



AUSTRALIAN BUREAU OF STATISTICS

SUBMISSION TO THE

JOINT STANDING COMMITTEE ON ELECTORAL MATTERS

INQUIRY INTO REPRESENTATION OF THE NORTHERN TERRITORY
AND THE AUSTRALIAN CAPITAL TERRITORY
IN THE HOUSE OF REPRESENTATIVES

Australian Bureau of Statistics
14 August 2003

**Australian Bureau of Statistics Submission to the
Joint Standing Committee on Electoral Matters
Inquiry into Representation of the Northern Territory and the Australian Capital
Territory in the House of Representatives**

This submission is in response to the invitation of 21 July 2003 from Mr Russell Chafer, Committee Secretary to the Joint Standing Committee on Electoral Matters, to the Australian Statistician.

2 Part A of this submission explains the methodology and data sources used to compile the population estimates used by the Australian Electoral Commission for its electoral determination, and their associated limitations. Illustrations of the extent of revision to population estimates for 30 June 1999 for the Northern Territory, the Australian Capital Territory and each of the States are given as an example. It is not yet possible to provide a similar illustration for the 30 September 2002 preliminary estimates used in the recent electoral determination. That analysis will only be possible after the release of final population estimates using the results of the yet to be conducted 2006 Population Census. However, the illustration does highlight the types of measurement errors that will exist in the September 2002 population estimates.

3 There is no fixed or predictable level of error in the quarterly population estimates. Rather, the Australian Bureau of Statistics (ABS) takes steps to minimise measurement errors in all statistical series where they are detectable, even if not measurable.

4 Mr Chafer's invitation also sought a response "to the comments made by Mr Tollner MP and Mr Warren Snowdon MP in relation to the statistics used for the most recent determination of State and Territory representation entitlements" and "ABS's advice on whether the Northern Territory's share of the national population is forecast to increase over the next two years". A further request from Mr Chafer in his facsimile letter to the Australian Statistician dated 22 July 2003 on behalf of the Chair of the Committee, Mr Petro Georgiou MP, sought "advice on whether there is an acknowledged margin of error in the quarterly population statistics used for the determination of State and Territory representation entitlements, and if so what that margin of error might be." Part B of this submission addresses these specific questions.

5 A number of key terms are used in this submission and these are defined in the Glossary attached.

PART A - POPULATION ESTIMATES METHODOLOGY AND SOURCES

Legislative requirements for population estimates

6 One of the core functions of a national statistical agency is to provide regular estimates of the population, and the Australian Bureau of Statistics is no exception. The *Census and Statistics Act 1905* requires the Statistician to conduct a population census every 5 years and to compile "statistics of the number of people of each State as on the last day of March, June, September and December in each year". These requirements were provided for in amendments to the *Census and Statistics Act 1905* in February 1977, alongside amendments to the *Representation Act 1905* and the *Commonwealth Electoral Act 1918*, as a result of two decisions by the High Court of Australia, *Attorney-General (Australia) (Ex relator McKinlay) v Commonwealth* (1975) 135 CLR 1; and *Attorney-General (New South Wales) (Ex relator McKellar) v Commonwealth* (1977) 139 CLR 527).

7 The *Commonwealth Electoral Act 1918* requires the Electoral Commissioner to ascertain the numbers of the people of the Commonwealth and of the several states and territories in accordance with the latest statistics of the Commonwealth in the thirteenth month after the first sitting day of a new House of Representatives. Section 47 of the *Commonwealth Electoral Act 1918* also places obligations on the Australian Statistician to provide statistical information to the Electoral Commissioner on request:

'47. The Australian Statistician shall, on request by the Electoral Commissioner, supply the Electoral Commissioner with all such statistical information as he or she requires for the purposes of this Division.'

These provisions are pursuant to section 24 of The Constitution which requires that the number of members chosen in the several States in the House of Representatives "shall be in proportion to the respective numbers of their people".

8 In respect of the 20 February 2003 electoral determination, the Australian Electoral Commissioner wrote to the Australian Statistician on 22 October 2002 advising of the legislative requirements to ascertain the population of each State and Territory between 13 February and the 12 March 2003. The Commissioner also advised the information required and sought confirmation that the September Quarter 2002 estimated resident population (ERP) statistics would be produced and available to the Australian Electoral Commission (AEC) in sufficient time for the necessary actions to be taken by 12 March 2003. In reply, the Australian Statistician advised an indicative release in mid February 2003, and later confirmed the date of 18 February 2003 for the provision of the 30 September 2002 population estimates to the Commissioner and release of the results on the ABS website.

The conceptual base

9 The fundamental concept in measuring Australia's population is the Estimated Resident Population or ERP. The ERP is the official measure of the population of Australia and is based on the concept of a person's residence for a period of twelve months or more within Australia, regardless of nationality or citizenship, with the exception of foreign diplomatic personnel and their families. The concept excludes people who are overseas for more than 12 months and overseas visitors who are in Australia for less than 12 months (see Glossary).

10 The ERP concept was developed in the late 1970s reflecting the increasing mobility of the population, both internationally and within Australia. Prior to the introduction of the ERP, all overseas arrivals and departures were included in the estimation process regardless of duration of stay. However, increasing volumes of international passenger movements (Australian residents departing overseas as well as overseas visitors to Australia) introduced increasing volatility in post census estimates of the Australian population. Furthermore, with increased travel within Australia, the use of Census of Population and Housing counts on a place of enumeration basis meant that the population of states and territories such as Queensland, the Northern Territory and Western Australia was overstated while that of Victoria, South Australia and Tasmania was understated due to the fact that the census is traditionally conducted in winter. For electoral representation purposes it was important that population estimates were changed to a place of usual residence basis.

Methodology

11 As noted above, estimates of the population of each state and territory and Australia are calculated as at the last day of March, June, September and December. These estimates are compiled using:

- data collected in the most recent Census of Population and Housing
- birth and death statistics from state and territory registrars
- overseas arrivals and departure data from the Department of Immigration and Multicultural and Indigenous Affairs
- Medicare data on changes of address from the Health Insurance Commission which are used as the basis for modelling interstate migration
- changes in state and territory defence force levels not accounted for in Medicare changes of address.

