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## LABOUR FORCE SURVEY — SAMPLE DESIGN

NEW ISSUE

- PHONE INQUIRIES • *about this paper*—contact Mr Richard Phillips on Canberra (062) 52 6753 or any ABS State office.  
• *about other statistics and ABS services*—contact **Information Services** on Canberra (062) 52 6007, 52 6627, 52 5402 or any ABS State office.
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### Introduction

ABS has been conducting labour force surveys since 1960. They were undertaken on a quarterly basis before February 1978 and have been monthly since then. Estimates derived from the surveys are published monthly in *The Labour Force, Australia Preliminary* (6202.0) and *The Labour Force, Australia* (6203.0). These publications also contain information about sample selection and survey methodology.

2. The purpose of this paper is to provide information on the implications of changes which are being made later this year to the sample used for the Labour Force Survey (LFS). It also outlines the current sample design used in the LFS and changes made to this design over the history of the survey.

3. Following each Population Census the ABS redesigns and reselects the LFS sample to take into account the new information which is obtained from the Census. The sample currently used in the LFS was designed and selected using data from the 1981 Census but will be updated and reselected using information collected in the 1986 Census. When a new sample is being introduced, the standard errors of the month-to-month movements are higher than usual during the changeover period. In order to reduce the impact of the higher standard errors on any individual monthly movement, it has been decided to phase in the new sample over the period from September 1987 to December 1987.

4. The number of persons surveyed has grown in recent years because fixed sample fractions have been applied to increasing populations in each State and Territory. The effects have been that the size of the sampling errors has declined and operational costs have risen. Therefore, the opportunity is being taken during the redesign to reduce the costs of running the monthly LFS by lowering the sample fractions. As a result, sampling errors will return to about the same levels as in 1980-81.

### Objectives of the labour force survey

5. The main purpose of the LFS is to obtain timely information on the labour force status of the Australian population, thereby enabling labour force trends to be monitored by policy makers and commentators. The LFS classifies the Australian population aged 15 and over according to labour force status — those employed full time or part time; those who are unemployed and whether they are looking for full-time or part-time work; and those not in the labour force. The major data items can also be cross-classified with variables such as occupation and industry. The survey data are collected using definitions recommended by the International Labour Office.

### Sample design used in the labour force survey

6. The survey is designed basically to provide estimates for the whole of Australia but some modifications have been made to enable reliable estimates to be produced for all States and Territories. Statistics are also available for a number of regions within States.

7. Since the 1960s, the basic methodology of the survey has remained the same. The survey is conducted using an Australia-wide multi-stage area sample of dwellings, which involves selecting geographical areas and then further selecting smaller areas or units within the originally selected areas. Two groups of dwellings are separately identified and sampled — private dwellings (houses, flats, etc) and so-called 'special dwellings' which include units such as hotels, motels and caravan parks. This sampling technique is used to ensure that all persons living in Australia have a chance of selection in the survey. At present, about two-thirds of one per cent of Australia's population is selected in the sample.

8. The sample selection methodology results in each dwelling or person in a particular State or Territory having the same probability of selection (known as the sample fraction). The sample fractions for each State and Territory are different to ensure that the size of the resulting sample is sufficient to produce reliable estimates of the main labour force aggregates for each State and Territory. Current and proposed sample fractions for the States and Territories are shown in paragraph 16.

9. The sample size is expressed in terms of a fraction rather than as a number of dwellings or persons because of the way in which the sample of dwellings has to be selected. As the ABS does not have a list of dwellings in Australia, the sampling procedure used is to choose small geographic areas at random and then visit a selection of the dwellings contained in them. Use of a constant sampling fraction between censuses has the effect that the number of dwellings in the sample increases as the population grows. While there is an improvement from this source in the accuracy of the survey results, it is partially offset by a deterioration in the efficiency of the sample as a result of moving away from the Census benchmarks. Periodic reductions in the sampling fraction are necessary to prevent the cost of collecting the information becoming too great as a result of the growth in the sample size.

