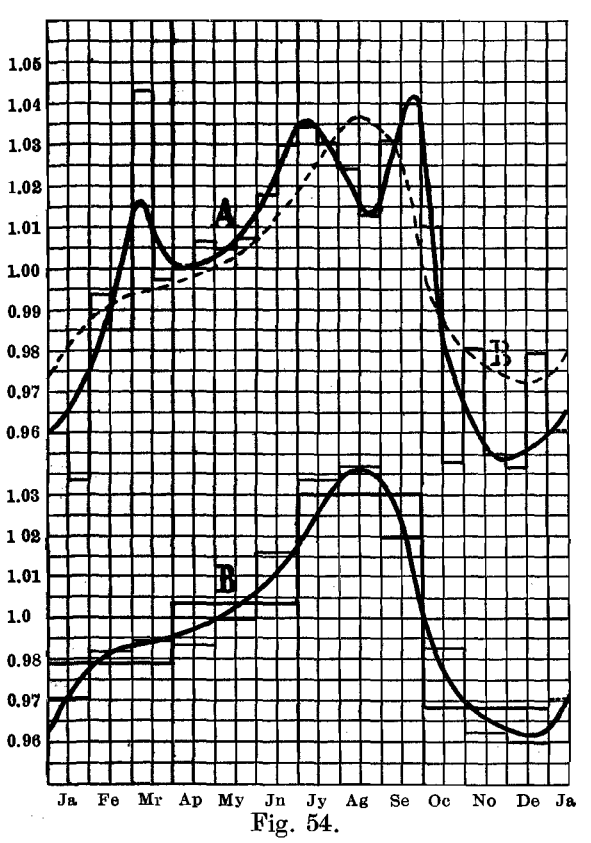


Fig. 54.

In order to further examine the question, the quarterly results of the births, *as registered*, during the eight years 1907-1914 were compiled, and this is done also for population. The interval between birth and registration has, however, shortened since the introduction of a maternity bonus : see pp. 151 and 152.

The following procedure was adopted. The births registered were taken out in the several quarters; these quarters were then equalised, the numbers being corrected to shew what would have been given by a constant population, since it was found that the increase of this last was sensibly at the rate $1 + 0.0247265\ t$. In this way the values shewn in Table XLII. hereinafter were obtained. These quarterly results may be subdivided into monthly values, as explained on the next section, so as to give the monthly values. These results are shewn by the curve B in Fig. 54.

TABLE XLII.—Births Registered. Australia, 1907-1914.

Births as Registered.				Births as Corrected for Equal Quarters and a Constant Population.			
236,462	243,191	254,141	242,860	241,457	244,914	251,457	238,830
—	—	—	—	.98891	1.00307	1.02987	.97815

The values for the individual months may be deduced as explained in the next section, and are as follows :—

1	2	3	4	5	6	7	8	9	10	11	12
.9807	.9916	.9944	.9936	.9996	1.0160	1.0333	1.0366	1.0197	.9924	.9922	.9699

and these monthly results are shewn by the small rectangles in curve B, Fig. 54.

For the greater part of the year, at least, the results are substantially identical for the two sexes, as a compilation made for the four years, 1907-1910, shews. The results were as follows :—

TABLE XLIII.—Seasonal Fluctuations* of Births, according to Sex. Australia, 1907-1910.

Males, Females or Persons.	Jan.	Feb..	Mar.	April	May.	June.
M	.9874	.9169	.9949	1.0152	1.0064	.9978
F	.9903	.9229	.9950	1.0079	1.0069	.9859
P	.9889	.9198	.9949	1.0116	1.0067	.9920
	July.	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**
M	1.0321	1.0410	1.0299	1.0378	.9924	.9482
F	1.0170	1.0583	1.0437	1.0465	.9760	.9479
P	1.0249	1.0504	1.0367	1.0420	.9844	.9480

* The registration was on the average 38.2 days after birth for the years 1907-1910.

Reverting to curves A and B, Fig. 54, the curve drawn by lines may be taken as a probable representation of the fluctuation; since there is no reason to suppose that the large oscillations are other than accidental.

As the theory of determining the Fourier curves to fit the group results presents certain special features, it is given hereunder.

16. **The subdivision of results for equalised quarters into values corresponding to equalised months.**—When quarterly results are available, they may (after equalising and also being freed from the annual progression so as to give, as residuals, only the fluctuation elements) be readily resolved into monthly values, which have a high degree of probability. The most convenient form in which to give such results is the *height* of the monthly group. Let the mean of the *heights* of four quarterly groups be denoted by R, with suffixes corresponding to the quarter (viz., 1 to 4), and that of the monthly group by r, with corresponding suffixes (viz., 1 to 12). Then the solution can proceed on one of two possible assumptions, viz. (*a*) that the amplitudes of the component fluctuations are identical, and the epochs are different, or (*b*) that the epochs are identical and the amplitudes are different.[1]

That is, we may assume either (*a*) that—

$$(375)\ldots\ldots y = a + b\,sin.\,(x+\beta) + b\,sin.\,2\,(x+\gamma);$$

or (*b*), that—

$$(376)\ldots\ldots y = a + b\,sin.\,(x+\beta) + c\,sin.\,2\,(x+\beta).$$

The data are, of course, inadequate in themselves to determine which assumption should be adopted, and the results are to that extent, uncertain. But this uncertainty, in general, is of small moment.

In case (*a*) we have—

$$(377)\ldots l = -\frac{6}{\pi} b\,cos.\,\beta = \frac{3}{2}(R_3 + R_4);\ m = \frac{6}{\pi} b\,sin.\,\beta = \frac{3}{2}(R_1 + R_4),$$

$$(378)\ldots p = -\frac{3}{\pi} b\,cos\,2\gamma = \frac{3}{4}(R_2 + R_4);\ q = \frac{3}{\pi} b\,sin\,2\gamma = \frac{3}{4}\sqrt{-2(R_1 R_3 + R_2 R_4)}$$

It will be seen that q is not independent of l, m and p, since we must have—

$$(379)\ldots\ldots q^2 = \frac{1}{4}(l^2 + m^2 - 4\,p^2)$$

From this last, the value $\frac{3}{4}\sqrt{-2\,(R_2 R_4 + R_1 R_3)}$ is deduced. Observing that $\frac{1}{2}\sqrt{3} - 1 = -0.1339746$; $\frac{1}{2}(1 - \sqrt{3}) = -0.3660254$; $\frac{1}{2}\sqrt{3} = 0.8660254$; we may put the values of r_1 to r_{12} in the following very convenient forms, viz.:—

$$(380)\ldots\ldots r_1 = -0.1340\,l + \frac{1}{2}\,m - \frac{1}{2}\,P + 0.8660\,q.$$

$$(381)\ldots\ldots r_2 = -0.3660\,l + 0.3660\,m - P$$

[1] See Studies in Statistical Representation (Statistical Applications of the Fourier Series), by G. H. Knibbs, Journ. Roy. Soc. New South Wales, Vol. xlv., pp. 76-110, 1911. In particular see pp. 88-89.

$$(382)\ldots\ldots r_3 = -\frac{1}{2}l + 0.1340\,m - \frac{1}{2}P - 0.8660\,q.$$

$$(383)\ldots\ldots r_4 = -\frac{1}{2}l - 0.1340\,m + \frac{1}{2}P - 0.8660\,q.$$

$$(384)\ldots\ldots r_5 = -0.3660\,l - 0.3660\,m + P$$

$$(385)\ldots\ldots r_6 = 1.8660\,l - \frac{1}{2}m - \frac{1}{2}P + 0.8660\,q.$$

$$(386)\ldots\ldots r_7 = +0.1340\,l - \frac{1}{2}m - \frac{1}{2}P + 0.8660\,q.$$

$$(387)\ldots\ldots r_8 = +0.3660\,l - 0.3660\,m - P$$

$$(388)\ldots\ldots r_9 = +\frac{1}{2}l - 0.1340\,m - \frac{1}{2}P - 0.8660\,q.$$

$$(389)\ldots\ldots r_{10} = +\frac{1}{2}l + 0.1340\,m + \frac{1}{2}P - 0.8660\,q.$$

$$(390)\ldots\ldots r_{11} = +0.3660\,l + 0.3660\,m + P$$

$$(391)\ldots\ldots r_{12} = -1.8660\,l + \frac{1}{2}m - \frac{1}{2}P + 0.8660\,q.$$

In case (b) we have—

$$(392)\ldots. l = -\frac{6}{\pi}\,8\,b\cos = \frac{3}{2}(R_3+R_4);\ m = \frac{6}{\pi}\,b\sin\beta = \frac{3}{2}(R_1+R_4).$$

$$(393)\ldots. P = -\frac{3}{\pi}\,c\cos 2\beta = \frac{3}{4}(R_2+R_4);\ q = \frac{3}{4}\sqrt{\left\{\frac{c^2}{b^2}[(R_3+R_4)^2 + (R_1+R_4)^2] - (R_1+R_3)^2\right\}}$$

Again, q is not independent of l, m, and p, since we have—

$$(394)\ldots\ldots \frac{4b^2}{c^2} = \frac{l^2+m^2}{p^2+q^2};\ \text{or}\ q^2 = \frac{c^2}{4b^2}(l^2+m^2) - P^2.$$

which leads to the value of q above written.

If $c = b$, the last expression for q in (394), reduces to that first given, viz., in (379). It is obvious from this last value for q, that the *ratio* c/b is at our disposal, and provided it be so chosen that the whole expression within the braces is *not* negative, there will be a real value for q. A unique solution will be that which makes the q term zero in the above series of equations for monthly values. This is given by making the expression within the braces in (393) zero. Hence for this we have

$$(395)\ldots\ldots \frac{c}{b} = (R_1+R_3)/\sqrt{\{(R_3+R_4)^2 + (R_1+R_4)^2\}}$$

If, therefore, the relation between β and γ, and between b and c are *both* unknown, we may, with advantage, write $q = 0$ in the series of equations 380) to (391). In short, if we assume that $c = b$ then γ is determinate.

If this relation be not assumed, but that $\gamma = \beta$ is assumed, we may, *within certain limits*, still make the ratio of c to b whatsoever we choose, and, if we have no ground for believing that a particular ratio is to be preferred, the simplest solution of the whole problem is, making the epochal angles β and γ identical, to so take the ratio of c to b that the q term will be eliminated from the series of equations for monthly values, viz., formulæ (380) to (391), etc.; that is, we may determine this ratio by (395)[1]. It may be reiterated that the subdivision of the quarterly into monthly values by the preceding formulæ assumes that the fluctuation involves only terms sin. x and sin. $2x$.

17. **Equalisation of periods of irregular length.**—In order to apply the formulæ of the preceding section, it has already been indicated that the crude data must be freed from any annual progression depending on a progression in population numbers and among the births themselves. It is preferable to operate, therefore, on rates, *i.e.*, to divide the number of births (or marriages or deaths, etc.) each month, quarter, or year, as the case may be, by the mean population of the month, quarter, or year itself. Even then a correction is necessary, since for precise results it is still necessary to equalise the period, in fact, if the seasonal fluctuation (or annual period of oscillation) to be determined be small in amplitude, the equalisation is an essential. Both months and quarters differ appreciably in length.[2]

For population-numbers and for birth-numbers, the equalising corrections will necessarily be made in a somewhat different manner. A table of corrections for the ends of the months or quarters is first formed. Numbers such as population-numbers and rate-numbers may be called *continuant*, and those such as numbers of birth, marriages and deaths, etc., *accretional*. For the purpose of *corrections* it may also be assumed that the daily values at the terminals of the unequal periods is the mean of the values for the adjoining periods.[3]

Then, except for the first and final period, there are two corrections. For a single leap-year there is no correction at the end of August, and none at the end of October. The equalised February is always in January, and excepting as above mentioned the terminal of the equalised month is always in the month following.[4]

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[1] Such a solution has the further advantage of making the deviations from the averages for the respective quarters a minimum.

[2] The shortest month is no less than 8 per cent. short of the average, and shortest quarter 1.37 per cent.

[3] It is more rigorous, of course, to determine the function, the integral of which gives the result dealt with, but this process is tedious and ordinarily quite unnecessary.

[4] There would have been some advantage if January had had 30 days, instead of 31, and February 30 days in ordinary and 31 in leap years, instead of 28 and 29 days.

Let δT and $\delta' T$ be the small periods to be *added* respectively to the beginning and the end of an unequal period to make it coincide with an equalised period, the length of this last being T_0. Let also the periods preceding and following that to be corrected be denoted by T and T'; and let the period to be corrected be denoted by T_m. Then, the correcting periods δT, etc., being small, we have very approximately, for *continuant numbers*, P, P_m and P', etc., denoting that corresponding to T_0,

$$(397)\ldots. P_0 = P_m + \frac{1}{2T_0}\{(P - P_m)\,\delta T + (P' - P_m)\,\delta' T\}$$

and for *accretional numbers*, N, N_m, N', etc., N_0 denoting that corresponding to the period T_0,

$$(398)\ldots. N_0 = N_m - \frac{1}{2}\left\{\left(\frac{N}{T} + \frac{N_m}{T_m}\right)\delta T + \frac{1}{2}\left(\frac{N_m}{T_m} + \frac{N'}{T'}\right)\delta' T\right\}$$

$$= Nm + \frac{1}{2T_0}\{-(N + N_m)\,\delta T + (N_m + N')\,\delta' T\}$$

The approximate identity of these expressions can readily be established.[1] In regard to the sign of the corrections it may be observed that for continuant numbers the value is to be *increased* when the shift of *either* terminal of the unequalised period towards the terminal of the equalised period is in the direction of higher values. For accretional numbers, the number is increased for an additive shift, diminished for a negative shift.

18. **Determination of a purely physiological annual fluctuation of birth-rate.**—The annual birth-rate fluctuation, as obtained in section 15, by means of the formulae of sections 16 and 17, cannot be regarded as furnishing the variations of the reproductive activity solely due to physiological causes, which variations may be presumed to repeat themselves every year. The distribution of the frequency of marriage, and therefore of birth, throughout the year is affected by the fêtes observed, and particularly by the "movable feasts" (Easter, etc.). The number of years to be included to secure a true mean-determination must embrace the whole cycle of movement. The extent of this cycle has been referred to in a paper on the Statistical Application of the Fourier Series, by the writer.[2] But even when this mean result is obtained, what may be called the physiological fluctuation is not to hand, since the effect of the "movable feast" is *distributed*, not *eliminated*. By a systematic analysis,

[1] The question of corrections of this kind has been dealt with at length by me in a paper read 5th July, 1911, at the Roy. Soc., N.S.W., see its Journ. xlv., pp. 79-85, which treats of the correction of an increasing population, and that for unequal months, quarters, half and whole years.

[2] Vide Journal Royal Soc. N.S.W., Vol. xlv., pp. 76-110.

however, of the results for different years in which the place of the movable feast is as different as possible, the effect of this distribution can be ascertained and corrections applied to eliminate the effect. The difficulty of a perfectly satisfactory solution will be apparent from Fig. 55 hereunder.

19. **Periodicities due to Easter.**—As ecclesiastically defined, Easter Day is the first Sunday after the 14th day of the paschal "Calendar Moon," a fictitious ecclesiastical moon, which is from one to three days later than the real moon. The average position of Easter for the century 1800 to 1899 is April 8.55 days, and for the century 1900 to 1999 is April 8.89 days, or say for the whole period of 200 years April 8.72 days. In Fig. 55 the Easters in each decade are shewn on a single line for the years 1800 to 1999 inclusive. An inspection of the figure shews that the points lie approximately on a series of 10 slanting lines, four days apart, these lines progressing at the rate of one half day per decade, and further that they are inversely symmetrical. For lines a, b, c, and e and a', b', c', and e' the symmetry is perfect: for lines d and d' however the symmetry is not absolutely perfect. It is evident that no means derived from two decades nor from periods of 19 years, nor from centuries are exactly comparable.

POSITION OF EASTER FOR 200 YEARS.

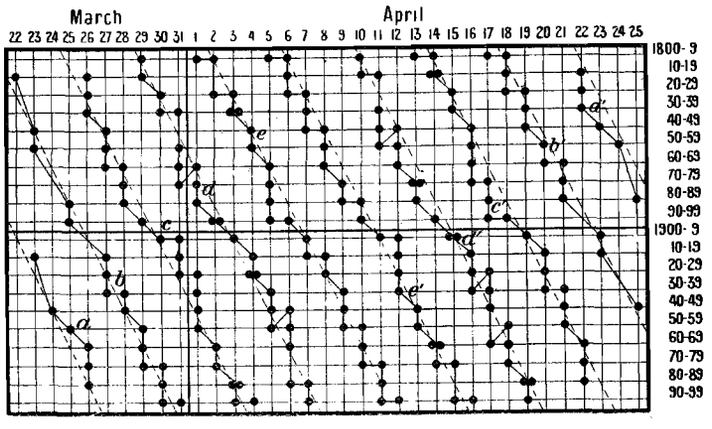

Fig. 55.

Since the tropical year = 365.2422 days and the synodic lunar month = 29.530588 days, the Metonic cycle, *19 tropical years is 6939.6018 days, and 235 complete lunations equal 6939.6882 days, differing only .0864 day from the nineteen years.

The following table exhibits the peculiarities for successive decades.

TABLE XLIV.—MEAN POSITION OF EASTER FOR 200 YEARS.*

1800.					1900.				
Decade.	Mean.	Easters in March.	Mean of March Easters.	Mean of April Easters.	Decade	Mean.	Easters in March.	Mean of March Easters.	Mean of April Easters.
	April.					April.			
0–9	9.46	1	29	9.56	0–9	10.56	2	30.5	13.12
10–19	8.16	3	25.67	13.57	10–19	8.36	3	27	12.86
20–29	8.86	2	28	11.50	20–29	8.06	2	29	10.25
30–39	7.86	3	29	11.43	30–39	9.66	2	27.5	12.62
40–49	9.06	2	25	12.50	40–49	8.96	2	26	12 12
50–59	8.56	3	27	13.57	50–59	7.56	2	27	10.38
60–69	7.96	3	28.67	11.86	60–69	9.66	2	27.5	12.88
70–79	9.36	2	29.5	11.88	70–79	8.66	3	28.33	13.14
80–89	9.46	2	25.5	12.62	80–89	8.66	2	28	11.25
90–99	6.76	2	27	9.25	90–99	8.76	2	30.5	10.88
Means	8.55	2.3	27.48	11.70	Means	8.89	2.2	28.09	11.94

* The complete Easter Cycle, restoring both the day of the week and of the month, is known as the "Dionysian" or "Great Paschal" period. Its length is 4.7.19 = 532 years.

To obtain a normal periodic fluctuation it would be preferable, were it practicable, to combine the results, each for a series of years such as would give Easter an identical distribution. In the period such a series is, however, impracticably long. Hence in the case of marriage, birth-rate, migration, etc., it is necessary to consider the actual effect on the periodic fluctuation studied. In respect of marriages the effect of Easter is to reduce the number of marriages in the Lent period (6 weeks) preceding, and to augment them in the preceding and following periods.

It may be noted that for the fluctuations of annual period in the marriage frequency, the great length of the Lent period, viz., 6 weeks, has the effect of throwing the increase of frequency as far back as February. The migration frequency is often thrown back into March. Thus, as is evident from the preceding table and the diagram, decennial means will clearly be nearly but not *exactly* comparable. The data for a thorough study of periodic fluctuation would in these cases have to be weekly groups.

XII.—NUPTIALITY.

1. **General.**—The phenomena of reproduction have a double aspect, viz., one a sociological and the other a physiological. Thus, from the standpoint of a theory of population, both are important. The women of reproductive age in any community furnish the potential element of reproduction; but the resolution into fact depends also upon social facts as well as upon physiological; for example, the relative proportion of married and single, *i.e.*, the nuptial-ratio, even more profoundly affect the result than physiological variations of fecundity. In Chapter XVIII. of the Census Report (Conjugal Condition), the numbers of married and unmarried females have been given as at 3rd April, 1911, in Australia. These will be considered mainly in regard to the child-bearing age, in dealing later with fecundity.

2. **The Nuptial-Ratio.**—The "nuptial-ratio," j, may be defined as the ratio of the married, J, to the unmarried, U, which latter may be taken generally as including the never married, the widowed, and the divorced. This ratio, J/U may apply to either sex and to any age, or age-group, or to the total for all ages, etc. The nuptial-ratio in any community may be regarded as a measure of the social instinct, and also a measure of the reproductive instinct, modified by social traditions as well as facilitated or hindered by economic conditions. This ratio, for the case of females, is, of course, specially important in relation to fecundity.

The significance of marriage in respect of reproductive activity depends upon the relative frequency of nuptial and ex-nuptial births, as well as upon the relative proportions of the married and unmarried, that is, it depends not merely upon the nuptial-ratio, but also upon nuptial and ex-nuptial fecundity, particularly during the reproductive period of life. The values of

$$(399)\ldots\ldots j = J/U$$

for various countries are given in the following table for women during the reproductive period, and for women of all ages, viz., from age 0 to the end of life.

TABLE XLV.—Ratios of Married Women in various Age-groups to Unmarried Women in the same Groups. Reproductive Ages. Female Nuptial Ratios.

Ages of Women.	Aust. Census, 1911†			C'wlth Aust.	England and Wales.		Scotland.		Ireland.		Belgium.	Germany.	
	Metropol'n.	Other.	Total.	1908.	1901.	1911.	1901.	1911.	1901.	1911.	1910.	1900.	1910.
10 to 14 incl.	.0000	.0000	.0000	.0001	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
15 „ 19 „	.0337	.0435	.0395	.0382	.0157	.0121	.0767	.0145	.0075	.0063	.0271	.0161	.0139
20 „ 24 „	.03510	.4892	.4242	.4214	.3731	.3184	0.3049	.2758	.1538	.1538	.04482	.3977	.3959
25 „ 29 „	1.0945	1.6325	1.3613	1.2997	1.8011	1.2645	1.3759	.9615	.8397	.8137	1.6385	1.8172	1.9359
30 „ 34 „	1.8201	2.8810	2.3318	2.4698		2.4565		1.8345			2.8324	3.6381	3.8471
35 „ 39 „	2.2491	3.5996	2.8938	2.9805	3.0124	3.0299	2.2854	2.3418	1.6777	1.7040	3.4697	4.2515	4.4905
40 „ 44 „	2.5045	3.9037	3.1586	3.1159		3.0747		2.4112			3.3632	3.8012	4.0635
45 „ 49 „	2.4617	3.6935	3.0324	3.1068	2.3915	2.6855	1.8199	2.0750	1.4343	1.5443	2.8921	3.0086	3.2488
50 „ 54 „	2.0628	3.1420	2.5634	2.6025		2.1756		1.6795			2.2601	2.1635	2.3415
55 „ 59 „	1.5747	2.3651	1.9470	1.8482	1.3217	1.6585	1.0007	1.3061	.8686	1.0490	1.5909	1.4864	1.5995
60 „ 64 „	1.0622	1.5751	1.3070	1.5815 *		1.1481		0.9089			1.0929	.09590	1.0353
0 „ 105 „	.5231	.5198	.5213	..	.5159	.5528	.4293	.4516	.3543	.3765	.5781	.5200	.5465

* Ages 60 to 61 only. † 3rd April, 1911.

The results in the table shew that there are considerable divergences between populations as regards their nuptial constitution, consequently even if the individual fecundity were constant, the birth-rates would differ. The results of the Australian Census of 1911 shew also that there are striking differences between metropolitan and extra-metropolitan communities, the marriage-rate being very much higher for the latter ; and they shew also that the nuptiality is very different as regards the sexes. See Vol. I., Chap., XVIII., Conjugal Condition, § 6, of the Census Report.

3. **The Crude Marriage-Rate.**—The lack of homogeneity in populations, illustrated in the last section, renders the crude marriage-rate, viz., the ratio of the *marriages*, J, to the *population*, P, of uncertain significance. The heterogeneity arises largely from divergences of social life and tradition, in respect of the relative frequency of marriage, and the frequency according to age. Inasmuch, however, as ordinarily the constitution of any population does not materially change, the marriage-rates for any particular country and for limited periods are comparable among one another, and their variations may generally be attributed to variations in the *economic* conditions of the population in question. Wars have, of course, a marked effect, see the points marked with asterisks, on Table XLVI., and also Fig. 56, giving the curve of the mean of the marriage-rates of a number of important countries. We shall denote the crude marriage-rate by n ; thus—

$$(400) \ldots\ldots n = J/P.$$

In some countries the marriage-rate is the ratio, not of the " marriages," but of the " persons married," to the population. In such cases the rates will be double those shewn in Table XLVI. hereunder, the which gives the marriage-rates for the countries for which in Table XXXIX. the crude birth-rates were given. This also gave the values of the marriage-rate. In Table XLVI., the mean in the final column is merely the unweighted mean, and is therefore *not* the rate for the aggregate of the populations. The trend, thus determined, treats each population as equally important in regard to the revelation of the secular tendency, if any, of the marriage-frequency. For the constitution of a norm a weighted-mean would of course be needed.

Fig. 56 illustrates the movement in the marriage-rate, and shews that movement in its relation to that of the western world generally (excluding America). Although the general trends shewn by broken lines of curves A and B, are by no means similar, there are often very similar fluctuations about this general trend, which appear readily enough if the general trend be regarded as a basic line about which the minor fluctuations may be regarded as moving.

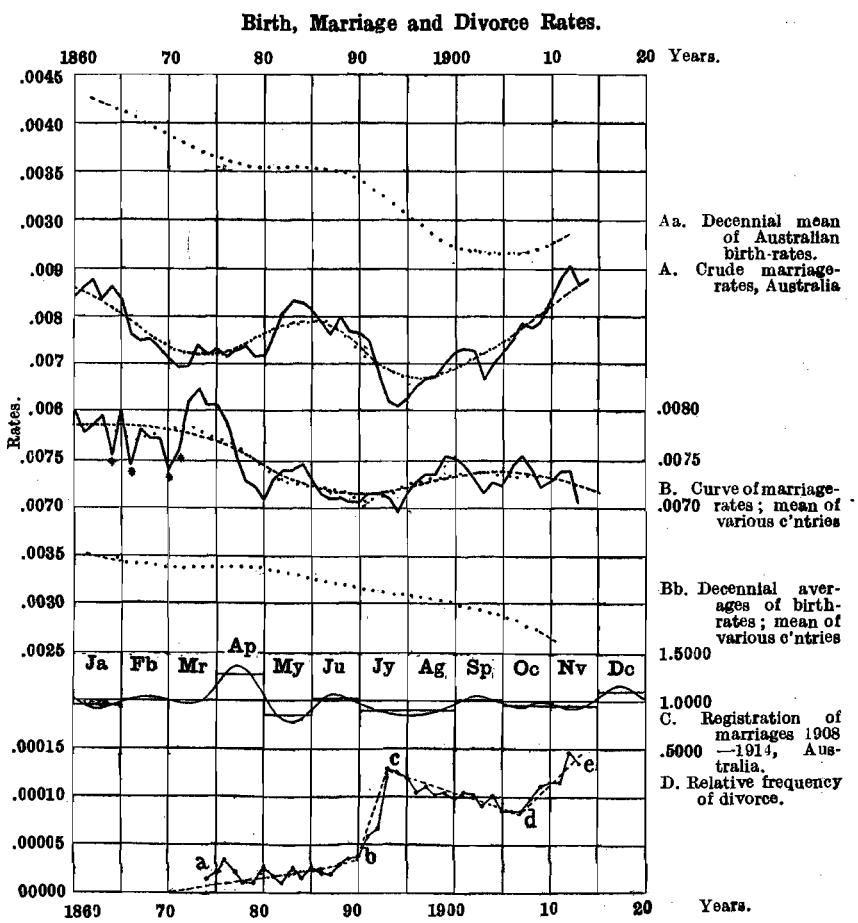

Fig. 56.

Curve Aa shews the successive decennial means of the birth-rates of Australia, the central year being changed one year at a time.

Curve A shews the marriage-rates of Australia by the zig-zag line; the fine dots shew the successive decennial means; the broken line, closely following the decennial means, indicates the general trend.

Curve B shews the mean of the marriage-rates of a series of countries; the fine dots shew the successive decennial means of these; the broken line indicates the general trend of the marriage-rates.

Curve Bb shews the successive decennial averages of the means of the crude birth-rates of a number of countries.

Curve C shews the mean annual fluctuation of the registration of marriages in Australia for the period 1908-1914.

Curve D shews the relative frequency of divorce per unit of population for Australia, the portion a b being prior to acts facilitating divorce; b c being the condition immediately following upon the passing of the facilitating Acts; c d, and d e being the subsequent trends of the relative divorce-frequency.

As regards birth-rates and marriage-rates, it will be observed that here there is some indication of a correlation between the phenomena. This correlation will not, of course, be well-marked, since the aggregate

of "first births" is not large compared with "all births," But the trend of the Australian birth-rate shewn by Curve Aa is strikingly similar to Curve A shewing the marriage-rate, and Curve Bb gives some indication of its connection with Curve B.

TABLE XLVI.

Marriage-rates for Various Countries—1860-1913—per 10,000 of the Population.

Year	Australia.	England and Wales.	Scotland.	Ireland.	France.	Prussia.	Italy.	Switzerland.	Norway.	Sweden.	Denmark.	Netherlands.	Belgium.	Austria.	Hungary.	Means per 100,000
1860	84	86	70	..	79	84	..	..	..	78	..	82	73	85	..	801
1861	86	82	68	..	82	80	..	..	..	73	75	81	71	80	..	778
1862	88	81	67	..	81	85	..	..	..	71	74	79	71	88	..	785
1863	84	84	72	..	80	87	..	..	..	73	75	83	73	85	..	796
1864	86	86	72	48	79	87	80	..	..	70	57*	84	75	83	..	*756
1865	83	88	74	55	79	91	91	..	..	71	89	85	76	78	..	800
1866	76	88	74	54	80	78	57*	..	..	67	84	84	79	65*	82*	*745
1867	75	83	70	54	79	93	68	..	..	61	77	84	78	97	104	781
1868	76	81	67	50	79	89	72	67	..	55	73	77	73	92	137	772
1869	73	80	67	50	83	90	80	72	..	57	74	77	74	104	110	772
1870	71	81	72	53	61*	74*	74	70	..	60	74	80	70	98	98	*740
1871	69	84	72	54	73*	80*	75	73	67	65	73	80	74	95	104	*759
1872	70	87	76	50	98	103	75	79	70	70	75	83	78	93	108	810
1873	74	88	78	48	89	102	79	77	73	73	81	86	78	94	113	822
1874	72	85	76	46	83	97	76	83	77	73	82	84	76	91	107	805
1875	73	84	74	46	82	91	84	90	79	71	85	84	73	86	109	807
1876	71	83	75	50	79	86	82	82	77	71	86	83	72	83	102	788
1877	73	79	72	47	75	80	78	79	76	69	81	81	69	76	94	753
1878	74	76	67	48	75	78	72	74	73	65	74	78	67	76	95	728
1879	72	72	64	44	76	77	76	70	68	63	74	77	68	78	104	722
1880	72	75	66	39	75	77	70	69	67	63	76	75	71	76	92	709
1881	76	76	70	43	75	77	81	69	64	62	78	73	71	80	100	730
1882	81	78	71	43	75	79	78	69	67	64	77	72	70	83	103	740
1883	84	78	71	43	75	80	81	69	66	65	77	71	68	79	105	741
1884	83	76	68	46	76	81	83	70	69	66	78	72	68	80	103	746
1885	82	73	66	43	75	82	80	70	67	67	76	70	68	77	101	731
1886	79	71	63	42	74	82	79	70	65	64	71	70	67	79	97	715
1887	76	72	64	43	73	80	80	71	63	63	70	70	71	79	90	710
1888	80	72	64	42	72	80	79	71	61	59	71	69	71	80	94	710
1889	77	75	67	45	71	82	77	71	63	60	71	70	73	76	82	707
1890	76	78	69	45	70	82	73	70	65	60	69	71	73	76	82	706
1891	75	78	70	46	75	82	75	71	66	59	68	71	74	78	86	716
1892	67	77	71	47	76	81	75	72	64	57	68	72	77	78	92	716
1893	62	74	66	47	75	81	74	72	65	57	70	73	76	80	94	711
1894	61	75	67	47	75	80	75	72	64	58	70	72	75	80	93	696
1895	62	75	68	51	74	80	73	73	65	59	71	74	78	81	85	713
1896	66	79	71	51	76	83	71	76	67	60	73	75	81	80	81	727
1897	67	80	72	51	76	84	72	79	67	61	75	74	83	81	82	736
1898	67	81	74	50	74	85	69	78	70	62	76	73	83	79	84	737
1899	70	83	75	50	77	85	74	78	71	63	75	74	83	83	91	755
1900	72	80	73	48	78	86	72	78	69	62	76	76	86	83	89	752
1901	73	80	70	51	78	83	73	76	66	61	72	77	87	82	88	745
1902	73	80	71	52	76	80	73	74	64	60	71	76	81	78	87	731
1903	67	79	72	52	76	80	72	74	60	58	71	75	79	78	82	716
1904	70	77	71	52	76	81	75	74	60	59	72	74	80	78	92	727
1905	73	77	68	53	77	81	77	75	58	59	72	73	79	78	86	724
1906	75	79	72	52	78	83	79	77	59	62	75	75	81	79	88	743
1907	79	80	72	52	80	82	78	77	60	62	77	75	80	76	100	754
1908	78	76	68	52	80	80	84	76	61	61	75	72	78	77	92	740
1909	79	74	64	52	78	78	78	75	60	60	74	71	77	76	87	722
1910	84	75	65	51	78	78	79	73	62	61	73	72	79	76	87	729
1911	88	76	67	54	78	80	75	74	63	59	72	72	80	76	93	738
1912	91	78	69	53	79	80	76	73	62	59	73	75	80	74	86	739
1913	87	78	71	51	75	..	..	..	63	59	72	78	..	..	..	704
1914	88	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
M'ns	758	791	698	487	771	831	761	740	661	634	744	761	753	815	949	..

4. **Secular Fluctuation of Marriage-rates.**—Fig. 56, embodying the results on Table XLVI., reveals the fact that the relative frequency of marriage has been increasing in Australia since 1897, although it has tended to diminish recently in the old world. It is apparent from a comparison of the two curves, A and B, that there is no very marked correlation between the two progressions. The factors influencing the relative frequency of marriage probably have a very unequal incidence in different countries. In order to obtain an accurate measure of reaction of the larger economic influences on the rates, statistics covering long periods of time will be required. The characteristics of the longer or secular fluctuations will fully appear only when much more statistical material is available than exists at present.

The period of the larger oscillations in the data shewn amounts to about 22 or 23 years in Australia, and about 30 or 31 years for the aggregate of the populations of the western world. The period of the minor fluctuations is very variable, and is somewhat ill-defined. In Table XLVII. are shewn the values of successive decennial means for the marriage-rates, and also for the birth-rates. These are shewn by dots on Fig. 56.

TABLE XLVII.--Decennial Unweighted Means of Marriage and Birth-rates, 1860 to 1909.

Decade Year.	Marriages per 100,000 of the Population.									
	1860.		1870.		1880.		1890		1900.	
Year.*	A	W	A	W	A	W	A	W	A	W
0 ..	..	..	740	781	758	746	734	712	687	734
1 ..	..	..	729	781	766	739	715	710	697	732
2 ..	..	..	724	786	774	732	701	711	707	737
3 ..	..	..	722	783	777	727	692	714	719	739
4 ..	..	..	721	778	783	725	680	716	729	739
5 ..	812	779	719	773	788	724	673	721	740	735
6 ..	799	773	719	770	793	723	669	726	749	733
7 ..	782	771	726	767	792	722	668	729	764	732
8 ..	764	773	737	760	778	720	673	730	782	733
9 ..	754	776	747	752	756	717	678	731	802	732
Decade Year.	Births per 100,000 of the Population.									
0 ..	..	..	3,894	3,396	3,534	3,382	3,435	3,179	2,743	3,009
1 ..	..	..	3,832	3,397	3,532	3,365	3,382	3,161	2,702	2,984
2 ..	..	..	3,793	3,397	3,526	3,343	3,313	3,142	2,683	2,960
3 ..	..	..	3,739	3,400	3,532	3,326	3,239	3,122	2,669	2,935
4 ..	..	..	3,688	3,396	3,533	3,311	3,155	3,102	2,663	2,915
5 ..	4,141	3,478	3,659	3,397	3,522	3,284	3,082	3,092	2,657	2,890
6 ..	4,102	3,436	3,625	3,381	3,519	3,272	3,005	3,082	2,651	2,862
7 ..	4,059	3,423	3,598	3,401	3,512	3,240	2,932	3,063	2,652	2,827
8 ..	3,997	3,420	3,572	3,393	3,503	3,218	2,863	3,052	2,671	2,776
9 ..	3,955	3,407	3,546	3,382	3,483	3,206	2,788	3,026	2,700	2,732

A denotes the values for the Commonwealth of Australia.

W denotes the values derived from the unweighted means for the series of countries shewn on Tables XXXIX and XLVI.

* The moment of time to which the values apply is the *beginning* of the years 0, 1, 2, etc.....,9.

5. **Fluctuation of annual period in the frequency of marriage.**— Social custom in regard to marriage expresses itself in a fluctuation of annual period, but the changes in the date of Easter make the results for any one year not comparable in general to those of any other. The movement of Easter has been already considered, see Part XI., Natality. The following results are for the period 1908-1914, and are corrected for inequality in the length of the month, and for an increasing population. The table gives the crude and the adjusted data.

TABLE XLVIII.

Number of Marriages Registered in the Different Months. Australia, 1908-14.

Period.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1908–14 ..	21,462	21,106	22,732	28,358	19,714	22,959	20,752	20,733	22,824	22,138	21,140	25,534
Equalised ..	21,060	22,691	22,420	28,653	19,205	23,232	20,357	20,369	23,154	21,750	21,455	25,106
Constant Population	21,325	22,924	22,599	28,817	19,271	23,258	20,434	20,299	23,022	21,579	21,343	24,790
Ratio to Average..	.9490	1.0201	1.0057	1.2824	.8576	1.0350	.9093	.9033	1.0245	.9603	.9498	1.1032

These results are shewn, the rectangles and the probable fluctuation, by curve C, on Fig. 56, and represent the fluctuation of the *registration* of marriage. It is not certain that the returns made to the Registrars of Marriages by those who celebrate them have not also seasonal peculiarities, and consequently the fluctuation shewn is compounded of the two, and in reference to the time scale is in advance of the true position. The components of the curve can be found by applying formulae (90) to (101) of § 5, part III., Determination of Constants, etc.[1]

6. **General.—Conjugal Constitution of the Population.**— The "general conjugal constitution" of a population is defined by the number of persons therein who have never been married; who are living in the state of marriage; or of widowhood, etc.; or who are living in the state of "divorced" persons. The actual unadjusted numbers of males and females in age-groups on the 3rd April, 1911, as indicated by the Census are shewn on the table of § 4, Chapter XVIII., Vol. I., of the Census Report. These are represented on Fig. 57, which shews both the group-values and the curves, which give sensibly the same totals. The results as furnished by the Census are somewhat vitiated by misstatements as to age; on the whole, however, they give a fair representation of the change in the

[1] See also formulae (375) to (395), § 16, Part XI., Natality.

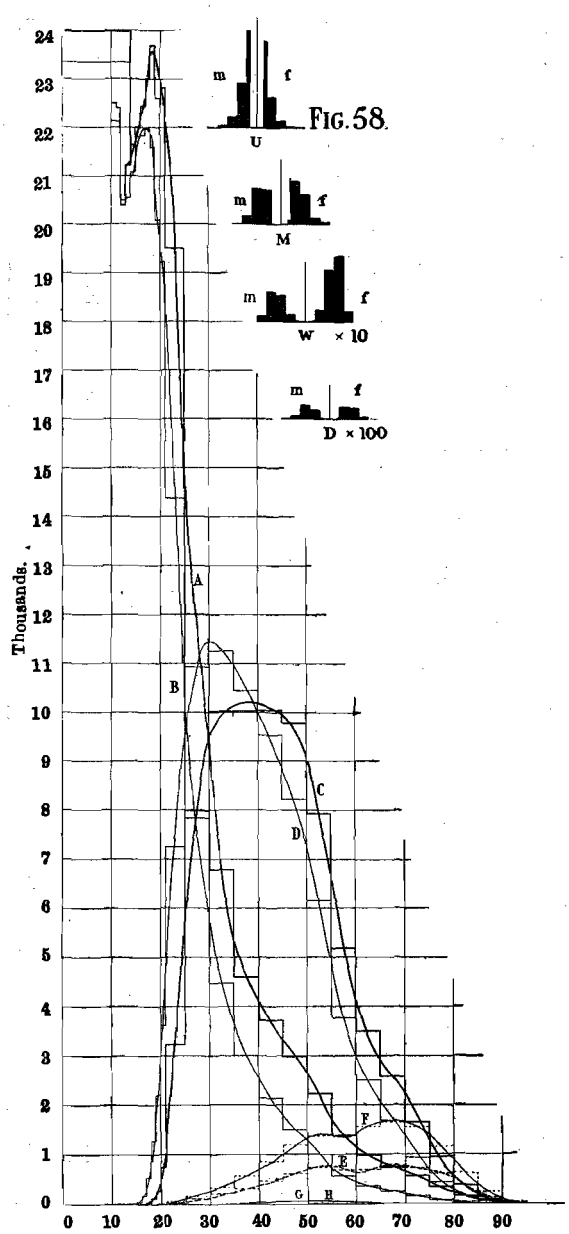

Fig. 57—The rectangles shew the total numbers as at the Australian Census of 1911 in 5-year groups, and the curves give approximately the equivalent areas, the heavy curves denoting the results for males, and the light those for females. Curves A and B shew the numbers of the "Never married"; C and D the numbers of the "married" E and F the numbers of the "widowed"; the former being for males; and G and H (which cannot be distinguished) shew the numbers of the divorced."

Fig. 58—The figures, which illustrate Table XLIX., shew the asymmetry of the distribution for the "never married, U; the "married," M; the "widowed," W; and the "divorced." The scale of W is ten times that of U and M, and that of D is 100 times that of U and M.

Fig. 57.

conjugal constitution with age. The general significance can be better grasped from the results shewn in the following table :—

TABLE XLIX.—Proportional Conjugal Constitution of the Australian Population, 3rd April, 1911, per 10,000,000 Total Population (Adjusted Numbers.)

Age-groups.		Proportion per 10,000,000 of Total Population.					Proportion per 1,000,000 of same Sex and Age-groups.			
		Never Married.	Married.	Widowed.	Divorced	Total.	Never Married.	Married.	Widowed.	Divorced
Under 14	M	1,506,806	0	0	0	1,506,806	1,000,000	0	0	0
	F	1,467,395	2	0	0	1,467,397	999,998	2	0	0
14 to 20	M	710,197	5,304	34	4	715,539	992,533	7,413	48	6
	F	662,798	35,358	184	18	698,358	949,080	50,630	264	26
21 to 39	M	875,496	699,580	14,646	1,731	1,591,453	550,123	439,586	9,203	1,088
	F	602,222	862,948	24,658	2,265	1,492,093	403,609	578,347	16,526	1,518
40 to 59	M	231,079	746,217	55,057	2,941	1,035,294	223,201	720,778	53,180	2,841
	F	116,157	621,059	107,535	2,229	846,980	137,142	733,263	126,963	2,632
60 to 79	M	58,438	194,935	61,309	595	315,277	185,354	618,297	194,461	1,888
	F	18,608	124,159	134,718	285	277,770	66,991	446,985	484,998	1,026
80 &above	M	4,507	10,770	12,301	45	27,623	163,161	389,893	445,317	1,629
	F	1,129	3,850	20,424	7	25,410	44,431	151,515	803,778	276
All Ages	M	3,386,523	1,656,806	143,347	5,315	5,191,992	652,259	319,108	27,609	1,024
	F	2,868,309	1,647,374	287,519	4,804	4,808,008	596,569	342,632	59,800	999

The table is based upon 4,455,005 persons, of which 2,313,035 were males, and 2,141,970 were females ; it shews the distribution of 10,000,000 persons on that basis. The ratios in the second part of the table shew the proportional distribution in each age group. This distribution is illustrated in the small diagrams of Fig. 58, in which U denotes the males and females belonging to the class " never married " ; M denotes the " married" males and females ; W denotes the " widowed," of each sex ; and D the divorced of each sex. These small diagrams represent by the rectangular areas on the left of the median line the males, and on the right thereof, the females. The scale of U and M is identical ; that of W is 10 times, and that of D, 100 times as great.

The age at which the married are equal numerically to the unmarried is about 29.49 for males when the proportion of the total at that age is 0.49557, and 25.27 years for females when the proportion at that age is 0.49699. The difference is 4.22 years, and the mean proportion 0.49629 is close to either. This is due to the fact that the number of widowed and divorced is very small at the ages in question.

7. **Relative conjugal numbers at each age.**—The progress of the conjugal constitution with age is completely defined by giving for each sex, the proportion living at each age, and the proportional division of each such number according to conjugal condition. In the following table, which represents the smoothed results for the population of Australia at the Census of 3rd April, 1911, the relative distribution of males and females is shewn in columns II. and III. These numbers multiplied by 0.2313035 in the case of males, and 0.2141970 in the case of females (see the preceding section) give the absolute numbers, smoothed. The distribution of 100,000 of these at each age is given for each conjugal condition, viz., in IV. and V., the unmarried ; in VI. and VII., the widowed ; and so on. Thus at each age a complete comparison is

possible of the conjugal state. Assuming the constancy of the conjugal constitution of the population the results given in columns IV. to XII. are the probability of the number of males or females which will be found characterised as never married, married, widowed or divorced, in a total of 100,000 males or females of each year of age throughout life. Columns II. and III. shew, for the population of 10,000,000, a probable number of males or females living at each year of age throughout the life-period on the assumption of an unchanging constitution according to sex and age. As a matter of fact the Australian population, however, has not reached a "steady" state as regards the constitution of its population.

TABLE L.—Relative Conjugal Numbers at each Age. Australia, 3rd April, 1911.

Age Last Birthday.	Proportion per 10,000,000 of same Sex.		Proportion per 100,000 of any Age in each Conjugal Condition.							
			Never Married.		Married.		Widowed.		Divorced.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XII.
0	253,554	263,314	100,000	100,000	..	..	..	..	..	..
1	236,741	247,352	100,000	100,000	..	..	..	..	..	..
2	227,662	238,776	100,000	100,000	..	..	..	..	..	..
3	221,173	232,426	100,000	100,000	..	..	..	..	..	..
4	216,158	226,689	100,000	100,000	..	..	..	..	..	..
5	211,030	221,422	100,000	100,000	..	..	..	..	..	..
6	205,544	216,147	100,000	100,000	..	..	..	..	..	..
7	199,236	210,605	100,000	100,000	..	..	..	..	..	..
8	193,611	205,675	100,000	100,000	..	..	..	..	..	..
9	189,232	201,852	100,000	100,000	..	..	..	..	..	..
10	186,115	199,135	100,000	100,000	..	..	..	..	..	..
11	184,835	197,118	100,000	100,000	..	..	..	..	..	..
12	184,813	196,086	100,000	100,000	..	..	..	..	..	..
13	185,860	196,417	100,000	99,998	..	2	..	..	..	..
14	188,588	198,425	99,993	99,958	7	42	..	..	..	..
15	192,846	202,463	99,982	99,783	18	215	..	2	..	..
16	196,742	206,660	99,945	99,207	55	789	..	4	..	..
17	200,105	209,910	99,842	97,445	156	2,547	2	8	..	..
18	202,552	212,020	99,507	94,363	491	5,621	2	15	..	1
19	203,339	212,575	98,803	90,089	1,191	9,878	4	27	2	6
20	202,932	211,646	96,862	84,638	3,111	15,290	23	59	4	13
21	201,908	209,144	93,784	77,311	6,156	22,547	54	121	6	21
22	200,256	205,554	88,724	70,131	11,172	29,634	93	204	11	31
23	197,226	200,885	82,292	61,261	17,537	38,393	153	302	18	44
24	192,582	195,288	76,334	54,327	23,403	45,192	236	418	27	63
25	186,746	189,284	70,235	48,343	29,402	51,018	326	555	37	84
26	180,702	183,033	64,175	44,043	35,349	55,149	426	701	50	107
27	174,619	177,047	58,423	40,529	40,975	58,487	535	857	67	127
28	168,700	171,165	53,325	37,220	45,937	61,599	654	1,036	84	145
29	163,041	165,339	49,526	34,316	49,586	64,280	782	1,242	106	162
30	157,732	159,615	45,773	31,703	53,169	66,641	918	1,477	140	179
31	152,938	154,153	42,050	29,253	56,732	68,827	1,060	1,726	158	194
32	148,316	149,297	38,623	27,299	59,998	70,490	1,210	2,001	169	210
33	144,192	144,913	35,755	25,742	62,703	71,732	1,365	2,303	177	223
34	140,534	141,029	33,532	24,593	64,757	72,523	1,523	2,648	188	236
35	137,417	137,532	32,018	23,352	66,100	73,362	1,687	3,038	195	248
36	134,594	134,166	30,608	22,188	67,326	74,092	1,860	3,462	206	258
37	132,387	131,164	29,495	21,236	68,252	74,546	2,041	3,951	212	267
38	130,491	128,344	28,536	20,209	69,012	75,059	2,233	4,456	219	276
39	128,870	125,725	27,727	19,392	69,612	75,368	2,436	4,957	225	283
40	127,499	123,036	27,035	18,423	70,089	75,785	2,645	5,504	231	288
41	126,085	120,006	26,296	17,585	70,601	76,023	2,867	6,100	236	292
42	124,753	116,766	25,596	16,697	71,060	76,272	3,098	6,737	246	294
43	123,297	113,820	24,815	16,111	71,584	76,108	3,345	7,486	256	295
44	121,810	111,075	24,004	15,481	72,121	75,913	3,606	8,311	269	295

Relative Conjugal Numbers at each Age. Australia, 3rd April, 1911.—*Continued.*

Age Last Birthday.	Proportion per 10,000,000 of same Sex.		Proportion per 100,000 of any Age in each Conjugal Condition.							
			Never Married.		Married.		Widowed.		Divorced.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XII.
45	120,227	108,316	23,205	14,831	72,620	75,875	3,887	9,000	288	294
46	118,632	105,580	22,540	14,203	72,959	75,593	4,195	9,911	306	293
47	116,738	102,742	22,062	13,632	73,124	75,231	4,503	10,846	311	291
48	114,201	99,455	21,696	13,064	73,159	74,888	4,831	11,760	314	288
49	110,863	95,281	21,573	12,592	72,924	74,455	5,191	12,668	312	285
50	106,112	90,165	21,317	12,216	72,747	73,959	5,627	13,545	309	280
51	99,890	84,049	20,762	11,745	72,755	73,183	6,172	14,798	311	274
52	93,341	78,320	20,065	11,362	72,858	72,254	6,767	16,118	310	266
53	86,985	73,129	19,593	11,034	72,763	71,200	7,336	17,511	308	255
54	80,868	68,376	19,471	10,676	72,387	70,127	7,837	18,961	305	236
55	74,798	63,726	19,317	10,315	72,094	69,009	8,300	20,484	289	192
56	68,840	59,053	19,105	9,966	71,915	67,531	8,704	22,342	276	161
57	62,865	54,585	18,994	9,653	71,433	65,772	9,291	24,427	282	148
58	57,474	50,631	18,896	9,316	70,806	63,932	10,012	26,611	286	141
59	53,237	47,302	18,694	9,031	70,294	62,064	10,728	28,770	284	135
60	49,602	44,622	18,757	8,754	69,406	60,052	11,558	31,063	279	131
61	46,433	42,424	18,920	8,434	68,371	58,108	12,439	33,332	270	126
62	43,873	40,678	18,940	8,156	67,491	55,959	13,313	35,763	256	122
63	44,724	39,258	18,879	7,741	66,677	53,939	14,206	38,202	238	118
64	39,870	37,904	18,781	7,556	65,853	51,569	15,138	40,761	228	114
65	38,149	36,588	18,382	7,256	65,254	49,263	16,160	43,371	204	110
66	36,376	35,276	17,709	6,879	64,547	47,147	17,542	45,868	202	106
67	34,574	33,782	17,457	6,690	63,524	44,855	18,832	48,353	187	102
68	32,771	32,078	17,520	6,409	62,309	42,859	20,000	50,634	171	98
69	30,912	30,164	17,790	6,068	61,063	40,966	20,979	52,872	168	94
70	29,096	28,194	18,276	5,861	59,406	38,856	22,140	55,194	178	89
71	27,341	26,359	18,817	5,668	57,938	36,880	23,087	57,367	158	85
72	25,460	24,608	19,358	5,422	56,563	34,905	23,943	59,592	136	81
73	23,562	22,890	19,817	5,185	55,468	33,008	24,587	61,730	128	77
74	21,669	21,121	20,152	5,131	53,990	31,012	25,738	63,784	120	73
75	19,861	19,281	20,026	4,858	52,024	29,141	27,841	65,932	109	69
76	18,123	17,400	19,323	4,759	50,334	27,327	30,248	67,849	95	65
77	16,459	15,453	18,125	4,649	48,595	25,442	33,202	69,848	78	61
78	14,639	13,441	16,539	4,558	47,549	23,500	35,824	71,885	88	57
79	12,568	11,545	15,480	4,466	46,784	21,890	37,668	73,591	68	53
80	10,817	9,762	14,788	4,371	43,965	20,214	41,167	75,366	80	49
81	9,023	8,189	14,950	4,291	42,166	18,556	42,789	77,109	95	44
82	7,263	6,830	15,833	4,236	41,072	16,882	42,976	78,842	119	40
83	5,824	5,640	16,704	4,150	39,347	15,183	43,875	80,667	74	..
84	4,630	4,650	17,647	4,080	37,348	13,495	44,912	82,425	93	..
85	3,662	3,842	18,654	4,012	35,419	12,063	45,809	..	118	..
86	2,832	3,142	18,473	3,960	33,588	10,288	47,786	..	153	..
87	2,166	2,516	17,964	3,891	31,936	8,809	49,900	..	200	..
88	1,634	1,975	17,196	3,830	31,746	7,754	50,794	..	264	..
89	1,258	1,536	15,808	3,770	31,615	7,264	52,234	..	343	..
90	968	1,186	14,732	3,720	30,357	7,204	54,464	..	447	..
91	722	878	15,569	3,681	28,743	7,521	55,688	..	..	..
92	532	616	16,260	3,640	26,016	8,581	57,724	..	..	..
93	363	416	17,857	3,601	23,810	9,882	58,333	..	..	..
94	233	280	20,370	3,563	22,222	11,537	57,408	..	..	..
95	169	210	20,513	3,534	20,513	13,044	58,974	..	..	..
96	125	159	20,690	3,501	24,138	14,746	55,172	..	..	..
97	99	117	21,739	3,470	26,087	16,630	52,174	..	..	..
98	78	84	22,222	3,446	27,778	18,276	50,000	..	..	..
99	61	61	21,429	3,427	28,571	20,050	50,000	..	..	..
100	43	42	20,000	3,411	30,000	21,811	50,000	..	..	..
Total	10,000,000	10,000,000	..	..	..	..	..	..	..	..

8. **The curves of the conjugal ratios.**—The smoothed results for each sex, representing the ratios which the "never married," the "married," the "widowed" and the "divorced" bear to each other (given in Table L) are graphed in Fig. 59, and are represented respectively by the curves U_m and U_f , M_m and M_f , W_m and W_f , and D_m and D_f .

Conjugal Ratios, Australia, 1911.

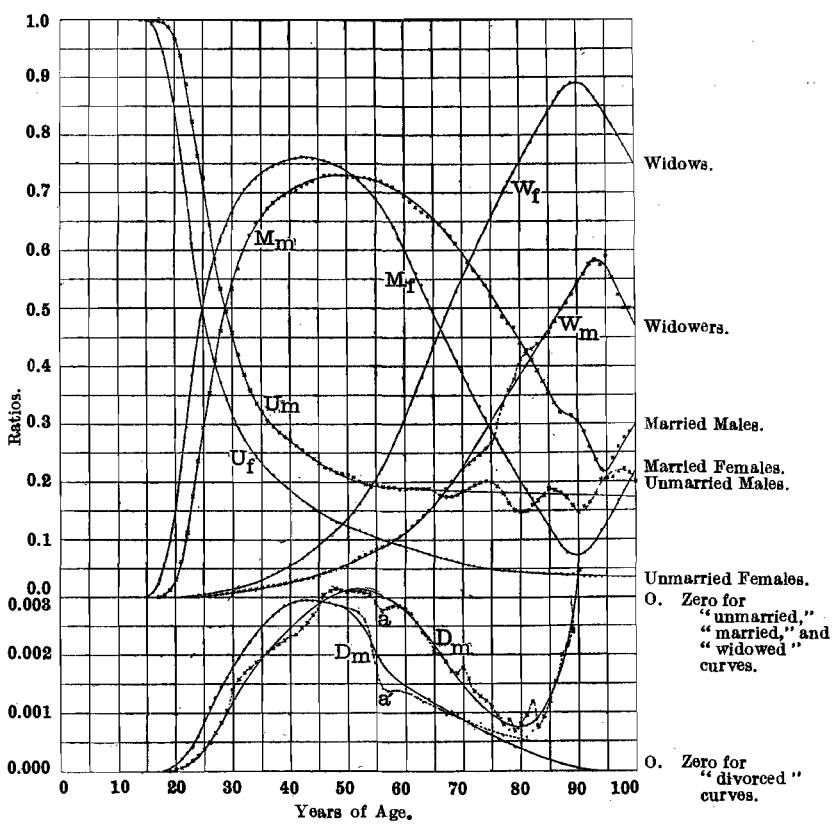

Fig. 59.

These curves shew merely the proportion of the unmarried, married, widowed, and divorced at each age, the number at *each* age being unity for males, and also unity for females. They thus shew the distribution for each age according to age, but not between one age and another.

The results for males are shewn by small crosses in the figures ; those for females by small dots. The curves for the "never married" are somewhat of the type e^{nx^p}, where p is large. The critical features of these curves can be best shewn in a tabular form, and are as in the following table :—

TABLE LI.—Critical features in the frequencies of conjugal conditions.

Australian Census, 3rd April, 1911.

Character of Critical Feature.	Exact Age.	Proportion of Total Age-group.
Maximum proportion married, males	49.5	0.73100
,, ,, ,, females	43.0	0.76160
Minimum proportion married, males	95.0	0.00217
,, ,, ,, females	90.0	0.00063
Equal frequency married and unmarried males	29.49	0.49556
,, ,, ,, ,, females ..	25.27	0.49699
Maximum proportion widowed, males	90.5	0.89100
,, ,, ,, females	93.7	0.58400
Equal frequency unmarried and widowed, males ..	67.5	0.18600
,, ,, ,, ,, females ..	49.5	0.12600
Maximum proportion of divorced, males	52.0	0.003115
,, ,, ,, females	44.0	0.00295

In general these results are for the smoothed curves represented in Fig. 59, as may be seen by a reference thereto. The ratios among one another of the various ratios given in Table L follow no simple law, and an examination of them was found to lead to no important results.

9. **The norms of the conjugal ratios.**—It is eminently desirable that a series of curves based upon the *aggregate* of all populations to be compared, should be tabulated and constructed on some such model as that indicated here for the population of Australia. Such a norm, representing the relative frequency of the never-married, the married, the widowed and divorced for the entire aggregate would constitute the best possible bases for comparisons of the position of individual nations and peoples. The international issue of graph paper on which such curves were already drawn, preferably in faint colour, would enable the statistician to see instantly the position of his own country in regard to the larger average in respect of the particular character compared.

10. **Divorce and its secular increase.**—The frequency of divorce is of sociological interest. The effect of the Divorce Act (55 Vict., No. 37) of New South Wales, and of Victoria (53 Vict., No. 1056), which came into force on 6th August, 1892, and 13th May, 1890, respectively, have had a conspicuous influence in increasing its frequency. In the former State the frequency was more than quadrupled for about three years; in the latter it was tripled, as the result of the operation of these Acts. Table

LII. shews the frequency of divorce per 10,000,000, for the several States of the Australian Commonwealth for which they were available up to 1886, and for the whole Commonwealth from 1887 onward.

The populations up to 1886, used to compute the divorce-rate, correspond to the number of States for which the divorce results were available, and the number of divorces include the judicial separations. The results for the successive years are as follows :—

TABLE LII.—Relative Frequencies, per 10,000,000 population, of Divorces and Judicial Separations. Australia, 1874 to 1913.

Year of Decade.	Rates* in Decades.					Proportion† of Judicial Separations.	
	1870.	1880.	1890.	1900.	1910.	Period.	Proportion.
0	..	237	377	981	1,066	1874–1879	.020
1	..	179	594	1,052	1,154	1880–1884	.052
2	..	113	684	1,024	1,464	1885–1889	.062
3	..	274	1,293	909	1,347	1890–1894	.043
4	140	176	1,261	1,014	..	1895–1899	.038
5	220	269	1,194	862	..	1900–1904	.042
6	350	229	1,039	860	..	1905–1909	.043
7	210	205	1,113	854	..	1910–1913	.023
8	140	297	1,024	997	..	1874–1913	.0381
9	120	361	1,043	1,163	..	..	..

* Number per 10,000,000 of population. † Ratio of judicial separations to judicial separations and divorces together.

The total number of divorces and judicial separations were 10,194 and 404 respectively, the total thus being 10,598. The relative frequencies, tabulated above, are shewn by the bottom curve in Fig. 56, viz., curve D. The proportions which judicial separations bear to the totals appear also in the table. Apparently divorce was increasing at first approximately at the rate 0.00000165 per unit of the population per annum, so that the number of divorces (V.) from 1781 to 1890 would be represented roughly by

$$(401)..... V = 0.00000165\ P\ (t - 1870),$$

in which formula t denotes the year for which the number is required, and P the population at the middle of the year.

The values according to this formula are denoted by the dotted line a b on Fig. 56. The relative frequency then rises in 3 years from, say 0.0000330 to the value 0.0001293 ; that is at the rate 0.0000321 per

person per annum — the line b c on the figure. The relief afforded through the change in the divorce acts, having apparently been secured in the short time mentioned, the relative frequency of divorce fell fairly regularly until about 1907, viz., at the rate of 0.00000333 per person per annum. Hence for this period the relative frequency is about

$$(402)\ldots\ldots\ V = -\ 0.00000333\ P\ (t - 1893).$$

This is the line c d on the graph. The relative frequency of divorce then rapidly increases to about 0.0000100 per person per annum. This is denoted by line d e on the graph.

11. **The abnormality of the divorce curve.**—Owing to the change in the divorce law being, as shewn, instantly followed by a large increase in the number of cases, the curve of frequency cannot be regarded as normal for the larger ages. For the purpose of estimating the rate of increase, previous to the legal change, the results for a few years before the change can be used. Similarly the results after the change can be carried backward to some common year in the changing period. This gives the following results :—

TABLE LIII.—Shewing Influence of Divorce Acts on Number of Divorces.

Australia.

State.	Average Increase per Annum (Number).		Number as at Change per Year. (1892).		Factor of Increase
	Before Legal Change	After Legal Change	Before Change.	After Change.	
N.S. Wales ..	(1884-1891) 5.6	(1893-1895) 0.0	69.7*	306.7*	4.4
Victoria ..	(1881-1889) 1.9	(1891-1893) 0.0	32.5	91.7	2.8
Commonwealth	(1881-1888) 7.4	(1893-1907) 5.6	116.6	436.6	3.7

* Divorces and judicial separations together.

In view of the fact that, as shewn, the change consequent upon the operation of the Divorce Acts is very marked in the frequency of divorce between 1890 and 1893, say 21 to 18 years before the Census of 1911, and that there is a remarkable decrease in the proportion of " divorced" for

ages about 55, see the points marked a and a′ in Fig. 59 (which would correspond to ages of about 35 in the year 1891), it seems more than probable that the left-hand branch of the divorce curves belongs to the later, and the right-hand branch belongs to the earlier divorce regime. To obtain the true tendency to divorce according to age of the parties, these irregular frequencies would, of course, have to be eliminated. Hence it is desirable to include in the statistics of divorce the age of petitioners and respondents. See later.

12. **Desirable form of divorce statistics.**—From what has preceded, it is evident that for divorce statistics to be of high value from the standpoint of sociology, they should fulfil the following requirements, viz., they should include the numbers both of petitions for judicial separation and for divorce, and should shew for each :—(1) The date and the ground of the petition ; (2) The action resulting therefrom (granting, refusal, or other action), together with the date of such action ; (3) The date of birth both of petitioner and respondent ; (4) and the date of their marriage. Statistics so kept would furnish results shewing frequency-according-to-age and age-differences and according to duration-of-marriage. The sociological value of such statistics is self-evident, for it would throw light upon the influence of age *per se*, of difference of age, and of duration of marriage, and thus would *expose the conditions which are of danger from the standpoint of social stability*.

13. **Frequency of marriages according to pairs of ages.**—The frequency of marriage according to pairs of ages can be well determined only for a considerable number of instances. For example, if assigned to groups, according to age last birthday, there are, between the ages 12 and 95 for brides, and 15 and 99 for bridegrooms, no less than 7140 groups. As for the last eight years the average number of marriages per annum was only 37,740, this gives a little over 5 per group on the average, a number insufficient to indicate the characteristics of the frequency. For this reason eight years **marriages** were taken, viz., 301,918, or the marriages of 603,836 **persons**, who were married during the years 1907 to 1914 inclusive. Of these marriages the ages of 57 brides were not stated, though the ages of the bridegrooms were given ; the ages of 19 bridegrooms were not furnished, though those of the brides were given ; and in 54 cases neither the age of bride or bridegroom was given. That is, there were 130 cases (or about 1 in 2322, or the 0.00043058th part) defective. These are disregarded.

For single year groups the numbers of marriages are shewn in Table LIV.

TABLE LIV.—NUMBER OF MARRIAGES* ARRANGED ACCORDING TO

* The figures denote the number

Ages of Bride-grooms	AGES OF BRIDES.																												
	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
15	..	..	..	..	1	..	..	..	1	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
16	..	..	2	2	8	13	8	6	3	4	3	..	..	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
17	..	..	..	12	44	59	51	30	16	10	8	5	..	1	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
18	..	1	3	28	113	233	309	195	112	78	58	30	12	11	6	5	2	6	..	1	..	..	1	1	..	..	..	..	..	..
19	..	1	2	38	208	426	778	740	395	327	194	90	47	42	24	7	11	4	5	2	4	3	1	..	1	..	..	1	1	..
20	..	..	8	37	214	602	1033	1261	1075	891	489	320	160	124	76	42	28	29	17	3	5	7	5	3	3	2	..	2	..	..
21	..	..	10	65	362	1158	2076	2527	2301	3764	1845	1185	733	465	289	190	118	73	58	34	24	15	19	19	8	4	5	5	4	3
22	..	..	16	68	266	870	1703	2342	2384	3960	3008	1869	1269	744	526	307	226	134	78	51	59	17	20	16	10	4	6	4	4	2
23	..	2	6	40	233	742	1494	2152	2550	4114	3468	3128	2032	1247	835	513	309	231	179	82	84	63	30	30	20	13	22	11	6	3
24	..	..	2	32	195	603	1170	1885	2267	3672	3302	3249	2989	1776	1311	769	545	395	228	132	94	61	72	41	34	27	21	15	8	2
25	..	..	7	38	157	460	971	1458	1824	3170	2981	3006	2821	2664	1616	1089	832	450	360	206	162	78	70	75	35	26	25	15	11	8
26	..	..	1	25	158	405	875	1197	1627	2630	2555	2683	2540	2382	2200	1354	948	584	424	239	190	124	100	64	48	30	26	19	17	9
27	..	..	2	16	97	311	607	985	1238	2171	2050	2255	2141	2073	1844	1723	1098	730	490	298	253	154	123	86	55	76	35	24	20	6
28	..	..	6	19	80	247	567	775	1036	1858	1783	1873	1957	1736	1668	1532	1320	879	590	360	289	203	166	114	82	66	53	31	35	12
29	..	..	2	10	52	182	339	606	766	1364	1353	1431	1484	1457	1317	1242	1121	1037	709	409	314	260	168	132	88	66	60	38	25	25
30	..	..	1	7	46	133	287	439	609	1022	986	1088	1145	1172	1183	982	944	830	742	423	365	229	204	153	100	76	61	33	46	14
31	..	..	..	6	27	94	186	311	402	727	737	769	786	820	841	752	754	703	599	555	339	230	182	157	100	76	46	48	23	14
32	..	..	..	9	29	78	154	259	344	604	710	668	727	767	790	621	673	636	555	472	497	280	225	173	126	94	67	42	41	14
33	..	..	..	2	22	54	114	193	261	462	513	553	512	549	563	536	541	517	461	355	342	317	193	180	130	90	64	50	36	19
34	..	..	..	5	12	50	121	157	215	334	366	422	551	455	432	449	449	407	384	264	344	275	298	197	157	95	95	66	35	30
35	..	..	..	7	18	26	81	126	174	304	323	313	364	477	375	398	387	354	377	270	288	246	235	233	164	103	94	87	63	36
36	..	..	1	6	13	37	76	93	129	241	272	273	300	323	368	337	324	333	362	239	258	228	223	190	188	126	115	75	61	30
37	..	..	1	3	7	27	40	90	101	188	171	259	236	242	263	327	254	250	255	167	227	194	178	153	153	165	111	103	56	45
38	..	..	1	1	8	22	47	74	75	181	178	205	259	250	216	215	354	240	243	193	216	216	178	187	172	160	189	120	84	40
39	..	..	..	4	8	18	28	57	58	125	113	128	164	177	204	190	197	243	208	160	168	169	174	154	147	142	139	151	101	58
40	..	..	..	5	9	13	18	39	71	90	110	112	138	157	139	161	172	180	208	121	152	132	128	173	118	124	126	124	118	73
41	..	..	..	1	2	6	14	21	26	70	53	87	87	85	122	109	116	108	119	142	117	115	93	106	101	73	76	86	70	73
42	..	..	1	1	3	1	22	26	34	52	70	64	88	84	84	112	114	106	131	107	135	110	98	132	124	86	111	97	73	66
43	..	..	..	..	2	3	6	18	21	39	42	72	59	64	68	93	91	81	110	84	105	101	97	96	86	88	85	81	71	55
44	..	..	..	..	3	3	10	11	17	41	36	49	48	57	62	64	65	70	74	66	96	80	90	72	76	68	80	84	67	29
45	..	..	..	1	4	5	14	12	12	35	23	37	45	72	45	51	72	79	92	75	61	72	86	93	95	77	73	78	65	51
46	..	..	..	..	3	4	5	13	15	38	29	32	37	43	52	44	50	56	66	57	63	62	57	88	87	48	66	54	62	42
47	..	..	..	1	..	6	6	8	14	30	21	21	24	26	29	48	52	36	49	38	46	49	60	65	64	74	69	47	47	42
48	1	..	..	..	1	3	10	7	14	16	15	37	32	30	27	30	49	44	41	42	47	49	48	44	55	66	81	60	61	38
49	..	..	1	..	1	2	4	5	4	11	20	15	21	27	26	32	28	29	23	31	39	19	41	48	58	50	58	55	48	40
50	..	..	..	..	1	4	6	8	6	6	9	15	23	28	26	24	22	31	37	32	34	38	27	52	40	41	54	57	66	34
51	..	..	..	..	..	..	2	2	6	7	8	5	8	8	16	10	9	20	20	24	13	26	23	28	38	20	36	34	29	30
52	..	..	..	..	1	4	3	..	5	8	11	7	11	10	9	21	12	12	16	25	25	20	18	32	24	22	40	34	31	25
53	..	..	..	..	2	2	1	3	3	2	6	9	4	14	11	11	12	19	13	19	17	14	14	22	21	23	26	27	29	19
54	..	..	..	..	..	..	2	..	1	3	7	5	8	7	18	9	12	13	12	9	19	19	24	19	24	14	20	20	26	16
Ages.	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**
55	..	..	..	..	..	..	4	2	1	2	5	4	3	3	9	4	6	7	13	14	15	14	15	17	8	23	17	21	21	23
56	..	..	..	..	..	..	1	1	4	4	3	5	5	9	4	3	6	8	17	6	5	9	9	14	18	18	17	15	25	12
57	..	..	..	..	1	..	..	1	..	2	3	3	1	2	7	3	5	12	3	5	5	3	13	14	10	9	14	11	6	14
58	..	..	..	..	..	..	..	..	2	3	4	5	2	4	4	7	7	5	6	4	6	8	6	10	13	11	11	13	19	11
59	..	..	..	..	..	..	..	1	2	..	1	4	5	2	4	2	5	1	5	4	5	5	2	2	5	7	12	3	6	5
60	..	..	..	..	1	..	1	1	..	1	2	2	2	1	3	5	5	11	6	3	3	6	4	9	10	12	14	11	9	7
61	..	..	..	..	..	1	..	..	1	..	1	4	1	2	..	2	6	..	2	1	4	2	3	3	1	7	10	10	8	9
62	..	..	..	..	..	..	..	1	..	..	1	2	3	2	3	..	3	1	3	1	7	1	1	3	6	2	6	7	7	4
63	..	..	..	..	..	..	..	..	1	..	..	1	3	3	2	3	3	2	5	2	4	2	7	6	4	3	4	4	4	2
64	..	..	..	..	1	..	..	..	..	..	1	1	1	3	3	5	2	1	1	..	6	3	2	1	1	3	5	10	4	5
65	..	..	..	..	..	..	..	..	1	1	..	..	1	1	..	..	2	1	3	3	2	..	8	3	2	8	4	4	4	3
66	..	..	..	..	..	..	..	..	2	1	..	1	..	..	2	..	1	2	..	2	..	2	1	1	5	2	2	1	4	1
67	..	..	..	..	..	..	..	1	..	1	..	..	3	..	1	..	1	..	1	3	1	3	2	1	2	3	1	5	3	6
68	..	..	..	..	..	..	..	..	2	..	1	..	..	2	1	1	1	3	..	2	..	1	3	3	..	4	3	2	3	3
69	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	3	1	2	2	..	2	..	2	2	2	3	1	1	..
70	..	..	..	..	..	..	..	..	..	..	..	..	2	..	1	1	2	3	2	1	2	1	2	1	..	5	2	4	7	9
71	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	1	1	..	1	..	1	2	2	1	1	3
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75	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	1	..	..	..	..	..	1	1
76	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	..	2	..	..	1	..	1	..	1	..	2	..
77	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	1	..	..	1	1
78	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	..	1	..	..
79	..	..	..	..	..	..	1	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	..	..	1	..	..
80	..	..	..	..	..	..	..	..	..	2	..	..	..	1	..	..	..	1	..	..	..	..	1	..	..	1	..	..	..	..
81	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
82	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
83	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..
84	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
85	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
86	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
87	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
88	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
89	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
90	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
95	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
99	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
N.S.	..	..	..	..	..	..	1	1	1	4	2	..	1	1	..	2	..	..	1	1	..	1	..	..	..	..	..	..	..	..
Total	**1**	**4**	**73**	**489**	**2412**	**6907**	**13246**	**18140**	**20231**	**32673**	**27950**	**26402**	**23903**	**20707**	**17731**	**14440**	**12372**	**10010**	**8405**	**5848**	**5558**	**4341**	**3854**	**3521**	**2924**	**2438**	**2369**	**2005**	**1688**	**1126**

THE AGES OF THE CONTRACTING PARTIES, AUSTRALIA. 1907-1914.

of couples : not of persons.

AGES OF BRIDES.

Ages of Bride-grooms	Total.	Not stated	95	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
15	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
16	51	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
17	239	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
18	1205	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
19	3353	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
20	6438	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
21	17374	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
22	19977	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
23	23655	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
24	24918	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
25	24650	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
26	23494	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
27	21012	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
28	19384	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
29	16113	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4
30	13392	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
31	10349	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
32	9745	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4
33	7712	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
34	6796	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
35	6066	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
36	5345	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	2	..	..	..	..	..	..	..	..	..	..	..	..	2
37	4411	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	2
38	4530	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	1	..	3	1	..	..	..	..	..	..	..	..	..	..	..	2
39	3737	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	2	..	4	3	2	4	11	2	3	3	7	4	36	61
40	3252	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	1	1	2	1	3	1	3	3	2	3	3	3	3	3	3	3	3	3	58
41	2336	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	2	2	1	1	2	1	4	2	3	2	1	2	3	4	5	6	6	7	61
42	2437	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	1	1	2	1	3	1	2	1	3	1	2	4	5	6	7	8	9	87
43	2058	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	..	2	1	2	5	2	1	2	1	2	3	4	5	6	7	8	9	10	90
44	1745	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	2	1	2	..	2	3	4	5	6	7	8	9	10	11	12	13	56
45	1847	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	1	1	1	..	1	1	2	1	3	4	5	6	7	8	9	10	11	12	13	14	15	16	75
46	1575	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	2	..	2	..	1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	59
47	1350	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	3	..	1	3	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	56
48	1363	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	3	1	..	1	3	1	4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	39
49	1146	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	2	..	4	..	2	7	2	4	2	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	42
50	1113	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	2	1	1	1	2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	32
51	748	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	3	3	1	2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	33
52	795	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	2	1	3	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	34
53	647	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	3	3	2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	35
54	623	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	1	2	1	1	4	..	1	..	1	1	2	3	4	5	6	7	8	9	10	11	36
Ages.	Total.		95	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
55	545	2	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
56	489	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
57	400	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
58	414	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
59	286	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
60	347	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
61	236	..	..	..	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
62	227	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
63	229	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
64	203	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
65	219	2	..	..	..	..	..	..	..	..	..	1	..	..	1	..	2	..	3	2	4	3	5	4	4	8	3	4	5	7	6	5	4	5	7	6	2	3	4	5	6	7	8	3	7	4
66	170	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	2	4	2	3	5	7	6	2	9	4	5	3	6	9	4	5	6	2	5	6	7	8	9	8	5	3	5
67	163	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	2	3	5	3	2	2	6	5	1	5	1	6	5	2	5	4	5	4	1	2	3	4	5	6	7	6	2	5
68	154	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	4	4	3	6	4	5	3	2	6	..	1	2	5	3	3	4	11	3	7	3	4	5	4	6	7	6	4
69	122	..	..	..	..	..	..	..	1	..	..	..	1	..	..	..	..	1	1	2	2	1	4	2	3	6	6	5	2	3	6	4	4	2	4	2	5	..	7	2	2	1	3	1	1	3
70	134	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	1	4	1	2	4	1	3	3	4	5	3	4	1	1	2	4	1	4	1	6	..	3	1	1	2	4	1	1	3
71	70	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	1	2	5	1	2	1	1	2	2	3	1	2	1	2	5	1	1	3	2	3	1	2	1	2	3	4	1	2
72	70	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	2	3	2	1	2	1	4	3	1	2	1	2	3	4	1	2	3	1	2	1	2	3	4	5	6	1	2
73	77	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	2	1	3	2	1	4	7	3	2	5	3	1	1	1	..	..	..	..	..	..	..	..	..	..	..	..	1
74	64	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	1	1	3	1	1	1	1	2	1	2	1	1	3	1	1	2	4	1	1	3	1	..	..	..	..	..	..	..	..
75	53	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	2	2	3	1	..	..	..	..	..	..	1	..	2	1	1	4	1	2	..	3	..	..	..	..	..	..	..	..	..	..	..	..
76	33	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	3	1	1	..	..	..	..	..	..	..	..	2	..	..	1	1	3	2	..	1	1	2	..	3	..	..	..	..	..	..	..	..
77	33	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	2	..	..	1	2	1	1	..	..	1	2	..	1	1	1	..	..	..	..	..
78	22	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
79	23	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
80	28	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
81	10	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
82	9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
83	8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
84	7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
85	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
86	3	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
87	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
88	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
89	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
90	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
95	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
99	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
N.S.	73	54	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Total	301918	111	1	..	1	3	1	2	4	6	6	4	10	11	14	21	21	36	43	51	54	58	95	68	81	93	58	136	98	159	165	189	179	229	238	351	308	481	493	649	663	712	946	948	1065	1287

This table exhibits the various irregularities in the data. The numbers are not quite trustworthy about the ages 21, for reasons which will appear later, as it is certain that in some cases misstatements are made by persons marrying under that age. This table is suitable for the analysis of the frequency at the lower groups of ages only. For the analysis of the frequency at the more advanced age groups, a second table of five-year groups has been prepared. (Table hereinafter).

The frequencies exhibited by this large group of marriages can, without sensible error, be referred to the beginning of the year 1911 (*i.e.*, to 1911.0), as the moment which they can be regarded as true, and from which any secular change may be reckoned, or they may be regarded as contemporaneous with the Census of 3rd April, 1911.

14. **Numbers corresponding to given differences of age.**—The mode of tabulation in Table LIV., though satisfactory in respect of shewing the grouping according to age-groups for single years, is by no means perfectly satisfactory for the purpose of very accurately determining the frequency of conjugal-groups according to various *differences of age*. It is obvious that when all bridegrooms, whose age was say x last birthday, and brides whose age was say y last birthday (x and y being integers), are grouped, the group contains brides who are one-half year older than the difference $x—y$, as well as brides one-half year younger than this difference. This can be readily seen from the nature of the table itself. To obtain some rough idea of the defect of such a mode of grouping, we may first divide the numbers (having regard to second differences) into four parts, so as to get the probable numbers attributable to each half of the age-period analysed. These quarter (or half-year) groups, however, will evidently not agree with what would have been given by an original compilation into half-year groups, for the reason indicated above ; this will appear more clearly hereinafter.

To properly determine the law of nuptial frequency according to specified differences of age the only perfectly satisfactory compilation would be one in which, for small age-groups of bridegrooms (say) the tabulation was according to a series of increasing age-differences (of the age of the bride), positive and negative, and (for complete analysis) a similar tabulation for small ranges of the age of the brides, with a series of increasing differences, positive and negative, of the age of the bridegroom. These two tabulations *would not give identical results*, but if the age-groups were small, they would be approximately identical. The data of the table are nevertheless of value, and give a result which is of high precision in regard to the characteristic features of the surface representing the relative frequency of marriages for given pairs of ages.

The results given in Table LIV. are for 301,918 marriages occurring in Australia during eight years, and are drawn from populations (mean annual), which aggregated to nearly 36 millions. The marriage rates were thus as shewn in Table LV., p. 193.

TABLE LV.—Marriage Rates, Australia, Total Period, 1907-1914.

Males ..	18,614,557	Females	17,206,457	Persons	35,821,014
Rates, Males	0.0162195	,,	0.0175468	,,	0.0168570

These rates may consequently be regarded as representing the probability of a marriage occurring in a population of males, females, or persons, constituted as the average for the eight years, 1907 to 1914, both inclusive, in Australia. The probability of a marriage occurring among the never-married, the widowed, and the divorced, cannot be so well ascertained.

By excluding the unspecified, the probability of marriage for any pair of ages can be ascertained roughly by dividing the numbers in Table LIV. by 301,864; the quotient is the *chance* of the marriage occurring in the group of the pair of ages in question, provided that the proportions to the whole population of the males and females in each group is unchanged. Denoting this probability by p_{xy}, the marriage-rate by r_m, and the population by P, the number of marriages, N_{xy}, to be expected of bridegrooms whose age last birthday was x, with brides whose age last birthday was y, is :—

$$(403)\ldots N_{xy} = P\, r_m\, p_{xy}\ ;\ N_{xy} = P' r'_m\, p_{xy}\ ;\ N_{xy} = P'' r''_m\, p_{xy}\ ;$$

P, P' and P'' denoting the population of persons, males, and females, respectively; and r_m, r'_m and r''_m similarly denoting the marriage rates based upon persons, males, or females, respectively. The numbers of the table would roughly give the chance according to "alleged age," not according to "actual age" unless the alleged is also the actual age. We shall proceed to examine this question.

15. **Errors in the ages at marriage.**—Before analysing the data giving the protogamic surface, it is desirable to determine the error of statement at ages earlier than 21. Here it may be mentioned[1] that the curves of apparent frequency of birth at different ages from say 17 to 22 shew that the numbers are doubtless erroneous. The same fact is suggested by the peculiar irregularities in the numbers graphed in Fig. 60, which shews the numbers of brides and bridegrooms at all ages; see curve A in the figure shewing the result for brides and curve B shewing that for bridegrooms. The explanation is unquestionably that the group "21 years last birthday" contains a number of persons whose real age was 18, 19 or 20, or possibly even younger than 18. From an investigation of birth-frequency during the seven years, 1908 to 1914, both inclusive, it was found that the numbers given at ages 18 to 21 needed to be multiplied by the factors 1.05701, 1.07918, 1.17022, and 0.82704 respectively. (This applies to females only. There is doubtless also an error for males). Correcting these factors so as to obtain the same totals, the figures in line (4) below are obtained; these are the probable correcting factors to be applied to the

[1] The matter is dealt with fully hereinafter.

numbers furnished directly. That is let M' be the true number of marriages for brides of any given age, and let M be the alleged number : then m being the factor of correction, we shall have :—

$$(404).....M' = m\ M,$$

hence, if the error occur solely through misstatements by persons of 18, 19, 20, and 21 years of age we should have, for each age of bridegroom, to form corrections of the type :—

$$(405)..(M'_{18}+M'_{19}+M'_{20}+M'_{21})=(m_{18}M_{18}+m_{19}M_{19}+m_{20}M_{20}+m_{21}M_{21})$$

This would be the appropriate scheme of correction[1] if corrections for only one sex were needed. The result would then be as follows in Table LVI. hereunder :—

TABLE LVI.—Correction of Numbers of Brides of Alleged Ages, 18 to 21. Australia, 1908-1914.

(1) Age of Bride ..	18.	19.	20.	21.	18–21.
(2) Number of Brides ..	13,246	18,140	20,231	32,673	Total, 84,290
(3) Ratio to Total for Ages 18-21 ..	0.1572	0.2152	0.2400	0.3876	Total, 1.0000
(4) Factor of Correction	1.0572	1.0794	1.1704	0.8272	Mean, 1.03355
(5) Product of (3) & (4)	0.16619	0.23229	0.28090	0.32062	Total, 1.00000

These figures imply that there are 5.72 per cent. more brides of 18, 7.94 per cent. more brides of 19, 17.04 per cent. brides of 20, and 17.28 per cent. less of brides of 21 than admit that they are the ages in question.

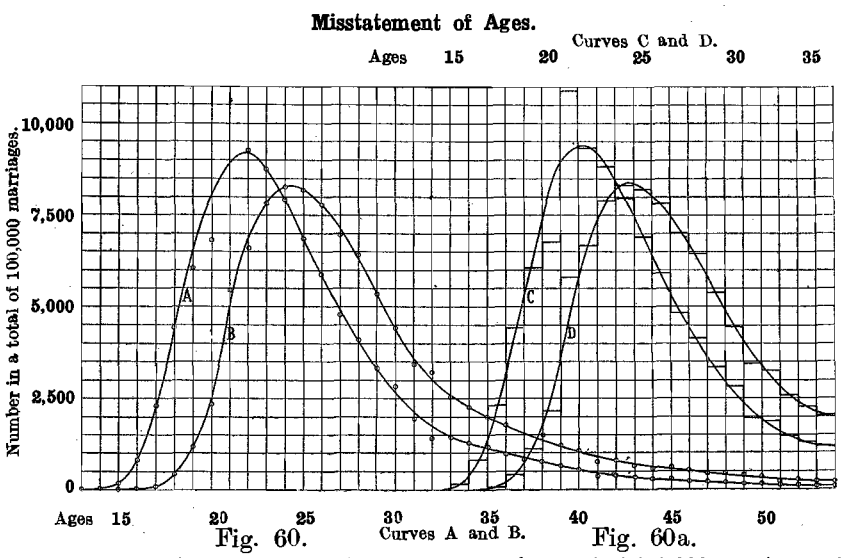


Fig. 60. Fig. 60a.

The curves A and B denote the number out of a total of 100,000 marriages of brides and bridegrooms respectively ; married at given ages. The dots and circles represent the original data, the curves themselves being the smoothed result.

Curves C. and D.—The areas of the rectangles shew the numbers of brides and bridegrooms, respectively, married at the given alleged ages. The true numbers are the areas to the curves, which furnish the smoothed results.

[1] If in any example the result needed a small correction to balance, it should be made proportional to these last m M-quantities.

An attempt has also been made to ascertain, by smoothing, the probable misstatement on the part of bridegrooms as well as on that of brides. For the sake of comparison the factors for converting the crude data into the smoothed results are given for both bridegrooms and brides, and for males and females from the smoothing of the results of the 1911 Census. The actual smoothing and its effect is shewn on Fig. 60a, see curves C and D, the former being the curve for brides, the latter that for bridegrooms. The areas to the curves give the smoothed results, the areas of the rectangles themselves shew the crude data. In this way the results (1) and (2) are obtained.

TABLE LVII.—Correction-Factors for Males and Females of Alleged Ages, 18 to 21. Australia, 1911.

Factor of Correction for—	How Obtained.	18.	19.	20.	21.
(1) Males ..	Smoothing of Curve shewing Number of Bridegrooms	1.211	1.137	1.262	0.831
(2) Females	Smoothing of Curve shewing Number of Brides ..	0.962	1.054	1.228	0.844
(3) Females	Smoothing of Fecundity Curves	1.0572	1.0794	1.1704	0.8272
(4) Females	Mean of (2) and (3) ..	1.010	1.067	1.199	0.836
(5) Males ..	Smoothing of Census of Population, 1911 ..	0.9843	1.0273	0.9955	1.0283
(6) Females	Smoothing of Census of Population	0.9924	1.0217	0.9902	1.0504

The indications from the smoothing of the number of brides, with those from the smoothing of the fecundity curves (see later) are in substantial agreement, so far as the ages of 19, 20, and 21 are concerned ; see lines (2) and (3) in the table above. It will be observed, however, that they are not in agreement with the Census deduction. An agreement was not, however, to be expected in the latter case, for the misstatements occur in regard to the age at marriage, an occasion on which there is not infrequently a motive for the misstatement.[1]

16. **Adjustment numbers for ages 18 to 21 inclusive.**—The actual adjustment of a table of numbers according to pairs of ages, however, involves the deduction of a number of brides and bridegrooms, which shall be equal for each group. It is evident that, inasmuch as the factors for the two are disparate, different results are obtained if we first correct by the factors for one sex and then by those of the other, or correct independently and take means, etc. For this reason the following method, though not ideally satisfactory, was adopted.

Denoting the correction-factor for bridegrooms (males) of age x by m_x, and that for brides (females) of age y by f_y, the composite factor (μ)

[1] Chiefly, but not wholly, owing to the attempt, by persons under 21 years of age, to avoid the legal requirements.

for the group of brides and bridegrooms of the respective ages, may be taken as :—

$$(406)\ldots\ldots \mu_{xy} = \sqrt{(m_x f_y)},$$

that is, it is regarded as the geometric mean of the two. If we decide to make the totals of the groups 18 to 21 unchanged, we shall have to apply a small correction to these factors. Let g_{xy} denote a group of marriages for the ages in question. If the sum of the products μg be equal to the sum of the original groups, no correction will be required. If it be not equal, then the correction can be distributed in the ratio of the groups themselves. That is, ξ denoting the correction, the new values (g') of the groups will become :—

$$(407)\ldots\ldots g' = g + \xi = g\ \{1 + (G - \Sigma \mu g)\ /\ G\}$$

G denoting the sum of the groups, that is to say, $G = \Sigma g$. This method of correcting leaves the entire aggregate unaffected, though it adjusts its component groups. The results are shewn in the table hereunder. The ξ correction necessary was very small, amounting to only 18 in 17,862. See Table LVIII.

TABLE LVIII.—Correction of Numbers of Marriages for Ages 18, 19, 20, 21. Australia, 1907 to 1914.

	Crude Results.					Factors of Correction.					Corrected Results.				
	18	19	20	21	Totals.	18	19	20	21	18	19	20	21	Totals
18	309	195	112	78	694	Males 1.211 Females 1.010 Means **1.1059**	1.211 1.067 **1.1367**	1.211 1.199 **1.2049**	1.211 0.836 **1.0062**	343	223	136	79	781
19	778	740	395	327	2,240	Males 1.137 Females 1.010 Means **1.0716**	1.137 1.067 **1.1015**	1.137 1.199 **1.1676**	1.137 0.836 **0.9750**	837	819	463	320	2,439
20	1,033	1,261	1,075	891	4,260	Males 1.262 Females 1.010 Means **1.1290**	1.262 1.067 **1.1604**	1.262 1.199 **1.2301**	1.262 0.836 **1.0271**	1,171	1,469	1,328	919	4,887
21	2,076	2,527	2,301	3,764	10,668	Males 0.831 Females 1.010 Means **0.9161**	0.831 1.067 **0.9416**	0.831 1.199 **0.9982**	0.831 0.836 **0.8335**	1,910	2,389	2,306	3,150	9,755
T'tls	4,196	4,723	3,883	5,060	17,862					4,261	4,900	4,233	4,468	17,862

The effect at the dividing ages of this regrouping is to change the groups $\frac{2,022}{6,897}\Big|\frac{912}{8,031}$ into $\frac{2,222}{6,939}\Big|\frac{998}{7,703}$; hence the five-year groups $\frac{3,302}{23,130}\Big|\frac{1,395}{56,029}$ become $\frac{3,502}{23,172}\Big|\frac{1,481}{55,701}$. The totals for brides require that the original figures in Table LIV. should be corrected by + 65, + 177, + 350, and — 592, and the totals for bridegrooms corrected by + 87, + 199, + 627 and — 913.

TABLE LIX.—Shewing the Number per 100,000 Bridegrooms, and per 100,000 Brides Married at Given Ages. Australia, 1907-1914.†

Age.	Crude Results.		Adjusted Results.	
	Bride-grooms.	Brides.	Bride-grooms.	Brides.
(i.)	(ii.)	(iii.)	(iv.)	(v.)
12 ..	..	1	0.0	0.5
13 ..	..	1	0.1	1.5
14 ..	..	24	0.2	24
12–14 ..	..	26	0.3	26
15 ..	1	162	0.8	162
16 ..	17	799	16.9	799
17 ..	79	2,288	79	2,288
18 ..	428*	4,409*	428	4,409
19 ..	1,176*	6,067*	1,176	6,600
15–19 ..	1,701	13,725	1,700.7	14,253
20 ..	2,340*	6,817*	2,542	8,020
21 ..	5,452*	10,626*	4,997	8,920
22 ..	6,615	9,257	6,868	9,200
23 ..	7,834	8,745	7,834	8,745
24 ..	8,253	7,917	8,253	7,917
20–24 ..	30,940	43,362	30,494	42,802
25 ..	8,165	6,858	8,190	6,819
26 ..	7,782	5,873	7,782	5,843
27 ..	6,960	4,783	7,120	4,897
28 ..	6,420	4,098	6,290	4,078
29 ..	5,337	3,315	5,337	3,297
25–29 ..	34,664	24,927	34,719	24,934
30 ..	4,436	2,784	4,383	2,670
31 ..	3,428	1,937	3,603	2,155
32 ..	3,228	1,841	3,003	1,760
33 ..	2,554	1,438	2,603	1,470
34 ..	2,251	1,277	2,278	1,260
30–34 ..	15,897	9,277	15,870	9,315
35 ..	2,009	1,166	1,995	1,143
36 ..	1,770	968	1,748	1,003
37 ..	1,461	808	1,533	873
38 ..	1,501	785	1,346	753
39 ..	1,238	664	1,183	643
35–39 ..	7,979	4,391	7,805	4,415
40 ..	1,077	560	1,040	547
41 ..	774	373	912	465
42 ..	807	426	800	397
43 ..	682	353	713	343
44 ..	580	314	649	303
40–44 ..	3,920	2,226	4,114	2,055
45 ..	612	313	589	271
46 ..	522	236	527	241
47 ..	447	220	468	213
48 ..	452	215	413	187
49 ..	380	163	363	163
45–49	2,413	1,147	2,360	1,075
50 ..	369	159	319	138
51 ..	248	102	282	118
52 ..	263	116	251	102
53 ..	214	79	225	90
54 ..	206	76	203	80
50–54 ..	1,300	532	1,280	528
55 ..	181	59	184	72
56 ..	162	63	167	66
57 ..	133	55	151	60
58 ..	137	53	136	54
59 ..	95	32	122	48
55–59 ..	708	262	760	300
60 ..	115	45	109	42
61 ..	78	19	97	36
62 ..	75	31	86	31
63 ..	76	27	76	27
64 ..	67	23	68	24
60–64	411	178	436	160
65 ..	73	32	60.0	21.8
66 ..	56	19	53.0	19.5
67 ..	54	18	47.0	17.1
68 ..	51	17	42.0	15.0
69 ..	41	14	37.5	12.6
65–69 ..	275	100	239.5	86.0
70 ..	44	19	34.0	10.5
71 ..	23	7	31.0	8.5
72 ..	23	7	28.0	6.7
73 ..	26	5	25.0	5.1
74 ..	21	4	21.5	3.6
70–74 ..	137	35	139.5	34.6
75 ..	17	3	17.2	2.8
76 ..	11	1	13.6	2.1
77 ..	11	2	10.9	1.6
78 ..	7	2	8.7	1.2
79 ..	7	1	7.0	0.9
75–79 ..	53	9	57.4	8.6
80 ..	9	1	5.6	0.7
81 ..	3	0	4.5	0.6
82 ..	3	1	3.6	0.5
83 ..	3	0	2.9	0.4
84 ..	2	0	2.3	0.3
80–84	20	2	18.9	2.5
85 ..	2	0	1.8	0.2
86 ..	1	0	1.4	0.1
87 ..	1	0	1.0	0.0
88 ..	0	0	0.6	0.0
89 ..	0	0	0.3	0.0
85–89	4	0	5.15	0.3
90 ..	0	0	0.25	
91 ..	0	0	0.15	
92 ..	0	0	0.1	
93 ..	0	0	0.05	
94 ..	0	0	0.0	
90–94 ..	0	0	0.55	
Unspecified ..	24	37	Nil	Nil

* These have been partially corrected for misstatement of age. † See Section 17, hereinafter, for description of Table.

17. **Probability of marriage of bride or bridegroom of a given age, to a bridegroom or bride of any (unspecified) age.**—The correction of the data, as indicated in the preceding section, admits of the construction of a table shewing in say 100,000 marriages the number occurring for bridegrooms of any given ages, and for brides of any given ages, the age of the other partner to the union being unspecified. In columns (ii.) and (iii.) of Table LIX., hereinbefore, the data are given the corrections referred to having been applied : columns (iv.) and (v.) are the smoothed results. The original data are shewn by dots on Fig. 60, the smoothed results by the curve, the ordinates to which represent throughout the probability of a marriage occurring within one half-year either side of any given age : that is, they are the values of the integrals :—

$$K \int_{x-\frac{1}{2}}^{x+\frac{1}{2}} x \, d\, x \quad \text{and} \quad K' \int_{y-\frac{1}{2}}^{y+\frac{1}{2}} y \, d\, y ;$$

see section 19 hereinafter.

18. **Tabulation in 5-year groups.**—So small a number as 300,000 does not give sufficient data for the determination of the averages for single years, at the higher ages. Before 25 is reached over one-fourth of the marriages have been consummated, and before 30, over two-thirds (exactly 0.277921, and 0.691744 respectively). This leaves for groups of over 30 years of age only about 93,069 among 6500 groups or an average of about 14 per group. It is thus necessary to form 5-year groups. These are shewn in Table LX. hereunder. The corrections, referred to in last section, change these numbers as follows :—

Original Data.			Adjusted Data.		
3,302 23,130	1,395 56,029	4,852 92,354	3,502 23,172	1,481 55,701	5,138 92.068
41,193	13,1151	Totals.	41,135	130,909	Totals.

The numbers given in the table itself are the uncorrected data. It will be seen that they are still small for the higher ages. To determine the critical features of the surface representing the frequency of marriage both Tables LIV. and LX. are required. Were these two tables smoothed they would give the probabilities of a marriage occurring within the year groups of specified ages or specified quinquennia. None of the groups is perfectly regular, but the greater regularity of the larger groups exists only for a limited range of years. The matter will be dealt with more fully hereinafter, viz., in § 23.

TABLE LX.—Number of Marriages Arranged According to Age at Marriage in Five Year Groups. Australia, 1907-14.

Bridegrooms' Ages.	Brides' Ages. 10 to 14.	15 to 19.†	20 to 24.†	25 to 29.	30 to 34.	35 to 39.	40 to 44.	45 to 49.	50 to 54.	55 to 59.	60 to 64.	65 to 69.	70 to 74.	75 to 79.	80 to 84.	Total,* 10 to 84.	Ratio Brides grooms to Total.
15–19† ..	9	!3,302	1,395	124	17	3	2	..	..	..	..	..	..	..	..	4,852	1,608
20–24† ..	**44**	**23,130**	!**56,029**	11,302	1,437	325	60	22	4	1	..	..	..	..	..	92,354	30,602
25–29 ..	18	10,637	!50,597	**34,896**	6,739	1,369	282	78	20	1	1	1	..	..	..	**104,639**	34,673
30–34 ..	1	2,795	15,513	!17,366	**9,130**	2,476	525	146	26	4	1	..	..	..	..	47,983	15,900
35–39 ..	3	917	5,134	! 7,298	5,672	**3,621**	1,038	! 313	65	15	2	2	..	..	..	24,080	7,979
40–44 ..	1	237	1,576	2,564	!2,811	2,473	**1,502**	510	112	26	8	1	..	..	..	11,821	3,917
45–49 ..	2	115	598	1,077	1,313	!1,653	1,279	**859**	263	74	36	8	..	..	..	7,277	2,411
50–54 ..	..	41	183	384	538	! 768	! 754	675	**406**	117	37	20	2	1	..	3,926	1,301
55–59 ..	..	11	73	129	197	313	360	! 445	289	**218**	65	26	4	2	..	2,132	706
60–64 ..	..	6	28	71	79	152	162	! 207	! 208	144	**106**	60	16	2	1	1,242	412
65–69 ..	..	1	15	24	43	66	80	! 133	122	113	105	**97**	19	7	1	826	274
70–74 ..	..	..	6	16	17	30	50	47	! 65	41	50	59	**28**	6	..	415	138
75–79 ..	..	1	2	3	8	6	11	13	17	! 31	14	21	25	**8**	**4**	164	54
80–84 ..	..	..	2	2	2	2	8	! 10	7	4	! 9	4	! 8	4	..	62	21
85–90 ..	..	..	..	1	..	..	1	! 4	1	1	1	1	1	..	1	12	4
Total*	78	41,193	131,151	75,257	28,003	13,257	6,114	3,462	1,605	790	435	300	103	30	7	301,785	100,000
Ratio of Brides to Total	26	13,650	43,459	24,937	9,279	4,393	2,026	1,147	532	262	144	99	34	10	2	100,000	.3313617‡

* Brides over 85 and bridegrooms over 95, and unspecified cases are omitted. The heavy faced type denotes the maximum on the vertical lines; the mark of exclamation (!) denotes the maximum on the horizontal lines.

† The values corrected for misstatement of ages, 18, 19, 20, and 21 give the following results:—For 3,302 and 1,395, 3,502 and 1,481; and for 23,130 and 56,029, 23,172 and 55,701. In the totals 41,193 and 131,151 become 41,435 and 130,909; and 4,852, and 92,354 become 5,138 and 92,068. The ratios 13,650 and 43,459 become 13,730 and 43,378; and 1,608 and 30,602 become 1,703 and 30,508.

‡ Factor of reduction to 100,000.

19. **Frequency of marriage according to age representable by a system of curved lines.**—Frequency according to pairs of ages (bride and bridegroom) can best be represented by a surface, the vertical height of which, above a reference plane, is the frequency for any pair of ages denoted by x, y co-ordinates. The numbers marrying in any given period, whose ages range between $x - \frac{1}{2}k$ and $x + \frac{1}{2}k$ (for bridegrooms), and between $y - \frac{1}{2}k$ and $y + \frac{1}{2}k$ (for brides), as ordinarily furnished by the data, are denoted by Z, the height of the parallelepiped. This frequency may, of course, be expressed as for the *exact age*, or it may be for the *age-groups*. When k is not infinitesimally small, the difference between the two is *sensible* and *important*. We shall assume for the present that the frequency varies only with age (not with time). The exact (instantaneous) age-frequency denotes the frequency which would exist if the persons were all of the exact age (x) in question, instead of being of various ages between $x - \frac{1}{2}k$ and $x + \frac{1}{2}k$. The age-group frequency denotes the frequency with the ages distributed between the limits referred to. For most practical purposes the latter is the more important. Suppose the exact frequency, z, for the population P, to be :—

$$(408)\ldots\ldots \frac{z}{P} = F(x \,.\, y)$$

then we shall have for any group-value :—

$$(409)\ldots\ldots Z = P \int\int F(x,y)\, dx\, dy$$

The group-values usually furnished are for single-year groups, hence the limits of the integral are $x \pm \frac{1}{2}$, $y \pm \frac{1}{2}$. It may sometimes be more convenient to use a series of functions of the form :—

$$(410)\ldots\ldots \frac{Z}{P} = F_Y(x)\ ;\ \text{or}\ F_X(y)$$

in which case the fixed value of Y or of X will be the middle of the range $y \pm \frac{1}{2}$, or $x \pm \frac{1}{2}$. Then we shall have :—

$$(411)\ldots\ldots Z = P \int F_Y(x)\, dx\ ;\ \text{or} = P \int F_X(y)\, dy$$

These last expressions, with fixed values either of Y or of X, are thus appropriate for representing the vertical or horizontal columns of figures in Tables LIV. and LX. by means of equations. For the vertical columns the abscissa is x, the age of the bridegrooms ; for the horizontal columns the abscissa is y, the age of the brides ; and the constants of the equations relate only to a particular range of y in the first case, and of x in the second, as many equations being required as there are ranges taken. We consider the matter more fully in a later section. This scheme of representation is practically more convenient than a more generalised system, it shews for each age of bridegroom (or of bride) the frequency of marriage with a bride (or a bridegroom) of a given age. (See part V., § 10, formulæ 211 to 216.)

20. **The error of adopting a middle value of a range.**—In dealing with group-ranges, in the manner referred to in the preceding section, the results are not strictly attributable to the middle age of the range, nor is the error of such an attribution by any means always wholly negligible. The function represents the value of a *range of values* of the argument, *i.e.*, for example, *all* bridegrooms whose age last birthday was x, x being an integer, or the group of bridegrooms whose age last birthday was say, between 20 and 24, etc. Suppose, for example, that the progression of a series of numbers, representing numbers at successive ages is approximately :—

$$(412)\ldots\ldots y = a + mx\ ;\ \text{so that}\ xy = ax + mx^2\ ;$$

then the true value of the product of the numbers into the ages is given by the integral :—

$$(413)\ldots\ldots \int_x^{x+1} xy\, dx = a\,(x + \tfrac{1}{2}) + m\,(x^2 + x + \tfrac{1}{3})$$

Consequently where we require the weighted mean-age, it is necessary to compare this value with that arising from the supposition that all may be regarded as of age $x + \frac{1}{2}$. If we make this last assumption, then we should have for the product of the numbers into the age, supposed common to all,

$$(414)\ldots\ldots a\,(x + \tfrac{1}{2}) + m\,(x^2 + x + \tfrac{1}{4}).$$

The former expression is algebraically greater than this latter one by the difference of $m/3$ and $m/4$, that is $m/12$, which is sensibly equivalent to a

shift (ϵ) of the central position of the amount $m/12y$. Thus, instead of the central value of the range of ages we should take the "weighted mean" xa, which is given by :—

$$(415)\ldots\ldots x_a = x + \tfrac{1}{2} + \epsilon = x + \tfrac{1}{2} + \frac{m}{12y}$$

In applying this we may take m as indicated by the mean of the differences of the groups adjoining on either side. Thus if the groups for the ages 20 (and less than 21), 21, and 22 were respectively 76,132, and 224, then, instead of taking 21.5 as the mean age-value, *i.e.*, the middle age of the range 21 (which include everyone whose age last birthday was 21), we could take m as the mean of 132–76 and 224–132, that is, $m = \frac{1}{2}(56 + 92)$; or, as is obvious, $\frac{1}{2}(224–76)$, *i.e.*, 74. Consequently by the rule above, viz. (415), we have $x_a = 21.5 + 74 / (12 \times 132) = 21.5467\dot{1}\dot{1}$.

A curve which would give the group-results indicated is $60 + 20\xi + 18\xi^2$, the origin of abscissæ being $x = 20$, so that $\xi = 1$ for $x = 21$, and so on. The integral of the curve is $60\,\xi + 10\,\xi^2 + 6\xi^3$. If we put $\xi = x - 20$ we obtain the curve $y = 6860 - 700\,x + 18x^2$ with the origin at $x = 0$, hence the integral between the limits $x = 21$ and $x = 22$ is $3430\,x^2 - 233\frac{1}{3}\,x^3 + 4\frac{1}{2}\,x^4$, which gives the result $2844\frac{1}{6}$ as the sum of the xy products. Dividing this by 132, the number in the group, the average age is found to be $21.5467\dot{1}\dot{1}$ as before. Let three successive groups for equal ranges of the variable be denoted by A, M, and B ; and let x_m be the middle point on the range of abscissæ of the middle group, M ; then the mean value required (*i.e.*, in the case under review, the average age of the persons in the group) is :—

$$(416)\ldots\ldots x_a = x_m + \frac{1}{24}\,k\,\frac{B - A}{M}$$

in which k is the range of the variable common to the three groups. If the curve of instantaneous values be of the second degree, this last formula is rigorously accurate. By means of it, the average values can, as a rule, be written in by inspection, and it can be ascertained where the correction $\epsilon = \frac{1}{24}\,k\,(B—A) / M$ is sufficiently large to be taken into account.

21. **General theory of protogamic and gamic surfaces.**—The ages of husbands being adopted as abscissæ, and those of wives as ordinates, the infinitesimal number dM in an infinitesimal group of married couples, consisting of husbands, whose ages lie between x and $x + dx$, and their wives, whose ages lie between y and $y + dy$, will be :—

$$(417)\ldots\ldots dM = Z\,dx\,dy = kF\,(x, y)\,dx\,dy.$$

Thus $Z = kF\,(x, y)$ is representable by a co-ordinate vertical to the xy plane. Since Z denotes an actual number of persons in a double age-group, between say the earliest age of marriage and the end of life, viz., (x_1 to x_2) and (y_1 to y_2), it is necessary, if we desire to institute comparisons between different populations, that Z should be expressed as a *rate*, z say : that is, $z =$ either Z/P ; or Z/M ; that is to say, the

vertical height will represent the relative frequency of married couples whose ages are, in the order of husband and wife, x and y, in either the whole popuation P, or the married portion of it M. Thus we shall have

$$(418)\ldots\ldots P, \text{ or } M = k \iint F(x, y)\, dx\, dy.$$

If the value of the double integral be taken for the limits denoting the range of ages of the married, say about 11 to 105, we shall have either M/P, or unity, as the result; according as we denote by the frequency in reference to the total population or to the total married.

Thus the marital or gamic condition of a community is completely specified by the gamic surface $F(x, y, z)$, the unique mode of which is the summit of the conoidal solid represented by (418) above. Its first principal meridian is the line joining the modes of the curves x = a constant, or y = a constant, passing therefore through the unique mode. The curves, z = any constant less than its maximum value, are necessarily closed curves, and may be called *isogamic contours*. The *orthogonal trajectory* passing through the unique mode is the second principal meridian of the surface. The values of x, y, and z for the unique mode of the surface may be called the *gamic mode of the "population,"* or of the "*married population,*" according as the constant k, in (418) above, gives M/P, or unity for the value of the double integral between the widest age limits.

The *gamic characteristics* of a population are more briefly, and of course less completely, defined by the two principal meridians which we may call its *gamic meridians*, and the position (and magnitude) of the *gamic mode*. Reducing these to their simplest numerical expression we have, for the briefest possible statement of the gamic characteristics of any community the values of x_m, y_m, and z_m; and of the *skewness of the profiles of the first and second principal meridians*. The sign of the skewness may be determined by always making the right hand branch of the curve that for increasing age for the first principal meridian, and increasing age of the husband for the second principal meridian.

A surface representing the frequency of marriage at particular pairs of ages we shall call a *protogamic surface*, and one representing the number of persons of particular pairs of ages living together in the state of marriage we shall call simply a *gamic surface*.

Curves of equal frequency on these two surfaces, we shall call *isoprotogamic* and *isogamic contours*, respectively, or more briefly, *isoprotogams* and *isogams*, and curves cutting such contours orthogonally will be called *protogamic* and *gamic meridians*.[1]

Let s denote a distance measured along a slope, so that ds is an element thereof. Then when—

$$(419)\ldots\ldots dz/ds = \sin \zeta$$

[1] The word "isogamy" has already been appropriated in a different sense in biology, viz., to denote the union of two equal and similar "gametes" in reproduction. This, however, will obviously lead to no confusion. The isogamy of a people might be regarded as of two kinds, *initial* or *nuptial* isogamy (isoprotogamy), and *characteristic* or *marital* isogamy (or simply isogamy).

= a maximum or a minimum, the element ds is an element of a meridian ; such meridians are the *principal meridians* above referred to ; *i.e.*, the principal meridians are the *lines of greatest and least slope.*

22. **Orthogonal Trajectories.**—The general theory of orthogonal trajectories may be stated as follows :—Let the co-ordinates of a system of curves (isogams or equal marriage frequency in the case considered) be denoted by x and y, and those of the trajectory, cutting the system orthogonally, by ξ and η ; then, although for any point of intersection of the two $x = \xi$ and $y = \eta$, dy/dx is not the same as $d\eta/d\xi$, Since the tangents to the two curves are at right angles, we have the geometric relation $dy/dx = - d\xi/d\eta$ or

$$(420).....1 + \frac{dy}{dx} \cdot \frac{d\eta}{d\xi} = 0$$

For any system of curves we have then

$$(421)....f\ (x,\ y,\ a)\ = 0\ ;$$

where a is a constant ; then, employing $\delta/\delta x$ and $\delta/\delta y$ to denote partial differentiation with respect to x and y, we have also

$$(422)..... \frac{\delta f}{\delta x} + \frac{\delta f}{\delta y} \cdot \frac{dy}{dx} = 0,$$

an equation by means of which a may be eliminated, so that a relation may be obtained between x, y and dy/dx. Let this relation be denoted by :—

$$(423).....\psi\ (x,\ y,\ \frac{dy}{dx}\ ) = 0$$

This last expression is the differential equation of the system of curves we require.

For orthogonal trajectories we have $\xi = x$, $\eta = y$ and $dy/dx = -1/(d\eta/d\xi)$, hence the differential equation of the system of orthogonal trajectories is :—

$$(424).....\psi\ (\xi,\ \eta,\ -\frac{1}{\frac{d\eta}{d\xi}}\ ) = 0$$

In the system we are considering, the curves (isogams) do not conform to any simple specification, hence the present imperfect data do not indicate any unique system of curves of a simple character. If they did, it would be preferable to deduce the principal meridians of the surface by means of the general equation thereto. An examination of the surface, however, shews that there is no practical advantage in attempting to express it analytically.

23. **Critical characters on the protogamic surface.**—A review of the figures in Tables LIV. and LX. reveals the fact that, in general, if we regard the numbers of marriages corresponding to any given age for brides (the columns), there is a clearly-defined maximum value ; but that if we regard those corresponding to any given ages for bridegrooms (the rows), there are in many cases two or even three maximum values.

In this latter case, too, the maximum is often less clearly defined. The positions of these maximum points and the numbers (frequency) corresponding thereto, are important, as they disclose the characteristics of the surface. There are two ways of estimating the position and frequency at the maximum (or any other point). One is to ascertain the position and frequency for the maximum of the frequency integral taken over the range $x - \frac{1}{2}$ to $x + \frac{1}{2}$, or over the range $y - \frac{1}{2}$ to $y + \frac{1}{2}$; the other is to determine those elements for the maximum instantaneous frequency; that is to ascertain the point when the frequency for an indefinitely small range is a maximum (expressed, however, per unit of age-difference, say one year). The latter only will be ascertained.

By applying formulæ (292) to (294), see Part VII., § 11, p. 92, the position and value of these maximum points (viz., those on the surface for ages of brides constant that of bridegrooms being variable, or for ages of husbands constant and that of brides variable), may be obtained. In this way the results given in the two following tables are deduced, viz., Tables LXI., and LXII., and in connection therewith it is to be remarked (*a*) that for results of high precision, the quinquennial grouping can be used only for the small groups at higher ages; and (*b*) that the grouping in fives, not only tends to obliterate characteristics readily discernible in year-groupings, but gives a frequency of the order of about 25 times the magnitude of those groupings. Thus for very young ages and for the older age-pairs, the large grouping gives the best indication.[1]

[1] The values are obtained in the following way :—The position of the maximum of one group (say of bridegrooms) corresponding to the range of another group (say of brides) is found from the succession of the group-totals of the first, for any one range of the second, and is attributed to a mean age of the second, computed from the progression of numbers in the series of group totals of the second. By way of illustration consider the group of 59, for the age-group 65-69 of brides, and 70 to 74 of bridegrooms; viz., the following figures :—

Instances in Group.	Adjoining Group Totals.
	60
3 . 4 . 1 . 1 . 2	105.97.19
2 . 1 . 1 . 2 . 2	
4 . 2 . 0 . 3 . 2	41.50.**59**.28.6
7 . 3 . 2 . 5 . 3	
3 . 0 . 0 . 2 . 4	14.21.25
	4

The surrounding group-totals are as shewn. If the ages of brides be taken as at the middle of the years, *i.e.*, as $65\frac{1}{2}$, $66\frac{1}{2}$, etc., and of the bridegrooms as $70\frac{1}{2}$, $71\frac{1}{2}$, etc., the actual weighted-mean ages (deduced from the individual numbers) are as shewn hereunder. Slightly different results are obtained if the ages are deduced from the vertical and horizontal columns, viz., 97, 59, 21; 50, 59, 28; and from the diagonal totals, viz., 105, 59, 25; and 19, 59, 14. These different results are for bride and bridegroom respectively :—

	Middle Values of Groups.		Actual Weighted Group-means.		Computed from Vertical Groups, etc.		Computed from Diagonal Groups.	
Years	67.5	72.5	67.35	72.64	67.48	72.45	67.46	72.40

This series of results shews that the error of assuming that the entire group is representable by the middle ages is not ordinarily considerable.

TABLE LXI.—Critical Positions on the Protogamic Surface for Year-groups. Marriages in Australia, 1907-1914. (Greatest frequency for various combinations of Age at Marriage).

Mean Age of Brides in Maximum Group.	Age of Bridegroom for Maximum Frequency.	Difference of Age.	Maximum Frequency.	Proportion of All Brides of same Age-Group.
13.5	21.2	7.7	1	0.250
14.7	22.4	7.7	17	0.233
15.7	21.6	5.9	69	0.141
16.6	21.6	5.0	372	.1504
17.6	21.7	4.1	1203	.1742
18.5	21.7	3.2	2164	.1621
			1986‡	.1492‡
19.5	21.9	2.4	2600	.1434
	21.8	2.5	2500‡	.1364
20.5	23.4	2.9	2573	.1272
				.1256
21.5	23.3	1.8	4156	.1266
				.1295
22.5	23.7	1.2	3511	.1256
23.5	24.3	1.2	3269	.1239
24.5	24.6	0.1	3040	.1272
25.5	25.7	0.2	2744	.1325
26.5	26.6	0.1	2247	.1276
27.5	27.7	0.2	1753	.1214
28.5	28.5	0.0	1328	.1073
29.5	29.5	0.0	1045	.1046
30.5	30.7	0.2	768	.0913
31.5	31.6	0.1	565	.0966
32.5	32.5	0.0	510	.0916
33.5	33.5	0.0	320	.0737
34.5	34.6	0.1	305	.0791
35.5	35.5	0.0	236	.0670
36.5	36.5	0.0	190	.0650
37.5	37.9	0.4	167	.0685
38.5	38.6	0.1	194	.0801
39.5	39.5	0.0	153	.0765
40.5	40.3	—0.2	121	.0717
41.5	41.2	—0.3	74	.0657
42.5	43.1	+0.6	94	.0730
43.5	45.2	+1.7	80	.07512
44.5	45.3	+0.8	63	.0664

In determining any critical point, however, the ages deduced as shewn above are not what is required. What is definitely sought is the position and value of the maximum frequency, referred to a mean-age of bridegrooms (x), (or of brides (y)); that is the value of y (or of x, respectively) at which the maximum value occurs. The data from which these are deduced are the series of parallelepipeds the heights of which may be taken as the group-totals. Thus, the horizontal series of group-numbers 50, 59 and 28, treated as ordinate-values bounded by a curve, gives 66.13 years as the *age* of brides, corresponding to a maximum frequency of 62.18. If the 41 group be included, the maximum will be changed to age 67.50 years, and the frequency to 60.29. The mean age of the bridegrooms should be ascertained on the vertical line 67.50 for brides, but without incurring sensible error it may be taken as $72.50 - 5\,(97-21) \div (24 \times 59) = 72.23$, see this part, section 20, formulæ (412) to (415); the factor 5, however, appearing because the unit is 5-years. Respecting the computation of the critical positions, it may be mentioned that the curve is found to be $y = 44\frac{1}{4} - 19\frac{5}{12}\,X + 23\frac{1}{4}\,X^2 - 5\frac{1}{6}\,X^3$, the origin of X being at age 55.00, and the unit of X being 5 years. This gives $x^2 - 3x + \frac{9}{4} = \frac{871}{372} =$ say 1. Hence (with sufficient approximation) $X_m = \frac{1}{2}$ and $\frac{5}{2}$ or in years five times these amounts, or $2\frac{1}{2}$ and $12\frac{1}{2}$. This gives $39\frac{17}{24}$ and $60\frac{7}{24}$ as the frequencies at the maximum and minimum.

Mean Age of Bridegrooms in Maximum Group.	Age of Bride for Maximum Frequency.	Difference of Age.	Maximum Frequency.	Proportion of all Bridegrooms of same Age-Group.
15.5	16.5	1.0	1	0.250
16.5	17.5	1.0	14	.274
17.5	17.7	0.2	60	.250
18.5	18.4	—0.1	318	.264
	18.5‡	0.0	352‡	.272‡
19.5	18.9	—0.6	820	.2416
			897‡	.2554‡
20.5	19.5	—1.0	1279	.1986
			1496‡	.2117‡
21.5	19.7	—1.8	2558	.1472
	19.7‡	—1.8‡	2410‡	.1465‡
21.5	21.4‡	—0.1‡	3250‡	.1968‡
22.5	21.6	—0.9	4110	.2057
	21.8‡	—0.7	3424	.1714
23.5	21.7	—1.8	4250	.1839
	22.1‡	—1.4‡	3508‡	
24.5	21.8	—2.7	3766	.1511
	22.8‡	—1.7‡	3333‡	
25.5	21.5§	—4.0§	3276§	.1329§
	23.3‡	—2.2‡	3026‡	.1225‡
	21.9	—3.6	3342	
26.5	21.6§	—4.9§	2710§	.1158
	23.4‡	—3.0‡	2694‡	.1147‡
	21.9	—4.6	2774	
27.5	22.6	—4.9	2271	.1080
	20.6	—6.9	2230	.1061
	21.8	—5.7	2293	
28.5	24.3	—4.2	1977	.1199
	21.9	—6.6	1973	
29.5	24.7	—4.8	1492	.0932
	22.0	—7.5	1458	
30.5	26.0	—4.5	1195	.0892
	21.9	—8.6	1080	
31.5	26.2	—5.3	849	.0820
32.5	26.1	—6.4	809	.0830
	22.7	—9.8	719	
33.5	26.3	—7.2	565	.0733
	23.4	—10.1	557	.0722
34.5	24.5	—10.0	560	.0823
	34.2?	— 0.3?	309?	.0455?
35.5	25.5	—10.0	486	.0800
36.5	26.5	—10.0	371	.0694
37.5	27.4	—10.1	332	.0753
	37.2	— 0.3	171	.0388
38.5	28.5	—10.0	364	.0804
	38.3	— 0.2	195	.0430
39.5	29.5	—10.0	246	.0658
	39.2	— 0.3	157	.0420
40.5	30.3	—10.2	217	.0667
41.5	31.5	—10.0	144	.0617
	41.2	— 0.3	76	.0325
42.5	32.5	—10.0	137	.0562
	42.3	— 0.2	90	.0361
43.5	32 9	—10.6	108	.0525
	42.9	— 0.6	94	.0457
44.5	32.7	—11.8	99	.0567
	43.5	— 1.0	57	.0326

‡ The results include corrections for misstatements of age. § These maxima disappear altogether when corrections are applied for misstatements of age.

TABLE LXII.—Critical Positions on the Protogamic Surface, for 5-Year Groups. Marriages in Australia, 1907-1914.

Maximum age-group of brides	10–14	15–19	20–24	25–29	30–34	35–39	40–44
Mean age of brides in maximum group ..	*14.3 ?	*18.3 ?	*21.6 22.5	*26.6 27.3	*32.2 32.1	? 37.2	? 42.2
Age of bridegroom for maximum frequency	22.9	23.1	†23.8	27.5	32.1	37.5	43.4
Difference of age ..	8.6	4.8	2.2 1.3	0.9 0.3	−0.1 −0.0	0.3	1.2
Maximum frequency ..	46.7	24685 ‡24727	†72500 ‡72170	36722	9397.6	3716.5	1541.1
Proportion of all brides of same age-group	0.600	0.599 ‡0.601	0.553 ‡0.551	0.488	0.336	0.280	0.251
Maximum age-group of bridegrooms ..	15–19	20–24	25–29	30–34	35–39	40–44	45–49
Mean age bridegrooms in maximum group	*18.4	22.3	27.3	32.2	37.1	42.2	47.3
Age of bride for maximum frequency ..	17.8	22.1	23.6	25.9	27.9	32.1	37.4
Difference of age ..	0.6	0.2	3.7	6.3	9.2	10.1	9.9
Maximum frequency ..	3800 ‡4000	59496 ‡59166	51865	18290	7465.5	2837.0	1683.8
Proportion of all bridegrooms of same age-group	0.783 0.779	0.644 0.643	0.496	0.381	0.310	0.240	0.231

Maximum age-group of brides	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84
Mean age of brides in maximum group ..	? 47.3	? 52.2	? 57.3	? 62.3	*67.3 67.3	*71.5 72.1	*76.50 76.8	*81.8 82.2
Age of bridegroom for maximum frequency	48.3	52.7	57.9	64.9	67.5	73.7	78.0	77.5
Difference of age ..	1.05	0.5	0.6	2.6	0.2 0.2	2.2 1.6	1.5 1.2	−4.3 −4.7
Maximum frequency ..	887.5	417.1	225.8	111.0	100.1	28.5	8.3	4.3
Proportion of all brides of some age-group	0.254	0.260	0.286	0.255	0.334	0.277	0.280	0.610
Maximum age-group of bridegrooms ..	50–54	55–59	60–64	65–59	70–74	75–79	80–84	85–89
Mean age bridegrooms in maximum group	52.1	57.3	62.3	67.3	72.2	77.3	82.4	87.4
Age of bride for maximum frequency ..	39.6	46.8	48.8	45.2	62.8 66.1	57.5 72.5	47.4 62.5 72.5	47.5
Difference of age ..	12.5	10.5	13.5	22.1	9.4 6.1	? ?	? ?	?
Maximum frequency ..	785.5	457.9	213.9	139.0	66.6 62.2	32.3 25.9	10.2 9.6 8.7	4.3
Proportion of all bridegrooms of same age-group	0.200	0.215	0.172	0.168	0.160 0.150	0.197 0.158	0.165 0.155 0.140	0.360

* Calculated from yearly group results. † It is impossible from the data to determine these values with precision. ‡ With partial corrections for misstatements of age.

Fig. 61 shews the graphs of the maximum values. It is evident from these graphs that the greatest frequency of marriage is not well-defined according to alleged ages. The surface shews ridges on the lines Aa, Ab, Acde, Afg and Ah. The highest point is for the group bridegrooms about 23.4, and brides 21.6 years of age, the frequency attaining to about 4,200, or about one seventy-second part (0.013911) of all the marriages.

The maximum group is 4114, or 0.13626 of the marriages. These figures are, however, somewhat uncertain, for reasons which will be pointed out in the next section.

