# **Appendix A** Statistical methods

### Age standardisation

In several situations, crude rates, simple percentages and means have been used to provide descriptive statistics. However, most comparisons have involved age standardisation. For this report, the indirect method of standardisation has been used, where possible, because several of the populations of interest are small and the counts of events or services in these areas are also relatively small. This method involves the following steps:

- calculation of age-specific rates for the standard population (usually the contemporary Major Cities population)
- calculation of the number of events (for example, deaths) expected to occur, if the standard age-specific rates applied to the population in each area
- comparison of the total number of events (for example, deaths) observed in the population of each area to the number expected (that is, the ratio of observed to expected events).

Because the ratio of the observed to expected deaths is exactly the same as the ratio of the 'indirect age-standardised rates' in each area to that in Major Cities, the difference between the mortality in one area and that in Major Cities can be expressed either as:

- one rate is 'so many times as high as another' or
- there are 'so many times more events (for example, deaths or consultations) than expected'.

For example, if 2,000 GP consultations were observed in an area, and 1,000 were expected, then there were 2 times as many consultations as expected, or the adjusted rate of consultation in the area was 2 times that in Major Cities.

### **Confidence intervals**

Because of the influence of chance and natural variation, calculated rates will vary a little from year to year, regardless of whether the rates are based on Census or survey data, although the latter may show greater variability. Where possible, so as to help determine whether calculated rates are meaningfully different from one area to another, confidence intervals have been calculated, and significant differences highlighted.

To simplify the text, two rates, percentages or means that are statistically significantly different at the 95% level of confidence are described simply as 'significantly different'. The words 'significantly' and 'significant' have been used only in this way in this report.

Frequently, differences in the underlying condition of the population are not statistically significant. This can be due to the fact that there is in fact little difference, or because the numbers of cases or observations are so small as to make it difficult to discern any real statistically significant difference.

In tables presented in this report, estimates significantly different from those in Major Cities are accompanied by an asterisk.

In a number of places, estimates that appear to show a difference, but are not significantly different from those in Major Cities, have been included (and identified as not significant) in tables. However, all such non-significant differences should be treated cautiously. These

estimates have been included for completeness and because, taken together, they may point to a pattern or a trend

Confidence intervals for indirect age standardisation rates (ratios of observed to expected events/observations) have been calculated using the two methods described below.

Where confidence intervals overlap, the rates are assumed to be not significantly different, but where they miss each other completely, the differences are considered to be 'significant'.

### Calculation of confidence intervals for census-type (for example, mortality) data

Confidence intervals for death rates were calculated on the basis of the number of observed deaths using the square-root transform described in Breslow and Day (Breslow and Day 1987:70–1). This method has been used where observed and expected cases have been actual counts.

### Calculation of confidence intervals for expanded survey data

This method has been used where the available data are weighted estimates based on survey data (for example, National Health Survey and Survey of Mental Health and Wellbeing of Adults).

The standard error of the estimate for O/E (Kendall & Stuart 1969) is calculated as:

$$SE = \sqrt{[((O/E)2 \times VARe] + VARo)/E2]}$$

where:

O/E = the ratio of the observed to expected number of cases

- The number of synthetic observed rates. The ABS provided weighted estimates of the total number of cases (synthetic numbers), based on the number of cases in the survey and a weighting factor
- E = the number of synthetic expected cases (based on the numbers of synthetic observed cases)
- VARo = the variance for the synthetic total number of observed cases.

The variance is the square of the standard error associated with the observed or expected number, calculated by the ABS and provided with the base data they had provided:

VARe =  $\Sigma(\text{pop}/\text{POP})2 \times (\text{SEe})2$ 

where:

pop = the population in each area in a specific age group

- POP = the standard population in a specific age group
- SEe = the standard error of the expected synthetic number of cases in the area in a specific age group.

The lower 95% confidence limit (L95%CL) = (O/E) - (1.96\*SE).

The upper 95% confidence limit (U95%CL) = (O/E) + (1.96\*SE).

These estimates of the upper and lower confidence limits are approximations, but have been used for simplicity. Confidence limits calculated using Fieller's theorem are identical to these estimates to the third decimal place.

# Appendix B Data sources

# Australian Institute of Health and Welfare (AIHW) National Mortality Database

Description: This database contains information on the cause of death supplied by the medical practitioner certifying the death or by a coroner. Registration of deaths is the responsibility of the state and territory registrars of births, deaths and marriages. Registrars provide the information to the ABS for coding of cause of death and the data are then provided to the AIHW.

