Australian Commission on **Safety and Quality** in Health Care

Atlas Focus Report: Colonoscopy - Technical note

The Australian Atlas of Healthcare Variation (Atlas) series provides statistics at a local level identifying variation across Australia for a number of health indicators. Statistics in the Atlas are presented in the form of maps, graphs and tables.

This technical note provides information on the methods used for data extraction and analysis, for presentation in the maps and graphs.

Activity rates are presented by local areas using Statistical Area Level 3 (SA3) geography defined by the Australian Bureau of Statistics (ABS), as well as Primary Health Network (PHN) areas defined by the Australian Government Department of Health, Disability and Ageing at state and territory, and national levels.

The Australian Commission on Safety and Quality in Health Care (the Commission) developed the specifications for each indicator. These can be found on the Metadata Online Registry (METEOR) at: meteor.aihw.gov.au/content/805536.

The specifications include details such as:

- the data source
- the relevant population
- inclusions and exclusions (description of items included and excluded, and relevant data source codes)
- the numerator (what is being measured) and denominator (in what population)
- computation (the calculation that shows how the numerator and denominator relate)
- disaggregation (the way the data are analysed and presented)
- data suppression rules (rules that set out what cannot be presented for reasons of confidentiality and/or reliability).

Atlas Focus Report

The Atlas Focus Report: Colonoscopy used Medicare Benefits Schedule (MBS) data.

Analyses are based on the place of usual residence of the patient (patient residence) and not the location where the service was provided. If the patient's residence was unknown or invalid, or could not be allocated to an SA3, PHN, or state or territory, the record was included in the total for Australia only.

The Medicare enrolment postcode is used as a proxy for the patient residence because it corresponds to most people's usual residence. Records with unknown or invalid age or sex were excluded from MBS data because they could not be age- and sex-standardised (see Analysis methods). The Commission conducted the data extraction and analysis, and presentation of the data in maps and graphs.

Medicare Benefits Schedule data

MBS data are a by-product of the assessment of claims for Medicare benefits by Services Australia and are provided to the Australian Government Department of Health, Disability and Ageing. The MBS data in this report comprise services provided between 1 July 2013 to 30 June 2024 for claims processed up to and including 6 May 2025 (data extraction date). A service includes any claims resulting in the payment of a Medicare benefit. Bulk-billing incentives and 'top-up' services are excluded from service counts as they are not attendances or procedures in their own right.

MBS data do not include:

- services provided free of charge to public patients in hospitals
- services that qualify for a benefit under the Department of Veterans' Affairs National Treatment Account
- services provided under an entitlement, such as services covered by third-party or workers compensation, where an interim benefit has not been paid, or services provided to repatriation beneficiaries or defence personnel
- services provided for insurance or employment purposes
- health screening services, except for services as directed by the Minister.

Some Australian residents may access medical services through other arrangements, such as salaried doctor arrangements. As a result, MBS data may underestimate the use of services by some members of the community.

Under Medicare, 'eligible persons' are persons who reside permanently in Australia. This includes New Zealand citizens and holders of permanent residence visas. Applicants for permanent residency may also be eligible, depending on their circumstances. In addition, overseas visitors from countries with which Australia has a reciprocal healthcare agreement might also be entitled to benefits under MBS arrangements.

For some patients, the total count for the services in question may be zero or negative (for example, due to cheque cancellations; see meteor.aihw.gov.au/content/601800). In these cases, all records of the patient are excluded from the analyses.

A patient's age calculated in MBS data is their age in years on the date the service was provided to them.

Analysis methods

Australian population

All indicators used an estimated resident population from the ABS in the denominator.

Population estimates as at 30 June in the relevant year were used as the denominator for 2013–14 to 2023–24. For example, population estimates as at 30 June 2017 were used for 2017–18.