24. **Apparent peculiarities of the protogamic frequency.**—Fig. 61 shews, by dots, the positions of maxima on the (vertical) columns, that is according to the ages of brides; and, by dots with circles, the positions of the maxima on the (horizontal) rows, that is according to the ages of bridegrooms. If the ages have been correctly given there is no unique mode on the horizontal lines; and this is a matter which demands special consideration. In Part X., § 6, Fig. 42, p. 115, it is shewn that the number of under-statements by women amounting to 10 years, is quite abnormal; it does not follow the progressive diminution which characterises understatements amounting from 1 to 11 years. In the figure the line bAde would be the characteristic summit if the greatest frequency of marriage was in the case of parties of the same age. The line f g would be the characteristic if a large number of men married wives 10 years younger than themselves; while for the line Af to hold good, very large numbers of men of ages 22 to 31 must marry women of 21 years of age, irrespective of the disparity of age. To give the line of maxima Ah, a considerable number of men must marry women whose difference of age is one-half their age above 22. Such characters in a protogamic surface, are, *a priori*, extremely improbable. They would also characterise the apparent protogamic surface, if a considerable number of women, really of ages 22 to 32, all gave their ages as 22, when marrying men of from 22 to 32 years of age, and if a considerable number of women of 32 and upwards understated their ages by 10 years. This explanation probably does not differ very materially from the fact. Hence Tables LIV and LX must be regarded as of inferior value. It is, of course, much to be regretted that social organisation does not admit of the social-psychological fact of conjugal frequency at equal and disparate ages being accurately ascertained.

25. **The contours of the protogamic surface.**—The tedium of a rigorous analysis of a surface, when the measure of uncertainty is so large as is the case with the protogamic surface for Australia, is not warranted. A rough smoothing of the 5-year groups was, therefore, effected, and attributing the smoothed values to the centre points of the groups, and a series of contours for the proportions of 5, 10, 20, 40, etc., in a million of total marriages of all ages, were inserted by graphic methods. These gave fairly smooth contours. Regular curves being drawn, so as to ignore the minute undulations of the contours the results shewn on Fig. 61 are obtained. These represent with considerable precision the actual data from which they were derived, and will enable such data to be reproduced. They disclose the frequency distribution, for all combinations of ages.

Curves of Equal Marriage Frequency.—The Protogamic Surface.

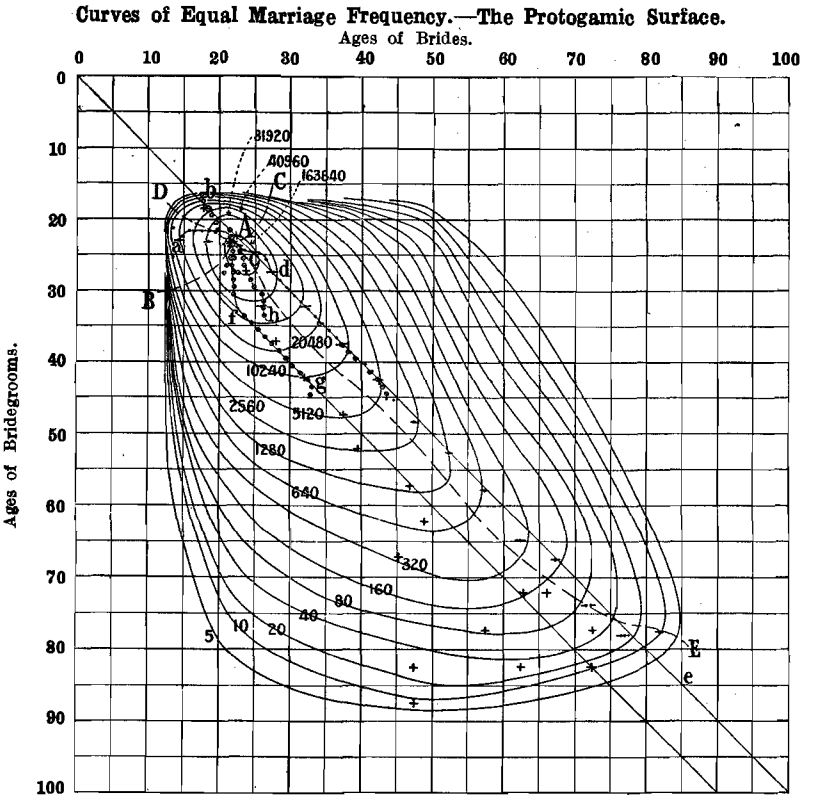


Fig. 61.

NOTE.—The pairs of ages which give equal frequency of marriage are found by following the course of any isoprotogam. The frequency indicated is per million marriages of all ages. The co-ordinates of any two points, whatsoever, on any isoprotogam are equivalent age-pairs, that is pairs of ages which are characterised by the same frequency of marriage.

The protogamic surface, indicated by the family of curves or isogamic contours, is not the surface of frequency for indefinitely small ranges of age, but the surface for 5-year ranges of age; see hereunder. These contours or "isogams" are numbered 5, 10, 20, etc., denoting the doubling of the frequency. The point denoted by an asterisk near A, is the summit of this surface, *i.e.*, its ordinates are the centre of the 5-year ranges of age for which the frequency of marriage is greatest. From the summit it falls most rapidly in the directions A, B and A, C, and least rapidly in the directions A, B and A E, the directions being shewn by broken lines.

The values on the protogamic surface can be thus interpreted:—Assuming that the frequency of marriage for given pairs of ages, is as in Australia during the eight years, 1907-1914, in every 1,000,000 marriages of brides and bridegrooms of all ages, the number to be expected in any 5-year group over the range of $2\frac{1}{2}$ years earlier to $2\frac{1}{2}$ years later than the ordinates of the point taken, in the case of both bride and bridegroom, will be that shewn by the corresponding isogam, along which there will be equal frequency of marriage. Thus, for example, following the variation with age contour corresponding to 10,240 marriages out of a total of 1,000,000, the frequency indicated will be very approximately that for the 5-year ranges, the middle values of which are brides 20 with bridegrooms 37; brides $24\frac{1}{2}$ with bridegrooms 40; brides 30 with bridegrooms 42; brides 35 with bridegrooms either $41\frac{1}{2}$ or 29; brides 37 with bridegrooms either 40 or 33; and so on. The contours thus shew the centre values of a 5-year range of age, at which there is equal frequency of marriage within the range. That is, if the co-ordinates of any point on a contour be x and y, the frequency of marriage is for the ages bridegrooms $x - 2\frac{1}{2}$ to $x + 2\frac{1}{2}$, with brides $y - 2\frac{1}{2}$ to $y + 2\frac{1}{2}$. Hence if M be the total number of marriages, the actual number will be the number on the contour divided by 1,000,000 and multiplied by M.

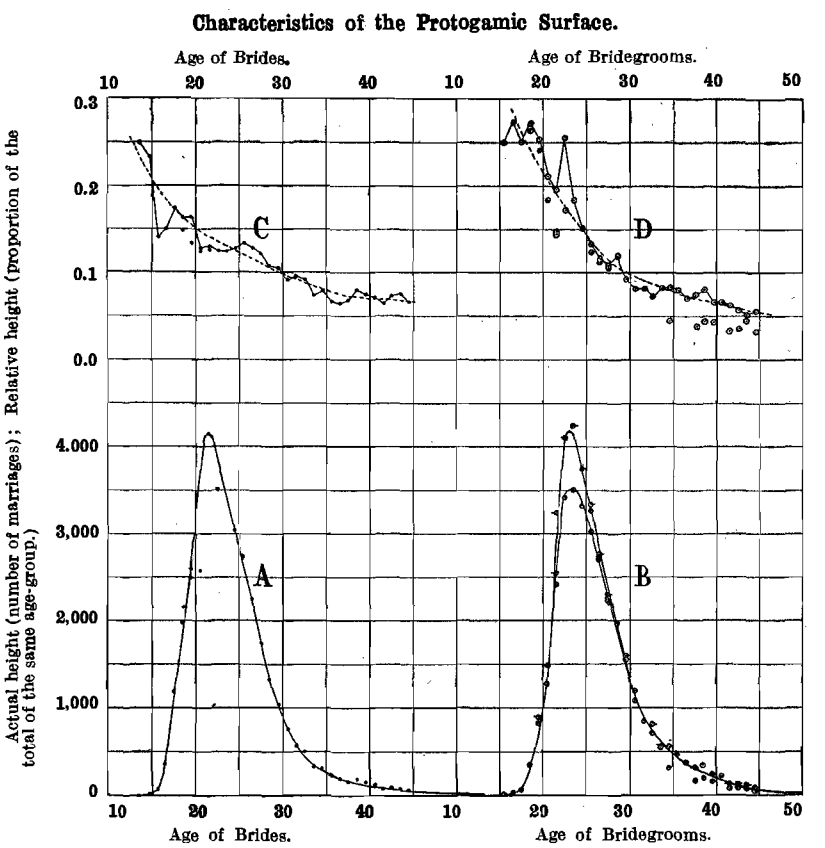


Fig. 62.

Curves A B C and D shew the various vertical features of the protogamic surface. Of these :—

Curve A shews the projection of the profile on the y or age-of-brides axis, the dots indicating the values according to the data, and the continuous line shewing the probable true position of the surface profile.

The outer Curve B shews the projection of the profile on the x or age-of-husbands axis, the dots and circles indicating the positions according to the data. The inner curve indicates the position of a series of second and fairly well-defined maxima. All the points shewn are maxima of some kind.

Curve C shews by dots, and a zig-zag line joining them, the proportion which the frequency at the various maxima bears to the totals for the same age-groups of brides. The general trend of this frequency as a function of age is shewn by a broken line.

Curve D shews by dots with circles and by a zig-zag line, the proportion which the frequencies at the various maxima bear to the total for the same age-groups of bridegrooms. The broken line shews their general trend.

Each contour is twice the height of the contour immediately outside it; thus the surface rises with great rapidity, and is very steep on the top, and also the left hand side in the figure. The proportion per million marriages for a 5-year group, ranging between $x \pm 2\frac{1}{2}$ and $y \pm 2\frac{1}{2}$ is defined by the numbers written along the contours. The *projection* on the y*—axis* of the ridge running from the top left-hand corner to the

bottom right-hand corner is shewn by curve A, Fig. 62 ; and its projection on the $x-axis$ is shewn by Fig. B. The proportion which the frequency at the maximum bears to the total for the same age-group of brides is shewn by curve C, and for the same age-group of bridegrooms by curve D. In these two last curves the zig-zag lines shew the successive principal maxima, and the dotted lines the general trend. It is probable that in a large population, when the ages at marriage are correctly given, the results would yield regular curves of the types drawn. The contours do not indicate curves of great regularity, but that is doubtless due (at least in part) to the inexact statement of age and the paucity of the numbers for higher ages.

27. **Relative marriage frequency in various age-groups.**—For sociologic purposes, a table shewing the relative marriage frequency in various age-groups is of obvious importance. Given an Australian population, constituted as to numbers of married and unmarried in age-groups as was its population during 1907 to 1914, 1,000,000 marriages are found to be distributed as follows :—

TABLE LXIII.—Relative Frequency of Marriage in Various Age-Groups. Australia, 1907-1914.

Age-group of Bride-grooms	Age-group of Brides.															All Ages.*
	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85–89	
15–19	30	11,605	4,920	411	56	12	7	3	2	1	..	..	..	..	..	..	17,048
20–24	146	76,788	184,576	37,452	4,762	1,077	199	73	13	3	1	..	..	..	..	..	305,080
25–29	60	35,249	167,668	115,639	22,331	4,537	935	259	66	6	3	2	..	..	..	..	346,765
30–34	10	9,262	51,407	57,547	30,255	8,205	1,740	484	86	13	7	3	..	..	..	..	159,019
35–39	7	3,039	17,013	24,184	18,795	11,999	3,440	1,037	215	50	13	5	..	..	..	..	79,797
40–45	5	785	5,222	8,496	9,315	8,195	4,978	1,690	371	86	30	10	1	..	..	..	39,183
45–49	4	381	1,982	3,569	4,351	5,477	4,239	2,827	872	245	80	27	3	..	..	..	24,058
50–54	3	136	607	1,273	1,783	2,499	2,545	2,237	1,346	388	166	53	7	3	..	..	13,046
55–59	2	43	182	414	686	978	1,293	1,425	1,027	697	215	99	17	6	2	..	7,086
60–64	1	20	93	209	331	457	547	686	689	524	351	199	50	9	3	..	4,169
65–69	1	7	43	88	143	219	265	365	431	431	315	182	63	13	5	..	2,571
70–74	1	5	23	40	66	99	146	186	215	215	166	113	73	21	7	1	1,377
75–79	1	3	7	13	20	28	38	48	64	85	92	73	47	27	11	1	558
80–84	..	1	5	9	10	14	22	28	33	29	23	13	8	4	2	1	202
85–89	..	..	1	1	2	3	5	10	8	5	3	2	1	1	..	..	42
All Ages*	271	137,324	433,750	249,345	92,906	43,799	20,398	11,358	5,438	2,778	1,465	781	270	84	30	3	1,000,000

* These totals are about ten times those in the final columns of Table LX., p. 199. Though in substantial agreement they are not absolutely identical because these results have been slightly smoothed.

The above table is founded upon the results given by a slight smoothing of the actual numbers, and gives the roughly adjusted relative-frequency of marriage according to age-groups, based upon the marriages of the 8-year period, 1907 to 1914 inclusive, the 1911 Census being regarded as giving a sufficient indication of the relative numbers of married and unmarried for the computation of any derivative relations. The middle point of time would be Jan. 0, 1911, while the Census is April 3rd, 1911. The total marriages were 301,922, or about 37,740 annually ; half of them had occurred by about April 28, 1911, that is 25 days after the Census, hence a correction is not required.

28. **The numbers of the unmarried and their masculinity.**—The smoothed results of the Census give the following numbers of unmarried at each age, viz., those shewn in Table LXIV. From these the ratios of the males to the females (M/F) have been computed; they are shewn opposite the letters "Mas." in the Table. From the numbers given the masculinities can be computed of the various age-groups, which are required hereinafter for the computation of the probability of marriage according to pairs of ages.

TABLE LXIV.—Number of Unmarried Males and Females and the Masculinity (M/F) at each Year of Age. Australia, 3rd April, 1911.

Year of Decennium in Age.	Ages.									
	0	10	20	30	40	50	60	70	80	90
0 M	58,648	43,049	45,466	16,700	7,973	5,232	2,152	1,230	370	33
F	56,401	42,654	38,370	10,839	4,987	2,340	830	360	92	8
Mas.	1.03984	1.00926	1.18493	1.54073	1.5987	2.2359	2.593	3.417	4.0	4.1
1 M	54,759	42,753	43,799	14,875	7,669	4,797	2,032	1,190	312	26
F	52,982	42,222	34,634	9,659	4,623	2,127	760	320	80	6
Mas.	1.03354	1.01258	1.26462	1.54001	1.6588	2.2553	2.674	3.719	3.9	4.3
2 M	52,659	42,748	41,097	13,250	7,386	4,332	1,922	1,140	266	20
F	51,145	42,001	30,878	8,730	4,226	1,938	715	280	69	4
Mas.	1 02960	1.01779	1.33094	1.51775	1,7477	2,2353	2,688	4,071	3.85	5.0
3 M	51,158	42,990	37,541	11,925	7,077	3,942	1,822	1,080	225	15
F	49,785	42,072	26,360	7,835	3,940	1,780	690	240	58	3
Mas.	1.02758	1.02182	1.42418	1.52201	1.7962	2.2146	2.641	4.50	4.05	5.0
4 M	49,998	43,618	34,003	10,900	6,763	3,642	1,732	1,010	189	11
F	48,556	42,484	22,725	7,278	3,707	1,549	650	205	48	2
Mas.	1.02970	1.02669	1.49628	1.49766	1.8244	2.3512	2.665	4.927	3.94	5.5
5 M	48,812	44,598	30,338	10,177	6,453	3,342	1,622	920	158	8
F	47,428	42,273	19,600	6,791	3,441	1,363	600	180	38	2
Mas.	1.02918	1.03062	1.54785	1.49860	1.8753	2.4519	2.703	5.11	4.16	4.0
6 M	47,543	45,482	26,823	9,529	6,185	3,042	1,490	810	121	6
F	46,298	43,915	17,267	6,319	3,212	1,248	550	155	28	1
Mas.	1.02689	1.03568	1.55342	1.50799	1.9256	2.4375	2.709	5.23	4.32	6.0
7 M	46,084	46,212	23,597	9,032	5,957	2,762	1,396	690	90	5
F	45,111	43,813	15,370	5,910	3,000	1,145	500	135	20	1
Mas.	1.02157	1.05475	1.53526	1.52826	1.9856	2.4122	2.792	5.11	4.5	5.0
8 M	44,783	46,620	20,808	8,613	5,731	2,512	1,328	560	65	4
F	44,055	42,854	13,646	5,630	2,783	1,032	450	120	14	1
Mas.	1.01652	1.08788	1.52484	1.52984	2.0593	2.4341	2.951	4.67	4.6	4.0
9 M	43,770	46,470	18,677	8,265	5,522	2,302	1,272	450	46	3
F	43,236	41,020	12,153	5,303	2,570	910	405	105	10	1
Mas.	1.01235	1.13286	1.53682	1.55855	2.1486	2.5297	3.141	4.28	4.6	3.0

100 and over—Males, 2; Females, 1. Totals under 13, 662,764, 611,873 = 1.08317.

Note.—The masculinity is for the year-groups, and may be assumed to be the masculinity at age $x + \frac{1}{2}$, where x is the tabular age, viz., the "age last birthday."

The change of masculinity with age follows no simple law, as will be seen from curve A on Fig. 63. The irregularities after 80 are due to the relatively small numbers on which the curve is based, and must be regarded as accidental. The masculinity diminishes in the earlier years, because of the greater mortality among males. Its constancy between the ages 25 and 37 is remarkable, as also is the sudden increase commencing at 66 years of age, and continuing to 76.

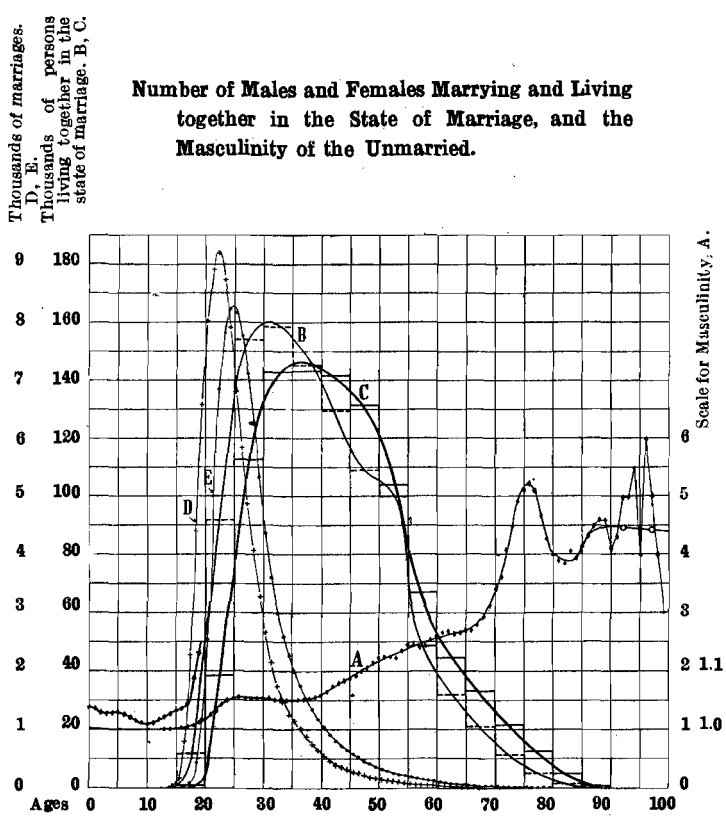


Fig. 63.

Curve A denotes the variation with age of masculinity (M/F) of the unmarried. The small lozenge-shaped dots are the values according to the data; the continuous line shews the general trend. The scale for the masculinity up to nearly 20 years has also been plotted on ten times the scale. See Table LXIV., p. 212.

Curve B denotes the number of married females of marriages living with their husbands in a total of 1,000,000 couples. See Table LXVIII., p. 224.

Curve C denotes the number of married males of various ages living with their wives, in a total of 1,000,000 couples. See Table LXVIII., p. 224.

Curve D shews the adjusted number of females of various ages, per 100,000 marriages, occupying between 1907 and 1914. See Table LIX., p. 197.

Curve E shews the adjusted number of males of various ages, per 100,000 marriages, occurring between 1907 and 1914. See Table LIX., p. 197.

29. **The theory of the probability of marriages in age-groups.**—The data do not exist for a definite and rigorous determination of the probability of marriage in age-groups; nevertheless a fairly accurate estimate is possible by means of a somewhat empirical theory, which will now be indicated. The deduced results are shewn in Tables LXVI. and LXVII., see pp. 219 to 222.[1]

For convenience the adjusted numbers from the Census are given in Tables LXIV. and LXV. hereinafter; the corresponding numbers of marriages occurring in each age-group are also given. The values of q given in the tables enable the number of marriages likely to occur in each age-group to be computed when the numbers of unmarried males and females in the group are known. Thus, q being the tabular number, the number of marriages, N, may be computed by means of formula (431) or formula (434) hereinafter. (See next section.)

Suppose that in any age-group there are M unmarried males and F unmarried females; and that in a unit of time N pairs of these marry. The probability *with F females in the group*, of a particular marriage occurring among the M males is obviously N/M; and *with M males in the group*, the probability of a particular marriage occurring among the F females is similarly N/F. Such a statement of probability, however, lacks generality. To obtain a more general one, an expression is needed which, given a definitive tendency towards the conjugal state in males and in females, though not necessarily of the same strength (or potential) in each sex, and not necessarily independent of the relative numbers of the sexes, nor even independent of the lapse of time, will give the number of marriages occurring in a group, constituted in any manner whatever in regard to the numbers of either sex. We shall call the tendency to marry the *conjugal potential* under a given condition. In the case of males let the conjugal potential be denoted by γ, and in the case of females by γ'; γ and γ' vary with age, doubtless also with time, and (we may assume) with the relative frequency of M and F. Without asserting it to be *exactly* the law of variation, we may suppose that the conjugal potential varies somewhat as some constant, multiplied into some power of the ratio of the numbers of the unmarried of each sex. Put p for the constant in the case of males, p' for the constant in the case of females, then the conjugal potentials are of the type $p.\, f\left(\frac{M}{F}\right)$, which function can, for all practical purposes, probably take the form

$$(425)\ldots\ldots \gamma = p\left(\frac{M}{F}\right)^r;\ \text{and}\ \gamma' = p'\left(\frac{F}{M}\right)^s$$

formulae in which r and s are indices to be ascertained by experiment.

[1] These results are on the basis of 10 million males, and the same number of females. Hence if they are multiplied by one ten-millionth of 1,508,623, and 1,277,259 respectively, they will give the absolute numbers, since these were the number of unmarried males and of unmarried females respectively, on 3rd April, 1911.

Thus $\gamma = p$ and $\gamma' = p'$ when the numbers of unmarried of either sex are equal ; ordinarily they do not differ sensibly therefrom. Again, if the number of females be large, the γ potential is doubtless smaller ; and if the number of males be large the γ' potential is smaller. This appears to be confirmed by experience. The expressions (425) can be made to fit the facts by appropriately determining r and s.

From (425) we have at once for the ratio of the conjugal potentials

$$(426)\ldots\ldots \frac{\gamma}{\gamma'} = \frac{p}{p'}\left(\frac{M}{F}\right)^{w},$$

where $w = r + s$, from which it is evident that it is not necessary to ascertain r and s individually, but only their sum, w. And if the conjugal potential vary with age, it could be ascertained only by comparing a series of results for the one age-group when the numbers of males and females were very divergent ; all other circumstances promoting marriage remaining constant. For this reason, with the limitations of existing data, we must assume (which doubtless, as already indicated, is not *exactly* true), that, when the numbers of the unmarried of each sex are equal, the conjugal potential and probability of marriage vary in the same way. That is

$$(427)\ldots\ldots \gamma \;/\; \gamma' \propto p/p' ;$$

or the probability of marriage is the effective measure of the conjugal potential ; or in other words (subject to what has been said above) we may suppose that, with equal numbers of unmarried males and females, the frequency of marriage is a normal measure of the conjugal potential.

If we make still another assumption, viz., that indicated hereunder (in the passages in italics), a crude type of solution becomes possible, and the problem may then be envisaged as follows :—

If there be M males in any age-group and F females in any other age-group, it is obvious that there can be MF marriages of particular pairs among these groups : and if a group out of these of N males and N females be taken, it is similarly self-evident that they can form NN marriages of particular pairs. *Consequently assuming that the marriage of particular pairs is equally probable, and that the relative magnitude of M and F does not influence the probability, p, then the chance* of N marriages occurring is

$$(428)\ldots\ldots p_{xy} = N_x N_y \;/\; (M_x F_y)$$

x and y denoting the age-groups referred to. The value of p cannot possibly become unity unless $M = F = N$. This probability does not, however, enable us to compute the likelihood of N marriages occurring with particular values for M nd F, since obviously N is not $\sqrt{p}.\sqrt{(MF)}$, although that is a solution of eq ation (428).[1] Subject to the assumptions

[1] For example, given M constant, N would depend upon $\sqrt{F}$, which is certainly not correct if M be large and F small. In this case N would evidently vary as F, not as $\sqrt{F}$.

made, the function representing the chance of N marriages occurring must clearly vary approximately as $\sqrt{(MF)}$, when they are sensibly equal, and must vary sensibly as F (or M) when M (or F) is relatively very large.

In order to obtain an expression that will readily fulfil the necessary conditions, we may observe that if we put

$$(429)\ldots\ldots N_{xy} = q_{xy} \cdot \phi(M_x) \cdot \psi(F_y)$$

and for ready computation assume that the functions ϕ and ψ may, with sufficient precision, take the form M^{ξ} and F^{η} ; then ξ and η must fulfil the following conditions, viz. :—

(*a*) In order to give kN, when the numbers of males and females are kM and kF (at the same time), we must have $\xi+\eta=1$, so that $k^{\xi} \cdot k^{\eta} = k$.

(*b*) As a consequence of this condition, viz., (*a*), it follows that when $M = F$, $\xi = \eta$, and each must be $\frac{1}{2}$.

(*c*) In order that, when M is relatively very great (or small) as compared with F, N shall vary as F (or M), ξ (or η) must become in such a case sensibly zero, and η (or ξ) must become sensibly unity.[1]

(*d*) The fundamental assumptions require also that the expressions shall be symmetrical in regard to M and F, *i.e.*, one can be had from the other by mere interchange.

In practical examples we may have the ratio of M to F varying from about 0.1 to about 10.0 through a wide range of important ages, so that a formula, to be of the widest application, should at least embrace this range. Up to 40 years of age M ranges from about F to $8F$. A function that will fulfil the required condition as above indicated is

$$(430)\ldots\ldots N \propto M^{\frac{F}{M+F}} \cdot F^{\frac{M}{M+F}}$$

Consequently we may write instead of (429) :—

$$(431)\ldots N_{xy} = q_{xy} \cdot M^{\frac{F}{M+F}} \cdot F^{\frac{M}{M+F}} = q_{xy} \cdot M\phi^{\frac{1}{1+\phi}} = q_{xy} \cdot F\mu^{\frac{1}{1+\mu}}$$

and to find q from the results furnished in Tables LXIV. and LXV. we have,

$$(432)\ldots\ldots q_{xy} = \frac{N_{xy}}{M\phi^{\frac{1}{1+\phi}}} = \frac{N_{xy}}{F\mu^{\frac{1}{1+\mu}}} \text{ ; or}$$

$$(432a)\ldots\ldots \log q_{xy} = \log N_{xy} - \frac{1}{1+\mu}\log M - \frac{1}{1+\phi}\log F,$$

x and y denoting the central values of the age-groups, *i.e.*, $x \pm \frac{1}{2}k$, $y \pm \frac{1}{2}k$ where k is the range of the group. The application of this formula can be greatly facilitated in the following way :—Let $S_{xy} = M_x + F_y$, that is, let

[1] ξ is the quantity denoted by ϕ_2, and η that denoted μ_2 on page 132 hereinbefore.

S_{xy} denote the total number of single persons in the groups of males of age x and females of age y, and let the masculinity (or the femininity) of S be denoted by M/F (or F/M); then assuming that the probability is identical for A males and B females, with that for B males and A females (which, however, though by no means certain, is not determinable from existing data), we may compute the value of the ratio

$$(433)\ldots R_\mu = R_\phi = (M^{\frac{F}{M+F}} . F^{\frac{M}{M+F}}) \Big/ \tfrac{1}{2}(M+F) = F\mu^{\frac{1}{1+\mu}} \Big/ \tfrac{1}{2}S = M\phi^{\frac{1}{1+\phi}} \Big/ \tfrac{1}{2}S$$

which depends merely upon the masculinity, μ (or the femininity ϕ), and is independent of the absolute value of S, or of M and F. Consequently with a table of values of R arranged according to the argument μ (or ϕ), we have, by simply dividing M by F, (or F by M) and entering the table,

$$(434)\ldots\ldots N_{xy} = \tfrac{1}{2} S_{xy} . R_\mu . q_{xy} = \text{say } \tfrac{1}{2} S_{xy} . Q_{xy}$$

Q itself could be tabulated but for the fact that the masculinity in age-groups may differ appreciably with the lapse of time. We require, therefore, two tables, viz., one for R depending upon the masculinity (or femininity), and one for q depending on the frequency of marriage for the age-groups in question. After preparing a table of the values of R, Table LXV., those of q can readily be calculated. In using the following table of the values of R, it is, of course, a matter of indifference whether it be entered with the argument "masculinity" or "femininity."

TABLE LXV.

Values of $R = (M^{\frac{F}{M+F}} . F^{\frac{M}{M+F}}) / \frac{1}{2}S$, for computing the effect of unequal numbers of unmarried males and females on the frequency of marriage.

M/F and F/M are interchangeable.

M/F	F/M	10000 R	M/F	F/M	10000 R	M/F	F/M	10000 R	M/F	F/M	10000 R	M/F	F/M	10000 R	M/F	F/M	10000 R	M/F	F/M	10000 R
1.0	1.0	10000	2.0	.5000	8,399	3.0	.3333	6,580	4.0	.2500	5,278	5	.2000	4,359	15	.0667	1,481	60	.0167	351
		34			203			152			107			668			96			
1.1	.9091	9,966	2.1	.4762	8,196	3.1	.3226	6,428	4.1	.2439	5,171	6	.1667	3,691	16	.0625	1,385	70	.0143	299
		90			200			147			102			503			84			
1.2	.8333	9,876	2.2	.4545	7,996	3.2	.3125	6,281	4.2	.2381	5,069	7	.1429	3,188	17	.0588	1,301	80	.0125	261
		130			195			142			100			388			76			
1.3	.7692	9,746	2.3	.4348	7,801	3.3	.3030	6,139	4.3	.2326	4,969	8	.1250	2,800	18	.0556	1,225	90	.0111	231
		159			191			136			96			309			66			
1.4	.7143	9,587	2.4	.4167	7.610	3.4	.2941	6,003	4.4	.2273	4,873	9	.1111	2,491	19	.0526	1,159	100	.0100	207
		178			186			132			93			249			61			
1.5	.6667	9,409	2.5	.4000	7,424	3.5	.2857	5,871	4.5	.2222	4,780	10	.1000	2,242	20	.0500	1,098	200	.0050	102
		193			180			127			90			207			227			
1.6	.6250	9,216	2.6	.3846	7,244	3.6	.2778	5,744	4.6	.2174	4,690	11	.0909	2,035	25	.0400	871	400	.0025	51
		200			174			123			87			173			151			
1.7	.5882	9,016	2.7	.3704	7,070	3.7	.2703	5,621	4.7	.2128	4,603	12	.0833	1,862	30	.0333	720	700	.0014	29
		204			169			118			84			146			186			
1.8	.5556	8,812	2.8	.3571	6,901	3.8	.2632	5,503	4.8	.2083	4,519	13	.0769	1,716	40	.0250	534	1000	.0010	20
		207			163			115			81			126			111			
1.9	.5263	8,605	2.9	.3448	6,738	3.9	.2564	5,388	4.9	.2041	4,438	14	.0714	1,590	50	.0200	423	2000	.0005	10
		206			158			110			79			109						

In the columns "10,000 R," the "differences" are also shewn.

From the values in the above table, a working table may readily be constructed so as to avoid tedious calculations of the function R.

When, however, the value of M is large, and that of F is small (or *vice versa*), the value of N depends mainly on F (or on M). In this case it is preferable to use a table of the values of $\mu^{\frac{1}{1+\mu}}$ (or of $\phi^{\frac{1}{1+\phi}}$) with the argument μ (or ϕ); see formulæ (431) or (432) just given. A table such as LXVA. will then be required.

The formula to be used will be

$$(435)\ldots\ldots N_{xy} = F \,.\, R'_{\mu} \,.\, q_{xy} = M \,.\, R'_{\phi} \,.\, q_{xy};$$

in which R'_{μ} is the tabular value $\mu^{\frac{1}{1+\mu}}$ and R'_{ϕ} is the tabular value $\phi^{\frac{1}{1+\phi}}$, the q quantities being as before.

TABLE LXVa.

Values of $R' = 2\mu^{\frac{1}{1+\mu}}$, for computing the effect of unequal numbers of unmarried males and females on the frequency of marriage.

$\frac{M}{F}$ or $\frac{F}{M}$	R′	$\frac{M}{F}$ or $\frac{F}{M}$	R′	$\frac{M}{F}$ or $\frac{F}{M}$	R′	$\frac{M}{F}$ or $\frac{F}{M}$	R′
10	1.2328	60	1.0694	200	1.0267	700	1.0094
20	1.1533	70	1.0616	300	1.0192	800	1.0084
30	1.1159	80	1.0556	400	1.0150	900	1.0076
40	1.0958	90	1.0507	500	1.0124	1,000	1.0069
50	1.0797	100	1.0467	600	1.0107	2,000	1.0038

The table shews very clearly that as the unmarried females (or males) become relatively fewer the number of marriages varies more nearly in the proportion of the number of females (or males).

30. **Masculinity of the unmarried in various age-groups.**—The results embodied in Table LXIV., make it possible to compute the masculinity of the unmarried for any combined age-groups, since this affects the number that may be expected to marry. The masculinities are shewn in two tables, viz., Table LXVI. and Table LXVII., the former giving the results for 2-year age-groups for ages 15 to 44 for bridegrooms, and ages 13 to 44 for brides; and the latter the results for 5-year age-groups for ages 15 to the end of life for bridegrooms, and 10 to the end of life for brides. From the values of M/F, $= \mu$, (or F/M, $= \phi$,) the values of $F/(M+F)$ and of $M/(M+F)$ may be readily computed if required. Thus[1]

$$(436)\ldots \frac{F}{M+F} = \frac{1}{1+\mu} = \frac{\phi}{1+\phi} = \phi_2\,; \quad \frac{M}{M+F} = \frac{1}{1+\phi} = \frac{\mu}{1+\mu} = \mu_2$$

[1] For other definitions of masculinity and femininity see Part X., § 3, (333) to (335), and Table XXI., pp. 132, 133 hereinbefore.

TABLE LXVI.—Shewing the Masculinity of the Unmarried in 2-year Age-groups (M/F), and the Probability-function 1,000,000 $_2q_{xy}$ for calculating the Number of Marriages in the Two-year Age-groups indicated.

AGE OF BRIDES AND NUMBER OF UNMARRIED FEMALES.

AGE OF BRIDEGROOMS AND NUMBER OF UNMARRIED MALES								
Age Group.	13–14 84,574	15–16 87,188	17–18 86,667	19–20 79,390	21–22 65,512	23–24 49,085	25–26 36,867	27–28½ 29,016
15–16 90,080	1.065 3	1.033 15	1.039 30	1.135 15	1.375 13	1.835 4	2.443 3	3.104 2
17–18 92,832	1.098 6	1.064 273	1.071 905	1.170 515	1.417 253	1.891 96	2.518 54	3.199 23
19–20 91,936	1.087 16	1.054 691	1.061 3,959	1.158 5,081	1.403 3,134	1.873 1,257	2.494 691	3.168 286
21–22 84,896	1.004 38	0.974 1,100	0.979 8,420	1.069 14,490	1.296 21,328	1.729 10,494	2.303 5,304	2.926 2,742
23–24 71,544	0.846 16	0.821 795	0.826 6,391	0.901 14,652	1.092 26,492	1.458 24,774	1.941 13,917	2.466 7,057
25–26 57,161	0.676 15	0.656 696	0.660 4,999	0.720 11,579	0.873 23,148	1.164 26,102	1.551 25,173	1.970 14,407
27–28 44,405	0.525 13	0.509 473	0.512 3,867	0.559 9,172	0.678 18,819	0.905 2,1970	1.205 22,699	1.530 20,553
29–30 35,377	0.418 8	0.406 312	0.408 2,552	0.446 6,632	0.540 13,383	0.721 15,776	0.960 17,670	1.219 16,710
31–32 28,125	0.333 8	0.323 238	0.325 1,719	0.354 4,436	0.429 9,529	0.573 10,650	0.763 12,658	0.969 12,193
33–34 22,825	0.270 8	0.262 169	0.263 1,398	0.287 3,408	0.348 6,950	0.465 8,707	0.619 9,068	0.787 9,683
35–36 19,706	0.233 7	0.226 211	0.227 1,055	0.248 2,497	0.301 5,450	0.402 6,074	0.534 7,830	0.680 7,804
37–38 17,645	0.209 6	0.202 102	0.204 733	0.222 1,823	0.269 3,831	0.359 5,156	0.479 5,392	0.608 6,775
39–40 16,238	0.192 5	0.186 153	0.187 453	0.205 1,317	0.248 2,542	0.331 3,153	0.440 4,035	0.560 4,477
41–42 15,055	0.178 3	0.173 45	0.174 275	0.190 678	0.230 1,538	0.307 2,041	0.408 2,390	0.519 2,977
43–44 13,840	0.164 1	0.159 35	0.160 154	0.174 465	0.211 1,082	0.282 1,551	0.375 1,726	0.477 2,427

See Note to the continuation of the Table on the next page.

TABLE LXVI.—Shewing the Masculinity of the Unmarried in 2-year Age-groups (M/F), and the Probability-function 1,000,000 ${}_2q_{xy}$ for calculating the Number of Marriages in the Two-year Age-groups indicated. (*Continued*).

AGE OF BRIDES AND NUMBER OF UNMARRIED FEMALES.

AGE OF BRIDEGROOMS AND NUMBER OF UNMARRIED MALES.

Age Group.	29–30 22,992	31–32 18,389	33–34 15,113	35–36 13,110	37–38 11,540	39–40 10,390	41–42 8,849	43–44 7,647
15–16 90,080	3.918 ..	4.899 ..	5.960 ..	6.871 ..	7.806 ..	8.670 ..	10.18 ..	11.78 ..
17–18 92,832	4.038 20	5.048 13	6.142 8	7.081 4	8.044 ..	8.935 ..	10.49 ..	12.140 ..
19–20 91,936	3.999 225	4.999 88	6.083 83	7.013 52	7.967 34	8.849 19	10.39 11	12.022 7
21–22 84,896	3.692 1,405	4.617 865	5.618 450	6.476 392	7.357 161	8.170 143	9.594 102	11.102 93
23–24 71,544	3.112 4.241	3.891 2,010	4.734 1,422	5.457 905	6.199 694	6.886 375	8.085 167	9.356 105
25–26 57,161	2.486 7.574	3.108 4,090	3.782 2,318	4.360 1,600	4.953 881	5.502 571	6.460 372	7.475 218
27–28 44,405	1.931 11,620	2.415 6,269	2.938 4,043	3.387 2,421	3.848 1,877	4.274 1,000	5.018 441	5.807 339
29–30 35,377	1.539 15,147	1.924 8,170	2.341 5,493	2.699 3,430	3.066 2,152	3.405 1,287	3.998 714	4.626 471
31–32 28,125	1.223 12,319	1.529 10,652	1.861 6,073	2.145 4,133	2.437 2,354	2.707 1,409	3.178 789	3.678 517
33–34 22,825	0.993 9.604	1.241 8,016	1.510 7,563	1.741 5,146	1.978 2,948	2.197 1,750	2.579 1,100	2.985 939
35–36 19,706	0.857 8,384	1.072 6,901	1.304 6,836	1.503 6,247	1.708 3,874	1.897 2,745	2.227 1,349	2.577 1,124
37–38 17,645	0.767 6,209	0.960 5,546	1.168 5,870	1.346 5,558	1.529 5,695	1.698 3,571	1.994 1,775	2.307 1,354
39–40 16,238	0.706 5,565	0.883 4,343	1.074 4,793	1.239 5,104	1.407 4,966	1.563 4,968	1.835 2,837	2.123 1,725
41–42 15,055	0.655 3,242	0.819 3,783	0.996 3,430	1.148 4,119	1.305 3,323	1.450 3,354	1.701 3,314	1.969 2,123
43–44 13,840	0.602 1,819	0.753 2,792	0.916 3,170	1.056 3,049	1.199 3,185	1.332 3,194	1.564 2,833	1.810 2,871

NOTE.—The upper figures denote the masculinity of the group, that is, the ratio of the number of all the unmarried males of the 2-year groups of ages (15 and 16 to 43 and 44), to the number of all the unmarried females of the 2-year groups (13 and 14 to 43 and 44). The lower figures are the values of the probability-function, ${}_2q_{xy}$, for the double 2-year groups, by means of which the number of marriages occurring annually in the indicated age-groups may be calculated by formulæ (431) and (432), (434), and (435).

TABLE LXVII.—Shewing the Masculinity (M/F) of the Unmarried in 5-year Age-groups (M/F), and the Probability-function, 1,000,000 ${}_5q_{xy}$, for calculating the number of Marriages in the 5-year Age-groups indicated.

AGE OF BRIDES AND NUMBER OF UNMARRIED FEMALES.

AGE OF BRIDEGROOMS AND NUMBER OF UNMARRIED MALES.	Age Groups.	10–14 211,433	15–19 214,875	20–24 152,967	25–29 78,036	30–34 44,341	35–39 29,953	40–44 21,483	45–49 15,006	50–54 9,734
	15–19 229,382	1.085 5	1.067 1,964	1.500 1,027	2.939 150	5.173 37	7.658 11	10.677 9	15.29 7	23.57 7
	20–24 201,906	0.955 26	0.940 13,850	1.320 40,184	2.587 13,821	4.553 3,068	6.741 1,054	9.398 280	13.45 152	20.74 44
	25–29 120,243	0.569 15	0.560 8,932	0.786 47,073	1.541 46,906	2.712 14,445	4.014 4,309	5.597 1,239	8.013 512	12.35 212
	30–34 67,650	0.320 4	0.315 3,897	0.442 22,202	0.867 29,880	1.526 21,665	2.259 8,006	3.149 2,305	4.508 921	6.950 260
	35–39 45,616	0.216 5	0.212 1,906	0.298 10,601	0.585 16,323	1.029 15,687	1.523 12,726	2.123 4,724	3.040 1,970	4.686 633
	40–44 36,868	0.174 4	0.176 618	0.241 4,033	0.472 6,800	0.832 8,721	1.231 9,356	1.716 7,127	2.457 3,259	3.787 1,084
	45–49 29,858	0,141 4	0.139 376	0.195 1,907	0.383 3,439	0.673 4,664	0.997 6,875	1.390 6,452	1.990 5,656	3.067 2,551
	50–54 21,945	0.104 4	0.102 188	0.144 812	0.281 1,647	0.495 2,415	0.733 3,746	1.022 4,399	1.462 4,794	2.255 4,041
	55–59 13,960	0.066 5	0.065 98	0.091 401	0.179 858	0.315 1,399	0.466 2,062	0.650 2,932	0.930 3,700	1.434 3,415
	60–64 9,660	0.046 6	0.045 68	0.063 306	0.123 642	0.218 980	0.322 1,715	0.450 1,658	0.644 2,243	0.992 2,668
	65–69 7,108	0.034 6	0.033 31	0.046 198	0.091 379	0.160 584	0.237 876	0.331 1,141	0.474 1,514	0.730 1,992
	70–74 5,650	0.027 6	0.026 28	0.037 137	0.072 221	0.127 349	0.189 507	0.263 734	0.376 944	0.580 1,172
	75–79 3,430	0,016 7	0.016 27	0.022 67	0.044 127	0.077 181	0.115 247	0.160 321	0.229 399	0.352 536
	80–84 1,362	0.006 9	0.006 45	0.009 123	0.017 238	0.031 247	0.046 335	0.063 519	0.091 635	0.140 703
	85–89 480	0.002 ..	0.002 26	0.003 51	0.006 75	0.011 124	0.016 195	0.022 382	0.032 697	0.049 565
	90–94 105	.0005 ..	.0005 ..	.0007 ..	.0013 ..	.0024 ..	.0035 115	.0049 173	.0070 229	.0108 339

See Note to the continuation of the Table on the next page.

TABLE LXVII.—Shewing the Masculinity (M/F) of the Unmarried in 5-year Age-groups, and the Probability-function, 1,000,000 ${}_5q_{xy}$, for calculating the number of Marriages in the 5-year Age-groups indicated. (*Continued*)

AGE OF BRIDES AND NUMBER OF UNMARRIED FEMALES.

AGE OF BRIDEGROOMS AND NUMBER OF UNMARRIED MALES.

Age Group.	55–59 5,698	60–64 3,645	65–69 2,505	70–74 1,405	75–79 695	80–84 347	85–89 110	90–94 23
15–19 229382	40.26 6	62.93 ..	91.57 ..	163.3 ..	330.1 ..	661.0 ..	2085 ..	9973 ..
20–24 201906	35.43 18	55.39 10	80.60 5	143.7 ..	290.5 ..	581.9 ..	1835 ..	8778 ..
25–29 120243	21.10 32	32.99 31	48.00 23	85.58 ..	173.0 ..	346.5 ..	.1093 ..	5228 ..
30–34 67,650	11.87 72	18.56 59	27.01 43	48.15 ..	97.34 ..	194.9 ..	615.0 ..	2941 ..
35–39 45,616	8.006 260	12.51 113	18.21 64	32.47 8	65.63 ..	131.5 ..	414.7 ..	1983 ..
40–44 36,868	6.470 442	10.11 249	14.72 126	26.24 16	53.05 ..	106.2 ..	335.2 ..	1603 ..
45–49 29,858	5.240 1,236	8.192 651	11.92 328	21.25 77	42.96 16	86.05 ..	271.4 ..	1298 ..
50–54 21,945	3.851 1,934	6.021 1,321	8.760 636	15.62 150	31.58 145	63.24 34	199.5 ..	954.1 ..
55–59 13,960	2.450 3,030	3.830 1,680	5.573 1,147	9.936 338	20.09 290	40.23 164	126.9 ..	607.0 ..
60–64 9,660	1.695 2,835	2.650 2,769	3.856 2,257	6.875 1,039	13.90 405	27.84 319	87.82 107	420.0 ..
65–69 7,108	1.248 2,572	1.950 2,585	2.838 2,081	5.059 1,287	10.23 582	20.48 467	64.62 212	309.0 ..
70–74 5,650	0.992 1.425	1.550 1.437	2.256 1.315	4.021 1.476	8.129 896	16.28 610	51.36 314	245.6 ..
75–79 3,430	0.602 764	0.941 979	1.369 957	2.441 970	4.935 1,094	9.885 958	31.18 406	149.1 465
80–84 1,362	0.239 610	0.374 475	0.544 295	0.969 207	1.960 171	3.925 163	12.38 281	59.22 ..
85–89 480	0.084 341	0.132 205	0.192 99	0.342 59	0.691 45	1.383 31	4.364 ..	20.87 ..
90–94 105	0.184 221	0.288 161	.0419 104	.0747 ..	.1511 ..	.3026 ..	.9545 ..	4.565 ..

NOTE.—The upper figures denote the masculinity of the group, that is, the ratio of the number of all the unmarried males of the 5-year groups of ages (15 to 19) to (90 to 94), to the number of all the unmarried females of the 5-year groups (13 to 14) to (90 to 94). The lower figures are the values of the probability-function, 1,000,000 ${}_5q_{xy}$, for the double 5-year groups, by means of which the number of marriages occurring annually in the indicated age-groups may be calculated by formulae (431) and (432), (434), and (435).

31. **The probability of marriage according to pairs of ages.**—Assuming that the "conjugal potential" does not change in any community, the number of marriages likely to occur among groups of the unmarried of given ages can be computed by means of formula (434), at least if the masculinity is at all similar to that shewn in Tables LXVI. and LXVII. These tables give also the values of q_{xy} as well as the masculinity.

If the conjugal potentials are the same for A males and B females as for B males and A females, and the law of variation is, as by hypothesis,

$$(437).....(\gamma + \gamma') \propto M^{\phi_2} \cdot F^{\mu_2} = M\phi_1^{\mu_2} = F\mu_1^{\phi_2}$$

then the qualification as to the masculinity being approximately identical disappears.[1] It is not unimportant, however, to remember that the fundamental assumption would have to be very erroneous (and that would seem to be impossible) in order to seriously prejudice the precision of the result obtained by the application of the formula (434). The error in any real application of the formula can be a differential one only, and if the constitution as regards numbers of the population be approximately therefore that from which it was derived, any defect in the theory of variation with relative numbers of the sexes, formula (430), has no sensible effect.

32. **The relative numbers of married persons in age-groups.**—The Census of 1911 disclosed the fact that the number of married persons living together on the night of the 3rd April, 1911, was 623,720. The number of wives absent from their husbands was 112,129, and husbands absent from their wives 110,053. There were 616,738[2] (out of a total of about 734,000 married couples) whose ages were fully specified, and who were living together.

This may not be a perfect sample of the entire population, for although the date of the Census, viz., 3rd April, is well chosen, the number of spouses of each age apart at a given moment is probably not sensibly proportional to the total number. As the totals, however, are only about one-fifth greater than the number for which the information is complete, the 616,738 may be taken as fairly representing the population. The results are shewn upon Table LXVIII.

[1] μ_1 and ϕ_1 are the same as μ and ϕ above; μ_2 and ϕ_2 are defined in Table XXI. p. 132 hereinbefore.

[2] This number is made up as follows:—

Husbands and wives completely specified as to age, and living together ..	616,738	Living together but Wife's Age not stated.	Living together but Husband's Age not stated.	Wives Absent.	Total Husbands.
Both ages unspecified ..	506				
	617,244	+ 4,108	+ 2,368	+ 112,129	= 735,849
Living together but wife's age not stated	4,108				‖
Living together but husband's age not stated	2,368				1.19313
Husbands absent	110,053				×
Total wives .. =	733,773	=	1.18976	×	616,738

TABLE LXVIII.—Number of Married Persons per 1,000,000 Married Couples, Living Together on the Night of the Census, 3rd April, 1911. In 5-year Age-groups.

Husbands' Ages.	Wives' Ages.																	Total, 10 to 99
	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 to 59	80 to 84	85 to 89	90 to 94	95 to 99	
15–19	..	577	347	39	8	3	..	..	..	..	..	..	..	..	..	..	..	..	974
20–24	8	5,771	24,015	7,168	1,090	217	63	28	6	..	..	..	..	..	..	..	..	..	38,366
25–29	2	3,574	40,354	54,338	11,871	2,015	383	112	44	11	2	1	..	..	..	..	..	..	112,707
30–34	..	1,090	17,907	54,009	54,757	12,145	2,264	516	123	29	11	5	2	..	..	..	..	..	142,858
35–39	..	376	5,845	24,489	51,157	47,891	10,786	1,965	379	89	16	11	3	2	..	..	..	..	143,009
40–44	..	130	2,048	9,082	25,695	47,680	44,462	9,936	1,934	452	92	36	10	3	..	..	..	..	141,560
45–49	..	44	760	3,287	9,510	23,654	43,595	40,083	8,644	1,450	340	96	16	10	..	..	..	..	131,489
50–54	..	24	258	1,090	3,124	7,694	19,245	35,589	29,716	5,800	1,138	311	50	13	3	..	..	..	104,055
55–59	..	11	94	334	921	2,380	5,567	13,677	22,851	16,769	3,478	666	154	41	11	..	..	..	66,954
60–64	..	5	45	135	357	798	1,899	4,506	9,790	13,578	10,622	2,330	478	81	18	2	1	..	44,645
65–69	..	..	23	62	156	413	830	1,840	4,081	6,684	9,571	7,639	1,629	292	42	8	..	..	33,270
70–74	..	..	8	26	58	180	319	718	1,505	2,615	4,405	6,040	4,533	1,004	118	15	6	2	21,552
75–79	..	2	5	23	29	57	131	268	517	820	1,600	2,996	3,322	2,238	399	37	8	..	12,452
80–84	..	2	2	3	15	24	42	79	152	227	472	751	1,156	1,111	655	84	26	..	4,801
85–89	..	..	2	..	2	6	10	16	28	53	84	148	198	267	183	91	6	..	1,094
90–94	..	..	..	2	..	..	2	6	1	3	8	34	37	31	36	18	15	..	183
95–99	..	..	..	..	..	..	..	..	..	2	2	5	5	5	6	3	..	..	28
100–104	..	..	..	..	..	..	..	..	..	2	..	1	..	..	..	..	..	..	3
Totals 15–104	10	11,606	91,713	154,087	158,750	145,157	129,598	109,339	79,771	48,584	31,841	21,070	11,593	5,098	1,471	258	52	2	1,000,000

33. **Conjugal age-relationships.**—For certain estimations it is important to know, for given ages of husbands, the average difference of the age of the wives ; and also for given ages of wives the average differences of the ages of the husbands. These relationships as at marriage, *i.e.*, *initially*, may be ascertained from marriage records. They may be called the *protogamic age-relationships*. The instantaneous relationships at any moment, however, are disclosed only by a Census, and may be called the *gamic age-relationships*.

The age-groups, with the age of the husband as argument, and those with age of wife as argument, lead, it will be found, to different results, which have no obvious direct mutual relation. Hence this, in common with other analogous groupings of a non-homogeneous character, must be independently made, for a reason which we shall now more definitively indicate. In cases of the kind under consideration two formulae are needed ; in one the argument is the age of the husband (or bridegroom), in the other the age of the wife (or bride).

34. **Non-homogeneous groupings of data.**—If, associated with any group-range, viz., x_k to x_{k+1} say, of any class of elements (ages of husbands in the case under review), there is a class of related elements (ages of wives), viz., y_{k-a} to y_{k+b} say, where a and b, in general, have large values ; and if, reciprocally, a group-range, y_k to y_{k+1} say, is associated

with the group x_{k-A} to x_{k+B} say, A and B also having large values, the result obtained from the former will have no simple relation with that based on the latter. For a result based on the argument x, has not the same constitution as one based on the argument y. If the distribution about the mode in such cases be not symmetrical in each, in fact *if it be not similar in all respects*, no direct functional relationship subsists between results for groupings arranged according to the values of x, and those for groupings arranged according to the values of y. Groupings subject to this limitation may be called *non-homogeneous groupings*, and require special consideration.

35. **Average differences in age of husbands and wives, according to Census.** — In Chapter XIX., Vol. I., § 2, of the Report on the Australian Census of 1911, results are given for a series of age-groups of husbands and of wives. The results are also given in greater detail in Vol. III., Table I., pp. 1106-7. The difference for the central-age of the group, which is sensibly, though not exactly, the mean-age, of those included therein, is as shewn on Fig. 64,[1] the curve marked A, representing the excess of the age of husband over the average age of their wives, as determined from groupings according to the age of the husbands, and the curve marked B, representing the excess of the age of the wife over the average age of their husbands, as determined from groupings according to the age of the wives.

The differences are given in Table LXIX. hereunder. The tangent line to curve A is coincident with the curve for the ages 40 to 60 inclusive (beginning point of year); hence for this interval the relation is—

$$(438)\ldots\ldots D_w = 0 + 0.098\ x_h, \text{ for ages 40 to 60,}$$

D_w denoting the average excess in years of the age of the husband over the average age of the wives, and x_h being the age of the husband.

The tangent is coincident with curve B for the ages 30 to 67 inclusive, and the age of the wife is greater than the average age of the husbands by the amount D_h, where

$$(439)\ldots\ldots D_h = -6.275 + 0.058\ x_w, \text{ for ages 30 to 67,}$$

in which x_w denotes the age of the wife. It is obvious from the table that the assumption ordinarily made is invalid. The characteristics of a table of values of the differences will be evident from the table itself.

[1] See page 227.

TABLE LXIX.—Differences of the average Age of Wives for Husbands of various Ages, and of the Average Ages of Husbands for Wives of various Ages. Australia, 1911.

Age of Husband A; Wife B.	Calculated Result, Curve A.				Calculated Result, Curve B.			
	Position of Tangent	Ordinate to Curve.	Smoothed value of D_w.	Crude value from Data.	Position of Tangent	Ordinate to Curve.	Smoothed value of D_h.	Crude value from Data.
14½	+1.42	..	..	..	—5.43	..	..	—8.4
15½	1.52	—6.52	—5.00	—5.0	5.38	—5.02	—10.40	10.4
16½	1.62	5.27	3.65	0.9	5.32	3.07	8.39	9.1
17½	1.72	4.52	2.80	2.8	5.26	2.25	7.51	7.5
18½	1.81	3.78	1.97	1.2	5.20	1.76	6.96	7.2
19½	1.91	3.48	1.57	1.1	5.14	1.44	6.58	6.6
20½	2.01	3.12	1.11	0.6	5.09	1.16	6.25	6.2
23	2.25	2.38	—0.13	—0.4	4.84	.80	5.70	5.7
27½	2.70	1.33	+1.37	+1.2	4.68	—.17	4.85	4.7
30 †	2.95	.90	2.05	..	4.54	.0	4.54	..
32½	3.19	.56	2.63	2.5	4.39	.0	4.39	4.4
37½	3.67	.10	3.57	3.6	4.10	.0	4.10	4.1
40 *	3.92	.0	3.92	..	3.96	.0	3.96	..
42½	4.16	.0	4.16	4.2	3.81	.0	3.81	3.8
47½	4.66	.0	4.66	4.7	3.52	.0	3.52	3.4
52½	5.15	.0	5.15	5.2	3.23	.0	3.23	3.1
57½	5.64	.0	5.64	5.8	2.94	.0	2.94	3.0
60 *	5.88	.0	5.88	..	2.80	.0	2.80	..
62½	6.13	+.08	6.21	6.5	2.65	.0	2.65	2.9
67 †	6.55	.19	6.74	..	2.50	.0	2.50	..
67½	6.61	.20	6.81	7.3	2.36	+.08	2.28	2.3
72½	7.11	0.66	7.73	8.1	2.07	.70	—1.37	—1.3
77½	7.60	1.58	9.18	9.2	1.78	1.96	+0.18	+0.4
82½	8.09	3.14	11.23	11.3	1.49	3.76	2.27	2.2
87½	8.58	5.70	14.28	14.4	1.20	6.70	5.50	4.2
92½	9.07	9.10	18.17	18.6	0.91	12.01	11.10	11.1
97½	9.56	14.90	24.46	22.3	0.62	+25.62	+25.00	+25.0
102½	10.05	29.95	40.00	40.0	—0.33	..	..	..

*† The asterisks and daggers denote the ages between which curves A and B, respectively, are straight lines.

In the figure the curves A and B are very approximately the smoothed values. The tangents are shewn by dotted lines ; the data by the dots ; it is instantly evident that the difference is not constant, but is a definite function of age. A and B are the curves of the gamic age-relationship.

36. **Average differences of age at marriage.**—A similar table to the preceding can be constructed for the ages at marriage. In order to eliminate the uncertainties due to paucity of data the results for the eight years 1907 to 1914 were combined. The combinations shewed the same tendency as was revealed by the Census, viz., for the numbers to be unduly large for the ages ending with the digits 0 and 5. The numbers for the purpose of the following table have, however, not been smoothed ; the smoothing in the table itself making that unnecessary.

Differences between Ages of Husbands of any Age and the Average Ages of their Wives, and between the Ages of Wives and the Average Ages of their Husbands.

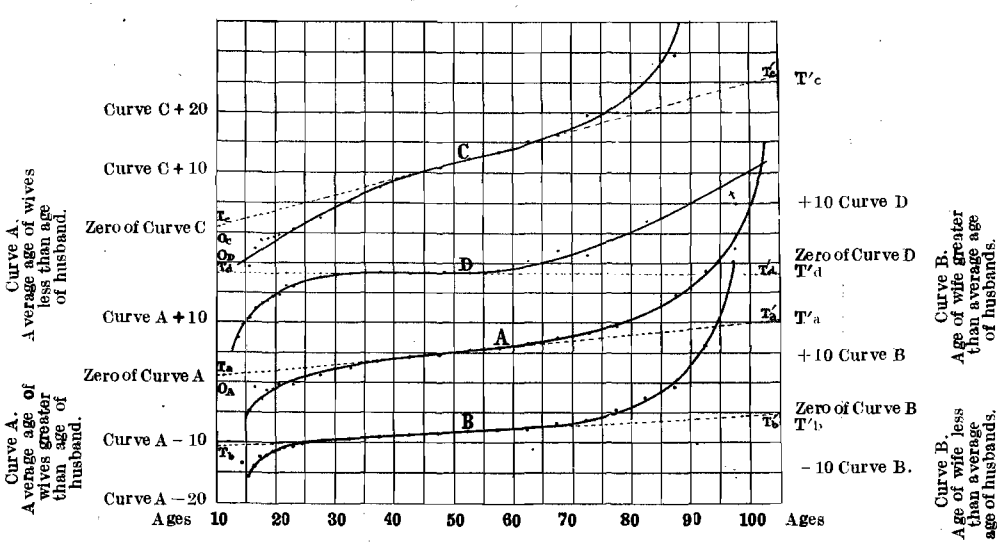


Fig. 64.

Curve A.—Excess of the husband's age over the average age of their wives, at the 1911 Census. See Table LXIX., p. 226. O_A is the zero for the curve.

Curve B.—Excess of the wife's age over the average age of their husbands, at the 1911 Census. See Table LXIX., p. 226. O_B is the zero for the curve.

Curve C.—Excess of the bridegroom's age over the average age of their brides, 1907-1914. See Table LXX., p. 228.

Curve D.—Excess of the bride's age over the average age of their bridegrooms. See Table LXX., p. 228.

The results are shewn by curves C and D in Fig 64. The tangent to curve C, which is analogous to curve A, is identical with the results for ages $42\frac{1}{2}$ to $67\frac{1}{2}$ years ; thus :—

$$(440)\ldots\ldots D'_w = -1.745 + 0.266\, x_h\ ;\ \text{for ages } 42\tfrac{1}{2} \text{ to } 67\tfrac{1}{2}.$$

For curve D, the difference of ages is analogous to curve B. The tangent is parallel to the age-axis at the distance

$$(441)\ldots\ldots D'_h = -1.76\ ;\ \text{for ages } 32\tfrac{1}{2} \text{ to } 60.$$

The table shews the differences outside these limits.

Towards the ends of the curves the results for all four curves are of course somewhat uncertain. C and D are the curves of the protogamic age-relationship.

TABLE LXX.—Difference of the Average Age of Brides for Bridegrooms of various Ages, and of the Average Age of Bridegrooms for Brides of various Ages.

Age of Bridegroom C; Bride D.	Calculated Result, Curve C.				Calculated Result, Curve D.			
	Position of Tangent	Ordinate to Curve.	Smoothed value of D'_w.	Crude value from D'_w.	Position of Tangent	Ordinate to Curve.	Smoothedvalue of D'_h.	Crude value from Data D'_h
13½	..	..	..	..	+1.76	+11.04	12.80	12.80
14½	..	..	..	..	1.76	8.45	10.21	10.21
15½	+2.38	—5.35	—2.97	—5.50	1.76	7.10	8.86	9.18
16½	2.64	5.08	2.44	2.36	1.76	6.10	7.86	7.86
17½	2.91	4.85	1.94	1.08	1.76	5.24	7.00	6.95
18½	3.18	4.56	1.38	0.81	1.76	4.50	6.26	6.25
19½	3.44	4.35	0.91	0.37	1.76	3.92	5.68	5.66
20½	3.71	4.08	—0.37	—0.18	1.76	3.42	5.18	5.26
23	4.37	3.49	+0.88	+0.49	1.76	2.24	4.00	3.94
27½	5.57	2.52	3.05	2.72	1.76	.70	2.46	2.46
32½†	6.90	1.48	5.42	5.35	1.76	.00	1.76	1.76
37½	8.23	.56	7.67	7.67	1.76	.00	1.76	1.72
42½*	9.56	.00	9.56	9.45	1.76	.00	1.76	1.91
47½	10.89	.00	10.89	10.95	1.76	.00	1.76	1.66
52½*	12.22	.00	12.22	12.30	1.76	.00	1.76	1.75
57½	13.55	.00	13.55	13.42	1.76	.00	1.76	1.31
60 †	..	..	..	..	1.76	.00	1.76	..
62½	14.88	.00	14.88	15.03	1.76	.06	1.82	.30
67½	16.21	.00	16.21	16.16	1.76	.28	2.04	2.08
72½	17.54	.90	18.44	19.52	1.76	.73	2.49	1.31
77½	18.87	2.30	21.17	19.93	1.76	1.54	3.30	5.83
82½	20.20	4.50	24.70	37.05	1.76	3.00	4.76	7.14
87½	21.53	8.09	29.62	29.62	1.76	5.30	7.06	..
97½	22.86	..	..	..	1.76	..	..	10.00

*† The asterisks and daggers denote the ages between which the curves C and D, respectively, are straight lines.

37. **The gamic surface.**—The data furnished in Table LXVIII. may be used to construct the *gamic surface*, on the same principle as was followed in the construction of the protogamic surface, dealt with in § 25 hereinbefore. The results are shewn on Fig. 65, from which it will be seen that the isogams are more elliptical in form than isoprotogams, and are more regular; see Fig. 61. The principal meridians AB, AC and AD, AE are in much the same positions as on the protogamic surface, but the point of maximum frequency A, and the line of greatest slope are for higher ages than on that surface. The interpretation of the curves is, *mutatis mutandis*, the same as that for the isoprotogams; in the case of Fig. 65, however, everything applies to persons "living in the state of marriage," instead of to "persons at the moment of marrying."

Curves of Equal Conjugal Frequency.—The Gamic Surface, 1911.

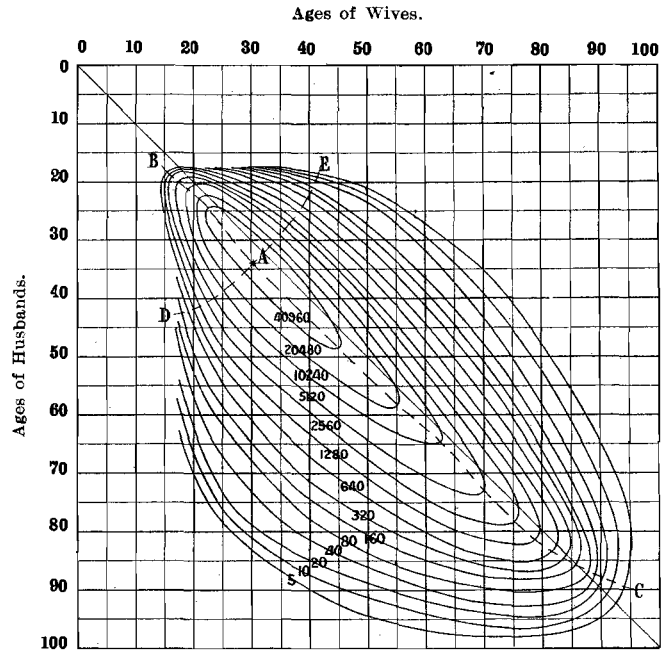


Fig. 65.

NOTE.—The pairs of ages for which an equal frequency of married couples existed at the Census of 1911 are found by following the course of any isogam. The remarks in the footnote to Fig. 61, p. 209, apply, *mutatis mutandis*, to the contours of the Gamic Surface.

38. **Smoothing of surfaces.**—Let it be supposed that the nature of statistical data is such that the most suitable representation is by means of the heights of series of parallelepipeds, as for example, in the case just considered, of the numbers of marriages of bridegrooms between given age limits and of brides between the same or other given age limits. For simplicity we may assume that the combination is according to age last birthday, and thus is in single year groups. Since the general equation of a surface of a second degree will involve nine constants, we can deduce the constants of a surface representing its integral between the limits $x = 0$, 1, 2, and 3, and $y = 0$, 1, 2, and 3, the deduced expression will give totals corresponding to those of the nine contiguous groups. By means of the corresponding surface equations, deduced from these, for lines parallel to the x-axis, or parallel to the y-axis, we can find the height to

this surface, along the four edges of the central parallelepiped. If this operation be then repeated, making each of the four adjoining parallelepipeds the central ones in a group, we shall obtain a second series of values for the distances along the four edges to the surface ; if these do not differ very greatly then the means of each pair of values may be taken, in general, as the smoothed result. In this way the greater part of the entire surface can be dealt with, and the series of verticals to the surfacc thus found will have reduced the original irregularities, and may be regarded as a first smoothing of the surface, conforming, however, as nearly as possible to the general series of group-heights. The results so obtained, however, are "instantaneous values," that is, they are the heights corresponding to the ranges x to $x + dx$, and y to $y + dy$.

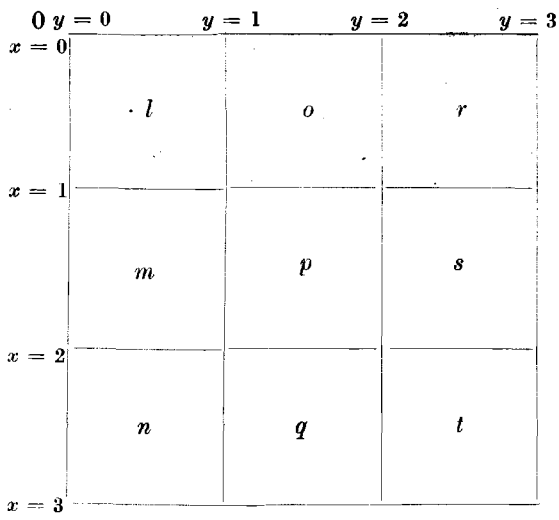
If the numbers be very irregular the process above indicated is extremely tedious, and of little value. It may then be preferable to regard the group results as vertical ordinates with the central values of the group-ranges as the horizontal co-ordinates. The procedure then involves the independent smoothing of a double system of curves, and the taking throughout of the means of the pairs of verticals so found. The whole procedure is then repeated, with the means thus obtained, until the smoothing is satisfactory. The criterion of good smoothing is that the "accumulated deviations" in either of the two directions (at right angles to one another) do not attain to appreciable values, and that they alternate in size. It should be noted that smoothing in this way does *not* give "instantaneous values," that is where k is the extent of the range, the heights now denote values true for the ranges $\frac{1}{2}k$ on either side of the values x and y, these being the ordinates of the centre of the ranges.

There is another possible scheme of solution, *viz.*, to ascertain the constants of an equation, which will give at once the group values for groups of the same double-range, the arguments being the ordinates of the centres of the groups. The method is analogous to that treated for a surface in Part V., § 10, formulæ (211) to (216), pp. 72-73, and the solution by a process analogous to that indicated in the section immediately following, will give the group-height for any value of x and y, the range being $x \pm \frac{1}{2}k$, $y \pm \frac{1}{2}k$.

39. **Solution for the constants of a surface representing nine contiguous groups.**—The most general expression for a surface, every section of which parallel to the x-axis and parallel to the y-axis is a curve of the second degree is

$$(442)\ldots z = A + Bx + Cy + Dxy + Ex^2 + Fx^2y^2 + Gy^2 + Hx^2y + Ixy^2$$

Let the values of the groups be denoted by the letters l, m.....t, according to the following scheme :—



The integral of the above, divided by xy, the area of the base, is :

$$(443)\ldots\ \frac{1}{xy}\iint F(x, y, k)\,dxdy = A + \frac{1}{2}Bx + \frac{1}{2}Cy + \frac{1}{4}Dxy + \frac{1}{3}Ex^2 + \frac{1}{3}Fy^2 + \frac{1}{6}Gx^2y + \frac{1}{6}Hxy^2 + \frac{1}{9}Ix^2y^2$$

from which we deduce, by putting x (*or* y) successively 1, 2, 3, and making y (or x) equal 1, 2, or 3, the following values of the constants A to I in terms of l, m,.....t. The results are :—

$$(444)\ldots\ A = -(q + o - 2p) + (n + l - 2m) + (l - p) - 3(s - p) + (t - q) + 3(r - o) + (p - o) - \frac{1}{2}(m - l)$$

$$(445)\ldots\ B = 3(q + o - 2p) - 3(n + l - 2m) + 8(s - p) - 3(t - q) - 5(r - o) - 2(p - o) + (m - l)$$

$$(446)\ldots\ C = 2(q + o - 2p) + 2p - 2(p - o) + 9(s - p) - 9(r - o) - 3(t - q)$$

$$(447)\ldots\ D = 4(p - o) - 6(q + o - 2p) - 24(s - p) + 15(r - o) + 9(t - q)$$

$$(448)\ldots\ E = \frac{3}{2}(n + l - 2m) - \frac{3}{2}(q + o - 2p) - 3(s - p) + \frac{3}{2}(t - q) + \frac{3}{2}(r - o)$$

$$(449)\ldots. F = -\frac{9}{2}(r - o) - \frac{9}{2}(s - p) + \frac{3}{2}(t - q)$$

$$(450)\ldots. G = -\frac{9}{2}(t - q) - \frac{9}{2}(r - o) + 9(s - p) + 3(q + o - 2p)$$

$$(451)\ldots. H = 12(s - p) - \frac{15}{2}(r - o) - \frac{9}{2}(t - q)$$

$$(452)\ldots. I = \frac{9}{4}(t - q) + \frac{9}{4}(r - o) - \frac{9}{2}(s - p)$$

It will be seen that the arithmetical labour of deducing the constants of a surface which will exactly reproduce any square system of 9 contiguous group-values, is very great, and ordinarily prohibitively so. In general, therefore, less rigorous methods have to be adopted, and are ordinarily quite satisfactory, particularly in view of the fact that in practical calculations values according to a given double-range are required.

40. **Nuptiality and conjugality norms.**—It would appear desirable to establish decennially, what may perhaps be called a *nuptiality or protogamic norm*, and also a *conjugality or gamic norm*, on the basis of an aggregation of the marriages of a large number of populations for the former; and of the Census results for the latter. The norms should preferably shew single-year results up to 24 years for brides, and 29 years for bridegrooms; and up to 34 years for wives, and 39 years for husbands, respectively.

The protogamic norm will reflect the trend in regard to the early institution of marriage, and the gamic norm the modification of this by change in longevity, the frequency of divorce, etc. These norms could include the curves of the totals according to the age of the males (bridegrooms and husbands), and according to the age of the females (brides and wives), and could include also the frequency of the group-pairs.

The norms of the conjugal state, "never married," "divorced," and "widowed," might, with advantage—as well as those of the "married"—also give the frequencies according to group-pairs.

41. **The marriage-ratios of the unmarried.**—It has already been shewn that the probability of marriage depends, among other things, upon the relative numbers among the unmarried of the sexes. So long, however, as a population does not greatly change its constitution according to sex and age, the crude probability of marriage according to sex and age may be regarded as varying approximately as the annual rate. This probability may be called the *peithogamic coefficient*[1] for the sex and age in question. It will be further discussed in Part XIII. in connection with fecundity.

[1] From $\pi\epsilon\iota\theta\omega$ to prevail upon, ($\Pi\epsilon\iota\theta\acute{\omega}$ the Goddess of Persuasion) and $\gamma\alpha\mu\iota\kappa\acute{o}\varsigma$, of or for marriage.

XIII.—FERTILITY AND FECUNDITY AND REPRODUCTIVE EFFICIENCY.

1. **General.**—The phenomena which directly concern the measure of the reproductive power of the human race will be dealt with in this part. These phenomena are in general complex, the variation of the reproductive power being in part of physiological origin, and in part of the result of the reaction of social traditions upon human conduct. This will appear in any attempt to determine the laws of what has been called bigenous[1] (better, digenous) natality, or natality as affected by the ages of both parents, as distinguished from those affecting merely monogenous natality, or natality as related to the producing sex. In deducing the most probable value for certain of the phenomena it will be necessary to minimise the effect of misstatement of age. This can probably be done more effectually than would at first sight appear probable. The final results, however, must be subject to some small degree of uncertainty.

The question of the reproductive efficiency of a population has in part been dealt with in Parts XI. and XII., dealing with Natality and Nuptiality; this, however, is derivative and depends in its turn upon the age-distribution and conjugal condition of the producing sex.

Many questions concerning the measurement of fertility and fecundity can be settled with sufficient precision without recourse to a differentiation depending on the age of the father, the better in Australia, perhaps, inasmuch as the decay of virility with age is not well marked, and in this aspect the digenous fertility stands in marked contrast with that of Hungary.

2. **Definitions.**—It is desirable, initially, to define the sense in which several terms will be used hereinafter.

Monogenous fertility and monogenous fecundity will denote the fertility and fecundity of the female considered without regard to the age of the associated male.

Digenous fertility and digenous fecundity will denote the fertility and fecundity of the female, as modified by the age of the associated male, and therefore is considered in relation to the ages of both males and females. Consequently computations of monogenous fertility or fecundity will be based upon the age of the female. It follows from this, that two populations will be (i.) exactly, or (ii.) approximately, comparable, only when the conjugal age-relationships are (i.) sensibly identical, or (ii.) are similar.

[1] By Joseph Körösi, see Phil. Trans. Lond. B., 1895, p. 781.

Isogeny will denote either equal fertility or equal fecundity, the former to be called *initial isogeny or isoprotogeny*; the latter *general isogeny*, or *characteristic isogeny*, or simply *isogeny*.

A curve, passing through a series of pairs of ages plotted as co-ordinates, in such a manner that it will pass through all ages which give either equal initial or equal general fertility or fecundity, will be called an *isogen* as applied to either. The curves may therefore, in the cases considered, be called *isoprotogens*, and *isogens*.

The terms "fertility" and "fecundity"[1] though ordinarily sensibly identical in meaning, have sometimes been assigned different meanings by statisticians, one being employed to signify the qualitative, and the other the quantitative, aspect of reproductivity.

Owing to their phonic resemblance the words "sterility" and "fertility" are the more appropriate to employ in order to denote the difference between producing or non-producing; while "fecundity," which biologically is used without qualificative to imply *producing in great numbers* (a meaning which requires the qualification "*great*" when fertility is used), is obviously the more appropriate word to denote "multiple fertility."[1]

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[1] In Latin, although "fertilitas" and "fecunditas" have no marked difference of meaning, the latter word seems to be the preferable one for denoting frequency of bearing offspring. The root of fecundus is "feo" (obsolete), or FE = Greek $\phi\upsilon$; c.f. Sanskrit bhu; Zend bû; see $\phi\acute{\upsilon}\omega$ Liddell and Scott's Greek-English Lexicon, 8 Edit., p. 1703.

The root of "fertilis" is "fero" = Greek root $\phi\epsilon\rho$: c.f., Sanskrit "bhar"; Zend "bar"; A.S., "bear-n"; the radical meaning being to bear or carry. See Liddell and Scott op. cit., p. 1662.

In regard to "sterilitas," c.f., Sanskrit "starî" (vacca sterilis).

In other languages the following correspondence might be suggested :—

English.	French.	Italian.	German.	Danish.	Swedish.
Fertility;	Fertilité;	Fertilità;	Fruchtbarkeit or Gebarfähigkeit	Frugtbarhed	Fruktsamhet;
Fecundity.	Fécondité.	Fecondità.	Ergiebigkeit or Fruchtbarkeit	Avledygtighed	Afvelsamhet.

Inasmuch "Fruchtbarkeit," "Frugtbarhed" and "fruktsamhet" ought, if possible, to be appropriated to the one meaning, the first suggestion as regards the German is to be preferred. That is, it is better to adopt "Fruchtbarkeit" for fertility and "Ergiebigkeit" for fecundity.

Körösi suggests "Ergiebigkeit der Ehen." "Mutterschaftsfrequenz" and "Maternitätsfrequenz" refer only to cases of maternity.

J. Matthews Duncan, in his "Fecundity, fertility, sterility and allied topics," 1866, 2nd Edit., 1871, has used "fecundity" to imply the quality of producing "without any superadded notion of quantity," and "fertility or productiveness" "the amount of births as distinguished from the capability to bear." For the reasons indicated in the text, it is better to adopt the terms "sterile" and "fertile" as contrasted, that is, as meaning "non-productive" and "productive" without reference to quantity, and the term "fecund" as conveying the idea of quantity. The matter seems of sufficient importance to abandon Duncan's usage.

Physiological or potential fecundity is, at present, not ascertainable : what is discoverable is only *actual fecundity*. Both rise to a maximum and fall away, the latter very early in life, while it is improbable that this is true of the former. The difference is theoretically (and of course practically) important. The following definitions make the matter clear :—

(i.) *Physiological fecundity at a given age* is the probability that a female of that age, subject to a *definite degree of physiological risk*, uniform for all ages, will reproduce.

(ii.) *Actual fecundity at a given age* is the probability that a female of that age, *subject to average actual risk* (as modified by social traditions, etc., and also by reproduction itself, and not necessarily uniform for all ages), will reproduce.

Inasmuch as physiological fecundity is probably not identical in populations of different races or nations, or even in populations of different localities and times, and is, moreover, dependent upon general health and mode and standard of living, the obtaining of its measure is in a high degree important, though at present impracticable.

Actual fecundity is, naturally enough, different for married and unmarried females. While it does not, even with married females, measure without correction the urgency of the reproductive impulse, or in unmarried females measure the force which this impulse opposes to restrictions created by social environment, it throws, as we shall later see, important light on this question.

3. **The measurement of reproductive efficiency.**—The determination of an unequivocal method of measuring the reproductive efficiency of a population is not without difficulty for the following reasons, viz., that—

(*a*) The life of women varies in duration ;
(*b*) The reproductive period is only a limited portion of it ;
(*c*) Fertility and fecundity are neither uniform for all ages, nor for all women ;
(*d*) It appears to be qualified by the age of the associated males ;
(*e*) Marriage and child-bearing initiate at different ages ;
(*f*) Reproductive efficiency must take account of the duration of life of the children ; and that
(*g*) The exercise of the reproductive function is subject to adventitious influences.

By way of enforcing the penultimate point, it may be noticed that generally a high birth-rate is associated with a high rate of infantile mortality, and the rate measured by taking account only of survivors at the end of one year or other prescribed period may give quite a different indication to that derived from births only. The following outline of various schemes of measurement, some of which have already been dealt with, will indicate the nature and limitations of each.

Rate Measured by—		Deduced Result known as—	Remarks.
Numerator.	Denominator.		
Total births, B	Total population, P	Crude birth-rate, B/P	Is dependent on age, sex, and conjugal constitution of total population, and therefore not strictly comparable as between different populations; it measures merely one element determining increase.
Total births, B	Total female population, F	Birth-rate referred to total number of women, B/F	Is dependent on female population only and is affected of course by the age and conjugal condition of that population.
Total births, B	Female population of reproductive age (viz., from about 10 to 60), F', say	Birth-rate referred to women of reproductive age only B/F'	Indicates reproductive efficiency of all women within the reproductive period. Owing, however, to the limits of this period being ill-defined at the initial and terminal ages, to the largeness of the number of women at those ages, and to the fact that it is dependent on the age-constitution within the group chosen to represent the reproductive age, the rate is not as definite as is desirable. The denominator, however, is a good crude measure of the potential of reproductive efficiency of the population.
Births in each age-group, B_x	The women in same groups, F_x	Birth-rate referred to women of each age-group in question, B_x/F_x	Is uncertain for comparison because the ratio of married to unmarried women may vary, and the relative frequency of maternity in each is not identical.
Nuptial births in each age-group, B'_x	Married women in same age-group, M_x	Nuptial maternity rate for each age-group, B'_x/M_x	Shews only the average frequency of maternity (average probability of maternity) for married women in each age-group.
Ex-nuptial births in each age-group of unmarried women, B''_x	Unmarried women in age-group, U_x	Ex-nuptial maternity rate for each age-group, B''_x/U_x	Shews only average frequency of maternity (average probability of maternity) for unmarried women in each age-group.
Appropriately weighted sum of birth-rates of the married and unmarried	Unity	Modified "Nuptial Index of Natality"	This attributes the reproductive facts of an existing population to a supposititious "standard" population, in which the relative number of married and unmarried females is the general average (norm) for the groups of populations to be compared. The comparison so attained may be regarded a suitable comparative measure of reproductive efficiency (natality).

4. **Natality tables.**—The preceding methods of measuring productive efficiency are all more or less defective. A more satisfactory scheme is to construct a monogenous age-group "natality table" for married, and one for unmarried, females. Such tables shew for each age the probability of the occurrence of a birth and the average number of children per confinement: see hereinafter. This, without doubt, is a more definite method, and stands in much the same relation to statistics of births, as a mortality table does in relation to statistics of deaths. It is, however, not perfectly satisfactory, because, as already indicated, it would appear that the age of the father as well as that of the mother affects the probability of maternity. This will be dealt with hereinafter. Tables of digenous natality, *i.e.*, double-entry tables, shewing the natality for every combination of age, are more complete and exact, and would be perfectly so, if the fertility at any age were *unaffected* by the number of previous confinements. This, however, is probably not the case. These matters will be dealt with in the various sections and tables hereinafter in this part.

5. **Norm of population for estimating reproductive efficiency and the genetic index.**—In order to eliminate the effect of variations in the constitution of populations, it is desirable to establish on as wide a basis as possible the norm of its female conjugal constitution, preferably for every 5 years of the reproductive period. This norm would shew for a total of 1,000, 10,000 or 100,000, etc., women of all reproductive ages, the number aged 10-14, 15-19, ... 55-59; that is from the 10th to the 59th year of age inclusive.* For each age-group there would be (at least) two classes, viz., the "unmarried" which might include widows and divorcées not remarried, and the " married." If, then, to these numbers in the age-groups of the " married" we attribute the nuptial birth-rates* and compute the births, and to the " unmarried" we similarly attribute the ex-nuptial birth-rates†, which are actually experienced by any population considered, we shall have comparable measures ; and the aggregate (divided if desired by 1,000; 10,000 or 100,000, etc.) will be the " Index of Natality" based on the women of reproductive age. In short, the birth-rates actually experienced in the various age-groups of females of reproductive ages, for a series of populations to be compared as regards reproductive efficiency, are attributed to a common standard population (the norm). The sums in the various cases are the comparable measures of reproductive efficiency. Symbolically this may be described as follows :— Let p_1 and p'_1, p_2 and p'_2, etc., denote the ratio of the married and of the unmarried respectively in age-groups 1, 2, etc., to the total number of women married and unmarried of reproductive ages in the norm or standard population ; that is, to the total of all the reproductive groups of that population. Then the sum $p_1+p_2+\ldots.p'_1+p'_2+\ldots. =1$. Hence the index of natality, ν, which measures reproductive efficiency, is simply—

$$(453)\ldots\ldots\ldots \nu=\Sigma_{10}^{59}(p\beta)+\Sigma_{10}^{59}(p'\beta')$$

where β denotes the nuptial, and β' the ex-nuptial, birth-rate based upon the numbers of the married and unmarried respectively, and not upon the total population of each group. In practice these results may of course for convenience be actually multiplied by 1,000, or any higher number.

This index of reproductive efficiency we shall call the *genetic index*. It is formed in a manner identical with that adopted to determine the index of mortality.

6. **The Natality Index.**—Following a procedure similar to that dealt with in last section, let q_1 and q'_1, q_2 and q'_2, etc., denote the ratio in the standard population of the married and unmarried‡ respectively to the

* By dividing the nuptial births in each age-group by the mean number of married women in that group, b_m/M.

† By dividing the ex-nuptial births in each age-group by the mean number of unmarried women in that group; b_u/U. When desirable to distinguish them " never married " may be used instead of " unmarried," the latter would include " widowed " and " divorced."

‡ See preceding note.

total of the standard population. Then these quantities will be smaller than p_1, p'_1, etc., in the ratio of the sum of all females of reproductive age in the standard population to the total standard population, male and female. Hence if we attribute to each age-group-ratio the birth-rate experienced in the population to be compared, we get a total also smaller in the same ratio. This then would give the natality-index ν'. That is—

$$(454)\ldots\ldots \nu' = \Sigma(q\beta) + \Sigma(q'\beta') = \frac{P'}{P}\ \nu$$

where P' denotes the females of reproductive age in the norm, and P denotes the total population, male and female, in the norm.

7. **Age of beginning and of end of fertility.**—The determination of the age at which fertility begins and ends is of importance, and also the range of the reproductive period, which, of course, may not extend in individual cases from the initial age to the terminal age for a large population. What will be discussed here is the latter. The limits may best be determined from the usual statistical data by considering the nature of the frequency as the limits are approached. Keeping in view the fact that the numbers from which the experience is drawn do not vary appreciably, the absolute numbers may preferably be used for judging the age-terminals We get, therefore, for the old-age limit the following results for the period from 1st January, 1907, to 31st December, 1914, for Australia, the population being nearly 5 millions.

TABLE LXXI.—Probability of Birth in Old-age, Australia, 1907 to 1914.

Line No.	Age of Mothers Nuptial and Ex-nuptial.	48	49	50	51	52	53	54	55	56	57	58	59	60	Totals.
1	No. of births in 8 years ..	322	113	39	13	6	5	3	2	1	1	0	0	0	505
2	Decrease at the rate of e^x ..	319	117.3	43.2	15.9	5.8	2.1	0.8	0.3	0.1	0.04	0.014	.0053	.0020	504.613
3	Decrease at varying rate..	322	113.4	42.0	16.4	6.8	3.0	1.4	0.7	0.4	0.2	0.1	0.069	0.053	506.522
4	Ratio of decrease	2.84	2.70	2.56	2.42	2.28	2.14	2.00	1.86	1.72	1.58	1.44	1.30		
5	"Equivalent number" of married women	16938	16105	15113	13898	12759	11716	10819	9940	8989	8071	7269	6608	6033	
6	Probability per 100,000* ..	2,377	877	323	117	59	53	35	25	14	15	0	0	0	
7	Married women of same age per annum† ..	2,377	877	320	117	71	49	35	25	17	10	4	? 2	? 1	

* Crude result. † Smoothed result, see formula (454).

The above results indicate that towards the end of the child-bearing period the numbers decrease (above 48 years of age) roughly at about the rate e^x, where x is the number of years ; see line 2. This at least holds from 48 to 52, when it would appear that the decrease is much more slow. A closer correspondence can be had by forming the numbers according to a formula varying the rate of decrease such as—

$$(455)\ldots\ldots n_{x+1} = \{2.84 - 0.14\ (x-48)\}\ n_x$$

where n_x denotes the number of mothers of age x, last birthday.

The figures in line 1 in Table LXXI. are 8 years' experience of nuptial and ex-nuptial births with women of from 48 to 60 years of age in Australia. During this time there were 476 of the former to 26 of the latter, the number of married and unmarried females of the ages mentioned being respectively 136,781 and 21,615, giving one case of maternity in 287.3 and 831.3 women, respectively. The frequency of maternity with unmarried women between the age-limits in question is thus 0.346 that of married women (or that of married women is 2.89 times that of unmarried women). If, therefore, we add to the number of married women 0.346 times the number of unmarried that will be the total "equivalent number" of married women to whom the cases of maternity can be ascribed. These, divided into one-eighth[1] of the numbers on line 1, give the crude probabilities of maternity for married women of the ages in question. The values, as calculated from the data, are given in line 6; the smoothed values obtained from these are given in line 7. Although a probability is given for age 58, the actual fact is that in over 7,000 possible cases (see line 5) no birth occurred; 57 is the greatest age at which a birth actually occurred. The values are shewn as curve A and on a larger scale, as curve B on Fig. 66. It will be noted that the continuation of the curve for ages 49 to 51 (see a b) on the figure, suggests that 53 is the age at which the value approaches zero, point c, and the curve for ages, 51 to 60, b d in figure, seems to be quite a different curve. No simple exponential relation, however, will bring these two curves under a single formula.[2] See page 244 for Fig. 66.

For the lower limit we have the following data, viz. :—

TABLE LXXII.—Probability of a Birth in Early Age, Australia, 1907-1914.

Line	Age.	11	12	13	14	15	16	17	18
1	Nuptial births, 8 years	0	0	4	30	170	1,138	4,062	11,761
2	Ex-nuptial births, 8 years	0	5	21	126	537	1,500	2,980	4,504
3	Total births, 8 years ..	0	5	25	156	707	2,638	6,942	14,265
4	Ratio of ex-nuptial to nuptial births	—	∞	5.2	4.2	3.16	1.32	0.73	0.38
5	Married women	..	..	1	18	93	349	1,145	2,551
6	"Never married" women	42,222	42,001	42,071	42,484	43,273	43,915	43,813	42,854
7	Probability of nuptial maternity per annum per 1,000	0	0	? 500	? 208	228	408	443	576
8	Probability of ex-nuptial maternity per annum per 1,000,000 unmarried women	0	1.6	6.5	37.1	155.1	427	850	1,313

[1] Approximately, see § 8, p. 240.

[2] Results deduced from the initial value 2377 by means of the formula—

$$n_{x+1} = \{2.75 - 0.15\ (x-48)\}\ n_x.$$

would be in substantial agreement with (455), and are as follows :—

2377 864 332 136 59 27 14 7 4 3 2 1 1

They are less probable, however, than those given on line 7 in the table.

The results on line 8 do not need smoothing. Those on line 7 for the ages 13 and 14 are, of course, very uncertain, the normal values would probably be much smaller than 200. It is evident from the above, that the cases of ex-nuptial maternity throw most light upon the question of the commencing age of fertility. These are shewn on line 2, and will be given very nearly by the equation.[1]

$$(456)\ldots\ldots n_{x-1} = \{1.50 + 0.50\ (18-x)\}\ n_x.$$

The results are shewn as curve D, and on a larger scale as curve E, on Fig. 66, on page 244.

The general result of the investigation as to the terminal conditions is that the null-points can be taken as say 11 and 60, the values being very small from ages 53 onward, and from 11 to 12.[2] The initial null-point is consistent with the curve of frequency of the first menstrual appearance, which would give a null-point of about 9 years[3] and a maximum just after 16 years of age are attained. The curve as shewn in Fig. 66, curve C, gives, according to Whitehead, the group-numbers of single year age-groups for a total of 4,000 cases under observation. These group-numbers are shewn by small circles, see p. 244.

8. **The maternity-frequency, nuptial and ex-nuptial, according to age, and the female and male nuptial-ratios.**—Let g, m, and u, denote respectively the number per annum (i.) of brides, (ii.) cases of nuptial maternity; and (iii.) cases of ex-nuptial maternity, and also let M and U denote the number of married and "never married" women among whom the latter occur. These numbers are given for each age from 12 inclusive onward, in Table LXXIII., see columns (ii.), (iii.), (iv.), (vi.), and (vii.), or g, m, u, M and U.

The numbers are for 8 years, and the mean population from which they are drawn is about 8.0406 times that of the moment of the Census, viz., 3rd April, 1911. Hence the epoch can be regarded as the date of the Census, and the numbers have been divided by 8.0406 to obtain the annual equivalent.

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[1] If we take 4500 as the number of ex-nuptial births for the age 18, we shall obtain 4.0, 27.7, 145.6, 545.8, 1500.3, 3000.0, and 4500, instead of the numbers shewn on line 3 in Table LXXII.

[2] At Budapest, J. Körösi records two mothers at 54, one at 56, and one at 57 in 4 years; vide, Phil. Trans. 1895, B., p. 794. In Edinburgh and Glasgow Matthews Duncan records for the ages 51, 52 and 57, and for an aggregate of 16,301 married mothers, 2, 4 and 1 respectively, p. 9 of his "Fecundity, Sterility, &c." 1871 Edit. C. Ansell in 1874, *vide* his "Statistics of Families," regards an alleged case at 59 as needing verification. Tauffer, of Budapest, in 2083 cases, records one at 54. In handbooks of Forensic Medicine, Casper-Liman mentions one case at 54; one is mentioned by Hofmann at 55; see Phil. Trans. loc. cit. C. J. and J. N. Lewis' "Natality and Fecundity," published 1906, out of 84,971 cases of births in Scotland in 1855, give for the ages 15, 16, 17 and 50 and upwards to 58; the following results, viz.:—

Ages	15.	16.	17;	50.	51.	52.	53.	54.	55.	56.	57.	58.
Numbers	3.	23.	132;	16.	5.	7.	1.	3.	2.	1.	1.	2.

[3] See "Sterility and Abortion," Whitehead, p. 46, or M. Duncan, op. cit., p. 32.

The ratio (e) of ex-nuptial to nuptial cases of maternity is found by dividing the values in column (iv.) by those in column (iii.) in Table LXXIII. That is to say—

$$(457)\ldots\ldots e = u / m.$$

The ratio of "brides" to "unmarried" females, or to females "never married" given in column (viii.) of the table, may be called the "*female nuptial ratio*" ($\mathfrak{g}$) according to age, and is given by—

$$(458)\ldots\ldots \mathfrak{g} = g / U$$

the total number of brides being the same as the number of marriages J in (400), p. 176. Suffixes will denote the age to which the ratio refers. The values $\mathfrak{g}$ are the probabilities of marriage according to age of the unmarried. This probability corresponds to a mean of the marriage-rates of 0.008403, and to a marriage rate over all the eight years of 0.00842863.[1] For any particular year the distribution according to age will therefore approximately be in the ratio of the crude marriage rate for the year in question to that above; expressed ordinarily, say as—

$$(459)\ldots\ldots \mathfrak{g}' = \frac{g}{U} \cdot \frac{n}{0.00843}$$

n being calculated as indicated by (400), p. 176.

The greatest number of never married appears to be for the year between the ages 16.32 to 17.32, the number being about 43,950. Similarly the greatest number of brides appears to be for the ages 21.90 to 22.90, the number being about 27,955.

The curve shewing the number of brides of each age is curve F, Fig. 67, and that shewing the number of the females "never married" is curve G of the same figure; G′ and G″ shew the terminal values on a larger scale. The circles with crosses denote the positions of the data when corrected for the error of statement of age at marriage; see pp. 193-6 hereinbefore. The crude results are shewn by circles on E′, G, G′ and G″. It will be seen from these terminal values that there is considerable regularity in the curve even for advanced ages (see p. 244).

The "*male nuptial ratio*," according to age, is, similarly to (458) and (459)—

$$(460)\ldots\ldots \mathfrak{v} = v / V;\ \text{or}\ (461)\ldots\ldots \mathfrak{v}' = \frac{v}{V} \cdot \frac{n}{0.00843}$$

The values are given in Table LXXIII., the crude results being shewn in column (xiv.). The curve shewing the number of bridegrooms of each age is curve W, Fig. 70, and that shewing the unmarried males is curve V of the same figure. V′ and V″ shew the terminal values on a larger scale. The smoothed values of the probability $\mathfrak{g}'$, and $\mathfrak{u}'$ are given in columns (xviii.) and (xix.) of Table LXXIII.

[1] Expressed per thousand, as is usual, 8.42863.

TABLE LXXIII.—Shewing the Numbers of Brides and Bridegrooms and the Cases of Nuptial and Ex-nuptial Maternity during the Years 1907-1914, Australia, and the Numbers of Married and Never Married Males and Females, at the Census of 3rd April, 1911. Shewing also the Probabilities of Marriage for Never Married Males and Females, and the Probability of Nuptial and Ex-nuptial Maternity, and Ratios Dependent upon these.

Age at Maternity.	Brides during 1907-1914 (g).	Cases of Nuptial Maternity (m).	Cases of Ex-nuptial Maternity (u).	Ratio of Ex-nuptial to Nuptial Cases u/m.	Married Women Census, 1911 (M).	Women Never Married Census, 1911 (U).	Ratio of Brides per annum to the Number Unmarried ($g = g/U$).	Crude Rate of Nuptial Maternity (per annum) ($p = m/M$).	Crude Rate of Ex-nuptial Maternity (per annum) ($u = u/U$).§	Ratio of Crude Ex-nuptial to Crude Nuptial Maternity Rate $= c = u/U \div m/M$.	Number of Bridegrooms 1907-1914 (v).	Men never Married Census, 1911 (V).	Ratio of Bridegrooms per Annum to the Number Unmarried $v = (v/V)$.	Probability of Nuptial Maternity, Smoothed p'.	Probability of Ex-nuptial Maternity (Smoothed) u'§	Ratio of Probability of Ex-nuptial Maternity to Nuptial Maternity c'.§	Probability of Marriage of Women (Smoothed) q'.	Probability of Marriage of Men (Smoothed) u'.
(i.)	(ii.)	(iii.)	(iv.)	(v.)	(vi.)	(vii.)	(viii.)	(ix.)	(x.)	(xi.)	(xii.)	(xiii.)	(xiv.)	(xv.)	(xvi.)	(xvii.)	(xviii.)	(xix.)
12	1	0	5	8	0	42,001	.00000024	..	.000015	..	..	42,748	..	..	.000015	..	.00000024	..
13	4	4	21	5.25	1	42,071	.0000095	.497	.000062	..	..	42,990	..	..	.000062	..	.0000095	..
14	73	30	126	4.20	18	42,284	.000215	.207	.000371	.0018	..	43,621	..	.2070	.00037	.0018	.000215	..
15	489	170	538	3.165	93	43,273	.001405	.227	.00155	.0068	4	44,598	.000011	.2270	.0016	.0071	.00141	.000011
16	2,412	1,140	1,502	1,317	349	43,915	.006831	.4062	.00425	.0105	51	45,482	.000140	.3010	.0042	.0109	.00683	.00014
17	6,918	3,974	2,991	.7526	1,145	43,813	.01964	.4316	.00849	.0197	239	46,212	.000643	.4580	.0085	.0187	.01964	.00064
18	13,246*	9,796	4,519	.4613	2,551	42,854	.03844	.4776	.01311	.0275	1,205	46,620	.00321	.4835†	.0131	.0271	.04064*	.00321
19	18,140*	18,165	5,339	.2939	4,499	41,020	.05500	.5022	.01619	.0322	3,353	46,470	.00897	.4790	.0157	.0325	.05937*	.00897
20	20,231*	25,307	5,302	.2095	6,933	38,370	.06557	.4540	.01719	.0379	6,438	45,466	.0176	.4640	.0172	.0368	.07674*	.01760
21	32,673*	35,529	5,040	.1419	10,100	34,634	.11733	.4375	.01810	.0414	17,374	43,799	.0493	.4425	.0180	.0407	.09706*	.04930
22	27,950	43,607	4,267	.0978	13,047	30,878	.11258	.4157	.01729	.0413	19,977	41,097	.0605	.4157	.01835†	.0446	.11966	.06050
23	26,402	50,655	3,878	.0765	16,521	26,360	.12457	.3813	.01830	.0480	23,655	37,541	.0784	.3813	.0181	.0474	.12544	.07840
24	23,903	53,569	3,208	.0599	18,905	22,725	.13082	.3524	.01756	.0498	24,918	34,003	.0911	.3524	.0176	.0497	.12623	.09110
25	20,707	54,712	2,567	.0469	20,683	19,600	.13139	.3290	.01629	.0495	24,650	30,338	.1011	.3330	.0169	.0500	.12613	.10110
26	17,731	55,453	2,181	.0393	21,620	17,267	.12771	.3190	.01571	.0492	23,494	26,823	.1089	.3190	.0160	.0510	.12407	.10890
27	14,440	54,229	1,812	.0334	22,180	15,370	.11684	.3041	.01466	.0482	21,011	23,597	.1107	.3071	.0154	.0512	.11867	.11270
28	12,372	53,753	1,719	.0320	22,584	13,646	.11276	.2960	.01567	.0529	19,384	20,808	.1159	.2930	.0149	.0515	.11376	.11270
29	10,010	49,739	1,417	.0285	22,765	12,153	.10244	.2717	.01450	.0534	16,113	18,677	.1073	.2735	.0146	.0527	.10202	.10850
30	8,405	48,535	1,373	.0283	22,784	10,839	.09644	.2649	.01575	.0594	13,392	16,700	.0997	.2560	.0143	.0548	.09200	.10150
31	5,847	40,683	861	.0212	22,726	9,659	.07530	.2226	.01109	.0498	10,349	14,875	.0865	.2415	.0140	.0569	.08348	.09270
32	5,558	42,093	969	.0230	22,542	8,730	.07918	.2322	.01380	.0594	9,745	13,250	.0915	.2250	.0137	.0606	.07620	.08600
33	4,342	37,934	827	.0218	22,421	7,835	.06892	.2104	.01313	.0624	7,712	11,925	.0804	.2104	.0135	.0643	.07014	.08100
34	3,854	34,848	792	.0227	22,059	7,278	.06586	.1965	.01353	.0689	6,796	10,900	.0775	.1965	.01325	.0673	.06492	.07630
35	3,521	31,794	705	.0222	21,700	6,791	.06448	.1822	.01291	.0708	6,066	10,177	.0741	.1850	.0130	.0699	.06008	.07250
36	2,914	29,895	648	.0217	21,350	6,319	.05735	.1741	.01275	.0732	5,345	9,529	.0698	.1741	.0127	.0726	.05584	.06980
37	2,438	26,632	551	.0207	21,000	5,910	.05130	.1577	.01160	.0736	4,411	9,032	.0607	.1635	.0122	.0748	.05205	.06550
38	2,369	25,044	564	.0225	20,560	5,630	.05233	.1515	.01246	.0822	4,530	8,613	.0654	.1485	.0115	.0788	.04861	.06120
39	2,005	21,116	441	.0209	20,215	5,303	.04702	.1299	.01034	.0796	3,737	8,265	.0562	.1299	.01045	.0792	.04572	.05300
40	1,688	17,255	389	.0225	19,851	4,987	.0421	.1081	.00970	.0897	3,252	7,973	.0507	.1081	.0095	.0833	.04263	.04660
41	1,126	12,425	204	.0164	19,457	4,623	.0303	.0794	.00549	.0691	2,336	7,669	.0379	.0870	.0076	.0817	.03999	.04195
42	1,287	11,138	205	.0184	19,026	4,226	.0379	.0728	.00603	.0828	2,447	7,386	.0412	.0670	.0059	.0820	.03763	.03980
43	1,005	7,542	156	.0207	18,453	3,940	.0336	.0508	.00492	.0968	2,058	7,077	.0362	.0495	.0043	.0860	.03540	.03770
44	948	4,783	86	.0180	18,040	3,707	.0318	.0330	.00289	.0877	1,745	6,763	.0321	.0330	.0030	.0909	.03330	.03570
45	946	2,776	58	.0209	17,554	3,441	.0343	.01967	.00210	.107	1,847	6,453	.0356	.0197	.0020	.100	.03133	.03395
46	712	1,399	37	.0264	17,064	3,212	.0276	.01020	.00143	.140	1,575	6,185	.0317	.0102	.0012	.133	.02999	.03245
47	663	688	17	.0247	16,554	3,000	.0275	.00517	.00070	.135	1,350	5,957	.0282	.0052	.00085	.170	.02828	.03100
48	654	311	12	.0386	15,975	2,783	.0292	.00242	.00054	.223	1,363	5,731	.0296	.0025	.00055	.220	.02670	.02960
49	493	106	7	.066	14,216	2,570	.0239	.00087	.00034	.391	1,146	5,532	.0258	.0012	.00035	.283	.02525	.02825
50	481	34	5	.147	14,303	2,340	.0256	.00030	.00028	.933	1,113	5,232	.0265	.0006	.00022	.367	.02393	.02695
51	308	12	1	.083	13,162	2,127	.0180	.00011	.00006	.545	740	4,797	.0192	.0003	.00012	.400	.02274	.02565
52	351	7	..	..	12,088	1,938	.0225	.00007	..	..	579	4,332	.0228	.00015	.00004	.27	.02166	.02435
53	238	4	1	.250	11,100	1,780	.0166	.00004	.00007	1.750	647	3,942	.0204	.00007	.00002	.29	.02067	.02300
54	228	3	..	..	10,286	1,549	.0191	.00004	..	..	621	3,642	.0212	.000035	.00001	.29	.01975	.02175
55	179	2	..	..	9,468	1,363	.0163	.00003	..	..	545	3,342	.0203	.000017	..	..	.01888	.02067
56	189	1	..	..	8,557	1,248	.0188	.00001	..	..	489	3,042	.0200	.000008	..	..	.01810	.01967
57	165	1	..	..	7,675	1,145	.0179	.00002	..	..	400	2,762	.0180	.000004	..	..	.01735	.01876
58	159	..	..	..	6,912	1,032	.0192	..	..	..	419	2,512	.0207	.000002	..	..	.01659	.01787
59	98	..	..	..	6,293	910	.0134	..	..	..	286	2,302	.0155	.000001	..	..	.01582	.01700
60	136	..	..	..	5,746	830	.0204	..	..	..	347	2,152	.0201	..	..	..	.01504	.01615
61	58	..	..	..	5,277	760	.0095	..	..	..	236	2,032	.0144	..	..	..	.01425	.01532
62	93	..	..	..	4,871	715	.0162	..	..	..	227	1,922	.0147	..	..	..	.01345	.01451
63	81	..	..	..	4,505	690	.0146	..	..	..	229	1,822	.0156	..	..	..	.01270	.01372
64	68	..	..	..	4,161	650	.0130	..	..	..	203	1,732	.0146	..	..	..	.01200	.01295
65	93	..	..	..	3,829	600	.0193	..	..	..	219	1,622	.0168	..	..	..	.01135	.01220
66	60	..	..	..	3,502	550	.0136	..	..	..	170	1,490	.0142	..	..	..	.01075	.01147
67	54	..	..	..	3,194	500	.0134	..	..	..	163	1,396	.0145	..	..	..	.01019	.01078
68	51	..	..	..	2,880	450	.0141	..	..	..	154	1,328	.0144	..	..	..	.00965	.01013
69	43	..	..	..	2,621	405	.0132	..	..	..	122	1,272	.0119	..	..	..	.00912	.00952
70	36	..	..	..	2,365	360	.0124	..	..	..	134	1,230	.0135	..	..	..	.00860	.00895
71	21	..	..	..	2,099	320	.0082	..	..	..	70	1,190	.0073	..	..	..	.00809	.00842
72	21	..	..	..	1,867	280	.0093	..	..	..	70	1,140	.0076	..	..	..	.00759	.00794
73	14	..	..	..	1,652	240	.0073	..	..	..	77	1,080	.0089	..	..	..	.00712	.00749
74	11	..	..	..	1,444	205	.0067	..	..	..	64	1,010	.0079	..	..	..	.00667	.00710
75	10	..	..	..	1,224	180	.0069	..	..	..	53	920	.0072	..	..	..	.00623	.00675
76	4	..	..	..	1,004	155	.0032	..	..	..	33	810	.0051	..	..	..	.00580	.00644
77	6	..	..	..	818	135	.0055	..	..	..	33	690	.0059	..	..	..	.00535	.00614
78	6	..	..	..	650	120	.0062	..	..	..	22	560	.0049	..	..	..	.00496	.00585
79	4	..	..	..	510	105	.0047	..	..	..	23	450	.0064	..	..	..	.00456	.00557
80	2	..	..	..	397	92	.0027	..	..	..	28	370	.0094	..	..	..	.00418	.00530
81	1	..	..	..	317	80	.0016	..	..	..	10	312	.0040	..	..	..	.00380	.00504
82	3	..	..	..	241	69	.0054	..	..	..	9	266	.0042	..	..	..	.00344	.00479
83	1	..	..	..	184	58	.0021	..	..	..	8	225	.0044	..	..	..	.00308	.00455
84	0	..	..	..	140	48	..	..	..	..	7	189	.0046	..	..	..	.00265	.00432
85	0	..	..	..	105	38	..	..	..	..	5	158	.0039	..	..	..	.00243	.00410
86	0	..	..	..	80	28	..	..	..	..	3	121	.0031	..	..	..	.00213	.00389
87	0	..	..	..	56	20	..	..	..	..	3	90	.0041	..	..	..	.00185	.00369
88	0	..	..	..	35	14	..	..	..	..	1	65	.0019	..	..	..	.00159	.00350
89	0	..	..	..	24	10	..	..	..	..	1	46	.0027	..	..	..	.00135	.00332
90	0	..	..	..	20	8	..	..	..	..	0	33	..	..	..	..	.00113	.00315
91	0	..	..	..	16	6	..	..	..	..	0	26	..	..	..	..	.00093	.00299
92	0	..	..	..	12	4	..	..	..	..	0	20	..	..	..	..	.00075	.00284
93	0	..	..	..	9	3	..	..	..	..	0	15	..	..	..	..	.00059	.00270
94	0	..	..	..	7	2	..	..	..	..	0	11	..	..	..	..	.00045	.00257
95	1	..	..	..	6	2	.062	..	..	..	1	8	.0168	..	..	..	.00033	.00245
96	0	..	..	..	5	1	..	..	..	..	0	6	..	..	..	..	.00022	.00234
97	0	..	..	..	4	1	..	..	..	..	0	5	..	..	..	..	.00012	.00224
98	0	..	..	..	3	1	..	..	..	..	0	4	..	..	..	..	.00005	.00215
99	0	..	..	..	2	1	..	..	..	..	1	3	.0416	..	..	..	.00002	.00207
100	0	..	..	..	1	1	..	..	..	..	73	2	..	..	..	..	.00001	.00200

Unspecified, 111. Total including the Unspecified, 301,922. For notes see next page.

9. **Nuptial and ex-nuptial maternity and their frequency-relations.**—The crude rate, according to age, of nuptial and of ex-nuptial maternity is found by dividing the number of cases of maternity of each kind by the number of married or of "unmarried" or "never married" women. That is to say $\mathfrak{p}$, $\mathfrak{u}$, and $\mathfrak{P}$ denoting the probability of maternity, according to age, respectively of the married, the never married, or of both combined, we shall have :—

$$(462)\ldots\ldots \mathfrak{p} = m \,/\, M\,;$$

$$(463)\ldots\ldots \mathfrak{u} = u \,/\, U\,;$$

$$(464)\ldots\ldots \mathfrak{P} = (m + u) \,/\, (M + U).$$

The relation, according to age, between the ex-nuptial and nuptial rates, is—

$$(465)\ldots. \mathfrak{e} = \mathfrak{u}/\mathfrak{p} = \frac{u}{U}\Big/\frac{m}{M} = \frac{M}{m} \cdot \frac{u}{U}$$

These crude rates and their ratio to each other are given in Table LXXIII. for the whole reproductive period in columns (ix.), (x.) and (xi.). The smoothed values are given in columns (xv.), (xvi.) and (xvii.).

The graphs of the numbers of cases of nuptial and of ex-nuptial maternity are shewn respectively by curves H and I, on Fig. 68, the dots in the former case, and the crosses in the latter, denoting the crude results. The ratio of the ex-nuptial cases to the nuptial cases are shewn by curve J, and on a larger scale by curve J,' Fig. 68. The nuptial and ex-nuptial maternity-rates are shewn on the same figure by curves K and L, the dots in the former, and the small circles in the latter indicating the crude results (see p. 244).

It should be noted that m and M in (462), etc., are not necessarily homogeneous, since each will contain, though in unequal proportions, primiparous and multiparous women, and these will have been subject to risk for unequal periods. Moreover the multiparæ may have given birth to very different numbers of children. If, therefore, the probability of maternity is affected by previous issue, the value of $\mathfrak{p}$ must be regarded as merely a *crude probability*. An exact probability would have to be defined in categories *according to the age, the number of previous issue, and the length of exposure to risk.* This will appear more clearly in the theory of fertility and sterility. For this reason the values given of $\mathfrak{p}$ and $\mathfrak{u}$ in Table LXXIII, are for the "average risk" of the "average married woman" or the "average never married woman" during twelve months, and takes no account of variation of the "risk" according to the age of the husband. In section 11 hereinafter it will be seen that the maxima vary.

Notes to Table LXXIII. on preceding page.

* If the corrections referred to in Part XII., § 15 and 16, pp. 193-6, be applied, these numbers become 14,004 ; 19,580 ; 23,678 ; 26,927 ; see formula (407). This will change the ratios in column (viii.) from .03844 to .04064 ; .05500 to .05937 ; .06557 to .07674 ; and .11733 to .09706.

† The maximum is for the *central age* 18.73, that is for the group of ages 18.23 to 19.23, and the amount is 0.4849.

‡ The maximum is for the central age 22.50 ; that is for the group of ages 22.00 to 23.00, and the amount is 0.01835.

§ The ex-nuptial births are attributed to the "never married," but may, perhaps, be equally well attributed to the "unmarried," that is the "never married" together with the "widowed" and "divorced."

Terminal Frequencies of Fertility; Frequency of Nuptial and Ex-nuptial Maternity; Probability of Marriage of both Sexes at each Age; etc.

Fig. 70. Fig. 67.

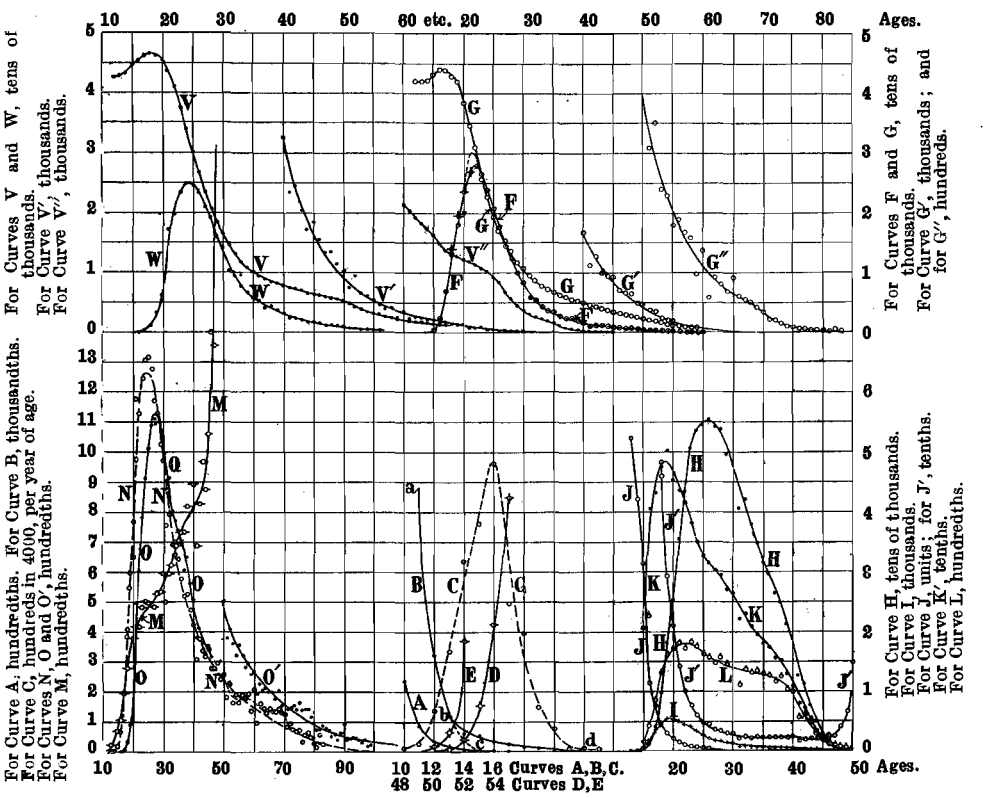


Fig. 69. Fig. 66. Fig. 68.

Fig. 66.—Curves A and B shew the terminal age of fertility. Curves D and E shew the initial age of fertility. Curve C shews the frequency of the appearance of menstruation according to age.

Fig. 67.—Curve F shews the numbers of brides at various ages. Curves G, G′ and G″ shew the numbers of the "never married" at various ages.

Fig. 68.—Curve H shews the number of cases of nuptial maternity, and Curve I those of ex-nuptial maternity at each age. Curves J and J′ shew the proportion of ex-nuptial to nuptial cases of maternity at each age. Curve K shews the nuptial and L the ex-nuptial rates of maternity at each age, the ex-nuptial rate being determined by attributing the births to the "never married."

Fig. 69.—Curve M shews the ratio of the ex-nuptial to the nuptial rates of maternity at each age. Curve N is the ratio of the brides at each age to the "never married females" of the same ages. Curves O and O′ are similarly the ratio of the bridegrooms at each age to the "never married males" of the same ages, curve O′ being displaced one division (10 years) to the right so as not to be confused with curve N.

Fig. 70.—Curve W shews the number of bridegrooms of each age, and V, V′ and V″ the number of "never married males" at each age.

In all the above cases the age is the "age last birthday."

10. **Maximum probabilities of marriage and maternity, etc.**—The position and amount of the maxima determined from the smoothed results in columns (xv.) to (xix.) of Table LXXIII. are as follow :—

Table LXXIV.—Maximum Probabilities, Marriage and Maternity.

Maximum probability of—	Year-group from— Age.	Age.	Amount.
Nuptial maternity	18.45	19.45	.0486
Ex-nuptial maternity	22.00	23.00	0.01835
Ratio of ex-nuptial on nuptial maternity	Probably no maximum value point of inflexion at—		
	25 to	26	0.0510
Marriage of women	24.52 to	25.52	0.12632
Marriage of men	27.5 to	28.5	0.11320

The maxima are for the two heterogeneous groups "nuptial" and "ex-nuptial" aggregated according to age merely. In the next section it will be shewn that the maxima are dependent upon age at marriage.

The largest number of marriages of brides would appear to be for the ages 21.9 to 22.9, and to be about 28,000 in 8 years ; and the largest number of marriages of bridegrooms, for the ages 24.8 to 25.8, the number being about 25,000 in 8 years, the total mean population aggregated for the years in question being 35,821,000 persons. The largest number of *cases of nuptial maternity* occurred for ages 26.12 to 27.12, the number being about 55,500 in 8 years, and the ratio at the crude maximum consequently 0.3182. The largest number of *cases of ex-nuptial maternity* occurred for the ages 19.5 to 20.5, the number being about 5,400 in 8 years, and the ratio at the crude maximum of cases, therefore, 0.01691.

The question of a more accurately defined maximum will be considered hereinafter.

11. **Probability of a first-birth occurring within a series of years after marriage.**—To determine the variation of initial fertility with age, the initial probability of maternity may be deduced by ascertaining primarily the number of women at different ages who were married during a given period. Then, tracing these through the first portion of their married life, the respective periods which elapsed after marriage before they gave birth to their *first living child* may be ascertained.

For this purpose the six-year period, 1909-14, was brought under observation, the experience being all cases in the Commonwealth of Australia within a series of years, viz., 6 after marriage. Owing to misstatements regarding age, however, the number of brides registered at each age during the several years under observation required correction. It was found that, if the actual numbers of brides registered at ages 18, 19, 20 and 21 years were accepted, without adjustment, anomalous results would be obtained. Evidently serious errors existed owing to brides of 18, 19, and 20 years overstating their age as 21, and therefore the numbers of brides upon which the rates of fertility should be founded

needed correction. A special type of smoothing of the number of brides of 18, 19, 20 and 21 years to remedy the misstatement of age had therefore to be adopted.[1]

A similar misstatement of age had evidently occurred in the case of *mothers* (registered as being 19, 20, and 21 years of age), who gave birth to a *first-born* child during the period 1909-14, and the numbers consequently had also to be smoothed, so as to eliminate the effect of misstatements in the age of mothers.[2]

Tables were compiled shewing the mean number of brides of each age in any year and in the year immediately preceding; and for the same ages the number of first confinements in successive years of duration of marriage. Assuming then that the migration elements balanced each other, the table gave a series of results shewing for the years 1909 to 1914 inclusive the aggregate number of brides of each age at marriage to which the aggregate number of first confinements could be referred, hence the ratio of the latter to the former gave the probability required.[3]

[1] The justification for this smoothing is really that the probability of a misstatement of age is very great, and the probability of some physiological or other cause, for the anomaly, is relatively negligible.

[2] The following are the unadjusted and adjusted figures :—

Age.	Nuptial First Births, according to Successive Years of Duration after Marriage.							Number of Brides to whom the Births may be ascribed, according to Successive Years of Duration after Marriage.						
	Total	0–1	1–2	2–3	3–4	4–5	5–6	Total	0–1	1–2	2–3	3–4	4–5	5–6
18	7,568	5,899	1,291	262	81	29	6	10,159	10,159	8,331	6,513	4,735	3,039	1,484
	7,568	5,899	1,291	262	81	29	6	10,736	10,736	8,802	6,880	5,003	3,213	1,571
19	11,625	9,071	1,943	429	118	48	16	13,838	13,838	11,364	8,899	6,463	4,156	1,998
	11,228	8,761	1,877	414	114	46	16	14,902	14,902	12,227	9,557	6,917	4,457	2,177
20	13,596	10,141	2,618	556	202	56	23	15,496	15,496	12,737	9,978	7,244	4,657	2,241
	14,400	10,741	2,773	589	214	59	24	18,100	18,100	14,860	11,630	8,453	5,475	2,675
21	17,507	12,613	3,699	823	262	81	29	24,850	24,850	20,309	15,838	11,520	7,498	3,702
	17,100	12,320	3,613	804	256	79	28	20,600	20,600	16,848	13,158	9,588	6,264	3,002

The upper number is that furnished by the registration records, the lower is that which was obtained after adjustment. The only adjustment deemed essential as a preliminary is for these ages, viz., 18 to 21. For all other ages the results are as given by the unadjusted data.

[3] The following illustration of the method of compiling will suffice :—

Year.	Age at Marriage.	Mean No. of Brides for Year and preceding Year.	Number of First Confinements in successive Years of Duration of Marriage.						Duration of Marriage, 0-1.			
			0-1	1-2	2-3	3-4	4-5	5-6	Age.	Brides.	Confinement.	Ratio.
1909	26	1,864	1,002	443	160	71	54	15	26	13,637	7,279	0.5338
	27	1,563	835	417	107	66	39	22	27	11,054	5,721	0.5176
									Duration of Marriage, 1–2.			
1910	26	2,076	1,047	551	219	79	46	..	26	11,068	3,095	0.2795
	27	1,616	853	444	149	73	41	..	27	9,004	2,566	0.2850
									Duration of Marriage, 2–3.			
1911	26	2,268	1,171	645	212	101	..	..	26	8,571	800	0.0933
	27	1,781	967	527	178	88	..	..	27	6,971	619	0.0888
	(From these the totals on the right were formed.)											

The probabilities so ascertained are shewn on Table LXXV. up to 6 years. The crude results are shewn by the dots on Fig. 71, on which the curved lines give the smoothed results, the corresponding numerical values appearing on the right hand side of the table.

TABLE LXXV.—Probability of a Nuptial First Birth occurring within 6 Years of Marriage, Based on Australian Data, 1909 to 1914.

