Technical supplement

Introduction

This is the *Second Australian Atlas of Healthcare Variation* in a series providing statistics at a local level identifying variation across Australia for a number of health items. Statistics in the Atlas are presented in the form of maps, graphs and tables. This technical supplement provides information on the methodology used for data extraction, and analysis for presentation in the maps and graphs. Activity rates are presented by local areas using the Australian Bureau of Statistics (ABS) Statistical Area Level 3 (SA3) geography, as well as at state and territory, and national levels.

The Australian Commission on Safety and Quality in Health Care (the Commission) and the Australian Institute of Health and Welfare (AIHW) developed the specifications for each indicator. These can be found on the AIHW Metadata Online Registry (METeOR) at www.meteor.aihw.gov.au/content/index.phtml/itemId/660066.

The specifications include details such as the data source, the relevant population, inclusions and exclusions, the numerator and denominator, computation, disaggregation and data suppression rules. Unless otherwise stated, indicators relate to all ages.

The specifications for the potentially preventable hospitalisations and maternity indicators are based on the nationally agreed specifications:

- National Healthcare Agreement: PI 18 – selected potentially preventable hospitalisations, 2017 (www.meteor.aihw.gov.au/content/index.phtml/itemId/630028)
- National Core Maternity Indicators: PI 06 – caesarean section for selected women giving birth for the first time, 2016 (www.meteor.aihw.gov.au/content/index.phtml/itemId/613184)
- National Core Maternity Indicators: PI 13(b) – third and fourth degree tears for all vaginal births, 2016 (www.meteor.aihw.gov.au/content/index.phtml/itemId/613194).

Technical supplement

Individual specifications based on the national specifications have been created for the purpose of this report to allow reporting at the SA3 level of analysis of individual indicators.

It is noted that states and territories may code conditions differently – for example, for infective and inflammatory conditions in urinary tract infections. This should be taken into account during interpretation and comparison across jurisdictions.

Two data sources were used in the Atlas:

- National Hospital Morbidity Database (NHMD)
- National Perinatal Data Collection (NPDC).

The AIHW conducted the data extraction and analysis, and presentation of the data in maps and graphs. Analyses in this report have not been adjusted to account for the under-identification of Aboriginal and Torres Strait Islander Australians in any of the data sources used. Data by Aboriginal and Torres Strait Islander status should be interpreted with caution because hospitalisations for Aboriginal and Torres Strait Islander patients are under-enumerated, and there is variation in the under-enumeration among states and territories.

1. National Hospital Morbidity Database

Data for most of the indicators in the Atlas were sourced from the NHMD. Most NHMD data used in this report are for 2014–15. For each reference year, the NHMD includes episodes for admitted patients discharged (separated) between 1 July and 30 June.

For indicators where the annual number of hospitalisations is too low or unreliable to report at a local level, three financial years of data (2012–13, 2013–14 and 2014–15) are combined. In this case, rates are based on the number of hospitalisations for three years and the summed population for three years. This method differs from the calculation of an average annual rate, although the results from both methods will generally be the same, or very similar, particularly for areas with low proportional population change between years.

The NHMD is a comprehensive dataset that has records for all episodes of admitted patient care from almost all hospitals in Australia. This includes all public and private acute and psychiatric hospitals, freestanding day hospital facilities, and alcohol and drug treatment centres. Hospitals operated by the Australian Defence Force and corrections authorities, and hospitals in Australia's offshore territories are not in scope but may be included. The data elements (variables) included in the NHMD are based on the Admitted Patient Care National Minimum Data Set (APC NMDS). More information on the 2014–15 APC NMDS can be found on METeOR (www.meteor.aihw.gov.au/content/index.phtml/itemId/535047).

For indicators that have been aggregated over three years, information on the years 2012–13 and 2013–14 can also be found on METeOR (www.meteor.aihw.gov.au/content/index.phtml/itemId/466132 and www.meteor.aihw.gov.au/content/index.phtml/itemId/491555). There are no known issues with the data contained in this report however ACT is undergoing a system-wide review of ACT Health data and reporting that will be finalised 31 March 2018.

