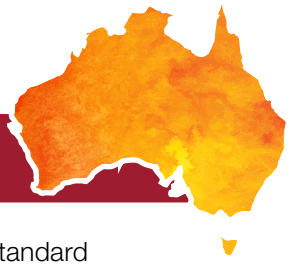
Chapter 4
Cardiac tests



At a glance

Cardiac stress tests and imaging are used in people with symptoms suggestive of coronary heart disease for accurate diagnosis, risk assessment and treatment planning. The Atlas examined use of exercise electrocardiogram (ECG), stress echocardiography, myocardial perfusion scans (MPS) and computed tomography of the coronary arteries, as one item. It also examined use of stress echocardiography and MPS as separate items.

Equitable access to cardiac imaging is important for improving cardiac care and outcomes in people at high risk of coronary artery disease in Australia. Appropriate use of these tests is also important for the sustainability of the health system, as they account for a substantial portion of the health budget. Use of cardiac imaging has grown at about twice the rate of treatment with revascularisation, suggesting that some testing is unnecessary and that healthcare resources could be better used.

The Atlas found that the rate of cardiac stress testing and imaging varies up to 10-fold between local areas in Australia. The largest variation is seen in the rates of stress echocardiography (varies up to 47-fold) and MPS (varies up to 57-fold).

The Atlas also mapped use of standard (or transthoracic) echocardiography, which is used to investigate symptoms suggestive of heart failure, structural heart diseases and other heart conditions. The Atlas found that the rate of standard echocardiography varies up to four-fold between local areas.

A lack of access to some cardiac tests for people in regional and remote areas is a key concern. The Atlas found that rates of cardiac stress tests and imaging, and standard echocardiography are higher in major cities than in regional and remote areas. This finding does not follow the pattern of need, as the burden of cardiovascular disease is higher in regional and remote areas. Barriers to access outside major cities include higher out-of-pocket costs for patients.

The Atlas also found that use of MPS is more common in socioeconomically disadvantaged areas in major cities and inner regional areas. This may be because MPS is less likely to have an out-of-pocket cost than stress echocardiography. Stress echocardiography is preferable to MPS in cases where it will give similar clinical information, because it does not expose the patient to radiation.

Regular review of MBS claims for reimbursement against identified criteria could improve the value gained from cardiac tests.

Recommendation

Cardiac stress tests and imaging

4a. The Commission to develop a clinical care standard on diagnosis, investigation and management of ischaemic heart disease.

Further recommendations for improving use of these tests are included under ‘General recommendations’.
See ‘Key findings and recommendations’, page 25.

4.1 Cardiac stress tests and imaging, 18 years and over

Why is this important?

Cardiac stress tests and imaging are used in people with symptoms suggestive of coronary heart disease for accurate diagnosis, risk assessment and treatment planning (for example, treatment with revascularisation by stenting or bypass surgery). Equitable access to cardiac imaging is important for improving cardiac care and outcomes in people at high risk of coronary artery disease in Australia.

Appropriate use of these tests is also important for the sustainability of the health system, as they account for a substantial portion of the health budget. Use of cardiac imaging has grown at about twice the rate of treatment with revascularisation – suggesting that some testing is unnecessary and that healthcare resources could be better used.

Rates of use of stress echocardiography have risen rapidly in recent years, with variation in use across Australia. There are concerns about both overservicing in some areas and underservicing in others.

What did we find?

Rates of cardiac stress tests and imaging vary up to about 10-fold across local areas, and are higher in major cities than in other areas.

What can be done?

Clinical decision support systems could guide the appropriate choice and frequency of cardiac stress tests and imaging, especially if they were incorporated into primary health practice software to ensure that the most appropriate tests are ordered. Medicare Benefits Schedule (MBS) financial reimbursement should reflect evidence-based best practice. Regular review of MBS claims for reimbursement could ensure that they meet the identified criteria.

Given the burden of disease in Aboriginal and Torres Strait Islander Australians, collecting accurate MBS data on services to these groups would be valuable for gaining further understanding of where improvements are most needed.

Cardiac stress tests and imaging, 18 years and over

Context

This item examines use of the following cardiac tests:

- Stress electrocardiogram (ECG), also known as an exercise ECG – an ECG performed while the patient exercises, usually on a treadmill
- Stress echocardiogram – an ultrasound of the heart, before and after exercise
- Myocardial perfusion scan (MPS) – radionuclide imaging of cardiac perfusion and function, with and without exercise
- Computed tomography of coronary arteries (CTCA) – a CT scan showing cardiac blood vessels.

An exercise ECG is not an imaging test; the other three tests listed above are imaging tests. The first three tests listed above are stress tests, while CTCA is an alternative to a stress test. Diagnostic imaging tests need to be provided in accordance with the item descriptors in the Health Insurance (Diagnostic Imaging Services Table) Regulations 2018.[1]

Stress echocardiogram use and MPS use are also examined in this Atlas as separate items. See Section 4.2 'Stress echocardiogram, 18 years and over' (page 201) and Section 4.3 'Myocardial perfusion scans, 18 years and over' (page 211). Stress ECG use and CTCA use are examined in this combined item only.

Stress tests show how well the heart can respond to an external stress such as exercise or specific medicines. These tests are used to investigate new or worsening symptoms in patients with known or suspected coronary heart disease.[2] Other indications for these tests include heart failure, cardiomyopathy, valvular heart disease and assessment several years after revascularisation (for example, by stenting or bypass surgery).[2] The choice of test is determined by the symptoms and clinical condition of the patient, although other factors such as local availability and cost to the patient will also influence test choice.[2]

Coronary heart disease is very common, and affects 5% of Australian men and 2% of Australian women.[3-4] Although both the fatal and non-fatal burden due to coronary heart disease have fallen substantially in Australia in recent times (by 35% and 21%, respectively, from 2003 to 2011), it remains the leading cause of burden of disease in this country.[4] Disease burden from coronary heart disease increases with socioeconomic disadvantage, and is higher in regional and remote areas of Australia than in major cities.[4]

Cardiovascular disease deaths are the greatest contributor to the mortality gap between Aboriginal and Torres Strait Islander Australians and other Australians.[5] In 2011–2015, Aboriginal and Torres Strait Islander Australians died from preventable and avoidable cardiovascular disease at 4.2 times the rate of other Australians (83.1 and 19.9 per 100,000, respectively).[6] In 2015–16, Aboriginal and Torres Strait Islander Australians were hospitalised for cardiovascular disease at a rate 1.7 times as high as the rate for other Australians, and would be expected to have a greater need for cardiac tests.[3,5,6]

Trends in use

As in many other countries, the use of cardiac imaging has grown rapidly in Australia since the early 2000s.[7-9] It is difficult to measure how much this greater use of cardiac imaging has improved cardiac outcomes, but the rate of cardiac imaging in Australia grew at about twice the rate of treatment with revascularisation between 2005–06 and 2014–15.[8,10] Between 2005–06 and 2014–15, the average growth per year for cardiac stress tests and imaging was[10]:

- Exercise ECG – 4%
- Stress echocardiogram – 14%
- MPS – 1%.

CTCA was introduced in Australia more recently than the other tests; the number of these tests grew by an average of 22% per year between 2011–12 and 2014–15.[10]

Overall, use of coronary artery disease diagnostics in Australia grew by an average of 6% per year from 2005–06 to 2014–15. Population ageing and growth each account for a 1–2% increase during this period.[10] Other potential contributors to the rise in cardiac testing include increased numbers of cardiologists, an increase in patient demand due to information on

the internet, inappropriate use of testing, and more inexperienced operators performing tests (which may lead to increased repetition of tests because a previous test was of low quality).[9,11] National figures showing the change in the number of cardiologists between 2005 and 2015 are not available, but the number of cardiologists registered in Australia increased by 273 (from 1,152 to 1,425) between October 2013 and June 2018.[12]

International comparisons of cardiac imaging rates are limited by differences in data collection methods.

Appropriate use of cardiac tests

Cardiac stress tests are used to investigate symptoms of coronary heart disease; the results are used to determine the patient's diagnosis, risk level and appropriate interventions.[2] Cardiac stress tests are generally performed by cardiologists; however, they may also be performed by general physicians.

Cardiac stress tests are rarely appropriate for screening for coronary heart disease in patients without symptoms.[2] In some cases, cardiac stress tests are used to plan management in people without symptoms if they have high absolute cardiovascular risk based on multiple risk factors such as age, blood pressure and cholesterol level.[2] Absolute cardiovascular risk is the risk of having a cardiovascular event, such as myocardial infarction (heart attack), in the next five years.[13]

For many low-risk patients with symptoms of coronary heart disease, an exercise ECG gives enough clinical information to plan management and is less costly than stress echocardiography, MPS and CTCA.[2,10,14] Stress echocardiography or MPS is recommended for low- and high-risk patients who have symptoms but are not suitable candidates for an exercise ECG – for example, if they cannot exercise or have an uninterpretable ECG.[2,10] Interpreting results of stress echocardiography can be difficult in morbidly obese patients, and other tests (for example, MPS with positron emission scanning) may be better alternatives.[2] Stress imaging is also recommended for higher-risk patients with symptoms.[10]

For most patients with suspected coronary artery disease, stress echocardiography and MPS give equivalent information. If locally available, stress echocardiography should generally be preferred as it does not involve radiation exposure and is less costly for the health system.[2,10] While an MPS is generally considered safe, the associated dose of radiation is approximately that of 150 chest X-rays.[10]

CTCA is a relatively new test. Currently in Australia, to qualify for an MBS rebate, CTCA can only be requested by a specialist or consultant physician.[1,10] CTCA may be appropriate for higher-risk patients with symptoms, and is valuable for ruling out disease with a high degree of confidence. However, because of its high cost, it should not be used in low-risk patients.[10,15,16]

Access to cardiac tests

Despite the universal healthcare system in Australia, there are geographic and financial barriers to accessing cardiac tests for some population groups. Availability of some of these cardiac tests is limited outside metropolitan areas and larger regional centres.[17] It may not be financially viable for private radiology practices to provide services to areas with small populations, and a public hospital may become the default provider of radiology services.[18] If a public diagnostic imaging service is not available locally, patients may need to travel further to access a public service or pay an out-of-pocket expense for a private service.[18] The average out-of-pocket cost for diagnostic imaging was $94 per service in 2009–10, but costs increased as remoteness increased.[19]

About the data

Data are sourced from the MBS dataset. This dataset includes information on MBS claims processed by the Australian Government Department of Human Services. It covers a wide range of services (attendances, procedures, tests) provided across primary care and hospital settings.

Cardiac stress tests and imaging, 18 years and over

The dataset does not include:

- Services for publicly funded patients in hospitals
- Services for patients in hospital outpatient clinics where claims are not made to the MBS
- Services covered under Department of Veterans' Affairs arrangements.

Rates are based on the number of MBS-subsidised services for cardiac stress tests and imaging per 100,000 people aged 18 years and over in 2016–17.

Because an MBS claim is included for each service rather than for each patient, patients who receive any of the services listed in this data item more than once in the financial year will have more than one MBS claim counted.

The analysis and maps are based on the residential address of the patient recorded in the MBS claim and not the location of the service.

Rates are age and sex standardised to allow comparisons between populations with different age and sex structures.

This analysis was not undertaken by Aboriginal and Torres Strait Islander status because this information was not available for the MBS data at the time of publication.

What do the data show?

Magnitude of variation

In 2016–17, there were 933,727 MBS-subsidised services for cardiac stress tests and imaging, representing 4,575 services per 100,000 people aged 18 years and over (the Australian rate).

The number of MBS-subsidised services for cardiac stress tests and imaging across 329* local areas (Statistical Area Level 3 – SA3) ranged from 1,184 to 11,568 per 100,000 people aged 18 years and over. The rate was **9.8 times as high** in the area with the highest rate compared to the area with the lowest rate. The number of services varied across states and territories, from 2,289 per 100,000 people aged 18 years and over in Tasmania to 6,673 in New South Wales (Figures 4.4–4.7).

After the highest and lowest 10% of results were excluded and 264 SA3s remained, the number of services per 100,000 people aged 18 years and over was 3.8 times as high in the area with the highest rate compared to the area with the lowest rate.

Analysis by remoteness and socioeconomic status

Rates of cardiac stress tests and imaging were higher in major cities than in other areas. There was no clear pattern according to socioeconomic status (Figure 4.8).

Analysis by cardiac test type

Nationally, 53% of cardiac stress tests and imaging were exercise ECGs, 33% were stress echocardiograms, 8% were MPS and 6% were CTCA. The proportions for each test were similar across all states and territories (Figure 4.1).

Analysis by referrer type

Nationally, 64% of cardiac stress tests and imaging were requested by general practitioners (GPs), 26% of tests were requested by cardiologists and 10% were requested by other health professionals. The proportion of tests requested by GPs varied from 42% in South Australia to 72% in New South Wales and the Australian Capital Territory. The proportion of tests requested by cardiologists varied from 19% in New South Wales to 47% in South Australia (Figure 4.2).

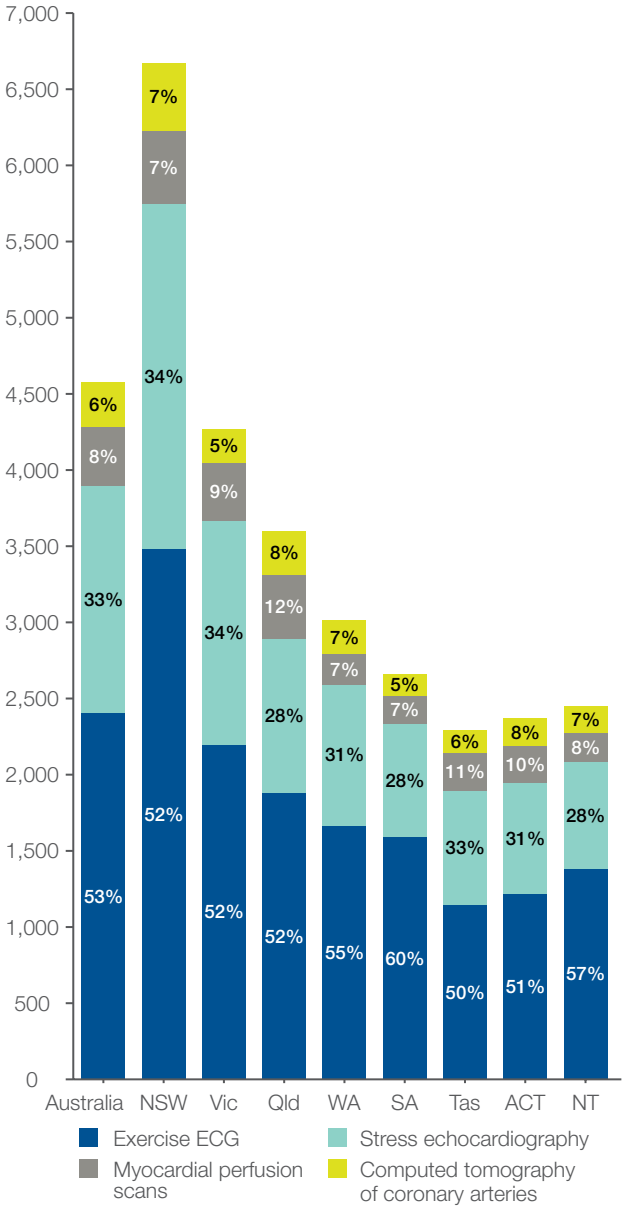
* There are 340 SA3s. For this item, data were suppressed for 11 SA3s due to one or more of a small number of services or population in an area, or potential identification of individual patients, practitioners or business entities.

Notes:

Some of the published SA3 rates were considered more volatile than others. These rates are excluded from the calculation of the difference between the highest and lowest SA3 rates in Australia.

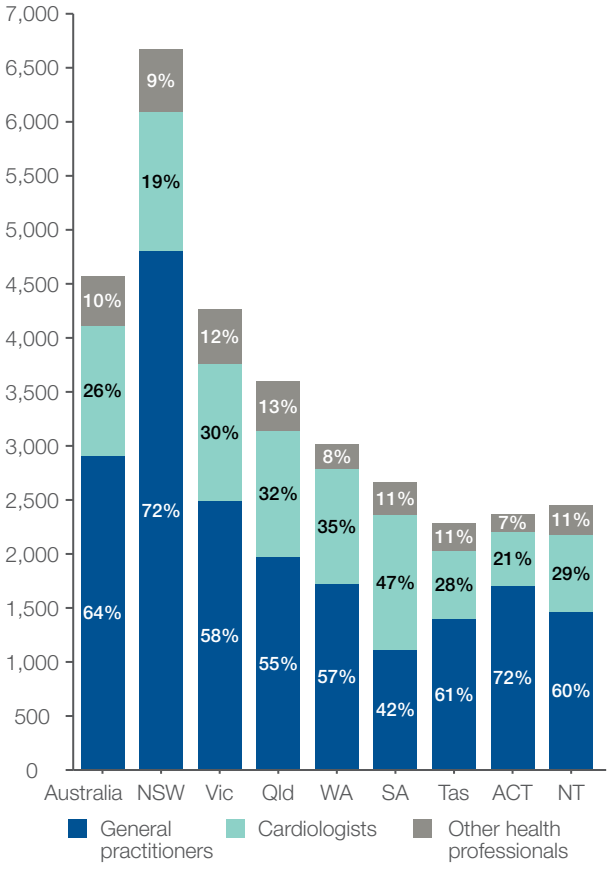
For further detail about the methods used, please refer to the Technical Supplement.

