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

AURA
Antimicrobial Use and Resistance in Australia

Antimicrobial use in the community: 2024

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Contents

Executive summary

Antimicrobials are an integral component of healthcare delivery and need to be readily available and effective. The more antimicrobials are used, the more likely it is that microorganisms will develop resistance. Antimicrobial resistance (AMR) is a critical risk to patient safety as it reduces the number of antimicrobials available to treat infections. It is a public health priority due to its serious and growing impact. AMR increases morbidity and mortality associated with infections caused by multidrug-resistant organisms. Hundreds of people in Australia die each year as a result of AMR.

The emergence of AMR and consequent reduction in the efficacy of antimicrobials has resulted in significant impacts on individuals receiving treatment for infections, and more broadly as AMR spreads through the community. As antimicrobials become ineffective, important treatments such as organ transplantation, a range of major surgical procedures, and chemotherapy for cancer may become limited, or no longer viable. Antimicrobial use also contributes to healthcare-associated greenhouse gas emissions.

Since 2015, there has been an overall downward trend in antimicrobial use in the Australian community sector supplied under the Pharmaceutical Benefits Scheme and Repatriation Pharmaceutical Benefits Scheme (PBS/RPBS). There was a gradual decline in the number of antimicrobial prescriptions dispensed under the PBS/RPBS between 2015 and 2019. This was followed by a substantial decrease in supply in 2020. This decrease, which was sustained in 2021, coincided with the response to the COVID-19 pandemic in Australia. Supply of antimicrobials under the PBS/RPBS has slowly increased since 2022 but remains below the volume dispensed in 2015.

Within the context of the overall decline in community antimicrobial use, there is a high level of dispensing under the PBS/RPBS for residents of aged care homes and for older Australians aged 65 years and over, which is trending up.

There is also an unknown quantity of antimicrobials dispensed privately, that is prescriptions not subsidised under the PBS/RPBS, as well as antimicrobials supplied over-the-counter without a prescription. Data on these activities are not reported nationally.

The overall decline in antimicrobial use in the community is encouraging despite high dispensing rates among older Australians and aged care home residents. The results from this report suggest that lower levels of antimicrobial use in Australia are achievable long-term. However, urgent action is needed to reestablish the downward trend. Targeted strategies are required to address the level of use and upward trend, especially for residents of aged care homes and older Australians. There remain many opportunities to further improve use of antimicrobials. Combined strategies of antimicrobial stewardship (AMS) and infection prevention and control are the most effective ways to reduce inappropriate antimicrobial use and to prevent and control AMR, which contributes to the sustainability of health care in Australia.

Key findings and trends

PBS/RPBS: Overall (2015–2024)

- There were 23,190,360 antimicrobial prescriptions supplied in 2024 – an increase of 4.8% from 2023, but 13% lower than 2019 and 20.8% lower than 2015.
- A little over one-third of Australians had at least one antimicrobial dispensed in 2024, with rates much higher for older Australians.

- Amoxicillin, cefalexin, amoxicillin–clavulanic acid and doxycycline remained the most frequently dispensed antimicrobials in 2024.
- Overall antimicrobial use across states and territories, local areas and age groups in 2024 remained mostly comparable with patterns since 2015.
- Australia ranked in the middle for community antimicrobial use compared to European countries in 2023, and use remained almost double that reported for the Netherlands, which was the European country with the lowest reported use.

PBS/RPBS: Aged care homes and older Australians (2021–2024)

- There were 659,767 antimicrobial prescriptions supplied to residents of aged care homes in 2024 – 2.8% of all antimicrobials dispensed in Australia, and a 14.4% increase from 2023.
- More than three-quarters of aged care home residents received at least one antimicrobial prescription in 2024.
- Cefalexin was the most frequently dispensed antimicrobial for aged care home residents – a third of antimicrobial prescriptions each year from 2021 to 2024.
- Proportionally, cefalexin was more often dispensed to older Australians who resided in aged care homes compared to older Australians in the community.
- Older Australian residents of aged care homes, aged 65 years and over, received more than double the number of antibacterial prescriptions per person compared to older Australians in the community in 2024.

What will be done to improve antimicrobial use and patient safety?

To promote ongoing reductions in antimicrobial use and improve appropriateness of antimicrobial prescribing in the community, the Australian Commission on Safety and Quality in Health Care (the Commission) will continue to:

- report the results of surveillance of antimicrobial use and resistance, as well as infections, healthcare-associated complications and potentially preventable hospitalisations and use the data to inform quality improvement strategies across community healthcare
- explore opportunities with the Australian Government Department of Health, Disability and Ageing (the Department) to increase the capacity to record and monitor private (non-PBS/RPBS) antimicrobial prescribing by an increasing range of clinicians and the indications for which antimicrobials are prescribed
- explore opportunities with the Department to record and monitor antimicrobial prescribing to Aboriginal and Torres Strait Islander peoples, accessed under the Remote Area Aboriginal Health Services Program[1]
- recruit and reconsent general practices for the MedicineInsight[2] program to contribute to ongoing surveillance of the appropriateness of antimicrobial use in the community
- support implementation of the National Safety and Quality Primary and Community Healthcare Standards (Primary and Community Healthcare Standards)[3], to deliver safe, high-quality, sustainable health care through dedicated actions for preventing and controlling infections and appropriate antimicrobial prescribing and use[4]

- consult with the Royal Australian College of General Practitioners (RACGP) about opportunities to promote AMS principles and practices as part of implementation of the RACGP accreditation standards
- collaborate with the Aged Care Quality and Safety Commission, aged care providers and general practitioners to promote appropriate personal and clinical care, AMS and antimicrobial prescribing for residents of aged care homes consistent with the requirements of the strengthened Aged Care Quality Standards[5]
- support health and aged care services to prevent and control AMR and use antimicrobials appropriately through the implementation of strategies that address the quality statements of the Antimicrobial Stewardship and Sepsis Clinical Care Standards[6, 7], and reduce unwarranted variations in care
- collaborate with clinicians and professional bodies such as the RACGP, the Australian College of Rural and Remote Medicine (ACRRM), Primary Health Networks (PHNs); organisations that represent pharmacists, nurse practitioners and other prescribers to promote appropriate antimicrobial use
- collaborate with prescribers, the Department and state and territory governments to investigate specific drivers of high antimicrobial use identified in certain geographic regions and develop targeted strategies to sustain improvements in antimicrobial use and appropriateness
- promote the importance of AMS knowledge and skills as key competencies for all clinicians able to prescribe antimicrobials as part of their scope of practice
- maintain the currency of the Commission's decision support tools for clinicians and consumers in antibiotic use and resistance[8] and in managing specific conditions[9-13], including sore throat, acute bronchitis, middle ear infection, chronic obstructive pulmonary disease and sinusitis
- work with developers of prescribing guidelines, including Therapeutic Guidelines Limited, to ensure AMR data informs guidelines, including *Therapeutic Guidelines: Antibiotic*[14]*,* and for these to be promoted to prescribers through clear communications
- reinforce messaging for consumers about the role of antimicrobials in AMR, the effects of antimicrobials on beneficial and harmful bacteria and that antibacterials are not required for the treatment of viral respiratory infections, and raise awareness of the impact of antimicrobials in the potential development of chronic conditions in children and adults
- promote maintenance of public health actions including messaging related to infection prevention and control and vaccination, to reduce the risk of the spread of AMR, transmission of infection and use of antimicrobials in the community
- partner with researchers to support projects relating to AMR and AMS.

Introduction

About this report

This report presents analyses of antimicrobial use in the Australian community in 2024. It builds on reports developed by the Australian Commission on Safety and Quality in Health Care (the Commission) including *Antimicrobial use and appropriateness in the community:2020–2021*[15], *Analysis of 2015–2022 PBS and RPBS antimicrobial dispensing data*[16] and *Antimicrobial use in the community: 2023*[17] and the series of national reports, which use data captured by the Antimicrobial Use and Resistance in Australia (AURA) surveillance program from 2016 to 2023.[18-22] Funding for the AURA surveillance program and for the preparation of this report is provided by the Australian Government Department of Health, Disability and Ageing (the Department), with further contributions from the states and territories by the collection and submission of their data on antimicrobial resistance (AMR) and antimicrobial use in hospitals.

Data on antimicrobial use presented in this report are sourced from the Pharmaceutical Benefits Scheme and the Repatriation Pharmaceutical Benefits Scheme (PBS/RPBS). The PBS/RPBS are Australian Government schemes that provide all Australians with subsidised access to many medicines, and provide information on antimicrobials dispensed or supplied from pharmacies to the Australian population. Information about methodology and considerations for interpretation of these data and analyses are included in Appendix 1.

Between 2015 and 2024, a number of factors influenced the supply of antimicrobials under the PBS/RPBS.

- In January 2016, chloramphenicol eye drops were rescheduled to become available over-the-counter without a prescription. Other antimicrobials available over-the-counter, or available without a prescription, such as antifungal treatments for oral or vaginal thrush and skin infections, are also not captured by the PBS/RPBS.
- From March 2020, the World Health Organization (WHO) declared the global COVID-19 pandemic.[23] In response, all Australian governments initiated a series of structural and policy decisions, along with clinical practice changes, to minimise the impact of the pandemic. This included the expansion of the Medicare Benefits Schedule (MBS) for telehealth consultations[24, 25], implementation of local community and state and territory lockdowns at various times and restricted interstate and international travel, which also impacted Australia's population.[26] There was also an increased emphasis on infection prevention and control measures[27], such as social distancing, hand hygiene and use of respiratory masks, which influenced the prevalence of other respiratory tract infections.[26]
- From April 2020, the maximum prescribed quantity and access to repeats were restricted for the five most commonly dispensed PBS/RPBS antimicrobials at the time – amoxicillin, amoxicillin–clavulanic acid, cefalexin, doxycycline and roxithromycin.[28]
- From June 2020, Queensland implemented a pharmacist prescribing trial for the over-the-counter treatment of uncomplicated urinary tract infections (UTIs) with select antimicrobials, which became permanent from October 2022.[29, 30] Subsequently, similar initiatives have also been adopted in all other jurisdictions.[31-36] These initiatives have also been expanded to include other conditions.[33, 37-41] These antimicrobials are not subsidised by the PBS/RPBS and volumes of antimicrobial use for these programs are currently not reported.
- In December 2022, the Therapeutic Goods Administration (TGA) highlighted a number of antimicrobials that were in short supply due to manufacturing issues or unexpected and

increased demand.[42] Antimicrobial shortages continued in 2023 and 2024 and may have influenced supply of alternative antimicrobials.

- Implemented over three stages from September 2023, March 2024 and September 2024, the maximum quantity of certain medicines for certain conditions supplied under the PBS/RPBS increased from 30 to 60 days. Some antimicrobials indicated for select chronic conditions were included under this measure, such as doxycycline, erythromycin and minocycline for severe acne.[43-45] The impact of this policy change on antimicrobials supplied in the community is likely to be small as eligible prescriptions account for a small percentage of antimicrobials supplied under the PBS/RPBS.

Over the ten-year reporting period, antimicrobial use in the community has declined by 20.8%. There was a gradual overall decline of 8.9% from 2015 to 2019. This was followed by a more dramatic decline of 24.6% from 2019 to 2020, which was sustained in 2021. Antimicrobial use has trended up from 2022. In 2024, it was up 4.8% from 2023 and up 16.4% from 2021.

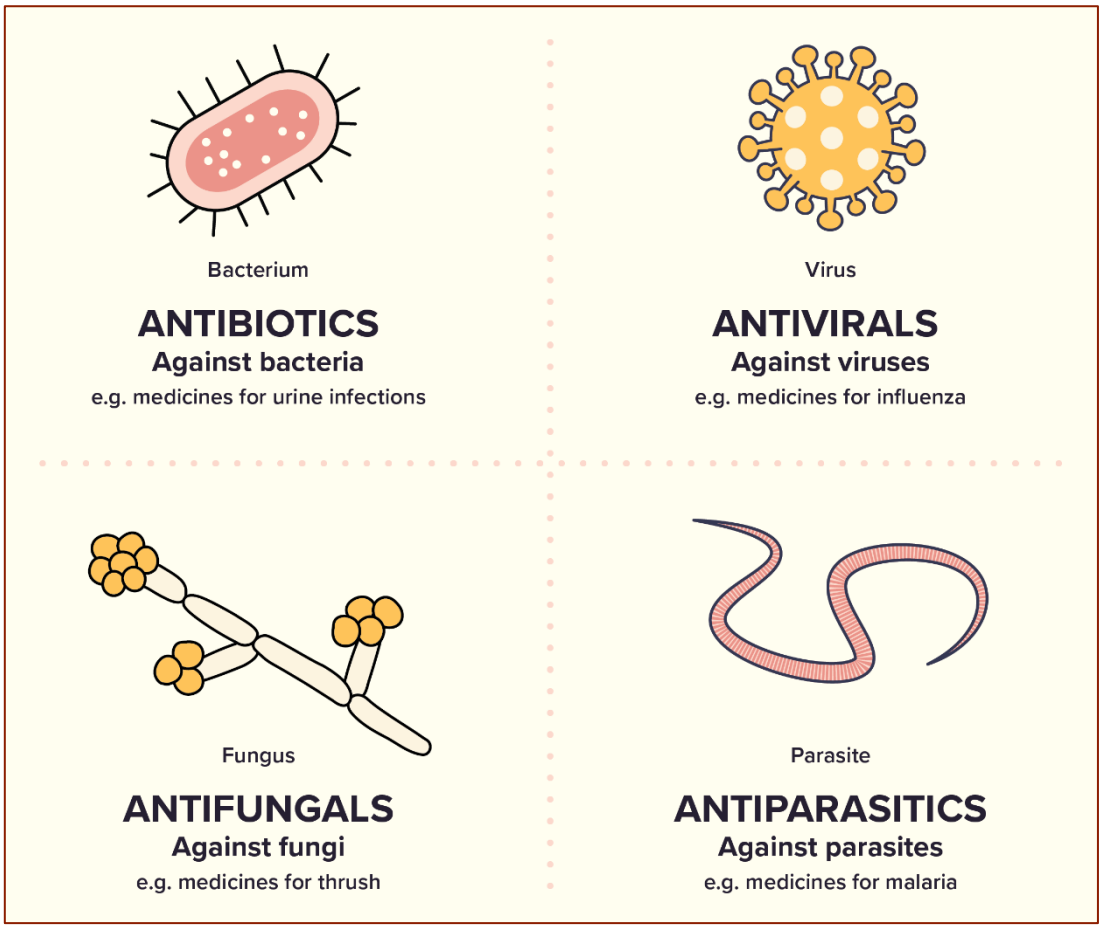
Encouragingly, despite recent increases, the volume of antimicrobial use in the community remains below pre-pandemic levels. This indicates lower levels of antimicrobial use in Australia are achievable long-term. Further analyses of PBS/RPBS antimicrobial dispensing by Statistical Area Level 3 (SA3) and Primary Health Network (PHN) are included in Appendix 2.