A summary of key data quality issues related to the 2014–15 NHMD is available at www.meteor.aihw.gov.au/content/index.phtml/itemId/638202. Data quality issues related to the NHMD for 2012–13 and 2013–14 are available at www.meteor.aihw.gov.au/content/index.phtml/itemId/568730 and www.meteor.aihw.gov.au/content/index.phtml/itemId/611030.

Data are collected at each hospital from patient administrative and clinical record systems, and forwarded to the relevant state or territory health authorities. The data are provided to the AIHW for national collation annually.

The counting unit for the NHMD is a 'separation'. Separation refers to an episode of admitted patient care, which can be a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay, beginning or ending in a change of type of care (for example, from acute care to rehabilitation). In this report, separations are referred to as 'hospitalisations'.

Because a record is included for each hospitalisation, rather than for each patient, patients hospitalised more than once in the financial year have more than one record in the NHMD.

The NHMD does not include non-admitted patient care provided in outpatient clinics or emergency departments. If patients in these settings are admitted to hospital subsequently, the care provided to them as admitted patients is included in the NHMD.

Hospitalisation records for which the overall nature of care was *Newborn care with unqualified days only*, *Posthumous organ procurement* or *Hospital boarder* were excluded from the analysis. Records with unknown or invalid age or sex were also excluded from the analysis if any age or sex was required for standardisation.

Hospitalisation records for which the place of usual residence of the patient was unknown, invalid, no fixed address, at sea or overseas were included in the total for Australia only, because these records could not be allocated to an SA3, or state or territory.

In 2011–12, it was estimated that 88% of Aboriginal and Torres Strait Islander patients were correctly identified in public hospital admission records. The levels of weighted completeness (and 95% confidence intervals) of Aboriginal and Torres Strait Islander identification for public hospitals in 2011–12 were 80% (76–83%) in New South Wales, 78% (71–84%) in Victoria, 87% (84–91%) in Queensland, 96% (92–98%) in Western Australia, 91% (85–95%) in South Australia, 64% (53–74%) in Tasmania, 58% (46–69%) in the Australian Capital Territory and 98% (96–99%) in the Northern Territory. It is unknown to what extent Aboriginal and Torres Strait Islander Australians might be under-identified in private hospital admission records.

There were wide variations in Aboriginal and Torres Strait Islander identification by remoteness, ranging from 77% (72–81%) in major cities to 99% (96–100%) in very remote areas. For more information, see Indigenous identification in hospital separations data: quality report at www.aihw.gov.au/publication-detail/?id=60129543215.

Components of NHMD analysis

Diagnoses and procedures

Hospital diagnosis and procedure data used in this report were reported to the NHMD by states and territories using the eighth edition of the *International Statistical Classification of Diseases and Related Health Problems*, *Tenth Revision*, *Australian Modification* (ICD-10-AM), incorporating the Australian Classification of Health Interventions, for 2013–14 and 2014–15. For 2012–13, the seventh edition was used.

The comparability of the coded diagnosis and procedure data can be affected by variations in the quality of the coding, and by state-specific coding standards. Further information on the quality and comparability of the coded data at a state and territory level can be found in *Australian Hospital Statistics 2012–13* and *Admitted Patient Care: Australian Hospital Statistics* for 2013–14 and 2014–15, available at www.aihw.gov.au/publication-detail/?id=60129546922, www.aihw.gov.au/publication-detail/?id=60129550483 and www.aihw.gov.au/publication-detail/?id=60129554702.

Aboriginal and Torres Strait Islander status

For indicators based on NHMD data, hospitalisations for Aboriginal and Torres Strait Islander Australians are compared with hospitalisations for other Australians. Other Australians comprise people who were reported as not of Aboriginal and/or Torres Strait Islander origin, and people for whom information on Aboriginal and Torres Strait Islander status was not reported.

Patient funding status

NHMD data in this report are presented separately for hospitalisations relating to the funding status of the patient. This reflects the funding arrangements for the patient's hospitalisation, rather than the sector of the hospital to which they were admitted.

Hospitalisations were categorised into funding status of patients – public or private – using the APC NMDS variable *Source of funding*. For further details, see www.meteor.aihw.gov.au/content/index.phtml/itemId/553314.