Figure 4.1: Number of MBS-subsidised services for cardiac stress tests and imaging per 100,000 people aged 18 years and over, age and sex standardised, by state and territory of patient residence, by cardiac test type, 2016–17



The data for Figure 4.1 are available at www.safetyandquality.gov.au/atlas

Figure 4.2: Number of MBS-subsidised services for cardiac stress tests and imaging per 100,000 people aged 18 years and over, age and sex standardised, by state and territory of patient residence, by referrer type, 2016–17



The data for Figure 4.2 are available at www.safetyandquality.gov.au/atlas

Notes:
Speciality of referrer was derived for some records for which this information was unknown.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

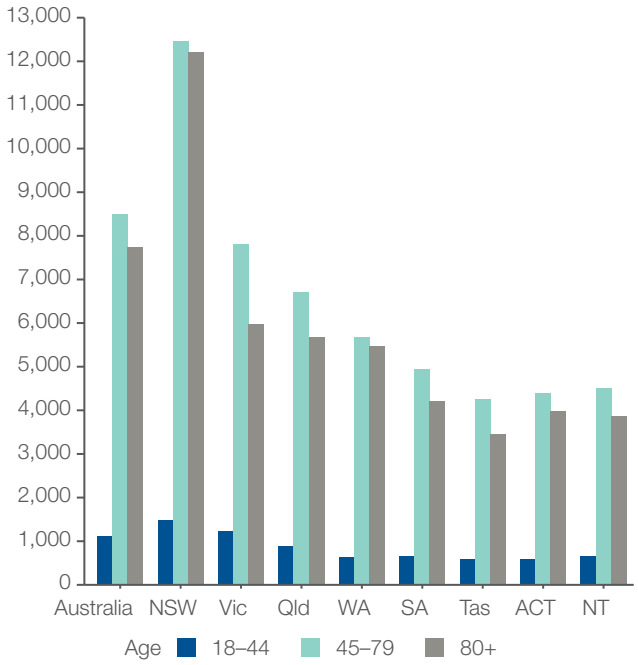
Cardiac stress tests and imaging, 18 years and over

Analysis by age group

Rates of cardiac stress tests and imaging were highest in the 45–79 years age group. The national rate in this age group was 8,497 per 100,000 people and varied from 4,255 per 100,000 people in Tasmania to 12,466 per 100,000 people in New South Wales.

The national rate for tests performed on the 80 years and over age group was slightly lower at 7,744 per 100,000 people. The rate varied from 3,447 per 100,000 people in Tasmania to 12,211 per 100,000 people in New South Wales (Figure 4.3).

Figure 4.3: Number of MBS-subsidised services for cardiac stress tests and imaging per 100,000 people by age group, age and sex standardised, by state and territory of patient residence, 2016–17



The data for Figure 4.3 are available at www.safetyandquality.gov.au/atlas

Interpretation

Rates of MBS-subsidised cardiac stress tests and imaging, and echocardiography varied markedly between states and territories. Variation in combined rates of use of these cardiac tests is likely to be due to geographical differences in the factors discussed below.

Rates of underlying disease

Variation is warranted and desirable when it reflects variation in the underlying need for care. Groups with higher rates of cardiovascular disease have greater need for cardiac tests, which should influence the variation in rates of use of these tests. Hospitalisations associated with cardiovascular disease increase with remoteness and with socioeconomic disadvantage, and are higher among Aboriginal and Torres Strait Islander Australians than among other Australians.[3]

Data analysis for this data item indicates that rates of MBS-subsidised cardiac stress tests and imaging were higher in major cities than in other remoteness categories. This suggests that people in inner and outer regional, and remote areas may be missing out on appropriate cardiac stress tests and imaging.

Access to services

Variation in cardiac testing rates is likely to reflect differences in geographical and financial access to services, both for referral and for performance of the tests.[8] Differences in the relative availability of private and public cardiology services in an area will influence the rates of MBS-subsidised cardiac stress tests and imaging requested. Diagnostic imaging services are concentrated in major cities, and out-of-pocket costs increase as remoteness increases.[19] Bulk-billing is common in some socioeconomically disadvantaged areas of major cities, so out-of-pocket costs will not be a barrier where this is the case.

Notes:
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

Clinical decision-making

Clinicians' differing thresholds for referral for cardiac testing are likely to affect patterns of variation in the use of cardiac tests – for example, in rates of testing asymptomatic patients.[10] Differences in practice regarding regularity of reviews and intervals for repeat testing are also likely to influence variation, both within and between states and territories. Patient demand may also influence clinical decision-making.[10]

Availability of previous test results

The extent of repeat testing on patients will also be related to the ease with which clinicians can access previous test findings or their perceptions about the quality of previously performed tests. Geographic differences in either of these factors will contribute to the variation observed in patterns of cardiac testing.

Cultural factors and access to culturally appropriate healthcare services are also likely to influence access to cardiac testing for Aboriginal and Torres Strait Islander Australians. Examples include conflicting cultural priorities and gender role responsibilities (such as enculturation of males to be 'strong' and to not express pain, and the female's prioritisation of family needs over self), and perceived discrimination within the health system.[20]

Funding models

The data for this item exclude services that are free of charge to public patients in hospitals, such as cardiac tests done for public patients in public hospital outpatient clinics or emergency departments. This means that the funding models of cardiac test services available in an area, and the relative accessibility of services to patients, may influence the variation seen. For example, the rates of cardiac testing seen in the Northern Territory and remote Western Australia may be low because a higher proportion of tests in these areas is done for public patients in hospital outpatient clinics (which are not counted in this data item). In contrast, the rates in New South Wales may be high because there are many locations in New South Wales where services and investigations undertaken in public hospital outpatient clinics are claimed through the MBS under specialist medical practitioner rights of private practice arrangements.

Proportions of individual tests

Variation in the proportions of individual cardiac tests used is likely to be due to geographical differences in the availability of the expertise required for different tests. For example, exercise ECG and stress echocardiography require different specialist expertise from MPS. Different patterns of availability of radiology and cardiology services will affect the proportions of individual tests undertaken in different areas. The local availability of sonographers will also influence the rate of stress echocardiography.

An MPS has a lower out-of-pocket cost for the patient than a stress echocardiogram. This may encourage referrers to request an MPS, even if a stress echocardiogram is appropriate, and this may be more common in socioeconomically disadvantaged areas. More than 95% of MPS studies are bulk-billed, compared with 70% of stress echocardiograms.[10]

Some patient characteristics and comorbidities, such as obesity, make exercise ECG unsuitable, and other cardiac tests need to be substituted.[21] Lower rates of exercise ECG and higher rates of the other cardiac tests in some areas could be partly due to variation in the proportion of patients who are not suitable candidates for exercise ECG.

Addressing variation

Variation that is unrelated to patient need or preference is referred to as unwarranted variation. Addressing variation in underlying disease burden and reducing the burden of disease overall would require strategies to address modifiable risk factors for cardiovascular conditions. These risk factors include smoking, obesity, alcohol use, physical inactivity, high blood pressure and poor diet.[4] A substantial proportion of cardiovascular events and burden of disease could be prevented by addressing modifiable risk factors from an early age through to adulthood, at both an individual and a population level.[22-24]

Cardiac stress tests and imaging, 18 years and over

Approaches to reducing unwarranted variation and improving appropriateness of care for cardiac testing are discussed below.

Improving equity of access

Equity issues related to out-of-pocket costs for diagnostic imaging and geographic distribution of imaging services were examined in a recent Senate inquiry into availability and accessibility of diagnostic imaging equipment around Australia.[25] Several strategies to increase access have been proposed, including increasing remuneration and providing equipment subsidies for providers of imaging in regional and remote areas to compensate for the extra costs of delivering services in these settings.[17,18]

Diagnostic imaging equipment and workforce are concentrated in larger cities in Australia.[25,26] There is a national shortage of sonographers, who carry out ultrasound examinations including stress and standard echocardiography.[27] While this problem affects all parts of Australia, it is more pronounced in rural and remote areas.[28] The scarcity of clinical training places for sonography graduates contributes to this shortage.[25] One of the barriers for private and public radiology services providing clinical placement training for sonography graduates is the cost involved. A subsidy to encourage services to take on trainees has been suggested.[29]

Training nurses and nurse practitioners to perform sonography in metropolitan and rural areas has also been recommended as a way to improve access to ultrasound.[25] Cardiac technologists could also be trained to perform sonography. Increasing support for tele-radiology services[25] and innovative service delivery models such as mobile cardiac investigation services could also improve access to diagnostic imaging in rural and remote areas.[25]

Overcoming cultural barriers that prevent Aboriginal and Torres Strait Islander Australians accessing health services will require a culturally respectful and non-discriminatory health system.[30]

Improving appropriate use of tests

A rapid increase in the use of cardiac imaging in recent times has prompted debate about appropriate and sustainable use in many countries.[7,8] Appropriate use of tests in patients with symptoms or diagnosed disease has also been a topic of international concern. The American College of Cardiology and others have published appropriate use criteria for cardiac imaging, including MPS (2005), CTCA (2006), stress echocardiography (2008) and multi-modality imaging (2014).[14,31-33] The European Society of Cardiology and the European Association of Cardiovascular Imaging have also recognised a need for appropriateness criteria for use of cardiac imaging, and have published criteria for use of imaging in heart failure.[7,34]

The United States Preventive Services Task Force released a recommendation statement in 2018 recommending against using resting or exercise electrocardiogram for screening in asymptomatic adults at low risk of cardiovascular events.[35]

A lack of alignment between United States appropriate use criteria and guidelines for standard echocardiography used by Australian clinicians has been noted.[36] Greater consistency between guidelines and appropriate use criteria would increase their usefulness if they were to be introduced in Australia.[36]

Use of cardiac stress tests and imaging to screen asymptomatic patients is not recommended in Australia. The Heart Foundation and the Royal Australian College of General Practitioners recommend conducting an absolute cardiovascular disease risk assessment every two years on adults aged 45 years and over who are not known to have cardiovascular disease or who are not clinically determined to be at high risk. The absolute cardiovascular disease risk assessment combines several risk factors to calculate the probability of a person having a cardiovascular event such as a heart attack or a stroke in the next five years. People deemed to have a low absolute cardiovascular risk (<10% absolute five-year cardiovascular risk) do not require a cardiac test.[37,38]

The Australian Choosing Wisely program reinforces this message. Choosing Wisely recommendations from the Royal Australian College of General Practitioners include 'Don't screen asymptomatic, low-risk patients (<10% absolute five-year cardiovascular risk) using ECG, stress test, coronary artery calcium score or carotid artery ultrasound'.[13,39] Choosing Wisely recommendations from the Australian and New Zealand College of Anaesthetists recommend against routinely requesting cardiac stress testing for asymptomatic patients before low- to intermediate-risk non-cardiac surgery.[40]

Clinical decision support material

Developing clinical decision support material to guide the choice and frequency of cardiac stress tests and imaging, and incorporating these decision aids into primary care practice software, would assist clinicians to choose the most appropriate cardiac stress test and improve appropriateness of care. Cardiovascular clinical decision support materials could be developed and made available alongside other decision support resources for primary healthcare practitioners.

As noted, this MBS item reports cardiac stress tests and imaging services but does not report on patients who receive a service more than once in the financial year – either the same type of cardiac test or any of the other tests listed in the data item. Reducing clinically unnecessary repeat testing is one way to reduce over-testing. Wider use of the My Health Record system should help reduce duplicate testing by ensuring that results of previous tests are available at the point of care.[41]

MBS item descriptions

Rebates are provided to patients for private cardiac stress tests and imaging through the MBS. The Cardiac Services Clinical Committee, under the auspices of the MBS Review Taskforce, has undertaken an extensive review of current MBS items in cardiology. The committee has made a number of recommendations to the Australian Government with the overarching themes of:

- Aligning MBS services with elements of evidence-based practice guidelines, where possible
- Ongoing review of items to ensure currency
- Ensuring that appropriate indications for use of services are clearly identified
- Developing systems for regular review and audit to ensure that claims for reimbursement meet the identified criteria.

This approach – ensuring that financial reimbursement of services is structured in a way that encourages appropriate care that is in line with the best available evidence – would benefit patients by improving the care they receive, and would benefit the community by allocating resources to services that are of high value.

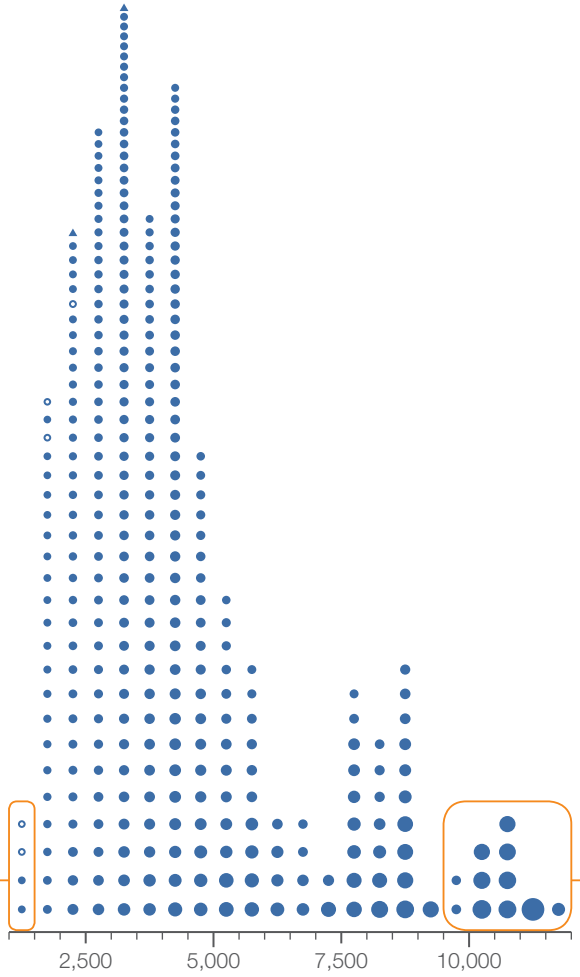
Other approaches

Other approaches to improving appropriateness of cardiac testing include structured request forms to prompt the most appropriate test to be selected, teaching medical students about the implications of overuse, and using decision support tools with patients during a discussion with their clinician about their symptoms and risk factors and their level of risk of having a cardiac event within five years.[10,42,43] In the emergency department setting, a decision aid for use with low-risk patients with chest pain resulted in a 19% lower rate of admission for cardiac stress testing compared with usual care, with no increase in adverse events.[42] The support of senior staff and clinicians is likely to be an important factor in promoting evidence-based best practice.

Cardiac stress tests and imaging, 18 years and over

Rates by local area

Figure 4.4: Number of MBS-subsidised services for cardiac stress tests and imaging per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17



Lowest rate areas

SA3	State	Rate	Services
Outback - North and East	SA	**1,184**	271
Alice Springs	NT	**1,269**	334
East Pilbara	WA	**1,318***	189
West Pilbara	WA	**1,351***	231

Highest rate areas

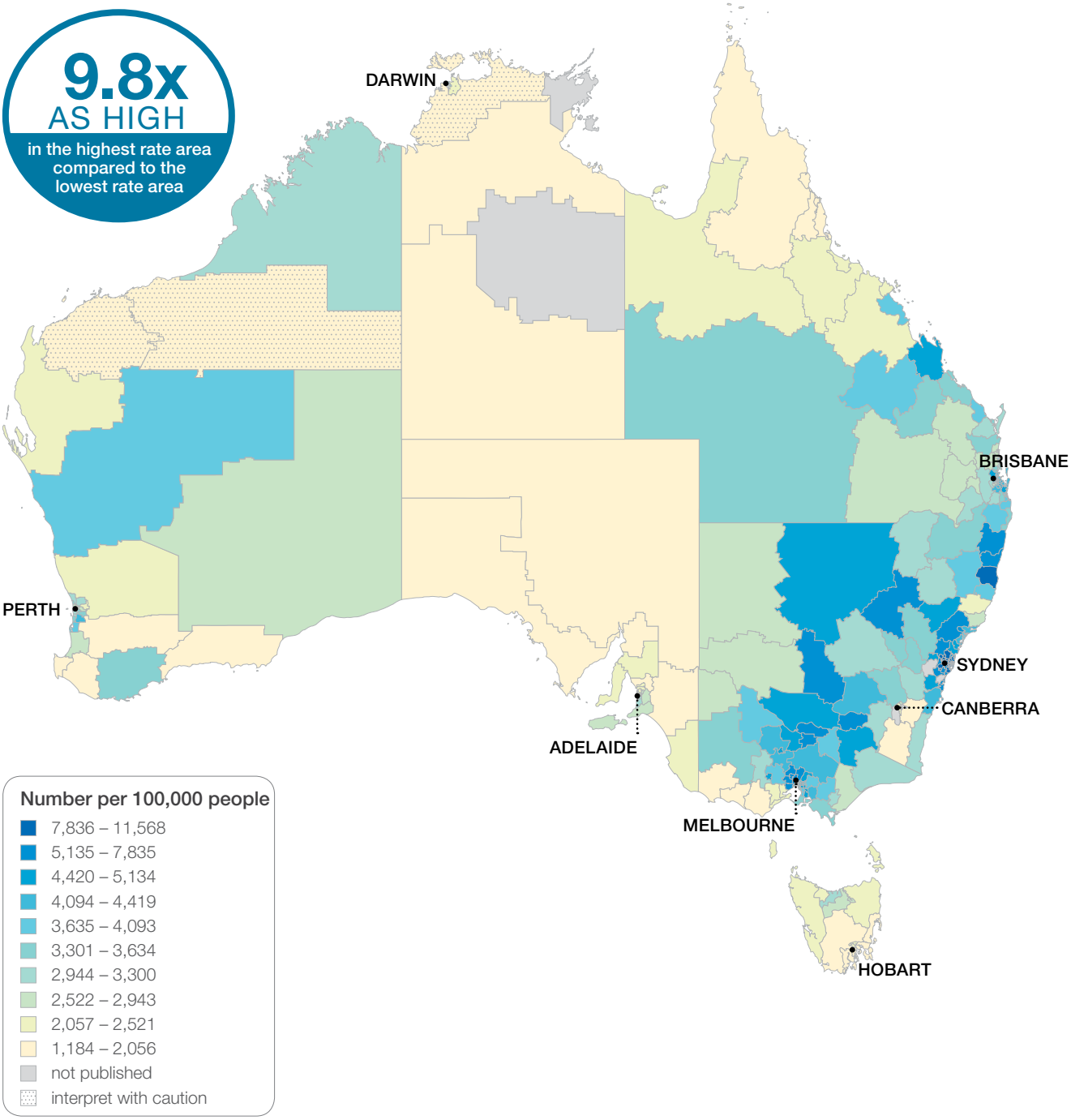
SA3	State	Rate	Services
Blacktown - North	NSW	**11,568**	6,487
Fairfield	NSW	**11,267**	17,772
Cronulla - Miranda - Caringbah	NSW	**10,917**	11,694
Merrylands - Guildford	NSW	**10,722**	12,094
Sutherland - Menai - Heathcote	NSW	**10,638**	10,155
Blacktown	NSW	**10,518**	10,912
Canterbury	NSW	**10,499**	11,237
Baulkham Hills	NSW	**10,350**	13,101
Parramatta	NSW	**10,293**	10,195
Rouse Hill - McGraths Hill	NSW	**9,890**	2,250
Dural - Wisemans Ferry	NSW	**9,681**	2,555