About antimicrobials and surveillance of community antimicrobial use

Antimicrobials is the term used for all medicines that treat and prevent infections caused by microbes (also known as microorganisms). ‘Antimicrobials’ refers to all antibiotics, antivirals, antifungals and antiparasitic agents (Figure I). The terms antibacterial and antibiotic have the same meaning, and they are used to treat and prevent infections caused by bacteria.

The World Health Organization (WHO) Anatomical Therapeutic Chemical (ATC) Classification also groups medicines according to the organ or system on which they act, and their therapeutic, pharmacological, and chemical properties. Almost all of the antimicrobial prescriptions supplied under the PBS/RPBS are antibacterials for systemic use, which are ATC code J01. See Appendix 1 for information about methodology and antimicrobials used for analyses in this report.

Figure I Types of antimicrobials and the types of infections different antimicrobials are used for



Community prescribing in general practice, community health services, aged care homes and other non-hospital settings accounts for the majority of antimicrobial use in Australia. Monitoring the overall volume of use of antimicrobials and the extent of inappropriate use is an important part of the approach to understand and address the risks associated with AMR.

The more antimicrobials are used, the more likely it is that microorganisms will develop resistance and spread. AMR poses a risk to patient safety because it reduces the number of antimicrobials available to treat infections. In the community setting, this could mean that there are no oral antimicrobial options available, resulting in increased hospitalisations for parenteral therapy with broader-spectrum antimicrobials.

Reducing the spread of AMR is a public health priority due to its serious and growing impact. It increases morbidity and mortality associated with infections caused by multidrug-resistant organisms. Hundreds of people in Australia die each year as a result of AMR.[46, 47] AMR may also limit future capacity for important treatments such as major surgeries, organ transplantation, cancer chemotherapy and diabetes management among others, due to a lack of effective antimicrobials.[48]

AMR and antimicrobial use also contributes to healthcare-associated greenhouse gas emissions.[49] AMR infections often use more healthcare resources. This includes the need for more antimicrobials and diagnostic testing, as well as more frequent appointments with clinicians or admission to hospital. Stewardship of both antimicrobial use and diagnostic testing helps to reduce the spread of AMR and increase the sustainability of health care through reduced greenhouse gas emissions and effective use of healthcare funding.

Surveillance of the volume of antimicrobial use and appropriateness of prescribing are essential to inform antimicrobial stewardship (AMS) and AMR prevention and control

strategies. This includes providing feedback about prescribing to clinicians and information to consumers about safe and appropriate use of antimicrobials.

The PBS/RPBS are estimated to account for more than 90% of prescriptions issued in the community.[50] However, the PBS/RPBS do not capture data on private prescriptions (that is prescriptions that are not subsidised under the PBS/RPBS), many prescriptions dispensed by many Aboriginal and Torres Strait Islander health services or medicines supplied over-the-counter without a prescription. The lack of mechanisms to record and monitor rates of private antimicrobial prescribing at the time of dispensing, and the reason why they are prescribed, continues to be an important gap in current surveillance of antimicrobial use in Australia. This is particularly important given the increasing proportion of private antimicrobial prescriptions issued in the community by medical and non-medical clinicians.[22]

Results

Prescription volume

Almost all antimicrobials supplied under the PBS/RPBS since 2016 were antibacterials for systemic use (ATC code J01) (Table 1). It is important to note that antimicrobials dispensed under the RPBS in 2024 were not available for analyses in this report. Therefore, year-to-year comparisons and trends should be interpreted with caution throughout this report. However, the impact is likely to be minimal as approximately 1% of all J01 antibacterials supplied under the PBS/RPBS are estimated to be RPBS prescriptions.[51] See Appendix 1 for further information about the antimicrobials included in these analyses and considerations for interpretation.

In 2024, there were 23,190,360 antimicrobial prescriptions supplied under the PBS in Australia, which was a 4.8% increase compared to 2023 (Table 1). While antimicrobial use has increased since 2022, it is 20.8% below the number of antimicrobial prescriptions supplied in 2015.

At least one antimicrobial was supplied under the PBS to 37.1% (*n* = 10,105,562) of the Australian population in 2024, compared to 36.4% (*n* = 9,699,404) in 2023.

Amongst people who received antimicrobials, the average number of prescriptions supplied per person was also similar: 2.28 in 2023 and 2.29 in 2024.

The vast majority (87.4%) of antimicrobial prescriptions were issued by general practitioners in 2024; with 7.4% issued by medical specialists and 4.4% by dentists. Less than 1% of antimicrobials supplied under the PBS were prescribed by midwives, nurse practitioners and optometrists combined.

Table 1 Number of PBS/RPBS antimicrobial prescriptions dispensed*, 2015–2024

Year	All antimicrobials (*n*)	J01 antibacterials (*n*)	Non-J01 antimicrobials (*n*)
2015	29,264,932	26,813,587	2,451,345
2016†	27,324,648	26,926,933	397,715
2017	26,553,451	25,924,324	629,127
2018	26,229,366	25,427,786	801,580
2019	26,669,561	25,871,075	798,486
2020	20,095,926	19,425,518	670,408
2021	19,931,271	19,208,986	722,285
2022	21,848,005	21,059,515	788,490
2023	22,126,604	21,364,753	761,851
2024	23,190,360	22,496,665	693,695

J01 = antibacterials for systemic use; PBS = Pharmaceutical Benefits Scheme; RPBS = Repatriation Pharmaceutical Benefits Scheme

* Total number of all antimicrobial prescriptions (originals and repeats) dispensed under the PBS/RPBS in the given year (see Appendix 1)

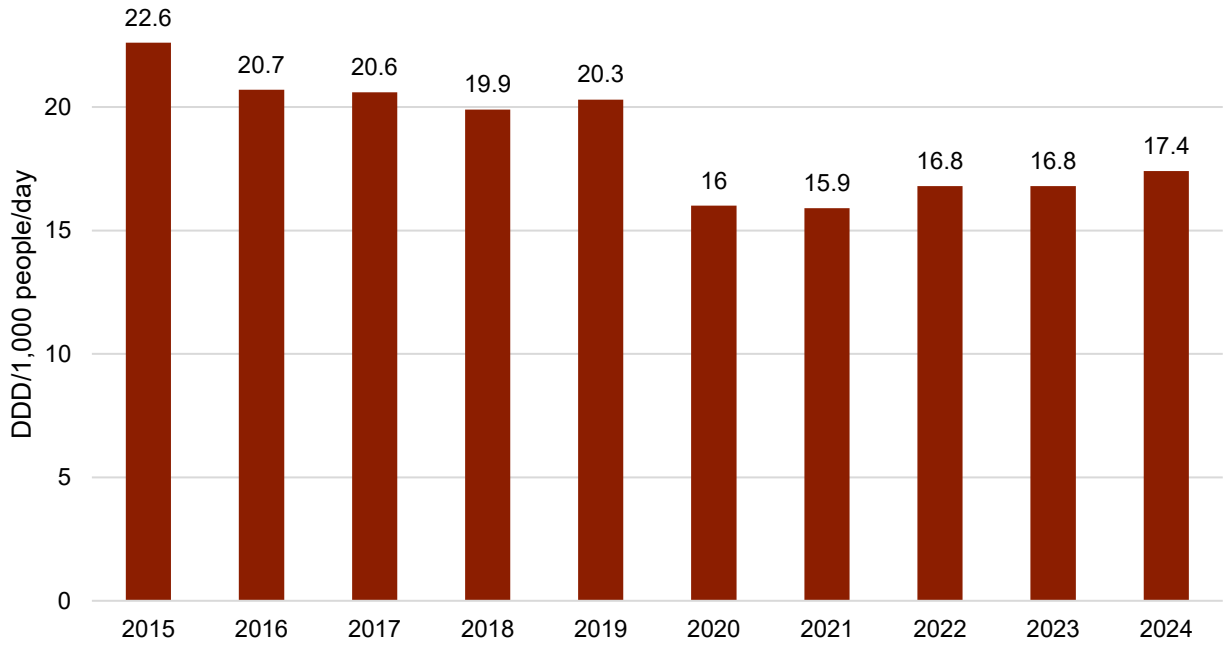
† Chloramphenicol eye drops were rescheduled to become available over-the-counter without a prescription in 2016. This contributed to the drop in the number of all antimicrobials and non-J01 antimicrobials dispensed from 2016

Source: Gadzhanova, Roughead[52]

Following an overall downward trend from 2015, the rate of all antimicrobials supplied in Australia remained stable from 2022 to 2023 at 16.8 defined daily doses (DDD) per 1,000 people per day. In 2024, it increased slightly to 17.4 DDD per 1,000 people per day (Figure 1).

Crude and age-standardised rates of antimicrobial prescriptions supplied per 1,000 people in Australia followed a similar trend to rate of supply (Figure 2).

Figure 1 Rate of PBS/RPBS antimicrobial prescriptions dispensed (DDD/1,000 people/day), 2015–2024

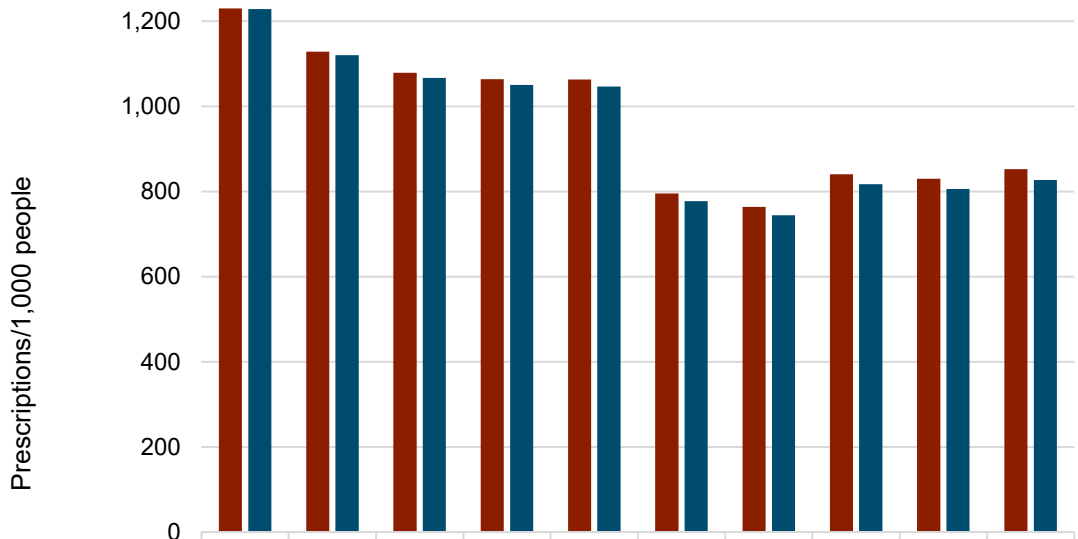


DDD = defined daily dose; PBS = Pharmaceutical Benefits Scheme; RPBS = Repatriation Pharmaceutical Benefits Scheme

Note: The DDD values determined by the World Health Organization Collaborating Centre for Drug Statistics Methodology for 2024 have been applied in this report, causing slight variation with results presented in previous reports.[53]

Source: Gadzhanova, Roughead[52]

Figure 2 Number of PBS/RPBS antimicrobial prescriptions dispensed per 1,000 people, crude and age-standardised rates, 2015–2024



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Crude rate	1,230	1,128	1,079	1,064	1,063	795	764	840	830	852
Age-Standardised rate	1,228	1,120	1,067	1,050	1,046	777	744	817	806	827

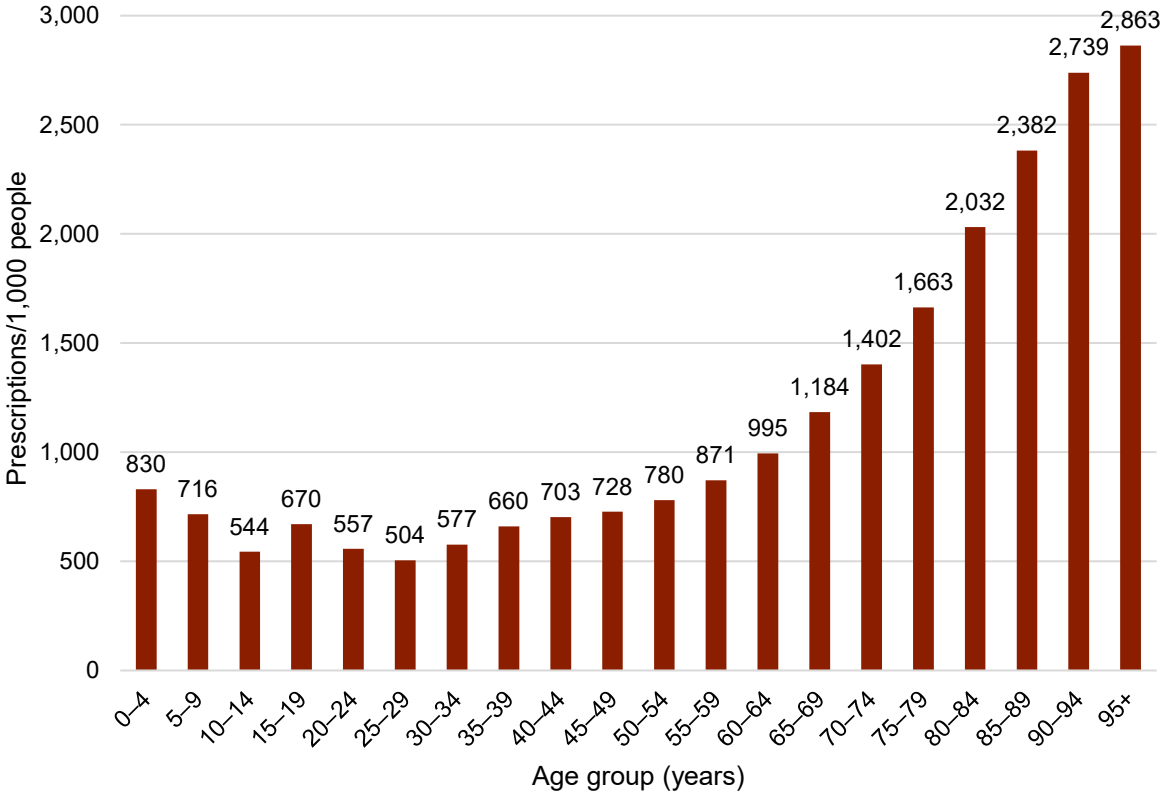
PBS = Pharmaceutical Benefits Scheme; RPBS = Repatriation Pharmaceutical Benefits Scheme

Note: Age-standardised rates were based on the age structure of the Australian national population in mid-2013 for consistency with previous reports; national rates were based on the total number of prescriptions dispensed and people in Australia in the given year.