Technical supplement

In some cases, the *Patient election status* (www.meteor.aihw.gov.au/content/index.phtml/itemId/326619) or *Hospital sector* (www.meteor.aihw.gov.au/content/index.phtml/itemId/269977) variables were also used. This is the approach used for reporting national hospital data by patient funding status. Hospitalisations for publicly funded patients comprise those for whom the patient funding source was:

- Health service budget (due to eligibility under a Reciprocal Health Care Agreement)
- Health service budget (no charge raised as a result of hospital decision) AND in public hospitals
- Health service budget (not covered elsewhere)
- Other hospital or public authority (contracted care) AND a patient election status of *Public* (regardless of hospital sector).

Hospitalisations for privately funded patients comprise those for whom the patient funding source was:

- Health service budget (no charge raised as a result of hospital decision) AND in private hospitals
- Other hospital or public authority (contracted care) AND a patient election status of *Private* (or not reported)
- Department of Veterans' Affairs
- Department of Defence
- Correctional facility
- Private health insurance
- Workers compensation
- Motor vehicle third-party personal claim
- Other compensation (for example, public liability, common law, medical negligence)
- Self-funding
- Other funding source
- Not known.

Transfers

People admitted to hospital are sometimes transferred to other hospitals for care. For two indicators – acute myocardial infarction and atrial fibrillation – a best estimate was used of occurrence of an event for which hospitalised care for the conditions was provided, rather than an estimate of the number of separate hospitalisation episodes if each episode following a transfer was counted. This was calculated by excluding hospitalisations starting with a transfer from another hospital, so that only the first hospitalisation was counted. Further information is available at www.meteor.aihw.gov.au/content/index.phtml/itemId/269976. Results from this method may differ slightly from calculations that exclude hospitalisations ending in a transfer. Further information is available at www.meteor.aihw.gov.au/content/index.phtml/itemId/270094.

2. National Perinatal Data Collection

The NPDC includes data about births in Australia, including births in hospitals, birth centres and the community. All live births and stillbirths of at least 20 weeks gestation or at least 400 grams birth weight are in scope of the collection, except in Western Australia, where births are included if gestational age is at least 20 weeks, or if gestation age is unknown and birth weight is at least 400 grams. The data are based on births reported to the perinatal data collection in each state and territory in Australia. Midwives and other birth attendants, using information obtained from mothers and from hospital or other records, complete notification forms for each birth. A standard de-identified extract is provided to the AIHW annually to form the NPDC. The data elements in the NPDC include the Perinatal National Minimum Data Set (Perinatal NMDS) and additional data elements. More information on the Perinatal NMDS for 2012–13, 2013–14 and 2014–15 can be found on METeOR, at www.meteor.aihw.gov.au/content/index.phtml/itemId/461787, www.meteor.aihw.gov.au/content/index.phtml/itemId/489433 and www.meteor.aihw.gov.au/content/index.phtml/itemId/517456.

Additional data elements are at different stages in the process of standardisation. Some have had national data standards but have not yet been implemented in the Perinatal NMDS. Others do not have common definitions for collecting the data, or data are not available for all jurisdictions.

Data quality issues related to the NPDC for 2012, 2013 and 2014 are also available at www.meteor.aihw.gov.au/content/index.phtml/itemId/597483, www.meteor.aihw.gov.au/content/index.phtml/itemId/624809 and www.meteor.aihw.gov.au/content/index.phtml/itemId/657522. There are no known issues with the data contained in this report however ACT is undergoing a system-wide review of ACT Health data and reporting that will be finalised 31 March 2018.

NPDC data in this report relate to births that occurred in the calendar years 2012, 2013 and 2014. For the two maternity indicators, the annual number of events is low at the SA3 level, and three years of data are combined. Rates are based on the number of events for three years and the number of births for three years. This method differs from the calculation of an average annual rate, although the results from both methods will generally be the same, or very similar, particularly for areas with low proportional birth change between years.

Data from the NPDC are presented by place of usual residence of the mother. Data by state and territory, and SA3 exclude Australian non-residents, residents of external territories, and records where either state or territory, or SA3 of usual residence was not stated. However, these records are included in the total for Australia. This may differ from data produced from the NPDC for other purposes, which may require the exclusion of these records from the Australian total.

