27. **Pulmonary Tuberculosis and Cancer in Australia, 1881-1910.**—In examining the characteristics of various diseases in Australia, perhaps the most striking feature that presents itself is the remarkable diminution during the past thirty years in the death rates from pulmonary tuberculosis, and the equally remarkable rise in the death rate from cancer. In fact, the advantage in the former case is so well counterbalanced by the disadvantage in the latter, that the combined diseases indicate very little reduction in the death rate.

DEATH RATES FROM PULMONARY TUBERCULOSIS AND CANCER IN AUSTRALIA

FOR THE PAST THIRTY YEARS (1881-1910) PER 100,000 OF THE CORRESPONDING SEX AND POPULATION.

Period.	Pulmonary Tuberculosis.			Cancer.			Pulmonary Tuberculosis and Cancer Together.		
	Males.	Females.	Persons.	Males.	Females.	Persons.	Males.	Females.	Persons.
1881-1885	146	113	131	35	36	36	181	149	166
1886-1890	139	101	121	42	43	42	181	144	164
1891-1895	124	88	107	51	48	50	176	136	157
1896-1900	106	81	95	59	58	58	165	140	153
1901-1905	100	77	89	64	61	63	164	139	152
1906-1910	81	69	75	71	70	70	152	139	146

The general results can be seen most strikingly in the diagram hereunder, in which the upper (dotted zigzag) line shews the rates for individual years of pulmonary tuberculosis, and the lower firm (zigzag) line the similar rates for cancer. The middle (zigzag) line, consisting of dots and dashes, shews the rates for the two diseases combined, also for individual years. The death rate for males from pulmonary tuberculosis is, roughly, 36 per cent. greater than for females, while for cancer it is only 3 per cent. greater for males than for females. It has been found that the death rates can be very accurately expressed by a simple formula based upon the lapse of time since 1880. These are given in the note hereunder.*

It will be observed that for the two diseases combined there is still a decrease in the rate of mortality, but it is only very slight; in other words, the advantages arising from advances in medicine, hygiene, etc., so far as tuberculosis is concerned, are nearly masked by the development of cancer.

The masculinity of pulmonary tuberculosis is diminishing as time advances; in other words, death from this disease, at present striking at male life more forcibly than at female life, is tending towards equality of incidence.

It is proper here to observe it does not follow that it is unimportant, from the economical standpoint, which disease preponderates, for the reason that the incidence of cancer is more marked at a late period of life, when life's economic value is diminishing; while the marked incidence of tuberculosis is in the earlier periods of life, viz., before the human being has recouped the economic expenditure involved in his rearing and education.

---

* P denotes deaths from pulmonary tuberculosis in a population of 100,000 persons of same sex, or of both sexes combined, as the case may be; and the subscript letter m, f, or p denotes males, females, persons; T denotes the date year.

Pulmonary Tuberculosis.	Cancer.
$P_m = 157 - 2.6 \ (T - 1880)$	$C_m = 32 + 1.4 \ (T - 1880)$
$P_f = 115 - 1.7 \ (T - 1880)$	$C_f = 31 + 1.4 \ (T - 1880)$
$P_p = 137 - 2.2 \ (T - 1880)$	$C_p = 31 + 1.4 \ (T - 1880)$

For both diseases combined, the formula may be found by adding the constants and coefficients, i.e., $P_p + C_p = 168 - 0.8 \ (T - 1880)$.

In order to make this point quite clear the two lower curves (see the diagram here-under) are given, the upper (or middle) curve shewing the number of persons dying at each age from pulmonary tuberculosis, the lower one shewing the number dying from cancer in a population of 10,000,000. Restricting the consideration to both sexes combined (persons) it will be seen that the heaviest incidence of pulmonary tuberculosis, is at the age of twenty-six or twenty-seven, while that for cancer is at the age of sixty-seven.