Source: Gadzhanova, Roughead[52]

The substantial difference in antimicrobial use across age groups (Figure 3) was consistent across states and territories and followed a similar pattern to previous years.[17] Older Australians were dispensed the greatest number of antimicrobials. On average in 2024, people aged 65–79 years received 1–2 antimicrobial prescriptions, while those aged 80 years and over received 2–3 antimicrobial prescriptions. The lowest number of antimicrobial prescriptions was supplied to Australians aged 25–29 years (Figure 3).

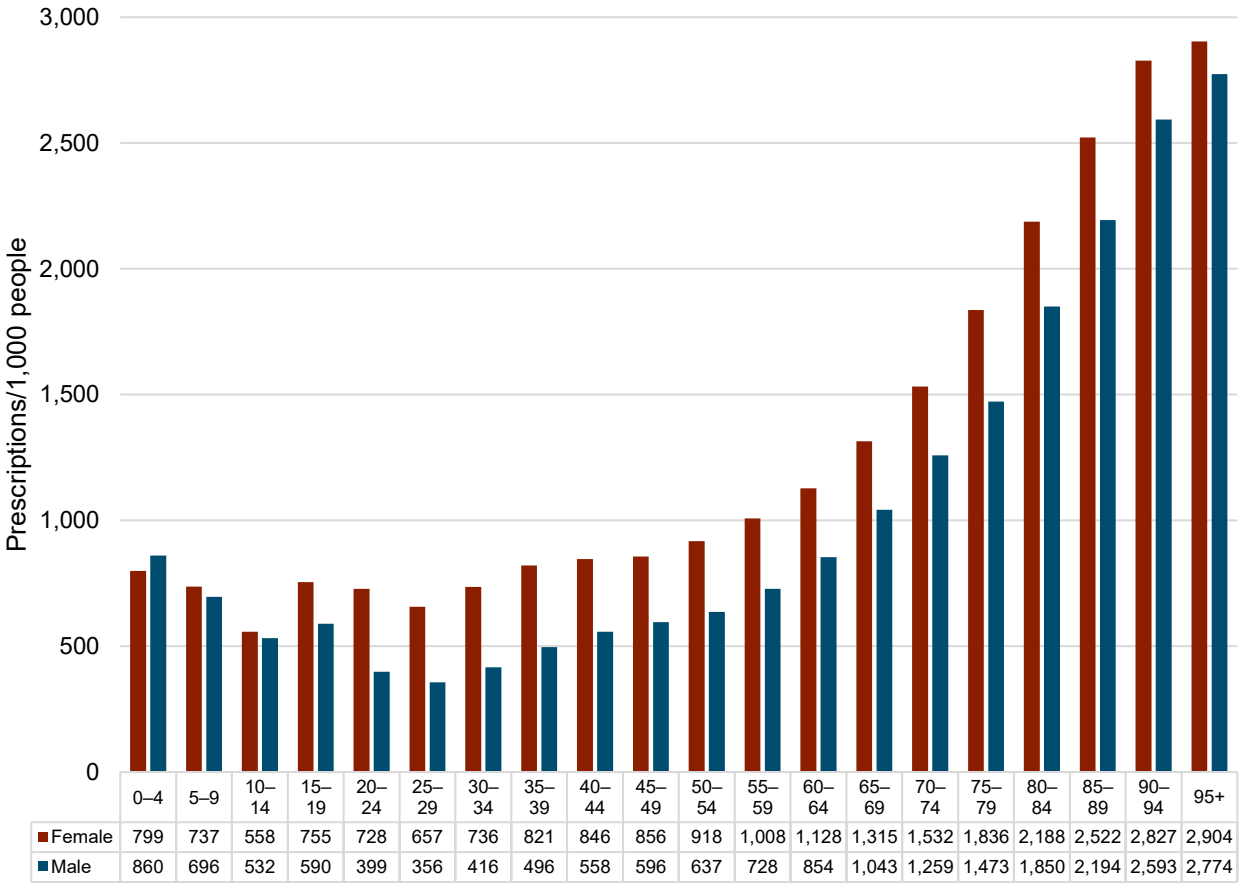
Figure 3 Number of PBS antimicrobial prescriptions dispensed per 1,000 people, by age group, 2024



PBS = Pharmaceutical Benefits Scheme
Source: Gadzhanova, Roughead[52]

When analysed by sex, females received more antimicrobial prescriptions than males across all age groups in 2024 except for those aged 0–4 years (Figure 4).

Figure 4 Number of PBS antimicrobial prescriptions dispensed per 1,000 people, by age group and sex, 2024



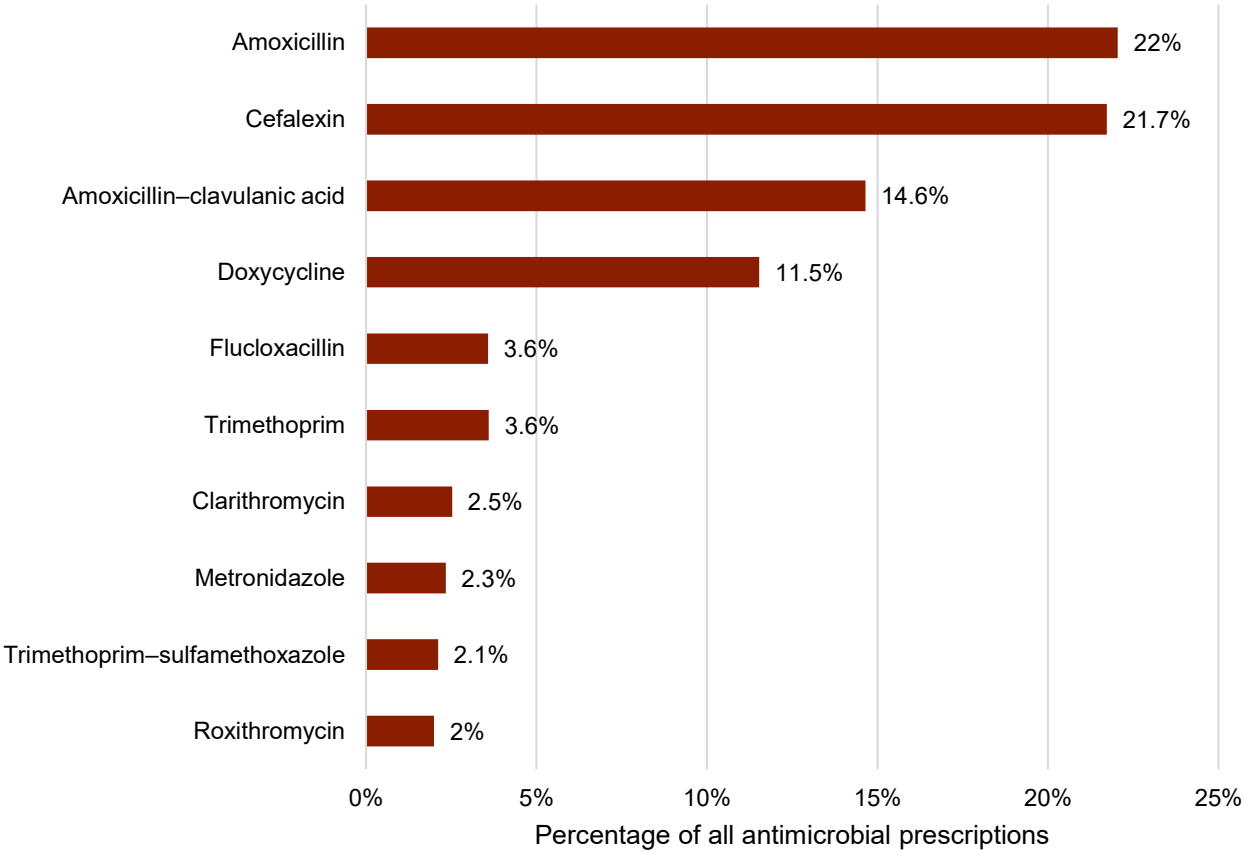
	0–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85–89	90–94	95+
Female	799	737	558	755	728	657	736	821	846	856	918	1,008	1,128	1,315	1,532	1,836	2,188	2,522	2,827	2,904
Male	860	696	532	590	399	356	416	496	558	596	637	728	854	1,043	1,259	1,473	1,850	2,194	2,593	2,774

PBS = Pharmaceutical Benefits Scheme

Source: Gadzhanova, Roughead[52]

The 10 most commonly dispensed antimicrobials were generally consistent from 2015 to 2024.[17] In 2024, these medicines accounted for a vast majority (86.1%) of all antimicrobials supplied in Australia. As in previous years[17], the four most commonly dispensed antimicrobials in 2024 were amoxicillin, cefalexin, amoxicillin–clavulanic acid and doxycycline (Figure 5).

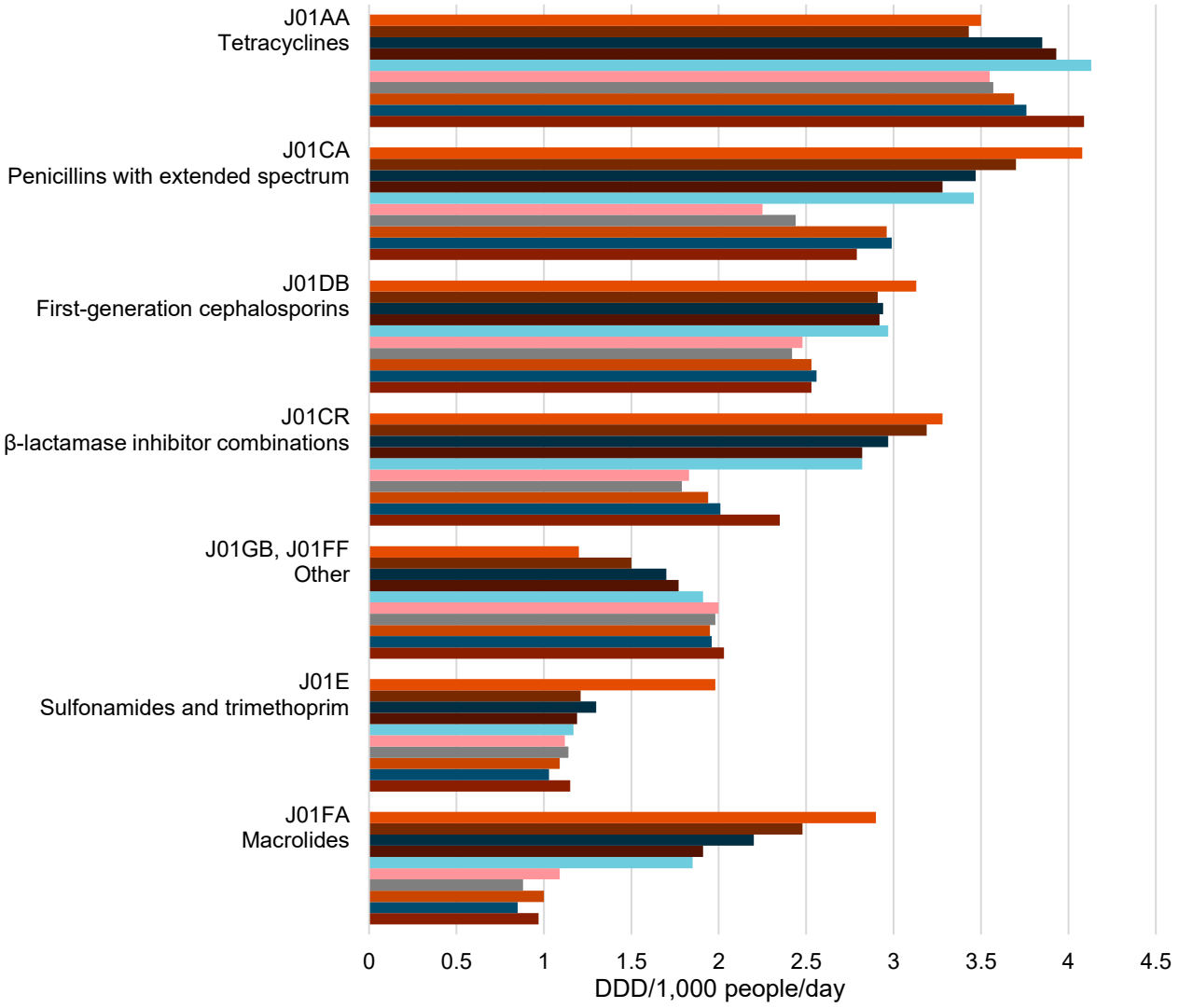
Figure 5 The 10 most commonly dispensed PBS antimicrobial prescriptions, 2024



PBS = Pharmaceutical Benefits Scheme
Source: Gadzhanova, Roughead[52]

The most commonly dispensed antimicrobial classes by DDD per 1,000 people per day in 2024 were tetracyclines followed by penicillins with extended spectrum and first-generation cephalosporins (Figure 6).

