Australian Bureau of Statistics

Statistical UPDATE

An Information Newsletter from the Queensland Office

Issue No. 16, March 2004

In This Issue

Editorial

A Happy New Year to *Statistical Update* subscribers. My name is David Jayne and I have recently been appointed to the position of Assistant Director, State and Territories Statistical Services (STSS) Branch in the Queensland office of the Australian Bureau of Statistics (ABS). I will be responsible for ensuring that the ABS has a good understanding of the statistical needs and priorities of users, with particular emphasis on the Queensland Government, and delivers high quality research, analytical and publication services to address these needs.

David Jayne

My ABS career exceeds 30 years, all of which has been spent in the Queensland office. My work experience has been diverse covering all areas in ABS at some stage. More recent achievements include establishing the Health and Vitals National Processing Centre (NPC) in the Queensland office. This centre collects and processes data for all births, deaths, marriages and divorces registered in Australia each year, including mortality coding of cause of death using the International Classification of Diseases (ICD–10). The NPC has taken a leadership role in the introduction of automated mortality coding and multiple cause coding for deaths. I have prepared a number of information papers, on the ABS experience, for presentation at national and international fora and assisted Statistics South Africa with the introduction and output of their multiple cause data.

STATISTICAL DEVELOPMENTS

Prior to commencing in STSS Branch, I undertook work for the National Centre for Aboriginal and Torres Strait Islanders Statistics unit (NCATSIS) on Indigenous mortality and issues related to the quality of Indigenous statistics. ABS is aware of the importance of, and interest in, Indigenous statistics and is committed to improving the coverage and quality of data relating to Indigenous persons.

I look forward to the challenges of my new position. As part of the team involved in the production of the *Statistical Update,* I would welcome any feedback and suggestions for improving future publications. If you wish to discuss this or any other issues, please feel free to give me a call on 07 3222 6083 or email me on <david.jayne@abs.gov.au>.

— David Jayne

2002 General Social Survey — A Snapshot of the Well-being of Australia

In December 2003, the ABS released the first results from its inaugural General Social Survey, conducted in March–June 2002.

Topics covered by the survey include: social attachment, crime and safety, personal stressors, financial stress and income, health and disability, use of information technology and transport.

The survey enables analysis and comparison of the interrelationship of social circumstances and outcomes across population groups.

The first results of the survey were released in *General Social Survey, Summary Results, 2002* (cat. no. 4159.0) on 18 December 2003.

General Social Survey state and territory tables were released as Excel datacubes on 21 January 2004 and *General Social Survey: Users' Guide* (cat. no. 4159.0.55.002) was released 19 February 2004.

Some findings of interest from the Queensland datacube (cat. no. 4159.3.55.001) include:

- Around 95% of Queensland adults (aged 18 years or over) had at least weekly contact with family or friends.
- Most (95%) felt that they could get support from people outside the household in time of crisis. Family members were the main source of support across all age groups. The extent to which friends and neighbours were sources of support varied across age groups. For the 18–24 years age group, 81% reported friends as a source of support, compared with 43% for those over 65 years. A much higher proportion of persons aged 65 and over reported that neighbours as a source of support (39%) compared with 17% for 18–24 year olds.
- Over half of adults (59%) reported at least one stressful situation involving themselves or someone close to them in the year prior to interview. The most common stressors were: serious illness (22%), death (19%), inability to get a job (16%), divorce or separation (13%), mental illness (8%) and alcohol or drug problems (8%).
- The majority (89%) of adults living in 'couple only, one family households' with no dependent children reported that they had no cash flow problems in the last 12 months. In contrast, 43% of adults living in lone parent households with dependent children reported having cash flow problems with 22.3% having three or more *different* types of cash flow problems in the last 12 months.
- Government support has been the main source of income for the last 2 years for 24% of all Queensland adults. For those 65 years and over this figure rises to 73%.

For further information contact Jenny Harber on 02 6252 5508 or <jenny.harber@abs.gov.au>.

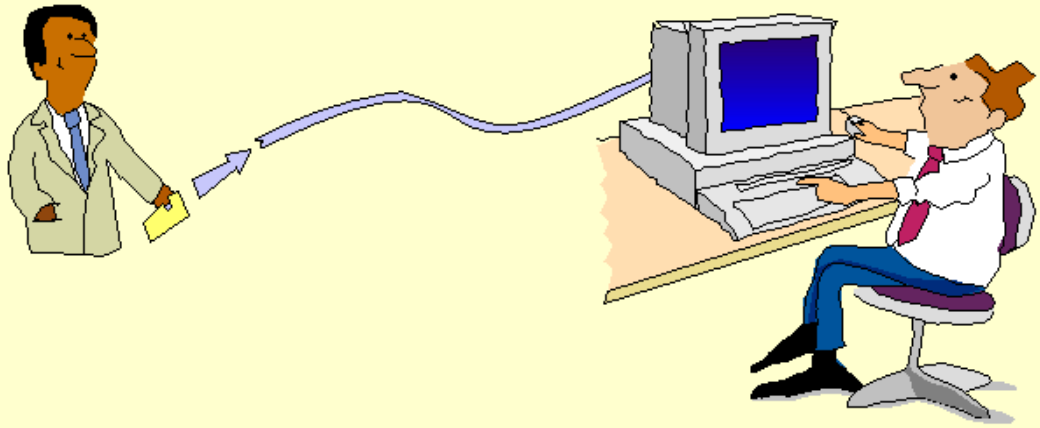
The Final Hard Copy Issue of *Statistical Update*

Dear readers, *Statistical Update* will be undergoing several changes in 2004. A review of the *Statistical Update* has been completed in recent months and the changes will be implemented progressively. This issue, February 2004, will be the final hard copy version produced and dispatched. In future, it will be available only in electronic format. The vast majority of our subscribers already recieve *Statistical Update* via electronic means. To ensure all our clients continue to receive prompt delivery of future issues, we'll need the email address details from those of you who have received this issue in hard copy. Please send an email with 'Subscribe' in the subject field to <arthur.poulter@abs.gov.au>.