10. One of the primary requirements of labour force data is to provide a measure of change in the characteristics of the labour force over time, especially month-to-month variations. The most reliable measure for assessing change from one month to the next would require information to be obtained from the same sample of dwellings each month. Considerations such as the impracticability of retaining the same respondents continually in the survey require that some of the sample be replaced regularly. This procedure is known as sample rotation. Since the monthly LFS commenced in 1978, approximately one-eighth of the sample has been replaced each month. The sample can be thought of as consisting of eight sub-samples (often referred to as rotation groups). Thus, one fresh sub-sample (rotation group) is introduced into the sample each month to replace an outgoing rotation group. This rotation generally takes place within the same geographic areas. With the current basis of sample rotation no private dwelling is retained in the sample for more than eight months, yet reliable measures of monthly changes in estimates can be compiled because seven-eighths of the sample is retained in consecutive monthly surveys. The availability of this matched sample also permits the production of estimates of 'gross flows' — the number of people who change labour force status from one category to another between successive months.

#### Method of estimation

11. LFS estimates of persons employed, unemployed and not in the labour force are calculated in such a way as to add to the independently estimated distribution of the usually-resident population aged 15 and over age and sex. The independent population statistics are known as benchmarks and are based on Population Census data adjusted for underenumeration and updated monthly for births, deaths and net permanent and long-term migration. Benchmarks are classified by State (or Territory) of usual residence, area (metropolitan, non-metropolitan), age and sex.

12. Expansion factors or 'weights' are applied to the sample responses to derive estimates that relate to the whole population in the scope of the survey. In essence,

weights are calculated each month by dividing the population in each benchmark cell by the corresponding number of persons in the sample. Each sample respondent is then given a weight corresponding to the State (or Territory), area, age and sex cell in which he/she is a usual resident. Estimates of the total number of persons in the population with a certain characteristic are formed by summing the weights of the persons in the sample with that characteristic. The weighting procedure reduces sampling variance by ensuring that estimates conform to the benchmark distribution of the population by age, sex and geographic area while at the same time automatically compensating and adjusting for any underenumeration or non-response in the survey.

13. Periodically, the benchmarks are revised when new information becomes available from the most recent Population Census. Whenever the benchmarks are revised then all labour force estimates that have been produced from the start of the old benchmark period may also be revised. In the current case, benchmarks based on the 1986 Population Census data will potentially lead to revisions in labour force estimates back to July 1981 (i.e., for all months following the 1981 Population Census, which formed the basis for the benchmarks currently used in the LFS).

#### Changes introduced in previous redesigns

14. As mentioned above, the basic methodology of the LFS has remained the same since the first survey was run in the early 1960s. The main changes in sample design and estimation procedures introduced at each redesign since the LFS commenced can be summarised as follows:

- The 1971 redesign,
  - (a) the introduction of different sampling fractions across States and Territories;
  - (b) a reduction in sample size through reducing the overall sampling fraction from 1 in 100 to about 1 in 150.
- The 1976 redesign,
  - (a) the introduction of regional stratification;
  - (b) an increase in the Australian Capital Territory sampling fraction from 1 in 200 to 1 in 100;
  - (c) the introduction of a 1/8 rotation scheme in the Special Dwellings sample.
- The 1981 redesign,
  - (a) as a result of population growth the Western Australian sampling fraction was reduced from 1 in 90 to 1 in 100;
  - (b) a relocation of Caravan Parks into the Special Dwellings sample from the Private Dwellings sample;
  - (c) a change in estimation procedure from State of enumeration to State of usual residence.