Notes:
Hollow circles (○) and asterisks (*) indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
Triangles (▲) indicate SA3s where only rates are published. The numbers of services are not published for confidentiality reasons.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

Cardiac stress tests and imaging, 18 years and over

Rates across Australia

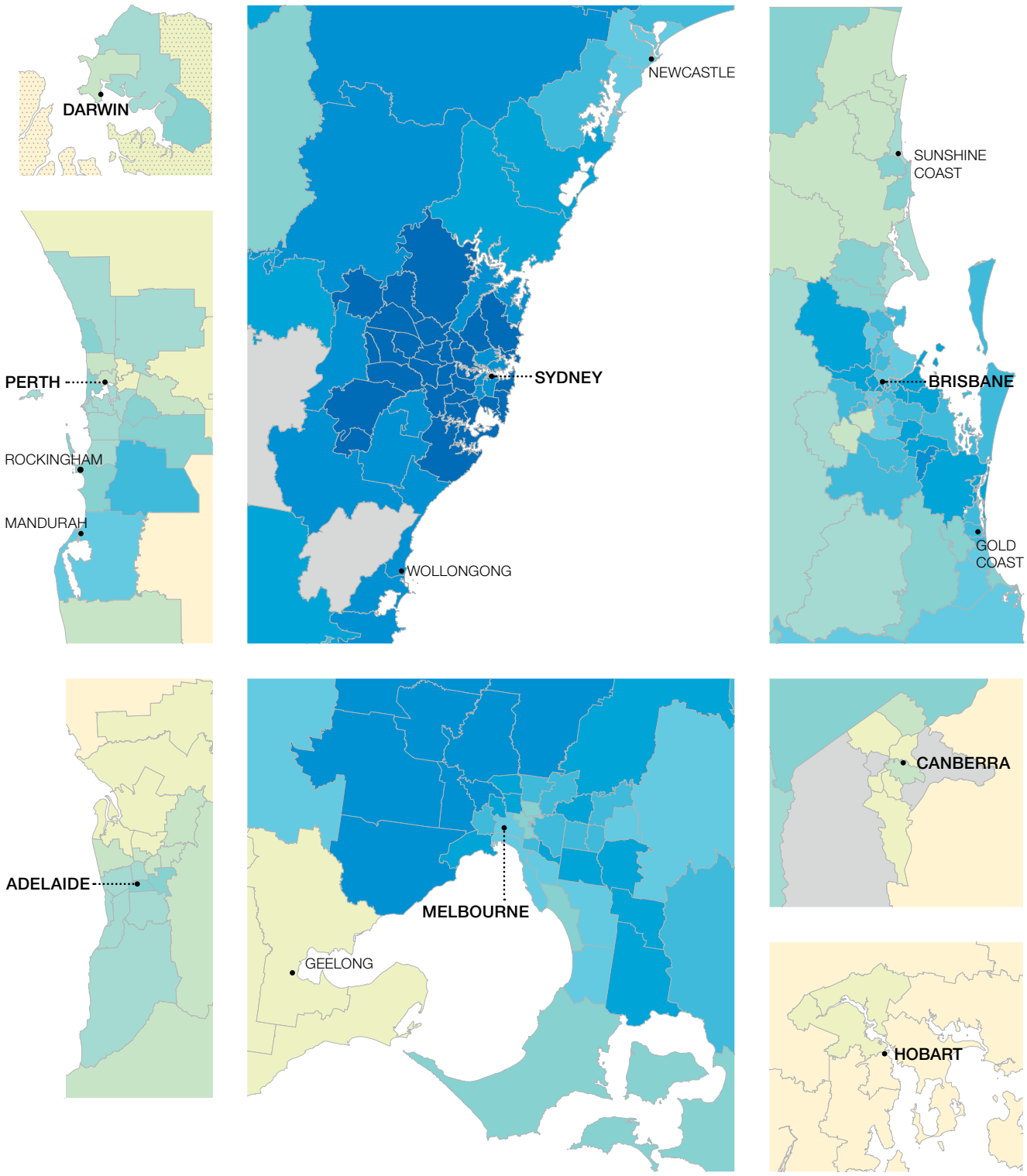
Figure 4.5: Number of MBS-subsidised services for cardiac stress tests and imaging per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17



Notes:
Dotted areas indicate rates that are considered more volatile than other published rates and should be interpreted with caution. These rates are excluded from the calculation of the difference between the highest and lowest SA3 rates in Australia.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

Rates across capital city areas

Figure 4.6: Number of MBS-subsidised services for cardiac stress tests and imaging per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17



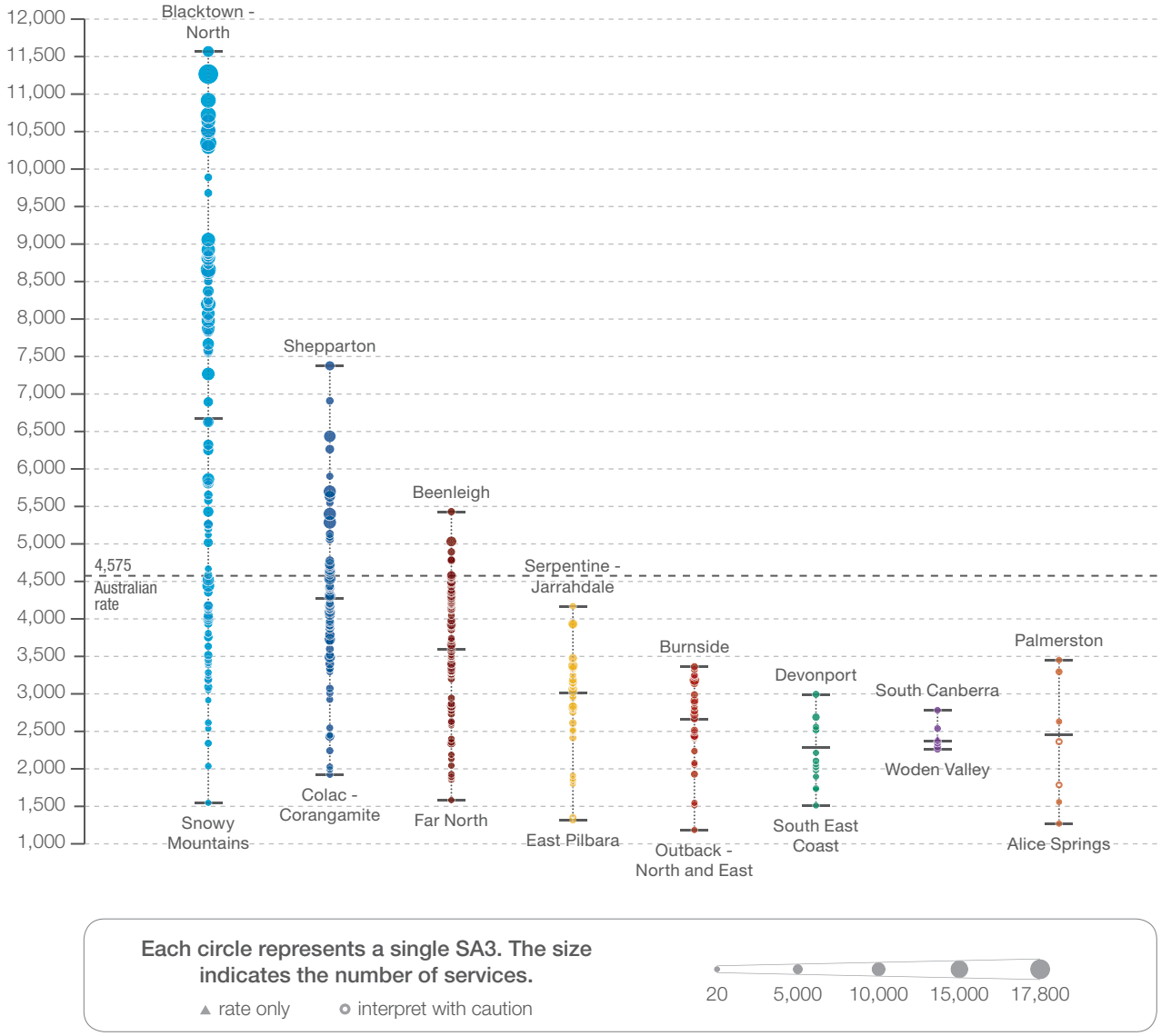
Notes:
Dotted areas indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

Cardiac stress tests and imaging, 18 years and over

Rates by state and territory

Figure 4.7: Number of MBS-subsidised services for cardiac stress tests and imaging per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17

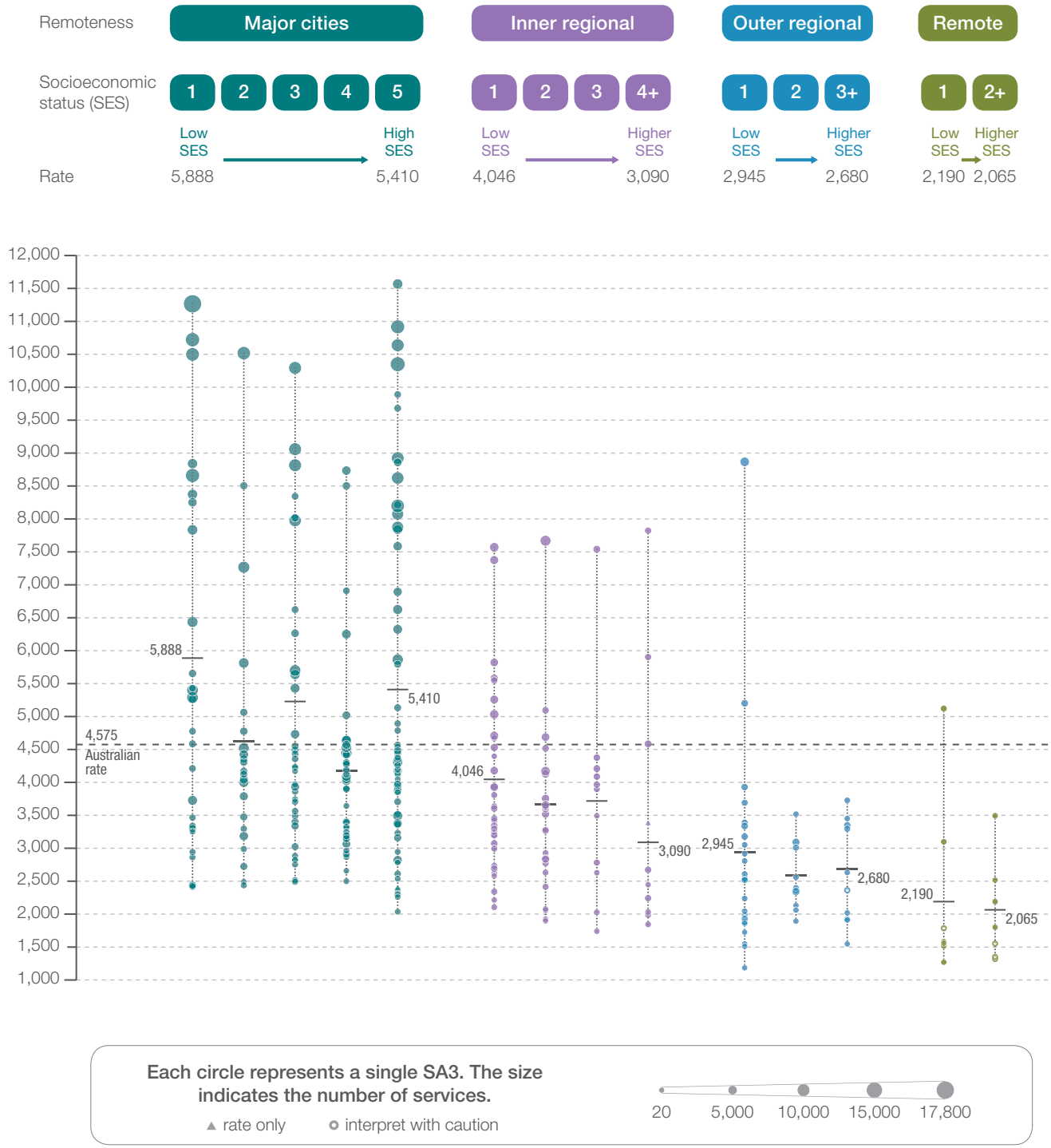
	NSW	Vic	Qld	WA	SA	Tas	ACT	NT
Highest rate	11,568	7,376	5,430	4,170	3,363	2,994	2,782	3,451
State/territory	6,673	4,268	3,597	3,012	2,661	2,289	2,370	2,450
Lowest rate	1,547	1,923	1,583	1,318*	1,184	1,511	2,259	1,269
No. services	444,753	216,856	145,791	62,080	41,745	11,552	7,125	3,739



Notes:
Hollow circles (o) and asterisks (*) indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
Triangles (▲) indicate SA3s where only rates are published. The numbers of services are not published for confidentiality reasons.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

Rates by remoteness and socioeconomic status

Figure 4.8: Number of MBS-subsidised services for cardiac stress tests and imaging per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17



Notes:
Hollow circles (○) indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
Triangles (▲) indicate SA3s where only rates are published. The numbers of services are not published for confidentiality reasons.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

Cardiac stress tests and imaging, 18 years and over

Resources

- Cardiac Society of Australia and New Zealand, *Noninvasive Coronary Artery Imaging: Current clinical applications*[16]
- *Therapeutic Guidelines: Cardiovascular*[44] (for electronic version, visit https://tgldcdp.tg.org.au/etgcomplete)
- Australian and New Zealand College of Anaesthetists, Choosing Wisely recommendation 2: Avoid ordering cardiac stress testing for asymptomatic patients prior to undergoing low to intermediate risk non-cardiac surgery[40]
- Royal Australian College of General Practitioners, Choosing Wisely recommendation 4: Don't screen asymptomatic, low-risk patients (<10% absolute 5-year CV risk) using ECG, stress test, coronary artery calcium score, or carotid artery ultrasound[39]
- Australian Commission on Safety and Quality in Health Care, *National Safety and Quality Health Service Standards* (2nd edition)[45]
- Wardliparingga Aboriginal Research Unit of the South Australian Health and Medical Research Institute, *National Safety and Quality Health Service Standards User Guide for Aboriginal and Torres Strait Islander Health*[46]

Australian initiatives

The information in this chapter will complement work already under way to improve the appropriate use of cardiac investigations in Australia. At a national level, this work includes:

- Australian and New Zealand College of Anaesthetists and Royal Australian College of General Practitioners, Choosing Wisely recommendations[39,40]
- MBS Review Taskforce Cardiac Services Clinical Committee, review including recommendations about cardiac tests[10]
- Australian Health Ministers' Advisory Council, *Aboriginal and Torres Strait Islander Health Performance Framework 2017 Report*.[6]

Many state and territory initiatives are also in place, including:

- Implementation of the Victorian cardiac services plan – *Design, Service and Infrastructure Plan for Victoria's Cardiac System*[47]
- The New South Wales Leading Better Value Care Program, which focuses on delivering better care for patients using a patient experience and health outcomes approach.[48]

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Cardiac stress tests and imaging, 18 years and over

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4.2 Stress echocardiography, 18 years and over

What did we find?

Rates of stress echocardiography vary up to about 50-fold across local areas, and are higher in major cities and inner regional areas than in outer regional and remote areas.

Context

A stress echocardiogram is an ultrasound of the heart that shows how it responds to stress with either exercise (treadmill or bicycle) or specific medicines.[1] This test is used to investigate new or worsening symptoms in patients with known or suspected coronary heart disease.[1,2] Other indications include pulmonary hypertension and heart valve disease.[1] It is rarely appropriate for investigating asymptomatic patients. See Section 4.1 'Cardiac stress tests and imaging, 18 years and over (page 183) for a discussion of the role of stress echocardiography compared with other cardiac tests.

