2 Statistical context

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| Attachment tables are identified in references throughout this Indigenous Compendium by an ‘A’ prefix (for example, in this chapter, table 2A.1). As the data are directly sourced from the 2014 Report, the Compendium also notes where the original table, figure or text in the 2014 Report can be found. For example, where the Compendium refers to ‘2014 Report, p. 2.1’ this is page 1 of chapter 2 of the 2014 Report, and ‘2014 Report, table 2A.1’ is attachment table 1 of attachment 2A of the 2014 Report. A list of attachment tables referred to in the Compendium is provided at the end of this chapter, and the full attachment tables are available from the Review website at www.pc.gov.au/gsp. |
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The Statistical context chapter (chapter 2) in the *Report on Government Services 2014* (2014 Report) contains contextual information to assist the interpretation of the performance indicators presented in this Report. Data are presented for Indigenous people for some items — those data are compiled and presented here. The Statistical context chapter also contains a discussion of the statistical concept of age standardisation and its application to prisoner population rates, and to death rates, for Indigenous and non‑Indigenous people.

Most of the service areas covered by the Report use estimated resident population (ERP) data from tables 2A.1 and 2A.2 in the 2014 Report for descriptive information (such as expenditure per person in the population) and performance indicators (such as participation rates for school education).

### Indigenous data in the Statistical context chapter

The Statistical context chapter in the 2014 Report contains the following data items for Indigenous people:

* people by country of birth
* people by language spoken at home
* estimated resident Australian Indigenous population, by age and sex
* language spoken at home by Indigenous Australians and proficiency in spoken English, by sex
* families and people in families in occupied private dwellings by Indigenous status and family/household composition
* people aged 15 years or over by weekly individual income and Indigenous status
* highest level of schooling completed by people aged 15 years or over, by Indigenous status (excluding people still attending secondary school)
* type of educational institution attending by Indigenous status
* tertiary education attainment for people aged 18
* type of tertiary education institution attending for people aged 18-24.

### Population

More than three quarters of Australia’s 22.7 million people lived in the eastern mainland states as at 30 June 2012, with NSW, Victoria and Queensland accounting for 32.1 per cent, 24.8 per cent and 20.1 per cent, respectively, of the nation’s population. Western Australia and SA accounted for a further 10.7 per cent and   
7.3 per cent, respectively, while Tasmania, the ACT and the NT accounted for the remaining 2.3 per cent, 1.7 per cent and 1.0 per cent, respectively (2014 Report, table 2A.1). As the majority of Australia’s population lives in the eastern mainland states, these jurisdictions generally have a large influence on national averages.

As in most other developed economies, greater life expectancy and declining fertility have contributed to an ‘ageing’ of Australia’s population. However, the age distribution of Indigenous Australians is markedly different to that of all Australians (figure 2.1). At 30 June 2012, 9.6 per cent of Australia’s population was aged   
70 years or over, compared with just 3.0 per cent of Australia’s Indigenous population, as at 30 June 2011 (table 2A.15 and 2014 Report, table 2A.1). Across jurisdictions, the proportion of all people aged 70 years or over ranged from 11.4 per cent in SA to 3.2 per cent in the NT (table 2A.1).

Figure 2.1 Population distribution, Australia, by age and sex, 30 June**a, b, c**

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| **All people (2012)** | **Indigenous (2011)** |
| Figure 2.1 Population distribution, Australia by age and sex, 30 June - All people 2012.  More details can be found within the text surrounding this image. | Figure 2.1 Population distribution, Australia by age and sex, 30 June - Indigenous 2011.  More details can be found within the text surrounding this image. |

a Includes other territories. b 2012 ERP data are preliminary, based on the *2011 Census of Population and Housing*. Estimates of the Australian Indigenous populations at 30 June 2011 are final based on the   
*2011 Census of Population and Housing*. c 2012 ERP data for Indigenous population were not available for this Report.

*Source*: ABS (2013) *Australian Demographic Statistics, December 2012*, Cat. no. 3101.0; ABS (2013) *Estimates of Aboriginal and Torres Strait Islander Australians, June 2011*, Cat. no. 3238.0.55.001; table AA.15 and 2014 Report, AA.1; 2014 Report, figure 2.1, p. 2.3.

### Population, by ethnicity and proficiency in English

In the NT, 16.3 per cent of people spoke an Australian Indigenous language at home (table 2A.11).

### Indigenous population profile

There were an estimated 669 881 Indigenous Australians (336 198 females and   
333 683 males) in Australia at 30 June 2011, accounting for approximately   
3.0 per cent of the total Australian population in 2011 (table 2A.15 and   
2014 Report, table 2A.1). The proportion of people who identified as Indigenous was significantly higher in the NT (29.8 per cent) than in any other jurisdiction. Across the other jurisdictions, the proportion ranged from 4.7 per cent in Tasmania to 0.9 per cent in Victoria (figure 2.5). Nationally, the Indigenous population is projected to grow to 721 064 people in 2021 (table 2A.16).

