About the Atlas

Who has developed the Atlas?

The Australian Commission on Safety and Quality in Health Care (the Commission), in collaboration with the Australian Institute of Health and Welfare (AIHW), has led the development of the fourth Atlas. Development has involved broad consultation with:

- The Australian Government Department of Health
- State and territory health departments and agencies
- Professional colleges and specialist societies
- Clinicians
- Healthcare organisations.

An oversight and advisory structure, including a state and territory advisory group (Jurisdictional Advisory Group) and a Primary Care Expert Advisory Group, has ensured wide-ranging input into the development of the fourth Atlas. For each chapter, a Topic Expert Group of lead clinicians and academic experts from across Australia was established. The Topic Expert Groups provided advice at key stages of development, including the interpretation of the Atlas findings. Members of the advisory groups were required to sign a confidentiality agreement and declare conflicts of interest before release of the preliminary data. The AIHW conducted the data extraction and analysis, produced the maps, graphs and tables, and provided expertise in interpreting the data.

How was it developed?

The Atlas examines a selection of procedures, investigations, treatments and hospitalisations in a range of clinical areas. A large number of clinical items were nominated and considered for inclusion, but many were not suitable because of poor data quality or small numbers, which limited the capacity to analyse and present the data. The final selection of clinical items reflects the following criteria:

- High levels of current or projected use
- Significant current or projected disease burden
- Significant potential for harm
- High use of health system resources
- Interest in the topic and clinical engagement to support review and action
- Availability of suitable data
- Important to monitor changes over time and compare with previous Atlas reports

The clinical items that met these criteria were reviewed by the Jurisdictional Advisory Group, the Primary Care Expert Advisory Group, and the Commission's executive. Following confirmation of clinical items for analysis, Topic Expert Groups were established around specific clinical themes. The Topic Expert Groups were consulted on prioritisation of the clinical items for analysis and on development of the data specifications, where possible. Following analysis of the data for each clinical item, the Jurisdictional Advisory Group, the Primary Care Expert Advisory Group and the Topic Expert Groups reviewed the results.

The expert groups also provided content for, and reviewed, the clinical commentaries. Their suggestions and the Commission's reviews of the literature were used as the basis for commentary on the possible reasons for healthcare variation and strategies for addressing variation. The clinical commentaries were also reviewed by:

- AIHW
- Medicine use experts
- The National Aboriginal and Torres Strait Islander Health Standing Committee
- Relevant clinical colleges.

More than 150 clinicians, researchers, policy experts and consumer representative organisations have examined and provided input on the clinical commentaries and data visualisations.

What does the Atlas measure?

The data in the Atlas show the rates for featured procedures, investigations, treatments or hospitalisations in each geographic area. To calculate rates, the number of interventions that occurred in an area is divided by the population of that area. Rates are age and sex standardised. Rates are based on the patient's place of usual residence and not the location of the hospital, clinic or pharmacy where the service was provided.

Why are the data age standardised and sex standardised?

The data in the Atlas have been age standardised (that is, controlled for age) so that fair comparisons can be made between areas that have different age structures. Without age standardisation, it would be difficult to know whether higher rates of an intervention in an area with a large number of retirees, for example, were due only to the older age of the local population. The data are also sex standardised, so that having a larger proportion of males or females in an area does not influence the findings. The early planned births (caesarean or induction) indicators are not age standardised because of small numbers.

Age standardisation involves calculating the rate in each area as if the area had a standard proportion of older and younger people. Sex standardisation involves calculating the rate in each area as if the area had a standard proportion of males and females. The resulting age- and sex-standardised rates can then be compared for all areas, knowing that differences in age and sex structure of the population have been accounted for.

About the Atlas

Magnitude of variation

The magnitude of variation (or 'times difference') shows how large the difference is between the lowest and highest rates of each intervention, and is expressed as a ratio of the highest to the lowest rates. For example, if the lowest rate was 10 per 100,000 people and the highest rate was 20 per 100,000 people, the magnitude of variation is two-fold.