Age last Birthday.	Crude Results. Probability of Giving Birth to a First Child for a Duration of Marriage of—							Adjusted Results. Probability of Giving Birth to a First Child for a Duration of Marriage of—							Age last Birthday.
	less than 1 yr.	1–2 yrs.	2–3 yrs.	3–4 yrs.	4–5 yrs.	5–6 yrs.	less than 6 yrs.	less than 1 yr.	0–1 yrs.	1–2 yrs.	2–3 yrs.	3–4 yrs.	4–5 yrs.	5–6 yrs.	
11	..	..	..	..	..	..	..	.0000	.0000	.0000	.0000	.0000	.0000	.0000	11
12	..	..	..	..	..	..	..	.1308	.0963	.0217	.0066	.0030	.0020	.0012	12
13	..	..	..	..	..	..	..	.2568	.1881	.0433	.0131	.0060	.0039	.0024	13
14	..	..	..	..	..	..	..	.3781	.2755	.0647	.0195	.0091	.0058	.0035	14
15	.3324	.1233	.0470	.0353	.0278	..	..	.4946	.3585	.0860	.0258	.0121	.0076	.0046	15
16	.4352	.1042	.0424	.0177	.0149	.0075	.6219	.6063	.4370	.1073	.0321	.0150	.0093	.0056	16
17	.4979	.1271	.0413	.0128	.0141	.0053	.6985	.6975	.4985	.1263	.0377	.0176	.0108	.0066	17
18	.5495	.1467	.0381	.0162	.0090	.0038	.7633	.7770	.5485	.1455	.0432	.0199	.0123	.0076	18
19	.5879	.1535	.0433	.0165	.0103	.0073	.8188	.8414	.5800	.1664	.0497	.0229	.0138	.0086	19
20	.5934	.1866	.0506	.0253	.0108	.0090	.8757	.8856	.5950	.1854	.0551	.0252	.0153	.0096	20
21	.5981	.2144	.0611	.0267	.0127	.0093	.9223	.9176	.5958	.2051	.0614	.0280	.0168	.0105	21
22	.5919	.2301	.0675	.0299	.0151	.0122	.9467	.9429	.5908	.2247	.0673	.0306	.0182	.0113	22
23	.5800	.2425	.0783	.0314	.0173	.0094	.9589	.9619	.5819	.2423	.0730	.0331	.0195	.0121	23
24	.5545	.2466	.0827	.0344	.0231	.0130	.9543	.9730	.5688	.2569	.0785	.0354	.0206	.0128	24
25	.5314	.2636	.0815	.0375	.0235	.0158	.9533	.9771	.5533	.2679	.0831	.0378	.0216	.0134	25
26	.5338	.2795	.0933	.0404	.0254	.0081	.9805	.9750	.5357	.2754	.0872	.0402	.0225	.0140	26
27	.5176	.2850	.0888	.0458	.0252	.0141	.9765	.9667	.5168	.2795	.0903	.0423	.0233	.0145	27
28	.5037	.2677	.1013	.0465	.0260	.0126	.9578	.9530	.4967	.2813	.0922	.0439	.0240	.0149	28
29	.4548	.2774	.0836	.0359	.0198	.0107	.8822	.9330	.4766	.2792	.0929	.0446	.0245	.0152	29
30	.4686	.2421	.0898	.0498	.0224	.0107	.8834	.9075	.4545	.2751	.0930	.0448	.0247	.0154	30
31	.4602	.3084	.1003	.0447	.0238	.0178	.9552	.8745	.4310	.2668	.0923	.0446	.0245	.0153	31
32	.4191	.2464	.0873	.0368	.0220	.0132	.8248	.8381	.4073	.2571	.0907	.0440	.0240	.0150	32
33	.4057	.2422	.0825	.0428	.0217	.0194	.8143	.7938	.3789	.2463	.0883	.0426	.0231	.0146	33
34	.3310	.2526	.0928	.0353	.0232	.0204	.7553	.7411	.3487	.2319	.0843	.0407	.0217	.0138	34
35	.3036	.1950	.0771	.0387	.0113	.0155	.6412	.6748	.3123	.2135	.0784	.0382	.0198	.0126	35
36	.3024	.1820	.0724	.0395	.0236	.0061	.6260	.6063	.2768	.1935	.0718	.0354	.0178	.0110	36
37	.2241	.1910	.0741	.0341	.0173	.0000	.5406	.5367	.2423	.1730	.0650	.0315	.0157	.0092	37
38	.1919	.1576	.0634	.0252	.0105	.0144	.4630	.4662	.2088	.1520	.0573	.0276	.0134	.0071	38
39	.1844	.1391	.0406	.0275	.0087	.0000	.4003	.3946	.1755	.1303	.0490	.0237	.0110	.0051	39
40	.1436	.0986	.0520	.0131	.0049	.0000	.3122	.3245	.1426	.1082	.0415	.0198	.0088	.0036	40
41	.1323	.0870	.0336	.0194	.0076	.0000	.2799	.2558	.1111	.0863	.0333	.0158	.0070	.0023	41
42	.0756	.0627	.0211	.0135	.0000	.0073	.1802	.1951	.0855	.0656	.0254	.0119	.0053	.0014	42
43	.0669	.0665	.0131	.0051	.0000	.0083	.1599	.1411	.0634	.0474	.0178	.0080	.0037	.0008	43
44	.0384	.0462	.0064	.0030	.0000	.0000	.0940	.0937	.0441	.0321	.0116	.0041	.0014	.0004	44
45	.0258	.0066	.0086	.0000	.0000	.0000	.0410	.0622	.0296	.0220	.0070	.0022	.0012	.0002	45
46	..	..	..	..	..	..	..	.0400	.0199	.0147	.0035	.0012	.0006	.0001	46
47	..	..	..	..	..	..	..	.0252	.0131	.0094	.0019	.0005	.0003	.0000	47
48	..	..	..	..	..	..	..	.0159	.0093	.0056	.0007	.0002	.0001	..	48
49	..		..	..	..	..	..	.0095	.0062	.0029	.0003	.0001	.0000	..	49
50	.0026	.0031	.0000	.0000	.0000	.0000	.0057	.0053	.0040	.0012	.0001	.0000	..	..	50
51	..	..	..	..	..	..	..	.0028	.0023	.0005	.0000	..	..	..	51
52	..	..	..	..	..	..	..	.0013	.0011	.0002	..	..	..	..	52
53	..	..	..	..	..	..	..	.0006	.0005	.0001	..	..	..	..	53
54	..	..	..	..	..	..	..	.0002	.0002	.0000	..	..	..	..	54
55	..	..	..	..	..	..	..	.0001	.0001	..	..	..	..	..	55

The probabilities in the table apply to the *total number of women married at the given ages, not to the survivors* after the series of years under observation. The probabilities are of course *cumulative*, that is to say

the probability, ${}_0p_n$, that a first birth will occur before the end of the n-th year after marriage, is the sum of the probabilities that it will occur during the first, during the second, etc., up to and including the n-th year. Or

$$(466)\ldots\ldots {}_0p_n = {}_0p_1 + {}_1p_2 + \cdots\cdots {}_{n-1}p_n$$

12. **Maximum probabilities of a first birth.**—From the smoothed results in the table, it will be seen that, as the interval to the first birth increases, the age of maximum increases. Thus the greatest probability of a first birth within the first year from marriage is for age at marriage 21.24, during the year succeeding that of marriage it is at age 28.47, and so on as shewn in the following table, viz., LXXVI.

TABLE LXXVI.—Shewing the Age of Maximum Probability of a First Birth. Australia 1909-1914.

Interval Years.	0–1	1–2	2–3	3–4	4–5	5–6	0–1	0–2	0–3	0–4	0–5	0–6	0–7*	0–8	0–9	0–10	0–11*
Vertex at (years)	20.74	27.97	29.62	29.75	30.03	30.14	20.74	23.75	24.52	24.91	25.06	25.16	25.22	25.26	25.30	25.32	25.33
Corresponding to Median Age at Marriage ..	21.24	28.47	30.12	30.25	30.53	30.64	21.24	24.25	25.02	25.41	25.56	25.66	† 25.72	25.76	25.80	25.82	† 25.83
Or to Median Age at Birth ..	21.74	29.97	32.62	33.75	35.03	36.14	21.74	25.25	26.52	27.41	28.06	28.66	29.22	29.76	30.30	30.82	31.33
Probability ..	.5962	.2813	.0931	.0448	.0247	.0154	.5962	.8259	.9050	.9421	.9637	.9772	.9859	.9916	.9953	.9978	.9998
By Formula (467)	..	..	..	..	..	..	..	.840	.920	.947	.960	.968	.973	.977			

* The ratios 9050/8259, 9421/9050, etc., are 1.0958, 1.0410, 1.0229, 1.0140, which continued, are 1.0089, 1.0058, 1.0038, 1.0025, 1.0020, the factor of the last two figures converging to 52/80. This, however, would give 1.0011 for 0-11. It is more probable, however, that the probability is of the type ${}_0p'_{n+1} = ({}_0p'_n + m)/(1+m)$ where m may perhaps be taken even as unity, implying that the residual chance is reduced about one half each year. The matter requires special investigation.

† These correspond to the values of the vertices on Fig. 71.

It is worthy of note that the above results for 0-2 up to 0-8 are roughly given by the formula—

$$(467)\ldots\ldots {}_0p'_n = 1 - \frac{0.16}{n-1},$$

in which n is the total duration of marriage.

The figure (71) and table shew clearly that the maximum is a function of the duration of marriage as well as of age. To find the maximum value for any durations 0 to t the line of vertices C D on Fig. 71 must be followed, or during year-intervals t to $t + 1$, the line C E must be followed. Thus for age 20 last birthday, the duration is 0 to 0.93, the probability is about 0.555. The graphic solution may also follow the method indicated in Fig. 71A, which needs no comment when examined in connection with Table LXXVI.

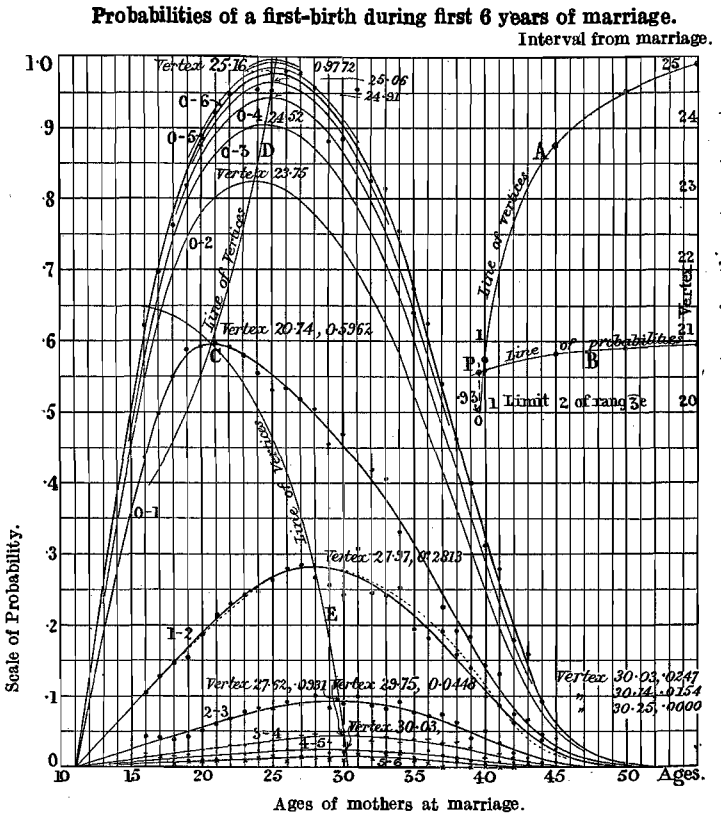


Fig. 71A.

Fig. 71.

13. **Determination of the co-ordinates of the vertices.**—The representation of group-totals by means of integral functions of the values of the central abscissa of the group-base (central value of the interval) has been referred to in Part V., § 10, pp. 72, 73. In curves of the type which has just been considered, the results about the vertices may be closely represented by a curve of the second degree, and the curve itself may be regarded as defining the curve of group-totals for all values of the central abscissa (the abscissa of the middle ordinates of the group). In such instances the co-ordinates for the maximum-group may be very accurately ascertained from the tabular maximum together with the tabular values on either side of it. Let the maximum tabular value denote the point M on the curve, and the adjoining tabular values denote the points A, B, viz., the points on either side. Then, if the difference of the mean of the ordinates of the points A and B, and the ordinate of M be denoted by h, and the half difference of the ordinates of B and A be denoted by l, that is if—

$$(468)\ldots\ldots h = y_m - \tfrac{1}{2}(y_b + y_a)\,;\ \text{and}\ l = \tfrac{1}{2}(y_b - y_a)\,;$$

then we shall have—

$$(469)\ldots\ldots y_{max} = y_m + \frac{l^2}{4h}\ ;\ x_{max} = x_m + \frac{l}{2h}$$

The proper maximum is greater than the tabular maximum by the amount $l^2/4h$, and its abscissa lies between that of the tabular maximum and the next highest tabular quantity distant from the former by the amount $l/2h$.

The positions of the vertices have been computed in this way. It remains to be noted, however, that when the value of the abscissa indicates merely the "age last birthday," it is necessary to add the amount $\frac{1}{2}$ to the value given by the formula in order to refer the co-ordinates to the middle values of the group-abscissæ. Thus, in Fig. 71, the curves are plotted with the argument "age," *i.e.*, last birthday, hence the vertex-value 20.74, see curve 0-1, and the maximum 0.5962, refer to the group of brides whose ages ranged between 20.74 years of age and 21.74 years of age. The middle value of the range is 21.24, but the average value is not that. The probability 0.5962 applies to the brides whose ages were between 20.74 and 21.74. Of 10,000 such, 5,962 would give birth to a first child within one year of marriage.

14. **Average age of a group.**—The error of adopting the middle value of any range has been considered in Part XII., § 20, pp. 200-201. It is sometimes preferable to relate the values of the dependent variable, not to the middle values but to the *average* values of the independent variable. In such a case formula (416), p. 201, may be used. Let A, M, and B be three group totals on equal bases k (equal intervals on the axis of abscissæ). The values of the co-efficients of a rational integral function of the second degree—the graph of which will represent, viz., the areas standing on the equal bases, the group-totals—may be found by the formulæ of Part V., §§ 1 to 9., pp. 64-72. The weighted mean abscissa of the middle group may be denoted by x'_m. If then we make the origin at 0, so that A is the integral of the equation $a + bx + cx^2$ between the limits 0 and k, M the integral between k and $2k$, and B between $2k$ and $3k$, then we shall have—

$$(470)\ldots\ldots x'_m = \frac{\frac{1}{12}bk^2 + \frac{1}{4}ck^3}{a + \frac{3}{2}bk + \frac{7}{3}ck^2}$$

which may be put in the very simple form—

$$(471)\ldots\ldots x_m + \epsilon = x_m + \tfrac{1}{24}k(B - A)/M.$$

This is the same formula as (416). In general, therefore, it is sufficient to find the value of the abscissa to which a group may be referred by using the value of the group and of these on either side: see the results as to average interval in §§ 21, 24, etc., hereinafter.

15. **Curves of probability for different intervals derived by projection.**—Reverting to Fig. 71, it may be noted that the probabilities of a first birth between 1 and 2 years, 2 and 3 years, etc., after marriage

may be derived for each age approximately by projection if the ratio of the aggregates and the position of the maximum are known. For example the faintly-dotted curve is the curve for the interval between 1 and 2 years after marriage derived by projection from that up to 1 year (0-1). The difference between the two curves is nearly negligible. The following are the relations between the curves :—

Let x, y be the co-ordinates of any point P on a curve, and let x', y' denote the co-ordinates of what may be called the *corresponding point* P′, on a curve derived therefrom by drawing the line P P′ Q to cut the axis (OX) of abscissæ in the point Q, so as to make the angle of intersection therewith, XQP, equal to θ, and also the ratio QP′/QP equal to ρ. Then, if θ and ρ be constant, the derived curve will belong to a family of curves of the type of the original, but differing therefrom in "skewness" if θ be not 90°. The co-ordinates of any point P′, viz., of the "corresponding point" on the derived curve are simply related to those of the point P on the original curve from which it was derived, being given by the equations—

$$(472)\ldots\ldots y' = \rho y\,;\ x' = x - y(1-\rho)\cot.\theta.$$

Hence if the equation of the original curve be $f(y) = F(x)$, that of the derived curve will be—

$$(473)\ldots\ldots f\left(\frac{y'}{\rho}\right) = F\,(x' - ky')\,;$$

in which $k = \cot.\,\theta\,(1-\rho)/\rho$.

To determine whether the succession of probabilities for 0-1, 0-2, 0-3, etc., and 0-1, 1-2, 2-3, etc., are rigorously derivable by projection would involve data embracing larger numbers and free from all uncertainty as to the effect of migration thereupon.

16. **Numbers of first-births according to age and duration of marriage.** —There were in Australia during the years 1907-14 inclusive, 220,021 cases of nuptial first births. The records of these were compiled according to "age last birthday," and duration of marriage." Multiplying the numbers as compiled by a factor, that would make the total 1,000,000, the results are as shewn in Table LXXVII., compiled for single months of duration of marriage from 1 to 12 months, and for single years of duration of from 1 to 26. The table thus furnishes the distribution of 1,000,000 nuptial first births according to age and duration of marriage. The figures for the months are of course only one-twelfth of the figures which would be comparable to the yearly values. This distribution may be called the *nuptial protogenesic distribution.*

TABLE LXXVII.—Shewing the Number in 1,000,000 Nuptial First-births of Births occurring for all Births occurring in Australia during the Years

Age of Mothers.	Interval after Marriage during which a Birth Occurs.																	
	0–1 mths.	1–2 mths.	2–3 mths.	3–4 mths.	4–5 mths.	5–6 mths.	6–7 mths.	7–8 mths.	8–9 mths.	9–10 mths.	10–11 mths.	11–12 mths.	0–1 year.	1–2 years.	2–3 years.	3–4 years.	4–5 years.	5–6 yrs.	6–7 yrs.
12 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
13 ..	0	5	0	5	0	0	0	0	0	0	5	0	15	4	..	..	..	..	..
14 ..	32	14	23	18	9	9	5	0	0	5	9	0	124	0	..	..	..	..	..
15 ..	45	73	109	68	91	77	68	36	9	27	23	0	626	18	..	..	..	..	..
16 ..	382	423	514	532	568	541	486	295	91	95	73	91	4,091	209	18	9	..	..	..
17 ..	959	1,073	1,336	1,663	1,532	1,836	1,859	1,250	532	704	450	304	13,498	1,054	73	5	9	..	..
18 ..	1,523	1,773	2,754	3,163	3,613	3,891	4,468	2,950	1,636	2,118	1,359	1,082	30,330	3,417	377	50	0	5	..
19 ..	**1,886**	2,227	**3,513**	4,272	5,127	6,054	6,790	4,609	2,850	3,909	2,972	2,345	46,554	7,794	1,054	155	32	0	..
20 ..	1,754	2,236	3,172	4,104	5,086	5,995	7,068	5,590	3,254	6,154	4,777	3,318	52,508	11,921	1,968	382	64	27	9
21 ..	1,877	**2,309**	3,454	**4,640**	**5,704**	**6,981**	**8,331**	**6,613**	4,613	9,122	6,845	4,772	65,261	16,125	2,950	682	227	36	23
22 ..	1,532	1,827	2,682	3,445	4,281	5,740	7,254	6,159	5,077	**11,981**	8,935	**6,708**	**65,621**	22,225	3,995	1,118	395	132	32
23 ..	1,113	1,523	1,941	2,909	3,854	4,740	6,263	5,413	**5,177**	11,953	**9,226**	6,331	60,443	**24,316**	5,672	1,859	677	236	95
24 ..	986	1,104	1,586	2,086	2,886	3,441	4,959	4,231	4,045	11,467	8,726	6,313	51,830	24,261	6,413	2,268	904	377	191
25 ..	768	818	1,273	1,573	1,873	2,850	3,754	3,250	3,895	10,549	7,986	5,645	44,234	21,988	**6,954**	2,550	1,040	550	277
26 ..	691	677	1,027	1,168	1,500	2,154	2,836	2,732	3,272	9,031	7,222	4,877	37,187	20,670	6,613	2,482	1,268	782	459
27 ..	382	432	718	895	1,136	1,463	2,254	2,145	2,373	7,649	5,909	4,177	29,533	18,419	6,009	**2,650**	1,373	**800**	427
28 ..	491	345	691	736	964	1,232	1,595	1,677	2,091	6,372	5,140	3,450	24,784	15,315	5,508	2,454	**1,432**	695	**541**
29 ..	305	282	414	600	568	845	1,177	1,245	1,613	4,536	3,659	2,795	18,039	12,281	4,436	2,263	1,218	727	455
30 ..	227	255	282	418	432	677	877	1,054	1,404	4,191	3,336	2,304	15,457	10,221	4,113	2,077	1,182	732	477
31 ..	209	159	241	395	359	450	641	691	945	2,600	2,245	1,782	10,717	7,549	2,936	1,618	868	532	377
32 ..	177	182	227	264	373	405	523	627	786	2,145	2,000	1,354	9,063	6,680	2,532	1,300	823	577	441
33 ..	173	168	195	150	273	345	441	436	564	1,654	1,468	1,082	6,949	5,086	2,032	1,154	650	441	395
34 ..	73	105	191	141	218	256	355	327	382	1,264	1,027	773	5,112	3,918	1,712	800	586	373	323
35 ..	105	100	132	127	227	177	268	318	314	1,014	863	559	4,204	3,530	1,314	714	423	282	268
36 ..	95	55	150	132	118	150	223	255	264	750	777	450	3,419	2,654	1,232	577	423	268	259
37 ..	55	91	36	105	64	114	141	155	182	609	527	345	2,424	2,054	1,041	459	282	259	168
38 ..	41	59	59	45	68	86	105	150	136	400	364	332	1,845	1,786	786	477	314	232	159
39 ..	73	32	32	68	82	86	123	109	82	309	259	232	1,487	1,427	641	377	200	114	100
40 ..	41	27	64	59	27	45	64	59	64	168	164	136	918	1,114	523	300	195	109	82
41 ..	14	27	36	27	41	23	59	32	45	109	105	68	586	600	286	173	114	68	55
42 ..	9	14	27	32	45	41	14	27	18	55	50	73	405	386	318	159	91	68	23
43 ..	5	14	18	27	14	18	23	18	14	41	36	36	264	295	132	105	36	64	32
44 ..	14	0	14	4	14	0	14	14	14	27	9	14	138	209	82	45	50	18	18
45 ..	0	18	9	0	9	..	5	5	..	27	18	18	109	91	55	50	14	14	5
46 ..	0	0	5	0	..	..	..	..	..	9	0	5	19	27	18	23	9	0	5
47 ..	4	0	4	5	..	..	..	..	..	0	0	9	22	14	18	14	5	5	4
48 ..	..	0	..	0	..	..	..	..	..	0	0	5	5	9	5	0	4	5	..
49 ..	..	5	..	0	..	..	..	..	..	5	5	0	15	5	0	5	..	4	..
50 ..	..	..	..	4	..	..	..	..	..	0	..	4	8	0	..	..	..	9	..
51 ..	..	..	..	..	..	..	..	..	..	0	..	..	0	4	..	..	..	..	..
52 ..	..	..	..	..	..	..	..	..	..	4	..	..	4	..	..	..	..	..	..
*Age at Maximum	20.0	20.1	20.1	21.0	20.2	20.6	20.9	21.2	22.4	22.4	23.0	22.80	..	23.6	25.1	26.0	27.6	27.4	28.0
Mean Interval	0.0	0.1	0.2	0.3	0.4	0.5	0.5	0.6	0.7	0.8	0.9	1.0	..	1.5	2.5	3.5	4.5	5.5	6.5
Age at Marriage	20.0	20.0	19.9	20.7	19.8	20.1	20.4	20.6	21.7	21.6	22.1	21.8	..	22.1	22.6	22.5	23.1	21.9	21.5
do.,smoothed	20.0	20.0	20.0	20.1	20.2	20.3	20.4	20.8	21.6	21.7	21.8	21.9	..	22.0	22.3	22.7	22.7	22.3	22.0
Frequency at Max.†(crude)	1,890	2,291	3,437	4,527	5,800	6,980	7,933	6,565	5,065	12,100	9,226	6,700	..	24,600	6,960	2,620	1,395	803	541
do.,(smooth'd	1,890	2,290	3,440	4,530	5,800	6,980	7,930	6,560	5,070	12,100	9,230	6,700	72,520	24,600	6,960	2,620	1,400	800	540
Totals ..	16,041	18,452	26,929	33,880	41,156	50,722	63,043	52,472	45,742	111053	86,569	61,789	607848	247676	71,816	29,354	14,908	8,541	5,700
Smoothed ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ratio Max. to Total ..	.1178	.1241	.1277	.1337	.1411	.1377	.1258	.1250	.1108	.1089	.1066	.1084	..	.0993	.0969	.0893	.0939	.0936	.0947

* Age at beginning of year of maximum. Add 0.5 year for the median age of the

durations of Marriage up to 26 Years with Women of Ages 13 to 52 inclusive. Based upon 220,021

1907-1914 inclusive. Unadjusted Numbers.

Interval after Marriage during which a Birth Occurs.																		Total Number of First Births.		Age of Mothers.	
7–8 yrs.	8–9 yrs.	9–10 yrs.	10–11 yrs.	11–12 yrs.	12–13 yrs.	13–14 yrs.	14–15 yrs.	15–16 yrs.	16–17 yrs.	17–18 yrs.	18–19 yrs.	19–20 yrs.	20–21 yrs.	21–22 yrs.	22–23 yrs.	23–24 yrs.	24–25 yrs.	25–26 yrs.	1–26 years.	0–26 years.		
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	12
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	19	..	13
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0	124	..	14
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	18	644	..	15
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	236	4,327	..	16
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,141	14,639	..	17
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3,849	34,179	..	18
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	9,035	55,589	..	19
0	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	14,371	66,879	..	20
14	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	20,057	85,318	..	21
9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	27,906	**93,527**	..	22
36	18	..	9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	32,918	93,361	..	23
82	59	18	9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	**34,582**	86,412	..	24
136	55	14	18	14	0	4	..	..	..	..	..	..	..	..	..	..	..	..	33,600	77,834	..	25
200	118	55	18	18	5	0	..	..	..	..	..	..	..	..	..	..	..	..	32,688	69,875	..	26
232	145	77	64	5	14	0	..	..	..	..	..	..	..	..	..	..	..	..	30,215	59,748	..	27
345	200	127	36	27	18	5	..	..	..	..	..	..	..	..	..	..	..	..	26,703	51,487	..	28
305	255	127	82	23	41	9	..	..	..	..	..	..	..	..	..	..	..	..	22,222	40,261	..	29
391	**264**	**227**	114	86	55	14	9	9	0	0	4	..	..	..	..	..	..	..	19,975	35,432	..	30
327	227	177	118	45	32	41	9	4	0	0	0	..	..	..	..	..	..	..	14,860	25,577	..	31
300	191	191	**205**	100	91	27	41	5	4	14	0	4	..	..	..	..	..	..	13,526	22,589	..	32
323	191	177	123	77	**109**	68	36	9	9	5	0	0	..	..	..	..	..	..	10,885	17,834	..	33
250	205	136	145	**132**	100	82	27	23	5	9	5	5	..	..	..	..	..	..	8,836	13,948	..	34
232	177	150	105	73	105	**114**	**41**	36	23	9	14	0	4	..	..	..	..	..	7,614	11,818	..	35
195	164	95	145	100	50	45	32	**68**	18	14	9	14	0	..	..	..	..	..	6,362	9,781	..	36
136	86	86	77	77	77	59	41	41	36	32	9	9	5	..	..	..	..	..	5,034	7,458	..	37
123	132	123	50	82	73	18	32	36	**45**	**64**	**27**	9	**18**	5	4	..	..	..	4,595	6,440	..	38
77	59	64	64	59	91	45	27	23	9	18	23	5	14	9	4	..	5	..	3,455	4,942	..	39
14	45	32	32	32	27	59	14	23	27	18	14	14	9	14	4	**9**	0	..	2,710	3,628	..	40
36	36	41	27	23	18	9	0	14	23	18	23	9	5	**14**	5	0	4	..	1,601	2,187	..	41
36	23	36	27	9	14	9	5	9	9	18	5	**27**	4	0	5	5	0	..	1,285	1,690	..	42
32	18	14	5	9	0	9	0	18	5	9	4	5	0	0	5	5	0	..	802	1,066	..	43
18	5	19	9	5	0	0	18	14	9	0	..	0	0	9	0	0	0	**9**	537	675	..	44
5	14	5	0	5	..	9	..	..	..	0	..	0	..	0	**14**	0	..	0	281	390	..	45
9	4	..	0	0	..	5	..	..	..	4	..	4	..	5	0	4	..	0	117	136	..	46
5	..	..	0	4	..	..	..	..	..	..	..	..	..	..	..	..	..	5	74	96	..	47
0	..	..	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	27	32	..	48
4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	18	33	..	49
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	9	17	..	50
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	4	..	51
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..	52
30	30	31	32	34	33	35	35	36	38	38	38	40	39	41	45	?	?	?	..	..		*Age at Maximum
7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5	16.5	17.5	18.5	19.5	20.5	21.5	22.5	..	..	..	..	..		Mean Int'rv'l
22.5	21.5	21.5	21.5	22.5	20.5	21.5	20.5	20.5	21.5	20.5	19.5	20.5	18.5	19.5	22.5	..	..	..	..	..		Age at Marriage
22.0	21.9	21.8	21.7	21.6	21.5	21.4	21.3	21.2	21.1	21.0	20.9	20.8	20.7	20.6	20.5	20.4	20.3	20.2	..	..		do., sm'thed
391	264	227	205	132	109	114	41	68	45	64	27	14	14	14	14	9	5	9	..	..		Frequency at Max†(crude)
390	285	225	175	140	115	93	75	60	47	36	27	20	15	11	8	6	5	4	..	..		do.,(sm'thed
3,872	2,691	1,991	1,486	1,005	920	631	332	332	221	232	137	105	59	56	41	23	9	14	392,152	1,000,000		Totals
..	..	..	..	..	820	620	442	322	264	193	140	101	72	51	37	25	16	9	1,000,000	..		Smoothed
.101	.106	.112	.117	.139	.140	.150	.170	.186	.178	.187	.193	.198	.208	.216	.216	.240	.313	.444	..	..		Ratio Max. to Totals

maximum 12 months. † The frequency at the maximum is for the age.

The detailed results for the successive years shew considerable regularity in the frequency of first births even for individual ages, as for example the births, for ages 23 and 25 during the tenth month and first year after marriage, were respectively as follows :—

Interval.	Year.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1908–1914.
Months 10-11	Number (23)	239	232	261	302	328	314	354	290.0*
	Number (25)	195	184	237	249	288	296	308	251.0*
	Corresponding Marriages ..	32,480	32,704	34,127	36,953	39,815	42,078	41,808	37,138*
Years 1–2	Number (23)	622	685	688	698	860	888	909	764.3*
	Number (25)	559	631	604	654	757	813	820	691.1*
	Corresponding Marriages	31,440	32,510	33,163	35,183	38,037	40,814	41,870	36,145*

* Average for the period 1908–1914.

The significance of these figures, which are taken at random, is seen, when the "corresponding marriages" (*i.e.*, the marriages earlier, by the proper interval, than the year indicated) are taken into account. The interval in question is about $10\frac{1}{2}$ months in the one case, and 18 months in the other. Thus for the two upper numbers the figures adopted for 1908 are those for 1907, plus one-eighth of the difference between them and those for 1908, and so on ; and for the lower numbers the mean of the figures for 1906 and 1907 ; and similarly throughout. The ratio of each number to the seventh of the total shews the degree of correspondence since the whole of these ratios are relative, and the vertical columns should be identical for exact correspondence. The ratios corresponding to the six lines above are :—

Interval.	Year.	1908.	1909.	1910.	1911.	1912.	1913.	1914.
Months 10–11	Number (23)	.82	.80	.90	1.04	1.13	1.08	1.22
	Number (25)	.78	.73	.94	.99	1.15	1.18	1.23
	Corresponding Marriages	.87	.88	.92	.99	1.07	1.13	1.13
Years 1–2	Number (23)	.81	.89	.90	.91	1.13	1.16	1.19
	Number (25)	.81	.91	.87	.95	1.09	1.18	1.19
	Corresponding Marriages	.87	.90	.92	.97	1.05	1.13	1.16

Seeing that the original numbers are very limited, the agreement is remarkably good, and confirms the utility of Table LXXVII., and the utility of the graphs of the protogenesic surface, to which surface reference will now be made.

17. **The nuptial protogenesic boundary and agenesic surface.**—If the relative numbers of first-births, after different durations of marriage and for different ages of women, given on Table LXXVII., are regarded as vertical (z) ordinates, with the ages of women and duration of marriage as the other two ordinates (x and y), the surface so defined may be called the *nuptial protogenesic surface* or *surface of nuptial primiparity*. In the graph of such a surface the area for which the ordinates are zero may be called the *agenesic region*, or the surface of absolute sterility; and the boundary between the two may be called the *agenesic boundary*.

The values of x and y for all points on the boundary between the agenesic region and the protogenesic surface are the ages and corresponding durations of marriage which define the existence of perfect sterility. Thus with a duration of marriage of say $6\frac{1}{2}$ years there were no cases of first-births among women of $19\frac{1}{2}$ years of age in the records extending from 1908 to 1914; see Table LXXVII. or Fig. 72.

The Protogenesic Surface. Australia, 1908-1914.

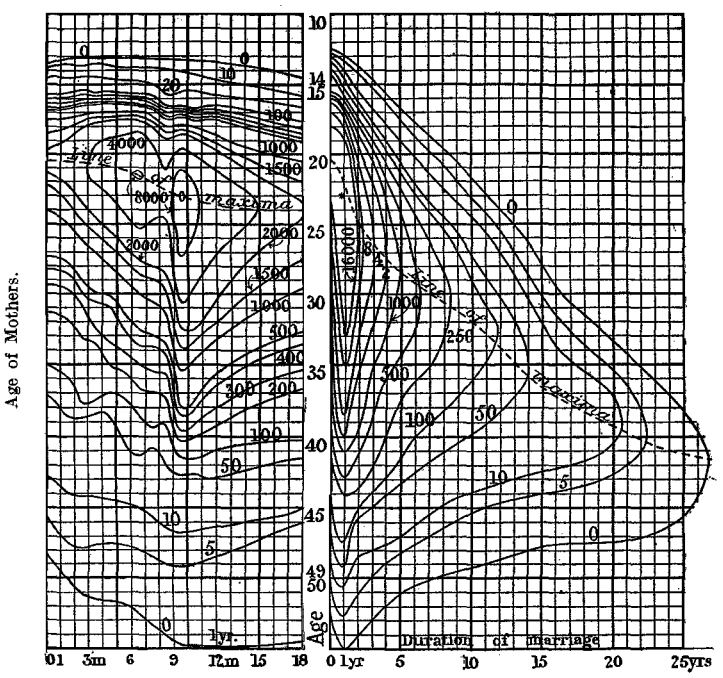


Fig. 72.

The contours represent equal frequency of first-births with varying age and duration of marriage. The area outside the contour 0 is the agenesic region. The figures on the contours are per million first births, for all women of age x last birthday, and for durations of marriage t to $t + 1$, where t is expressed in months on the left hand part of the figure and in years on the right hand part.

The characteristic features of the protogenesic surface are shewn in Figs. 72 and 73. On Fig. 72 this surface is defined, by contours, on extended lateral scale for 0 to 18 months after marriage, and on a smaller

lateral scale from 0 to 27 years after marriage, and in both cases for the whole nuptial reproductive period, say 13 to 52 first-births. A vertical frequency of 1 on the right hand side of Fig. 72 corresponds to the frequency of 12 on the left hand side. The line of maxima is shewn by a broken line on the figure. In Fig. 73 the vertical sections of the protogenesic surface are shewn for each age from 13 to 27 years ("age last birthday"), and for the 5-year groups 28-32, 33-37, 38-42, 43-47, and for the group for all ages from 13 to 52.

Profiles of the Protogenesic Surface.

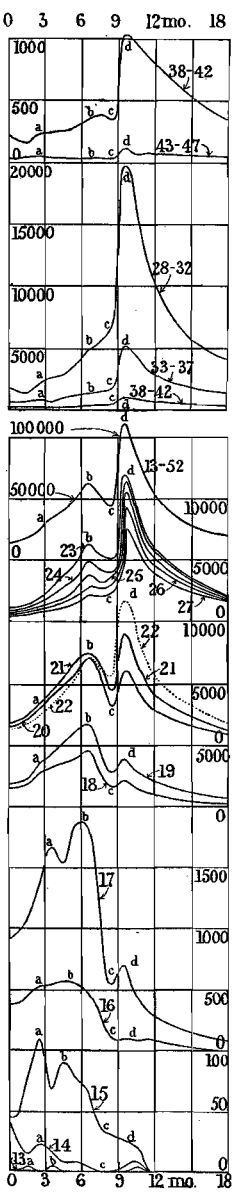


Fig. 73.

The frequencies of first-births, which are identical on any contour, are indicated by figures. These are per million total first births for intervals of a month of duration of marriage on the left-hand side of the figure, and for intervals of a year's duration of marriage on the right hand side. The "age" indicated is always to be taken as the "age last birthday," or what is the same thing, and more general, for the age x to the age $x+1$.

It will be seen that these contours constitute a family of curves for which there is no simple mathematical specification. The unique maximum shewn by a small contour like an "O" on the left hand side of the figure and by an asterisk on the right hand side.

The profiles of the protogenesic surface, shewn on Fig. 73, from 0 to 18 months, are the curves shewing the frequency at various ages, for a total of a million first-births at all ages, and for the first 18 months after marriage. These curves have characteristic similarities, indicated by the points letters a, b, c, d, on the figure. The similarities are important since they shew that there is a remarkable regularity in the interval between marriage and first-birth in women of different ages. The curves drawn are not for instantaneous group-values, viz., for the groups x to $x+dx$, but are the values for mensual groups, the abscissæ for which are referred to the middle of the month.

18. **Curve of nuptial protogenesic maxima.**—The curved broken line on Fig. 72, shewing the ordinates for greatest frequency of first-birth, can be replaced by a regular curve, which will give the actual values of these ordinates with sufficient precision. Adopting as the argument the "age last

birthday," that is the initial value of the age where the range is from x to $x+1$, and for the corresponding initial value of the duration y, where the duration meant is from y to $y+1$, we have—

$$(474).....y = 1.45\ \xi^{\frac{5}{3}} = 1.45\ (x - 20)^{\frac{5}{3}}$$

ξ being the " age last birthday" less 20. This gives the values on the upper line, while those on the lower are scaled from Fig. 72 :—

Age ..	20	25	30	35	40	
Calc. Value	0.0	2.12	6.73	13.23	21.37	(Initial value of the duration.)
Graph Value	0.0	2.2	7.0	13.0	21.5	(„ „ „

The maximum frequency per million total births, where the age is " age last birthday," and the duration is from y to $y+1$, cannot be expressed by any simple mathematical formula. The values, however, are given at the bottom of Table LXXVII.

19. **Ex-nuptial protogenesis.**—The previous issue is not ascertained in the case of ex-nuptial births, and the point of time to which the interval corresponding to duration of marriage should be referred cannot be defined. Hence no comparison can be made with nuptial protogenesis.

20. **Average age for quinquennial age-groups of primiparæ.**—The following table gives the average age of mothers of first-births in quinquennial groups :—

TABLE LXXVIII.—Average Age of Mothers, First-births, for Quinquennial Groups.

Age-group ..	14	15–19	19	20–24	25–29	30–34	35–39	40–44	45–49	50–52
Average Age ..	14.36	18.78	18.77	22.61	27.19	32.06	37.08	41.74	46.31	41.84
Middle Age	14.0	17.50	16.51	22.50	27.50	32.50	37.50	42.50	47.50	46.50
Difference ..	+0.36	+1.28	+2.27	+0.11	−0.31	−0.44	−0.42	−0.76	−1.19	−4.66

The differences between the middle and average ages are obviously too large to be neglected, and therefore it is always necessary to decide whether the average value or the middle value of the ranges of the argument (age-group ranges) shall be used. In general the middle value is the more convenient.

21. **Average interval between marriage and a first-birth, a function of age.**—The data furnished in Table LXXVII. shew that the average interval between marriage and first-births is a definite function of age.[1]

[1] T. A. Coghlan, in his " Child-birth in New South Wales, a study in statistics," has given results (see his Table VIII., on p. 26) for the average period from " marriage to birth of first-child" for " post-nuptial conceptions only." He introduces an adjustment for the non-stationary character of the population from which they are derived, see p. 26. His main result, however, is wholly erroneous, and the true result is inconsistent with his conclusion, viz., that for married women between the ages of 17 and 39 the average period between marriage and a first-birth is only 19.4 months, and the range between 18.3 and 21.5 months. The matter will be referred to more fully later, see pp. 271-2, and particularly the note on the latter page.

If age-groups of primiparæ be formed, it is found that the mean ages of the groups and the average intervals between marriage and first-births are as shewn in the third column of the Table hereunder, viz., LXXIX., see also Figs. 74 and 75. The average values of the ages and of the corresponding intervals are as follows :—

TABLE LXXIX.—Average Ages and Average Interval between Marriage and First-births.

(i.) Age of Married Women ..	Under 20	20–24	25–29	30–34	35–39	40–44	45–49
(ii.) Average Age	18.77	22.61	27.19	32.06	37.08	41.74	46.31
(iii.) Average interval between Marriage and First-birth (crude data)	0.623	0.994	1.483	2.026	2.862	3.501	4.048
(iv.) Average interval by formula (smoothed data)	0.604	0.991	1.502	2.100	2.766	3.420	4.209
(v.) Difference (data–calc.) ..	+0.019	+0.003	—0.019	—0.074	+0.096	+0.080	—0.161

The values on line (iii.) are fairly well given by the simple formula :—

$$(475)\ldots\ldots i = 0.0437\,\chi + 0.01221\,\chi^{1.5}$$

where i is the *average interval* between marriage and the first-births, and χ is 11 years less than the average age, a 5-year group, that is to say, the age 11 is taken as the zero of χ. This age has not been arbitarily adopted, but, as is shewn by the line OP on Fig. 74, is indicated as the minimum age to which reproductive facts should be referred. (See Table LXXII., p. 239 and p. 268).

The small crosses in Fig. 75 are the results for individual years of age last birthday, computed by means of the formula (475) ; see p. 268.

There is a fairly definite indication that the continuation of the curve should be as shewn by the broken line in Figs. 74 and 75, terminating therefore at about age 55. There are, however, so few births at ages greater than 45, that this part of the curve cannot be regarded as yet well determined or determinable : see p. 268.

The following Table, LXXX., gives the results in greater detail, and furnishes also smoothed values of the *approximate* average interval[1] between marriage and first-births for all first-births within a year of marriage, and for all ages during the reproductive period. Since formula (475) refers to the average age, it will not give the quantities in the Table LXXX :—

[1] The intervals are only approximate. They have been calculated by assuming that the births in each month during the first 12 months may be referred to the middle of the months, and those during the intervals of from 1–2 years onwards may be referred to the middle of the year. The change in rapidity of births is so great during the year after that of marriage that a correction is necessary for rigorous accuracy. That the difference is appreciable is obvious from the following results :—

	1st Births to 9 mths	1st Births to 12 mths	All First-births.
Approximate average interval, age 22 ..	5.52	7.53	11.70 months
Average interval more rigorously calculated..	5.53	7.54	10.88 months

The intervals are found more rigorously hereinafter for births occurring not earlier than nine months after marriage.

TABLE LXXX.—The Protogenesic Indices, according to Age. (Approximate Average Intervals between Marriage and First-births)* Australia, 1908-1914.

Age of Mother at Birth.	Average Interval.								
	Births Occurring within 12 months after Marriage.		Births Occurring after 12 mths. Marriage.	All First-births.					
	Crude Result.	Smo'th'd Result.	Crude Result.	Crude Result.	Smoothed Result.		Smoothed Result.		Interval for Age-Group. Crude Result.
Years.	Months.	Months.	Months.	Months.	Months.		Years.		Months.
10 ..	..	..	..	..	0.00		0.00		
11 ..	..	..	..	..	0.85		0.071		
12 ..	..	..	..	..	1.72		0.143		
13 ..	5.17	2.88	18.00	8.38?	2.61		0.217		4.03
14 ..	3.39	3.49	..	3.39	3.53		0.294		
15 ..	4.41	4.06	18.00	4.80	4.47		0.373		(7.48)
16 ..	4.49	4.60	19.85	5.33	5.44		0.453		
17 ..	5.12	5.11	19.15	6.21	6.44		0.537		7.55
18 ..	5.64	5.58	19.54	7.20	7.47		0.623		
19 ..	6.07	6.03	19.94	8.32	8.53		0.711		
20 ..	6.56	6.44	20.57	9.57	9.62		0.802		
21 ..	6.89	6.82	21.19	10.25	10.73		0.896		
22 ..	7.53	7.11	21.51	11.70	11.91		0.992		11.93
23 ..	7.77	7.48	22.84	13.08	13.10		1.092		
24 ..	8.04	7.77	23.99	14.42	14.33		1.195		
25 ..	8.26	8.02	25.29	15.61	15.60		1.300		
26 ..	8.36	8.24	26.69	16.94	16.91		1.409		
27 ..	8.55	8.43	27.75	18.20	18.26		1.522		17.80
28 ..	8.52	8.58	29.46	19.38	19.65		1.638		
29 ..	8.61	8.71	30.95	20.94	21.08		1.757		
30 ..	8.75	8.80	33.68	22.81	22.56		1.880		
31 ..	8.64	8.86	34.39	23.60	24.08		2.007		25.15
32 ..	8.55	8.89	37.44	25.85	25.65		2.137		
33 ..	8.49	8.88	39.41	27.36	27.26		2.272		
34 ..	8.46	8.85	42.38	29.96	28.93		2.411		
35 ..	8.30	8.78	43.75	31.14	30.64		2.553		
36 ..	8.30	8.68	45.85	32.73	32.41		2.700		
37 ..	8.44	8.55	47.51	34.82	34.22		2.852		34.34
38 ..	8.45	8.38	52.24	39.70	36.09		3.008		
39 ..	7.99	8.19	50.15	37.47	38.02		3.168		
40 ..	7.71	7.96	49.74	39.09	40.00		3.333		
41 ..	7.62	7.70	55.74	42.82	42.03		3.503		
42 ..	7.32	7.41	56.15	44.50	44.13		3.677		42.01
43 ..	7.26	7.08	53.32	41.90	46.28		3.856		
44 ..	6.87	6.73	59.60	48.99	48.50		4.041		
45 ..	7.46	6.34	55.77	42.13	50.77		4.231		
46 ..	8.25	5.92	78.92	69.50	53.11†	51.50‡	4.426†	4.292‡	
47 ..	5.90	5.47	64.50	50.55	55.51	50.55	4.626	4.212	48.58
48 ..	11.50	4.98	52.00	46.21	57.98	46.22	4.832	3.851	
49 ..	7.17	4.47	54.00	33.93	60.52	40.50	5.043	3.375	
50 ..	7.50	3.92	66.00	36.75	63.12	30.50	5.260	2.542	
51 ..	..	3.34	18.00	18.00	65.79	18.00	5.483	1.500	28.54
52 ..	9.50	2.73	..	9.50	68.53	9.50	5.711	0.792	
53 ..	..	..	..	..	71.34	3.00	5.945	0.250	
54 ..	..	..	..	..	74.23	1.20	6.185	0.100	
55 ..	..	..	..	..	77.18	0.00	6.432	0.000	
	7.49 months 24.20 years		29.06 m. 27.34 yrs.	15.95 months. 25.43 years.					

* Based on a total of 220,021 births. † These values from ages 46 to 55 are merely extensions of the curve. ‡ These values are probably fairly reliable.

The yearly groups may with advantage be referred to the " age last birthday," instead of the middle-age value, which is approximately the "age last birthday plus $\frac{1}{2}$." Let then ξ denote the " age last birthday," less 10 ; the intervals are found to be very accurately given in months and in years respectively by the following formulæ, viz. :—

$$(476)\ldots.i' = 0.8364\xi + 0.01062\xi^2 + 0.000198\xi^3, \text{ and for months ;}^1$$

$$(476a)\ldots.i'' = 0.0697\xi + 0.000885\xi^2 + 0.0000165\xi^3, \text{ for years :}^1$$

ξ is of course expressed in years in either case. The values may be readily computed by taking the interval for age 10 as zero, and the smoothed results for 20, 30 and 40, and applying formulæ (199) to (199c), see Part V., § 7, p. 69, and remembering that the coefficients b, c, d vary inversely as the variable, and as the square, and the cube of the variable, respectively. To develope the table we may calculate the values for 11, 12 and 13 (*i.e.*, for $\xi = 1, 2$ and 3), or calling the leading differences for 10 years as D_1, D_2, and D_3, the leading differences d_1, d_2 and d_3 can be found by the formulæ[2]—

$$(477)\ldots\ldots d_1 = 0.1D_1 - 0.045D_2 + 0.0285D_3$$

$$(477a)\ldots. d_2 = \ldots\ldots 0.01D_2 - 0.009D_3$$

$$(477b)\ldots. d_3 = \ldots\ldots\ldots\ldots 0.001D_3$$

We have also, for the coefficients of the equations above :—

$$(478)\ldots\ldots b = d_1 - \tfrac{1}{2}d_2 + \tfrac{1}{3}d_3$$

$$(478a)\ldots. c = \ldots\ldots \tfrac{1}{2}d_2 - \tfrac{1}{2}d_3$$

$$(478b)\ldots. d = \ldots\ldots\ldots\ldots \tfrac{1}{6}d_3$$

The agreement between the crude values and the values by formula (476) for the average interval between marriage and first-birth is remarkably close throughout, the curve applying as far as age 45. Beyond this age the values for the extrapolated curve are given as well as those of the probable value of the interval.

22. **The protogenesic indices.**—The average interval, calculated as shewn in the preceding section (viz., by formula (484) in the section next following, § 23, but omitting the correction term ϵ) is not rigorously

[1] These formulæ are for the " approximate" average interval ; see the preceding note.

[2] See Text Book. Institute of Actuaries, Part II., Chap. XXIII., Art. 22, p. 443, Edit. 1902.

exact, but is sufficiently approximate to be used as an index of the frequency distribution throughout the interval. We shall call the interval so calculated the *protogenesic index* for married women of the age in question, and for all ages, the *general protogenesic index*.[1]

Table LXXX. is thus a table of protogenesic indexes rather than a table of average intervals, though the intervals are approximately correct.

We shall now consider methods of correctly estimating the interval.

23. **Exact evaluation of the average interval from a limited series of group-values.**—The average interval may be determined with a higher degree of approximation from the series of group-values *for equal ranges* themselves by formulæ developed as follows :—Since the group-values can often[2] be reproduced with sufficient accuracy by a rational integral function we have, in such cases, for the value (x_m) of the interval (the distance to the centroid vertical) :—

$$(479)\ldots x_m = \frac{\int_0^x xy\,dx}{\int_0^x y\,dx} \equiv \frac{\frac{1}{2}ax^2+\frac{1}{3}bx^3+\text{etc.}}{ax+\frac{1}{2}bx^2+\text{etc.}} = \frac{1}{2}x + \frac{bx^2+cx^3+\frac{9}{10}dx^4+\frac{4}{5}ex^5+\ldots}{12a+6bx+4cx^2+3dx^3+\frac{12}{5}ex^4+\ldots}$$

in which last expression we may substitute, by means of formulæ (195) to (197), see Part V., § 5, pp. 67, 68, the values of the groups themselves for a, b, c, etc. This will give a series of formulæ according to the number of groups taken simultaneously into account. We may take the common value and the ranges as unity : if it be k the value deduced will then be multiplied finally by k.

It will be convenient to call the group values A, B, C, etc., hence if n of these are included, n will be the value of x. That is to say, in formulæ in which D appears, x will be 4. From (479) we thus obtain the following series of formulæ, viz :—

$$(480)\ldots\ldots x_m = 1 + \frac{2}{3}\cdot\frac{-A+B}{A+B}\ ;\ \text{for } x = 2;$$

$$(481)\ldots\ldots x_m = 1\tfrac{1}{2} + \frac{9}{8}\cdot\frac{-A+C}{A+B+C}\ ;\ \text{for } x = 3;$$

$$(482)\ldots\ldots x_m = 2 + \frac{4}{45}\cdot\frac{-19A-3B+3C+19D}{A+B+C+D}\ ;$$
$$\text{for } x = 4\ ;\ \text{and}$$

$$(483)\ldots\ldots x_m = 2\tfrac{1}{2} + \frac{125}{288}\cdot\frac{-5A-2B+2D+5E}{A+B+C+D+E}\ ;\ \text{for } x = 5$$

[1] To fully define the term it should be preceded by the term " nuptial " ; but for obvious reasons this may be always understood.

[2] But not invariably : see latter part of Section 24.

If the common range be k, these expressions should of course be multiplied by that quantity.

From these formulæ multiply-infinite series of formulæ may be developed, and such development can be effected by processes similar to those indicated in Part VI., § 2, and Table VI., pp. 75 to 77.

A practical way of applying the formulæ is to calculate by an approximate method and make the necessary correction, if it be sensible. Thus :—

$$(484)\ldots\ldots x_m = \frac{(A + 3B + 5C + 7D + \text{etc.})}{2(A + B + C + D + \text{etc.})} + \epsilon$$

where ϵ is a small quantity. For the value of ϵ, we have, from (480) to (483) :—

$$(485)\ldots\epsilon_2 = \frac{1}{6} \cdot \frac{-A + B}{A + B};$$ when there are two quantities only.

$$(486)\ldots\epsilon_3 = \frac{1}{8} \cdot \frac{-A + C}{A + B + C};$$ when there are three quantities only.

$$(487)\ldots\epsilon_4 = \frac{1}{90} \cdot \frac{-17A + 21B - 21C + 17D}{A + B + C + D};$$ when there are four quantities only.

$$(488)\ldots\epsilon_5 = \frac{1}{288} \cdot \frac{-49A + 38B - 38D + 49E}{A + B + C + D + E};$$ when there are five quantities only.

Σ_n denoting the sum of n successive groups, A, B, etc., these expressions may be put in the arithmetically more convenient form hereunder, viz. :—

$$(489)\ldots\epsilon_2 = 0.1\dot{6}(B - A) / \Sigma_2;\ \epsilon_3 = 0.125(C - A) / \Sigma_3;$$
$$\epsilon_4 = \{ 0.1\dot{8}(D - A) - 0.2\dot{3}(C - B) \} / \Sigma_4$$

$$(490)\ldots\epsilon_5 = \{ 0.17014(E - A) - 0.13194(D - B) \} / \Sigma_5$$

Whenever each group-value in a series is not greater than say 2 to $2\frac{1}{2}$ times an adjoining group-value, the preceding formulæ give fairly good results, and may be used for a succession of three, four, or five groups in a way which will now be indicated.

24. **Evaluation of group-intervals for an extended number of groups.**— To apply the preceding formulæ to a large number of groups it will be convenient to adopt the following notation. Let A, B, C, etc., be denoted by A_1, A_2, A_3, etc., and let also $x' = x_m$ for A_1 to A_k reckoned from the beginning of A_1, $x'' = x_m$ for say A_{k+1} to A_m, etc., reckoned

not from the beginning of A_{k+1}, but from the beginning of A_1; and so on. Let also A', A'', etc., denote the totals of the various series of groups in question; that is, let $A' = A_1 + A_2 +$ etc.; $A'' = A_{k+1} + A_{k+2} +$ etc.; and so on.[1] Then the value for the entire series is :—

$$(491)\ldots\ldots {}_0x_m = \frac{A'x' + A''x'' + A'''x''' + \text{etc.}}{A' + A'' + A''' + \text{etc.}} = \frac{\Sigma(A'x')}{\Sigma A'}$$

Consequently, if $x' = w' + \epsilon'$, where w' is an approximate value of x' and ϵ' is the *correction* to make it exact, we shall have for the true value of ${}_0x_m$:—

$$(492)\ldots\ldots {}_0x_m = \frac{\Sigma(A'w')}{\Sigma A'} + \frac{\Sigma(A'\epsilon')}{\Sigma A'}$$

in which $\Sigma(A'\epsilon') = A'\epsilon' + A''\epsilon'' +$ etc. Let the factors 1/6, 1/8, 1007/90, 3051/90, 49/288, 38/288, on formulæ (485) to (488) be denoted by a_1, a_2, etc., and generically by a', a'', etc. Then, since when ϵ', ϵ'', etc., are multiplied respectively by A', A'', etc., their denominators disappear, we have, for the total correction ϵ_0 say, the sum of the numerators divided by the sum of all the groups. Thus $a A'$, $a'' A''$, etc., denoting the numerators, we have :—

$$(493)\ldots\ldots {}_0x_m = \frac{\Sigma(A'w')}{\Sigma A'} + \frac{\Sigma(a'A')}{\Sigma A'}$$

that is to say, the approximate value of the average interval, found by multiplying each group by the middle value of its interval, and dividing the sum of all the products by the sum of all the groups, merely requires the correction found by multiplying each group by its correction coefficient (a), and dividing by the sum of the whole of the groups. Hence formulæ may be developed to embrace the corrections by multiplying the individual groups by factors, and these factors are readily found by summations. Thus we obtain the following, viz. :—

$$(494)\ldots {}_0x_m = (0.375\,A_1 + 1.5\,A_2 + 2.625\,A_3 + 3.375\,A_4 + 4.5\,A_5 + 6.625\,A_6 + \text{etc.}) / \Sigma A.$$

the series of coefficients being in threes; thus the coefficient for the third term from any term of the series is 3 greater than that of the term from which it is reckoned. Further, :—

$$(495)\ldots {}_0x_m = (0.3\dot{1}\,A_1 + 1.7\dot{3}\,A_2 + 2.2\dot{6}\,A_3 + 3.6\dot{8}\,A_4 + \text{etc.}) / \Sigma A \text{ ; and}$$

$$(495a)\ldots {}_0x_m = (0.32986\,A_1 + 1.63194\,A_2 + 2.5\,A_3 + 3.36806\,A_4 + 4.57014\,A_5 + \text{etc.}) / \Sigma A \text{ ;}$$

the series of coefficients being respectively in fours and in fives: thus the coefficient of the fourth term in the one case, and of the fifth term in the other, from any term in the series, is 4 greater in the former case and 5 greater in the latter, than the coefficient of the term from which it is reckoned.

[1] It is of course immaterial what number of groups are combined.

25. **Average interval for curves of the exponential type.**—In cases where A_2 is very small (or very large) compared with A_1, the preceding formulæ are not very accurate.[1] In general, if the curve giving the groups be approximately of the type $e^{\pm mx}$, and the groups be also very different in magnitude, it is preferable to proceed as follows :—[2]

Let A_1, A_2 be two adjoining groups ; these can be satisfied by the equation :—

$$(496)\ldots\ldots y = Be^{bx}, \text{ or } y = e^{a+bx} ;$$

in the former of which, therefore, $B = e^a$. Similarly three adjoining groups, A_1, A_2 and A_3 may be satisfied by the equation :—

$$(497)\ldots\ldots y = A + Be^{bx}$$

Putting A_1 the group for the range 0 to 1 ; A_2 the group with the range 1 to 2 ; A_3 the group with the range 2 to 3 ; we have from these equations the following, viz. :—From (496) :—

$$(498)\ldots\ldots \frac{A_2}{A_1} = \frac{A_3}{A_2} = e^b ; \text{ or } b = 2.3025851\ log_{10}\frac{A_2}{A_1}$$

and this applies to a whole series of groups if the ratio A_{n+1}/A_n be constant. Also :—

$$(499)\ldots\ldots B = \frac{b\,A_1}{e^b - 1} = \frac{b\,A_2}{(e^b - 1)e^b} = \frac{b\,A_3}{(e^b - 1)\,e^{2b}} = \text{etc.}$$

the final equation in (499) being true only if $A_3/A_2 = A_2/A_1 = n$, say.

From (497) we have, similarly to (499) :—

$$(500)\ldots A_1 = A + B\,(e^b - 1)/b ;\ A_2 = A + B\,(e^b - 1)\,e^b/b ;$$
$$A_3 = A + B\,(e^b - 1)\,e^{2b}/b ;$$

and consequently :—

$$(501)\ldots\ldots (A_3 - A_2)/(A_2 - A_1) = e^b,$$
$$\text{or } b = 2.3025851\ log_{10}\{(A_3 - A_2)/(A_2 - A_1)\} ; \text{ etc.}$$

---

[1] For example, if there be two groups, on equal bases 0-x, x-$2x$, one of which is three times greater than the other, the straight line (which in such a case would be the assumed curve, giving areas equal to the groups), would start at the terminal 0 (or $2x$) of one of the groups. If one is greater than 3 times the other, it will fall within one of the rectangles. The question has been exhaustively considered by Prof. Karl Pearson, see Biometrika, Vo. I., pp. 265-303, Vol. II., pp. 1-23.

[2] As the formulæ of this section are of general application x has been used for the independent, and y for the dependent variable.

Writing n for e^b, we have also :—

(502).. $B = b\,(A_2 - A_1)/(n-1)^2 = b\,(A_3 - 2A_2 + A_1)/(n-1)^3$, etc. ;

and

$$(503)\ldots\ldots A = A_1 - \frac{B}{b}(n-1) = A_1 - \frac{A_2 - A_1}{n-1} = \frac{A_1 n - A_2}{n-1}, \text{ etc.}$$

Thus the constants b, B and A in (497) are determined.

In applying these formulæ to ascertain the average interval, four cases will require specially to be considered, viz., when the factor b is positive, and when it is negative, the range being either 0 to 1, or 1 to 2 in both cases. For the ascending and descending branches respectively, these cases correspond to the curves Be^{bx} and Be^{-bx}. For the purpose in view (496) is suitable, and the results, to be tabulated for various ratios of A_1/A_2 or A_2/A_1, will be the groups $B\int_0^1 e^{bx}$, $B\int_1^2 e^{bx}$, $B\int_0^1 e^{-bx}$, and $B\int_1^2 e^{-bx}$. The mean interval lies between the centre of the group-range and the side on which the groups have higher values. For the more general case, that is when three values are satisfied, we should have to determine

$$(504)..\ x_m = \frac{\int xy\,dx}{\int y\,dx} \equiv \frac{\int x(A + Be^{bx})\,dx}{\int (A + Be^{bx})\,dx} \equiv \frac{\frac{1}{2}Ax^2 + B\{(bx-1)e^{bx}+1\}/b^2}{Ax + B(e^{bx}-1)/b}$$

If A, however, be taken as zero, this last will become

$$(505)\ldots\ldots {}_0x_m \equiv \frac{(bx-1)\,e^{bx}+1}{b\,(e^{bx}-1)} = \frac{xe^{bx}}{e^{bx}-1} - \frac{1}{b}$$

which function is the basis of the tabulation hereunder for ratios of A_2 to A_1 and for ranges of $x = 1$ and 2, by applying (498). It may be noted that the value of (505) $= 0$ for $x = 0$. In the table hereunder, LXXXI., the four cases above referred to are as follows :—

Case	I. ;	$A_2 > A_1$;	Origin 0 ;	Range	0—k ;	Tabular	Interval	computed	from	0.
„	II. ;	„ ;	„ ;	„	k—$2k$;	„	„	„	„	k.
„	III. ;	$A_2 < A_1$;	„ ;	„	0—k ;	„	„	„	„	0.
„	IV. ;	„ ;	„ ;	„	k—$2k$;	„	„	„	„	k.

These four cases are illustrated by Fig. 78, hereinafter.

The necessary formulæ for calculating the required values are simple if we put $A_2 = n A_1$, viz. :—

$$(506)..\ {}_0x'_1 = 1 + \frac{1}{n-1} - \frac{1}{b}\ ;\ {}_1x'_2 = 2 + \frac{1}{n-1} - \frac{1}{b}\ ;\ \ldots {}_{p-1}x'_p = p + \frac{1}{n-1} - \frac{1}{b}\ ;$$

formulæ which are convenient for computing tabular values.

For negative values of b, in which case A_2 is less than A_1, it is arithmetically convenient to use the ratio $A_1/A_2 = m$, so that $m = 1/n$, and put $\beta = -b$, then the preceding formulæ become :—

$$(507)..\ {}_0x''_1 = 1 - \frac{m}{m-1} + \frac{1}{\beta}\ ;\ {}_1x''_2 = 2 - \frac{m}{m-1} + \frac{1}{\beta}\ ;\ {}_{p-1}x''_p = p - \frac{m}{m-1} + \frac{1}{\beta}$$

It may be easily verified that ${}_{p-1}x'_p + {}_{p-1}x''_p = 1$.

By means of the preceding formulæ Table LXXXI. has been computed: it will serve for readily estimating the position of the centroid vertical for any group by means of the relative magnitudes of the adjoining groups. The determination of that vertical from the relative magnitudes of the groups on either side of any group in question gives results of a fair degree of precision.

To satisfy three groups by means of (497) we have for the value of A in terms of A_1 to A_3, :—

$$(508)\ldots\ldots A = \frac{A_1 A_3 - A_2^2}{A_1 + A_3 - 2A_2}$$

instead of (503): hence we can subtract this quantity from the groups and we then obtain :—

$$(509)\ldots\ldots A'_1 = A_1 - A\ ;\quad A'_2 = A_2 - A\ ;\ \text{etc.}\ ;\ \text{etc.}$$

these reduced groups, denoted by accents, conforming to the relation $A'_3/A'_2 = A'_2/A'_1$.

The value of the average interval is therefore :—

$$(510)\ldots {}_0x'_p = \frac{\frac{1}{2}(1+3+\ldots 2p-1)A + A'_1\,{}_0x'_1 + A'_2\,{}_1x'_2 + \ldots \text{to } p \text{ terms}}{A_1 + A_2 + \ldots\ldots \text{to } p \text{ terms.}}$$

Results so computed have a high order of precision. If A, and A'_1, etc., be expressed in ratios to A_1+ etc., as unity, the denominator of course disappears.

TABLE LXXXI.—Abscissæ of the Centroid Verticals of Groups Bounded by the Curve Be^{bx} and Be^{-bx}. For the Computation of Average Intervals, etc.

Ratio A_2/A_1 or A_1/A_2	Case I.	Case III.	Ratio A_2/A_1 or A_1/A_2	Case I.	Case III.	Ratio A_2/A_1 or A_1/A_2	Case I.	Case III.
1.0	.50000	.50000	4.0	.61199	.38801	9	.66988	.33012
1.25	.51857	.48143	4.5	.62085	.37915	10	.67682	.32318
1.5	.53370	.46630	5.0	.62867	.37133	11	.68297	.31703
1.75	.54639	.45361	5.5	.63563	.36437	12	.68848	.31152
2.0	.55731	.44269	6.0	.64189	.35811	13	.69346	.30654
2.25	.56685	.43315	6.5	.64757	.35243	14	.69800	.30200
2.5	.57531	.42469	7.0	.65277	.34723	15	.70216	.29784
2.75	.58290	.41710	7.5	.65754	.34246	20	.71672	.28328
3.0	.58976	.41024	8.0	.66196	.33804	25	.73100	.26900
3.5	.60177	.39823	8.5	.66606	.33394	50	.76479	23521

For case II. add unity to the value for case I., and for case IV. add unity to the value for case III.

Applying the various formulæ to the results given on the penultimate line on Table LXXVII. for all first-births, 12 months or more after marriage, the following results are obtained :—

By formula (484), neglecting the correction ϵ, 29.06 months (Index).
,, (494), applied through same range, 28.18 ,, (Interval)
,, (495) ,, ,, ,, 28.00 ,, ,,
,, (506) ,, ,, ,, 27.72[1] ,, ,,
By graduating and using monthly values for the groups up to 48 months 27.70[1] ,, ,,

26. **Positions of average intervals for groups of all first-births.**—The positions of the average intervals (abscissæ of the centroid verticals), computed on the basis of the results shewn on the penultimate line of Table LXXVII., will probably be found approximately true for any population. By means of Table LXXXI., they may be readily found.

TABLE LXXXII.—Average Intervals* in Months for First-births, for Various Ranges of Interval. Australia, 1908-1914.

Range of Int'rval	Average Value.	Range of Int'rval	Average Value.	Range of Int'rval	Average Value.	Range of Int'rval	Average Value.	Range of Int'rval	Average Value.	Range of Interval	Average Value.
months.	months.	years.	months.	years.	months.	months.	months.	months.	months.	years.	months.
0– 1	.051	0– 1	7.51	12–13	149.76	0–3	1.70	0– 6	3.68	½– 1	10.34
1– 2	1.52	1– 2	16.35	13–14	161.69	3– 6	4.65	0– 9	5.41	½– 5	17.35
2– 3	2.53	2– 3	28.95	14–15	173.67	6– 9	7.40	0–12	7.51	½–10	19.60
3– 4	3.52	3– 4	39.22	15–16	185.73	9–12	10.34	years		½–15	20.43
4– 5	4.52	4– 5	53.39	16–17	197.74	years		0– 5	13.07	½–20	20.72
5– 6	5.52	5– 6	65.53	17–18	209.69	0– 1	7.51	0–10	14.63	½–25	20.79
6– 7	6.50	6– 7	77.61	18–19	221.68	1– 5	22.36	0–15	15.19	½–26	20.80
7– 8	7.49	7– 8	89.63	19–20	233.67	5–10	81.12	0–20	15.38	1– 5	22.36
8– 9	8.55	8– 9	101.67	20–21	245.66	10–15	142.95	0–25	15.43	1–10	25.82
9–10	9.53	9–10	113.71	21–22	257.67	15–20	203.05	0–26	15.43	1–15	27.13
10–11	10.52	10–11	125.73	22–23	269.65	20–25	261.40			1–20	27.59
11–12	10.53	11–12	137.77	23–24	281.58	25–26	305.43			1–25	27.71
				24–25	293.49					1–26	27.72

* These will be sensibly true for any distribution at all similar to that shewn in Table LXXVII. and in Table LXXXIII. hereinafter.

The above results have been computed by using graphic graduation[2] where necessary, by means of the values given in Table LXXXI., and by formula (416), p. 201. In general the computed values proved to be sensibly identical. A result intermediate between the extreme values has always been taken, regard being had to the general probabilities of each case.

[1] These last results are the most accurate; the value for the month 11-12 is taken into account in the graduating; in applying formulæ (494) and (495) and (506) it is not considered.

[2] It is impossible in the absence of monthly data to determine the position of the centroid vertical with great precision. By graphic graduation conforming to the 11 to 12 months group and to the 1-2, and 2-3 years groups, the result, 16.46 was obtained. By extrapolating the 10-11, 11-12 months group-results, adopting this extrapolation for the year-group 0-1, and conforming to this fictitious year-group and the actual year-groups 1-2 and 2-3, the result is 16.25 by formula (510). Adopting the extrapolated result and the group 1-2 only, gives 15.91; while the exponential curve conforming to the group 1-2 and 2-3 only, gives the result 16.79. The groups 1-2, 2-3 and 3-4, treated by formulæ (508) and (510) give 16.63. After consideration of all the circumstances I have adopted 16.35 as the result which I believe to be nearest the correct value. Similarly the results 28.95, 28.93 and 29.11 were obtained for the group 2-3; of these the first was adopted.

Average Issue and the Protogenesic Indices.

Fig. 75.

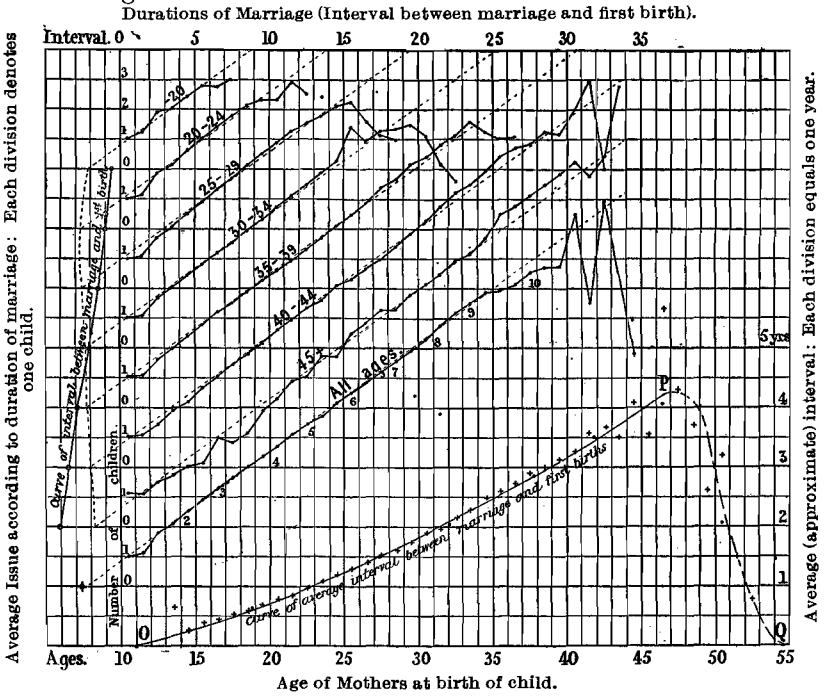


Fig. 74.

FIG. 74.—The lower curve OPQ is the curve of the protogenesic indices (or approximately computed average intervals between marriages and the first-births) according to the age of mother at the birth of the first child.

FIG. 75.—The upper series of lines are graphs of the average number of children born to all mothers under 20 years of age, to mothers of from 20 to 24, 25 to 29, etc., and to mothers of all ages—who come under observation—according to duration of marriage. The fine dots give the crude results. The parallel broken lines indicate that the average *rate of increase* is nearly independent of the age of the mothers, and is dependent on the duration of the marriage.

27. **The unprejudiced protogenesic interval.**—The protogenesic interval gives unequivocally a measure of what may be called the *modified-fertility* of married women, that is fertility as modified by physiological and social conditions, by Malthusianism, etc. It is evident that *first* births are likely to give the best available indication of the physiological element in fertility; that is to say, the ratio of cases of nuptial-maternity at any age to the total number of nulliparous women, is a better indication of variations with age of physiological fertility, than would be the indication given by later births. But what have been called "prejudiced cases" should obviously be excluded, viz., cases where maternity, being expected, leads to marriage. For this reason the interval obtained by excluding such cases is not only appreciably longer, but also gives a truer idea of the normal probability of maternity, other things being equal. Results were published in New South Wales in 1899, purporting to shew

that, *when prejudiced cases were excluded*, the "average period from marriage to the birth of a first child" was, for unprejudiced mothers of from 17 to 39 years of age, about 19½ months, individual cases ranging between 18.3 and 21.9 months.[1] In order to definitely ascertain whether there was any justification for the statement, the New South Wales statistics, upon which they were based, were examined and recompiled; the data are given in Table LXXXIII. hereunder.

Table LXXXIII.—Interval between Marriage and First Births occurring later than 9 Months after Marriage.—New South Wales, 1893–98.

Age.	Interval (mths.)			Interval Years.)																		
	9 to 10	10 to 11	11 to 12	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	10 to 11	11 to 12	12 to 13	13 to 14	14 to 15	15 to 16	16 to 17	17 to 18	18 to 19	20 to 21	22 to 23	
13	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
14	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
15	3	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5
16	15	11	7	20	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	54
17	52	51	42	132	9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	286
18	134	137	108	380	37	3	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	800
19	273	256	159	641	73	17	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,420
20	320	337	209	772	129	36	9	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,818
21	470	425	292	1,026	172	41	11	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2,439
22	544	521	365	1,181	210	61	22	4	6	1	..	..	..	..	..	..	..	..	..	..	..	..	..	2,915
23	483	498	357	1,205	249	79	37	17	7	1	1	..	..	..	..	..	..	..	..	..	..	..	..	2,934
24	453	431	265	1,031	245	96	40	13	9	5	1	..	..	..	..	..	..	..	..	..	..	..	..	2,589
25	419	382	246	925	205	85	41	17	10	6	5	2	1	..	..	..	..	..	..	..	..	..	..	2,344
26	342	294	240	801	205	83	41	17	19	4	5	1	1	..	1	..	..	..	..	..	..	..	..	2,054
27	243	264	185	650	176	74	38	34	15	10	2	7	..	2	..	..	..	..	..	..	..	..	..	1,700
28	232	185	153	549	142	86	32	27	15	18	4	5	3	1	1	..	..	..	..	..	..	..	..	1,453
29	141	145	103	417	122	52	43	13	12	9	6	8	3	2	2	..	..	..	..	..	..	..	..	1,078
30	133	131	83	343	124	46	37	32	16	14	6	6	3	5	3	1	..	..	..	..	..	..	..	983
31	68	83	62	248	76	32	20	10	13	7	4	7	6	5	1	..	..	1	..	..	..	..	..	643
32	52	53	48	209	78	27	12	19	9	9	14	7	8	3	3	4	1	..	..	..	..	..	..	556
33	48	47	41	142	66	25	13	8	8	8	6	6	4	3	3	1	2	..	..	..	..	..	..	431
34	33	45	31	117	43	16	13	5	6	1	2	2	4	1	4	4	4	1	..	1	..	..	..	333
35	33	29	25	95	34	16	11	6	2	4	8	4	5	..	3	..	4	1	..	1	..	..	..	281
36	29	25	12	90	32	7	12	6	4	1	4	7	3	4	4	..	1	2	..	1	1	1	..	246
37	12	22	9	59	20	8	8	6	2	2	1	2	..	3	..	2	1	1	1	..	..	..	..	159
38	10	12	8	58	13	14	3	7	..	3	1	3	1	2	1	..	..	..	1	1	..	..	..	138
39	11	8	13	47	15	9	5	1	1	1	2	2	..	..	1	1	..	..	..	1	..	..	..	118
40	..	3	5	37	15	6	2	3	..	..	1	1	1	2	1	..	2	..	3	..	1	..	..	83
41	2	2	..	10	7	3	..	1	1	..	1	..	..	1	..	..	..	..	1	..	..	..	2	31
42	3	6	3	17	12	3	..	1	1	2	1	..	..	..	..	..	..	..	..	..	..	..	..	49
43	1	3	2	8	3	2	1	1	..	1	..	..	1	..	1	..	..	..	..	..	..	..	..	24
44	2	..	..	6	1	1	..	..	1	..	..	..	..	..	1	..	..	..	..	..	..	..	..	12
45	..	1	1	9	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	12
46	..	..	..	3	..	..	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	5
Σ	4,561	4,407	3,075	11229	2,515	928	453	256	158	107	76	70	44	34	30	13	15	6	6	5	2	1	2	27,993

Further, to ascertain whether any material difference existed between the results for New South Wales for the period 1893-8, and for the whole of Australia for the period 1908-14, the latter were also computed, and are shewn in the same table. On Fig. 79 the intervals for successive ages are shewn by a light zig-zag line, and for the Commonwealth by a heavy zig-zag line. The two are evidently substantially identical, as the figures in Table LXXXIV. also shew.

[1] See note on page 257, hereinbefore.

Table LXXXIV.—Protogenesic Interval or Average Interval elapsing between Marriage and First-birth, for all First-births occurring not Earlier than 9 months after Marriage. New South Wales, 1893-8; and Australia, 1908-14.

Age of Mother last Birth-day.	Interval.		Age of Mother last Birth-day.	Interval.		Age of Mother last Birth-day.	Interval.		Age of Mother last Birth-day.	Interval.	
	N.S.W.	Aust.		N.S.W.	Aust.		N.S.W.	Aust.		N.S.W.	Aust.
years.	months.	months.	years.	months.	months.	years.	months.	months.	years.	months.	months
13	—	13.83*	23	16.10	16.25	33	28.87	30.70	43	—	49.38
14	—	10.14*	24	16.88	17.20	34	30.10	33.64	44	—	57.35
15	—	12.09*	25	17.30	18.23	35	32.21	35.04	45	—	47.49
16	—	13.65	26	28.28	19.49	36	35.91	36.92	46	—	58.70
17	13.48	12.72	27	19.71	20.54	37	32.34	38.55	47	—	—
18	13.93	13.46	28	20.91	21.92	38	33.00	43.62	48	—	—
19	14.40	14.05	29	22.07	23.39	39	28.47	42.14	49	—	—
20	15.03	14.46	30	24.65	25.42	40	43.88	43.77	50	—	—
21	14.71	14.76	31	25.15	26.28	41	—	48.57	51	—	
22	15.04	15.02	32	30.09	28.94	42	—	49.83	52	—	—

* Depend upon 9, 14, and 68 cases only.

The above table and Fig. 79 indicate that there has been no material change in the interval between marriage and first-birth during the elapsed 15 years, and also that the average period is not constant but is a function of the age when tabulated according to "age of mothers," that is, according to age at maternity. It will be shewn later that when the

TABLE LXXXV.—Approximate Protogenesic Index for

(These results are only approximate, the table being constructed from the data in Table

Ages of Mothers at Marriage.	Number of each Duration of Marriage, the total being 1,000,000,															
	0–9 months.	9–12 months.	1–2 yrs.	2–3 yrs.	3–4 yrs.	4–5 yrs.	5–6 yrs.	6–7 yrs.	7–8 yrs.	8–9 yrs.	9–10 yrs.	10–11 yrs.	11–12 yrs.	12–13 yrs.	13–14 yrs.	14–15 yrs.
12	..	0	4	0	0	0	0	0	0	0	0	0	0	0	4	0
13	10	5	0	0	9	9	5	0	0	0	0	9	0	0	0	0
14	110	14	18	18	5	0	0	9	14	0	0	9	14	5	0	0
15	576	50	209	73	50	32	27	23	9	18	18	18	18	14	5	0
16	3,832	259	1,054	377	155	64	36	32	36	59	14	18	5	18	9	9
17	12,040	1,458	3,417	1,054	382	227	132	95	82	55	55	64	27	41	14	9
18	25,771	4,559	7,794	1,968	682	395	236	191	136	118	77	36	23	55	41	41
19	37,328	9,226	11,921	2,950	1,118	677	377	277	200	145	127	82	86	32	27	36
20	38,259	14,249	16,125	3,995	1,859	904	550	459	232	200	127	114	45	91	68	27
21	**44,522**	20,739	22,225	5,672	2,268	1,040	782	427	345	255	**227**	118	100	**109**	82	41
22	37,997	**27,624**	**24,316**	6,413	2,550	1,268	**800**	**541**	305	**264**	177	**205**	77	100	**114**	32
23	32,933	27,510	24,261	**6,954**	2,482	1,373	695	455	**391**	227	191	123	**132**	105	45	41
24	25,336	26,506	21,988	6,613	**2,650**	**1,432**	727	477	327	191	177	145	73	50	59	32
25	20,054	24,180	20,670	6,009	2,454	1,218	732	377	300	191	136	105	100	77	18	27
26	16,057	21,130	18,419	5,508	2,263	1,182	532	441	323	205	150	145	77	73	45	14
27	11,798	17,735	15,315	4,436	2,077	868	577	395	250	177	95	77	82	91	59	0
28	9,822	14,962	12,281	4,113	1,618	823	441	323	232	164	86	50	59	27	9	5
29	7,049	10,990	10,221	2,936	1,300	650	373	268	195	86	123	64	32	18	9	0
30	5,614	9,831	7,549	2,532	1,154	586	282	259	136	132	64	32	23	14	9	18
31	4,090	6,627	6,680	2,032	800	423	268	168	123	59	32	27	9	0	0	0
32	3,564	5,499	5,086	1,712	714	423	259	159	77	45	41	27	9	0	9	0
33	2,745	4,204	3,918	1,314	577	282	232	100	14	36	36	5	5	0	5	0
34	2,048	3,064	3,530	1,232	459	314	114	82	36	23	14	9	5	0	0	..
35	1,768	2,436	2,654	1,041	477	200	109	55	36	18	19	0	0	0	..	..
36	1,442	1,977	2,054	786	377	195	68	23	32	5	5	0	4	0	..	..
37	943	1,481	1,786	641	300	114	68	32	18	14	0	0	0	..	..	..
38	749	1,096	1,427	523	173	91	64	18	5	4	0	4	0	..	..	..
39	687	800	1,114	286	159	36	18	5	9	0	0	0	..	..	..	..
40	450	468	600	318	105	50	14	5	5	0	..	..	..	..	..	..
41	304	282	386	132	45	14	0	4	0	0	..	..	..	..	..	..
42	227	178	295	82	50	9	5	0	4	0	..	..	..	..	..	..
43	151	113	209	55	23	5	5	0	0	..	..	..	..	..	..	..
44	88	50	91	18	14	4	4	0	..	..	..	..	..	..	..	..
45	46	63	27	18	0	0	9	..	..	..	..	..	..	..	..	..
46	5	14	14	5	5	0	0	..	..	..	..	..	..	..	..	..
47	13	9	9	0	0	..	..	..	..	..	..	..	..	..	..	..
48	0	5	5	0	..	..	..	..	..	..	..	..	..	..	..	..
49	5	10	0	0	..	..	..	..	..	..	..	..	..	..	..	..
50	4	4	4	0	..	..	..	..	..	..	..	..	..	..	..	..
51	0	0	0	..	..	..	..	..	..	..	..	..	..	..	..	..
52	0	4	0	..	..	..	..	..	..	..	..	..	..	..	..	..
Totals	348,437	259,411	247,676	71816	29354	14908	8,541	5,700	3,872	2,691	1,991	1,486	1,005	920	631	332

tabulation is according to "age at marriage," there is a great approach to constancy of the interval, though the distribution according to interval is very different for different ages.

28. **Protogenesic Index based on age at and duration of marriage.**—The protogenesic indexes as determined in the preceding sections, viz., §§ 21, 22, 26 and 27, are based upon the *ages at maternity*. For certain purposes, however, they might with advantage be based upon the *ages at marriage*, and for exact results the evaluation of the index would of course require a compilation according to those ages, and cannot be quite satisfactorily deduced from the results given in Table LXXVII. A very fair approximation, however, can be obtained by reconstructing that table (see pp. 252-3), and the simplest form which this reconstruction can take is to treat the results in columns 1-2, 2-3, etc., years as respectively applicable to "ages at marriage, 1 year, 2 years, etc., earlier than that in the age-column. Such a compilation will be sufficiently accurate to disclose the general characteristics of the protogenesic indices for ages at marriage. This has been done in Table LXXXV. hereunder, which is self-explanatory when compared with Table LXXVII.

Australia, 1908 to 1914 based on Age at Marriage.

LXXVII. by moving the successive columns upwards, 1, 2, 3, etc., places respectively).

including those Born within 9 Months of Marriage.												Protogenesic Index, or Approximate Average Interval.		Protogenesic Quadratic Index. (Crude).	Ages of Moth'r at Marriage.
15–16 yrs.	16–17 yrs.	17–18 yrs.	18–19 yrs.	19–20 yrs.	20–21 yrs.	21–22 yrs.	22–23 yrs.	23–24 yrs.	24–25 yrs.	25–26 yrs.	9 mths. to 26 yrs.	Crude.	Smooth'd		
0	0	0	4	0	..	..	..	..	..	..	12	134.0	134.0	159.0	12
0	0	0	0	4	0	..	..	..	..	..	41	80.9	88.0	101.9	13
0	0	0	0	0	0	0	0	0	0	..	106	66.0	67.0	82.5	14
9	0	14	0	5	4	0	0	0	5	0	601	57.4	58.0	81.8	15
4	4	5	5	0	0	0	4	0	0	0	2,167	33.3	34.8	47.8	16
5	9	9	14	14	5	5	4	9	4	0	7,190	29.5	28.5	44.3	17
9	5	9	9	9	18	9	4	0	0	0	16,424	24.8	25.3	35.8	18
23	23	14	9	9	14	14	5	5	0	9	27,406	23.5	23.6	34.0	19
36	18	32	27	5	9	14	5	5	0	0	39,196	22.9	22.4	32.6	20
68	36	64	23	14	5	0	5	0	0	0	54,645	22.3	21.6	31.6	21
41	45	18	14	9	4	0	0	0	0	5	64,922	21.1	21.2	29.4	22
36	9	18	23	27	0	9	14	4	0	..	65,125	21.0	21.0	29.2	23
23	27	18	5	5	0	0	0	0	..	..	61,525	20.8	20.9	28.0	24
23	23	18	4	0	0	5	0	..	..	..	56,667	20.7	20.8	27'8	25
14	9	9	0	0	0	..	..	..	..	..	50,539	21.2	20.9	28.4	26
9	5	0	0	4	0	..	..	..	..	..	42,252	21.2	21.0	28.5	27
18	9	0	0	0	..	..	..	..	..	..	35,220	21.1	21.1	27.7	28
14	0	4	0	..	..	..	..	..	..	..	27,283	21.4	21.2	28.1	29
0	0	0	..	..	..	..	..	..	..	..	22,621	21.3	21.3	27.9	30
..	..	..	..	..	..	..	..	..	..	..	17,248	21.1	21.4	26.6	31
..	..	..	..	..	..	..	..	..	..	..	14,060	21.7	21.4	27.8	32
..	..	..	..	..	..	..	..	..	..	..	10,728	21.2	21.5	26.7	33
..	..	..	..	..	..	..	..	..	..	..	8,882	21.6	21.5	26.5	34
..	..	..	..	..	..	..	..	..	..	..	7,045	21.9	21.6	26.7	35
..	..	..	..	..	..	..	..	..	..	..	5,526	21.4	21.6	25.9	36
..	..	..	..	..	..	..	..	..	..	..	4,454	21.5	21.5	25.8	37
..	..	..	..	..	..	..	..	..	..	..	3,405	21.2	21.4	25.2	38
..	..	..	..	..	..	..	..	..	..	..	2,427	19.8	21.2	22.9	39
..	..	..	..	..	..	..	..	..	..	..	1,565	21.8	21.0	25.2	40
..	..	..	..	..	..	..	..	..	..	..	863	19.5	20.7	22.0	41
..	..	..	..	..	..	..	..	..	..	..	623	20.7	20.5	23.9	42
..	..	..	..	..	..	..	..	..	..	..	410	19.9	20.4	22.4	43
..	..	..	..	..	..	..	..	..	..	..	181	20.8	20.0	24.1	44
..	..	..	..	..	..	..	..	..	..	..	117	19.5	19.3	24.6	45
..	..	..	..	..	..	..	..	..	..	..	38	20.0	18.3	22.9	46
..	..	..	..	..	..	..	..	..	..	..	18	14.3	17.0	14.7	47
..	..	..	..	..	..	..	..	..	..	..	10	14.3	15.4	14.7	48
..	..	..	..	..	..	..	..	..	..	..	10	10.5	13.5	10.5	49
..	..	..	..	..	..	..	..	..	..	..	8	14.3	11.3	14.7	50
..	..	..	..	..	..	..	..	..	..	..	..	..	8.8	10.5	51
..	..	..	..	..	..	..	..	..	..	..	4	10.5	6.0	..	52
332	221	232	137	105	59	56	41	23	9	14	651,563				Totals

Much more accurate results would be secured by that reconstitution of the data, which would be possible if monthly or quarterly graduations for at least the first 3 years after marriage were used. Such graduations would have to be both for the horizontal and vertical values, and when effected, the sub-divided numbers would admit of a new table being compiled, giving with considerable exactitude the required numbers of births occurring after various durations of marriage, borne by women of various ages at marriage (instead of ages at maternity). The general characteristics of the values determined from such a table will, however, not differ materially from those in the table pp. 270, 271.

In the final columns of Table LXXXV. are given the crude and smoothed protogenesic indexes or approximate of protogenesic intervals according to age, with the argument "age at marriage." These are quite different in form from those deduced with the argument "ages at maternity." The values exhibit considerable regularity and require relatively little smoothing. As might be expected *a priori*, the interval decreases rapidly as the age at marriage increases, until the age 20 is reached, when it is 21 months. It remains sensibly constant till age 46, and then rapidly diminishes. It is evident that it must necessarily have a small value at the end of the child-bearing period.

The protogenesic index, or the protogenesic interval, determined according to "age at marriage," is perhaps to be preferred to one or the other based on the "age of mothers" (*i.e.*, age at maternity). The average "period elapsing between marriage and the birth of the first child of post-nuptial conception" is evidently not the same for all women marrying at ages below 40 years, as had been stated,[1] but is a function of age, and is very nearly constant for a long period, viz., from about 22 to 45 years of age. The maximum frequency is about age 23.4 or 23.5, but cannot be very accurately ascertained without a special compilation.

29. **Protogenesic quadratic indices and quadratic intervals.**—The fact that the protogenesic indexes or the protogenesic intervals are sensibly identical through a wide range of ages, notwithstanding the "scatter" of the distributions varies enormously, necessitates the adoption of a second and different index, or of a second and different type of "interval." This will of course be of the nature of a higher moment since the higher the power the greater the influence of the distribution on the product. It will in most cases be sufficient to employ the second power of the "duration of marriage," and to use the quadratic index, viz., that

[1] T. A. Coghlan, "Childbirth in New South Wales," 1899, p. 26, says: ". . . . but where a marriage proves fertile, as the following table shews, the period elapsing from marriage to the birth of the first child of post-nuptial conception averages the same for all women marrying at ages below 40 years. This average period is 19.4 months, ranging between 18.3 and 21.5 months." In the table referred to the results are grouped under "age of mother," not under "age at marriage," but the text might suggest that what is implied is "age of mother at marriage" (age of brides). The table shews that from age at marriage 21 to 45 the average interval is sensibly constant, and only slightly larger than that deduced by Coghlan if in his Table VIII. "age at marriage" be substituted for "age of mothers."

analogous to the *radius of gyration* in mechanics. That is, we shall require the value of G where its square is given by :—

$$(511)\ldots\ldots G^2 = \frac{\int x^2 f(x)\, dx.}{\int f(x)\, dx}$$

When $f(x)$ is a rational integral function ($a + bx$ + etc.), this gives—

$$(512)\ldots\ldots {}_0G_x^2 = \tfrac{1}{3}x^2 + \frac{bx^3 + \frac{16}{15}cx^4 + dx^5 + \frac{96}{105}\, ex^6 + \ldots.}{12a + 6bx + 4cx^2 + 3dx^3 + \frac{12}{5}\, ex^4 + \ldots.}$$

a formula which is appropriate when the graphed areas extend from the origin. The values of b, c, etc., can be ascertained from the group-totals, see, for example, by formulæ (195) to (197d), etc., pp. 67, 68. When the graph-totals are not continuous to the origin, the solution is a matter of integrating between the same limits in both numerator and denominator. If the limits be $x-\frac{1}{2}k$ to $x+\frac{1}{2}k$, that is, if the middle of the group-range be taken as the value x in the formula, then it is easy to shew that

$$(513)\ldots\ldots G_m^2 = \frac{a\,(x^2+\frac{1}{12}k^2) + b\,(x^3+\frac{1}{4}k^2x) + c\,(x^4+\frac{1}{2}k^2x^2+\frac{1}{80}k^4)+\text{etc.}}{a + bx + c\,(x^2 + \frac{1}{12}k^2) + d\,(x^3 + \frac{1}{4}k^2x) + \text{etc.}}$$

G_m being the radius of gyration of the figure standing on the range referred to, viz., $x \pm \frac{1}{2}k$. This formula can be readily recast into arithmetically convenient forms.

When the function is a simple exponential one (Be^{bx}), we have :—

$$(514)\ldots\ldots {}_0G_1^2 = \frac{n}{n-1}\left(1 - \frac{2}{b}\right) + \frac{2}{b^2}\ ;\ \text{or generally}$$

$$(515)\ldots\ldots {}_0G_p^2 = \frac{n}{n^p - 1}\left(p - \frac{2}{b}\right) + \frac{2}{b^2}$$

in which $n = e^b$. These are also suitable only for the figure starting from the origin. When the limits of the integral are p and q, we shall have

$$(516)\ldots\ldots {}_pG_q^2 = \frac{n^q q\left(q - \frac{2}{b}\right) - n^p p\left(p - \frac{2}{b}\right)}{n^q - n^p} + \frac{2}{b^2} = \frac{n^t t^2 - n^s s^2}{n^t - n^s} + \frac{1}{b^2}\ *$$

in which last expression $s = p - 1/b$ and $t = q - 1/b$. When the values of the squares of the several " radii of gyration" have been obtained, the radius of gyration of the whole series of groups is given by :—

$$(517)\ldots G_0^2 = (A_1G_1 + A_2G_2 + \text{etc.})/(A_1 + A_2 + \text{etc.}) = \Sigma(AG)/\Sigma A$$

A_1 denoting the number in group 1, A_2 in group 2, and so on.

The *protogenesic quadratic index* is computed in a manner analogous to that for computing the simple protogenesic index : that is by multiplying the square of the middle value of the successive yearly ranges of

* This may be seen by adding $1/b^2$ to the first term, thus making the terms in brackets perfect squares when multiplied by q and p respectively; and then multiplying both numerator and denominator by $e^{-\frac{1}{b}}$.

duration by the number in the group: that is in formula (491) x'^2, x''^2, etc., is written instead of x', x'', etc., x', etc., here denoting the durations of marriage.

30. **Correction of the protogenesic interval for a population whose characters are not constant.**—When a population is increasing, all other facts remaining the same, the first-births, after a given duration of marriage (i), are drawn from a smaller population than are those for any lesser duration and presumably also from a smaller number of marriages. For comparative purposes, therefore, they need to be "corrected" so as to agree with what would be shewn by a constant population. Thus, were the ratio of first-births to marriages constant, it might very properly be assumed that the number of first-births to be expected would vary roughly as the ratio of the total marriages (marriages at all ages) for the period i years earlier, to the total number for the period being compared. Thus, if J_{-i} be the total number in the former case, and J the total number in the latter, the correction to be applied would be[1] :—

$$(518)\ldots\ldots 1 + c_i = J / J_{-i}$$

a quantity ordinarily greater than unity, *i.e.*, c_i is ordinarily a positive factor since populations generally are increasing.

We may, however, envisage the problem more rigorously as follows :

Let M, with suffixes shewing the age, denote the number of mothers of first-born children, and J the number of women marrying, from which they were derived. Then in the case of a "constant population," in which also the relative frequencies of nuptial first-births were constant, the former number would bear a constant ratio to the latter, for any age in question ; that is to say, for any age and at any time we should have $M/J = \mu$, a constant. Actually this ratio, however, is not quite constant, hence, rigorously, the number of nuptial primiparæ must be taken as :—

$$(519)\ldots\ldots M_x = {}_x\mu_t J_x = J_x \cdot f(x, t)$$

In short we cannot take the marriages as the basis of the correction, but we should take what may be called their *Malthusian equivalent* ; that is the number of marriages so reduced (or increased) as to be of equal productive efficiency : thus, μJ must replace J, and μ is not a constant. The character of μ may not be simple ; it is probably a function also of the interval elapsing before birth, *i.e.*,

$$(520)\ldots\ldots \mu = f(x, i, t).$$

The form and constants of this function can be ascertained only by computing μ for differing ages with different intervals and at different times. Thus, instead of (518) we should write :—

$$(521)\ldots\ldots 1 + c_i = \mu' J / (\mu'_{-i} \cdot J_{-i})$$

[1] This was pointed out by Sir (then Mr.) T. A. Coghlan, Childbirth in New South Wales, 1899, p. 26. He used this correction, which, however, would not be completely satisfactory if the "Malthusian coefficient" were increasing.

in which μ' denotes :— (*a*) the value of μ for a given age and interval, (when J and c are to be ascertained for a given age and interval), or (*b*) :— its value for the total for all ages and for a given interval, (when J and c are required for the total of all marriages). For Australia the ratio M/J is known only since 1893. During the period 1893-1914 it ranged between .790 in 1903, and .901 in 1912, for first-births and women of all ages (see hereinafter). As this average 0.0156 per annum for the 9 years interval between the years mentioned, it is of the same order as the yearly increase of population, and in the case cited would increase the correction. It may fall or rise 0.03 in one year. This term may be neglected, however, because its effect is relatively negligible when the correction is large, so that it has very little influence on the result computed by ignoring it. This is shewn by the results in the following table :—

TABLE LXXXVI.—Correction to the Computed Average Interval between Marriage and First-birth when Population is Increasing.

Factors to be multiplied into the computed average interval between marriage and first-birth when the correction for increase is ignored See (511) to (514).	When the increase per unit per annum is,				
	0.010	0.015	0.020	0.025	0.030
	Multiply the computed interval by the factor :—				
(*a*) When the first-births after 12 months are taken into account	1.0195	1.0294	1.0395	1.0500	1.0604
(*b*) When the first-births after 9 months are taken into account	1.0132	1.0199	1.0267	1.0338	1.0408
(*c*) When all first-births are taken into account	1.0083	1.0125	1.0168	1.0213	1.0257

It is to be remembered that the epoch to which the results refer is (sensibly) the middle of the year of observation, and that the intervals are 0, 1, 2, etc., years.

Since the *relative* numbers for different intervals will probably differ from those of Australia but slightly for most countries, we obtain the following very simple rules :—(i) If the ratio of first-births to marriages increase continually at the rates indicated in Table LXXXVI., or (ii.) if that ratio be constant, and the number of marriages increase continually at the rates in the table, or (iii.) if the sum of the ratios in question be as indicated in the table, then—

The correction to the interval for all first-births occurring more than twelve months after marriage is	Twice the rate of increase. $1 + 2r$
For all first-births occurring more than nine months after marriage the correction is	The rate of increase plus one-third. $1 + 1\frac{1}{3}r$
For all first-births occurring after marriage, the correction is	The rate of increase less one-sixth. $1 + \frac{5}{6}r$

in which r denotes the rate of increase.

31. **Proportion of births occurring up to any point of time after marriage.**—The rate of occurrence of first-births, for different intervals after marriage, is well shewn by giving the proportion of the whole which have occurred up to any given time. The following table furnishes the proportions in question :—

TABLE LXXXVII.—Shewing Proportion of Nuptial First-births occurring up to any point of time after Marriage.

Age of Mothers.	Up to End of Month.											
	1	2	3	4	5	6	7	8	9	10	11	12
15 ..	.0699	.1832	.3525	.4581	.5994	.7189	.8245	.8804	.8044	.9363	.9720	.9798
20 ..	.0262	.0597	.1071	.1685	.2445	.3341	.4398	.5234	.5721	.6641	.7355	.7851
25 ..	.0099	.0204	.0367	.0569	.0810	.1176	.1659	.2076	.2577	.3932	.4958	.5683
30 ..	.0070	.0140	.0229	.0362	.0493	.0685	.0945	.1240	.1631	.2761	.3677	.4346
35 ..	.0080	.0156	.0284	.0395	.0562	.0723	.0958	.1216	.1485	.2338	.3083	.3577
40 ..	.0120	.0201	.0324	.0466	.0606	.0748	.0977	.1161	.1340	.1884	.2376	.2781
45 ..	.0128	.0281	.0510	.0536	.0714	.0714	.0867	.1020	.1122	.1658	.1888	.2194
13–52 ..	.0160	.0345	.0614	.0953	.1365	.1872	.2502	.3027	.3484	.4595	.5461	.6078
13–52 Proportion of first year's births during month	.0264	.0304	.0443	.0557	.0677	.0834	.1037	.0863	.0753	.1827	.1424	.1017
Proportion of first year's births up to end of months ..	.0264	.0568	.1011	.1568	.2245	.3079	.4116	.4979	.5732	.7559	.8983	1.0000

Age of Mothers.	Up to End of Year.								
	2	3	4	5	6	10	15	20	26
15 ..	1.0000	..	..	..	..	(7)	..	..	..
20 ..	.9634	.9928	.9985	.9995	.9999	1.0000	(13)	..	..
25 ..	.8508	.9402	.9729	.9863	.9933	.9996	1.0000	(18)	..
30 ..	.7278	.8458	.9043	.9367	.9565	.9928	.9998	1.0000	(22)
35 ..	.6455	.7631	.8223	.8614	.8869	.9562	.9932	.9997	1.0000
40 ..	.5704	.7052	.7842	.8314	.8585	.9202	.9676	.9916	(25) 1.0000
45 ..	.4974	.6276	.7270	.7908	.8316	.9107	.9541	.9745	1.0000
13–52 ..	.8555	.9273	.9567	.9716	.9801	.9943	.9988	.9998	1.0000
13–52 Proportion of first year's births during month	..	..	..	..	..	..	..	..	..
Proportion of first year's births up to end of month	1.4075	1.5254	1.5739	1.5984	1.6125	1.6350	1.6431	1.6448	1.6451

This table is interpreted as follows :—Taking the upper line, 13-52, 0.0160 of all nuptial first-births occur within one month of marriage, 0.3484 occur before the end of the ninth month after marriage, and 0.6078 before the end of the twelfth month. Again, of the nuptial first-births occurring, with women of all ages, during the year of marriage, 0.5732 are born before the end of nine months, and all births exceed those born during the first twelve months by only 0.6451. This is shewn on the last line of the table.

32. **Range of the gestation period.**—In order to accurately estimate the cases of first-births properly attributable to pre-nuptial insemination, the range of the normal gestation-period must be taken into account as

well as the frequency of premature live births. Contrary to popular opinion this gestation-period has a considerable range.[1] The following data represent the best available results :—

TABLE LXXXVIII.—Relative Frequency of Births after Different Periods, between the last Menstruation and Parturition.

Duration Days.	Authorities.					
	Reid.* 500 Cases.	Hannes.† 561 Cases.	Hannes.‡ 314 Cases.	Hannes. 875 Cases.	Various§ 51 Cases.	Reid, with Hannes.
241–250	56	36	16	28	?	41
251–160	59	37	13	29	20	44
251–170	150	141	111	130	210	140
271–280	317	325	366	340	510	329
Maximum (days)	(277.77)	(277.73)	(277.02)	(277.42)	(274.64)	(277.58)
281–290	269	271	258	267	160	268
291–200	97	121	118	120	100	109
301–310	24	50	76	59	?	41
311–320	18	14	22	17	?	18
321–330	10	5	19	10	?	10
Total	1,000	1,000	1,000	1,000	1,000	1,000
Average¶ Duration	277.2	279.2	281.9	280.3	276.5	278.8

NOTE.—The cases for 241 to 251, 316-330, have been obtained by extrapolating Reid's curve.

* See Hart, Edinburgh Medical Journal, 1914, New Ser. XII., p. 401 ; also Journ. Edin. Obstetr. Soc., XXXVIII., pp. 107-134 ; 1912-3. Biometric analysis of some insemination-labour and menstrual-labour curves in certain mammalia. The distribution of Reid's results according to the normal curve of probability for a table of frequency is unquestionably unsatisfactory, as an examination of the original data will shew. The distribution does not conform to the normal curve. The average is given as 278.3 ; it should be 278.84 ; there is an arithmetical mistake in the original calculation.

† Zeit. f. Geburt und Gynäk. LXXI., 1912, p. 524. Die körperliche Entwicklung der Frucht in ihrer Beziehung zur berechneten Schwangerschaftsdauer. Walther Hannes. Children 3000 to 4000 grammes weight.

‡ Same authority, children above 5000 grammes weight.

§ Interval reckoned from coitus, certain. These i clude 51 cases reported by Desormeaux, Girdwood, Montgomery, Rigby, Lockwood, Lee, Dewers, Beatty Skey, McIlvain, Ashwell, Clay and Reid.

The average durations indicated are not exactly identical with the maximum frequency, since the frequency curves are very slightly asymmetric.

If Hannes' cases are combined with Reid's, a total of nearly 1400 is obtained. If the result be "smoothed," so as to agree with the final column of Table LXXXVIII., the result shewn in Table LXXXIX. on next page is obtained.[1]

[1] Other values are as follows :—Hippocrates, *περὶ ὀκταμήνου*, generally within 280 days ; Hensen, 128 cases, 272.5 days after coitus ; see Handbuch der Physiologie by Hermann, VI., 2., p. 73, 1881 ; M. Zöllner, after menstr., first-births 279.1, second births 282.0 ; see Zur Kenntniss und Berechnung der Schwangerschaftsdauer, Jenenser Dissertation, 1885, p. 6. Hasler, 195 cases, 281.0 ; after coitus 665 cases, 272 days ; Glusing, after menstr., 279.6 ; Würzburger Dissertation, 1888, p. 15 ; Voituriez, 274-8 after menstr. Thêse de Paris (Lille), 1885, p. 62 ; Winckel, 274.8, Lehrbuch d. Geburtshülfe, p. 78, 1889 ; Ahlfeld, 270.4 after coitus, Monatschr. f. Geburtskr u. Frauenkr., XXXIV., p. 304. 1869.

TABLE LXXXIX.—Shewing the Frequency per diem per 100,000 Births occurring between the 240th and 332nd day after the Termination of the Menstrual Period.

Day	No.	Ratio of Aggregate.	Day	No.	Ratio of Aggregate.	Day	No.	Ratio of Aggregate.	Day	No.	Ratio of Aggregate.	Day	No.	Ratio of Aggregate.
240	297	.00297	260	675	.09012	280	3,429	.56930	300	657	.93538	320	111	.99424
241	303	.00600	261	733	.09745	281	3,318	.60248	301	597	.94135	321	101	.99525
242	310	.00910	262	807	.10552	282	3,196	.63444	302	546	.94681	322	91	.99616
243	318	.01228	263	911	.11463	283	3,014	.66458	303	496	.95177	323	81	.99697
244	327	.01555	264	1,052	.12515	284	2,847	.69305	304	455	.95632	324	71	.99768
245	338	.01893	265	1,305	.13820	285	2,676	.71981	305	420	.96052	325	61	.99829
246	349	.02242	266	1,548	.15368	286	2,504	.74485	306	389	.96441	326	51	.99880
247	361	.02603	267	1,784	.17152	287	2,332	.76817	307	361	.96802	327	40	.99920
248	374	.02977	268	2,015	.19167	288	2,160	.78977	308	334	.97136	328	30	.99950
249	388	.03365	269	2,246	.21413	289	1,988	.80965	309	304	.97440	329	20	.99970
250	404	.03769	270	2,470	.23883	290	1,816	.82781	310	277	.97717	330	15	.99985
251	420	.04189	271	2,689	.26572	291	1,644	.84425	311	252	.97969	331	10	.99995
252	437	.04626	272	2,913	.29485	292	1,477	.85902	312	227	.98196	332	5	1.00000
253	455	.05081	273	3,132	.32617	293	1,320	.87222	313	207	.98403	333	0	..
254	474	.05555	274	3,420	.36037	294	1,189	.88411	314	188	.98591	240	..	..
255	496	.06051	275	3,455	.39492	295	1,077	.89488	315	171	.98762	to	100,000	..
256	521	.06572	276	3,501	.42993	296	976	.90464	316	156	.98918	333		
257	551	.07123	277	3,511	.40564	297	885	.91349	317	143	.99061			
258	587	.07710	278	3,506	.50010	298	804	.92153	318	131	.99192			
259	627	.08337	279	3,491	.53501	299	728	.92881	319	121	.99313			

Maximum frequency occurs on the 277.67th day. Average (240 to 332 days) = 279.28 days.*

* If the average date be found in the usual way (*i.e.*, from the weighted mean), it will prove to be 278.78. But the births occurring on the nth day range between n and $n + 1$, hence the average is about $n + \frac{1}{2}$, consequently the 278.78th day is from 278.78 to 279.78; hence the average interval is 279.28 about.

It would appear from these results that the *most frequent interval* between the termination of menstruation and parturition, and *the average interval*, may be regarded for practical purposes as identical, and may be taken as 278 days on the average for births of children of ordinary weight, and that only 2 or 3 days need to be added in the case of the birth of heavier children. For first-births the interval is about 3 days shorter. From insemination to parturition the interval is slightly shorter, perhaps 5 or 6 days on the average. In view of social custom, however, the interval for first-births may be taken as say about 14 days longer than the 278, or about 292 days in all. Making allowance for live births occurring after 210 days from insemination, and for the fact that 40 per cent. of births occur between the 261st and 278th day from the last menstruation, (see Table LXXXIX.), we may take 274 days, or 9 months, as the period to be rejected as uncertain as regards post-nuptial conception.

The frequency-curve for the interval between the termination of menstruation and parturition is curve *E* on Fig. 76, see later, page 284.

33. Proportion of births attributable to pre-nuptial insemination.—It is evident, from the preceding table, that there is a certain period during which it is not possible to ascertain what proportion of births should be regarded as attributable to pre-nuptial insemination.[1] The numbers

[1] T. A. Coghlan in 1899 based his computations on the assumption of a 9-months interval, see Childbirth in New South Wales. He points out that in the years 1893-8, the nuptial first-births registered were 41,384, of which 13,366, or 32.3 per cent., were "due to pre-nuptial conception." It may be observed that pre-nuptial insemination may have characterised some cases where birth occurred in the tenth or even eleventh month after marriage, and a small number of births may be attributable to cases of post-nuptial insemination from 200 to 240 days after marriage, and a considerable number from 240 to 270 days. However, the percentage he deduced for New South Wales in 1893-8 seems, on the whole, to be confirmed by the present investigation for Australia, 1908-14.

per million nuptial first-births for women of all ages born during various intervals after marriage are shewn on the penultimate line of Table LXXVII.

By plotting the groups of first-births occurring monthly from 1 to 12 months, and drawing a continuous curve giving the same totals, results are obtained analogous to those shewn on Figs. 76 and 77. On the former figure the part of curve A, marked f, g, g', h, denotes the boundary of the groups, which may be attributed to pre-nuptial insemination. The curve i, i', j shews the boundary of the groups which may be attributed to post-nuptial insemination. On Fig. 77 the curve k, l, l', m, denotes the pre-nuptial insemination quota, and the curve n, n', o, p, the post-nuptial quota; see page 284.

By fixing the position of that part of the curve shewn by the dotted lines in the figures referred to, it would appear that about 0.634 of the births occurring during the 9th month after marriage are to be attributed to pre-nuptial insemination. Thus, about 0.952 of the first-births occuring within 9 months of marriage are due to pre-nuptial insemination. This is equal to 0.546 of all first-births occurring during the year of marriage, and 0.332 of all first-births, in every case for women of all ages. These ratios, it will be seen from Fig. 73, are a fairly definite function of the age of the mothers; and this function could be ascertained by treating the group-results given in Table LXXVII. in the manner above described.[1]

34. **Issue according to age and duration of marriage.**—The recording of the number of children borne by married women of various ages, and after various durations of marriage, furnish data of value in any attempt to ascertain the law of increase "according to age and duration of marriage." But it is to be kept in view that the immediate results from such data apply only to those who thus, through maternity, come under observation, and does not apply to married women generally. That is to say, if averages be formed these averages are *not* averages for all married women of the given ages and durations of marriage. During the seven years, 1908-1914, 805,015 mothers came under observation in Australia, their total issue being 2,675,291, or an average of 3.3233 each. The results are shewn in Table XC. hereunder, the averages being found as follows :—

Let ${}_i m''_x$ denote the mothers of age-group $x - k/2$ to $x + k/2$, and of duration of marriage $i - 1$ to i, and let the total issue of these be ${}_i C_x$; then the average, ${}_i c_x$, is given by :—

$$(522)\ldots\ldots c_x = {}_i C_x \,/\, {}_i m''_x$$

and these are the averages which have been tabulated.[2]

[1] The attributing of the whole of the births occurring during the 9 months after marriage to pre-nuptial insemination, gives a result somewhat too great. Nevertheless it is clear that for practical purposes it is a satisfactory rule for eliminating the so-called "prejudiced" from the "unprejudiced" cases, to assume that, on the average, births occurring less than 9 months after marriage are "prejudiced."

[2] The original data will be found in the Population and Vital Statistics of Australia for the years 1908-1914, Bulletins 14, 20, 25, 29, 30, 31 and 32.

TABLE XC.—Shewing the Average Number of Children Born to those who Bear during Varying Intervals after Marriage, based upon the Experience of Australia during the Years 1908-1914.

Duration of Marriage.	Age-groups. (Age at Birth of Last Child.)								Totals, All Ages.	
	-19.	20-24.	25-29.	30-34.	35-39.	40-44.	45-	All Ages.	Mothers.	Issue.
Years.	AVERAGE NUMBER OF CHILDREN.									
0–1	1.006	1.010	1.016	1.030	1.051	1.029	1.142	1.013	134,171	135,996
1–2	1.250	1.157	1.085	1.087	1.089	1.113	1.151	1.125	61,213	68,906
2–3	1.925	1.882	1.747	1.700	1.627	1.454	1.545	1.802	64,229	115,759
3–4	2.145	2.171	2.087	2.039	1.997	1.923	1.786	2.107	70,317	148,160
4–5	2.466	2.622	2.520	2.441	2.401	2.207	2.041	2.525	59,407	150,009
5–6	2.791	3.020	2.919	2.825	2.803	2.670	2.153	2.906	53,275	154,836
6–7	*2.750	3.401	3.339	3.194	3.216	3.038	3.000	3.290	47,250	155,476
7–8	3.000	3.776	3.731	3.576	3.544	3.447	2.846	3.655	41,713	152,461
8–9	..	4.105	4.126	3.954	3.883	3.820	3.142	4.018	37,115	149,129
9–10	..	4.292	4.514	4.330	4.271	4.149	3.940	4.374	32,170	140,725
10–11	..	*4.347	4.910	4.705	4.600	4.619	4.318	4.726	29,607	139,942
11–12	..	4.950	5.256	5.122	4.965	4.954	4.931	5.091	25,887	131,795
12–13	..	4.571	5.541	5.513	5.329	5.319	5.037	5.443	23.372	127,226
13–14	..	..	5.790	5.868	5.725	5.608	5.761	5.718	20,339	117,691
14–15	..	..	6.131	6.269	6.091	6.056	5.721	6.156	17,572	108,160
15–16	..	..	*6.24	7.434	6.453	6.324	6.493	6.494	15.217	98,827
16–17	..	..	5.59	6.967	6.859	6.688	6.844	6.844	13,271	90,836
17–18	..	..	5.16	7.239	7.401	6.985	7.282	7.193	11,617	83,539
18–19	..	..	5.00	*7.371	7.679	7.431	7.291	7.575	10,073	76,308
19–20	..	..	..	7.480	8.018	7.865	7.775	7.926	8,520	67,530
20–21	..	..	..	7.111	8.418	8.282	8.168	8.329	7,424	61,839
21–22	..	..	..	6.192	8.824	8.750	8.449	8.751	5,988	52,403
22–23	..	..	..	5.60	9.154	9.230	8.962	9.191	4,726	43,437
23–24	..	..	..	..	9.609	9.503	9.171	9.483	3,561	33,770
24–25	..	..	..	16.00	9.265	9.973	9.700	9.884	2,664	26,330
25–26	..	..	..	..	*9.053	10.450	10.500	*9.932	1,809	17,967
26–27	..	..	..	..	9.105	10.730	10.773	10.16	1,146	11,637
27–28	..	..	..	..	7.000	10.860	11.150	10.54	643	6,781
28–29	..	..	..	..	..	11.260	11.480	10.71	383	4,102
29–30	..	..	..	..	..	11.210	11,840	10.75	192	2,064
30–31	..	..	..	..	..	12.00*	*12,220	12.51	77	963
31–32	..	..	..	..	..	13.00	11.770	9.51	45	428
32–33	..	..	..	..	..	10.00	12.460	12.94	17	220
33–34	..	..	..	..	..	..	14.80	7.80	5	39
All Durations	1.202	1.760	2.643	3.837	5.341	6.997	8.565	3.3233	..	..
Totals all dur'tions										
Mothers	29,371	185,694	239,066	181,191	118,310	46,705	4,678	805,015	805,015	..
Issue ..	35,292	326,868	631,954	695,220	626,641	326,095	40,181	2,675,291	..	2,675,291

* Owing to the limited data, the values are not reliable for the age-group 45, nor for the values shewn by the asterisks and those for greater durations of marriage.

The table shews that, for all ages, the average total issue of married women, with various durations of marriage, who each year appear in the Australian maternity records, increases approximately at the rate of one child in 2.745 years, or 0.3643 of a child per annum. The results are graphed in Fig. 75, p. 268. The parallel dotted lines in the figure shew that the *rate of increase of the total issue according to the duration of marriage is identical for all ages*, at least for the greater part of the range of duration. That the graphs approximate so closely to straight lines, and, moreover, to parallel straight lines, is remarkable.[1] These lines may be defined by equations :—

$$(523).....c''_x = a_x + bi = 0.6667 + 0.3643i, \text{ approximately ;}$$

[1] This characteristic can no doubt be deduced, but no explanation of an elementary nature can be offered.

in which only ax is dependent on the age of the mothers, being about $\frac{2}{3}$, and b is constant for all ages. The more exact values of a are given in Table XCI. hereinafter.

The results shewn in Fig. 75, p. 268, and detailed in the table referred to, can be referred in a general way also to the age-groups, that is to say, if γ_x denote the average issue for mothers of a given age-group for all durations of marriage, then the number is as shewn in Table XCI. The average ages for these age-groups, as shewn in the table, are found on the supposition that the distribution of the cases of nuptial maternity occurring during the period 1907-1914, in Australia, apply. This distribution is given in Table LXXIII., p. 242, and the average ages of each age-group have been calculated strictly[1] : these are as given hereunder.

TABLE XCI.—Shewing the Total Issue for Mothers in various Age-groups, for All Durations of Marriage ; the Constants of Formulæ for Computing this Number, and the Differences between the Observed and Computed Numbers. Australia, 1908-1914.

Age-group		-19	20–24	25–29	30–34	35–39	40–44	45–	13–52
Average age		18.92	22.87	27.46	32.35	37.29	41.91	46.29	..
Average number of children, all durations of marriage		1.202	1.760	2.643	3.837	5.341	6.997	8.565	3.3233
Smoothed result† ..		1.242	1.751	2.636	3.895	5.413	6.994	8.764	..
The above crude and smoothed results are equivalent to durations for all ages of:	(Crude)	1.37	2.90	5.33	8.60	12.73	17.28	21.58	Crude
	(Smoothed)	1.48	2.88	5.31	8.76	12.93	17.27	22.13	Smoothed
Values of Ax for age-group		.6515	.7909	.7778	.6921	.6646	.5977	.4939	.7029
Value of b		.3643	.3643	.3643	.3643	.3643	.3643	.3643	.3643
Calculated Values of $Ax + bu$ when u = and the value of ϵ‡	Year of duration. 1	1.016—.010	1.155—.145	1.052—.036	1.056—.026	1.029+.021	0.962+.067	0.858+.284	1.067—.054
	2	1.380—.130	1.520—.363	1.416—.331	1.421—.334	1.393—.304	1.326—.213	1.223—.072	1.432—.307
	3	1.744+.181	1.884—.002	1.781—.034	1.795—.095	1.758—.131	1.691—.237	1.587—.042	1.796+.006
	4	2.109+.036	2.258—.087	2.155—.068	2.159—.120	2.122—.125	2.055—.132	1.951—.165	2.160—.053
	5	2.473—.007	2.622—.000	2.519+.001	2.524—.083	2.486—.085	2.419—.212	2.315—.274	2.524+.001

† The smoothed result conforms to a rational integral equation of the fourth degree.
‡ ϵ is the quantity which, added to the tabular value (calculated), makes it identical with the data.

The smoothed results for the average number of children, according to age, for all durations of marriage, are given by :—

$$(524)\ldots\ldots \gamma_x = 1 + b\chi + c\chi^2 + d\chi^3 + e\chi^4 ;$$

in which $\chi = x - 13$, and the values of which for $2\frac{1}{2}$ years' intervals are as follow :—

TABLE XCII.—Shewing the Effect of "Age of Mothers" upon the Total Issue for All Durations of Marriage. Australia, 1908-1914.

Ages at birth of last child, in years ..	13	15.5	18	20.5	23	25.5	28	30.5	33	35.5	38	40.5	43	45.5	48
Children*	1.000	1.019	1.160	1.413	1.770	2.221	2.760	3.378	4.070	4.829	5.650	6.528	7.460	8.441	9.470
Difference for $2\frac{1}{2}$ yrs	0.019	0.141	0.253	0.357	0.451	0.539	0.618	0.692	0.759	0.821	0.878	0.932	0.981	1.029	

* That these are given by a curve of the fourth degree, can be readily seen by taking the values for 13, 18, 23, etc.

[1] That is, the numbers are referred to the exact average for the year of age, not merely to the age for the middle point.

In the above table the differences for $2\frac{1}{2}$ years shew that for all durations of marriage, *differences of age have much less influence than differences in duration.* To obtain this relationship exactly, it is necessary to compile for each age, and for given durations of marriage the total issue. For all age-groups the general result is 0.3643 a child per year, that is 0.9107 for $2\frac{1}{2}$ years. From the above table, however, it would appear that this value is not attained for "all durations of marriage" until, almost exactly, age 40.

Such results as are referred to, are dependent upon the combination of two things, viz. :—(*a*) The age-effect proper, and (*b*) the fact that for the higher ages the average of the durations of marriage are greater, and thus, throughout the range of observation, the conditions are not homogeneous.

35. **Initial and terminal non-linear character of the average issue according to duration of marriage.**—An inspection of Fig. 75, p. 268, and the results given in the preceding table, shew that there is a more or less systematic departure from linearity at the terminals of the graphs representing "issue according to duration of marriage." The table reveals the fact that the character of the differences, according to age, and for various durations of marriage, between the values according to formula (523), and the individual results are as follow :—

(i.) For the first year of duration of marriage, the computed total issue for ages under 35 is too great, and for ages over 35 is too small.

(ii.) For the second year of duration of marriage, the computed total issue is *invariably* too great, the maximum difference being at about age 24.

(iii.) For the third year of the duration of marriage, the computed issue is less than the actual for the younger ages, but soon becomes greater, the maximum difference occurring at about the age 43 or 44.

(iv.) The same remarks apply to the fourth year of the duration of marriage with the exception that the age is later than 45.

(v.) In the fifth year of the duration of marriage, the differences are small until the age of 40 is reached, when the computed result becomes markedly greater than the actual.

The relatively large differences for the various age-groups characterising the second year of the duration of marriage are due to the fact that the length of the period, which must necessarily intervene between a first and second birth, does not admit of so wide a "scatter" of the cases of maternity as to make the result uniform ; thus the average for the second year is in defect. This consequence is one which will (and does) tend to vanish for longer durations of marriage, owing to the fact that any want of coincidence of the intervals between birth and birth must more markedly characterise the points of time in proportion to their remoteness from the first year of duration of marriage. Owing to the fact that the period of

gestation alone is three-fourths of a year, and the period of lactation a considerable part of a year, and to the fact that so great a proportion of births appear in this year, it follows that the second year of duration must necessarily disclose a falling off in the apparent average. As time goes on, however, this apparent defect will tend to disappear, as will be clearly seen by a reference to Fig. 75, p. 268.

The character of the curves at their terminals for the longer durations may be fairly well ascertained by combining the terminal values. This has been effected as follows :—In the series shewn on Fig. 75 the two differences between the three last averages of the issue of curve for under 20, are taken, and similarly the four differences between the five last averages of the issue, etc., the number of values (averages of issue) being respectively 3, 5, 8, 9, 10, 12, and 12. The means of the differences, the numbers of which are respectively 7, 7, 6, 6, 5, 5, 5, 4, 2, 2, are taken, the results being as follows :— +0.230, +0.285 + 0.582, +0.106, + 0.153, —0.105, — 0.162, + 0.060, —0.246, +0.845, —0.489. The accumulated results compared with the successive multiples of 0.3643 furnish the co-ordinates of the average terminal shape. This gives :—

0	.364	.729	1.093	1.457	1.822	2.186	2.550	2.914	3.279	3.643	4.007
0	.230	.515	1.097	1.203	1.356	1.251	1.089	1.149	.903	1.748	1.259
Diff.	.134	.214	—.004	.254	.466	.935	1.461	1.765	2.376	1.895	2.748
Smth'd	.025	.100	.225	.400	.625	.900	1.225	1.600	2.025	2.500	3.025

The differences shew the amounts by which the successive points fall short of the line defined by the formula (523). As is shewn by the smoothed values, the defect from the linear condition, once it initiates, increases, on the average, very approximately as the square of the duration from the initiating point onward. This average defect η is expressed by the equation :—

$$(525)\ldots\ldots \eta = 0.025\ I^2$$

I denoting the duration reckoned from the initiating point. This point may approximately be found as follows :—

Average age at birth*	18.9	22.9	27.5	32.4	37.3	41.9	46.3	
Initiation of droop†	6.0	10.0	15.0	18.0	24.0	29.0	33.?	
Difference	12.9	12.9	12.5	14.4	13.3	12.9	13.3	Aver. 13.1

* *i.e.*, Age of mother at birth of children. † Years of duration of marriage.

In these results the first line gives the average age of women at the time of maternity, and the second line gives the points where the droop from the linear relationship commences : the positions of these points being estimated from the graphs, Fig. 75, p. 268. The differences give a sensibly constant age, which is seen to average 13.16, hence the droop implies that the fecundity of those who are characterised by early marriage and late motherhood is less than the average for those who may be regarded as falling into the normal place.

Fig. 76. Fig. 79.

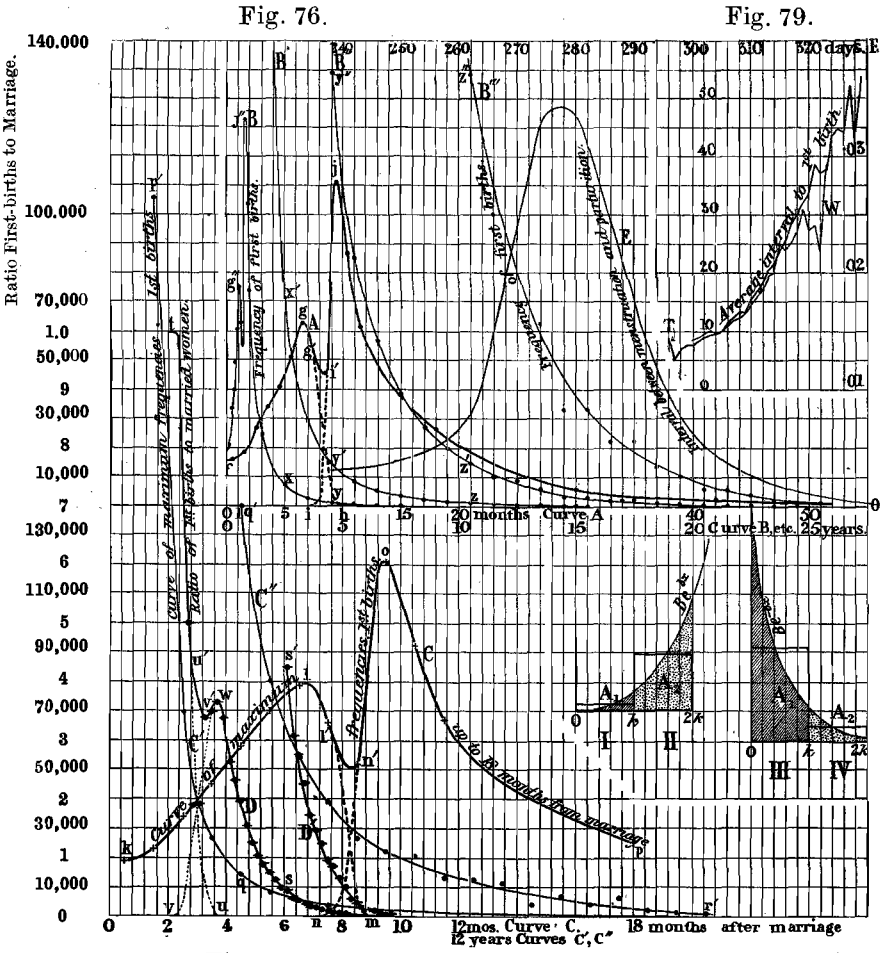


Fig. 77. Fig. 78.