For future issues, we will email you with a link to the ABS web site page containing the new issue of *Statistical Update*. All previous issues can also be accessed via the web site.

If you have a particular need for an issue in hard copy form, it may still be satisfied. The .PDF attachment at the end of the ABS web page is a formatted copy of that issue, which may be downloaded to your computer and printed on your own printer.

Thank you for your support of *Statistical Update* and we look forward to keeping you up to date with statistical developments in the ABS. Queries on any issues regarding *Statistical Update* should be directed to <arthur.poulter@abs.gov.au> or phone 07 3222 6084.



Printed ABS Publications Can Now Be Purchased On-line

The ABS 'e-Commerce' facilities have been upgraded to allow clients to order and pay for *printed* publications on-line.

For selected publications, users have an additional option to order printed publications, in addition to the existing download option for electronic products. Users will be able to pay for their orders via the CommWeb banking web site, and the order will be fulfilled by the ABS print contractor.

Most *current* issue publications will be available for purchase on-line. Later on, printed copies of previous editions of some publications will become available on-line. The following types of publication, however, will *not* be made available for purchase in printed form via e-Commerce:

- publications that are provided free of charge on the ABS web site,
- publications produced by the ABS print contractor that are out of stock and
- early issues of publications that have been saved as a .PDF file from a scanned image of the hard-copy publication.

For further information contact Keith Gilligan on 02 6252 6521 or <keith.gilligan@abs.gov.au>.

Regional Small Business Statistics for 2000–01

The experimental small business statistics published in *Experimental Estimates, Regional Small Business Statistics, Australia* (cat. no. 5675.0) are part of an ABS strategy to respond to our clients' need for regional data. Queensland Government clients, may find this data very useful to inform policy decision making which affects regional communities. Economic data may also add an important element to modelling economic behaviour in regional Queensland

Small businesses are defined as those businesses whose total income or expenses were between $10,000 and $5m in the financial year. The data exclude tax-exempt businesses and some government activity. The statistics in this publication cover 76% of all businesses, but only 24% of business income.

Although the data provide information on the economic activity of small business at a regional level, they cannot provide a complete measure of economic activity in a region.

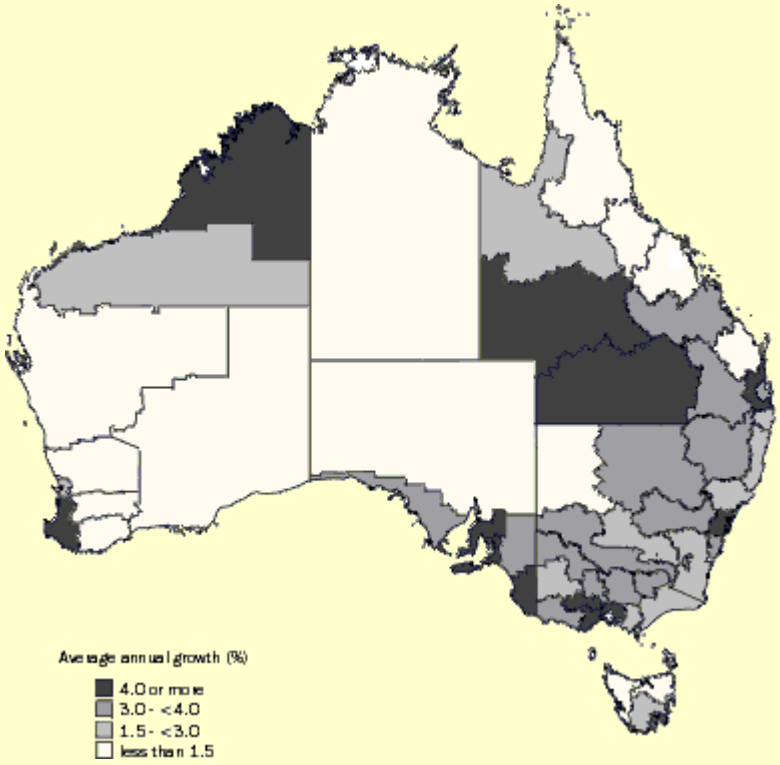
Despite these limitations the data are valuable for several reasons. They offer a viable regional time series and the health of large business is often reflected in that of small business. Further, the performance of small business is generally a good indicator of the prevailing economic conditions in a particular region.

The data have been compiled from confidentialised files provided by the Australian Taxation Office of completed tax returns for companies, partnerships and trusts, and individuals declaring business income.

Some Findings About Queensland

In most statistical divisions, Queensland's small businesses fared well from 1995–96 to 2000–01 with three statistical divisions out of 11 demonstrating average annual income growth of over 4% a year. As the map below shows, Far North, Northern, Mackay and Wide Bay–Burnett SDs had an average annual growth of less than 1.5%.

Experimental Estimates: Average Annual Growth in Total Income of Small Businesses bv Statistical Division. 1995–96 to 2000–01