COMMONWEALTH OF AUSTRALIA.—DEATH RATES FOR PULMONARY TUBER-CULOSIS AND CANCER, 1881 TO 1910.
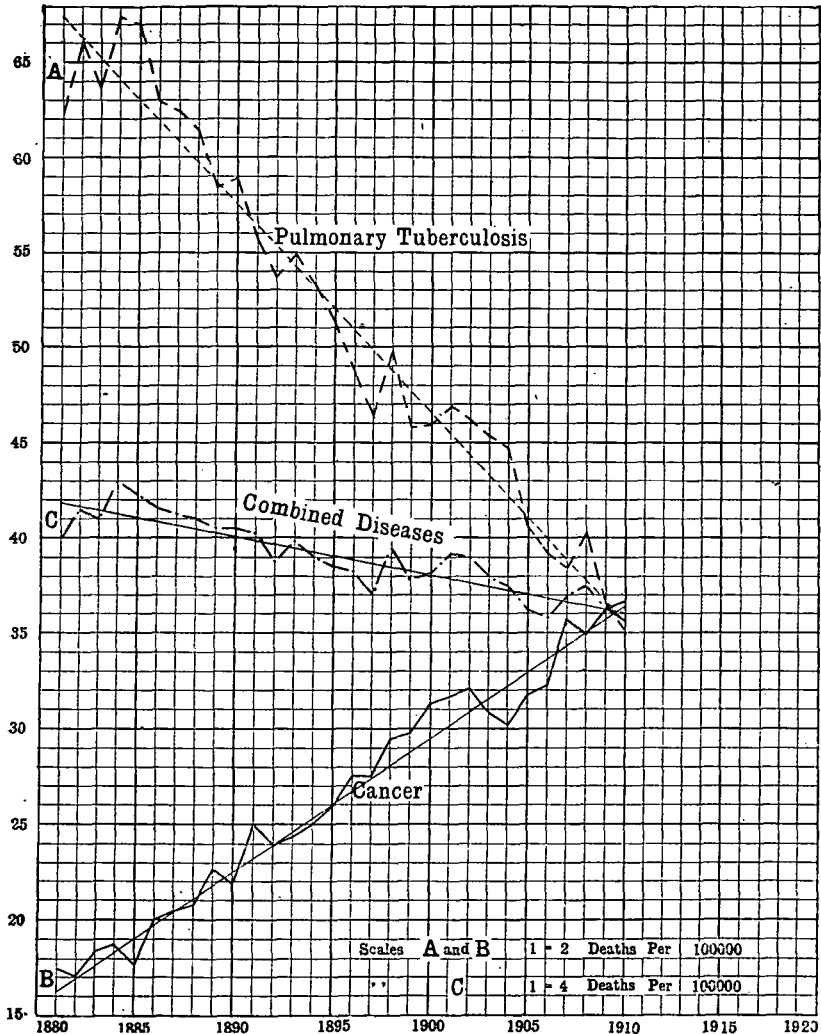
EXPLANATION OF GRAPHS —The base of each small square represents an interval of one year, while the height in the cases of curves A and B represents one death per 50,000 of population; and in the case of C, one death per 25,000 of population. In the cases of A and B, the base line (15) represents thirty deaths per 100,000; and in the case of C. it represents sixty deaths per 100,000. Thus, for curves A and B, the numbers on the left-hand column have to be doubled; and in the case of curve C, have to be quadrupled to give the number per 100,000. These curves indicate the linearity of trend of the diseases, and the fact that this trend is in opposite directions.

COMMONWEALTH OF AUSTRALIA.—DEATHS AT VARIOUS AGES, FOR VARIOUS DISEASES.
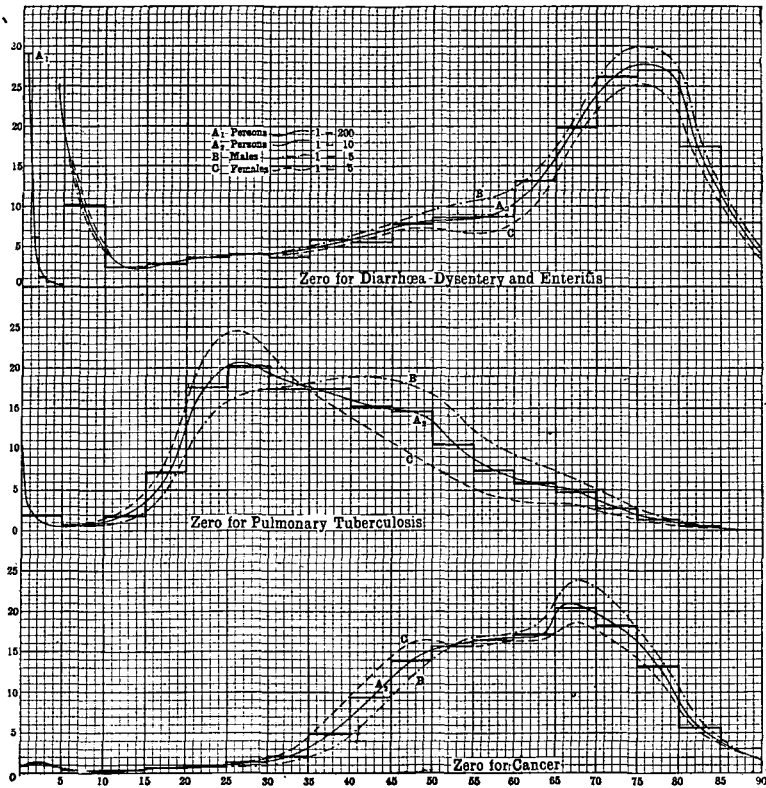
EXPLANATION OF GRAPHS.—The curves represent the number of deaths per annum at each age in a total population of 10,000,000, corresponding to the Australian experience for the four years 1907-10, the population of 10,000,000 being assumed to be distributed according to sex and age in the same proportions as the mean Australian population for 1907-10. In each case the continuous line represents persons, the broken line represents females, and the dot and dash line represents males. The base of each small square represents one year of age, while the height represents 200 deaths in a total population of 10,000,000 in the case of curve A 1, ten deaths in the case of curve A 2, and five deaths in the case of curves B and C.