In Australia, growth in the use of stress echocardiograms averaged 14% per year between 2005–06 and 2014–15.[3] Increases have also been seen in other countries.[4] Differences in data collection methods make international comparisons of rates of use difficult, but, in 2014, the rate of stress echocardiography in Ontario, Canada, was 730 per 100,000 people, compared with 1,049 per 100,000 people in Australia in 2014–15.[5,6]

Stress echocardiography, 18 years and over

About the data

Data are sourced from the Medicare Benefits Schedule (MBS) dataset. This dataset includes information on MBS claims processed by the Australian Government Department of Human Services. It covers a wide range of services (attendances, procedures, tests) provided across primary care and hospital settings.

The dataset does not include:

- Services for publicly funded patients in hospitals
- Services for patients in hospital outpatient clinics where claims are not made to the MBS
- Services covered under Department of Veterans' Affairs arrangements.

Rates are based on the number of MBS-subsidised services for stress echocardiograms per 100,000 people aged 18 years and over in 2016–17.

Because an MBS claim is included for each service rather than for each patient, patients who receive any of the services listed in this data item more than once in the financial year will have more than one MBS claim counted.

The analysis and maps are based on the residential address of the patient recorded in the MBS claim and not the location of the service.

Rates are age and sex standardised to allow comparisons between populations with different age and sex structures.

This analysis was not undertaken by Aboriginal and Torres Strait Islander status because this information was not available for the MBS data at the time of publication.

What do the data show?

Magnitude of variation

In 2016–17, there were 303,525 MBS-subsidised services for stress echocardiography, representing 1,491 services per 100,000 people aged 18 years and over (the Australian rate).

The number of MBS-subsidised services for stress echocardiography across 325* local areas (Statistical Area Level 3 – SA3) ranged from 104 to 4,894 per 100,000 people aged 18 years and over. The rate was **47.1 times as high** in the area with the highest rate compared to the area with the lowest rate. The number of services varied across states and territories, from 698 per 100,000 people aged 18 years and over in the Northern Territory to 2,265 in New South Wales (Figures 4.9–4.12).

After the highest and lowest 10% of results were excluded and 260 SA3s remained, the number of services per 100,000 people aged 18 years and over was 5.8 times as high in the area with the highest rate compared to the area with the lowest rate.

Analysis by remoteness and socioeconomic status

Rates of stress echocardiography were higher in major cities and inner regional areas than in outer regional and remote areas. There was no clear pattern according to socioeconomic status (Figure 4.13).

* There are 340 SA3s. For this item, data were suppressed for 15 SA3s due to one or more of a small number of services or population in an area, or potential identification of individual patients, practitioners or business entities.

Notes:

Some of the published SA3 rates were considered more volatile than others. These rates are excluded from the calculation of the difference between the highest and lowest SA3 rates in Australia.

For further detail about the methods used, please refer to the Technical Supplement.

Interpretation

Variation in rates of MBS-subsidised stress echocardiography is likely to be due to geographical differences in the factors discussed under 'Cardiac stress tests and imaging, 18 years and over' on page 188.

Addressing variation

Strategies for addressing variation in the use of stress echocardiography are discussed under 'Cardiac stress tests and imaging, 18 years and over' on page 189.

Resources

See 'Cardiac stress tests and imaging, 18 years and over' on page 198.

Australian initiatives

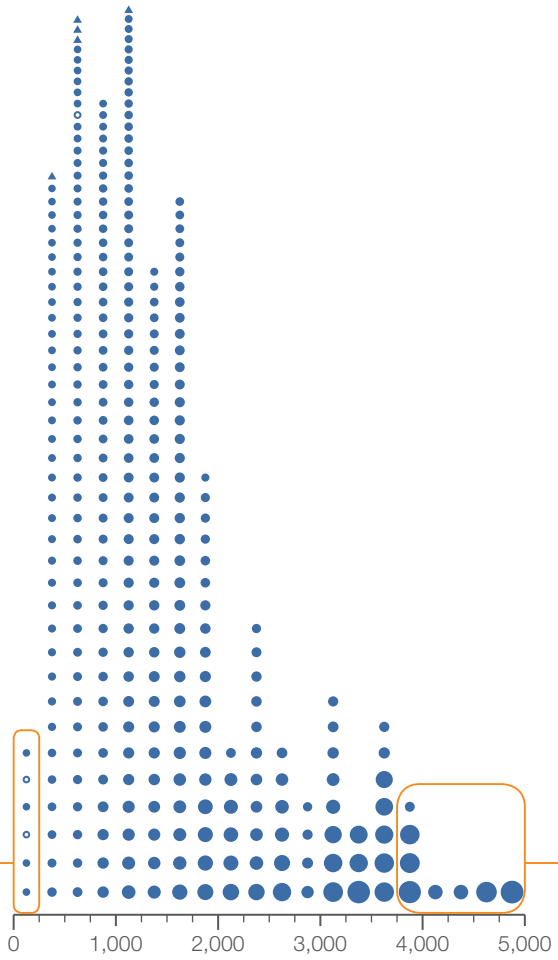
See 'Cardiac stress tests and imaging, 18 years and over' on page 198.

Notes:
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

Stress echocardiography, 18 years and over

Rates by local area

Figure 4.9: Number of MBS-subsidised services for stress echocardiography per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17



Lowest rate areas

SA3	State	Rate	Services
Eyre Peninsula and South West	SA	**104**	60
Goldfields	WA	**129**	32
Mid North	SA	**171**	50
East Pilbara	WA	**227***	34
West Pilbara	WA	**235***	42
Esperance	WA	**248**	40

Highest rate areas

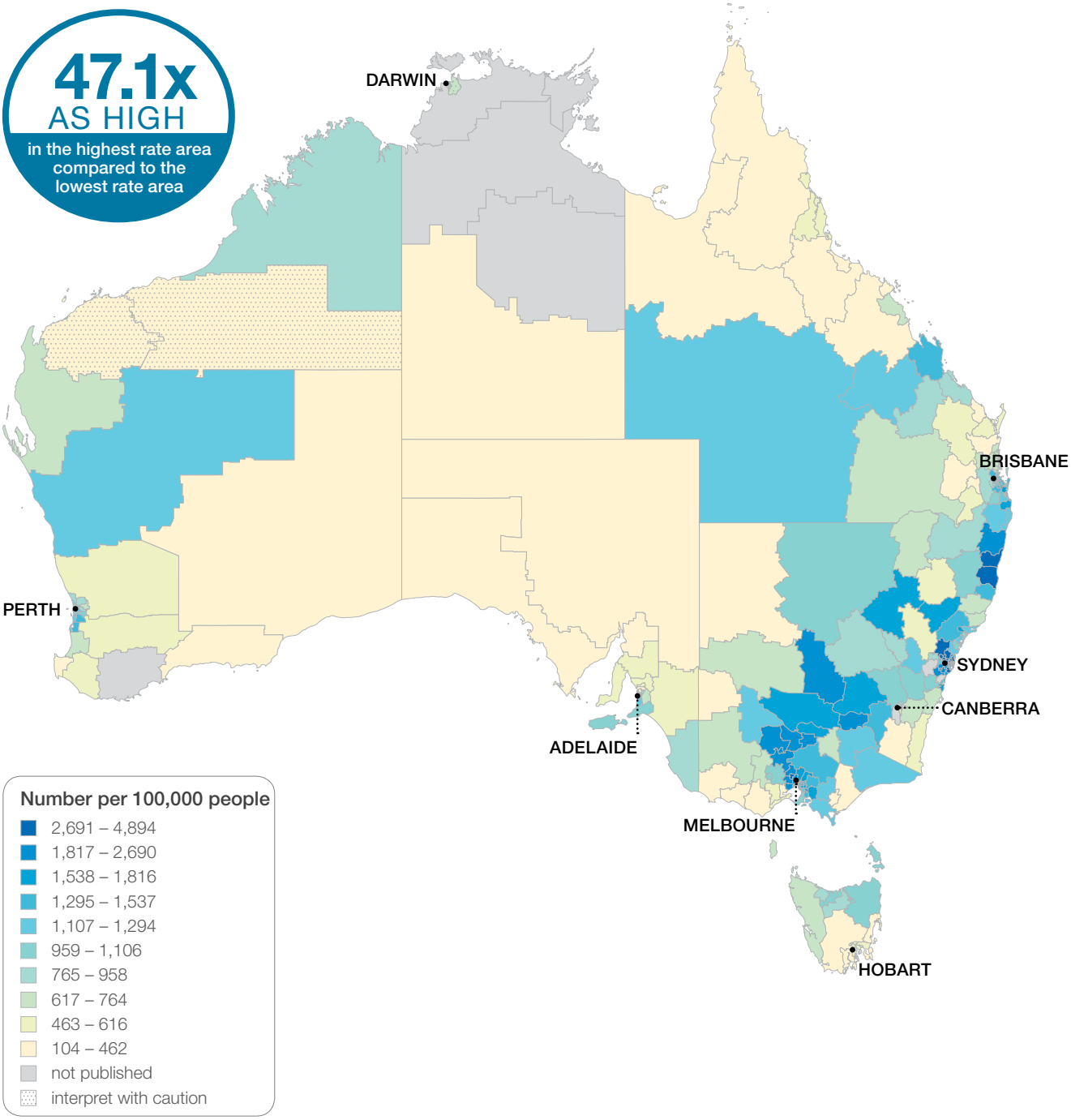
SA3	State	Rate	Services
Cronulla - Miranda - Caringbah	NSW	**4,894**	5,234
Sutherland - Menai - Heathcote	NSW	**4,713**	4,508
Blacktown - North	NSW	**4,261**	2,438
Kempsey - Nambucca	NSW	**4,123**	2,414
Baulkham Hills	NSW	**3,999**	5,057
Canterbury	NSW	**3,998**	4,276
Rouse Hill - McGraths Hill	NSW	**3,781**	864
Eastern Suburbs - South	NSW	**3,768**	4,147

Notes:
Hollow circles (○) and asterisks (*) indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
Triangles (▲) indicate SA3s where only rates are published. The numbers of services are not published for confidentiality reasons.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

Stress echocardiography, 18 years and over

Rates across Australia

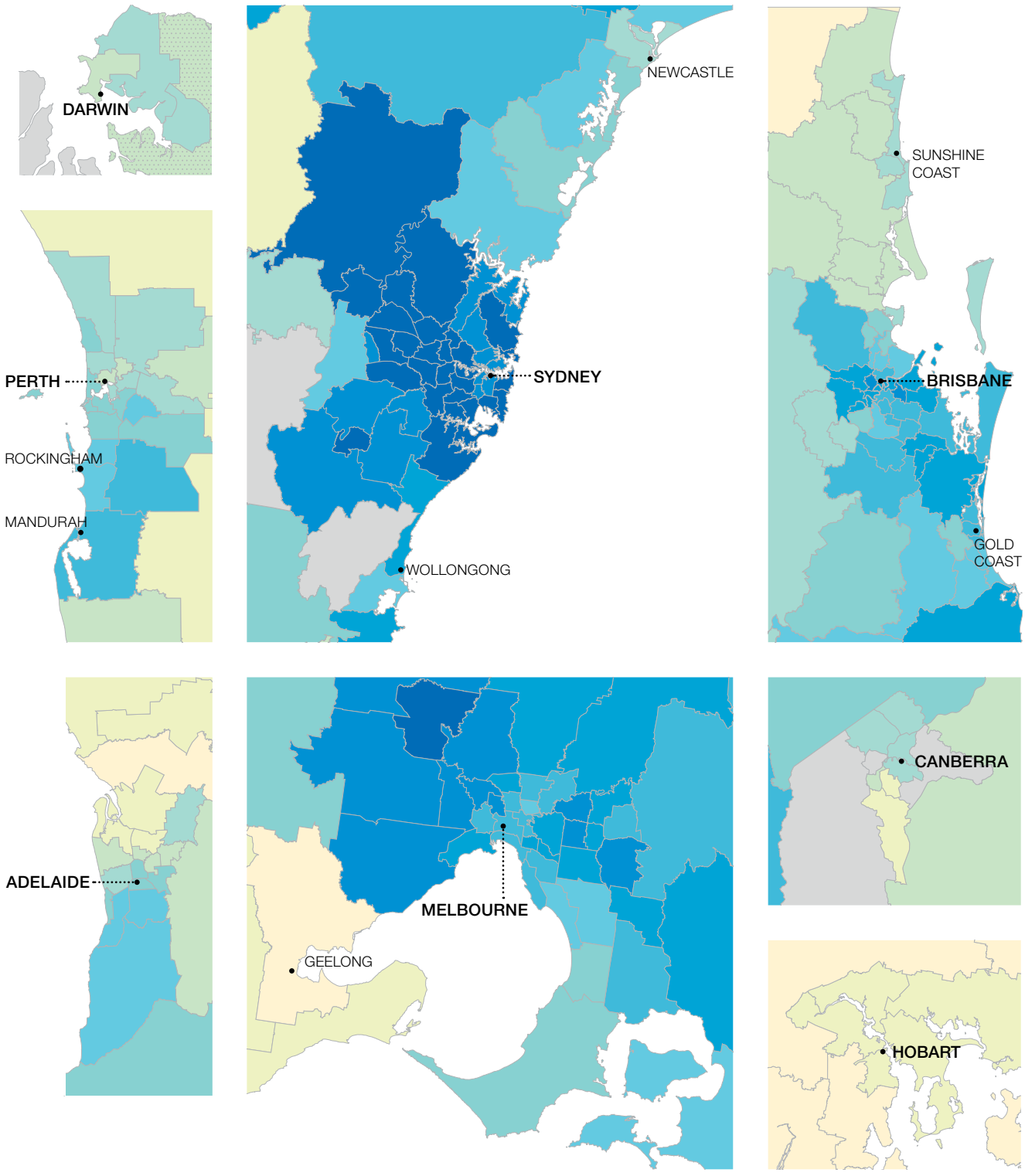
Figure 4.10: Number of MBS-subsidised services for stress echocardiography per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17



Notes:
Dotted areas indicate rates that are considered more volatile than other published rates and should be interpreted with caution. These rates are excluded from the calculation of the difference between the highest and lowest SA3 rates in Australia.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

Rates across capital city areas

Figure 4.11: Number of MBS-subsidised services for stress echocardiography per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17



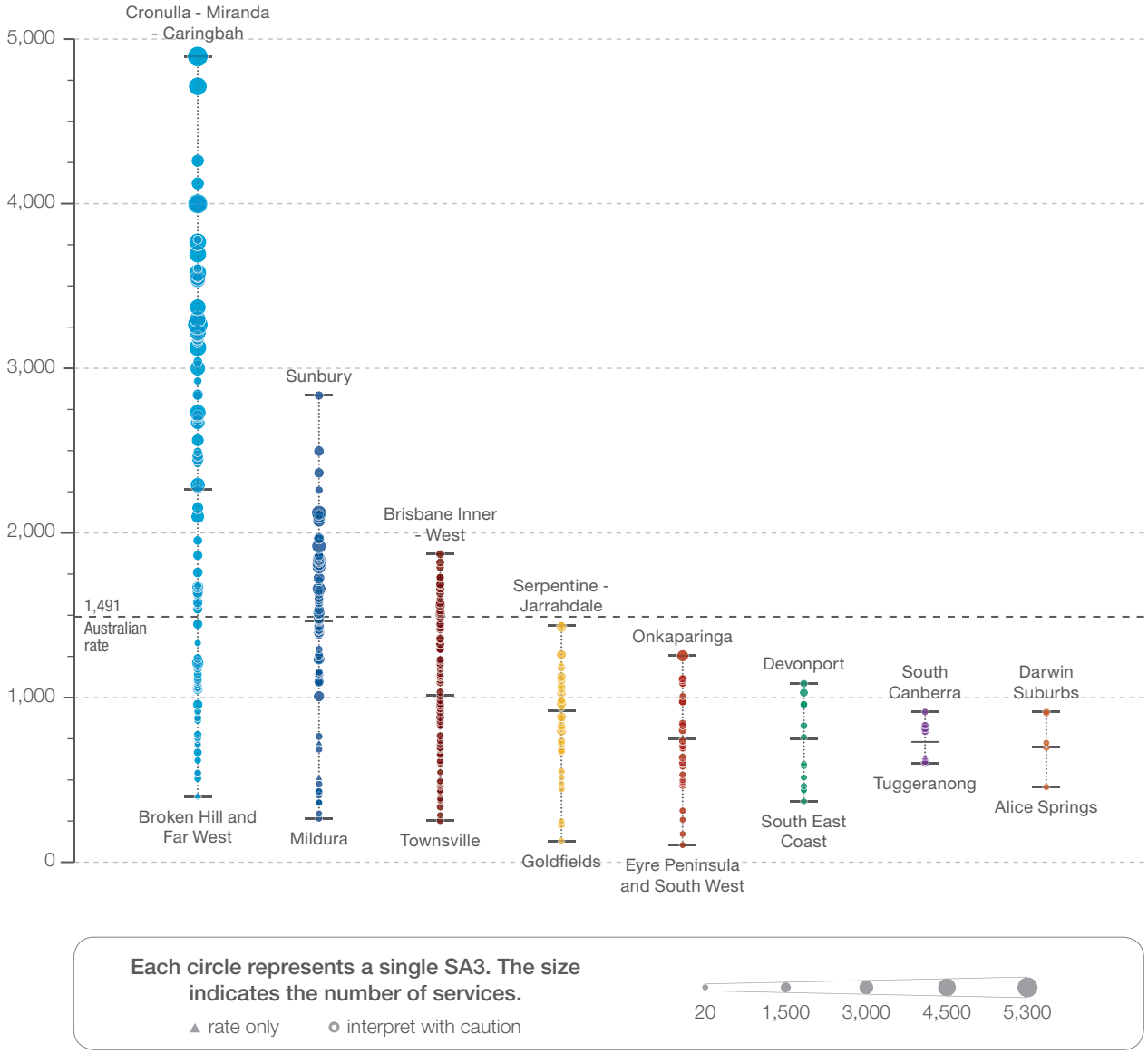
Notes:
Dotted areas indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