Fig. 76.—Curve A denotes the frequency, according to duration of monthly-groups, of first-births, viz., the number of cases in a total of 1,000,000 first-births for all durations of marriage (see Table LXXVII., pp. 252-3). The curve f, g, g′, h, denotes the relative numbers attributable to prenuptial insemination, and the curve i, i′, and j, etc., the relative numbers attributable to post-nuptial insemination.

Curve B denotes the frequency, according to duration, of yearly groups, with a less extended lateral scale, the point g″ thereon corresponding to g on Curve A.

Curves B′, B″ and B‴ are plotted on a larger vertical scale, y′ and y″ being the same point as y, and z′ and z″ the same point as z.

Curve E is the curve of relative frequency of birth, according to the interval after the last menstruation, see Table LXXXIX., p. 278.

Fig. 77.—Curve C shews the relative maximum frequencies according to age (*i.e.*, for any age). The points l, l′ and m, and n, n′, o and p have the same significance as points g, g′ and h, and i, i′ and j in Fig. 76, curve A, and the point k corresponds to f.

Curves C′, C″, are an extension of curve C, the lateral scale being altered. The point p′ is the same as p, q′ as q, etc.

Curve D denotes the ratio, according to age, of first-births, to married women. It appears to be compounded of two curves, viz., u, u′ and v, v′, w, s. Curve D′ is plotted on a larger scale, the point s′ being identical with s.

Fig. 78 illustrates the formulæ for determining the exponential curves so as to make the shaded areas equal to the areas of the rectangles A_1 and A_2, in order to determine the positions of the centroid verticals, etc. See formulæ (496) to (510), pp. 264-5.

Fig. 79 is the graph of the approximate average intervals to between marriage and the " unprejudiced" first-births for New South Wales, 1893-1898, and for the Commonwealth, 1908-1914; the light zig-zag line marked W denoting the result for the former, and the heavy zig-zag line marked T denoting that for the latter. The figures denote months, and the lateral divisions denote two years' duration.

36. The polygenesic, fecundity, and gamogenesic distributions.—As we have seen, there are two ways in which records of *issue*, according to age and duration of marriage, come to hand, viz. :—

(i.) When, at the registration of births, the age, duration of marriage, and "*previous issue*" are also registered ; and

(ii.) When, at a Census, the age, duration of marriage, and total issue are ascertained.

There are certain differences between these. In (i.) the total age-range covered is that of the child-bearing period only ; in (ii.) the age-range is from the earliest age of maternity to the end of life. In (i.) the cases come under observation *during a period of time* ; in (ii.) they come under observation *at a given moment*. Hence, to deduce (ii.) from (i.) it is essential that the necessary records of births, migration, and deaths should extend over a long period of time, and even then, the deduction of (ii.) from (i.) is by no means simple. Both records are, however, of value statistically and both yield appropriate measures of fecundity, though on the other hand both require corrections if they are to represent what would have been furnished by a "constant population."

If, on a plane, the ages of mothers (x) be plotted as abscissae, and their duration of marriage (y) be plotted as ordinates, and if then verticals to this xy-surface be drawn denoting the number of cases of maternity, corresponding to each age and duration, the surface so defined may be called the *genesic distribution at maternity*, or simply (i.) *the polygenesic distribution*. Similarly if the verticals denote the number of children recorded at any moment as having been borne by women of any age and duration of marriage, the distribution may be called the *general genesic distribution*, or (ii.) the *fecundity distribution*.[1] The fecundity-distribution-contours, or lines denoting equal issue for various ages and durations of marriage, can be drawn by means of formula (523), together with the values of the constants given in Table XCI., the values of the durations (according to age) where the linear condition ends, see § 35, and formula (525). If 11 be assumed to be the earliest age of what may be called "extraordinary marriage," and 14 be assumed to be the earliest age of "ordinary marriage," and if also the generally approximate result, be adopted, viz., $0.6667 + 0.3643\ i$, the plan of the polygenesic surface will have for a limiting boundary the line $y = x - 11$; its surface will, for the major part, be (approximately) a plane, steepest at right angles to the axis of abscissæ (age), and making an angle θ with the xy plane, the tangent of which angle is 0.3643. For any age x, the line on the surface denoting increasing durations of marriage,

[1] The assigning of the word "polygenesic" to the one, and "fecundity" to the other distribution, is, of course, somewhat arbitrary : the terms might, of course, have been interchanged.

rises uniformly till it attains the value $y = x - 14$. For greater durations than this the surface will droop. Between the axis and the contour-line representing say the third or fourth child, the surface is somewhat irregular.

If the distribution is based on the *ages at marriage* and the duration of marriage, it may appropriately be called the *gamogenesic distribution*. The abscissæ then are the ages of mothers when married (*i.e.*, "ages at marriage"), and the ordinates, as before, are the duration of marriage.

37. **Diminution of average issue by recent maternity.**—Returning to the results shewn in Tables XC. and XCI., for the second and subsequent years of duration of marriage, it may be noted that they are important in any attempt to ascertain what may be called the *unmodified fertility-ratio*. When the fertility-ratio is found by merely dividing the total number of cases of nuptial maternity at any age by the number of married women at the same age, the quotient is "modified" by the fact that they are *not all at equal risk*. If the fertility-ratio is to shew what is due to change of age alone, or rather, to change of age, unmodified by the effect of a recent birth, but unaffected as to all other factors, a certain proportion of the married women should be subtracted from the total. We shall first consider the question of estimating the diminution of average issue by recent cases of maternity.

Formula (523), shewing the general rate of increase in the average issue, (since it is derived only from all cases of maternity *coming under observation for each duration*), gives what may be called "the unmodified rate of increase" for what also may be called "the fertile section only" of the whole body of married women; see § 34, hereinbefore. Consequently the differences of average issue for successive durations of marriage, although an indication of, do *not* give a very exact measure of the proportions of women who are virtually removed from risk. These proportions are doubtless better defined by the differences between the observed average and the average issue computed upon the assumption of constant average rate of increase per year of duration. Hence the ratio of the diminution in the cases of maternity for any given age-group and for any given duration of marriage may at least approximately be found as follows :—

Let c'' be the average number of children (or average issue) on the supposition of a uniform increase, and c the actual number, each with suffixes to denote the duration of marriage and age. Then the diminution-ratio, that is the amount by which any previous births will have diminished the actual record of cases, will presumably be c/c''. But this diminution-ratio applies only to the cases in which maternity has occurred.

Consequently if the values of this fraction be formed, for successive years of duration, commencing not from marriage, but from the number for the first year of duration of marriage, it will furnish a rough estimate of the correction necessary, if it be desired to ascertain, from the number of cases actually occurring, the number of cases that would have occurred had the whole of the women in any age-group been at full average risk.

If to the values of c'', for duration 0 to 1, given in the top line of Table XC., successive multiples of 0.3643 be added, and the sums, so formed, be subtracted from the values on the second, third, etc., lines of that table, we shall obtain the figures shewn on Table XCIII. on next page. These figures afford a fairly good indication of a systematic effect, according to duration, that is, of an effect which varies with age. This variation is not the same for each duration, and appears to change somewhat irregularly with age. The mean of the changes gives a fairly regular curve (see the upper part of Table XCIII.).[1] The individual graphs for the various durations, however, appeared to shew that the adoption of this general average for each series, was of doubtful validity, and for this reason a different linear change according to age was adopted for each duration.

In any attempt to estimate the diminution of the numbers at risk by means of the falling off in the average issue, according to duration, it is probably desirable to take the adjusted results in the upper part of Table XCIII. This will give — .186/.364, + .177/.729, etc., for age 18.92, —.217/.364, +.177/.364, etc., for age 22.87; and so on. The results are shewn in Table XCIV. If we call the tabular value c'', the ratio ρ of the altered risk to the average risk is given by :—

$$(526)\ldots\ldots \rho = 1 + c'' / 0.3643 = 2.745\ (0.3643 + c'').$$

The value of $1-\rho$ will be required ; it is consequently :—

$$(527)\ldots\ldots 1 - \rho = -2.745\ c''.$$

Since c'' is negative, if for any duration of marriage fewer women than the average have given birth to children (owing to a recent birth, etc). then this last expression is positive. Table XCIII. shews the deviations, according to age and durations of marriage up to four years ; from the general rate of increase.

[1] The curve can be very closely represented by the curve $a + bx + cx^n$, where n is greater than 1. Smoothed, the values would be about + .000, —.031, —.072, —.124, —.183, —.265, —.422.

TABLE XCIII.—Shewing the Average Effect of a recent Maternity upon the Average Issue (Number of Children) Corresponding to Various Durations of Marriage, and of a Consequent Correction.

Mothers Age-group. Years.	Excess (+) or Defect (—) in the Average Number of Children, on an Average (Linear) Increase according to Duration of Marriage. Duration of Marriage. Crude Results. *1–2.	2–3.	3–4.	4–5.	Mean.	Adjusted Results. †1–2.	2–3.	3–4.	4–5.	Average Age.
–19	—.120	+.190	+.046	—.007	+.027	—.186	+.177	+.078	+.049	18.92
20–24	.217	.143	.068	.210	—.054	.217	.106	.031	—.014	22.87
25–29	.295	.022	—.022	+.047	.062	.252	.023	—.024	.086	27.46
30–34	.307	—.059	.084	—.046	.124	.292	—.070	.086	.168	32.65
35–39	.326	.153	.147	.107	.183	.328	.154	.141	.241	37.29
40–44	.280	.304	.199	.279	.265	.363	.237	.197	.313	41.91
45–	—.355	—.326	—.449	—.558	.422	—.396	—.315	—.249	—.382	46.29
Aver. Difference for an age-difference of 10 yrs.						—.077	—.179	—.120	—.158	..

Mothers Age-group.	Average Increase in the Average Number of Children. Crude Results.‡				Adjusted Results.§				Age.
19–	.244	.675	.220	.321	.245	.690	.240	.453	17.5
20–24	.147	.725	.289	.451	.147	.680	.275	.446	22.5
25–29	.069	.662	.340	.433	.088	.650	.310	.429	27.5
30–34	.057	.613	.339	.402	.053	.600	.345	.402	32.5
35–39	.030	.538	.370	.404	.032	.530	.380	.365	37.5
40–44	.084	.341	.469	.284	.019	.440	.415	.328	42.5
–45	.009	.394	.241	.255	.011	.330	.450	.271	47.5

Values of $1 - \rho = -2.745\ c'''$

Mothers' Age.	$k=1$	$k=2$.	$k=3$.	$k=4$.
12	+.364	..	..	..
13	.385	— .777	..	..
14	.407	.728	— .376	..
15	.428	.679	.343	— .304
16	.449	.629	.310	.261
17	.470	.580	.277	.218
18	.491	.531	.244	.174
19	.512	.482	.211	.131
20	.534	.433	.178	.088
21	.555	.384	.146	.044
22	.576	.335	.113	— .001
23	.597	.286	.080	+ .043
24	.618	.236	.047	.086
25	.639	— .187	— .014	.129
30	.745	+ .059	+ .151	.346
35	.850	.304	.316	.563
40	.956	.550	.480	.780
45	1.062	.800	.645	.997
50	+1.167	+1.041	+ .810	+1.214

* These results are found by adding multiples of 0.3643 to the figures in the first row of Table XC., and then subtracting them from the figures for the corresponding duration in the successive columns.

† These results are the linear smoothings of the crude results. The linear adjustments are made by using the "average" ages, and can be regarded only as fairly satisfactory. The total number of cases of maternity analysed is, however, large; viz., 805,015.

‡ These rows are the differences of the columns in Table XC.

§ The adjustments follow no general law: the first is on a curve Ae^{-bx}, the second is $A' - Bx^2$, the third, $A'' + B'x$, and the fourth $A''' - B'x - Cx^2$, the intervals $x_2 - x_1$, etc., between the age groups being taken as always of equal value, *i.e.*, the adjusted values are for 17.5, 22.5, etc.

The above table appears to shew that the period of time over which the influence of a case of maternity extends on the average, follows no simple law, and is by no means negligible for some years, especially as regards the later portion of the child-bearing period. The whole method is not quite satisfactory, but is the best available, until the record of the procreative history of a large number of married women is to hand, giving the intervals between marriage and the births of successive children preferably compiled for intervals of single months from at least one to sixty, and for somewhat larger intervals (quarters, half-years, or years), to the end of the child-bearing period. Such statistics would reveal accurately the characteristic of the frequency of maternity according to duration of marriage, and would allow of the ratio ρ referred to in formulæ (528, 529) hereinafter being more exactly ascertained.[1]

[1] As far as I am aware such a statistic has not been compiled, although it is of considerable importance.

38. **Crude fertility according to age corrected for preceding cases of maternity.**—The ratio (m/M), between the number of nuptial mothers (m) of a given age-group during a given period of time, to the total number (M) of married women of the same age-group, is not the true monogenous-fertility-ratio, inasmuch as the M married women are not homogeneous as regards the maternity-risk (ρ) to which they are subject. Obviously m/M is too low a value for women whose fertility remains in abeyance, and is too high a value for women who have just borne children. The survivors after the lapse of k years of the married women of age x last birthday are $L_{x+k} \,/\, L_x$.[1] Consequently if ρ_k is the average risk for the kth year after a birth (calling the year of birth 0), the corrected fertility ratio $(\mathfrak{p}'')$ is given by the equation :—

$$(528)\ldots\ldots \qquad \mathfrak{p}''_x = \frac{m_x}{M_x - \left\{m_{x-1}\cdot\frac{L_x}{L_{x-1}}(1-\rho_1)(1-r_{x-1}) + m_{x-2}\cdot\frac{L_x}{L_{x-2}}(1-\rho_2)(1-2r_{x-2}+\text{etc.}\right\}}$$

$(1-kr_{x-k})$ denoting the rate at which the mothers of age $x-k$ have increased in k years. This may perhaps be ordinarily taken as the same at all ages, and as the rate of the population increases. The above formula may be put in the following form, viz. :—

$$(529)\ldots\ldots \qquad \mathfrak{p}'' = \frac{m_x}{M_x}\cdot\frac{1}{1-\left\{\frac{m_{x-1}}{M_x}\cdot\frac{L_x}{L_{x-1}}(1-\rho_1)(1-r_1)+\ldots+\frac{m_{x-k}}{M_x}\cdot\frac{L_x}{L_{x-k}}(1-\rho_k)(1-kr_k)+\ldots\right\}}$$

and the ratios of the m/M quantities in the denominator do not need to be very exactly computed. It will always be abundantly accurate for the purpose in view to assume that :—

$$(530)\ldots\ldots L_x/L_{x-k} = 1 - \tfrac{1}{2}k\,(q_x + q_{x-k})$$

a formula which is satisfactory through a fairly large range for k.[2] Since the quantity between the braces in (529) is positive and small, its effect is to increase the value of $\mathfrak{p}''$. The correction is important in any attempt to ascertain the age of greatest fertility, consequently the values given in Table LXXIII., p. 242, are those with which we are mainly concerned ; see columns ix. and xv. therein. The values of the factors (κ) of m/M in the denominator of (529) can be readily tabulated for say $r = 0.01$ and 0.03.

---

[1] L_x denoting the mean population living in the year of age x : as in the ordinary actuarial notation.

[2] For example from Australian Life Tables for 1901-1910, Report of Census, Vol. III., pp. 1217-8, we have for ages 40 and 30, from the L values 0.93986, and from the q values 0.93815, *i.e.*, for so large a value of k as 10, the error is less than 0.002.

The value of the L, ρ and r terms are as follows for Australia :—

TABLE XCIV.—Shewing the Factors Required to Correct the "Crude Fertility-ratio," for Preceding Cases of Maternity. Australia, 1908-1914.

Age of Mother.	Values of $(1-kr)\ L_x / L_{x-k}$ $r = .01$* ; $k = 1$ to 4.				Values of κ when $r = .01$. $r = .01$ and $.03$; $k = 1$ to 4.			
	1.	2.	3.	4.	1.	2.	3.	4.
15	.9879	.9761	.9643	.9527	+.423 .414	—.662 .635	—.331 .311	—.290 .266
20	.9868	.9739	.9613	.9590	+ .527 .516	—.422 .405	—.171 .160	—.084 .077
25	.9858	.9720	.9584	.9450	+.630 .617	—.182 .175	—.013 .012	+.122 .112
30	.9849	.9701	.9556	.9414	+.733 .718	+.057 .055	+.144 .135	+.326 .299
35	.9840	.9683	.9529	.9378	+.837 .820	+.294 .282	+.301 .282	+.528 .484
40	.9830	.9663	.9500	.9340	+.940 .921	+.531 .509	+.456 .428	+.728 .667
45	.9821	.9645	.9472	.9304	+1.043 1.022	+.767 .736	+.611 .573	+.927 .850

* To find the values for any other value, r' say, of r, multiply the tabular values by $(r'-r)\ /\ r$.

† To find the values for any other value of r, multiply by $(1-rk)\ /\ (1-.01k)$. Thus, for $r=.02$ the multipliers of the successive columns are 0.9899, 0.9796, 0.9691, 0.9583 ; and if $r=.03$ the successive multipliers are 0.9797, 0.9592, 0.9381, 0.9167.

The above values are very approximately given by :—

$$(531)\ldots\ldots(1-kr)\ L_x\ /L_{x-k} = 1 - 0.000188k\ (47.7 + x)\ ;^1$$

and those for the correcting factors ϵ by :—

$$(532)\ldots\epsilon_1 = 0.02070\,(x + 5.43)\ ;\quad (532a)\ldots\epsilon_2 = 0.04763\,(x-28.91)\ ;$$
$$(532b)\ldots\epsilon_3 = 0.03140\ (x-25.54)\ ;\quad (532c)\ldots\epsilon_4 = 0.04057\ (x-22.15).$$

Formula (525) may thus be written :—

$$(533)\ldots\ldots \mathfrak{p}'' = \frac{m_x}{M_x} \cdot \frac{1}{1 - \frac{1}{M_x}\left(\kappa_2 m_{x-1} + \ldots\ldots + \kappa_k m_{x-k}\right)},$$

k being the tabular value given in Table XCIV. (in which $r = .01$ and $r = .03$), and the probability of maternity ascertained by this last formula, will be free from the effect of recent cases of maternity : that is the crude probability must be multiplied by the fraction following m/M.

39. **Age of greatest fertility.**—When the probabilities according to age of maternity have been corrected so as to represent what would be given if all women were at equal risk, then the age of greatest probability may be regarded as the age of greatest fertility. Applying formula (533) to the data in Table LXXIII., p. 242, we have the following results about the maximum :—

[1] More exactly the values of the constant to be added to x are 47.60, 46.81, 47.63, and 48.63, and of the coefficients to be multiplied into k are 0.0001933, 0.0003866, 0.0005700, and 0.0007433.

TABLE XCV.—Shewing Corrections to the Fertility-ratio for Ages 13 to 23, when Allowance is made for Preceding Cases of Maternity.

Age of Mothers.	Values of κ when k = 1 to 4.				Factor K in $Kp = p''$		Fertility-ratio.	
	1.	2.	3.	4.	Crude.	Smoothed.	Crude.	Corrected.
13	+.374	—.727	—.371	—.342	1.039	1.001	.5?	.52?
14	.394	.681	.341	.304	1.011	1.013	.2055	.2076
15	.414	.635	.311	.266	1.013	1.024	.2269	.2299
16	.434	.589	.281	.288	1.012	1.036	.4063	.4112
17	.455	.543	.251	.190	1.048	1.048	.4316	.4521
18	.475	.497	.221	.152	1.066	1.059	.4776	.5093
19	.495	.451	.191	.114	1.077	1.071	.5022	.5409
20	.516	.405	.160	.077	1.092	1.083	.4540	.4956
21	.536	.359	.130	.039	1.074	1.094	.4375	.4700
22	.556	.313	.100	—.001	1.106	1.106	.4157	.4596
23	+.577	—.267	—.070	+.037	1.123	1.117	.3813	.4283

Although the values of κ are of the same order of magnitude, yet within the range shewn, the values of the successive κm-terms rapidly diminish, so that although there is no theoretical justification for stopping at $k = 4$, the inclusion of later terms would but slightly affect the result (at least in the second place decimals).

The factors K shew that about the age of maximum fertility the correcting factors to give the fertility, unprejudiced by previous cases of maternity, increase linearly with age, and are represented very approximately by the formula :—

$$(534)\ldots\ldots K = 1 + 0.01163\ (x - 12.91).$$

The values for these factors, so computed, are the smoothed values in the preceding table.

A smoothing, independent of that already given in Table LXXXIII., gave, as the maximum for the uncorrected fertility-ratio, 0.483 ; and a similar smoothing of the corrected values gave 0.517, the maxima and corresponding ages being :—

Uncorrected, age, 18.8,[1] 0.483 ; corrected, age, 19.0, 0.517.[2]

In the method outlined, of correcting the crude fertility-ratio (probability of maternity), equal " weight" is attributed to the values of k. An examination of Fig. 75 shews, however, that the " weight" to be attributed should probably decrease with increase in the value of k (that is with the number of years elapsed since a previous birth). Moreover, the change in the numbers of married women and cases of maternity is so rapid at the ages of maximum fertility that the age divisions should be less than one year, and the ages need to be very exactly given, which unfortunately they are not. For these reasons great exactitude in regard to the correction is at present impracticable.

40. **Fecundity-correction for infantile mortality.**—The frequencies of child-bearing as between two populations are, like their birth-rates, rigorously comparable as accurate measures of fecundity, only when their infantile mortality-rates are identical, and the crude frequencies require,

[1] The result in Table LXXXIII. was 18.23 years.
[2] The factor, according to (534) above, gives, on multiplying into, 0.483, 0.5168.

therefore, a correction, to reduce the risk of maternity to an equality ;[1] see Part XI., §§ 4-6, pp. 145-152. It has been shewn that the infantile mortality correction to birth-rate is, on the whole, about $\beta_0 = \beta (1+0.033\mu)$; see p. 145. If, therefore, there were two equal populations of say married females (M), of equal fecundity (f), but with different rates of infantile mortality, we should have for the cases of maternity (m) occurring therein, respectively :—

$$(535)\ldots\ldots m_1 = fM(1 + k_1\mu_1), \text{ and } m_2 = fM(1 + k_2\mu_2) ;$$

whence it follows that

$$(536)\ldots\ldots f = \frac{m_1}{M(1 + k_1\mu_1)} = \frac{m_2}{M(1 + k_2\mu_2)}$$

Thus the correction is always very small, and, in general, is practically negligible.

41. **Secular trend of reproductivity.**—The *crude reproductivity* may be measured by the ratio of the number of confinements to the number of persons at uniform risk ; thus the *crude nuptial reproductivity* is the ratio of nuptial confinements to the total number of married women, and similarly, the *crude ex-nuptial reproductivity* is the ratio of ex-nuptial confinements to the total "unmarried," which here will include the "divorced" and "widowed." The ratios are "crude," since no corrections have been applied for age-differences in the female population, and it is obvious from columns ix., x., xv., and xvi. of Table LXXIII., p. 242, that fertility greatly varies with age. For this reason, *whenever the age-distribution is not identical, the results are not strictly comparable :* they do not rigorously measure the degrees of reproductivity, or of malthusianism, operating. Consequently, for strict comparisons, a properly determined *index of initial reproductivity* would have to be computed, see §§ 3 to 6, pp. 235-239.

Nuptial and Ex-nuptial Maternity-Ratios, etc.

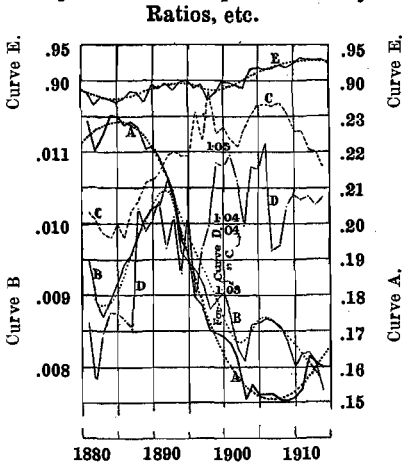


Fig. 80.

Curve A is the ratio of nuptial confinements to all married women.

Curve B is the ratio of ex-nuptial confinements to "unmarried" women of 12 years of age and upwards.

Curve C is the ratio of the ex-nuptial to the nuptial confinement rates, the range being between .038 and .059.

Curve D shews the variation in the average number at a birth.

Curve E shews the variations in the survival factor for the first year of life.

Neglecting this, however, for the present, and restricting the consideration to the crude initial nuptial

[1] It may be noted that after deducting the period of gestation and the puerperal period, there remains about one-sixth of a year during which mothers of the first-sixth of any year of record may give birth to a second child even in the same year, and the chance of this occurring is increased by the death of the child born.

and ex-nuptial reproductivities, the results are set out in Table XCVI. hereunder; see columns (ii.), (iii.), and (v.) thereof. The results are shewn also by curves A and B of Fig. 80, the former curve denoting the nuptial, and the latter the ex-nuptial frequency of maternity. The figure shews that while the nuptial and ex-nuptial rates by no means run identically, they yet exhibit, on the whole, similarity of trend, the ex-nuptial rate being roughly 0.05 of the nuptial. The exact fluctuations of the ratio of the ex-nuptial to the nuptial rate are indicated in column (v.) of Table XCVI., and are shewn as curve C in Fig. 80. The dotted lines on curves A and B shew the general trend of the phenomena.

TABLE XCVI.—Shewing the Secular Changes of Nuptial and Ex-nuptial Reproductivity. Australia, 1881 to 1914.

Year. (i.)	Ratio of Nuptial Confinements to Married Women.* (ii.)	Ratio of Ex-nuptial Confinements to Number of Unmarried Women.† (iii.)	Ratio of Births to Total Confinements. (iv.)	Ratio of Ex-nuptial to Nuptial Rates. (v.)	Infantile Mortality (Ratio of Deaths of Children during first 12 Months)‡ (vi.)	Survival Coefficients for end of First Year (vii.)
1881	.2285	.00950	1.00865	.0416	.1165	.8835
1882	.2206	.00891	1.00779	.0404	.1357	.8643
1883	.2245	.00870	1.00847	.0388	.1222	.8778
1884	.2305	.00893	1.00875	.0380	.1260	.8740
Mean 1–4 ..	**.2269**	**.00901**	**1.00842**	**.0397**	**.1251**	**.8749**
1885	.2301	.00918	1.00873	.0399	.1292	.8708
1886	.2274	.00946	1.00866	.0381	.1271	.8729
1887	.2285	.00957	1.00852	.0419	.1164	.8836
1888	.2271	.00983	1.01021	.0433	.1164	.8836
1889	.2206	.01008	1.00989	.0457	.1319	.8681
Mean 5–9 ..	**.2267**	**.00962**	**1.00920**	**.0418**	**.1242**	**.8758**
1890	.2216	.01021	1.01005	.0461	.1082	.8918
1891	.2181	.01026	1.01030	.0470	.1155	.8845
1892	.2133	.01060	1.00865	.0497	.1058	.8942
1893	.2072	.01034	1.01008	.0499	.1149	.8851
1894	.1947	.00961	1.00931	.0494	.1031	.8969
Mean 0–4 ..	**.2110**	**.01020**	**1.00968**	**.0484**	**.1115**	**.8885**
1895	.1916	.00947	1.01008	.0494	.1012	.8988
1896	.1788	.00935	1.00900	.0558	.1126	.8874
1897	.1770	.00914	1.01066	.0517	.1048	.8952
1898	.1700	.00879	1.00997	.0586	.1272	.8728
1899	.1697	.00894	1.01086	.0527	.1167	.8833
Mean 5–9 ..	**.1774**	**.00914**	**1.01011**	**.0536**	**.1125**	**.8875**
1900	.1691	.00905	1.01078	.0535	.1002	.8998
1901	.1668	.00865	1.01095	.0519	.1037	.8963
1902	.1625	.00826	1.01060	.0508	.1071	.8929
1903	.1513	.00807	1.00997	.0533	.1105	.8895
1904	.1554	.00859	1.01079	.0553	.0825	.9175
Mean 0–4 ..	**.1610**	**.00852**	**1.01062**	**.0530**	**.1008**	**.8992**
1905	.1524	.00861	1.01076	.0565	.0819	.9181
1906	.1527	.00868	1.01112	.0568	.0836	.9164
1907	.1527	.00864	1.00962	.0566	.0814	.9186
1908	.1506	.00857	1.00969	.0569	.0780	.9220
1909	.1506	.00837	1.01024	.0556	.0718	.9282
Mean 5–9 ..	**.1518**	**.00857**	**1.01029**	**.0565**	**.0793**	**.9207**
1910	.1511	.00801	1.01040	.0530	.0751	.9249
1911	.1541	.00818	1.01033	.0531	.0680	.9320
1912	.1632	.00821	1.01037	.0503	.0708	.9292
1913	.1609	.00805	1.01025	.0500	.0720	.9280
1914	.1598	.00766	1.01038	.0479	.0713	.9287
Mean 0–4 ..	**.1578**	**.00802**	**1.01035**	**.0509**	**.0714**	**.9286**

* That is, to all married women, irrespective of age.

† That is, to "never-married," "widowed," and "divorced," of 12 years of age and upwards, taken together.

‡ The infantile mortality as given is *not* the ratio of deaths registered as under one year of age, in any year, to the births registered in the same year, but are those given in a paper "On the improvement in infantile mortality, etc.," read before the Australasian Medical Congress in September, 1911 (see p. 672 Journ.), and are related to the number of births of the "equivalent year."

42. **Crude and corrected reproductivity.**—It has been shewn in Part XI., § 6, see Table XXXV., that the crude birth-rate gives only the *initial* reproductivity, and that, owing to the measure of infantile

mortality, the residual, after the first 12 months have elapsed, is more significant than the birth-rate as regards the increase of the population. The necessary correction is secured by multiplying by a "*survival factor.*" The principle may be extended for various purposes. Thus survival factors (σ) may be calculated for the commencing school-age, the ages of puberty or nubility, the commencing age of military service, the age of highest average economic efficiency, and so on. In actuarial notation these factors are denoted by l_x/l_0, and for brevity's sake may be denoted by σ_x. To compare two populations for survivals, S, up to any age x, we have, therefore, B denoting the births :—

$$(537)\ldots\ldots S_x = Bl_x/l_0 = B\sigma_x = B - D_x$$

in which D_x denotes the aggregate of the deaths (of the native-born) up to age x. When $x = 1$, the values of σ are unity, less the rate of infantile mortality taken for the "equivalent year." For rates, these quantities must be divided by the mean population of the period covered by the births. The more rigorous treatment of this question has already been dealt with in Part XI., §§ 7 to 9, pp. 152-180 ; see also Tables XXXVI. and XXXVII. The infantile mortality varies, however, considerably from year to year, see column (vi.) in Table XCVI., which gives the rates calculated approximately for the "equivalent year."[1] If γ denote the infantile mortality (see p. 151, hereinbefore), σ being the survival factor, then we have :—

$$(538)\ldots\ldots\sigma = 1 - \gamma\ ;\ \text{or}\ \gamma = 1 - \sigma\ ;$$

as on (352), p. 151. This, of course, differs according to sex, with time, as is shewn in Table XCVI., and according to locality. The highest value of the survival-factor for Australia was 0.9320 in 1911. For the period 1901-10 for the Commonwealth of Australia it was 0.90490 for males, and 0.92047 for females,[2] corresponding to infantile mortalities of 0.09510 and 0.07953. We thus arrive at the conception of a *survival-value* for a birth-rate, that is, the birth-rate reduced to its value at age x, and this survival-value may be averaged for the whole of life, *i.e.*, integrated for all ages. Such an integral will constitute the best general measure of the reproductivity. It is equal to the average period lived multiplied by the birth-rate. Or if ω denote the greatest possible age, then :—

$$(539)\ \ldots\ldots \Sigma_0 = \beta \int_0^{\omega} \sigma_x\, dx$$

and Σ_0 is the reproductivity of the population taken as a whole. If σ_0 be unity, and the unit of x be one year, then the value of (538) will be the

[1] *Vide* a paper (by the author): "The improvement in infantile mortality ; its annual fluctuations and frequency according to age, in Australia." Journ. Australasian Medical Congress, Sydney, Sept. 1911, pp.670-679.

[2] See Life Tables, Census Report, Vol. III., pp. 1215 and 1217.

birth-rate multiplied into the number of years expressing the length of life lived on the average ; consequently the product of the birth-rate into the "expectation of life at age 0," may be taken as the most serviceable expression of the reproductivity.[1]

The value given by (538) may be regarded as the *crude reproductivity*. The birth-rate β is ordinarily computed as for the total population, but may also be based upon the total female population, upon the female population of child-bearing ages, or upon the married of child-bearing ages plus a reduced number of the unmarried, equating them to the nuptial condition. Let the ratio of the fertility of women at full risk (or otherwise if desired), at any age x, to the fertility at the age at which it is a maximum be denoted by f_x : then the actual number of married women of all ages may be reduced to an *equivalent number* of women at the age of maximum fertility by multiplying by this quantity. With these can be included also the unmarried, with whom in Australia the fertility is about one-twentieth of that of the married. The corrected reproductivity may be given in the form of a birth-rate, viz., β_e :—

$$(540)\ldots\ldots \beta_e = B \,/\, \Sigma\,(f_x M_x + f'_x U_x)$$

in which Σ denotes "sum," f and f' are the ratios for the fertilities of the married and unmarried respectively, referred to the greatest fertility of the married, and M and U are respectively the numbers of the married and the unmarried, who together give birth to B children. This measures the ratio of the actual births to a *fictitious* number of mothers of highest fertility, and hence birth-rates so computed shew the variations of the extent to which potential fertility is actualised. These, of course, may be further reduced to their survival values.

The mode of comparing reproductive efficiency by means of an index, viz., the genetic index or first natality index, has already been indicated ; see § 5, p. 237, hereinbefore.

43. **Progressive changes in the survival coefficients.**—The survival-factors are by no means constant, as is shewn in column vii. of Table XCVI. As tabulated, they are merely unity, less the ratio of the deaths under 12 months to the births in the same year. This, as shewn before,

[1] Actuarially, the quantity :—

$$\mathring{e}_x = \mathrm{T}_x \,/\, l_x = \int_x^\omega l_x\, dx \div l_x$$

when $x = 0$, may, when multiplied by the birth-rate, be adopted as the measure of the reproductivity of a population. Since this is obtained from the mortalities at successive ages, it is not quite homogeneous, as it is affected by the vitality of migrants, and, moreover, the mortality of the older part of the population is affected by their earlier history, and may not therefore represent future experience. If $l_0 = 1$, then $\mathring{e}_0 = \mathrm{T}_0 = \Sigma_0 \,/\, \beta$.

is not quite correct, see pp. 155-160, but the correction is of no moment for the present purpose. It is worthy of note that the infantile mortality is roughly about 0.5522 of the rate of confinements of married women, as is shewn by comparing the means. The means (see Table XCVI.) 0.2269, 0.2267, etc., multiplied by the above fraction gives the following results :—

Period	1881-4	1885-9	1890-4	1895-9	1900-4	1905-9	1910-4
Infantile mortality ..	.1251	.1242	.1115	.1125	.1008	.0793	.0714
As computed from the nuptial confinement rate	.1253	.1252	.1165	.0980	.0889	.0838	.0871
Survival factor divided by ratio of nuptial confinements	.5513	.5479	.5284	.6342	.6261	.5224	.4525

The ratio is therefore not uniformly constant.

The infantile mortality is decreasing, but nevertheless shews a fairly definite fluctuation, see curve E, Fig. 80, which shews it on a large vertical scale ; its limiting value is, of course, unity.

XIV.—COMPLEX ELEMENTS OF FERTILITY AND FECUNDITY.

1. **General.**—In dealing with the more complex elements of fertility and fecundity, it will generally be necessary to distinguish between the nuptial and ex-nuptial cases, and since their frequency is very different, some simple method of correlating and comparing the two will have to be devised.[1]

Often it is necessary to distribute unspecified cases, since, in double-entry tabulations, the cases are often *partially* specified, and the neglect of partially-specified and wholly-unspecified cases will often lead to material error.

There is another general matter of importance, viz., the corrections required in statistics of duration, if they are required to represent the results which, other things being equal, would have been furnished by a constant population. This will receive attention in § 3, pp. 298-9.

2. **Correspondence and correlation.**—It is often possible to see the essential identity of two curves by mere change of scale, or by systematic deformations (anamorphosis) of one in order to bring it into agreement with another. This fact is of value in the graphs of various vital phenomena.

For example, any attempt to make the widest possible comparisons of population phenomena requires the construction of world-norms for the human race. But such an attempt involves the consideration of physiological and general correspondence of human developments. In connection with marriage, fertility, fecundity, etc., and their significance, for instance, this demands the consideration of the following, viz. :—

(*a*) The average ages of puberty, nubility, etc.
(*b*) The frequency-distribution about those ages ;
(*c*) The fertility and fecundity at different ages ;
(*d*) The characteristics of the decay of fecundity at the end of the fertile period.

---

[1] The determination of a type-formulæ to be adopted for any two curves, the ascertaining of their constants, and of the "skewness" of each curve will serve to exhibit their degree of correlation. This can also be expressed by a correlation coefficient ; see "Statistical Methods," by C. B. Davenport, 1904, and the monographs of Prof. Karl Pearson, W. F. Sheppard, G. U. Yule, De Vries, W. Palin Elderton, Gini, Savorgnan, and others.

Suppose, for example, curve A, Fig. 81, represents the average fertility according to age of women of one part of the world and B that of another part. Let x, x', x'', etc., denote the abscissa of the initial point, that of the mode, and that of the terminal point of the curve A, or of curve B, the particular curve being indicated by the suffix a or b. Then the simplest correspondences are those where $x_a/x_b = x'_a/x'_b = x''_a/x''_b$, etc., or where $x_b - x_a = x'_b - x'_a =$ etc., *i.e.*, where the abscissæ of the corresponding critical points of the curves are in a constant ratio, and the ordinates are also in a constant ratio, or where the abscissæ of the critical points differ by a constant. Correspondence of this character may be called *planar*, because the curve B can be derived from the curve A by parallel linear projection on to a plane inclined to that on which A lies. If the two curves in question be represented by $y_a = F_a(x)$; $y_b = F_b(x)$ then planar correspondence may be defined as follows :—

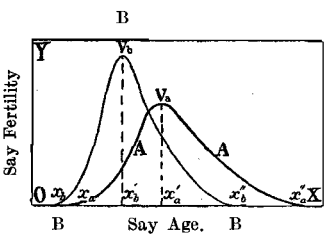


Fig. 81.

The points on curve B are in *planar correspondence* with those on A when—

$$(541)\ldots\ldots y_b = k\,F_a(mx_a + q)$$

k, m, and q being constants : when k or m or both are functions of x_a, then the correspondence is *non-planar*. If these functions of x_a are not simple, the correspondence becomes less significant.

This method of envisaging the problem has advantages over the system of determining a mere numerical "coefficient of correlation,"[1] because it is often possible to construct one curve from the data of the other. Moreover, it is not without value to examine how far the graphs of phenomena, which might have been imagined *a priori* to be identical, or convertible by oblique projection with change of scale, differ. Later nuptial and ex-nuptial fertility, according to age, will be compared.

3. **Corrections necessary in statistics involving the element of duration.**—The type of corrections necessary to be applied to the data of statistics involving the element of duration, depends upon the purpose in view. Two types are of special importance, that which aims at presenting the results, in the form in which they would have been given by (*a*) a constant population, and (*b*) by a population increasing according to some definite law, which for general comparative purposes is preferably

[1] See Galton's graphic method, F. Galton, 1888, Proc. Roy. Soc. Lond., XLV., 136–145. Davenport, Statistical methods, p. 44, 2nd Edit., Lond., 1904. See also Pearson's, Yule's, and other papers on the subject.

the *norm of increase*, *i.e.*, the characteristic of the increase of the whole of the populations to be compared. The latter involves the smaller corrections, and has the advantage that for many purposes the corrections will be negligible. Let it be supposed that the population is an *increasing* one : the data will then be characterised as follows :—

(i.) The data for longer durations, drawn therefore from a smaller population, will be smaller (all other things being equal) than would characterise a constant population of the size from which the more recent data are drawn. Hence the necessary correction is a factor $1+e$, where e is positive.

(ii.) If the numbers of individuals have been taken into account for earlier dates, they can be deduced from the survivors, provided (*a*) that a correct mortality table is available, and (*b*) that migration has introduced no (material) modification.

(iii.) If the data are related to events occurring with a varying rate (as in cases of birth, marriage, death, etc.), the rate at which they occur must be determined according to the duration in question.

The type-formula for correction is as follows :—Let N denote the number given at any point of time, that is, let N denote the *survivors* after the duration i, from N' persons ; then if, in origination, N may be presumed to vary with the population, we shall have, on making allowance for the fact that these are only survivors, and that what is required is a result which shall either coincide (i.) with the final magnitude of the population, viz., at the date from which i is reckoned, or (ii.) with a definite rate of population growth (the rate of normal increase) :—

$$(542)\ldots N' = Ne^{\rho i} L_{x-1}/L_x = Ne^{\rho i}[1 + \tfrac{1}{2}(q_{x-1}+q_x)],^*\text{approximately.}$$

* See formula (530), p. 289. The notation is the ordinary actuarial notation. It is fairly obvious that L_{x-i}/L_x must equal $1 + \frac{1}{2}(q_{x-i}+q_x)\, i$ approximately. It will be found that, through a large range, this latter and arithmetically more convenient form is sufficiently accurate for correction purposes to the data of statistics of duration. For example, if 12 be taken as the lowest age (it is the age of least mortality for Australian females), and successive intervals of 10 years from this be also taken, the following results are obtained, viz. :—

$x-i$ and x ..	12–22	12–32	12–42	12–52
Exact formula ..	1.03114	1.0933	1.1861	1.3133
Approx. formula ..	1.03110	1.0893	1.1500	1.2888

Even the final difference is ordinarily of no moment, since, as a rule, the numbers to which it would have to be applied are very small.

In this ρ will denote in case (i.) the absolute rate of increase, and in case (ii.) the excess over the normal rate of increase. Certain events, however, for example births, marriages, and deaths, migration, etc., occur with a rapidity which fluctuates on either the positive or negative side of the general rate of increase of the population, in which case it may be necessary to introduce, into equation (542), a factor depending on the fact in question.

4. **Distribution of partially and wholly unspecified quantities in tables of double-entry.**—If a series of quantities, A, B, C, etc., and A′, B′, C′, etc., fully specified so as to permit of proper double-entry, and others, a, a', etc., and α, α', etc., specified so as to permit only of single entry, and again a third set ω not specified, so as to permit of entry under either of two series of headings, be tabulated or arranged as hereunder, and totalled, the result will be as shewn symbolically in the following table :—

TABLE XCVII.—Scheme of a Double-entry Tabulation of Defectively Specified Data.

Arguments	y	y'	y''	y'''	etc.	etc.	Specified as regards x only.	Totals.
x	A	B	C	D	etc.	etc.	a (b)	S + a (S + b)
x'	A′	B′	C′	D′	etc.	etc.	a' (b')	S′ + a' (S′ + b')
x''	A″	B″	C″	D″	etc.	etc.	a'' (b'')	S″ + a'' (S″ + b'')
etc.	etc.	etc.	etc.	etc.	etc.	etc.	etc.	etc.
Specified as regards y only	α (β)	α' (β')	α'' (β'')	α''' (β''')	etc.	etc.	ω (0)	$[\alpha+\alpha'+\ldots]+\omega$ $(\beta+\beta'+\ldots)+0$
Totals	T + α	T′+α'	T″+α''	T‴ + α'''	etc.	etc.	$[a+a'+\ldots]+\omega$ $(b+b'+\ldots)+0$	$\Sigma S+\Sigma a+\Sigma\alpha+\omega$ $\Sigma T+\Sigma a+\Sigma\alpha+\omega$

In this type-table, the horizontal and vertical totals of the fully-specified quantities are respectively S, S′, etc., and T, T′, etc., but the aggregates of the rows are S + a, etc., and of the columns are T + α, etc. (*i.e.*, for the fully specified quantities together with those specified as regards one particular only). The totals T + α are specified as regards the "arguments" in the horizontal headings, and the totals S + a are specified as regards the "arguments" in the vertical headings. Thus the grand total is $\Sigma S (= \Sigma T) + \Sigma a + \Sigma\alpha + \omega$, and this is the sum of either of the series of totals, viz., that of the final column or that of the final row.

In order to distribute the quantity wholly unspecified, it is necessary to add a portion of ω to the (vertical) columns, and a portion thereof to the (horizontal) rows, so that the corrected values of A, B,.....A′, B′...., etc., shall equal the grand total, and so that the adjustment

shall be the most probable. Such adjustment can be effected as follows : It is assumed that the division of the quantity ω into two parts, viz., ω' and ω'', proportional to the aggregates of the a and α quantities respectively, is the most probable apportionment of the doubly-unspecified quantity among the two, and further, that if these divisions, ω' and ω'', be again subdivided proportionally to the individual values of a, a', etc., and α, α', etc., the result will be the most probable subdivision. Let—

$$(543)\ldots\ldots \omega = \omega' + \omega''; \text{ and } \Omega = \Sigma a + \Sigma\alpha; \text{ then}$$

$$(544)\ldots\ldots \omega' = \Sigma a \,.\, \omega / \Omega; \text{ and } \omega'' = \Sigma\alpha \,.\, \omega / \Omega;$$

consequently the amounts of the corrections to the a and α quantities are ascertained by multiplying each of them by the ratio ω/Ω, or what is the same thing, the required result is attained by multiplying by this factor increased by unity. Calling the adjusted numbers b and β respectively, their values are :—

$$(545)\ldots\ldots b = a\,(1 + \omega / \Omega);\ \beta = \alpha\,(1 + \omega / \Omega).$$

Similarly, if these b and β quantities are distributed proportionally to the A, B, C, etc., quantities, and the A, A′, A″, etc., quantities respectively, the required corrections are :—

$$(546)\ldots \mathrm{A} + \mathrm{a} = \mathrm{A}\left(1 + \frac{b}{\mathrm{S}} + \frac{\beta}{\mathrm{T}}\right);\ \mathrm{B} + \mathrm{b} = \mathrm{B}\left(1 + \frac{b}{\mathrm{S}} + \frac{\beta'}{\mathrm{T}'}\right); \text{etc.}$$

$$(547)\ldots \mathrm{A}' + \mathrm{a}' = \mathrm{A}'\left(1 + \frac{b'}{\mathrm{S}'} + \frac{\beta}{\mathrm{T}}\right);\ \mathrm{B}' + \mathrm{b}' = \mathrm{B}'\left(1 + \frac{b'}{\mathrm{S}'} + \frac{\beta}{\mathrm{T}}\right); \text{etc.}$$

and so on. The additive quantities, Ab / S, $A\beta / T$, etc., are most readily computed separately, and are then added to the fully-specified quantities. By the process indicated, both series of singly-specified quantities, and the unspecified quantities are suitably distributed, the adjusted table consisting of the values A + a, B + b, etc. ; and A′ + a′, B′ + b′, etc.

The process indicated is also valid when the distribution should be made on other bases.

Let $\mathrm{a} = \mathrm{a}_1 + \mathrm{a}_2$; $\mathrm{b} = \mathrm{b}_1 + \mathrm{b}_2$; etc., $\mathrm{a}' = \mathrm{a}'_1 + \mathrm{a}'_2$; etc., etc., the subdivisions being the values of Ab/S, $A\beta/T$, etc. Then, if the fundamental supposition that the corrections are proportional to A, B, etc., A′, B′, etc., be not satisfactory, any function of these quantities

may be substituted, in which case S and T will be $\Sigma\phi(A)$, and $\Sigma\psi(A)$, the former denoting the sum of the values of ϕA, ϕB, etc., and the latter the sum of ψA, $\psi A'$, etc. The process is identical in all respects with the preceding one, when the substitutions of ϕA for A, etc., have been made.

In general, this method of distribution not only gives results of a very high degree of probability,[1] but has also the advantage of being arithmetically very convenient.

5. **Unspecified cases follow a regular law.**—In general, the number of unspecified cases in any compilation exhibit great regularity. It will be sufficient to take two examples, which may be obtained from Tables CXIII. and CXIV. hereinafter.

According to the former Table, out of 733,773 wives, 21,151 made no statement as to the duration of marriage, but stated the number of children borne by them; 12,073 stated the duration of marriage, but omitted to state how many children were borne by them, and 3747 gave no information as regards either particular. See Census Report, Vol. III., pp. 1140-1. In the latter table, out of the same number, 5432 stated the number of children borne by them, but did not state their ages; 15,477 stated their ages, but did not state the number of children borne by them; and 343 gave no information as regards either particular: see Census Report, Vol. III., pp. 1136-7.

The regularity of distributions of the partially-specified cases is shewn by forming the ratios of the unspecified to the completely specified in the same category. The results are as follow:—

TABLE XCVIII.—Exhibiting the Regularity of the Ratios of those who Fail to Specify Particulars completely to those who do not so Fail.

Ratio to total who fully Specify, of those who omit to State	Particulars Specified—Issue to the Number of—										
	0	1	2	3	4	5	6	7	8	9	10
Duration of Marriage	.0253	.0220	.0232	.0273	.0303	.0347	.0369	.0386	.0406	.0421	.0433
Age ..	.0066	.0068	.0069	.0077	.0081	.0084	.0086	.0079	.0087	.0085	.0089

	Particulars Specified—Issue to the Number of—										
	11	12	13	14	15	16	17	18	19	20	21, etc.
Duration of Marriage	.0452	.0539	.0554	.0464	.0465	.0370	.0652	.0490	.0488	.0625	.1081
Age ..	.0094	.0081	.0094	.0066	.0088	.0105	.0074	.0236	.0000	.0000	.0208

[1] The ground of assurance as to this is indicated in the next section.

Table XCVIII.—Exhibiting the Regularity of the Ratios of those who Fail to Specify Particulars completely to those who do not so Fail—*continued.*

Ratio to total of those who fully Specify, of those who Omit to State	Duration of Marriage.									
	0–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–
No. of Children borne	.0216	.0204	.0174	.0104	.0142	.0137	.0130	.0145	.0124	.0151

	Ages of Wives.											
	14	15	16	17	18	19	20	21–24	25–29	30–34	35–39	40–44
No. of Children borne	.0000	.0000	.0148	.0105	.0107	.0161	.0234	.0215	.0209	.0198	.0201	.0212

	Ages of Wives.											
	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85–89	90–94	95–99	100–04
No. of Children borne	.0207	.0236	.0238	.0263	.0290	.0349	.0378	.0642	.0824	.0625	.0000	2.0000

From the above results it is evident that the number who fail to specify "duration of marriage" is a fairly definite function of the "number of children borne," and also that the number who fail to specify the "number of children borne" is also a fairly definite function of the "duration of marriage," (see the upper part of the Table). Also, the lower part of the table shews that those who omit to state the number of children borne is a fairly definite function both of the "duration of marriage," and—as might consequently be expected—of the "age of the wives." These facts justify, *pro tanto*, the distribution of the unspecified cases, and there is little reason to doubt the result, after distribution, has a much higher degree of probability than that which rejects all partially-specified cases.

Other tabulations disclose, in an equally striking way, the regularity of the numbers of the unspecified, and confirm the desirability of adjusting tabulations generally, in the manner indicated, before using the results. The use of the fully specified tabulation as proportionally correct is obviously *not* satisfactory.

6. **Number of children at a confinement—a function of age.**—By dividing for each age the number of cases of confinement into the number of children born, during a sufficiently long period, the average number of children at a confinement is found to vary with age : that is, B denoting children born, and M the number of their mothers :—

$$(548)\ldots\ldots 1 + \epsilon_x = B_x / M_x = f(x)$$

ϵ denoting the excess over unity. Seven years' experience give the following results, the figures, however, being confined to cases of twins, that is, the third child in cases of triplets is not taken into account :—

TABLE XCIX.—Shewing Excess due to the Occurrence of Multiple Births according to Age in the Average Number of Children Born per Confinement, Australia, 1907–14.

Age.	Nuptial Confinements.				Ex-nuptial Confinements.			
	Confinements.	Excess* over 1 Child.	Ratio.		Confinements	Excess* over 1 Child.	Ratio.	
			Crude.	Smoothed.			Crude.	Smoothed.
12	0	..	..	.0000	5	..	..	.0000
13	4	..	..	.0006	21	..	..	.0007
14	30	..	..	.0013	126	..	..	.0014
15	170	..	..	.0019	537	1	.0019	.0021
16	1,138	2	.0018	.0026	1,500	2	.0013	.0028
17	3,962	12	.0030	.0032	2,980	11	.0037	.0035
18	9,761	35	.0036	.0038	4,504	15	.0033	.0042
19	18,071	94	.0052	.0045	5,317†	22	.0041	.0049
20	25,159	148	.0059	.0051	5,272	30	.0057	.0056
21	35,326	203	.0057	.0058	5,008	32	.0064	.0063
22	43,353	254	.0059	.0064	4,231	36‡	.0085	.0070
23	50,322	333	.0066	.0070	3,848	30	.0078	.0077
24	53,175	394	.0074	.0077	3,182	26	.0081	.0084
25	54,259	453	.0083	.0083	2,548	19	.0075	.0091
26	55,006†	447	.0081	.0090	2,161	20	.0093	.0098
27	53,735	494	.0092	.0096	1,785	27	.0151	.0105
28	53,244	509	.0096	.0102	1,699	20	.0118	.0112
29	49,200	539	.0110	0.109	1,410	7	.0050	.0119
30	47,980	555	.0116	.0115	1,356	17	.0125	.0126
31	40,199	484	.0120	.0122	851	10	.0118	.0134
32	41,528	565‡	.0136	.0128	956	13	.0136	.0146
33	37,426	508	.0136	.0134	812	15	.0185	.0162
34	34,362	486	.0141	.0141	779	13	.0167	.0186
35	31,349	445	.0142	.0147	688	17	.0247	.0200
36	29,399	496	.0169	.0154	636	12	.0189	.0190
37	26,213	419	.0160	.0160	544	7	.0129	.0160
38	24,664	380	.0154	.0163	555	9	.0162	.0135
39	20,790	326	.0157	.0158	436	5	.0115	.0115
40	17,023	232	.0136	.0145	383	6	.0016	.0102
41	12,252	173	.0141	.0129	201	3	.0149	.0083
42	11,012	126	.0114	.0114	205	0	.0000	.0068
43	7,457	85	.0114	.0101	155	1	.0065	.0056
44	4,746	37	.0078	.0088	85	1	.0118	.0045
45	2,755	21	.0076	.0075	58	0	.0000	.0036
46	1,389	10	.0072	.0063	36	1	.028	.0028
47	684	4	.0058	.0052	17	..	..	.0022
48	310	1	.0032	.0042	12	..	..	.0016
49	106	0	.0000	.0032	7	..	..	.0011
50	34	0	.0000	.0023	5	..	..	.0007
51	12	0	.0000	.0016	1†	..	..	.0004
52	6	1	.1666	.0009	0	..	..	.0002
53	4	..	..	.0005	1	..	..	.0001
54	3	..	..	.0002	..	..	..	..
Total	897,618	9,271	.001032	..	54,913	428	.000778	..

* Triplets are included in the result. † Maximum for confinements. ‡ Maximum excess for multiple births.

The results shewn indicate that the increase with age, x, is as follows:

$$(549)\ldots\ldots\beta''_n = 1 + 0.00064\ (x - 12);\ \text{up to age } 37.$$

$$(550)\ldots\ldots\beta''_e = 1 + 0.00070\ (x - 12);\ \text{up to age } 30\ (?)$$

The excess of over is the quantity ϵ in (548). Probably the age 37 could be adopted in both cases. For later ages, Table XCIX. must be consulted, and the values are uncertain. As the numbers are small this fact is, however, of little moment. Later, the case will be more fully analysed, for example, in regard to the duration of marriage, etc. Curves A and B, Fig. 82, shew the nuptial and ex-nuptial results respectively. The nuptial maximum is 0.0163 for age 38.4, and the ex-nuptial maximum is 0.0201 for age 35.5. The numbers after age 44 in the nuptial, and after age 36 in ex-nuptial cases are so small as to make the results for later ages doubtful, and the somewhat wide dispersion of the ex-nuptial results then probably is large for the later ages.

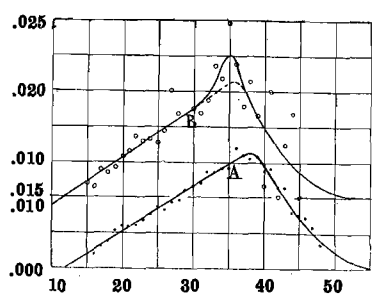


Fig. 82.

Curve A shews by a continuous line the smoothed curve of the excess over 1 at a birth, according to the age of the married mother; and Curve B similarly shews the results for unmarried mothers. The dots and circles shew the crude results.

7. **Relative frequency of multiple births.**—For the period 1881 to 1915, the relative frequencies of twins, triplets, and quadruplets were as follow:—

TABLE C.—Multiple Births, Australia, During 35 Years, 1881–1915, and for Other Places.

	Population Aggregate.*	Female Population Aggregate.*	Confinements.	Cases of Twins.	Cases of Triplets.	Cases of Quadruplets.	Cases of Quintuplets.
Numbers	113,900,167	53,955,512	3,329,594	32,636	276	5	0
Ratios ..	34,208,424	16,204,832	1,000,000	9,802	82.9	1.50	0
,,	..	..	102.02	1	.00846	.00015	0
,,	..	..	12,064	118.25	1	.0188	0
,,	..	..	665,919	6,527	53.2	1	0

Year.	Authority.	Total Births.	Confinements	Cases of Twins.	Cases of Triplets.	Cases of Quadruplets.	Cases of Quintuplets.
	Neefe†	50,000,000	1,000,000	12,080	156	1.8	..
1871-80	Prinzing‡	63,000,000	1,000,000	11,677	143	1.3	..
1872-80	Knibbs	German Empire	1,000,000§	12,856	124	1.33	0.25¶

* Sum of the mean annual populations of the Australian States for which the necessary birth statistics were taken out.

† Zur Statistik der Mehrgeburten. Jahr. f. Nat. u. Stat., 1877, Bd. XXVIII., p. 174.

‡ Medizinischen Statistik. H. Prinzing, p. 65.

§ Confinements 12,013,134; Twins 154,444; Triplets, 1489; Quadruplets, 16; in the German Empire.

¶ Based on 15,965,391 children born, excluding still-births about 15,758,822.

Quintuplets have been reported by Volkmann,[1] Düsseldorf; by A. Bernheim,[2] Philadelphia; by Horlacher,[3] Württemberg; by Nyhoff,[4] Groningen; in 30 cases collected by the last-named, the majority were born at between 4 and 5 months.

Sextuplets are reported by Vassali,[5] and Vortisch, Alburi,[6] and *sextuplets* at Hameln in Westphalia in 1600[7]; no cases, however, so far as I am aware, have been reported in Australia.

The observed frequency of multiple births is as follows :—

TABLE CI.—Relative Frequency of Twins in Various Countries.*

Country.	Period.	Frequency.	Country.	Period.	Frequency.
Australia ..	..	..	Switzerland ..	1881–1900	.0126
Spain	1863–70	.0087	Germany ..	1901–1902	.0127
Roumania ..	1871–80	.0088	Baden ..	1891–1900	.0128
France	1899–1902	.0109	Prussia ..	,,	.0129
Belgium	1890, 5, 1900	.0111	Netherlands ..	,,	.0129
			Hungary ..	,,	.0131
Italy	1891–1900	.0117	Württemberg	,,	.0132
Russia	1887–91	.0121	Norway ..	1876–1880	.0133
Bavaria	1891–1900	.0123	Sweden ..	1871–80	.0146
Saxony	,,	.0123	Finland ..	1891–1900	.0147
Austria	1896–1900	.0126			

* The results other than for Australia are given in H. Prinzing's "Handbuch der medizinischen Statistik, p. 64.

The frequencies, however, have wide ranges of values. Thus, in Italy, they ranged in the period 1892-1899 through .0080 for Basilicata, to .0148 for Venice. For rough approximations the order of frequency with which twins, triplets, etc., occur, is as follows :—

Confinement.	Twins.	Triplets.	Quadruplets.	Quintuplets
1	.01	.0001	.000001	.0000002

8. **Uniovular and diovular multiple births.**—Observations as to the frequency of what may be called uniovular and diovular production of twins shew (i.) that the sexes are the same where the twins are produced by the division of a single ovum; (ii.) that this occurs in about one-fifth or one-fourth of the cases, these being recognised by the fact that they have common chorion; and (iii.) that where the twins are produced from two ova, the sexes may be identical or otherwise, these being recognised by the fact that the chorion is divided.

[1] Zentral bl. f. Gyn., 1879, p. 17.
[2] Deutsche med. Wochenschrift, 1899, p. 274.
[3] Horlacher, Württ., Korr. Bl. 1840.
[4] Zeitschr. f. Geb. u. Gyn., 1903, Bd. liii., p. 173.
[5] Anatom. Anzeiger, Bd. x., No. 10.
[6] Münch. med. Wochenschr., 1903, No. 38, pp. 1639-40 a photograph is given. Date of birth, 9th January, 1600.
[7] Deutsche med. Wochenschr., No. 19, 1899, p. 312.

Statistics for an examination of this question are not available in Australia, but are available for the German Empire. The data for 1906 to 1911 inclusive are as follows :—

TABLE CII.—Frequency of Multiple Births (German Empire, 1906–11).

Confinements.	2 Males.	Pairs.	2 Females.	3 males.	2m.,1f.	1m.,2f.	3 Females.	Males Born.	Females Born.	Total Quintuplets.*
12,013,134	49,425	58,382	46,637	343	390	395	361	28	36	
Children Born.	Total Cases of Twins.			Total Cases of Triplets.				Total Cases of Quadruplets.		
12,170,604	154,444			1,489				16.		3.
10,000,000†	128,563			1,239.5				13.3		2.54

* This is based upon 15,965,391 children born ; or about 15,758,800 confinements in 1872 to 1880, during which time 4 quintuplets were born. † This would give the proportion 3.05. As is evident for the number of children, the twins must be multiplied by 2, the triplets by 3, etc.

The proportion (ξ) of uniovular cases can be deduced at once from the preceding figures. Let μ denote the masculinity, defined as the ratio of the difference of the pairs of males and pairs of females to their sum ; see (335), p. 132. Obviously, the uniovular cases are in the ratio $(1+\mu)$ pairs of males to $(1-\mu)$ pairs of females. The diovular cases are in the same ratio as regards the same pairs, and the mixed pairs are equal to both combined, that is they are :—

TABLE CIII.—Theoretical Distribution of Diovular and Uniovular Cases Among Cases of Twins.

Total T	2 males :	Male and female	+	Female and male	:	2 females
$T(1-\xi)$	$1+\mu$:	1	+	1	:	$1-\mu$
$T\xi$ ..	$1+\mu$:	0	+	0	:	$1-\mu$

Of the total there are ξ uniovular and $(1-\xi)$ diovular cases : consequently—

$$(551).....\xi = \frac{M+F-P}{M+F+P}\text{ ; and }\mu = \frac{1}{2}\cdot\frac{M-F}{M+F}$$

M denoting the number of pairs of males, F the pairs of females, and P the cases of one of each sex. The above results thus give $\xi = 0.24397$ and $\mu = 0.029023$.

Direct observations according to Weinberg[1] and Ahlfeld[2] gave respectively for the relative frequency of uniovulate cases 0.21 and .0172, but it would appear from the preceding result that a sufficiently extended number of cases could be expected to give a higher ratio.

[1] Beiträge zur Physiologie und Pathologie der Mehrlingsgeburten beim Menschen. Archiv f. ges. Physiol., 1901, Bd. lxxxviii, p. 346 ; Neue Beiträge zur Lehre von den Zwillingen. Zeit. f. Geb. u. Gyn., 1903, Bd. xlviii., H. 1.

[2] Zeit. f. Geb. u. Gyn., 1902, Bd. xlvii., p. 230.

A similar investigation may be applied to the more limited results for triplets. Neglecting the masculinity tendency, it is obvious that for the triovular and diovular cases the proportions of cases in each category will be respectively :—

TABLE CIV.—Theoretical Distribution of Diovular and Triovular Cases Among Triplets.

Total T	3 males : (*M*)	2 males and 1 female : (*P*)	1 male and 2 females : (*Q*)	3 females (*F*)
$T(1-\xi')$	.125	.375	.375	.125
$T\xi'$ ..	.25	.25	.25	.25*

* It is assumed that when the births m.f.m and f.m.f occur, the chance of the two males or two females being uniovular is zero. If this condition were not physiologically impossible, it is easy to see (by exhaustive enumeration) that the probabilities of the four cases would be 0.2 : 0.3 : 0.3 : 0.2.

An examination of the individual figures for each year shews that the differences are too great to give any ground for deducing masculinity to be other than zero. Hence we may take means adopting :—

352 : 392.5 : 392.5 : 352 instead of 343 : 390 : 395 : 361.

and this gives for the series of triovular and diovular births respectively :

20.25 : 60.75 : 60 : 75 : 20.25 and 331.75 : 331.75 : 331.75 : 331.75,

or 162 triovular and 1327 diovular births in all ; or ratio of diovular cases of no less than 0.8912 of the total, the triovular being 0.1088. Thus it follows that *triovulation is a much rarer occurrence than the production of uniovular twins*, that is, the ratio of triovulation in triplets to diovulation is 8.20. From the above we obtain by symmetrically including all the data :—

$$(552).....\xi' = \{3(M+F)-(P+Q)\}/(M+P+Q+F).$$

Thus, according to the recent experience of the German Empire, we have for 10,000,000 cases of confinement, 31,365.5 cases of uniovulation production of twins among the twins, and 1104.6 cases occurring among the triplets. We may assume at least the same ratio for the cases of quadruplets and quintuplets, which will give, say, 14.1 for both combined.[1] Hence the ratio ζ of occurrence for all cases of uniovular production of twins (*i.e.*, appearing as twins or as portion of triplets, &c.) :—

$$(553).....\zeta = 0.0032484.$$

or, say, 13 cases in 4000, or 1 case in 308.

[1] In quadruplets there are 16 possible orders in which births may occur, and in these 24 possible cases of uniovulation. Since, however, the number of males and females are unequal—28 and 36—the possible cases have not occurred, and hence we may regard the 16 quadruplets and 3 quintuplets as roughly expressing the probable number of cases. Schrœder (Lehrbuch der Geburtshülfe, 10° aufl.) gives for twins 1 : 89, triplets 1 : 7910, quadruplets 1 : 371126.

9. **Small frequency of triovulation.**—The preceding analysis appears to shew that the triovular cases are only 162 in 12,013,134 confinements. The probability of triovulation, ζ', therefore, would appear to be :—

$$(554)\ldots\ldots \zeta' = 0.00001348.$$

or, say, 1 case in 74,000 confinements, though triplets occur at the rate of 1 case in 8068 confinements in the German Empire. This subject might well form the result of more definitive study when the data are adequate.

10. **Nuptial and ex-nuptial probability of twins according to age.**—The probability, in any nuptial or in any ex-nuptial confinement, of the occurrence of twins has been analysed from an aggregate of the Australian data from 1908 to 1914, both inclusive. It must, of course, be in substantial agreement with the result found for ϵ in § 8. Table CV., columns (ii.) and (vi.), give the number respectively of nuptial and ex-nuptial confinements (totals 897,618 and 54,913) occurring in Australia in 8 years, and the numbers of twins corresponding to each, viz., 9187 and 422. These are shewn by curves A and B, Fig. 83, the dots denoting the individual results for nuptial cases, and the firm lines the smoothed results ; the values for the latter being given in column (v.) of the table. The ex-nuptial cases are denoted by circles, and where the numbers were small, the quinquennial aggregates only were graphed. The rate of increase per year of age up to age 37 is for nuptial and ex-nuptial cases respectively.

Frequency of Twins according to Age.

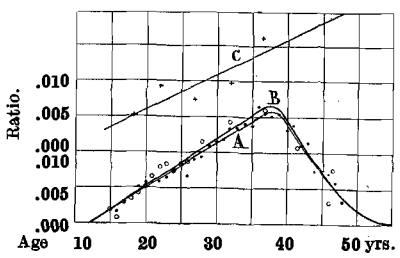


Fig. 83.

Curve A represents the ratio of the number of cases of at least two births to the number of nuptial confinements.

Curve B represents the same ratio for ex-nuptial confinements.

Curve C represents the number of cases of three or more at a birth to the number of cases of two or more.

$$(555)\ldots\ldots \epsilon_2 = 0.000632\,(x - 12) \text{ and } \epsilon'_2 = 0.000668\,(x - 12)$$

x being the age of the mother. Beyond the age in question the results can be taken from the table. The ratios for all ages are—nuptial, 0.010234, and ex-nuptial, 0.00768. The general result is (i.) that *with increase of age* (and possibly duration of marriage) *the frequency of twins increases linearly,* till the end of the ordinary child-bearing period is approached, and (ii.) *this increase is slightly greater for ex-nuptial cases,* viz., about 5.7 per cent. greater. The ex-nuptial relative frequency of

twins for all ages combined is exactly 0.75 the nuptial relative frequency. Since in the ex-nuptial cases the confinements are probably on the whole not repeated, the result would appear to be due to age. This matter will be further considered later.

TABLE CV.—Shewing Probability according to Age of the Occurrence of Nuptial and Ex-nuptial Twins, and of Triplets, based on 8 Years' Australian experience, 1907-1914.

Age.	Nuptial Confinements.	Cases of Nuptial Twins.	Frequency of Nuptial Twins.		Ex-Nuptial Confinements.	Cases of Ex-Nuptial Twins.	Frequency of Ex-nuptial Twins.		All Twins.	All Triplets	Ratio of Triplets to Twins.
			Crude	Smo'thed.			Crude.	Smo'thed.			
(i.)	(ii.)	(iii.)	(iv.)	(v.)	(vi.)	(viii.)	(vii.)	(ix.)	(x.)	(xi.)	(xii.)
12	0	0	0	.0000	5	..	..	.0000	..	..	.0030
13	4	0	0	.0006	21	..	..	.0007	..	..	.0035
14	30	0	..	.0013	126	0	.0000	.0013	..	..	.0039
..	**34**	..	..	..	**152**	..	..	..	..	..	..
15	170	0	..	.0019	537	1	.0019	.0020	..	..	.0044
16	1,138	2	.0018	.0025	1,500	1	.0007	.0027	..	..	.0049
17	3,962	12	.0030	.0032	2,980	9	.0030	.0033	..	..	.0054
18	9,761	36	.0037	.0038	4,504	16	.0036	.0040	..	..	.0058
19	18,071	94	.0052	.0044	5,317	23	.0043	.0047	..	..	.0063
..	**33,102**	**144**	..	..	**14,838**	**50**	**.0337**	..	**194**	**1**	**00.52**
20	25,159	147	.0058	.0051	5,272	27	.0051	.0053	..	1	.0068
21	35,326	202	.0057	.0057	5,008	33	.0066	.0060	..	3	.0072
22	43,353	254	.0059	.0063	4,231	34	.0080	.0067	..	1	.0077
23	50,322	329	.0065	.0069	3,848	32	.0083	.0073	..	6	.0082
24	53,175	392	.0074	.0076	3,182	24	.0075	.0080	..	3	.0086
..	**207,335**	**1,324**	..	..	**21,541**	**150**	**.0696**	..	**1,474**	**14**	**.0095**
25	54,259	452	.0083	.0082	2,548	21	.0082	.0087	..	1	.0091
26	55,006	434	.0079	.0088	2,161	19	.0087	.0094	..	3	.0096
27	53,735	487	.0091	.0095	1,785	25	..	.0100	..	8	.0101
28	53,244	506	.0095	.0101	1,699	23	..	.0107	..	5	.0105
29	49,200	538	.0109	.0107	1,410	8	..	.0114	..	2	.0110
..	**265,444**	**2,417**	..	..	**9,603**	**96**	**.0100**	..	**2,513**	**19**	**.0076**
30	47,980	548	.0114	.0114	1,356	14	..	.0120	..	7	.0115
31	40,199	485	.0121	.0120	851	13	..	.0127	..	4	.0119
32	41,528	559	.0135	.0126	956	11	..	.0134	..	8	.0124
33	37,426	505	.0135	.0133	812	15	..	.0140	..	3	.0129
34	34,362	488	.0142	.0139	779	15	..	.0147	..	4	.0133
..	**201,495**	**2,585**	..	..	**4,754**	**68**	**.0143**	..	**2,653**	**26**	**.0098**
35	31,349	436	.0140	.0145	688	17	..	.0154	..	10	.0138
36	29,399	488	.0166	.0152	636	9	..	.0160	..	12	.0143
37	26,213	414	.0158	.0158	544	7	..	.0167	..	5	.0148
38	24,664	377	.0153	.0161	555	8	..	.0168	..	4	.0152
39	20,790	324	.0156	.0156	436	5	..	.0163	..	3	.0157
..	**132,415**	**2,039**	..	..	**2,859**	**46**	**.0161**	..	**2,085**	**34**	**.0163**
40	17,023	226	.0133	.0143	383	6	..	.0150	..	6	.0162
41	12,252	171	.0140	.0127	201	3	..	.0134	..	2	.0166
42	11,012	123	.0112	.0112	205	0	..	.0118	..	2	.0171
43	7,457	85	.0114	.0099	155	1	..	.0104	..	0	.0176
44	4,746	36	.0076	.0086	85	1	..	.0090	..	**1**	**?**
..	**52,490**	**641**	..	..	**1,029**	**11**	**.0107**	..	**652**	**11**	**.0169**
45	2,755	21	.0076	.0074	58	0	..	.0077	..	..	**?**
46	1,389	10	.0072	.0062	36	1	..	.0064	..	..	**?**
47	684	4	.0060	.0051	17	0	..	.0052	..	..	**?**
48	310	1	.0032	.0041	12	0	..	.0042	..	..	**?**
49	106	0	..	.0031	7	0	..	.0032	..	..	**?**
..	**5,244**	**36**	..	..	**130**	**1**	**.0077**	..	**37**	..	**.0000**
50	34	..	..	.0022	5	..	..	.0023	..	..	**?**
51	12	..	..	.0016	1	..	..	.0016	..	..	**?**
52	6	1	.17	.0009	0	..	..	.0009	..	..	**?**
53	4	..	..	.0005	1	..	..	.0005	..	..	**?**
54	3	..	..	.0002	..	..	..	.0002	..	..	**?**
..	**59**	**1**	..	..	**7**	..	..	..	1	..	**.0000**
Not Stated											
Totals	897,618	9,187	.01023	..	54,913	422	.00768	..	9,609	105	.01093

11. **Probability of triplets according to age.**—The results of the 8 years, 1907-14, gave the following results for nuptial and ex-nuptial twins and triplets, viz. :—

	Twins.			Triplets.		
	Nuptial.	Total.	Ex-nuptial.	Nuptial.	Total.	Ex-nuptial.
Numbers	9,187	(9,609)	422	98	(105)	7
Ratio ..	1.0000	..	.0459	1.000	..	0.071

The numbers are too small, however, to establish that the frequency of the occurrence of triplets ex-nuptially is between 50 and 60 per cent. greater than nuptially.

If the frequency be related to the number of twins, it is roughly given by the smoothed results in column (xii.) of Table CV. We shall call the probability P_3/P_2 say, τ_3. Thus we shall have :—

$$(556)\ldots\ \tau_3 = 0.0030 + 0.00047\ (x - 12);\ \text{or} = 0.00047\ (x - 5.6)$$

the second form, however, being without meaning till the age of child-bearing. The firm line, curve C, on Fig. 83, denotes the increase ; the crosses represent the group results used in deducing this.

12. **Probability of twins according to duration of marriage.**—Given a birth, the probability of a second child being born is found by dividing the number of twins, including triplets, by the number of confinements tabulated according to duration of marriage. Thus, column (v.) in Table CVI. is found by dividing the figures in column (iii.) by those in column (ii.). The crude results are shewn by the dots in Fig. 84, and the smoothed results by the firm line, curve A. For the form of the initial part of the curve see § 14, and also Fig. 85 hereinafter.

13. **Probability of triplets according to duration of marriage.**—The probability of a third child being born may, as before, be referred to the number of cases where a second child has been born. This probability is found by dividing the number of triplets by the number of twins, including the triplets, etc. But the numbers to be dealt with are so small and irregular that the expedient was adopted of forming groups of eleven. As no correction was applied for the systematic error of the grouping, the curve represents the ratio of 11-year groups of duration of marriage, the argument being the central years of the group. The results are shewn on Fig. 84, curve B, and the data are shewn in Table CVI., and seem to indicate the change with duration of marriage is sensibly a linear one through for the major part (presumably) of the child-bearing period.

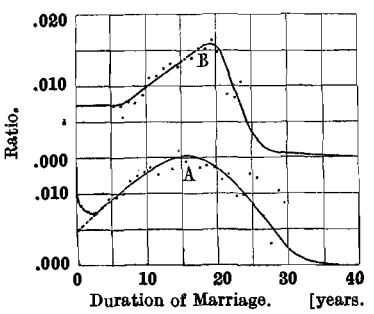


Fig. 84.

Curve A denotes the frequency of the birth of two or more children to the number of confinements.

Curve B denotes the ratio of 11-year means of the number of triplets to the number of cases of two or more children.

TABLE CVI.—Probability of Twins* and Triplets† according to Duration of Marriage. Australia, 1908-1914.

Duration of Marriage.	Confinements	Twins including Triplets.	Triplets.	Ratio of Twins to Confinements.		Ratio of Triplets to Twins (Groups of 11).	
				Crude.	Smoothed	Crude.	Smoothed
(i.)	(ii.)	(iii.)	(iv.)	(v.)	(vi.)	(vii.)	(viii.)
0–1	134,171	1,129	9	.0084	0084	..	.0073
1–2	61,213	460	3	.0075	.0075	..	.0073
2–3	64,229	465	4	.0072	.0072	..	.0073
3–4	70,317	564	3	.0080	.0080	..	.0073
4–5	59,407	551	2	.0093	.0090	..	.0073
5–6	53,275	504	4	.0095	.0098	.0074	.0073
6–7	47,250	468	1	.0099	.0106	.0072	.0075
7–8	41,713	492	3	.0118	.0113	.0078	.0080
8–9	37,115	466	7	.0125	.0120	.0077	.0087
9–10	32,170	417	3	.0130	.0126	.0088	.0095
10–11	29,607	404	5	.0136	.0132	.0112	.0102
11–12	25,887	328	2	.0127	.0138	.0115	.0109
12–13	23,372	352	5	.0151	.0143	.0125	.0117
13–14	20,339	273	2	.0134	.0148	.0130	.0124
14–15	17,572	281	6	.0160	.0152	.0128	.0131
15–16	15,217	228	9	.0150	.0154	.0138	.0138
16–17	13,271	196	2	.0148	.0152	.0139	.0146
17–18	11,617	159	1	.0137	.0149	.0153	.0155
18–19	10,073	139	0	.0138	.0145	.0152	.0158
19–20	8,520	117	2	.0137	.0139	.0164	.0158
20–21	7,424	89	2	.0120	.0132	.0149	.0149
21–22	5,988	76	0	.0127	.0124	.0087	.0121
22–23	4,726	46	1	.0097	.0114	.0083	.0095
23–24	3,561	35	0	.0098	.0103	.0105	.0068
24–25	2,664	34	0	.0128	.0092	..	.0043
25–26	1,809	22	0	.0122	.0080	..	.0028
26–27	1,146	8	0	.0070	.0067	..	.0016
27–28	643	2	0	.0031	.0054	..	.0010
28–29	383	4	1	.0104	.0041	..	.0006
29–30	192	..	0	..	.0028	..	.0003
30–31	77	..	..	..	.0016	..	.0002
31–32	45	..	..	..	.0010	..	.0002
32–33	16	..	..	..	.0006	..	.0001
33–34	5	..	..	..	.0004	..	.0001
34–35	0	..	..	..	.0003	..	.0001
35–36	1	..	..	..	.0002	..	.0000
Totals	805,015	8,308	77	.010320	..	.00927	..

* That is, of two or more occurring at a birth. † That is, of third child in any case where two are born.

14. **Remarkable initial fluctuation in the frequency of twins, according to interval after marriage.**—There is no known ground for supposing that the ratio of the number of twins to the number of confinements in which they occur, can in any way depend on the interval after marriage, at least, if that interval be small. The results in Tables CVII. and CVIII.

hereunder for the years 1908 to 1915 and 1908 to 1914 respectively, shew, however, that apparently the dependence exists. The average for the first three months after marriage equals that of the third three months, and both are very much above the average. The second and fourth periods of three months are about equal. These results are shewn by curve C on Fig. 85.

TABLE CVII.—Shewing Variation in the Frequency of Twins during the First 24 Months after Marriage. Australia 1908-1915.

Year.	Twins Born during Interval after Marriage of Months					Confinements during Intervals after Marriage of Months					Ratio of Twins during Intervals after Marriage of Months				
	0–3	3–6	6–9	9–12	12–24	0–3	3–6	6–9	9–12	12–24	0–3	3–6	6–9	9–12	12–24
1908	16	24	34	56	60	1,533	3,152	4,006	7,007	6,298	.0104	.0076	.0085	.0080	.0095
1909	21	26	44	62	48	1,799	3,556	4,139	7,307	6,973	.0116	.0073	.0106	.0085	.0068
1910	19	29	58	59	48	1,888	3,659	4,474	7,500	6,919	.0101	.0079	.0129	.0079	.0069
1911	15	31	49	64	56	1,987	4,075	5,220	7,877	7,400	.0076	.0076	.0094	.0081	.0075
1912	27	32	60	61	60	2,119	4,458	5,827	8,399	8,518	.0127	.0072	.0103	.0069	.0071
1913	17	34	61	66	65	2,107	4,502	5,916	9,301	9,142	.0081	.0076	.0103	.0071	.0071
1914	14	32	58	60	63	2,080	4,268	5,897	9,185	9,247	.0067	.0075	.0098	.0065	.0069
1915	28	46	51	76	82	2,023	4,149	5,828	8,795	8,953	.0099	.0111	.0088	.0086	.0091
Totals	157	254	415	504	482	15,536	31,819	41,307	65,871	63,450	.01010	.00798	.01005	.00765	.00760

Thus the proportion of twins for all pre-nuptial conceptions is high. It is to be noted, however, that the proportion of ex-nuptial twins over all is low (see Table CV.), and it is not unlikely that the initial high rate, and, in general, the higher rate for the cases due to pre-nuptial insemination is due to the transfer, owing to the *peithogamic* influence, of what might have been ex-nuptial to the nuptial cases. To obtain the fluctuation more exactly, the results were taken out monthly, from 1908 to 1914, according to interval after marriage.

TABLE CVIII.—Shewing Variations in the Frequency of Twins for each Interval of One Month after Marriage (First Births only), and of Triplets. Australia 1908-14.

Interval* ..	0–1	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9	9–10	10–11	11–12	0–12
Twins ..	39	40	50	55	70	83	85	109	170	195	146	87	1,129
Confinements	3,529	4,059	5,925	7,455	9,055	11,160	13,870	11,545	10,064	24,434	19,047	13,595	133,738
Ratio ..	.0110	.0098	.0084	.0073	.0077	.0074	.0061	.0094	.0169	.0080	.0076	.0064	.00844

Interval† ..	1–2	2–3	3–4	4–7	7–11	11–26	1–26	0–26	Interval†	0–1	1–26
Twins ..	400	141	58	59	17	7	682	1,811	Triplets	8	6
Confinements‡	54,497	15,801	6,458	6,413	2,209	905	86,283	220,021	Twins	1,129	682
Ratio	.0073	.0089	.0091	.0092	.0077	.0078	.00790	.00823	Ratio	.0071	.0088

* Months. † Years. First births.

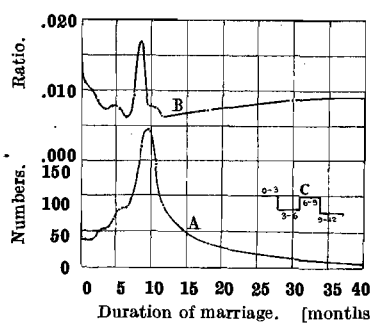


Fig. 85.

Curve A denotes the actual number of twins in Australia during 7 years' experience.

Curve B denotes the ratio of cases of births of 2 or more children to cases of confinement.

Curve C denotes, similarly to curve B, the group ratios for three months, however, instead of one.

The ratio for 1-4 is .0078, and for 5-26 is .0087. The numbers for the lesser subdivisions are doubtless too small to rely on the results. The results shewn are for *first births* only; but for the smaller durations the distinction is without meaning. Fig. 85 shews the results, curve A denoting the actual number of twin births, and curve B the frequency with which twins occur.

15. **Frequency of twins according to order of confinement.**—From the frequency of the occurrence of twins according to previous issue, an estimation according to order of confinement can be made by taking account of the probability of twins or triplets, &c. From the frequency according to previous issue, it may be deduced that the probability of twins is approximately as follows :—

Previous Confinements	0	1	2	3	4	5	6	7	8	9	10
Probability (about)	.0082	.0096	.0107	.0117	.0124	.0130	.0134	.0136	.0138	.0139	.0140

We have also from the general result that the frequency of single births, twins, and triplets in Australia was, for 1908-14,

$$\left.\begin{array}{l} 799831 : 8247 : 77 \\ 1 : 0.010311 : 0.000096 \end{array}\right\} \text{ or roughly, say, } 10{,}000 : 100 : 1$$

The probability of twins occurring twice, ${}_2p_2$, is, therefore, approximately identical with that of the occurrence of triplets, p_3, that is :—

$$(557)\ldots\ldots {}_2p_2 = p_2^2 = p_3, \text{ approximately.}$$

The number entered under 0 will be correct. That is, the cases "according to previous issue," and "according to previous confinements" are identical. But in every case where there were twins or triplets, etc., at the first birth, the cases would be tabulated under "previous issue," 2 or 3, etc., respectively, instead of under 2; and similarly *mutatis mutandis* for all later columns in the "according-to-previous-issue"

tabulation. We therefore must add the appropriate numbers, and deduct equal numbers from later columns. The precision of the result will, of course, never be of a high order.

The data are given in the upper part of Table CIX., and the approximate restatement according to the order of confinement forms the lower part of the table.

TABLE CIX.—Frequency of Multiple Births according to Previous Issue. Australia 1908-14.

Previous Issue (upper table), or Order of Confinement (lower table.)

Numbers.	0	1	2	3	4	5	6	7	8	9
Cases of at least 2 children ..	1,811	1,357	1,325	1,094	834	591	477	306	227	127
Cases of at least 3 children ..	12	10	7	7	8	5	9	2	4	1
Mothers of at least 1 child	220,807	167,091	125,779	92,116	65,343	46,156	31,733	21,918	14,727	9,671
Ratio of twins to mothers	.00820	.008121	.01053	.01188	.01276	.01280	.01503	.01396	.01541	.01313
According to order of Confinement — Twins	1,811	1,386	1,337	1,096	831	590	467	302	218	122
According to order of Confinement — Mothers	220,807	169,851	126,377	92,083	65,099	45,683	31,253	21,467	14,287	9,254
According to order of Confinement — Corresponding Ratio	.00820	.00816	.01058	.01190	.01277	.01292	.01494	.01407	.01526	.01318
Ratio Triplets Smoothed ..	.000055	.000062	.000074	.000088	.000106	.000130	.000158	.000193	.000235	.000286

Numbers.	10	11	12	13	14	15	16	17	18	19	20	21	22
Cases of at least 2 children ..	79	39	21	9	6	2	1	0	0	0	1	0	1
Cases of at least 3 children ..	0	0	0	0	0	0	1	0	0	0	0	0	0
Mothers of at least 1 child	5,694	3,181	1,665	814	388	144	59	25	6	3	1	0	1
Ratio of twins to mothers	.01387	.01226	.01261	0.01388									
According to order of Confinement — Twins	74	37	19	8	5	2	1	0	0	0	1	0	1
According to order of Confinement — Mothers	5,378	2,964	1,530	740	340	127	52	21	5	2	0	1	1
According to order of Confinement — Corresponding Ratio	.01376	.01248	.01242	.01081	.01471	.01575	.01923						

Since the correction system affects the number of twins and the mothers in the same way, it obviously cannot produce any appreciable difference in the ratios, though it may alter the numbers. This is seen in the results given in the table above. If the number of triplets be smoothed, the result shewn in the final line is obtained. But the numbers are too small to lead to any reliance upon their value, though they confirm in a general way the dictum that multiple fecundity increases with the issue, thus also with age and duration of marriage.

TABLE CX.—Shewing Secular Variation in the Frequency of Twins and Triplets. Australia, 1881-1915.

Year.	No. of Confinements (Total).*	Cases of 2 or more Children.	Cases of 3 or more Children.	Cases of 4 or more Children.	Ratio of Twins† to Confinements.		Ratio of Triplets to Twins, etc.‡	
					Crude.	Smoothed.	Crude.	Smoothed.
(i.)	(ii.)	(iii.)	(iv.)	(v.)	(vi.)	(vii.)	(viii.)	(ix.)
1881	63,818	545	7	0	.00854	.0080	..	..
2	64,069	496	3	0	.00774	.0082	..	..
3	68,135	575	2	0	.00843	.0084	..	..
4	72,832	629	8	0	.00863	.0086	..	..
5	76,026	661	3	0	.00869	.0087	.0063	.0063
6	79,009	682	2	0	.00863	.0088	.0056	.0056
7	83,085	704	4	0	.00847	.0090	.0054	.0056
8	86,393	875	6	1	.01012	.0096	.0066	.0062
9	87,195	859	3	0	.00985	.0099	.0068	.0070
1890	91,030	910	5	0	.00999	.0102	.0072	.0076
1	91,734	941	4	0	.01025	.0103	.0083	.0081
2	91,980	784	12	0	.01023	.0102	.0082	.0082
3	90,379	899	11	1	.00994	.0100	.0080	.0081
4	86,384	797	7	0	.00922	.0096	.0081	.0081
5	91,225	907	12	1	.00994	.0094	.0085	.0085
6	86,526	775	4	0	.00895	.0094	.0089	.0088
7	90,614	960	5	1	.01059	.0099	.0085	.0089
8	88,993	883	4	0	.00992	.0104	.0086	.0088
9	90,244	971	9	0	.01075	.0107	.0088	.0087
1900	92,057	985	7	0	.01069	.0108	.0084	.0086
1	92,826	1,005	11	0	.01082	.0107	.0089	.0088
2	92,852	972	12	0	.01046	.0104	.0088	.0092
3	89,060	877	10	1	.00984	.0102	.0098	.0095
4	93,973	1,005	9	0	.01069	.0104	.0093	.0097
5	95,060	1,012	11	0	.01064	.0107	.0099	.0099
6	97,867	1,083	5	0	.01106	.0107	.0100	.0100
7	100,161	951	13	0	.00949	.0102	.0099	.0099
8	110,491	1,065	6	0	.00963	.0098	.0100	.0097
9	112,921	1,142	14	0	.01011	.0100	.0096	.0096
1910	115,609	1,189	13	0	.01028	.0102	.0092	.0093
1	120,957	1,236	14	0	.01021	.0102	.0093	.0089
2	131,726	1,350	16	0	.01024	.0101	..	..
3	134,343	1,369	8	0	.01019	.0101	..	..
4	136,576	1,406	11	0	.01029	.0102	..	..
5	133,444	1,417	10	0	.01061	.0104	..	..
Tot'ls	3,221,594	32,917	281	5§	.010217	..	.00853	..

* That is, nuptial and ex-nuptial. † Including triplets and quadruplets. ‡ That is, the ratio of 9-year groups of triplets including quadruplets to 9-year groups of twins, including triplets. § Ratio of quadruplets to triplets = 0.018.

16. **Secular fluctuations in multiple-births.**—The ratio of multiple births to confinements would appear *a priori* to be independent of time, but it will be seen from Fig. 86 that there are indications of a definite secular fluctuation, see also Table CX. above. The number of confinements which constitutes the basis of the experience is more than doubled in the 35 years under review (see column ii.), and the number of twins (which includes triplets and quadruplets) is large. The aggregate experience includes 3,221,594 confinements, in which there were a total of 32,917 births of two or more children, a total of 281 births of 3 or more children, and 5 quadruplets. These give the ratios shewn in the table. In Fig. 85, curve A is the smoothed secular fluctuation-curve of the twins; curve B that of the triplets (which

Secular Fluctuation in Relative Frequency of Births and Twins and Triplets.

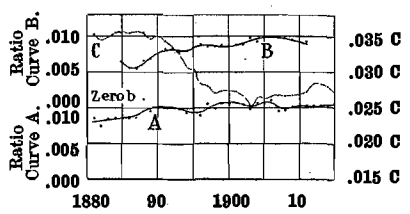


Fig. 86.

Curve A denotes the smoothed secular fluctuation of the ratio of births of two or more to the number of confinements.

Curve B denotes the ratio of 11-year groups of births of three or more to the number of births of two or more.

Curve C denotes the crude birth rate and number of births per unit of the general population.

were grouped in nines); while curve C shews the fluctuations of the crude birth-rates for the same years. The individual values are shewn by dots. It will be observed that on the whole the frequency of twins and triplets rises as the frequency of births diminishes.

17. **Comparison of nuptial and ex-nuptial fertility.**—In columns (x.) and (xvi.) of Table LXXIII., p. 242 hereinbefore, the crude and smoothed ratios for ex-nuptial fertility, attributed wholly to the "never married," were given. The crude results are repeated in column (ii.) of Table XCI. hereunder. If attributed to the "unmarried," which includes the widowed and divorced, the results in column (iii.) are obtained, and the corresponding smoothed results are shewn in column (iv.). Reference to the table shews that the maximum fertility is nuptially attained at about the year of age 18.3 to 19.3, and is about 0.484. The maximum fertility is ex-nuptially attained, however, only at about age 21.5 to 22.5, and is about 0.0182; that is to say, the maximum is about 3.2 years later, and the proportion at the maximum is only 0.0376, or say 3/80ths. For all ages from 12 to 57 we have for nuptial-fertility ratio 0.1704, and for the ex-nuptial ratio 0.00993. Hence the proportion of the averages is 0.05828. It is obvious that the initial parts of the curves representing the nuptial and ex-nuptial fertility-ratios are not likely to be identical, because the nuptial denominator for early ages will be small, and the ex-nuptial denominator will be large. Curves A and C, Fig. 87, denote respectively the nuptial and ex-nuptial curves. By the process indicated in § 2, p. 298, the results in columns (vi.) and (vii.) of Table CXI. are obtained; these are shewn in Fig. 87 by curve C; hence the curves are not in planar correspondence. If, however, the curve A be corrected for the effect of previous births, the two curves come into closer correspondence[1]; that is, ex-nuptial fertility has, in general, nearly the same characteristics as nuptial fertility, excepting that the greater measure of restraint operates to make the maximum occur later, and to enormously reduce the ratio.

Nuptial and Ex-nuptial Fertility-ratios.

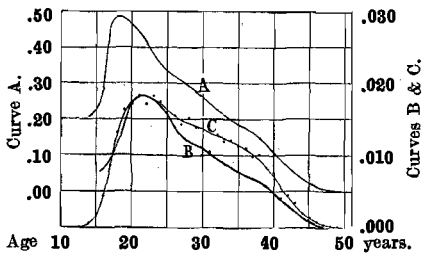


Fig. 87.

Curve A denotes the nuptial fertility ratio.

Curve B is the oblique projection of curve A.

Curve C is the ex-nuptial fertility ratio.

[1] It is obvious that the ex-nuptial curve does not need the same correction, since oft-repeated ex-nuptial maternity is not likely to occur.

TABLE CXI.—Comparison of Nuptial and Ex-nuptial Fertility-ratios according to Age. Australia 1907 to 1914.

Age of Mother.	Ratio of Ex-nuptial Births to—			Ratio of Nuptial Births to the Married.	Ex-nuptial Rate Computed by Oblique Projection.*	
	the "Never Married."	the "Unmarried."				
	Crude.	Crude.	Smoothed.	Smoothed.	Rate.	Age.
(i.)	(ii.)	(iii.)	(iv.)	(v.)	(vi.)	(vii.)
12	.0000	.0000	.0000	..	..	..
13	.0001	.0001	.0001	..	..	..
14	.0004	.0004	.0004	.207	.0077	15.4
15	.0016	.0016	.0016	.227	.0085	16.5
16	.0043	.0043	.0043	.301	.0113	18.0
17	.0085	.0085	.0085	.458	.0171	20.1
18	.0131	.0131	.0131	.483	.0181	21.3
19	.0162	.0162	.0158	.479	.0179	22.3
20	.0172	.0172	.0174	.464	.0174	23.2
21	.0181	.0181	.0181	.443	.0166	24.0
22	.0173	.0171	.0181	.416	.0156	24.9
23	.0183	.0182	.0177	.381	.0142	25.7
24	.0176	.0174	.0172	.352	.0132	26.4
25	.0163	.0161	.0163	.333	.0124	27.3
26	.0157	.0154	.0154	.319	.0119	28.1
27	.0147	.0143	.0149	.307	.0115	29.0
28	.0157	.0152	.0145	.293	.0110	30.0
29	.0145	.0139	.0141	.274	.0102	30.9
30	.0157	.0150	.0136	.256	.0096	31.7
31	.0111	.0104	.0131	.241	.0090	32.6
32	.0138	.0128	.0127	.225	.0084	33.5
33	.0131	.0119	.0123	.210	.0079	34.4
34	.0135	.0121	.0119	.197	.0079	35.3
35	.0129	.0113	.0114	.185	.0069	36.3
36	.0127	.0109	.0108	.174	.0065	37.2
37	.0116	.0097	.0101	.164	.0061	38.1
38	.0125	.0101	.0093	.149	.0056	39.0
39	.0103	.0082	.0083	.130	.0049	39.9
40	.0097	.0074	.0070	.108	.0040	40.7
41	.0055	.0041	.0054	.087	.0033	41.6
42	.0060	.0043	.0042	.067	.0025	42.4
43	.0049	.0033	.0030	.050	.0019	43.3
44	.0029	.0019	.0020	.033	.0012	44.2
45	.0021	.0013	.0013	.020	.0007	45.1
46	.0014	.0008	.0008	.010	.0004	46.0
47	.0007	.0004	.0004	.005	.0002	47.0
48	.0005	.0003	.0003	.003	.0001	48
49	.0003	.0002	.0002	.001	.0000	49
50	.0003	.0001	.0001	.001	.0000	50
51	.0001	.0000	.0000	.000	.0000	51

* The oblique projection brings the maximum points into arbitrary agreement, the values for the ages indicated also being determined thereby. The rates for these ages are found from those of the nuptial curve by using the projection-ratio.

The difference between the nuptial and ex-nuptial probabilities of confinement are more comprehensively indicated by a decennial table. In Table CXII. hereunder these are given as the number of cases respectively occurring per 10,000 married and per 100,000 "never married" women. The rates, based upon the numbers of the "unmarried," are somewhat smaller.

TABLE CXII.—Shewing the Probabilities of Nuptial and Ex-nuptial Confinement and their Ratio, for Five-Year Age-groups. Australia 1907-1914.

Age Groups.	No. of Married Women at Census 1911.	No. of Cases of Nuptial Confinement in 8 Years.	Probability of Maternity* during 1 Year.	No. of "Never Married" Women at Census 1911.	No. of Unmarried Women at Census 1911.	No. of Cases of Ex-nuptial Confinement	Probability of Maternity† during 1 Year.	Probability of Maternity during 1 Year.	Ratio of Probability of ex-nuptial to nuptial maternity.	
									Based upon the Never Married.	Based upon the Unmarried.
11–14	19	34	2,226	168,778	168,778	152	11	11	.0005	.0005
15–19	8,637	33,245	4,791	214,875	214,905	14,889	862	862	.0180	.0180
20–24	65,506	208,667	3,962	152,967	153,514	21,695	1,765	1,759	.0445	.0444
25–29	109,832	267,886	3,036	78,036	79,918	9,696	1,546	1,510	.0509	.0497
30–34	112,532	204,093	2,257	44,341	47,903	4,822	1,353	1,253	.0600	.0555
35–39	104,825	134,481	1,597	29,953	35,888	2,909	1,208	1,009	.0757	.0632
40–44	94,917	53,143	697	21,483	30,325	1,040	602	427	.0865	.0613
45–49	82,263	5,280	80	15,006	27,172	131	108	60	.136	.075
50–54	60,989	60	1.2	9,734	23,463	7	9	3	.73	.025
55–60	38,905	4	.12	5,698	20,063	0	0	0	?	?

* Probability per annum per 10,000 married women of same age-group.
† Probability per annum per 100,000 "never married" women of same age-group.

18. **Theory of fertility, sterility and fecundity.**—The *fertility-ratio* or *probability of maternity in a unit of time* may be defined as the proportion of cases, which, subjected to a given degree of risk for a unit of time, result in maternity; and similarly, the *sterility ratio* or *probability of maternity* is the arithmetical complement of the probability; or calling these respectively p and q, $p+q = 1$. If instead of "a unit of time," we write "*various given periods of time*," we arrive at the conception of a varying *degree* of fertility or sterility, which for brevity, we may call the fertility, $\mathfrak{q}$, or the sterility, $\mathfrak{s}$. That is to say, instead of making a sharp *qualitative* cleavage between the fertile and the infertile or sterile, both are to be regarded as varying quantitatively. Any compilation shewing the frequency of cases of maternity according to duration of marriage reveals the propriety of this mode of envisaging the question. But we have seen that fertility decreases after a certain age, hence age must also be taken into account. Further, the "degree of risk" varies with the age of the husband. Hence, if x denote the age of the wife, y that of the husband, i the duration of the risk, we have :—

$$(558)\ldots\ldots \mathfrak{q} = f(x, y, i)\,;\ \text{and}\ \mathfrak{s} = 1 - \mathfrak{q}$$

Fertility and sterility in the sense indicated are determined by the question of a single case of maternity. If instead of this we substitute "result in n cases of maternity," or "result in the bearing of n' children," we arrive at the quantitative conception of fecundity. It is not unlikely that the "degree of risk" varies with the number of previous births. If so, we must write (x, y, i, n) in this last equation.

If the total number of married women of age x be denoted by ${}_xM$, the duration of their marriage be denoted by a suffix i, the number of nulliparæ, primiparæ, and multiparæ up to n by the suffixes $1, 2, \ldots n$, then we can have compilations of the types

$$(559)\ldots\ldots {}_xM = {}_xM_0 + {}_xM_1 + \ldots {}_xM_i$$

$$(560)\ldots\ldots {}_xM = {}_xM'_0 + {}_xM'_1 + \ldots {}_xM'_n$$

that is, compilation according to age and duration of marriage, or according to age and "issue." It is at once evident that an exhaustive compilation according to x, y, i and n is out of the question, since the individual numbers in each "parcel" would be too small. Hence, serviceable tables must ignore some of the factors.

In some countries fertility probably varies but slightly with the age of the husband, and in all the distribution according to the age probably does not materially vary. Hence, by ignoring the issue, tables of "fertility and sterility" and of "fecundity" may take the following forms, the partial tables serving all general practical purposes :—

Tables of Fertility and Sterility (effect of "Previous Issue" being Ignored).

Arguments of complete tables.	Argument of partial tables.
(i.) Age of wife, with (ii.) age of husband. (iii.) Duration of marriage.	(i.) Age of wife only (*i.e.*, with husbands of all ages). (ii.) Duration of marriage.

The tables themselves should shew, for each combination of age and duration of marriage, the proportion of married women who have borne one child.

Tables of Fecundity (effect of "Previous Issue" being Ignored).

(i.), (ii.), and (iii.) as above.	(i.) and (ii.) as above.

The tables themselves should shew, for each combination of age and duration of marriage, the proportion of married women who have borne n children, where n is successively 0, 1, 2, 3, 4, etc., etc.

Such tables will need to be for small age-groups (say for single years), and for durations of marriage, which change by small amounts (say one year), inasmuch as the age and duration change together, and the effect of age is considerable.

19. **Past fecundity of an existing population.**—The past fecundity of any population as at a particular moment is given by a census, both according to "duration of existing marriage" and according to "age." The usual tabulation according to *existing* marriage ignores the fact that the record is incomplete, and that for deduction purposes a previous marriage may to some extent modify the fecundity. The results in Tables CXIII. and CXIV. hereunder are deduced from the Census tabulations by applying the method outlined in § 4, p. 300, to the crude results. The aggregates for the same "issue" are not, of course, in agreement since in the one case the numbers according to the issue from *existing marriages* are recorded, and in the other, the numbers according to age include all previous issue.

Numbers who bore 1, 2..*n* Children; also Proportion found to be Sterile.

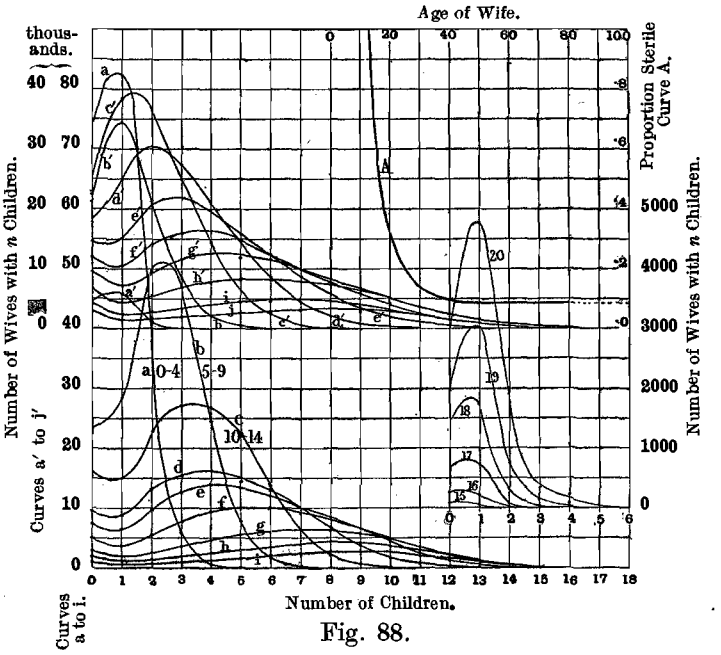


Fig. 88.

Curves a to i shew numbers who bore 0 to *n* children during durations of marriage 0 to 4, 5 to 9, 10 to 14, etc., see Table CXIII.

Curves a′ to j′ shew the numbers who bore 0 to *n* children according to age and without regard to duration of marriage; curve a′ denoting all under 20; curve b′ all aged 20 to 24 last birthday; curve c′ all aged 25 to 29, etc.; see Table CXIV.

Curves 15 to 20 shew numbers of wives who bore 0 to *n* children for ages 15 to 20 last birthday; see Table CXIV.

These curves are valid only for integral values of the abscissa (number of children).

Curve A shews the proportion of wives according to age, but of all durations of marriage, who proved sterile.

Table CXIII.—Shewing Issue of 1,000,000 Wives according to Duration of Existing

Duration Existing Marriage.	Number of Wives who had given Birth to Children to the Number of—									
	0.	1.	2.	3.	4.	5.	6.	7.	8.	9.
Under 5 years ..	73,765	82,436	37,904	5,874	469	23	..	..	..	..
5–9 years ..	23,504	28,564	50,165	47,053	24,421	7,800	1,776	344	87	7
10–14 ,, ..	16,031	15,059	22,961	27,141	26,897	22,421	13,774	6,325	2,265	718
15–19 ,, ..	9,586	8,821	13,150	15,427	16,200	14,542	13,072	10,191	6,814	3,767
20–24 ,, ..	7,374	6,465	9,714	12,603	13,916	13,276	12,066	10,253	8,336	6,602
25–29 ,, ..	5,082	3,806	5,450	7,701	9,413	10,078	10,095	9,162	8,043	6,656
30–34 ,, ..	2,947	2,036	2,669	3,566	4,684	5,581	5,977	6,336	6,228	5,734
35–39 ,, ..	1,904	1,212	1,436	1,921	2,600	3,080	3,478	3,864	4,354	4,101
40–44 ,, ..	1,055	600	778	948	1,206	1,582	2,024	2,330	2,511	2,618
45 and over ..	970	585	606	821	1,094	1,513	1,883	2,374	2,859	3,057
Totals for existing marriage ..	142,218	149,584	144,833	123,055	100,900	79,896	64,145	51,179	41,492	33,260
Total per million for all ages ..	123,995	146,153	145,107	124,239	103,088	82,140	67,029	53,803	44,026	35,392

*This does not include children by previous marriage, or ex-nuptial children ; it shews the relative frequency of issues of a given *number* according to "duration of marriage."

† The actual total number of wives was 733,773, of which 3747 gave no information either as to duration of marriage or as to number of children ; 12,073 gave no information as to number of children, but stated their age ; and 21,151 gave no information as to age, but stated the number of children. The 3747 were distributed proportionately to the partially specified totals, the two parts being 1362

Table CXIV.—Shewing Issue of 1,000,000 Wives according to Age, at

Age of Wives.	Number of Wives to whom had been Born Children to the Number of—										
	0	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
13	1	0	..	..	..	..	..	..	..	..	..
14	18	7	0	..	..	..	..	..	..	..	..
15	92	34	0	..	..	..	..	..	..	..	..
16	249	207	14	0	..	..	..	..	..	..	..
17	679	701	61	5	0	0	..	..	..	..	..
18	1,445	1,723	296	19	1	1	0	..	..	..	..
19	2,086	3,002	747	123	8	0	0	..	..	..	..
20	2,987	4,751	1,765	320	22	3	0	..	..	..	..
21-24	19,474	29,692	19,135	7,862	2,215	439	106	16	4	0	0
25-29	25,137	38,540	36,232	24,981	14,161	6,352	2,357	749	215	53	7
30-34	18,429	25,026	30,571	27,374	21,064	14,291	8,631	4,645	2,082	836	284
35-39	14,383	15,159	20,990	21,917	19,799	16,043	12,429	8,728	5,785	3,558	1,945
40-44	12,037	10,458	14,208	16,019	16,525	14,677	12,635	10,073	7,847	5,985	4,208
45-49	9,516	7,165	9,519	11,466	12,622	11,945	11,484	9,762	8,327	6,749	5,223
50-54	6,688	4,240	5,378	6,848	7,850	8,276	8,145	7,926	7,351	6,484	5,343
55-59	4,171	2,377	2,755	3,336	3,991	4,403	4,599	4,811	4,882	4,427	4,083
60-64	2,938	1,408	1,601	1,803	2,340	2,583	2,955	3,113	3,290	3,106	2,953
65-69	1,913	861	928	1,107	1,307	1,608	1,941	2,101	2,285	2,116	2,175
70-74	1,057	503	503	651	723	891	1,005	1,169	1,168	1,294	1,239
75-79	474	214	296	269	314	424	512	484	562	584	587
80-84	164	61	86	110	113	149	182	181	171	167	155
85-89	46	12	12	22	27	49	39	36	49	28	38
90-94	10	12	9	7	6	6	9	9	7	4	6
95-99	1	0	0	0	0	0	0	0	1	1	0
100-104	0	0	1	0	0	0	0	0	0	0	0
Totals	123,995	146,153	145,107	124,239	103,088	82,140	67,029	53,803	44,026	35,392	28,246
Totals per million for existing marriages	142,218	149,584	144,833	123,055	100,900	79,896	64,145	51,179	41,492	33,260	26,328

The actual total number of wives was 733,773, of which 343 gave no information as to age, or as to number of children ; 15,477 gave no information as to number of children, but stated their age ; 5432 gave no information as to age, but stated the number of children. The 343 were divided into two groups, viz., 254 and 89, these being distributed proportionately among the partially specified totals. The total additions thus become for the several ages and age-groups : 0, 0, 0, 5, 11, 28, 70, 167, 1228,

Marriage* at Census of 3rd April, 1911, Australia (Based upon 733,773 Wives.)†

Number of Wives who had given Birth to Children to the Number of—												Totals.
10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21 and over.	
..	..	..	..	..	..	..	..	..	..	..	..	200,471
1	..	..	..	..	..	..	..	..	..	..	..	183,722
175	63	10	6	..	..	..	..	..	..	..	..	153,846
1,741	726	277	99	29	9	1	..	..	..	..	..	114,452
4,530	2,364	1,295	606	250	115	39	10	6	..	1	..	109,821
5,172	3,455	2,145	1,199	592	282	157	50	18	3	6	6	88,571
4,845	3,313	2,223	1,301	668	317	145	67	29	6	4	6	58,677
3,722	2,789	2,211	1,237	672	319	171	67	29	23	9	14	39,213
2,675	2,077	1,560	978	514	287	141	59	23	4	1	10	23,981
3,467	2,676	2,319	1,433	788	421	202	88	44	23	1	22	27,246
26,328	17,463	12,040	6,859	3,513	1,750	856	341	149	59	22	58	1,000,000
28,246	18,826	13,035	7,488	3,834	1,927	941	379	182	68	36	66	1,000,000

and 2385. The increased numbers thus become :—For Age-groups as indicated in table, 3358, 2903, 2074, 1371, 1210, 943, 591, 439, 230, 316 ; in all 13,435. For numbers of children as indicated in table, 2796, 2569, 2816, 2614, 2373, 2142, 1828, 1521, 1298, 1076, 876, 604, 493, 288, 125, 62, 24, 17, 6, 2, 1, and 5 ; in all 23,536. These aggregates of unspecified and partially specified were then distributed proportionately to the original numbers, see Vol. III., p. 1140-1, Census Report.

Census of 3rd April, 1911, Australia. (Based upon 733,773 Wives.)

Number of Wives to whom had been Born Children to the Number of—											Totals.
11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21 and over.	
..	..	..	..	..	..	..	..	..	..	..	1
..	..	..	..	..	..	..	..	..	..	..	25
..	..	..	..	..	..	..	..	..	..	..	126
..	..	..	..	..	..	..	..	..	..	..	470
..	..	..	..	..	..	..	..	..	..	..	1,446
..	..	..	..	..	..	..	..	..	..	..	3,485
..	..	..	..	..	..	..	..	..	..	..	5,966
..	..	..	..	..	..	..	..	..	..	..	9,848
0	0	..	..	..	..	..	..	..	..	..	78,943
5	3	0	0	0	0	..	..	..	..	..	148,792
97	31	7	3	3	1	0	..	..	..	..	153,375
907	380	160	67	16	3	1	0	0	0	0	142,270
2,437	1,443	766	328	178	78	20	13	0	1	3	129,939
3,458	2,241	1,287	685	327	156	73	26	8	8	5	112,052
3,699	2,611	1,482	754	356	196	67	33	8	8	13	83,756
3,021	2,166	1,313	669	335	171	74	36	21	7	8	51,656
2,205	1,759	1,000	548	298	144	70	33	6	7	12	34,172
1,592	1,305	762	410	236	113	51	21	11	4	8	22,855
904	656	463	238	114	58	13	13	8	..	11	12,681
357	347	194	105	53	14	4	7	6	1	1	5,809
116	76	47	22	10	4	6	..	..	..	3	1,823
24	16	6	4	1	3	0	..	..	..	1	413
4	1	1	0	0	..	..	..	..	..	1	92
0	0	0	1	0	..	..	..	..	..	0	4
0	0	0	0	..	..	..	..	..	..	..	1
18,826	13,035	7,488	3,834	1,927	941	379	182	68	36	66	1,000,000
17,463	12,040	6,859	3,513	1,750	856	341	149	59	22	58	1,000,000

2252, 2203, 2071, 1993, 1677, 1431, 888, 648, 476, 316, 157, 81, 23, 4, 0, 2 ; in all, 15,731 ; and for the numbers of children as indicated in the table, 591, 717, 730, 693, 602, 490, 415, 309, 277, 218, 181, 128, 76, 51, 18, 12, 7, 2, 3, 0, 0, 1 ; in all 5521. These aggregates for the unspecified, together with the partially-specified, were then distributed proportionately to the original numbers ; see Vol. VIII. Census Report, pp. 1366-7.

The results given in Table CXIII. are shewn by curves (*a*) to (*i*) in Fig. 88; and those in Table CXIV. are shewn by the curves (*a'*) to (*j'*) in the same figure, the single year results of the latter table being marked 15, 16, ... 20. Interpolated curves would give the results for any other 5-year age or duration ranges.[1]

The curves of frequency of cases, according to number of issue, for the 5-year, or for the single-year age-groups, are of the same type, and are essentially dimorphic: strictly they give values only for integral values of the variable.[2] Thus they could no doubt be fairly well represented by curves of the type:—

$$(561) \ldots\ldots y = Ae^{-ax} + Bx^{b+cx}$$

in which x has the values 0, 1, 2, 3, ... etc.

20. **Fecundity during a given year.**—A different type of compilation is necessary to reveal what may be called the "*existing fecundity.*" The existing nuptial fecundity is shewn by the number of married women in each age-group, the number who failed to bear a child during the year, and the number who bore the nth child where $n = 1, 2, 3, \ldots$ etc. This is deduced from two sources, viz., (i.) from the Census record for the numbers of married women; and (ii.) from the records of one year or for a series of years (1908-1914). The grand total of those who bore a child during the whole period of 7 years, i vided by 7.0666, gave a result substantially identical with that for the ear 1911, which may be regarded as satisfactory.[3] This is seen from the close agreement of the numbers in the two upper portions of Table CXV. It is evident, therefore, that the vital statistics results for the Census year represent fairly satisfactorily the general case, and a 3 or 5-year result with the Census year as middle year would ordinarily be quite satisfactory.

[1] It is clearly desirable that Census results should be compiled for single years, as soon as public appreciation of the value of a correct statement of age leads to accuracy.

[2] Statistical results furnish a number of examples of this character: for example the numbers of families living in houses with 1, 2, 3, . . . n rooms, etc.

[3] If the rate of change of the proportion married be supposed linear, the married female population at the Census is to the aggregate of married females as 1 : 7.1272. The ratio of the number of brides is 1 : 6.9473. The ratio of females is 1 : 7.1077, and of population 1 : 7.1150. It is obvious, therefore, that the ratio 7.0666 is very nearly correct.

TABLE CXV.—Shewing for various Age-groups and for all Durations of Marriage the Number who, during the year, bore the *n*th Child, where n = 0 to 10; and the Total of those who bore a Child later than the 10th. Australia, 1911 and 1908-1914.

Age of Mothers	Total Married Women *	No. who Bore a Child during the Year.†	No. who Bore no Child during the Year.	Number for which the Child Born was the—												Order not Specified.
				1st	2nd	3rd	4th	5th	Later than 5th.	6th	7th	8th	9th	10th	Later than 10th.	
-19	8,716	4,146	‖4,570	3,456	619	53	4	0	0	0	0	0	0	0	§0	14
20-24	65,959	25,957	40,002	13,039	7,717	3,642	1,085	246	62	50	8	4	0	0	0	166
25-29	110,591	33,817	76,774	9,271	8,672	7,109	4,727	2,419	1,554	1,093	336	86	29	8	§57	30
30-34	113,310	25,682	87,628	3,632	4,327	4,522	4,328	3,501	5,342	2,527	1,565	745	317	131	§57	30
35-40	105,550	16,839	88,711	1,279	1,539	1,997	2,277	2,243	7,476	2,143	1,848	1,383	970	591	541	28
40-44	95,573	6,763	88,810	303	316	405	531	722	4,479	740	777	771	706	607	878	7
45-	82,933	713	82,220	20	24	29	36	40	561	48	64	70	72	86	221	3
Totals	582,632	113,917	468,715	31,000	23,214	17,757	12,988	9,171	19,474	6,601	4,598	3,059	2,094	1,423	§1,699	313

Numbers Corresponding to the Above Based upon the Totals for the Period 1908-1914.

-19	*8,716	§4,156	‖4,560	3,410	676	66	4	0	0	0	0	0	0	0	0	
20-24	65,959	26,277	39,682	13,248	8,043	3,578	1,102	§246	60	48	10	2	0	0	0	
25-29	110,591	33,831	76,760	9,317	8,703	7,065	4,748	2,468	1,530	1,041	348	101	29	8	3	
30-34	113,310	25,639	87,671	3,592	4,317	4,624	4,281	3,504	5,321	2,523	1,529	757	326	123	§63	
35-40	105,550	16,742	88,808	1,259	1,490	1,963	2,274	2,293	7,463	2,130	1,865	1,416	968	580	504	
40-44	95,573	6,609	88,964	288	312	418	547	666	§378	717	746	749	677	579	910	
45-	82,933	663	82,270	22	19	21	33	36	532	48	60	65	76	74	209	
Totals	582,632	113,917‡	468,715	31,136	23,560	17,735	12,989	9,213	19,284	6,507	4,558	3,090	2,076	1,364	1,689	

Proportions to Totals of Same age; 1911 Results.

-19	100,000	47,568	52,432	39,651	7,102	618	46	0	0	0	0	0	0	0	0	161
20-24	100,000	39,353	60,647	19,768	11,700	5,522	1,645	§373	§94	76	12	6	§0	0	6	251
25-29	100,000	30,579	69,421	8,384	7,842	6,428	4,274	2,187	1,405	988	304	§78	26	7	2	59
30-34	100,000	22,665	77,335	3,205	3,819	3,991	3,820	3,090	4,714	2,230	1,381	657	280	116	50	26
35-40	100,000	15,953	84,047	1,212	1,458	1,892	2,157	2,125	7,083	2,030	1,751	1,310	919	560	513	26
40-44	100,000	7,076	92,924	317	331	424	556	755	4,686	774	813	807	739	635	918	7
45-	100,000	860	99,140	24	29	35	44	48	676	58	77	84	87	104	266	4

Proportions to Totals of Same Age; Based upon the Totals for the Period 1908–1914.

-19	100,000	47,682	52,318	39,123	7,756	757	46	0	0	0	0	0	0	0	0
20-24	100,000	39,838	60,162	20,085	12,194	5,425	1,670	373	91	73	15	3	0	0	0
25-29	100,000	30,591	69,409	8,425	7,870	6,388	4,293	2,232	1,383	941	315	91	26	7	3
30-34	100,000	22,627	77,373	3,170	3,810	4,081	3,778	3,092	4,696	2,226	1,349	668	288	109	56
35-39	100,000	15,862	84,139	1,193	1,412	1,860	2,154	2,172	7,071	2,018	1,767	1,342	917	550	477
40-44	100,000	6,915	93,085	302	326	437	572	697	4,581	750	781	784	708	606	952
45-	100,000	799	99,160	27	23	25	40	43	641	58	72	78	92	89	252

* Adjusted numbers, see Census Report, Vol. II., p. 19, and also Vol. III., pp. 1136-7. The numbers given are the Census numbers adjusted and multiplied by a factor to make them agree with the mean female population of the year. † In cases where a woman bore twice in the same year, she has been counted twice. The results in this column are obtained from the vital statistics of the year 1911. ‡ The actual figures throughout have been multiplied by a factor (viz., 0.141509 = 1 ÷ 7.0666), so as to make this total, 113,917, to agree with the total above; hence, if the distribution for 1911 were identical with that of the seven-year period 1908-1914, the figures in the several columns would be identical. They are approximately so. § The whole of the numbers in the column are those for 1908-1914, multiplied by 0.141509. ‖ These numbers are obtained by subtracting the totals of those who bore children from the total number of married women.

TABLE CXVI.—Shewing the Number of Married Women at each Age, the Number of Cases of Maternity, and the Number for all Durations of Marriage, who had not given Birth to a Child. Australia 1907-1914.

Age last Birth-day.	No. of Married Women at Census 1911.†	Average Annual No. Cases of Maternity, 1907-14.	No. of Wives at Census 1911 who had given Birth to no Children.†	Range in Years of Durations of Marriage. (up to)	Proportion of Married Women who had not given Birth to a Child.		Age last Birth-day.	No. of Married Women at Census 1911.	No. of Wives at Census 1911 who had given Birth to no Children.†	Proportion of Married Women who had not given Birth to a Child.	
					Crude.	Smoothed.				Crude.	Smoothed.
(i.)	(ii.)	(iii.)	(iv.)	(v.)	(vi.)	(vii.)	(i.)	(ii.)	(iv.)	(vi.)	(vii.)
13	1	0.5	1	1*	1.0000	1.0000	..	..	..	..	..
14	18	3.7	13	2	.7222	.8140	..	..	..	..	..
	19	**4.2**	**14**	..	**.7368**	..	..	..	..	..	..
15	93	21.2	67	3	.7204	.6530	55	9,468	769	..	.0817
16	349	141.9	183	4	.5244	.5330	56	8,557	678	..	.0815
17	1,145	494.7	498	5	.4349	.4450	57	7,675	581	..	.0814
18	2,551	1,219	1,061	6	.4159	.3820	58	6,912	531	..	.0813
19	4,499	2,261	1,531	7	.3403	.3403	59	6,293	501	..	.0814
	8,637	**4,137.8**	**3,340**	..	**.3867**	..	..	**38,905**	**3,060**	**.0786**	..
20	6,933	3,150	2,192	8	.3162	.3075	60	5,746	479	..	.0815
21	10,100	4,423	2,772	9	.2744	.2815	61	5,277	458	..	.0816
22	13,047	5,428	3,422	10	.2622	.2580	62	4,871	435	..	.0820
23	16,521	6,306	3,973	11	.2405	.2365	63	4,505	412	..	.0823
24	18,905	6,669	4,123	12	.2181	.2165	64	4,161	382	..	.0827
	65,506	**25,976**	**16,482**	..	**.2516**	..	..	**24,560**	**2,166**	**.0882**	..
25	20,683	6,811	4,123	13*	.1993	.1990	65	3,829	353	..	.0837
26	21,620	6,903	3,958	14	.1831	.1825	66	3,502	319	..	.0842
27	22,180	6,751	3,678	15	.1658	.1670	67	3,194	283	..	.0848
28	22,584	6,691	3,448	16	.1527	.1524	68	2,880	247	..	.0854
29	22,765	6,192	3,238	17	.1422	.1424	69	2,621	211	..	.0861
	109,832	**33,348**	**18,445**	..	**.1679**	..	..	**16,026**	**1,413**	**.0882**	..
30	22,784	6,042	3,034	18*	.1332	.1339	70	2,365	190	..	.0868
31	22,726	5,065	2,849	19	.1254	.1266	71	2,099	168	..	.0876
32	22,542	5,240	2,684	20	.1191	.1203	72	1,867	146	..	.0885
33	22,421	4,722	2,540	21	.1133	.1147	73	1,652	129	..	.0896
34	22,059	4,338	2,416	22	.1095	.1101	74	1,444	115	..	.0908
	112,532	**25,407**	**13,523**	..	**.1202**	..	..	**9,427**	**748**	**.0793**	..
35	21,700	3,958	2,299	23	.1059	.1062	75	1,224	96	..	.0921
36	21,350	3,721	2,195	24	.1028	.1029	76	1,004	82	..	.0934
37	21,000	3,315	2,101	25	.1000	.1000	77	818	70	..	
38	20,560	3,118	2,017	26	.0981	.0979	78	650	59	..	
39	20,215	2,629	1,942	27	.0961	.0959	79	510	48	..	
	104,825	**16,741**	**10,554**	..	**.1007**	..	..	**4,206**	**355**	**.0844**	
40	19,851	2,148	1,880	28	.0947	.0942	80	397	38	..	
41	19,457	1,548	1,823	29	.0936	.0927	81	317	30	..	
42	19,026	1,386	1,766	30	.0928	.0913	82	241	23	..	
43	18,543	939	1,710	31	.0922	.0900	83	184	17	..	
44	18,040	595	1,653	32	.0916	.0888	84	140	13	..	
	94,917	**6,616**	**8,832**	..	**.0930**	..	..	**1,279**	**121**	**.0946**	
45	17,554	346	1,577	33	.0898	.0877	85	105	10	..	
46	17,064	174.2	1,494	34	.0876	.0868	86	80	8	..	
47	16,554	85.6	1,403	35	.0847	.0860	87	56	6	..	
48	15,975	38.7	1,306	36	.0817	.0852	88	35	5	..	
49	15,216	13.2	1,203	37	.0791	.0845	89	24	4	..	
	82,363	**657.7**	**6,983**	..	**.0848**	..	..	**300**	**33**	**1.100**	
50	14,303	4.2	1,116	38	.0780	.0837	90	20	3	..	
51	13,162	1.5	1,049	39	.0797	.0832	91	16	2	..	
52	12,088	0.9	981	40	.0812	.0827	92	12	1	..	
53	11,100	0.6	914	41	.0823	.0823	93	9	0	..	
54	10,286	0.1	847	42	.0823	.0819	94	7	0	..	
	60,939	**7.3**	**4,907**	..	**.0805**	..	..	**64**	**6**	**.0937**	
							95-100	21	0		

Uncertain

* Actually extends to about 1 year greater than shewn. † Graduated.