In the above diagrams the curve marked "A" indicates the result for persons, while the curves marked "B" and "C" represent the similar results for males and females respectively.

28. **Frequency of Pulmonary Tuberculosis and Cancer according to Age.**—If the death rates be based on the actual number of persons living at each age, that is, if they be deduced from the number who die from the diseases in question in various age-groups and the number of persons of the same age actually living, then we find for those affected with pulmonary tuberculosis that the lowest incidence occurs at about five years of age. Then the rate quickly increases till the age twenty-eight or twenty-nine is reached. The death rate then falls off slightly, and increases again until the maximum is reached at about forty-eight or forty-nine years of age, after which the death rate of the number at risk again fairly rapidly falls off. These results are shewn on the diagram hereunder.

COMMONWEALTH OF AUSTRALIA.—DEATH RATES OF PERSONS OF DIFFERENT

AGES, PULMONARY TUBERCULOSIS, 1907 TO 1910.
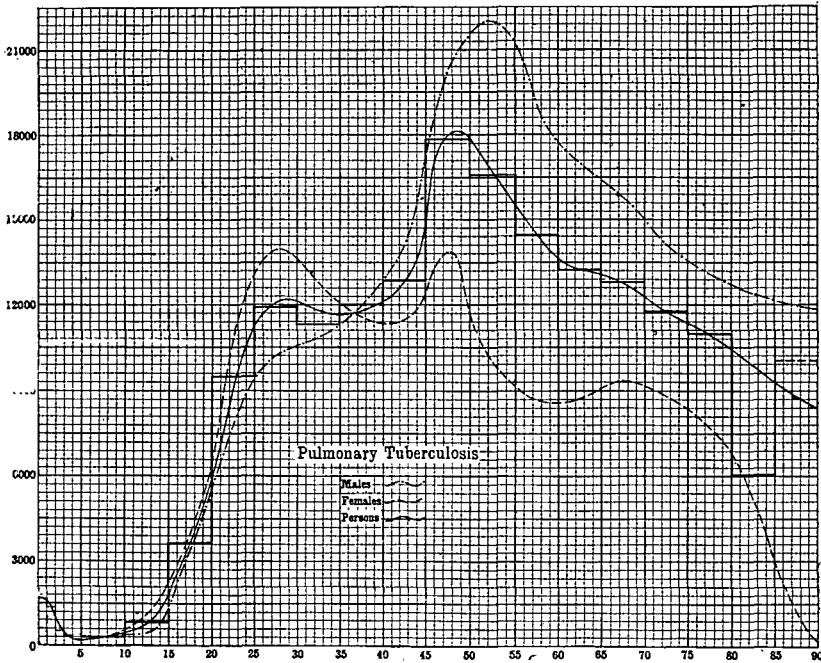
EXPLANATION OF GRAPHS.—The curves represent the number of deaths per 10,000,000 of population at each age, the continuous line representing the number of deaths per 10,000,000 of total population, the broken line representing the number of female deaths per 10,000,000 of female population, and the dot and dash line representing the number of male deaths per 10,000,000 of male population. The base of each small square represents one year of age, and the vertical height a death rate of 300 per 10,000,000. The figures on the left-hand margin represents the death rate per 10,000,000, those on the lower margin represent years of age.