The majority of Indigenous Australians (82.8 per cent) at August 2011 spoke only English at home, while a further 9.0 per cent spoke an Indigenous language and also spoke English very well or well. However, 1.8 per cent did not speak English well or at all (up to 12.1 per cent in the NT) (table 2A.19).

Figure 2.2 Indigenous Australians as a proportion of the population,   
30 June 2011**a, b**

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| Figure 2.2 Indigneous Australians as a proportion of the population 30 June 2011.  More details can be found within the text surrounding this image. |

a ‘Australia’ includes other territories. b 2012 ERP data are preliminary, based on the *2011 Census of Population and Housing*. Estimates of the Australian Indigenous populations at 30 June 2011 are final based on the *2011 Census of Population and Housing*.

*Source*: ABS (2012) *Australian Demographic Statistics, June 2012*, Cat. no. 3101.0; ABS (2013) *Estimates of Aboriginal and Torres Strait Islander Australians, June 2011*, Cat. no. 3238.0.55.001; table AA.15 and 2014 Report, AA.1; 2014 Report, figure 2.5, p. 2.7.

### Income

Nationally in August 2011, 25.9 per cent of people aged 15 years or over had a relatively low weekly individual income of $299 or less (2014 Report, table 2A.33). The proportion was around three times higher for younger people (74.8 per cent for people aged 15–19 years) and Indigenous Australians (37.2 per cent), similar for females (30.4 per cent) and lower for older people (20.7 per cent for people aged   
85 years or over) (figure 2.3).

Figure 2.3 Weekly individual income of $299 or less, by sex, Indigenous status and age, 2011a

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| Figure 2.3 Weekly individual income of $299 or less by sex, Indigenous status and age 2011.  More details can be found within the text surrounding this image. |

a ‘Australia’ includes other territories.

*Source*: ABS (2012) *2011 Census of Population and Housing*, *Australia, States and Territories, Basic Community Profile, Table B17 — Total personal income (weekly) by age by sex*, Cat. no. 2001.0, Canberra; ABS (unpublished) *2011 Census of Population and Housing*, *Australia*, Table generated on 3/10/2012 using ABS Table Builder; table AA.36 and 2014 Report, tables AA.33 and AA.39; 2014 Report, figure 2.8, p. 2.11.

**Educational attainment**

Employment outcomes and income are closely linked to the education and skill levels of individuals. Tables 2A.41–48, 2014 Report, 2A.49 and sector overview B Child care, education and training contain reporting on education and skill levels including highest level of school completed and tertiary education attendance and attainment.

### Statistical concepts used in the Report — reliability of estimates

*Variability bands*

Variability bands accompanying mortality data should be used for the purpose of within jurisdiction analysis at a point in time and over time (box 2.1). They should not be used for comparing mortality rates at a single point in time or over time between jurisdictions as the variability bands and mortality rates do not take into account differences in under‑identification of Indigenous deaths between jurisdictions.

Rates derived from administrative data counts are not subject to sampling error but might be subject to natural random variation, especially for small counts.

Typically in this standard method, the observed rate is assumed to have natural variability in the numerator count (for example, deaths, hospital visits) but not in the population denominator count. Variations in Indigenous death rates may arise from uncertainty in the recording of Indigenous status on the death registration forms (in particular, under‑identification of Indigenous deaths) and in the *Census of Population and Housing*, from which population estimates are derived. These variations are not considered in this method. Also, the rate is assumed to have been generated from a normal distribution (2014 Report, figure 2.11). Random variation in the numerator count is assumed to be centred around the true value — that is, there is no systematic bias.

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| Box 2.1 **Technical concepts and formulas — variability bands** |
| **Variability bands**  The variability bands to be calculated using the standard method for estimating  95 per cent confidence intervals are:  *Crude rate (CR)*  (equation 2.9)  Where:  is the numerator of the estimated proportion  *Age‑standardised rate (ASR)*  (equation 2.10)  Where:  is the proportion of the standard population in age group  is the number of deaths in age group  is the number of people in the population in age group .  *Infant mortality rate (IMR)*  (equation 2.11)  Where:  is the number of deaths in infants aged less than 1 year. |
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### Statistical concepts used in the Report — age standardisation of data

#### Rationale for age standardisation of data

The age profile of Australians varies across jurisdictions, periods of time, geographic areas and/or population sub‑groups (for example, between Indigenous and non‑Indigenous populations). Variations in age profiles are important because they can affect the likelihood of using a particular service (such as a public hospital) or particular ‘events’ occurring (such as death, incidence of disease or incarceration). Age standardisation adjusts for the effect of variations in age profiles when comparing service usage, or rates, of particular events across different populations.