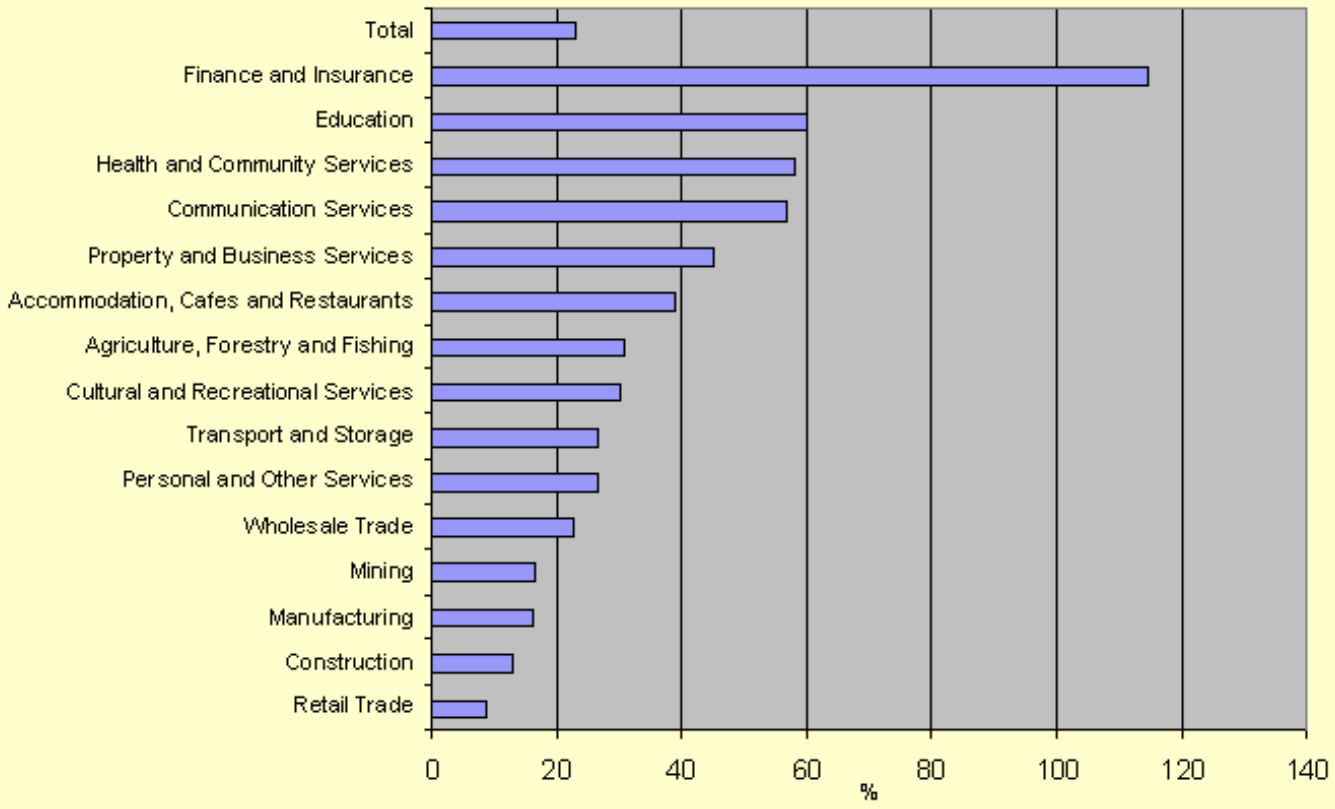


Regional Small Business Statistics for 2000–01 — *continued*

The agricultural industry contributed strongly to income growth in the south-west corner of Queensland. In the South West and Central West SDs, over 55% of small business income was sourced from agriculture, forestry and fishing in 2000–01 and the increase in cattle prices had a substantial effect on the business income in the area in recent years. The average profit of small businesses in the agricultural industry in Central West SD was $72,082 in 2000–01 and $25,387 in the South West SD, both increasing substantially from 1995–96 to 2000–01.

Growth, Income and Expenses, Agriculture, Queensland, 1995–96 to 2000–01

Income Growth by Industry, Moreton Statistical Division, 1995–96 to 2000–01



Regional Small Business Statistics for 2000–01 — *continued*

The other area to demonstrate strong growth in small business was Moreton SD. All industry divisions grew by at least 8% over the period 1995–96 to 2000–01. Small business in the service industries were generally the fastest growing, with Property and business services and Finance and insurance having the largest absolute increases in income.

In the slower growing seaboard SDs, where the Agriculture, forestry and fishing industry represented between 17% and 25% of small business income, depressed sugar prices and poor recent seasons contributed to relatively slow growth. In these SDs the increase in income was generally exceeded by the increase in expenses, contributing to slower growth and reduced profitability from 1995–96 to 2000–01. Average profit to small business in this industry fell by over 70% in Mackay and Northern SDs to $7,626 and $10,285, respectively, in 2000–01.

For further information about these statistics please contact Mark Chalmers on 07 3222 6307 or <mark.chalmers@abs.gov.au>.

The Queensland Coast Attracts Retirees

The ABS released *Census of Population and Housing: Australia in Profile — A Regional Analysis* (cat. no. 2032.0) on 16 January 2004. The analysis used results from the 2001 Census of Population and Housing to describe the major differences in the social and economic characteristics of people living in different parts of Australia. It covers population growth and distribution, cultural diversity, living arrangements, education, employment and unemployment, income and living standards and housing. Each chapter includes a comprehensive indicator table with data for each region covered in the publication. A case study on North West Queensland Statistical Division is also featured which draws together a wide range of census data relating to the population living and working in the area.

Key findings of the report relating to Queensland include:

- Some of the oldest populations in Australia were in Queensland coastal areas popular with retirees. In the Sunshine Coast Statistical Sub-Division (SSD), and Redcliffe City (SSD) almost one in five people were aged 65 years and over, compared with one in eight in Australia as a whole. Both these regions also had high proportions of older couples (14% and 13% of families in these regions were couples where both partners were aged 65 years or more).
- In contrast, younger couples without children made up a higher proportion of families living in inner city areas than in other regions. They made up 20% of all families in the inner city area of Brisbane, the highest level of all the regions examined in the report, and well above the Australian average of 7%. This region also had the highest proportion of rented dwellings in Australia (58%).
- Across Australia, the highest rate of computer use at home was recorded in the Western Inner Brisbane Statistical Region Sector, where six out of ten people used a computer at home in the week prior to the 2001 Census. This region also had the highest rate of Internet use at home in Australia (50%). Both of these facts are consistent with the region having the highest proportion of its population attending a TAFE or university (30%).
- The lowest rates of Internet use at home in Queensland occurred in the remote areas of South West and Central West Queensland (16%).