Stress echocardiography, 18 years and over

Rates by state and territory

Figure 4.12: Number of MBS-subsidised services for stress echocardiography per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17

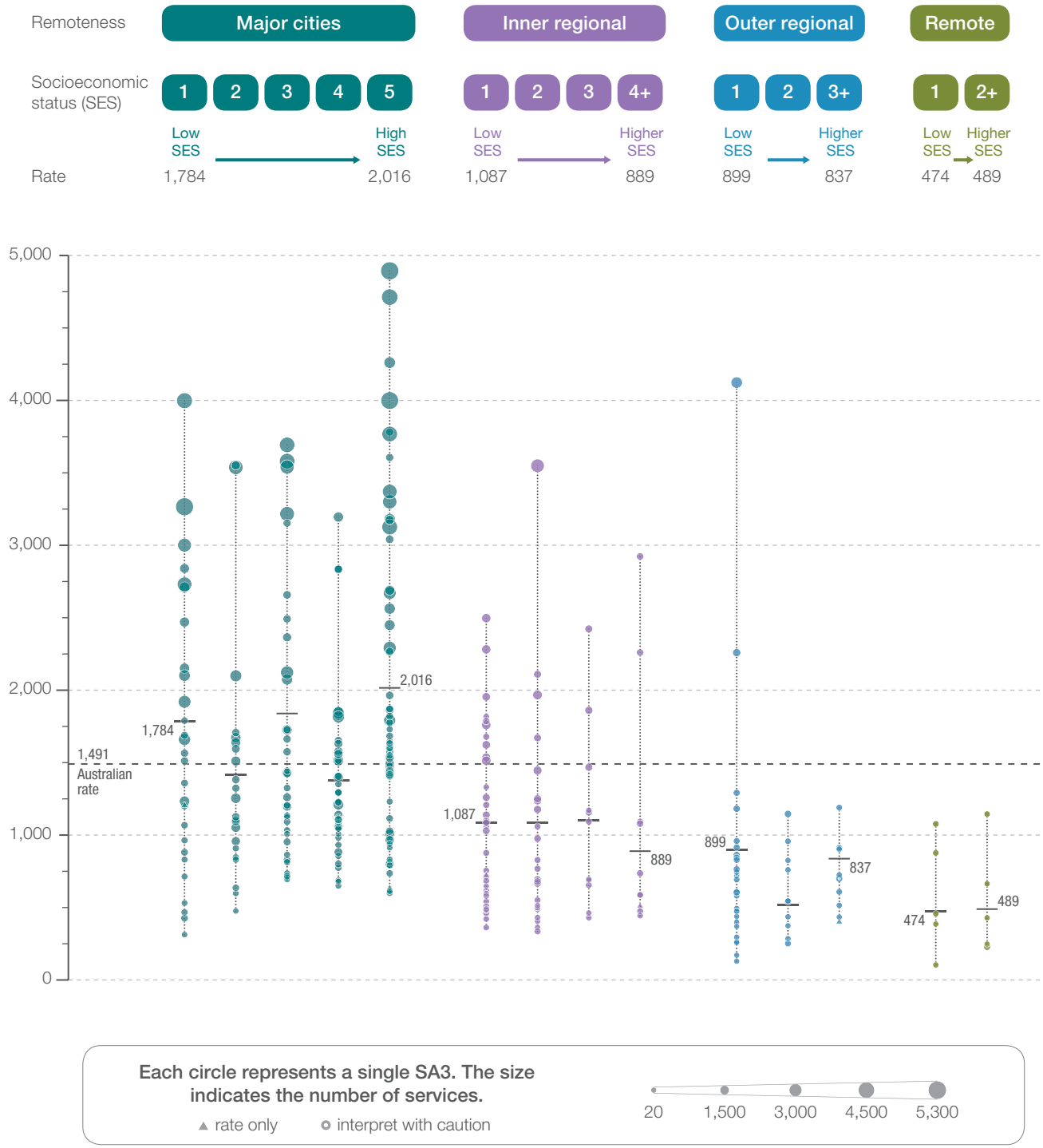
	NSW	Vic	Qld	WA	SA	Tas	ACT	NT
Highest rate	4,894	2,835	1,871	1,440	1,254	1,085	913	912
State/territory	2,265	1,465	1,014	920	747	749	731	698
Lowest rate	399	265	252	129	104	370	600	457
No. services	150,723	73,863	41,160	18,942	11,782	3,774	2,214	1,042



Notes:
Hollow circles (○) indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
Triangles (▲) indicate SA3s where only rates are published. The numbers of services are not published for confidentiality reasons.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

Rates by remoteness and socioeconomic status

Figure 4.13: Number of MBS-subsidised services for stress echocardiography per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17



Notes:
Hollow circles (○) indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
Triangles (▲) indicate SA3s where only rates are published. The numbers of services are not published for confidentiality reasons.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

Stress echocardiography, 18 years and over

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4.4 Standard echocardiography, 18 years and over

Why is this important?

Standard (or transthoracic) echocardiography is used for accurate diagnosis and treatment planning in people with symptoms suggestive of heart failure, structural heart diseases and other heart conditions. It is an important clinical tool, but a rapid increase in use of standard echocardiography has raised concerns that some use is not appropriate.

There are also concerns that standard echocardiography is not always available where it is needed most. The burden of cardiovascular disease is higher in regional and remote areas of Australia, and equitable access to standard echocardiography is important for improving cardiac care and outcomes for people living in these areas.

What did we find?

Rates of standard echocardiography vary up to about four-fold across local areas, and are higher in major cities and inner regional areas than in outer regional and remote areas.

What can be done?

Aligning the Medicare Benefits Schedule (MBS) item descriptors for standard echocardiography items with best-practice guidelines, as recommended by the MBS Review Taskforce, could improve the appropriateness of use.

A centralised system for storing images and reports in Australia could reduce unnecessary repeat requests because of difficulties accessing previous results. A combination of education, audit and feedback may be another viable strategy to reduce potential low-value echocardiography use and increase adherence to best-practice guidelines.

Reducing financial and geographic barriers to access is important for increasing equity of use of standard echocardiography. Barriers to access outside major cities include higher out-of-pocket costs for patients living in these areas.

Standard echocardiography, 18 years and over

Context

This data item examines the use of standard (or transthoracic) echocardiography, an ultrasound examination of the heart. The data presented for this item include echocardiography provided in the primary care and hospital settings. Use of stress echocardiography is discussed separately (see Section 4.2 'Stress echocardiography, 18 years and over', page 201).

Guidelines recommend echocardiography to investigate:

- Suspected heart failure or structural heart disease[1,2]
- Suspected or known ventricular hypertrophy or dysfunction[2]
- Valvular disease[3]
- Pulmonary hypertension[4]
- Congenital heart disease[5]
- Suspected or confirmed acute rheumatic fever.[6]

The most common of these is investigation of suspected heart failure or structural heart disease.[7] The clinical indications for the use of MBS-subsidised cardiac ultrasound services are specified in the item descriptors in the Health Insurance (Diagnostics Imaging Services Table) Regulations 2018.[8]

Echocardiography is an important clinical tool, but a rapid increase in use has led to concerns about inappropriate use in several countries.[9] Between 2012 and 2017, the number of echocardiography services grew by an average of 7% each year in Australia.[9] In the United Kingdom (UK), the rate increased by 7% each year between 2007 and 2013.[10] In the United States (US), the rate of echocardiography among Medicare beneficiaries increased by 8% per year in the early 2000s, prompting a number of measures to improve appropriateness of requests, including appropriate use criteria.[11-13]

Two Australian hospital-based studies have assessed reasons for echocardiography referrals against the US appropriate use criteria. The proportion of 'inappropriate' echocardiography referrals was 20% at a regional hospital, and 10% at a large tertiary hospital.[7,14] In the regional hospital, inappropriate echocardiography referrals were more common for outpatients than for inpatients (24.4% versus 9.6%). The most common inappropriate indication at both hospitals was for routine surveillance as part of regular follow-up in patients with stable chronic cardiac conditions, such as heart failure and coronary artery disease, with no change in clinical status.[7,14]

There have not been any similar analyses of Australian echocardiography referrals in community settings.

Comparison of international rates of echocardiography is limited by differences in data collection methods. Considerable variation in the use of echocardiography has been noted between different areas within Australia[15] previously, and within the US[12] and the UK.[10]

Cardiovascular disease deaths are the greatest contributor to the mortality gap between Aboriginal and Torres Strait Islander Australians and other Australians.[16] Aboriginal and Torres Strait Islander Australians have higher rates of heart failure and rheumatic heart disease (which damages heart valves) than other Australians[17-19] and would be expected to have greater need for echocardiography.

Cardiovascular disease is a greater contributor to fatal disease burden among Aboriginal and Torres Strait Islander adults living in remote areas compared with those living in non-remote areas.[19] Poor access to echocardiography in regional and remote areas is likely to disproportionately affect Aboriginal and Torres Strait Islander Australians living in these areas.

About the data

Data are sourced from the MBS dataset. This dataset includes information on MBS claims processed by the Australian Government Department of Human Services. It covers a wide range of services (attendances, procedures, tests) provided across primary care and hospital settings.

The dataset does not include:

- Services for publicly funded patients in hospitals
- Services for patients in hospital outpatient clinics where claims are not made to the MBS
- Services covered under Department of Veterans' Affairs arrangements.

Rates are based on the number of MBS-subsidised services for standard echocardiograms per 100,000 people aged 18 years and over in 2016–17.

Because an MBS claim is included for each service rather than for each patient, patients who receive any of the services listed in this data item more than once in the financial year will have more than one MBS claim counted.

The analysis and maps are based on the residential address of the patient recorded in the MBS claim and not the location of the service.

Rates are age and sex standardised to allow comparisons between populations with different age and sex structures.

This analysis was not undertaken by Aboriginal and Torres Strait Islander status because this information was not available for the MBS data at the time of publication.

What do the data show?

Magnitude of variation

In 2016–17, there were 945,056 MBS-subsidised services for standard echocardiography, representing 4,599 services per 100,000 people aged 18 years and over (the Australian rate).

The number of MBS-subsidised services for standard echocardiography across 328* local areas (Statistical Area Level 3 – SA3) ranged from 2,279 to 7,957 per 100,000 people aged 18 years and over. The rate was **3.5 times as high** in the area with the highest rate compared to the area with the lowest rate. The number of services varied across states and territories, from 2,624 per 100,000 people aged 18 years and over in Tasmania to 5,309 in New South Wales (Figures 4.20–4.23).

After the highest and lowest 10% of results were excluded and 264 SA3s remained, the number of services per 100,000 people aged 18 years and over was 2.1 times as high in the area with the highest rate compared to the area with the lowest rate.

Analysis by remoteness and socioeconomic status

Rates of standard echocardiography were higher in major cities and inner regional areas than in outer regional and remote areas. There was no clear pattern according to socioeconomic status (Figure 4.24).

* There are 340 SA3s. For this item, data were suppressed for 12 SA3s due to one or more of a small number of services or population in an area, or potential identification of individual patients, practitioners or business entities.

Notes:

Some of the published SA3 rates were considered more volatile than others. These rates are excluded from the calculation of the difference between the highest and lowest SA3 rates in Australia.

For further detail about the methods used, please refer to the Technical Supplement.

Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

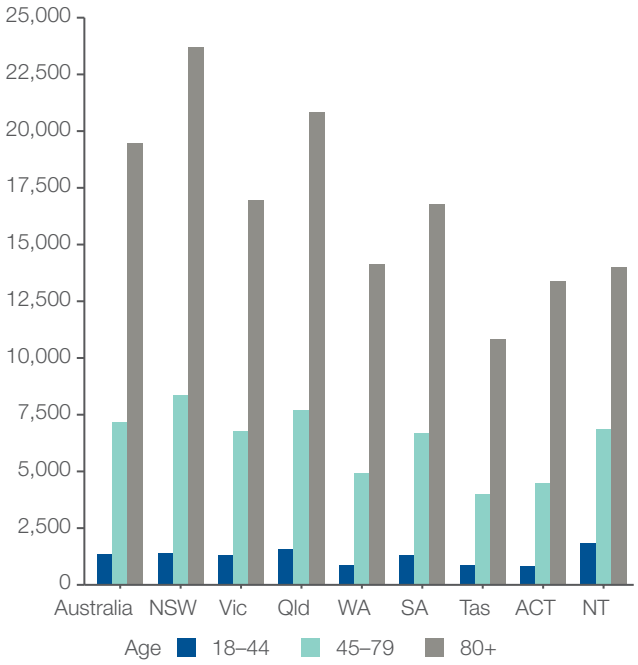
Standard echocardiography, 18 years and over

Analysis by age group

Rates of standard echocardiography were highest for the 80 years and over age group. The national rate for this age group was 19,469 services per 100,000 people and varied from 10,829 services per 100,000 people in Tasmania to 23,703 services per 100,000 people in New South Wales.

The national rate for tests performed on the 80 years and over age group was 2.7 times as high as the rate for the 45–79 years age group (which had the next highest rate). This pattern was consistent across all states and territories (Figure 4.19).

Figure 4.19: Number of MBS-subsidised services for standard echocardiography per 100,000 people by age group, age and sex standardised, by state and territory of patient residence, by age group, 2016–17



The data for Figure 4.19 are available at www.safetyandquality.gov.au/atlas

Interpretation

In addition to overarching reasons for variation discussed under 'Cardiac stress tests and imaging, 18 years and over' on page 188, variation in rates of use of MBS-subsidised standard echocardiography is likely to be due to geographical differences in the factors discussed below.

Rates of underlying disease

Variation is warranted and desirable when it reflects variation in the underlying need for care. Groups with higher rates of cardiovascular disease have greater need for cardiac tests, which should influence the variation in rates of use of these tests. The need for echocardiography is likely to be higher in areas with higher rates of heart failure and other relevant conditions, such as rheumatic heart disease. Rates of cardiovascular disease increase with age and socioeconomic disadvantage.[17]

Rates of heart failure and rheumatic heart disease are also higher among Aboriginal and Torres Strait Islander Australians than among other Australians.[18,19] Areas with larger proportions of Aboriginal and Torres Strait Islander people would be expected to show higher rates of echocardiography. The Northern Territory Rheumatic Heart Disease Control Program may account for higher rates of echocardiography in some areas of the Northern Territory.[20]

Access to services

Variation in echocardiography rates is likely to reflect differences in geographical and financial access to services, both for referral and for performance of echocardiography.[15] A previous analysis of outpatient cardiac imaging in Australia found that the local availability of doctors was the strongest correlate of echocardiography rates.[15]

Notes:
For further information about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule and ABS Estimated Resident Population 30 June 2016.

In the same study, greater socioeconomic advantage was also correlated with higher use of echocardiography.[15] Out-of-pocket costs for imaging are likely to be a barrier for socioeconomically disadvantaged populations. The average out-of-pocket cost for standard echocardiography in Australia was $102 in 2014.[21]

Clinical decision-making

Clinicians' differing thresholds for echocardiography referral may contribute to variation. For example, greater use of repeat testing by clinicians for individual patients may influence the patterns seen. In a recent study of Australian doctors' decision-making about cardiac imaging, greater experience and training were flagged as an important factor in selecting appropriate patients for echocardiography.[22]

Availability of previous echocardiography results

In a qualitative study of Australian hospital doctors, lack of availability of previous test results, even if recent, was cited as a common reason for requesting an echocardiogram.[22] It has been suggested that requesting of repeat tests contributes to the higher echocardiography rates in large Australian cities, where there are several referral centres.[15]

Funding models

As is the case for cardiac stress tests and imaging, the funding models of echocardiography services available in an area, and the relative accessibility of these services to patients, may influence the variation seen. For example, the rates of cardiac testing seen in the Northern Territory and remote Western Australia may be low because a higher proportion of tests in these areas is done for public patients in hospital outpatient clinics (which are not counted in this data item). In contrast, the rates in New South Wales may be high because there are many locations in New South Wales where services and investigations undertaken in public hospital outpatient clinics are claimed through the MBS under specialist medical practitioner rights of private practice arrangements.

Patient and referrer expectations

According to a sample of Australian doctors who request echocardiograms, patients often expect a test to be done.[22] Doctors interviewed for the study thought that patient expectations were influenced by information found on the internet, the level of patients' private insurance cover and referral to a cardiologist.[22]

Addressing variation

Strategies for addressing variation in the use of echocardiography are discussed below.

The Cardiac Services Clinical Committee of the MBS Review Taskforce recently recommended to the Australian Government that MBS items for echocardiography be restructured into six new items that align with best-practice guidelines.[8] The committee also recommended including these items in an online checker tool to determine eligibility of requests for echocardiography.[8] A previous poor-quality echocardiogram is a common indication for a repeat echocardiogram. The Cardiac Services Clinical Committee recommended that the MBS item descriptors be revised to reflect the Cardiac Society of Australia and New Zealand's position statement for training and performance in adult echocardiography.[9,23]

Other strategies that have been proposed to better target use of echocardiography to patient need in Australia include US-style appropriateness criteria; a combination of education, audit and feedback; a centralised system for storage of imaging reports; and reducing financial and geographic barriers to access. These strategies are discussed below.