*Calculating age standardised rates*

Age standardisation adjusts each of the comparison/study populations (for example, Indigenous and non‑Indigenous) against a standard population (box 2.2).

Prior to the 2011 ERP rebasing cycle, it was generally accepted that the ABS produces a new ‘standard population’ every ten years, with the last standard population being 30 June 2001 and the next population expected to be   
30 June 2011. While following this advice has been accepted practice in Australia in recent years, it is important to note that neither demographic nor epidemiological methodology require the standard population to be updated this frequently. In fact, analysis recently undertaken by a joint ABS‑AIHW working group demonstrated that the frequency of the change in the standard population resulted in negligible difference in the comparison of key indicators over time. The use of age‑standardisation in statistical analysis in Australia, particularly involving health and demographic data, has increased substantially. As more age‑standardised data are used, and as age‑standardised time series become longer, a regular revision to the standard process becomes increasingly more resource‑intensive and onerous.

Therefore, ABS and AIHW are recommending that the standard population be revised every 25 years (that is, 2001, 2026, 2051 etc.) instead of every 10 years, which would reduce the frequency of revisions without reducing the effectiveness of age‑standardised comparisons. This would also align the revision cycle with what demographers generally consider to be the timespan of a generation. The latest standard population used is the final 30 June ERP for the 2001 (AIHW 2013). The result is a standardised estimate for each of the comparison/study populations.

The Review generally reports age‑standardised rates that have been calculated using either one of two methods, as appropriate. The direct method is generally used for comparisons between study groups. The indirect method is recommended when the age‑specific rates for the population being studied are not known (or are unreliable), but the total number of events is known (AIHW 2013).

The *direct* *method* has three steps:

Step 1: Calculate the age‑specific rate for each age group for the study/comparison group.

Step 2: Calculate the expected number of ‘events’ in each age group by multiplying the age‑specific rates by the corresponding standard population.

Step 3: Sum the expected number of cases in each age group and divide by the total of the standard population (box 2.7, equation 2.15).

The *indirect method* has four steps:

Step 1: Calculate the age‑specific rates for each age group in the standard population.

Step 2: Apply the age‑specific rates resulting from step 1 to the number in each age group of the study population and sum to derive the total ‘expected’ number of cases for the study population.

Step 3: Divide the observed number of events in the study population by the ‘expected’ number of cases for the study population derived in step 2.

Step 4: Multiply the result of step 3 by the crude rate in the standard population (box 2.2, equation 2.16).

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| Box 2.2 **Technical concepts and formulas — direct and indirect age standardisation** |
| The formula for deriving the age standardised rate using the direct method is:  (equation 2.15)  The formula for deriving the age standardised rate using the indirect method is:  (equation 2.16)  The formula for deriving the age standardised ratio using the indirect method is:  (equation 2.17)  Where:  is the age‑standardised rate for the population being studied  is the standardised ratio for the population being studied  is the age‑group specific rate for age group ***i*** in the population being studied  is the population of age group ***i*** in the standard population  is the observed number of events in the population being studied  is the expected number of events in the population being studied  is the age‑group specific rate for age group ***i*** in the standard population  is the population for age group ***i*** in the population being studied  is the crude rate in the standard population. |
| *Source*: AIHW (2013). |
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Tables 2A.54 and 2A.55 in the attachment contain examples of the application of direct and indirect age standardisation, respectively. Standardised rates are generally multiplied by 1000 or 100 000 to avoid small decimal fractions. They are then reported as age standardised rates per 1000 or 100 000 population (AIHW 2013).

Figure 2.4 compares crude imprisonment rates and imprisonment rates standardised against the age profile of the total Australian prisoner population for Indigenous and non‑Indigenous Australians.

Figure 2.4 Indigenous and non‑Indigenous crude and age standardised imprisonment rates, 2007‑08a, b

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| **Indigenous**  **Figure 2.4 Indigenous and non-Indigenous crude and age standardised imprisonment rates 2007-08 - Indigenous.  More details can be found within the text surrounding this image.  Non‑Indigenous**  Figure 2.4 Indigenous and non-Indigenous crude and age standardised imprisonment rates 2007-8 - Non - Indigenous.  More details can be found within the text surrounding this image. |

a For detailed notes relating to these figures, please see the *Report on Government Services 2009*,   
table 8A.4. **b** Rates are based on the indirect standardisation method, applying age‑group imprisonment rates derived from Prison Census data.