Figure 6 Rate of PBS/RPBS prescriptions dispensed (DDD/1,000 people/day), by antimicrobial class*, 2015–2024



	J01AA	J01CA	J01DB	J01CR	J01GB, J01FF	J01E	J01FA
2015	3.50	4.08	3.13	3.28	1.2	1.98	2.9
2016	3.43	3.7	2.91	3.19	1.5	1.21	2.48
2017	3.85	3.47	2.94	2.97	1.7	1.3	2.2
2018	3.93	3.28	2.92	2.82	1.77	1.19	1.91
2019	4.13	3.46	2.97	2.82	1.91	1.17	1.85
2020	3.55	2.25	2.48	1.83	2	1.12	1.09
2021	3.57	2.44	2.42	1.79	1.98	1.14	0.88
2022	3.69	2.96	2.53	1.94	1.95	1.09	1
2023	3.76	2.99	2.56	2.01	1.96	1.03	0.85
2024	4.09	2.79	2.53	2.35	2.03	1.15	0.97

DDD = defined daily dose; PBS = Pharmaceutical Benefits Scheme; RPBS = Repatriation Pharmaceutical Benefits Scheme

* Selected J01 antibacterials for systemic use

Note: The DDD values determined by the World Health Organization Collaborating Centre for Drug Statistics Methodology for 2024 have been applied in this report, causing slight variation with results presented in previous reports.[53]

Source: Gadzhanova, Roughead[52]

Original prescriptions accounted for 86.2% of all prescriptions supplied for the top 10 antimicrobials in 2024. This is similar to 2022 (86.5%) and 2023 (86.6%) but is a marked increase from 77.1% in 2019, which was before the PBS/RPBS policy changes to restrict repeat prescriptions came into effect in April 2020. This policy change was to encourage prescribers to issue repeat prescriptions for antimicrobials only when indicated.[28] Since then, the majority of original prescriptions for amoxicillin, amoxicillin–clavulanic acid, cefalexin, doxycycline and roxithromycin were ordered without repeats (Table 2), which reflects the marked decrease in the number of repeat prescriptions dispensed.[54]

Repeat prescriptions filled within 10 days usually indicate a continuation of the original course of treatment. If a repeat prescription is dispensed after 10 days, it may indicate an interruption of the original course, and that use is likely to be inappropriate. The pattern of repeat dispensing remained similar from 2021 to 2024 (Table 2).

A policy change was implemented over stages between 2023 and 2024 to increase the maximum quantity of some antimicrobials from 30 to 60 days for select chronic conditions.[43-45] This applied to doxycycline for bronchiectasis, chronic bronchitis and severe acne from September 2024[45]. Of all doxycycline prescriptions supplied under the PBS in 2024, 0.6% were dispensed with the increased maximum quantity, notwithstanding these prescriptions were only supplied in the last four months of the year.

Table 2 Number and percentage of PBS/RPBS repeat antimicrobial* prescriptions dispensed within 10 days of the original prescription, 2019 and 2021–2024

	2019		2021		2022		2023		2024	
Antimicrobial	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)
Amoxicillin	193,492	50.3%	39,902	50.4%	46,809	52.8%	54,516	54.3%	64,471	56.9%
Cefalexin	398,222	51.3%	33,495	36.5%	37,447	37.6%	34,059	36.3%	37,877	36.9%
Amoxicillin–clavulanic acid	510,847	61.1%	25,934	60%	28,631	59.9%	22,709	60.8%	29,205	63%
Doxycycline	102,562	32.8%	66,969	24.1%	76,934	26.8%	73,713	25.6%	77,763	26.3%
Flucloxacillin	7,466	56.1%	5,370	47.9%	5,055	47.2%	6,161	52.1%	5,562	49.5%
Trimethoprim	35,494	40.8%	30,485	39.3%	27,600	37.9%	23,856	36.9%	22,819	36.8%
Clarithromycin	54,748	55.8%	28,456	49.5%	31,705	49.4%	27,844	48.7%	36,260	54.3%
Metronidazole	14,613	44.8%	12,381	40.3%	7,879	41.8%	8,971	39.2%	8,440	39.2%
Trimethoprim–sulfamethoxazole	28,948	34%	20,228	26.3%	18,592	25.5%	18,120	25.7%	23,897	27.4%
Roxithromycin	142,145	69.9%	144	6.4%	123	5.9%	89	5%	100	5.5%

PBS = Pharmaceutical Benefits Scheme; RPBS = Repatriation Pharmaceutical Benefits Scheme

* Most commonly dispensed antimicrobials in 2024 (see Figure 5)

Notes:

1. Number of repeat prescriptions dispensed within 10 days of the original prescription being dispensed, and as a percentage of number of repeat prescriptions dispensed in the given year (number of repeat prescriptions dispensed in the given year not shown).
2. From 1 April 2020, repeats were not allowed for amoxicillin, amoxicillin–clavulanic acid, cefalexin, doxycycline and roxithromycin (shaded) so 2020 data were excluded from Table 2 to enable full year-to-year comparison.
3. Repeats were not allowed for flucloxacillin capsules, but repeats were allowed for flucloxacillin powder for oral liquid.
4. From September 2024, doxycycline could be supplied for up to 60 days for eligible chronic conditions.
5. Less than 10 days was chosen for analysis as most pack sizes provide courses for 5 to 10 days.

Source: Gadzhanova, Roughead [15, 52]

State and territory and local area

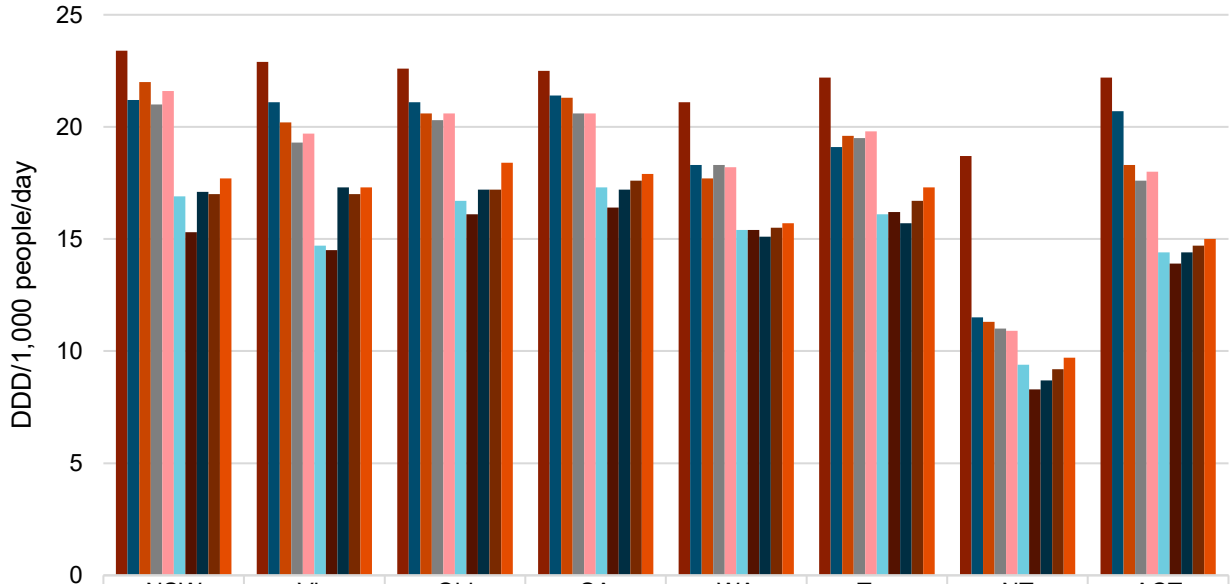
Following the national trend, antimicrobial use declined overall across all states and territories from 2015 to 2024 (Figures 7 and 8). However, there was variation between jurisdictions.

Lower rates of antimicrobial use in the Northern Territory (NT) observed in Figures 7–11 and Tables 3 and 4 may reflect the access to supply of antimicrobials outside the PBS/RPBS or more limited access to health care (see Appendix 1).

In 2024, the rate of antimicrobials supplied was highest in Queensland (18.4 DDD/1,000 people/day) and lowest in the Australian Capital Territory (15 DDD/1,000 people/day) (the NT excluded; Figure 7).

When analysed by aged-standardised rate, antimicrobial use was also highest in Queensland (886 prescriptions/1,000 people) and lowest in Western Australia (726 prescriptions/1,000 people) in 2024 (the NT excluded; Figure 8).

Figure 7 Rate of PBS/RPBS antimicrobial prescriptions dispensed (DDD/1,000 people/day), by patient's state or territory, 2015–2024



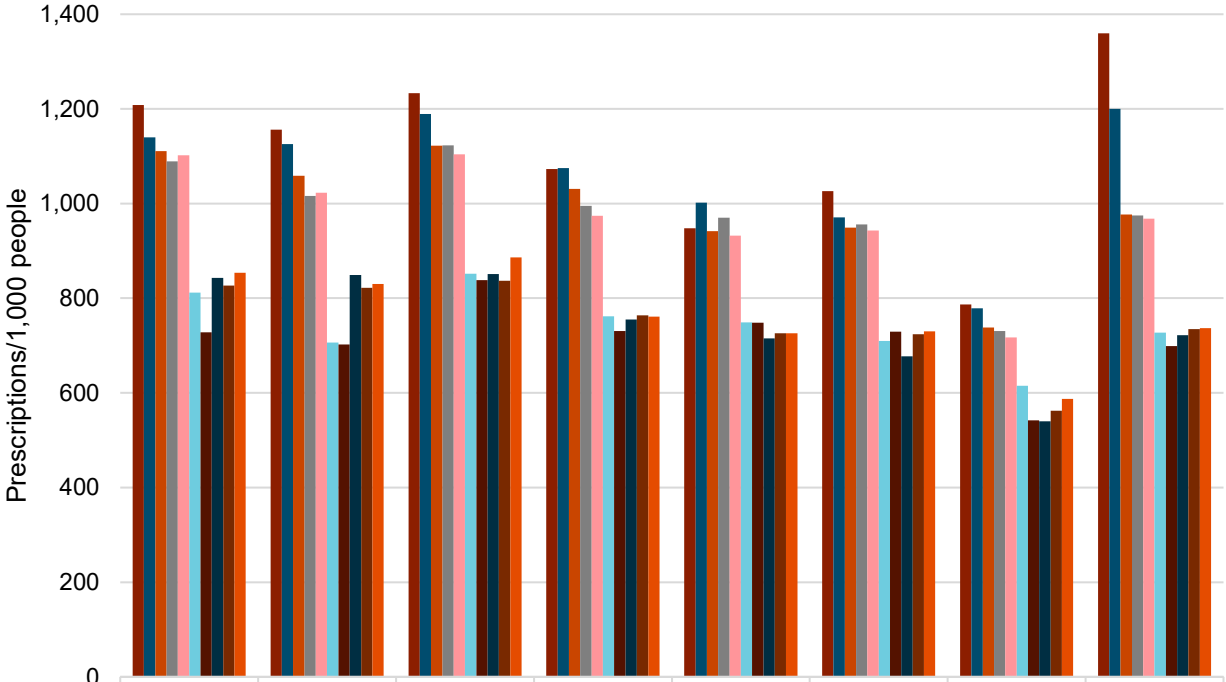
	NSW	Vic	Qld	SA	WA	Tas	NT	ACT
2015	23.4	22.9	22.6	22.5	21.1	22.2	18.7	22.2
2016	21.2	21.1	21.1	21.4	18.3	19.1	11.5	20.7
2017	22	20.2	20.6	21.3	17.7	19.6	11.3	18.3
2018	21	19.3	20.3	20.6	18.3	19.5	11	17.6
2019	21.6	19.7	20.6	20.6	18.2	19.8	10.9	18
2020	16.9	14.7	16.7	17.3	15.4	16.1	9.4	14.4
2021	15.3	14.5	16.1	16.4	15.4	16.2	8.3	13.9
2022	17.1	17.3	17.2	17.2	15.1	15.7	8.7	14.4
2023	17	17	17.2	17.6	15.5	16.7	9.2	14.7
2024	17.7	17.3	18.4	17.9	15.7	17.3	9.7	15

DDD = defined daily dose; PBS = Pharmaceutical Benefits Scheme; RPBS = Repatriation Pharmaceutical Benefits Scheme

Note: The DDD values determined by the World Health Organization Collaborating Centre for Drug Statistics Methodology for 2024 have been applied in this report, causing slight variation with results presented in previous reports.[53]

Source: Gadzhanova, Roughead[52]

Figure 8 Number of PBS/RPBS antimicrobial prescriptions dispensed per 1,000 people, age-standardised rate by patient's state or territory, 2015–2024



	NSW	Vic	Qld	SA	WA	Tas	NT	ACT
2015	1,208	1,156	1,233	1,073	948	1,026	787	1,360
2016	1,140	1,126	1,189	1,075	1,002	971	779	1,200
2017	1,111	1,059	1,122	1,031	942	949	738	977
2018	1,089	1,016	1,123	995	970	956	731	975
2019	1,102	1,023	1,104	974	932	943	717	968
2020	812	706	852	762	749	710	615	727
2021	728	702	838	731	748	729	542	699
2022	843	849	851	755	715	677	540	722
2023	827	822	837	764	726	724	562	735
2024	854	830	886	761	726	730	587	737

PBS = Pharmaceutical Benefits Scheme; RPBS = Repatriation Pharmaceutical Benefits Scheme

Note: Age-standardised rates were based on the age structure of the Australian national population in mid-2013 for consistency with previous reports.