In response to a rapid increase in use of echocardiography in the early 2000s, the American College of Cardiology and others published appropriate use criteria for echocardiography in 2007, followed by an update in 2011.[24-27] US Medicare reimbursement cuts for echocardiography were also made in the US in 2005 and 2007.[28] Rates of echocardiography among Medicare beneficiaries plateaued from 2007.[12]

Standard echocardiography, 18 years and over

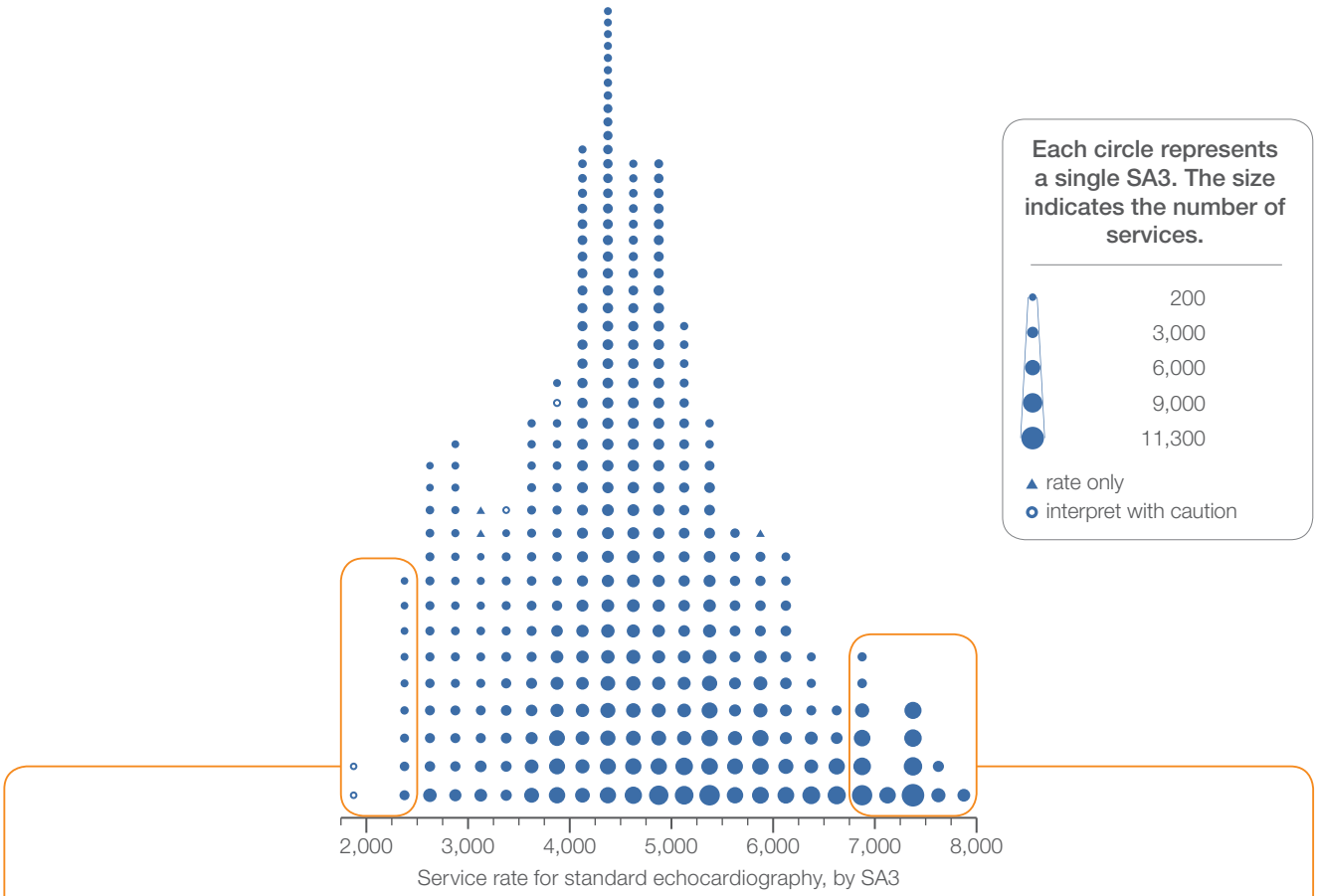
Some have suggested that incorporating the US appropriate use criteria for echocardiography into Australian practice has the potential to improve patient outcomes, contain costs and reduce variation.[29] However, Australian practice relies heavily on US and European guidelines, and inconsistencies between these guidelines and the US appropriate use criteria should be addressed before considering their application in Australia.[29] In addition, Australian research into the decision-making process of doctors requesting cardiac imaging argues against using appropriateness criteria, as other factors are stronger influences.[22] These factors include training, experience, management of patient expectations, and accessibility of services.[22] Investigating aspects of bulk-billing practices and cardiology practice models that influence rates of cardiac testing, and the choice of tests, could point to other system-level changes to improve appropriate use.

A centralised system for storing images and reports in Australia could reduce unnecessary repeat requests because of difficulties accessing previous results.[8] Repeat echocardiograms within the same year account for 11% of MBS echocardiography services, and repeats within a five-year window account for 40% of services.[8] An Australian qualitative study has reported that requesting of repeat echocardiograms occurs because a patient's recent echocardiogram results could not be obtained.[22]

A combination of education, audit and feedback may be another viable strategy to reduce potential low-value echocardiography use and increase adherence to best-practice guidelines.[30,31] Also, given the burden of disease in Aboriginal and Torres Strait Islander Australians, collecting accurate MBS data on services to these groups would be valuable for gaining further understanding of where improvements are most needed.

Rates by local area

Figure 4.20: Number of MBS-subsidised services for standard echocardiography per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17



Lowest rate areas

SA3	State	Rate	Services
East Pilbara	WA	**1,785***	203
West Pilbara	WA	**1,906***	248
Mundaring	WA	**2,279**	865
West Coast	Tas	**2,329**	378
Bayswater - Bassendean	WA	**2,335**	1,670
Belmont - Victoria Park	WA	**2,375**	1,293
Meander Valley - West Tamar	Tas	**2,388**	567
Swan	WA	**2,390**	2,054
Esperance	WA	**2,396**	352
Huon - Bruny Island	Tas	**2,446**	497
Central Highlands (Tas)	Tas	**2,469**	256

Highest rate areas

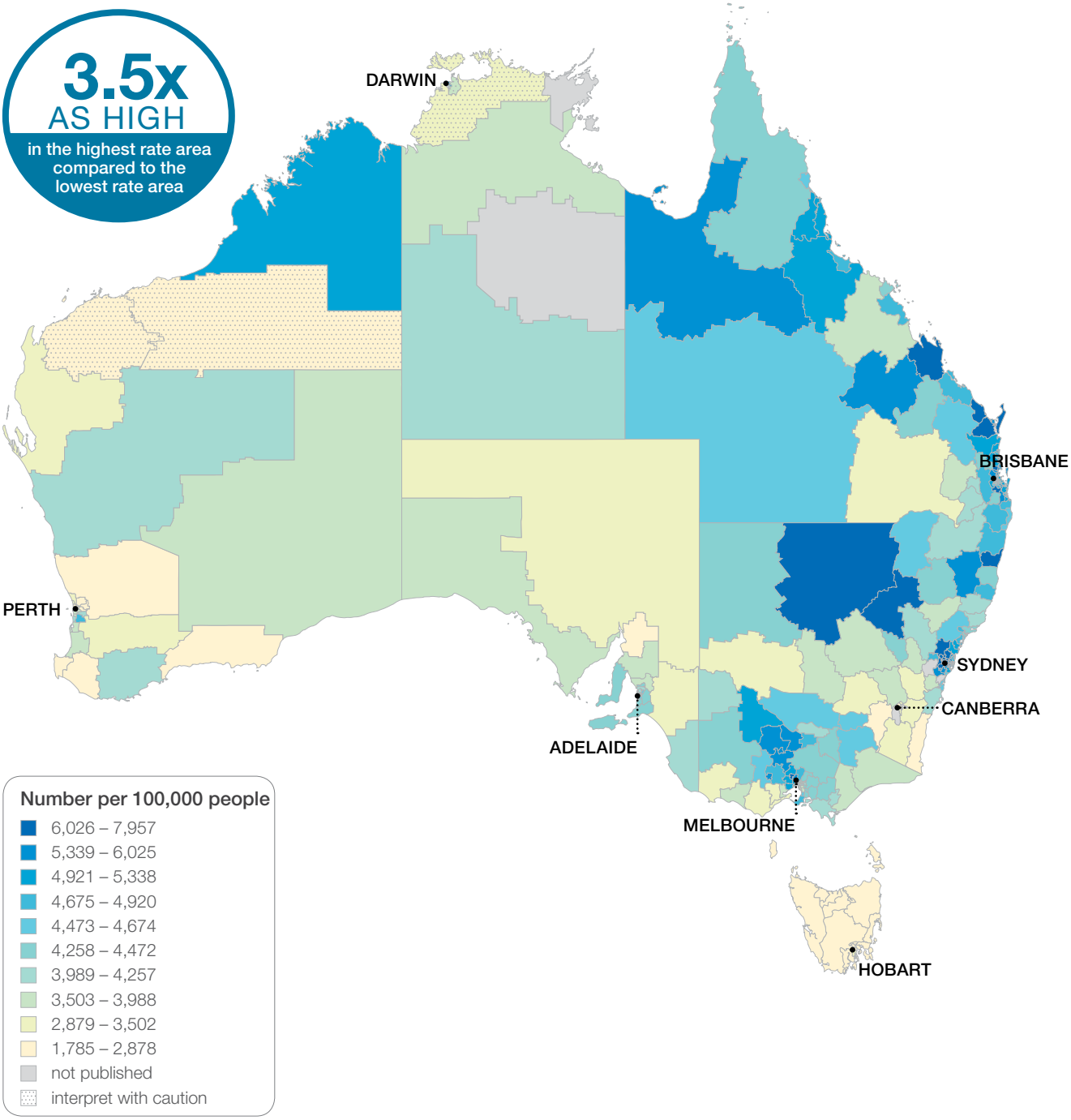
SA3	State	Rate	Services
Blacktown - North	NSW	**7,957**	4,079
Dubbo	NSW	**7,626**	5,083
St Marys	NSW	**7,625**	2,855
Blacktown	NSW	**7,426**	7,566
Fairfield	NSW	**7,277**	11,282
Penrith	NSW	**7,269**	7,265
Merrylands - Guildford	NSW	**7,268**	8,241
Bundaberg	Qld	**7,051**	6,842
Mount Druitt	NSW	**6,999**	5,136
Rouse Hill - McGraths Hill	NSW	**6,976**	1,450
Canterbury	NSW	**6,966**	7,660
Rockhampton	Qld	**6,898**	6,902
Dural - Wisemans Ferry	NSW	**6,839**	1,776
Bankstown	NSW	**6,792**	9,606

Notes:
Hollow circles (○) and asterisks (*) indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
Triangles (▲) indicate SA3s where only rates are published. The numbers of services are not published for confidentiality reasons.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

Standard echocardiography, 18 years and over

Rates across Australia

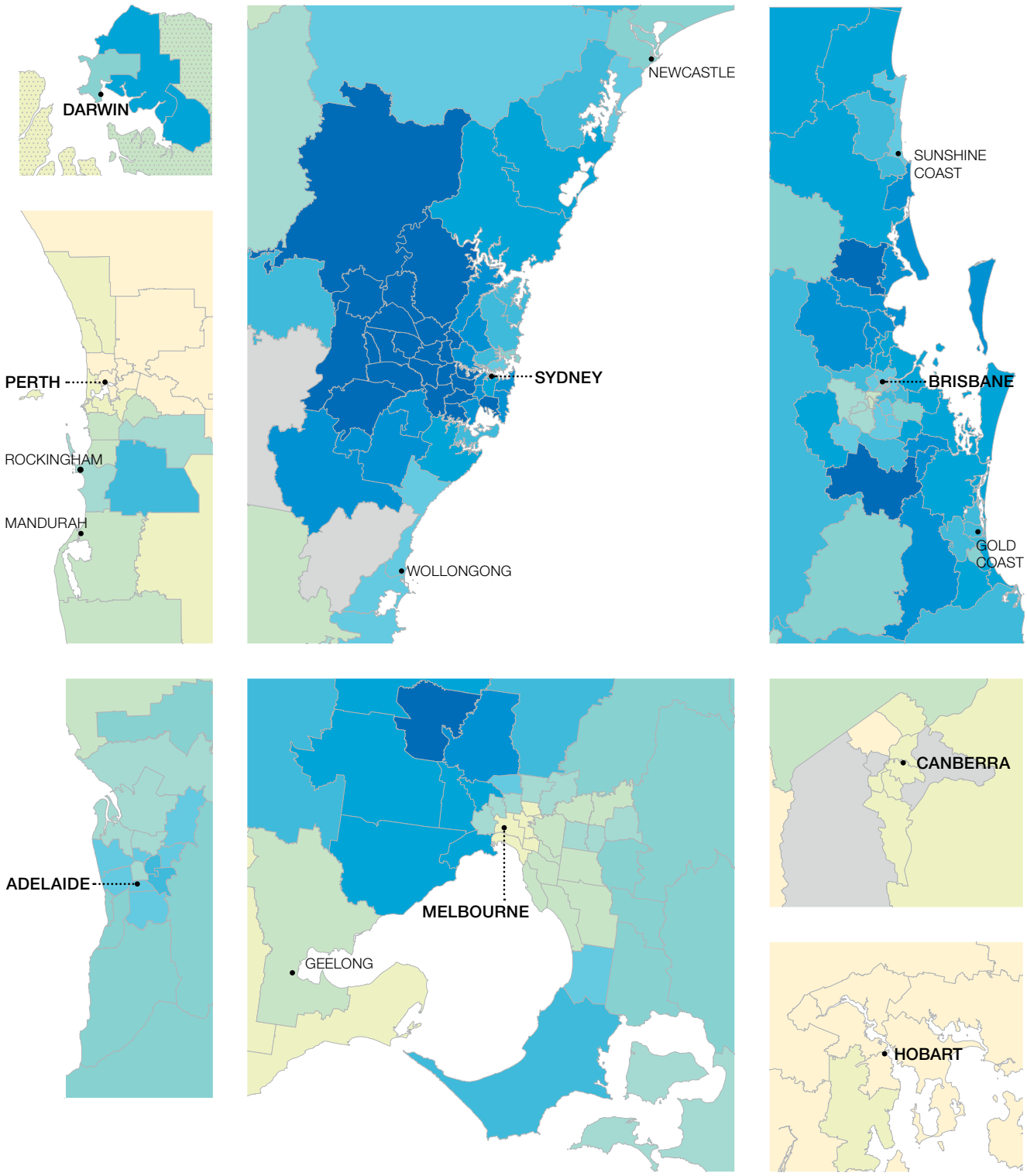
Figure 4.21: Number of MBS-subsidised services for standard echocardiography per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17



Notes:
Dotted areas indicate rates that are considered more volatile than other published rates and should be interpreted with caution. These rates are excluded from the calculation of the difference between the highest and lowest SA3 rates in Australia.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

Rates across capital city areas

Figure 4.22: Number of MBS-subsidised services for standard echocardiography per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17



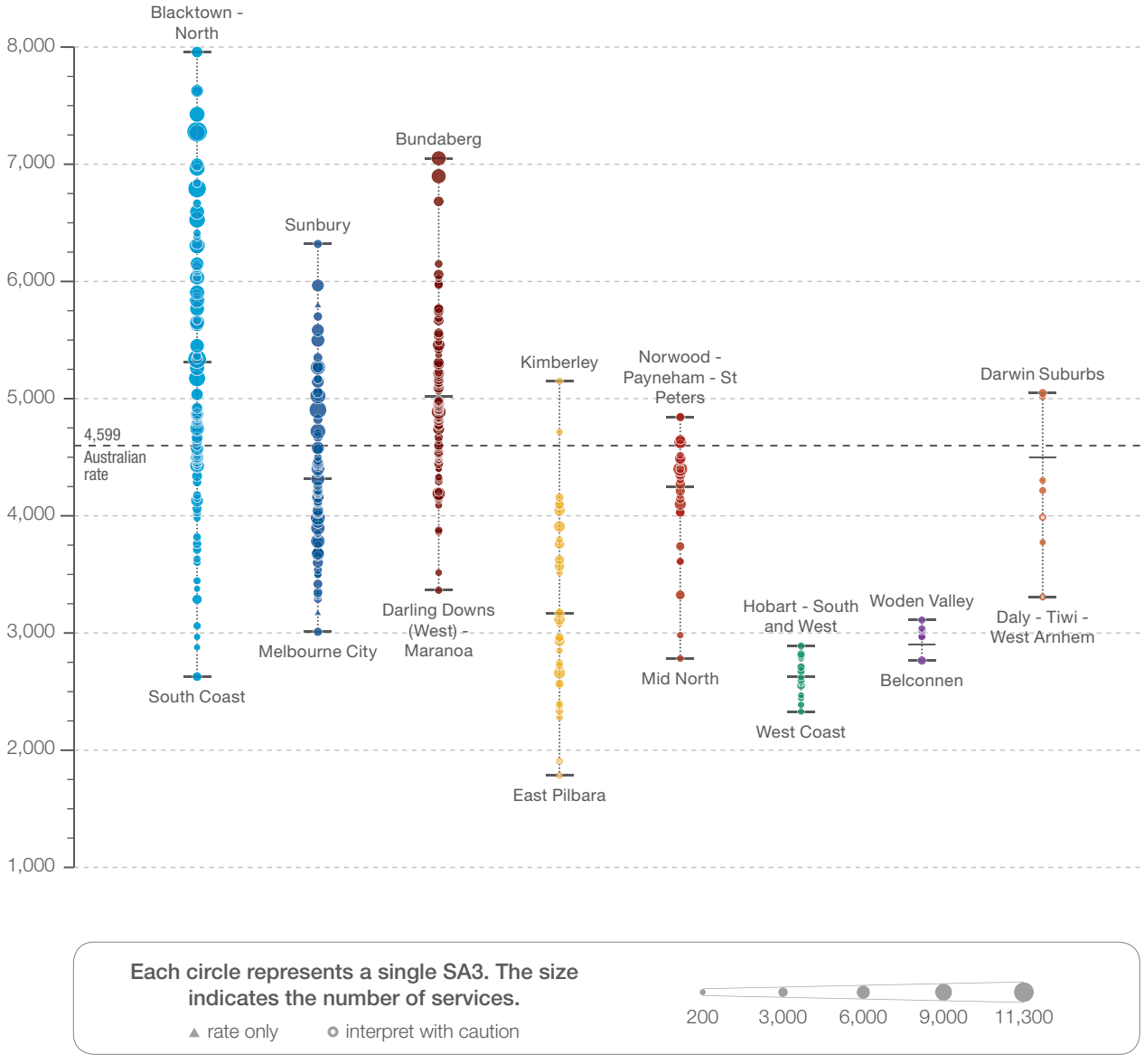
Notes:
Dotted areas indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