### Design changes to be implemented in 1987

15. The life of each LFS sample is approximately 5 years and the efficiency of the sample deteriorates slightly during that time. However, the effect of the deterioration is more than offset by the beneficial impact on the sample errors of the increase in the overall number in the sample caused by applying a fixed sampling fraction to a population which is growing. (The accuracy of a sample is dependent mainly on the actual numbers sampled rather than on the proportion sampled.) Therefore, the new sample fractions will be reduced by about 13 per cent compared with the old ones to cut the operational costs of the LFS. The overall number in the sample at the end of 1987 will be about the same as in 1980-81. *The sampling errors will increase initially by about 7 per cent over the current level but will decline gradually during the life of the new sample.*

16. The current and the new sampling fractions for each State and Territory are:

	Current	New
New South Wales	1 in 200	1 in 230
Victoria	1 in 200	1 in 230
Queensland	1 in 140	1 in 160
South Australia	1 in 100	1 in 115
Western Australia	1 in 100	1 in 115
Tasmania	1 in 60	1 in 70
Northern Territory	1 in 100	1 in 115
Australian Capital Territory	1 in 100	1 in 115

17. Some changes will be made to regional boundaries in New South Wales, Victoria and Queensland. The new regions have been established in response to representations from users of regional data. These regions were set up after taking a number of factors into account, including State geography, consistency with other statistical collections, and the need for a minimum number of persons to be included in each region so that reliable data could be produced on employment and unemployment.

### Implementation of new sample

18. The new sample will be phased in from September 1987. One quarter of the new sample will be introduced each month so that, by December 1987, the entire new sample will be in place. Replacement will occur at the rotation group level with two rotation groups being substituted each month. Such a pattern of implementation means that any changes in labour force estimates due to differences between the two samples, or any other influences, will be spread over the four months rather than being concentrated in one inter-month period.

### Potential effects on labour force survey estimates

19. The implementation of a new sample as well as the introduction of new population benchmarks from the 1986 Population Census, may affect estimates derived from the LFS. Implications for estimates produced from the LFS due to the sample redesign are as follows:

- (a) There will be higher standard errors for the estimates of month-to-month movements produced over the period September 1987 to December 1987 compared with those for the corresponding series produced prior to this period and from January 1988 onwards. *These are estimated to be up to 22 per cent higher than the normal standard errors on monthly movements.*
- (b) Analysis has shown that the unemployment rate is marginally higher (about 4 per cent) for those persons in sample for the first time. Normally, this will not affect the overall estimates of month-to-month movements because the number of persons in sample for the first time does not change significantly. However, during the transition period, there will be twice as many people as usual in sample for the first time. This may cause a small upward movement in the number of unemployed persons from August to September (about 3,500 persons) and a compensating decrease from December to January.
- (c) It is possible that regional estimates will not be available over the implementation period, September 1987 to November 1987 inclusive. Since regional estimates will be subject to higher sampling errors than usual during the sample implementation period it is possible that the standard errors may be too high for regional estimates to be usable. Also, as some new regional boundaries will be introduced with the new sample, there will be a problem matching new and old boundaries. Analysis of the sampling errors associated with these estimates and the problems caused by changed regional boundaries will be undertaken to determine whether they can be released. If satisfactory regional estimates are able to be produced, it is likely that there will be a longer than normal delay in their availability.
- (d) Estimates of gross flows on a monthly basis will also be affected by introduction of the new sample. As the sample is to be phased in two rotation groups at a time the sampling errors associated with gross flows estimates will increase over those normally associated with these statistics. In addition, the methodology used in calculating the gross flows estimates means that the results obtained during the phase-in period will not be comparable with those produced in other periods. These estimates will be reviewed once they are compiled to determine the magnitude of the associated errors and the provision of gross flows data for this period.

20. The availability of new population benchmarks will also affect estimates from the LFS. New benchmarks will be available early in 1988 and are expected to be introduced by April 1988. They may result in labour force

estimates being revised for the period July 1981 to March 1988. All estimates produced after March 1988 will be based on the new benchmarks.

### **Summary**

21. There is a need to redesign the sample used in the LFS because of changes in size and distribution of the Australian population and the requirement to maintain a statistically efficient and cost effective sample. As part of

the redesign the overall sampling fraction will be reduced by 13 per cent. However, the new sample will be introduced over a four month period in order to minimise the possible effects on continuity of the labour force estimates.

**IAN CASTLES**  
**Australian Statistician**