Some items of interest from the case study on North West Queensland (Chapter 8) include:

- North West Queensland Statistical Division (SD) is one of the most sparsely populated regions of Australia, with a population density of one person per ten square kilometres in 2001. The majority of the population live in Mount Isa (C) (59%, or 21,100 people), followed by Carpentaria (S) and Cloncurry (S) (both 11%). In June 2001, 27% of the population was Indigenous, with 38% of the Indigenous population living in Mt Isa.

The Queensland Coast Attracts Retirees — *continued*

- Although the size of the population of North West Queensland (SD) remained almost constant between 1996 and 2001, the region had a high rate of population turnover. In the 12 months prior to the 2001 census, 4,600 people left the region, while 3,400 people arrived. The majority of people moving to the region were young families with children, who may be attracted by the employment opportunities in the region. In particular, 17% of employed people moving into the region worked in the mining industry, which is centred in Mt. Isa.
- The mining industry is very important to the region's overall economy and social profile. In 2001, 16% of employed people worked in mining, more than any other industry. Because the employment opportunities in mining attract people to the region, the labour force participation rate in the region was 74%. At the same time the unemployment rate was relatively low at 4% for non-Indigenous persons and 14% for the Indigenous population.
- High rates of employment and wages paid in the mining industry contributed to the high median gross weekly household weekly income in the region ($1,007). However, the income for households with at least one Indigenous person were lower than for non-Indigenous households ($759 per week compared with $1,073).
- The movement of young families into the region, along with the high proportion of the population who were Indigenous, contributed to a relatively young age profile. In 2001, the median age of residents was 29 years, compared with 35 years for the total population of Queensland
- About 4% of the population (1,400 people) in the region reported speaking a language other than English at home. Of this group, 13% spoke an Australian Indigenous language at home, 11% spoke Tagalog (Filipino), 8% spoke Italian, and 7% spoke German.

For further information contact Chris Mason on 02 6252 6214 or <chris.mason@abs.gov.au>.

What's Happening in Local Government Finance?

The ABS Local Government Statistics Unit (LGSU) has been developing new forms in conjunction with most state/territory agencies to lessen the burden on councils reporting annual financial data. A full suite of these forms has been developed for use by Grants Commissions or Departments of Local Government in all jurisdictions in gathering financial information for the 2002–03 year.

The LGSU also completed a post enumeration survey of the Local Government Finance Statistics quarterly estimates survey. This involved a series of interviews with councils currently in the survey to look at issues such as the quality of data provided to the ABS and the Electronic Data Reporting process and instrument. A number of recommendations from councils have been implemented and have been incorporated into the form relating to the September quarter 2003 which is currently in the field.

In 2003–04, the LGSU will be conducting a methodological review of this survey. In particular, the ABS will be looking at possible improvements in the way the sample of councils in the survey is selected. Any outcomes from that review will be implemented in the September 2004 quarter. The LGSU made some minor changes to the sample for the September 2003 collection by rotating some councils in/out of the survey.

The LGSU is also looking at the quality of the local government frame and, in particular, at the quality of frames currently being used in the ABS to select councils and other local government units for inclusion in various surveys. This project will be completed by mid 2004. Previously there has been a number of sources within the ABS for making such selections, and the aim of this project is to amalgamate, rationalise and centralise them. This should result in an improvement in data quality and also make for more representative selections of local government units in ABS surveys. In particular, this project will be looking at the treatment of Indigenous councils and public non-financial corporations.

What's Happening in Local Government Finance? — *continued*

The consultation phase of the development of the Local Government Purpose Classification has been completed. The response received from the consultation was excellent, with great interest shown from a range of users within the sector. The ABS has incorporated feedback received into the classification and is currently embarking on a formal internal ABS approval process. It is expected that the classification will be approved and available for use in April 2004.

For further information contact Dean Bloom on 07 3222 6404 or <dean.bloom@abs.gov.au>.

Queensland State Supplementary Survey, 2004

Each year, ABS Queensland calls for submissions from state government agencies on topics for the Queensland State Supplementary Survey. This survey is conducted as a supplement to the Australia-wide monthly population survey using a multistage area sample. Information is obtained from approximately 5,000 private dwellings in urban and rural areas of Queensland. The information collected can relate to individuals in the household, the household itself or dwelling characteristics.

This year six submissions were received, an increase from recent years. These submissions were assessed by the ABS according to their suitability for the methodology of the Queensland State Supplementary Survey and recommendations made to the Queensland State Statistical Consultative Committee for their selection of the preferred topic. The topic selected for the 2004 Queensland State Supplementary Survey was submitted by the Department of Housing. Proposed data items include characteristics of a dwelling, reasons for choosing a dwelling, intention to change dwellings and reasons for changing. The topic will be developed further over the next few months and the survey will go into the field in October. Data are due to be published in April 2005.

For further information contact Robert Boyle on 07 3222 6213 or <robert.boyle@abs.gov.au>.

Children and Youth Statistics

In 2003, the ABS established the National Children and Youth Statistics Unit (NCYSU) in response to the need for a statistical evidence base to support community and government policy relating to children and youth. The objectives of the NCYSU include: maintaining dialogue with key stakeholders about emerging issues, data gaps and needs; developing statistical products relating to children and youth and providing statistical leadership regarding children and youth statistics. The NCYSU is guided by an advisory group comprising ABS and non-ABS representatives.

In November 2003, the NCYSU launched the Children and Youth Theme Page on the ABS web site. The theme page provides information on key ABS data sources, and relevant non-ABS sources. The Theme Page can be accessed through the ABS web site by selecting 'Themes' from the navigator bar, then clicking on 'Children and Youth' under the 'People' sub-heading. The NCYSU newsletter, which is available on the theme page, details recent developments in children and youth statistics.