21. **Number of married women without children, all durations of marriage.**—The relative numbers of married women of each age, and for all durations of marriage, who are without children, are readily determinable by means of a Census. That for 1911 gave the results shewn in Table CXVI. above. The smoothed results in column (vii.) of the table are shewn by curve A on Fig. 88. The ratio very rapidly falls to the value of about one-fourth, which is attained during age 22; one-eighth

is reached during age 31 ; one-tenth during age 37 ; and the minimum during age 58, which age is, of course, somewhat uncertain. After the age of that minimum the results are very uncertain. Apparently the curve will require several terms of the type Ae^{-ax} to empirically represent it, thus the ratio being denoted by σ, and the age ξ being reckoned from say 12 or 13, the ratio will be of the form :—

$$(562).....\sigma = A + Be^{-b\xi}\ C + e^{-c\xi} + ... + K\xi^{k}$$

22. **Sterility-ratios according to age and duration of marriage.**—The effect of the age of the husband being ignored, the number of cases of sterility, (or more strictly of childlessness,)[1] according to duration of marriage, for women of different ages in Australia was found from the Census of 1911 to be as shewn in the following table :—

[1] Physiological sterility is the condition, not merely of childlessness, but of childlessness due either to failure to conceive, or to retain the fertilised ovum the full time. The data of ordinary statistics cannot conclusively establish the frequency of physiological sterility, since what is given are merely measures of childlessness.

A number of instances are given in the " Handbuch der Medizinischen Statistik," by Friedrich Prinzing, Dr. Med., 1906, Cap. III. ; " Die sterilen und kinderlosen Ehen," pp. 30-40.

The following estimations of sterility may be mentioned :—*

Authority.	No. of Marriages under Observation.	Elapsed Period after Marriage.	No. of Sterile Cases.	Ratio.
Dresden Returns ..	27,911	5 years	672	0.02407
Dresden Returns ..	27,911	10 years & more	134	0.00480
Austerlitz, Prag, 1891-1900	3,920	Not stated	295	0.0753
Hofmeier	2,220	Not stated	?	0.147
Lier and Ascher	2,500	Not stated	?	0.090
Huizinga (Groningen) ..	1,180	Not stated	?	0.115
Verrijn Stuart, Netherlands	9,443	16 to 21 years	?	0.131
Do., poorer classes ..	?	Not stated	?	†0.141 ‡0.110
Do., middle classes ..	?	Not stated	?	†0.162 ‡0.109
Do., well-to-do classes	?	Not stated	?	†0.160 ‡0.126

† Town. ‡ Country.

*Other results are :—Spencer, Wells & Sims (Great Britain), 0.125 ; Duncan (Glasgow and Edinburgh), 0.163 ; Ansell, 1919 cases, Married Women, 0.079 ; A Swedish County, 0.100 ; Massachusetts, 1885, 0.176 ; Women over 50, 0.119.

The whole of the above statements are, of course, defective, inasmuch as sterility is a function both of duration of marriage as well as of age, etc.

Table CXVII.—Sterility according to Age and Duration of Existing Marriage. Australia, 3rd April, 1911 (Census).

Age of Wives at Time of Census	Duration of Existing Marriage. Under 5 Years.			5 to 10 Years.			10 to 15 Years.			15 to 20 Years.			20 to 25 Years.		
	Childless Mothers.	Total Mothers.	Sterility Rate.	Childless Mothers.	Total Mothers.	Sterility Rate.	Childless Mothers.	Total Mothers.	Sterility Rate.	Childless Mothers.	Total Mothers.	Sterility Rate.	Childless Mothers.	Total Mothers.	Sterility Rate.
Under *14	1	1	1.000	..	..	..	..	..	..	..	..	..	..	..	..
*14	13	18	.722	..	..	..	..	..	..	..	..	..	..	..	..
*15	67	92	.728	..	..	..	..	..	..	..	..	..	..	..	..
*16	179	338	.530	..	..	..	..	..	..	..	..	..	..	..	..
*17	490	1,044	.469	..	..	..	..	..	..	..	..	..	..	..	..
*18	1,042	2,512	.415	..	..	..	..	..	..	..	..	..	..	..	..
*19	1,496	4,270	.350	..	..	..	..	..	..	..	..	..	..	..	..
*20	2,114	6,693	.316	7	261	.027	..	..	..	..	..	..	..	..	..
21–24	13,378	43,424	.308	474	11,926	.040	..	..	..	..	..	..	..	..	..
25–29	14,724	45,673	.322	3,004	47,789	.063	346	10,587	.033	1	21	.048	..	..	..
30–34	7,398	19,739	.375	3,998	38,675	.103	2,079	40,121	.052	262	8,594	.030	2	21	.095
35–39	4,099	8,118	.505	2,889	16,992	.170	2,693	32,715	.082	1,348	31,792	.042	279	9,324	.030
40–44	2,597	3,575	.726	2,120	6,731	.315	2,096	14,568	.144	1,723	24,408	.071	1,250	32,477	.038
45–49	1,753	1,869	.938	1,712	2,749	.623	1,517	5,280	.287	1,199	9,253	.130	1,365	22,758	.060
50–54	893	894	.999	1,108	1,187	.933	1,089	1,865	.584	803	3,230	.249	803	7,780	.103
55–59	431	431	1.000	530	531	.998	701	779	.900	566	1,088	.520	590	2,265	.234
60–64	247	247	1.000	255	255	1.000	332	332	1.000	420	447	.940	411	791	.520
65–69	140	140	1.000	117	117	1.000	173	173	1.000	198	199	.995	305	337	.905
70–74	64	64	1.000	74	74	1.000	91	91	1.000	100	100	1.000	127	128	.992
75–79	20	20	1.000	28	28	1.000	37	37	1.000	38	38	1.000	53	53	1.000
80–84	3	3	1.000	7	7	1.000	11	11	1.000	4	4	1.000	17	17	1.000
85–89	1	1	1.000	2	2	1.000	3	3	1.000	2	2	1.000	4	4	1.000

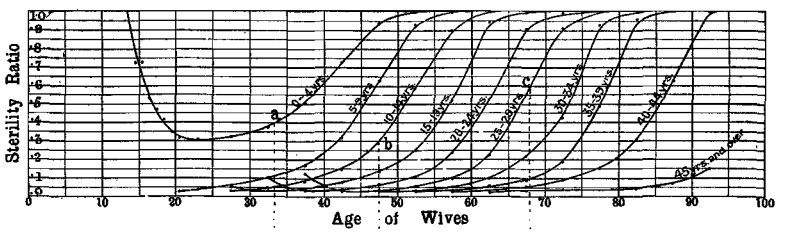
Age of Wives at Time of Census	Duration of Existing Marriage. 25 to 30 Years.			30 to 35 Years.			35 to 40 Years.			40 to 45 Years.			Over 45 Years.		
	Childless Mothers.	Total Mothers.	Sterility Rate.	Childless Mothers.	Total Mothers.	Sterility Rate.	Childless Mothers.	Total Mothers.	Sterility Rate.	Childless Mothers.	Total Mothers.	Sterility Rate.	Childless Mothers.	Total Mothers.	Sterility Rate.
35–39	1	8	.125	..	..	..	..	..	..	..	..	..	..	..	..
40–44	221	8,075	.027	..	..	..	..	..	..	..	..	..	..	..	..
45–49	1,005	28,666	.035	165	6,556	.025	..	..	..	..	..	..	..	..	..
50–54	955	17,237	.055	663	20,004	.033	121	5,081	.024	..	..	..	..	..	..
55–59	456	4,762	.096	511	9,574	.053	432	12,606	.034	91	3,087	.029	..	..	..
60–64	346	1,590	.218	284	2,946	.096	388	6,437	.060	250	7,789	.032	59	2,209	.027
65–69	292	522	.559	213	978	.218	189	2,120	.089	226	4,083	.055	214	6,630	.032
70–74	188	206	.913	125	295	.424	106	569	.186	101	1,150	.088	221	5,660	.039
75–79	72	72	1.000	68	73	.932	59	121	.488	46	305	.151	116	2,994	.039
80–84	15	15	1.000	23	23	1.000	25	26	.962	18	57	.316	46	945	.049
85–89	2	2	1.000	5	5	1.000	9	9	1.000	5	8	.625	14	200	.070
90–94	..	..	..	..	..	..	1	1	1.000	1	1	1.000	6	41	.146
95–99	..	..	..	1	1	1.000	..	..	..	..	..	..	..	..	..

* The results are from Census Report III., p. 1136. The general results are obtained from an unpublished series of compilations according to age-groups, and duration-of-marriage groups. In neither case were the "unspecified" distributed; such distribution, however, can affect the results only very slightly.

An examination of the results given in the table shews that initially the sterility-ratio decreases; it attains a minimum, and then increases; see particularly the duration of marriage 0 to 4 years (*i.e.*, under 5 years). The initial fall may be regarded as the normal decrease of childlessness with increase of the duration of the risk. From the minimum onward, however, the curve shews the true measure of sterility for a given duration of marriage, and for any age terminating the given duration of marriage.

The curves on Fig. 89 are the *sterility-ratios according to age*, each curve denoting a separate range of duration of marriage. By projection[1] Fig. 90, shewing the *curves of equal sterility*, is derived. From these, the correlative durations of marriage and ages, corresponding to any degree of sterility, can be at once seen. The dots give the positions as determined from the data,[2] the curves throughout are smoothed.

Fig. 89.



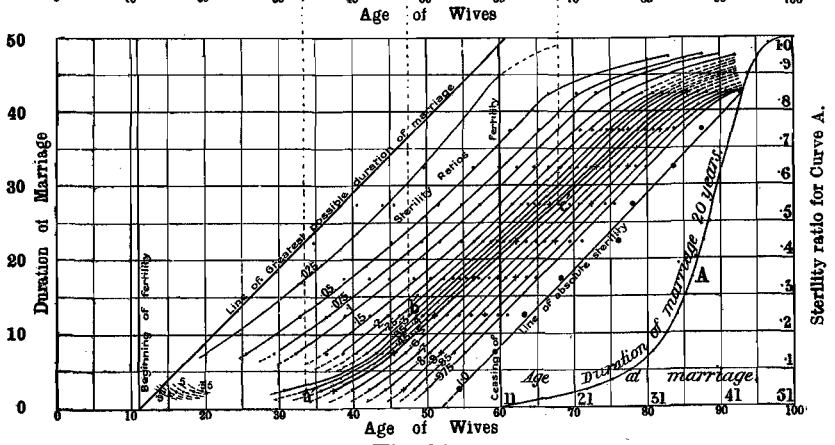


Fig. 90.

In Fig. 89 the ordinates to the curves denote the degrees of sterility: the abscissæ denote the age corresponding to the duration of marriage shewn on any curve in question.

In Fig. 90, the intersections of the curves with the lines of equal sterility on Fig. 89, are projected, to the ordinates-line corresponding to the mean of the range of durations, viz., 2.5, 7.5, 12.5, etc. years. Smoothed curves have then been drawn shewing the probable position of the curves of equal sterility.

Curve A in Fig. 90 denotes the sterility-ratio according to age at marriage where the duration of marriage is 20 years.

On Fig. 90 they represent the projected results, and the lines drawn among them, the smoothed general results deduced therefrom. Thus the

[1] It has been assumed that the group-results for the ranges 0-5, 5-10, 10-15, etc., are sensibly correct for the durations 2.5, 7.5, 12.5, etc., as is evident from Fig. 90. This is not quite exact; the error is not large, however, and the inherent limitations of the determination of the ratio render the measure of uncertainty of but little moment.

[2] The three broken lines crossing from Fig. 89 to Fig. 90, indicate the scheme of projection. Thus, the point b, viz., the intersection of the curve assumed to represent a sterility of 0.3 for a duration of marriage of 12.5 years, is found in the graph (plan), Fig. 90, as the point b′, viz., on the line parallel to the axis of age at the distance (ordinate) therefrom 12.5, and similarly for point a and c and a′ and c′.

new curves so obtained represent completely the sterility-ratios according to age taken in conjunction with past duration of marriage.[1]

It is obvious that tables shewing average sterility can be constructed

(i.) according to *age at marriage* and time since elapsed ; and

(ii.) according to *age attained* after the given interval between it and marriage.

As, however, the one differs from the other merely by the whole amount of the duration, it is immaterial in which form they are set out. In the following table (CXVIII.) the former method is adopted ; Figs. 89 and 90, however, give the age attained after a given duration of marriage.[2]

TABLE CXVIII.—Shewing for various Ages and Durations of Marriage the Degree of Sterility experienced. Australia, 1911.

Sterility-Ratio.	Corresponding Durations of Marriage (in Years).								
	5	10	15	20	25	30	35	40	45
	When the Age at Marriage is :—*								
.025	..	13.8	15.5	16.6	17.1	17.1	16.7†	16.0†	15.1†
.050	..	19.3	21.3	22.9	23.7	24.3	24.3	24.4	27.6
.075	..	23.1	24.9	26.3	27.2	27.8	28.0	28.1	31.9
.100	..	25.8	27.6	28.8	29.6	30.1	30.3	30.9	34.1
.150	..	29.3	30.7	31.8	32.4	32.6	32.5	33.4	37.9
.200	..	31.6	32.7	33.8	34.1	34.3	34.5	35.4	
.250	..	33.4	34.3	35.1	35.4	35.7	35.9	36.8	
.300	..	34.9	35.5	36.2	36.6	37.0	37.2	37.9	
.350	34.0	35.8	36.5	37.1	37.5	37.9	38.0	38.6	
.400	35.1	36.7	37.2	37.8	38.3	38.7	38.8	39.6	
.450	36.1	37.5	38.1	38.7	39.2	39.7	40.0	40.8	
.500	37.1	38.7	38.8	39.5	39.8	40.4	40.9	41.7	
.600	39.0	39.8	40.1	40.7	41.0	41.4	41.7	42.6	
.700	40.8	41.4	41.6	42.1	42.2	42.5	42.8	43.7	
.800	42.5	43.0	43.1	43.3	43.5	43.7	43.7	44.6	
.900	44.5	44.5	44.6	44.7	44.0	44.0	45.0	46.0	
.950	45.9	46.1	46.1	46.2	46.3	46.3	46.3	47.0	
.975	47.6	47.7	47.7	47.8	47.7	47.6†	47.6†	48.0†	
1.000	51.6†	51.5†	51.4†	51.3†	51.2†	51.1†	50.9†	50.7†	

* The table is thus interpreted :—Reading horizontally, if the age at marriage was say 16.6 years, and the duration of marriage was 20 years, 0.025 would be the proportion without children. Similarly if the age at marriage was 17.1 years, and the duration of marriage was either 25 years or 30 years, or reading vertically, for the duration of marriage of 15 years, if the age at marriage were 15.5, then 0.025 would be sterile ; if the age were 21.3, then 0.050 would be sterile ; and so on.

† The apparent anomaly in these results may possibly be explained by the more fertile not living sufficiently long to be included in the category of those whose duration of marriage attained the number of years indicated.

The sterility-ratios given in the table for durations of marriage 0-5, do not accord very closely with those deduced by the method of Part

[1] Strictly these curves represent the mean of 5-year groups, both as regards duration of marriage and age. The corrections to make them instantaneous results, however, are small.

[2] Data have not been compiled which would enable these results to be worked out with very great precision. For this it would of course be necessary to compile according to single years both as regards age and duration of marriage ; and give results according to " age at marriage" and " duration of marriage" instead of existing age.

XIII., §§ 11-13, pp. 245 to 250. The probability of a birth, and that of childlessness should together equal unity: For 0-6 years the agreement, however, is closer; see Fig. 71, p. 249, or the values given in Table LXXV., p. 247. As, however, the results for the shorter durations are necessarily somewhat uncertain, these differences are not remarkable. It may be pointed out the results indicated in Table LXXI., p. 238, shew that for the age 51 the probability of a birth is 1.17 per thousand, hence the final value should probably be 0.999, rather than 1.000. But tables of this kind are, of course, probably never reliable to this order of precision.

23. **Curves of sterility according to duration of marriage.**—The sterility-ratios determined from the age of the married woman only, are based upon the *assumption that fertility is independent of the age of the husband*: this is shewn hereafter not to be the case. Or we may regard the results as true for the average condition (*i.e.*, the condition including husbands of all ages). Continuing this assumption and taking the curve for a duration of marriage of 20 years, it is found that the proportion sterile who are married at the ages 11, 12, . . . 51 respectively are as shewn in Fig. 90, Curve A. The ordinate at age 11 is not necessarily zero, but owing to the fact that marriages at that age usually arise from special circumstances, the value of the sterility-ratio is practically zero.[1] The curve has a point of inflexion, for marriages at about age 40, (*i.e.*, $d^2y/dx^2=0$ for $x = 40$), and the sterility-ratio changes most rapidly at about age 28 (*i.e.*, $d^3y \,/\, dx^3 = 0$ for $x = 28$). The curves of sterility can be obtained by plotting the ages in the vertical columns in Table CXVIII., as abscissæ, and the value of the observed sterility as an ordinate. For every given duration of marriage there will be a different curve.

24. **Fecundity according to age and duration of marriage: various distributions and ratios.**—As already pointed out, fecundity is a function of the age of the husband and of the wife, as well, of course, as of the duration of marriage. It has been shewn herein also, for various durations of marriage, that on the average (*i.e.*, the results being for husbands of all ages combined), and for those only who come under observation in cases of birth, the number of children borne, according to duration of marriage (i), is about $\frac{2}{3} + \frac{4}{11} i$; see formula (523) of Part XIII., §§ 34, 35, and Table XC., pp. 279-283. The surface of representation of this is, for the most part, sensibly a plane. It defines the polygenesic[2] distribution, see p. 285; and thus may be called the *polygenesic surface*. In the case of this distribution differences of age have much less influence, if any, than differences in duration of marriage. It is important to bear in mind, however, that this distribution, as above stated, applies only to a limited

[1] That is the marriages are what have been (somewhat ill-advisedly) called prejudiced"—and do not represent the average liability of becoming fertile.

[2] The word " polygenesis" has been used to indicate the origination of a race arising from several independent ancestors or germs. The above use will, however, lead to no confusion, and is consistent with the general mode of word construction. The word polyphorous (from πολύφόρος = bearing many) is used hereinafter for a different function.

number of married women, viz., *those whose total fecundity happens to come under review through repeated child-bearing.* In Part XIII., § 36, p. 285, the *total number of children borne* by married women of given limits of age and duration of marriage has been called the "general genesic," or "fecundity" distribution. For many purposes, however, it is desirable to know the *number of mothers* (z) instead of the number of children (say, $z' = kz$, $k = 0, 1, 2 \ldots n$) being the number borne by each woman). It is also preferable to relate the number of married women to the *exact* number, k, of children borne by each. Let, therefore, ${}_0m$, ${}_1m$, ${}_2m \ldots {}_nm$ denote the number of married women who bore $0, 1, 2 \ldots n$ children respectively, the range of whose ages are between x_0 and x_1, x_1 and x_2, etc., and the range of whose durations-of-marriage are t_0 and t_1, t_1 and t_2, etc., the ages and duration limits, however, being quite independent. Then the various quantities of importance may be embraced by the following distributions, which will hereinafter be de fined, viz.:—(i.) The age-genesic distribution, (ii.) the durational genesic distribution, (iii.) the age-fecundity distribution, (iv.) the durational fecundity distribution, (v.) the age-polyphorous distribution, (vi.) the durational polyphorous distribution, (vii.) the duration-and-age-fecundity distribution, (viii.) the age-and-duration fecundity distribution, (ix.) the duration-and-age polyphorous distribution, and (x.) the age-and-duration polyphorous distribution. The *ages* may be those at the moment of enumeration or at the moment of marriage : for given purposes either may be required.

These distributions are most clearly defined by means of a symbolic table, Table CXIX., shewing the two types of possible compilation of the results exhibiting the degree of fecundity characteristic of a community. With the aid of this table the various types of distribution—essentially ratios—are readily symbolically represented.

TABLE CXIX.—Scheme of Compilation according (i.) to Age, and (ii.) to Duration of Marriage, exhibiting the Characteristics of the Fecundity of a Population.

Either (i.) Age-Group, or (ii.) Duration-Group.		Total Number of children borne by *each* married woman where the age is given, or during the *existing marriage* where the duration is given.							Totals of (horizontal) rows.
		0	1	2	..	k	..	n	
x_0 to x_1	t_0 to t_1	${}_0m_1$	${}_1m_1$	${}_2m_1$	..	${}_km_1$	..	${}_nm_1$	M_1
x_1 to x_2	t_1 to t_2	${}_0m_2$	${}_1m_2$	${}_2m_2$	..	${}_km_2$	..	${}_nm_2$	M_2
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
x_{p-1} to x_p	t_{p-1} to t_p	${}_0m_p$	${}_1m_p$	${}_2m_p$	..	${}_km_p$	..	${}_nm_p$	M_p
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..
x_{s-1} to x_s	t_{s-1} to t_s	${}_0m_s$	${}_1m_s$	${}_2m_s$	..	${}_km_s$	..	${}_nm_s$	M_s
Totals of (vert.) columns		${}_0M$	${}_1M$	${}_2M$	..	${}_kM$	..	${}_nM$	M

To distinguish clearly between (i.) and (ii.), the m and M quantities are not accented for the former, and are accented (m' and M') for the latter. The surface, the z co-ordinate to which is the height above the xk, or the xt plane, as the case may be, is :—

$$(563)\ldots\ldots z = f_1(x, k)\ ;\ \text{or}\ z = f_2(t, k),$$

in which, of course, k is a variable.

The following table, viz., CXX., gives symbolically the definition of each distribution.

TABLE CXX.—Types of Distribution.

DOUBLE ENTRY DATA.

Age Distribution.	Group Formulæ.		Durational Distribution.
(i.) Age genesic =	$z_{ag} = {}_k m_p / M$	${}_k m'_p / M' = z'_{dg}$	= (ii.) Durational genesic
(iii.) Age fecundity =	$z_{af} = {}_k m_p / {}_k M$	${}_k m'_p / {}_k M' = z'_{df}$	= (iv.) Durational fecundity
(v.) Age polyphorous .. =	$z_{ap} = {}_k m_p / M_p$	${}_k m'_p / M'_p = z'_{dp}$	= (vi.) Durational polyphorous
The equations of the continuous surfaces for the above are $z = f(x, k)$		Equations of the continuous surfaces for the above are $z = f(t, k)$.	

TRIPLE ENTRY DATA.

A table required for each range of duration.	A table required for each age-group.

Age Distributions.	Group Formulæ.		Durational Distributions.
(vii.) Duration and age fecundity =	$z_{d.af} = {}_k m''_p / {}_k M''$	${}_k m''_p / {}_k M'' = z_{a.df}$	= (viii.) Age and durational fecundity
(ix.) Duration and age polyphorous =	$z_{d.ap} = {}_k m''_p / M''_p$	${}_k m''_p / {}_p M'' = z_{a.dp}$	= (x.) Age and durational polyphorous
The equation of the continuous surface for each range of duration is $z = f(x,k)$		The equation of the continuous surface for each range of duration is $z = f(t,k)$	

25. **The age-genesic distribution.**—This distribution furnishes at once the means for determining how a given total of married women may be "partitioned" according to (i.) age, and (ii.) the number of children borne by them. These ratios, multiplied by 1,000,000, are given in Table CXIV., pp. 322-3, for various age-limits. The ignored elements are the durations of marriage and the ages of the husbands.

26. **The durational genesic distribution.**—This distribution similarly furnishes the basis for ascertaining how a given total of married women may be subdivided according to (i.) duration of existing marriage, and (ii.)

number of children borne by them. The ratios multiplied by 1,000,000 are given in Table CXIII., pp. 322-3. The ignored elements are the ages both of the wives and their husbands.

27. **The age-fecundity distribution.**—This distribution represents the relative numbers, according to age, of married women who bore a given number of children : thus it enables the relative frequency according to age of those who bore any given number of children to be compared, as between one community and another, a fact which will be immediately obvious from the table hereunder. The ignored elements are the durations of marriage and the ages of the husbands.

TABLE CXXI.—Shewing, for Wives of all Durations of Marriage combined, and for each Total Number of Children borne by them (*i.e.*, 1, 2, 3 . . . . to n), the Proportion Contributed by each Age-group indicated. Australia, Census 3rd April, 1911. Age-Fecundity Distribution.

Ages of Wives at Census	No. of Wives	Ratio to Total	Result as by Table CXIII.†	Ratio of the Number in a given Age-group to the Total of all Ages, of those who bore k Children, where k is successively 0, 1, 2 . . . . n.																					
				0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	over 20
13	1	00000	00000	0000																					
14	18	00002	00002	0001	0000																				
15	92	00013	00013	0006	0002																				
16	345	00047	00047	0017	0014	0000																			
17	1,061	00145	00145	0048	0047	0004	0000																		
18	2,557	00348	00348	0101	0115	0020	0000																		
19	4,376	00596	00597	0146	0201	0052	0010	0001																	
20	7,224	00985	00985	0209	0318	0122	0026	0002	0000																
21–24	57,896	07890	07894	1378	1991	1313	0630	0215	0054	0016	0001	0000													
25–29	109138	14874	14879	1802*	2596*	2495*	2008	1377	0782	0357	0142	0050	0013	0002	0003	0000									
30–34	112523	15335	15337	1376	1720	2085	2200*	2048*	1754	1316	0881	0478	0240	0107	0052	0023	0008	0007	0000	0002					
35–39	104619	14258	14228	1146	1049	1456	1766	1922	1959*	1871	1636	1372	1025	0699	0492	0305	0219	0175	0009	0003					
40–44	95,392	13000	12994	1026	0742	0981	1285	1597	1785	1894*	1888*	1793	1724	1526	1319	1117	1043	0893	0094	0080	0408	0841	0000	0625	0556
45–49	82,237	11207	11205	0896	0510	0658	0922	1212	1449	1697	1816	1888*	1911*	1864	1876	1745	1728	1787	0177	0171	1878	1308	1190	3125	0833
50–54	61,447	08374	08376	0669	0304	0378	0549	0770	1003	1199	1467	1659	1840	1874*	1952*	2019*	2005*	1973*	0189*	0205*	1918*	2057*	1429	1875	1944*
55–59	37,900	05165	05166	0442	0171	0193	0274	0381	0533	0683	0886	1090	1241	1441	1534	1645	1778	1744	0170	0191	1918	1776	2857*	2500*	1667
60–64	25,065	03416	03417	0314	0100	0113	0151	0229	0318	0440	0565	0726	0857	1045	1150	1349	1284	1448	0152	0147	1838	1776	0952	1875	1667
65–69	16,640	02268	02285	0215	0063	0065	0094	0131	0175	0280	0370	0506	0585	0761	0840	0972	1033	1069	0123	0118	1470	1215	1906	0000	1111
70–74	9,297	01267	01268	0125	0035	0037	0051	0070	0108	0140	0215	0265	0355	0422	0467	0499	0605	0582	0057	0064	0327	0654	1190	0000	2222
75–79	4,254	00580	00581	0058	0016	0021	0023	0031	0052	0076	0090	0121	0154	0197	0814	0253	0243	0260	0024	0016	0122	0373	0476	0000	
80–105	1,691	00230	00233	0025	0006	0007	0011	0014	0028	0031	0043	0052	0055	0062	0071	0073	0054	0062	0005	0003	0121	0000			
13–105	733773	1.00	1.00	104761	109720	106195	90218	73962	58482	47045	37540	30537	24399	19317	12805	8841	5023	2575	1280	625	245	107	42	16	36
Totals		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Note.—The figures marked with an asterisk are the maxima in the vertical columns and those underlined are the maxima in the horizontal lines.

† The figures though very approximate to those in the column to the left are obtained from a wholly different distribution of unspecified and partially specified cases.

The figures in the body of the table are, of course, decimals. They are not deduced from those given in Table CXIV., pp. 322-3, but from the results of a more detailed distribution of the unspecified quantities for various age and duration-of-marriage groups, see Table CXXIII., p. 338-9 later.

Fig. 91 shews the characteristics of the age-fecundity surface, the age being that at the time of the Census. If compiled according to the "age at marriage" the form of contours is, of course, materially changed.

Age-Fecundity Surface.

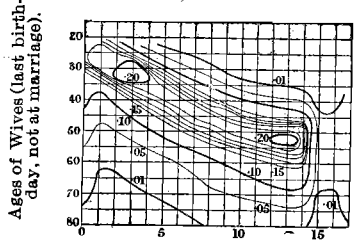


Fig. 91.

28. **The durational fecundity distribution.**—This distribution is exactly analogous to that preceding, the arguments in the table being limits of duration of marriage and the number of children borne. The values could be obtained *roughly* from the data in Table CXIII., by dividing the numbers of wives who bore a given number of children by the corresponding total (*i.e.*, of the vertical columns, see pp. 322-3). More *accurately* it could be found from the data given in Table CXXIII. hereinafter (pp. 338-9), the results for all ages being added together for the required numbers.

The ignored elements are the ages of the wives and of the husbands. If instead of being made out for *all* ages, durational fecundity surfaces are determined for various age-groups, their characteristics will not markedly differ, as might be inferred from Table CXVIII., p. 330 hereinbefore.

29. **The age-polyphorous distribution.**—The data which give the age-fecundity distribution by dividing the tabular numbers by the totals according to the number of children borne, give also the age-polyphorous distribution if divided by the totals of the respective age-groups, see Table CXXII. hereunder, in which the required ratios are given. The distribution thus shews the relative frequency with which married women in any given age-group bear 0, 1, 2 . . . etc., children.

The ignored elements are the duration of marriage and the age of the husbands.

Age-Polyphorous Surface.

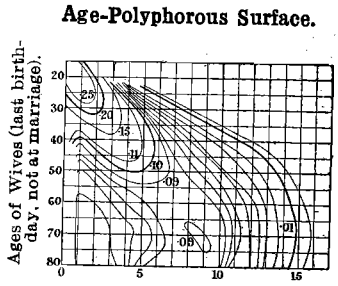


Fig. 92.

Fig. 92 shews the characterisics of the age-polyphorous surface, the age being that at the time of the Census. If compiled according to the "age at marriage" the form of the contours is, of, course, materially changed.

TABLE CXXII.—Shewing, for all Durations of Marriage combined, the Relative Numbers of Married Women of given Age-groups who bore 0, 2, 3 . . . to *n* Children. Australia, Census of 3rd April, 1911. Age-polyphorous Distribution.

Ages of Wives.	No. of Wives	Ratio of the Number who bore the *k*th Child to the total Married Women of the Age-groups indicated, where *k* =																					
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Over 20	Total.
13	1	1.000	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.0
14	18	7200	2800	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.0
15	92	7280	2720	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.0
16	345	5300	4410	0290	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.0
17	1061	4690	*4850	0420	0040	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.0
18	2557	4149	*4939	0849	0055	0004	0004	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.0
19	4376	3497	*5034	1252	0203	0014	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.0
20	7,224	3034	*4828	1789	0324	0022	0003	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.0
21–24	57,896	2495	*3772	2408	0980	0275	0055	0013	0002	00003	..	..	..	..	..	..	..	..	..	..	..	..	..	1.0
25–29	109138	1730	*2610	2428	1660	0933	0419	0153	0049	0014	00003	00005	00004	00001	..	..	..	..	..	..	..	..	..	1.0
30–34	112523	1281	1678	*1967	1764	1346	0912	0550	0294	0130	0052	0018	00055	00018	00003	00002	00001	00001	..	..	..	..	..	1.0
35–39	104619	1147	1100	1478	*1522	1359	1095	0842	0587	0400	0240	0129	0060	0026	0010	0004	0001	..	..	..	..	..	..	1.0
40–44	95,392	1126	0853	1093	1215	*1238	1095	0934	0743	0574	0440	0309	0177	0104	0055	0024	0013	0005	0001	0001	..	..	..	1.0
45–49	82,237	1142	0680	0849	1010	*1091	1030	0971	0829	0700	0567	0438	0292	0188	0106	0056	0028	0013	0006	0002	0001	0001	..	1.0
50–54	61,447	1140	0543	0652	0806	0927	*0956	0918	0896	0825	0730	0589	0407	0290	0164	0083	0039	0021	0008	0004	0001	0000	0001	1.0
55–59	37,900	1222	0495	0540	0653	0743	0823	0847	*0878	0878	0799	0734	0539	0384	0236	0118	0058	0031	0012	0005	0003	0001	0001	1.0
60–64	25,065	1312	0437	0479	0542	0677	0742	0828	0845	*0884	0834	0805	0588	0475	0257	0149	0078	0037	0020	0007	0001	0001	0002	1.0
65–69	16,640	1353	0415	0417	0508	0581	0617	0788	0837	*0928	0858	0883	0647	0516	0312	0165	0094	0044	0022	0008	0005	0000	0002	1.0
70–74	9,297	1408	0417	0419	0498	0559	0682	0713	0869	0869	*0930	0878	0644	0474	0327	0161	0079	0043	0009	0008	0005	0000	0008	1.0
75–79	4,254	1425	0416	0524	0487	0531	0712	0825	0790	0872	0881	*0893	0555	0527	0287	0157	0073	0024	0007	0009	0005	..	..	1.0
80–105	1,691	1532	0373	0473	0597	0609	0875	0905	*0958	0934	0798	0710	0538	0385	0160	0095	0035	0012	0012	..	..	..	..	1.0
13–105 Nos.	733773	104761	109720	106195*	90218	73962	58482	47045	37540	30537	24399	19317	12805	8841	5023	2575	1280	625	245	107	42	16	36	1.0
Ratio	100000	14277	14953	14472	12295	10080	07970	06411	05116	04162	03325	02633	01745	01205	00685	00351	00174	00085	00033	00015	00006	00002	00005	1.0
Result as by CXIII.†		14222	14958	14483	12306	10090	07990	06415	05118	04149	03326	02632	01746	01204	00686	00351	00175	00086	00034	00015	00006	00002	00006	1.0

Note.—The figures marked with an asterisk are the maxima in the horizontal lines, and those underlined are the maxima in the vertical columns, excepting in the case of column 0, where .1126 is the minimum.

† The figures though very approximate to the line above are given by a wholly different distribution of unspecified and partially specified cases.

The figures in the body of the table are, of course, decimals. They are not deduced from those given in Table CXIV., pp. 322-3, but from the results of a more detailed distribution of the unspecified quantities for various age and duration-of-marriage groups, see Table CXXIII., pp. 338-9 later.

30. **The durational polyphorous distribution.**—The data from which the durational fecundity is derived furnish also the numbers required for the computation of the durational polyphorous distribution, viz., that which shews for given durations of marriage, or between given limits of duration of marriage, the relative frequency with which given numbers of children are borne. The ignored elements are the ages of the wives and of their husbands. This table has not been computed, but the necessary data are given in Table CXXIII. hereinafter.

31. **Fecundity distributions according to age, duration of marriage and number of children borne.**—The fecundity distribution tables, so far, are of the type $z = f(x, y)$, but if age, duration of marriage and number of children borne, be simultaneously taken into account, then the distribution-frequency is of the type $z = f(w, x, y)$, and cannot be represented by a single three-dimensional graph, for example, height contours upon a plane. It is necessary in fact to have a graph for each value of w adopted in the tabulations.

The exigencies of tabulation, of course, also require that a separate table of the values of z shall be given for each value of one co-ordinate (say w), for the values given by double entry of the other two (say x and y).

In Table CXXIII., hereunder, the results are tabulated for single years of age from 13 to 20, (last birthday), for the ages 21 to 24, and then for every five year age-group onward. The table gives, for existing marriage, the number of wives, of various ages and durations of marriage, who failed to give birth to children, or who gave birth to 1, 2, 3, etc.

In the tables as originally compiled, there was a considerable number of unspecified cases, viz., the following :—

Class (i.), the larger class, in which the ages were specified.

Class (ii.), a relatively small class, in which the ages were *not* specified.

In each of these were three sub-classes as follow, viz.:—

(a) in which the duration of marriage was not specified;

(b) in which the number of children was not specified;

(c) in which neither the duration of marriage nor the number of children was specified.

It was consequently necessary to effect a distribution in order to get anything like the most probable results.[1]

The method of distribution was that outlined in § 4, Table XCVII., and formulæ (543) to (547). That is to say, sub-class (c) was first distributed proportionately among sub-classes (a) and (b), and sub-classes (a) and (b) of Class (i.) were distributed proportionately among the fully specified cases. In Class (ii.) the corrected sub-classes (a) and (b) were then proportionately distributed among the fully specified corrected groups of Class (i.). The details of the distribution shewed that the result was very satisfactory judged by the regularity of the ratios (see § 5 hereinbefore).

[1] The method of adopting the fully specified cases as characteristic of the whole, involves merely multiplying each by the ratio of the totals. An examination of actual results shewed that recourse to this procedure was unsatisfactory. It rejects part of the evidence available. To distribute the partially specified cases is, therefore, much to be preferred.

TABLE CXXIII.—Shewing, for Various Durations of existing Marriage, the Number of Wives in Various Age-groups who bore *k* Children, where *k* = 0, 1, 2, etc. Australian Census, 3rd April, 1911.

Number of Wives to whom had been born Children to the Number of :—

Duration of Marriage.	*Age 13	Age 14.			Age 15.			Age 16.				Age 17.					Age 18.						
	0	0	1	Total.	0	1	Total	0	1	2	Total	0	1	2	3	Total	0	1	2	3	4	5	Total.
0–5	1	13	5	18	67	25	92	183	152	10	345	498	514	45	4	1,061	1,061	1,263	216	14	1	1	2,556
5–10	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1
Totals	1	13	5	18	67	25	92	183	152	10	345	498	514	45	4	1,061	1,061	1,263	217	14	1	1	2,557

	Age 19.						Age 20.							Age 21-24.									
	0	1	2	3	4	Total.	0	1	2	3	4	5	Total.	0	1	2	3	4	5	6	7	8	Total.
0–5	1,530	2,203	548	84	3	4,368	2,185	3,445	1,178	140	5	0	6,953	13,947	20,116	9,708	1,499	104	4	0	0	0	45,378
5–10	..	..	..	5	3	8	7	43	114	94	11	2	271	493	1,725	4,232	4,175	1,482	314	73	10	..	12,506
10–15	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	5	1	4	1	2	12
Totals	1,530	2,203	548	89	6	4,376	2,192	3,488	1,292	234	16	2	7,224	14,440	21,841	13,940	5,675	1,591	319	77	11	2	57,896

*25–29	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Over 20	Total.
0–5	15,392	20,412	10,234	1,632	144	5	..	..	..	..	..	..	..	..	..	.	..	..	..	..	..	..	47,819
5–10	3,127	7,205	14,778	14,400	7,689	2,358	500	78	17	1	..	..	..	..	..	..	..	..	..	..	..	..	50,153
10–15	360	865	1,480	2,082	2,350	2,212	1,171	453	133	31	4	4	..	..	..	..	..	..	..	..	..	..	11,145
15–20	1	0	1	5	0	1	4	2	4	1	1	0	1	..	..	..	..	..	..	..	..	..	21
Totals	18,880	28,482	26,493	18,119	10,183	4,576	1,675	533	154	33	5	4	1	..	..	..	..	..	..	..	..	..	109,138
*30–34																							
0–5	7,788	8,174	4,099	675	55	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	20,792
5–10	4,185	6,678	11,083	10,308	5,759	1,988	466	97	17	2	..	..	..	..	..	..	..	..	..	..	..	..	40,587
10–15	2,166	3,459	6,051	7,827	8,093	7,022	4,372	2,087	727	204	49	13	5	2	..	..	..	..	..	..	..	..	42,077
15–20	273	565	906	1,037	1,241	1,244	1,348	1,122	710	377	155	52	15	2	2	1	1	..	..	..	..	..	9,051
20–25	2	0	1	2	1	2	3	0	5	2	2	2	..	..	..	..	..	..	..	..	..	..	22
Totals	14,414	18,876	22,140	19,849	15,149	10,257	6,189	3,306	1,459	585	206	67	20	4	2	1	1	..	..	..	..	..	112,525
*35–39																							
0–5	4,395	2,767	1,307	203	24	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8,701
5–10	3,060	3,060	4,503	4,068	2,228	786	203	60	24	1	1	..	..	..	..	..	..	..	..	..	..	..	17,994
10–15	2,832	3,210	5,454	6,288	6,087	4,943	3,240	1,511	585	207	57	24	3	2	..	..	..	..	..	..	..	..	34,443
15–20	1,422	2,034	3,458	4,424	4,782	4,596	4,297	3,546	2,596	1,393	666	281	106	39	8	1	..	..	..	..	..	..	33,649
20–25	292	435	739	944	1,092	1,128	1,062	1,019	985	898	626	324	161	68	37	11	2	1	..	..	..	..	9,824
25–30	1	0	1	0	0	0	1	2	0	1	0	1	0	1	..	..	..	..	..	..	..	..	8
Totals	12,002	11,506	15,462	15,927	14,213	11,458	8,803	6,138	4,190	2,500	1,350	630	270	110	45	12	2	1	..	..	..	..	104,619
*40–44																							
0–5	2,811	787	244	23	4	..	..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	3,869
5–10	2,300	1,523	1,530	1,068	571	232	53	7	3	1	..	..	..	..	..	..	..	..	..	..	..	..	7,288
10–15	2,236	1,974	2,607	2,626	2,435	1,821	1,046	486	177	71	22	5	..	..	..	..	..	..	..	..	..	..	15,506
15–20	1,836	1,999	3,069	3,654	3,859	3,359	2,931	2,227	1,442	819	387	177	65	27	10	4	..	..	..	..	..	..	25,865
20–25	1,323	1,570	2,587	3,634	4,156	4,165	3,984	3,531	3,034	2,541	1,814	957	559	264	110	56	17	3	3	..	..	..	34,308
20–35	233	287	385	585	782	864	890	835	819	775	721	550	363	232	109	60	33	7	6	0	1	2	8,539
30–35	0	0	0	0	2	0	4	1	1	0	4	0	1	1	1	..	..	..	..	..	..	..	15
Totals	10,739	8,140	10,422	11,590	11,809	10,441	8,908	7,087	5,476	4,207	2,948	1,689	988	524	230	120	50	10	9	0	1	2	95,390
*45–49																							
0–5	1,901	112	11	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2,026
5–10	1,882	624	309	139	46	21	5	1	2	..	..	..	..	..	..	..	..	..	..	..	..	..	3,029
10–15	1,646	1,105	1,001	854	553	305	168	63	29	9	3	2	..	..	..	..	..	..	..	..	..	..	5,738
15–20	1,281	1,055	1,479	1,567	1,516	1,195	826	466	277	132	59	16	12	3	1	17	7	3	1	0	1	..	9,914
20–25	1,444	1,478	2,312	2,973	3,364	3,130	2,870	2,297	1,666	1,163	749	383	195	88	31	122	68	22	6	2	3	2	24,368
25–30	1,061	1,053	1,631	2,441	3,050	3,276	3,515	3,250	3,018	2,652	2,100	1,459	913	508	263	88	32	21	7	3	1	1	30,339
30–35	175	170	242	339	437	545	601	738	772	706	690	542	422	268	165	0	0	..	..	..	..	..	6,816
35–40	0	1	0	0	1	0	0	2	0	1	0	0	1	1	..	..	..	..	..	..	..	..	7
Totals	9,390	5,598	6,985	8,314	8,968	8,472	7,985	6,817	5,764	4,663	3,601	2,402	1,543	868	460	227	107	46	14	5	5	3	82,237
*50–54																							
0–5	969	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	970
5–10	1,221	68	13	4	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,308
10–15	1,224	451	208	126	45	25	11	4	4	1	..	..	..	..	..	..	..	..	..	..	..	..	2,099
15–20	877	600	619	565	406	219	119	51	30	20	7	2	5	..	..	..	..	..	..	..	..	..	3,520
20–25	862	748	1,055	1,289	1,291	1,098	782	552	352	166	83	44	23	11	4	2	1	..	..	..	..	..	8,363
25–30	1,019	769	1,237	1,742	2,144	2,329	2,244	2,145	1,761	1,264	847	454	268	110	49	22	13	6	1	..	..	..	18,424
30–35	704	590	749	1,076	1,580	1,893	2,156	2,275	2,380	2,414	2,049	1,439	977	546	265	117	64	25	14	1	2	3	21,319
35–40	129	111	128	151	229	304	331	477	540	624	634	560	509	339	189	99	49	16	17	5	1	3	5,435
40–45	..	..	..	2	..	..	..	1	..	..	..	..	2	1	1	..	1	..	..	..	..	1	9
Totals	7,065	3,338	4,009	4,955	5,697	5,868	5,643	5,505	5,067	4,489	3,620	2,499	1,784	1,007	508	240	128	47	22	6	3	7	61,447

* Ages at date of Census.

TABLE CXXIII.—**Shewing, for Various Durations of existing Marriage, the Number of Wives in various Age-groups who bore k Children, where k=0, 1, 2, etc. Australian Census, of 3rd April, 1911.**—*Cont.*

Duration of Marriage.	Number of Wives to whom had been born Children to the Number of :—																					
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Over 20	Total.
*55–59																							
0–5	466	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	466
5–10	578	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	579
10–15	770	60	21	3	1	0	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	856
15–20	630	285	174	75	37	8	4	1	0	1	..	..	..	..	..	..	..	..	..	..	..	..	1,215
20–25	575	388	387	390	292	184	112	73	32	26	5	5	2	1	..	..	..	..	..	..	..	..	2,472
25–30	493	398	488	625	721	762	661	433	264	143	93	48	16	11	9	1	1	..	..	..	..	..	5,167
30–35	544	369	510	751	889	1138	1,176	1,286	1,174	927	707	402	215	118	53	23	10	2	..	..	..	..	10,294
35–40	463	318	398	558	784	898	1,069	1,311	1,583	1,600	1,515	1,161	873	509	261	111	64	26	9	10	4	4	13,529
40–45	113	57	69	71	92	128	188	222	275	331	462	425	348	254	126	83	44	19	10	2	..	2	3,321
45–	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	1
Totals	4,632	1,876	2,047	2,473	2,816	3,118	3,211	3,326	3,328	3,028	2,783	2,041	1,454	893	449	218	119	47	19	12	4	6	37,900
*60–64																							
0–15	905	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	905
15–20	477	22	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	499
20–25	459	190	130	74	22	5	4	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	885
25–30	380	231	265	270	248	168	97	45	29	9	5	4	..	..	..	..	..	..	..	..	..	..	1,751
30–35	312	203	267	320	428	445	417	330	211	142	86	35	11	5	3	1	..	..	..	..	..	..	3.216
35–40	422	235	302	397	551	690	829	802	888	687	524	304	220	56	38	17	12	6	4	1	1	2	6,988
40–45	270	170	207	253	381	468	620	796	887	1,019	1,088	832	642	401	207	105	45	21	7	1	1	3	8,424
45–	64	44	29	45	67	84	108	145	261	234	315	297	319	183	125	72	35	18	8	2	1	1	2,397
Totals	3,289	1,095	1,200	1,359	1,697	1,860	2,075	2,119	2,216	2,091	2,018	1,472	1,192	645	373	195	92	45	19	4	3	6	25,065
*65–69																							
0–15	456	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	456
15–20	213	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	214
20–25	340	30	4	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	376
25–30	328	115	73	50	19	4	4	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	594
30–35	234	139	180	157	139	102	55	39	26	13	6	2	3	..	..	..	..	..	..	..	..	..	1,095
35–40	204	154	161	233	278	339	335	241	178	103	56	15	16	3	2	4	..	..	..	..	..	..	2,322
40–45	245	117	159	214	278	272	485	554	591	509	399	246	146	69	43	22	11	3	..	..	..	..	4,363
45–	231	134	116	191	253	308	433	557	749	803	1,009	813	694	447	230	131	63	33	13	8	0	4	7,220
Totals	2,251	690	693	846	967	1,026	1,312	1,392	1,544	1,428	1,470	1,076	859	519	275	157	74	36	13	8	0	4	16,640
*70–74																							
0–20	351	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	351
20–25	139	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	140
25–30	205	18	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	225
30–35	145	75	74	24	19	3	3	2	1	1	..	..	..	..	..	..	..	..	..	..	..	..	347
35–40	119	84	84	116	105	72	29	32	14	3	1	1	..	..	..	..	..	..	..	..	..	..	660
40–45	110	71	98	126	133	191	187	141	100	73	31	18	6	6	0	1	1	..	..	..	..	..	1,293
45–	240	139	133	196	263	367	444	633	693	788	784	579	435	298	150	72	39	8	7	5	0	8	6,281
Totals	1,309	388	390	463	520	633	663	808	808	865	816	598	441	304	150	73	40	8	7	5	0	8	9,297
*75–79																							
0–30	278	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	278
30–35	79	4	0	0	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	84
35–40	70	32	26	5	6	2	0	1	0	2	..	..	..	..	..	..	..	..	..	..	..	..	144
40–45	50	38	63	62	38	35	37	20	8	6	0	1	0	2	0	0	1	..	..	..	..	..	361
45–	129	103	134	140	181	266	314	315	363	367	380	235	224	120	67	31	9	3	4	2	..	..	3,387
Totals	606	177	223	207	226	303	351	336	371	375	380	236	224	122	67	31	10	3	4	2	..	..	4,254
*80–105																							
0–35	117	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	117
35–40	38	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	39
40–45	27	17	11	11	5	2	1	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	76
45–	77	45	69	90	98	146	152	161	157	135	120	91	65	27	16	6	2	2	..	..	..	..	1,459
Totals	259	63	80	101	103	148	153	162	158	135	120	91	65	27	16	6	2	2	..	..	..	..	1,691
Totals Ages 13–105 and all Durations of Marriage.	104,761	109,720	106,195	90,218	73,962	58,482	47,045	37,540	30,535	24,399	19,317	12,805	8,841	5,023	2,575	1,280	625	245	107	42	16	36	733,773

* Ages at date of Census.

From the data furnished, distributions (vii.) to (x.) can readily be computed.

32. **The duration and age-fecundity distributions.**—For a series of duration-of-marriage-groups these distributions are obtained by computing, for successive age-groups and for each number of children borne, the relative frequency of the mothers within the indicated age-limits who bore a given number of children to the total mothers of all ages (which are included) bearing the same number of children. These results may be obtained by a re-arrangement of the data in Table CXXIII., pp. 338-9. The distribution is (vii.) of Table CXX., p. 333.

The ignored element is only the age of husbands.

33. **The duration and age-polyphorous distributions.**—These, for a series of duration-of-marriage groups, are obtained by computing for a series of age-groups the relative frequency of the mothers within the age-group who bore a given number of children to the total of all mothers in the same age-group (*i.e.*, who bore 0 to n children). The results may be obtained by the same re-arrangement as is required for the distribution referred to in § 32, the present distribution being (ix.) in Table CXX., p. 333. The ignored element is, again, the age of the husbands.

34. **The age and durational fecundity distributions.**—By dividing in each age-group the number of mothers who bore any given number of children, and whose duration of marriage was between given limits, by the total number of mothers who bore the same number of children (*i.e.*, for all durations of marriage in the age-group in question), the ratios in Table CXXIV. hereinafter are obtained. Each series of ratios is the age and durational fecundity distribution for the fundamental age-group. This case is (viii.) in Table CXX., p. 333. The only ignored element is the age of the husbands.

35. **The age and durational polyphorous distributions.**—As in the case of the distributions immediately preceding Table CXXIII., pp. 338-9 furnishes the required data. The series of divisors in each age-group are the totals for the indicated limits of duration of marriage. Thus for married women of a given age and a given duration of marriage, the relative frequency of giving birth to 0, 1, 2 . . . n children are obtained, and these are shewn in Table CXXV. below. This case is (x.) in Table CXX., p. 333, and the only ignored element is again the age of the husbands.

TABLE CXXIV.—Shewing, for a Series of Limits of Duration of Existing Marriage, and according to the Age groups given in the Table, the Ratios of Married Mothers who bore k (where k = 0, 1, 2 . . . . 20, and "over 20") Children, to the Total Number who, for all Durations of Marriage, Bore that Number. Census 3rd April, 1911. Australia. Duration and Age Fecundity Distribution.

Duration of Marriage.	Proportion of the Number of Women who, within the Indicated Limit of Duration of Marriage, Bore k Children to the Total Number of Married Women who Bore k Children, where k =																				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	over 20
0–5	1.000	1.000	9988	9533	5714	1.000																
5–10	..	..	0012	0467	4286																	
Nos.	3,353	4,162	820	107	7	1																
*13–19	1.00	1.00	1.00	1.00	1.00	1.00																
0–5	9699	9308	7147	2774	0678	0125																
5–10	0301	0692	2853	7225	9291	9844	9480	9091	1.00													
10–15	..	..	..	0001	0031	0031	0520	0909														
Nos.	16,632	25,329	15,232	5,909	1,607	321	77	11	2													
*20–24	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00													
0–5	8153	7166	3863	0901	0141	0011																
5–10	1656	2530	5578	7947	7551	5153	2985	1463	1104	0303												
10–15	0191	0304	0559	1149	2308	4834	6991	8500	8637	9394	.9000	1.00										
15–20	..	..	..	0003	0000	0002	0024	0037	0259	0303	.1000	..	1.00									
Nos.	18,880	28,482	26,493	18,119	10,183	4,576	1,675	533	154	33	5	4	1									
*25–29	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00									
0–5	5404	4330	1852	0341	0036	0001																
5–10	2903	3538	5006	5193	3802	1938	0753	0293	0117	0034												
10–15	1503	1833	2733	3943	5342	6846	7064	6313	4983	3488	2379	0194	2500	5000								
15–20	0189	0299	0409	0522	0820	1213	2178	3394	4866	6444	7524	0776	7500	5000	1.00	1.00	1.00					
20–25	0001	0000	0000	0001	0000	0002	0005	0000	0034	0034	0097	0030	0000									
Nos.	14,414	18,876	22,140	19,849	15,149	10,257	6,189	3,306	1,459	585	206	67	20	4	2	1	1					
*30–34	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00					
0–5	3662	2405	0845	0127	0016	0004																
5–10	2550	2659	2913	2554	1568	0686	0231	0098	0057	0004	0007											
10–15	2360	2790	3528	3948	4283	4314	3682	2462	1396	0808	0423	0381	0111	0182								
15–20	1185	1768	2236	2778	3365	4012	4881	5777	6196	5572	4933	4460	3926	3546	1777	0834						
20–25	0243	0378	0478	0593	0768	0984	1206	1660	2351	3592	4637	5143	5963	6182	8223	9166	1.00	1.00				
25–30	..	..	..	..	..	..	..	0003	0000	0004	0000	0016	0000	0090								
Nos.	12,002	11,506	15,462	15,927	14,213	11,458	8803.	6,138	4,190	2,500	1,350	630	270	110	45	12	2	1				
*35–39	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
0–5	2617	0966	0234	0020	0003																	
5–10	2142	1871	1468	0921	0484	0222	0060	0010	0005	0002												
10–15	2082	2425	2502	2266	2062	1744	1174	0686	0323	0169	0075	0030										
15–20	1710	2456	2945	3153	3268	3217	3291	3143	2633	1947	1313	1048	0658	0515	0435	0333						
20–25	1232	1929	2482	3135	3519	3989	4472	4982	5541	6040	6152	5666	5658	5038	4783	4667	3400	3000	3333			
25–30	0217	0353	0369	0505	0662	0828	0999	1178	1496	1842	2446	3256	3674	4428	4739	5000	6600	7000	6667	0000	1.00	1.00
30–35	..	..	..	..	0002	0000	0004	0001	0002	0000	0014	0000	0010	0019	0043							
Nos.	10,739	8,140	10,422	11,590	11,809	10,441	8,908	7,087	5,476	4,207	2,948	1,689	988	524	230	120	50	10	9	0	1	2
*40–44	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	..	1.00	1.00
0–5	2025	0200	0016	0001	0001																	
5–10	2004	1115	0442	0167	0052	0025	0006	0001	0003													
10–15	1753	1974	1434	1027	0617	0360	0210	0092	0050	0019	0008	0008										
15–20	1364	1885	2117	1885	1690	1410	1034	0684	0482	0283	0164	0067	0078	0034	0022	0749	0654	0652	0714	0000	2000	
20–25	1538	2640	3310	3576	3751	3695	3594	3370	2890	2494	2080	1595	1264	1014	0674	5374	6355	4783	4286	4000	6000	6667
25–30	1130	1881	2335	2936	3401	3867	4398	4767	5236	5688	5832	6074	5917	5853	5717	3877	2991	4565	5000	6000	2000	3333
30–35	0186	0304	0346	0408	0487	0433	0758	1083	1339	1514	1916	2256	2735	3088	3587	0000						
35–40	..	0001	0000	0000	0001	0000	0000	0003	0000	0002	0000	0000	0006	0011	0000							
Nos.	9,390	5,598	6,985	8,314	8,968	8,472	7,985	6,817	5,764	4,663	3,601	2,402	1,543	868	460	227	107	46	14	5	5	3
*45–49	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0–5	1383	0003																				
5–10	1743	0204	0032	0008	0004																	
10–15	1747	1351	0519	0254	0079	0043	0019	0007	0008	0002												
15–20	1252	1797	1544	1140	0713	0373	0211	0093	0059	0044	0019	0008	0028									
20–25	1231	2241	2632	2601	2266	1871	1386	1003	0695	0370	0229	0176	0129	0110	0079	0083	0078					
25–30	1455	2304	3086	3516	3763	3969	3977	3896	3475	2816	2340	1817	1503	1092	0964	0917	1016	1276	0455			
30–35	1005	1768	1868	2172	2773	3226	3820	4133	4697	5378	5660	5758	5476	5422	5217	4875	5000	5320	6363	1667	6667	4285
35–40	0184	0332	0319	0305	0402	0518	0587	0866	1066	1390	1752	2241	2853	3366	3720	4125	3828	3404	3182	8333	3333	4285
40–45	0000	0000	0000	0004	0000	0000	0000	0002	0000	0000	0000	0000	0011	0010	0020	0000	0078	0000	0000	0000	0000	1430
Nos.	7,905	3,338	4,009	4,955	5,697	5,868	5,643	5,505	5,067	4,489	3,620	2,499	1,784	1,007	568	240	128	47	22	6	3	7
*50–54	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

TABLE CXXIV.—Shewing, for a Series of Limits of Duration of Existing Marriage, and according to the Age groups given in the Table, the Ratios of Married Mothers who bore k (where k = 0, 1, 2 . . . . 20, and "over 20") Children to the Total Number who, for all Durations of Marriage, bore that Number. Census, 3rd April, 1911. Australia. Duration and Age Fecundity Distribution—*continued.*

Duration of Marriage.	Proportion of the Number of Women who, within the Indicated Limit of Duration of Marriage, Bore k Children to the Total Number of Married Women who Bore k Children, where k =																					
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	over 20
0–5	1006																					
5–10	1248	0005	0000																			
10–15	1662	0320	0103	0012	0004	0000	0003															
15–20	1360	1519	0850	0303	0131	0026	0012	0003	0000	0003												
20–25	1241	2068	1891	1577	1037	0590	0349	0219	0096	0086	0018	0024	0014	0011								
25–30	1064	2122	2384	2527	2560	2444	2059	1302	0793	0472	0334	0235	0110	0123	0200	0046	0084					
30–35	1174	1967	2491	3037	3157	3650	3662	3867	3528	3062	2540	1971	1479	1322	1181	1055	0841	0426				
35–40	1000	1695	1944	2256	2784	2280	3329	3942	4757	5284	5444	5688	6004	5700	5813	5092	5378	5532	4737	0833	1.00	6667
40–45	0244	0304	0337	0288	0327	0410	0586	0667	0826	1033	1660	2082	2393	2844	2806	3807	3697	4042	5263	0167	0000	3333
†45	..	..	..	..	..	..	..	..	..	..	0004	0000	0000	0000								
Nos.	4,632	1,876	2,047	2,473	2,816	3,118	3,211	3,326	3,328	3,028	2,783	2,041	1,454	893	449	218	119	47	19	12	4	6
*55–59	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0–15	2752																					
15–19	1450	0200																				
20–25	1396	1735	1083	0544	0130	0027	0019	0066														
25–30	1155	2110	2208	1987	1461	0903	0467	0212	0131	0043	0025	0027										
30–35	0949	1854	2225	2355	2522	2392	2010	1557	0952	0679	0426	0238	0092	0078	0086	0051						
35–40	1283	2146	2517	2921	3247	3710	3996	3785	4007	3286	2597	2065	1846	0868	1019	0872	1304	1333	2105	2500	3333	3333
40–45	0820	1553	1725	1862	2245	2516	2988	3656	4003	4873	5391	5652	5386	6217	5550	5385	4892	4667	3684	2500	3333	5000
†45	0195	0462	0242	0331	0395	0452	0526	0684	0907	1119	1561	2018	2676	2827	3351	3692	3804	4000	4211	5000	3334	1667
Nos.	3,289	1,095	1,200	1,359	1,697	1,860	2,075	2,119	2,216	2,091	2,018	1,472	1,192	645	373	195	92	45	19	4	3	6
*50–64	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0–15	2026																					
15–29	0946	0014																				
20–30	1510	0435	0058	0012	0000	0010																
25–30	1457	1667	1053	0530	0196	0033	0030	0007														
30–35	1041	2014	2598	1856	1438	0994	0420	0280	0168	0091	0041	0019	0035									
35–40	0906	2232	2323	2754	2875	3304	2553	1731	1153	0721	0381	0139	0186	0058	0073	0255						
40–45	1088	1696	2294	2530	2875	2651	3697	3980	3828	3565	2714	2286	1700	1323	1564	1401	1486	0833	1.00	1.00	0000	1.00
†45	1026	1942	1674	2258	2616	3002	3300	4002	4851	5623	6864	7556	8079	8613	8363	8344	8514	9167				
Nos.	2,251	690	693	846	967	1,826	1,312	1,392	1,544	1,428	1,470	1,076	859	519	275	157	74	36	13	8	0	4
*65–69	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0–20	2681																					
20–25	1062	0026																				
25–30	1566	0464	0026	0022																		
30–35	1108	1933	1897	0518	0365	0047	0045	0025	0012	0011												
35–40	0910	2165	2154	2505	2019	1137	0437	0396	0173	0035	0012	0017										
40–45	0840	1830	2513	2722	2558	3017	2821	1745	1238	0844	0380	0301	0136	0197	0000	1370	0250					
†45	1833	3582	3410	4233	5058	5799	6697	7834	8577	9110	9608	9682	9864	9803	1.00	8630	9750	1.00	1.00	1.00	0000	1.00
Nos.	1,309	388	390	463	520	633	663	808	868	865	816	598	441	304	150	73	40	8	7	5	0	8
*70–74	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0–30	4587																					
30–35	1304	0226	0000	0000	0044																	
35–40	1155	1808	1166	0241	0265	0066	0000	0030	0000	0053												
40–45	0825	2147	2825	2996	1681	1155	1054	0595	0216	0160	0000	0043	0000	0164	0000	0000	1000					
†45	2129	5819	6069	6763	8010	8779	8946	9375	9784	9787	1.00	9957	1.00	9936	1.00	1.00	9000	1.00	1.00	1.00		
Nos.	606	177	223	207	226	303	351	336	371	375	380	236	224	122	67	31	10	3	4	2		
*75–79	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
0–35	4517																					
35–40	1467	0016																				
40–45	1043	0270	1375	1089	0486	0132	0065	0062	0063													
†45	2973	0714	8625	8911	9514	9968	9935	9938	9937	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Nos.	259	63	80	101	103	148	153	162	158	135	120	91	65	27	16	6	2	2				
*80–105	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Grand Total	104761	109726	106195	90,218	73,962	58,482	47045	37540	30535	24399	19317	12805	8,841	5,023	2,575	1,280	625	245	107	42	16	36

* Ages. † 45 and over.

TABLE CXXV.—Shewing, for Various Durations of existing Marriage, the Proportion of Women of Various Groups of Ages, who bore 1, 2, 3 . . . n Children, the Total for each Age-group between the Limits of Duration of Marriage being Unity. Australia, Census of 3rd April, 1911. Duration and Age-polyphorous Distribution.

Duration of Marriage and Age.	Proportion of the Total of Women within the Indicated Limit of Duration of existing Marriage who bore Children to the Number of k, in which k =																					T'tals	Total No. for the Duration.
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	over 20	
0–5	3972	4931	0970	0121	0005	0001	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	8,441
5–10	..	..	1111	5556	3333	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	9
*13–19	3968	4925	0970	0128	0008	0001	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	8,450
0–5	3083	4502	2080	0313	0022	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	52,331
5–10	0391	1384	3401	3341	1169	0247	0057	0008	0002	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	12.777
10–15	..	..	..	0833	4168	0833	3333	0833	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	12
*20–24	2554	3890	2339	0908	0247	0049	0012	0001	0000	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	65,120
0–5	3219	4269	2140	0341	0030	0001	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	47,819
5–10	0624	1437	2947	2871	1533	0470	0100	0015	0003	0000	..	..	..	..	..	..	..	..	..	..	..	..	1.00	50,153
10–15	0323	0776	1328	1868	2109	1985	1051	0406	0119	0027	0004	0004	..	..	..	..	..	..	..	..	..	..	1.00	11,145
15–20	0476	0000	0476	2380	0000	0476	1906	0952	1906	0476	0476	0000	0476	..	..	..	..	..	..	..	..	..	1.00	21
*25–29	1730	2610	2428	1660	0933	0419	0153	0049	0014	0003	00005	00004	00001	..	..	..	..	..	..	..	..	..	1.00	109,138
0–5	3745	3931	1972	0325	0025	0001	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	20,792
5–10	1031	1645	2732	2540	1419	0490	0115	0024	0004	0000	..	..	..	..	..	..	..	..	..	..	..	..	1.00	40,587
10–15	0515	0822	1438	1860	1924	1670	1039	0496	0172	0049	0010	0003	0001	0001	..	..	..	..	..	..	..	..	1.00	42,077
15–20	0302	0620	1000	1146	1370	1374	1489	1239	0784	0416	0171	0057	0016	0002	0002	0001	0001	..	..	..	..	..	1.00	9,051
20–25	0909	0000	0454	0909	0454	0909	1365	0000	2273	0909	0909	0909	..	..	..	..	..	..	..	..	..	..	1.00	22
*30–35	1281	1678	1967	1764	1346	0912	0550	0294	0130	0052	0018	00055	00018	00003	00002	00001	00001	..	..	..	..	..	1.00	112,525
0–5	5051	3180	1502	0233	0028	0006	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	8,701
5–10	1701	1700	2502	2262	1238	0437	0113	0033	0013	0001	0000	..	..	..	..	..	..	..	..	..	..	..	1.00	17,994
10–15	0822	0932	1583	1826	1767	1435	0941	0349	0170	0060	0016	0007	0002	0000	..	..	..	..	..	..	..	..	1.00	34,443
15–20	0423	0605	1027	1315	1420	1366	1307	1054	0772	0414	0138	0084	0032	0010	0002	0001	..	..	..	..	..	..	1.00	33,649
20–25	0297	0443	0751	0961	1112	1148	1081	1037	1003	0914	0636	0329	0164	0069	0038	0011	0004	0002	..	..	..	..	1.00	9,824
25–30	1250	0000	1250	0000	0000	0000	1250	2500	0000	1250	0000	1250	0000	1250	..	..	..	..	..	..	..	..	1.00	8
*35–40	1147	1100	1478	1522	1359	1095	0842	0587	0400	0240	0129	0060	0026	0010	0004	0001	0000	0000	..	..	..	..	1.00	104,619
0–5	7265	2034	0632	0059	0010	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	3,869
5–10	3156	2090	2099	1466	0783	0318	0073	1010	0004	0001	..	..	..	..	..	..	..	..	..	..	..	..	1.00	7,288
10–15	1443	1274	1682	1692	1570	1174	0675	0313	0114	0046	0014	0003	..	..	..	..	..	..	..	..	..	..	1.00	15,506
15–20	0710	0773	1187	1413	1492	1299	1133	0861	0557	0317	0150	0068	0025	0010	0004	0001	..	..	..	..	..	..	1.00	25,865
20–25	0386	0458	0754	1058	1212	1214	1161	1030	0884	0740	0529	0279	0163	0077	0032	0016	0005	0001	0001	..	..	..	1.00	34,308
25–30	0273	0336	0451	0685	0916	1012	1042	0978	0959	0908	0844	0644	0425	0271	0128	0070	0039	0009	0007	0000	0001	0002	1.00	8,539
30–35	0000	0000	0000	0000	1334	0000	2667	0667	0667	0000	2667	0000	0667	0667	0667	..	..	..	..	..	..	..	1.00	15
*40–44	1126	0853	1093	1215	1238	1095	0934	0743	0574	0440	0309	0177	0104	0055	0024	0013	0005	0001	0001	0000	0625	0556	1.00	95,390
0–5	9383	0553	0054	0005	0005	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	2,026
5–10	6213	2060	1021	0459	0152	0069	0016	0003	0007	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	3,029
10–15	2869	1926	1745	1487	0964	0532	0293	0110	0050	0016	0005	0003	..	..	..	..	..	..	..	..	..	..	1.00	5,738
15–20	1292	1064	1492	1582	1529	1205	0833	0470	0279	0133	0060	0016	0012	0003	0001	0017	0007	0003	0001	0000	0001	..	1.00	9,914
20–25	0593	0606	0943	1220	1380	1285	1178	0943	0684	0477	0307	0157	0080	0036	0013	0050	0028	0009	0002	0001	0001	0001	1.00	24,368
25–30	0350	0347	0538	0805	1005	1080	1157	1071	0995	0874	0692	0482	0301	0167	0087	0029	0010	0007	0002	0001	0000	0000	1.00	30,339
30–35	0257	0249	0355	0497	0641	0800	0888	1083	1133	1036	1012	0795	0619	0393	0242	..	..	..	..	..	..	..	1.00	6,816
35–40	0000	1429	0000	0000	1428	0000	0000	2857	0000	1429	0000	0000	1429	1428	..	..	..	..	..	..	..	..	1.00	7
*45–49	1142	0680	0849	1010	1091	1030	0971	0829	0700	0567	0438	0292	0188	0106	0056	0028	0013	0006	0002	0001	0001	0000	1.00	82,237
0–5	9890	0010	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	970
5–10	9335	0520	0099	0031	0015	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,308
10–15	5831	2149	0991	0600	0214	0119	0052	0019	0020	0005	..	..	..	..	..	..	..	..	..	..	..	..	1.00	2,009
15–20	2491	1705	1759	1605	1153	0622	0338	0145	0085	0057	0020	0006	0014	..	..	..	..	..	..	..	..	..	1.00	3,520
20–25	1031	0894	1261	1452	1544	1313	0935	0660	0421	0198	0099	0053	0028	0013	0005	0002	0001	..	..	..	..	..	1.00	8,363
25–30	0553	0417	0672	0946	1164	1264	1218	1164	0956	0686	0460	0246	0145	0060	0027	0012	0007	0003	00005	..	..	..	1.00	18,424
30–35	0330	0277	0351	0505	0741	0888	1012	1067	1117	1133	0960	0675	0458	0256	0124	0055	0030	0012	0007	00004	0001	0001	1.00	21,319
35–40	0237	0204	0236	0278	0421	0559	0610	0878	0994	1148	1166	1030	0937	0624	0348	0182	0090	0029	0013	0009	0002	0005	1.00	5,435
40–45	..	..	..	2222	..	..	..	1111	..	..	..	..	2223	1111	1111	..	1111	..	..	..	..	1111	1.00	9
*50–59	1140	0543	0652	0806	0927	0956	0918	0896	0825	0730	0589	0407	0290	0164	0083	0039	0021	0008	0004	0001	0000	0001	1.00	61,447

TABLE CXXV.—Shewing for Various Durations of Existing Marriage the Proportion of Women of Various Groups of Ages, who Bore 1, 2, 3 . . . n Children, the Total for each Age-group between the Limits of Duration of Marriage being Unity. Australia, Census of 3rd April, 1911. Duration and Age-polyphorous Distribution—*continued.*

Duration of Marriage and Age.	Proportion of the Total of Women within the Indicated Limit of Duration of Existing Marriage who Bore Children to the Number of k, in which k =																						Total No. for the Duration.
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	over 20	T'tals	
0–5	1000	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	466
5–10	9983	0017	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	579
10–15	8995	0701	0245	0035	0012	0000	0012	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	856
15–20	5185	2346	1432	0617	0305	0066	0033	0008	0000	0008	0000	..	..	..	..	..	..	..	..	..	..	..	1.00	1,215
20–25	2327	1570	1565	1578	1182	0744	0453	0295	0129	0105	0020	0020	0008	0004	..	..	..	..	..	..	..	..	1.00	2,472
25–30	0954	0770	0944	1210	1395	1475	1279	0838	0512	0277	0180	0093	0031	0021	0017	0002	0002	..	..	..	..	..	1.00	5,167
30–35	0528	0358	0495	0730	0864	1105	1143	1250	1140	0900	0687	0391	0209	0115	0051	0022	0010	0002	..	..	..	..	1.00	10,294
35–40	0342	0236	0294	0412	0579	0664	0791	0979	1157	1183	1120	0858	0646	0376	0193	0082	0048	0020	0007	0007	0003	0003	1.00	13,529
40–45	0340	0172	0208	0214	0277	0385	0566	0668	0828	0997	1391	1280	1048	0765	0380	0250	0132	0057	0030	0006	0000	0006	1.00	3,321
45 and over	..	..	..	..	..	..	..	..	..	..	1.000	..	..	..	..	..	..	..	..	..	..	..	1.00	1
*54–59	1222	0495	0540	0653	0743	0823	0847	0878	0878	0799	0734	0539	0384	0236	0118	0058	0031	0012	0005	0003	0001	0001	1.00	37,900
0–15	1.00	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	905
15–20	9559	0441	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	499
20–25	5186	2147	1469	0836	0249	0057	0045	0011	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	885
25–30	2170	1319	1513	1542	1416	0959	0554	0257	0166	0052	0029	0023	..	..	..	..	..	..	..	..	..	..	1.00	1,751
30–35	0970	0631	0830	0995	1331	1384	1297	1026	0656	0442	0267	0109	0034	0016	0009	0003	..	..	..	..	..	..	1.00	3,216
35–40	0604	0336	0432	0568	0789	0988	1186	1148	1271	0983	0750	0435	0315	0080	0054	0024	0017	0009	0006	0001	0001	0003	1.00	6,898
40–45	0320	0202	0246	0300	0452	0556	0736	0945	1053	1209	1292	0988	0762	0476	0246	0125	0053	0025	0008	0001	0001	0004	1.00	8,424
45 and over	0267	0184	0121	0188	0280	0350	0451	0605	0839	0976	1314	1239	1331	0764	0521	0300	0146	0075	0033	0008	0004	0004	1 00	2,397
*60–64	1312	0437	0479	0542	0677	0742	0828	0845	0884	0834	0805	0588	0475	0257	0149	0078	0037	0020	0007	0001	0001	0002	1.00	25,065
0–15	1.00	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	456
15–20	9953	0047	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	214
20–25	9043	0798	0106	0027	0000	0026	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	376
25–30	5522	1936	1229	0842	0320	0067	0067	0017	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	594
30–35	2137	1269	1644	1434	1269	0932	0502	0356	0238	0119	0055	0018	0027	..	..	..	..	..	..	..	..	..	1.00	1,095
35–40	0379	0663	0693	1003	1197	1460	1443	1038	0767	0443	0241	0065	0069	0013	0009	0017	..	..	..	..	..	..	1.00	2,322
40–45	0562	0268	0364	0490	0637	0623	1112	1270	1354	1167	0915	0564	0335	0152	0099	0050	0025	0007	..	..	..	..	1.00	4,363
45 and over	0320	0185	0161	0265	0350	0427	0600	0772	1037	1112	1397	1126	0961	0619	0319	0181	0087	0046	0018	0011	0000	0006	1.00	7,220
*65–69	1353	0415	0417	0508	0581	0617	0788	0837	0928	0858	0883	0647	0516	0312	0165	0094	0044	0022	0008	0005	0000	0002	1.00	16,640
0–20	1.00	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	351
20–25	9929	0071	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	140
25–30	9112	0800	0044	0044	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	225
30–35	4179	2161	2133	0692	0547	0087	0086	0058	0029	0028	..	..	..	..	..	..	..	..	..	..	..	..	1.00	347
35–40	1803	1273	1273	1758	1591	1091	0433	0485	0212	0045	0015	0015	..	..	..	..	..	..	..	..	..	..	1.00	660
40–45	0852	0549	0758	0974	0129	1427	1446	1090	0773	0565	0240	0139	0046	0047	0000	0008	0007	..	..	..	..	..	1.00	1,293
45 and over	0382	0221	0212	0312	0419	0587	0707	1008	1103	1255	1248	0922	0692	0474	0239	0115	0062	0013	0011	0008	0000	0013	1.00	6,281
*70–74	1408	0417	0419	0498	0559	0682	0713	0869	0869	0930	0878	0644	0474	0327	0161	0079	0043	0009	0008	0005	0000	0008	1.00	9,297
0–30	1.00	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	278
30 35	9405	0476	0000	0000	0119	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	84
35–40	4861	2222	1806	0347	0417	0139	0000	0069	0000	0139	..	..	..	..	..	..	..	..	..	..	..	..	1.00	144
40–45	1385	1053	1745	1717	1052	0975	1025	0554	0222	0166	0000	0028	0000	0055	0000	0000	0028	..	..	..	..	..	1.00	361
45 and over	0381	0304	0396	0413	0534	0785	0927	0930	1072	1084	1122	0694	0661	0354	0198	0092	0027	0009	0012	0006	..	..	1.00	3,387
*75–79	1425	0416	0524	0487	0531	0712	0825	0790	0872	0881	0893	0555	0527	0287	0157	0073	0024	0007	0009	0005	..	..	1.00	4,254
0–35	1.00	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	117
35–40	9744	0256	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	39
40–45	3553	2237	1447	1447	0658	0263	0132	0132	0131	..	..	..	..	..	..	..	..	..	..	..	..	..	1.00	76
45 and over	0528	0308	0473	0617	0672	1001	1042	1103	1076	0925	0822	0624	0446	0185	0110	0041	0014	0012	..	..	..	..	1.00	1,459
80–105	1532	0373	0473	0597	0609	0875	0905	0958	0934	0798	0710	0538	0384	0160	0095	0035	0012	0012	..	..	..	..	1.00	1,691

* Totals for ages indicated. Ages at the time of the Census.

36. Fecundity-distributions according to age at marriage.—By subdivision, according to duration of marriage, of the numbers in Table CXXIII., pp. 338-9, and subsequent rearrangement, tables can be prepared giving very approximately the distributions corresponding to the ages at marriage[1]. As this involves the relative numbers marrying at successive ages, it is essential to know the frequency of marriage at given ages. This is furnished by Table LIV., p. 190[2]. The results are as follow :—

TABLE CXXVI.—Shewing the Relative Number of Marriages according to Ages of Brides. Australia, 1907-1914,[3] and the Average Age for each Year Group.

Alleged age (last birthday) ..	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Mean age ..	12.66	13.66	14.67	15.67	16.61	15.57	18.54	19.52	20.52	21.49	22.49	23.49	24.49	25.49
No. of marriages per 1,000,000	3	13	242	1,620	7,992	22,885	43,889	64,027*	81,033*	90,337*	92,609	87,491	79,199	68,610
Alleged age (last birthday, ..	26	27	28	29	30	31	32	33	34	35	36	37	38	39
Mean age ..	26.49	27.48	28.48	29.48	30.48	31.49	32.49	33.49	34.49	35.49	36.49	37.49	38.49	39.49
No. of Marriages per 1,000,000	58,749	48,897	40,286	33,259	26,627	21,480	16,927	14,553	†11,548	†10,451	†9,415	†8,444	†7,540	†6,702
Alleged age (last (birthday) ..	40	41	42	43	44	45	46	47	48	49	50	51	52	53 to 95
Mean age ..	40.49	41.49	42.49	43.49	44.49	45.49	46.49	47.49	48.49	49.49	50.49	51.49	52.49	..
No. of marriages per 1,000,000	†5,931	†5,225	†4,584	†4,003	†3,481	†3,014	†2,598	†2,230	†1,906	†1,623	†1,375	†1,160	†975	7,064

* Smoothed for misstatement of age. † Smoothed to a curve by a multiplier changing regularly, viz., the reciprocals of 1.105, 1.110, 1.115, etc.

The preceding table shews that, from the age 18 onwards, the average age is, sensibly, the age last birthday plus one half-year, and no serious error will result if it be so taken even for the ages earlier than 18. Hence a correction can be readily made for the effect of mortality, and a synthetic table prepared in the following way :—

Let a, b, etc., denote the marriages at ages (last birthday) x_1, x_2, etc., reduced for a half-years' mortality ; a', b', etc., these reduced for one and a half years' mortality ; a'', b'', etc., the same reduced for two and

[1] Original compilation according to age at marriage is, of course, the best method of obtaining the proper numbers.

[2] This gives 8 years' experience in Australia of the frequency of marriage at different ages, the total cases being 301,918.

[3] These numbers are deduced from those shewn on pp. 190-191 by distributing the 111 unspecified cases.

a half years' mortality, the mortality being both of husbands and wives,[1] and so on. Then, ignoring migration, the numbers according to age, as, at a census, and for a given duration of marriage, will be as shewn in the following table, viz. :—

TABLE CXXVII.—Scheme of Compilation of Numbers according to Duration of Marriage.

Durations of Marriage.	Age at Census.							
	x_1	x_2	x_3	x_4	x_5	x_6	x_7	etc.
0 – 1 ..	a	b	c	d	e	f	g	etc.
1 – 2 ..		a'	b'	c'	d'	e'	f'	etc.
2 – 3 ..			a''	b''	c''	d''	e''	etc.
3 – 4 ..				a'''	b'''	c'''	d'''	etc.
4 – 5 ..					a^{iv}	b^{iv}	c^{iv}	etc.

The total numbers of married women for durations of 0 to 5 years, 5 to 10 years, etc., are consequently :—

$$(564)\ldots {}_0M_5 = (a) + (a' + b) + (a'' + b' + c) + (a''' + b'' + c' + d) + (a^{iv} + b''' + c'' + d' + e) + (b^{iv} + c''' + \ldots + f) + \text{etc.}$$

$$(565)\ldots {}_5M_{10} = (a^{v}) + (a^{vi} + b^{v}) + (a^{vii} + b^{vi} + c^{v}) + \text{etc.}$$

$$(566)\ldots {}_{10}M_{15} = (a^{x}) + (a^{xi} + b^{x}) + (a^{xii} + b^{xi} + c^{x}) + \text{etc.; etc.; etc.}$$

It is obvious that a synthetic table can be prepared by means of which the partition can be effected of a group of married women between given limits of age and duration of marriage : in this way the mean age of any element may also be readily ascertained. Obviously the successive quantities vertically are, with sufficient precision for the purpose in view, respectively—in actuarial notation :—

$$m_x(1-\tfrac{1}{2}q'_x)\,;\ m_{x-1}(1-\tfrac{1}{2}q'_{x-1}).p'_{x-1}.p'_x\,;\ m_{x-2}(1-\tfrac{1}{2}q'_{x-2}).p'_{x-2}.p'_{x-1}.p'_x$$

m denoting the number of marriages, according to the age of the woman,

[1] For rigorous results the fact must be taken into account that the death of husbands also removes the women from the category " married." Hence the correction for mortality includes the probable number of deaths of wives, and of husbands, diminished, however, by the joint deaths, which are counted, of course, once only.

q'_x the probability of a woman[1] of age x either dying or becoming a widow within one year, and p'_x the probability of living in wifehood one year.[2]

Adopting the roughly approximate method we obtain from the data in Table LIV., pp. 190-1,[3] the figures shewn in Table CXXVIII. hereunder.

TABLE CXXVIII.—Shewing Example of Computation of Distribution of Numbers according to Age at and Duration of Marriage.

Duration of marriage	Ages at Census.															
	12	13	14	12-14	15	16	17	18	19	15–19	20	21	22	23	24	20–24
0–1	1	4	73	78	489	2,409	6,898	13,227	18,084	41,107	20,198	32,616	27,898	26,351	23,854	130,917
1–2	..	1	4	5	73	488	2,404	6,878	13,190	23,033	18,028	20,132	32,502	27,795	26,249	124,706
2–3	..	..	1	1	4	73	488	2,398	6,858	9,821	13,149	17,969	20,062	32,382	27,687	111,249
3–4	..	..	..	0	1	4	73	486	2,391	2,955	6,837	13,106	17,906	19,988	32,256	90,093
4–5	..	..	..	0	0	1	4	73	485	563	2,384	6,815	13,060	17,840	19,910	60,009
0–5	1	5	78	84	567	2,975	9,867	23,062	41,008	77,479	60,596	90,638	111,428	124,356	129,956	516,974
5–6	..	..	..	..	..	..	1	4	73	78	483	2,376	6,791	13,012	17,771	40,433
6–7	..	..	..	..	..	..	..	1	4	5	72	481	2,368	6,766	12,962	22,649
7–8	..	..	..	..	..	..	..	..	1	1	4	72	479	2,359	6,740	9,654
8–9	..	..	..	..	..	..	..	..	..	0	1	4	72	477	2,350	2,904
9–10	..	..	..	..	..	..	..	..	..	0	..	1	4	72	475	552
5–10	..	..	..	..	..	..	1	5	78	84	560	2,934	9,714	22,686	40,298	76,192

In the above results it is obvious that the age at marriage is at once approximately, though not exactly, obtained for each sub-group by subtracting the "duration" from the "age." The general result may be represented as follows :—

Let s, with appropriate suffixes, denote an element of S, the total between given limits of age and duration of a series of groups of s : then

$$(567)\ldots\ldots {}_{x,t}S_{x',t'} = s_1 + s_2 + \ldots. \text{ etc.};$$
$$+$$
$$s'_1 + s'_2 + \ldots. \text{ etc.}$$
$$+$$
$$\text{etc.} + \text{etc.} + \ldots. \text{ etc.};$$

[1] If husbands and wives were of the same age the probability of mortality which takes both into account would be approximately $1 - \frac{1}{2}q_m - \frac{1}{2}q_f + \frac{1}{4}q_m q_f$ for one half-year, the suffixes m and f denoting male and female respectively. Corresponding changes must also be made in the p_x factors.

[2] For greater rigour account must be taken of the exact interval; the half-year and year is not exactly correct, because the distribution is not uniform. This refinement, however, is not called for, because migration and other irregularities prejudice the data to a much greater extent.

[3] Similarly those given in Table CXXVI. could be used, and would perhaps be more reliable as they are smoothed results. The table includes only allowances for deaths of wives : the deaths of husbands have been omitted from consideration.

x and x' denoting the age limits, and t and t' the duration limits. Consequently if G be any given total of a series of groups, and g be the value of any component group, its approximate value is given by[1]

$$(568).....g = G.s / S$$

the suffixes being the same for g and s.

For greater precision the values of s must be taken in Table CXXVIII. as modified not only by death but also by migration. In this way tables compiled according to the ages as at the Census can be reconstructed to furnish results according to the ages at marriage. The recasting of the ages may be effected as follows :—

Let x_c and x_e denote respectively the ages at which fertility commences (say 11 or 12), and ends (say 58 or 59) ; t_a and t_b the limits of any *duration of marriage* adopted in compilation, x_1 and x_2 being also *any age limits* adopted, as at the *moment to which the compilation refers* (the Census) ; then the whole *range of ages, x', at marriage* is given by :—

$$(569).....x'_1 \text{ to } x'_2 \equiv (x_1 - t_b) \text{ to } (x_2 - t_a)$$

because on the inferior side an age will be included less than the lower age limit by the whole amount of the longer term of the duration, and on the superior side an age which is less only by the shorter term of the duration.

[1] The group syntheses (*a*) in Table CXXVIII. further extended ; (*b*) those obtained by taking no account of deaths, and (*c*) those given by the Census are respectively as *a*, *b*, and *c* hereunder, *a* and *b* being reduced so as to give the same *total* as at the Census.

Owing to Census defects the Census results (*c*) cannot be regarded as absolutely correct; and owing to migration effects the synthesis results (*a*) or (*b*) will, of course, materially differ from the Census. It is evident, however, that the general correspondence between the Census and the synthetic results is sufficiently well established over a wide range of durations and ages, and that the correspondence furnishes a sufficient reason for relying upon the subdivision of the group-totals into their elements, especially for the earlier ages, and lesser durations of marriage. For age 20, viz., the age at which the misstatements are known to be large, the results are by (*a*) 7158 ; 66 : (*b*) 7157 ; 67 : (*c*) Census, 6953 ; 271. Corrections for mortality are probably an unnecessary refinement.

Duration.	Ages. 11–14	15–19	20–24	25–29	30–34	Totals.
Synthesis (*a*)						
0–5	8	7,523	50,199	49,515	20,894	128,139
5–10	..	8	7,398	49,166	48,291	104,863
10–15	..	..	8	7,239	47,925	55,172
15–20	..	..	..	8	7,052	7,060
20–25	..	..	..	..	8	8
	8	7,531	57,605	105,927	124,171	295,242
Synthesis (*b*)						
0–5	9	7,342	49,224	48,750	20,637	125,967
5–10	..	9	7,347	49,224	48,750	105,330
10–15	..	..	9	7,347	49,224	56,580
15–20	..	..	..	9	7,347	7,356
20–25	..	..	..	..	9	9
	9	7,356	56,580	105,330	125,967	295,242
Synthesis (*c*)						
0–5	19	8,422	52,331	47,819	20,792	129,383
5–10	..	9	12,777	50,158	40.587	103,531
10–15	..	..	12	11,145	42,077	53,234
15–20	..	..	..	21	9,051	9,072
20–25	..	..	..	..	22	22
GTtl.	19	8,431	65,120	109,143	112,529	295,242

Hence it follows that if the age-groups and durations both change by a constant, the range of ages at marriage will be always as above (569). Since ages outside the limits x_c and x_e have no significance as regards fertility they may be ignored and consequently the earliest age of marriage may be taken say, as 11, and the latest say, as 58.

If $x'_2 = x'_1 + 1$ and $t_b + t_a + 1$, the range of ages extends over two years. The subdivision by applying the synthetic results can consequently give only approximate results and cannot sensibly attain to the accuracy of "direct compilation according to the age at marriage."

37. **Complete tables of fecundity.**—Still disregarding the age of husbands, complete tables of fecundity are based, as in the case of sterility, on the age at—and duration of—marriage. They give the proportions of those married at each age who bear 0, 1, 2, 3, etc., children, after the lapse of given durations of marriage. They are most serviceable if developed in the following way, viz. :—

Arguments for each Table.	*Body of Table.*
Age *at marriage*; and duration of marriage (for the child-bearing period only).	Proportion—for each increase of 1 year of age, and for each increase of 1 year in the duration of marriage—of the grand total of married mothers who bear 0 children (Sterility table); who bear 1 child; who bear 2 children; etc., etc.

From such a table as the above the derivative tables, previously indicated, can be readily prepared. Tables compiled on the basis of age at marriage could be distinguished as *gamogenesic*, etc., see p. 285. Fig. 93, and the notes thereto, exhibit in perspective the nature of the gamogenesic surfaces representing the proportion of wives who, having married at a given age, have borne during a duration of marriage of t years k children.

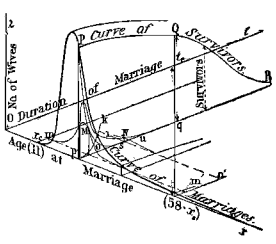


Fig. 93.

38. **Digenesic surfaces and diisogenic contours.**—If the husband's age be not ignored fecundity relations become greatly increased in complexity. For example, instead of a maternity rate or a birth-rate according to the age of wife, we have a series for each age of the

husbands ; the compilation-table becomes one of double entry, and the various fertility and fecundity-relations become correspondingly multiplied. If the ages of husbands and wives constitute respectively the abscissæ and ordinates of verticals, the heights of which represent the particular *birth-rates, maternity-rates* or else that characterise the combinations of ages in question, the surface defined by the totality of the verticals may be called a *digenesic surface.* That is to say, a vertical z of a digenesic surface is represented by :—

$$(570) \ldots\ldots z = \beta \,.\, F(x, y) = \beta_{xy}, \text{ or } \mathfrak{p}_{xy}$$

where β_{xy} is the birth-rate (or $\mathfrak{p}_{xy}$ is the maternity rate) for the group of wives of the ages y to $y + dy$, the ages of whose husbands lie between x and $x+dx$. To avoid circumlocution let the case be restricted to the consideration of birth-rate only. The curves z = constant, or lines of equal birth-rate on this surface are *diisogenic contours* (they have been called by Körösi and Galton[1] *isogens*). Any series of ages x, y, x', y', x'', y'', etc., for which β_{xy} is constant may be called the *diisogenous ages.* The system of orthogonal trajectories which define the lines of the most rapid increase or decrease of birth-rate for any points through which they pass, may be called the meridians of these points.

The diisogeny of communities has not yet been generally investigated. Körösi has examined the question for the population of Budapest. For Australia the results are given hereinafter, and differ materially from the results for Budapest.

39. **Diisogenic graphs and their significance.**—Owing partly to paucity in the number of instances when they are distributed into small age-groups, coupled with the fact that even " physiological fecundity" is probably by no means uniform in the human race, and the further fact that the intentional restriction of fecundity is operative in widely different degrees, the crude data, distributed say in year-groups, do not give very definite indications of the exact position of the contours, though they reveal unmistakeably that the birth-rate is not only profoundly affected

[1] See, " An estimate of the degrees of legitimate natality as derived from a table of natality compiled by the author from his observations made at Budapest." By Joseph Körösi, Phil. Trans., Vol. 186, Pt. II., pp. 781-875, 1896.

" Isogens," by Francis Galton, Proc. Roy. Soc., Lond., Vol. 55, p. 18.

The question had engaged the attention of a large number of persons, for example, A. N. Kiaer, 1875. Stieda, R. Boeckh, Bertillon, Neefe, and others.

by the age of the mother but is also by no means unaffected by the age of the father. It is also evident that, for a considerable range of single-year age-groups, the relation that β is constant when $x + my$ is constant, is approximately true, a point to which we shall recur ; see (576) hereinafter. Thus the problem to be solved is that of determining, from the somewhat irregular surface indicated by the crude data, the more regular surface which ideally defines the general characteristic of birth-rate as related to the ages of the husband and wife, viz., x, y. The magnitude of the accidental differences between single-year age-groups is so large that meticulous precision is out of the question. Hence, using limited ranges of age we may proceed as follows in order to "smooth" the surface.

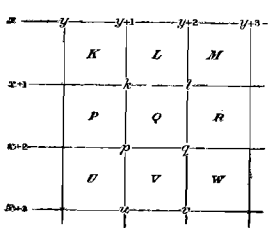


Fig. 94.

Let K, L, M, etc., Fig. 94 denote crude values of the birth-rates for the age-groups x to $x + 1$, y to $y + 1$, etc. Then *approximately*

$$(571)\ldots k = \tfrac{1}{4}(K+L+P+Q)\,;\ l = \tfrac{1}{4}(L+M+Q+R);\ \text{etc., etc.}$$

If this does not give a sufficiently smooth surface we can reconstitute a smoothed value of Q, Q' say, from k, l, p, and q, thus :—

$$(572)\ldots Q' = \tfrac{1}{4}(k+l+p+q) = \tfrac{1}{16}\{4Q+2(L+P+R+V)+(K+M+U+W)\}$$

In this last the weight assigned to the values L, P, etc., and K, M, etc., vary reciprocally as the square of the distance to the centre of the group-square from the centre of Q. If the results are extremely irregular it may even be preferable to adopt :—

$$(573)\ldots\ldots Q' = \tfrac{1}{9}(K+L+M+P+Q+R+U+V+W)$$

instead of the preceding formula. The smoothed values being to hand, the contours may readily be drawn. When deemed necessary small corrections can first be applied to the heights for any systematic error introduced by the process of smoothing.

Since the group heights are too small for the central value when the surface is convex upwards, too great when it is concave upwards, a limitation which is accentuated when the mean of a number of heights is formed, as in (571) to (573). This error is analogous to that dealt with in Part IX., §§ 8 and 9, formulæ (311) to (323), and Table XV. The corrections may be ascertained as soon as the surface is approximately determined.

If z_k ..... to z_w are the vertical heights of the centres of the squares in Fig. 94, for the average height z_0 for the whole area of 4 squares embraced between the lines joining the points K, M, W, U, would be rigorously

$$(574)\ldots.z_0 = \tfrac{1}{36}\{16z_q+4(z_l+z_r+z_v+z_p) + (z_k+z_m+z_w+z_u)\}$$

provided the sections of the surface are curves of the third or a lesser degree; or, if the four component surfaces K, L, Q, P, etc., were "ruled surfaces," the height z_0 would be, also quite rigorously :—

$$(575)\ldots.z_0 = \tfrac{1}{16}\{4z_q+2(z_l+z_r+z_v+z_p) + (z_k+z_m+z_w+z_u)\}$$

If the external factors, therefore, are made unity in (574) and (575) the internal will be, respectively, $\frac{4}{9}$, $\frac{1}{9}$, $\frac{1}{36}$, and $\frac{1}{4}$, $\frac{1}{8}$, and $\frac{1}{16}$. It is evident from these results that the elimination of systematic error involves in all cases the assignment of a high "weight" to the central value. But it is equally certain that if the central values be considered liable to deviations from the general trend of the surface, which, compared with the systematic errors introduced are small, we may practically reach a better result by employing (571) or even (573).[1]

Another and more satisfactory method of obtaining values of β_{xy} is to smooth the series of the values of the type K, P, U, etc.; *i.e.*, with y constant; and independently those at right angles thereto, viz., K, L, M, etc., *i.e.*, with x constant. The means of the two results for each point are then adopted as a first smoothing, and the process repeated as often as is found necessary. This leads to more rigorous results, but can be readily employed only when the original results do not deviate largely from the general trend of the surface.

40. **Diisogens, their trajectories and tangents.**—The general nature of surfaces such as are here under consideration has been indicated in Pt. XII., §§ 21 and 22, pp. 201-203, and the fundamental formulæ of orthogonal trajectories have been given. The system of contours upon such surfaces (diisogens) probably do not conform to any simple geometrical specification; the present imperfect data certainly do not point to their representation by any system of curves of a simple character, though the settlement of this question must remain for more extended investigation and more accurate data. At any point (x, y) whatsoever, dy / dx furnishes the relation by means of which the birth-rate equivalence

[1] The question of the adjustment of such values, has been systematically treated by E. Blaschke, Ph. D., see his "Methoden der Ausgleichung von Wahrscheinlichkeiten," Wien, 1893. See also Phil. Trans., Vol. 186, II., pp. 870-5, 1895. See also Part XII. herein, § 39, pp. 230-2.

of pairs of ages may be expressed in the form $K\beta = x + G\Delta y =$ a constant. For we shall have, for the direction of the tangent to a diisogen, $dy/dx = \tan\theta = 1/G$ say. Hence it follows that

$$(576)\ldots x - \Delta y \cot\theta = x - \Delta y \frac{dx}{dy} = C\,;\ \text{that is } x + G\Delta y = C$$

If k be the recripocal of K then kC will be the constant value of the birth-rate for the diisogen in question. Ordinarily dx/dy is negative.

Parallelism of the tangents of diisogens to the x-axis would imply that the increase of the age of the *husband* had no influence whatever on the birth-rate, while the parallelism of the tangents to the y-axis would denote that the age of the *wife* had no influence. If, therefore, the age of the wife has, in general, the preponderating influence, the diisogens must make a smaller angle with the x-axis than with the y-axis. If the diisogens are inclined 45° to each axis, then the birth-rate is constant when $x + y$ is constant.[1]

41. **Digenesic age-equivalence in two populations.**—As already shewn, the diisogens or their orthogonal trajectories determine the correlative changes in the ages of husbands and wives which give equivalence of birth-rate, *i.e.*, *diisogeny*. The *diisogenic factor* G in formula (576) for any pair of ages (*i.e.*, of husband and wife) is the coefficient which must be multiplied into the age of the wife so that the product, plus the age of the husband, will be continually proportional to the birth-rate. It holds, of course, only for a moderate range of age-differences about the point for which it is ascertained. Thus the expressions :—

$$(577)\ldots\ldots x - y \frac{dx}{dy} = \text{constant}\,;\ x \frac{dy}{dx} - y = \text{constant},$$

apply only to a limited region. For two populations the differential coefficients are not identical. Hence, *for a given difference of age in the wife*, the equivalent difference of age in the husband is not the same. The factor to make one equal the other may be called the *masculine factor of age-equivalence*, E. Similarly the factor to make the difference in the wives' age equal, *for a given difference in the age of husband*, may be called the *feminine factor of equivalence*, E'. Suffixes can be used to denote the ages (of husband and wife) to which these factors exactly apply.

[1] Roughly speaking this represents the general character of the relation indicated (on Table 3, facing p. 852, Phil. Trans., Vol. 186, Pt. II.), by Körösi. Thus, for quite a large range of ages, the birth-rate would appear, according to that authority, to depend merely upon the sum of the ages of husband and wife, and not upon their individual ages. This condition may be called *equilateral diisogeny*, and is probably not a general condition.

Let δy denote any small difference in the age of wives at the point x, y, common to the populations A and B, the tangents to the diisogens making the angles θ_a and θ_b respectively, with the x-axis. Then since $\delta x_a = \delta y \cot \theta_a$ and $\delta x_b = \delta y \cot \theta_b$, we have

$$(578)\ldots\ E = \frac{\delta x_b}{\delta x_a} = \frac{\delta y \cot \theta_b}{\delta y \cot \theta_a} = \frac{G_b}{G_a} = \frac{\tan \theta_a}{\tan \theta_b} = \frac{dF_a(x)/dx}{dF_b(x)/dx}$$

Similarly—

$$(579)\ldots\ldots E' = \frac{\delta y_b}{\delta y_a} = \frac{\delta x \tan \theta_b}{\delta x \tan \theta_a} = \frac{G_a}{G_b} = \frac{1}{E}$$

that is, the masculine and feminine factors of age-equivalence are reciprocals.

42. **Birthrate-equivalences for given age-differences.**—The factors of age-equivalence merely disclose the equivalent differences of age for two populations for a given age-difference in either sex, but not the birth rate equivalence. This latter depends not only upon the direction of the tangents to the graphs of the diisogens in plan (*i.e.*, upon the tangents to their horizontal projections), but also to the angle of slope ψ of the orthogonal trajectories. The tangent to any point Q, on a trajectory will be required. The angle it makes with the z-axis will be ζ so that $\zeta + \psi = 90°$. The following procedure will always be abundantly accurate for determining the age-equivalence and digenesic efficiency for any point Q the co-ordinates of which in plan are x_q, y_q. Let P′ P P″, Q′ Q Q″, and R′ R R″ in Fig. 95 be three diisogens (the values of which are known), crossed by the orthogonal trajectory P, Q, R, which in general is, of course, a curve of double curvature (tortuous curve). Let this trajectory be projected orthogonally on to the horizontal plane X O Y passing through P : this projection is the broken line P q r, the projections of short stretches of the diisogens being similarly the broken lines q′ q q″ and r′ r r″; P′ P P″ is itself in the plane of projection.

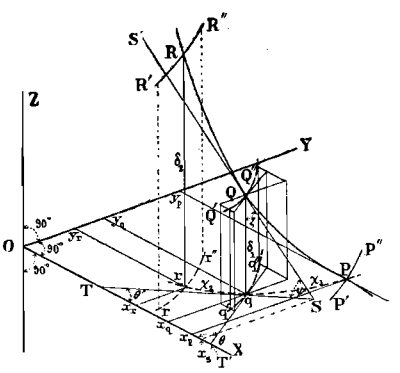


Fig. 95.

Let the curved line Pq be denoted by χ_1, and the curved line Pr, of which Pq forms part, by χ_2, measured along the curve ; and let also the difference of birth-rates for P and Q (*i.e.*, Qq) be denoted by δ_1, and the

difference for P and R be denoted by δ_2; then we may assume that the curved triangle, P Q R r q P in relation to lengths along the curved axis P q r, is, with sufficient precision, given by $\delta = b\chi + c\chi^2$, and therefore that the tangent at the point Q is $d\delta/d\chi = b + 2c\chi$. Thus we shall have :—

$$(580)..\tan\psi = \frac{1}{\chi_2 - \chi_1}\left\{\delta_1\frac{\chi_2}{\chi_1} - \delta_2\frac{\chi_1}{\chi_2} + 2\chi_1\left(\frac{\delta_2}{\chi_2} - \frac{\delta_1}{\chi_1}\right)\right\}$$

When $\delta_2 = 2\delta_1$, this becomes

$$(581).....\tan\psi = \frac{\delta_1}{\chi_1}\cdot\frac{\chi_2^2 - 2\chi_2\chi_1 + 2\chi_1^2}{\chi_2(\chi_2 - \chi_1)}$$

and when, in addition, $\chi_2 = 2\chi_1$, the expression becomes, of course,

$$(582).....\tan\psi = \delta_1/\chi_1 = \delta_2/\chi_2$$

The direction of this line of slope tangentially passing through Q, and making the angle ψ with the horizontal plane, is shewn by the projection S q T, which is tangential to p q r, passing tangentially through the point q. It, of course, makes the angle θ' with the O X axis. Consequently the angles θ' and ψ, or their complements θ and ζ, give all the necessary relations required.

Since the line, Q q, in the figure $= \delta_1 = \beta_q - \beta_p$, viz., the difference of birth-rates indicated by the diisogens at P and Q, the horizontal equivalent thereof, S q $= s$, say, measured in the direction of the tangent to the orthogonal trajectory at Q is :—

$$(583).....s = \delta_1\cot\psi = (\beta_q - \beta_p)\tan\zeta$$

since $\zeta + \psi = 90°$. Thus, in plan, the rate of change of the birth-rate at any point x, y on a diisogen can be ascertained from the position of the diisogens on either side, and the position of the orthogonal trajectory through the point. Thus the age-equivalence of this difference of birth-rate is to be found by *dividing* by the sine and cosine of the angle which the orthogonal trajectory makes with the co-ordinate axes, θ and θ'; their sum, $\theta + \theta' = 90°$. Consequently the masculine birth-rate-equivalence, H say, for wives of the one age, is :—

$$(584)..... H = (\beta_q - \beta_p)\tan\zeta\ \mathrm{cosec}\ \theta$$

since $1/\sin\theta = \mathrm{cosec}\ \theta$, and the feminine birthrate-equivalence H', for husbands of the one age, is

$$(585)..... H' = (\beta_q - \beta_p)\tan\zeta\ \sec\theta$$

We thus have, from these two equations, for two populations, A and B for any common small difference of birth-rate, the ratio :—

$$(586)\ldots\ldots \frac{H_b}{H_a} = \frac{\tan \zeta_b \operatorname{cosec} \theta_b}{\tan \zeta_a \operatorname{cosec} \theta_a}\ ;\ \text{and}\ \frac{H'_b}{H'_a} = \frac{\tan \zeta_b \sec \theta_b}{\tan \zeta_a \sec \theta_a}$$

These relations, however, can be determined very readily from appropriate graphs of the populations.

43. **Diisogeny in Australia.**—Diisogeny is doubtless best exhibited by the maternity rates, not the birth-rates, the ratios to be ascertained being the proportions which the number of cases of maternity bear to the number of women at risk in any age-group with husbands of any age-group.

In order to ascertain the nuptial maternity rates of Australia according to *pairs of ages*, the nuptial cases of maternity have been taken out for the seven years 1908 to 1914 inclusive, that is, for the Census year 1911, and for the three years before and after that year. In order to relate these cases of maternity in age-groups to the numbers of married couples in the same age-groups at the Census, they have been divided, not by 7, but by a number which gave the true average, viz., 7.13143.[1] The results thus obtained are shewn by the uppermost of the figures in Table CXXIX. hereunder. Thus the results used are equivalent to a total 5,232,988 married women, among whom maternity was experienced 814,617 times. This gives an annual maternity rate of 0.15567. But of this number of married women, 7.6368 per cent. were 60 years of age and over, and 12.7667 per cent. were 55 years of age and over, so that about 87 per cent. were of child-bearing age. Hence the birth-rate for married

[1] This figure was ascertained in the following way :—The number of females in the years 1908 to 1914 inclusive were multiplied by a linear changing ratio (determined from the intercensal period 1901-1911) in order to obtain the numbers of married women during the years in question, the results being as hereunder :—

1908 ..	2.018706	×	.33355	=	677,377	$\frac{\text{Total population}}{\text{Census population}} = \frac{31,697,285}{4,455,005}$	= 7.11498
1909 ..	2.058512	×	.33818	=	696,148		
1910 ..	2.103318	×	.34081	=	716,832	$\frac{\text{All females, 7 years}}{\text{Census females}} = \frac{15,224,455}{2,141,970}$	= 7.10769
1911 ..	2.156781	×	.34344	=	740,725		
1912 ..	2.224484	×	.34607	=	769,827	$\frac{\text{Total married females, 7 years}}{\text{Census year (whole)}} = \frac{5,232,988}{734,226}$	= 7.12722
1913 ..	2.301011	×	.34870	=	802,363		
1914 ..	2.361643	×	.35133	=	829,716		

$\frac{\text{Total No. of married women in 7 years}}{\text{No. at Census date}} = \frac{5,232,988}{733,773} \equiv 7.13162$

$\frac{\text{Total births in 7 years}}{\text{Births in Census year}} \equiv 7.12758$

This was found to agree with other deductions as to the number of years, viz., $7+\epsilon$ where ϵ was a small fraction (as shewn above) varying between 0.10769 to 0.13162. The actual division used was 7.13143, the reciprocal of which is 0.140224. This, multiplied into the births during the 7 years, gave the uppermost figure shewn in the table.

women of 13 to 54 years of age inclusive was 0.17845, or for women of 13 to 59 years of age inclusive, 0.16854. Körösi's results were 46,926 children from 71,800 married couples, in 4 years, that is 0.16339 per annum.[1]

The numbers of husbands and of wives recorded in the Australian Census of 3rd April, 1911, were not equal. It was deemed probable that the number of wives recorded would be the best basis for determining the distribution according to the age of the married women at the Census: in this way the numbers exposed to risk are ascertained in each age-group. The adjusted distribution[2] gives the numbers which constitute the denominators of the ratios.

In general there is a considerable number of cases for each pair of age-groups adopted; the table discloses the number. It is evident, however, that in extreme instances the numbers are small, and the maternity rates consequently ill-determined.[3] They may be regarded, however, as well ascertained where the number of mothers has been shewn in heavy figures.

The age-distribution as at the Census probably differs but little from the average distribution over the 7 years, which yielded the births: hence the ratios ascertained may be accepted as very closely representing the true amounts. The results are shewn in Table CXXIX. hereunder.

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[1] The average crude birth-rate for Australia for 1908-14 was .02745, and for Hungary for 1908-12, 0.3632. Apparently the Budapest maternity-rate is not larger than that of Australia.

[2] The following is a conspectus of the data:—

		Unspecified as regards Wife's Age.	Husbands whose Wives were with them.	Husbands whose Wives were Absent.	Total Husbands
Unspecified as regards husband's age ..	2,368	4,108 506	620,846 2,874	11,084 1,045	3,919
Wives whose husbands were with them ..	619,106	4,614	623,720	112,129	735,849
Wives whose husbands were absent ..	108,892	1,161	110,053	..	..
Total Wives ..	..	5,775	733,773	..	..

The adjustment was effected as follows:—The 506 doubly unspecified cases were divided into 185 and 321, that is in the proportion of each to their sum, and those were distributed proportionally among the wives and husbands unspecified. Next the 1161 wives, unspecified as regards age, were distributed proportionally among the 108,892 whose ages were given, thus making up the total 110,053. A like proceeding was followed in the case of the 1045 husbands, unspecified as regards age, so as to make the total 112,129. The individual totals were then reduced by multiplying throughout by 0.981485, so as to form the same aggregate 110,053 as in the case of the wives. One half of each was then distributed proportionally to the individual original numbers, thus making the grand total 733,773. See Table I., pp. 1106-7, Vol. III., Census Report.

[3] In general, tables prepared in this manner have the advantage that it may at once be seen whether any change of a ratio, necessary to make it conform to a general law, is probable or otherwise. A result like that shewn for ages of husbands 17, and of wives 16, viz., 1.55, is of course not impossible, but it would not be true for a very large number of cases.

TABLE CXXIX.—Shewing the Average Number of Cases of Maternity per annum for Married Couples of various Pairs of Ages, based upon 814,617 Cases of Maternity and 5,232,988 Couples; the Number of Couples to whom they may be referred, and the Corresponding Birth Rates for the Groups, in Australia during the 7 Years, 1908-1914. Diisogenic Distribution (for Maternity).

Ages of Husbands.	AGES OF WIVES.																							Total Cases of Maternity.	Total Number of Wives.
	13	14	15	16	17	18	19	20	21–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85–89	90–94	95–99	
14	..	..	0.0	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
	..	..	0.0	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
15	..	..	..	0.0	..	0.0	..	0.1	0.1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.2	..
	..	..	..	1	..	1	..	2	?	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4
	..	..	..	0.0	..	0.0	..	0.05	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
16	..	..	0.0	0.8	1.0	0.1	0.4	0.1	0.6	0.1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3.1	..
	..	..	3	4	2	3	2	1	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	17
	..	..	0.0	0.2	0.5	0.03	0.2	0.1	0.6	0.1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
17	..	0.4	0.3	2.1	3.9	3.1	3.1	1.8	1.4	2.0	0.1	..	..	..	..	..	..	..	..	..	..	..	..	..	18.2	..
	..	..	1	2	8	6	10	6	15	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	48
	..	?	0.3	1.55	0.49	0.52	0.31	0.30	0.09	?	?	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
18	..	0.1	1.0	7.0	15.8	21.9	15.8	8.4	10.1	0.4	0.1	..	..	..	..	..	..	..	..	..	..	..	..	..	80.6	..
	..	..	4	10	31	57	39	20	36	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	203
	..	..	0.25	0.70	0.51	0.38	0.41	0.42	0.28	0.07	?	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
19	0.3	0.0	2.4	13.6	30.7	66.9	71.5	43.0	53.6	7.3	0.7	0.0	..	..	..	..	..	..	..	..	..	..	..	..	290.0	..
	?	?	?	14	67	111	98	73	126	29	8	3	..	..	..	..	..	..	..	..	..	..	..	..	..	529
	..	..	..	0.971	0.458	0.602	0.729	0.589	0.425	0.251	0.09	0.0	..	..	..	..	..	..	..	..	..	..	..	..	..	..
20	0.0	0.0	1.4	13.6	44.2	94.8	142.9	134.8	185.1	24.7	3.2	0.8	0.0	..	..	..	..	..	..	..	..	..	..	..	645.5	..
	1	4	16	29	86	180	255	302	434	75	12	3	3	..	..	..	..	..	..	..	..	..	..	..	..	1,400
	0.0	0.0	0.09	0.468	0.513	0.526	0.560	0.446	0.426	0.329	0.27	0.27	0.0	..	..	..	..	..	..	..	..	..	..	..	..	..
21	0.1	2.4	8.3	62.3	228.1	578.1	1,048.9	1,338.2	6,067.8	1,747.9	180.7	27.9	4.3	0.3	0.0	..	..	..	..	..	..	..	..	..	11295.3	..
to	?	3	35	126	451	1,099	1,916	2,889	13,541	5,028	762	154	42	20	5	..	..	..	..	..	..	..	..	..	..	26,071
24	..	0.8	0.237	0.494	0.506	0.526	0.547	0.463	0.447	0.347	0.237	0.181	0.10	0.015	0.0	..	..	..	..	..	..	..	..	..	..	..
25	0.1	0.4	5.2	29.7	124.1	361.1	706.7	1,126.1	10,446.9	13,001.3	2,321.9	302.6	30.9	1.8	0.0	0.0	..	..	..	..	..	..	..	..	28458.8	..
to	..	1	24	99	301	725	1,413	2,567	26,001	38,398	8,387	1,435	275	81	32	8	1	1	..	..	..	..	..	..	..	79,749
29	?	0.4	0.216	0.300	0.301	0.498	0.429	0.477	0.401	0.338	0.276	0.210	0.112	0.022	0.0	0.0	..	..	..	..	..	..	..	..	..	..
30	..	0.1	1.4	8.8	32.7	90.2	193.9	374.1	4,383.8	11,421.4	9,338.4	1,532.5	137.4	4.6	0.3	0.0	..	..	..	..	..	..	..	..	27519.6	..
to	..	..	5	37	66	232	441	904	11,814	38,291	38,816	8,672	1,635	376	91	22	8	4	1	..	..	..	..	..	..	101,415
34	..	?	0.28	0.238	0.495	0.388	0.439	0.413	0.371	0.298	0.243	0.176	0.083	0.0122	0.0033	0.0	..	..	..	..	..	..	..	..	..	..
35	..	..	0.8	3.4	10.2	30.4	64.6	113.6	1,381.8	5,153.9	8,024.6	5,974.8	630.1	15.3	0.4	0.0	..	..	..	..	..	..	..	..	21403.9	..
to	..	..	4	6	31	93	138	281	3,897	17,480	36,510	34,426	7,844	1,476	282	67	12	9	2	1	..	..	..	..	..	102,559
39	..	..	0.2	0.57	0.329	0.327	0.467	0.404	0.354	0.294	0.220	0.173	0.0803	0.00103	0.0014	0.0	..	..	..	..	..	..	..	..	..	..

Ages.	13	14	15	16	17	18	19	20	21–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85–89	90–94	95–99	Totals	Totals
40	..	..	0.4	0.3	4.1	6.9	20.8	35.6	450.7	1,745.5	3,876.4	5,302.7	2,509.2	61.7	0.4	0.0	..	..	..	..	..	..	..	..	14014.7	..
to	..	..	3	5	6	20	61	88	1,386	6,529	18,471	34,517	32,562	7,358	1,450	340	70	27	7	3	..	..	..	..	..	102,903
44	..	..	0.13	0.06	0.68	0.345	0.341	0.404	0.324	0.267	0.2098	0.1536	0.0775	0.00838	0.00028	0.0	..	..	..	..	..	..	..	..	..	..
45	..	0.1	0.1	0.7	1.5	3.6	7.9	10.5	155.9	612.3	1,322.3	2,587.4	2,160.3	297.1	0.7	0.0	..	..	..	..	..	..	..	..	7160.4	..
to	..	..	1	..	5	10	16	44	507	2,381	6,884	17,242	32,140	29,881	6,525	1,100	259	73	12	7	..	..	..	..	..	97,087
49	..	..	0.1	?	0.3	0.36	0.493	0.238	0.307	0.257	0.1922	0.1500	0.0672	0.00995	0.00011	0.0	..	..	..	..	..	..	..	..	..	..
50	..	..	..	0.4	0.8	1.9	2.4	4.5	47.8	177.9	401.6	727.1	859.7	187.3	3.5	0.0	..	..	..	..	..	..	..	..	2414.9	..
to	..	..	..	3	1	4	11	10	179	798	2,289	5,675	14,352	26,833	22,679	4,456	876	241	39	10	3	..	..	..	..	78,458
54	..	..	..	0.13	0.8	0.47	0.22	0.45	0.267	0.2229	0.1754	0.1281	0.0599	0.00698	0.00015	0.0	..	..	..	..	..	..	..	..	..	..
55	..	..	..	..	..	0.0	0.8	1.3	12.2	53.5	102.8	203.0	198.8	60.9	15.4	0.0	..	..	..	..	..	..	..	..	648.7	..
to	..	..	..	..	..	4	5	5	65	247	680	1,771	4,192	10,395	17,599	12,995	2,708	521	121	33	9	..	..	..	..	51,350
59	..	..	..	..	..	0.0	0.16	0.26	0.187	0.216	0.1511	0.1146	0.0474	0.00585	0.00087	0.0	..	..	..	..	..	..	..	..	..	..
60	..	..	..	..	0.1	0.1	0.3	0.1	5.7	17.8	38.1	54.1	59.7	11.5	0.7	0.0	..	..	..	..	..	..	..	..	188.2	..
to	..	..	..	..	..	1	2	1	33	100	265	596	1,438	3,453	7,583	10,590	8,319	1,834	378	65	15	1	2	..	..	34,677
64	..	..	..	..	?	0.1	0.15	0.1	0.172	0.178	0.143	0.0907	0.0415	0.00333	0.00009	0.0	..	..	..	..	..	..	..	..	..	..
65	..	..	..	..	..	..	..	0.7	2.2	7.6	14.8	17.6	16.7	5.3	0.0	0.0	..	..	..	..	..	..	..	..	64.9	..
to	..	..	..	..	..	..	..	..	17	45	115	307	626	1,404	3,150	5,192	7,466	5,989	1,281	234	35	8	..	..	..	25,869
69	..	..	..	..	..	..	..	?	0.129	0.106	0.128	0.057	0.0266	0.0037	0.0	0.0	..	..	..	..	..	..	..	..	..	..
70	..	..	..	..	..	..	..	..	0.3	1.1	1.8	3.9	3.1	2.0	0.0	0.0	..	..	..	..	..	..	..	..	12.2	..
to	..	..	..	..	..	..	..	..	6	19	43	133	238	542	1,151	2,014	3,411	4,700	3,541	801	98	14	6	1	..	16 717
74	..	..	..	..	..	..	..	..	0.05	0.058	0.042	0.029	0.013	0.004	0.0	0.0	..	..	..	..	..	..	..	..	..	..
75	..	..	..	..	..	0.0	0.0	0.0	0.3	0.4	1.9	1.8	2.1	1.1	0.0	0.0	..	..	..	..	..	..	..	..	7.6	..
to	..	..	..	..	..	1	0	1	2	16	21	42	98	202	395	632	1,277	2,332	2,593	1,786	332	36	8	..	..	9,774
79	..	..	..	..	..	0.0	0.0	0.0	0.15	0.025	0.090	0.043	0.021	0.005	0.0	0.0	..	..	..	..	..	..	..	..	..	..
80	..	..	..	..	..	0.0	0.0	0.0	0.0	0.1	0.7	0.7	0.4	0.1	0.0	0.0	..	..	..	..	..	..	..	..	2.0	..
to	..	..	..	..	..	1	0	0	1	2	11	18	32	61	117	176	367	587	908	891	549	82	26	..	..	3,829
84	..	..	..	..	..	0.0	0.0	0.0	0.0	0.05	0.63	0.39	0.013	0.002	0.0	0.0	..	..	..	..	..	..	..	..	..	..
85	..	..	..	..	..	..	..	..	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	..	..	..	..	..	..	..	..	0.2	..
to	..	..	..	..	..	..	..	..	1	0	1	5	7	12	21	42	67	117	158	221	156	89	7	..	..	904
89	..	..	..	..	..	..	..	..	0.0	?	0.0	0.02	0.0	0.0	0.0	0.0	..	..	..	..	..	..	..	..	..	..
90	..	..	..	..	..	..	..	..	..	0.0	0.0	0.0	0.0	0.0	0.0	0.0	..	..	..	..	..	..	..	..	0.0	..
to	..	..	..	..	..	..	..	..	..	1	0	0	1	5	1	3	8	32	34	23	34	20	5	..	..	173
94	..	..	..	..	..	..	..	..	..	0.0	0.0	0.0	0.0	0.0	0.0	0.0	..	..	..	..	..	..	..	..	..	..
95	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.0	..	..	..	..	..	..	..	..	..	..
to	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	5	5	5	6	5	..	..	..	28
99	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.0	..	..	..	..	..	..	..	..	..	..
100	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.0	..	..	..	..	..	..	..	..	..	..
and	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	0	3	..	..	..	..	..	..	..	7
over	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.0	..	..	..	..	..	..	..	..	..	..
T'tls	0.5	3.5	21.3	142.7	497.2	1259.1	2280.0	3192.9	23206.3	33975.3	25630.1	16737.0	6612.7	649.0	21.4											
	1	8	98	336	1,055	2,548	4,407	7,194	58,062	109,446	113,275	104,998	95,485	82,098	61,082	37,642	24,850	16,474	9,080	4,086	1,237	255	54	1	114229.0	733,773

NOTE.—The uppermost number denotes the average number of births deduced from 7 years' results. The middle number is the number of married women in the age-group at the Census of 1911, viz., the middle year of the 7 years referred to. The lowest number is the maternity rate deduced by dividing the uppermost by the middle number.

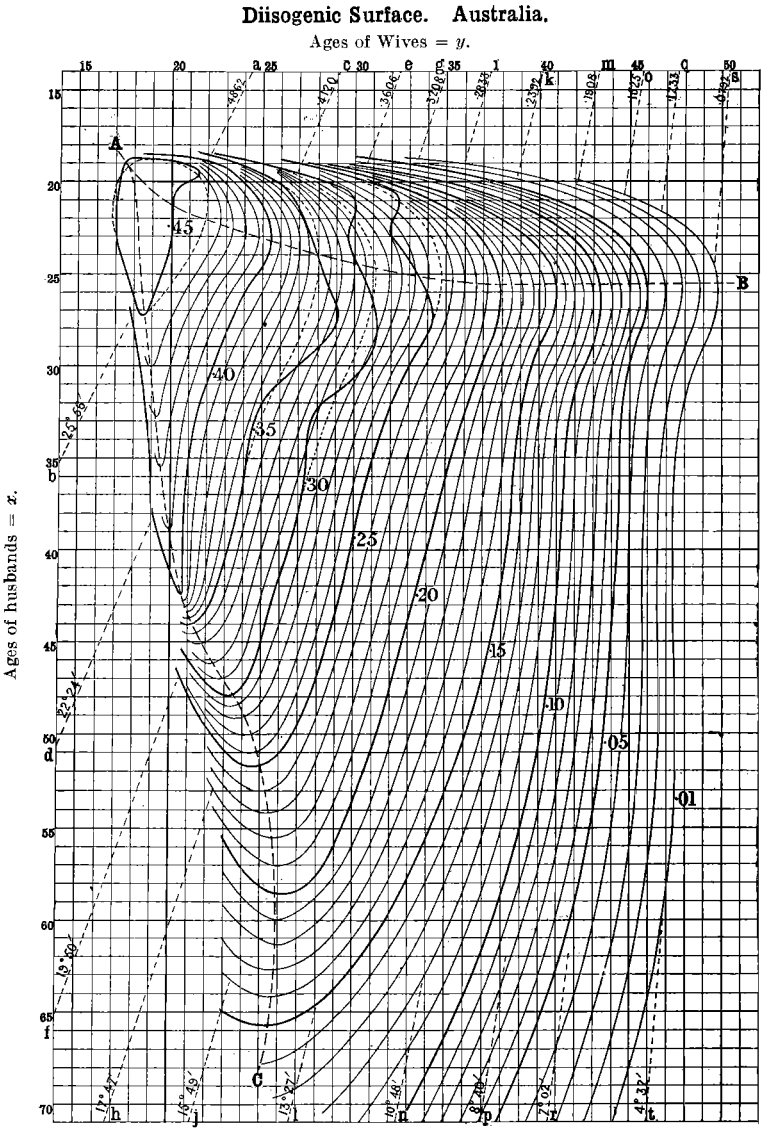

Fig. 96.

The maternity rates shewn, denote the ratio of the average number of cases of maternity occurring to the number of wives at risk, whose ages are shewn at the top line of the figure, their husbands' ages being shewn at the left hand side of the figure. The dotted lines roughly represent the major part of the surface between the principal meridians AB and AC.