12 The five-yearly Census of Population and Housing provides the benchmark for post census population estimates. The results of the census are adjusted to take account of:

- persons away from home on census night
- the need to exclude overseas visitors
- underenumeration and overenumeration of the population in the census
- residents temporarily overseas on census night.

13 The initial results are further evaluated using demographic analytical techniques, comparison with other data sources and internal consistency checks and further adjustments are applied. As the census is conducted in August, the estimates are then backdated to 30 June using births, deaths, net overseas migration and net interstate migration.

14 For subsequent periods the estimates are incremented from the census benchmark using estimates of natural increase (the excess of births over deaths), net overseas migration and net interstate migration in the intervening period.

15 Every five years new benchmark estimates are available from the census and this provides an opportunity to compare the estimates based on the previous census with the estimates from the most recent census. The difference in these two estimates is known as Intercensal Error. The intercensal error provides the basis for revising the estimates for the period between the previous and current censuses.

Timeliness

16 The quarterly population estimates are routinely released 5 to 6 months after the reference date in Australian Demographic Statistics (ABS cat. no. 3101.0). However, for at least the last two electoral determinations, arrangements have been made to ensure the latest estimates were released slightly earlier so that they were available to the Australian Electoral Commission to meet the determination timetable set by the Commonwealth Electoral Act 1918. For the most recent electoral determination, the Australian Statistician determined the population as at the 30 September 2002 of the various Australian states and territories, and the Commonwealth of Australia, provided these to the Australian Electoral Commissioner on 18 February 2003 and on the same date released the data on the ABS website under the title *Population, Australian States and Territories - Electronic delivery* (ABS cat. no. 3239.0.55.001).

Data sources for population estimates and their associated quality assurance processes and limitations

17 Like all statistical measures, the data sources used to compile the population estimates are subject to measurement error (see Glossary). Whilst the ABS population estimates are based on the best available data, understanding the limitations is important when using them for decision making.

18 Quality assurance and data analysis procedures are employed in processing data used for compiling population estimates and observable errors are corrected, or missing data estimated or imputed. Not all measurement errors in the population estimates can be quantified, nor are they all systematic. An estimate of measurement errors associated with a particular quarterly estimate is not available until after the next census when final population estimates for the intercensal period are prepared, based on the new census results. Accordingly, the 30 June 1999 population estimates and their components that were used for the 9 December 1999 electoral determination are used in this submission to illustrate the measurable errors associated with the quarterly population estimates.

The Population Census

19 The population census aims to count all people in Australia on census night. The planning and development for the census is a major exercise and commences some seven years before census night. The ABS recruits and trains census collectors who know the local area so as to minimise any errors that may occur during delivery and collection of forms. Procedures are in place to provide mail back envelopes when collectors are unable to make contact with residents in dwellings. Special enumeration strategies are developed and implemented for Indigenous Australians, the homeless, and persons in transit on overnight trains, buses, planes and ships. Significant planning and processes are implemented to ensure a high quality Indigenous enumeration including recruitment of local community collectors, recognition and respect for cultural sensitivities and multi-stage quality assurance processes.

20 A comprehensive media and advertising campaign is undertaken to raise awareness of the census and keep the community informed during the enumeration cycle. A telephone census inquiry service, census booklet, web site and interpreter service are provided to help answer householders' questions. Information packs are also provided to federal and state parliamentarians, local councils, community groups and schools.

21 In spite of these efforts, experience has shown that a small percentage of the population is missed and an even smaller percentage of the population is counted more than once. A household based Post Enumeration Survey (PES) conducted three weeks after the census is the main source for assessing the level and characteristics of people undercounted and overcounted. The PES does not include dwellings in very sparsely populated areas due to the high cost of enumeration. The PES also does not include Indigenous communities, as the close involvement of the

Indigenous community organisations in the census enumeration process makes it impractical to effectively conduct an independent PES for these communities. Also, the PES does not include persons in non-private dwellings such as hotels, motels, hospitals and other institutions. However, these population subgroups are included in the population to which the net undercount adjustment is applied within each state and territory, capital city and balance of state (for states), age and sex groups. The net undercount adjustment also provides for inconsistencies apparent from demographic analysis and, for 2001, an adjustment to allow for over-imputing the number of persons in occupied dwellings from which a completed census form was not received. The level of net undercount in each state and territory is then used to add to the census counts on a usual residence basis.

22 2001 Census net undercount estimates are presented in Table 1. Overall, the net undercount for Australia was 1.8%, with the Northern Territory having the highest (4.0%) net undercount and the Australian Capital Territory the lowest (1.0%). As the PES is a sample of dwellings, estimates derived from the survey are subject to sampling error estimated by the standard error. The standard error on the PES adjustment is the measure of the likely difference between the survey estimate and the true value had all households been included in the PES. There are 19 chances in 20 (95% confidence) that the figure that would have been obtained if all dwellings had been included in the survey will be within plus or minus 2 standard errors of the estimate. For 2001, the net undercount rate for Australia of 1.8% has a standard error of 0.1 percentage points. This means that there are 19 chances in 20 that the net undercount rate is in the range of 1.6% to 2.0%.