The standard presentation of the perinatal indicators produced from the NPDC is number per 100, rather than number per 1,000, as used in this report. This should be taken into account if comparing perinatal data between different sources and reports.

All states and territories have a data item to record Aboriginal and Torres Strait Islander status of the mother on their perinatal form, although there are some differences among the states and territories. In 2014, information on Aboriginal and Torres Strait Islander status was provided for nearly all mothers (99.8%) who gave birth; however, no formal assessment of the quality of Aboriginal and Torres Strait Islander identification in NPDC data has been undertaken. For more information, see *Australia's Mothers and Babies 2014 – in brief*; www.aihw.gov.au/publication-detail/?id=60129557656.

Components of NPDC analysis

Aboriginal and Torres Strait Islander status

For indicators based on NPDC data, data for Aboriginal and Torres Strait Islander women are compared with data for non-Indigenous women. Non-Indigenous women comprises women who were reported as not of Aboriginal and/or Torres Strait Islander origin. Women for whom information on Aboriginal and Torres Strait Islander status was not reported were excluded from the analysis by Aboriginal and Torres Strait Islander status.

Patient funding status

For NPDC data, patient funding status was determined using the additional data element *Admitted patient elected accommodation status*. Public patients are those for whom the admitted patient's (mother's) elected accommodation status was *Public*. Private patients are those for whom the admitted patient's elected accommodation status was *Private*. Women who gave birth at home or in birth centres attached to hospitals are not included in the analysis of patient funding status. The exception was where the Northern Territory home birth services were provided by the hospital and the mother was an admitted patient. The number of these records is small and is included in the analysis by the admitted patient elected accommodation status.

Technical supplement

3. Analysis methods

Populations

Most indicators use an estimated resident population in the denominator, with the exception of the indicators for *Caesarean section* and *Third- and fourth-degree perineal tears*, where the denominators are births from the NPDC.

Where available, populations were based on the estimated resident population from the ABS at the start of the reporting period, based on data from the 2011 Census of Population and Housing. For example, for the reporting period 2014–15, the estimated resident population at 30 June 2014 was used. For indicators where three financial years of data (2012–13, 2013–14 and 2014–15) were used, the population was the sum of the estimated resident population at 30 June 2012, 30 June 2013 and 30 June 2014.

The population of Aboriginal and Torres Strait Islander Australians was based on the projected Aboriginal and Torres Strait Islander population (Series B: www.ausstats.abs.gov.au/Ausstats/subscriber.nsf/0/AEE5C09DB715A1BBCA257CC900143F80/$File/aboriginal%20and%20torres%20strait%20islander%20population%20projections%20fact%20sheet.pdf). The population of other Australians was based on the estimated resident population.

Derived populations

For the knee replacement and lumbar spinal surgery indicators with an age range of 18 years and over, separate male and female estimates of Aboriginal and Torres Strait Islander Australians aged 18 and 19 years were not published by the ABS. They were derived as follows:

- Sex ratios of Aboriginal and Torres Strait Islander Australians were calculated for people aged 18 and 19 years separately, and for each state and territory, based on 2011 Census counts of Aboriginal and Torres Strait Islander males and females aged 18 and 19 years, in each state and territory
- The sex ratios were applied to the total of Aboriginal and Torres Strait Islander Australians aged 18 and 19 years in each state and territory, to calculate Aboriginal and Torres Strait Islander males and females by single year of age in each state and territory
- The corresponding population of other Australians was calculated by deducting the estimate of Aboriginal and Torres Strait Islander Australians from the estimated resident population.

For the acute myocardial infarction indicator, population data for Aboriginal and Torres Strait Islander Australians aged 35–84 years for each state and territory were sourced from the Australian Government Department of Health, because the highest age group for publicly available ABS data was 65 years and over for Tasmania and the Australian Capital Territory. These data were commissioned by the Department of Health for analyses that require detailed breakdowns of Aboriginal and Torres Strait Islander data. The data were based on the population information available from the ABS 2011 Census of Population and Housing, and the ABS estimated resident population for later years. More information is available from Public Health Information Development Unit of Torrens University Australia at www.phidu.torrens.edu.au/help-and-information/indigenous-estimates.