Australian rate

Rates for an intervention may appear higher or lower than the Australian rate; in most cases, the most appropriate rate is difficult to define and not necessarily the Australian rate. Depending on the intervention, a higher or lower rate may be clinically appropriate. It is difficult to conclude what proportion of the variation is unwarranted or to comment on the relative performance of health services and clinicians in one area compared with another. An Australian rate is provided to encourage investigation into the reasons for any variation seen at local, regional, or state and territory levels.

About the data

The Atlas provides information on clinical items grouped into six clinical themes, covering procedures, investigations, treatments or hospitalisations.

The introduction to each chapter provides an overview of the clinical items; international comparisons, where possible; national and state or territory initiatives to improve care; and key findings and recommendations. Specific data limitations are also outlined. Clinical commentary is presented alongside each item, outlining the context, magnitude of variation, and possible reasons for the variation.

The fourth Atlas uses data sourced from four national health datasets:

- Medicare Benefits Schedule (MBS)
- National Hospital Morbidity Database (NHMD)
- National Perinatal Data Collection (NPDC)
- Pharmaceutical Benefits Scheme (PBS).

The years of data shown for each clinical item depend on the source and the most recently available data:

- MBS items are analysed for services provided in 2018–19
- NHMD items are analysed for hospitalisations in
  - 2014–15 to 2017–18 for potentially preventable hospitalisations
  - 2012–13 to 2014–15 and 2015–16 to 2017–18 for lumbar spinal surgery items, which are analysed for three combined years because of small numbers
  - 2012–13, 2015–16 and 2017–18 for ear, nose and throat surgery items
- The NPDC item is analysed for early planned births (caesarean or induction) in 2017
- PBS items are analysed for prescriptions dispensed in 2018–19.

Data were rerun for selected hospitalisation indicators from previous Atlases to allow robust comparison of rates over time through time-series analyses. Due to changes in data specifications and updates to NHMD datasets, some fourth Atlas results may differ from those reported in previous Atlases.

For MBS and PBS items, the Medicare enrolment postcode is used as a proxy for the patient residence because it corresponds to most people's usual residence. For NHMD items, the rates are determined by the person's usual place of residence as recorded at the time of hospital admission. For the NPDC item, the rates are based on the mother's place of residence.

The Atlas presents age- and sex-standardised rates per 100,000 people for all items, except for the NPDC items, which are presented as a percentage. NPDC data are not standardised, as a result of small numbers.

Rates are age and sex standardised to the Australian population using the Australian Bureau of Statistics (ABS) Estimated Resident Populations (ERPs). The standard population is ERP at 30 June 2001. The denominator population estimates are based on ERPs, and are either at 30 June or 31 December, depending on data sources.

Population estimates as at 31 December in the relevant year were used as the denominator for indicators based on NHMD data for 2012–13 to 2017–18. For example, population estimates as at 31 December 2017 were used for 2017–18. Population estimates as at 31 December were calculated as the average of the 30 June population estimates before and after the relevant December.

Where three years of data were combined, the denominator was the sum of the population estimates as at 31 December for each year.

Population estimates as at 30 June 2018 were used as the denominator for indicators based on MBS and PBS data for 2018–19.

The geographic local areas used are ABS standard geographical regions known as the Statistical Areas Level 3 (SA3). SA3s provide a standardised regional breakdown to assist in analysing data at the local level. SA3s generally have populations between 30,000 and 130,000 people. To enable comparisons, local areas are also grouped by Primary Health Network, state and territory, and by remoteness and socioeconomic status.

Primary Health Networks connect health services across a specific geographic area so that patients, particularly those needing coordinated care, have access to a range of services.

Remoteness is calculated according to the ABS Australian Statistical Geography Standard (ASGS) 2016 using Statistical Area Level 1 (SA1) to remoteness concordance. SA1 population was concorded to SA3, and the remoteness category with the highest percentage of SA3 population was allocated to the SA3. The remote and very remote categories were combined into one, giving a total of four remoteness categories (Major Cities, Inner Regional, Outer Regional, Remote).