The results tabulated above, and slightly smoothed, are shewn on Fig. 96, in which the heavy lines, viz., the birth-rates ·05, ·10, ·15, ... ·45, are first ascertained from the tabular results, and then smoothed. The thin lines, shewing differences of ·01 in the maternity rate, are then drawn in (having regard to second differences). The diisogens 0·45, 0·35,

0·30, and 0·25 exhibit some peculiarity. This is probably not due to physiological differences in fertility; the dotted lines are believed to better represent the character of the physiological law (modified, of course, by the incidence of social traditions). The broken line A B is one of the principal meridians of the surface, and denotes the ages where small differences in the ages of the *husbands* have no effect on the fertility. The broken line A C is the other principal meridian, and denotes the ages where (*very*) small differences in the age of the *wives* have no effect. As the higher ages—during the fertile period of woman's life—are reached, the age of the husband has apparently very little influence at least from 35 to 65 years of age. The graph, Fig. 96, however, requires no interpretation.

Diisogenic Surface. Budapest.

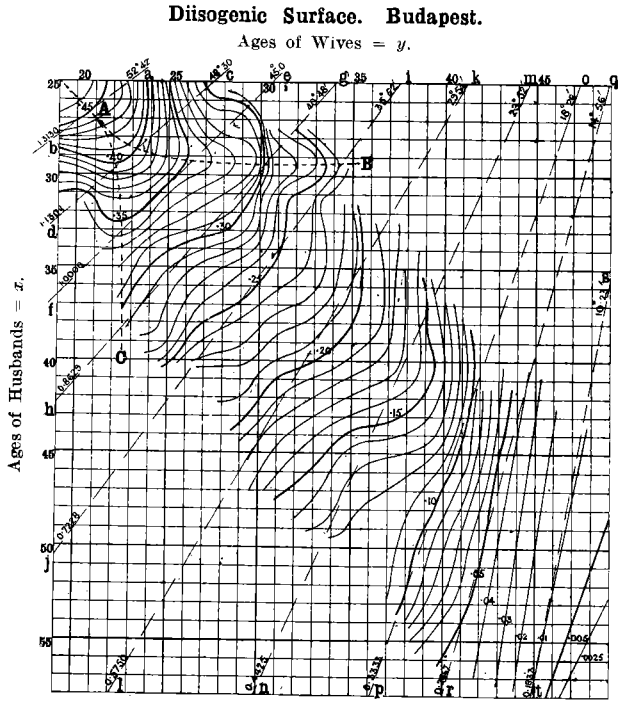

Fig. 97.

44. **Diisogeny generally.**—Körösi's results[1] for Budapest (as re-reduced by me) are shewn on Fig. 97. The results for individual ages shew great irregularity, but were computed as indicated hereinbefore, §§ 38 and 39. The irregularities doubtless would disappear with larger numbers. It will be seen in Fig. 97 that at age 36 for husbands and 30 for wives, the direction of the diisogen is inclined 45° to the axes x and y for a considerable length thereof and that, for an extended range of ages of husband and wife, the relation roughly holds that the birth-rate is

[1] Phil. Trans., Vol. 186, Pt. II., pp. 781-875.

constant when the *sum* of the ages of husband and wife are constant, and further that it *decreases* with *increase* in this sum.[1] The statement acquires greater generality, however, if put in another way, viz. :—

For ages greater than that of the maximum fertility of women and for those combinations of ages of husband and wife which are most common, the fertility-ratio may be regarded as represented—very roughly of course—by straight lines : that is to say, x and y being respectively the ages of husband and wife at the time of the birth, the fertility-ratio is constant when $kx + y$ is constant. These constant values are typically represented by the lines ab, cd, ef, etc., on Fig. 97, and by a′b′, c′d′, e′f′, etc., on Fig. 96. The pairs of ages, x and y, which give identical fertility-ratios, may be called *corresponding age-pairs*. They do not, of course, actually lie on straight lines, as is evident from either Fig. 96 or Fig. 97. Moreover *the fertility-ratio* (and thus the value of k) *diminishes with increase of the sum of the corresponding age pairs* (the age of maximum value having been passed). Obviously, also, k differs for various populations.[2] A rough general comparison of the Budapest (Körösi's) results for Budapest, and those for Australia is best indicated by shewing the position of the lines of " corresponding age-pairs" according to the value of the fertility-ratio (birth-rate).

TABLE CXXX.—Comparison of Approximate Lines of Equal Fertility according to Pairs of Ages ; Australia and Budapest.

Fertility or Maternity Ratio, viz., ratio of Births (or Cases of Maternity) to Married Women at risk.	Australia (Maternity rates). Intersection Point of Lines of Equal Fertility. $x = -50$; $y = +55\frac{1}{2}$				When $x = 0$ $y =$	Budapest (Birth rate). Intersection Point of Lines of Equal Fertility. $x = \pm 0$; $y = +55\frac{1}{2}$				When $x = 0$ $y =$	Reference letters.
	Angle $= \theta$		Tangent $= k$			Angle $= \theta$		Tangent $= k$			
	Obsd.	Calc.	Obsd.	Calc.		Obsd.	Calc.	Obsd.	Calc.		
	° ′	° ′			Years	° ′	° ′			Years.	
000 ..	..	4.0	..	..	..	..	9.0	..	..	..	..
001 ..	4.32	4.28	.0792	.0781	51.54	10.23	9.58	.1833	.1757	55.5	s t
0.05 ..	7.2	6.21	.1233	.1113	49.34	14.56	13.53	.2667	.2472	55.5	q r
0.10 ..	8.40	8.42	.1525	.1530	47.88	18.26	18.46	.3333	.3398	55.5	o p
0.15 ..	10.48	11.3	.1908	.1953	45.96	23.52	23.39	.4425	.4379	55.5	m n
0.20 ..	13.27	13.24	.2392	.2382	43.54	29.54	28.32	.5750	.5437	55.5	k l
0.25 ..	15.49	15.45	.2833	.2820	41.34	35.52	33.25	.7228	.6598	55.5	i j
0.30 ..	17.47	18.6	.3208	.3269	39.46	40.48	38.18	.8632	.7898	55.5	g h
0.35 ..	19.50	20.27	.3606	.3729	37.47	45.0	43.11	1.0000	.9385	55.5	e f
0.40 ..	22.24	22.48	.4120	.4204	34.90	48.30	48.4	1.1301	1.1132	55.5	c d
0.45 ..	25.56	25.9	.4862	.4695	31.19	52.42	52.57	1.3127	1.3246	55.5	a b
0.50 ..	?	..	?	..	?	?	..	?	..	?	

The two systems of lines are:—

For Australia ; $k_b\,(x + 50) + y = 55.5$; and

For Budapest ; $k_b\,(x + o) + y = 55.5$.

[1] Or $x + Ky$ = constant, see (576). Galton and Körösi's suggestion that $k = 1$ is an extremely improbable one, and is not borne out by the data, as Körösi's own results shew.

[2] As already mentioned, the number of cases of maternity reviewed by Körösi was 46,926, occurring in the years 1889, 1890, 1891 and 1892, and these were attributable to 71,800 families according to the Census of 1st January, 1891, giving a rate of 16.339 per 100 families per annum over all. See p. 790, op. cit. The number is, of course, insufficient to determine the surface with great accuracy.

It would appear that the directions of these lines vary about equally for equal changes of rate since they are given by the formulæ.

(587)..$\theta = 4° + 47°r$, for Australia ; $\theta = 9° + 97\frac{2}{3}°r$ for Budapest.

These values are approximately correct for the regions within lines AB and AC on Figs. 96 and 97, but not outside those regions.

45. **Multiple Diisogeny.**—The equal frequency of twins, or of triplets, etc., according to pairs of ages may be called *multiple diisogeny*, the series of ages giving equal frequency being in this case also known as "corresponding pairs." The *twin digenous surface, triplet digenous surface*, etc., are the surfaces defined by the terminals of the z co-ordinates corresponding to the frequency of twins, triplets, etc., the x and y co-ordinates representing as before the ages of the husband and wife respectively.

In order that the results may be unequivocal, the ratios to be used should be those of the number of births "of at least $n + 1$ children," to the number of births "of at least n children." That is, the ratio of twins should be to the cases of maternity ; the ratio of triplets should be to the cases where there were at least twins ; of quadruplets to at least triplets, and so on. Suppose in a population P there were :—

A′ cases of maternity in which only *one* child was born ;
B′ ,, ,, ,, *two* children were born ;
C′ ,, ,, ,, *three* ,, ,,

and let $A' + B' + C' + \text{etc.} = M$, the total cases of maternity. Then the maternity ratio for the population is :—

$$(588)\ldots\ldots m_1 = (A' + B' + C' + \text{etc.}) / P = M/P.$$

The twin ratio, so taken as to include all mothers who had at least two children at a birth, is :—

$$(589)\ldots\ldots m_2 = (B' + C' + \text{etc.}) / M = B/M.$$

The triplet ratio, or that based on all mothers who had at least three children at a birth, is :—

$$(590)\ldots\ldots m_3 = (C' + \text{etc.}) / (B' + C' + \text{etc.}) = C/B,$$

and so on.

In this system we have :—

$$(591) \ldots . m_1 = M/P \; ; \; m_1 m_2 = B/P \; ; \; m_1 m_2 m_3 = C/P \; ; \text{ etc.} \; ;$$

that is, the population multiplied by the product of the ratios $m_1 . m_2 \ldots m_n$ gives the number of women bearing at least n children. The ratio m_n is thus the relative frequency with which a woman—who in any child-birth has given birth to n children—will have given birth to the $(n + 1)$ child on the same occasion.

For the 9 years, 1907 to 1915, in Australia there were in all 1,042,588 cases of maternity ; 10,630 cases of twins and triplets, and 100 cases of triplets : that is 1,031,858 single births, 10,530 cases of twins, and 100 cases of triplets. The ratios and their degree of fluctuation are shewn in the following table :—

Table CXXXI.—Shewing Frequency of Occurrence of Twins and Triplets (Nuptial and ex-Nuptial Cases combined). Australia, 1907-1915.

Year 1900.*	Cases of Maternity.	Twins including Triplets, etc.	Triplets.	Ratio of Twins to Cases of Maternity m_2	Ratio of Triplets to Cases of Twins. m_3	Ratio of Twins, 5 Year Average.	Ratio of Triplets, 5 Year Average.
7	109,305	1,042	13	.00953	.01247	—	—
8	110,491	1,065	6	.00963	.00563	—	—
9	112,921	1,142	14	.01011	.01225	.00996	.01057
10	115,609	1,189	13	.01028	.01093	.01011	.01053
11	120,957	1,236	14	.01022	.01132	.01021	.01034
12	131,726	1,350	16	.01025	.01185	.01024	.00946
13	134,343	1,369	8	.01019	.00584	.01031	.00870
14	136,576	1,406	11	.01029	.00782	—	—
15	133,444	1,417	10	.01062	.00706	—	—
Totals	1,105,372	11,216	105	.01015 *	.00936 *	—	—

* 1908-1914 gave 0.010311 and 0.00931. See p. 314 herein.

The 5-year averages shew the regularity of the ratios, and justify the combination of the results of a series of years for the purpose of examining the characteristics of multiple diisogeny.

46. **Twin and triplet frequency according to ages.**—The data for determining the ratios m_2 and m_3 according to formulae (589) and (590) are given immediately by the records of births, and—unlike the maternity ratios m_1, formula (588)—are independent of the Census results. The

numbers of unspecified cases are negligibly small. There is some uncertainty in the numbers for ages 18 to 21 inclusive, owing to misstatements as to age. The following table, based upon 1,035,439 mothers, 10,533 twins, and 104 triplets, gives the available results for 9 years.

TABLE CXXXII.—Shewing the Frequency of Twins and Triplets in Cases of Maternity,* according to the Age of the Mother and of the Father. Australia, 1907-1915.

Age† Groups.	Ages of Mothers.												
	Mothers Under 19	19	20	21–24	25–29	30–34	35–39	40–44	45–54	All Ages of Mothers.	25–39	Triplets÷ Twins 25–39	Triplets ÷ Twins All Ages.
Fathers Under 19	0 ; 3 527 .0057	0 ; 8 380 .0211	.. .. ..	.. .. ..	.. .. ..	.. .. ..	.. .. ..	.. .. ..	.. .. ..	0 ; 11 907 .0121	.. .. ..	.. .. ..	.. .. ..
19–20	0 ; 11 2,413 .0046	0 ; 9 1,923 .0046	0 ; 11 1,584 .0069	0 ; 4 2,154 .0002	0 ; 2 335 .0059	.. .. ..	.. .. ..	.. .. ..	.. .. ..	0 ; 37 8,409 .00440	0 ; 2 335 .0059	.. .. ..	.. .. ..
21–24	0 ; 33 7,985 .0041	0 ; 55 9,439 .0058	1 ; 83 12,159 .0068	5 ; 366 54,749 .0067	2 ; 137 15,413 .0089	1 ; 21 1,630 .0129	0 ; 6 275 .0218	.. .. ..	.. .. ..	9 ; 701 101,650 .00690	3 ; 164 17,318 .0095	.0183	.0128 .. ..
25–29	0 ; 13 4,664 .0028	0 ; 26 6,446 .0040	0 ; 55 10,271 .0054	2 ; 603 94,452 .00636	7 ; 1,075 117,756 .00913	6 ; 269 21,278 .0126	2 ; 34 2,723 .0124	0 ; 5 287 .0174	.. .. ..	17 ; 2,080 257,877 .00807	15 ; 1378 151,757 .00908	.01088	.0082 .. ..
30–34	0 ; 3 1,204 .0025	0 ; 7 1,773 .0039	0 ; 18 3,355 .0054	3 ; 251 39,785 .00631	7 ; 928 103,618 .00895	5 ; 1,097 84,976 .01291	6 ; 219 13,976 .0157	0 ; 19 1,263 .0150	.. .. ..	21 ; 2,542 249,950 .01017	18 ; 2.244 202,570 .01108	.00525	.0083 .. ..
35–39	0 ; 0 407 ..	0 ; 3 594 .0051	0 ; 5 1,039 .0048	0 ; 73 12,564 .00581	3 ; 446 46,867 .00951	7 ; 905 72,990 .01240	10 ; 838 54,557 .01536	3 ; 67 5,707 .0117	0 ; 2 156 .0128	23 ; 2,339 194,881 .01200	20 ; 2,189 174,414 .01255	.00548	.0098 .. ..
20–44	.. .. ..	.. .. ..	0 ; 4 643 .0062	0 ; 26 4,093 .0064	1 ; 143 15,664 .00913	4 ; 429 35,051 .01224	5 ; 752 48,109 .01563	5 ; 282 22,723 .01241	0 ; 3 590 .0051	15 ; 1,639 126,873 .01292	10 ; 1,324 98,824 .01339	.00831	.0092 .. ..
45–49	.. .. ..	.. .. ..	0 ; 3 218 .0138	0 ; 9 1,379 .0065	2 ; 58 5,516 .0105	0 ; 152 11,936 .01274	8 ; 357 23,485 .01520	2 ; 229 19,418 .0118	0 ; 18 2,703 .0067	12 ; 826 64,655 .01278	10 ; 567 40.937 .01385	.0176	.0145 .. ..
50–54	.. .. ..	.. .. ..	.. .. ..	0 ; 2 509 .0039	1 ; 14 1,533 .0087	1 ; 56 3,639 .0154	3 ; 94 6,596 .0143	0 ; 72 7,775 .0093	0 ; 14 1,687 .0083	5 ; 252 21,799 .01156	5 ; 164 11,828 .01386	.0304	.0198 .. ..
55–59	.. .. ..	.. .. ..	.. .. ..	.. .. ..	0 ; 4 619 .0064	0 ; 9 946 .0095	1 ; 22 1,837 .0120	1 ; 29 1,828 .0158	0 ; 5 677 .0074	2 ; 69 5,907 .01168	1 ; 35 3.402 .01028	.0285	.0289 .. ..
60–64	.. .. ..	.. .. ..	.. .. ..	.. .. ..	0 ; 2 216 .0092	0 ; 6 342 .0175	0 ; 5 488 .0102	0 ; 8 540 .0148	0 ; 1 116 .0086	0 ; 22 1,702 .01292	0 ; 13 1,046 .01242	.0000	.0000 .. ..
65–89	.. .. ..	.. .. ..	.. .. ..	.. .. ..	.. .. ..	0 ; 9 292 .0308	0 ; 6 536 .0112	.. .. ..	.. .. ..	0 ; 15 828 .01811	0 ; 15 828 .01811	.0000	.0000 .. ..
All ages of Fathers	0 ; 63 17,200 .00366	0 ; 108 20,555 .00525	1 ; 179 23,269 .00612	10 ; 1,334 203,685 .00636	23 ; 2,809 307,597 .00913	24 ; 2,953 233,080 .01267	35 ; 2,333 152,582 .01529	11 ; 711 59,541 .01194	0 ; 43 5,929 .00725	104; 10533 1,035.439 .01017	All Triplets÷ All Twins =.00988 ..	.. .. ..	.0099 .. ..
25–39	0 ; 16 6,275 .0025	0 ; 36 8,813 .0041	0 ; 78 14,665 .00532	5 ; 927 146,801 .00631	17 ; 2,443 268,241 .00913	18 ; 2,271 179,224 .01267	18 ; 1,091 71,256 .01531	3 ; 91 7,257 .01254	0 ; 2 156 .0128	.. .. ..	.. .. ..	.. .. ..	.. .. ..
Triplets ÷Twins 25–39	.0000	.0000	.0000	.0054	.0060	.0079	.0164	.0329	.0000	..	..	..	..
Triplets ÷Twins All ages	.0000	.0000	.0056	.0075	.0082	.0081	.0150	.0155	.0000	.0099	..	..	..

* The table shews for various age-groups of mothers and fathers the numbers of cases of maternity, and of twins and triplets occurring during a period of 9 years. The first number is the number of triplets; the second—divided from the first by a semi-colon—is the number of twins; the numbers beneath, viz., on the second lines are the "cases of maternity"; the numbers on the third lines are the ratio of the occurrences of twins to the cases of maternity. These ratios are calculated by the formula (589). † The ages are "ages last birthday."

An examination of the individual columns in the table for any given age-group of wives discloses the fact that there are no systematic differences for various ages of the husband. This is confirmed by the combination of the results for considerable groups.[1] *The age of the husband*, though it has an unmistakable influence on the maternity ratio, *has no influence whatever on the twin-ratio.* It is equally clear that the age of the wife is correlated with the frequency of twins.

The graph of the results indicates that the initial part of the curve (*i.e.*, wives' ages up to 20 inclusive) does not conform to the general curve (owing perhaps to misstatements of age). The curve has a maximum at about 37½ years of age (*i.e.*, age 37 last birthday), and is nearly a straight line almost up to the maximum value.

The following table gives the probabilities for the *exact ages*, not "age last birthday."

TABLE CXXXIII.—Shewing, according to Age of the Mother, the Relative Frequency with which at least a Second Child is Born.* Australia, 1907-1915. Twin-ratios.

Age of Mother	Twin Ratio.	Age of Mother.	Twin Ratio.	Age of Mother.	Twin Ratio.	Age of Mother.	Twin Ratio.
11	.00100	22	.00605	33	.01299	44	.01070
12	.00137	23†	.00659	34	.01370	45	.00997
13	.00180	24	.00714	35	.01440	46	.00937
14	.00217	25	.00770	36	.01499	47	.00880
15	.00260	26	.00827	37	.01526	48	.00823
16	.00305	27	.00885	38	.01526	49	.00772
17	.00352	28	.00944	39†	.01502	50	.00725
18	.00400	29	.01007	40	.01470	51	.00680
19	.00449‡	30	.01075	41	.01380	52	.00636
20	.00500	31	.01146	42	.01260	53	.00593
21	.00552	32	.01221	43	.01155	54	.00551
22	.00605	33	.01299	44	.01070	55	.00510

* The table shews the ratio of cases of birth of two or more children to cases of maternity, the age being *exact* (*i.e.*, not age last birthday).

† The ratios have been ascertained with great precision for all the ages from 23 to 39. Later they are less accurate, but the number of cases is relatively small.

‡ The ratios are somewhat uncertain owing to misstatements of age.

[1] For example the following results were obtained :—

Ages of Husbands.	Ages of Wives.								
	Under 19.	19.	20.	21–24.	25–29.	30–34.	35–39.	40–44.	45–54.
Under 30	.0039	.0054	.0062	.0064	.0091	.0127	.0133	.0174	
25 to 39..	.0025	.0041	.0053	.0063	.0091	.0127	.0153	.0124	.0128
All ages of husbands ..	.0037	.0053	.0061	.0064	.0091	.0127	.0153	.0119	.0073

These clearly establish the fact that the age of the husband has no influence whatever.

47. **Apparent increase of frequency of twins with age of husbands.**—If ages greater than 40 be left out of consideration, and the material for ages (wives and husbands respectively) of 25 to 39 years of age alone be embraced, the values of the twin-ratios according to the ages of husbands and wives are given approximately by the following expressions, viz. :—

$$(592)\ldots\ldots m_2 = 0.0034 + 0.000228\,x\,;\ m'_2 = -0.0076 + 0.00060\,y.$$

These give the following results for husbands and wives respectively :—

Ages of Husbands	19–20	21-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-89
Data	.0059	.0095	.0091	.0111	.0125	.0134	.0139	.0139	.0103	.0124	.0181
Formula ..	.0080	.0086	.0097	.0108	.0120	.0130	.0142	.0154	.0165	.0176	.0188

Ages of Wives	Under 19	19	20	21-24	25-29	30-34	35-39	40-44	45-54
Data	.0025	.0041	.0053	.0063	.0091	.0127	.0153	.0125	.0128
Formula	.0038	.0041	.0047	.0062	.0089	.0119	.0149	.0179*	.0224*

* The straight line does not hold good for these ages.

This increase with the age of the husband is not, however, due to any influence the husband may be supposed to have upon multiple-births, but wholly to the fact of association in pairs according to age. The smaller coefficient 0.000228 (as compared with 0.000600) arises from the greater "spread" of the ages of the husbands.[1]

Although the attribution of the increased frequency with age to the husband is physiologically meaningless, nevertheless for rough estimates the method is valid, and so long as it is remembered that the effect is not due to increasing age of the husbands, there is no objection to this method of estimation.

48. **Triplet diisogeny.**—The numbers of triplets shewn on Table CXXXII. are quite insufficient to determine with any exactitude the digenous relations of triplets. The age-groups are too small. But if 30 be made a dividing age we get the following result :—

Husbands.	Wives.		Wives.	
	Ages under 30.	Ages 30 & over.	Ages under 30.	Ages 30 & over
Ages under 30	17 ; 2497 342650.	9 ; 335 25236.	.0068 .000050	.0269 .00036
Ages 30 and over	17 ; 2011 241775.	61 ; 5603 424284.	.0084 .000070	.0109 .000144
	Numbers.		Ratios.	

[1] If the ages were identical of husband and wife throughout, the maximum effect would be on a line making an angle of 45 degrees with either axis : consequently the ratio of multiple births if attributed to either sex would yield the same result.

As it has no influence on the occurrence of twins, it may be assumed as extremely unlikely that the age of the husband has any influence on the occurrence of triplets. This is confirmed by the above partitioning of the results, which shews opposite apparent influence. The results given in the final column of Table CXXXII. may therefore be taken as exhibiting the influence of the age of the wife. This influence can be expressed

$$(593)\ldots\ldots m_3 = -0.0044 + 0.00047\ y.$$

y being the exact age of the wife.

The results as ascertained from the data and as given by the formula are :—

Age	20	21–24	25–29	30–34	35–39	40–44	45–49
Data	.0056	.0075	.0082	.0081	.0150	.0155	.0000
Formula ..	.0050	.0064	.0085	.0109	.0132	.0155	?

Having regard to the number of available cases it is certain that the frequency of triplets increases with the age of the wife. The rate of increase 0.00047 agrees well with that of the rate of increase 0.00060 in the case of twins. On plotting the results according to the age of the husband it was found that the points on the graph constituted a curve, not a straight line.

49. **Frequency of twins according to age and according to order of confinement.**—The relation between the frequency of the birth of twins according to age and according to order of confinement can be roughly seen from the results given hereunder. According to the order of confinement the frequency is very closely given by the equation :—

$$(594)\ldots\ldots m'_2 = 0.0082 + 0.00114\ n - 0.0000185\ n^{2.5},$$

the calculated and observed results being respectively :—

Previous confinements	0	1	2	3	4	5	6	7	8	9	10
Formula	.0083	.0094	.0105	.0115	.0123	.0129	.0135	.0138	.0140	.0141	.0139
Data	.0082	.0096	.0107	.0117	.0124	.0130	.0134	.0136	.0138	.0139	.0140
Corresponding age ..	26.78	28.25	29.32	31.32	32.24	33.01	33.58	33.86	34.14	34.28	34.42

And if the age corresponding to these values be inserted from Table CXXXIII., the values on the final line are obtained.

50.—**Unexplored elements of fecundity.**—To distinguish between the *effect of previous births* and age upon the frequency of maternity, of twins, etc., more comprehensive data are required than at present exist for

Australia. The effect is one which, so far as the maternity-ratio is concerned, reflects social tradition in a larger measure than the physiological law; the latter is modified but not obliterated. In the case of twins, triplets, etc., the physiological laws doubtless alone operate.

The records necessary to ascertain the characteristics of *digenous masculinity at birth* exist for only two years, and disclose the fact that the variations according to age are too large to admit of satisfactory analysis, unless say 10 years' material is available.

Assertions from time to time have been made to the effect that the characteristics of first-born children are often sharply differentiated from those of later children. If in the record of cases of mortality the ages of father and mother were also given, and the order of the birth of the deceased, the data for the consideration of this question as regards length of life according to age and to place in order of birth would be available.

This question, however, belongs more properly to the subject of mortality, and will not be further considered in this monograph.

XV.—MORTALITY.

1. **General.**—Human mortality may be considered statistically under two aspects, viz.,

(i.) A *general* one ; that is, the aspect which has regard to the aggregate *mortality from all causes of death* ; and

(ii.) A *particular* one ; that is, the aspect which takes account of *mortality from particular causes* or by particular modes of death.

Both will be referred to.

Deaths from particular causes or by particular modes are, in general, functions both of age and time, i.e., an individual rate of mortality μ', viz., the ratio of the number of deaths D' from a particular cause to that part of the population P' subject to the risk of such death, is :—

$$(595).....\mu' = D' \,/\, P' = f(x, t)$$

x denoting age, and t time. It also varies with sex. In estimating the general rate of mortality it is convenient, although in many respects unsatisfactory, *virtually* to regard all persons in the population as equally subject to the risk of death from each cause[1] : hence the general rate of mortality may be regarded—subject to some limitations—as made up of the sum of the supposititious rates δ', δ'', etc., from each cause ; that is to say, the general rate of mortality is the ratio of total deaths during a unit of time to the total mean population, or algebraically :—

$$(596).....\delta = \delta' + \delta'' + \text{etc.} \equiv \frac{D'}{P} + \frac{D''}{P} + \text{etc.} = \frac{D}{P} .$$

$D = D' + D'' +$ etc., denotes the total deaths, and P the mean population during the unit of time in question. This rate is known as the *crude death-rate*, and is obviously inconsistent with (595). If the age-distributions of all populations were substantially identical, this method of evaluating the rate of mortality could be regarded, for many purposes, as fairly satisfactory.[2] Inasmuch, however, as each particular rate, μ', etc., is a special function of age, the general rate δ is obviously also dependent upon the age and sex distribution. The distinction may thus be drawn between *class mortality* and *general mortality*, "class" denoting any section of the population, defined in any appropriate way.

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[1] For example :—Females only are liable to death from say misadventures in parturition, and that only between certain age-limits ; and children are alone liable to death from diseases associated with dentition, etc., etc.

[2] Throughout statistics conceptual precision has often to be sacrificed in order to express results simply, but the simplicity thus attained is usually more or less misleading.

Comparisons, the purpose of which is to measure, in a crude way, the virulence of the death-forces as between one population and another, *may therefore be made on the basis of a common age and sex distribution*, that is, the rates of mortality for each age or age-group, actually experienced by each population, may be applied to a "standard," or preferably to a "normal," population, the resulting totals giving the comparison required. That is to say, if the fact of variation with time (t) be ignored (though this variation will probably not be even approximately identical for any two populations), the quantity to be ascertained will be that indicated in (599) hereunder.

Let the *proportion* of the normal population between the ages x and $x + dx$ be :—

$$(597)\ldots\ldots\ldots \eta_x\,dx = f_1(x)\,dx, \text{ so that } \int_0^\omega \eta_x\,dx = 1$$

and let the instantaneous rate of mortality (the so-called "force of mortality") at age x be :—

$$(598)\ldots\ldots\ldots {}_1\mu_x = {}_1f_2(x), \text{ and } {}_2\mu_x = {}_2f_2(x)$$

for populations 1 and 2 respectively ; then adopting the same function (597) for both populations and applying (598) to each, we have :—

$$(599)\ldots\ldots\ldots \mu'_0 = \int_0^\omega (\mu_x \cdot \eta_x)\,dx \equiv \int_0^\omega \{f_2(x) \cdot f_1(x)\}\,dx;$$

with antecedent suffixes denoting whether the result applies to population 1 or 2.

These quantities may be called the *mortality-coefficients* of the respective populations, and generally they will differ somewhat from the "crude death-rates." If the age-distribution of a population happens to be sensibly identical with the "standard" or "normal" distribution, the mortality-coefficient would of course be sensibly the same as the crude death-rate" ; and it might otherwise also agree with it, but only accidentally. For arithmetical convenience it is usual to compute an *index-of-mortality*, by attributing to "standard" or "normal" groups the death-rates actually experienced in the corresponding groups of the population under review.

The preceding rectification of the crude death-rate for the purpose of comparisons, is but one of the possible methods. Its significance depends virtually upon a common distribution of causes of death, these differing only in frequency of operation. If two countries had the same age-distribution, but one was characterised by violence of the diseases which caused mortality in the *earlier*, and the other by those which caused mortality in the *later* years of life, the results would differ even for the

same differences of rate in each disease, inasmuch as with the same rates the diseases characteristic of the earlier years of life levy a larger toll than those characteristic of later years. In short, the influence or "weight" of a cause of death varies, according to the relation of its incidence with age. Crude death-rates and the indexes of mortality are therefore both of restricted application, and need to be interpreted with full regard to their inherent limitations.

The frequency according to age of the occurrence of disease is very diverse, consequently in the aggregate of mortality from all causes the peculiar incidence of each is to a great extent masked ; and as regards the secular trend of mortality the intervention of epidemics may produce great irregularities.

Many diseases have a well-defined annual period, while others have not ; these periods, however, are not identical in phase. The aggregate of the deaths from all causes, therefore, gives a less definite indication of an annual period. Inasmuch as diversity of phase and of amplitude do not wholly obliterate the periodicity, the general death-rate, viz., $\delta = D / P$, *i.e.*, the deaths divided by the number of the population, is as follows :—

$$(600)\ldots \delta = D/P = D\, f_1(t) \left\{ 1 + a_0 + \Sigma_{n=1}\, a_n \sin n\,(\theta + a_n) \right\} / \left\{ P_0 f_2(t) \right\}$$

in which θ is a *fraction* of a unit of time (say of a year), $n = 1, 2, 3$, etc., and both D_0 and P_0 are means over a unit of time, as at a particular epoch. Thus the graph of a death-rate, extending over several units of time (years), is made up of a non-periodic curve—representing the *general trend*—upon which is superimposed a periodic curve repeating itself during each unit upon a scale varying with the death-rate itself.[1]

2. **Secular changes in crude death-rates.**—The general lowering of the general crude death-rate in the western world has been remarkable, and is best exhibited by deducing the *general trend* of the rates for each country. The death-rates for Australia are shewn in Table CXXXIV., from 1881 to 1915, for males, females, and persons ; see columns (ii.) to (iv.). In order to partially eliminate the irregularities of results for single years, quinquennial means were formed, see columns (viii.) to (x.), and the smoothing of these for "persons" gives the values in column (xiv.), the maximum value 0.01570 being that for the year 1884 and the minimum 0.01066 that for the year 1911. This fall to about two-thirds of its earlier value in 27 years is remarkable, and is accounted for not only by a still greater decrease in infantile mortality, but also in general mortality up to 60 or 65 years of age. It is worthy of note that the year 1895 was characterised by a halt in the decrease exhibited by the general trend of the death-rate.

[1] So long, of course, as the character of the periodicity is maintained.

The rates of infantile mortality are given in columns (v.) to (vii.), the quinquennial means in columns (xi.) to (xiii.), and the smoothed result or *general trend* in column (xv.). Here again the fall has not been continuous, see values for 1894-5. The character of the lowering of the rates does not therefore fall under any law susceptible of simple mathematical expression.

TABLE CXXXIV.—Shewing Secular Changes of the Death-rates, and of the Infantile Mortality-rates in Australia, from 1881 to 1915.

Year.	Death Rates × 100,000.			Infantile Mortality Rates × 10,000.			Quinquennial Mean Death Rates × 100,000.			Quinquennial Mean Rates of Infantile Mortality × 10,000.			General Trend of Death Rates (Smoothed) × 100,000.	General Trend of Infantile Mortality (Smoothed) × 10,000.
	Males.	Females.	Persons.	Males.	Females.	Persons.	Males.	Females.	Persons.	Males.	Females.	Persons.		
(i.)	(ii.)	(iii.)	(iv.)	(v.)	(vi.)	(vii.)	(viii.)	(ix.)	(x.)	(xi.)	(xii.)	(xiii.)	(xiv.)	(xv.)
1881	1,589	1,328	1,469	1,232	1,095	1,165	1,636	1,348	1,504	1,372	1,203	1,293	1,528	1,293
1882	1,746	1,419	1,596	1,446	1,265	1,357	1,675	1,380	1,540	1,363	1,195	1,284	1,552	1,284
1883	1,654	1,381	1,529	1,302	1,138	1,222	1,708	1,404	1,569	1,353	1,186	1,274	1,569	1,272
1884	1,804	1,460	1,646	1,348	1,168	1,260	1,722	1,417	1,582	1,342	1,176	1,263	1,570	1,261
1885	1,747	1,434	1,604	1,360	1,221	1,292	1,689	1,397	1,555	1,330	1,166	1,251	1,562	1,251
1886	1,659	1,392	1,537	1,348	1,189	1,271	1,676	1,381	1,541	1,316	1,155	1,238	1,546	1,238
1887	1,583	1,317	1,461	1,235	1,091	1,164	1,651	1,386	1,520	1,300	1,140	1,222	1,526	1,221
1888	1,589	1,300	1,456	1,251	1,072	1,164	1,611	1,336	1,485	1,281	1,122	1,203	1,500	1,203
1889	1,672	1,385	1,540	1,400	1,234	1,319	1,603	1,323	1,474	1,260	1,101	1,182	1,474	1,185
1890	1,554	1,287	1,431	1,152	1,009	1,082	1,570	1,289	1,440	1,237	1,078	1,159	1,444	1,163
1891	1,618	1,328	1,484	1,232	1,074	1,155	1,553	1,274	1,424	1,212	1,053	1,135	1,410	1,138
1892	1,419	1,144	1,291	1,142	970	1,058	1,496	1,223	1,369	1,188	1,024	1,108	1,368	1,112
1893	1,502	1,227	1,374	1,240	1,072	1,149	1,459	1,186	1,332	1,167	998	1,086	1,326	1,086
1894	1,386	1,128	1,266	1,107	952	1,031	1,419	1,147	1,292	1,158	993	1,076	1,292	1,074
1895	1,372	1,102	1,245	1,099	921	1,012	1,403	1,131	1,276	1,161	997	1,079	1,280	1,078
1896	1,414	1,135	1,283	1,202	1,045	1,126	1,411	1,139	1,285	1,177	1,012	1,096	1,282	1,096
1897	1,342	1,065	1,212	1,126	967	1,048	1,416	1,145	1,289	1,196	1,031	1,115	1,284	1,114
1898	1,540	1,267	1,412	1,364	1,175	1,272	1,404	1,130	1,275	1,204	1,038	1,125	1,283	1,125
1899	1,411	1,156	1,291	1,246	1,085	1,167	1,395	1,157	1,263	1,198	1,034	1,117	1,273	1,117
1900	1,314	1,026	1,178	1,086	915	1,002	1,403	1,123	1,270	1,181	1,019	1,097	1,255	1,097
1901	1,366	1,064	1,222	1,122	947	1,037	1,362	1,086	1,231	1,145	993	1,062	1,231	1,062
1902	1,383	1,102	1,249	1,142	997	1,071	1,322	1,052	1,194	1,103	946	1,019	1,201	1,020
1903	1,837	1,080	1,215	1,183	1,025	1,105	1,302	1,037	1,176	1,053	892	970	1,172	971
1904	1,212	988	1,105	891	756	825	1,269	1,019	1,150	1 005	852	930	1,144	920
1905	1,214	950	1,088	906	724	818	1,235	994	1,120	952	800	878	1,118	872
1906	1,201	973	1,092	901	760	833	1,212	974	1,098	887	734	813	1,098	827
1907	1,211	977	1,099	884	734	811	1,200	957	1,084	867	711	791	1,085	792
1908	1,224	981	1,107	855	697	778	1,188	952	1,075	849	702	777	1,076	770
1909	1,151	906	1,033	787	642	716	1,184	946	1,070	820	671	748	1,070	751
1910	1,154	924	1,043	817	675	748	1,192	947	1,074	804	650	729	1,067	733
1911	1,182	940	1,066	759	607	685	1,186	941	1,069	790	641	718	1,066	718
1912	1,251	984	1,123	801	630	717	1,189	946	1,072	791	640	717	1,070	708
1913	1,193	953	1,078	788	653	722	1,200	944	1,079	776	626	703	1,079	702
1914	1,167	927	1,051	791	635	715	..	..	..	..	..	..	..	..
1915	1,208	916	1,066	743	605	675	..	..	..	..	..	..	..	..

The results in the above Table are shewn in Curves A and B of Fig. 98, the dots shewing the quinquennial means and the continuous line the general trend. The correlation between the two curves is fairly well indicated, because, although the ratio of the annual number of cases of deaths of children under 1 year of age, to the annual number of deaths of all ages is somewhat variable, there is some degree of general correspondence when a mean is taken over a number of years. See Fig. 98, p. 377.

The following example sufficiently illustrates the variable character of the ratio of infantile to total deaths, shewn in lines (*a*) and (*b*) hereunder :—

TABLE CXXXIV.A.—*Ratio x 10,000, of Infantile to Total Deaths, according to Sex. Australia.

Year	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.
Males (*a*) ..	2,155	2,206	1,890	1,930	1,971	1,925	1,834	1,804	1,880	1,720	1,798	1,832	1,871	1,672
Females (*b*) ..	2,477	2,469	2,039	2,030	2,099	2,041	1,915	1,907	1,966	1,787	1,874	1,973	1,955	1,798
Females (*c*) ..	2,410	2,295	2,202	2,123	2,056	2,003	1,960	1,930	1,905	1,886	1,873	1,864	1,858	1,855
Males (*d*) ..	2,138	2,078	2,024	1,976	1,923	1,893	1,863	1,839	1,819	1,807	1,798	1,792	1,788	1,786
(*d*) ÷ (*c*) = (*e*)	.887	.905	.919	.931	.935	.945	.951	.953	.955	.958	.960	.961	.962	.963

* The figures on lines (*a*) and (*b*) are the ratios of the annual numbers of male and of female infantile deaths to the annual number of total male and of total female deaths respectively. The figures on lines (*c*) and (*d*) are the smoothed ratios for females and males respectively. The figures on line (*e*) are the ratios of male to the female ratios as determined from the smoothed ratios (*c*) and (*d*).

Although the ratio oscillates between somewhat wide limits, the female ratio is invariably higher than the male-ratio: the general death-rate of females, however, is lower than that for males.

These results indicate that the *proportion of infantile deaths to total deaths for both sexes is rapidly decreasing*; *the decrease for females being more rapid than for males.* This is best seen by forming quinquennial means from which the general trend can be readily ascertained. The magnitude and general trend of the ratios of infantile to total mortality in the case of females and also in the case of males, are shewn respectively by curves M and N in Fig. 98, p. 377.

3. **Secular changes in mortality according to age.**—The death-rate for any age-group is the ratio of the number of deaths per unit of time (per annum) therein to the average number of persons in the group during that unit, *i.e.*, to the number at risk.[1] This ratio is markedly different for the two sexes. The following table, viz., CXXXV., based upon the censal results and intercensal experience since 1881[2], shews that for nearly all ages a remarkable diminution in the death rates has taken place. That this must be so is obvious from the results given in Table CXXXIV.

In a later Table, viz., CXXXVI., the average, also according to age, of the ratios between the death-rates of the sexes is given. These average ratios are the ratios of the sum of the four ratios given in each age-group for females to those given for males, and may be referred to the epoch 1900.0 for all comparisons as to any possible change with time.

[1] Actuarially, the ratio of the number of deaths experienced by persons between given limits of age to the total number of units of time (years of life) lived within those age-limits by the population considered.

[2] The results for 1911 are really based upon the deaths occurring during the nine years 1907 to 1915 inclusive. The actual populations for these years are assumed to be distributed according to age as at the Census of the middle year, viz., 1911, which must be substantially correct.

It is obvious from the table that *estimations of the frequency of death based upon tables compiled on the experience of past years are erroneous*, if applied at the present time.[3] We shall investigate hereinafter the law of change.

TABLE CXXXV.—Shewing the Mean Death-rates in Age-groups deduced for Various Epochs, and Illustrating their Secular Changes. Australia, 1881 to 1915.

Age or Age-group	Males. Rate × 100,000.				Females. Rate × 100,000.				Average ratio of Female to Male Death Rate.	
	1881–1891, say 1886.0	1891–1901, say 1896.0	1901–1911, say 1906.0	1907–1915, say 1911.0	1881–1891, say 1886.0	1891–1901, say 1896.0	1901–1911, say 1906.0	1907–1915, say 1911.0	Age.	Data. Sm'thed result.
0–0*	25,439	23,473	19,341	16,360	21,340	19,333	15,562	12,867	0.0	‡.1866
0	14,366	12,738	10,112	8,540	12,414	10,786	8,349	6,862	0.5	.8395
1	3,576	2,685	1,804	1,559	3,427	2,519	1,684	1,389	1.5	.9371
2	1,379	982	677	642	1,336	963	631	575	2.5	.9524
3	891	628	441	409	834	617	412	382	3.5	.9477
4	692	497	350	301	648	488	325	300	4.5	.9571
0–4†	4,549	3,777	2,801	2,455	4,035	3,276	2,365	2,023	2.5	.8614
5–9	384	310	222	222	355	293	201	202	7.5	.9236
10–14	253	219	192	173	235	192	171	153	12.5	.8973
15–19	528	366	300	256	406	315	272	221	17.5	.8372
20–24	793	541	410	364	597	447	370	341	22.5	.8326
25–29	870	651	473	431	781	586	468	432	27.5	.9349
30–34	890	737	552	508	813	703	539	475	32.5	.9416
35–39	1,007	902	714	666	976	847	674	586	37.5	.9374
40–44	1,236	1,029	918	841	1,090	836	746	641	42.5	.8233
45–49†	1,591	1,311	1,222	1,120	1,262	1,000	890	794	47.5	.7525
50–54	2,085	1,737	1,522	1,511	1,568	1,273	1,044	1,050	52.5	.7199
55–59	2,803	2,454	2,091	2,153	2,037	1,793	1,497	1,473	57.5	.7157
60–64	3,717	3,624	3,095	3,174	2,694	2,677	2,293	2,177	62.5	.7231
65–69	5,528	5,207	4,708	4,678	4,423	3,753	3,619	3,471	67.5	.7587
70–74	7,488	7,104	7,584	6,972	6,218	5,704	6,074	5,523	72.5	.8069
75–79	11,778	11,686	11,845	10,900	10,076	9,967	9,378	9,162	77.5	.8350
80–84	15,275	16,210	16,450	16,815	14,490	13,984	13,306	14,575	82.5	.8704
85–89	27,169	26,041	27,372	26,783	24,227	21,960	22,836	21,701	87.5	.8427
90–94	24,661	26,917	30,577	30,896	28,455	26,497	29,433	28,960	92.5	1.0026
95–99	45,050	37,500	36,974	39,111	32,207	45,941	41,188	38,319	97.5	.9938
100–4	24,188	39,844	33,724	113,043	18,621	47,312	39,224	107,229	102.5	1.0075

* Nominally at the instant of birth, but not really so. For the first week after birth the curve is quite distinct from the general death-rate curve after that period. The values given are deduced from the results for the five age-groups, 0 to 4 inclusive, by formula (197), p.68 herein. If computed on the basis of $\mu = A + Cx + Bc^x$, see C. H. Wickens' Journ. Austr. Assoc. Adv. Sci. XIV., 1913, p. 535. The values for 0 will be .27640, .26330, .22790, .19460 and .22740, .21470, .17840 and .15090. But true values of μ_0 are really much greater than these.

† Between these limits (inclusive) the ratio is 0.8593.

‡ The ratio of death-rates using .27640 + etc., to .22740 + etc., is 0.8017.

4. **The changes in the ratio of female to male mortality according to time and age.**—The ratio of female to male mortality, according to time, may be deduced from the rates given in Table CXXXIV., and those according to age from the rates given in Table CXXXV.

To avoid the irregularities of individual years the former ratio is obtained by dividing the results in column (ix.) by those in column (viii.), Table CXXXIV. The quotients are given in Table CXXXVI., and are shewn by the dots on curve C, Fig. 98. This is the ratio for *general mortality*. For *infantile mortality* the results in column (xii.) of Table CXXXIV. are divided by those of column (xi.), and these are shewn by

[3] Thus the actuarial tables used by insurance societies err on the side of conservatism; they are based upon death-rates which are now excessively high.

small crosses on curve D, Fig. 98. The firm lines denote the general trend of these results. They give some indication of correlation with the general and infantile death-rates, see Curves A and B, and the difference between the two curves is less marked ; see Fig. 98, p. 377.

TABLE CXXXVI.—Shewing Ratios of Female to Male Death-rates, and Female to Male Rates of Infantile Mortality. Based upon Quinquennial Means. Australia, 1881-1913.

Year of Decade.	Ratios of Female to Male Death-Rates (Curve C).				Ratios of Female to Male Rates of Infantile Mortality (Curve D).			
	1880.	1890.	1900.	1910.	1880.	1890.	1900.	1910.
0	..	.821	.800	.795	..	.872	.863	.809
1	.824	.820	.797	.793	.877	.869	.867	.811
2	.824	.818	.796	.796	.877	.862	.858	.809
3	.822	.813	.796	.788	.876	.855	.847	.807
4	.823	.808	.803	..	.876	.858	.848	..
5	.827	.803	.805	..	.877	.859	.840	..
6	.824	.807	.804	..	.878	.860	.828	..
7	.840	.809	.797	..	.877	.862	.820	..
8	.829	.805	.801	..	.876	.862	.829	..
9	.825	.829	.799	..	.874	.863	.818	..
*2.0	..	..	..	.7925	..	..	..	.8089
*2.5	..	.8160	.7986	..	.8766	.8630	.8565	..
*3.0	.8232	..	..	..	..	..	..	..
*7.5	.8290	.8112	.8013	..	.8762	.8611	.8270	..

* These are means of five quinquennial means, except in two instances where they are means of four quinquennial means.

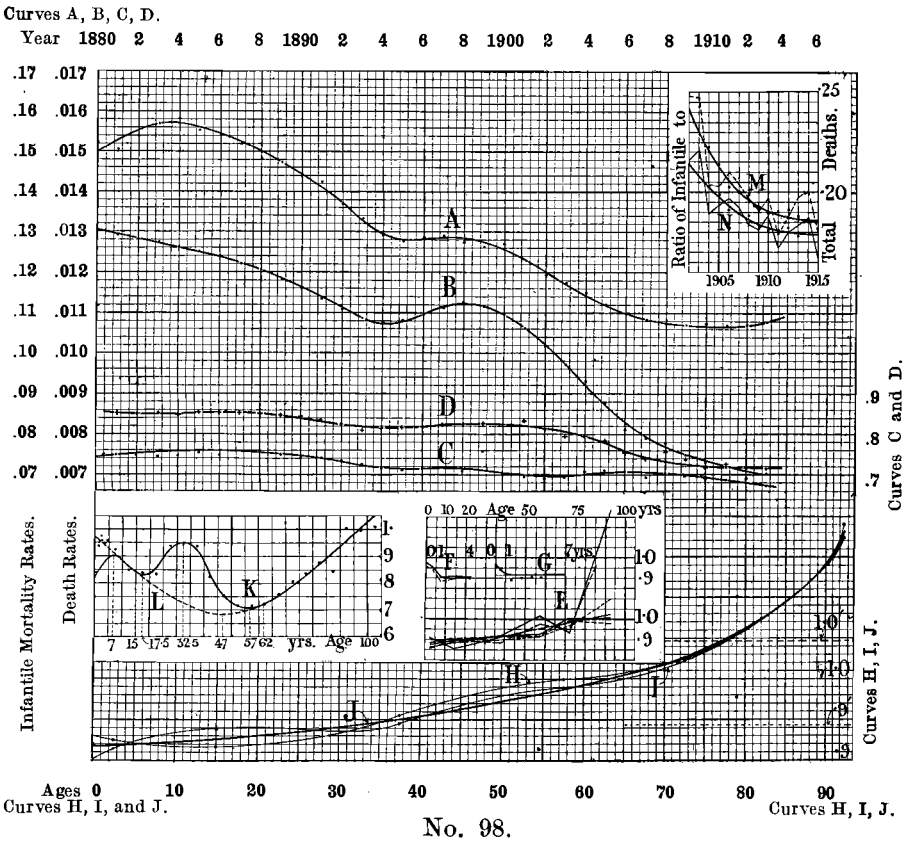
That the ratio of female to male mortality varies with time, having changed from 0.824 in 1881 to 0.788 in 1913, shews that life-tables for males and females, based on experience dating many years back, can no longer represent the facts with sufficient exactitude.

The curve, shewing the ratio of female to male mortality according to age, may be deduced from Table CXXXV., and in view of the overlap or the partial overlap of the 1907-15 results on those of 1901-11, the epoch to which the ratio may be referred is 1900.[1] These ratios are based upon the sums of the four ratios for each sex, given in the table. The result is shewn in Fig. 98, curve K. There are two maxima and two minima in the curve, at the ages indicated in the table ; see p. 377.

The dotted curve L, from which the curve K departs *during the reproductive period of life*, is symmetrical about an axis passing through the age 47. It is not unlikely that this departure from the curve L is due to the vicissitudes of reproduction ; see the reference hereinafter to the *gestate force of mortality*.

[1] Though not strictly exact, this assumption is sensibly correct.

Mortality Curves and their Relations. Australia.



No. 98.

Curve A shews the trend of the quinquennial means of the annual death-rates for "persons" from 1880 to 1913 for the Commonwealth of Australia: the dots shew the quinquennial means themselves; see Table CXXXIV., p. 373.

Curve B similarly shews the trend of the quinquennial means of the infantile mortality rates: the dots shewing, as before, the quinquennial means; see Table CXXXIV., p. 373.

Curve C.—The dots shew the ratios of the quinquennial means of the death-rates for females to the quinquennial means of the death-rates for males, and the continuous line shews the general trend of these results; see Columns viii. and ix. of Table CXXXIV., p. 373.

Curve D.—The minute crosses shew the ratios of the quinquennial means of the rates of female infantile mortality to the quinquennial means of the rates of male infantile mortality, and the continuous line shews the general trend of these results; see columns xi. and xii. of Table CXXXIV., p. 373.

Curves E.—The firm lines are the graphs for males and the broken line the graphs for females, of the results given in the vertical columns of the lower part of Table CXXXVIII., p. 379.

Curves F. shew the changes in the ratios of decrease of mortality for ages 0 to 4, the firm line indicating the results for males and the broken line those for females; see pp. 378-380.

Curve G shews the mean of the results for ages 0 to 4, so reduced that the mean agrees with curve J; see pp. 379-380.

Curves H and I are drawn through the terminals of ordinates representing the means of the factors of decrease and increase. They shew the effect of age; see pp. 379-380.

Curve J may be regarded as the corresponding line for "persons." The scale needs modification. The line denoting unity may be taken at 0.9547: thus 0.9′ and 1′.0 are the correct places for 0.9 and 1.0 in relation to the curve; see p. 380.

Curve K.—The ratios of female to male mortality according to age, are shewn by curve K, the data being indicated by the dots, and the smoothed result by the continuous curve. The smoothed results are given in Table CXXXVII.; see p. 377.

Curve L.—This curve is symmetrical about age 47, and is coincident with curve K from age 62 years onwards; for its significance see p. 376.

Curve M.—The broken lines joining the points shew the ratio of female infantile to total female deaths for successive years. The dots shew the quinquennial means of these, and the firm line shews their general trend; see p. 374.

Curve N.—Similarly the fine zigzag lines are the lines joining the points defining the ratios of male infantile deaths to total male deaths for successive years. The dots shew the quinquennial means of these, and the firm line their general trend. The ratios of the ordinates to curve N to the ordinates to curve M, are given in line (*e*) in Table CXXXIV. A; see p. 374.

TABLE CXXXVII.—Shewing for the Period of 1881 to 1915 the Average Ratio of Female to Male Mortality, according to Age. Australia.

DATA.						SMOOTHED RESULT.								
						AVERAGE RATIOS OF FEMALES TO MALE DEATH-RATES.								
Age-group.	Ratio × 1000	Age-group.	Ratio × 1000	Age-group.	Ratio × 1000.	Age.	Ratio × 1000	(a)	Age.	Ratio × 1000	(a)	Age.	Ratio × 1000	(a)
0.0	817	15–20	837	65–70	759	0.0	817	971	35.0	944	710	70.0	773	773*
0–1	840	20–25	833	70–75	807	5.0	894	927	40.0	882	693	75.0	810	810*
1–2	937	25–30	935	75–80	835	7.0	903†	909	45.0	787	682	80.0	850	850*
2–3	952	30–35	942	80–85	870	10.0	883*	883*	47.0	753	660†	85.0	892	892*
3–4	948	35–40	937	85–90	843	15.0	836*	836*	50.0	730	683‡	90.0	935	935*
4–5	957	40–45	823	90–95	1.003	17.5	834‡	819	55.0	713	605	95.0	980	980*
5-year means	..	45–50	753	95–100	994	20.0	839	802	57.0	710	702	100.0	1026	1028*
0–5	861	50–55	720	100–105	1.007	25.0	894	767	60.0	716	715	102.0	1044	1044*
5–10	924	55–60	716	..	..	30.0	944	736	62.0	724*	724*	..	..	..
10–15	897	60–65	723	..	..	32.5	950†	722	65.0	741*	741*	..	..	..
15–20	837	65–70	759	..	..	35.0	944	710	70.0	773*	810*	..	..	..

* Curve of ratios identical with curve L in Fig. 98, shewn by broken lines.
† Maximum values. ‡ Minimum values.
(*a*) Columns (*a*) are the values to curve L shewn by broken lines in Fig. 98. This curve is symmetrically situated about an axis, passing through the axis of abscissæ at age 47.0. For the significance of curve L reference should be made to the text.

5. **Secular changes in mortality vary with age.**—For any age or group of ages, let μ_0 denote the mortality at a particular date, adopted as time origin; and let ρ denote its *rate* of change—the sign being negative if it be decreasing—so that

$$(601)\ldots\ldots\ldots \mu_t = \mu_0 e^{\rho t} = \mu_0 e^{\phi(t)t}.$$

The last form is necessary only if ρ be *not* constant. It will be found probably in all cases that ρ is a function of time, and it is also a function of age. The results for small age-groups are of course irregular, so that it is only in extended age-groups that the laws of the secular changes according to age and time are rendered obvious and unequivocal. This can be seen by an analysis of the results given in Table CXXXV.,[1] and it is important to know whether for any given age ρ is sensibly constant for any sensible period.

The analysis is effected by forming a series of sums of age-group-results from Table CXXXV., and calculating the coefficients which, multiplied into the results of any period will give those of a later period.

[1] For example the sum of the rates 0 to 49 gave the following indication :—

Year (*a*)	1886.0	ρ	1896.0	ρ	1906.0	ρ	1911.0	
Males (*b*)	.12101 × .8314	= .09843 ×	.7928	= .07804 ×	$\sqrt{(.8219)}$	= .07036	Data
Males (*c*)	.12118 × .8050	= .09755 ×	.8050	= .07853 ×	$\sqrt{(.8050)}$	= .07046	Computed
Females(*d*)	.10550 × .8052	= .08495 ×	.7882	= .06696 ×	$\sqrt{(.7679)}$	= .05868	Data
Females(*e*)	.10636 × .7909	= .08412 ×	.7909	= .06659 ×	$\sqrt{(.7909)}$	= .05922	Computed

The constant ratios .8050 and .7909 therefore reproduce the results fairly well, for males and females respectively, though with a decennium as unit for the ratio-value, we find the value of the ratio is

$$_{10}\rho = 0.8052 - 0.000127t - 0.0001573t^2$$

for females, t being expressed in years reckoned from 1886.0. The results are computed by taking the square root of the quantities .8314 and .7928: allowing each the weight 2 and .9016 = $\sqrt{(.8219)}$ the weight 1. This gives 0.89723, the square of which is .8050. The factors to divide into .12101, .09843, etc., are respectively 1, .8050, .64802 and .58142; the division gives .12101, .12227, .12043 and .12101 the mean of all being .12118 from which by inverting the procedure the above values for males are deduced; similar results give .10636, etc., for females.

The values, found as shewn, suggest that, for the purpose of obtaining values for successive dates, multiplication by a factor and its powers, or say an *annual quinquennial* or *decennial coefficient of variation*, has advantages over the employment of differences.

The quantities in columns ii. to iv., and vii. to ix., of this table, for males and females respectively, are deduced for the corresponding series of age-groups shewn ; the ratios are assumed to be true for the centres of the ranges of ages, an assumption which is sufficiently exact for the purpose in view.[1]

TABLE CXXXVIII.—Shewing the Changing Ratios for different age-groups as between different dates. Australia, 1881 to 1915.

AGE GROUPS.	MALES.					FEMALES.				
	1886 to 1896	1896 to 1906.	1906 to 1911.	Means	Ratio to Total.	1886 to 1896.	1896 to 1906.	1906 to 1911.	Means	Ratio to Total.
(i.)	(ii.)	(iii.)	(iv.)	(v.)	(vi.)	(vii.)	(viii.)	(ix.)	(x.)	(xi.)
00	.9606^2	.9077^2	.8459	.9165	1.0528	.9518^2	.8972^2	.8268	.9050	1.0474
0	.9416^2	.8910^2	.8445	.9019	1.0361	.9321^2	.8798^2	.8219	.8891	1.0291
1	.8665^2	.8197^2	.8642	.8473	.9733	.8573^2	.8175^2	.8248	.8349	.9654
2	.8439^2	.8182^2	.9480	.8544	.9815	.8490^2	.8094^2	.9112	.8456	.9777
3	.8395^2	.8380^2	.9274	.8565	.9838	.8601^2	.8171^2	.9272	.8563	.9901
4	.8469^2	.8392^2	.8600	.8464	.9723	.8678^2	.8161^2	.9231	.8582	.9923
Means ..	.8832	.8523	.8817	.8705	1.0000	.8864	.8395	.8725	.8649	1.0000
0–4 ..	.9112^2	.8612^2	.8765	.8843	.9251	.9011^2	.8496^2	.8554	.8714	.9138
[5–14] ..	.9113^2	.8847^2	.9541	[.9092]	..	.9067^2	.8758^2	.9543	[.9038]	..
[14–24] ..	.8286^2	.8848^2	.8732	[.8600]	..	.8716^2	.9179^2	.8754	[.8908]	..
5–24 ..	.8564^2	.8847^2	.9030	.8770	.9175	.8858^2	.9018^2	.9043	.8955	.9392
25–49 ..	.9098^2	.9153^2	.9193	.9139	.9561	.8983^2	.9138^2	.8827	.9014	.9453
50–64 ..	.9530^2	.9265^2	1.0194	.9557	.9998	.9548^2	.9174^2	.9723	.9433	.9893
65–79 ..	.9838^2	1.0029^2	.9343	.9815	1.0268	.9683^2	.9909^2	.9520	.9741	1.0216
80–104 ..	1.0366^2	1.0054^2	2.5304	1.1229	1.1747	1.1481^2	.9680^2	1.4448	1.1354	1.1908
Means 1	.9418	.9327	1.0305	.95588	=1.0000	.9592	.9236	1.0019	.95351	=1.0000
Means 2	.9436^2	.9343^2	..	..	..	.9635^2	.9247^2	..	..	..

The quantities shewn in the table for the 10-year intervals are the square roots of the quantities originally given. In the totals these are counted twice. In the means 1 denotes the arithmetical mean, 2 the mean of the squares.

The irregularities of the results are doubtless due in part to actual irregularities in the death-rates themselves, and in part to errors in the data. They shew unmistakeably that the death-rate up to age say 60 decreases with time, and that, at any rate above age 80, the rate for males increases with time. The results exhibiting this are illustrated by curves E, F, G, H and I, Fig. 98, E shewing the six results given in Table CXXXVIII., for males by firm lines, and the six results for females by broken lines. The thick line divides the values under unity, viz., those

[1] Let a series of quantities, a and A, be respectively the numerators and denominators which give the ratio for any range of the variable. Then it is assumed that :—

$$(\alpha)\ldots\ldots\left(\frac{1}{n}\Sigma a\right)\Big/\left(\frac{1}{n}\Sigma A\right)\equiv a_m / A_m = a_0 / A_0$$

where a_0 and A_0 are the values for the middle range, the suffix notation being $-k, \ldots\ldots -1, 0, 1 \ldots\ldots k$. Obviously in general such an assumption is invalid ; the true range is that which gives a value of a' / A' equal to a_m / A_m. Later the assumption will also be made that the mean of a series of ratios may also be ascribed to mid-point of the entire range. The error of such an assumption is best illustrated by setting out the two results thus :—

$$(\beta)\ldots\rho_m = (\rho_1 + \rho_2 + \ldots + \rho_n)/n \equiv \left(\frac{a_1}{A_1} + \frac{a_2}{A_2} + \ldots + \frac{a_n}{A_n}\right)/n$$

$$(\gamma)\ldots\ldots\rho'_m = \frac{a_1 + a_2 + \ldots + a_n}{A_1 + A_2 + \ldots + A_n} \equiv \left(\frac{a_1}{A_m} + \frac{a_2}{A_m} + \ldots + \frac{a_n}{A_m}\right)/n$$

Although in general ρ'_m is not equal to ρ_m, if the successive ratios are in arithmetical progression, they are in agreement, and $\rho_m = a_m / A_m$ above. If these successions of ratios are sensibly linear in their changes, the error will be negligible.

which represent a decrease, from those which represent an increase (on the upper side). It would appear from this figure that the change is somewhere between 70 and 80, and that the rate of *decrease* of mortality unmistakably diminishes as age increases.

Curve G shews the mean of the results multiplied by a factor so as to make the average agree with curve J. Curves F shew the changes in the ratios of decrease for ages 0 to 4, the firm line denoting the results for males and the broken line those for females. Curves H and I are drawn through the ratios, to the total, of the means of the factors of decrease (or increase): they illustrate the general correspondence in the male and female cases of the effect of age, the curve J being the probable general indication, *i.e.*, for persons. The line denoting unity may be taken as at 0.9547: thus the broken line at 1.0474 will be really unity in relation to the curve.[1]

It is obvious that advances in hygiene, therapeutics, and social condition will be marked by diminished mortality. Whether that will extend over all ages or will characterise all but the older ages, depends upon whether the term of life is virtually sharply fixed or not. We shall consider the matter further in a later section.

6. **Fluent life-tables.**—For many purposes (much of insurance business for example) the ordinary tables of rates of mortality (μ_x or m_x), of probabilities of living or dying within a year (p_x or q_x), or of expectations of life ($\overset{\circ}{e}_x$), of the population survivors (l_x), at age x, etc., are satisfactory because they represent not only a considerable body of past experience, but also are 'on the safe side' for the major part of the uses to which they are applied (determination of insurance premiums, etc.). For the accurate prediction of life, however, existing tables are not at all satisfactory, because, representing past experience, they take no account of the fact that the rates of mortality for the major part of life are rapidly diminishing, that is the probability of life is increasing for every age, say up to 60 for both sexes in *many* and probably in *all*, civilised countries. Hence for estimations of the true probability of life, for the evaluation of payments for annuities, etc., existing life-tables are seriously defective.

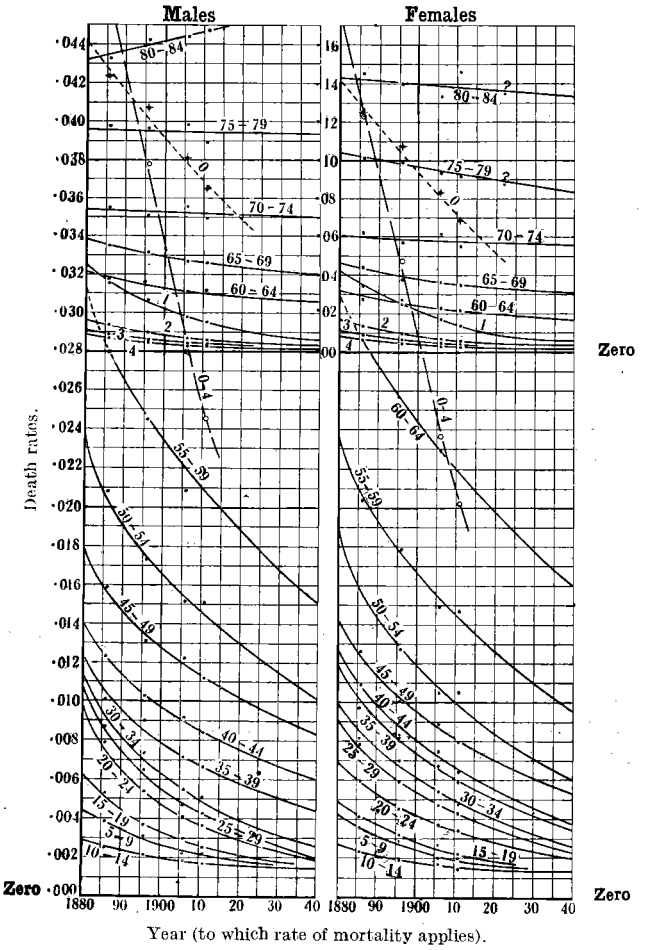
To avoid this difficulty *it is necessary to construct fluent life-tables*, extrapolated for as many years as may seem safe. Such tables are, to the extent they are extrapolated, *prediction tables*. In these, past experience is brought under review in two ways: that is (*a*) as to the values of the various functions as they existed at a given moment, and (*b*) their trend, or variation with time. As the variation with time is not linear probably an *annual coefficient of variation* would best attain the object in view, and could be readily applied.[2]

[1] Any resulting "error of scale" may almost be ignored.

[2] Thus if this were 0.993 for example, the values of the factors for successive years would be —to three decimals—0.993, 0.986, 0.979, 0.972 . . .0.9454, the last being for the 8th year forward. A linear diminution of .007 would have given .9444.

It is *only by means of fluent life-tables* that accurate predictions of survivors for any given age can be ascertained. In Fig. 99, shewing the change of death-rates with time, the dots denote the values according to the data: the system of curved lines shews what may be regarded as the general trend of the mortality-rate for the various age-groups. The results for individual age-groups are irregular, but they unmistakably point to a diminution of the type e^{-mt}, where t denotes the period elapsed, m however having a different value for each age and sex. This index factor (m) has no simple relation to age or to the magnitude of the mortality-rate itself, but is probably related to the two combined; that is, *it is a function of* μ *and* x. We shall first deal with the method of evaluating it, and it will simplify the matter if m be *not* treated as a function of time as in the final form of (601).

Change of Rates of Mortality according to Age and Time.



NOTE. — The scale for the older ages, viz., .00 to .16, is shewn between the graph for the males and that for the females, the zero corresponding to .028 in the graphs for the lower ages. The curves shew the general trend of the improvement.

Fig. 99.

The dots shew the rates of mortality according to the data; the curved lines denote the general trend. The scale of the upper part of the graphs is shewn in the middle, the divisions representing ten times as great a quantity as in the lower part. The extrapolation of the curves to the year 1940 give an indication of the continuation of the improvement.

7. **Determination of the general trend of the secular changes in mortality.**—The results given in Table CXXXV., shewing a decrease with time—except for very great ages—in the rates of mortality, are best studied in Fig. 99. As this figure, however, gives only the rates of mortality as ordinates, and the epochs to which they refer as abscissæ ; and does not shew the *ratio* of the improvement, it is necessary to evaluate this ratio. To do this the mortality at any epoch must be divided by that at some epoch of reference. Thus we may assume—see Fig. 99—that over greater or lesser stretches of time, the curve of variation of the mortality is of the form (601) with m constant ; that is :—

$$(602)\ldots\ldots \mu_t = \mu_0 e^{rt}\ ;\ \text{hence}\ log\ \mu_t = log\ \mu_0 + rt\ log\ e$$

The logarithmic homologue of this relation being a straight line, as shewn, the values of μ_0 and r may be found by the " method of least squares." Or, put $R_t = \mu_t / \mu_0$; then, reckoning t from the year for which μ_0 is taken, the general trend of the change in mortality can be computed by the following formulæ, the derivation of which from (602) is obvious.

$$(603)\ldots\ldots r'\ log\ e = \frac{1}{n}\left(\frac{log\ R_1}{t_1} + \frac{log\ R_2}{t_2} + \text{etc.}\right)$$

In this expression n is one less than the number of dates for which μ is known : r' is, of course, the mean value of r. Having found $r'\ log\ e$ the mean initial value of the rate of mortality is :—

$$(604)..log\ \mu'_0 = \{log\ \mu_0 + log\ \mu_1 + log\ \mu_2 + \ldots - r'\ log\ e\ (t_1 + t_2 + \ldots)\} / (n+1)$$

and μ'_0 is the mean value to be substituted for the original μ_0 to compute later rates; that is, the general trend may then be taken as $\mu'_t = \mu'_0\ (e^{r'})^t$ the value of $e^{r'}$ being determined according to the unit of t (*i.e.*, for a year, a quinquennium, a decennium, etc.).[1]

Within what limits an assumption of the relation expressed by (602) may be supposed to exist is of course to be ascertained by graphing the results on a suitable scale.

8. **Modification of the general trend by age.**—In order to discover the relation between age and the present secular improvement in mortality, it will suffice to take the terminal values only into account ;[1] provided we restrict ourselves to the most consistent results. The improvement for 25 years has therefore been computed, and is as follows, the tabulated results being the values of μ_{25} / μ_0 :—

[1] The following instance will suffice to disclose the significance of the method :—

	Year	1886	1896	1906	1911	Sum of Squares
(*a*)	Date	.01379	.00982	.00677	.00642	of residuals.
(*b*)	Adopting terminals	.01379	.01016	.00748	.00642	
(*c*)	By (603) and (604)	.01386	.00993	.00711	.00602	
	(*b*) — (*a*)	.00000	+ .00034	+ .00071	.00000	.00000062
	(*c*) — (*a*)	+ .00007	+ .00011	+ .00034	— .00040	.00000029

The values of $e^{r'}$ for a unit of 5 years, by (*b*), *i.e.*, adopting terminal values 0.8582 : by (*c*), *i.e.*, by above method 0.8463.

TABLE CXXXIX.—Shewing the secular improvement for 25 years in the Rates of Mortality. Australia, 1886-1911.

	Age 1	2	3	4	7.5	12.5	17.5	22.5	42.5	47.5	67.5
Males ..	.436	.466	.459	.435	.544	.684	.485	.459	.680	.704	.846
Females	.405	.430	.458	.463	.533	.651	.544	.571	.588	.629	.785
Ratio*	1.076	1.084	1.002	.940	1.021	1.051	.890	.804	1.157	1.119	1.078

* Ratio of male to female ratio of improvement. The smaller the ratio the greater the diminution of the mortality.

These results shew (i.), that in general the *diminution of mortality is more marked in young life than in old*; *and* (ii.), *that the diminution is not identical for males and females.*

Changes in rates of mortality, whether due to causes outside human control or otherwise, may be regarded as due to changes in the relation between the human organism and its environment. Factors known to be operative in various organisms, and which are possibly operative in the human case, are :—

(i.) Evolution of the protective reaction between the organism and its environment.

(ii.) Changes of the food supply in amount and quality.

(iii.) Changes due to the reactions of the organism to economic conditions, in respect of its nutritional and neural apparatus, etc.

(iv.) Changes in individual and general hygiene, in therapeutical and surgical knowledge, and in prevailing traditions which affect the vitality of the organism ; etc.

For our present purpose it is *not material whether the change* is what may be called *internal*—as (i.) above— *or external* : either or both may be regarded as *changes in environment, i.e.*, provided they are regarded as either *actual* or *virtual* changes. In short, the effect upon the death and morbidity rates, of any given change in human environment, necessarily varies with the modifiability or "plasticity" of the human organism. The plasticity, however, is not the only element which influences the results. The rate of a general improvement in environment will probably be masked to some extent by evolutionary disturbances, as, for example, by dentitional and puberal changes and, in the case of females, by the demands made on the organism by the exercise of the reproductive function. Hence, *a priori*, it is not to be expected that the secular variation of mortality according to age will reveal any simple progression with age. Moreover, to maintain the same rate of improvement for the ages of least mortality, as for those of greater mortality, is probably, from the nature of the case, very difficult.

Let R_x denote the ratio of change in μ_x in a given unit of time ; R being supposed to vary only with age (x). Excepting at the age of minimum mortality, a given value of μ is characteristic of two ages, viz., one less and the other greater than this minimum age. Since the *plasticity*

of the organism[1] diminishes with age, a given (absolute) change in environment will *tend* to have less effect on the later than on the earlier age, other things being equal. It follows, therefore, that, *in so far as plasticity alone is concerned*, R_x will be greater than R_{x+k}. If the plasticity degrade continuously with age we may suppose that it could be expected to vary probably either as $1 / (x + a)^{b+cx}$ or else as $1 / e^{ax^b}$, the value of a in the former representing the interval between fertilisation and birth, or say 0.75 year, since the plasticity is initially a maximum, and is greatest *in utero*. Consequently if it were necessary to take plasticity alone into account the *reciprocal* of the last quantity should be a factor distinguishing between the equal values of μ for different ages. The former expression, it is found, does not represent the facts; the latter possibly would do so but for the other elements influencing the result. For the purpose of analysing these complex relations between age, the change in the rate of mortality, and the magnitude of that rate, we shall make use of the Census Life Tables for Australia for 1881-1890, and 1901-1910, see Census Report, Vol. III., pp. 1209-1218. For exact ages 0 and 1, the ratios of μ_x are used, and for the purpose in hand it will be abundantly accurate to take $\mu_x = \frac{1}{2}(m_{x-1} + m_x)$ for ages 2 and above 2,[2] m being the central death-rate for each age in question. In order to fix upon values of the mortality with which to associate the ages and ratios of change, the *geometric means* of the mortalities used in computing the ratios have been adopted, which is consistent with the first form of formula (601). It will also be assumed that the tabular values may be referred to the central point of time of the period from which the data are derived.[3]

As already defined, R_t denotes the ratio of change for the time, that is $R_t = \mu_t / \mu_0$ as before, see formula (603). But there will be some advantage in fixing our attention upon the ratio of improvement rather than upon the ratio of reduction of mortality. Thus if there be no improvement (diminution) in the death-rate with the lapse of time, the quantity considered should be 0, and on the other hand the vanishing of death altogether would be denoted by unity. Let B denote this ratio of betterment (or of improvement), then :—

$$(605)\ldots\ldots {}_0B_t = 1 - {}_0R_t = (\mu_0 - \mu_t) / \mu_0$$

[1] The fixation of plastic elements, by means of which the growth and reconstitution of the cellules of the organism are ensured, or *anabolism*, and the production of heat and energy by the oxidation of dynamic elements, or *katabolism*, constitute together the *metabolism* of the organism. The rate of metabolism or of waste and repair may appropriately be said to measure the plasticity of the organism. The plastic and dynamic elements, for example, the albumins, fats, hydrocarbons, etc., require also the presence of mineral salts and vitamines, in order to properly fulfil their nutritive and dynamic functions. The modifiability of the organism may of course be affected by its environment as well as by age : but its *potential modifiability* may be regarded as the measure of its plasticity.

[2] The error of this assumption is, of course, nearly negligible for most purposes for almost any ages, and for the present purpose is quite negligible. The central death-rate is the number of deaths occurring between any age limits divided by the mean population.

[3] That is, the table for the period 1881-1891 can be regarded as referable to the *point of time* 1886.0, and the table for 1901-1911 to the moment 1906.0.

with suffixes to denote the age to which the formula refers. As already indicated, the magnitude of B will be influenced by various circumstances. For example, the ratio of improvement will probably be low (and as a matter of fact is low) for those ages which are characterised by the lowest rates of mortality[1]; that is *for the ages when vitality is greatest a favourable advance in the environment will produce a relatively small effect.* To analyse the effect of the value of the death-rate upon the improvement we may divide B by the geometric mean of the death-rates measuring the change; that is by :—

$$(606)\ldots\ldots \mu_m = \sqrt{(\mu_0\,\mu_t)},$$

and call the ratio of the betterment to this quantity, λ, or the *relative betterment*,[2] thus :—

$$(607)\ldots\ldots \lambda_t = B_t \,/\, \mu_m \equiv (1 - \mu_t \,/\, \mu_0) \,\Big/\, \sqrt{(\mu_0\mu_t)}$$

Since the limits of B are 0 and 1, this quantity can attain to considerable magnitude when t is considerable, and is therefore a sensitive measure of any improvement in the rate of mortality.

The following Table gives for males and females the values of μ_m, B, and λ, the values for μ_0 and μ_t being those given by the analysis of the Census results for thirty years, and the interval being referable therefore to the period between 1886.0 and 1906.0. For values of R, if required, we have simply $1 - B$.

The values of B are shewn in Fig. 100, curves B and B′; in which also the mean death-rates $\sqrt{(\mu_0\mu_t)}$ are shewn, viz., curve A male, and curve A′ female. These exhibit the following characteristics :—

Curves of Relative Improvement for 20 Years in Death-rates.

	Initial Point.	1st Maximum Age. Amount.	1st Minimum. Age. Amount.	2nd Maximum. Age. Amount.	Remarks.
Males	0.175	2.8 yrs. 0.508	12.8 yrs. 0.209	23.3 yrs. 0.491	Later values.
Females	0.215	2.7 yrs. 0.520	13.2 yrs. 0.224	24.5 yrs. 0.400?	are irregular

Upon plotting the ratio of the betterment, viz., the values of λ for males and females, we obtain the results as shewn upon Fig. 100 by curves C and C″, representing the ratio of improvement in the case of males, and curves C′ and C‴, representing the ratio of improvement in the case of females. These exhibit the following characteristics :—

Ratio of the Relative Improvement to the Death-rate for 20 Years.

	Initial Value.	1st Maximum. Age. Amount.	Minimum. Age. Amount.	2nd Maximum. Age. Amount.	Remarks.
Males	0.70	9.2 yrs. 164.6	13.8 yrs. 94.8	16.8 yrs. 109.4	Results after-
Females	1.07	9.5 yrs. 176.4	(13.8 yrs. 108.3)	(16.8 yrs. 100.5)	wards irregular

[1] This corresponds with the age at which the reproductive function commences to unfold, viz., at about age 12. Probably what may be called the age of effloresence of the organism is generally its period of highest vitality.

[2] This is suggested by the word $\beta\epsilon\lambda\tau\acute{\iota}\omega\sigma\iota\varsigma$, *i.e.*, betterment; β is already appropriated for birth-rate, etc.

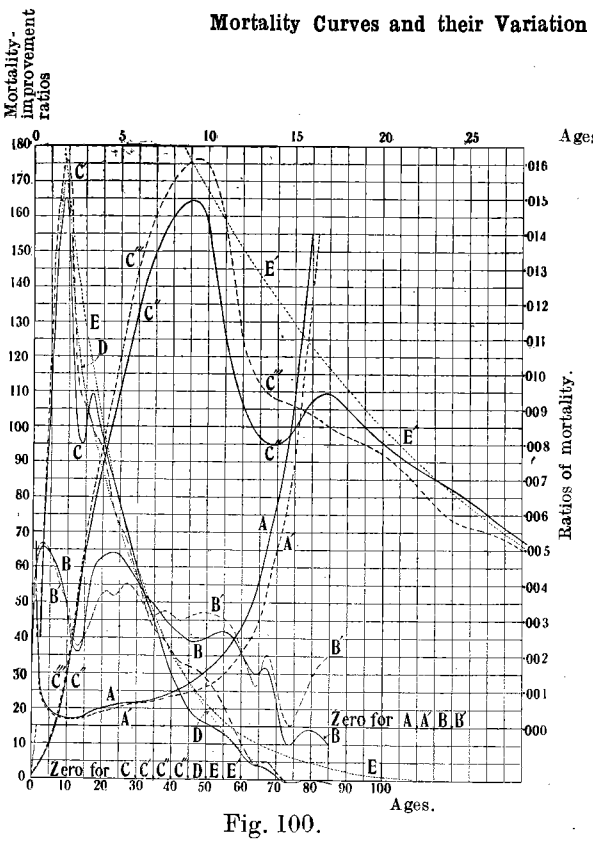
The values for age 0 cannot be deemed to closely represent the facts ; to obtain these a table of deaths occurring on successive days after birth would be needed, and not merely extrapolated results based upon successive years. For all other ages, however, they represent the facts with considerable accuracy.

It will be convenient to call the ratio λ the *mortality improvement ratio.*

TABLE CXL.—Shewing the Mean Mortality, the Relative Improvement in Mortality in 20 Years and the Ratio of this Relative Improvement to the Mean Mortality for Males and Females. Australia, 1886.0 to 1906.0.

Exact Age.	Males.				Females.			Exact Age.	Males.				Females.		
	Mean Death Rate 1896.0	Improvement. Relative.	Improvement. Ratio to Death Rate	Plasticity Curve	Mean Death Rate 1896.0	Improvement. Relative.	Improvement. Ratio to Death Rate.		Mean Death Rate 1896.0	Improvement. Relative.	Improvement. Ratio to Death Rate.	Plasticity Curve	Mean Death Rate 1896.0	Improvement. Relative.	Improvement. Ratio to Death Rate.
0	25100	175	.70	279.0	20150	215	1.07	45	01217	244	20.1	27.7	00963	310	32.2
1	04640	451	9.7	265.0	04270	463	10.8	46	01283	239	18.6	26.4	00988	312	31.6
2	01750	499	28.5	251.8	01660	514	31.0	47	01353	239	17.7	25.0	01018	317	31.1
3	00796	507	63.7	239.2	00752	519	69.0	48	01426	244	17.0	23.8	01055	321	30.4
4	00559	500	89.5	227.2	00522	503	96.4	49	01503	249	16.6	22.6	01095	322	29.4
5	00441	488	110.7	215.9	00409	492	120.3	50	01583	251	15.9	21.5	01140	320	28.1
6	00354	469	132.5	205.5	00324	470	145.0	51	01668	256	15.3	20.4	01190	319	26.8
7	00299	449	150.1	194.8	00269	432	160.6	52	01758	260	14.8	19.4	01249	317	25.4
8	00267	423	158.4	185.1	00235	395	168.1	53	01855	263	14.2	18.4	01319	316	23.9
9	00243	387	159.3	175.8	00215	377	175.3	54	01964	267	13.6	17.5	01398	310	22.2
10	00222	331	163.1	167.0	00201	354	176.1	55	02081	268	12.9	16.6	01488	304	20.4
11	00208	264	126.9	158.7	00193	305	158.0	56	02209	266	12.0	15.8	01586	295	18.8
12	00206	219	106.3	150.7	00195	244	125.1	57	02349	259	11.0	15.0	01694	284	16.8
13	00216	210	97.2	143.2	00204	225	110.7	58	02503	246	10.6	14.2	01814	267	14.7
14	00241	229	95.0	136.0	00221	238	107.7	59	02667	229	8.6	13.5	01948	244	12.5
15	00284	282	99.3	129.2	00243	257	105.8	60	02842	212	7.5	12.9	02091	217	10.4
16	00335	359	106.9	122.8	00273	282	103.3	61	03030	192	6.3	12.2	02249	185	8.2
17	00385	421	109.3	116.6	00309	306	98.9	62	03234	172	5.3	11.6	02418	155	6.4
18	00429	450	104.9	110.8	00343	333	97.1	63	03465	156	4.5	11.0	02605	127	4.9
19	00466	466	100.0	105.3	00375	357	95.2	64	03746	149	4.0	10.5	02831	115	4.1
20	00490	476	97.2	100.0	00404	373	92.3	65	04098	155	3.8	9.9	03137	138	4.4
21	00531	483	91.9	95.0	00431	380	88.2	66	04520	166	3.7	9.5	03514	179	5.1
22	00556	487	87.6	90.3	00457	379	82.9	67	04971	167	3.4	9.0	03898	201	5.2
23	00577	491	85.1	85.7	00479	371	77.5	68	05423	151	2.5	8.5	04253	194	4.6
24	00598	490	81.9	81.5	00504	372	73.8	69	05862	118	2.0	8.1	04596	165	3.6
25	00616	485	78.7	77.4	00535	383	71.6	70	06285	069	1.1	7.7	04945	116	2.3
26	00630	473	74.9	73.5	00565	396	70.1	71	06721	013	.2	7.3	05314	053	1.0
27	00642	458	71.3	69.8	00593	403	67.9	72	07240	—030	—.4	6.9	05740	—005	—0.1
28	00651	440	67.6	66.3	00619	398	64.3	73	07883	—051	—.7	6.6	06260	—042	— .7
29	00660	426	63.5	63.0	00638	392	61.4	74	08647	—052	—.6	6.3	06893	—049	— .7
30	00668	411	61.5	59.9	00652	382	58.6	75	09484	—044	—.5	6.0	0763	—033	— .4
31	00680	392	57.6	56.9	00664	361	54.4	76	1035	—032	—.3	5.7	0843	—006	— .1
32	00696	374	52.6	54.0	00676	338	50.0	77	1126	—021	—.2	5.4	0926	+019	+0.2
33	00714	360	50.4	51.3	00692	324	46.8	78	1222	—012	—.1	5.1	1013	042	0.4
34	00736	352	47.8	48.8	00714	315	44.1	79	1321	—008	—.1	4.9	1108	064	0.6
35	00763	342	44.8	46.3	00737	314	42.6	80	1422	—011	—.1	4.6	1210	085	.7
36	00795	330	41.5	44.1	00762	317	41.6	81	1530	—013	—.1	4.4	1321	104	.8
37	00826	318	38.5	41.8	00790	321	40.6	82	1645	—018	—.1	4.2	1440	121	.8
38	00862	303	35.2	39.7	00816	324	39.7	83	1775	—029	—.2	4.0	1569	134	.9
39	00902	289	32.0	37.7	00838	323	38.5	84	1915	—037	—.2	3.8	1705	141	.8
40	00943	281	29.8	35.9	00859	316	36.8	85	..	..	..	3.6	..	..	..
41	00987	274	27.8	34.1	00876	307	35.0	86	..	..	..	3.4	..	..	..
42	01037	266	25.6	32.4	00896	301	33.6	87	..	..	..	3.2	..	..	..
43	01094	258	23.6	30.7	00919	301	32.7	88	..	..	..	3.1	..	..	..
44	01154	250	21.7	29.2	00941	307	32.6	89	..	..	..	2.9	..	..	..

Mortality Curves and their Variation with Time.



Curves A and A′ represent the geometric means, according to age, of the rates of mortality for 1886.0 and 1906.0, for males and females respectively.

Curves B and B′ are the ratios of the diminution in the rate of mortality in 20 years to the geometric mean of the rates, in the case of males and females respectively.

Curves C and C′ are the ratios of the improvement (last mentioned) divided by the geometric mean rates of mortality.

Curves C″ and C‴ are the curves C and C′ respectively, plotted to an extended horizontal scale but with the same vertical scale.

Curves E and E′—the plasticity curve—shews, in a roughly approximate way, the general trend of the mortality-improvement ratio: see § 10.

Fig. 100.

9. **Significance of the variations in the mortality improvement ratio.**– The following relation between the changes in mortality and in the mortality-improvement-ratio is important.

The variations of the curve of the mortality improvement ratio are reciprocal to those of the mortality itself; that is, x and η being the ordinates to the mortality-improvement-ratio curve, and x and y the ordinates to the mortality curve, we have, practically for all ages,[1]:—

$$(608)\ldots\ldots \eta' / \eta = Ky / y'\text{; or } s = K / r$$

η, η' and y, y' being successive ordinates, and s and r their respective ratios.[2] K, however, is not a constant; nor is it any simply expressed function of x, though generally it is a little less or a little greater than unity.

[1] Certainly for all ages for which the mortality ratio can be very accurately evaluated.

[2] That is η and y are values for x, and η' and y' values for $x + 1$.

This reciprocal relationship reveals the fact that as the mortality at the beginning of life decreases with the successive years, the relative-improvement-ratio increases in very similar proportion. This reciprocal movement of the mortality-ratio, as compared with the mortality-improvement-ratio with increasing age, probably continues throughout life, and certainly continues till at least age 70. The values of the coefficient K in (608) above, are given in Table CXLI., K_m denoting those which apply to males and K_f those which apply to females. The ratios $s=\eta'/\eta$ and $1/r = y/y'$ are also shewn, viz., by the smaller figures between the values of η and y respectively. This coefficient K may be called the *beltiotic coefficient*.[3]

TABLE CXLI.—Shewing the ratios between the mean mortalities and the mortality-improvement-ratios for successive ages. Australia, 1886-0 to 1906-0.

Exact Ages from to (x).	Ratio of Mean Mortalities ($1/r$)	Ratio of Mortality Improvement ratios. (s)	Values of K		Exact Ages from to (x).	Ratio of Mean Mortalities ($1/r$)	Ratio of Mortality Improvement ratios. (s)	Values of K		Exact Ages from to (x).	Ratio of Mean Mortalities ($1/r$)	Ratio of Mortality Improvement ratios. (s)	Values of K.	
			Males. K_m	Females. K_f				Males. K_m	Females. K_f				Males. K_m	Females. K_f
0–1	5.409	13.945	2.578	2.154	28–29	.986	.940	.953	.983	56–57	.941	.918	.976	.952
1–2	2.651	2.934	1.107	1.110	29–30	.988	.968	.980	.973	57–58	.938	.962	1.026	.930
2–3	2.198	2.232	1.016	1.011	30–31	.982	.936	.953	.945	58–59	.939	.809	.862	.914
3–4	1.424	1.401	.984	.970	31–32	.977	.913	.934	.936	59–60	.938	.869	.927	.888
4–5	1.268	1.237	.976	.978	32–33	.975	.958	.983	.959	60–61	.938	.850	.906	.854
5–6	1.246	1.197	.961	.956	33–34	.970	.949	.978	.972	61–62	.937	.837	.893	.837
6–7	1.184	1.133	.957	.919	34–35	.965	.936	.970	.997	62–63	.933	.849	.910	.821
7–8	1.120	1.055	.942	.914	35–36	.960	.927	.965	1.009	63–64	.925	.882	.954	.904
8–9	1.099	1.005	.914	.955	36–37	.962	.927	.964	1.012	64–65	.914	.950	1.039	1.202
9–10	1.095	1.024	.935	.939	37–38	.958	.913	.953	1.009	65–66	.907	.970	1.069	1.295
10–11	1.067	.780	.731	.862	38–39	.956	.911	.953	.997	66–67	.909	.916	1.008	1.126
11–12	1.010	.838	.830	.800	39–40	.956	.930	.973	.978	67–68	.917	.929	.795	.966
12–13	.954	.914	.958	.926	40–41	.955	.932	.976	.970	68–69	.925	.824	.891	.853
13–14	.896	.977	1.090	1.054	41–42	.952	.924	.971	.981	69–70	.933	.545	.584	.670
14–15	.849	1.045	1.231	1.079	42–43	.948	.920	.971	.997	70–71	.935	.931	.427	.459
15–16	.848	1.077	1.270	1.090	43–44	.948	.918	.968	1.023	71–72	.928	.926	..	..
16–17	.870	1.022	1.175	1.085	44–45	.948	.927	.978	1.009	72–73	.918	.917	..	..
17–18	.897	.959	1.069	1.089	45–46	.949	.928	.978	1.006	73–74	.912	.908	..	..
18–19	.921	.953	1.035	1.072	46–47	.948	.948	1.000	1.015	74–75	.912	.903	..	..
19–20	.951	.972	1.022	1.045	47–48	.949	.963	1.014	1.013	75–76	.916	.905	..	..
20–21	.923	.946	1.025	1.019	48–49	.949	.974	1.026	1.003	76–77	.919	.910	..	..
21–22	.955	.953	.997	.998	49–50	.949	.958	1.009	.993	77–78	.921	.914	..	..
22–23	.964	.972	1.009	.979	50–51	.949	.967	1.019	.997	78–79	.925	.914	..	..
23–24	.965	.963	.998	1.003	51–52	.949	.965	1.017	.993	79–80	.929	.916	..	..
24–25	.971	.961	.990	1.030	52–53	.948	.959	1.011	.997	80–81	.929	.916	..	..
25–26	.978	.952	.973	1.034	53–54	.945	.958	1.014	.982	81–82	.930	.917	..	..
26–27	.981	.951	.969	1.017	54–55	.944	.946	1.002	.982	82–83	.927	.918	..	..
27–28	.986	.948	.961	.987	55–56	.942	.935	.993	.980	83–84	.927	.920	..	..

The ratios in the Table ($1/r$) are the values of the mortality at any age divided by the mortality at the age greater by one year; that is, the tabular values are the quantities μ_x/μ_{x+1}.

The tabular ratios of the mortality-improvement-ratios are the values obtained by dividing the mortality-improvement-ratio for any age by that of the age *less* by one year; that is the tabular values are the quantities λ_{x+}/λ_x

The coefficient K is that quantity which, multiplied into the ratio of the mean mortalities, gives reciprocally the ratio of the mortality-improvement-ratios.

[3] From βελτιωτικός, bettering or amending.

If the value of the ratio y is required for a single unit of time (1 year), we have, on the assumption of a geometrically progressive decrease in mortality, $\mu_1 = \mu_t^{\frac{1}{t}}$; consequently :—

$$(609)\ldots B_1 = [1-(\mu_t/\mu_0)^{\frac{1}{t}}]/\mu_0 \text{ and } \lambda_1 = (1-\mu_1/\mu_0)/\sqrt{(\mu_0\,\mu_1)}$$
$$= B_1/(\mu_0{}^{2t-1}\mu_t)^{\frac{1}{2t}}$$

$$(610)\ldots\ldots \xi^t = \mu_t/\mu_0; \text{ and } \mu_1 = \mu_0\xi$$

The form of the expression for λ is independent of the unit of time, though of course its numerical value is dependent on that unit.

10. **The plasticity curve.**—If we except the period between exact ages 14 and 17, the beltiotic coefficient continually decreases in value from age 10. If a curve be drawn representing the general result, it is found (from the 20 years' improvement in the mortality conditions) that it is fairly well represented by the equation $y = 278.95\ (0.95)^x$. This curve, viz., E and E′ on Fig. 100, may be called the *plasticity curve*, and its ordinates are given in Table CXL. The amount by which the beltiotic curve (*i.e.*, the curve of the mortality-improvement-ratio) falls short of the plasticity curve, does not, however, and least of all initially, constitute a measure of the great difficulty of attaining to the limit, which plasticity would admit of, were it not for the great difficulty of initial adjustment to a new environment, and to the exhaustion of energy involved by puberal developments. For the analysis of these questions, however, the available data appear to be inadequate,[1] and they will not be further discussed here.

No simple relation expresses the variation of the constants 278.95 and 0.95 with the unit of time over which the improvement is measured.

11. **Rate of mortality at the beginning of life.**—The mortality at the beginning of life is probably considerably affected by local circumstances ; consequently for the first two weeks and perhaps even the first month of life it would be difficult to assign any particular law of change of mortality with age.[2] Statistics for Saxony gave a first minimum rate at 8 days, and a lesser maximum 15 days, and those for Sweden gave

[1] It may be noted that for the relative improvement to be unity we must have $\mu_t = 0$ in (605), that is to say, death must vanish. But no diminution of mortality in a geometrical ratio can reach zero, for though $\mu_0\,\xi^t$ may be as small as we please, it cannot become zero with ξ positive and t finite : moreover, when the death-rate is large the value of λ cannot be great with any practicable change of death-rate.

[2] See " The improvement in infantile mortality : its annual fluctuations and frequency according to age in Australia." by G. H. Knibbs, Journ. Australas. Med. Congress., Sept. 1911, pp. 670-679 ; see also " Die Sterblichkeit im ersten Lebensmonat, Zeit. f. Soz. Mediz., Leipzig Bd. v., p. 175, 15th April, 1910.

a somewhat similar indication[1], while Australian records do not lend any support to this recrudescence of the rate of mortality. Prussian statistics shew a minimum rate for 9 days and a rise to 14 days.[2]

The statistics in Australia are imperfect, and some distributing was necessary owing to the want of precision in stating the *exact interval after birth*. The defective statement of age does not, however, affect the deductions hereinafter. In the following table the results for the fractions of the first day are merely computed: the rates, calculated without regard to migration, the effects of which are nearly negligible, and are not accurately ascertainable, are determined by deducting the deaths from the total births in order to ascertain the numbers of survivors.

The rates so found shew that from the end of the first day the law of mortality is expressed by $\mu_x = \mu_1/x$, for 5 or even 6 days. The generality of this expression can be extended, if it be put in the following form, viz. :—

$$(611)..\mu_x = \mu_1 [1 + f(x)]/x, \text{ consequently } 1 + f(x) = x\,\mu_x/\mu_1$$

and $f(x)$ for the first 5 or 6 days is zero. The shorter expression indicates that after the first 24 hours, and for about the first week of life the *probability of death diminishes as the length of time lived, reckoned from the moment of birth*. The following rates are computed for "persons" (*i.e.*, males and females) from the records of about 500,000 births and the deaths which resulted from them.

TABLE CXLII.—Death-rates per diem at the Beginning of Life. Based upon 499,674 Births, and the Deaths occurring therein. Australia, 1909, 1910, 1912 and 1913.

Age-group or Age Days.	Death-rates per Diem.	Age Days.	Death-rates per Diem.	Age Days.	Death-rates per Diem.	Age Days.	Death-rates per Diem.
0*	.015000	4	.001416	40	.0002237	200	.0001233
0–⅛*	.014061	5	.001137	50	.0002117	225	.0001142
⅛–¼*	.012355	6	.000975	60	.0002035	250	.0001063
¼–½*	.010143	7	.000853	70	.0001948	275	.0000986
½–¾*	.007934	8	.000767	80	.0001875	300	.0000923
¾–1*	.006330	9	.000703	90	.0001804	325	.0000865
0–1*	.009404	10	.000653	100	.0001740	350	.0000821
1	.005743	15	.000497	125	.0001594	365	.0000802
2	.002927	20	.0003961	150	.0001464	..	..
3	.001899	30	.0002678	175	.0001337	1095	.00001084
4	.001416	40	.0002237	200	.0001233	..	..

* Approximate estimates only. There are no available statistics for the accurate estimation of the frequency of death during each of the first 24 hours of life.

[1] Op. cit., p. 676. The results are given on graph No. 7 on the page mentioned.

[2] See Handbuch d. Med. Statistik., Fr. Prinzing, 1906, pp. 281-2; also G. Lommatzsch. Zeit. f. sächs. stat. Bureau, 1897, Bd. xliii., p. 1.

We may take the mean of μ/x for the first 5 days as the value of the mortality *at* the end of the first day; this gives the rate 0.005729 per diem. Using this to determine $1 + f(x)$, we find that its values are as follow:—

TABLE CXLIII.—Shewing the Values of $x\mu_x/\mu_1$, that is $1 + f(x)$ in (611).

Exact Age, Days.	$1 + f(x)$.		Exact Age, Days.	$1 + f(x)$.		Exact Age, Days.	$1 + f(x)$.	
	Crude.	Smoothed.		Crude.	Smoothed.		Crude.	Smoothed.
1–5	1.0000	1.0000	30	1.4023	1.4023	125	3.4779	3.4373
6	1.0211	1.0200	35	1.4442	1.4442	150	3.8331	3.8067
7	1.0422	1.0438	40	1.5619	1.5620	175	4.0841	4.1022
8	1.0710	1.0714	45	1.7038	1.7043	200	4.3044	4.3342
9	1.1044	1.1028	50	1.8476	1.8466	225	4.4851	4.5131
10	1.1398	1.1380	55	1.9894	1.9889	250	4.6387	4.6493
12.5	1.2280	1.2280	60	2.1313	2.1312	275	4.7329	4.7532
15	1.3013	1.3013	70	2.3802	2.3930	300	4.8333	4.8352
17.5	1.3526	1.3526	80	2.6182	2.6330	325	4.9071	4.9057
20	1.3828	1.3828	90	2.8340	2.8500	350	5.0157	4.9749
25	1.3990	1.3990	100	3.0372	3.0450	365	5.1096	..
30	1.4023	1.4023	125	3.4779	3.4373	..	..	..

From 5 to 10 is a second degree curve, the 1st diff. for a unit being = +·0200, 2nd diff. = + .0038. From 40 to 60 is a straight line, the common difference for a unit being + .02846. The curve from 60 to 120 is a second degree curve, the 1st diff. being + 0.2622 and the 2nd diff. − 0.02238. From 125 to 350 is a third degree curve, the first rank of difference being + 0.3694, − 0.0739, and + 0.0104, the last being the common differences.

The results in the above table shew that although for the first few (five) days the death-rate diminishes as the duration of life, *this rapid rate of diminution is not continued*, but the rate falls off more slowly—and on the whole continually—till the minimum death-rate occurs.

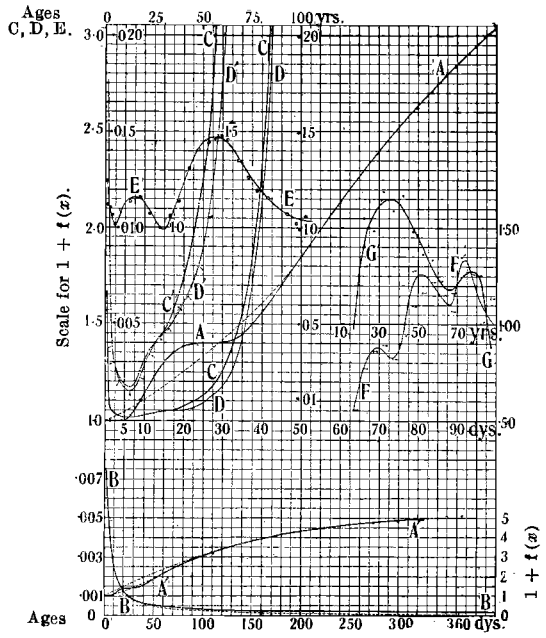


Fig. 101.

Mortality Curves.

Curve A A shews the values of $1 + f(x)$ for 90 days, see (611) p. 390.

Curve A′ A′, shews on a smaller scale the values of $1 + f(x)$ for 360 days.

Curve B B is the curve of rates of mortality for 360 days; the dotted line shews what *would* be the curve if the hyperbolic law held throughout.

Curve C C is the curve of rates of mortality for males, and curve D D is that for females.

Curves C′ and D′ are the same as C and D, except that the vertical scale is increased tenfold.

Curve E E is the curve of masculinity of the rates of mortality according to age; see Table CXLVI.

Curve F F is the curve of the ratios of the rates of mortality for males "not married" to those for married males, according to age.

Curve G G is the curve of the ratios of the rates of mortality for females "not married" to those for married females, according to age.

The characteristics of the diminution of the initial death-rate may be summed up as follows :—

(*a*) For the first 24 hours of life satisfactory data do not exist to determine the characteristics of the death-rate (see below).

(*b*) From the end of the first to the end of the fifth day the rate varies inversely as the duration of life.

(*c*) From the end of the fifth day the rate of diminution rapidly falls off till about the 20th day, then less rapidly till the 30th day, then the rapidity of the falling off of the rate of diminution approximates to what it was from the 5th to the 20th days, but after that decreases slowly and fairly regularly.

(*d*) No simple function expresses these changes in the variation of the death-rate, and they probably differ somewhat in different countries.

If the expression (611) is put into the form :—

$$(612)\ldots\ldots\mu_x = \frac{\mu_1}{x}\, e^{a\,(x-1)^b}$$

this can be fitted to a considerable range of the curve, *provided that minor fluctuations are ignored.* It cannot, however, represent with sufficient accuracy a year's results. To fit any two points on the curve besides the origin we have :—

$$(613)\quad \ldots\ldots\log\frac{\log y'}{\log y} = b\log\frac{x'-1}{x-1}$$

in which $y = x\mu/\mu_1 = 1 + f(x)$. When b is found a can be readily obtained from (612).

For the values of μ for fractions of the first day it may be assumed that the curve is $\mu_0 e^{-x}$. For this to give .995729 at the end of the first day we must make $\mu_0 = 0.015573$ (per diem), and this would be the mortality for $x=0$, viz., at the moment of birth, and is equivalent to a death-rate of 5.684 per annum. This may be put in another way, viz., it is equivalent to a rate of unity per 64.21 days (*i.e.*, 365 ÷ 5.684), and implies that such a rate, if operating uniformly for that period on a group of children for 64.21 days, the group being kept constant, would in that time account for the death of all born.

12. **Composite character of aggregate mortality according to age.**— Before dealing further with the variation with age of the rate of mortality, it is desirable to review the nature of the aggregate rate of mortality.

The general rate of mortality for any age, $D_x/P_x = \mu_x$, viz., the aggregate number of deaths of persons between given infinitesimal limits of age occurring in a unit of time, divided by the average number of persons of the same age[1] (the average being taken over the unit period in which the

[1] In practice D and P are taken between limits x and x', say, in which case μ is not given but instead the average over the range. The difference is dealt with later.

deaths occurred) is made up of the rates from each cause, and if regarded from the summation point of view —see (596), p. 370—is compounded of a series of rates, the graphs of which are by no means similar. For example, in " causes of deaths," Nos. 31 and 32, the real number at risk are those shewn in line 2 below, the variation with age is quite unlike the variation with age of the total mortality, and is by no means identical in the two cases, as will be at once seen from a Table given hereinafter. The results are as follows :—

1. Age-group ..	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	Ttl.
2. Cases of Maternity 1907-1915*	211	54,527	262,866	317,815	238,746	155,813	60,970	6,075	79	..
3. Cases of Puerperal Septicæmia	1	96	370	515	459	307	112	12	1 ?	1872
4. Ratio	.00474	.00176	.00141	.00162	.00192	.00197	.00184	.00197	.01266 ?	..
5 Cases of other Accidents of Pregnancy & Labour	4	161	587	816	799	829	397	55	0 ?	3648
6. Ratio	.01896	.00295	.00223	.00257	.00335	.00532	.00651	.00905	.00000 ?	..

* Actually births. These are, however, only slightly too great. The correction may be neglected for the present purpose.

The results shew that out of a total of 100 deaths at all ages from puerperal septicæmia and other accidents of pregnancy and labour, 34 will arise from the former cause, and 66 from the latter ; and also that the distribution according to age differs considerably for septicæmia ; the proportion dying at different ages remaining more nearly constant than in the case of deaths from other accidents of pregnancy and labour. The fall to a minimum occurs at about age 23.4, when the ratio is about 0.00219. The minimum in the case of septicæmia is at about age 23.1, and the ratio is about 0.00139, the proportion of the deaths from other accidents of pregnancy, etc., being here 0.61 of the two combined.[1]

Causes of death may be classified, as regards their relative frequency according to age, as follow, viz.[2] :—

(i.) *Normal*, viz., those in which the relative frequency is similar to the relative frequency of death from all causes combined ;

[1] See formulæ (292) and (294), p. 92 herein.

[2] The causes of death given in a Table hereinafter may be classified according to the scheme indicated, and are as follows, viz. :—

Class (i.) **Normal.**—9. Influenza ; 12. Epidemic Diseases ; 16*a*. General Diseases ; 18. Cerebral Hæmorrhage, etc.; 18*a*. Other Diseases of the Nervous System ; 20. Acute Bronchitis ; 22. Pneumonia ; 23. Other Diseases of the Respiratory System ; 24. Diseases of the Stomach ; 25. Diarrhœa and Enteritis ; 27. Hernia and Intestinal Obstruction ; 28*a*. Diseases of the Digestive System ; 29. Acute Nephritis, etc. ; 30*a*. Other Diseases of the Genito-Urinary System ; 32*a*. Diseases of the Skin and Cellular Tissue ; 32*b*. Diseases of the Organs of Locomotion ; 35. Violent Death ; 38. Ill-defined Diseases.

Class (ii.).—**Infantile, Sub-classes** (*a*), (*b*) **and** (*c*).—5. Measles (*b*) ; 7. Whooping Cough (*a*) ; 8. Diphtheria and Croup (*b*) ; 14. Tubercular Meningitis (*b*) ; 15. Other Forms of Tuberculosis (*c*) ; 17. Simple Meningitis (*a*) ; 33. Congenital Debility and Malformations (*a*) ; 33*a*. Other Diseases of Infancy (*a*).

Class (iii.).—**Senile.**—16. Cancer and other Malignant Tumours ; 19. Organic Diseases of the Heart ; 19*a*. Other Diseases of the Circulatory System ; 21. Chronic Bronchitis ; 28. Cirrhosis of the Liver ; 34. Senile Debility.

Class (iv.).—**Median.**—1. Typhoid Fever ; 13. Tuberculosis ; 26. Appendicitis, etc. ; 31. Puerperal Septicæmia ; 32. Accidents of Pregnancy and Labour ; 36. Median ; 30. Non-cancerous tumours of the female genital organs.

Organic diseases of the heart and other diseases of the circulatory system are hardly to be included in the " normal" series, because the death-rate in the first year of life is not very great.

(ii.) *Infantile*, viz., those which characterise infancy only ;

(iii.) *Senile*, viz., those which characterise old age only ;

(iv.) *Median*, viz., those which characterise middle age only.

The infantile causes of death may be subdivided into three subclasses, viz. (*a*) those in which the mortality is greatest in the first year of life ; (*b*) those in which it is later than the first year ; and (*c*) those in which the mortality is greatest in the first year, but is followed by an irregular mortality for all ages.

It is obvious that, apart from variations in the distribution according to age, and general differences in local salubrity, epidemics will cause differences in mortality rates according to age, hence to be representative of a country, the deduced mortality rates must be taken over a sufficient period of time. The results in the Table CXLIV. hereinafter are based upon 9 years' experience, viz., from 1907-1915 in Australia, and the distribution of the population, according to age and sex is assumed to be as at the Census of 3rd April, 1911. Before analysing these results it will be necessary to consider the character of curves of organic increase or decrease.

13. **The curve of organic increase or decrease.**—The curve e^x (or e^{-x}) and its variants, may, for obvious reasons, appropriately be called the curve of organic increase or (organic decrease). In considering its application to the increase of population by birth or the reduction of population by death, etc., certain characters of the curve deserve notice, and will now be considered. If to adapt it to a given instance, the expression be put in the more general form hereunder, we may note that :—

$$(614)\ldots\ldots y = Ae^{nx+a} = (Ae^a)e^{nx} = A'e^{nx} = A'\mathfrak{m}^x$$

in which $\mathfrak{m} = e^n$. Hence the addition of a constant to the index of e *affects only the vertical scale of the graph* of the curve, *while n affects its horizontal scale.* If n be constant the final form in the above expression is satisfactory, but if it change with x, then the appropriate expression is—

$$(615)\ldots\ldots y = Ae^{nx\phi(x)} = Ae^{x.n\phi(x)} = Ae^{n'x} = A\phi(x)^x$$

and the form of $\phi(x)$ will be determined by the law of change in n'. Geometrically this is equivalent to changing the x-scale as x increases.

In order to ascertain the form of $\phi(x)$ the quantities, group or other, may be set out as shewn hereunder, and the quotients B/A = b, C/B=c, etc., computed. If b, c, d, etc., are not equal, then the curve Be^{bx} will not satisfy the data. If on computing also the values of b (c—1) / (b—1); c (d—1)/ (c—1) , etc., it is found that they are not equal, the curve $A+Be^{bx}$ will also not satisfy the values. The last step may be shortened by putting the above in the form (c—1)/(1—1/b). Similarly, if the quotients of the differences of the ordinates are not equal the equation will not apply.

Scheme of Examination of Data.

Value, of ..	x_1	x_2	x_3	x_4	x_5	, etc.
or Range between	x_1 to x_2 ,	x_2 to x_3 ,	x_3 to x_4 ,	x_4 to x_5 ,	x_5 to x_6 ,	etc.
Group value ..	A ,	B ,	C ,	D ,	E ,	etc.
Ratio B/A, etc.	b	c	d	e	f	
Reciprocals A/B, etc.	1/b	1/c	1/d	1/e	1/f	
or Ratio of differences	$\frac{y_3-y_2}{y_2-y_1}$;	$\frac{y_4-y_3}{y_3-y_2}$;	etc.			

If the values are increasing in the order A . . . E, n is positive, if diminishing n is negative, x being regarded as positive throughout.

There is, of course, no universal guide for deciding what form of function to adopt, but if b, c, d ascend by a common difference, the function will be of the form $Be^{bx(1+ax)}$; if by a common multiple, it will be of the form Be^{bx^2}; if by a common power of x, of the form Be^{bx^p}, and so on. Successive values of $m = e^n$ may therefore be analysed on the same principles as the original data.

14. **Exact value of abscissa corresponding to the quotient of two groups.**—It is obvious that if there be two distributions (*e.g.*, the number of deaths occurring in a population of a given magnitude in a given unit of time, both set forth according to age) and the average over a range of the variable be ascertained (*e.g.*, the average death-rate of all persons between ages x_1 and x_2) the quotient found, by dividing one group by the other group, with the same range, will, in general, be the *exact* value for some given value of the abscissa; and ordinarily this value must not be referred to the middle of the range in question, when high precision is desired. Let the two distributions be denoted by G and H, and let G be the numerator group and H the denominator group; and let the five quantities x_1, x_g, x_h, x_m. and x_2 denote respectively :—(i.) the value of the abscissa at the beginning of the group; (ii.) the abscissa of the mean ordinate of the group G, and (iii.) that of H; (iv.) the abscissa where the ratio becomes exact; and (v.) the value of the abscissa at the end of the range. That is, if ${}_gy_m$ and ${}_hy_m$ denote the ordinates at x_m for the two distributions, then we must have :—

$$(616)\ldots\ldots G/H = {}_gy_m/\ {}_hy_m$$

The following laws hold as to the position of x_m in relation to x_g and x_h the latter being the abscissæ of the ordinates equal to the respective means of the two distributions ;—

(i.) The two distributions increase linearly,[1] then $x_m = \frac{1}{2}(x_1+x_2)$.

(ii.) The relative increase of the two distributions, though not linear, is identical throughout (*i.e.*, they increase in the same proportion); then x_m is the common abscissa of the means of the group-ordinates.

[1] Provided, however, that the prolongation of the bounding lines does not meet on the axis of the abscissæ, since, in this case, the required ratio holds for any value of x; that is to say, in this case x_m is indeterminate. This, however, does not vitiate the adoption of the middle of the range, or indicate that it should not be adopted.

(iii.) The ordinates of one distribution are constant throughout; the values of the other are variable ; x_m is the abscissa of the ordinate equal to the mean of the ordinates of the variable distribution.

(iv.) The relative increase of the ordinates of distribution G is more rapid than that of the ordinates of distribution H ; then $x_g > x_m > x_h$.

(v.) The relative increase of the ordinates of distribution G is less rapid than those of distribution H ; then $x_g < x_m < x_h$.

(vii.) Where the distributions G or H include maxima or minima (either one or both), no general law applies as regards the value of the abscissa x_m, and it may have more than one value. In general also the position of x_m in such cases is not accurately determinable from the group-data.

The most general supposition that can be made regarding the curve of instantaneous values which, between given limits, will satisfy a particular group-value (not near a maximum or minimum, at a point of inflexion, or very near the terminals) is that it is approximately represented by Be^{bx} or Bn^x in which e^b or n is the ratio of any group to the adjoining group. A curve of this type will satisfy three groups G_{-1}, G and G_1, in ascending or descending order of magnitude, see Part XIII., §25 (508), p. 266. Let the value of G/G_{-1} be n_1, and of G_1/G be n_2, then the value of $\mathfrak{m} = e^b$, which will give a curve satisfying the three group totals, is[1] :—

$$(617)\ldots\ldots \mathfrak{m} = n_1 (n_2 - 1)/(n_1 - 1)$$

The common quantity χ to subtract so as to get three groups with the common ratio $\mathfrak{m}$ between the second and first, and third and second, is :—

$$(618)\ldots\ldots \chi = G (n_2 - n_1)/(1 + n_1 n_2 - 2n_1)$$

where G is the central group, and the position of the ordinate corresponding to the group-height, $G / (x' - x)$ say, is wholly dependent upon $\mathfrak{m}$,[2] which should be substituted for either n_1 or n_2.

The abscissa of intercept of the group-rectangle with the curve of distribution is obviously independent of the scale, or of the zero of the

[1] It is important to bear in mind when high accuracy is desired, that the mean of n_1 and n_2 is not necessarily at all near the value $\mathfrak{m}$. For example suppose the groups are 1000, 1200, and 2040, the value of n_1 is 1.2, and of n_2, 1.7. The arithmetic mean is 1.45, and geometric 1.42829. While the value of $\mathfrak{m}$ is 4.2. For the ratios (1000—937.5) : (1200—937.5) : (2040—937.5) are identical, and are 4.2. Similarly the groups 2040, 1200, and 1000 give for n_1 the value $1/1.7 = 0.0588235$, and for that of n_2 the value $1/1.2 = 0.0833333$ give $1/4.2 = 0.0238095$, as may be seen by applying the formula for the value of $\mathfrak{m}$. The position of the abscissa of the ordinate to the curve corresponding to the mean height is the same in either case, as also is the position of the centroid vertical.

[2] The value of x_m is that of the abscissa of the point (or points), where a line parallel to the axis of abscissæ and distant therefrom the average of the group-ordinates cuts the bounding curve (the curve of distribution); or—in a graph—the abscissa of the intersection of the group rectangle with the curve of distribution.

figure. We suppose the range to be 0 to 1, and the curve to be $y = Ae^{ax}$, in which e^a is $\mathfrak{m}$. Hence since log. $\mathfrak{m} = a$ log. e, we have by integrating between the limits 0 and 1 :—

$$(619)\ldots\ldots y_m = e^{ax_m} = \frac{1}{a}(e^a - 1) = \mathfrak{m}^{x_m} = \frac{\log e}{\log m}(m - 1)$$

Consequently by taking logarithms of this last form of the equation, we have, since $\log_{10}$ 2.3025851 = 0.3622157 :—

$$(620)\ldots\ldots x_m = \frac{\log_{10}(\mathfrak{m} - 1) - \log_{10}(\log_{10} \mathfrak{m}) - 0.3622157}{\log_{10} \mathfrak{m}}$$

To find the value of x_m when there are two curves we have, writing ξ for x_m for convenience, and in order to distinguish this case from the previous one :—

$$(621)\ldots\ldots \frac{A(e^a-1)/a}{B(e^b-1)/b} = \frac{Ae^a\xi}{Be^b\xi}; \text{ wherefore } \frac{(\mathfrak{m}_a - 1)/a}{(\mathfrak{m}_b - 1)/b} = \frac{\mathfrak{m}_a^\xi}{\mathfrak{m}_b^\xi}$$

But $1/a$ divided by $1/b$ = log. $\mathfrak{m}_b$/ log. $\mathfrak{m}_a$ consequently :—

$$(622)\ldots\ldots \left(\frac{\mathfrak{m}_a}{\mathfrak{m}_b}\right)^\xi = \frac{\log \mathfrak{m}_b}{\log \mathfrak{m}_a} \cdot \frac{\mathfrak{m}_a - 1}{\mathfrak{m}_b - 1}, \text{ and therefore}$$

$$(623)\ldots\xi = \frac{(\log \mathfrak{m}_a - 1) - \log(\mathfrak{m}_b - 1) + \log(\log_e \mathfrak{m}_b) - \log(\log_e \mathfrak{m}_a)}{\log \mathfrak{m}_a - \log \mathfrak{m}_b}$$

which put in suitable form for computation with Briggsian logarithms is

$$(623a)\ldots\ldots \xi =$$
$$\frac{\log_{10}(\mathfrak{m}_a - 1) - \log_{10}(\mathfrak{m}_b - 1) + \log_{10}\log_{10}\mathfrak{m}_b - \log_{10}\log_{10}\mathfrak{m}_a - 0.3622157}{\log_{10}\mathfrak{m}_a - \log_{10}\mathfrak{m}_b}$$

The fraction ξ can thus be readily tabulated in a table of double entry, with the arguments $\mathfrak{m}_a$ and $\mathfrak{m}_b$. If in these last formulæ (623) or (623a) we put $\mathfrak{m}_b = 1$, we get (620). If (623) is used it is important to note that the Napierian logarithms are to be used where indicated. Formula (622) may be regarded as the fundamental equation for the determination of x_m or ξ.

The preceding formulæ are unsuitable when $\mathfrak{m}_a = \mathfrak{m}_b$. But by putting $\mathfrak{m}_a = \mathfrak{m}_b + h$ where h is a very small quantity, we obtain, after expanding both sides of the following equation, viz. :—

$$(624)\ldots\ldots \left(\frac{\mathfrak{m} + h}{\mathfrak{m}}\right)^\xi = \frac{\log \mathfrak{m}}{\log(\mathfrak{m} + h)} \cdot \frac{\mathfrak{m} - 1 + h}{\mathfrak{m} - 1}$$

which is (621) recast, and remembering that the powers of h are negligible :—

$$(625)\ldots\ldots \xi' = \frac{\mathfrak{m}}{\mathfrak{m} - 1} - \frac{1}{\log_e \mathfrak{m}}.$$

ξ', therefore, is not really indeterminate, when $\mathfrak{m}_a = \mathfrak{m}_b$, as might have easily been wrongly inferred from (623). When both $\mathfrak{m}_a$ and $\mathfrak{m}_b$ are 1 it may readily be shewn that $\xi' = 0.5$ by expansions applied to (625), which is but a special case of the following, viz. :—

If $\mathfrak{m}_a = 1/\mathfrak{m}_b$, then we have at once from (622) that $\xi = \frac{1}{2}$. And finally if $\mathfrak{m}_a = k\mathfrak{m}_b$ we have

$$(626)\ldots\ldots k^{\xi} = \{(k\mathfrak{m}_b - 1)\log \mathfrak{m}_b\}/\{(k-1)\log k\mathfrak{m}_b\}$$

by means of which also tables may be constructed.

The following table will enable the value to which any group-ratio should be referred to be readily found, after the values of $\mathfrak{m}_a$ and $\mathfrak{m}_b$ for the two distributions have been ascertained. Where the original distributions are increasing with x the value ξ given in the table is read from the left-hand toward the right; where diminishing, with increase of x, from the right-hand toward the left. Thus if $\mathfrak{M}_a = 1/\mathfrak{m}_a$ and $\mathfrak{M}_b = 1/\mathfrak{m}_b$, then :—

$$(627)\ldots\ldots \xi_{\mathfrak{M}} = 1 - \xi_{m}$$

consequently the table may be entered for the reciprocals of *both*[1] the ratios without altering the result provided the point to be determined is taken either ξ_m from one end of the range or $\xi_{\mathfrak{M}}$ from the other.

TABLE CXLIV.—Shewing the values of ξ, viz., the relative Distance from the Initial Value of any Range on the Axis of abscissæ, to the Ordinate, to which the Ratio of any Two Groups should be ascribed, the whole Range being regarded as Unity.

VALUES OF ξ.

m_a or m_b	.05	.10	.15	.20	.25	.5	1.0	1.25	1.50	1.75	2.0	3	4	5	7.5	10	15	20	25	40	m_a or m_b
.05	.281	.302	.315	.324	.332	.357	.383	.392	.399	.406	.411	.427	.439	.447	.462	.474	.488	.500	.508	.525	.05
.10	..	.323	.337	.347	.355	.382	.408	.417	.424	.430	.436	.452	.464	.473	.488	.500	.514	.526	.534	.550	.10
.15	..	..	.351	.361	.369	.396	.423	.432	.440	.446	.451	.467	.479	.489	.504	.516	.530	.542	.550	.566	.15
.20	..	..	..	.371	.380	.406	.434	.443	.451	.457	.463	.479	.491	.500	.515	.527	.541	.553	.561	.577	.20
.25	..	..	..	..	.388	.415	.443	.452	.460	.466	.472	.488	.500	.509	.524	.536	.550	.561	.569	.586	.25
.50	..	..	..	..	..	.443	.471	.480	.488	.495	.500	.516	.528	.537	.552	.564	.578	.589	.597	.613	.50
1.0	..	..	..	..	..	..	.500	.509	.517	.523	.529	.545	.557	.566	.581	.592	.607	.617	.624	.639	1.0
1.25	..	..	..	..	..	..	..	.519	.526	.532	.538	.554	.566	.575	.590	.601	.614	.625	.633	.648	1.25
1.50	..	..	..	..	..	..	..	..	.534	.540	.546	.562	.574	.582	.597	.608	.622	.634	.641	.656	1.50
1.75	..	..	..	..	..	..	..	..	..	.547	.552	.568	.580	.588	.602	.614	.628	.639	.646	.661	1.75
2.0	..	..	..	..	..	..	..	..	..	..	.557	.573	.585	.594	.607	.618	.632	.643	.650	.665	2.0
3	..	..	..	..	..	..	..	..	..	..	..	.590	.602	.611	.624	.635	.649	.659	.666	.680	3
4	..	..	..	..	..	..	..	..	..	..	..	..	.612	.621	.634	.645	.658	.668	.675	.689	4
5	..	..	..	..	..	..	..	..	..	..	..	..	..	.629	.642	.653	.666	.676	.683	.696	5
7.5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.658	.669	.681	.691	.698	.711	7.5
10	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.677	.689	.698	.705	.718	10
15	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.701	.710	.716	.729	15
20	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.719	.724	.737	20
25	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.727	.742	25
40	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.755	40

If x, x_m and x' are respectively the beginning of the range, the point at which the ordinates to the two distributions are in the exact ratio of the corresponding groups, and the end of the range, ξ is the ratio of the distance x to x_m to the distance x to x'.

Most of the quantities in the table have been directly calculated, and are less than .0005 in error. The greatest error in the interpolated part of the table will be about .002.

Let h and k be any two small quantities such that $m'_a = m_a + h$, and $m'_b = m_b - k$, then by expanding and neglecting powers of h and k higher than the first we obtain :—

$$\frac{h}{k} = -\frac{m_a}{m_b}\cdot\frac{\xi_{m_a m_b} - \xi_{m_b m_b}}{\xi_{m_a m_b} - \xi_{m_a m_a}}$$

which shews that if we add (or subtract) any small quantity to (or from) m_a to get a tabular value we must subtract (or add) m_a/m_b times the quantity from (or to) m_b in order to obtain the true value of ξ

This follows from the fact that the ξ quantity alone is approximately unity in all practical cases, and gives the required quantity by a single interpolation.

If reciprocals be taken of *both* m_a and m_b, the value of ξ is the arithmetical complement of its value for m_a and m_b, *i.e.* :—

$$\xi_{m_a m_b} + \xi_{\frac{1}{m_a}\frac{1}{m_b}} = 1$$

[1] It hardly needs to be added that the table must not be entered for *one* reciprocal only.

15. **Absence of climacterics in mortality.**—A general impression exists that death is more than normally frequent at some age between the ages of 50 and 60 in the case of males, and an age between 40 and 50 in the case of females. The crude figures for individual years are very irregular, and no precise deduction can be based upon them until they are smoothed. The sums for 9 years (1907-1915) from Australian records are as follows :—

Ages	48	49	50	51	52	53	54	55	56	57
Deaths of Males	2841	2723	3667*	2323	3071	2827	2987	2903*	3010	2781
Smoothed Means	..	2912	2925	2922	2926	2921	2960	2902	2938	2931
Ages	..	37	38	39	40*	41	42	43	44	45*
Deaths of Females ..	..	1402	1619	1540	1608	1206	1695	1396	1449	1673
Smoothed Means	..	..	1529	1475	1534	1489	1478	1470	1527	1493
Ages	58	59	60	61	62	63	64	65	66	67
Deaths of Males	3011	2705	3636*	2232	2896	2995	3068	3905*	3044	3286
Smoothed Means	2930	2873	2896	2893	2959	3032	3182	3260	3307	..
Ages	46	47	48	49	50*	51	52	53	..	..
Deaths of Females ..	1423	1524	1601	1741	1782	1319	1733	1601	..	..
Smoothed Means	1534	1590	1619	1593	1635	1635	1584	..	..	..