The population of other Australians was calculated by deducting the number of Aboriginal and Torres Strait Islander Australians from the estimated resident population published by the ABS.

Age and sex standardisation

This report presents age- and sex-standardised rates. Age and sex standardisation is a technique used to remove the influence of age and sex when comparing populations with different age and sex structures. For this report, the Australian estimated resident population at 30 June 2001 was used as the standard population. Some indicators used specific age ranges or were only relevant to women. In these cases, only the relevant age and sex groups were included in age- and sex-standardisation

calculations. Standardised rates based on different age groups and/or standard populations are not directly comparable.

The age group of 65 years and over was the highest used in standardisation for Aboriginal and Torres Strait Islander status analysis, and 85 years and over was the highest age group used for all other analyses. This did not apply to the acute myocardial infarction indicator and two maternity indicators, which used specific age ranges under 85 years.

For the maternity indicators, records with no stated age were the only records excluded from age standardisation. For third- and fourth-degree perineal tears, a small number of vaginal births to females aged under 15 years and over 44 years were included in the lowest age group (15–19 years) and the highest age group (35–44 years), respectively. The standard population was restricted to females aged 15–44 years. This was to avoid skewing of the age-standardised rates as a result of a small number of such records.

The general age standardisation formula for populations is available at: www.meteor.aihw.gov.au/content/index.phtml/itemId/327276.

Geography levels

This report presents data based on the ABS Australian Statistical Geography Standard (ASGS edition 2011) SA3 geography (www.meteor.aihw.gov.au/content/index.phtml/itemId/455824). There are 333 SA3s covering Australia without gaps or overlaps. SA3s generally have a population of between 30,000 and 130,000 people, and are built up on whole SA2s (www.meteor.aihw.gov.au/content/index.phtml/itemId/659774). These areas were grouped by state or territory, remoteness and socioeconomic status to assist comparisons. For further information, see www.abs.gov.au/geography.

Allocation to an SA3 was based on the patient's usual place of residence, rather than the place where they received the service. The geographical data that were used to allocate a record to an SA3 level varied depending on the data source (see Table 1).

The accuracy of the information on geography (SA2 or other) could vary across and within states and territories, depending on the methods of allocation used by the hospital and the level of detail captured on the patient's address at the service level.

Table 1: Geographical data used to allocate an SA3

Data source	Data on geographical location
NHMD	Statistical Area Level 2* (SA2) was used. If SA2 was not available, SA2 was derived. Except New South Wales, all states and territories provided SA2 for most records. If SA2 was not available, the following geographic units were used to map to SA2: • For New South Wales, Statistical Local Area† (SLA) was used. For 2014–15, postcode was used if an SLA could not be mapped on an SA2. Postcode was not used for 2012–13 and 2013–14 • For Victoria, SLA was used • For South Australia, postcode was used • For the Northern Territory, postcode was used.
NPDC	SA2 was used. If SA2 was not available, SLA was used. SA2 was provided by all states and territories except the Australian Capital Territory (for 2012, 2013 and 2014) and the Northern Territory (2012 only). For both territories, SLA was used for the years specified above.

* www.meteor.aihw.gov.au/content/index.phtml/itemId/457289
† This is the geographic area defined in the ABS Australian Standard Geographical Classification edition 2011 (the classification used before the ASGS).

Technical supplement

For the NHMD, when SLA or postcode was used, an appropriate ABS correspondence files were used to identify the corresponding SA2. The SA2 was then mapped to SA3, with a one-to-one relationship. In some cases, a geographic unit overlapped SA2 boundaries. Where this occurred, records for that geographic unit were randomly allocated to the SA2s, according to the proportion of the unit (postcode or SLA) population in the SA2s. This is standard practice for the NHMD. Because of the random nature of the allocation, the SA2 data for individual records might not be accurate and reliable; however, the overall distribution of records by SA2 is considered useful.

For the NPDC, when SLA was used, an ABS correspondence file was used to directly correspond SLA to SA3. In some cases, an SLA overlapped SA3 boundaries. Where this occurred, records that overlapped boundaries were proportionately distributed across the SA3s, according to the proportion of the SLA population in the SA3s. This is standard practice for the NPDC.