Source: Gadzhanova, Roughead[52]

Tables 3 and 4 show antimicrobial use also varies by local area defined by both SA3 and PHN. The highest and lowest antimicrobial dispensing rates largely remained consistent from 2023 to 2024 and compared to previous years (see Appendix 2).[17]

Table 3 Highest and lowest number of PBS/RPBS antimicrobial prescriptions dispensed per 1,000 people, age-standardised rate by patient's SA3, 2023–2024

State or territory	2023				2024			
	Lowest SA3	Rate	Highest SA3	Rate	Lowest SA3	Rate	Highest SA3	Rate
NSW	Botany	363	Richmond - Windsor	1,501	Botany	382	Richmond - Windsor	1,571
Vic	Melbourne City	531	Casey - South	1,172	Melbourne City	544	Casey - South	1,189
Qld	Far North	266	Beenleigh	1,400	Far North	272	Beaudesert	1,633
SA	Adelaide City	574	Playford	949	Adelaide City	564	Playford	954
WA	Kimberley	293	Canning	1,005	Kimberley	331	Canning	972
Tas	Central Highlands	197	Brighton	1,075	Central Highlands	200	Brighton	1,110
NT	East Arnhem	42	Palmerston	698	East Arnhem	37	Palmerston	725
ACT	North Canberra	559	Weston Creek	1,036	Fyshwick - Pialligo - Hume	547	Weston Creek	1,055

PBS = Pharmaceutical Benefits Scheme; RPBS = Repatriation Pharmaceutical Benefits Scheme; SA3 = Statistical Area Level 3
Notes:

1. Age-standardised rates were based on the age structure of the Australian national population in mid-2013 for consistency with previous reports.
2. See Appendix 2 for further analyses of PBS/RPBS antimicrobial dispensing by SA3.

Source: Gadzhanova, Roughead[52]

Table 4 Highest and lowest number of PBS/RPBS antimicrobial prescriptions dispensed per 1,000 people, age-standardised rate by patient's PHN, 2023–2024

State or territory	2023				2024			
	Lowest PHN	Rate	Highest PHN	Rate	Lowest PHN	Rate	Highest PHN	Rate
NSW	Murrumbidgee	700	Nepean Blue Mountains	1,118	Murrumbidgee	718	Nepean Blue Mountains	1,105
Vic	Western Victoria	827	South Eastern Melbourne	889	North Western Melbourne	816	Gippsland	884
Qld	Central Queensland, Wide Bay, Sunshine Coast	824	Brisbane South	878	Western Queensland	861	Darling Downs and West Moreton	912
SA*	Adelaide	765	Country SA	810	Adelaide	741	Country SA	808
WA†	Country WA	633	Perth North	764	Country WA	637	Perth North	738
Tas§	Tasmania	721	Tasmania	721	Tasmania	715	Tasmania	715
NT§	Northern Territory	451	Northern Territory	451	Northern Territory	455	Northern Territory	455
ACT§	Australian Capital Territory	738	Australian Capital Territory	738	Australian Capital Territory	722	Australian Capital Territory	722

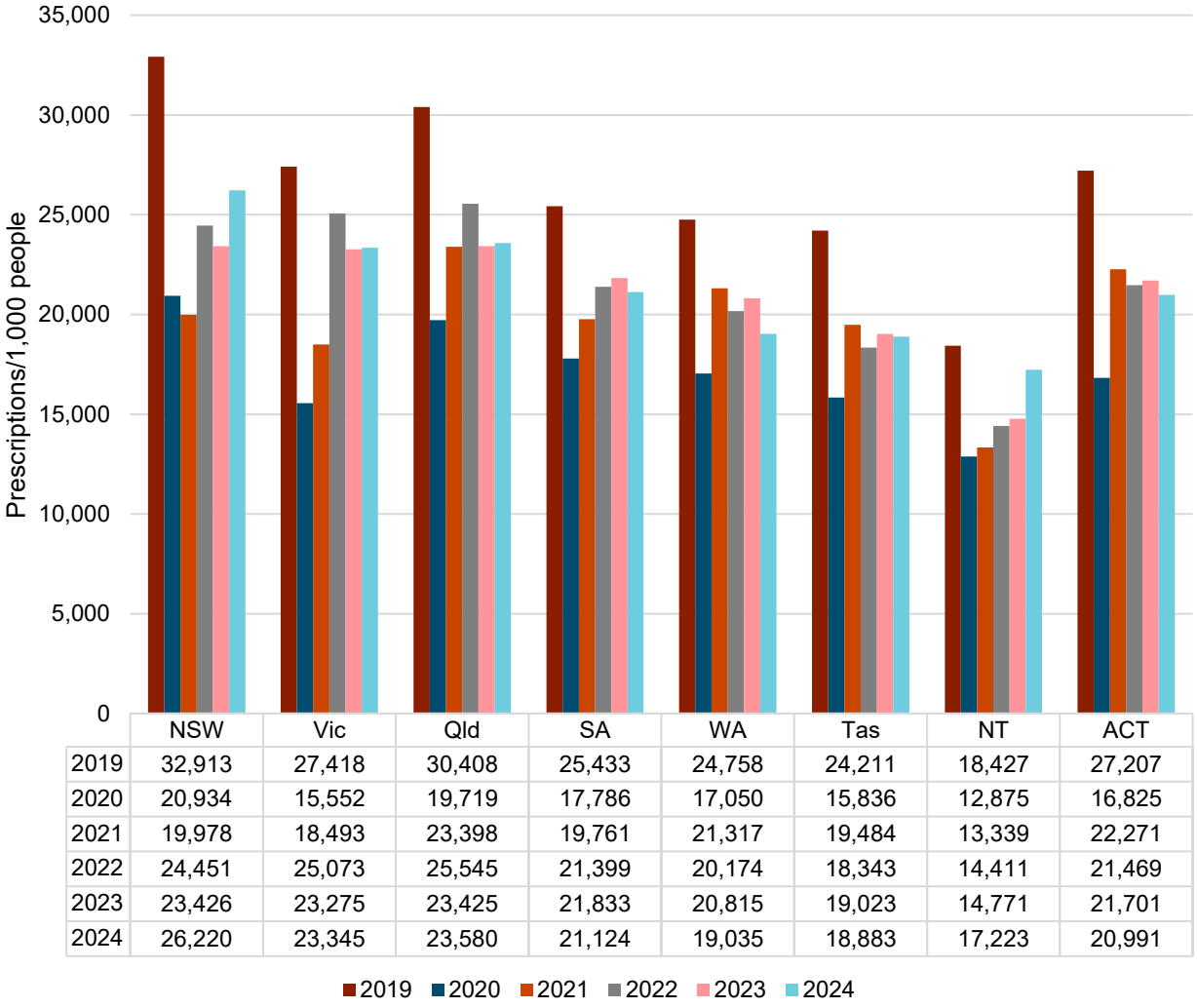
PBS = Pharmaceutical Benefits Scheme; PHN = Primary Health Network; RPBS = Repatriation Pharmaceutical Benefits Scheme
* There are two PHN regions in South Australia
† There are three PHN regions in Western Australia
§ There is one PHN region in Tasmania, the Northern Territory and the Australian Capital Territory, respectively
Notes:

1. Age-standardised rates were based on the age structure of the Australian national population in mid-2013 for consistency with previous reports.
2. See Appendix 2 for further analyses of PBS/RPBS antimicrobial dispensing by PHN.

Source: Gadzhanova, Roughead[52]

The majority of antimicrobial prescriptions are supplied in the winter months, June to August. The age-standardised rate of antimicrobials supplied in winter follows a similar trend to yearly national and state and territory antimicrobial use. The age-standardised rate of antimicrobials supplied in winter has fallen overall since 2019. However, rates have consistently risen in NT since 2020 (Figure 9).

Figure 9 Number of PBS/RPBS antimicrobial prescriptions dispensed per 1,000 people in winter (June–August), age-standardised rate by prescriber's state and territory, 2019–2024



	NSW	Vic	Qld	SA	WA	Tas	NT	ACT
2019	32,913	27,418	30,408	25,433	24,758	24,211	18,427	27,207
2020	20,934	15,552	19,719	17,786	17,050	15,836	12,875	16,825
2021	19,978	18,493	23,398	19,761	21,317	19,484	13,339	22,271
2022	24,451	25,073	25,545	21,399	20,174	18,343	14,411	21,469
2023	23,426	23,275	23,425	21,833	20,815	19,023	14,771	21,701
2024	26,220	23,345	23,580	21,124	19,035	18,883	17,223	20,991

PBS = Pharmaceutical Benefits Scheme; RPBS = Repatriation Pharmaceutical Benefits Scheme

Note: Age-standardised rates were based on the age structure of the Australian national population in mid-2013 for consistency with previous reports.

Source: Gadzhanova, Roughead[52]

The age-standardised rates of antimicrobial use in the 2024 winter months are mapped to Australian SA3 and PHN regions in Figures 10 and 11. Further analyses of PBS/RPBS antimicrobial dispensing by local area level are included in Appendix 2.

Figure 10 Number of PBS antimicrobial prescriptions dispensed per 100,000 people in winter (June–August), age-standardised rate by prescriber's SA3, 2024

PBS = Pharmaceutical Benefits Scheme; SA3 = Statistical Area Level 3

Notes:

1. Age-standardised rates were based on the age structure of the Australian national population in mid-2013 for consistency with previous reports.
2. Some data are not published due to suppression (see Appendix 1).
3. See Appendix 2 for further analyses of PBS/RPBS antimicrobial dispensing by SA3.

Source: Gadzhanova, Roughead[52]

Figure 11 Number of PBS antimicrobial prescriptions dispensed per 100,000 people in winter (June–August), age-standardised rate by prescriber's PHN, 2024

PBS = Pharmaceutical Benefits Scheme; PHN = Primary Health Network

Notes:

1. Age-standardised rates were based on the age structure of the Australian national population in mid-2013 for consistency with previous reports.
2. There is one PHN region in Tasmania, the Northern Territory and the Australian Capital Territory, respectively, two PHN regions in South Australia, and three PHNs regions in Western Australia.
3. See Appendix 2 for further analyses of PBS/RPBS antimicrobial dispensing by PHN.

Source: Gadzhanova, Roughead[52]

Aged care and older Australians

Aged care homes

In 2024, there were 659,767 antimicrobial prescriptions supplied under the PBS to Australians of all ages who resided in aged care homes. These prescriptions accounted for 2.8% of all antimicrobials supplied in Australia in 2024, despite aged care home residents accounting for approximately 0.7% of the total population.[55] There was a 14.4% increase in the number of antimicrobial prescriptions supplied from 2023 to 2024, and 25.9% increase from 2021 to 2024 (Table 5).

Of Australians who resided in aged care homes, 79.5% (*n* = 157,430) received at least one antimicrobial supplied under the PBS in 2024, compared to 72.6% (*n* = 141,588) in 2023.

The overall prescribing rate for antimicrobials supplied to Australians in aged care homes under the PBS was 329 prescriptions per 100 people in 2024, or just over three antimicrobial prescriptions per resident on average. This was an 11.5% increase from 295 prescriptions per 100 people in 2023. The rates in 2022 and 2021 were 273 and 283 prescriptions per 100 people, respectively.

The vast majority of antimicrobials supplied to residents of aged care homes were J01 antibacterials for systemic use. In 2024, there were 617,084 prescriptions for J01 antibacterials supplied under the PBS to aged care home residents. This was a 15% increase compared to 2023 (Table 5).

Of Australians who resided in aged care homes in 2024, 75.6% (*n* = 151,235) received at least one J01 antibacterial for systemic use supplied under the PBS, compared to 69.7% (*n* = 135,904) in 2023.

Table 5 Number of PBS/RPBS antimicrobial prescriptions dispensed, aged care home residents, 2021–2024

Year	All antimicrobials (*n*)	J01 antibacterials (*n*)	Non-J01 antimicrobials (*n*)
2021	523,891	485,847	38,044
2022	518,917	483,275	35,642
2023	576,579	536,483	40,096
2024	659,767	617,084	42,683

J01 = antibacterials for systemic use; PBS = Pharmaceutical Benefits Scheme; RPBS = Repatriation Pharmaceutical Benefits Scheme

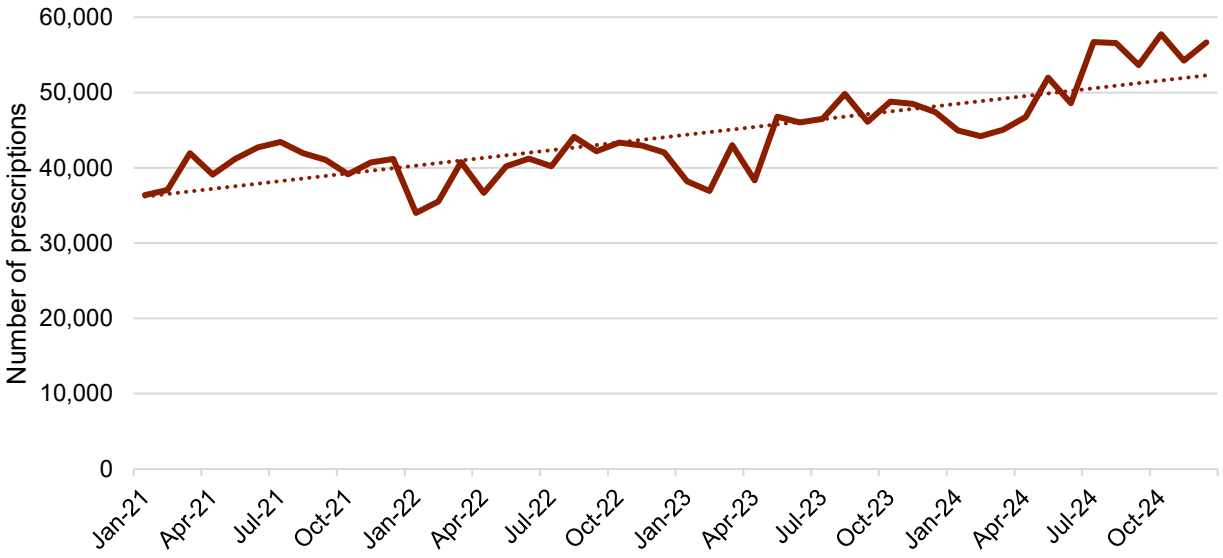
Note: The aged care indicator for a patient's residence in an aged care home was introduced in July 2017 and became mandatory from July 2020. Therefore, analyses for data from 1 January 2021 to 31 December 2024 were included in this report to ensure complete and reliable data analysis.