Table 1: NET UNDERCOUNT 2001 CENSUS

	Net Undercount		Standard Error		Net undercount 95% confidence interval (a)	
	Number	Rate (%)	Number	Rate (percentage points)	Lower limit	Higher limit
NSW	130,100	2.0	13,200	0.2	103,700	156,500
Vic.	67,300	1.4	8,700	0.2	49,800	84,700
Qld	68,500	1.9	8,400	0.2	51,700	85,300
SA	24,300	1.6	3,200	0.2	17,800	30,800
WA	37,400	2.0	5,300	0.3	26,800	48,100
Tas.	7,400	1.6	1,300	0.3	4,700	10,100
NT	7,800	4.0	1,300	0.6	5,200	10,400
ACT	3,300	1.0	1,200	0.4	800	5,700
Australia	346,100	1.8	42,700	0.1	307,600	384,600

(a) Calculated by adding and subtracting 2 standard errors from the estimate of net undercount. Calculations are on unrounded numbers then results rounded to the nearest hundred

Source: *Information Paper: Census of Population and Housing, Data Quality - Undercount, Australia 2001* (ABS cat. no 2940.0)

23 Also shown in Table 1 are the standard errors of the net undercount estimates together with the net undercount 95% confidence interval for each state and territory. There are 19 chances in 20 that the net undercount for the ACT fell within the range 800 and 5,700 around an estimate of 3,300. For the Northern Territory,

there were 19 chances in 20 that the net undercount fell within the range 5,200 and 10,400 around an estimate of 7,800. Similarly, for Western Australia, there were 19 chances in 20 that the net undercount fell within the range 26,800 and 48,100 around an estimate of 37,400.

24 To calculate the quarterly ERP, the net undercount is used to adjust the census population count, and hence the sampling errors of the net undercount estimates used to prepare the 30 June population estimates in a census year typically flow on to the quarterly estimates. However, over time they will be masked through measurement errors in other components of population change such as natural increase, overseas migration and interstate migration.

Natural increase

25 Birth and death statistics are provided by state and territory registrars. For preliminary quarterly population estimates, births and deaths compiled on a date of *registration* are used as a substitute for date of *occurrence*. In statistical processing of birth and death registration statistics, the ABS employs various data quality assurance processes (e.g. detection and removal of duplicate registration records, search for missing sequences of records, resolution of registrar processing delays) to ensure the aggregate statistics are of acceptable quality.

26 Australia is regarded as having a sound civil registration process. Although most births and deaths are registered reasonably promptly, there is an interval between the date of occurrence of a birth or death and the date of registration. There is a detectable delay in a small proportion of registrations, more so for births than deaths. This delay can change over time and is not usually predictable. Whilst the number of registrations may reasonably approximate the number of occurrences within the year, seasonality of births and deaths means that there are differences between quarterly natural increase based on a date of registration basis compared to a date of occurrence basis. Delays in the registration process can occasionally occur (e.g. new registration systems). Accordingly, estimates of natural increase for each financial year are revised 15 months after the end of the year. The revisions take account of subsequently reported registrations, converted to a date of occurrence basis and an adjustment applied for anticipated further late registrations based on historical trends. Any additional measurement error in final estimates of natural increase (e.g. due to unregistered births or deaths) will be included in the intercensal error (see Glossary) calculated using the population estimates based on the results of the next population census .

Table 2: NATURAL INCREASE, COMPARISON OF PRELIMINARY AND FINAL ESTIMATES, JUNE QUARTER 1999

	Year ended 30 June 1999			Quarter ended 30 June 1999		
	Preliminary (a)	Final (b)	Difference	Preliminary (a)	Final (b)	Difference
NSW	39,084	40,561	1,477	9,657	10,055	398
Vic.	26,247	27,076	829	6,375	6,385	10
Qld	24,544	24,427	-117	6,202	6,117	-85
SA	6,593	6,751	158	1,713	1,652	-61
WA	14,220	14,509	289	4,055	3,855	-200
Tas.	2,458	2,658	200	673	713	40
NT	2,824	2,749	-75	811	801	-10
ACT	3,106	2,932	-174	886	721	-165
Australia (c)	119,094	121,687	2,593	30,378	30,302	-76

(a) Preliminary estimates based on the number of birth and death registrations within the quarter on a State/Territory of usual residence basis.

(b) Final estimates based on births and deaths occurring in the quarter including an adjustment for anticipated late registrations.

(c) Includes Other Territories

Source: *Australian Demographic Statistics, June 1999 and September 2002* (ABS cat. no. 3101.0)

Overseas Migration

27 Net overseas migration is measured using information provided on passenger cards completed by passengers crossing Australia's borders. Data on permanent and long term arrivals and departures are used for population estimation purposes, together with an adjustment to take account of passengers' changes in travel intentions.

28 Because of the significant impact of overseas migration on population growth for Australia and in particular states and cities, the data available from the Department of Immigration and Multicultural and Indigenous Affairs incoming and outgoing passenger cards are critical to the accurate measurement of the Australian population. The ABS works closely with the Department in detecting systemic data quality issues and correcting for errors through imputation techniques for missing data, missing cards or unreadable cards. Data quality issues for these data series are reported monthly in *Overseas Arrivals and Departures, Australia* (ABS cat. no. 3401.0).

29 Overseas migration estimates can be affected by changes between intended and actual duration of stay of travellers to or from Australia. As a duration of stay or absence of 12 months or more determines inclusion or removal from the population, it will not be until over 12 months after the initial crossing of the Australian border that confirmation is obtained that the person was indeed a permanent or long term arrival or departure. Any resultant change in category of overseas movement is known as category jumping. In recent years, with increased numbers of overseas students and temporary business entrants to Australia, the volume of long term arrivals to Australia has increased substantially. However, many of these people depart Australia for short absences, which presents difficulties in determining their residential status. The ABS is seeking to better understand and develop a new method of measuring the extent of category jumping and its impact on overseas migration statistics.

30 An additional but relatively small error in migration statistics impacting on population estimates involves unauthorised persons arriving in Australia not being included in the incoming passenger card series. This error is compounded because, if later deported, a departure card is completed and processed. These errors will be resolved at the next census. ABS estimates that approximately 12,500 persons were missed in the calculation of the 1996 Census based population estimates during the 1996-2001 intercensal period. Some were subsequently included in the 2001 Census based estimates whilst others were removed from the population without first having been added. The ABS has identified a method of correcting for this source of error at the national level, however, a reliable method for distributing the adjustment to the states and territories has not yet been identified for inclusion in revised post censal population estimates.