Custodian: Australian Institute of Health and Welfare Collection type: Administrative Frequency of collection: Annual Scope/coverage: All Australian registered deaths Rurality indicator: ASGC Indigenous identifier: Yes, but variable quality Issues: Nil

### Australian Bureau of Statistics (ABS) perinatal deaths data

Description: Perinatal deaths data are provided by the state and territory registrars of births, deaths and marriages. The information supplied to the ABS is that contained in medical certificates of cause of perinatal death prepared by the certifying medical practitioner.

Custodian: ABS

Collection type: Administrative

Frequency of collection: Annual

Scope/coverage: All perinatal deaths registered in Australia

Rurality Indicator: ASGC

Indigenous identifier: Yes, but variable quality

Issues: A small number of records in the perinatal deaths data set did not contain details of the mother's age, or the postcode of the mother's address, and so were excluded from certain analysis in this report.

### Child Dental Health Survey (2001)

Description: The Child Dental Health Survey provides yearly information on the dental health of children attending school dental services in Australia.

Custodian: Dental Statistics and Research Unit

Collection type: Survey

Frequency of collection: Annual

Scope/coverage: The data cover 110,834 children from all states and territories except for New South Wales

Rurality indicator: ARIA

Indigenous identifier: Limited

Issues: This collection uses ARIA to report rurality which is not directly comparable with the ASGC. Data for the 6- and 12-year-olds is collected through school dental clinics, and is considered to capture details of most children who attend school (although coverage is higher in some states than others). The need for payments by parents in some states reduces the participation and therefore the representativeness of available data from those states. At present it is not possible to report on Indigenous Australians as information about Indigenous status is collected well in only a few states. Work is proceeding to improve data quality and it is hoped that reporting will be possible in the future (personal communication, Jason Armfield, Dental Statistics and Research Unit).

### National Aboriginal and Torres Strait Islander Survey (2004–05)

Description: This survey provides information about the health circumstances of Indigenous Australians from All remote and non-All remote areas across Australia.

Custodian: Australian Bureau of Statistics

Collection type: Survey

Frequency of collection: Triennial

Scope/coverage: The 2004–05 survey collected information from 10,439 Indigenous Australians in rural and remote regions of Australia.

Rurality indicator: ASGC

Indigenous identifier: Yes

Issues: Occasionally, published information on those people in Remote and Very Remote areas will not be available where sample sizes are too small; in this case data will often be aggregated.

### **National Cancer Statistics Clearing House**

Description: The aim of the NCSCH is to foster the development and dissemination of national cancer statistics for Australia and specifically to:

- enable computation and publication of national statistics on cancer
- allow tracking of interstate movement of cancer cases via record linkage
- facilitate exchange of scientific and technical information between cancer registries and promote standardisation in the collection and classification of cancer data
- facilitate cancer research both nationally and internationally.

The NCSCH receives data from individual state and territory cancer registries on cancer diagnosed in residents of Australia. This commenced with cases first diagnosed in 1982. The data items provided to the NCSCH by the state and territory cancer registries enable record

linkage to be performed and the analysis of cancer by site and behaviour. Custodian: Australian Institute of Health and Welfare Collection type: Administrative, based on notifications Frequency of collection: Ongoing (annual reporting) Scope/coverage: All Australian cancer notifications Rurality indicator: ASGC Indigenous identifier: No Issues: Nil

### National Drug Strategy Household Survey (2001)

Description: The National Drug Strategy Household Survey was conducted between July and October 2001. This was the seventh survey in a series which commenced in 1985, and it was the second to be managed by the Australian Institute of Health and Welfare.

Custodian: Australian Institute of Health and Welfare

Collection type: Survey

Frequency of collection: Triennial

Scope/coverage: Almost 27,000 Australians aged 14 years and older participated in the survey, in which they were asked about their knowledge and attitudes towards drugs, their drug consumption histories, and related behaviours.

Rurality indicator: ASGC (Remote and Very Remote aggregated)

Indigenous identifier: Yes

Issues: Limited coverage of remote areas due to sampling frame

### National Drug Strategy Household Survey (2004)

Description: The 2004 National Drug Strategy Household Survey was conducted between June and November 2004. This was the eighth and largest survey in a series which commenced in 1985, and was the third to be managed by the Australian Institute of Health and Welfare.

Custodian: Australian Institute of Health and Welfare

Collection type: Survey

Frequency of collection: Triennial

Scope/coverage: Almost 30,000 Australians aged 12 years and older participated in the survey, in which they were asked about their knowledge of and attitudes towards drugs, their drug consumption histories, and related behaviours.

Rurality indicator: ASGC (Remote and Very Remote aggregated)

Indigenous identifier: Yes

Issues: Limited coverage of remote areas due to sampling frame.

### National Health Survey (1995)

Description: The 1995 survey aimed to collect information about the health status of Australians, their use of health services and facilities and health-related aspects of their lifestyle.