Source: Gadzhanova, Roughead[56]

The J01 antibacterials were the most commonly dispensed antimicrobial class to aged care residents, representing 2.7% of all J01 antibacterials supplied in Australia under the PBS in 2024 compared to 2.5% in 2023. Figure 12 shows use of J01 antibacterials in aged care homes by month.

The next most commonly supplied antimicrobials under the PBS to aged care home residents were ATC codes S01 and S02, which were topical antimicrobials for eyes and ears, respectively (Figure 13). As the PBS/RPBS do not capture data on indication, it is difficult to comment on this finding.

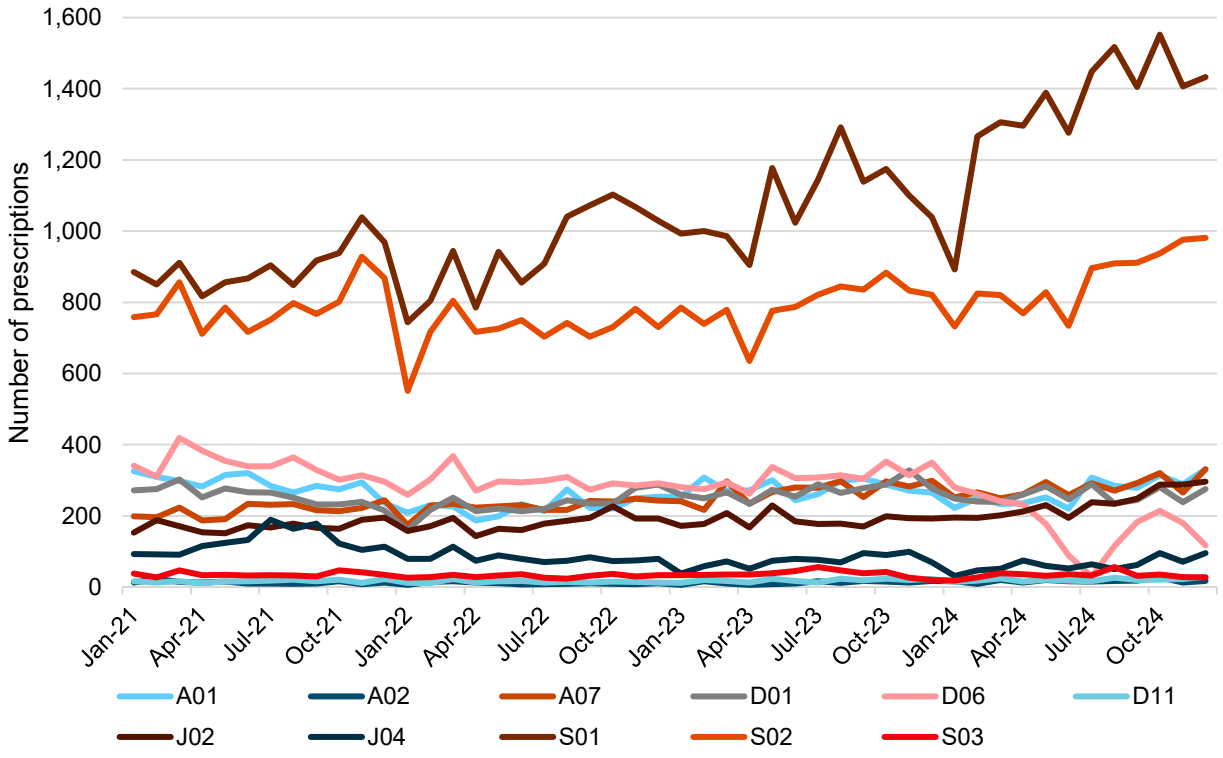
Figure 12 Number of PBS/RPBS prescriptions for J01 antibacterials for systemic use dispensed, aged care home residents, 2021–2024



PBS = Pharmaceutical Benefits Scheme; RPBS = Repatriation Pharmaceutical Benefits Scheme

Source: Gadzhanova, Roughead[56]

Figure 13 Number of PBS/RPBS antimicrobial prescriptions dispensed, aged care home residents, 2021–2024



A01 = stomatological preparations; A02 = drugs for acid related disorders; A07 = antidiarrheals, intestinal anti-inflammatory/anti-infective agents; D01 = antifungals for dermatological use; D06 = antibiotics and chemotherapeutics for dermatological use; D11 = other dermatological preparations; J02 = antimycotics for systemic use; J04 = antimycobacterials; PBS = Pharmaceutical Benefits Scheme; RPBS = Repatriation Pharmaceutical Benefits Scheme; S01 = ophthalmologicals; S02 = otologicals; S03 = ophthalmological and otological preparations

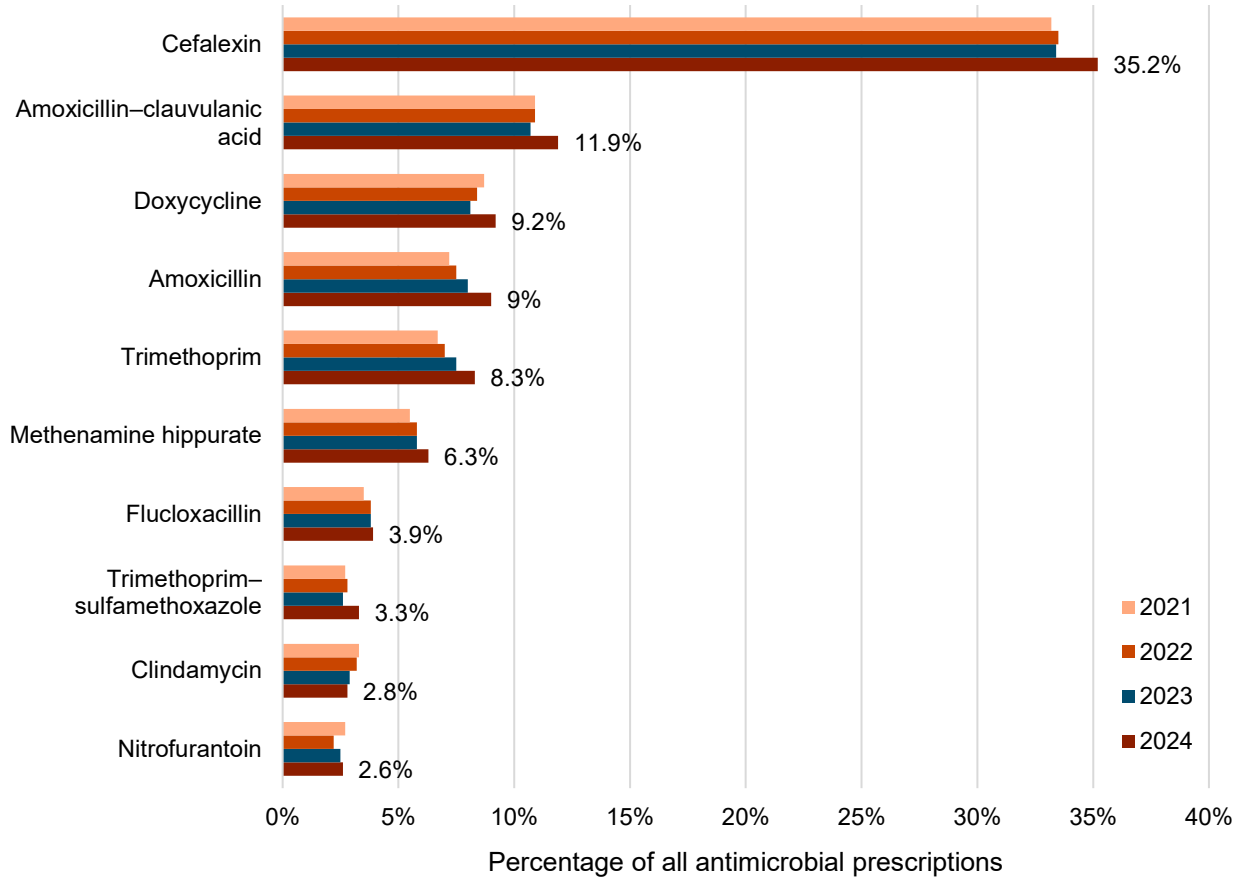
* Selected antimicrobial classes

Note: Many antimicrobials for skin conditions are available over-the-counter without a prescription so are not captured by the PBS/RPBS.

Source: Gadzhanova, Roughead[56]

The 10 most commonly dispensed antimicrobials accounted for 86.5% of all antimicrobials dispensed to aged care home residents from 2021 to 2024. Cefalexin was by far the most frequently supplied antimicrobial (Figure 14).

Figure 14 The 10 most commonly dispensed PBS/RPBS antimicrobial prescriptions, aged care home residents, 2021–2024



PBS = Pharmaceutical Benefits Scheme; RPBS = Repatriation Pharmaceutical Benefits Scheme

Note: Data labels for 2024 are shown.

Source: Gadzhanova, Roughead[56]

Older Australians

When comparing antimicrobial use in older Australians aged 65 years and over, patterns vary depending on place of residence. It is important to note the diversity of this age group and the difference in population size across settings. The healthcare needs of older Australians across settings are also likely to vary. See Appendix 1 for considerations for interpreting data with respect to age and aged care residency.

Of all J01 antibacterials dispensed under the PBS in 2024, 2.7% were supplied to older Australians in aged care homes, while 29.7% were supplied to older Australians in the community. This was compared to 2.5% and 28.7% respectively, in 2023.

The average number of J01 antibacterial prescriptions supplied per person in 2024 was much higher for older Australians who resided in aged care homes (3.1) than the community (1.48). This was similar to 2023 (2.76 compared to 1.34, respectively).

Cefalexin, a J01 antibacterial, remained the most frequently dispensed antimicrobial for older Australians across settings. Proportionally, it was more often supplied to those who resided in aged care homes than the community (Table 6).

Table 6 Number and percentage of PBS antimicrobial* prescriptions dispensed to people aged 65 years and over, by setting, 2024

	Aged care home		Community	
Antimicrobial*	(*n*)	(%)	(*n*)	(%)
Cefalexin	213,264	35.2%	1,716,875	25.7%
Amoxicillin–clavulanic acid	72,136	11.9%	989,216	14.8%
Doxycycline	55,718	9.2%	887,332	13.3%
Amoxicillin	54,751	9%	1,046,905	15.7%
Trimethoprim	50,546	8.3%	357,453	5.4%
Methenamine hippurate	37,984	6.3%	232,408	3.5%
Flucloxacillin	23,874	3.9%	220,226	3.3%
Trimethoprim–sulfamethoxazole	19,971	3.3%	185,317	2.8%
Clindamycin	16,894	2.8%	110,344	1.7%
Nitrofurantoin	16,046	2.6%	92,385	1.4%

PBS = Pharmaceutical Benefits Scheme

* Most commonly dispensed antimicrobials in aged care homes in 2024 (see Figure 14)

Note: Percentage of J01 antibacterials for systemic use dispensed in 2024.

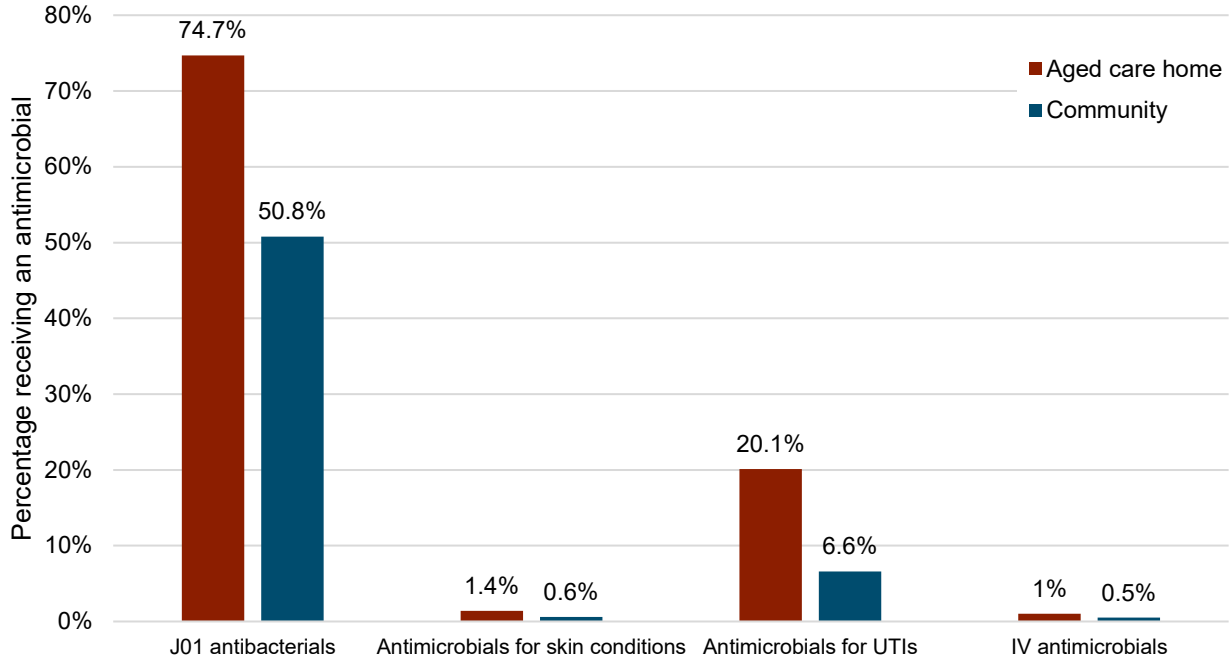
Source: Gadzhanova, Roughead[56]

Of older Australians who resided in aged care homes, 74.7% received a J01 antibacterial under the PBS in 2024, compared to 50.8% of older Australians in the community (Figure 15). This was compared to 68.6% and 45.6%, respectively, in 2023.