Remoteness and socioeconomic analysis

SA3s were grouped into remoteness categories and socioeconomic quintiles based on the ABS 2011 ASGS and the ABS 2011 Socio-Economic Indexes for Areas (SEIFA), respectively. For more information on SEIFA, see www.meteor.aihw.gov.au/content/index.phtml/itemId/517903. This method of grouping was applied to the data sources used in this report to assign the provided or derived SA3s to remoteness and socioeconomic groups. Because of the method used, national data by remoteness and socioeconomic status presented here may differ slightly from equivalent data calculated using the geographic unit (postcode, SLA or SA2) recorded on the individual records. However, it is expected that the overall patterns would be similar.

The ABS 2011 ASGS has five remoteness categories, which divide Australia into broad geographic regions that share common characteristics of remoteness for statistical purposes. These categories divide each state and territory into several regions based on their relative access to services.

The following remoteness categories are used:

- Major cities
- Inner regional
- Outer regional
- Remote
- Very remote.

The ABS publishes a remoteness category for each SA1 (see www.meteor.aihw.gov.au/content/index.phtml/itemId/457287). The proportion of the population in each remoteness category was calculated for each SA3 using the following ABS correspondence files: SA1 to remoteness area (see ASGS *Volume 5 – Remoteness Structure*, 2011), SA1 to SA2 and SA2 to SA3 (see ASGS *Volume 1 – Main Structure and Greater Capital City Statistical Areas*, 2011). The remoteness category with the highest proportion of population was allocated to the SA3.

The SEIFA Index of Relative Socio-Economic Disadvantage (IRSD) was used for socioeconomic analysis. SEIFA IRSD is a product developed by the ABS (see *Census of Population and Housing: Socio-Economic Indexes for Areas (SEIFA), Australia, 2011*, www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/2033.0.55.001Main+Features12011?OpenDocument) that ranks areas in Australia according to relative socioeconomic disadvantage. The index is based on information collected in the 2011 Census on different aspects of disadvantage, such as low income, low educational attainment and high unemployment. A low score indicates a high proportion of relatively disadvantaged people in an area. For example, an area could have a high proportion of people without educational qualifications or working in low-skill occupations. In contrast, a high score indicates a low proportion of relatively disadvantaged people in an area. It is important to note that the index reflects the overall socioeconomic position of the population in an area, and that the socioeconomic position of individuals in that area may vary.

The ABS publishes an index value for each SA1. The SA1s are then ranked according to their level of disadvantage (index value) and grouped into five equal categories (quintiles), with the lowest category reflecting the lowest 20% of areas with the greatest overall level of disadvantage. For each SA3, the number of SA1s in each quintile was calculated, and the quintile with the largest number of SA1s was selected as the quintile for that SA3.

Combining remoteness and SEIFA

When remoteness categories and socioeconomic quintiles are combined, there are 25 possible combinations that SA3s can be assigned to. Some categories and quintiles were combined to ensure that each of the final 14 combinations contained at least six SA3s for comparison purposes (Table 2).

In this report, the SA3s in the combined *Remote* and *Very remote* areas are labelled 'remote'. The SA3s with the most overall disadvantage are labelled 'low SES (1)', and the SA3s with the least overall disadvantage are labelled 'high SES (5)'.

Where socioeconomic quintiles are combined (for example, quintiles 4 and 5), the SA3s with the least overall disadvantage are labelled 'higher SES' (for example, 4+).

Suppression protocol

Rates based on low numbers of events and/or very small populations are more susceptible to random fluctuations and therefore may not provide a reliable representation of activity in that area. For this reason, results for some areas were suppressed (Table 3).

Data from suppressed SA3s were included in analyses for larger geographic areas – for example, analysis by state and territory, remoteness and socioeconomic status. This explains why, for example, the overall rate for lumbar spinal fusion in the Northern Territory was outside the range of the publishable SA3 rates for the Northern Territory (see Figure 4.21 and 4.22). Only two Northern Territory SA3 rates were publishable, and these rates were the same.