Some recent and forthcoming releases on children and youth:

- *Census of Population and Housing: Australia's Youth, 2001* (cat. no. 2059.0) (released 5 February 2004)
- *Children's Participation in Culture and Leisure Activities, Australia* (cat. no. 4901.0) (released 30 January 2004)

Other recent and forthcoming publications with data on children and youth:

- *Census of Population and Housing: Australia in Profile — A Regional Analysis* (cat. no. 2032.0) (released 16 January 2004)
- *Indigenous Social Survey* (cat. no. 4714.0) (to be released on 15 April 2004)

For further information contact Carrington Shepherd on 08 9360 5255 or <carrington.shepherd@abs.gov.au>.

STATISTICAL DEVELOPMENTS

Prison Growth Exceeds the Population Growth

On 22 January the ABS released the publication *Prisoners in Australia, 2003* (cat. no. 4517.0).

In the past 10 years, the prisoner population in Australia increased by nearly 50%, from 15,866 on 30 June 1993 to 23,555 on 30 June 2003. This increase has exceeded the 15% growth in the Australian adult population in the same period.

From 1993 to 2003 (at 30 June), the female prisoner population in Australia increased by 110%, compared with a 45% increase in the male prisoner population. Overall, the adult imprisonment rate increased from 119 to 153 prisoners per 100,000 adult population.

In Queensland a total of 5,243 prisoners were in custody on the night of 30 June 2003. Of these, 93% were males; 23% were Indigenous ; and 21% were unsentenced.

The indigenous imprisonment rate in Queensland was 1,698 per 100,000 adult indigenous population while for non-Indigenous persons it was 139 per 100,000 adult non-Indigenous persons.

Over the 1993–2003 period, changes in the Queensland prison population have included:

- The number of prisoners increased from 2,068 to 5,243. (The inclusion of work outreach camps and community custody centres for the first time in 2003 has contributed to the increase in numbers.)
- The mean age of prisoners increased from 30.2 years to 34.2 years;
- The proportion of female prisoners increased from 4% to 7%;
- The proportion of prisoners on remand increased from 13% to 21%;
- The imprisonment rate increased from 88 to 181 per 100,000 adult population;
- The indigenous imprisonment rate increased from 971 to 1,698 per 100,000 adult indigenous population;
- The median aggregate sentence length decreased from 4.2 years to 3.5 years; and
- The proportion of prisoners with known prior adult imprisonment increased from 47% to 66%.

For further information contact Nick Skondreas on 03 9615 7381 or <nick.skondreas@abs.gov.au>.

CENSUS

Census Papers — Helping You Understand the Data

Australian Bureau of Statistics

7 August 2001 census

Nine new working papers in the 2001 Census Papers program have recently been released on the ABS web site. These papers provide background information on data collection and procedural issues, and discuss data quality issues that have potential to affect the interpretation of census results. Topics now available include:

- *2001 Census of Population and Housing: Ancestry — First and Second Generation Australians* focuses on ancestry from the perspective of first and second generation Australians.

- *2001 Census of Population and Housing: Ancestry — Detailed Paper* analyses ancestry data quality in terms of question design, field operations and processing issues. To provide a comparative measure, this paper refers to the 1986 Census results, the only other time ancestry data have been collected.

Census Papers — Helping You Understand the Data — *continued*

- *2001 Census of Population and Housing: Housing* evaluates the quality of 2001 Census data relating to the five major housing variables: number of bedrooms, tenure type, rent/mortgage payment, landlord type and dwelling structure.
- *2001 Census of Population and Housing: Computer and Internet Use* examines the development and processing of the information technology questions in the 2001 Census and discusses the quality of the output produced. Census results are compared with information technology data collected from other ABS sources.
- *2001 Census of Population and Housing: Income* examines the quality of income data from the Census. Changes in question format, collection and processing procedures are analysed, as are non-response rates and intercensal change. Comparisons with other sources of income data provide further measures of data quality.
- *2001 Census: Labour Force Status* examines the quality of labour force data from the 2001 Census, questions used, and how development and processing might have impacted on the data and the effect of non-response and intercensal change. Comparisons with the labour force survey results provide an indication of data quality.
- *2001 Census: Occupation* evaluates occupation data and how various stages in the development and processing of the 2001 Census might have impacted on the data from these questions and compares quality measures with those of the 1996 Census.
- *2001 Census: Level, Main Field and Year of Completion of Highest Non-School Qualification* focuses on the data quality of the Census questions relating to the highest non-school qualifications completed and includes information on the effect of implementation of a new classification system, the Australian Standard Classification of Education.
- *2001 Census: Industry* evaluates the data quality of the Industry questions in the 2001 Census. Topics analysed include: changes made to the Industry questions and the coding procedures between the 1996 and the 2001 Censuses; a comparison with the August 2001 Labour Force Survey; and possible changes for the 2006 Census.

2001 Census Papers, and working papers from previous censuses are available free of charge on the ABS web site <www.abs.gov.au> via the path: Census > (Census Information) Fact Sheets and Census Papers > Census Papers.

For further information contact Kirsty Laughlin on 3222 6111 or <kirsty.laughlin@abs.gov.au>.

Analytical Program Examines Census Data

The Australian Census Analytical Program is producing a series of releases each of which focuses on a different aspect of census data.

The Australian Census Analytical Program is run in conjunction with senior researchers from universities in Australia including RMIT University, Swinburne University, Australian National University and University of Canberra.

Topics covered by the program include Counting the Homeless, Caring Labour in Australia's Community Services, Indigenous Australians in the Contemporary Labour Market, etc.

The first of the series, *Australian Census Analytic Program: Counting the Homeless* (cat. no. 2050.0) was released in November 2003. On census night in 2001 the homeless population in Australia was 99,900, compared with 105,304 homeless people on census night in 1996.

CENSUS

Analytical Program Examines Census Data
— continued

The report found that absolute homelessness, such as sleeping out and improvised shelter, accounted for only 14% of homelessness in Australia. Most homeless people were sheltered somewhere at night, about half staying temporarily with friends, acquaintances and relatives, but as a group homeless people were highly transient.