* If the errors be supposed to accrue mainly through ages 1 and 2 years above and below the true age, the true value can be found approximately by taking the mean of 5 years, since the results are usually linear for small ranges of age. The excess over this can then be distributed among the ages plus and minus 1 and 2, according to the probabilities of the case. The general trend can then be found. One-third of the excess over one-fifth was added to the age below, one two-thirds to the age above. The quinquennial means so corrected were formed, and are as given opposite "smoothed means."

The instances where the age ends in the integers 0 and 5 shew the usual defect, viz., a tendency to give approximate ages ending in those numbers. When the necessary distribution of the excess, however, is effected no indication exists of climacterics (marked in the death-rates of males or females) in the range shewn. This is evident from the following rates deduced from the adjusted population results of the Census, after making allowance for the difference from the mean of the 9 years included,[1] viz. :

Ages (Males)	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
Death-rates' ..	0124	0130	0138	0148	0159	0173	0183	0202	0220	0241	0255	0276	0295	0319	0344	0377	0404	0430
Smoothed ..	0124	0130	0138	0148	0160	0174	0180	0198	0218	0240	0253	0267	0292	0318	0345	0373	0402	0432
Ages (Females	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53		
Death-rates' ..	00607	00598	00635	00632	00645	00658	00701	00702	00740	00789	00830	00852	00924	00991	01031			
Smoothed ..	00598	00613	00628	00643	00658	00673	00690	00711	00738	00773	00818	00873	00928	00983	01038			

It is worthy of note that the actual number of deaths of males oscillates very little on either side of the average, 2921, between the ages 49 and 62 ; and also that the actual number of deaths of females between the ages 38 and 45, and between 45 and 52, oscillate but small amounts on either side of the averages, viz., 1499 and 1598 respectively. The death-rates of course all increase appreciably.

16. **Fluctuations of the ratio of female to male death-rates according to age.**—The average ratio of the female rate of mortality to the male rate of mortality for 1886 to 1915, according to age, is given in the final column of Table CXXXV., p. 375, and this ratio for the death-rate for all ages is

[1] The ratio of males and females as at the Census of 1911, and for the sum of the mean populations, gave the following results :—

Sum Mean Male Populations 1907–15 ÷ Males at Census 1911 = 21,150,358 ÷ 2,313,035 = 9.143985
,, Female ,, ,, ÷ Females ,, ,, = 19,620,889 ÷ 2,141,970 = 9.160207

The divisors used to obtain the mean numbers were 9.1440 and 9.1602 for males and females respectively.

given in Table CXXXVI., p. 376. It is analysed in Table CXXXVII. p. 377. The fluctuations with time of the rates according to age are shewn in the following table :—

TABLE CXLV.—Shewing the Variation in the Ratio of Female to Male Mortality-rates according to Age; 1886 to 1911. Australia.

Age-group.	Epoch.				Age-group.	Epoch.			
	1886.0	1896.0	1906.0	1911.0		1886.0	1896.0	1906.0	1911.0
0 ..	.864	.975	.826	.803	40–44	.882	.812	.813	.763
1 ..	.958	.938	.933	.818	45–49	.793	.763	.728	.709
2 ..	.969	.981	.932	.896	50–54	.752	.733	.686	.695
3 ..	.936	.982	.934	.933	55–59	.727	.731	.716	.684
4 ..	.936	.982	.929	.996	60–64	.725	.739	.741	.686
0–4 ..	.887	.867	.844	.824	65–69	.800	.721	.769	.742
5–9 ..	.924	.945	.905	.913	70–74	.830	.803	.801	.792
10–14 ..	.929	.877	.891	.884	75–79	.855	.853	.792	.840
15–19 ..	.769	'861	.907	.862	80–84	.949	.863	.809	.867
20–24 ..	.753	.826	.902	.935	85–89	.892	.843	.834	.810
25–29 ..	.898	.900	.989	1.002	90–94	1.154	.984	.963	.937
30–34 ..	.913	.954	.976	.936	95–99	.715	1.225	1.139	.979
35–39 ..	.969	.939	.944	.880	100–104	.770	1.187	1.163	.949
0–4 ..	.887	.867	.844	.824	15–49*	.854	.865	.894	.870
5–14* ..	.926	.911	.898	.897	50–89*	.816	.786	.769	.765

* Average of rates merely.

The results in the table shew that, on the whole, there is a decrease in the ratio of the death-rates for females, *i.e.*, the environment or its effect has become more favourable in the case of females than in the case of males in Australia. This result is well defined for ages 0 to 4 ; fairly well-defined for ages 5 to 14, and is not well defined for later ages. Moreover for all ages the results are rather irregular. The reciprocal of this ratio, viz., the male divided by the female rate for the years 1907-1915, is given in Table CXLVI. hereinafter, and is shewn on Fig. 101 by curve E.

17. **Rates of mortality as related to conjugal condition.**—The effect of conjugal condition upon death-rates is well marked, and is shewn in the following table, based upon three years' results, viz., 1910-1912. For convenience of comparison the mortality results for nine years for all males and all females is repeated[1] in the table, the masculinity ratio between the death-rates being also given ; see curve E, Fig. 101. The ratio of the death-rate of the "not married" to that of the married fluctuates considerably from age-group to age-group, both for males and females. For males between 20 and 85 years of age the death-rate is considerably higher for the "not-married." For females the advantage lies with the "not married" until the child-bearing period has been passed, after which it lies with the "married." The exact age at which the death-rates become equal in the case of females is probably about 43 years.

[1] These results were given in Table CXXXV., p. 375, and the average "feminity" of the death-rate was also given for each age-group.

TABLE CXLVI.—Shewing in Age-groups the Average Death-rates of all Males and all Females, 1907-1915, and of Married and Unmarried Males and Married and Unmarried Females, 1910-1912. Australia.

Age-Group.	Age.	1907-1915. Mortality Rate.		Ratio Male to Female Rate.	Mortality, Males, 1910-1912.			Mortality, Females. 1910-1912.		
		Males.	All Females.		Married. (m)	Not Married. (u)	Ratio. u/m	Married. m'	Not Married. u'	Ratio. u'/m'
0 ..	0.43	.08540	.06862	1.2445						
1 ..	1.46	.01559	.01389	1.2226						
2 ..	2.48	.00642	.00575	1.1153						
3 ..	3.49	.00409	.00382	1.0712	..	.01034	—	..	.00858	—
4 ..	4.49	.00301	.00300	1.0037						
0–4 ..	1.98	..	..	..						
5–9 ..	7.42	.00222	.00202	1.0949						
10–14 ..	12.60	.00173	.00153	1.1315						
15–19 ..	17.58	.00256	.00221	1.1597	.00257	.00251	0.977	.00388	.00215	0.554
20–24 ..	22.49	.00364	.00341	1.0699	.00244	.00378	1.549	.00418	.00321	0.768
25–29 ..	27.46	.00431	.00432	.9984	.00329	.00504	1.532	.00454	.00390	0.859
30–34 ..	32.50	.00508	.00475	1.0684	.00405	.00682	1.684	.00482	.00429	0.890
35–39 ..	37.50	.00666	.00586	1.1363	.00564	.00896	1.589	.00616	.00506	0.821
40–44 ..	42.51	.00841	.00641	1.3108	.00752	.01099	1.665	.00643	.00609	0.947
45–49 ..	47.47	.01120	.00794	1.4101	.01039	.01535	1.477	.00765	.00974	1.273
50–54 ..	52.39	.01511	.01050	1.4394	.01406	.01917	1.363	.01065	.01237	1.162
55–59 ..	57.45	.02153	.01473	1.4615	.02039	.02709	1.329	.01459	.01778	1.219
60–64 ..	62.48	.03174	.02177	1.4578	.02947	.03614	1.226	.02097	.02416	1.152
65–69 ..	67.46	.04678	.03471	1.3479	.04523	.05266	1.164	.03529	.03766	1.067
70–74 ..	72.41	.06972	.05523	1.2624	.06730	.08364	1.243	.05504	.07433	1.351
75–79 ..	77.27	.10900	.09162	1.1898	.10721	.13670	1.275	.09348	.11829	1.265
80–84 ..	82.15	.16815	.14575	1.1537	.16415	.20613	1.256	.14615	.14664	1.003
85–89 ..	86.96	.2678	.2170	1.2342	.2640	.2199	0.883	.2106	.2385	1.133
90–94 ..	91.88	.309	.2895	1.0669						
95–99 ..	96.70	.391	.3832	1.0207	.354	.327	0.924	.328	.505	1.541
100&over	101.4?	1.13	1.07	1.0542						
All ages'	..	.001194	.000945	1.2636	..	..	..	..	..	..

The "married" include "widowed" and "divorced."

The graphs of the ratios of the death-rates of the "not-married" to the death-rates of the married are curve G for males, and curve F for females, Fig. 101.

18. **Exact ages of least mortality.**—The ages of least mortality appear to vary slightly, but cannot be ascertained with a very high degree of precision, owing to the limitations of the data. They may be taken, however, to be as follows :—

Males (Year)	1886.0	1896.0	1906.0	Females	1886.0	1896.0	1906.0
Exact Age	12.0	11.8	11.0	..	12.0	12.2	10.6
Death-rate	.00232	.00213	.00178	..	.00223	.00178	.00159
*General trend (.889)	.00232	.00206	.00183	(.830)	.00223	.00185	.00154
† or (.896)	.00231	.00207	.00185	(.823)	.00225	.00185	.00152

* Allowing twice the weight to the ratio for the 20-years period to that for the 10-years period.

† Allowing equal weight to the 20-years and 10-years periods. This result is less probable than the former.

These results, deduced from the values given in the Life Tables of the Australian Census, Vol. III., pp. 1209 to 1218, are probably nearly correct, and indicate a minimum mortality at "exact age" 11.6 for both males and females, and not only a less mortality, but also a greater improvement in the case of females : the factors for 10 years being respectively 0.889 and 0.830. These for 25 years would be respectively 0.745

and 0.628. The ratios of female to male deaths were—from the data—0.961, 0.836, 0.893 ; from the general trend—0.961, 0.898, 0.843. Thus the improvement increases at the rate indicated by multiplying by 0.99362 per annum, or by 0.938 for a 10-year period, that is as 0.959, 0.899, 0.843, at 1886, 1896 and 1906.

19. **General theory of the variation of mortality with age.**—From time to time attempts have been made to present a rational theory of the variation of the death-rate with age.[1] On the other hand it has been held that such attempts are merely efforts to clothe what is really an empirical " fitting of the curve," with a rational guise.[2] It is certain, however, that, in a general way, the aggregate of the menaces to life may be subsumed under certain elementary conceptions, which we now proceed to indicate. Actuaries have adopted the term "*force of mortality*," to denote the death-rate *at* a given age (*i.e.*, between the ages x and $x + dx$). This may be deemed to be *composite*, and to consist of several forces of mortality which, operating over a considerable range of ages, have their maximum effect, however, at different ages. Thus the deaths D_x of persons whose ages are (sensibly) x, in a population P_x of the same age (within the same limited age limits) is :—

$$(628).....D = P\ (\mu' + \mu'' + \mu''' + \text{etc.}) = P\mu$$

(with the same suffix—denoting age—throughout).

The following conception of the nature of the life-and-death struggle of a living organism represents the phenomena in a general way.[3]

(i.) The plasticity of an organism, *i.e.*, its modifiability in reacting to its environment, is a maximum at its origin,[4] and continually diminishes during life ;

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[1] Prof. Karl Pearson, adopting the "Vision of Mirza" conception, suggests an analysis by means of systems of progressive elimination, viz., first of deaths due to " old-age mortality," then those due to other elements, and finally those due to infantile mortality. He divided the deaths into five elements, viz. (i.) those from old-age mortality (mode, at age $72\frac{1}{2}$, mean, age $67\frac{1}{2}$) ; (ii.) those from middle-age mortality (mode, age 42) ; (iii.) those from mortality of youth (mode, age 23) ; (iv.) mortality of childhood (mode, age 23) ; and (v.) infantile mortality. This last should start—so it is averred—at $-$ 0.75, *i.e.*, nine months before birth. The "recorded deaths" are the post-natal, which to the ante-natal are as 246 : 605. See K. Pearson, " The Chances of Death," etc., Vol. I., 1897, pp. 1–41.

[2] Prof. Harald Westergaard says :—(See his paper on the "Scope and Method of Statistics," Journ. Americ. Stat. Assoc., Vol. XV., Sept., 1916, p. 254):—"Several mathematicians have erred in thinking that it would be possible to find a mathematical law of mortality, a physiological law, as it were. We have several formulas of this kind, by Lambert, Moser, Gompertz, Makeham. For a certain period of life Makeham's formula is exceedingly practical, *but after all it is only a beautiful formula of interpolation.*"

[3] It may be added that the similar problem *in utero*, though important to physiologists, can be solved only when a sufficient number of women, having become competent and interested observers of their own careers, supply the necessary data.

[4] This is probably a measure of the rapidity of metabolism in the organism.

(ii.) In virtue of its plasticity an organism is both *vulnerable* and *recuperable.*

(iii.) On "birth," *i.e.*, on the introduction into a new environment, the *inimical force*, *i.e.*, the difficulty of adjustment to the new environment, is very great, but this difficulty diminishes continually and with great rapidity. The initial difficulty of adaptation to the new environment may be called the *natal force of mortality.*

(iv.) This falls off so rapidly that it may be regarded as operating for the very limited number of days[1] that constitute what may be called the initial or *natal adaptative effort.*

(v.) The adaptation having been established, a new condition supervenes during which the mortality is markedly less, and characterises what may be called the *infantile adaptative effort*, covering roughly the first twelve months of life.

(vi.) The inimical force, now greatly diminished as a consequence of successful initial adaptation, may be called the *infantile force of mortality.* This, like the natal force of mortality, also degrades, but nothing like so rapidly.

(vii.) Since organic life is maintained in virtue of its plastic endowment (adaptability to its environment) the inimical forces (or measure of the difficulty of adaptation) increase continually from the moment of birth (or more strictly from the moment of origin *in utero*). This growing incapacity for adaptation may be called the *senile force of mortality.*

(viii.) The pressure put on the organism of social life (education, etc.), and by the arising of puberty, and the assertiveness of the reproductive forces, constitute an inimical force, characteristic of the period of life commencing in childhood and vanishing at the end of the disturbing (reproductive) period. This may be called the *genesic force of mortality.*

So far the consideration has embraced both sexes, but in the case of the female another force must be assumed, when a differentiation between reproductive and non-reproductive females is taken into account, viz., the following :—

(ix.) The exhaustion and general dangers of reproduction, initiating on reaching puberty, and continuing till the end of the reproductive period, constitute an inimical force which may be called the *gestate force of mortality.*

[1] From what has preceded, see § 11 of this part, it would appear that this is about 5 days.

(x.) There exist also dangers to life which are of a purely casual nature. The aggregate of these may be called the *adventitious force of mortality*. This, however, probably need not be separated from the other forces of mortality.[1]

These several forces of mortality can be so evalued as to be *additive* in character, as in formula (628), so that the (average) aggregate force of mortality is their sum. This aggregate of inimical forces thus gives the measure at any age of the force determining the rate of death for persons of the age in question. We shall later refer again to this element. We may also suppose that there are in addition what may be called *special forces of mortality*. The indication given may be regarded as the condition of things when general hygiene is fairly satisfactory throughout life. Not only, however, do individual instances differ from this, but so also do the characteristics of particular communities.[2]

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[1] The conception of life as a play between conservative and inimical forces has been presumed by some to be inadequate. Thus although the rapid diminution of the "natal" and "infantile" forces of mortality may be supposed to measure the quick and slower elements of the adaptation attained, the "secular" force of mortality specially characteristic of old age, to measure the decrease of adaptability, and the "genesic" and "gestate" forces of mortality—analogous to one another—to measure the stress put on the organism by the play of the reproductive function, and its consequential effects, entering as it were, as a disturbing factor the effect of which ultimately vanishes, yet there is another factor, acting throughout life, which, as Gompertz considered, is apparently independent of the progressive deterioration with age of the organism, and of course independent also of its adaptativeness. This chance element, viz., the "adventitious force of mortality," would, of course, include death by accident or misadventure, is certainly not a constant; it is a function of age, and differs strikingly as between the sexes. The real vicissitudes of life of a chance nature are, however, not on the average uniform, and probably are not very dissimilar in relative frequency to the relative frequency of death from such causes as have already been indicated. To the extent this is so they may, of course, be regarded as embraced in the other inimical forces.

In considering the whole question, it is to be remembered that we are not really dealing with individual lives, but with a *multiplex-organism*, viz., an aggregate of lives or population; and we are measuring the progressive reduction of that organism by the elimination of theoretically infinitesimal elements (removal by death). And from this point of view it is obviously *very doubtful whether the conception of an adventitious force of mortality is necessary at all*, and it is certain that to the extent the relative frequency conforms to the other types of inimical forces it may be regarded with advantage not as merely masked by, but included in them. Prof. Westergaard says, however, op. cit., p. 254: "If we seek a formula for the combined effects of all the causes in action, we run the risk of overlooking some, which it would really be exceedingly important to take into consideration."

[2] In Saxony, for example, the mortality apparently falls till the eighth day after birth after which there appears to be a recrudescence of mortality till the fifteenth or sixteenth day before the final continuous fall of the infantile mortality. In Sweden the mortality shews a less marked and irregular recrudescence till the twelfth or thirteenth day. In Australia the rapid fall continues till the end of the fourth or fifth day, then continues at somewhat the same rate for twelve months. Thus for the *period of high infantile mortality* Australia seems normal for good infant hygiene, Sweden more normal than Saxony, and Saxony abnormal, *i.e.*, the infant hygiene is probably not at all good. From this it is obvious that each large population will probably have to be treated independently in regard even to the *form* of the curve representing the earlier stages of the force of *infantile mortality*. This has already been shewn, see pp. 389-392.

20. **The Gompertz-Makeham-Lazarus theory of mortality.**—In 1825, B. Gompertz,[1] suggested that death was possibly " the consequence of two generally coexisting causes," viz. : (i.) *Chance*, without previous disposition to death or deterioration ; and (ii.) *Deterioration*, or lessened ability to withstand destructive agencies. Assuming that exhaustion of the resisting power to disease proceeds in constant ratio for equal increments of age, that is, that the *force of mortality* increases in geometrical progression, he deduced his well-known formula, viz. :—

$$(629)\ldots\ldots \mu_x = -\frac{1}{l_x}.\frac{dl_x}{dx} = Bc^x$$

B and c being constant, independent of the age (x), and determinable from the data of a mortality table, l_x being the number living at the age x, and dl_x the change in l_x in the time (*i.e.*, change of age) dx.

In January 1860, Makeham, having examined a number of mortality tables for the ages 20 to 80, found it was necessary to modify the Gompertz formula. He shewed that, for the age-period mentioned, the so-called " force of mortality," μ_x, as given in several *mortality tables*, could be closely represented without changing the constants of formula (629) by adding a constant A, viz., by an expression of the form :—

$$(629a)\ldots\ldots \mu_x = A + Bc^x.$$

in other words, the force of mortality, assumed by Gompertz to be a geometrical progression, should, according to Makeham, be represented by a geometrical progression plus a constant.

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[1] Gompertz shewed that if the chance of disease were equal at all ages, and if its effect were independent of age, then it would follow that the number of living and dying, as the age increased in arithmetical progression, would decrease in geometrical progression. But, if liability to death increased with age, the number living would diminish faster than in geometrical progression. He observed that, although the hypothesis was not an " unlikely supposition with respect to a great part of life, the contrary appears to take place at certain periods " ; see his paper " On the Nature of the Function expressing the Law of Human Mortality," read before the Roy. Soc., Lond., 16th June, 1825, and appearing in the Phil. Trans., 1825, pp. 513-585. He had given an earlier paper (June 29th, 1820) at the same society, entitled "A Sketch of an Analysis and Notation applicable to the Estimates of the Value of Life Contingencies." Phil. Trans., Pt. I., 1820, pp. 214-294. This obviously led to the later ones ; see also a supplement to both read 20th June, 1861, and published in the Phil. Trans., 1862, Vol. 152, pp. 511-559. Prof. De Morgan discussed Gompertz's view ; see " On a Property of Mr. Gompertz's Law of Mortality," Journ. Inst. Actuaries, Vol. VIII., July 1859, pp. 181-184 ; and also Phil. Mag., Nov. 1839. To represent number living at age x, Prof. De Morgan used :—

$$l_x = e^{k+be^x} = dg^{q^x} \text{ where } d = e^k\ ,\ g = e^b\ ,\ q = e^c$$

Later, viz., 1839, Ludwig Moser published in Berlin his " Die Gesetze der Lebensdauer.

Later he discovered that a further modification, viz., the introduction of a term Cx, that is, an arithmetical progression, gave the formula a wider extension. Thus his second modification was the expression :—

$$(629b)\ldots\ldots \mu_x = A + Cx + Bc^x.$$

The significance of expressions of this type is seen at once from (630) hereinafter, that is :—

$$(629c)\ldots \log_e y = -\int Bc^x dx = K - \frac{B}{\log c} c^x \text{ ; or } y = kg^{c^x}$$

according to Gompertz ; or

$$(629d)\ldots \log_e y = -\int (A + Bc^x)dx = K - Ax - \frac{B}{\log c} c^x \text{; or } y = ks^x g^{c^x}$$

according to Makeham's first modification of Gompertz's formula ; and

$$(629e)\ldots \log_e y = -\int (A + Cx + Bc^x)dx = K - Ax - \tfrac{1}{2}Cx^2 - \frac{B}{\log c} c^x;$$
$$\text{or } y = ks^x h^{x^2} g^{c^x}$$

according to Makeham's second modification.

In these K is merely an integration constant, and is equal to $\log_e k$, and $\log_e g = -B/\log_e c$; $\log_e s = -A$; $\log_e h = -\frac{1}{2}C$.

More recently Wilhelm Lazarus, of Hamburg,[1] and later Vitale Laudi,[2] of Trieste, in order to embrace results for earlier ages, abandoned the arithmetical progression represented by the term Cx, and introduced in its place a second geometrical progression making the form of the instantaneous rate of mortality.

$$(629f)\ldots\ldots \mu_x = A + Gb^x + Bc^x.$$

C. H. Wickens has shewn that, for Australia, infantile mortality from birth to age 5 is well expressed by a formula of the type of Makeham's second modification of the Gompertz formula[3] ; see also § 20 hereinafter.

An expression is general, however, if it cover the whole range of life with the one series of constants for any particular epoch : this none of the formulæ will do with the number of terms adopted. Before further developing the matter we shall consider the nature of a constant population, the death-rates of which are also constant.

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[1] See Uber Mortalitätsverhältnisse und ihre Ursachen, Hamburg, 1867. Lazarus' paper was translated by T. B. Sprague, M.A. ; see Journ. Inst. Act., Vol. XVIII., pp. 54-61 ; 212-223. T. S. Lambert published an article on Longevity, in 1869, New York.

[2] In a publication, " Die Rechnungsgrundlagen der k.k. priv. Assicurazioni Generali in Triest," a very concise exposition is given of the biologic basis of the fundamental formula under the title " Die biologische Begründung der Ausgleichungsformel nach Lazarus," See § 2, pp. xxiv.-xxix.

[3] See " Investigations concerning a Law of Mortality," C. H. Wickens, A.I.A., Journ. Aust. Assoc. Adv. Sc. XIV., pp. 526-536.

21. **Theory of an "actuarial population."**—Consider an indefinitely large group of persons, who born at a given moment, are then subject to death, the rate of which (governed solely by age) is characteristic of their environment (and period). If this group be neither increased nor diminished by emigration, and as age increases be lessened only by death, the proportion of survivors at each age may be regarded as furnishing the relative numbers of what may be called an *actuarial population*. A population so constituted plays an important part in actuarial investigations as to the probability of death according to age, and has also been called a "*constant population*."

Let the *ratio* of such a population after the period x has elapsed, P_x say (the members now being all of age x) to the initial population, viz., that at age 0, P_0 say, be denoted by y_x; that is, let $y_x = P_x/P_0$; then initially y, or $(y_0) = 1$ and $1-y_x$ will denote the ratio of the aggregate of deaths up to the age x.

Let $\mu = \phi(x)$ denote the *rate* per unit of time[1] at which death occurs at the "exact age" x; then the number dying in a unit of time, whose ages are between x and $x + dx$, is the number living between those age-limits, multiplied by the rate of dying, that is, $y\mu\ dx$. Thus if μ be regarded as positive

$$(630)\ldots\ldots -dy = y\mu dx;\ \text{or}\ \frac{dy}{y} = -\phi(x)\,dx$$

By integration we obtain :—

$$(631)\ldots\ldots \log y = -\int \phi(x)\,dx:\ \text{or}\ y = e^{-\int \phi(x)\,dx}$$

Equations (630) and (631) are the bases of the theory of an "actuarial population." The number of survivors at each age obviously depends on the form of $\phi(x)$, and is completely determined when that function is known. Various forms that have been adopted for $\phi(x)$, and their integrals have already been given, formulæ (629) to (629*f*).

The probability at birth, of living to age x is y_x, as given by (631) above. The probability of dying before age x (ν_x, say), is the arithmetical complement of the probability of living, viz., $1-y_x$; that is :—

$$(632)\ldots\ldots \nu_x = 1 - y_x = 1 - e^{-\int \phi(x)\,dx}$$

Similarly the probability (p_x) of persons of age x living to age $x+1$ and (q_x) that of dying before that age, are respectively :—

$$(633)\ldots\ldots p_x = (y_{x+1})/y_x;\ \text{and}\ q_x = (y_x - y_{x+1})/y_x = 1 - p_x.$$

The *average of the death-rates* (M) of persons dying between ages x_1 and x_2 is :—

$$(634)\ldots\ldots \mathrm{M} = \frac{1}{x_2 - x_1}\int_{x_1}^{x_2}\mu\,dx = \frac{1}{x_2 - x_1}\int_{x_1}^{x_2}\phi(x)\,dx$$

[1] Which may be a day, month, year, etc., but is usually a year

When the range of ages is a unit (or 1 year) we shall denote this quantity by the letter (m). The *group-rate of mortality* (M) for persons dying between the ages x_1 and x_2, is the ratio of the total deaths between the ages in question occurring in a unit of time, to the average population from which the deaths are drawn ; that is :—

$$(635)..M = \frac{y_2 - y_1}{\frac{1}{x_2 - x_1}\cdot\int_{x_1}^{x^2} y\,dx} = \frac{e^{-\int\phi(x_2)dx} - e^{-\int\phi(x_1)dx}}{\frac{1}{x_2 - x_1}\int_{x_1}^{x^2} e^{-\int\phi(x)dx}\,dx}$$

When the group-rate of mortality is taken through a range of age, of one year only, it is known actuarially as the *central death-rate* (m) of the year in question. In this case $x_2 - x_1$ is unity, and disappears in the above expression, and $y_2 = y_1 + 1$. Since through the greater part of life μ does not change very rapidly, $\mu_{x+\frac{1}{2}}$ is approximately equal to m_x, the group-range being really from *exact* age x to exact age $x+1$, and M for a range of k years will—to a very rough approximation—be km.

If, for so small a range of age as one year, it be assumed that the mean population is the mean of the populations at the beginning of, and end of the year of age (which is sensibly correct for a considerable range of the table [1]) the following relations hold between m, m, and μ :—

$$(636)....\mathrm{m} = \mathrm{colog}_e\, p = -\log(1-q) = q + \tfrac{1}{2}q^2 + \tfrac{1}{3}q^3 + \tfrac{1}{4}q^4 + \ldots$$

$$(637)....m = 2q/(2-q) = q_x(1-\tfrac{1}{2}q) = q + \tfrac{1}{2}q^2 + \tfrac{1}{4}q^3 + \tfrac{1}{8}q^4 + \ldots$$

$$(638)....\mu_{+\frac{1}{2}} = \qquad\qquad = q \pm \epsilon$$

in which last expression ϵ is usually very small, but is not readily susceptible of any general expression, and must be specially determined for the very early and very late stages of life.

The *instantaneous rate of mortality* μ, at any exact age, is, of course, not immediately furnished by statistical data, but has to be deduced therefrom. It is the value of M in equation (634) or of M in equation (635) when x_1 and x_2 become identical.

22. **The relation between the mortality curve and the probability of death.**—The relation between μ_x and q_x may be established as follows : For any limited range of ages, excepting during the first year of life, the instantaneous mortality may be put in the form $\mathrm{A} + \mathrm{B}\,\mathfrak{m}^\chi$, the integral of which is $\mathrm{C} + \mathrm{A}\chi + \mathrm{B}\mathfrak{m}^\chi/\log_e \mathfrak{m}$. If three successive values of μ for equal changes of age are μ_0, μ_1 and μ_2, then we shall have [2] :—

$$(639).....\mathrm{A} = \frac{\mu_2\mu_0 - \mu_1^2}{\mu_2 - 2\mu_1 + \mu_0}\ ;\quad \mathrm{B} = \frac{(\mu_1 - \mu_0)^2}{\mu_2 - 2\mu_1 + \mu_0};$$

$$(640).....\mathfrak{m} = \frac{\mu_2 - \mu_1}{\mu_1 - \mu_0}\ ;\ \mathfrak{m} - 1 = \frac{\mu_2 - 2\mu_1 + \mu_0}{\mu_1 - \mu_0} = \mathfrak{n}$$

[1] See Census Report, Vol. III., pp. 1215-6, for example.

[2] For greater precision, three values one place earlier, μ_{-1}, μ_0 and μ_1 can also be taken, and the corresponding values of A′, B′, $\mathfrak{m}'$ and $\mathfrak{n}'$ computed, entering the corresponding values of μ (the suffixes of which are unity less than those given). Thus for the stretch μ_0 to μ_1 the mean of the two results will—in general—be more accurate than either. Geometrically this is very simple ; $\mathfrak{m}$ is the ratio of the *differences* of the rates of mortality : so long as the differences are in constant ratio the one value $\mathfrak{m}$ applies.

If the successive values of μ are for ages k years apart, then the values of A and B remain unchanged for values one year apart, but the value of $\mathfrak{m}$ for 1 year, $\mathfrak{m}_1$ say, is $\mathfrak{m}_1 = \mathfrak{m}_k^{\frac{1}{k}}$ or $\mathfrak{m}_1{}^k = \mathfrak{m}_0$. This quantity is, of course, always positive, being greater than unity for an ascending curve, and less than unity for a descending curve. The use of the quantity $\mathfrak{n}$, enables $\log \mathfrak{m} = \log (1 + \mathfrak{n})$ to be conveniently expanded in the series $\mathfrak{n} - \frac{1}{2}\mathfrak{n}^2 + \frac{1}{3}\mathfrak{n}^3 -$ etc., which is convenient when $\mathfrak{n}$ is small.

Although the above expression for the curve is simple, yet when the value of the integral is applied to (635) in order to find the *average population*, it leads to an arithmetically intractable expression.[1] Consequently a direct general expression for p_x and q_x is not readily obtained in terms of μ. It is usual in actuarial computation to compute the Gompertz-Makeham constants from the values of μ and to find p and q from the values of y (that is, from l_x and l_{x+1}). The relation can, however, be obtained in quite another way. Put

$$(641) \ldots\ldots q = \gamma q' = \gamma \cdot \tfrac{1}{2}(\mu_x + \mu_{x+1});$$

then γ is a correction factor to what is ordinarily an approximate value. It can be computed and entered in a double-entry table for a suitable range of values of $\kappa = \mu_{x+1}/\mu_x$, and a suitable range of values of μ. Such a table would admit of q being readily and accurately found by interpolations, and would simplify the computations of life-tables. Similarly tables could be constructed in which the arguments were m_x, and the ratios $\kappa' = m_{x+1}/m_x$. This, however, will not be dealt with further in this article.

In *actuarial notation*,[2] l_x, the relative number of persons living at age x is so expressed that l_0 is 100,000, 10,000, or some such large unit;

---

[1] Put $\mathrm{K} = e^{-\mathrm{C}}$; $\alpha = e^{-\mathrm{A}}$; $\beta = e^{-\mathrm{B}/\log_e \mathfrak{m}}$, then

$$\int e^{-\left\{\mathrm{C}+\mathrm{A}\chi+\mathrm{B}\mathfrak{m}^\chi/\log_e \mathfrak{m}\right\}} dx = \mathrm{K}\int \alpha^\chi \beta^{\mathfrak{m}^\chi}\, d\chi = \mathrm{K}\int e^{-z}\, d\chi$$

Let $\alpha = \mathfrak{m}^t$ and $\beta\mathfrak{m}^\chi = e_\chi^{-v}$, consequently taking logarithms $\mathfrak{m}^\chi \log_e \beta = 1$. Differentiating $\mathfrak{m}^\chi \log_e \mathfrak{m} \log_e \beta . d\chi = dv = v \log_e \mathfrak{m}\, d\chi$ (by substitution).

$$\alpha^\chi = \mathfrak{m}^{t\chi} = (\mathfrak{m}^\chi)^t = (v/\log_e \beta)^t \text{ ; consequently}$$

$$\int \alpha^\chi \beta^{\mathfrak{m}\chi}\, d\chi = \int (v/\log_e \beta)^t \cdot e^v \cdot dv/v \log_e \mathfrak{m} = \frac{1}{(\log_e \beta)^t \log_e \mathfrak{m}} \int e^v v^{t-1}\, dv;$$

the value of the integral being $e^v [v^{t-1} - (t-1) v^{t-2} + (t-1)(t-2) v^{t-3} -$ etc.] which gives the required values, if it be remembered that when $x = 0, 1,$ etc. $v = \log_e \beta, m \log_e \beta,$ etc., respectively.

Neglecting the C term we have, however, by expansion,

$$\int e^{-z} d\chi = \int [1 - \mathrm{A}\chi + \tfrac{1}{2}\mathrm{A}^2\chi^2 - \tfrac{1}{6}\mathrm{A}^3\chi^3 + \ldots. - (\beta + \mathrm{A}\beta\chi - \tfrac{1}{2}\mathrm{A}^2\beta\chi^2)\mathfrak{m}^\chi + \tfrac{1}{2}(\beta^2 - \tfrac{1}{2}\mathrm{A}\beta^2\chi)\mathfrak{m}^{2\chi} + \tfrac{1}{6}\beta^3\mathfrak{m}^{3\chi} - \text{etc.}]\, d\chi.$$

which can be integrated term by term.

[2] Ordinarily actuarial methods are based upon the algorithms of "finite-differences." The connection between these and infinitesimal methods has been dealt with in a paper entitled "On the relation between the theories of compound interest and life contingencies," by J. M. Allen, F.I.A.; see Journ. Inst. Act., Vol. xli., pp. 305-337; see also discussion pp. 337-348, and particularly that by D. C. Fraser.

d_x denotes the number of persons dying between ages x and $x + 1$; and similarly :—

$$(642)\ldots\ldots p_x = \frac{l_{x+1}}{l_x}\ ;\ \text{and}\ q_x = \frac{l_x - l_{x+1}}{l_x} = \frac{d_x}{l_x}$$

$$(643)\ldots\ldots m_x = \frac{d_x}{l_{x+\frac{1}{2}}}\ ;\ \text{and}\ p_x = \frac{2 - m_x}{2 + m_x}$$

Also, since p and q are arithmetical complements,

$$(644)\ldots\ldots q_x = \frac{2m_x}{2 + m_x}\ ;\ \mu_x = -\frac{1}{l_x}\cdot\frac{dl_x}{dx} = -\frac{d}{dx}(\log\ l_x)^1$$

23. **Limitations of the Gompertz theory and of its developments.**— The conception put forward by Gompertz, and the modifications of that conception by Makeham, have, as already stated, been again modified by Laudi and Lazarus, who, to embrace results for earlier ages, replaced Makeham's result by putting for the value of the number living :—

$$(645)\ldots\ldots y_x = l_x = kH^{\beta^x} s^x b^{c^x}.\ ^2$$

More recently C. H. Wickens has shewn that a similar type of expression fits ages up to age five.[3]

These formulæ, however, cannot be made to conform to the whole range of facts, viz., from the earliest to the latest ages, as has already been shewn. Although Mr. Wickens has shewn that, in a general way, a curve of the Gompertz-Makeham type represents the facts for the first few years of life, the formulae given do not conform to the details of the first twelve months of life : in short, it is not consistent with the " natal"

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[1] It is generally assumed that $m_x = \mu_{x+\frac{1}{2}}$ approximately, the approximation being quite as accurate as the data. Approximations of greater precision are given in the Text Book of the Institute of Actuaries II., 1887 Edit., p. 25, and by later writers.

[2] Laudi and Lazarus gave the value 1.291219 to H and 0.4 to b, which give factors that become sensibly unity when x is 15. Thus the term for age 15 is 1.000000274, and for age 20 is 1.00000000281. For age 1, however, the term is as high as 1.1076433.

[3] Mr. Wickens' formula gives for the h term (hx^2) and for ages up to 5, the following values for h, viz., 1.00056 for males, and 1.00037 for females, which are obviously not in good agreement with the value 1.1076433 mentioned above for age 1.

Mr. Wickens, putting—

$$A = -\log_e s = \frac{1}{M}(\alpha - \tfrac{1}{2}\gamma)\ ;\ B = -\log_e c \log_e g = \frac{\beta \log c}{M^2 (c-1)}\ ;\ \text{and}$$

$$C = -2\log_e h = \gamma/\mathrm{M}\ ;\ \text{in which}$$

$$\alpha = -(\log s + \log h)\ ;\ \beta = -(c-1)\log g\ ;\ \text{and}\ \gamma = -2\log h\ ;$$

M denoting log$e$, *i.e.*, 0.4342945, gives the result in the form :—

$$\mu_x = 0.00816 - 0.00113x + 0.21971^{0.124532x}\ ;\ \text{for males.}$$

$$\mu'_x = 0.00645 - 0.00074x + 0.17199^{0.148722x}\ ;\ \text{for females.}$$

the fit being excellent. See also "Assurance Magazine" (Journ. Inst. Act.), Vol. X., pp. 283-5, 1862. (Letter dated 15th August, 1861).

or "infantile" forces of mortality, as is evident from Fig. 101, p. 319. Formulae of that type can, of course, be made to represent the earlier features of the curve of mortality, viz., the natal and infantile and earlier forces of mortality, that is, the Lazarus-Laudi scheme of addition can be extended, the effect of the earlier terms disappearing when we please. This would give a complete general formula of the type

$$(646)\ldots\ldots \mu_x = a + bc^x + \beta\gamma^x + BC^{\alpha x} + \ldots + Sx^s + Tx^t + \ldots$$

It will be found hereinafter that a somewhat different conception already outlined in § 19 really accords with the facts, and it may be added that Westergaard's opinion that the formulae are really empirical, is substantially supported by the analysis.

24. **Senile element in the force of mortality.**—The senile element in the force of mortality may be assumed to operate from birth, with, of course, increasing potency as age advances. Initially it clearly ought to be zero, and thus it can be simply expressed by[1] :—

$$(647)\ldots\ldots \mu_s = Sx^s, \text{ or } \log \mu_s = \log S + s \log x.$$

Applying this gives for male and female senile death-rates, respectively :—

$$(648)\begin{cases} \text{Males } u = 0.0^{13}\,06100\,x^{5.9671}\ ; \quad \text{females } = 0.0^{13}\,2826\,x^{6.6189}\ ; \text{ or} \\ \text{,, } \log \mu = \overline{13}.78533 + 5.9671 \log x\ ; \text{ ,, } = \overline{14}.45117 + 6.6189 \log x, \end{cases}$$

and they give a common value 0.99844 for the annual rate of mortality at age 111.40 years. These formulæ give the results in columns (ii.) and (vii.) of Table CXLVIII., p. 413. To find log. S we have :—

$$(649)\ldots \log S = \log \mu_1 - \log x_1\,[(\log \mu_2 - \log \mu_1)/(\log x_2 - \log x_1)],$$

[1] This was decided upon empirically after examining the applicability of other forms. For example, if senile impairment *accumulated* at a constant rate, it would be expressed by $Se^{\sigma x}$. If the accumulated effect accelerated with age, a linear acceleration would require $Se^{\sigma x^2}$. Thus the index 2 would be too great if the acceleration were greater than linear, and too small if it were more rapid than linear. $Se^{\sigma x^s}$ was examined : this gave ${}_2\mu_s \,/\, {}_1\mu_s = e^{\sigma(x_2^s - x_1^s)}$ and $d\mu \,/\, dx = S\sigma s e^{\sigma x^s} x^{s-1}$. The value of σ may be readily found by means of a table of values of the x term (in brackets) for various values of s. Taking $S = .0021852$, $\sigma = 0.00064$, and $s = 2$ gave, for "persons"

	Age	0.	7.5	12.5	17.5	. . .	52.5	57.5	62.5	67.5	72.5	77.5	82.5
Calc.	μ	.0022	.0023	.0024	.0027		.0128	.0181	.0266	.0404	.0632	.102	.170
Data	μ	—	—	—	—		.0129	.0182	.0268	.0345	.0631	.103	.162

The result is obviously too high for early ages, when s was made unity. Formulæ of the type $Sx^{\sigma x}$ are inappropriate between 0 and 1, because x^x has a minimum at $x = .03678794$, i.e., $1/e$, when its value is 0.6922007. $S\,(e^{\sigma x^s} - 1)$ would, however, probably be satisfactory from age 1 onwards.

s being the quantity in the square brackets. It would probably be preferable to adopt a mortality curve for the older ages, passing *among* the points given by the relatively meagre and uncertain data, than to follow them closely, since the general indication is probably the more reliable.

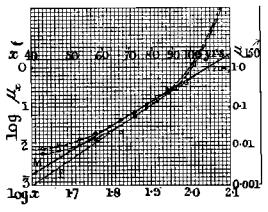

Fig. 102.

The curves shew the senile element in mortality.

The fit of the formula to the data is shewn on Fig. 102, on which the lines represent the logarithmic homologues of the senile curves, the small circles denoting the data for males and the small squares those for females.

25. **The force of mortality in earlier childhood.**—The rates of mortality from age 1.5 to 7.5 were as follow from 1907-1915 in Australia:—

Ages (years)	0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5
Males ..	.07608	.01550	.00641	.00408	.00301	—	—	.00220
Coefficient		.204	.414	.637	.738	.731		
Females	.06156	.01380	.00574	.00381	.00300	—	—	.00200
Coefficient		.224	.376	.652	.791	.667		

No elementary function will satisfactorily represent these results with precision.[1] The following results, however—empirically found—reproduce the data almost exactly, and shew the fluctuating character of the value of e^{-b} in the expression e^{-bx}, which would represent the curve:—

TABLE CXLVII.—Rates of Mortality in Childhood. Australia, 1907-15.

Exact Age.	Males.	Females	Exact Age.	Males.	Females	Exact Age.	Males.	Females
0.5	.07608	.06156	4.5	.00304	.00300	8.5	.00208	.00185
	.408	.428		.938	.935		.970	.970
1.0	.03104	.02635	5.0	.00285	.00281	9.0	.00202	.00179
	.500	.524		.940	.935		.970	.970
1.5	.01552	.01381	5.5	.00268	.00262	9.5	.00196	.00174
	.596	.610		.946	.935		.970	.970
2.0	.00925	.00842	6.0	.00253	.00245	10.0	.00190	.00169
	.692	.681		.952	.935		.970	.970
2.5	.00640	.00574	6.5	.00240	.00229	10.5	.00184	.00164
	.762	.772		.962	.935		.970	.970
3.0	.00488	.00443	7.0	.00229	.00214	11.0	.00179	.00159
	.832	.862		.970	.935		.970	.970
3.5	.00406	.00382	7.5	.00221	.00201	11.5	.00173	.00154
	.852	.878		.970	.955		1.000	1.000
4.0	.00346	.00335	8.0	.00214	.00191	12.0	.00173	.00154
	.879	.895		.970	.965			

NOTE.—The small figures are the ratios which multiplied into the values immediately above them give those immediately below.

[1] We have seen in § 11 that, for the greater part of first year of life, $\mu = \mu_0 [1 + f(x)] / x$, and that toward the end of the first year $f(x)$ is large—about 4—compared with unity. Also it is evident from curve A′, Fig. 101, that it is approximately a constant at about 320 days to perhaps 400 days, thus $\mu = 5\mu_0 / x$, and would appear to have become constant at least for some range of x. Such, however, is not the case. If it were we should have $x\mu_x = k [1 + f(x)]$ a constant. We obtain, however, the following results :—

.03808	.02325	.01602	.01428	.01354	—	—	.01650
.03078	.02070	.01435	.01333	.01350	—	—	.01500

which shew that $1 + f(x)$ is not expressible by any simple relation. The results for males for $2\frac{1}{2}$, $3\frac{1}{2}$, and $4\frac{1}{2}$ years can be expressed by $\mu_x = \mu_0 e^{-ax^b}$, and for females this expression is also fairly approximate.

26. **Genesic and Gestate elements in mortality.**—If the infantile and juvenile, and the senile elements of the mortality be subtracted from the totals, the residuals will constitute the genesic element in the case of males, and the gestate elements in the case of females. The rate of diminution seemed to be constantly 0.97 per half-year (see Table CXLVII., p. 412) from age 8.5 to 11.5 for both sexes. This is equivalent to 0.73752 for 5 years, and the adoption of this gives the results in columns (iii.) and (viii.) of Table CXLVIII. This may be regarded as the measure of degradation of the power of adjustment to environment. The residuals smoothed as shewn on Fig. 103, are given in columns (iv.) and (ix.). On this figure the heavy curve, M, denotes results for males, and the light one, F, results for females. The computed mortality curves and those given by the crude data, are shewn in columns (v.) and (vi.) for males, and columns (x.) and (xi.) for females. The agreement in general is fair up to 62.5 years. Afterwards the results diverge somewhat. It has, however, to be remembered that these divergencies are not really large, and do not make large differences as between the computed and actual numbers of deaths.

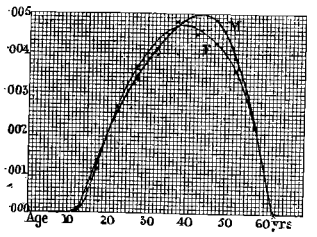

Fig. 103.

The curves shew the genesic (M) and gestate (F) elements in mortality.

TABLE CXLVIII.—Illustrating the component-elements of the Force of Mortality. Australia, 1911.

	Male Rates of Mortality, × 100,000					Female Rates of Mortality, × 100,000.				
	Senile Element.	Juvenile Element.	Genesic Sm'thd.	Total. (Computed.)	Total. Observed.	Senile Element.	Juvenile Element.	Gestate Sm'thd.	Total. (Computed.)	Total. Observed.
(i.)	(ii.)	(iii.)	(iv.)	(v.)	(vi.)	(vii.)	(viii.)	(ix.)	(x.)	(xi.)
2.5 ..	0	640	0	640	641	0	574	0	574	574
7.5 ..	0	221	0	221	220	0	201	0	201	200
12.5 ..	0	163	10	173	173	0	149	4	153	153
17.5 ..	2	120	133	255	255	0	110	120	230	220
22.5 ..	7	89	252	348	364	3	81	268	352	341
27.5 ..	24	65	343	432	432	10	60	366	436	433
32.5 ..	64	48	413	525	508	29	44	435	508	475
37.5 ..	151	36	467	654	666	74	33	467	574	586
42.5 ..	318	26	497	841	841	170	24	462	656	641
47.5 ..	617	19	484	1,120	1,122	354	18	426	798	796
52.5 ..	1,121	14	387	1,522	1,522	686	13	356	1,055	1,057
57.5 ..	1,930	11	220	2,161	2,161	1,254	10	215	1,479	1,479
62.5 ..	3,173	8	3	3,184	3,179	2,177	7	3	2,187	2,181
67.5 ..	5,022	6	0	5,028	4,693	3,623	5	0	3,628	2,201
72.5 ..	7,693	4	0	7,697	7,034	5,814	4	0	5,818	5,580
77.5 ..	11,455	3	0	11,458	11,136	9,041	3	0	9,044	9,379
82.5 ..	16,635	2	0	16,637	17,387	13,674	2	0	13,676	15,026
87.5 ..	23,632	2	0	23,634	27,557	20,188	2	0	20,190	22,492
92.5 ..	33,926	1	0	33,927	31,673	29,161	1	0	29,162	30,007
97.5 ..	45,071	1	0	45,072	40,475	41,314	1	0	41,315	39,873
02.5 ..	60,744	1	0	60,745	1.23393	57,531	1	0	57,532	1.16876

27. **Norm of mortality-rates.**—A study of mortality rates for the same country at different times, and for various countries, shews that the real nature of the mortality curve will probably be revealed only by

obtaining a norm of mortality rates on a wide basis. Such a norm would necessitate a compilation for a large series of populations, of the following data, viz. :—

(*a*) *Infantile deaths* according to *hours* for the *first week* of life ; then according to *days* for the *first month* of life : and according to *weeks* for the balance of the year.

(*b*) *Deaths in childhood* according to *months* for the second year ; and according to *quarters* for the third year and afterwards ;

(*c*) annually—or better *semi-annually*—till 15.

Afterwards the annual number of deaths.

The "number living" would preferably be deduced for the first 12 months (making corrections, however, for migration), by subtracting the deaths from the recorded births. Afterwards, or at any rate after the second year, the census data would in most cases be preferable to use.

The combination of a large number of results, viz., all deaths in any age-group, and the sum of the populations in the same age-group from which such deaths were drawn, would probably disclose the true laws of the incidence of death. Only in large bodies of figures can it be hoped that the minor chance influences will counteract one another.

28. **Number of deaths from particular causes.**—The actual numbers of deaths according to sex and age, which occurred in Australia during the 9 years 1907-1915 from various causes, were as shewn in the following table, viz., No. CLXIX., their relative frequency from all causes together, but retaining the age-groups, that is their ratios to the totals for the same sex, being shewn on the last two lines, see pp. 416-417 :—

29. **Relative frequency of deaths from particular diseases according to age and sex.**—If for each sex and for each age-group in that sex, the number of deaths from each cause be divided by the total deaths from all causes, the quotients are the relative positions of the disease as regards their contribution to the totality of deaths. Thus they measure the gravity of the incidence of any disease in question. This has been done and the results are shewn in Table CL., on pp. 418-419.

30. **Death-rates from particular diseases according to age and sex.**—It has already been pointed out that the incidence of death according to sex, has diverse characters as regards its relation to age ; see § 12, p. 393 hereinbefore. If the ratio of the number of deaths which occur in one year from any disease, in any age-group, and for either sex, to the average number of persons of the same sex in the age-group be found, this ratio will be the annual death-rate for the particular disease in question.[1] Thus the ratios are exactly analogous to the values with accents in (628) of § 19, p. 402 ; that is, they are the individual components of the death-rate for the same sex and age-group. They represent the ratio of the number of persons of a particular age-group who will (probably) die of the particular disease in question during the one year. These ratios, multiplied by 1,000,000, are shewn in Table CLI. and are thus the (partial) death-rates for each disease and for the two sexes, see pp. 420-421.

The forms of the rate-of-mortality curves for each disease are shewn on Fig. 104, the heavy lines denoting the curves for males and the lighter line those for females. They illustrate the marked differences in the incidence of death as between the sexes for the same disease, and according to age as between different diseases.

31. **Rates of mortality during the first twelve months of life.**—The incidence of death during the first twelve months of life is so varied that the means for the successive years 0, 1, 2, 3, etc., cannot be regarded as giving a satisfactory indication in regard thereto. Even in the first month of life, the frequency of deaths greatly varies for the successive weeks therein, so that a month is clearly too large a unit to adopt for rigorous results. Consequently, a tabulation for the first four weeks is necessary as well as for each of the succeeding eleven months. The population on which the ratios were based was 399,823 male births, and 38,027 females, which was reduced by the deaths themselves and increased by the net immigration of the same sex.[2]

[1] The sum of the mean populations for each sex and for the 9 years under review were distributed according to the Census of 1911, the middle year. This gave the divisors by means of which the rates were computed.

[2] The immigration is by no means wholly negligible for accurate results : thus it was estimated to be—for each sex—267 for the eleventh to the twelfth month, while the deaths were : males, 933 ; females, 768. Its neglect does not, however, obviously make a large error, since the deaths are drawn mainly from those born in the country under consideration.

TABLE CXLIX.—Actual Number of Deaths in Australia according to Cause, Age, and Sex, during 9 Years, 1907-1915.

Cause	Sex	AGES. 0	1	2	3	4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 99	100 and over	Total. †
1 Typhoid Fever ..	M	8	10	8	16	14	88	134	390	732	653	418	325	238	196	127	71	50	28	13	6	3	1	0	0	0	3,529
	F	5	6	14	18	17	84	203	346	348	263	168	134	99	82	58	34	15	16	13	1	1	3	0	0	0	1,928
5 Measles	M	209	315	146	56	34	100	19	25	60	19	15	7	4	8	11	6	1	3	3	1	2	0	0	0	0	1,044
	F	171	240	108	62	35	103	24	30	18	20	16	17	11	12	6	5	3	2	3	1	0	1	0	0	0	888
7 Whooping Cough* ..	M	1,127	359	101	49	27	44	1	0	0	1	0	0	0	0	0	1	1	1	0	3	0	0	0	0	0	1,715
	F	1,263	406	157	65	31	61	3	1	1	2	0	0	0	0	0	2	1	1	0	0	0	0	0	0	0	1,994
8 Diphtheria and Croup..	M	183	380	370	405	301	787	186	52	20	17	10	8	7	3	4	5	2	1	0	2	0	1	0	0	0	2,744
	F	134	309	338	324	309	961	209	70	26	20	11	12	8	3	5	2	3	1	0	1	0	0	0	1	0	2,747
9 Influenza*	M	183	41	17	16	11	34	17	44	52	62	42	79	94	124	108	112	116	171	228	243	178	80	36	6	0	2,094
	F	129	41	18	12	5	43	28	37	63	49	45	69	53	68	80	66	119	174	246	290	161	98	35	9	2	1,940
12 Other Epidemic Diseases*	M	135	29	11	5	7	16	15	35	80	91	57	61	72	76	83	67	75	77	92	72	52	28	11	2	1	1,250
	F	114	19	16	9	11	12	13	22	28	31	32	13	21	43	46	19	49	58	56	66	38	19	4	3	0	742
13 Tuberculosis of the Lungs	M	77	71	27	16	6	62	105	595	1,391	1,781	1,812	1,868	1,799	1,843	1,574	1,109	771	576	321	135	37	15	2	0	0	15,993
	F	67	47	22	19	14	76	225	1,112	1,978	2,118	1,626	1,371	1,078	866	540	392	311	271	158	68	26	3	1	0	0	12,389
14 Tuberculous Meningitis	M	190	174	113	59	54	139	72	51	35	43	35	25	19	20	5	4	2	1	0	1	0	0	0	0	0	1,042
	F	147	155	99	75	46	140	81	81	63	36	25	13	10	7	5	5	1	1	1	0	0	0	0	0	0	991
15 Other forms of Tuberculosis	M	175	85	42	25	25	80	91	106	120	129	93	106	99	93	86	81	47	31	32	16	1	2	0	0	0	1,565
	F	120	78	37	21	13	58	61	111	143	125	109	106	70	64	47	24	35	19	13	5	4	2	1	0	0	1,266
16 Cancer and other Malignant Tumours ..	M	20	20	22	14	16	53	27	61	87	138	178	355	694	1,278	1,729	1,957	2,117	2,433	2,038	1,471	708	276	32	16	5	15,745
	F	12	23	17	19	10	20	33	46	73	160	310	623	1,077	1,526	1,643	1,683	1,658	1,729	1,549	1,198	561	234	56	11	0	14,271
16*a* Other General Diseases*	M	975	153	102	104	79	381	331	375	449	372	448	541	669	753	801	728	688	637	478	359	170	48	5	1	0	9,647
	F	702	142	96	77	58	350	305	289	372	425	425	475	431	504	569	579	559	651	500	413	143	37	5	4	0	8,111
17 Simple Meningitis* ..	M	1,096	600	251	122	87	308	175	205	203	142	93	104	87	105	86	61	40	35	27	14	7	1	1	0	0	3,850
	F	898	465	178	122	82	229	134	136	100	71	59	71	57	70	49	26	16	20	18	13	0	1	1	0	0	2,816
18 Cerebral Hæmorrhage and Softening* ..	M	175	43	13	7	4	21	16	37	64	77	136	191	320	492	734	908	1,067	1,225	1,399	1,341	809	315	71	14	2	9,481
	F	137	45	10	9	8	20	16	32	60	66	80	138	254	410	613	649	831	1,152	1,442	1,350	807	363	103	17	1	8,613
18*a* Other Diseases of the Nervous System* ..	M	2,042	349	201	99	86	207	175	251	290	299	402	494	596	790	739	661	619	699	579	524	252	93	10	1	1	10,459
	F	1,450	353	173	91	83	176	153	195	237	239	232	289	343	351	363	318	385	420	350	341	191	89	24	4	1	6,851
19 Organic Diseases of the Heart	M	38	33	17	9	19	156	231	344	367	395	437	622	959	1,328	1,787	2,071	2,432	3,027	3,266	2,955	1,711	657	146	31	5	23,043
	F	37	23	20	21	21	174	289	345	348	404	433	579	754	984	1,169	1,278	1,585	2,266	2,490	2,350	1,259	532	119	19	1	17,500
19*a* Other Diseases of the Circulatory System* ..	M	106	26	17	15	16	106	81	135	137	141	173	280	400	551	678	721	623	800	780	711	416	178	37	10	1	7,139
	F	61	28	14	15	20	79	117	133	186	196	212	216	271	274	270	317	268	400	515	440	282	140	34	4	0	4,492
20 Acute Bronchitis* ..	M	1,273	197	74	36	19	31	7	7	11	9	6	12	9	20	29	26	40	56	91	125	87	41	7	0	1	2,214
	F	954	169	60	33	16	33	6	9	4	12	9	8	15	13	16	26	32	48	79	117	86	39	19	2	0	1,805
21 Chronic Bronchitis ..	M	5	3	1	0	3	20	9	7	14	15	18	27	44	101	139	198	363	556	814	1,041	840	406	110	26	1	4,761
	F	8	4	2	2	0	8	10	11	12	24	13	27	24	48	88	124	183	404	664	814	652	340	115	36	5	3,618

22	Pneumonia*	M	1,163	544	236	109	69	234	135	257	429	391	499	658	690	896	841	637	626	610	609	548	324	143	40	1	2	10,691
		F	851	447	168	90	57	178	140	174	244	258	281	357	346	339	285	298	285	418	446	425	267	98	37	2	0	6,491
23	Other Diseases of the Respiratory System*	M	1,899	721	275	133	104	203	76	109	159	180	176	299	433	532	598	588	592	698	707	701	461	206	35	8	1	9,894
		F	1,461	607	241	137	85	178	84	93	133	118	115	165	148	194	227	205	249	364	467	486	345	138	43	9	4	6,296
24	Diseases of the Stomach*	M	259	44	19	11	8	17	12	15	27	42	49	77	74	112	109	112	111	132	142	127	82	34	7	0	0	1,622
		F	224	41	22	10	9	25	16	41	68	63	70	82	84	86	74	88	70	109	127	122	99	39	11	2	0	1,582
25	Diarrhœa and Enteritis (all ages)*	M	12,462	2,554	439	197	89	171	48	43	44	62	66	92	89	121	149	181	220	294	425	436	332	133	39	7	1	18,694
		F	9,889	2,218	422	162	90	191	44	41	65	68	77	104	93	127	110	138	194	305	390	421	329	142	45	13	5	15,683
26	Appendicitis and Typhlitis	M	4	2	9	12	16	137	208	234	254	161	146	122	108	119	87	67	47	33	28	10	5	0	0	0	0	1,809
		F	2	5	7	10	17	128	182	170	120	106	90	81	49	72	56	30	23	27	21	7	4	2	0	0	0	1,209
27	Hernia, Intestinal Obstructiou* ..	M	456	67	27	16	11	32	26	48	43	43	58	58	78	111	116	123	155	163	188	180	95	33	6	1	1	2,135
		F	266	24	18	9	11	37	18	15	28	49	62	88	79	115	101	111	120	169	171	166	83	47	8	0	0	1,795
28	Cirrhosis of Liver ..	M	8	7	0	1	1	8	7	7	12	34	64	107	196	285	362	293	239	210	151	115	40	8	0	0	0	2,155
		F	8	5	4	1	0	8	5	5	11	21	35	79	119	171	147	134	129	109	79	66	24	3	0	0	0	1,163
28*a*	Other Diseases of the Digestive System* ..	M	206	38	35	38	27	127	75	112	117	150	139	180	217	237	272	235	218	263	228	176	85	47	5	1	0	3,228
		F	172	29	30	43	40	159	91	92	162	208	199	207	223	204	246	225	248	258	240	190	97	42	9	1	0	3,415
29	Acute Nephritis and Bright's Disease* ..	M	127	57	28	27	17	92	77	196	297	324	310	437	658	918	1,055	1,120	1,136	1,219	1,144	1,013	501	171	31	9	0	10,964
		F	80	59	27	11	12	85	97	183	354	349	323	420	482	553	639	602	617	668	618	455	240	78	22	7	0	6,981
30	Non-cancerous Tumoursof the Female Genital Organs	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		F	4	0	0	0	0	1	1	19	124	168	184	158	157	152	82	59	41	32	37	30	9	5	3	0	0	1,266
30*a*	Other Diseases of the Genito-urinary System*	M	45	10	1	1	3	10	4	10	38	33	40	73	109	156	179	225	347	524	685	811	538	242	40	7	0	4,131
		F	22	6	3	1	3	8	4	9	25	32	34	46	51	52	58	57	56	51	68	55	30	15	2	0	0	688
31	Puerperal Septicæmia	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		F	0	0	0	0	0	0	1	96	370	514	459	307	112	12	1	0	0	0	0	0	0	0	0	0	0	1,872
32	Other Accidents of Pregnancy and Labour ..	M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		F	0	0	0	0	0	0	4	161	587	816	799	829	397	55	0	0	0	0	0	0	0	0	0	0	0	3,648
32*a*	Diseases of the Skin and Cellular Tissue* ..	M	195	15	10	7	5	13	15	17	19	29	27	34	35	70	56	69	74	107	140	163	132	79	24	7	1	1,343
		F	149	18	9	5	5	13	8	16	15	25	24	25	27	32	35	43	60	79	110	149	108	46	13	7	1	1,022
32*b*	Diseases of the Organs of Locomotion	M	34	18	13	13	13	56	58	26	17	20	11	18	10	11	19	13	22	15	19	12	4	2	1	1	0	426
		F	17	17	9	7	6	27	20	5	10	10	7	8	6	8	9	8	5	9	14	5	4	1	0	0	0	212
33	Congenital Debility and Malformations* ..	M	17,204	109	43	15	12	21	11	8	2	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	17,428
		F	12,976	85	23	14	13	18	7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13,138
33*a*	Other Diseases of Infancy	M	2,143	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,143
		F	1,638	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,638
34	Senile Debility	M	0	0	0	0	0	0	0	0	0	0	0	0	2	4	14	81	393	1,142	3,104	4,802	5,057	3,121	1,116	278	78	19,192
		F	0	0	0	0	0	0	0	0	0	0	0	1	0	2	10	21	213	783	2,096	3,470	3,917	2,827	1,148	309	64	14,861
35	Violent Death—Suicide Excepted*	M	903	493	369	248	177	863	902	1,472	1,763	1,661	1,495	1,446	1,510	1,597	1,418	1,110	869	705	622	429	288	120	24	10	3	20 497
		F	672	377	291	225	189	471	294	294	289	251	224	235	203	204	210	188	151	225	243	250	214	128	59	12	4	5,903
36	Suicide	M	0	0	0	0	0	0	13	76	264	362	425	473	523	507	475	367	265	203	112	64	32	13	0	0	0	4,174
		F	0	0	0	0	0	0	8	79	116	113	122	101	90	105	72	48	29	17	11	4	1	0	0	0	0	916
38	Unknown or ill-defined Diseases*	M	672	241	52	33	16	61	42	49	69	84	106	170	242	299	458	439	502	421	282	217	108	50	6	3	0	4,622
		F	612	251	42	23	18	37	26	28	59	70	72	99	115	163	185	154	209	177	113	94	47	28	1	2	1	2,626
	Total Deaths* ..	M	45,797	7,808	3,089	1,914	1,376	4,678	3,401	5,399	7,666	7,961	7,985	9,349	11,084	13,757	14,928	14,447	14,870	17,096	18,747	18,824	13,357	6,544	1,842	440	104	252,463
		F	35,452	6,742	2,695	1,742	1,384	4,191	2,960	4,529	6,840	7,500	6,982	7,553	7,357	7,971	8,114	7,958	8,753	11,433	13,348	13,863	10,029	5,540	1,918	474	89	185,367
	Frequency relative to total according to age-group ..	M	18,140	3,093	1,223	758	545	1,853	1,347	2,138	3,036	3,153	3,163	3,703	4,394	5,449	5,913	5,722	5,890	6,771	7,425	7,456	5,291	2,592	730	174	41	100,000
		F	19,125	3,637	1,454	940	720	2,261	1,597	2,443	3,690	4,046	3,766	4,074	3,969	4,300	4,377	4,293	4,722	6,168	7,201	7,479	5,410	2,989	1,035	256	48	100,000

* Causes of death for which the mortality is relatively great during the first year of life. † For the relative frequency of each cause of death, see Table CLI. preferably, or CL.

TABLE CL.—Ratio according to Age-groups of Deaths from Particular Causes to the Total Deaths from all Causes in the same Age-group according to Sex. Average for 9 years. Australia, 1907-1915.

Ref No.	Cause.	Sex	0	1	2	3	4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 99	100 and over.	All Ages.
1	Typhoid Fever	M	0002	0013	0026	0084	0102	0188	0394	0722	0955	0820	0524	0348	0215	0142	0085	0049	0034	0016	0007	0003	0002	0002	..	..	..	0140
		F	0001	0009	0052	0103	0127	0200	0686	0764	0509	0351	0241	0177	0135	0103	0071	0043	0017	0014	0010	0001	0001	0005	..	..	..	0104
5	Measles	M	0046	0403	0473	0293	0247	0214	0056	0046	0078	0024	0019	0008	0004	0006	0007	0004	0001	0002	0002	0001	0001	..	..	..	..	0041
		F	0048	0356	0401	0356	0262	0246	0081	0066	0026	0027	0023	0023	0015	0015	0007	0006	0003	0002	0002	0001	..	0002	..	..	..	0048
7	Whooping Cough ..	M	0246	0460	0327	0256	0196	0094	0003	..	..	0001	..	..	..	..	..	0001	0001	0001	..	0002	..	..	..	..	..	0068
		F	0356	0602	0583	0373	0232	0146	0010	0002	0001	0003	..	..	..	..	..	0003	0001	0001	..	..	..	..	..	..	..	0108
8	Diphtheria and Croup	M	0040	0487	1198	2116	2188	1682	0547	0096	0026	0021	0013	0009	0006	0002	0003	0004	0001	0001	..	0001	..	0001	..	..	..	0109
		F	0038	0458	1254	1860	2316	2293	0706	0155	0038	0027	0016	0016	0011	0004	0006	0003	0003	0001	..	0001	..	..	..	0021	..	0148
9	Influenza	M	0040	0052	0055	0084	0080	0073	0050	0082	0068	0078	0053	0084	0085	0090	0072	0078	0078	0100	0122	0129	0133	0122	0195	0136	..	0083
		F	0036	0061	0067	0069	0038	0103	0095	0082	0092	0065	0064	0091	0072	0085	0099	0083	0136	0152	0184	0209	0161	0177	0182	0190	0225	0105
12	Other Epidemic Diseases	M	0029	0037	0036	0026	0051	0034	0044	0065	0104	0114	0071	0065	0065	0055	0056	0046	0050	0045	0049	0038	0039	0043	0060	0046	0096	0050
		F	0032	0028	0059	0052	0083	0029	0044	0049	0041	0041	0046	0017	0028	0054	0057	0024	0056	0051	0042	0048	0038	0034	0021	0063	..	0040
13	Tuberculosis of the Lungs	M	0017	0091	0087	0084	0044	0133	0309	1102	1814	2237	2269	1998	1623	1340	1054	0768	0519	0337	0171	0072	0028	0023	0011	..	..	0634
		F	0019	0070	0082	0109	0105	0181	0760	2455	2892	2824	2329	1815	1465	1086	0666	0493	0355	0237	0118	0049	0026	0005	0005	..	..	0668
14	Tuberculous Meningitis	M	0042	0223	0366	0308	0392	0297	0212	0094	0046	0054	0044	0027	0017	0015	0003	0003	0001	0001	..	0001	..	..	..	..	..	0041
		F	0042	0230	0367	0430	0345	0334	0274	0179	0092	0048	0036	0017	0014	0009	0006	0006	0001	0001	0001	..	..	..	..	..	..	0054
15	Other Forms of Tuberculosis	M	0038	0109	0136	0131	0182	0171	0268	0196	0157	0162	0117	0113	0089	0068	0058	0056	0032	0018	0017	0009	0001	0003	..	..	..	0062
		F	0034	0116	0137	0121	0098	0138	0206	0245	0209	0167	0156	0140	0095	0080	0058	0030	0040	0017	0010	0004	0004	0004	0005	..	..	0068
16	Cancer and other Malignant Tumours ..	M	0004	0026	0071	0073	0116	0113	0079	0113	0114	0173	0223	0380	0626	0929	1158	1355	1424	1423	1087	0781	0530	0422	0174	0364	0481	0624
		F	0003	0034	0063	0109	0075	0048	0112	0102	0107	0213	0444	0825	1464	1914	2025	2115	1894	1512	1160	0864	0559	0422	0292	0232	..	0770
16*a*	Other General Diseases	M	0213	0196	0330	0543	0574	0815	0973	0695	0586	0467	0561	0579	0604	0547	0537	0504	0463	0373	0255	0191	0127	0073	0027	0023	..	0382
		F	0198	0211	0356	0442	0435	0835	1030	0638	0544	0567	0609	0629	0586	0632	0701	0728	0639	0569	0375	0298	0143	0067	0026	0084	..	0438
17	Simple Meningitis ..	M	0239	0768	0813	0637	0632	0658	0515	0380	0265	0178	0117	0111	0078	0076	0058	0042	0027	0021	0014	0007	0005	0001	0005	..	..	0153
		F	0253	0690	0661	0700	0615	0546	0453	0300	0146	0095	0084	0094	0078	0088	0060	0033	0018	0017	0014	0009	..	0002	0005	..	..	0152
18	Cerebral Hæmorrhage and Softening ..	M	0038	0055	0042	0037	0029	0045	0047	0069	0083	0097	0170	0204	0289	0358	0492	0629	0718	0716	0746	0712	0606	0481	0386	0318	0192	0376
		F	0039	0067	0037	0052	0060	0048	0054	0071	0088	0088	0115	0183	0345	0514	0756	0815	0949	1008	1080	0974	0805	0655	0537	0359	0112	0465
18*a*	Other Diseases of the Nervous System ..	M	0446	0447	0651	0517	0625	0442	0515	0465	0378	0376	0503	0528	0538	0574	0495	0458	0416	0409	0309	0278	0189	0142	0054	0023	0096	0414
		F	0409	0524	0642	0522	0622	0420	0517	0431	0347	0319	0332	0383	0466	0440	0447	0400	0440	0367	0262	0246	0190	0161	0125	0084	0112	0370
19	Organic Diseases of the Heart	M	0008	0042	0055	0047	0138	0334	0679	0637	0479	0496	0547	0665	0865	0965	1197	1433	1636	1771	1742	1570	1281	1004	0793	0705	0481	0913
		F	0010	0034	0074	0121	0157	0415	0976	0762	0509	0539	0620	0767	1025	1235	1441	1606	1811	1982	1865	1695	1255	0960	0620	0401	0112	0944
19*a*	Other Diseases of the Circulatory System	M	0023	0033	0055	0078	0116	0227	0238	0250	0179	0177	0217	0299	0361	0401	0454	0499	0419	0468	0416	0378	0311	0272	0201	0227	0096	0283
		F	0017	0042	0052	0086	0150	0188	0395	0294	0272	0261	0304	0286	0368	0344	0333	0398	0306	0350	0386	0317	0281	0253	0177	0084	..	0242
20	Acute Bronchitis ..	M	0278	0252	0240	0188	0138	0066	0021	0013	0014	0011	0008	0013	0008	0014	0019	0018	0027	0033	0049	0066	0065	0063	0038	..	0096	0088
		F	0269	0251	0223	0189	0120	0079	0020	0020	0006	0016	0013	0011	0020	0016	0020	0033	0037	0042	0059	0084	0086	0070	0099	0042	..	0097
21	Chronic Bronchitis ..	M	0001	0004	0003	..	0022	0043	0027	0013	0018	0019	0022	0029	0040	0073	0093	0137	0244	0325	0434	0553	0629	0620	0597	0591	0096	0189
		F	0002	0006	0007	0012	..	0019	0034	0024	0017	0032	0019	0036	0033	0060	0109	0156	0209	0353	0498	0587	0650	0614	0600	0759	0562	0195
22	Pneumonia	M	0254	0697	0764	0570	0502	0500	0397	0476	0560	0491	0625	0704	0623	0651	0563	0441	0421	0357	0325	0291	0243	0218	0217	0023	0192	0424
		F	0240	0663	0623	0517	0427	0425	0473	0384	0357	0344	0403	0473	0470	0425	0351	0374	0326	0366	0334	0307	0266	0177	0193	0042	..	0350

23	Other Diseases of the Respiratory System	M	0415	0923	0890	0695	0756	0434	0223	0202	0207	0226	0220	0320	0391	0387	0401	0407	0398	0408	0377	0372	0345	0315	0190	0182	0096	0392
		F	0412	0900	0894	0786	0637	0425	0284	0205	0194	0157	0165	0219	0201	0243	0280	0258	0285	0318	0350	0351	0344	0249	0224	0190	0449	0340
24	Diseases of the Stomach	M	0057	0056	0062	0057	0058	0036	0035	0028	0035	0053	0061	0082	0067	0081	0073	0078	0075	0077	0076	0067	0061	0052	0038	..	..	0064
		F	0063	0061	0082	0057	0068	0060	0054	0090	0099	0084	0100	0109	0114	0108	0091	0111	0080	0095	0095	0088	0099	0070	0057	0042	..	0085
25	Diarrhoea and Enteritis (all ages)	M	2721	3271	1421	1029	0647	0366	0141	0080	0057	0078	0083	0098	0080	0088	0100	0125	0148	0172	0227	0232	0249	0203	0212	0159	0096	0741
		F	2789	3290	1566	0930	0675	0456	0149	0091	0095	0091	0110	0138	0126	0159	0136	0173	0222	0267	0292	0304	0328	0256	0235	0274	0562	0846
26	Appendicitis and Typhlitis	M	0001	0003	0029	0063	0116	0293	0612	0433	0331	0202	0183	0131	0097	0086	0058	0046	0032	0019	0015	0005	0004	..	..	..	..	0072
		F	0001	0007	0026	0057	0127	0305	0615	0375	0175	0141	0129	0107	0067	0090	0069	0038	0026	0024	0016	0005	0004	0004	..	..	..	0065
27	Hernia, Intestinal Obstruction	M	0100	0086	0087	0084	0080	0068	0076	0089	0056	0054	0073	0062	0070	0081	0078	0085	0104	0095	0100	0096	0071	0050	0033	0023	0096	0085
		F	0075	0036	0067	0052	0083	0088	0061	0033	0041	0065	0089	0117	0107	0144	0124	0140	0137	0148	0128	0120	0083	0085	0042	..	..	0097
28	Cirrhosis of Liver ..	M	0002	0009	..	0005	0007	0017	0021	0013	0016	0043	0080	0115	0177	0207	0242	0203	0161	0123	0081	0061	0030	0012	..	..	..	0085
		F	0002	0007	0015	0006	..	0019	0017	0011	0016	0028	0050	0105	0162	0215	0181	0168	0147	0095	0059	0048	0024	0005	..	..	..	0063
28a	Other Diseases of the Digestive System ..	M	0045	0049	0113	0199	0196	0271	0221	0207	0153	0188	0174	0192	0196	0172	0182	0163	0147	0154	0122	0094	0064	0072	0027	0023	..	0128
		F	0049	0043	0111	0247	0300	0379	0307	0203	0237	0277	0285	0274	0303	0256	0303	0283	0283	0226	0180	0137	0097	0076	0047	0021	..	0184
29	Acute Nephritis and Bright's Disease ..	M	0028	0073	0091	0141	0124	0197	0226	0363	0387	0407	0388	0467	0594	0667	0707	0775	0764	0713	0610	0538	0375	0261	0168	0205	..	0434
		F	0023	0088	0100	0063	0090	0203	0328	0404	0518	0465	0463	0556	0655	0694	0787	0757	0705	0584	0463	0328	0239	0141	0115	0148	..	0377
30	Non-cancerous Tumours of the Female Genital Organs	F	0001	..	..	..	..	0002	0003	0042	0181	0224	0264	0209	0213	0191	0101	0074	0047	0028	0028	0022	0009	0009	0016	..	..	0068
30a	Other Diseases of the Genito-urinary System ..	M	0010	0013	0003	0005	0022	0021	0012	0018	0050	0042	0050	0078	0098	0113	0120	0156	0234	0306	0365	0431	0403	0370	0217	0159	..	0164
		F	0006	0009	0011	0006	0023	0019	0013	0020	0037	0043	0049	0061	0069	0065	0071	0072	0064	0045	0051	0040	0030	0027	0010	..	..	0037
31	Puerperal Septicæmia ..	F	..	..	..	..	..	..	0003	0212	0541	0685	0657	0407	0152	0015	0001	..	..	..	..	..	..	..	..	..	..	0101
32	Other Accidents of Pregnancy and Labour ..	F	..	..	..	..	..	..	0014	0355	0858	1088	1144	1098	0540	0069	..	..	..	..	..	..	..	..	..	..	..	0197
32a	Diseases of the Skin and Cellular Tissue ..	M	0043	0019	0032	0037	0036	0028	0044	0032	0025	0036	0034	0036	0032	0051	0037	0048	0050	0063	0075	0087	0099	0121	0130	0159	0096	0053
		F	0042	0027	0033	0029	0038	0031	0027	0035	0022	0033	0034	0033	0037	0040	0043	0054	0069	0069	0082	0108	0108	0083	0068	0148	0112	0055
32b	Diseases of the Organs of Locomotion	M	0007	0023	0042	0068	0095	0120	0170	0048	0022	0025	0014	0019	0009	0008	0013	0009	0015	0009	0010	0006	0003	0003	0005	0023	..	0017
		F	0005	0025	0033	0040	0045	0065	0068	0011	0015	0013	0010	0011	0008	0010	0011	0010	0006	0008	0010	0004	0004	0002	..	..	..	0011
33	Congenital Debility and Malformations ..	M	3757	0140	0139	0078	0087	0045	0032	0015	0003	0001	0001	..	..	0001	..	..	..	..	..	..	..	..	..	..	..	0690
		F	3660	0013	0085	0080	0098	0043	0024	0004	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0709
33a	Other Diseases of Infancy	M	0468	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0085
		F	0462	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0088
34	Senile Debility	M	..	..	..	..	..	..	..	..	..	..	..	..	0002	0003	0009	0056	0264	0668	1656	2551	3786	4769	6059	6318	7500	0760
		F	..	..	..	..	..	..	..	..	..	..	..	0001	..	0003	0012	0026	0243	0685	1570	2503	3906	5103	5985	6519	7191	0802
35	Violent Death (Suicide excepted)	M	0197	0631	1195	1296	1286	1845	2652	2726	2300	2086	1872	1547	1362	1161	0950	0768	0584	0412	0332	0228	0216	0183	0130	0227	0288	0812
		F	0190	0559	1080	1292	1417	1124	0993	0649	0423	0335	0321	0311	0276	0256	0259	0236	0173	0197	0182	0180	0213	0231	0308	0253	0449	0319
36	Suicides	M	..	..	..	..	..	..	0038	0141	0344	0455	0532	0506	0472	0369	0318	0254	0178	0119	0060	0034	0024	0020	..	..	..	0165
		F	..	..	..	..	..	..	0027	0174	0170	0151	0175	0134	0122	0132	0089	0060	0033	0015	0008	0003	0001	..	..	..	..	..	0049
38	Unknown or Ill-defined Diseases	M	0147	0309	0168	0172	0116	0130	0124	0091	0090	0106	0133	0182	0218	0217	0307	0304	0338	0246	0150	0115	0081	0076	0033	0068	..	0183
		F	0173	0372	0156	0132	0135	0088	0088	0062	0086	0093	0103	0131	0156	0205	0228	0194	0239	0155	0085	0068	0047	0051	0005	0042	0112	0142
	Total	M	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	Total Deaths ..	F	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

TABLE CLI.—Death-rates in Age-groups or the Number of Deaths in Australia per Million Persons in each Age-group, according to Cause, Age and Sex. 9-year Average. (1907-1915).

	Cause.	Sex	0	1	2	3	4	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85–89	90–94	95–99	100 and over	All Ages	Relative Frequency of Death from each cause.*
1	Typhoid Fever	M	15	20	17	34	31	41	68	185	348	353	266	231	180	160	129	106	107	77	48	35	38	41	0	0	0	167	.01398
		F	10	12	30	39	38	40	105	169	174	151	114	104	86	82	75	63	37	49	54	7	15	118	0	0	0	98	.01040
5	Measles	M	390	629	303	120	74	47	10	12	29	10	10	5	3	7	11	9	2	8	11	6	25	0	0	0	0	49	.00414
		F	331	495	231	136	78	50	12	15	9	11	11	13	10	12	8	9	7	6	12	7	39	0	0	0	0	45	.00479
7	Whooping Cough	M	2,102	717	210	108	59	21	1	0	0	1	0	0	0	0	0	1	2	3	0	17	0	0	0	0	0	81	.00679
		F	2,445	837	335	143	69	29	2	1	1	1	0	0	0	0	0	4	2	3	0	0	0	0	0	0	0	101	.01076
8	Diphtheria and Croup ..	M	341	758	768	866	658	373	94	25	10	9	6	6	5	2	4	7	4	3	0	12	0	41	0	0	0	130	.01087
		F	259	637	722	711	694	464	108	34	13	11	7	9	7	3	7	4	7	3	0	7	0	0	0	808	0	140	.01482
9	Influenza	M	341	82	35	34	24	16	9	21	25	33	27	56	71	101	109	170	248	468	848	1,407	2,240	3,274	6,038	5,333	0	99	.00829
		F	250	85	38	26	11	21	15	18	31	28	31	54	46	68	103	122	296	528	1,018	1,917	2,340	3,839	5,285	7,276	24,096	99	.01047
12	Other Epidemic Diseases	M	252	58	23	11	15	7	8	17	38	49	36	43	55	62	84	100	160	210	342	417	655	1,146	1,845	1,778	10,870	58	.00495
		F	221	39	34	20	25	6	7	11	14	19	22	10	18	43	60	35	122	176	232	436	552	744	604	2,425	0	38	.00400
13	Tuberculosis of the Lungs	M	144	142	56	34	13	29	53	282	661	964	1,152	1,331	1,364	1,501	1,593	1,653	1,646	1,576	1,194	782	466	614	335	0	0	757	.06334
		F	130	97	47	42	31	37	116	543	986	1,219	1,106	1,064	939	863	698	726	774	823	654	449	378	117	151	0	0	631	.06683
14	Tuberculous Meningitis ..	M	354	348	235	126	118	66	36	24	17	23	22	18	14	16	5	6	4	3	0	6	0	0	0	0	0	49	.00413
		F	285	319	211	164	103	68	42	40	31	21	17	10	9	7	6	9	2	3	4	0	0	0	0	0	0	51	.00535
15	Other Forms of Tuberculosis	M	326	170	87	53	55	38	46	50	57	70	59	76	75	76	87	121	100	85	119	93	13	82	0	0	0	74	.00620
		F	232	161	79	46	29	28	32	54	71	72	74	82	61	64	61	44	87	58	54	33	58	78	151	0	0	65	.00683
16	Cancer and other Malignant Tumours	M	37	40	46	30	35	25	14	29	41	75	113	253	526	1,041	1,750	2,917	4,519	6,658	7,580	8,518	8,913	11,296	5,367	14,222	54,347	744	.06236
		F	23	47	36	42	22	10	17	22	36	92	211	483	938	1,521	2,125	3,116	4,124	5,249	6,409	7,917	8,153	9,166	8,455	8,892	0	727	.07699
16*a*	Other General Diseases ..	M	1,818	306	210	222	173	180	168	178	213	201	285	385	507	613	811	1,085	1,469	1,743	1,779	2,079	2,140	1,965	839	889	0	456	.03821
		F	1,359	293	205	169	130	168	157	141	185	245	289	369	375	502	736	1,071	1,391	1,976	2,069	2,729	2,078	1,449	755	3,234	0	413	.04376
17	Simple Meningitis ..	M	2,044	1,198	521	261	190	146	89	98	96	77	59	74	66	86	87	90	85	96	100	81	88	41	168	0	0	182	.01525
		F	1,738	958	380	268	184	111	69	66	50	41	40	55	50	70	63	48	40	61	74	86	0	39	151	0	0	144	.01519
18	Cerebral Hæmorrhage and Softening	M	326	86	27	15	9	10	8	18	30	42	86	136	243	401	743	1,353	2,278	3,352	5,203	7,765	10,184	12,892	11,909	12,444	21,739	448	.03755
		F	265	93	21	20	18	10	8	16	30	38	55	107	221	409	793	1,201	2,067	3,497	5,967	8,922	11,728	14,219	15,551	13,743	12,048	439	.04646
18*a*	Other Diseases of the Nervous System ..	M	3,808	697	417	212	188	98	89	119	138	162	256	352	452	643	748	985	1,321	1,913	2,153	3,034	3,172	3,806	1,677	889	10,870	495	.04143
		F	2,807	727	369	200	186	85	79	95	118	138	158	224	299	350	469	589	958	1,275	1,448	2,254	2,776	3,486	3,624	3,234	12,048	349	.03696
19	Organic Diseases of the Heart	M	71	66	35	19	40	74	117	163	174	214	278	443	727	1,081	1,808	3,087	5,191	8,283	12,147	17,111	21,540	26,890	24,488	27,556	54,348	1,089	.09126
		F	71	47	43	46	47	84	149	169	173	232	295	449	657	981	1,512	2,366	3,943	6,879	10,303	15,530	18,296	20,839	17,967	15,360	12,048	892	.09441
19*a*	Other Diseases of the Circulatory System ..	M	198	52	35	32	35	50	41	64	65	76	110	199	303	449	686	1,075	1,330	2,189	2,900	4,117	5,237	7,285	6,206	8,889	10,870	338	.02828
		F	118	58	30	33	44	38	60	65	93	113	144	168	236	273	349	587	667	1,214	2,131	2,908	4,098	5,484	5,134	3,234	0	229	.02423
20	Acute Bronchitis	M	2,374	393	154	77	40	15	4	3	5	5	4	9	7	16	29	39	85	153	338	724	1,095	1,678	1,174	0	10,870	105	.00877
		F	1,846	348	128	72	35	16	3	4	2	7	6	6	13	13	21	48	80	146	327	773	1,250	1,528	2,869	1,617	0	92	.00974
21	Chronic Bronchitis ..	M	9	6	2	0	7	9	5	3	7	8	11	19	33	82	141	295	775	1,521	3,027	6,028	10,575	16,617	18,450	23,111	10,870	225	.01886
		F	15	8	4	4	0	4	5	5	6	14	9	21	20	48	114	230	455	1,226	2,747	5,379	9,475	13,318	17,364	29,102	60,241	184	.01952
22	Pneumonia	M	2,169	1,086	490	233	151	111	69	122	204	212	317	469	523	730	851	949	1,336	1,669	2,265	3,173	4,079	5,853	6,709	889	21,739	505	.04235
		F	1,647	921	359	197	128	86	72	85	122	148	191	277	311	338	369	552	709	1,269	1,845	2,809	3,880	3,839	5,585	1,617	0	331	.03502

23	Other Diseases of the Respiratory System	M	3,541	1,440	571	284	228	96	39	52	76	97	112	213	328	433	605	876	1'263	1,910	2,629	4,059	5,804	8,431	5,871	7,111	10,870	468	.03919
		F	2,828	1,251	514	300	191	86	43	45	66	68	78	128	129	193	294	380	619	1,105	1,932	3,212	5,014	5,406	6,493	7,276	48,193	321	.03397
24	Diseases of the Stomach	M	483	88	39	24	17	8	6	7	13	23	31	55	56	91	110	167	237	361	528	735	1,032	1,391	1,174	0	0	77	.00642
		F	434	84	47	22	20	12	8	20	34	36	48	63	73	86	96	163	174	331	526	806	1,439	1,528	1,661	1,617	0	81	.00853
25	Diarrhœa and Enteritis (all ages)	M	23,238	5,101	912	421	195	81	24	20	21	34	42	66	68	99	151	270	470	805	1,581	2,525	4,180	5,443	6,541	6,222	10,870	884	.07405
		F	19,140	4,570	901	355	202	92	23	20	32	39	53	81	81	126	142	255	483	926	1,614	2,782	4,781	5,562	6,795	10,509	60,241	799	.08461
26	Appendicitis and Typhlitis	M	7	4	19	26	35	65	106	111	120	87	93	87	82	97	88	100	100	90	104	58	63	0	0	0	0	86	.00717
		F	4	10	15	22	38	62	94	83	60	61	61	63	43	72	72	56	57	82	87	46	58	78	0	0	0	62	.00652
27	Hernia, Intestinal Obstruction	M	850	134	56	34	24	15	13	23	20	23	37	41	59	90	117	183	331	446	699	1,042	1,196	1,351	1,006	889	10,870	101	.00846
		F	515	49	38	20	24	17	9	7	14	28	42	68	68	114	131	205	299	513	708	1,097	1,206	1,841	1,208	0	0	91	.00968
28	Cirrhosis of Liver ..	M	15	14	0	2	2	4	4	3	6	18	41	76	149	232	366	437	510	575	562	666	504	327	0	0	0	102	.00854
		F	15	10	9	2	0	4	3	2	5	12	24	61	104	170	190	248	321	330	327	436	349	118	0	0	0	59	.00627
28*a*	Other Diseases of the Digestive System ..	M	384	76	73	81	59	60	38	53	56	81	88	128	169	193	275	350	465	720	848	1,019	1,070	1,924	839	889	0	153	.01279
		F	333	60	64	94	90	77	47	45	80	120	135	161	194	203	318	417	617	783	993	1,256	1,410	1,645	1,359	808	0	164	.01842
29	Acute Nephritis and Bright's Disease ..	M	237	114	58	58	37	44	39	93	141	175	197	311	499	747	1,068	1,669	2,425	3,336	4,255	5,866	6,307	6,999	5,200	8,000	0	518	.04343
		F	155	122	58	24	26	41	50	89	176	201	220	326	420	551	827	1,114	1,535	2,028	2,557	3,007	3,488	3,055	3,322	5,659	0	356	.03766
30	Non-cancerous Tumors of the Female Genital Organs	F	8	0	0	0	0	1	1	9	62	97	125	123	136	151	106	109	102	97	153	198	131	196	453	0	0	65	.00683
30*a*	Other Diseases of the Genito-urinary System	M	84	20	2	2	7	5	2	5	18	18	25	52	83	127	181	335	741	1,434	2,548	4,696	6,773	9,905	6,709	6,222	0	195	.01636
		F	43	12	6	2	7	4	2	4	12	18	23	36	44	52	75	106	139	155	281	363	436	588	302	0	0	35	.00371
31	Puerperal Septicæmia ..	F	0	0	0	0	0	0	1	47	184	296	312	238	98	12	1	0	0	0	0	0	0	0	0	0	0	95	.01010
32	Other Accidents of Pregnancy and Labour	F	0	0	0	0	0	0	2	79	292	469	544	643	346	55	0	0	0	0	0	0	0	0	0	0	0	186	.01968
32*a*	Diseases of the Skin and Cellular Tissue ..	M	364	30	21	15	11	6	8	8	9	16	17	24	27	57	57	103	158	293	521	944	1,661	3,233	4,026	6,222	10,870	64	.00532
		F	288	37	19	11	11	6	4	8	7	14	16	19	24	32	45	80	149	240	455	985	1,569	1,802	1,963	5,659	12,048	52	.00551
32*b*	Diseases of the Organs of Locomotion	M	63	36	27	28	28	27	29	12	8	11	7	13	8	9	19	19	47	41	71	69	50	82	168	889	0	20	.00169
		F	33	35	19	15	13	13	10	2	5	6	5	6	5	8	12	15	12	27	58	33	58	39	0	0	0	11	.00114
33	Congenital Debility and Malformations ..	M	32,080	218	89	32	26	10	6	4	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	824	.06903
		F	25,116	175	49	31	29	9	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	670	.07088
33*a*	Other Diseases of Infancy	M	3,996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	101	.00849
		F	3,170	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	83	.00884
34	Senile Debility	M	0	0	0	0	0	0	0	0	0	0	0	0	2	3	14	121	839	3,125	11,544	27,807	63,663	127,737	187,186	247,111	847,825	907	.07602
		F	0	0	0	0	0	0	0	0	0	0	0	1	0	2	13	39	530	2,377	8,673	22,932	56,924	110,737	173,335	249,798	771,085	757	.08017
35	Violent Death—Suicide excepted	M	1,684	984	767	531	387	409	458	699	838	899	951	1,030	1,145	1,300	1,435	1,654	1,855	1,929	2,313	2,484	3,626	4,912	4,026	8,889	32,608	969	.08119
		F	1,300	777	621	493	425	227	152	144	144	144	153	183	174	203	272	348	376	683	1,005	1,652	3,110	5,014	8,908	9,700	48,193	301	.03184
36	Suicide	M	0	0	0	0	0	0	7	36	125	196	270	337	397	413	481	547	566	555	417	371	403	532	0	0	0	197	.01653
		F	0	0	0	0	0	0	4	39	58	65	83	78	78	105	93	89	72	52	46	26	14	0	0	0	0	47	.00494
38	Unknown or Ill-defined Diseases	M	1,253	481	108	71	35	29	21	23	33	45	67	121	184	243	464	654	1,072	1,152	1,049	1,257	1,360	2,046	1,006	2,667	0	219	.01831
		F	1,185	517	90	51	41	17	13	14	29	40	49	77	100	162	239	285	520	537	468	621	683	1,097	151	1,617	12,048	134	.01417
Deaths all Causes.	As at 30th June, 1911 ..	M	85,398	15,594	6,415	4,092	3,010	2,215	1,729	2,564	3,643	4,308	5,076	6,659	8,406	11,202	15,107	21,533	31,741	46,782	69,723	109,003	168,152	267,834	308,957	391,111	1,130,435	11,937	1.00
	Per 1,000,000 same sex and age-group.	F	68,619	13,891	5,752	3,820	2,999	2,023	1,528	2,211	3,405	4,315	4,751	5,860	6,413	7,944	10,495	14,733	21,773	34,707	55,231	91,615	145,747	217,008	289,596	383,185	1,072,289	9,447	1.00
Census Results	As at 31st Dec., 1905† ..	M	101,120	18,040	6,770	4,410	3,500	2,212	1,932	3,043	4,042	4,785	5,610	7,038	9,180	12,093	15,558	21,057	30,674	47,596	76,464	116,621	169,497	247,539	360,968	518,718	847,297		
		F	83,490	16,840	6,310	4,120	3,250	2,004	1,763	2,664	3,697	4,685	5,602	6,597	7,569	8,586	10,681	15,038	23,324	36,575	60,289	94,307	138,276	208,288	312,104	460,610	806,338		

* Calculated from the actual aggregates given in Table CXLIX. † From the Census Life Tables.

TABLE CLII.—Shewing the Numbers Dying per Month during each of the First Four Weeks of Life per 100,000 of the same Sex and Age, and during each of the First 12 Months of Life per 1,000,000 of the same Sex and Age. Australia, 1910-1915.

No.	Males—Cause.	Age at Death.				Age at Death.											Total
		Under 1 week.	1 week and under 2 weeks	2 weeks and under 3 weeks	3 weeks and under 1 mth.	Under 1 Mth.	1 mth. and under 2 mths.	2 mths. and under 3 mths.	3 mths. and under 4 mths.	4 mths. and under 5 mths.	5 mths. and under 6 mths.	6 mths. and under 7 mths.	7 mths. and under 8 mths.	8 mths. and under 9 mths.	9 mths. and under 10 mths.	10 mths. and under 11 mths.	11 mths. and under 12 mths.	Under 1 Year.
8	Whooping Cough	2	3	13	21	108	304	254	205	148	117	117	123	78	65	100	73	1,702
28	Pulmonary Tuberculosis	..	..	..	..	..	5	8	8	8	16	8	11	16	5	3	5	93
29	Acute Miliary ,,	..	..	..	..	..	0	3	5	0	5	3	8	0	3	5	0	32
30	Tubercular Meningitis	..	1	0	1	5	5	31	24	18	21	35	24	35	35	35	38	305
31	Abdominal Tuberculosis	..	1	0	0	3	10	10	32	21	18	16	11	11	11	13	32	188
34	Tuberculosis of Other Organs	..	..	..	..	..	5	3	0	3	3	0	0	8	3	0	3	26
35	Disseminated Tuberculosis	..	..	..	..	..	..	3	11	3	0	0	3	3	5	0	3	29
37	Syphilis	33	17	27	24	252	216	173	74	48	48	24	19	30	0	8	13	919
61	Meningitis	36	17	12	10	187	117	141	184	167	149	205	190	206	196	143	197	2,084
71	Convulsions	405	187	80	40	1,685	203	160	162	98	88	115	86	75	107	70	76	2,985
89	Acute Bronchitis	24	64	55	62	521	542	250	169	148	74	88	77	67	48	81	49	2,143
91	Broncho-Pneumonia	17	45	40	41	362	466	335	240	198	186	235	174	212	161	191	235	3,011
92	Pneumonia	43	37	29	31	347	276	165	162	172	117	139	130	145	172	124	97	2,058
104	Diarrhœa and Enteritis	64	151	186	172	1,446	1,826	2,324	2,505	2,427	2,331	2,125	1,843	1,663	1,423	1,183	1,157	22,303
109	Hernia, Intestinal Obstruction	37	17	8	8	169	36	37	63	74	101	99	86	62	62	24	22	839
150	Malformations	776	195	91	52	2,632	354	220	179	106	74	69	94	43	43	22	49	3,983
151	Congenital Debility, Icterus and Sclerema	7,193	990	649	355	21,681	2,046	1,122	724	511	430	357	227	185	124	89	130	28,410
152	Other Diseases peculiar to early infancy	1,713	184	79	24	4,690	99	52	0	0	0	0	0	0	0	0	0	5,003
153	Lack of Care	29	2	0	2	80	21	10	0	0	0	0	0	0	0	0	0	114
	Other Causes	480	232	192	109	2,432	750	464	424	384	322	363	241	354	358	337	340	6,854
		10,852	2,143	1,461	952	36,600	7,281	5,765	5,171	4,534	4,100	3,998	3,347	3,193	2,821	2,428	2,519	
	Population of males at the beginning of each period allowing for migration (on which the results are based).	399,823	389,936	388,016	386,716	385,413	382,661	380,528	378,654	377,052	375,642	374,299	373,226	372,236	371,409	370,753	370,087	
	Total Deaths (Males) on which results are based	9,859	1,924	1,306	1,311		2,796	2,200	1,963	1,713	1,543	1,499	1,251	1,190	1,049	901	933	31,288

No.	Females—Cause.	Age at Death.				Age at Death.											Total
		Under 1 week.	1 week and under 2 weeks	2 weeks and under 3 weeks	3 weeks and under 1 mth.	Under 1 Mth.	1 mth. and under 2 mths.	2 mths. and under 3 mths.	3 mths. and under 4 mths.	4 mths. and under 5 mths.	5 mths. and under 6 mths.	6 mths. and under 7 mths.	7 mths. and under 8 mths.	8 mths. and under 9 mths.	9 mths. and under 10 mths.	10 mths. and under 11 mths.	11 mths. and under 12 mths.	Under 1 Year.
8	Whooping Cough	1	2	20	24	132	398	310	202	162	85	108	122	152	122	106	106	2,008
28	Pulmonary Tuberculosis	1	0	2	0	8	3	0	3	8	14	8	14	8	11	0	8	85
29	Acute Miliary ,,	..	..	..	..	..	0	0	0	3	8	0	0	0	3	0	8	22
30	Tubercular Meningitis	..	..	..	..	..	0	14	22	22	27	19	22	25	33	42	39	264
31	Abdominal Tuberculosis	..	..	..	1	3	5	16	14	25	16	19	3	17	8	22	3	151
34	Tuberculosis of Other Organs	..	..	..	1	3	0	0	0	0	0	3	0	0	0	0	0	6
35	Disseminated Tuberculosis	..	..	..	..	..	0	0	5	0	0	3	0	0	0	3	0	11
37	Syphilis	22	12	20	14	176	135	65	107	57	41	58	28	17	11	25	17	739
61	Meningitis	40	27	14	7	222	87	102	128	140	140	135	169	150	172	139	137	1,715
71	Convulsions	286	116	43	29	1,151	146	117	87	82	93	94	75	69	103	70	67	2,157
89	Acute Bronchitis	15	40	57	35	379	357	250	158	132	80	72	72	69	81	50	47	1,756
91	Broncho-Pneumonia	14	28	33	32	283	372	277	191	153	154	163	122	164	194	153	132	2,357
92	Pneumonia	25	22	26	17	228	173	106	137	118	146	149	136	103	133	136	95	1,657
104	Diarrhœa and Enteritis	37	96	106	95	835	1,432	1,876	2,144	2,197	1,937	1,666	1,544	1,328	1,368	1,159	992	18,456
109	Hernia, Intestinal Obstruction	18	13	0	9	99	32	11	27	57	77	77	53	44	25	19	11	530
150	Malformations	597	122	62	40	2,003	203	128	104	99	92	80	47	36	61	56	59	2,970
151	Congenital Debility, Icterus and Sclerema	5,579	809	518	289	17,375	1,418	878	710	419	352	265	243	155	142	128	114	22,226
152	Other Diseases peculiar to early infancy	1,329	147	64	24	3,750	73	38	0	0	0	0	0	0	0	0	0	3,863
153	Lack of Care	30	0	0	0	74	0	5	0	0	0	0	0	0	0	0	0	79
	Other Causes	343	152	130	58	1,670	649	343	355	233	223	254	252	283	306	328	306	5,262
		8,337	1,586	1,095	675	28,391	5,483	4,536	4,394	3,967	3,485	3,173	2,902	2,620	2,773	2,436	2,141	
	Population of females at the beginning of each period allowing for migration (on which the results are based).	380,827	373,570	372,209	371,276	370,516	368,534	366,933	365,413	364,077	362,943	361,949	361,078	360,333	359,557	358,927	358,426	
	Total Deaths (Females) on which results are based	7,259	1,365	939	770		2,026	1,668	1,609	1,447	1,267	1,150	1,049	945	998	875	768	24,135

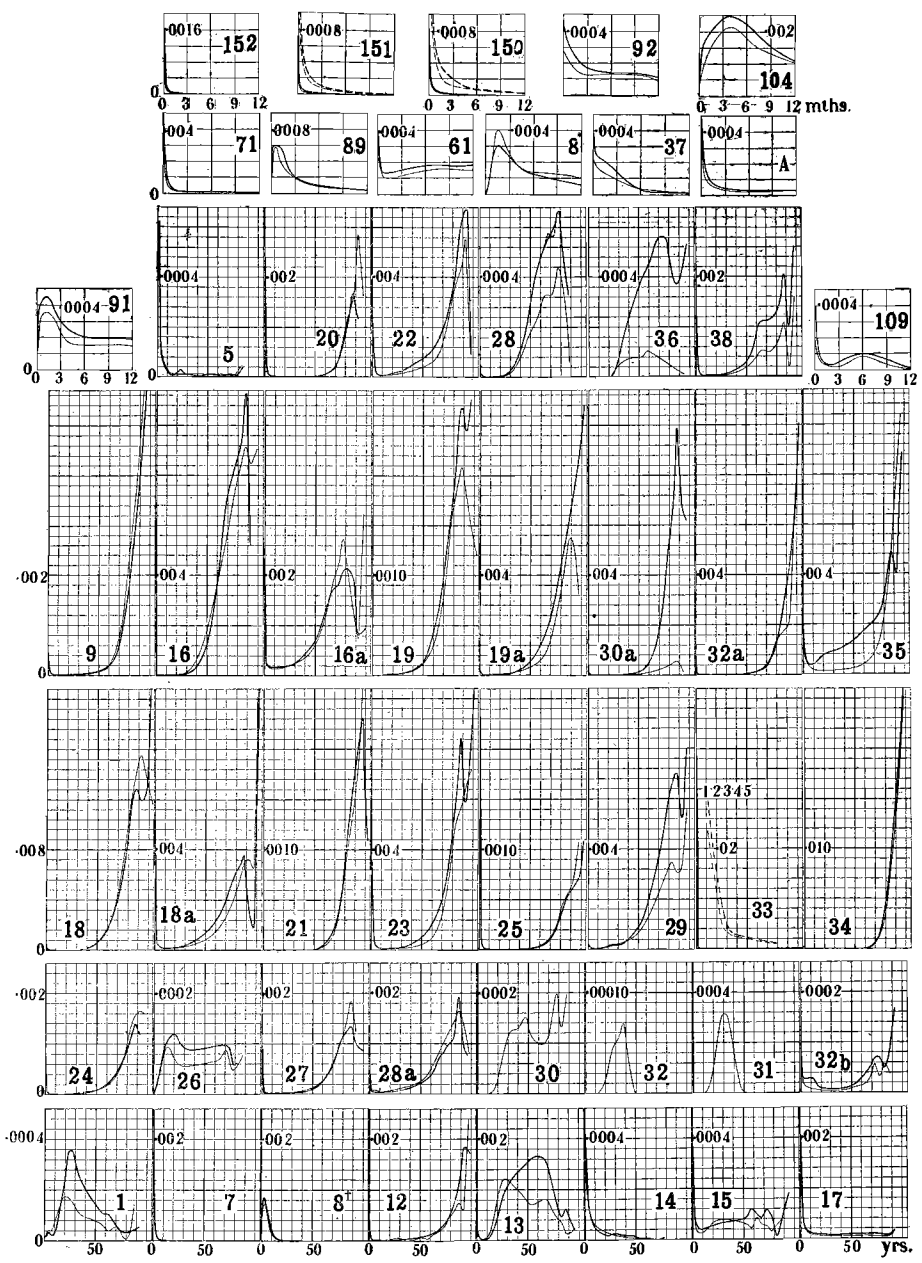

Fig. 104.

The 13 figures ruled into rectangles are death-rates for the first 12 months of life, the rates being shewn by the figures on one of the horizontal lines. The 38 figures ruled into smaller squares shew the death-rates for all ages of the diseases indicated by the numbers. For the index to the above curves see next page.

Index to Curves in Figure 104.

DEATH-RATES FOR ALL AGES.

†1. Typhoid Fever
5. Measles.
7. Whooping Cough.
8. Diphtheria and Croup.
9. Influenza.
12. Other Epidemic Diseases.
13. Tuberculosis of the Lungs.
14. Tuberculous Meningitis.
15. Other forms of Tuberculosis.
16. Cancer and other Malignant Tumours.
16*a*. Other General Diseases.
17. Simple Meningitis.
18. Cerebral Hæmorrhage and Softening.
18*a*. Other Diseases of the Nervous System.
19. Organic Diseases of the Heart.
19*a*. Other Diseases of the Circulatory System.
20. Acute Bronchitis.
21. Chronic Bronchitis.
22. Pneumonia.
23. Other Diseases of the Respiratory System.
24. Diseases of the Stomach.
25. Diarrhœa and Enteritis (all ages).
26. Appendicitis and Typhlitis.
27. Hernia, Intestinal Obstruction.
28. Cirrhosis of Liver.
28*a*. Other Diseases of the Digestive System.
29. Acute Nephritis and Bright's Disease.
30. Non-cancerous Tumours of Female Genital Organs.
30*a*. Other Diseases of the Genito-urinary System.
31. Puerperal Septicæmia.
32. Other Accidents of Pregnancy and Labour.
32*a*. Diseases of the Skin and Cellular Tissue.
32*b*. Diseases of the Organs of Locomotion.
33. Congenital Debility and Malformations.
34. Senile Debility.
35. Violent Death (Suicide excepted).
36. Suicide.
38. Unknown or Ill-defined Diseases.

DEATH-RATES FOR FIRST YEAR OF LIFE.

*8. Whooping Cough.
37. Syphilis.
61. Meningitis.
71. Convulsions.
89. Acute Bronchitis.
91. Broncho-Pneumonia.
92. Pneumonia.
104. Diarrhœa and Enteritis.
109. Hernia and Intestinal Obstruction.
150. Malformations.
151. Congenital Debility.
152. Other Diseases peculiar to Early Infancy.
A. Other Causes.

* These numbers, on Fig. 104, are identical with those of the "Detailed Nomenclatures of Diseases" of the International Commission, Session July 1909, at Paris.

† These numbers, on Fig. 104, are identical with those in Table CXLIX. to CLI., and where not marked "*a*" are those of the "Abridged Nomenclature" of diseases of 1909, where "*a*" or "*b*" added it denotes that the balance for the class in question is included.

The form of the mortality curves during the first year are given on the upper part of Fig. 104; see the Index thereto.

32. **Annual fluctuation of death-rates.**—The frequency of death from particular causes, and therefore generally, is affected by the season of the year, and though in the aggregate of deaths from all causes the seasonal effect is somewhat masked, it is not wholly obliterated. To ascertain rigorously the character of the annual periodicity, either generally or from a particular "cause," of death it is necessary to obtain the rates for small units of time, say equalised months; thus the rates δ_1, δ_2, ... δ_{12} must be obtained: these are sensibly independent of the fluctuations in the deaths and population during the month. Inasmuch, however, as deaths occur very rapidly in the first few days of life, any periodicity in birth-rate involves the death-rate; that is to say, the constitution of the population is not quite homogeneous, and a correction is—theoretically—necessary. The correction, however, is so small that it may be neglected. These last observations apply, *mutatis mutandis*, also to deaths from certain particular causes. The annual fluctuations of birth-rate, and the mode of solving have been indicated at length in Part XI., §§ 14-19, pp. 166-174. General factors for reducing the values given for calendar months to the values for equalised months must be so applied as to have regard to the average values at the beginning and end of the months.

Table CLIII. depends upon a total of 252,443 deaths of males[1], and 185,367 deaths of females occurring in an aggregate population of

[1] For example there were 3529 deaths from typhoid in the 9 years, of which 473 occurred in the month of January. These, when corrected, for the growth of population during the year, and altered so as to give the result for the exact twelfth of the mean length of the year, gave the basis for the calculation of the results in the table.

over 21,000,000 males and nearly 20,000,000 females. The numbers given in the table correspond to a population of 10 millions in each case.

In Table CLIV. the proportions of deaths occurring in months of equal length, when the population is constantly the same, are given.

Algebraically if b and e be the equalising *corrections* at the beginning and end of the month to D, the number of deaths, and P be the sum of the populations of the corresponding month for the whole period under review, the results in Tables CLIII. and CLIV. are respectively :—

$$(650).....\delta = (D+b+e)/P\,; \quad (651).....\rho = 12\delta\,/\,\Sigma\delta.$$

TABLE CLIII.—Shewing Average Number of Deaths due to Various Causes, per 10,000,000 Males, and per 10,000,000 Females respectively of all Ages during each Equalised Month of the Year. Based upon 9 Years' Experience (1907-1915) in Australia.

Cause of Death.	Sex	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Typhoid Fever	M	221	231	247	223	167	108	63	54	50	51	92	164	1,671
	F	129	152	156	118	97	80	41	26	24	25	50	88	986
Whooping Cough	M	77	64	43	45	61	63	66	79	85	74	77	77	811
	F	100	83	71	63	64	63	92	94	102	102	94	89	1,017
Diphtheria and Croup ..	M	81	76	99	123	149	153	142	109	102	85	83	89	1,291
	F	95	88	86	147	151	165	145	128	116	90	107	83	1,401
Influenza	M	39	27	29	38	54	69	99	163	188	140	93	49	988
	F	48	27	28	36	45	56	94	160	191	146	97	59	987
Tuberculosis	M	613	581	585	580	646	641	713	701	692	669	640	590	7,651
	F	527	484	489	514	511	512	533	590	558	585	496	516	6,315
Cancer	M	637	659	604	638	603	594	571	595	619	643	622	658	7,443
	F	613	628	613	615	623	593	578	587	588	610	615	605	7,268
Diabetes	M	58	56	62	65	66	86	78	85	73	73	65	68	835
	F	74	74	68	80	82	94	102	98	109	99	90	93	1,063
Organic Diseases of the Heart	M	855	784	802	832	903	995	1,052	1,070	994	925	884	794	10,890
	F	725	613	650	667	697	834	950	891	780	744	629	670	8,850
Diseases of the Respiratory System	M	757	646	743	844	1,000	1,250	1,500	1,594	1,519	1,197	1,042	830	12,922
	F	519	472	471	581	723	895	1,083	1,217	1,088	895	726	609	9,279
Diarrhoea and Enteritis ..	M	1,021	941	866	764	503	265	203	166	185	338	782	1,069	7,103
	F	894	820	787	678	457	264	164	127	137	309	644	895	6,176
Infancy	M	662	697	695	703	686	719	734	656	683	614	666	680	8,196
	F	580	543	571	608	562	579	616	561	504	528	521	532	6,705
Old Age	M	692	664	629	671	754	857	905	873	836	733	722	732	9,068
	F	629	567	548	566	631	697	748	726	688	628	581	570	7,579
Total all Causes ..	M	10,406	9,681	9,469	9,633	9,604	9,881	10,411	10,309	10,215	9,570	9,984	10,146	109309
	F	8,152	7,667	7,391	7,724	7,702	7,897	8,279	8,411	7,895	7,697	7,802	7,967	94,584

TABLE CLIV.—Shewing for each Equalised Month the Average Relative Frequency of Death due to Various Causes, the Population being Constant throughout the Year. Based upon 9 Years' Experience (1907-1915). Australia.

Cause of Death.	Sex	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Typhoid Fever	M	1.589	1.657	1.773	1.599	1.199	.779	.449	.391	.357	.367	.663	1.179	12.000
	F	1.567	1.844	1.905	1.436	1.178	.979	.494	.320	.288	.304	.612	1.071	12.000
Whooping Cough	M	1.139	.942	.630	.664	.910	.930	.975	1.176	1.258	1.095	1.138	1.144	12.000
	F	1.185	.978	.835	.742	.761	.744	1.082	1.107	1.205	1.206	1.105	1.052	12.000
Diphtheria and Croup ..	M	.752	.706	.921	1.141	1.381	1.426	1.316	1.015	.948	.790	.776	.829	12.000
	F	.810	.752	.739	1.258	1.295	1.414	1.241	1.098	.994	.774	.914	.711	12.000
Influenza	M	.468	.332	.349	.463	.657	.840	1.199	1.982	2.281	1.707	1.134	.593	12.000
	F	.580	.332	.345	.434	.550	.676	1.140	1.942	2 325	1.779	1.182	.714	12.000
Tuberculosis	M	.961	.912	.917	.910	1.012	1.006	1.118	1.100	1.086	1.049	1.003	.926	12.000
	F	1.001	.919	.929	.976	.971	.973	1.013	1.121	1.061	1.112	.943	.981	12.000
Cancer	M	1.027	1.062	.975	1.029	.972	.958	.921	.959	.998	1.036	1.164	1.061	12.000
	F	1.011	1.037	1.012	1.015	1.029	.979	.954	.969	.971	1.007	1.016	.998	12.000
Diabetes	M	.839	.811	.888	.927	.952	1.235	1.123	1.224	1.047	1.041	.938	.975	12.000
	F	.834	.837	.767	.901	.929	1.056	1.148	1.102	1.232	1.124	1.012	1.052	12.000
Organic Diseases of the Heart	M	.942	.864	.884	.917	.995	1.096	1.159	1.179	1.095	1.020	.974	.875	12.000
	F	.983	.831	.882	.904	.945	1.130	1.288	1.208	1.058	1.008	.853	.909	12.000
Diseases of the Respiratory System	M	.703	.599	.690	.784	.929	1.161	1.392	1.480	1.411	1.112	.968	.771	12.000
	F	.671	.611	.610	.752	.935	1.157	1.400	1.573	1.407	1.157	.939	.788	12.000
Diarrhoea and Enteritis ..	M	1.725	1.590	1.463	1.290	.850	.448	.344	.281	.312	.570	1.321	1.805	12.000
	F	1.737	1.594	1.530	1.317	.889	.512	.319	.246	.266	.600	1.252	1.739	12.000
Infancy	M	.971	1.020	1.017	1.030	1.004	1.053	1.075	.961	.999	.899	.975	.996	12.000
	F	1.038	.971	1.002	1.089	1.005	1.037	1.102	1.003	.902	.945	.933	.951	12.000
Old Age	M	.916	.878	.833	.888	.997	1.134	1.197	1.155	1.106	.970	.955	.969	12.000
	F	.996	.897	.868	.896	.999	1.103	1.184	1.150	1.089	.995	.920	.903	12.000
Total all Causes	M	1.047	.974	.952	.969	.966	.994	1.047	1.037	1.027	.963	1.004	1.020	12.000
	F	1.034	.973	.938	.980	.977	1.002	1.050	1.067	1.002	.977	.990	1.011	12.000

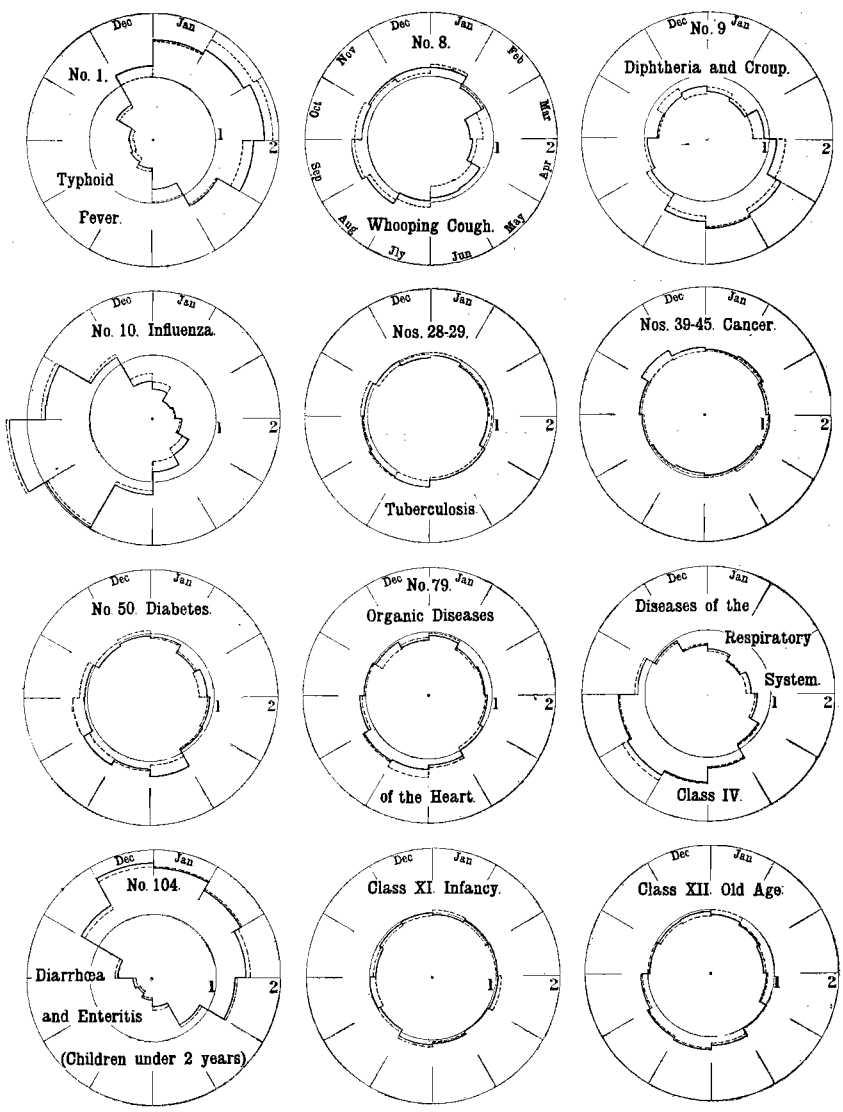

FIG. 105.

The distances from the centres of the circles shew the average ratios of the death-rate per month to the average rate for the entire year, the ratios for males being denoted by firm lines, and those for females by dotted lines, the succession of months being clockwise. In the case of absence of fluctuation the sector-boundaries would all be on the circle marked " 1," *e.g.*, " Cancer." In the case of " Influenza" it will be seen that the September rate is more than double the average for the year.

33. **Studies of particular causes of death: voluntary death.**—Although the study of particular causes of death might appear not to belong to the general theory of population, it is really an essential. For example, if diseases, the incidence of which is characteristic of earlier life, be combatted, the consequence will be an increase in deaths from those which

characterise later years (*e.g.*, tuberculosis and cancer). Again statistics of voluntary death or *suicide*, are of special importance, inasmuch as they disclose the regularity of human conduct even in matters which might be thought to be peculiarly under individual control, and be imagined to lie outside regular law. But suicide follows well-defined laws, and even as regards the *mode* of death the regularity is remarkable, as the following table shews :—

TABLE CLV.—Mode of Voluntary Death. Australia 1907-15.

Mode of Death.	Number of Suicides.									Totals.	Ratio to Aggregate.	Range.			
	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.			Lowest (*a*).	Mean.	Highest (*b*).	Mean of (*a*) & (*b*)*
Poison	57	88	70	79	93	128	127	121	105	868	.2079	57	96.4	128	92.5
Asphyxia	2	1	2	0	2	4	2	2	0	15	.0036	0	1.7	4	2.0
Hanging and Strangulation	71	68	67	72	69	79	79	72	84	661	.1583	67	73.4	84	75.5
Drowning	37	31	24	42	43	34	25	30	38	304	.0728	24	33.8	38	31.0
Firearms	129	146	138	134	133	168	163	201	196	1,408	.3373	129	156.4	201	165.0
Cutting Instruments	61	54	74	79	65	76	88	76	89	662	.1586	54	73.6	89	71.5
Precipitation from Height	6	4	7	3	2	0	6	4	4	36	.0086	0	4.0	7	3.5
Crushing	3	6	5	8	6	8	10	2	8	56	.0134	2	6.2	10	6.0
Other	19	15	11	15	33	17	16	26	13	165	.0395	11	18.3	33	22.0
Total, Males	385	413	398	432	446	514	516	534	537	4,175	1.0000	385	464	537	461
Poison	32	35	54	34	52	70	76	61	64	478	.5201	32	53.1	76	54.0
Asphyxia	0	0	0	0	1	0	1	0	1	3	.0033	0	0.3	1	0.5
Hanging and Strangulation	12	15	9	10	10	12	22	15	18	123	.1338	9	13.7	22	15.5
Drowning	19	14	19	19	13	11	14	17	21	147	.1600	11	16.3	21	16.0
Firearms	3	7	6	6	9	10	9	4	5	59	.0642	3	6.6	10	6.5
Cutting Instruments	5	6	5	13	9	8	4	3	6	59	.0642	3	6.6	13	8.0
Precipitation from Height	1	2	0	0	2	0	2	4	3	14	.0152	0	1.6	4	2.0
Crushing	2	2	1	0	0	1	1	2	2	11	.0120	0	1.2	2	2.0
Other	2	3	3	2	2	6	2	3	2	25	.0272	2	2.8	6	4.0
Total, Females	76	84	97	84	98	118	131	109	122	919	1.0000	76	102	131	103
Ratio of Females to Males	.197	.203	.244	.194	.220	.230	.254	.204	.227	.220		.194	.219	.254	2.37
Ratio of Males to Females	5.07	4.92	4.10	5.16	4.55	4.36	3.94	4.90	4.40	4.54		3.94	4.60	5.16	4.55

* It is worthy of note that the mean of the highest and lowest number of suicides in any year is sensibly equal to the arithmetic mean. The male population increased about 18.40 per cent. on the period covered, and the female 21.82 per cent.

The ratio of the total females of age 16 and above, to the total males of 16 and above, was about 1.10904, and of 21 and above was 1.12391. This would indicate a frequency of 4.097, or 4.042 to 1 for male, as compared with female suicides. But this relative frequency is very variable. On the whole it is rapidly increasing. The ratios of the death-rates of males and females according to age are as follow, viz. :—

Age.	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85–89
Ratio of Death Rates	1.7	0.37	2.15	3.01	3.25	4.32	5.09	3.93	6.17	5.14	7.86	10.67	9.07	14.27	28.79	∞
Smoothed Ratio	.74	1.37	1.99	2.62	3.25	3.88	4.51	5.13	5.76	6.39	7.30	8.80	11.50	15.60	28.80	?

These results shew that the ratio of the rate of suicide by men to that of suicide by women increases about 0.125 per annum till about age 60, when it becomes more rapid. The general result is, that this rate ρ can be expressed between the ages 10 and 57.5 as :—

$$(652) \ldots\ldots \rho = 0.1256\ (x - 6.63)$$

after which the points lie upon the curve indicated by the numbers 6.39, 7.30, etc., in the preceding result as smoothed.

The annual fluctuation of suicide is fairly well-defined. By correcting the results so as to make them represent what would have been furnished by records of equal months, and a constant population [1] (as at the middle of the period), the following values are obtained, viz. :—

TABLE CLVI.—Number of Suicides per diem in a Population of 1,000,000 Persons. Australia, 1900 to 1915.

Period.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1900-1909*	.359	.371	.335	.336	.310	.284	.301	.326	.307	.353	.323	.345
1907-1915	.376	.356	.326	.335	.306	.262	.346	.295	.351	.358	.356	.381
Mean ..	.367	.364	.330	.335	.308	.273	.324	.310	.329	.356	.340	.363

* These results are given by $0.3291 + 0.0354 \sin (x + 72° 4') - 0.0117 \sin 2 (x + 73°.22') + 0.0031 \sin 3 (x + 12° 49') - 0.0142 \sin 4 (x + 40° 52') - 0.0131 \sin 5 (x + 0°.16') + 0.0104 \sin 6x$: Journ. Roy. Soc. N.S.W., xlv., p. 99.

The final mean results probably do not define the curve representing an indefinitely large number of cases. The results given are based upon only about 10,000 cases, and at least 10 times this number would be necessary to get satisfactory results. The distribution is more likely to be of the form. [2]

$$(653)\ldots y = A + B \sin x + C \cos x = A + b \sin (x + \beta) + c \cos (x + \gamma)$$

$$(654)\ldots A = (\Sigma_1^n y)/n\,;\ B = b \cos \beta - c \sin \gamma\,;\ C = b \sin \beta + c \cos \gamma.$$

[1] The population records give for the population at the middle of each month the following results, 00 omitted :—

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Males—	209,686	210,012	210,338	210,662	210,983	211,305	211,657	212,039	212,421	212,834	213,278	213,723
Females—	194,153	194,513	194,873	195,054	195,055	195,056	195,442	196,211	196,981	197,766	198,567	199,369

[2] See " Studies in Statistical Representation" (Statistical Applications of the Fourier series), by G. H. Knibbs, Journ. Roy. Soc., N.S.W., xlv., pp. 76-110, 1911; in particular pp. 97-110.

XVI.—MIGRATION.

1. **Migration.**—The effect of immigration, and indeed of migration generally, is to modify the age, sex, and race constitution of a community, and these facts are well illustrated in the statistics of any new country (*e.g.*, the Commonwealth of Australia). Concentrations of population due to seasonable or similar influences, or from other causes, may also become a factor of importance from particular points of view. For example, statistics of morbidity or of mortality, the object of which is to differentiate between urban and country hygienic conditions, may be materially affected even by temporary concentrations of populations in cities ; for example, by the fact that serious impairments of health may lead to transfer to the cities for special treatment, with a consequent increase of the mortality and morbidity rates ; and so on. Certain obvious economic consequences may, too, arise from such concentrations. For these reasons statistics for particular purposes are often limited as regards precision.