31 There may be situations where for newly arrived migrants to Australia, the initial settlement state or territory may be different to their final state or territory of settlement. Subsequent migration within Australia soon after arrival may not be detected in the interstate migration estimates. Such changes will be resolved at the next census and these and other errors in overseas migration estimates will be included in the estimate of intercensal error.

32 Table 3 contains the preliminary and final estimates of Net Overseas Migration for the year and quarter ended 30 June 1999. Due to a change in the design of passenger cards, implemented in July 1998, a discontinuity in the statistics of duration of stay in Australia for overseas visitors and duration of absence overseas of Australian residents has been detected. The discontinuity was resulting in spurious estimates for category jumping. On detection of this change, the ABS set category jumping to zero and is currently developing an alternative method of estimating migration category jumping based on newly available data for implementation later this year and covering estimates from 30 September 2001 onwards.

Table 3: NET OVERSEAS MIGRATION, COMPARISON OF PRELIMINARY AND FINAL ESTIMATES, JUNE QUARTER 1999

	Year ended 30 June 1999			Quarter ended 30 June 1999		
	Preliminary (a)	Final (b)	Difference	Preliminary (a)	Final (b)	Difference
NSW	53,375	41,088	-12,287	8,853	8,042	-811
Vic.	27,014	24,691	-2,323	3,270	2,377	-893
Qld	17,102	13,710	-3,392	3,118	2,236	-882
SA	2,932	2,682	-250	298	143	-155
WA	15,876	13,381	-2,495	2,293	2,286	-7
Tas.	-228	171	399	-84	-194	-110
NT	1,059	1,006	-53	221	247	26
ACT	223	-225	-448	75	-347	-422
Australia (c)	117,335	96,483	-20,852	18,041	14,795	-3,246

(a) Preliminary estimates based on net permanent long term migration plus a preliminary estimate of category jumping.

(b) Final estimates based on net permanent long term migration with an estimate of category jumping = 0.

(c) Includes Other Territories

Source: *Australian Demographic Statistics, June 1999 and September 2002* (ABS cat. no. 3101.0)

33 Incoming passenger cards are also used to estimate the number of Australian residents overseas on census night who were away for less than 12 months and who returned in the period up to 12 months after census night. These estimates are included in the 30 June estimates in a census year based on the results of the new census. As a complete count is made, there are no sampling errors involved.

Interstate Migration

34 Australia does not have a comprehensive and timely source of statistics on interstate migration. Some European countries have population registers which permit regular updates of the population based on the place of residence. Unlike these population registers, Australia's lists of residents such as electoral rolls, tax and rate payers and drivers license registers do not cover the complete population and are not always updated in a timely manner sufficient for quarterly population estimates.

35 In the absence of such data for Australia, interstate migration estimates are compiled using a statistical model constructed from the internal migration results of the most recent census, changes of address as advised to Medicare/Health Insurance Commission each quarter and changes in the number of Defence Force personnel in each state and territory. The use of the census results to inflate the Medicare address changes data compensates for the tendency for some groups of the population to not report their change of address to the Health Insurance Commission (e.g. healthy young people, especially males, and those not covered by Medicare). Estimates of intercensal interstate migration are evaluated and revised with the availability of the results from the next census.

36 The intercensal interstate migration model for the next intercensal period is then calibrated using the new census results. This ensures that the model is relevant and of acceptable accuracy.

37 Due to the lack of hard data, interstate migration has historically been the most challenging component of population change to measure. The ABS periodically reviews alternative sources of data to estimate quarterly interstate migration. Although Medicare address changes are not without their limitations as a data source, no other alternative data source has been found to be superior for quarterly population estimates.

Table 4: NET INTERSTATE MIGRATION, COMPARISON OF PRELIMINARY AND FINAL ESTIMATES, JUNE QUARTER 1999

	Year ended 30 June 1999			Quarter ended 30 June 1999		
	Preliminary (a)	Final (b)	Difference	Preliminary (a)	Final (b)	Difference
NSW	-14,294	-13,050	1,244	-4,044	-3,728	316
Vic.	3,975	2,527	-1,448	1,109	750	-359
Qld	17,233	16,682	-551	4,860	4,722	-138
SA	-2,869	-1,631	1,238	-864	-554	310
WA	1,775	296	-1,479	36	-338	-374
Tas.	-3,669	-3,317	352	-785	-698	87
NT	-938	-953	-15	-354	-362	-8
ACT	-1213	-506	707	42	220	178
Australia (c)	0	0	..	0	0	..

(a) Preliminary estimates based on modelled data from Medicare and the 1996 Census plus Defence Force level changes.

(b) Final estimates after validation with the results of the 2001 Census.

(c) Includes Other Territories

Source: *Australian Demographic Statistics, June 1999 and September 2002* (ABS cat. no. 3101.0)

Intercensal error and revision of intercensal estimates

38 When the population estimates for a census year become available for the states, territories and Australia, they can be compared with the alternative estimates for the same date already produced by updating the previous census year estimates for natural increase, net overseas migration and net interstate migration. The difference between the two estimates is called the intercensal error (see Glossary). This measure is therefore a performance indicator for the population estimates based on the last census over the intercensal period (although it also includes any inconsistencies between the two censuses and their respective net undercount estimates).

39 The census allows an assessment of how much of the intercensal error was due to inaccuracies in estimates of interstate migration. The census questions which allow this assessment are the questions on usual residence 1 year ago and 5 years ago. Estimates of interstate migration based on census data are used to revise the interstate migration component of the post-censal population updates (based on the

previous census). The resulting difference between the revised post-censal estimates (based on the previous census and revised interstate migration) and the estimates based on the latest census is termed the intercensal discrepancy (see Glossary). The intercensal discrepancy is a non-attributable residual error which may include imprecision in either of the census year population estimates (including the elements that contribute to those estimates), or the individual components of intercensal population change. The discrepancy cannot be attributed to specific quarters in the intercensal period. Therefore the intercensal discrepancy acts as a balancing item, that when combined with births, deaths and migration equals the change in the intercensal population estimates. It is distributed on a uniform basis across quarterly population estimates in the intercensal period.