Australian Census Analytic Program: Australia Online: How Australians are Using Computers and the Internet (cat. no. 2056.0) was released on 12 January 2004. The study found that small country town usage was well below the national average for home computers (32% compared with 42% nationally) and the Internet (25% compared with 37% nationally). In contrast, people living out of town in rural areas (the rural balance), enjoyed higher home computer usage (41%) only marginally less that the national average. Internet usage in these areas was 32%.

The study highlighted the need for access to the Internet in places other than the home or at work. Australians not in the work force, Indigenous Australians, children and those in disadvantaged households often accessed the Internet in 'other' places like public libraries and schools.

Australian Census Analytic Program: Indigenous Australians in the Contemporary Labour Market (cat. no. 2052.0) was released on 20 January 2004. The study found that work undertaken by Indigenous Australians was more likely to be concentrated in the public sector and low skilled occupations. Indigenous Australians remained three times more likely to be unemployed, and less likely to be either working or looking for work than other Australians. The study found that poor education levels was the major cause of the employment differences between Indigenous and other Australians.

Australian Census Analytical Program: The Micro-Dynamics of Change in Australian Agriculture: 1976–2001 (cat. no. 2055.0) was released on 9 February 2004. The purpose of this study was to provide a better understanding of the changes within rural Australia, particularly in the farm sector and the implications for resource management. While rural adjustment trends are well documented in other countries such as Canada and the United Sates, this is not so in Australia. The project explores methods of combining socio-economic data of persons and households from the Population Census with agricultural activity data from farms as collected by the Agricultural Census to help provide some answers.

Other publications yet to be released include:

Australian Census Analytical Program: Caring Labour in Australia's Community Services (cat. no. 2051.0)

Australian Census Analytical Program: Australia's Most Recent Immigrants (cat. no. 2053.0)

Australian Census Analytical Program: Australians' Ancestry: 2001 (cat. no. 2054.0)

For further information contact Michael Beahan on 02 6252 7007 or <michael.beahan@abs.gov.au>.

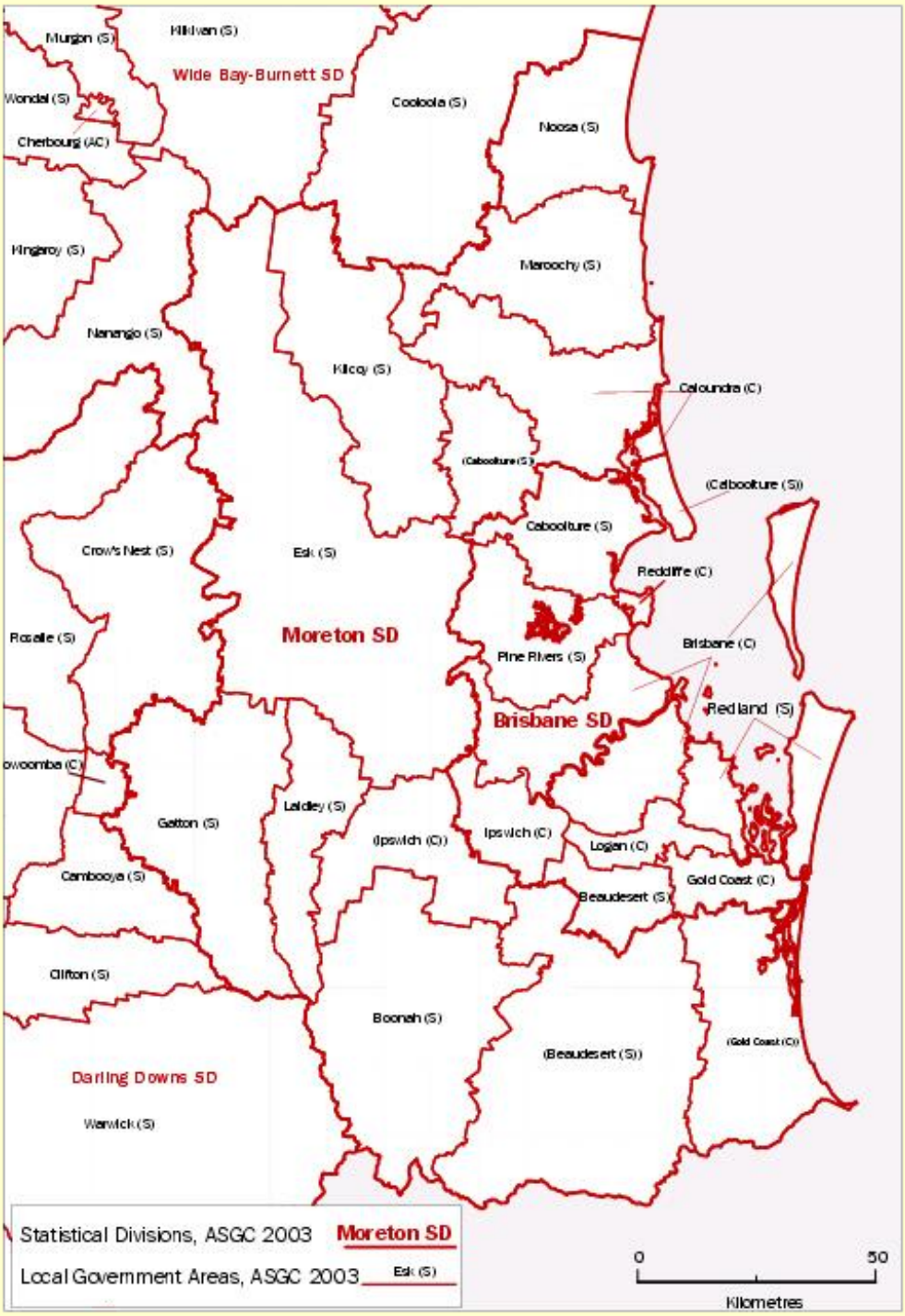
REVIEWS

Outcomes from the Review of Statistical Geography of South East Queensland

After considerable consultation, the ABS has determined a new statistical geography for Statistical Divisions (SDs) for South East Queensland, which is detailed in the maps below. Changes from this review will come into effect with the Australian Standard Geographic Classsification (ASGC) Edition 2006, in time for use in the next census. Map 1 shows the existing geography of South East Queensland..