In countries where the migration of adults is a striking characteristic, the constitution of the population according to age ceases to be normal ; but the aggregates obtained by inclusion of the group of countries between which the migration takes place, tend to restore the normality. In Australia financial arrangements between the component States have, among other things, led to records being kept (*a*) of oversea migration, (*b*) of interstate migration by sea, and to a partial record (*c*) of overland migration. All of these shew fluctuations of annual period.

Records of overland migration by road are not kept, but such migration is assumed to be in balance, that is to say, the immigration and emigration are supposed to be equal. It will be seen later that overland immigration by rail virtually balances the overland emigration.

2. **Proportion born in a country.**—The correlation of birth-place and age in any population is of sociologic importance.[1] In the following results, from the 1911 Australian Census, the "unspecified" cases (as to whether the birth-place was Australia or outside of Australia) have, for each age-group, been distributed in the proportion of the numbers given as born in and out of Australia, respectively. The results are as shewn in Table CLVII. hereunder and in Fig. 106. These disclose the fact that the initial preponderance of persons born in Australia diminishes very rapidly with age ; this of course being due to the fact that the commencement of colonisation was at a point of time nearly identical with the birth of the present oldest inhabitants.

[1] An analysis of the Australian population will be found in the Census Report, Vol. I., pp. 120-125.

TABLE CLVII.—Shewing according to Age and Sex the Proportion of Persons Living in but not Born in Australia.[1]

Age last Birth-day.	Proportion not Born in Australia.		Age last Birth-day.	Proportion not Born in Australia.		Age last Birth-day.	Proportion not Born in Australia.		Age last Birth-day.	Proportion not Born in Australia.	
	Males.	Females		Males.	Females		Males.	Females		Males.	Females
0	.0036	.0036	15–19	.0403	.0243	50–54	.4536	.3244	85–89	.9792	.9756
1	.0106	.0103	20–24	.0699	.0513	55–59	.5875	.4915	90–94	.9781	.9886
2	.0160	.0166	25–29	.1866	.1100	60–64	.7014	.6485	95–99	.9569	.9449
3	.0202	.0193	30–34	.2290	.1531	65–69	.7572	.7181	00 and over	.9143	.8966
4	.0215	.0207	35–39	.2538	.1806	70–74	.8880	.8653			
5–9	.0249	.0242	40–44	.3007	.2083	75–79	.8952	.9318			
10–14	.0239	.0232	45–49	.3834	.2673	80–84	.9731	.9637			

The results in the table are graphed in Fig. 106, the Curves M, M′ and F, F′ denoting respectively the results for males and females. The irregular form of the curves is due to the age-peculiarities of the migration. As the population develops by natural increase the curves will tend to become similar to the dotted forms, the F and M curves to become identical, and both will approach more and more the base-line.

Proportions born in Australia.

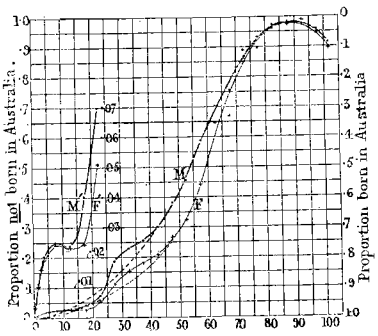

Fig. 106.

Curves M and F shew respectively the proportion of males and of females born in Australia. Curves M′ and F′ are plotted on ten times the vertical scale of Curves M and F.

It might be supposed that by comparing the Census results with the birth-registration results, reduced according to the mortality, so as to shew the number of survivors, the excess of immigrants over emigrants would appear. Such is not the case, however, notwithstanding the striking regularity of the results : see Census Report, Vol. I., pp. 93-94.

[1] See Census Report, Vol. II., pp. 130-1 for males, and pp. 132-3 for females. The unspecified according to age have been ignored. Let the total T of either sex be made up of I those born in Australia, O those born outside, and U the unspecified. Then the adjusted numbers I' and O' will be respectively, $I' = I \,.\, T/(T - U)$; $O' = O \,.\, T/(T - U)$.

Item.		N.S.W.	Vict.	Q'land.	S. Aus.	W. Aus.	Tas.	Total. (Cwlth.)
No. of Males	..	22,957	15,869	8,329	5,378	3,808	2,761	59,102
No. of Females		22,136	15,089	7,967	5,124	3,684	2,584	56,584
Ratio of excess	M	.0282	.0183	.0346	.0444	.0373	.0120	.02774
of reduced registration	F	.0321	.0323	.0336	.0357	.0231	.0240	.03174
Nos.	P	.0301	.0251	.0341	.0402	.0303	.0178	.02970

These excesses, ranging from about $1\frac{1}{4}$ to about $4\frac{1}{2}$ per cent., are only in part accounted for by the migration of infants (see p. 94 above referred to), in fact only one-tenth may be referred to migration. They disclose the necessity of fixing the age exactly by recording the *date of birth*. The practice of accepting loose statements as regards age is from every point of view most unsatisfactory for the purposes of accurate tabulation.

3. **Correlation, owing to migration, between age and length of residence.**—The length of residence of the proportion of persons *not* born in Australia, shewn in Table CLVII. and Fig. 106, is furnished by data given in the Report of the Census, Vol. II., pp. 392-393. The middle of the age and length-of-residence groups may be regarded as a sufficiently accurate indication of the average value in both cases. It will then be seen that, for any given length of residence, there is an age at which the numbers are a maximum.

The maximum values are—for males—about as follows :—

MALES.

Average length of residence .. (yrs.)	0–1	1–2	2–3	3–4	4–5	5–10	10–15	15–20	20–25	25–30	30–35	35–40
Age giving maximum numbers .. (yrs.)	24.2	24.7	26.3	27.6	28.6	30.3	34.6	39.7	44.0 (28.6)	49.0 (31.6)	53.8 (37.0)	58.6 (42.5)
Approx. numbers ..	9,590	4,420	3,180	2,430	1,460	868†	1,148†	1,040†	3,000† (904)†	3,600† (1210)†	2,200† (740)†	1,120† (446)†
Total (and average) in age group	39,228	17,571	12,760	9,347	5,816	3,644	4,440	4,315	11,478	13,946	8,386	4,563

† These maximum numbers correspond to the maximum ages on the two lines above.

The above results shew that the curves are dimorphic and consequently that the relation between the frequency of migration and the age of the migrants is not simple. This is to be expected in a new country, where special tendencies in migration are likely to be in evidence from time to time. The complete record of migration requires that migration should be tabulated according to age, and for some purposes a Census is preferably tabulated under the headings "age at entry into the Commonwealth," and "duration of residence."[1] Only in this way can the relation between age and frequency be accurately and conveniently ascertained.

Before dealing in detail with the several classes of migration, the general theory may be indicated.

4. **The theory of migration.**—Migration, either into or out of any territory, varies according to age and sex. The character of these variations change greatly from time to time, when long periods are considered, but are ordinarily fairly constant for short periods. As between place and place, it is, no doubt, other things being equal, also a function of their distance apart.

[1] This is analogous to the tabulating with the headings "duration of marriage" with "age *at* marriage" instead of "age at the Census."

Let the ratio of the number migrating (T) in a unit of time (1 year) to the population (P) in which it occurs, be called the *migration ratio* (τ); then we shall have :—

$$(655)\ldots\ldots \tau = T/P = \Sigma_1^n T \;/\; \Sigma_1^n P$$

the last expression giving the weighted average over the n years included. That is, it is the ratio of the sums of the migrants to the aggregate of the mean populations of the same years.

Let the number of migrants consist of T_m males and T_f females, then the ratios of each of these to their sum may be called the *sex-ratios* α and γ respectively,[1] of the migration. Thus :—

$$(656)\ldots\ldots \alpha = T_m/(T_m + T_f)\,;\ \gamma = T_f/(T_m + T_f).$$

Thus we shall have for the annual number of male and female migrants, respectively :—

$$(657)\ldots\ldots T_m = P\tau\alpha\,;\ T_f = P\tau\gamma.$$

The male and female "migration ratios," however, are given by

$$(658)\ldots\ldots \tau_\alpha = T_m/M\,;\ \tau_\gamma = T_f/F\,;$$

and if the number of males and females in the population be equal, we shall have :—

$$(659)\ldots\ldots \tau_\alpha = 2\alpha\,.\,\tau\,;\ \tau_\gamma = 2\gamma\,.\,\tau.$$

The components of the fluctuation of annual period are distinctly traceable—in many cases the causes can be assigned.

The "migration ratio" τ is not a population-ratio indicating the number of *different* persons migrating : it merely represents the relative quantity of migration independent of the individuals. It has a *fluctuation of annual period*, and minor periods within that, and these can be represented and dealt with as already indicated, see Part III., § 5, pp. 39, 40, in particular formulæ (90) to (101), and Part XI., §§ 16, 17, pp. 169-172.

[1] The first letters of ἀνήρ and γυνή.

The "migration-ratio" is a *function of age and of time*, and is probably in all cases polymorphic, that is :—

$$(660).....\tau = \phi\,(x) = \Sigma(A'e^{\frac{1}{nx}}),\text{ or } = \Sigma(Ax^m e^{-nx^p})$$

in other words, it may be regarded as the sum of a series of curves of one or both of the types shewn, see formulæ (23) to (39*a*), pp. 22 to 24, and formulæ (147) to (156), pp. 52 to 55. Like nearly all statistical curves it will probably not conform exactly to any simple expression. The variation with time will ordinarily be considerable in new countries.

The characteristics of the annual fluctuations are not quite identical for the sexes : hence each of the components (T_m and T_f) may be analysed separately, or the total ($T_m + T_f$) may be analysed, and the fluctuation of the sex-ratio, determined for individual months, may be analysed.

5. **Migration-ratios for Australia.**—The migration-ratios for Australia, determined as indicated by formulæ (655) to (659), are as follow :

TABLE CLVIII.—Shewing the Migration-ratios for Australia and the Sex-ratios of the Migration for Oversea and Interstate Sea Migration and for Migration by Railway.

To (I) or from (E)	Oversea Migration, 1909–1913.				Interstate Sea Migration, 1909–1913.				Interstate Migration by Railway, 1914–1916.			
	Males.	Females.	Persons.	Ratio Males to Total.	Males.	Females.	Persons.	Ratio Males to Total.	Males.	Females.	Persons.	Ratio Males to Total.
N.S.W. I	.05237	.02644	.04003	.68549	.04557	.03251	.03935	.60666	.18966	.09635	.14426	.67506
,, E	.03654	.01751	.02748	.69666	.04394	.03095	.03775	.60976	.19104	.09447	.14466	.68094
Vic. I	.02195	.01336	.01763	.61875	.07226	.04807	.06009	.59749	.19580	.07766	.13582	.70974
,, E	.01376	.00788	.01080	.63298	.07313	.04766	.06032	.60242	.19071	.08047	.13474	.69681
Qld. I	.02284	.01472	.01912	.64953	.05516	.03251	.04482	.66902	.16804	.11287	.14238	.63129
,, E	.00928	.00267	.00626	.80570	.05028	.03137	.04165	.65623	.16970	.11476	.14413	.62984
S. Aus. I	.02199	.01048	.01632	.68336	.05873	.03534	.04720	.63097	.22646	.10576	.16490	.67288
,, E	.01130	.00372	.00757	.75729	.05502	.03463	.04497	.62041	.23406	.10170	.16655	.68857
W. Aus. I	.05561	.03502	.04676	.67788	.07460	.07288	.07386	.57566	..	..	..	..
,, E	.02308	.00963	.01730	.76057	.08202	.07593	.07940	.58876	..	..	..	..
Tas. I	.02129	.01104	.01630	.66986	.22592	.16258	.19505	.59379	..	..	..	..
,, E	.00910	.00566	.00742	.62842	.24873	.18082	.21564	.59163	..	..	..	..

The table shews that as regards oversea migration, immigration is preponderant : in interstate sea migration it is also generally preponderant, the exceptions being—Victoria, "males" and "persons"; Western Australia, "males," "females" and "persons." Interstate migration by railway shews an approximate equality between immigration and emigration, the balance on either side being variable.

That these results have very accordant values from year to year will appear from the following table ;—

TABLE CLIX.—Interstate Immigration by Sea, 1909-1913.

Year	State.	Migration-ratios. Males.	Females.	Persons.	Ratio of Male Migrants to Total Migrants	State.	Migration-ratios. Males.	Females.	Persons.	Ratio of Male Migrants to Total Migrants	State.	Migration-ratios. Males.	Females.	Persons.	Ratio of Male Migrants to Total Migrants
1909	*	.0401	.0278	.0343	.6134	Victoria.	.0651	.0407	.0528	.6099	Q'land.	.0575	.0323	.0460	.6801
1910	N.S.W.	.0408	.0294	.0354	.6026		.0670	.0442	.0556	.5994		.0521	.0323	.0430	.6571
1911		.0487	.0347	.0420	6066		.0747	.0504	.0625	.5967		.0559	.0323	.0452	.6714
1912		.0488	.0359	.0427	.6008		.0763	.0526	.0644	.5915		.0522	.0311	.0425	.6641
1913		.0454	.0320	.0390	.6110		.0714	.0491	.0603	.5931		.0557	.0320	.0448	.6717
1909	S. Aust.	.0536	.0315	.0427	.6356	W. Aust.	.0693	.0691	.0692	.5705	Tas.	.1886	.1331	.1614	.5961
1910		.0555	.0349	.0453	.6209		.0790	.0757	.0776	.5808		.2017	.1396	.1713	.6007
1911		.0605	.0371	.0490	.6278		.0783	.0753	.0770	.5811		.2210	.1606	.1862	.5886
1912		.0610	.0362	.0488	.6352		.0709	.0707	.0708	.5694		.2465	.1792	.2139	.5935
1913		.0578	.0337	.0458	.6351		.0698	.0664	.0683	.5756		.2464	.1829	.2158	.5915

* Excluding Federal Territory.

TABLE CLX.—Shewing for the Years 1909 and 1913*, the Ratio of Male Migration to the Total Migration†, and the Proportion of Males, Females and Persons, under 12 Years of Age, to the Total Number of Emigrants. Australian Interstate Migration by Sea.‡

States from	N.S. Wales.	Victoria.	Queensland.	S. Australia.	W. Australia.	Tasmania.
To N.S. Wales.		Masc. M. .066 ,, .059 .607 F. .095 .600 ,, .085 P. .078 ,, .069	Masc. M. .061 ,, .063 .665 F. .112 .667 ,, .118 P. .078 ,, .082	Masc. M. .086 ,, .070 .591 F. .109 .599 ,, .103 P. .095 ,, .083	Masc. M. .161 ,, .126 .573 F. .212 .598 ,, .163 P. .183 ,, .141	Masc. M. .095 ,, .087 .518 F. .079 .499 ,, .098 P. .087
To Victoria.	Masc. M. .061 ,, .063 .612 F. .086 .578 ,, .082 P. .071 ,, .071		Masc. M. .084 ,, .085 .649 F. .119 .600 ,, .122 P. .096 ,, .100	Masc. M. .065 ,, .063 .647 F. .122 .677 ,, .099 P. .085 ,, .075	Masc. M .182 ,, .155 .539 F. .196 .550 ,, .182 P. .189 ,, .167	Masc. M. .061 ,, .059 .618 F. .088 .600 ,, .096 P. .071
To Queensland.	Masc. M. .059 ,, .063 .687 F. .126 .678 ,, .116 P. .080 ,, .080	Masc. M. .085 ,, .081 .649 F. .136 .642 ,, .130 P. .103 ,, .098		Masc. M. .033 ,, .109 .831 F. .160 .567 ,, .155 P. .054 ,, .129	Masc. M. .106 ,, .270 .610 F. .067 .525 ,, .263 P. .091 ,, .267	Nil.
To S. Australia.	Masc. M. .095 ,, .078 .601 F. .054 .588 ,, .128 P. .111 ,, .098	Masc. M. .063 ,, .052 .659 F. .113 .674 ,, .109 P. .080 ,, .070	Masc. M. .018 ,, .156 .829 F. .089 .427 ,, .070 P. .030 ,, .107		Masc. M. .112 ,, .106 .629 F. .189 .635 ,, .161 P. .140 ,, .126	Masc. M. .024 ,, .000 .971 F. .053 .348 ,, .000 P. .029 ,, .000
To W. Australia.	Masc. M. .162 ,, .143 .556 F. .193 .566 ,, .174 P. .176 ,, .156	Masc. M. .178 ,, .148 .543 F. .184 ,, .170 P. .181 ,, .157	Masc. M. .058 ,, .103 .340 F. .121 .439 ,, .181 P. .100 ,, .091	Masc. M. .120 ,, .112 .607 F. .191 .620 ,, .158 P. .148 ,, .130		Masc. M. .097 ,, .417 .633 F. .056 .343 ,, .087 P. .082 ,, .200
To Tasmania.	Masc. M. .080 ,, .081 .483 F. .072 .494 ,, .087 P. .076 ,, .084	Masc. M. .054 ,, .053 .620 F .082 .612 ,, .096 P. .065 ,, 069	Masc. M. .100 ,, .111 .409 F. .100 ,, .154 P. .100 ,, .136	Nil.	Nil.	

* The upper figures are for the year 1909, the lower for the year 1913. † The masculinity of the migration in the table is the ratio of males to persons. ‡ Based upon the departures from and arrivals in the States indicated.

6. Periodic fluctuations in migration.—Periodic fluctuations of migration are exhibited alike by oversea migration, by interstate migration by sea, and by migration overland. The following tables give the variations for the first and second for Australia. Table CXLI. shews also the monthly variations of the sex-ratio (or masculinity) of the migration. To express these results by Fourier series, see Part III., § 5, pp. 38-40, and also Part XI., § 16, pp. 169-171.

TABLE CLXI.—Shewing Oversea Migration into and from Australia during the period 1909-1913, and its Fluctuations for "Persons" during the Year. (For equalised months and a constant population).

State.	I or E	Totals for 1909–13.			Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		Persons.	Males.	Females												
N.S.W.	I	337,997	231,694	106,303	.899	1.110	1.180	1.096	.989	.992	.792	.876	.920	.985	1.091	1.070
	E	232,056	161,666	70,390	1.002	1.101	1.316	1.227	1.101	.884	*m* .848	.806	.761	.896	.976	1.082
Masc.	I	.6855	..	..	.697	.665	.698	.679	.708	.708	.723	.689	*m* .694	.679	.659	.689
	E	.6967	..	..	.692	.670	*m* .642	.680	.712	.707	.721	.735	.709	.716	*m* .712	.705
Vict.	I	116,603	72,148	44,455	.883	1.040	.990	.914	1.105	.856	.756	.832	.994	1.024	1 234	1.372
	E	71,425	45,211	26,214	1.189	1.288	1.529	1.386	.974	.801	.766	.627	.602	.720	.877	1.241
Masc.	I	.6187	..	..	.632	.612	.593	.637	.652	.659	.645	.636	*m* .628	.613	.594	.565
	E	.6330	..	..	.663	.620	*m* .580	.601	.631	.652	.658	.689	.664	.658	.649	*m* .626
Qld.	I	58,507	38,002	20,505	.850	.717	1.114	.743	.963	1.165	.855	.989	1.172	1.264	.938	1.230
	E	19,161	15,438	3,723	1.125	*m* 1.244	1.434	1.243	1.022	.801	.697	.709	.777	.895	1.062	.991
Masc.	I	.6495	..	..	.650	.670	.595	.677	.672	.688	*m* .637	.628	.711	.626	.670	.592
	E	.8057	..	..	.890	.854	.840	.702	.748	.777	.775	.812	.841	.848	.863	*m* .865
S. Aust.	I	33,496	22,890	10,606	.902	1.004	1.037	*m* .918	1.038	.854	.840	.731	.816	1.050	1.796	1.014
	E	15,529	11,760	3,769	.939	1.305	1.699	1.480	1.084	.808	.719	*m* .723	.684	.726	.880	.953
Masc.	I	.6834	..	..	.733	.713	.714	.721	.654	.652	.698	.762	*m* .747	.708	.568	.659
	E	.7573	..	..	.833	.769	*m* .680	.691	.761	.811	.791	.826	.789	.802	*m* .744	.737
W. Aust.	I	67,168	45,532	21,636	1.389	1.169	.702	.847	1.059	.860	1.095	.594	.842	.811	1.556	1.076
	E	24,846	18,897	5,949	.932	1.058	1.436	1.298	1.198	.895	.796	*m* .797	.641	.679	.897	1,378
Masc.	I	.6779	..	..	.715	.703	.746	.724	.682	.662	.654	.708	*m* .612	.653	.610	.707
	E	.7606	..	..	.793	.750	*m* .683	.709	.718	.758	.772	.801	.806	.788	*m* .781	.838
Tas.	I	15,633	10,472	5,161	.841	1.105	1.279	1.169	1.029	1.036	1.002	.840	1.040	.833	.821	1.005
	E	7,121	4,475	2,646	1.518	1.582	1.732	1.427	.755	.639	.499	.561	.590	.952	*m* .625	1.120
Masc.	I	.6698	..	..	.622	.641	.686	.705	.704	.696	*m* .689	.671	.675	.814	.624	.648
	E	.6284	..	..	*m* .685	.580	.553	.583	.612	.652	.628	.637	.671	.722	.607	.690

The quantity underlined is the greatest, and that marked *m* the least during the year.

The two upper figures in each section are the relative average magnitudes of the migration for the month, the monthly average for the year being unity.

The two lower figures are the migration-ratios for the corresponding months, viz., the ratio of the migrants to the population of the State,

In Table CLXII. hereunder the fluctuations of interstate migration by sea are shewn, and the "migration-ratios" are also shewn.

TABLE CLXII.—Shewing the Fluctuations for "Persons" in the Interstate Migration by Sea in Australia for the Period 1909-1913.

(For equalised months and a constant population and the migration ratios ×1,000,000.)

	State.	Fluctuation Ratio (Total = 12.000) and Migration-ratios for Persons.												
		Migrants.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
From N.S.W. P = 8438184.	To— Victoria	**137,916**	**1.545**	**1.254**	**1.045**	**1.157**	**.891**	**.663**	**.595**	**.641**	**.797**	**1.164**	**.965**	**1.283**
		16,344	2,105	1,707	1,423	1,575	1,214	963	*m* 810	873	1,085	1,586	1,314	1,748
	Q'land	**109,542**	**1.195**	**1.011**	**1.059**	**1.225**	**1.318**	**1.256**	**.952**	**.883**	**.782**	**.706**	**.711**	**.902**
		12,982	1,293	1,094	1,146	1,325	1,425	1,359	1,030	955	846	*m* 764	769	976
	S. Aust.	**20,788**	**1.243**	**1.194**	**1.485**	**1.325**	**1.096**	**.776**	**.622**	**.592**	**.744**	**.860**	**.879**	**1.184**
		2,464	255	245	305	272	225	159	128	*m* 122	153	176	180	243
	W. Aust.	**16,218**	**1.068**	**1.253**	**1.270**	**1.366**	**1.333**	**.809**	**.683**	**.636**	**.763**	**.858**	**.871**	**1.160**
		1,922	170	200	202	218	212	129	109	*m* 101	122	137	139	185
	Tas.	**33,517**	**1.991**	**1.858**	**1.200**	**.907**	**.498**	**.437**	**.460**	**.448**	**.661**	**.730**	**.827**	**1.983**
		3,972	659	615	397	300	165	*m* 145	152	148	219	242	274	656
	N. Terr.	**825**	**.83**	**.60**	**.97**	**.217**	**.128**	**.108**	**.102**	**.87**	**.59**	**.93**	**.73**	**.93**
		98	7	5	8	18	10	9	8	7	*m* 5	8	6	8
	Total ..	**318,806**	**1.425**	**1.228**	**1.106**	**1.178**	**1.032**	**.859**	**.710**	**.701**	**.772**	**.925**	**.852**	**1.212**
		37,781	4,489	3,866	3,482	3,708	3,251	2,704	2,237	*m* 2,207	2,429	2,911	2,682	3,816
From Victoria. P = 6.613587.	N.S.W.	**145,326**	**1.354**	**1.274**	**1.343**	**1.297**	**.958**	**.738**	**.629**	**.610**	**.743**	**.709**	**1.088**	**1.257**
		21,973	2,479	2,333	2,458	2,376	1,755	1,352	1,151	*m* 1,117	1,361	1,298	1,992	**2,302**
	Q'land.	**25,828**	**.935**	**.909**	**.987**	**1.187**	**1.467**	**1.515**	**1.272**	**1.031**	**.760**	**.606**	**.652**	**.679**
		3,905	304	296	321	387	477	493	414	336	247	*m* 197	212	221
	S. Aust.	**28,006**	**1.266**	**1.231**	**1.233**	**1.212**	**1.083**	**.787**	**.701**	**.631**	**.779**	**.775**	**1.050**	**1.252**
		4,235	447	435	435	428	382	278	247	*m* 223	275	274	371	442
	W. Aus.	**46,031**	**1.082**	**1.339**	**1.438**	**1.307**	**1.220**	**.926**	**.716**	**.729**	**.710**	**.703**	**.864**	**.965**
		6,960	627	777	835	758	708	537	415	422	412	*m* 407	501	560
	Tas.	**153,568**	**1.614**	**1.253**	**1.041**	**1.009**	**.683**	**.594**	**.653**	**.602**	**.748**	**.786**	**1.112**	**1.905**
		23,220	3,126	2,425	2,013	1,952	1,322	*m* 1,149	1,264	1,164	1,447	1,520	2,151	3,686
	N. Terr.	**156**	**.92**	**.10**	**1.46**	**.39**	**2.46**	**1.15**	**.77**	**.92**	**1.38**	**.31**	**1.60**	**.54**
		24	2	*m* 1	3	1	5	2	1	2	3	.6	3	1
	Total	**398,915**	**1.390**	**1.246**	**1.207**	**1.174**	**.925**	**.758**	**.695**	**.649**	**.745**	**.736**	**1.041**	**1.434**
		60,317	6,986	6,266	6,066	5,901	4,649	3,810	3,493	*m* 3,264	3,745	3,697	5,230	7,211

TABLE CLXII.—Shewing the Fluctuations for "Persons" in the Interstate Migration by Sea in Australia for the period 1909-13—*continued.*

	State.	Fluctuation Ratio (Total = 12.000) and Migration-ratios for Persons.												
		Migrants.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
From Queensland. P = 3,060,025	N.S.W.	**106,280**	**1.140**	**.957**	**.976**	**.890**	**.811**	**.781**	**.788**	**.905**	**1.036**	**1.057**	**1.037**	**1.622**
		34,731	3,300	2,769	2,825	2,578	2,347	*m* 2,261	2,282	2,619	2,998	3,058	3,001	4,693
	Vict.	**19,664**	**1.088**	**.914**	**.818**	**.959**	**.721**	**.773**	**.785**	**1.039**	**1.131**	**1.205**	**1.071**	**1.496**
		6,426	582	490	438	514	*m* 386	414	420	556	606	645	573	801
	S. Aust.	**593**	**1.23**	**.69**	**.93**	**.92**	**1.78**	**.63**	**1.11**	**.97**	**.69**	**1.03**	**1.05**	**.97**
		194	20	10	20	14	29	*m* 10	17	16	11	16	17	16
	W. Aust.	**325**	**1.11**	**1.22**	**.85**	**2.14**	**1.85**	**.85**	**.52**	**.59**	**.92**	**.89**	**.29**	**.77**
		116	10	11	8	19	16	8	5	5	8	8	*m* 3	7
	Tas.	**62**	**0.0**	**4.8**	**4.7**	**2.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
		20	0	8	8	*m* 4								
	N. Terr.	**529**	**.79**	**.93**	**.95**	**1.47**	**.89**	**1.09**	**.77**	**1.16**	**1.11**	**1.04**	**1.13**	**.67**
		173	11	13	14	21	13	16	11	17	16	15	16	*m* 9
	Total	**127,453**	**1.130**	**.952**	**.953**	**.908**	**.804**	**.780**	**.788**	**.926**	**1.049**	**1.078**	**1.040**	**1.592**
		41,651	3,924	3,302	3,307	3,151	2,791	*m* 2,708	2,736	3,213	3,640	3,743	3,610	5,526
From S. Australia. P = 2052589.	N.S.W.	**22,115**	**1.285**	**1.422**	**1.494**	**1.231**	**.956**	**.694**	**.591**	**.560**	**.772**	**.870**	**.855**	**1.270**
		10,774	1,153	1,277	1,341	1,105	858	623	531	*m* 503	693	781	768	740
	Vict.	**25,828**	**1.222**	**1.445**	**1.188**	**1.069**	**.770**	**.793**	**.673**	**.626**	**.749**	**1.105**	**1.027**	**1.333**
		12,583	1,281	1,515	1,245	1,121	807	831	706	*m* 657	786	1,160	1,077	1,397
	Q'land.	**1,019**	**.77**	**1.21**	**.84**	**1.07**	**1.17**	**1.25**	**.98**	**.84**	**1.18**	**1.03**	**.66**	**1.00**
		496	32	50	35	44	48	52	40	35	49	43	*m* 27	**42**
	W. Aust.	**43,341**	**1.128**	**1.275**	**1.317**	**1.185**	**1.049**	**.869**	**.800**	**.783**	**.786**	**.911**	**.896**	**1.001**
		21,115	1,984	2,243	2,318	2,086	1,845	1,529	1,408	*m* 1,377	1,383	1,603	1,577	1,760
	Total	**92,303**	**1.188**	**1.357**	**1.318**	**1.163**	**.950**	**.810**	**.717**	**.686**	**.777**	**.956**	**.920**	**1.158**
		44,969	7,941	8,348	7,501	6,681	5,568	4,617	4,331	*m* 4,455	5,614	6,862	6,954	10,528
From W. Australia. P = 1436533	N.S.W.	**20,370**	**1.292**	**1.350**	**1.232**	**.967**	**.884**	**.804**	**.685**	**.579**	**.830**	**.930**	**1.062**	**1.385**
		14,180	1,527	1,595	1,456	1,142	1,045	949	809	*m* 684	981	1,100	1,255	1,637
	Vict.	**45,690**	**1.283**	**1.310**	**1.135**	**.978**	**.828**	**.609**	**.519**	**.608**	**.796**	**1.077**	**1.093**	**1.763**
		31,806	3,400	3,476	3,007	2,592	2,195	1,615	*m* 1,375	1,612	2,110	2,852	2,898	4,674
	Q'land.	**531**	**1.08**	**.79**	**1.22**	**.93**	**1.45**	**1.22**	**.68**	**.86**	**.77**	**1.02**	**.95**	**1 04**
		370	33	24	38	28	45	38	*m* 21	26	24	31	29	32
	S. Aust.	**47,205**	**1.088**	**1.182**	**1.096**	**1.050**	**.833**	**729**	**.775**	**.776**	**.913**	**1.032**	**1.012**	**1.514**
		32,860	2,980	3,236	3,000	2,877	2,281	*m* 1,996	2,122	2,125	2,499	2,827	2,772	4,145
	N. Terr.	**266**	**0.0**	**1.17**	**0.0**	**.267**	**.13**	**1.22**	**27**	**.45**	**0.0**	**3.39**	**.00**	**2.71**
		185	0	18	..	41	*m* 2	26	4	7	..	52	..	42
	Total	**114,062**	**1.200**	**1.262**	**1.134**	**1.010**	**.841**	**.698**	**.655**	**.673**	**.848**	**1.037**	**1.051**	**1.591**
		79,401	7,941	8,348	7,501	6,681	5,568	4,617	*m* 4,331	4,455	5,614	6,862	6,954	10,528

TABLE CLXII.—Shewing the Fluctuations for "Persons" in the Interstate Migration by Sea in Australia for the Period 1909-13—*continued.*

	State.	Fluctuation Ratio (Total = 12.000) and Migration-ratios for Persons.												
		Migrants.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
From Tasmania P = 959218.	N.S.W.	**37,786**	**1.566**	**1.474**	**1.482**	**1.442**	**1.018**	**1.044**	**.825**	**.553**	**.735**	**.520** *m*	**.613**	**.728**
		3,939	5,140	4,837	4,865	4,735	3,343	3,427	2,708	1,815	2,411	1,709	2,013	2,388
	Vict.	**168,563**	**1.606**	**1.619**	**1.432**	**1.223**	**.821**	**.686**	**.693**	**.680** *m*	**.709**	**.876**	**784**	**.871**
		17,572	23,512	23,700	20,970	17,911	12,014	10,053	10,149	9,952	10,389	12,831	11,485	12,756
	S. Aus.	**339**	**.57**	**.67**	**4.01**	**3.33**	**.81**	**.78**	**0.0**	**.07** *m*	**.28**	**.71**	**.60**	**.17**
		35	17	20	118	98	24	23	..	2	8	21	18	5
	W. Aust.	**158**	**0.0**	**.46**	**3.49**	**6.68**	**1.06**	**.31** *m*	..	..	..	..	..	..
		16	0	6	48	92	15	4	..	..	..	..	..	..
	Total	**206,846**	**1.595**	**1.590**	**1.447**	**1.271**	**.857**	**.752**	**.715**	**.655** *m*	**.713**	**.810**	**.752**	**.843**
		21,564	28,669	28,563	26,001	22,839	15,396	13,506	12,857	11,768	12,809	14,560	13,516	15,150
From N. Territory. P = 10338.	N.S.W.	**412**	**.87**	**.64**	**.61**	**.58**	**.75**	**1.11**	**.93**	**.41** *m*	**1.72**	**1.81**	**1.49**	**1.08**
		39,800	2,900	2,100	2,000	1,900	2,500	3,700	3,100	1,300	5,700	6,000	4,900	3,600
	Vict.	**210**	**.57**	**1.66**	**1.37**	**.51**	**.40** *m*	**.40**	**.57**	**.91**	**.80**	**1.49**	**1.26**	**2.06**
		20,300	9,700	2,800	2,300	8,700	6,800	6,800	9,700	1,500	1,300	2,500	2,100	3,500
	Q'land.	**387**	**.75**	**.53**	**.44** *m*	**.84**	**1.02**	**.93**	**1.12**	**1.39**	**.65**	**1.77**	**1.24**	**1.33**
		37,400	2,300	1,600	1,300	2,600	3,200	2,900	3,500	4,400	2,000	5,500	3,900	4,200
	W. Aust.	**161**	**0.0**	**1.57**	**0.0**	**1.49**	**1.49**	**.75**	**1.12**	**.30** *m*	**.37**	**2.01**	**.52**	**2.38**
		15,600	0	2,000	0	1,900	1,900	9,700	1,400	3,900	4,800	2,600	6,800	3,100
	Total	**1,170**	**.66**	**.91**	**.61** *m*	**.78**	**.88**	**.87**	**.95**	**.81**	**1.02**	**1.76**	**1.23**	**1.52**
		113,200	6,200	8,600	5,700	7,400	8,300	8,200	9,000	7,600	9,600	1,600	1,200	1,400

The upper figures are the relative average magnitudes of the migration for the month, the monthly average for the year being unity. Those underlined are the maximum-values and those marked "*m*" the minimum values during the year.

The small figures are the number of migrants ("persons") per 1,000,000 population in the State *from* which the migration takes place.

That *Land Migration* also shews marked periodicity is evident from Table CLXIII. It is worthy of notice that the total immigration for a year is sensibly equal to the total emigration for the same period, though the want of balance for individual months may be considerable.

TABLE CLXIII.—Shewing the Periodic Fluctuation of Overland Migration (by Railway) for equalised months and a Constant Population. Australia, 1914-1916. ("Persons.")

Month.	Arrivals or Immigration.				Departures or Emigration.			
	N.S.W.	Vic.	Q'land.	S. Aust.	N.S.W.	Vic.	Q'land.	S. Aust.
January ..	1.1517	1.0855	1.5297M	1.1928	1.2452	1.0973	1.2142	1.2352
February ..	.9824	.9812	1.0387	.9737	1.0044	.9437	.9738	1.0580
March ..	1.1099	.9427	1.2059	.9944	1.0339	1.0848	1.1270	1.0250
April ..	1.2085	1.1153	1.3487	1.1649	1.1811	1,1745M	1.2167	1.2827M
May ..	.9584	.9353	1.0189	.9761	.9498	.9928	.8907	1.0278
June ..	.8034*m*	.8360	.7474	.8007 *m*	.7888 *m*	.8533 *m*	.7072	.8643
July ..	.8389	.8269 *m*	.7472	.8528	.7999	.8921	.6995 *m*	.8904
August ..	.8734	.8985	.8454	.9445	.8938	.9179	.8231	.8488 *m*
September ..	.9394	1.0494	.7266	.9602	.9432	1.0177	.8349	.8892
October ..	.8700	1.1441	.7610	.9047	1.0000	.9115	.8703	.8970
November ..	.9091	.9884	.7117 *m*	.9350	.8809	.9970	.8219	.8725
December ..	1.3549M	1.1967 M	1.3188	1.3002 M	1.2790 M	1.1174	1.8207 M	1.1091
Mean No. for equalised mnth. Aggr. Popn. ..	67,102	48,188	24,278	18,063	67,007	47,804	24,516	18,244

M denotes the maximum and *m* minimum value.

7. **Migration and Age.**—If the ages of migrants of each sex are recorded at the moment of entry into or exit from any community, it is possible to know continuously the constitution of the population according to sex and age, once a population Census has been taken. Results forwarded to the compiling authority only at long intervals require corrections, of the type referred to in Part XI., §§ 7-9, pp. 152-160. The deduction of ages is best effectuated by referring all the results to the one point of time, say the end of the calendar year.

8. **Defects in migration records and the closure of results.**—Notwithstanding that elaborate care was taken as regards the record of emigration, it has been found in Australia that errors occur therein of considerable magnitude. From the 1901 Census and the intercensal records up to the Census of 1911, it appeared that, if the discrepancy were attributed wholly to this source of error, it would amount, in the case of males, to 0.1459 of the whole recorded male migrants outward (departures) and in the case of females to 0.0995 of the whole recorded female migrants outward. A still more extraordinary result was that apparently the island-continent of Australia was rapidly losing females.[1]

Suppose that a statistical element E_0 is accurately ascertained at any point of time (*e.g.*, as at a Census) and after n years is again accurately ascertained and found to be E_n; and further that the intervening changes are $e_1, e_2, \ldots e_n$. Then :—

$$(661)\ldots E_n = E_0 + k\,(e_1 + e_2 + \ldots + e_n)\,;\ \text{or}\ k = (E_n - E_0)/(e_1 + e_2 + \ldots + e_n)$$

The quantity k may be called the *coefficient of proportional linear adjustment*, and E_1, E_2, etc., may be found by the successive additions, viz., of ke_1, ke_2, etc., instead of the unadjusted change. We may, however, correct the results as indicated in (662), that is :—

$$(662)\ldots E_n = E_0 + e_1 + e_2 + \ldots + e_n + \epsilon = E_0 + (e_1 + \kappa) + (e_3 + \kappa) + \ldots + (e_n + \kappa).$$

in which last expression $\kappa = \epsilon/n$, the total defect of closure, ϵ, being divided equally among the changes. Thus in this case E_1, E_2, etc., may be found by successive additions, viz., of $e_1 + \kappa$, $e_2 + \kappa$, etc. This may be called *simple linear adjustment*. The question as to whether one or the other or either is legitimate, must always be decided by the nature of the case, and obviously no general rule can apply.

[1] Upon a change being made on the system as between State and State, such that the aggregate of the State-increments of population gave the increment of population to the Commonwealth, this peculiarity vanished.

XVII.—MISCELLANEOUS.

1. **General.**—It is proposed in this part to refer to a number of miscellaneous matters, which have not been included in previous parts, and which either do not fall under any particular heading, or have been omitted from earlier consideration.

2. **Subdivision of population and other groups.**—The values of group-subdivisions, which are obtained by dividing groups by the middle ordinate, are given earlier, see Part VI., § 4, pp. 80-81. These formulæ are not always applicable. Two questions often arise, viz. (i.) the value of the subdivisions or (ii.) of their ratios to each other.

Considering first the subdivision of a group g into two parts, let it be supposed that the function, representing a series of groups, viz., $g_{-4}, \ldots . g_{-1}, g, g_1 \ldots . g_4$, is $a+bx+cx^2+$ etc., then we shall have[1] :—

(663).....

$$g_{-\frac{1}{2}} = \tfrac{1}{2}g - \tfrac{1}{256}[61(g_1-g_{-1}) - 44(g_2-g_{-2}) + 19(g_3-g_{-3}) - 3\tfrac{1}{2}(g_4-g_{-4}) + \text{etc.}]$$

$g_{-\frac{1}{2}}$ denoting the portion of the group g on the negative side of the middle ordinate of that group. This formula is in general suitable about maxima and minima values, but *may*, of course, be inappropriate if $g_k - g_{-k}$ increase more rapidly than the coefficients diminish. It may often be employed, however, when *pairs* of terms in the square brackets are sharply convergent.

Another process of arriving at values for the subdivision of groups into halves is the following :—Let the values of the successive groups be C, B, A, M, A', B' and C', and M, the group to be divided. Then the portion next to A is[2] :—

$$(664)..M' = \tfrac{1}{2}M - \tfrac{1}{2048}[201(A'-A) - 44(B'-B) + 5(C'-C) - ..]$$

which in many cases gives substantially the same result as (663), though it is not an identical formula, and apparently might be regarded as not in agreement therewith.

---

[1] This is deduced by finding, in terms of the groups themselves, the values of the constants a, b, etc., of the curve : and then integrating between the limits which give the first half of the group to be subdivided.

[2] This is easily derived from the usual formula for interpolation into the middle, viz., $F(\frac{1}{2}) = F + \frac{1}{2}a' - \frac{1}{8}b_0 + \frac{3}{128}d_0 - \frac{5}{1024}f_0 +$ etc., by regarding the aggregates $C, C+B, C+B+A, C+B+A+M$, etc., as successive totals represented by ordinates represented by $\alpha + \beta x + \gamma x^2 +$ etc. ; finding the value to the middle ordinate of group M and subtracting $C+B+A$.

In the case of groups rapidly increasing or rapidly diminishing in amount—as for example the numbers dying at the beginning of life in 0–1, 1 to 2, etc., days, weeks, months or years, the following method of subdivision may be followed :—

Let it be required to divide each of a series of larger groups A, B, C, etc., for equal limits of a variable into s smaller groups, viz., $a_1, a_2, \ldots a_s$; $b_1, \ldots b_s$; $c_1, \ldots c_s$; etc., and suppose that $B=mA$; $C=m'B=mm'A$; etc. Then if $m'=m$, etc., it is obvious that the successive values of the smaller groups will be :—

$$(665)..(a_1 + na_1 + n^2a_1 + \ldots) + (b_1 + nb_1 + n^2b_1 + \ldots) + \text{etc.} =$$
$$(a_1 + \ldots + n^{s-1}a_1) + (n^s a_1 + \ldots + n^{2s-1}a_1) + (n^{2s}a_1 + \ldots n^{3s-1}a_1)$$

in which n is the sth root of m and m'. The brackets shew the groups, the sum of which give the original values A, B, C, etc. Since from each of any three adjoining groups an equal quantity Q may be cut off or added, so that the altered values A', B', C' will be A', $m_0 A'$, $m_0^2 A'$, we can constitute the group-divisions by adding a common value Q/s to each of a series of quantities of the type of (665) above, n_0 in this case being the sth root of m_0. Hence we have :—

$$(666).....a\,(1 + n + n^2 + \ldots n^{s-1}) = A' = A - Q;$$

from which, since n is known, a can consequently be determined, and the series a, na, n^2a, etc., to which, if a common quantity $q=Q/s$ is added we obtain a_1, a_2, etc. Thus :—

$$(667).....a_1 = A'/(1 + n + n^2 + \ldots + n^{s-1}) + q = a + q;$$
$$a_2 = na + q; \quad a_3 = n^2a + q; \text{ etc.}$$

In applying this method practically, any group may be subdivided by treating it as B, and dividing it according to the indications of the groups on either side A and C.

3. **The measure of precision in statistical results.**—Statistical results, expressed without regard to their possible or probable error, often suggest the attainment of a precision far beyond that which the data can furnish. For example, if the ratio of the survivors after one year be given (as in life-tables) to 5 decimals, the results *imply* for Australian data an average precision of *age* for the first year of 1.1 hour, or at its terminal of 0.4 hour. For other countries it will be much the same. Again, in the case of the instantaneous rate of mortality at the end of the first year, the expression to 5 places of decimals *implies* a precision, in the *time* or epoch to which it may be deemed to apply, of 8 days. In both cases the apparent precision is illusory,[1] forasmuch as the recording of the facts and their actual

[1] See Census Report, Vol. III., p. 1215, and also p. 1212.

variableness does not conform to this order of precision. For example, births and deaths are not recorded as regards age to 0.4 hour per annum even on the average: nor can the point of time to which they may appropriately be referred be deemed to be ascertained to 8 days or its equivalent in a decade. Actuarial tables are often carried to 7 places of decimals. A unit in the last place is (on the average) for ages 1 to 2 about equivalent to an age-difference of 2 minutes, and, owing to the diminution of death-rate with the lapse of time, also to about the same as to the point of time to which the result is presumed to apply.

Let u and y denote respectively functions of time (t) and of age (x), then if :—

$$(668)\ldots\ldots \Delta u = I\,dt\,;\ \Delta y = J\Delta x\,;\ \text{or}\ I = du/dt\,;\ J = dy/dx$$

in the limit, I and J are the *ratios of relative importance*—as compared with the units of u and y—of precision in the units respectively of t and x. These ratios serve as guides in fixing the relative accuracy required in the data giving the two co-ordinates. If in graphing results, the units on the axis of abscissæ are, respectively, I and J times the units on the axis of ordinates, then the curve will make an angle of 45° with either axis, and this, in so far as it is practicable to follow it, is the best scale-relation between ordinate and abscissa for any graph intended to be used for analysis.

The life-tables published in connection with the Australian Census of 3rd April, 1911, follow the usual tradition as regards the number of figures to which the results are expressed. It is not, however, implied that the precision indicated is realised, they merely are followed for the sake of consistency in the results.

By suitable combinations of arithmetical and graphical methods results can be obtained to any required degree of practical precision.[1]

4. **Indirect relations.**—It is often necessary to establish statistical relations which really depend upon some intermediary statistical relation. For example, the average number of children born to an individual, or "average issue" may be related to age of "mothers," and such a relation would, of course, be a direct one. For certain purposes, however, (*e.g.*, social insurance) the average issue may be required as related to the age of fathers. The later relation, though physically indirect, is a regular and important one. Nevertheless, it is one which may be deduced by means of certain data from direct relations; at the same time it is not preferable to obtain it in this way. The relations according to "wives" and "husbands" are both given immediately by the Census, and the relation so given is, in general, to be preferred to the deduced relation: see Fig. 107.

[1] If the value of I or J is not between the limits $\frac{1}{4}$ to 4, the natural scale for both co-ordinates is not ordinarily satisfactory in graphing a function; however, the mode of variation of the greater co-ordinates will assist in the determination of a truly smoothed curve.

Fertility Curves.

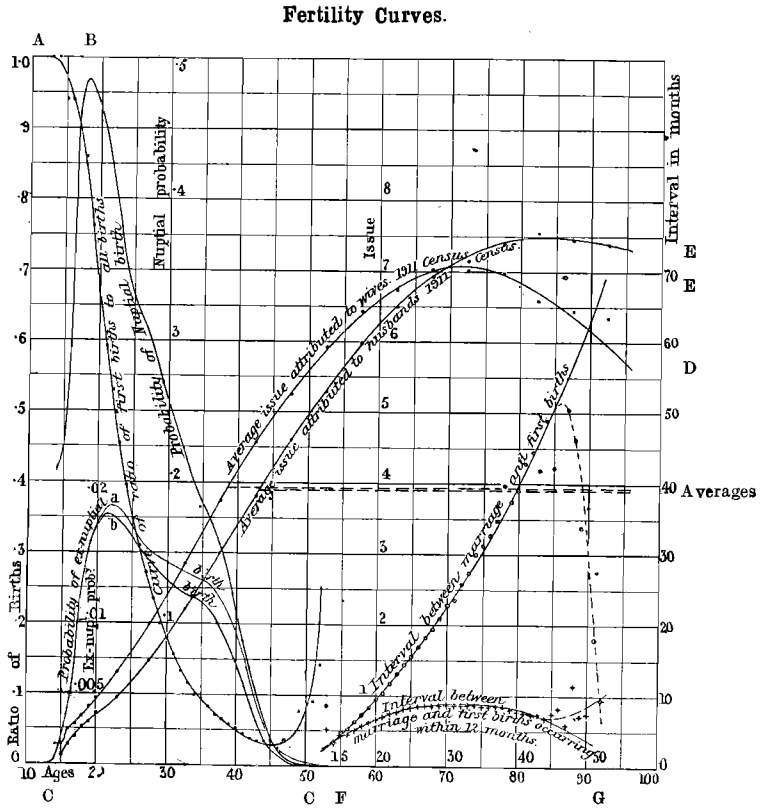

Fig. 107.

Curve A shews the ratio, according to age, of first births to all births.
Curve B shews the probability, according to age, of a nuptial birth ; see also p. 242 and p. 243.
Curve Ca shews the probability, according to age, of an ex-nuptial birth on the assumption (i.) that they are attributable wholly to the never-married.
Curve Cb shews the probability, according to age, of an ex-nuptial birth on the assumption (ii.) that they are attributable equally to the never-married, widowed, and divorced.
Curve D shews the average issue, according to age, of wives at the Census of 1911.
Curve E shews the average issue, according to age, as related to husbands at the Census of 1911.
Curve FE' shews the average interval, according to age, between marriage and first-births.
Curve FG shews the average interval, according to age, between marriage and first-births, occurring within 1 year of marriage.

5. Limits of uncertainty.—The limits of an uncertainty in any deduced quantity may be due to possible errors in the numbers upon which it is founded, or upon an uncertainty as to the particular quantity which should be employed. The first cause of uncertainty is sufficiently illustrated by the ratio of, say, first births to all births : for prediction purposes the smoothed numbers in Table CLXIV. are really more probable than the crude numbers : see Fig. 107.

The second cause of uncertainty is illustrated in the following example :—If the "never married," the "widowed" and the "divorced" are regarded as a homogeneous class, the probability of a case of ex-nuptial maternity during one year is found by dividing the number of births in one year by the sum of the average numbers in the three

classes. If, however, they are not homogeneous as regards this probability, a more accurate result might be obtained by dividing by the never married. The general probability must lie between the two results : see the curves marked Ca and Cb on Fig 107, and the results in columns marked I. and II. respectively in Table CLXIV.

It may be noted that the characteristics of a variation may be wholly changed by restriction within limits. This is seen by taking the interval according to age between marriage and a first birth, when the consideration is restricted to the lapse of 12 months, or is indefinite : see the curves FG and FE′ respectively.

TABLE CLXIV.—Shewing Rates of First to All Births, and Probabilities of Ex-nuptial Maternity. Australia, 1907-14.

Age.	Ratio of First to all Births.		Probability Ex-nuptial Maternity based on assumption		Age.	Ratio of First to all Births.		Probability Ex-nuptial Maternity based on assumption	
	Crude.	Smoothed.	I.	II.		Crude.	Smoothed.	I.	II.
12 ..	..	1.0000	.000015	.000015					
13 ..	1.0000	.9970	.000062	.000062	34 ..	.0994	.1040	.01325	.0118
14 ..	1.0000	.9930	.00037	.00037	35 ..	.0923	.0920	.0130	.0115
15 ..	.9404	.9715	.0016	.0015	36 ..	.0817	.0825	.0127	.0110
16 ..	.9407	.9430	.0042	.0042	37 ..	.0703	.0730	.0122	.0103
17 ..	.9130	.9035	.0085	.0085	38 ..	.0640	.0640	.0115	.0094
18 ..	.8602	.8450	.0131	.0131	39 ..	.0583	.0560	.01045	.0084
19 ..	.7627	.7627	.0157	.0162	40 ..	.0524	.0485	.0095	.0072
20 ..	.6594	.6624	.0172	.0173	41 ..	.0437	.0425	.0076	.0058
21 ..	.5912	.5912	.0180	.0179	42 ..	.0381	.0370	.0059	.0044
22 ..	.5285	.5170	.01835	.0181	43 ..	.0352	.0338	.0043	.0030
23 ..	.4534	.4485	.0181	.0179	44 ..	.0351	.0310	.0030	.0018
24 ..	.3960	.3960	.0176	.0174	45 ..	.0349	.0285	.0020	.00123
25 ..	.3482	.3482	.0169	.0161	46 ..	.0244	.0295	.0012	.00080
26 ..	.3098	.3080	.0160	.0154	47 ..	.0360	.0338	.00085	.00040
27 ..	.2722	.2710	.0154	.0147	48 ..	.0255	.0428	.00055	.00022
28 ..	.2352	.2370	.0149	.0141	49 ..	.0769	.0555	.00035	.00013
29 ..	.1987	.2065	.0146	.0135	50 ..	.1333	.0790	.00022	.00009
30 ..	.1800	.1795	.0143	.0130	51 ..	.0909	.1230	.00012	.00006
31 ..	.1555	.1560	.0140	.0126	52 ..	.1429	.2500	.00004	.00004
32 ..	.1324	.1355	.0137	.0123	53 ..	..	..	.00002	.00002
33 ..	.1160	.1182	.0135	.0120	54 ..	..	..	.00001	..
34 ..	.0994	.1040	.01325	.0118	55 ..	..	..	..	..

I. denotes the ratio of births to the never-married ; II., the ratio of births to the aggregate of the never-married, widowed and divorced.

6. **The theory of "happenings" or "occurrence frequencies."**—In order to establish a rational theory of, and to completely interpret, the frequency curves met with in the various elements of the statistics of population, a theory of the frequency of occurrences of various kinds is a first requisite, and the type-forms of distribution established by Prof. K. Pearson and his co-workers are a contribution thereto, based upon the application of the theory of probability, plus certain empirical assumptions by means of which assymetrical forms of various kinds are deduced. Recently a foundation has been laid of a perfectly general theory of the frequency of occurrences, by Prof. Sir Ronald Ross. This latter seems to have had its birth in an attempt made in 1866 by Dr. Farr to develop a definite theory of an epidemic (cattle plague)[1]. In 1873-5 Dr. G. H.

[1] Dr. William Farr, "On the Cattle Plague," Journ. Soc. Sci., 20th Mar., 1866.

Evans endeavoured to extend Farr's theory to other epidemics.[1] The subject was again reopened by Dr. J. Brownlee[2] in a series of very significant contributions, and later, by Ross. Quite recently the last-named has put forward a definite theory, the fundamental elements of which are outlined in this section.[3] Although the main object was initially the determination of a basis for a theory of epidemics, the results are entirely general, and may be called the theory of "occurrences" or "happenings."

The differential equation of independent occurrences, reduced to its simplest expression, may be deduced as follows :—

Suppose a population P to consist of two parts, viz., A a part which is unaffected, and Q a part which[4] is affected[4], by any "happening,"[5] so that $P = A + Q$. Suppose also that some portion, viz., hdt, of the unaffected part becomes affected in the time dt, and also that a portion rdt of the affected part reverts to the unaffected part in the same element of time, so that the element of increase of the affected part is $(h-r)\,dt$; and finally let bdt, mdt, idt and edt denote in the unaffected part, the rates of *birth*, *death* (or mortality), *immigration* and *emigration* respectively ; and Bdt, Mdt, Idt and Edt denote the similar rates in the affected part. Obviously therefore :—

$$(669)\ldots dP = A\,(b-m+i-e)dt + Q(B-M+I-E)dt = (Av + Q\,V)dt\,;$$

$$(670)\ldots dA = A(b-m+i-e-h)dt + Q(B+r)dt = \{A(v-h) + Q(B+r)\}\,dt\,;$$

$$(671)\ldots dQ = Ahdt + Q(-M+I-E-r)dt = \{Ah + Q\,(V-B-r)\}\,dt\,;$$

[1] Dr. G. H. Evans, "Some arithmetical considerations on the progress of epidemics," Trans. Epidemiol. Soc. London, Vol. 3, Pt. III., p. 551, 1873-5.

[2] Dr. J. Brownlee (i.) Theory of an Epidemic," Proc. Roy. Soc. Edin., Vol. 26, Pt. IV., p. 484, 1906; (ii.) "Certain considerations on the causation and course of epidemics," Proc. Roy. Soc. Med., Lond., June 1909; (iii.) "The mathematical theory of random migration and epidemic distribution," Proc. Roy. Soc., Edin., Vol. 31, Pt. II., p. 261, 1910 ; (iv.) "Periodicity in infectious disease," Proc. Roy. Phil. Soc., Glasgow, 1914; (v.) "Investigations into the theory of infectious diseases, etc., Public Health, Lond., Vol. 28, No. 6, 1915; (vi.) "On the curve of the epidemic," Brit. Med. Journ., May 8, 1915.

[3] Lieut.-Col. Prof. Sir Ronald Ross. (i.) "The logical basis of the sanitary policy of mosquito reduction." Cong. Arts and Sci., St. Louis, U.S.A., Vol. 6, p. 89, 1904, and Brit. Med. Journ., May 13, 1905 ; (ii.) The prevention of malaria in Mauritius," Waterlow and Sons, Lond., 1908, p. 29-40 ; (iii.) The prevention of malaria, J. Murray, Lond., 1910 ; 2nd Edit., 1911 ; Addendum on "the theory of happenings," 1911 ; (iv.) Some quantitative studies in epidemiology, Nature, Lond., Oct. 5, 1911 ; (v.) "Some *a priori* pathometric equations," Brit. Med. Journ., Mar. 27, 1915 ; (vi.) "An application of the theory of probabilities to the study of *a priori* pathometry" ; Proc. Roy. Soc., Lond., Vol. 92, ser. A., July 14, 1915, pp. 204-230. See also H. Waite, "Mosquitoes and Malaria," Biometrika, Lond., Oct. 1910, Vol. 7, No. 4, p. 421.

[4] The affection may be of any nature, such as a disease, etc., and the supposition is quite general.

[5] The "happening" is the becoming affected, and is equally general with the preceding supposition.

and writing v and V for the algebraic sum of the quantities in the brackets in (669), the final forms of the preceding equations are given as is necessary of course, $dP = dA + dQ$. It may be noted that only aA and dQ contain terms representing the *happening* (h) *and reverting elements* (r), and that $QBdt$ appears in (670) but not in (671), because, in general at least, the progeny of the affected part are not affected at the instant of birth. Although the *variation elements* b, m, i, e and B, M, I, E will, if long periods are considered, generally be functions of time, they *may be regarded as constant* when short periods only are under review. Consequently for elementary cases mean values may be taken without sensible error,[1] similarly in regard to the *reverting element.*[2]

The most important element is the *happening element*, h, which it is to be clearly understood ordinarily falls on both groups (A and Q) alike. Should, however, it fall upon individuals already affected, it merely reaffects them and does not cause them to pass from one group to the other. Hence, though the total number of "happenings" is $P.hdt = (A + Q)\,hdt$, the number $Qhdt$ are already affected and must not be taken account of. The actual number of *new cases* Gdt, say, is thus only $Ahdt$. Thus :—

$$(672)\ldots\ldots Gdt/Phdt = \frac{A}{P}\ ;\ \text{or}\ G = hA = h\,(P - Q)$$

"Happenings" may be divided into two classes, viz. :—(a) those in which the frequency of the happening is *independent* of—and (b) those on which is *dependent* upon—the number of individuals already affected.[3] In independent happenings h and G are constants, in dependent happenings they are functions of Q.

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[1] If, as is often the case, the "happenings" have no effect on the birth, death and migration rates, then we may have $b = B$, $m = M$, $i = I$, $e = E$, and consequently $v = V$, which may also occur fortuitously though the several terms differ. In general b is less than B in marriages, m than M in accidents, while in certain alarming epidemics (*e.g.*, cholera, plague, malaria) i is greater than I, and e less than E, in which case v is greater than V. In fatal accidents $M = 1$, and B, I and E are all 0, which value may also be assigned when considering happening among the *same* individuals. If a surrounding population be not affected $I = 0$; if affected individuals cannot move $E = 0$.

[2] In the case of "independent happenings"—see later, rdt denotes merely the proportion of affected individuals who may become reaffected in the time dt. (*e.g.*, by divorce in marriage). In "dependent happenings" it implies loss of capacity for affecting others (*e.g.*, in infectious disease it implies both immunity and loss of infectivity). In some diseases r may be zero (*e.g.*, leprosy and organic diseases, fatal accidents) ; it may be of small value (*e.g.*, many zymotic diseases) ; it may be of high value (*e.g.*, snake-bite, heat-stroke, etc.), and it may be unity (*e.g.*, slight accidents).

[3] To the former belong cases which are attributable to what may be called external causes (*e.g.*, accidents, non-infectious diseases, etc.) ; to the latter belong all cases attributable to propagation from individual to individual (*e.g.*, infectious diseases, etc.),

In *independent happenings*, therefore, the happening falls upon the same proportion (hdt) of the population in every element of time. Put $x = Q/P$ and $P - Q$ for A, then equations (669) and (671) give :—

$$(673)\ldots\ldots dP/dt = vP - (v - V)\,xP$$

$$(674)\ldots\ldots d\,(xP)/dt = hP\,(1 - x) + (V - B - r)\,xP$$

and by differentiation :—

$$(675)\ldots\ldots d\,(xP)/dt = xdP/dt + Pdx/dt.$$

From these three last equations, we have after dividing by P, and eliminating $d\,(xP)/dt$ and dP/dt :—

$$(676)\ldots\ldots dx/dt = h - (h + v - V + B + r)\,x + (v - V)\,x^2$$

which gives one form of integral if $v - V = 0$, and a different one if v and V are unequal.

When the sum of the variation elements of the affected group is constant the case may be called the *equivariant case*, the total population is unaltered.[1] Putting :—

$$(677)\ldots\ldots K = h + B + r\,;\ L = h/K\,;\ y = L - x\,;\ \text{hence}$$

$$(678)\ldots\ldots dx/dt = -\,dy/dt = K\,(L - x) = Ky\,;\ dy/y = -\,Kdt\,;$$

which gives on integrating :—

$$(679)\ldots\ldots \log y = -\,Kt + C, \text{ or } y = y_0\,e^{-Kt},$$

y_0 being the value of y at the beginning of the "happening." Consequently, since $y_0 = L - x_0$:—

$$(680)\ldots\ldots x = L - (L - x_0)\,e^{-Kt}$$

viz., the proportion of the total population affected at the time t, the proportion being x_0 when $t = 0$.[2]

When v is not equal to V, we have the *general case of independent happenings* which involves the integration of (676). This may be written in the form :—

$$(681)\ldots\ldots dx/dt = K\,(L - x)\,L' - x) \equiv K\,(\alpha - \beta - x)\,(\alpha + \beta - x)$$

[1] An example would be the occurrence of slight accidents in which case $r = 1$, or the attainment of a certain standard of wealth tending to diminish simultaneously the birth, death, and migration rates of the affected by an equal decrement. If the progeny of the affected are also affected B should be omitted from (670), and inserted in (671), and will disappear in (674) and (676).

[2] Obviously in (673) if $v - V = 0$, a differential equation of the same form as (678) is obtained, hence $P = P_0 e^{vt}$, formula (2), p. 10 herein.

in which $a = (h + B + r + K)/2K$ and $\beta = \sqrt{(a^2 - h/K)}$, the roots $L = a - \beta$ and $L' = a + \beta$, being always real and positive when $v > V$. This gives :—

$$(682)\ldots. x = L - (L' - L)\ (L - x_0)/\{(L' - x_0)\ e^{2K\beta t} - (L - x_0)\}$$

which simplifies slightly if $x_0 = 0$. The relative number of the affected depends upon whether K, that is whether $v - V$ is positive or negative, the former being usually the case in injurious happenings and the latter the case in beneficial ones. This gives :—

$$(683)\ldots P = P_0 e^{vt}.\ Le^{-KLt}/(L' - L)\ ;\ \text{or}\ P_0 e^{vt}.\ -Le^{-KL't}/(L' - L)$$

the former expression being appropriate when K is positive, the latter when it is negative.

Among *dependent happenings* the case of *proportional happenings* is important as a first approximation to the study of the infection of a community. In this instance h is a function of Q and consequently of t. If each affected individual affects c others in a unit of time the total happenings in the time dt will be $cQdt$. The number of new cases per element of time may be taken as probably :—

$$(684)\ldots\ldots Gdt/cQdt = A/P\ ;\ \text{or}\ G = cQ\ (1 - x)\ ;\ h = cx.$$

This gives :—

$$(685)\ldots dx/dt = Kx(L - x),\ \text{in which}\ K = c - v + V;\ L = 1 - (B + r)/K,$$

from which may be obtained :—

$$(686)\ldots\ldots x = L/\{1 + (L/x_0 - 1)\ e^{-KLt}\}.$$

This gives regular bell-shaped curves : x_0 and Q_0 can never be zero.

Sufficient has been indicated to shew the value and reach of Prof. Ross's analysis of the question, and to render evident the fact that it is the foundation of a rational theory of "occurrences" of any kind, which can be numerically defined, in a population.

7. **Actual statistical curves do not coincide with elementary type forms.**—The importance of a rational theory of "happenings" does not consist in the fact that the curves deduced from elementary suppositions, meticulously correspond to actual statistical frequencies, but in the fact that deduced types give the general configuration. Since in actual cases what may be called the *frequency of initiation* is variable, the deduced forms of frequency at any given moment are only partially applicable to actual cases. Moreover any assymetrical and polymorphic curve, and indeed even any regular curve, can be built up in an infinite number of ways. The dissection of a curve into additive components is therefore,

in general, purely empirical. Although this is so, when extra-mathematical reasons exist for the acceptance of an hypothesis of constituent elements, whose origins, and general characters, are known, it may be possible to effect an analysis into components which yields a real and not merely a formal interpretation.[1]

In general, type-curves, the interpretation of which is impossible and is ignored outside certain selected points (*e.g.*, the points where they meet the axis of abscissæ) are logically unsatisfactory.

The function of a "theory of happenings" and of the "theory of probability," is therefore one of guidance in interpretation, and of deciding as to the applicability or otherwise of particular types of mathematical expression for the representation of the change of frequency with change of the variable. Mere arithmetical tests of the "goodness of fit" of particular mathematical expressions are significant or otherwise according as they conform to what is known *a priori*, or is deducible from *a priori* considerations, and these must certainly be taken in conjunction with the observations over the whole range of experience.[2]

8. **International norm-graphs and type-curves.** — The function served by the creation of norms has been indicated in Part VIII., § 6, p. 102. When norms for every important population-character have been computed, it is desirable that they should be *graphed and used internationally*. This could be done by printing squared graphed paper, with the norm shewn thereon, say in pale colour (or by a very fine line). The graphing of the same character on such paper for any particular population, would then immediately disclose the nature of its deviation from the normal. In this way the population phenomena could be graphically studied in their comparative relationships.

An extension of the system would be for each country to shew by pale tint not only the international norm, but also its own norm for (say) the previous decade.

Type-curves for international use would also greatly assist in the work of a better technical reduction of statistical results. The forms desirable or necessary would doubtless be more readily recognised when the international norms had been obtained.

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[1] For example in the harmonic analysis of tides, the forms and periods of the components are determined by celestial positions (*i.e.*, of the sun, moon, "anti-sun," "anti-moon," etc.), and the elements to be ascertained are merely the epoch of each component and its amplitude.

[2] For example, to systematically vary the representation of facts in order to agree with some adopted mathematical expression to which it is thought they *ought* to conform, is only to delude oneself. The character of terminal conditions is often known *a priori*, and the mathematical expression representing the facts should not be merely one in substantial arithmetical agreement with the frequency, but one which expresses as accurately as may be the law of its change. Similarly, the adoption of an expression which disturbs the observed critical values of the frequency, vitiates the results.

9. **Derivative elements from population-theory.**—It is beyond the purpose of this monograph to discuss the various **derivative branches** of the theory of population; such, for example, as the estimation from probate-records of the aggregate of private wealth; of the economic value of an average man or woman; of the economic value of different classes of persons; the cost of, and economic value of, education, etc. The present increasing length of life tends to give a higher average economic value—other things being equal—to an individual: the average wealth possessed per individual is probably also increasing.

Although all that relates to population may, in a comprehensive view, be regarded as belonging to its theory, it is quite appropriate that purely economic questions should be separated out. Therefore, while results obtained by means of the development of the population-theory are essential and are of the first order of importance, in any attempt, for example, to reach decisions as to the economic aspects of population, the questions that arise are so extensive that they must be treated independently. Nevertheless, the value of a suitably developed theory of population is not seen until it is viewed in the light of all its applications among which the economic is but one.

Similar observations apply to the anthropometric elements of the population. These are probably correlated with elements treated hereinbefore; nevertheless, it is preferable to deal with them independently.

10. **Tables for facilitating statistical computations.**—Mathematical tables of various kinds have been prepared for facilitating statistical computations, among which may be specially mentioned "Tables for Statisticians and Biometricians," by Prof. Karl Pearson, F.R.S., etc. In this monograph the following tables are solely for facilitating the computation or illustrating the mode of deducing quantities which enable required quantities to be found by inspection:—

Tables	I.	VI.	XVII. & XVIII.	XXXVI. & XXXVII.	XL.	LXV.	LXVI.	
Pages	20	77	123	159	163	217	219-220	
Tables	LXVII.	LXXV.	LXXXI.	CXLIV.				
Pages	221-222	247	266	398				

11. **Statistical integrations and general formulae.**—Reference has already been made in Part VI., §§ 6-8, pp. 82-84, to statistical integrations, and references were given to various tables, see p. 82. The integration of functions of a single variable is the subject of one of the Cambridge Tracts in Mathematics and Mathematical Physics, No. 2. This and the works previously mentioned will enable most integrations occurring in practical cases to be effected. For convenience the following are given:—

Table of Integrals and Limits.

$\int dx = x = 2\arctan\sqrt{\left(\frac{1-\cos x}{1+\cos x}\right)}$: $\int(ax\pm b)\,dx = \frac{1}{2}(ax^2\pm 2bx) = \frac{1}{2a}(ax\pm b)^2$; $C = \frac{b^2}{2a}$;

$\int\frac{dx}{x} = \log x = \log\left(\frac{x}{a}+\frac{x}{b}\right)$: $\int\frac{dx}{ax\pm b} = \frac{1}{a}\log(ax\pm b)$: $\int\frac{mx+n}{ax+b}dx = \frac{m}{a}x+\frac{an-bm}{a^2}\log(ax+b)$:

$\int\frac{dx}{ax^2+bx} = \frac{1}{b}\log\frac{x}{ax+b}$: $\int\frac{dx}{(x+a)(x+b)} = \frac{1}{b-a}\log\frac{x+a}{x+b}$: $\int\frac{dx}{ax^2+bx+c} = \int\frac{dx}{\phi}$, put $\beta = b^2-4ac$,

then $\int\frac{dx}{\phi} = \frac{1}{\sqrt{\beta}}\log\frac{2ax+b-\sqrt{\beta}}{2ax+b+\sqrt{\beta}} = \frac{2}{\sqrt{\beta}}\log\frac{2ax+b-\sqrt{\beta}}{\sqrt{\phi}} = \frac{2}{\sqrt{-\beta}}\arctan\frac{2ax+b}{\sqrt{-\beta}} = \frac{1}{\sqrt{-\beta}}\arcsin\frac{(2ax+b)\sqrt{-\beta}}{2a\phi}$.

$= \frac{2}{\sqrt{-\beta}}\arcsin\frac{2ax+b}{2\sqrt{(a\phi)}}$, $= \frac{2}{2ax+b}$ when $\beta = 0$: $\int\frac{x\,dx}{ax^2+bx+c} = \int\frac{x\,dx}{\phi} = \frac{1}{2a}\log\phi - \frac{b}{2a}\int\frac{dx}{\phi} =$

$= \frac{1}{2a}\log\phi - \frac{b}{2a\sqrt{\beta}}\log\frac{2ax+b-\sqrt{\beta}}{2ax+b+\sqrt{\beta}} = \frac{1}{2a}\log\phi - \frac{b}{a\sqrt{-\beta}}\arctan\frac{2ax+b}{\sqrt{-\beta}} = \frac{b}{a(2ax+b)} + \frac{1}{a}\log(2ax+b)$, when $\beta = 0$:

$\int\frac{mx^2+nx+p}{ax+b}dx = \frac{mx^2}{2a}+\frac{an-bm}{a^2}+\frac{a^2p-abn+b^2m}{a^3}\log(ax+b)$: $\int x^2dx = \frac{1}{3}x^3 = \frac{1}{3}(x^{\frac{3}{2}}+a^{\frac{3}{2}})(x^{\frac{3}{2}}-a^{\frac{3}{2}})$:

$\int x^3dx = \frac{1}{4}x^4 = \frac{1}{4}(x^2+ax+\frac{a^2}{2})(x^2-ax+\frac{a^2}{2})$, etc.: $\int\frac{dx}{x(ax^2+bx+c)} = \int\frac{dx}{x\phi}$; put $\beta = b^2-4ac$;

$\int\frac{dx}{x\phi} = \frac{1}{2c}\log\frac{x^2}{\phi}-\frac{b}{2c}\int\frac{dx}{\phi}$, see above: $\int\frac{dx}{x^3\phi} = \frac{1}{cx}-\frac{b}{2c^2}\log\frac{x^2}{\phi}+\frac{b^2-2ac}{2c^2}\int\frac{dx}{\phi}$, see above:

$\int x^m dx = \frac{x^{m+1}}{m+1} = \frac{ax^{m+1}+b}{a(m+1)}$: $\int\frac{dx}{x^m} = -\frac{1}{(m-1)x^{m-1}} = -\frac{a+bx^{m-1}}{(m-1)ax^{m-1}}$:

$\int x^{-(1+\varepsilon)}dx = \frac{x^{-\varepsilon}-1}{-\varepsilon} = \frac{e^{-\varepsilon\log x}-1}{-\varepsilon} = \log x-\frac{1}{2!}\varepsilon(\log x)^2+\frac{1}{3!}\varepsilon^2(\log x)^3-\frac{1}{4!}\varepsilon^3(\log x)^4+\ldots = \log x$ for $\varepsilon = 0$

$\int\sin(ax+b)\,dx = -\frac{1}{a}\cos(ax+b)$: $\int\cos(ax+b)\,dx = \frac{1}{a}\sin(ax+b)$: $\int\tan x\,dx = -\log\cos x$:

$\int\tan(ax+b)\,dx = -\frac{1}{a}\log\cos(ax+b)$: $\int\cot(ax+b)\,dx = \frac{1}{a}\log\sin(ax+b)$:

$\int\frac{dx}{\sin(ax+b)} = \frac{1}{a}\log\tan\frac{1}{2}(ax+b)$: $\int\sin ax\sin bx\,dx = \frac{1}{2}\left\{\frac{\sin(a-b)x}{a-b}-\frac{\sin(a+b)x}{a+b}\right\}$:

General Formulæ. $\int f(x)\,dx = xf(0)+\frac{x^2}{2!}f'(0)+\frac{x^3}{3!}f''(0)+\ldots$: $U_1 = \int U\,dx$: $U_2 = \int U_1\,dx$:

$U' = \frac{d}{dx}U$: $U'' = \frac{d}{dx}U'$. $\int U\,dx = xU-\frac{x^2}{2!}U'+\frac{x^3}{3!}-\ldots = xU-\int xU'dx$: $\int UV\,dx = UV-\int UV'dx$:

$\int UV\,dx = UV_1-U'V_2+U''V_3-\ldots$: $\int x^mV\,dx = x^mV_1-mx^{m-1}V_2+m(m-1)x^{m-2}V_3-\ldots$: $\int U^mU'dx = \frac{U^{m+1}}{m+1}$

$\int(UV'+UV')\,dx = UV$: $\int(aU+b)^mU'dx = \frac{(aU+b)^{m+1}}{a(m+1)}$: $\int\frac{U}{(U+V)^m}dx = \int\frac{dx}{(U+V)^{m-1}}-\int\frac{V}{(U+V)^m}dx$:

$\int\frac{U'}{U}dx = \log U = -\frac{1}{m}\log\frac{1}{U^m}$: $\int\frac{U'}{U^m}dx = -\frac{1}{(m-1)U^{m-1}}$: $\int\frac{VU'}{U^2}dx = -\frac{V}{U}+\int\frac{V'}{U}dx$:

$\int\frac{UV'-U'V}{V^2}dx = \frac{U}{V}$: $\int\frac{UV'-UV'}{UV}dx = \log\frac{U}{V}$: $\int\frac{UV'-UV'}{U^2+V^2}dx = \arctan\frac{U}{V}$: $\int\frac{UV^2+VU^2}{UV(U+V)}dx = \log\frac{UV}{U+V}$:

$\int U\log x\,dx = U_1\log x-\int\frac{U_1}{x}dx$: $\int V\log U\,dx = V_1\log U-\int\frac{U'V_1}{U}dx$: $\int U(\log x)^n dx =$

$= U_1(\log x)^n-n\int\frac{U_1(\log x)^{n-1}}{x}dx = U_1(\log x)^n-nU_2(\log x)^{n-1}+n(n-1)U_3(\log x)^{n-2}-\ldots$:

$\int Ue^{ax}dx = \frac{1}{a}Ue^{ax}-\frac{1}{a}\int U'e^{ax}dx = \frac{e^{ax}}{a}\left\{U-\frac{U'}{a}+\frac{U''}{a^2}-\ldots\frac{(-1)^nU^{(n)}}{a^n}\right\}$: $\int\frac{e^x}{x}dx = \int\frac{dx}{\log x}$, $e^x = x$:

$\int Ua^xdx = \frac{Ua^x}{\log a}-\frac{1}{\log a}\int U'a^xdx = U_1a^x-\log a\int U_1a^xdx = \frac{Ua^x}{\log a}-\frac{U'a^x}{(\log a)^2}+\frac{U''a^x}{(\log a)^3}-\ldots = U_1a^x-U_2a^x\log a+\ldots$

$\int a^{mx+n}dx = \frac{a^{mx+n}}{m\log a}$: thus $\int e^{mx}dx = \frac{1}{m}e^{mx}$: and $\int e^{mx+n}dx = \frac{1}{m}e^{mx+n}$:

$\int x^ma^xdx = \frac{a^x}{\log a}\left\{x^m-\frac{mx^{m-1}}{\log a}+\frac{m(m-1)x^{m-2}}{(\log a)^2}-\ldots\pm\frac{m(m-1)\cdots2.1}{\log a^m}\right\}$: $\int\frac{e^{ax}}{x}dx = \log x+\frac{ax}{1.1}+\frac{1}{2}\frac{(ax)^2}{2!}+$

$+\frac{1}{3}\frac{(ax)^3}{3!}+\ldots$: $\int x^ma^{nx}dx = \int\left\{1+\frac{nx\log x}{1}+\ldots+\frac{n^kx^k(\log x)^k}{k!}\right\}x^mdx$:

Table of Integrals and Limits.

$$\int \frac{a^x}{x^m}dx = -\frac{a^x}{(m-1)x^{m-1}} - \frac{a^x \log a}{(m-1)(m-2)x^{m-2}} - \frac{a^x(\log a)^2}{(m-1)(m-2)(m-3)x^{m-3}} - \frac{a^x(\log a)^{m-2}}{(m-1)\cdots 2.1\,x} + \frac{(\log a)^{m-1}}{(m-1)\cdots 2.1}\int \frac{a^x}{x}dx :$$

$$\int x^{nx}dx = x\left\{1 - \frac{nx}{2^2} + \frac{n^2x^2}{3^3} - \frac{n^3x^3}{4^4} + \cdots\right\} + \frac{nx^2\log x}{1!}\left\{\frac{1}{2} - \frac{nx}{3^3} + \frac{n^2x^2}{4^4} - \cdots\right\} + \frac{n^2x^3(\log x)^2}{2!}\left\{\frac{1}{3} - \frac{nx}{4^4} + \frac{n^2x^2}{6^5} - \cdots\right\} + \cdots$$

$$\int x^{m+nx}dx = \int x^m\left\{1 + nx\log x + \frac{1}{2!}(nx\log x)^2 + \frac{1}{3!}(nx\log x)^3 + \cdots\right\}dx :$$

$$\int \frac{a^x}{x}dx = \log x + x\log a + \frac{1}{2}\frac{(x\log a)^2}{2!} + \frac{1}{3}\frac{(x\log a)^3}{3!} + \cdots : \int \frac{a^x}{x^2}dx = -\frac{a^x}{x} + \log a\int \frac{a^x}{x}dx :$$

$$\int e^{ax}\begin{matrix}\cos\\ \sin\end{matrix}{}^n bx\,dx = \frac{e^{ax}\cos^{n-1}bx\,(a\begin{matrix}\cos\\ \sin\end{matrix}bx \pm nb\begin{matrix}\sin\\ \cos\end{matrix}bx)}{a^2+n^2b^2} + \frac{n(n-1)b^2}{a^2+n^2b^2}\int e^{ax}\begin{matrix}\cos\\ \sin\end{matrix}{}^{n-2}bx\,dx :$$

$$\int x^m e^{ax}\begin{matrix}\sin\\ \cos\end{matrix}bx\,dx = x^m e^{ax}\frac{a\begin{matrix}\sin\\ \cos\end{matrix}bx \mp b\begin{matrix}\cos\\ \sin\end{matrix}bx}{a^2+b^2} - \frac{m}{a^2+b^2}\int x^{m-1}e^{ax}(a\begin{matrix}\sin\\ \cos\end{matrix}bx \mp b\begin{matrix}\cos\\ \sin\end{matrix}bx)\,dx =$$

$$= e^{ax}\left\{\frac{1}{\theta}x^m\begin{matrix}\sin\\ \cos\end{matrix}(bx-\zeta) - \frac{m}{\theta^2}x^{m-1}\begin{matrix}\sin\\ \cos\end{matrix}(bx-2\zeta) + \cdots \pm \frac{m(m-1)\cdots 1}{\theta^{m+1}}\sin[bx-(m+1)\zeta]\right\}, \text{ in which}$$

$a+b\sqrt{-1} = \theta(\cos\zeta + \sqrt{-1}\sin\zeta)$: $\int x^m\log x\,dx = \frac{x^{m+1}}{m+1}\left(\log x - \frac{1}{m+1}\right)$, true also if $m=0$.

$$\int (a+bx)^m\log x\,dx = \frac{(a+bx)^{m+1}}{(m+1)b}\log x - \frac{1}{(m+1)b}\int \frac{(a+bx)^{m+1}}{x}dx : \int (a+bx)\log x\,dx =$$

$$= \frac{\log x}{2b}\left\{(a+bx)^2 - a^2\right\} - x\left(a + \tfrac{1}{4}bx\right) : \int (a+bx)^2\log x\,dx = \frac{\log x}{3b}\left\{(a+bx)^3 - a^3\right\} - x\left(a^2 + \tfrac{1}{2}abx + \tfrac{1}{3}b^2x^2\right)$$

$$\int x^m\log(a+bx)\,dx = \frac{x^{m+1}}{m+1}\log(a+bx) - \frac{b}{m+1}\int \frac{x^{m+1}}{a+bx}dx : \int \frac{\log x}{(a+bx)^m}dx = -\frac{\log x}{(m-1)b(a+bx)^{m-1}} +$$

$$+ \frac{1}{(m-1)b}\int \frac{dx}{x(a+bx)^{m-1}} = \frac{\log x}{(m-1)b\,\phi^{m-1}} + \frac{1}{(m-1)ab}\left\{\frac{1}{(m-2)\phi^{m-2}} + \frac{1}{(m-3)a\,\phi^{m-3}} + \frac{1}{(m-4)a^2\phi^{m-4}} + \cdots + \frac{1}{2a^{m-3}\phi^2} + \right.$$

$$\left. + \frac{1}{a^{m-3}\phi} + \frac{1}{(m-1)a^{m-1}b}\log\frac{x}{\phi}\right\} : \int x^m(\log x)^n dx = \int z^n e^{(m+1)z}dz \text{ , } \log x = z \text{ , } = \frac{x^{m+1}\log x^n}{m+1} -$$

$$- \frac{n}{m+1}\int x^m(\log x)^{n-1}dx = \frac{x^{m+1}}{m+1}\left\{(\log x)^n - \frac{n}{m+1}(\log x)^{n-1} + \frac{n(n-1)}{(m+1)^2}(\log x)^{n-2} - \cdots \pm \frac{n(n-1)\ldots 2.1}{(m+1)^n}\right\} :$$

Limits. $\lim_{x=1}\frac{x^m-1}{x-1} = m$: $\lim_{x=a}\frac{x^m-a^m}{x^n-a^n} = \frac{m}{n}a^{m-n}$: $\lim_{x=\infty}\frac{\log(x+1)}{\log x} = 1$: Denote $\log(\log x)$ by $\log^2 x$;

then $\lim_{x=\infty}\frac{\log^k(x+1)}{\log^k x} = 1$: $\lim_{x=\infty}\frac{\log_a^k x}{\log_e^k x} = \frac{1}{\log_e a}$: $\lim_{x=\infty}(1+\frac{1}{x})^x = \lim_{x=\infty}(1-\frac{1}{x})^{-x} = e = 2{\cdot}71828182845904523\ldots$

$\lim_{x=0}(1+x)^{\frac{1}{x}} = e$: $\lim_{x=\infty}(1+x)^{\frac{1}{x}} = 1$: $\lim_{x=\infty}(1+\frac{y}{x})^x = \lim_{x=0}(1+xy)^{\frac{1}{x}} = e^y$; $\lim_{x=0}\frac{a^x-1}{x} = \log a$ $\therefore \lim_{x=0}\frac{e^x-1}{x} = 1$

$\lim_{x=\infty}\left(\log^k(x+1) - \log^k x\right) = 0$: $\lim_{x=\infty}\left(1+\frac{1}{2}+\frac{1}{3}+\cdots+\frac{1}{x} - \log x\right) = \gamma = 0{\cdot}57721566490\cdots$ = Euler's const.

$\lim_{x=\infty}\left\{\left(1+\frac{1}{2}+\frac{1}{3}+\cdots\frac{1}{x}\right)/\log x\right\} = 1$: $\lim_{\substack{x=\infty\\ a>1}}a^x/x = \infty$: $\lim_{x=\infty}a^x/x^m = \infty$ if m be +; $\lim_{x=0}e^{\frac{a^x-1}{x}} = \frac{a}{b}$:

$\lim_{x=+0}x\log_a x = 0$: $\lim_{x=\infty}\log_a x/x^n = \infty$: $\lim_{x=0}x^n\log_a x = -\infty$: $\lim_{m=\infty}\frac{x^m}{m!} = 0$: $\lim_{\substack{m>-1\\ m<-1}}\frac{m(m-1)\ldots(m-n+1)}{n!} = \begin{matrix}0\\ \infty\end{matrix}$

$\lim_{x=+0}x^x = 1$ $\therefore 0^0 = 1$ (not invariably) : $\lim_{x=+0}x^{x^m} = 1$: $\lim_{x=+0}x^{x^{-m}} = 0$: $\lim_{x=0}x^{\frac{1}{\log(e^x-1)}} = e$: $\lim u^v = e^{\lim v(u-1)}$, if the exp. is determ.

$\lim_{x=1}(1+\log x)^{\frac{1}{x-1}} = e$: $\lim(1^r+2^r+\cdots m^r)/m^{r+1} = \frac{1}{r+1}$: $\lim_{m=\infty}\left\{(a+1)^r+(a+2)^r+\cdots+(a+m)^r\right\}/m^{r+1} = \frac{1}{r+1}$

Minimum Values. $\Gamma(x=1{\cdot}4616321\ldots) = 0{\cdot}8856032\ldots$: x^x for $x = 0{\cdot}3678794\ldots = 0{\cdot}6922007$.

$\lim_{x=a}(1+\phi x)^{\psi x} = \lim_{x=a}\left[(1+\phi x)^{\frac{1}{\phi x}}\right]^{\phi x\cdot\psi x}$; if $\phi a = 0, \psi a = \infty$, and $\phi a.\psi a = m$, then $\lim_{x=a}\Phi(x) = e^m$

$\lim_{x=0}e^{\frac{a^x-b^x}{x}} = \frac{a}{b}$: $\lim_{x=a}\frac{e^{mx}-e^{ma}}{x-a} = me^{ma}$: $\lim_{x=0}\sqrt[x]{(\frac{a+x}{a-x})} = e^{\frac{2}{a}}$: $n! = \sqrt{(2\pi n)}(n/e)^n e^{\frac{1}{12n}+\theta}$, $\theta < \frac{1}{24n(n+1)}$

In the above Tables the sign "=" merely denotes that a following quantity is also a value of the integral, not that it is necessarily equal, as will be obvious in the first few examples. The general formulæ facilitate the integration of many types of expression occurring in statistics.

XVIII. – CONCLUSION.

1. **The larger aim of population statistic.**—Inasmuch as population is the foundation-element of all branches of social statistics, its complete study is both of practical value and general interest. For this reason an adequate "theory of population" has become a necessity. Moreover, international relationships have made it evident that the proper co-ordination of the whole world's statistical method and effort has become an imperious need of civilisation.[1] This emphasises the importance of the formation of a basis for international comparisons, and is a desideratum yearly becoming more urgent. Only by a sufficiently wide survey of human facts can the required *norms* of all sorts be established, norms which represent the characters of the great unit constituted by the aggregation of all the nations. It is only in the comparatively slow secular changes of these norms, that the drift of mankind in the gross can be unequivocally revealed ; when that drift is ascertained, the quicker and more marked variations of individual nations and populations can then be forced to disclose the real significance of their differentiating tendencies. The limits of human expansion are much nearer than popular opinion imagines; the difficulty of future food supplies will soon be of the gravest character ; the exhaustion of sources of energy necessary for any notable increase of population or advance in the standards of living, or both combined, is perilously near. Within periods of time, insignificant compared with geologic ages, the multiplying force of living things, man included, must receive a tremendous check. The present rate of increase in the world's population cannot continue for four centuries,[2] and the extraordinary increase in the standard of living which has characterised the last few decades must quickly be brought to a standstill, or be determined by the destructive forces of human extravagance. Very soon world-politic will have to face the question whether it is better that there should be larger numbers and more modest living, or fewer numbers and lavish living ; whether world-morality should aim at the enjoyment of life by a great multitude, or aim at the restriction of life-experience to a few, that they may live in relative opulence. The statistician of the

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[1] This is the raison d'etre of the " Institute International de Statistique," and the ideal aim which its activities have in view.

[2] If we take the present population as about 1,700,000,000, and the annual rate of increase as 0.01159 the increase doubles the population in 60.15 years, and gives a population 3.16 times as great in 100 years ; thus in 200 years the population will have increased 10-fold, and in 400 years 100-fold. We thus get, at the end of successive centuries, the following populations in round numbers :—100 years, 5,380,000,000 ; 200 years, 17,040,000,000 ; 300 years, 53,930,000,000 ; 400 years, 170,710,000,000.

future will utilize all discovery of the mysterious play, and no less cryptic, limitation of life-force to make prediction sure. Given co-ordinated international effort, there would be no difficulty in so directing future statistical technique that all countries and all analysts could add their quota in a form suitable for the wider study of the drift of mankind in the more important relations of civic, national, and international life.

In earlier days monarchs utilized statistic as a basis for judging the probability of success in operations of war and plunder. That use has not disappeared, but the plexus of relations, which, through the fructifying power of science, the modern world has seen established, particularly in the realms of industry and commerce, has shewn a growing measure of economic solidarity in the affairs of mankind. The modern world responds to everything that profoundly touches any one nation. By the conditions of modern life mankind tends to be welded into a unit. By the magic of invention, humanity has been quickened ; distance—if not annihilated—has been immensely shortened ; life has been enriched in the potentialities of material and psychical enjoyment, and be it said also in the plane of its possible intellectual and moral effort. The destiny of mankind will therefore be the supreme problem of those statisticians of the future, who have an adequate outlook on that science and art with which it is their privilege to concern themselves. For the craftsman with acute and microscopic vision there are a multitude of analyses to be made ; for one with the capacity for reaching wide generalisations there is no end of larger work, while for him who is happily able to see both the trees *and* the forest of the statistical landscape, there is the most far-reaching task of all, the creation of a statistical world-picture, which shall reveal the secrets of man's place in the many-sided world of social-economics, using that word in its fullest and most ideal sense.

2. **The impossibility of any long-continued increase of population at the present rate.**—An increase of population at the rate of 1 per cent. per annum is often regarded as unduly slow ; the increase for the United States between 1790 and 1860 was nearly 3 per cent. per annum, a rate which has recently also been attained in Australia. That this rate cannot possibly last even five centuries is a fact, however, that, though immensely important, is not realised.

It has been contended in reply to Malthus that experience has shewn that food-production will advance even more rapidly than the growth of population. It can do so for only a very limited time. The false inference has been drawn from this fact that therefore almost any population can be provided for. The point demands attention, for the argument is a plausible one. Notwithstanding this it is invalid, as can easily be shewn.[1]

[1] See L. Hirsch, La théorie de la population de Th. R. Malthus, Bibliothèque Universelle, Dec. 1916, No. 252, pp. 553-567, and Jan. 1917, No. 253, pp. 141-154.

If the earth's present population be taken as low even as 1,500,000,000 persons (which is, of course, an underestimate), and its land area, excluding the Arctic and Antarctic continents, be assumed to be, say, 33,000,000,000 acres ; and if further it is supposed that by some means it is possible to make the whole of this land-area yield an average of as much as 22.8 bushels of food-corn per acre, per annum, the total yield would be only 752,400,000,000 bushels.

In Australia, and in fact generally, the food-corn consumption is on the average, about equivalent to 5.7 bushels per annum, viz., one-fourth of the amount above assumed, which means that the total population which could be fed with 5.7 bushels of food-corn per annum together with other foods in like proportion, would be only 132,000,000,000. At a rate of increase of population of 0.01 per annum,[1] somewhat less than the rate for all countries which have accurate statistics, it would require only 450 years to exhaust the food requirement mentioned (more exactly 449.96 years). That no possible increase of the earth's reproductiveness can materially affect the question can also be readily shewn. For—to postulate the impossible—let it be supposed that every acre of area on the earth's entire surface could produce as much as 228 bushels, that is, ten times the above amount, with other foods in like proportion : this being done, it would take less than 700 years (681.37 years) for the population to exhaust the food supply. The fundamental element in Malthus' contention is thus seen to be completely established. Even a low rate of increase must soon exhaust the possibilities of food-supply, and as we have seen already the material of the earth is inadequate to provide bodies for any long-continued increase quite apart from the food question. It is quite clear therefore that statistical analyses of the world's progress in various ways will soon become of the highest order of importance.

3. **Need for analysis of existing statistical material.**—At present there exists a large and accumulating mass of unanalysed material. Numerical data have in many instances already become a burden, and in other cases threaten to become one. But when their significance has been penetrated they seem no longer tedious ; they have been transformed into illuminating and interesting facts.

Here, however, we need a word of warning. The problem of all so-called knowledge is to subsume what we know—or think we know—under suitable elementary conceptions, conceptions, in fact, that are within our intellectual grasp, and that we can mentally handle. As in physics the Boyle-Charles gaseous laws, the molecular law of equal numbers in equal volumes at equal pressures and temperatures, and the conception of mass

[1] The number of years in which a population is doubled is given by the following quantities divided by the increase. When the increase or

divisor is	.000	.010	.020	.030	.040	.050
the numerator is	.6931	.6966	.7001	.7035	.7069	.7103

(See also footnote p. 31.)

as independent of velocity,[1] are but crude statements of the actual facts, so crude that their elementary simplicity entirely disappears when necessary qualifications are made, so likewise does a deeper knowledge of statistic reveal that relations subsisting among crude data are subject to corrections that, not infrequently, are very elaborate. The more simple and obvious of these relations constitute a kind of rough frame-work about which more subtle and accurate conceptions may cluster,[2] or, to change the figure, they are a skeletal foundation on which the body of justly conceived statistic is to be built up.

4. **The trend of destiny.**—To the extent man is ignorant, he is both the puppet of Fortune, and the victim of Desire. Anyone who has seriously reflected upon the facts of the last ten decades must realise that, within the next ten, tremendous problems will arise for solution and these will touch fundamentally the following matters, viz. :—

(i.) The multiplying power of the human race ;

(ii.) The organic constitution of Nature and the means at human disposal for avoiding the incidence of its unfavourable aspects ; *i.e.*, eugenics in its wider sense ;

(iii.) The enhancing of the productivity of Nature, and the limits of its exploitation ;

(iv.) The mechanism of the social organism, and the scheme of its control ;

(v.) Internationalism and the solidarity of humanity.

For the adequate study of these matters, not only will the mere technique of the collection and analysis of statistic require to be much advanced, but the popular opinion as to the value of the effort will also have to progress. Given, however, an intelligent public opinion, as to the utility of statistical inquiries, there would be some ground for hope that the great questions, the analysis of which would throw light upon human destiny, could be properly attacked. It is for educational departments, worthy of the name, to create such opinion by the mechanism of their systems, in order that each human being should be sufficiently interested to cordially co-operate, by accurately furnishing the necessary data in the taking of a census of population or wealth. Census-taking is a costly operation, but it is the foundation of all branches of statistic that have a direct human interest. Its value and the facility of using it would be immensely increased if it were meticulously accurate. The importance of technique and of precision, matters apparently of little moment, can be rightly estimated only when the ultimate aim of all statistical inquiry is realised to be " the study of man's destiny" as the denizen of a world of limitations.

[1] According to modern views " mass" in matter becomes infinite when its velocity equals that of light.

[2] Thus, for example, the crude mortality of one population may agree with that of another, but when corrected may seriously differ, shewing either a better or worse state of things regarding the conditions of human life.

INDEX.

APPENDIX A.

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APPENDIX B.

ON THE MATERIALS FOR, AND THE CONSTRUCTION OF, TABLES OF NATALITY, ISSUE AND ORPHANHOOD.

A Paper read by Mr. CHAS. H. WICKENS, A.I.A., Supervisor of Census, Commonwealth Bureau of Census and Statistics, Melbourne, on 18th August, 1914, at the Australian Meeting of the British Association for the Advancement of Science.

SYNOPSIS:

1. **Objects of paper.**—The objects of the present paper are—

(i.) to briefly review the data requisite and available for the construction of tables of natality, issue and orphanhood, and the purposes for which such tables are required ;

(ii.) to specially indicate material of a valuable nature available for the purpose in the Vital Statistics of Australia ;

(iii.) to furnish a series of natality, issue and orphanhood tables for males based on the Australian experience ;

(iv.) to outline the methods adopted in the construction and graduation of these tables.

2. **National data.**—In the demographic field, which comprises the statistics of births, the natality table should occupy as prominent a place as that occupied by the mortality table in the cognate field comprising statistics of deaths. Unfortunately, however, for the interests of Demography, such is not the case, and whilst mortality tables are now published for most civilized countries, and extend in some cases over a long range of periods of observation, similar particulars in respect of births are not available. The cause of this defect is mainly the absence of the requisite material, and whilst statistics of ages at death are now regularly published in most countries, statistics of the ages of parents at the birth of their children are in most cases either not collected or are not published if collected. For the compilation of national natality tables, statistics of births according to the ages of the parents are essential. In the absence of such statistics, ingenious devices have been adopted for approximating to the results which these statistics would disclose, and some of these are discussed in later sections. Before leaving the present section, however, mention may be made of the interesting fact that for the year 1855 the Scottish birth registers contain very complete data in respect of births, which have been tabulated and analysed by Messrs. C. J. and J. N. Lewis in their "Natality and Fecundity." (Oliver and Boyd, Edinburgh, 1906.)

For 1856 and succeeding years the special details were not collected.

3. **Social uses of natality statistics.**—Apart from their demographic value as scientific data for the interpretation and analysis of the life of man, natality and kindred tables have very important uses in connection with various social requirements. An important occasion of this nature arose in the United Kingdom in 1911, when particulars as to the incidence of natality on the lives of the fathers were required in connection with the National Insurance scheme then under consideration. The object in view on that occasion was the determination of the cost of a maternity allowance to mothers, and the ascertainment of the appropriate premium chargeable for the benefit.

Another purpose for which statistics of this nature are required is that of determining the cost of orphan benefits in connection with superannuation and similar schemes. The data required in these cases are usually the numbers of orphans under specified ages that arise from time to time through the deaths of fathers of successive ages.

4. **First National Insurance basis.**—In their investigations in 1911 in connection with the National Insurance scheme, Sir G. F. Hardy and Mr. F. B. Wyatt, made an estimate of natality as a function

of the age of the father, which they based upon statistics of orphanhood for the Dominion of New Zealand, in the absence of data of an appropriate character relative to the United Kingdom itself. The data in question shewed for a series of years the number of orphans of each age that had arisen in consequence of the deaths of fathers of successive ages. By working backwards, by means of a mortality table from the number of surviving orphans under 5 years of age to the number actually born, a natality table for New Zealand was constructed. This table of rates was then applied to the appropriate United Kingdom population, and the number of births which it disclosed was compared with the total actually recorded, the rates being then adjusted to bring the two results into accord. The adjustment applied was a reduction of the rates by 8 per cent. throughout. This method, whilst undoubtedly ingenious, has serious shortcomings, of which the most important are : (i.) the estimating of natality rates from orphanhood data, and (ii.) the assumption that the natality incidence so estimated for New Zealand was applicable to the United Kingdom. Even if an assumption of the latter class were allowed to pass, it is not clear why the actual data relative to natality, which have been available in Australia for many years past, should not have been employed, *unless, possibly, their existence was unknown to the investigators.*

5. **Second National Insurance basis.**—In 1912 the National Insurance actuarial advisory committee further considered the question of natality rates in connection with the maternity benefit, and on this occasion use was made of statistics derived from the returns for the Census of 1911 for the Metropolitan Borough of Camberwell. The Census data so employed were (i.) the number of husbands present with wives and of wives present with husbands in quinquennial age-groups ; (ii.) for the same age-groups the number of husbands and the number of wives with one or more children under one year of age, twin births being treated in the same manner as single births. These figures represented the survivors of births which took place during the twelve months preceding the date of the Census, twin births being counted as single, and to obtain the total number of such occurrences during that period it was necessary to make allowance for—

(i.) deaths of children born during the period, who had died before the date of the Census ;

(ii.) deaths of mothers at or after date of birth ;

(iii.) deaths of fathers after date of conception.

Statistics on these points not being available, an addition of 10 per cent. was made to allow roughly for the adjustments required. From these adjusted figures natality rates for successive ages were computed, and

tested by application to the estimated population according to age at the middle of 1909. The result so obtained was compared with the mean of the recorded births for the period 1909-11 corrected to allow for twin births, illegitimate births and still births, and the natality rates were then subjected to such further correction as would make the computed births accord with the recorded.

6. **Friendly Society experience.**—Amongst the records of Friendly Society experience, data concerning natality, issue or orphanhood are very meagre, and one of the few cases in which such information is available is that given by Mr. A. W. Watson in his actuarial lectures on Friendly Societies. The data there furnished relate to the Hearts of Oak Benefit Society, and are given in age-groups, shewing the number of cases of claims in respect of maternity benefit made by male members of the Society of different ages, and the total number of male members of such ages. The records of the Society do not admit of an analysis of the membership according to conjugal condition, so that rates of natality in respect of males are obtainable only in respect of married and single combined. For many practical purposes, however, this is not a disadvantage, since premium rates in respect of maternity benefit are usually payable by all, whether married or single.

7. **Orphanhood tables deduced from death statistics.**—As previously noted in section 4 above, orphanhood tables have been constructed from death statistics in New Zealand for many years past, the data recorded being the number of children living at various ages who have been rendered orphans by the deaths of fathers of various ages. The importance of this information was recognised at a conference of Australasian Statisticians, held in Hobart in January 1902, at which a resolution was passed affirming the desirability "that information be published relative to the number of children rendered fatherless each year, shewing ages and sexes." Notwithstanding this resolution, which was agreed to unanimously, Western Australia was the only State of Australia which consistently carried out the desired tabulation, the details according to sexes of children having been published annually in that State for single ages of children to age 21, and for quinquennial age-groups in the case of fathers from 1903 onwards. Special investigations of a similar nature have been made in New South Wales for the years 1903 and 1911, but the tabulation has not been carried out annually as in the cases of New Zealand and Western Australia. In all such cases the possibility of making the desired investigation depends on the fact that the death registers contain provision for recording the age of the deceased and the ages of the surviving children.

8. **Surviving issue tables deduced from service experience.**—There are in Australia two other experiences of some importance in this matter, both of which have been obtained in connection with the Public Service in respect of proposals for superannuation. Each of them consists of a tabulation of the number of members in the respective services according to conjugal condition, and also of the number and ages of surviving children. The earlier of these comprised 12,253 male members of Commonwealth Public Service at 31st December, 1908, while the latter referred to 12,675 male members of the New South Wales Public Service at 31st December, 1910. Particulars concerning the former are contained in the Report on Superannuation by the Commonwealth Statistician, dated 19th October, 1910, and concerning the latter in the Departmental actuarial sub-committee's report, dated 12th April, 1912.

9. **Summary.**—It will be seen that of the sources of information quoted in the foregoing sections, one only, viz., the Hearts of Oak experience, relates to natality in relation to all males. Three others, viz., the annual returns of New Zealand and Western Australia, and the special 1903 and 1911 returns of New South Wales, relate to orphanhood, but only as at its initiation, that is to say, they furnish data respecting the numbers of each age who become orphans in any year, but not concerning the number of orphans of any age existing in the community at any point of time. Finally, three others, viz., the Camberwell experience referred to in 5, and the two service experiences referred to in 8, relate to surviving issue. Of these data all are of importance for different purposes, but probably the most valuable is that relating to natality, so much so, that as seen in 4 and 5 above, data concerning orphanhood and surviving issue have both been pressed into the service for obtaining estimates of natality.

10. **Australian natality statistics.**—As previously noted, the ignoring of the extensive Australian statistics of natality appears explicable *only on the supposition that its existence was unknown*; yet records of the ages of fathers and mothers at the birth of their children have been published annually in New South Wales since 1893, in Victoria and in Western Australia since 1903, and for the Commonwealth of Australia as a whole, as well as for each State separately, in the publications of the Commonwealth Bureau of Census and Statistics since 1908, and for all the States except South Australia for 1907 also. These Commonwealth results furnish additional information of interest, inasmuch as they supply for each of the States and the Commonwealth separate particulars for single births, twin births, and triplet births, tabulated according to the ages of the fathers and mothers either separately or in combination. These latter data enable particulars to be obtained not only of the number of births occurring to parents of a given age, but also of the number of children so born, and hence permit of the computation of the variation with the age of the parents of the average number of children to a birth.

11. **Nuptial and ex-nuptial births.**—The births referred to in the preceding section are those which have arisen in wedlock, and which are usually termed "legitimate" births. In the Commonwealth Bureau of Census and Statistics the terms "Nuptial" and "Ex-nuptial" are now employed in place of the terms "legitimate" and "illegitimate," as it is considered that the latter terms connote more than the occurrences warrant, and that the former terms more nearly express the fact. The former terms have been used throughout the remainder of the present paper. As the father does not appear in the registration of ex-nuptial births, the age data relative to such births necessarily relate solely to those of the mothers. For the purpose of the tables given in this paper, data relative to males only have been dealt with, and consequently all rates furnished relate to nuptial births, except in cases where special calculations have been made to allow for ex-nuptial births for the purpose of comparing results. In this connection it may be noted, that during the four years 1909-12, the total number of births registered in Australia was 486,153, of which 28,013, or 5.76 per cent., were ex-nuptial, the ratio of ex-nuptial to nuptial births being thus, 611 : 10,000.

12. **Natality table.**—For the purpose of the tables contained in this paper, the data employed have been :—

(i.) The nuptial births registered in the Commonwealth of Australia during the four years 1909 to 1912, tabulated according to the ages of the fathers, and also according to whether the births were single births, twins, or triplets ;

(ii.) the male population of the Commonwealth at the Census of 3rd April, 1911, tabulated according to age ;

(iii.) the mean male population of the Commonwealth for each of the four years 1909 to 1912.

Items (i.) and (ii.) were graduated graphically, adjusted results being obtained for single ages, while from (iii.) and the adjusted form of (ii.), there was obtained the number of years of male life lived in Australia in each year of age during the period 1909 to 1912.

The ratio of the number of births at each age to the number of years of male life for the same age gave the nuptial natality rate for males irrespective of conjugal condition. These rates were then graphically graduated, the alterations so made being, however, very slight, as the rates obtained by division ran on the whole very smoothly.

The natality table so obtained for Australia was as follows, the figures given representing the ratio of the number of cases of nuptial births to the total number of males of the same age last birthday as the fathers concerned :—

TABLE I.—Australian Nuptial Natality Table for Males, 1909–12.

Age of Fathers last Birth-day.	Ratio of Number of Cases of Nuptial Births per annum to Mean Number of Males of the same Age as the Fathers.	Age of Fathers last Birth-day.	Ratio of Number of Cases of Nuptial Births per annum to Mean Number of Males of the same Age as the Fathers.	Age of Fathers last Birth-day.	Ratio of Number of Cases of Nuptial Births per annum to Mean Number of Males of the same Age as the Fathers.
16	.00006	41	.11162	66	.00190
17	.00031	42	.09633	67	.00163
18	.00160	43	.08680	68	.00139
19	.00617	44	.07803	69	.00119
20	.01331	45	.06961	70	.00101
21	.03007	46	.06142	71	.00083
22	.04838	47	.05360	72	.00068
23	.07037	48	.04626	73	.00055
24	.09081	49	.03935	74	.00045
25	.10882	50	.03295	75	.00038
26	.12517	51	.02720	76	.00035
27	.13941	52	.02192	77	.00033
28	.15363	53	.01730	78	.00031
29	.16417	54	.01352	79	.00029
30	.16679	55	.01124	80	.00028
31	.15984	56	.00958	81	.00027
32	.15505	57	.00827	82	.00026
33	.15279	58	.00700	83	.00025
34	.15037	59	.00572	84	.00024
35	.14751	60	.00496	85	.00023
36	.14422	61	.00434	86	.00022
37	.14108	62	.00360	87	.00021
38	.13814	63	.00309	88	.00020
39	.13425	64	.00263	89	.00019
40	.12648	65	.00224	..	..

According to this table the Australian nuptial natality rate for all males commences at 6 per 100,000 at age 16, and increases to a maximum of 16 per cent. at age 30, and declines thereafter to 2 per 10,000 at age 88. In other words, according to the Australian experience under consideration, one male in every 17,000 at age 16 annually becomes a nuptial father at that age, one in 160 at age 19, one in 10 at age 25, one in 6 at age 30, one in 7 at age 36, one in 9 at age 41, one in 25 at age 49, one in 200 at age 60, one in 1000 at age 70, one in 4000 at age 83, and one in 5000 at age 88.

13. **Children per confinement.**—The figures given in the preceding table represent the numbers of cases of births per annum expressed as ratios of the mean number of males for the several years of age, and this is the form in which the information is required when it is a question of paying a specified benefit on the occurrence of a live birth irrespective of the number of children born thereat. For the purposes of issue and orphanhood tables, however, as well as in cases where benefits depend on

the numbers actually born, it is necessary to know also the number of children per confinement. As mentioned in section 10 above, the Australian data are furnished separately in respect of single births, twins and triplets, and hence it is possible to obtain a measure of the probability that a man becoming a father at any age will on that occasion become the father of twins or triplets. For the four years under review, viz., 1909-12, the number of single births in Australia was 448,721, of twin births 4644, and of triplet births 54, representing a total of 458,140 live-born children, after allowing for 31 twin and triplet children who were still-born. In this connection it may be noted that where, in the case of twins, one of the children, or in the case of triplets one or two of the children, are still-born, but one is born alive, the case is recorded as one of twins or triplets, but only the number of children born alive is recorded. Cases of twins or triplets in which all the children were still-born are not recorded in the Australian vital statistics except in the case of the State of Western Australia, concerning which a reference will be found in section 17 hereafter. From the figures given above it will be seen that for the four years 1909-12, the average number of live children per nuptial confinement was 1.01041, or roughly speaking, that one confinement in every 100 was a case of twins, and one in every 8500 was a case of triplets.

The average number of nuptial children per confinement was computed for each age of the father, and the results so obtained were plotted to scale, and graphically graduated, the result being as follows :—

Table II.—Average Number of Children per Nuptial Confinement.

Age of Father.	Average No. of Children per Confinement.	Age of Father.	Average No. of Children per Confinement.	Age of Father.	Average No. of Children per Confinement.
16	1.00247	41	1.01233	66	1.01480
17	1.00362	42	1.01248	67	1.01486
18	1.00446	43	1.01263	68	1.01491
19	1.00510	44	1.01278	69	1.01496
20	1.00565	45	1.01292	70	1.01501
21	1.00615	46	1.01305	71	1.01506
22	1.00662	47	1.01317	72	1.01511
23	1.00707	48	1.01328	73	1.01516
24	1.00750	49	1.01339	74	1.01521
25	1.00792	50	1.01350	75	1.01525
26	1.00832	51	1.01360	76	1.01529
27	1.00871	52	1.01370	77	1.01533
28	1.00908	53	1.01380	78	1.01537
29	1.00944	54	1.01390	79	1.01540
30	1.00980	55	1.01399	80	1.01543
31	1.01015	56	1.01408	81	1.01546
32	1.01049	57	1.01416	82	1.01549
33	1.01080	58	1.01424	83	1.01551
34	1.01108	59	1.01432	84	1.01553
35	1.01132	60	1.01439	85	1.01555
36	1.01152	61	1.01446	86	1.01557
37	1.01170	62	1.01453	87	1.01559
38	1.01186	63	1.01460	88	1.01560
39	1.01202	64	1.01467	89	1.01560
40	1.01218	65	1.01474	..	..

From this table it will be seen that the number of children per confinement increases with the age of the father, the curve representing the facts tending to become asymptotic at the older ages. Roughly speaking, it may be said that at age 16 one case in 400 results in a multiple birth, at 19 one in 200, at 21 one in 150, at 25 one in 125, at 31 one in 100, at 34 one in 90, at 42 one in 80, at 48 one in 75, and at 59 one in 70.

14. **Issue table.**—A combination of the results in the two preceding tables gives the initial issue rates for successive ages. I have not inserted a table shewing these, as the particulars, if required, can be readily computed from the tables in the preceding sections. One of the chief uses of an issue table is that of shewing for each male age the number of surviving children at each age, and thus enabling an estimate to be made of the liability in respect of orphan benefits that would be cast on a fund in consequence of the death of a male of any given age.

For this purpose it is necessary to relate the data to some exact age of the males. For example, as given, the data indicate that a specified number of males during the year of age from 25 to 26 become fathers, and as the births then resulting will be distributed over the year of age more or less uniformly, it will follow that at any point of time there will be fathers of all intermediate fractional ages from 25 to 26 with children in the first year of age of all fractional ages from 0 to 1. For convenience in subsequent use, these data were reduced by allowing for infant mortality, also for deaths of males, so as to show the number of surviving children under one year of age corresponding to the number of males who attained the exact age 26. In the actual construction of such an issue table, it is thus necessary to take into account the rate of mortality amongst the children, and also amongst the males. The rate of mortality adopted on the present occasion was the most recent table for the Commonwealth of Australia, that for the decennium 1901-10. In this table the rates are given separately for males and females, and to obtain a basis for the children of both sexes the weighted mean of these rates was taken, the weighting employed being the ratio of male to female births for the years 1909-12. The mortality table for males was recast, so as to shew the number of males surviving at each age out of 100,000 coming under observation at age 14.

The figures so obtained are shewn in the following table :—

Table III.—Surviving Nuptial Children under One Year of Age, Corresponding to Males Surviving out of 100,000 at Age 14.

Age of Father.	Males Surviving out of 100,000 at Age 14.	Surviving Nuptial Children under 1 Year of Age.	Age of Father.	Males Surviving out of 100,000 at Age 14.	Surviving Nuptial Children under 1 Year of Age.	Age of Father.	Males Surviving out of 100,000 at Age 14.	Surviving Nuptial Children under 1 Year of Age.
16	99,521	..	41	87,539	10,650	66	54,421	119
17	99,242	6	42	86,787	9,322	67	52,119	97
18	98,940	29	43	85,997	7,975	68	49,699	80
19	98,612	150	44	85,167	7,120	69	47,161	65
20	98,268	578	45	84,296	6,338	70	44,515	52
21	97,904	1,243	46	83,383	5,595	71	41,772	42
22	97,522	2,798	47	82,430	4,882	72	38,948	32
23	97,127	4,486	48	81,437	4,211	73	36,060	25
24	96,721	6,501	49	80,411	3,590	74	33,131	18
25	96,302	8,357	50	79,343	3,015	75	30,195	14
26	95,870	9,974	51	78,237	2,490	76	27,293	11
27	95,425	11,425	52	77,093	2,027	77	24,463	9
28	94,969	12,671	53	75,907	1,609	78	21,734	7
29	94,500	13,901	54	74,676	1,250	79	19,128	6
30	94,024	14,784	55	73,396	961	80	16,666	5
31	93,537	14,949	56	72,063	785	81	14,368	4
32	93,032	14,255	57	70,669	656	82	12,244	3
33	92,512	13,757	58	69,206	555	83	10,301	3
34	91,975	13,483	59	67,663	460	84	8,540	2
35	91,423	13,195	60	66,039	367	85	6,972	2
36	90,843	12,867	61	64,333	310	86	5,598	1
37	90,241	12,501	62	62,539	264	87	4,417	1
38	89,612	12,148	63	60,656	213	88	3,420	1
39	88,951	11,811	64	58,681	177	89	2,593	1
40	88,259	11,394	65	56,605	146	..	..	..

From the results given in the preceding table, detailed tabulations have been prepared shewing on the basis of the Australian mortality experience 1901-10, and the Australian birth experience 1909-12, how many children in each year of age up to 20 would be surviving on the attainment by their fathers of successive ages. In other words, the process records the growth of the second generation as a function of the age of the first generation. There are 100,000 males assumed as under observation at 14, and these are carried through the succeeding ages by means of the life table. Similarly, at each age attained by the fathers, there are new entrants on the second generation as well as the survivors of those who entered at the earlier ages of the fathers. By applying the appropriate probabilities of survival, these numbers are readily determined, and from the detailed table so computed, it may be seen how many out of 100,000 males of the first generation at age 14 there are surviving at say age 50, and corresponding thereto how many there are of the second generation in each year of age.

15. **Orphanhood table.**—One of the important uses to which such a table may be applied, is that of determining the rate of orphanhood in a community under given conditions. The term orphan is somewhat vague, but is generally used in this and similar discussions as applying to a child of dependent age whose father is dead. The upper limit of dependent age will vary under different circumstances, but for the purposes of the present paper it has been taken as 15. For example, it is clear that if marriage is deferred, and if the birth-rate remains fairly constant, there will be a tendency for an increase in orphanhood, since the probability of the father dying while the child is still young is increased by the deferment of marriage.

To obtain rates of orphanhood, it is necessary to work backwards from the results given in Table III. This table gives the number of children under one year of age corresponding to the males of the first generation of a given exact age, but, clearly, some of these children will already be orphans. Not only so, but some are orphans at birth, the father having died before the birth of his child. For example, at age 26 in Table III., there are shewn 9974 children under one year of age. These represent the number of children born to fathers aged 25 last birthday, and surviving when the father reaches age 26, or to the time at which he would have reached it if he had survived. On the average, therefore, the father of these children must at date of conception have been aged $24\frac{3}{4}$ years, and the number of children amongst them who are not orphans will be found by multiplying the total of 9974 by the probability that a male aged $24\frac{3}{4}$ will reach age 26. A calculation similar to this has been made for each age, and the results obtained give the number of children under one year of age whose fathers are living, the subtraction from the total figures giving the number of orphans under one year of age corresponding to each age of the first generation.

The complete detailed table of children not orphaned has been prepared in the manner above indicated by making an allowance at each age for the survival of the father in conjunction with the survival of the child. This table furnishes the number of surviving non-orphaned children of each age corresponding to males of a given age, and is of value in such questions as those concerning the average number of children of dependent age which a male of a given age has to support.

The following table gives the number non-orphaned, orphaned, and total children under the age of 15 corresponding to the number of males of the first generation shewn in Table III., and repeated here :—

Table IV.—Children Under Fifteen corresponding to Males Surviving out of 100,000 at Age 14.

Ages of Males.	Males Surviving out of 100,000 at Age 14.	Corresponding Children Under 15.			Ages of Males.	Males Surviving out of 100,000 at Age 14.	Corresponding Children Under 15.		
		Whose Fathers are Living.	Orphans.	Total.			Whose Fathers are Living.	Orphans.	Total.
16	99,521	..	..	..	57	70,669	41,356	7,220	48,576
17	99,242	6	..	6	58	69,206	35,113	6,588	41,701
18	98,940	34	..	34	59	67,663	29,567	5,963	35,530
19	98,612	183	..	183	60	66,039	24,644	5,357	30,001
20	98,268	749	5	754	61	64,333	20,347	4,766	25,113
21	97,904	1,955	12	1,967	62	62,539	16,634	4,208	20,842
22	97,522	4,667	32	4,699	63	60,656	13,465	3,681	17,146
23	97,127	8,966	73	9,039	64	58,681	10,800	3,191	13,991
24	96,721	15,152	142	15,294	65	56,605	8,591	2,749	11,340
25	96,302	23,035	248	23,283	66	54,421	6,794	2,356	9,150
26	95,870	32,367	401	32,768	67	52,119	5,347	2,019	7,366
27	95,425	42,978	610	43,588	68	49,699	4,214	1,742	5,956
28	94,969	54,664	884	55,548	69	47,161	3,339	1,522	4,861
29	94,500	67,407	1,229	68,636	70	44,515	2,669	1,350	4,019
30	94,024	80,868	1,639	82,507	71	41,772	2,129	1,203	3,332
31	93,537	94,310	2,148	96,458	72	38,948	1,686	1,069	2,755
32	93,032	106,925	2,738	109,663	73	36,060	1,321	945	2,266
33	92,512	118,939	3,411	122,350	74	33,131	1,024	829	1,853
34	91,975	130,485	4,163	134,648	75	30,195	794	733	1,527
35	91,423	141,271	4,991	146,262	76	27,293	611	640	1,251
36	90,843	151,062	5,875	156,937	77	24,463	459	557	1,016
37	90,241	159,070	6,752	165,822	78	21,734	346	480	826
38	89,612	165,211	7,602	172,813	79	19,128	258	408	666
39	88,951	169,241	8,388	177,629	80	16,666	192	345	537
40	88,259	171,236	9,109	180,345	81	14,368	140	291	431
41	87,539	171,112	9,741	180,853	82	12,244	103	242	345
42	86,787	168,468	10,276	178,744	83	10,301	73	201	274
43	85,997	163,512	10,605	174,217	84	8,540	53	164	217
44	85,167	156,791	11,002	167,793	85	6,972	38	133	171
45	84,296	148,667	11,179	159,846	86	5,598	26	108	134
46	83,383	139,804	11,265	151,069	87	4,417	18	86	104
47	82,430	130,942	11,331	142,273	88	3,420	16	67	83
48	81,437	121,973	11,353	133,326	89	2,593	10	57	67
49	80,411	112,780	11,286	124,066	90	1,921	3	51	54
50	79,343	103,422	11,125	114,547	91	1,388	..	44	44
51	78,237	93,991	10,868	104,859	92	977	..	36	36
52	77,093	84,586	10,502	95,088	93	667	..	29	29
53	75,907	75,247	10,026	85,273	94	442	..	23	23
54	74,676	66,020	9,428	75,448					
55	73,396	57,040	8,716	65,756					
56	72,063	48,664	7,945	56,609	..	..	3,815,980	288,653	4,104,633

16. **Application of results to Australian Census experience.**—The figures now obtained may be considered as shewing, in so far as nuptial offspring are concerned, the normal relations between successive generations which are subject to the birth and death rates employed in this investigation, and consequently should, when applied to the Australian Census data for adult males for 1911, give approximately the numbers of nuptial children under the age 15 whose fathers are living, and those whose fathers are dead. Before the aggregate so obtained can be compared with the Census results for children under 15, an allowance must be made for children of ex-nuptial birth. As previously mentioned, the ratio of ex-nuptial to nuptial births for Australia for 1909-12 was 611 : 10,000 and as ex-nuptial children are usually subject to higher rates of mortality on the average than those of nuptial birth, the number of ex-nuptial children under the age of 15 have, in the absence of more complete data, been taken as 5½ per cent. of the number of nuptial children of the same age.

When these calculations were made, the total so obtained was 1,418,909, as compared with 1,409,823, the actual Census figures, a discrepancy of only 9086 in a total of 1,409,823, or about $6\frac{1}{2}$ per 1000. This discrepancy is due to the fact that the number of births in Australia, which reached a maximum of over 110,000 in 1891, fell considerably in succeeding years, and stood at or about 100,000 per annum for the six years 1898 to 1903, rising fairly rapidly in succeeding years, and exceeding 122,000 for 1911.

For the purpose of estimating the number of orphans under 15 in the Census population, the items obtained from the orphanhood table were proportionately reduced, and the figures obtained were as follows :—

Estimate as to Orphanhood and Ex-nuptial Birth of Australian Children under 15 at Census of 3rd April, 1911.

Children of Nuptial Birth—	
Whose Fathers were Living	1,253,123
Orphans	83,200
Children of Ex-nuptial Birth	73,500
Total Children under 15 at Date of Census	1,409,823

It will be seen from these figures that the number of orphans under 15 in Australia represents 5.9 per cent. of the number of children of that age. On this basis the number at the present time (August, 1914) in Australia would be approximately 91,500.

17. **Still births.**—Where benefits payable in respect of maternity are payable whether the child is born alive or dead, it is necessary to obtain particulars respecting still as well as live births. In only one of the Australian States, viz., Western Australia, are still-births registered. From the experience of that State for the years 1909-12, it appears that the total number of still-births of viable age represents 3 per cent. of the number of live births. In making a computation for a benefit payable whether the child is alive or dead, it will be necessary, therefore, to increase the natality figures by this percentage.

18. **Conclusion.**—From an examination of the data employed in the preparation of the present paper, it is clear that such tables as those contained in it can only be of service for a population similarly circumstanced to that of Australia. An essential feature is the ratio of nuptial births to male population at each age, and this again is determined in part by the ratio of married to total males at each age. In Australia this latter ratio is very similar to that for New Zealand, but is markedly different to the corresponding ratio for the United Kingdom, the proportion unmarried being considerably greater in Australia and New Zealand.

Such conclusions indicate the necessity for complete records in each country as contrasted with dependence on other countries' results, and suggest that even a sample record such as that obtained from the borough of Camberwell may not give reliable results for the whole Kingdom.

For reliable tables of natality, issue, and orphanhood three things are required :—

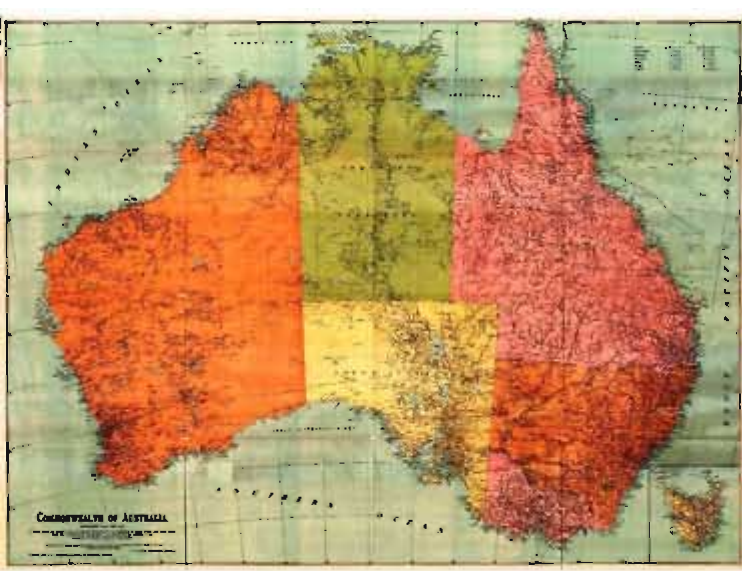
(i.) Census results according to age.

(ii.) Death registrations according to age of deceased.

(iii.) Birth registrations according to ages of parents at the date of the birth registered.

With these, authentic tables can be compiled. The present paper has dealt entirely with natality, etc., as functions of the age of the father, as this is the phase of the question which has been most in requisition for practical use. The data, however, are available for dealing with these matters as functions of the age of the mother, and are at present being investigated.


COMMONWEALTH OF AUSTRALIA.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