40 Table 5 contains the estimates of intercensal error and intercensal discrepancy for the 1996-2001 intercensal period. As can be seen, whilst the discrepancy for Australia is -0.05%, the percentage discrepancy varied across the states and territories.

Table 5: 1996-2001 INTERCENSAL ERROR AND INTERCENSAL DISCREPANCY, AS AT 30 JUNE 2001

	Intercensal error	Intercensal discrepancy (a)	
	number (b)	number (b)	per cent
NSW	27,000	21,400	0.33
Vic.	-35,600	-26,900	-0.56
Qld	-5,800	-3,900	-0.11
SA	9,600	2,700	0.18
WA	-11,500	-5,100	-0.27
Tas.	1,800	100	0.01
NT	200	300	0.15
ACT	4,300	1,300	0.42
Australia (c)	-10,600	-10,600	-0.05

(a) Includes reconciliation of internal migration results from the 2001 Census

(b) Estimates rounded to nearest hundred.

(c) Includes Other Territories

Source: *Australian Demographic Statistics, June 1999 and September 2002* (ABS cat. no. 3101.0) and unpublished data available on request.

41 With the availability of final quarterly estimates for the 1996-2001 intercensal period, the preliminary 30 June 1999 population estimates provided by the ABS to the Australian Electoral Commissioner for use in the 9 December 1999 electoral determination can be compared with the final estimates based on the 2001 Census for the same reference date, as shown in Table 6. (It should be noted that the Australian Electoral Commission also obtains statistics from the Norfolk Island Administration for inclusion in the determination calculation and these are not included in Table 6.)

42 The difference between preliminary and final estimates represents the combined impact of revisions to components of population change between 30 June 1996 (the previous census year base) and 30 June 1999 and the inclusion of 1996-2001 intercensal discrepancy components for quarters from 30 June 1996 to 30 June 1999. The difference therefore presents an approximation of the measurable net error in the 30 June 1999 population estimates used for the 9 December 1999 electoral determination.

Table 6: PRELIMINARY AND FINAL POPULATION ESTIMATES, 30 JUNE 1999

	Preliminary	Final	Change (c)	
	number (a)	number (b)	number	per cent
New South Wales	6,411,680	6,411,370	-310	-0.0
Victoria	4,712,173	4,686,402	-25771	-0.5
Queensland	3,512,356	3,501,421	-10935	-0.3
South Australia	1,493,074	1,497,819	4745	0.3
Western Australia	1,861,016	1,849,733	-11283	-0.6
Tasmania	470,261	471,430	1169	0.2
The Commonwealth (excluding the territories)	18,460,560	18,418,175	-42385	-0.2
Northern Territory	193,882	192,735	-147	-0.1
Territory of Christmas Island	1,897	1,528	-369	-19.5
Territory of Cocos (Keeling) Islands	587	542	-45	-7.7
Australian Capital Territory	310,173	312326	2,153	0.7
Jervis Bay Territory	689	549	-140	-20.3
Australian Antarctic Territory (c)	65	65	-	-
Coral Sea Islands Territory (c)	4	4	-	-
Territory of Heard Island and McDonald Island (c)	0	0	-	-
Territory of Ashmore and Cartier Islands (c)	0	0	-	-

(a) Provided to the Electoral Commissioner by the Australian Statistician on 8 December 1999.

(b) Final estimates including intercensal discrepancy.

(c) The change from preliminary estimates to final estimates, number and percentage.

(c) Information provided by the relevant managing agencies.

43 As noted earlier, a similar process can be undertaken for the 30 September 2002 estimates (used for the most recent electoral determination) in late 2007 with the availability of final estimates including the results of the 2006 Population Census.

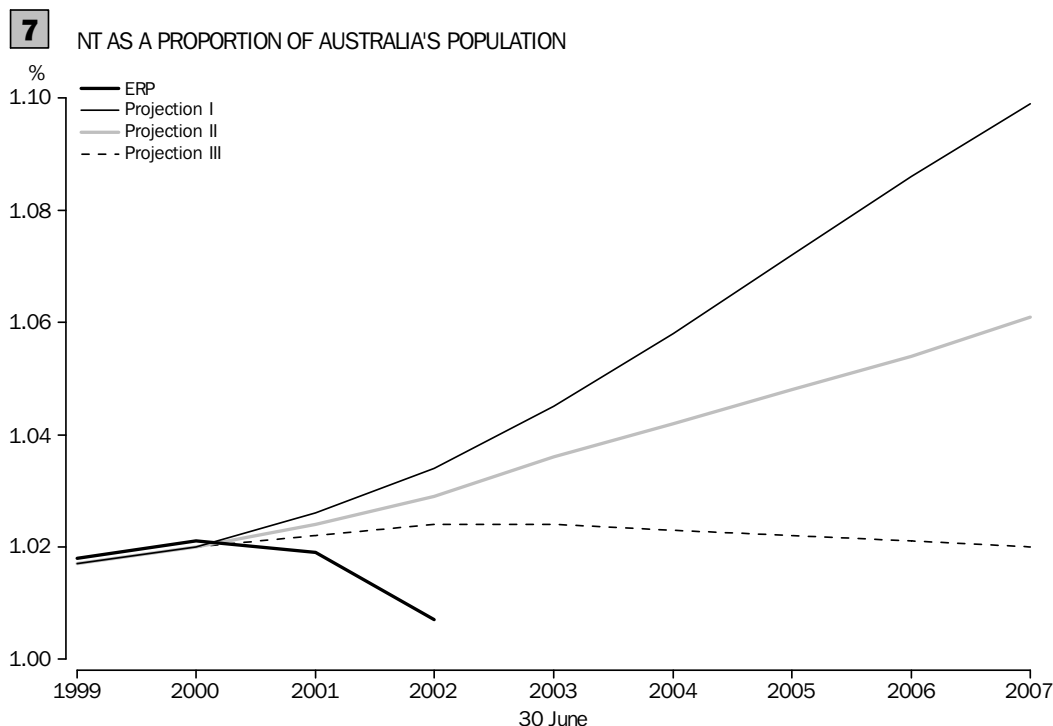
Population projections

44 ABS prepares deterministic population projections every 2-3 years. These projections are not intended as predictions or forecasts, but as illustrations of growth and change in the population which would occur if certain assumptions about future levels of fertility, mortality, net overseas migration and net internal migration were to prevail over the projection period. The assumptions are developed through

analysis of recent and longer term trends in components of population growth and though consultation with Commonwealth, State and Territory Government agency representatives, expert demographers and other key users. The projection series provide for various assumptions to illustrate the range of possible outcomes.