The socioeconomic quintiles are based on the ABS 2016 Index of Relative Socio-Economic Disadvantage at the SA1 level. The quintile with the highest number of SA1s was allocated to the SA3. Some quintiles were combined within a remoteness category to ensure sufficient numbers of SA3s for comparison purposes.

Defined daily dose (DDD) is a measurement unit of assumed average maintenance dose per day for a medicine used for its main indication in adults, created by the World Health Organization. The DDD does not necessarily correspond to the recommended or average prescribed daily dose.

Use of DDDs allows comparisons of medicine dispensing independent of price, preparation and quantity per prescription. Expressing medicine dispensing in DDDs per thousand people per day (DDDs/1,000/day) allows the aggregation of data for medicines that have different daily doses.

The data specifications for each item can be accessed on the AIHW Metadata Online Registry (METeOR) at meteor.aihw.gov.au

Data limitations

The clinical items describe variation in health service provision. It is not currently possible to conclude what proportion of the variation is unwarranted, or to comment on the relative performance of health services and clinicians in one area compared with another. The data are provided to encourage and promote further analysis and discussion about variation at local, regional, and state and territory levels.

About the Atlas

Some data have been suppressed for the following reasons:

- To protect confidentiality of a patient – for example, when the number of prescriptions and the population are very small; this could potentially lead to identifying a patient
- To protect confidentiality of a service provider or a business entity in the MBS data – for example, when the services are predominantly provided by one or two providers
- To account for low numbers of events or very small populations – these rates are more susceptible to random fluctuations
- To preserve confidentiality – data suppressed in isolation may be calculable from the presented totals unless accompanied by other data suppressions to prevent back-calculation.

Suppressed SA3 data are included for larger area analysis.

Data for Aboriginal and Torres Strait Islander people

Data according to Aboriginal and Torres Strait Islander status have been provided for NHMD and NPDC items only. Analysis was not undertaken by Aboriginal and Torres Strait Islander status for the MBS and PBS data because this information is not available.

Analyses in this report have not been adjusted to account for the under-identification of Aboriginal and Torres Strait Islander people in NHMD and NPDC datasets. 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.

Maps and graphs

Data for each of the items in the Atlas are displayed as maps and graphs to show variation in rates by geographic location of patient residence.

On the maps, age- and sex-standardised rates in each of the geographic areas are ranked from lowest to highest and then split into 10 categories (deciles). These are displayed with colour gradients, where darker colours represent higher rates and lighter colours represent lower rates. Separate maps show the greater capital city areas in more detail.

Standard figures are provided for NHMD, MBS and PBS items where data are available. Each figure presents a different analysis:

- Numbers and rates by local area, listing the areas with the lowest and highest rates
- Numbers and rates by state and territory
- Rates by remoteness and socioeconomic status
- Times difference and rates by local area across years (time series analysis), where applicable

NHMD items have two more standard figures where data are available:

- Rates by state and territory, by Aboriginal and Torres Strait Islander status
- Percentages and rates by state and territory, by patient funding status.