Standard echocardiography, 18 years and over

Rates by state and territory

Figure 4.23: Number of MBS-subsidised services for standard echocardiography per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17

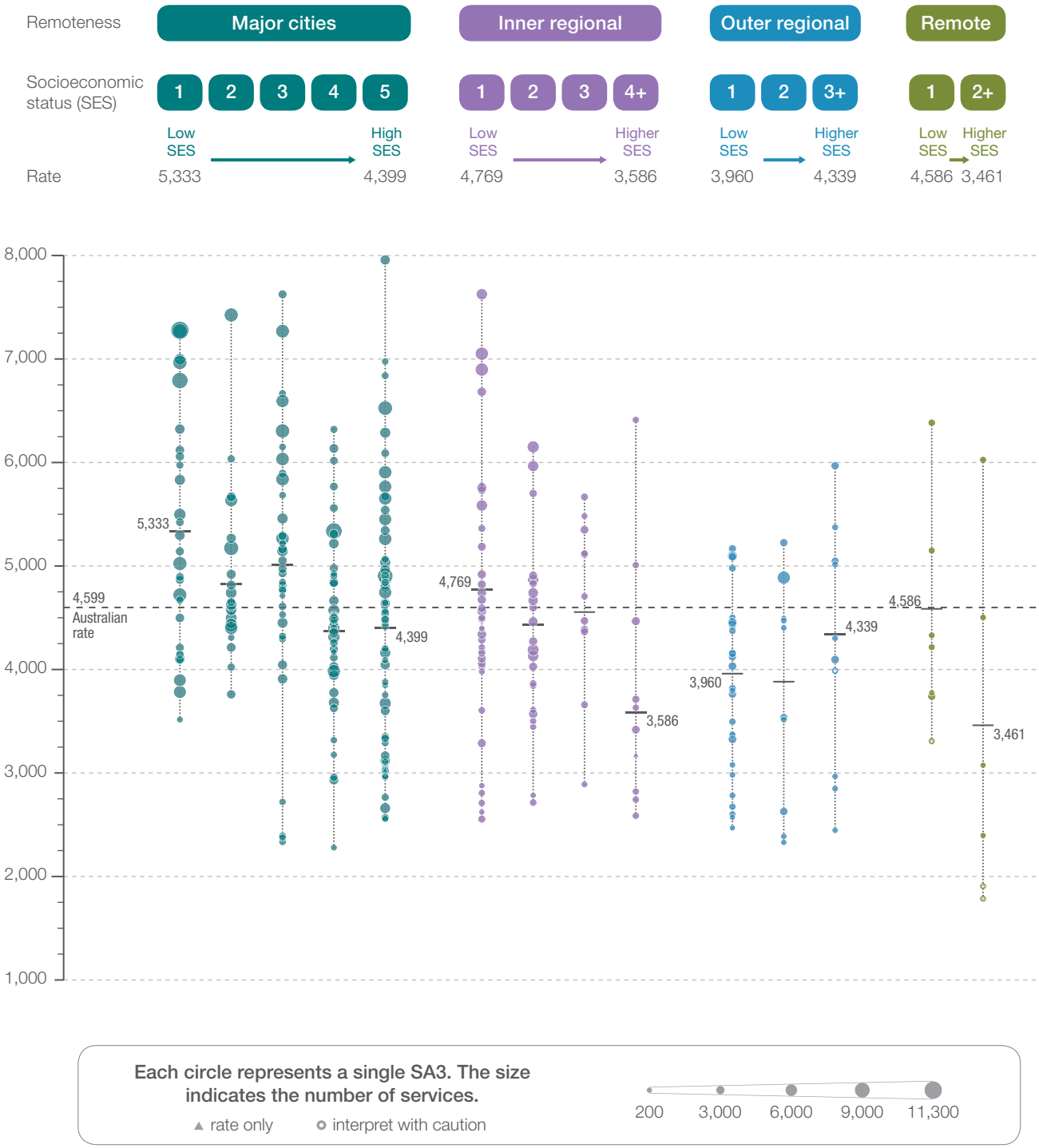
	NSW	Vic	Qld	WA	SA	Tas	ACT	NT
Highest rate	7,957	6,320	7,051	5,149	4,843	2,890	3,111	5,048
State/territory	5,309	4,316	5,016	3,167	4,250	2,624	2,902	4,499
Lowest rate	2,628	3,010	3,365	1,785*	2,783	2,329	2,765	3,307*
No. services	359,202	224,211	200,703	64,222	68,247	13,211	8,590	6,582



Notes:
Hollow circles (o) and asterisks (*) indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
Triangles (▲) indicate SA3s where only rates are published. The numbers of services are not published for confidentiality reasons.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

Rates by remoteness and socioeconomic status

Figure 4.24: Number of MBS-subsidised services for standard echocardiography per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17



Notes:
Hollow circles (○) indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
Triangles (▲) indicate SA3s where only rates are published. The numbers of services are not published for confidentiality reasons.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

Standard echocardiography, 18 years and over

Resources

- *Therapeutic Guidelines: Cardiovascular*[32] (for electronic version, visit https://tgldcdp.tg.org.au/etgcomplete)
- US appropriate use criteria for echocardiography[27]
- British Society of Echocardiography, clinical indications for echocardiography[33]
- American Society of Echocardiography, clinical guidelines on use of echocardiography in various conditions.[34]

Australian initiatives

The information in this chapter will complement work already under way to improve the appropriate use of echocardiography in Australia. At a national level, this work includes:

- MBS Review Taskforce Cardiac Services Clinical Committee, review including recommendations about cardiac tests[9]
- The Better Cardiac Care for Aboriginal and Torres Strait Islander People project.

Many state and territory initiatives are also in place, including:

- Implementation of initiatives in New South Wales to improve cardiovascular care for Aboriginal and Torres Strait Islander people
  - NSW Ministry of Health provides echocardiography machines for loan through the Poche Centre for Indigenous Health at the University of Sydney, for clinicians visiting Aboriginal health services
  - NSW Ministry of Health is part of the national Better Cardiac Care for Aboriginal and Torres Strait Islander People (Better Cardiac Care) initiative
- Implementation of the Victorian cardiac services plan – *Design, Service and Infrastructure Plan for Victoria's Cardiac System*.[35]

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4.3 Myocardial perfusion scans, 18 years and over

What did we find?

Rates for myocardial perfusion scans (MPS) vary up to about 60-fold across local areas, and are higher in major cities and inner regional areas than in outer regional and remote areas.

Context

MPS is a radionuclide imaging test of cardiac perfusion and function, with and without exercise. It is used to investigate symptoms of coronary artery disease, and allows evaluation of cardiac perfusion and function at rest and during stress.[1] MPS is also known as myocardial perfusion imaging.

Indications for MPS include:

- Symptoms suggesting angina
- Acute chest pain
- Recent acute coronary syndrome
- Known coronary artery disease and new or worsening symptoms
- Previous coronary revascularisation
- Valvular heart disease.[1,2]

MPS is not appropriate for screening of asymptomatic low-risk patients.[2]

The rate of MPS use in Australia rose by 51% between 1999 and 2007 and then fell by 16% between 2007 and 2017.[3] Canada has shown a smaller but similar pattern of rise and fall: MPS use rose by 7% from 1992 to 2001, and fell by 8.2% from 2008 to 2014.[4]

Appropriate use of MPS

A stress electrocardiogram (ECG) may be the appropriate first step for many low-risk patients with symptoms of coronary heart disease, as it can provide the required information without exposing the patient to radiation and at less cost to the health system than other cardiac tests.[2,5,6] If a stress ECG is not available, or would not give the required clinical information, stress echocardiography is generally preferred over MPS, again because it does not involve radiation exposure and is less costly to the health system.[2]

Myocardial perfusion scans, 18 years and over

MPS provides better clinical information than stress echocardiography for some patients.[2] MPS may also be appropriate for patients who are not good candidates for stress echocardiography (for example, patients who are unable to exercise).[2] See Section 4.1 'Cardiac tests and imaging, 18 years and over' (page 183) for a discussion of the role of MPS compared with other cardiac tests.

Access to MPS

Availability of MPS and other cardiac tests varies according to location in Australia.[7] Availability of tests will reflect geographic availability of the required expertise. A previous study of variation in cardiac testing in Australia found that rates of echocardiography and stress echocardiography were strongly correlated with the local availability of doctors, whereas rates of MPS were not.[8]

An MPS has a lower out-of-pocket cost for the patient than a stress echocardiogram. This may encourage referrers to request an MPS, even if a stress echocardiogram is appropriate, and this may be more common in socioeconomically disadvantaged areas. More than 95% of MPS studies are bulk-billed, compared with 70% of stress echocardiograms.[5]

The Cardiac Services Clinical Committee of the Medicare Benefits Schedule (MBS) Review Taskforce reviewed cardiac imaging tests and commented that, although it would be preferable for all patients to have easy access to stress echocardiography, this is unlikely to be achieved in the short term.[5] The committee recommended retaining MBS reimbursement for MPS as a first-line investigation for patients who cannot access stress echocardiography because of distance, waiting time or out-of-pocket costs for stress echocardiography in their area.[5] The committee noted that, given the differing cost and radiation exposure of these cardiac tests, the patient should be fully informed and involved in the decision about which test should be requested.

About the data

Data are sourced from the MBS dataset. This dataset includes information on MBS claims processed by the Australian Government Department of Human Services. It covers a wide range of services (attendances, procedures, tests) provided across primary care and hospital settings.

The dataset does not include:

- Services for publicly funded patients in hospitals
- Services for patients in hospital outpatient clinics where claims are not made to the MBS
- Services covered under Department of Veterans' Affairs arrangements.

Rates are based on the number of MBS-subsidised services for MPS per 100,000 people aged 18 years and over in 2016–17.

Because an MBS claim is included for each service rather than for each patient, patients who receive any of the services listed in this data item more than once in the financial year will have more than one MBS claim counted.

The analysis and maps are based on the residential address of the patient recorded in the MBS claim and not the location of the service.

Rates are age and sex standardised to allow comparisons between populations with different age and sex structures.

This analysis was not undertaken by Aboriginal and Torres Strait Islander status because this information was not available for the MBS data at the time of publication.

Data suppression

For all items in the Atlas, some data have been suppressed to manage the low number of events and/or very small populations in some areas, to protect the identity of patients and providers. This process takes into account the Australian Government Department of Health's requirements for reporting MBS data (see Technical Supplement).

The process has resulted in particularly marked data suppression for MPS MBS items. This is indicated on the maps in grey. Most local areas (Statistical Area Level 3 – SA3) were suppressed to prevent identification of the provider (practitioner or business entity). The effect of data suppression was greatest in inner and outer regional and remote areas:

- Overall, 62 SA3s were suppressed, which represents 18% of all SA3s and 8% of all services
- 37 SA3s were suppressed to prevent identification of the provider
- The proportion of SA3s suppressed in each remoteness category was 3% in major cities, 26% in inner regional areas, 43% in outer regional areas and 74% in remote areas.

What do the data show?

Magnitude of variation

In 2016–17, there were 79,905 MBS-subsidised services for MPS, representing 384 services per 100,000 people aged 18 years and over (the Australian rate).

The number of MBS-subsidised services for MPS across 278* local areas (Statistical Area Level 3 – SA3) ranged from 29 to 1,652 per 100,000 people aged 18 years and over. The rate was **57.0 times as high** in the area with the highest rate compared to the area with the lowest rate. The number of services varied across states and territories, from 182 per 100,000 people aged 18 years and over in South Australia to 485 in New South Wales (Figures 4.14–4.17).

After the highest and lowest 10% of results were excluded and 224 SA3s remained, the number of services per 100,000 people aged 18 years and over was 4.9 times as high in the area with the highest rate compared to the area with the lowest rate.

Analysis by remoteness and socioeconomic status

Rates of MPS were higher in major cities and inner regional areas than in other remote areas. Rates were higher in areas with lower socioeconomic status in major cities, and inner regional and remote areas. There was no clear pattern according to socioeconomic status in outer regional areas (Figure 4.18).

Interpretation

Variation in rates of MBS-subsidised MPS is likely to be due to geographical differences in the factors discussed under 'Cardiac stress tests and imaging, 18 years and over' on page 188.

Addressing variation

Strategies for addressing variation in the use of MPS are discussed under 'Cardiac stress tests and imaging, 18 years and over' on page 189.

Resources

See 'Cardiac stress tests and imaging, 18 years and over' on page 198.

Australian initiatives

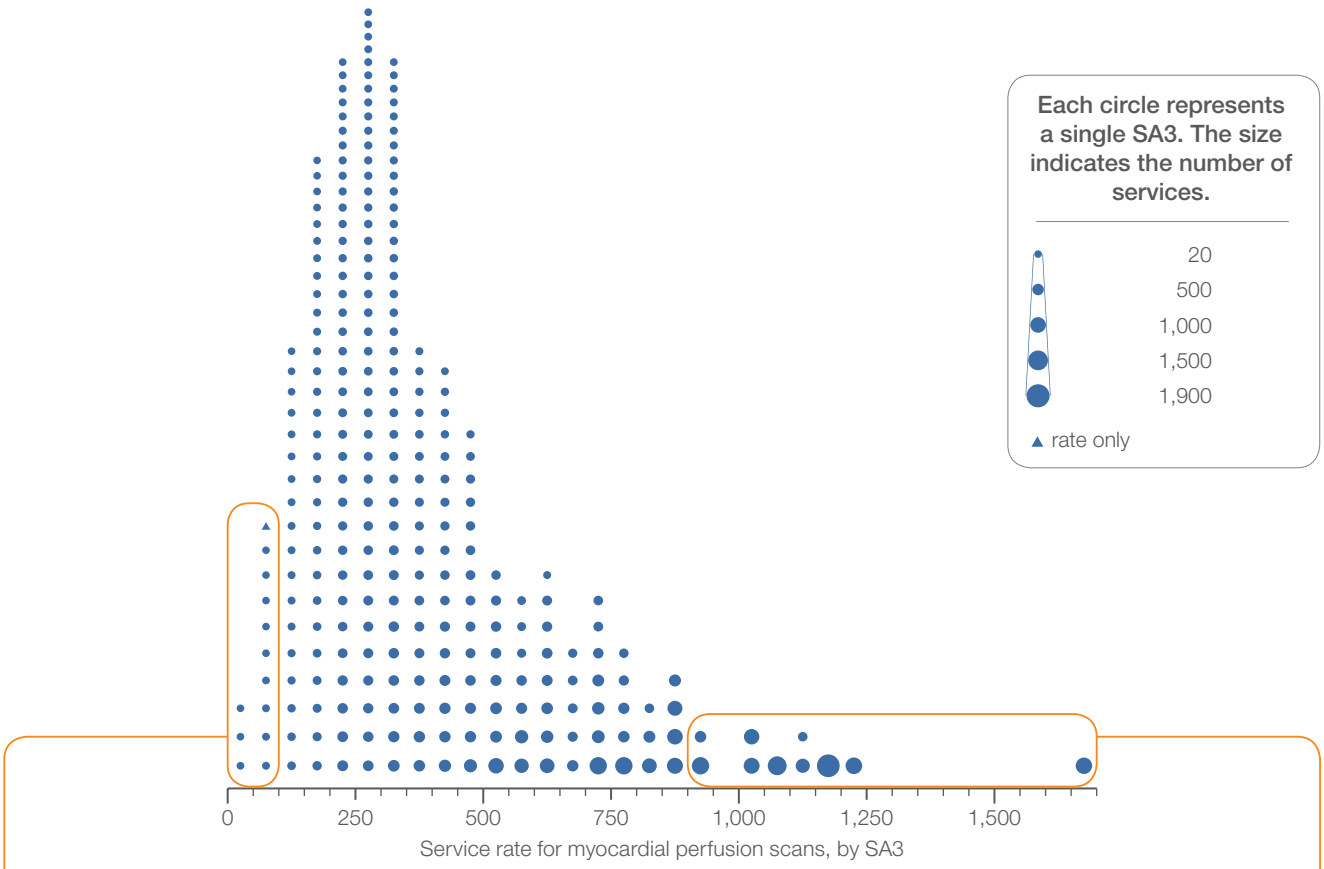
See 'Cardiac stress tests and imaging, 18 years and over' on page 198.

* There are 340 SA3s. For this item, data were suppressed for 62 SA3s due to one or more of a small number of services or population in an area, or potential identification of individual patients, practitioners or business entities.