Age and sex standardisation

This report presents age- and sex-standardised rates. Age- and sex-standardisation is a method 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 as at 30 June 2001 was used as the standard population. Some indicators used specific age ranges. In these cases, only the relevant age groups were included in age- and sex-standardisation calculations. Standardised rates based on different age groups and/or standard populations are not directly comparable.

Five-year age groups were used from 0-4 years to 85 years and over. The age- and sex-standardisation method was adapted from the general age-standardisation formula for populations, available at meteor.aihw.gov.au/content/327276.

Geography levels

This report presents data based on the ABS Australian Statistical Geography Standard (ASGS) Edition 3 (2021) SA3 geography. There are 340 spatial SA3s, covering Australia without gaps or overlaps. SA3s generally have a population of 30,000–130,000 people and comprise clusters of whole SA2s (meteor.aihw.gov.au/content/747315). These areas were grouped by PHN 2023 area, state or territory, remoteness and socioeconomic status to assist comparisons. For more information on ASGS Edition 3, see meteor.aihw.gov.au/content/747163.

Allocation to an SA3 was based on the postcode of the patient's residence, not the place where they received the service.

MBS data

For the MBS data, an ABS correspondence was used to map postcode to SA3 based on ASGS Edition 3. Where a postcode overlapped SA3 boundaries, the number of events was apportioned across the SA3s, according to the proportion of the postcode population in the SA3s. The overall distribution of events by SA3 is considered to be statistically representative of the split population.

Primary Health Network areas

PHNs connect health services across a specific geographic area so that patients, particularly those needing coordinated care, have access to a range of services, including primary healthcare services, secondary healthcare services and hospital services. There are 31 PHN areas that cover the whole of Australia.

The number of events at SA3 level was mapped to a PHN area using an ABS correspondence. Where an SA3 overlapped PHN boundaries, the number of events was

apportioned across the PHN areas, according to the proportion of the SA3 population in the PHN areas.

The Australian Capital Territory, Northern Territory and Tasmania have only one PHN area each. PHN rates may differ from state or territory rates because populations are sourced from different data.

Post office boxes

Seven post office box postcodes in major cities were excluded from analyses by SA3, PHN area, remoteness and socioeconomic status. This is because it is difficult to estimate the place of patient residence in these cases. However, these post office box postcodes were included in analyses by state and territory, and national level.

The following post office box postcodes were excluded:

- 2001 Sydney
- 2124 Parramatta
- 3001 Melbourne
- 4001 Brisbane
- 5001 Adelaide
- 6843 Perth
- 7001 Hobart

Remoteness and socioeconomic analysis

SA3s were grouped into remoteness categories and socioeconomic quintiles based on the ASGS Edition 3 and the ABS Socio-Economic Indexes for Areas (SEIFA) 2021, respectively. Data by SA3 were assigned to remoteness and socioeconomic groups using this method of grouping. As a result of the method used, national data by remoteness and socioeconomic status in this report may differ slightly from equivalent data calculated using the postcode recorded on the individual records. However, it is expected that the overall patterns would be similar. For more information on SEIFA 2021, see meteor.aihw.gov.au/content/762080.

Derived remoteness categories

The ASGS Edition 3 remoteness categories 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.

An ABS correspondence file was used to allocate a remoteness category to each SA3. Where an SA3 overlapped two or more remoteness categories, the category with the largest population was selected.

Derived socioeconomic quintiles

There are four indexes in SEIFA 2021, and the Index of Relative Socio-Economic Disadvantage (IRSD) 2021 was used for socioeconomic analysis. IRSD 2021 ranks areas in Australia according to relative socioeconomic disadvantage. The index is based on information collected in the 2021 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. These are ranked according to their level of disadvantage (index value) and grouped into 10 equally populated categories (deciles), with the lowest category reflecting the 10% of areas with the greatest overall level of disadvantage. For each SA3, the deciles were combined to form quintiles, and the number of SA1s in each quintile was calculated. The quintile with the largest number of SA1s was selected as the quintile for the SA3.