Outcomes from the Review of Statistical Geography of South East Queensland — *continued*

MAP 1 QUEENSLAND, ASGC 2003 STATISTICAL DIVISIONS



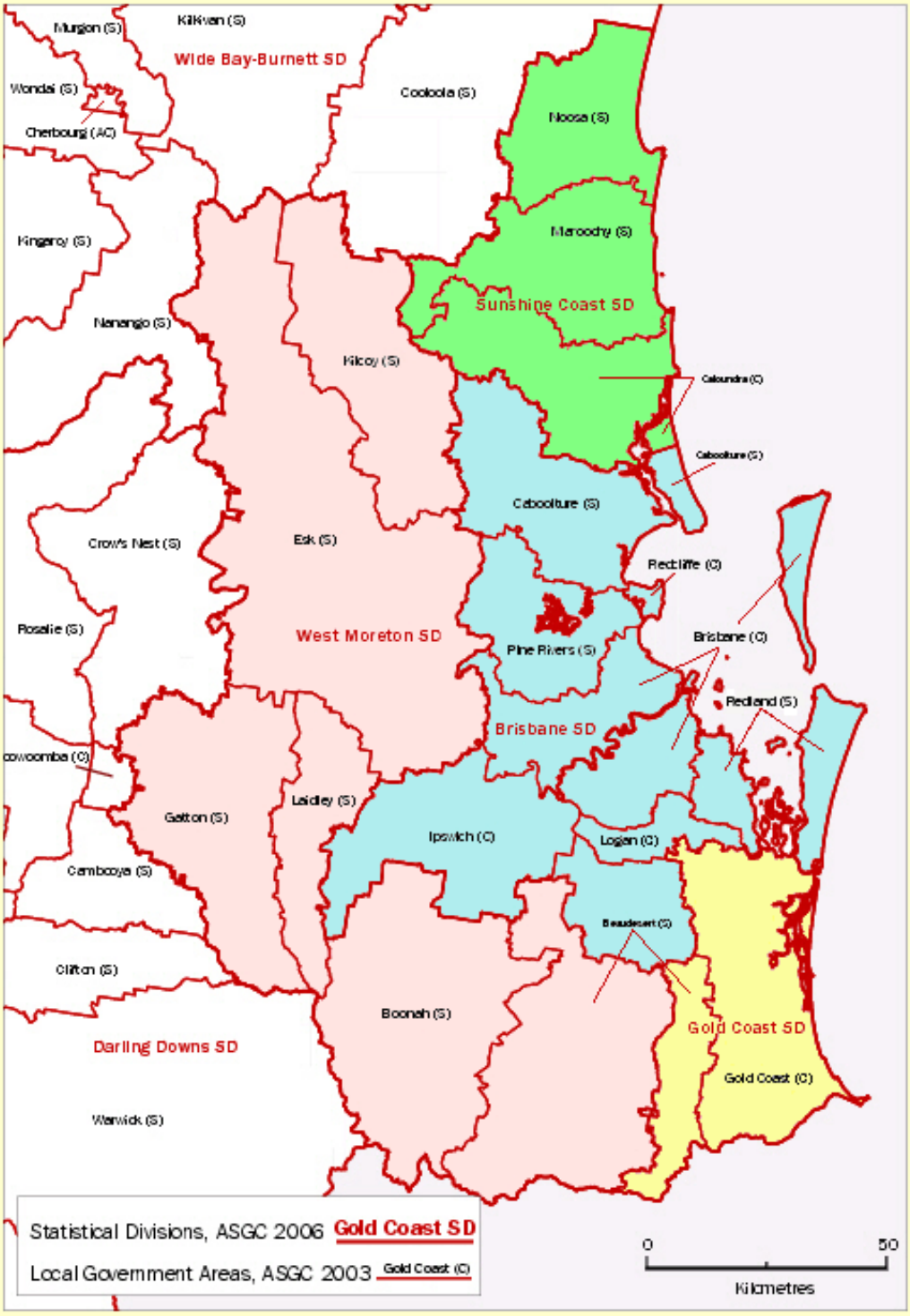
The changes to SDs are described below:

Moreton SD As the population of South East Queensland has grown, particularly in the Gold Coast and Sunshine Coast regions, the areas in the Moreton SD have developed distinct regional identities. A better statistical measurement of these regions can be achieved through the creation of three SDs out of the current Moreton SD, as outlined below:

- *Gold Coast SD* The Local Government Area (LGA) of Gold Coast City and the Tamborine/ Canungra areas of Beaudesert LGA will be combined to create the Gold Coast SD.
- *Sunshine Coast SD* The LGAs of Caloundra, Maroochy and Noosa become the components of the new Sunshine Coast SD.
- *West Moreton SD* The remaining LGAs in Moreton SD, Gatton, Laidley, Boonah, Esk and Kilcoy, become the components of an SD called West Moreton. The rural and mountainous south and south-west of the Beaudesert Shire will also be included in this SD. These areas are relatively homogenous in that they share a commonality in their rural characteristics.

Outcomes from the Review of Statistical Geography of South East Queensland — *continued*

MAP 2 QUEENSLAND, REVIEW OF STATISTICAL GEOGRAPHY—ASGC 2006



Brisbane SD The Brisbane SD should contain the anticipated development of the city for the next 15–20 years. The Brisbane SD will be extended to include the whole of the Caboolture and Ipswich LGAs and the northern urban section of the Beaudesert LGA. There will be some further minor refinement of the SD boundaries which intersect Beaudesert LGA.