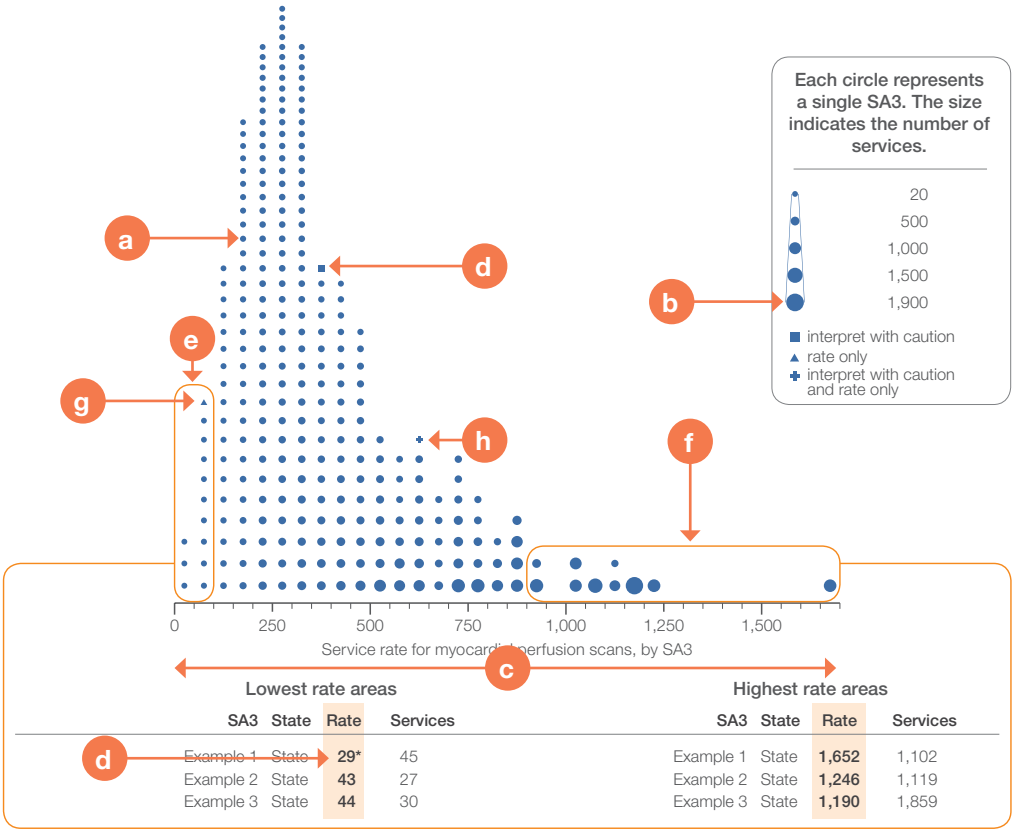
Standard figures for NPDC items are percentages by state and territory where data are available. Each figure presents a different analysis.

Further information on interpreting the figures for the print version of the fourth Atlas is provided on pages 33–36.

Additional figures are available for the online interactive Atlas at safetyandquality.gov.au/atlas

How to interpret our data visualisations

Histogram



a **What does the circle represent?**
Each circle represents an SA3. SA3s are geographical areas defined by the ABS that provide a standardised regional breakdown of Australia. SA3s generally have populations between 30,000 and 130,000 people.

b **Circle size**
The size of a circle indicates the number of events in that SA3. A large circle represents an SA3 with a greater number of events than SA3s with a smaller circle. Each histogram is accompanied by a legend to indicate scale.

c **Horizontal axis**
The horizontal axis shows the age- and sex-standardised rate. Rates are age and sex standardised to allow comparisons between populations with different age and sex structures.

d **Squares and asterisks**
Squares and asterisks indicate rates that are considered more volatile and should be interpreted with caution.

e **Lowest rates**
SA3s in the box are SA3s with the lowest age- and sex-standardised rates in Australia. The names, rates and numbers of events for these SA3s are listed in the table below the histogram.

f **Highest rates**
SA3s in the box are SA3s with the highest age- and sex-standardised rates in Australia. The names, rates and numbers of events for these SA3s are listed in the table below the histogram.

g **What does a triangle represent?**
Each triangle represents an SA3 where only the rate is published. The number of events is not published for confidentiality reasons.

h **What does a cross represent?**
Each cross represents an SA3 where the rate should be interpreted with caution, and the number of events is not published for confidentiality reasons.

About the Atlas

How to interpret our data visualisations

State and territory graphic

a **Squares and asterisks**
Squares and asterisks indicate rates that are considered more volatile and should be interpreted with caution.

b **Vertical axis**
The vertical axis shows the age- and sex-standardised rate. Rates are age and sex standardised to allow comparisons between populations with different age and sex structures.

c **What does the circle represent?**
Each circle represents an SA3. SA3s are geographical areas defined by the ABS that provide a standardised regional breakdown of Australia. SA3s generally have populations between 30,000 and 130,000 people.

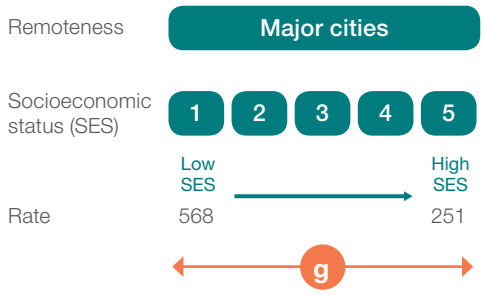
d **Australian rate line**
This line indicates the age- and sex-standardised rate for Australia.