Combining remoteness and socioeconomic quintiles

When remoteness categories and socioeconomic quintiles are combined, there are 25 combinations to which SA3s can be assigned. Some categories and quintiles were combined to ensure that each of the final 14 combinations contained at least six SA3s for comparison purposes (Table 3).

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+).

Table 1 Number of SA3s by combined remoteness categories and socioeconomic quintiles

	Socioeconomic quintile				
Remoteness	1 (Low)	2	3	4	5 (High)
Major cities	30	26	36	32	67
Inner regional	33	27	7	14†	
Outer regional	25	15	7†		
Remote and very remote	11	8†			

* 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.

† Numbers between columns where adjacent socioeconomic quintiles were combined.

Suppression protocol

Rates based on small numbers of events and/or very small populations are more susceptible to random fluctuations and may not provide a reliable representation of activity in that area. For reliability reasons, areas with volatile rates were suppressed (Table 2). Data that could lead to the identification of individual patients or providers were also suppressed. If applicable, consequential suppression was applied to manage confidentiality.

Suppressed SA3s were marked as not published and coloured grey in maps. Data from these suppressions were included in analyses for larger geographic areas – for example, analysis by state and territory, remoteness and socioeconomic status.

Sensitivity analysis

Most 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 for standardisation was less than 30. The Northern Territory requested that consideration be given to relaxing this suppression rule. For earlier analyses, a sensitivity analysis was used to investigate the volatility of the rates for the affected SA3s. For consistency, the sensitivity analysis was applied to all affected SA3s, not just those in the Northern Territory. The procedure to conduct the sensitivity analysis is summarised in Box 1.

Table 2 Rules for the suppression of an area of patient residence.

Data source	Numerator	Denominator	Denominator for age and sex groups
MBS data	• Fewer than 20 • Fewer than 6 services* • Fewer than 6 patients* • Fewer than 6 providers* • One provider provided more than 85% of services* • Two providers provided more than 90% of services*	Fewer than 1,000	Fewer than 30#

* Suppression rules relate to protecting confidentiality. Suppression rules not marked with an asterisk relate to volatility.

Suppression rule relating to the sensitivity analysis.

Box 1: Summary of sensitivity analysis

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

1. The numerator was increased by 1 in each group with a small denominator, to generate a simulated rate
2. All rates, including the simulated rates, were rounded to whole numbers
3. All publishable 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 rates for non-affected SA3s and the actual rates for affected SA3s were ranked from lowest to highest and split into deciles
5. The decile of the simulated rate (step 3) was compared with the decile of the actual rate (step 4)
6. Steps 1 to 5 were repeated with a decrease in the relevant numerators by 1. Negative numerators were reset to zero before generating a simulated rate.

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 using the actual rates (the most extreme scenario). This was a conservative method 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 were met in each simulation (increasing or decreasing the relevant numerators by 1):

- There was no difference in the decile for the simulated and actual rates; for example, both simulated and actual rates were in the lowest decile
- There was a difference of one decile, and the simulated rate was not on the cusp of the next decile (the decile that would make the difference become two deciles); 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 was published with caution. Although it was considered potentially more volatile than other published rates. The rates with caution were not included in the calculation of the national magnitude of variation and were presented with a diagonal line pattern in maps and bar charts, and as open circles in time series line graphs.

Presentation of rates in Australia maps and time-series graphs

Rates for SA3s were rounded to whole numbers. Rounded rates were ranked from lowest to highest and 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 the number of publishable SA3s is not a multiple of 10. Furthermore, if there was more than one SA3 with the same rate at the boundary of a decile, SA3s with the same rate were assigned to the same decile.

Identification of areas with consistently high and low rates

SA3s with consistently high or consistently low rates have been identified. Consistently high or consistently low is defined as those SA3s that fall in the top 10% or bottom 10% of all SA3s for the five most recent reporting years.

For more information

Please visit: safetyandquality.gov.au/atlas-colonoscopy