Myocardial perfusion scans, 18 years and over

Rates by local area

Figure 4.14: Number of MBS-subsidised services for myocardial perfusion scans per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17



Lowest rate areas

SA3	State	Rate	Services
Onkaparinga	SA	**29**	45
Fleurieu - Kangaroo Island	SA	**43**	27
Mitcham	SA	**44**	30
Marion	SA	**60**	47
Cairns - South	Qld	**71**	59
Kenmore - Brookfield - Moggill	Qld	**76**	32
Sherwood - Indooroopilly	Qld	**76**	26
Murray and Mallee	SA	**78**	61
Kwinana	WA	**86**	
Fremantle	WA	**95**	34
Manjimup	WA	**96**	26
Brisbane Inner - East	Qld	**96**	25
Adelaide Hills	SA	**98**	66

Highest rate areas

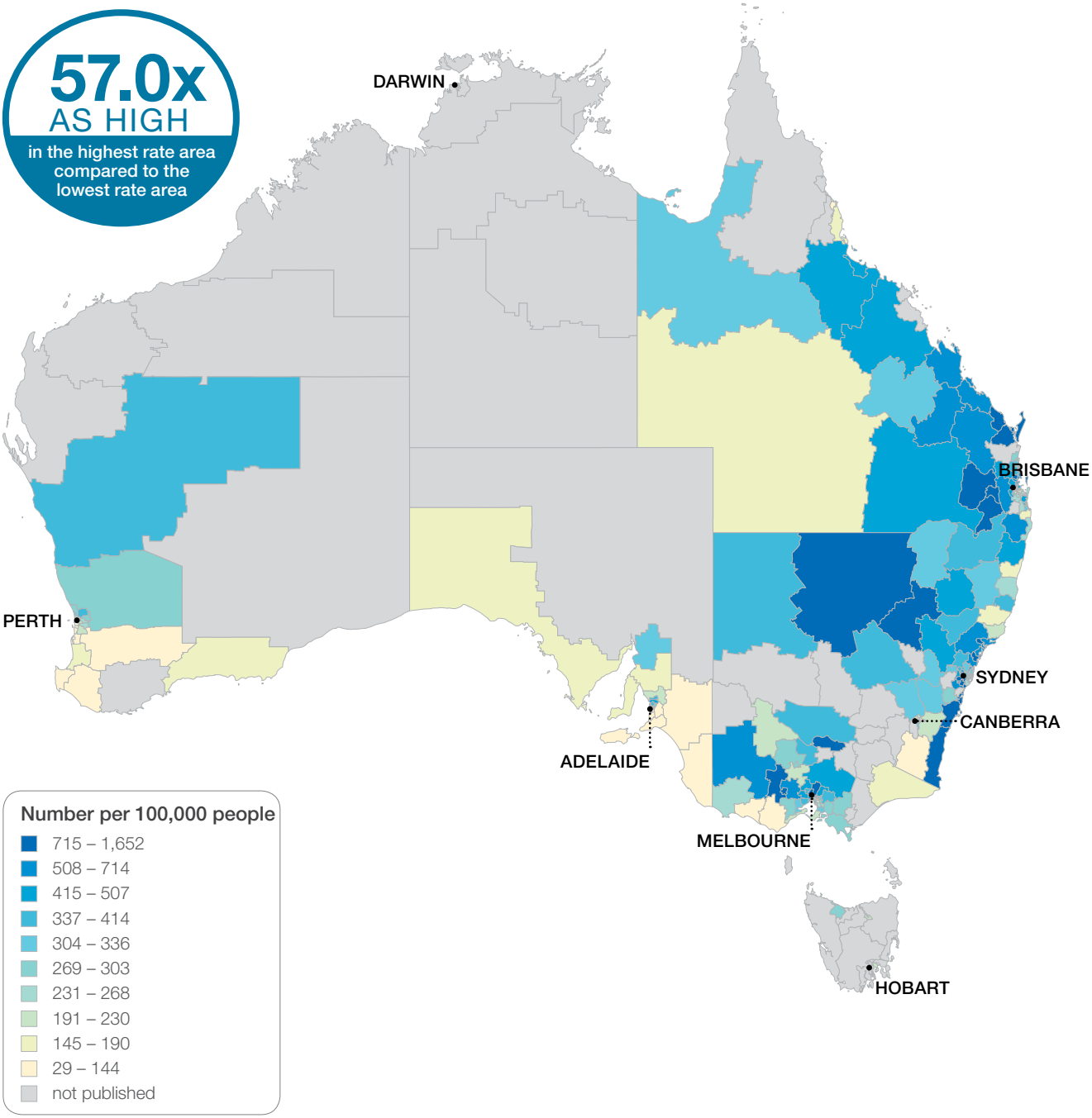
SA3	State	Rate	Services
Dubbo	NSW	**1,652**	1,102
Kiama - Shellharbour	NSW	**1,246**	1,119
Fairfield	NSW	**1,190**	1,859
Bourke - Cobar - Coonamble	NSW	**1,145**	265
Dapto - Port Kembla	NSW	**1,104**	822
Shoalhaven	NSW	**1,071**	1,392
Ballarat	Vic	**1,041**	984
Bundaberg	Qld	**1,033**	1,037
Maryborough	Qld	**940**	506
Toowoomba	Qld	**912**	1,209

Notes:
Triangles (▲) indicate SA3s where only rates are published. The numbers of services are not published for confidentiality reasons.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

Myocardial perfusion scans, 18 years and over

Rates across Australia

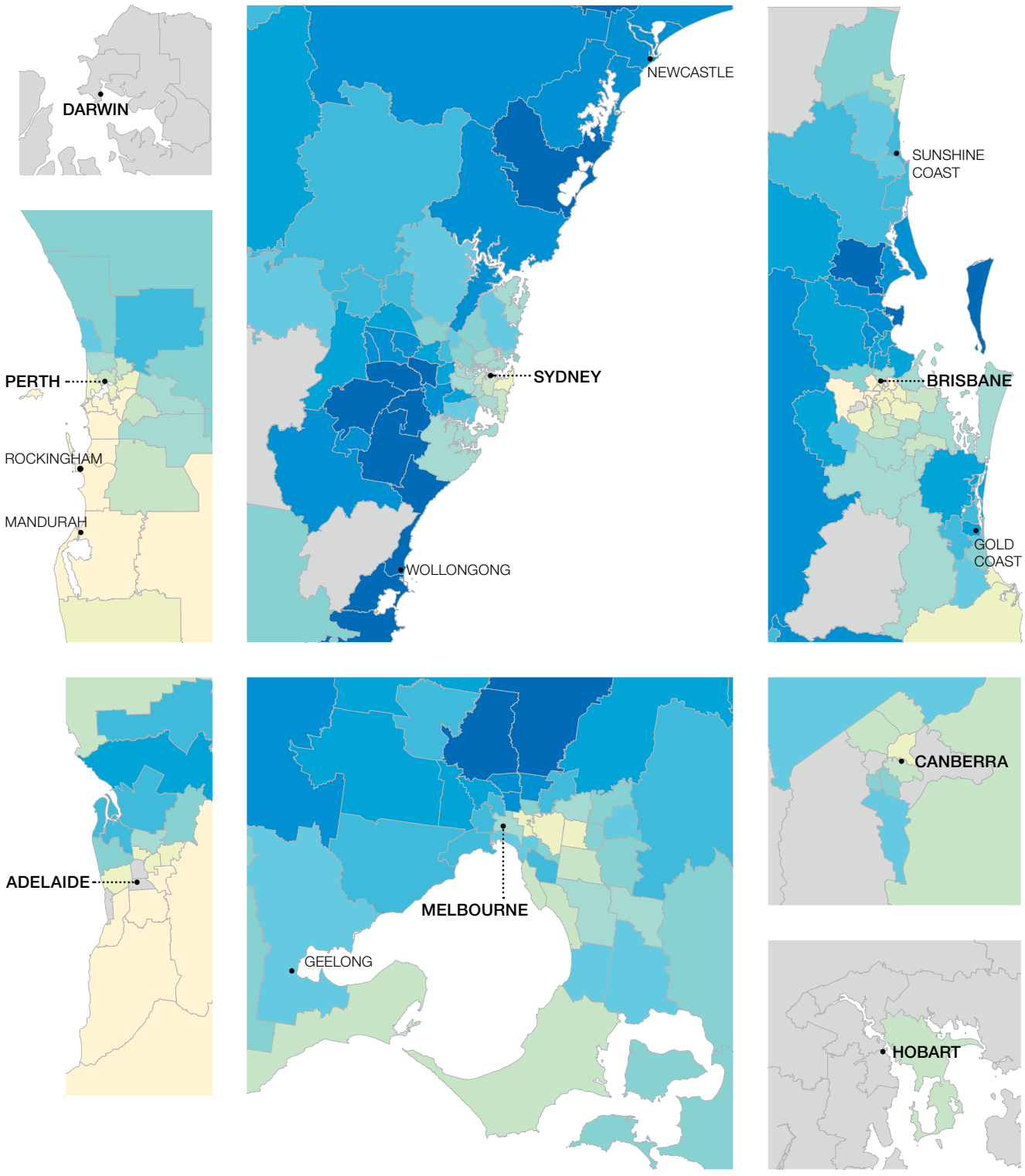
Figure 4.15: Number of MBS-subsidised services for myocardial perfusion scans per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17



Note:
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

Rates across capital city areas

Figure 4.16: Number of MBS-subsidised services for myocardial perfusion scans per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17



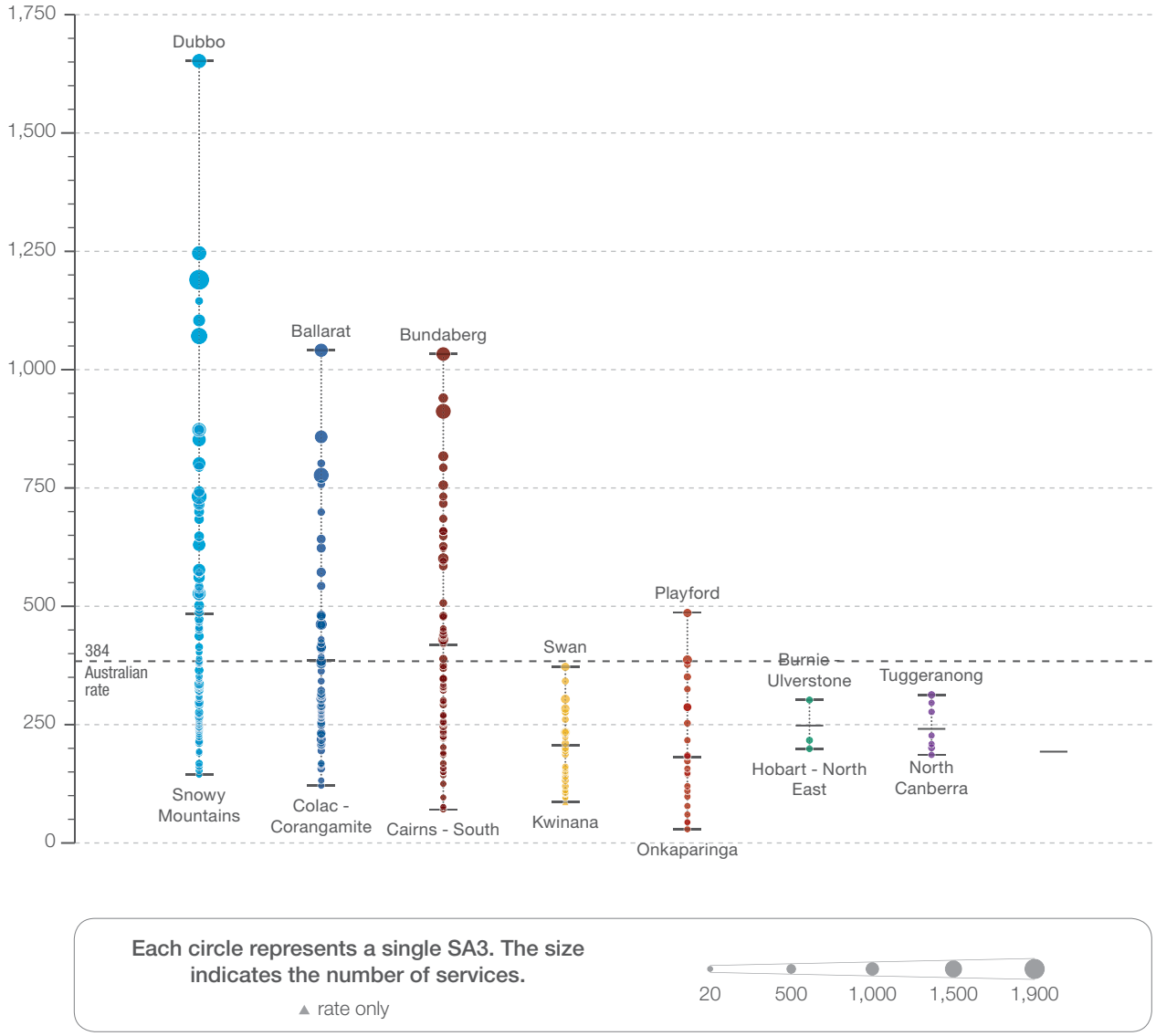
Note:
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

Myocardial perfusion scans, 18 years and over

Rates by state and territory

Figure 4.17: Number of MBS-subsidised services for myocardial perfusion scans per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17

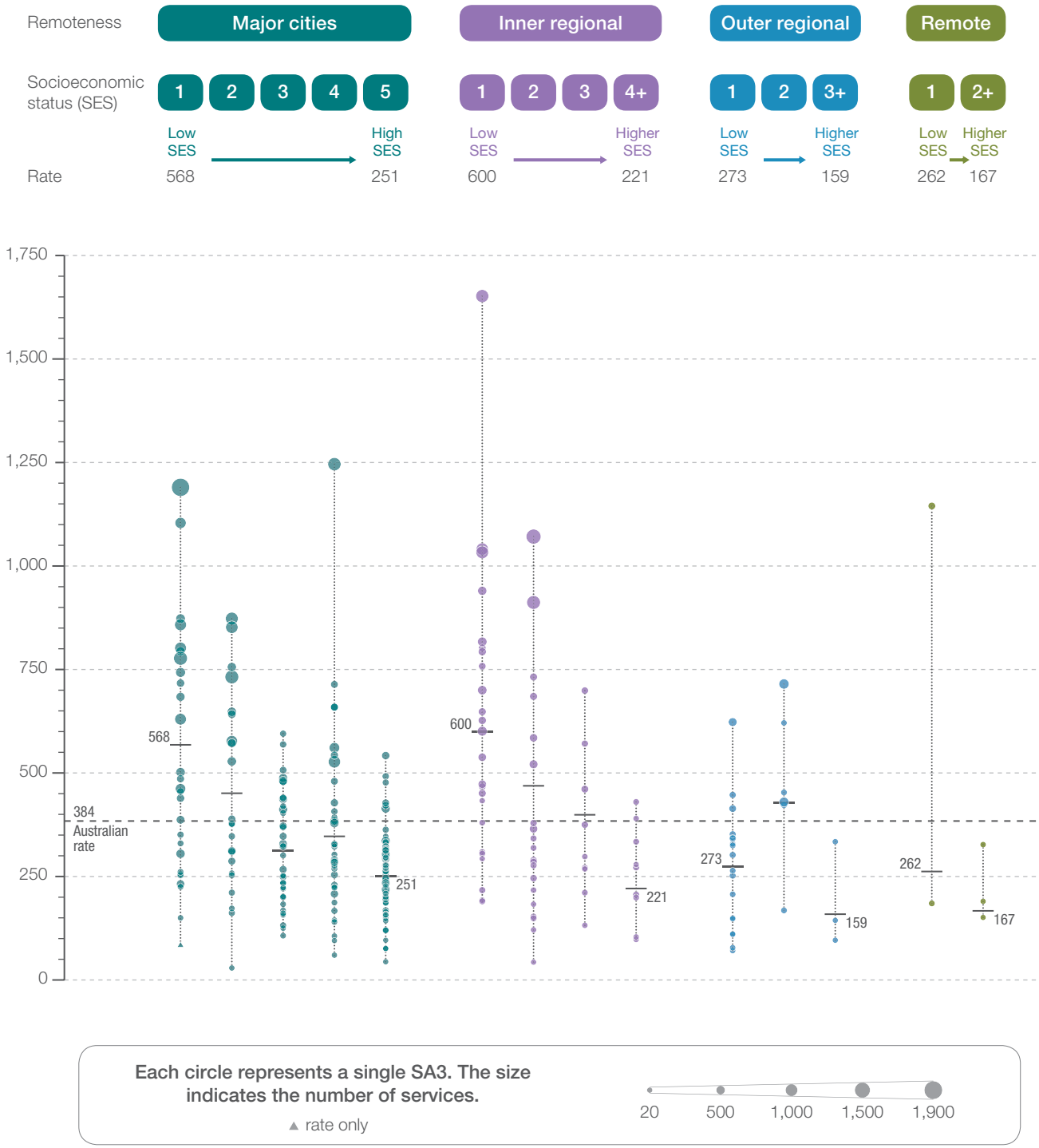
	NSW	Vic	Qld	WA	SA	Tas	ACT	NT
Highest rate	1,652	1,041	1,033	372	486	302	313	
State/territory	485	385	418	206	182	248	241	193
Lowest rate	144	121	71	86	29	199	186	
No. services	33,155	20,196	17,112	4,227	2,953	1,292	700	262



Notes:
Triangles (▲) indicate SA3s where only rates are published. The numbers of services are not published for confidentiality reasons.
Rates for NT SA3s are not published for reliability and/or confidentiality reasons.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

Rates by remoteness and socioeconomic status

Figure 4.18: Number of MBS-subsidised services for myocardial perfusion scans per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17



Notes:
Triangles (▲) indicate SA3s where only rates are published. The numbers of services are not published for confidentiality reasons.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of Medicare Benefits Schedule data and ABS Estimated Resident Population 30 June 2016.

Myocardial perfusion scans, 18 years and over

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