45 The currently available population projections were released in August 2000, based on assumptions for population growth from 30 June 1999 onwards. Figure 7 illustrates the proportion of Australia's population in the NT for the three main projection series, compared with the latest available population estimates. Projection series I and II indicate an increase in NT's population as a proportion of Australia's population. Projection series III indicates only a slight increase in the population up to 2002 and 2003 after which the population share in the NT declines slightly. The representation entitlement scenario in Table 2 of the Department of the Parliamentary Library Research Note "A Fair Deal for Territory Voters?" No 27, 18 March 2003 only used the middle projection series.

46 The latest available ERP shares indicate that all three 1999 based projection series appear to have been optimistic and that the share of population in the NT has been declining in recent years. The core reason is that the assumptions for net internal migration for the Northern Territory used in the projections have been optimistic as the number of arrivals from other parts of Australia have been declining over recent 5 years. Recent population estimates for the NT are slightly below even the lowest projection series III.



47 Population projections are only as accurate as the assumptions underpinning them. Circumstances and population trends change over time and so the ABS updates these population projections every 2-3 years. The next update will be published in *Population Projections, Australia 2002 to 2101* (ABS cat. no. 3222.0)

scheduled for release on 2 September 2003. An updated analysis of those projections and the NT projected share of the population can be provided to the committee as a supplementary submission on or after 2 September.

48 Various commentators have suggested that the NT population is likely to increase following recent capital investment and projected construction activity, other economic activity and government programs in the Northern Territory. However, based on the information available to it, the ABS has estimated that the NT population has declined slightly in 4 of the last 5 quarters leading to an 0.1% decline in the population for the year ending 30 December 2002. By comparison, the national population growth rate was 1.3% for the same period.

PART B - RESPONSES TO SPECIFIC ISSUES

49 ABS has been asked to comment in this submission on three specific matters as follows:

- a "to the comments made by Mr Tollner MP and Mr Warren Snowdon MP in relation to the statistics used for the most recent determination of State and Territory representation entitlements";
- b "ABS's advice on whether the Northern Territory's share of the national population is forecast to increase over the next two years"; and
- c "advice on whether there is an acknowledged margin of error in the quarterly population statistics used for the determination of State and Territory representation entitlements, and if so what that margin of error might be."

These matters are addressed in turn.

50 The article "Out for the Count" published in the May-June 2002 issue of the *About the House* magazine included the following:

"The Member for Lingiari, Warren Snowdon, says that while he has no problem with the formula used to determine the Territory's 'representation entitlement', the statistical information used to determine the seat allocation for the Territory was flawed.

"The Constitution states that the latest statistics must be used when the formula is applied to determine the allocation of electorates," says Mr Snowdon. "The statistical information used by the Electoral Commissioner to determine the Territory's allocation was not accurate."

and further

"This standard error means that the population used to determine our seat entitlement could be out by anything up to 4,000 people," Mr Snowdon says. "Therefore, the figure of 291 people is well within the range of statistical error, and in addition to that, we've demonstrated that the Australian Bureau of Statistics' estimates for particular regions in the Territory are not accurate.

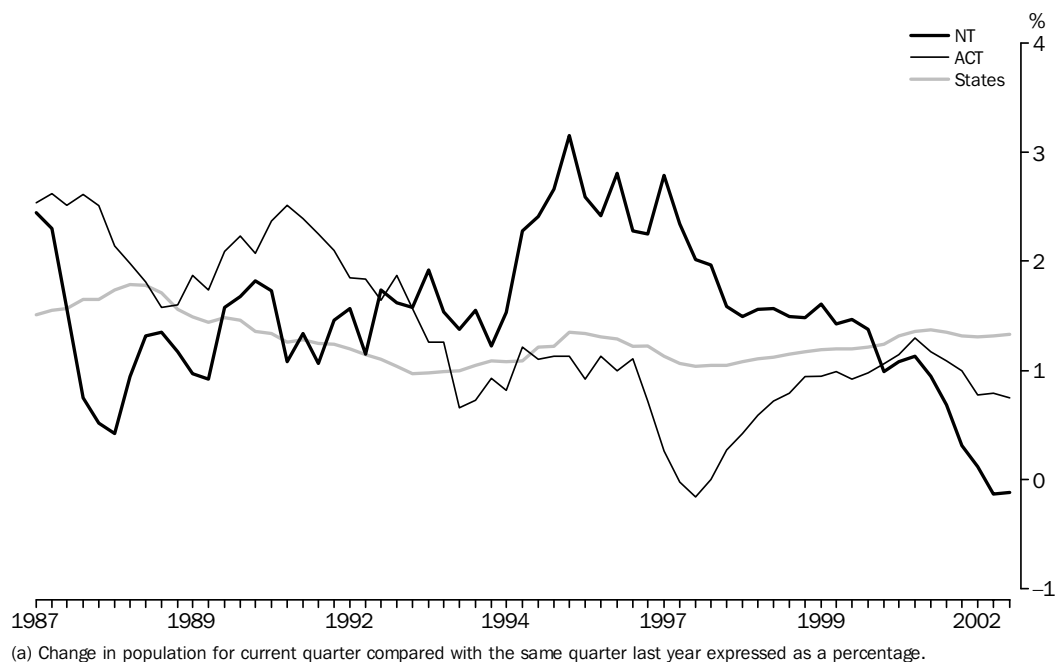
"The Bureau's population estimates for the last four quarters have been so varied that if the Electoral Commission had used the figures for the June quarter instead of the September quarter, we would have been just above the quota for two seats."