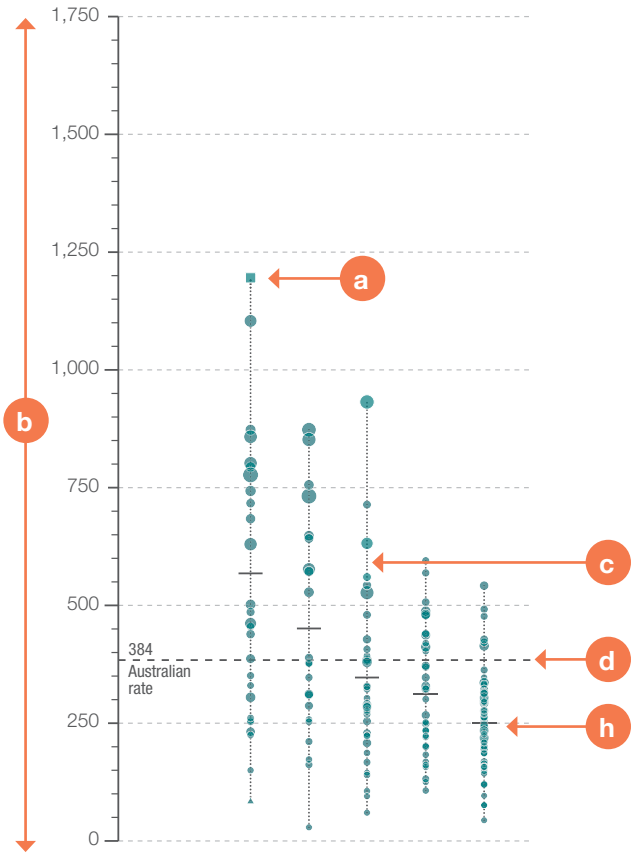
e **Circle size**
The size of a circle indicates the number of events in that SA3. A large circle represents an SA3 with a greater number of events than SA3s with a smaller circle. Each graphic is accompanied by a legend to indicate scale.

f **State and Territory rates**
This line indicates the age- and sex-standardised rate for a state or territory.

How to interpret our data visualisations

Remoteness and socioeconomic status graphic





g **Remoteness and socioeconomic status**
Each SA3 is assigned a remoteness category and a socioeconomic status (SES) category, using remoteness and SES defined by the ABS. The lowest SES category has the most overall disadvantage, and the highest SES category has the least overall disadvantage. Some SES categories are combined in remoteness categories, except in major cities, to ensure sufficient numbers of SA3s for comparison. In this example, the remoteness and SES rate is higher with greater socioeconomic disadvantage.

h **Remoteness and SES**
This line indicates the age- and sex-standardised rate for a combination of remoteness and SES.

About the Atlas

How to interpret our data visualisations

Rates across years line graph

a **Vertical axis**
The vertical axis shows the age- and sex-standardised rate. Rates are age and sex standardised to allow comparisons between populations with different age and sex structures.

b **Australian rate**
The Australian age- and sex-standardised rate.