The death rate for cancer, based on the total number living of the corresponding age, shews quite different characteristics. Thus, it attains its maximum value at the age of about two, falls to a minimum at about age eleven or twelve, and then continually and very rapidly increases for all later ages, as is evident in the following diagram on page 234.

Of the two diseases it will thus be seen that, economically, pulmonary tuberculosis is the more serious. Thus, although cancer is so increasing as nearly to obliterate the effect of decrease in death from tuberculosis, it is still a matter for congratulation that the ravages of tuberculosis have been greatly reduced. In other words, pulmonary tuberculosis strikes at the race at a period of life when its promise lies in the future, and before the heavy expenses of rearing and education have borne fruit in the various economic activities. Cancer, on the other hand, strikes at life later, after the period of highest economic activity, in fact when that activity is declining.

COMMONWEALTH OF AUSTRALIA.—DEATH RATES OF PERSONS OF DIFFERENT
AGES, CANCER, 1907 TO 1910.
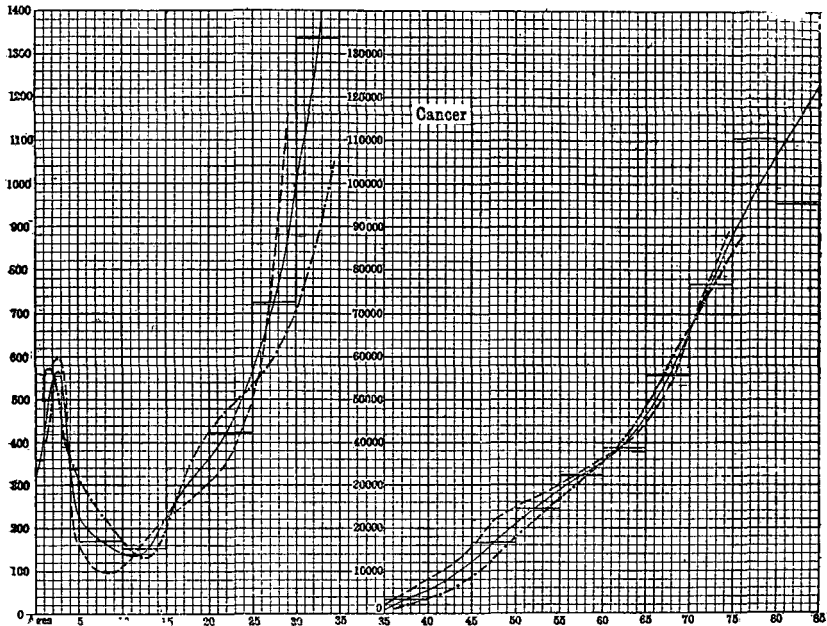
EXPLANATION OF GRAPHS.—The broken line with dots — · —· — · — denotes the results for males; the plain broken line — — — — — denotes those for females, and the continuous line those for persons (both sexes combined).

The base of each small square represents one year of age, while the height represents a death rate of twenty per 1,000,000 of population in the curve on the left of the diagram, and a death rate of 2000 per 1,000,000 of population in the curves on the right. The marginal figures on the left of the respective curves denote rates of mortality per 1,000,000 of population at the respective ages which are indicated in the lower margin of the diagram.

29. **The Incidence of Scarlet Fever, Measles, Whooping Cough, Diphtheria and Croup, Typhold, Diarrhœa, Enteritis, and Dysentery.** — In the following table is shewn the average quinquennial incidence of these diseases from 1881 to 1910 inclusive:—

DEATHS PER MILLION OF THE CORRESPONDING SEX PER ANNUM FOR VARIOUS DISEASES, AUSTRALIA, 1881-1910.

Period.	Masculinity of Population.	Scarlet Fever.		Measles.		Whooping Cough.		Diphtheria and Croup.		Typhoid.		Diarrhœa, Enteritis, and Dysentery.	
		M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
1881-1885	1177	68	85	68	83	125	201	414	453	544	564	1355	1184
1886-1890	1172	40	53	30	34	127	203	492	535	548	489	950	919
1891-1895	1136	36	51	98	99	140	200	325	375	278	222	631	561
1896-1900	1117	32	45	108	112	107	150	146	158	401	277	557	498
1901-1905	1095	21	27	39	44	90	121	101	105	252	176	372	306
1906-1910	1084	12	16	22	23	102	124	100	106	190	127	838	734