51 The 30 September 2002 estimated resident population statistics provided to the Electoral Commissioner were the latest estimates of the population of the Australian states and territories and the Commonwealth. The estimates are preliminary and they are subject to various sources of measurement error as set out in detail in Part A of this submission. The standard error of the net undercount

adjustment is just one source of error and the only quantifiable error at this point in time. Other sources of error can only be evaluated after the results of the 2006 Census of Population and Housing are available. Based on recent experience in estimating the NT population, and as set out in Part A of this Submission, it is improbable that the total error on the NT population estimate for 30 September 2002 could be as high as 4,000 persons. However, the ABS agrees that "the figure of 291 people is well within the range of statistical error" to quote Mr Snowdon MP.

52 In respect of the last paragraph of the italicised quote in paragraph 50 above, Figure 8 below illustrates the respective annual population growth rates of the Northern Territory and the Australian Capital Territory compared the growth rates for the sum of the six Australian states over the last 25 years. The growth rate of the Northern Territory has been volatile over time as is that of the Australian Capital Territory in comparison of the states. This comparative volatility is due to the small size of the NT and ACT populations compared to the sum of the states. Larger populations have more stable changes in growth over time.

8 ANNUAL POPULATION GROWTH RATES (a), June 1987 to December 2002



53 The "Out for the Count" article also includes this paragraph:

Mr Tollner points to a Parliamentary Library research paper which he says shows the Northern Territory gaining population. "The numbers used by the Electoral Commission to calculate our level of representation were an anomaly," he says. "And the decision to cut representation for the Territory doesn't serve the current push for boosting resource allocation to rural and remote Australia."

54 The ABS notes the Department of the Parliamentary Library's Research Note "A Fair Deal for Territory Voters?", 2002-03 No 27, 18 March 2003. The representation entitlement scenario in Table 2 of the Research Note only used the projection series II from the projections based on 30 June 1999. As noted in Figure 7 (below paragraph 46 above) the actual NT population share has been tracking below even the lowest growth population projection from the 1999 series. A new series of ABS population projections based on 30 June 2002, with a new range of assumptions for components of population growth, will be released on 2 September 2003.

55 ABS advice has been sought on whether the Northern Territory share of the national population is forecast to increase over the next two years. Whilst the Northern Territory annual population growth rate has been above that for the states since the early 1990s, it has been below that of the states since December 2000. For the Australian Capital Territory, the annual growth rate has been below that of the states since 1993/1994. The relative growth rates of each territory versus the sum of the States is an important indicator of whether that territory is growing or declining in population size relative to the states of Australia.

56. The new series of ABS population projections to be released on 2 September 2003 will also shed light on whether the NT share of the national population is projected (not forecast) to increase over the next two years.

57 ABS advice has also been sought on whether there is an acknowledged margin of error in the quarterly population statistics used for the determination of state and territory representation and, if so what the margin of error might be. There is an acknowledged margin of error in the quarterly population statistics used for the determination of State and Territory representation entitlements. This submission has described the potential measurement errors. Steps are taken by the ABS to minimise such errors, however, it is not possible until after the next census to quantify their magnitude.

PART C - SUMMARY

58 The 30 September 2002 estimated resident population statistics provided by the Australian Statistician to the Australian Electoral Commissioner and used in the most recent electoral determination, are subject to measurement error and revision, and it will only be after the 2006 Census of Population and Housing that the estimates will be finalised. However, they represent the best estimates that can be made given current methodologies and available data sources.

57 The ABS is continually reviewing its data sources and methodologies to ensure that they continue to represent best practice in this challenging field of statistics.

Australian Bureau of Statistics
August 2003

GLOSSARY

The following terms are used in the submission and are defined as follows:

Estimated Resident Population (ERP)

The official measure of the population of Australia is based on the concept of residence. It refers to all people, regardless of nationality or citizenship, who usually live in Australia, with the exception of foreign diplomatic personnel and their families. It includes usual residents who are overseas for less than 12 months. It excludes overseas visitors who are in Australia for less than 12 months.

State or territory of usual residence

State or territory of usual residence refers to the state or territory of usual residence of:

- the population (estimated resident population);
- the mother (birth collection); or
- the deceased (death collection).

In the case of overseas movements, state or territory of usual residence refers to the state or territory regarded by the traveller as the one in which he/she lives or has lived. State or territory of intended residence is derived from the intended address given by settlers, and by Australian residents returning after a journey abroad. Particularly in the case of the former, this information does not necessarily relate to the state or territory in which the traveller will eventually establish a permanent residence. For the Census of Population and Housing, a person's usual residence is defined as being the place in Australia where they have lived or where they intend to live for six months or more.

State or territory of enumeration

Population census counts on a state or territory of enumeration reflect the state or territory in which each person was enumerated on census night.

Australia

For the purposes of population estimates, Australia is defined as the six states, the Northern Territory, the Australian Capital Territory and the 3 main Other Territories. Following the 1992 amendments to the *Acts Interpretation Act* to include the Indian Ocean Territories of Christmas Island and the Cocos (Keeling) Islands as part of geographic Australia, population estimates commencing from September quarter 1993 include estimates for these two territories. To reflect this change, another category of the state and territory level has been created, known as Other Territories. Other Territories include Jervis Bay Territory, previously included with the Australian Capital Territory, as well as Christmas Island and the Cocos (Keeling) Islands, previously excluded from population estimates for Australia. Data for Other

Territories, while not detailed separately each quarter, are included in Australia totals commencing from September quarter 1993. Estimates for 30 June are published each year. The other offshore territories of Australia are mostly uninhabited except for small scientific and meteorological teams at the Australian Antarctic Territory and the Coral Sea Islands Territory. Norfolk Island population statistics are not compiled by the ABS but are available from the Norfolk Island Administration.