When J01 antibacterials were analysed by sex for aged care home residents, more older males (78%) were supplied at least one prescription than older females (73.1%). However, in the community, more older females (53.7%) were supplied at least one J01 antibacterial prescription than older males (47.5%) (Figure 16).

Figure 15 also shows that the rate of dispensing antimicrobials for UTIs for older people in aged care homes was more than three times higher than for older people in the community. Supply of intravenous antimicrobials and of antimicrobials for skin conditions was comparably very low.

Figure 15 PBS antimicrobial prescriptions dispensed for people aged 65 years and over, by setting and classification*, 2024



J01 = antibacterials for systemic use; UTI = Urinary tract infection; IV = Intravenous; PBS = Pharmaceutical Benefits Scheme

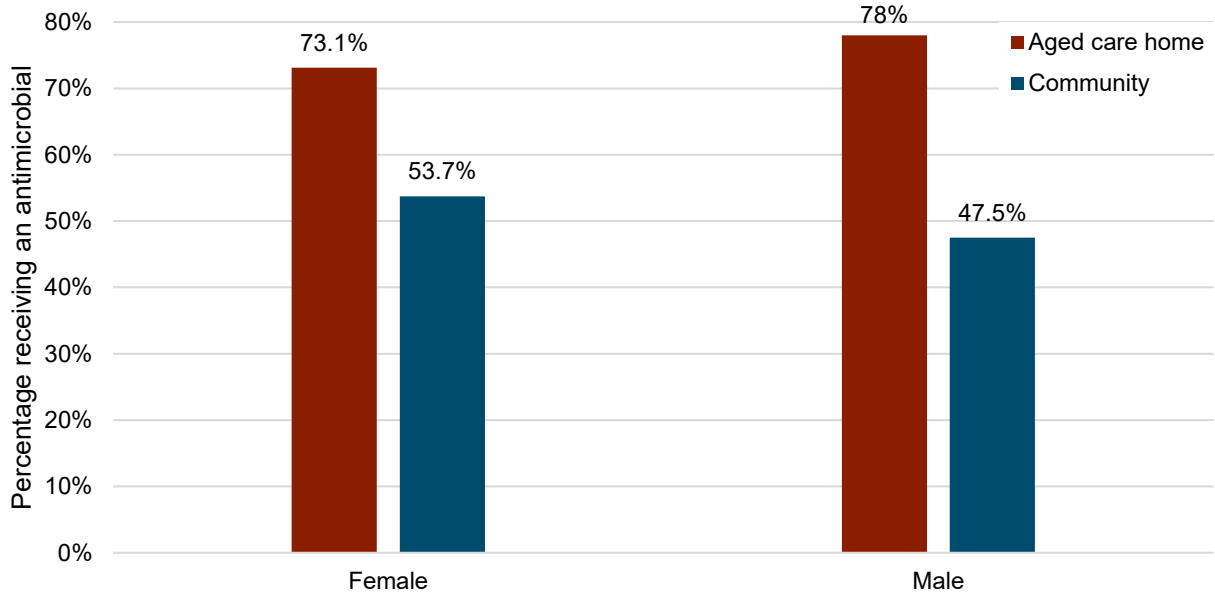
* Per World Health Organization Anatomical Therapeutic Chemical Classification and PBS/RPBS listings

Notes:

1. PBS/RPBS data do not indicate the diagnosis or condition of the patient or the indication for prescription. Antimicrobials for UTIs include methenamine hippurate, nitrofurantoin, norfloxacin and trimethoprim. Other antimicrobials, including J01 antibacterials for systemic use, may also be used for UTIs but this cannot be determined from the dataset.
2. Many antimicrobials for skin conditions are available over-the-counter without a prescription so are not captured by the PBS/RPBS.

Source: Gadzhanova, Roughead[56]

Figure 16 PBS prescriptions for J01 antibacterials for systemic use dispensed for people aged 65 years and over, by setting and sex, 2024



J01 = antibacterials for systemic use; PBS = Pharmaceutical Benefits Scheme Note: PBS/RPBS data do not indicate the diagnosis or condition of the patient or the indication for prescription.

Source: Gadzhanova, Roughead[56]

Antimicrobials for urinary tract infections in aged care homes and the community

In this report, antimicrobials for UTIs include methenamine hippurate, nitrofurantoin, norfloxacin and trimethoprim given WHO ATC codes and PBS/RPBS listings. It is important to note that as indication for prescribing cannot be determined from the PBS/RPBS dataset, other antimicrobials such as the J01 antibacterials cefalexin and amoxicillin–clavulanic acid may also be used for UTIs but are not included in the analyses for this section of this report.

Of all antimicrobials for UTIs supplied under the PBS in 2024, 7.8% were for older Australians in aged care homes, while 51.5% were supplied to older Australians in the community. Just over one-third (33.6%) of prescriptions for UTIs across both settings were for methenamine hippurate, which is only indicated for prophylaxis[57] (Table 7).

When analysed by sex, more older females than older males across both aged care homes and the community received at least one antimicrobial for UTI (Figure 17).

For older females, more than twice as many residing in aged care homes (23.3%) received at least one prescription for an antimicrobial for UTI compared to those in the community (9.4%) (Figure 17).

Table 7 Number and percentage of PBS antimicrobial prescriptions for urinary tract infections* dispensed to people aged 65 years and over, by setting, 2024

	Aged care home		Community	
Antimicrobial*	(*n*)	(%)	(*n*)	(%)
Trimethoprim	50,546	47.9%	357,453	51.2%
Methenamine hippurate	37,984	36%	232,408	33.3%
Nitrofurantoin	16,046	15.2%	92,385	13.2%
Norfloxacin	1,025	1%	16,690	2.4%

PBS = Pharmaceutical Benefits Scheme

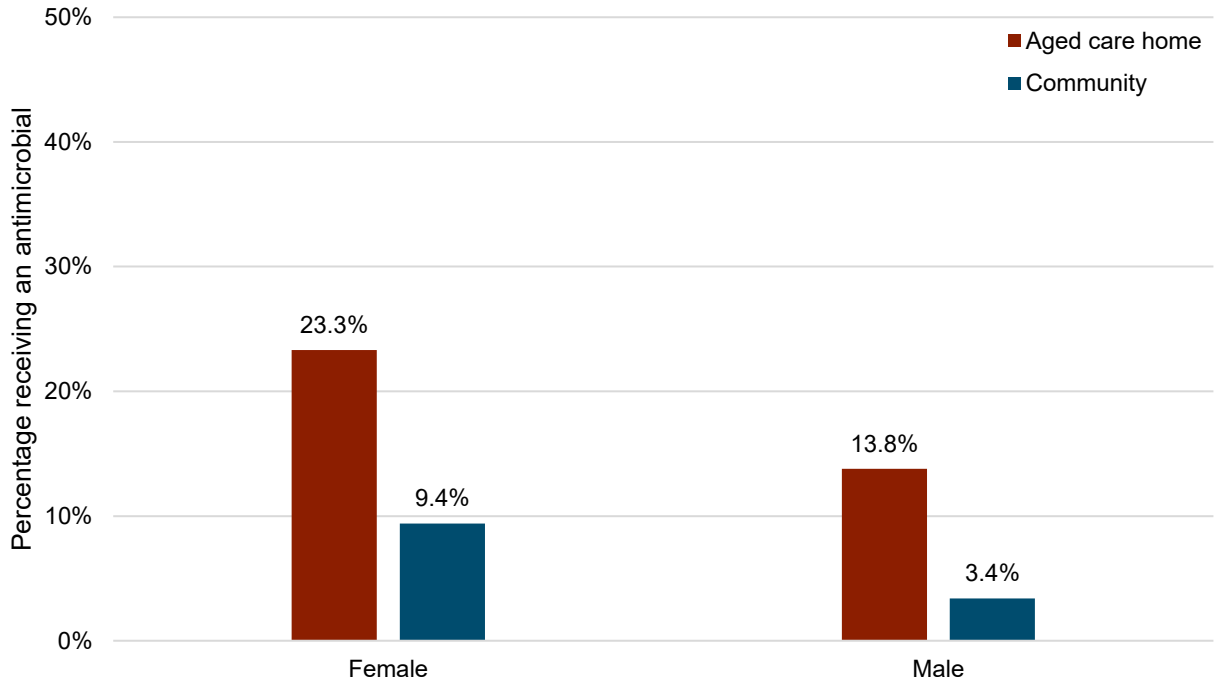
* Antimicrobials used for urinary tract infections per World Health Organization Anatomical Therapeutic Chemical Classification and PBS/RPBS listings

Notes:

1. Percentage of antimicrobials listed.
2. PBS/RPBS data do not indicate the diagnosis or condition of the patient or the indication for prescription. Other antimicrobials, including J01 antibacterials for systemic use, may be used for urinary tract infections.
3. From March 2024, methenamine hippurate could be supplied for up to 60 days.

Source: Gadzhanova, Roughead[56]

Figure 17 PBS prescriptions for antimicrobials for urinary tract infections* dispensed for people aged 65 years and over, by setting and sex, 2024



UTI = Urinary tract infection; PBS = Pharmaceutical Benefits Scheme

* Antimicrobials used for urinary tract infections per World Health Organization Anatomical Therapeutic Chemical Classification and PBS/RPBS listings

Note: PBS/RPBS data do not indicate the diagnosis or condition of the patient or the indication for prescription. Antimicrobials for UTIs include methenamine hippurate, nitrofurantoin, norfloxacin and trimethoprim. Other antimicrobials, including J01 antibacterials for systemic use, may also be used for UTIs but this cannot be determined from the dataset.

Source: Gadzhanova, Roughead[56]

Antimicrobials for skin conditions in aged care homes and the community

It is important to note that many antimicrobials for skin conditions, such as topical antifungals, are available over-the-counter without a prescription. These antimicrobials are not captured by the PBS/RPBS, which is likely to have influenced the comparatively low numbers of prescriptions shown in Table 8. This is despite skin conditions being the most common indication for antimicrobial prescriptions in aged care homes.[58]

Additionally, as indication for prescribing cannot be determined from the PBS/RPBS dataset, other antimicrobials, such as J01 antibacterials flucloxacillin, cefalexin and amoxicillin–clavulanic acid may also be used for skin conditions but are not included in the analyses for this section of this report.

Of all antimicrobials for skin conditions supplied under the PBS in 2024, 3.5% were for older Australians in aged care homes, while 35.1% were supplied to older Australians in the community.

For residents of aged care homes who received a topical antifungal, 72.9% received one prescription in 2024, while 16.4% received two prescriptions. This suggests that a majority of aged care home residents used topical antifungals available under the PBS for a limited duration. However, more than 3% had six or more prescriptions supplied in the year.

Table 8 Number and percent of PBS antimicrobial prescriptions dispensed for skin conditions* to people aged 65 years and over, by setting, 2024

	Aged care home		Community	
Antimicrobial*	(*n*)	(%)	(*n*)	(%)
Silver sulfadiazine	2,073	39.1%	13,545	25.4%
Miconazole	1,019	19.2%	2,505	4.7%
Griseofulvin	827	15.6%	13,080	24.6%
Terbinafine (topical)	711	13.%	3,611	6.8%
Terbinafine (systemic)	380	7.2%	16,483	31%
Dapsone	243	4.6%	3,685	6.9%
Ketoconazole	51	1%	327	0.6%

PBS = Pharmaceutical Benefits Scheme

* Antimicrobials used for skin conditions per World Health Organization Anatomical Therapeutic Chemical Classification and PBS/RPBS listings

Notes:

1. Percentage antimicrobials listed.
2. PBS/RPBS data do not indicate the diagnosis or condition of the patient or the indication for prescription.
3. Many antimicrobials for skin conditions are available over-the-counter without a prescription so are not captured by the PBS/RPBS.

Source: Gadzhanova, Roughead[56]

Intravenous antimicrobials in aged care homes and the community

Of all intravenous antimicrobials supplied under the PBS in 2024, 3.2% were for older Australians in aged care homes, while 45.5% were supplied to older Australians in the community.

Ceftriaxone accounted for 81.5% of all intravenous antimicrobials supplied to residents of aged care homes (Table 9). The overall numbers, however, were low as most intravenous antimicrobial use occurs in acute inpatient settings. Intravenous antimicrobials in the community may be associated with Hospital in the Home programs.