Table 2: Number* of SA3s by combined ASGS remoteness categories and SEIFA IRSD quintiles

ASGS remoteness	Quintiles of SEIFA IRSD				
	1 (Low)	2	3	4	5 (High)
Major cities	30	27	33	37	61
Inner regional	31	20	18	9	
Outer regional	23	16	9		
Remote and Very remote	10	7			

* Numbers are not in proper columns where socioeconomic quintiles were combined. Two SA3s (Blue Mountains – South and Illawarra Catchment Reserve) were not included because the population in these areas was too small for them to be assigned a socioeconomic quintile.

Table 3: Rules for suppression of standardised rate for an area

Data source	Numerator	Denominator	Denominator for age- and sex-specific groups
NHMD	• Fewer than 20 (single year of data), or • Fewer than 10 (three years of data)	Fewer than 1,000	Fewer than 30
NPDC	Fewer than 5	Fewer than 100	Fewer than 10

Technical supplement

As most of the data were age and sex standardised, several SA3s in the Northern Territory were consistently suppressed because the population in one or more age and sex groups used for standardisation was fewer than 30. As a result of this, the Northern Territory requested that consideration be given to relaxing this suppression rule. To do this, the AIHW undertook some sensitivity analysis to investigate the volatility of the rates of the affected SA3s (Box 1). For consistency, this sensitivity analysis was conducted for all data at the SA3 level – that is, not just results from Northern Territory SA3s.

Standardised rates were suppressed for volatility, and publishable rates (including those published with caution) were presented in the report as whole numbers.

Box 1: Summary of sensitivity analysis

For each indicator and each SA3 that was suppressed as a result of a low (below-threshold) denominator for one or more age- and sex- specific groups (affected SA3), the following analysis was undertaken:

1. The numerator was increased by 1 in each of the groups with a low denominator to generate a simulated rate.
2. All rates, including the simulated rates, were rounded to whole numbers.
3. All publishable SA3 rates for non-affected SA3s and the simulated rates for affected SA3s were ranked from lowest to highest and split into 10 categories (deciles).
4. All publishable SA3 rates for non-affected SA3s and the actual rates for affected SA3s were ranked from lowest to highest and split into deciles.
5. The allocated decile of the simulated rate (step 3) was compared with the allocated decile of the actual rate (step 4).

To achieve maximum differences between the simulated and actual rates, rates were simulated by increasing, rather than decreasing, the relevant numerators by 1. This was because some numerators could be zero and could not be decreased to become negatives. All affected SA3s were included in the simulation simultaneously, to generate maximum differences between the deciles calculated using the simulated rates and the deciles calculated with the actual rates (the most extreme scenario). This was a conservative approach compared with simulation conducted for one affected SA3 at a time.

The volatility of the actual rate for an affected SA3 was not considered to have a material impact on its decile if either of the following conditions was met:

1. There was no difference in the decile allocated for the simulated and actual rate. For example, both simulated and actual rates were in the lowest decile.
2. There was a difference of one decile, and the simulated rate was not on the cusp of the next decile. For example, the actual rate was in the lowest decile and the simulated rate was in the second decile, and not on the cusp of the third decile.

Where the decile for an affected SA3 was considered to be robust against the volatility of the rate, the rate has been published with caution. This is because the rate is considered potentially more volatile than other published SA3 rates. The rates published with caution are not included in the calculation of the total magnitude of variation, and are represented in the report with an asterisk (tables), cross (graphs) and hatching (maps).

Presentation of data in Australia and capital city area maps

Rounded rates for SA3s were ranked from lowest to highest and then split into 10 categories (deciles). The deciles are displayed using various shades of colour, where darker colours represent higher rates and lighter colours represent lower rates. Each decile may not have the same number of SA3s if there was more than one SA3 with the same rate at the boundary of a decile. Where this occurred, SA3s with the same rate were assigned to the same decile.

Identification of highest and lowest rate areas

SA3s with the highest and lowest rates have been identified for each indicator. Having regard to the overall distribution of the rates, selection of SA3s was made from the histogram column by column, with the aim of identifying at least the 10 highest and lowest rate areas for SA3s. The selection of SA3s was also dependent on the width of the column in the histogram, and the choice of what width to use was somewhat arbitrary. For some indicators, fewer than 10 SA3s are listed. This is because inclusion of the next column of the histogram would have resulted in a list of SA3s too long for publication.