Components of population growth

For Australia, population growth is the sum of natural increase and net overseas migration. For states and territories, population growth also includes net interstate migration. After the census, intercensal population growth also includes an allowance for intercensal discrepancy. These individual items are referred to as the components of population growth

Natural Increase

Excess of births over deaths within a period of time.

Net undercount

The difference between the gross undercount and the gross overcount. This is the total effect of missing some people and counting others more than once. Gross undercount is the number of people who should have been counted in the census but were not. Gross overcount is the number of people in the census who should not have been counted, either because they had already been counted or because they were overseas and should not have been counted at all. If a person was counted in the census three times, they would have contributed two counts to the gross overcount.

Net interstate migration

The difference between the number of persons who have changed their place of usual residence by moving into a given state or territory and the number who have changed their place of usual residence by moving out of that state or territory during a specified period. This difference can be either positive or negative.

OVERSEAS MIGRATION

Net overseas migration

Net overseas migration is net permanent and long-term overseas migration plus an adjustment for the net effect of category jumping.

Overseas arrivals and departures (OAD)

Overseas arrivals and departures (OAD) refer to the arrival or departure of persons, through Australian airports (or sea ports), which have been recorded. Statistics on OAD relate to the number of movements of travellers rather than the number of travellers (i.e. the multiple movements of individual persons during a given reference period are all counted).

Category of movement

Overseas arrivals and departures are classified according to length of stay (in Australia or overseas), recorded in months and days by travellers on passenger cards. There are three main categories of movement:

- permanent movements;
- long-term movements (one year or more); and
- short-term movements (less than one year).

A significant number of travellers (i.e. overseas visitors to Australia on arrival and Australian residents going abroad) state exactly 12 months or one year as their intended period of stay. Many of them stay for less than that period and on their departure from, or return to, Australia are therefore classified as short-term. Accordingly, in an attempt to maintain consistency between arrivals and departures, movements of travellers who report their actual or intended period of stay as being one year exactly are randomly allocated to long-term or short-term in proportion to the number of movements of travellers who report their actual length of stay as up to one month more, or one month less, than one year.

Net permanent and long-term movement

The difference between the number of permanent (settler) and long-term arrivals and the number of permanent and long-term departures. Short-term movements are excluded.

Long-term arrivals

Long-term arrivals comprise:

- overseas visitors who intend to stay in Australia for 12 months or more (but not permanently); and
- Australian residents returning after an absence of 12 months or more overseas.

Long-term departures

Long-term departures comprise:

- Australian residents who intend to stay abroad for 12 months or more (but not permanently); and
- overseas visitors departing who stayed 12 months or more in Australia.

Permanent arrivals (settlers)

Permanent arrivals (settlers) comprise:

- travellers who hold migrant visas (regardless of stated intended period of stay);
- New Zealand citizens who indicate an intention to settle; and
- those who are otherwise eligible to settle (e.g. overseas born children of Australian citizens).

This definition of settlers is used by the Department of Immigration and Multicultural and Indigenous Affairs (DIMIA). Prior to 1985 the definition of settlers used by the Australian Bureau of Statistics (ABS) was the stated intention of the traveller only. Numerically the effect of the change in definition is insignificant. The change was made to avoid the confusion caused by minor differences between data on settlers published separately by the ABS and the DIMIA.

Permanent departures

Permanent departures are Australian residents (including former settlers) who on departure state that they are departing permanently.

Category jumping

Category jumping is the term used to describe changes between intended and actual duration of stay of travellers to/from Australia, such that their classification as short-term or as long-term/permanent movers is different at arrival/departure from that after 12 months. Category jumping consists of two components - an Australian resident component and an overseas visitor component. The Australian resident component of category jumping for a reference quarter is estimated by comparing the number of residents departing short-term in that quarter with all residents who left in that quarter and return in the following 12 months, to obtain the net number of Australian residents who jump category. Similarly, the number of overseas visitors arriving short-term in a quarter is compared with all overseas visitors and permanent arrivals who arrived in that quarter and depart in the following 12 months, to obtain the net number of overseas visitors who jump category. Estimates of category jumping are derived by subtracting the Australian resident component from the overseas visitor component.

QUALITY MEASUREMENT

Intercensal error

Intercensal error is the difference between two estimates of census year population, the first based on the latest census and the second arrived at by updating the previous census date estimate with intercensal components of population change which do not take account of information available from the latest census.

Intercensal discrepancy

Intercensal discrepancy is the difference between two estimates of a census year population, the first based on the latest census and the second arrived at by updating the previous census date estimate with intercensal components of population change which take account of information available from the latest census. It is caused by errors in the start and/or finish population estimates and/or in estimates of births, deaths or migration in the intervening period which cannot be attributed to a particular source.

Measurement error

All statistical measures are subject to measurement error. These measurement errors can be divided into two categories, sampling error (see **standard error** below) and non sampling error. **Non sampling error** arises from inaccuracies in collecting, recording and processing data. Every effort is made to minimise reporting error by the careful design of questionnaires, intensive training and supervision of census collectors and interviewers, and efficient and quality assured data processing procedures. For data sourced from other government departments, the ABS undertakes quality analysis of the data provided and liaises closely with the agencies concerned to ensure data quality shortcomings are addressed where possible.

Standard error of net undercount

Statistics produced from the Post Enumeration Survey (PES) on undercount, overcount and net undercount are subject to sampling error. Since only a sample of dwellings is included in the PES, estimates derived from the survey may differ from figures which would have been obtained if all dwellings had been included. One measure of the likely difference is given by the Standard Error which indicates the extent to which an estimate might have varied by chance because only a sample was included. For further information, see the Technical Note (page 33) of the *ABS Information Paper: Census of Population and Housing, Data Quality - Undercount, 2001* (ABS catalogue number 2940.0).