Custodian: Australian Bureau of Statistics

Collection type: Survey.

Frequency of collection: Triennial.

Scope/coverage: Approximately 54,000 persons in private dwellings. The survey did not sample in sparsely populated areas, so residents of Very Remote areas of Australia were excluded from the survey. It is possible that sampling in All regional areas is biased towards people who live in larger centres.

Rurality indicator: ASGC (Outer Regional and Remote aggregated)

Indigenous identifier: Yes

Issues: Limited coverage of remote areas due to sampling frame.

### National Health Survey (2001)

Description: The 1995 survey aimed to collect information about the health status of Australians, their use of health services and facilities and health-related aspects of their lifestyle.

Custodian: Australian Bureau of Statistics

Collection type: Survey

Frequency of collection: Triennial

Scope/coverage: Approximately 26,900 persons in private dwellings. The survey did not sample in sparsely populated areas, so residents of Very Remote areas of Australia were excluded from the survey. It is possible that sampling in All regional areas is biased towards people who live in larger centres.

Rurality indicator: ASGC (Outer Regional and Remote aggregated)

Indigenous identifier: Yes

Issues: Limited coverage of remote areas due to sampling frame.

### National Health Survey (2004-05)

Description: The 1995 survey aimed to collect information about the health status of Australians, their use of health services and facilities and health-related aspects of their lifestyle.

Custodian: Australian Bureau of Statistics

Collection type: Survey

Frequency of collection: Triennial

Scope/coverage: Approximately 25,900 persons in private dwellings. The survey did not sample in sparsely populated areas, so residents of Very Remote areas of Australia were

excluded from the survey. It is possible that sampling in All regional areas is biased towards people who live in larger centres.

Rurality indicator: ASGC (Outer Regional and Remote aggregated)

Indigenous identifier: Yes

Issues: Limited coverage of remote areas due to sampling frame.

### National Perinatal Data Collection (2002–2004)

Description: The National Perinatal Data Collection (NPDC) is a national population-based cross-sectional data collection of pregnancy and childbirth.

Custodian: National Perinatal Statistics Unit

Collection type: Epidemiological (cross section)

Frequency of collection: Annual

Scope/coverage: The data are based on births reported to the perinatal data collection in each state and territory in Australia. Information is included in the NPDC for all births of at least 400 grams birthweight or at least 20 weeks gestation.

Rurality indicator: ASGC

Indigenous identifier: Yes, maternal Indigenous status only.

### National Survey of Mental Health and Wellbeing of Adults (1997)

Description: The 1997 National Survey of Mental Health and Wellbeing of Adults (SMHW) was conducted from May to August 1997 from a representative sample of persons living in private dwellings in all states and territories of Australia.

Custodian: Australian Bureau of Statistics

Collection type: Survey

Frequency of collection: Every 10 years (due 2007)

Scope/coverage: Approximately 13,600 private dwellings were initially selected in the survey sample. One person aged 18 years or over from each dwelling was subsequently invited to participate. Approximately 10,600 people aged 18 years or over participated in the survey, representing a response rate of 78%.

Rurality indicator: Capital city and rest of state reported in 'Mental Health and Wellbeing: Profile of Adults, Australia, 1997.

Indigenous identifier: No

Issues: This survey has not been repeated since 1997.

### **Population Estimates**

Description: The Australian resident population based on births, deaths and net migration.

Custodian: Australian Bureau of Statistics

Collection type: Administrative

Frequency of collection: Quarterly

Scope/coverage: Total Australian population

Rurality indicator: ASGC and other geographic splits

Indigenous identifier: Yes

Issues: Between Census years these data are projected (estimated) and then revised when the latest Census data are available.

### Survey of Disability, Ageing and Carers (2003)

Description: The primary objective of the survey was to collect information about three population groups:

- people with a disability
- older people (i.e. those aged 60 years and over)
- people who provide assistance to older people and people with disabilities.

Custodian: The Australian Bureau of Statistics

Collection type: Survey

Frequency of collection: Conducted twice (in 1998 and 2003)

Scope/coverage: The survey covered people in both urban and rural areas in all states and territories, except for those living in remote and sparsely settled parts of Australia. The exclusion of these people will have only a minor impact on any aggregate estimates that are produced for individual states and territories, with the exception of the Northern Territory (NT) where they account for over 20% of the population. However, separate estimates have not been produced for the NT.

Rurality indicator: Urban and rural only, not remote

Indigenous identifier: No

Issues: See scope/coverage.