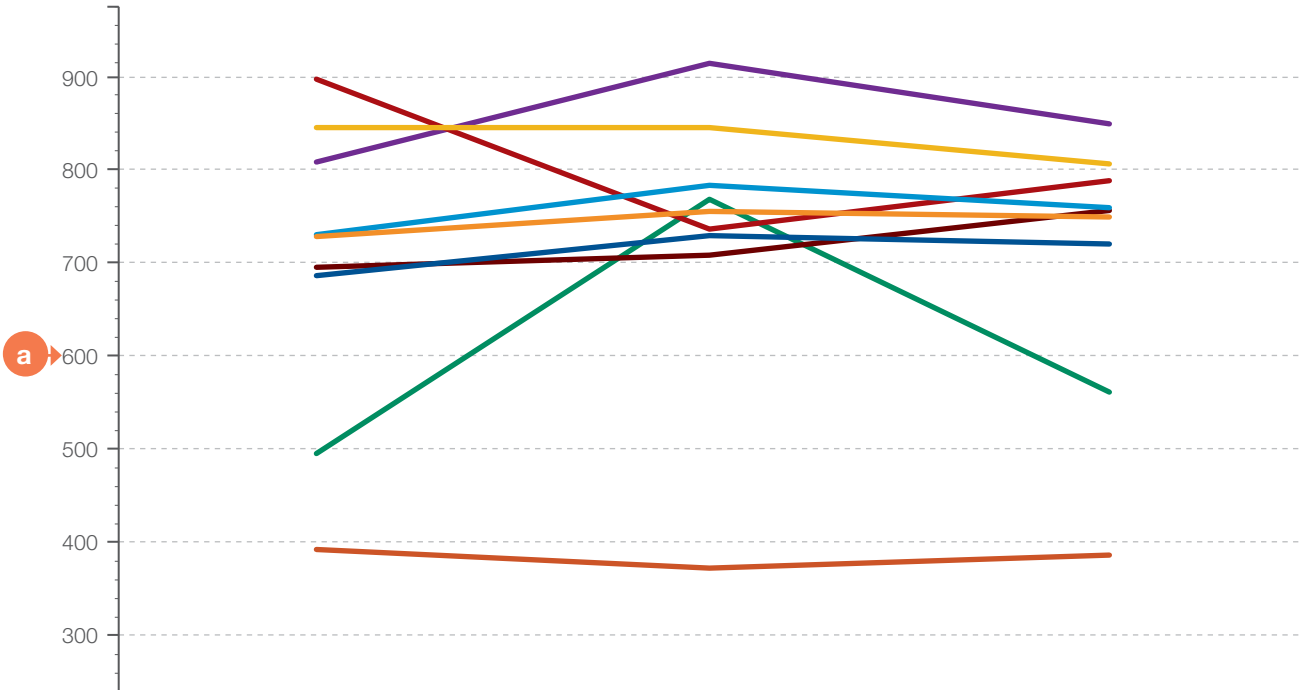
c **Highest rate**
The highest rate is the highest age- and sex-standardised rate of all SA3 rates.

d **Lowest rate**
The lowest rate is the lowest age- and sex-standardised rate of all SA3 rates.

e **Magnitude of variation**
The magnitude of variation is the times difference between the highest and lowest SA3 rates in Australia. Rates published with caution are excluded from the calculation.

f **Magnitude of variation without top and bottom 10%**
The magnitude of variation is the times difference between the highest and lowest SA3 rates after excluding the highest and lowest 10% of SA3 rates.

	2012–13	2015–16	2017–18	
Highest SA3 rate	2,414	1,753	1,836	c
Australian rate	**729**	**756**	**750**	b
Lowest SA3 rate	218	258	305	d
Magnitude of variation	11.1	6.8	6.0	e
Magnitude of variation without top & bottom 10% SA3	2.3	2.3	2.2	f



How to interpret our data visualisations

Rates across years graphic (interactive Atlas only)

This fully interactive graph is available at safetyandquality.gov.au/atlas

g **What does each diamond represent?**
Each diamond shows the rates for all SA3s in Australia for a given year.

h **What does the rectangle represent?**
Each rectangle represents an SA3. SA3s are geographical areas defined by the ABS that provide a standardised regional breakdown of Australia. SA3s generally have populations between 30,000 and 130,000 people.

i **Vertical axis**
The vertical axis shows the age- and sex-standardised rate. Rates are age and sex standardised to allow comparisons between populations with different age and sex structures.

j **Australian rate**
This line indicates the Australian age- and sex-standardised rate.

k **Rate of hospitalisation**
SA3s are not presented for those suppressed due to a small number of hospitalisations and/or population in an area. Darker colour of a rectangle represents an SA3 with a higher rate, and light colour represents an SA3 with a lower rate.

Notes are displayed for SA3 rates that are considered more volatile than other published rates and needs to be interpreted with caution.