The northern sections of the Gold Coast will be excluded from the Brisbane SD and the relevant definitions in the ASGC will be revised to accommodate this change.

No changes were made to Darling Downs SD, Wide Bay–Burnett SD or Fitzroy SD as they are considered to be representative of their regions.

Should you wish to discuss the changes or for further information contact Maria Shpakoff on 07 3222 6321 or <maria.shpakoff@abs.gov.au>.

Chi square test in bivariate analysis. What does it mean?

Chi square (χ^2) (pronounced kai square) is a term that pops up in statistics but just what does it mean and what is a χ^2 test — what does it test?

Chi square tests can be used to determine whether a relationship between variables identified in a sample study (e.g. males and females have different beverage preferences) can be generalised to the population or was due to chance alone.

The χ^2 test is typically based on the assumption that there is no relationship between the two variables in the total population. This is called the null hypothesis.

The test determines whether there is a statistically significant relationship or not within the data by comparing the actual sample results with the set of values that would be expected if there were no relationship between the variables. If a relationship does exist the $\chi 2$ test will enable us to *reject* the null hypothesis.

Consider the following table of beverage preferences of a sample of 50 males and 50 females randomly chosen from the population. (These are the observed or O values.)

	Tea	Coffee	Beer	Wine	Other	Total
Male	4	12	13	6	15	50
Female	12	9	6	12	11	50
Total	16	21	19	18	26	100

For statistical propriety, we first need to determine how certain of our results we need to be. For this analysis an arbitrary probability of error of 5% will do, as not much of consequence would happen if we were wrong in our conclusions in extrapolating the results of the survey to the whole population.

To determine whether there is any relationship evident between beverage preference and sex in the data we need to compare these data with the figures that would have been obtained if there were *no relationship* in the data (the null hypothesis), calculated from the row and column totals.

To do this we take the product of the row and column totals in the table above for each cell and divide by the total for all cells. So for tea drinking males we multiply the top row total (50) by the first column total (16) and divide by 100 to get an E value of 8. Similarly for all other cells. This results in a table like this with 50% of the column total for both males and females in each cell. These are our expected or E values for the null hypothesis.

	Tea	Coffee	Beer	Wine	Other	Total
Male	8	10.5	9.5	9	13	50
Female	8	10.5	9.5	9	13	50
Total	16	21	19	18	26	100

In plain language, the formula for chi squared is : χ^2 = the sum of all the values of $(O–E)^2/E$ where O = observed number and E = expected number.

The values of O–E are:

	Tea	Coffee	Beer	Wine	Other
Male	4 – 8 = – 4	12 – 10.5 = 1.5	13 – 9.5 = 3.5	6 – 9 = – 3	15 – 13 = 2
Female	12 – 8 = 4	9 – 10.5 = – 1.5	6 - 9.5 = –3.5	12 – 9 = 3	11 – 13 = –2

Chi square test in bivariate analysis. What does it mean? — *continued*

Our $(O–E)^2/E$ values are:

	Tea	Coffee	Beer	Wine	Other
Male	16/8 = 2	2.25/10.5 = 0.214	12.25/9.5 = 1.289	9/9 = 1	4/13 = 0.308
Female	16/8 = 2	2.25/10.5 = 0.214	12.25/9.5 = 1.289	9/9 = 1	4/13 = 0.308

Adding all the $(O–E)^2/E$ values gives $\chi^2 = 9.622$. Now the question arises how do we interpret this result? We need to refer to a table of values of the χ^2 distribution. But which row of the χ^2 table do we use to interpret this result? To do this we need to find the number of *degrees of freedom* in our original table. We might think that there are 10 as there are 10 cells in the table (not counting the row and column totals), but this is not the case.

In general, the number of degrees of freedom of a table is the number of rows in the table of observed frequencies minus one, multiplied by the number of columns, minus one, (r–1)(c–1), where neither (r–1) or (c–1) = 0. (In that case it is the number of cells – 1.) Ours is a 5 x 2 table so the number of degrees of freedom it has is 4 x 1 = 4.

This table shows the first five lines of the χ^2 table.

	p value											
df	**0.25**	**0.20**	**0.15**	**0.10**	**0.05**	**0.025**	**0.02**	**0.01**	**0.005**	**0.0025**	**0.001**	**0.0005**
1	1.32	1.64	2.07	2.71	3.84	5.02	5.41	6.63	7.88	9.14	10.83	12.12
2	2.77	3.22	3.79	4.61	5.99	7.38	7.82	9.21	10.60	11.98	13.82	15.20
3	4.11	4.64	5.32	6.25	7.81	9.35	9.84	11.34	12.84	14.32	16.27	17.73
4	5.39	5.59	6.74	7.78	9.49	11.14	11.67	13.23	14..86	16.42	18.47	20.00
5	6.63	7.29	8.12	9.24	11.07	12.83	13.33	15.09	16.75	18.39	20.51	22.11

A check along the df = 4 line to the probability of error 0.05 column shows that the value of χ^2 we obtained (9.622) is larger than the value tabulated for p = 0.05 (9.49), so we can reject the null hypothesis (the idea that there is no evidence of beverage preference attributable to sex) and assume there is some relationship between beverage preference and sex with only a 5% chance of being wrong. This means that only 5% of similar samples of a population in which there was no relationship between sex and beverage preference can be expected to give a value of χ^2 as high as this by chance.

In this case the hypothesis we are testing is that there is no relation between beverage preference and sex (the null hypothesis). We are able to reject that. Note, however that χ^2 cannot prove a hypothesis is correct. Looking at the original data we might conclude that males have a preference for beverages beginning with letters in the first half of the alphabet, but that would not prove any causal relationship!

So what can χ^2 do for you? A χ^2 test can help you sort the chaff from the wheat — it can be used to reject wrong hypotheses but cannot, alas, be used to prove right ones. In fact, two different hypotheses applied to the same data can both give probabilities large enough to prevent their rejection. In that case the test is telling you to collect more data!

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