# Appendix C Rural Health Information Framework

Table C1: The Rural Health Information Framework

Ho	How healthy are Australians? Is it the same for everyone? Where is the most opportunity for improvement?	How healthy are Australians? same for everyone? Where is t	lians? ere is the most opportu	nity for improveme	пt?
Health conditions	Human function	Life exp	Life expectancy and wellbeing	Deaths	
Prevalence of disease, disorder, injury or trauma or other health-related states. <i>Chronic diseases, injury, mental health,</i> <i>oral health, communicable diseases and</i> <i>birth outcomes.</i>	Alterations i activities (ac participatior <i>Disability ar</i> <i>activity sick</i>	ʻunction, ction). sual	Broad measures of physical, mental and social wellbeing of individuals and other derived indicators such as disability- adjusted life expectancy (DALE). <i>Life expectancy, disability-adjusted life</i> years, self-assessed health status and self-assessed happiness.		Age- and/or condition-specific mortality rates. Perinatal mortality, age-specific mortality, overall death rates, premature mortality, burden in each area.
		Determinants of health	lith		
Are the factor	Are the factors determining health changing for	changing for the better? Is it the same for everyone? Where and for whom are they changing?	for everyone? Where a	nd for whom are th	iey changing?
Environmental factors	Socioeconomic factors	Community capacity	Health behaviours	iours	Person-related factors
Physical, chemical and biological factors such as air, water, food and soil quality, resulting from chemical pollution and waste disposal. <i>Water, sewerage, food</i> <i>availability, housing, recreational</i> <i>and cultural facilities, the</i> <i>workplace, environmental</i> <i>hazards.</i>	Socioeconomic factors such as education, employment, per capita expenditure on health, and average weekly earnings. <i>Education, employment, after-tax</i> <i>income.</i>	Characteristics of communities and families such as population density, age distribution, health literacy, housing, community support services and transport. <i>Population characteristics, social</i> <i>issues and social capital,</i> <i>services, health literacy,</i> <i>perception of risk, housing,</i> <i>transport, cost of living, regional</i> <i>business health.</i>	7	Attitudes, beliefs knowledge and behaviours, for example, patterns of eating, physical activity, excess alcohol consumption and smoking. Smoking, alcohol consumption, illicit drugs, physical activity, nutrition, sexual practices, driving practices.	Genetic-related susceptibility to disease and other factors such as blood pressure, cholesterol levels and body weight. Genetically determined diseases, specific birth defects, blood pressure, cholesterol and body weight.

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(continued)

Framework
Information
<b>Rural Health</b>
: The
(continued)
Table C1

How well is the health system performing in	Health system performance in delivering quality health actions to improve the health of all Australians? Is it the same for everyone?	all Australians? Is it the same for everyone?
Effective	Appropriate	Efficient
Care, intervention or action achieves desired outcome. Effectiveness of retrieval for victims of trauma, STI education, immunisation, breast cancer and cervical screening and medical/surgical intervention.	Care/intervention/action provided is relevant to the client's needs and based on established standards. <i>Female GPs, surgical procedure, specialist consultations,</i> <i>post surgical care and rehabilitation, aged care,</i> <i>accreditation, waiting times for elective surgery, reasons</i> <i>for visiting a GP.</i>	Achieving desired results with most cost effective use of resources. Cost of providing services in each area, cost of providing services to service people from each area, cost of screening in each area, ratio of expenditure to positive outcomes.
Responsive	Accessible	Safe
Service provides respect for persons and is client orientated and includes respect for dignity, confidentiality, participation in choices, promptness, quality of amenities, access to social support networks, and choice of provider.	Ability of people to obtain health care at the right place and right time irrespective of income, physical location and cultural background. <i>Physical distance to health services, reduced access due</i> to discrimination, lack of access because of cost, ratio of	The avoidance or reduction to acceptable limits of actual or potential harm from health care management or the environment in which health care is delivered. <i>Rate of medical and surgical misadventure, survival rates</i> <i>in intensive care units.</i>
Culturally appropriate, contraentanty, choice of GP, waiting times for elective surgery, response time in hospital emergency departments, bulk billing, waiting times to consult allied health workers and test results, closed books and level of satisfaction of the population.	nearm workers and nearn racintes to population, occasions of service per person per year, times when health services are not available.	
Continuous	Capable	Sustainable
Ability to provide uninterrupted, coordinated care or service across programs, practitioners, organisations and levels over time. <i>Rate of case-care conferencing.</i>	An individual's or service's capacity to provide a health service based on skills and knowledge. Accreditation and rates of admission for surgical medical misadventure (also covered under 'safe' dimension).	System or organisation's capacity to provide infrastructure such as workforce, facilities and equipment, and be innovative and respond to emerging needs (research, monitoring). Health students from rural areas, recruitment and turn over of GPs, hours worked and time on call.

Note: Based on the National Health Performance Framework. Text in italics refers to specific rural, regional and remote issues considered in the Rural Health Information Framework.

Source: AIHW 2003a.

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