*Source*: ABS (unpublished) *Australian Demographic Statistics, December 2007*, Cat. no. 3101.0;   
ABS (unpublished) *Experimental Projections Aboriginal and Torres Strait Islander Population*, Cat. no. 3231.0; ABS (unpublished) *Prisoners in Australia*, Cat. no. 4517.0; State and Territory governments (unpublished); SCRGSP (2009) *Report on Government Services 2009*, table 8A.4; table 2A.55; 2014 Report, figure A.13,   
p. A.33.

*Calculating age standardised ratios*

A variation of the *indirect method* is used to calculate age standardised ratios   
(2014 Report, box 2.6). These ratios express the overall experience of a study population in terms of a standard population, where the standard population is the population to which the study population is being compared.

*Application of age standardised ratios*

Standardised Mortality Ratios (SMRs) have been used to compare death rates between the Indigenous and non‑Indigenous populations (table 2.1). The SMR is the ratio between the observed number of deaths in the Indigenous population and the expected number of deaths that would have occurred if the Indigenous population experienced the same age‑specific death rates as the non‑Indigenous population. Where the number of observed deaths is higher than the number of expected deaths, the SMR is greater than 1 and the difference in deaths is the excess number of deaths of Indigenous people (AIHW 2011a).

*New developments in age standardisation techniques*

The ABS and the AIHW have recently worked on improving age‑standardisation techniques.

*Principles on the use of direct age‑standardisation in administrative data collections: for measuring the gap between Indigenous and non‑Indigenous Australians* (AIHW 2011b) recommends that the direct method of age‑standardisation be used for purposes of comparing health and welfare outcome measures (for example, mortality rates, life expectancy, hospital separation rates and disease incidence rates) of the Indigenous population and non‑Indigenous population. The principles provide consistency and guidance on when and how to use the direct age‑standardisation method and under what circumstances it should not be used.

Table 2.1 Indigenous deaths, main causes and standardised mortality ratios, 2004–2008a, b, c

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|  | Male | | |  | Female | | |
|  | Observed deaths | Expected deaths | SMR |  | Observed deaths | Expected deaths | SMR |
| Diseases of the circulatory system | 321 | 107 | 3.0 |  | 260 | 148 | 1.8 |
| Neoplasms | 200 | 120 | 1.7 |  | 191 | 150 | 1.3 |
| External causes | 225 | 61 | 3.7 |  | 98 | 64 | 1.5 |
| Endocrine, metabolic and nutritional disorders | 86 | 12 | 7.2 |  | 96 | 15 | 6.4 |
| Diseases of the respiratory system | 94 | 24 | 3.9 |  | 96 | 33 | 2.3 |
| Diseases of the digestive system | 70 | 11 | 6.4 |  | 76 | 14 | 4.2 |
| Diseases of the nervous system | 33 | 13 | 2.5 |  | 59 | 16 | 1.3 |
| Conditions originating in the perinatal period | 31 | 14 | 2.2 |  | 21 | 14 | 1.6 |
| Certain infectious and parasitic diseases | 27 | 6 | 4.5 |  | 22 | 7 | 3.1 |
| **All causes** | **1 211** | **397** | **3.1** |  | **957** | **497** | **1.9** |

SMR = Standardised Mortality Ratio. a Data for Queensland, WA, SA and the NT combined. b Observed and expected deaths are reported as average number of annual deaths from 2004–2008. Excepted deaths are based on non‑Indigenous death rates. c Standardised mortality ratio is the observed Indigenous deaths divided by expected Indigenous deaths, based on the age, sex and cause‑specific rates for non‑Indigenous Australians.

*Source*: AIHW (2011) *Life expectancy and mortality of Aboriginal and Torres Strait Islander people*, Cat. no. AIHW 51, Canberra; 2014 Report, table 2.6, p. A.35.

### List of attachment tables

Attachment tables for data within this chapter are contained in the attachment to the Compendium. These tables are identified in references throughout this chapter by a ‘2A’ prefix (for example, table 2A.1 is table 1 in the Statistical context attachment). Attachment tables are on the Review website (www.pc.gov.au/gsp).

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| **Table 2A.55** | Age standardisation of data using the indirect method |

### References

AIHW (Australian Institute of Health and Welfare) 2011a, *Life expectancy and mortality of Aboriginal and Torres Strait Islander people*, Cat. no. IHW 51, Canberra.

—— 2011b, *Principles on the use of direct age‑standardisation in administrative* data collections: for measuring the gap between Indigenous and non‑Indigenous Australians, Cat. no. CSI 12, Canberra.

—— 2013, Age‑standardised rate, METeOR, meteor.aihw.gov.au/  
content/index.phtml/itemId/327276 (accessed 27 August 2013).