Table 9 Number and percentage of PBS intravenous antimicrobial prescriptions dispensed to people aged 65 years and over, by setting, 2024

	Aged care home		Community	
Antimicrobial	(*n*)	(%)	(*n*)	(%)
Ceftriaxone	2,210	81.5%	6,478	17.9%
Gentamicin	280	10.3%	2,632	7.3%
Cefazolin	108	4%	17,393	48.2%
Tobramycin	89	3.3%	1,641	4.5%
Benzylpenicillin	25	0.9%	3,722	10.3%
Vancomycin	n.p.	n.p.	4,250	11.8%

n.p = not published; PBS = Pharmaceutical Benefits Scheme

Note:

1. Percentage of antimicrobials listed.
2. Some data are not published due to suppression.

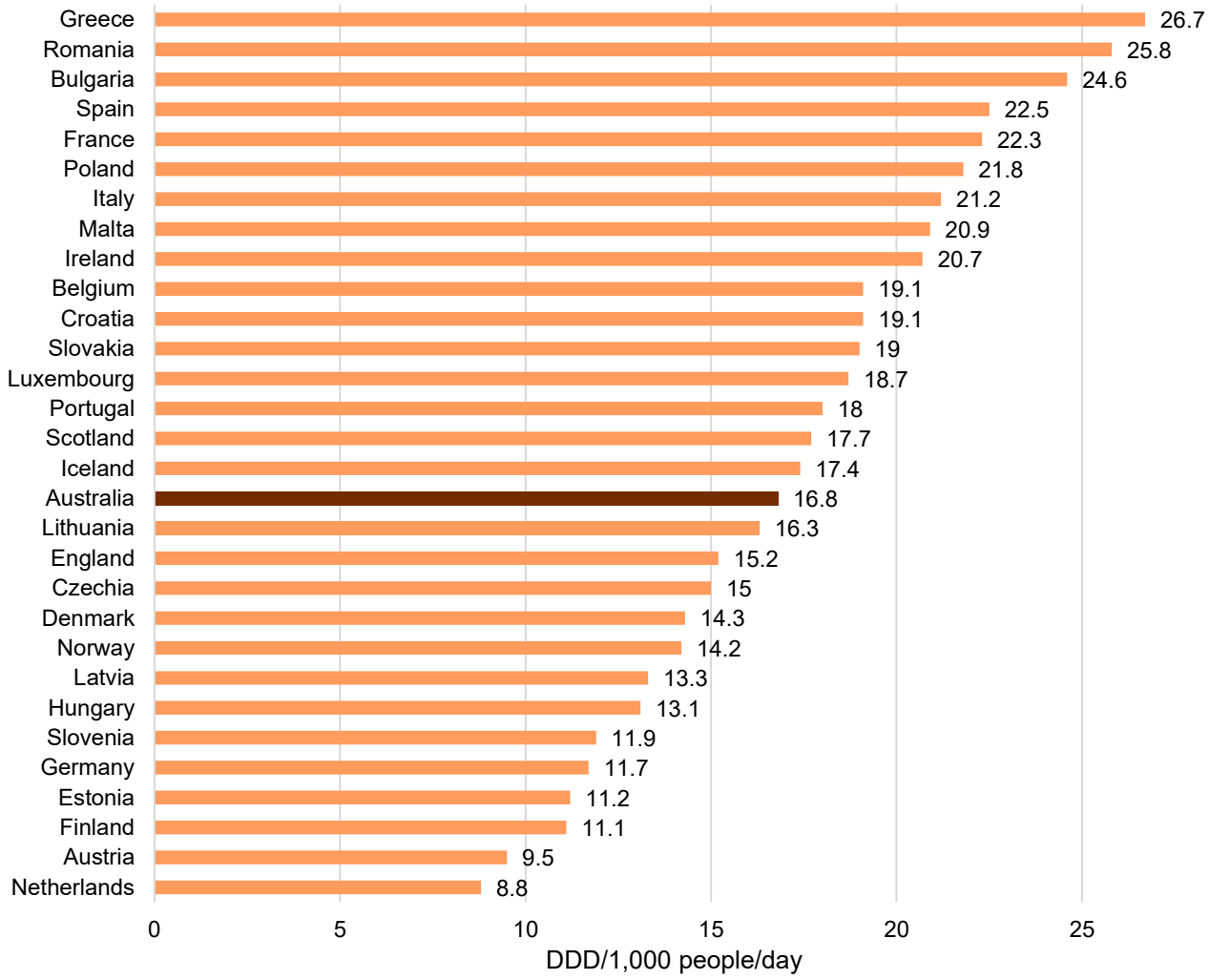
Source: Gadzhanova, Roughead[56]

International comparison

Australia is estimated to have consistently high antimicrobial prescribing rates relative to most other countries in the Organisation for Economic Co-operation and Development (OECD).[59] Globally, antimicrobial use reduced substantially during the COVID-19 pandemic, with the most pronounced reductions observed in high-income countries.[60-64]Following the pandemic, high-income countries experienced an upward trend in antimicrobial use, with a slight increase in 2021 followed by larger rises in 2022 and 2023.[60]This pattern is consistent with what was observed in Australia.[22, 65]

Australia's use of antimicrobials in the community remained steady in 2022 and 2023 at 16.8 DDD per 1,000 people per day.[17] This is up from 16 in 2020. In comparison to European countries, England and Scotland, Australia ranked in the middle for community antimicrobial use in 2023.[66-68] However, use was nearly double that reported for the Netherlands (Figure 18).

Figure 18 Community antimicrobial use in Australia, European countries, England and Scotland, 2023



DDD = defined daily dose

Notes:

1. The DDD values determined by the World Health Organization Collaborating Centre for Drug Statistics Methodology for 2024 have been applied in this report, causing slight variation with results presented in previous reports.[53]
2. There are some variations in data collection between countries that cannot be displayed.
3. Complete international data for 2024 were not available for comparison in this report.

Sources: Gadzhanova, Roughead[52]; European Centre for Disease Prevention and Control[66]; UK Health Security Agency[67]; Antimicrobial Resistance and Healthcare Associated Infection Scotland[68]

Conclusions

It is encouraging that overall antimicrobial use in the community in 2024 has remained below pre-pandemic levels, although there is evidence of increasing use from 2022 onwards. Compared to 2023, there was minimal difference in the patterns of prescribing under the PBS/RPBS across age groups, states and territories and local areas, the most frequently prescribed antimicrobials and the use of repeats. The increase of 4.8% from 2023 to 2024 may be due to an increase in the Australian population over that period. However, DDD per 1,000 people per day, a rate controlled for population, also increased from 16.8 in 2023 to 17.4 in 2024, which reinforces the upward trend. Internationally, Australia's usage rates remained higher than comparable European countries and England, and near double that of the Netherlands.[66-68]

The overall decline in antimicrobial use in the community from 2015 to 2024, particularly since 2020, indicates that lower levels of antimicrobial use are achievable in the long-term. The profound effect of the COVID-19 pandemic on antimicrobial use is evident in Australia and has also been observed in other high-income countries.[60, 69, 70] However, there are several factors that may have influenced the decline in antimicrobial use in Australia, including PBS/RPBS policy changes for repeat prescriptions.[28] It is likely that local prescriber preference is a major influence on antimicrobial use given the ongoing trends in supply by local area.

There are opportunities to enhance community understanding of the role of antimicrobials in treating infections, particularly the lack of benefit of antibiotics for viral infections, and some bacterial conditions for which antimicrobials provide little to no benefit. There are also opportunities to enhance community understanding of the positive impact of reducing inappropriate antimicrobial use on the sustainability of health care.

The Commission will continue to reinforce messaging for consumers about the role of antimicrobials in AMR, the effects of antimicrobials on beneficial and harmful bacteria, and raise awareness of the potential impact of antimicrobials on the development of chronic conditions in children and adults.[71-74] The Commission will also promote infection prevention and control practices in the community to reduce the spread of AMR.

Combined strategies of AMS and infection prevention and control in the community appear to be most effective in reducing antimicrobial use and improving prescribing appropriateness, as well as reducing incidences of infections and healthcare-associated greenhouse gas emissions. However, strategies must be dynamic to adapt to challenges like ongoing medicines shortages, and for particular settings and populations.

Although antimicrobial use in aged care homes accounts for a small proportion of overall use in the community, the very high dispensing rates per person and the volume of use are cause for concern. Antimicrobial use is notably higher for older Australians who reside in aged care homes than for those who reside in the community. It is well documented that aged care home residents are susceptible to infections for a variety of reasons, including advanced age, multiple comorbidities, poor functional status and compromised immune status.[22, 75] Being residential, these facilities are a close living environment for residents in which they will likely be in frequent contact with potentially colonised or infected staff, visitors or other residents, and environmental surfaces. Residents may also have multiple or prolonged hospitalisations for the same reasons that make them susceptible to infections.[22] Frequent hospital transfers may also increase the risk of AMR spreading to aged care homes.

Despite the contributing factors that increase the risk of infection for aged care home residents, issues that have been identified for improvement of antimicrobial prescribing in this setting include ensuring the documentation of key prescribing elements (indication and review or stop date), rationalising antimicrobial prescriptions for prophylactic use, and promoting

appropriate microbiological sampling.[58] The gap in surveillance of indication and of non-prescription antimicrobials in the PBS/RPBS dataset is also important to note in this context. This is especially the case for skin conditions, which are often treated with over-the-counter antimicrobials and are the most common reason for antimicrobial prescribing in aged care homes.[58] Targeted AMS and infection prevention and control strategies are important for improving the safety of care provided to aged care home residents.[75, 76]

The Commission will continue to work with the Aged Care Quality and Safety Commission, health service providers and clinicians and local and professional organisations across community and aged care settings and use surveillance data to inform targeted strategies for improving antimicrobial use and resident and patient safety. In addition, the Commission will continue to support the implementation of the national safety and quality standards for the primary and community and aged care sectors[3, 5] to promote effective programs for infection prevention and control and AMS.

The Commission will also continue to explore opportunities with the Department to enhance surveillance of the volume and appropriateness of antimicrobial use in Australia. This could include addressing important gaps in current surveillance efforts such as repeat prescriptions; the indications for use and supply of antimicrobials outside the PBS/RPBS from private prescriptions, emerging models of service delivery such as community pharmacy prescribing and expanded scope of practice for a range of registered healthcare practitioners; and in Aboriginal and Torres Strait Islander health services.

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Appendix 1: Data source description

About the Pharmaceutical Benefits Scheme and Repatriation Pharmaceutical Benefits Scheme

The Pharmaceutical Benefits Scheme (PBS) provides timely, reliable and affordable access to necessary medicines for Australians. The PBS is part of the Australian Government's broader National Medicines Policy[77], the aim of which is to meet medication and related service needs, so that both optimal health outcomes and economic objectives are achieved. Under the PBS, the Australian Government subsidises the cost of medicine for most medical conditions. Most of the listed medicines are dispensed by pharmacists, and used by patients at home.[78]

The Repatriation Pharmaceutical Benefits Scheme (RPBS) provides eligible people, as designated by the Australian Government Department of Veterans' Affairs, with access to a wide range of medicines and wound care items at a concession rate.[79] Antimicrobials dispensed under the RPBS in 2024 were not available for analyses for this report.

The proportion of prescriptions written in the community that are captured by the PBS/RPBS is estimated to be more than 90%.[50] Almost all antimicrobials supplied under the PBS/RPBS are Anatomical Therapeutic Chemical (ATC) J01 antibacterials for systemic use. It is estimated that approximately 1% of all J01 antibacterials supplied under the PBS/RPBS are RPBS prescriptions.[51]

The PBS/RPBS also capture public hospital outpatient and discharge prescriptions in all states and territories except New South Wales. The PBS/RPBS do not capture data on private prescriptions (that is non-PBS/RPBS prescriptions that are not subsidised under the PBS/RPBS), or those dispensed by many Aboriginal and Torres Strait Islander health services.

The Australian Government Department of Health, Disability and Ageing (the Department) analyses PBS/RPBS data to inform economic analyses and policy development. Comprehensive medicine usage data are required for several purposes, including pharmacosurveillance and targeting, and evaluation of initiatives for the quality use of medicines. The data are also needed by regulatory and financing authorities, and the pharmaceutical industry.

Data source and criteria

This report analyses data on antimicrobials dispensed under the PBS/RPBS, from 1 January 2015 to 31 December 2024 and includes all prescriptions priced under the patient co-payment which are prescriptions that do not attract a reimbursement (Table A1.1).

These data were obtained from Services Australia following approval for disclosure from the Department and the Australian Government Department of Veterans' Affairs. The Department collects data on antimicrobial dispensing in the community through the PBS/RPBS from the Medicare pharmacy claims database. The data do not contain details on any prescriptions supplied privately or on antimicrobials provided over-the-counter (i.e. without the need for a prescription).

For reporting on antimicrobial use in aged care, the data include an indicator for patient residence in an aged care home. The aged care indicator was introduced in July 2017 and became mandatory from July 2020. Analyses for data from 1 January 2021 to 31 December 2024 were included in this report. The aged care indicator does not capture multi-purpose services.

Table A1.1 PBS/RPBS community antimicrobial use data source

Subject and type of surveillance	Passive surveillance of antimicrobial use in the community
Data source	Pharmaceutical Benefits Scheme (PBS)/Repatriation Pharmaceutical Benefits Scheme (RPBS)
Type of data	Dispensed volume, trends
Setting	Australian general practices and community health services
Coverage	National 2015: 29,264,932 prescriptions for all antimicrobials 2016: 27,324,648 prescriptions for all antimicrobials 2017: 26,553,451 prescriptions for all antimicrobials 2018: 26,229,366 prescriptions for all antimicrobials 2019: 26,669,561 prescriptions for all antimicrobials 2020: 20,095,926 prescriptions for all antimicrobials 2021: 19,931,271 prescriptions for all antimicrobials 2022: 21,848,005 prescriptions for all antimicrobials 2023: 22,126,604 prescriptions for all antimicrobials 2024: 23,190,360 prescriptions for all antimicrobials

PBS = Pharmaceutical Benefits Scheme; RPBS = Repatriation Pharmaceutical Benefits Scheme

Notes:

1. Data include all antimicrobials dispensed through the PBS/RPBS; therefore, antimicrobials dispensed from some inpatient and outpatient services, and some community health services, and Aboriginal and Torres Strait Islander health services may not be captured.
2. Private prescriptions (i.e. prescriptions that are not subsidised under the PBS/RPBS) including pharmacist prescribing initiatives are not captured by this dataset.
3. Antimicrobials available over-the-counter or without a prescription are not captured by this dataset.
4. PBS/RPBS data do not indicate the diagnosis or condition of the patient or the indication for prescription.

Source: Gadzhanova, Roughead[52]

Data development and analysis

The Australian Commission on Safety and Quality in Health Care (the Commission) engaged the University of South Australia to perform the analyses as part of the development of this report.

The antimicrobials included in the analyses are shown in Tables A1.2 and A1.3 and are listed by World Health Organization (WHO) ATC Classifications. ATC codes group medicines according to the organ or system on which they act, and their therapeutic, pharmacological, and chemical properties. Almost all antimicrobials supplied under the PBS/RPBS are ATC code J01, antibacterials for systemic use. The codes included in addition to J01 antibacterials ensure that data captured better reflect antimicrobial exposure in the community and aged care settings.

Table A1.1 Antimicrobials included in the overall analyses of PBS/RPBS data, 2015–2024

ATC codes	Description
J01	Antibacterials for systemic use
A02BD	Combinations for eradication of *Helicobacter pylori*
A07AA09	Vancomycin (intestinal anti-infectives)
A07AA11	Rifaximin (intestinal anti-infectives)
D06AX09	Mupirocin (cream/ointment)
D06BA01	Sulfadiazine silver (cream)
S01AA01, S01AA07, S01AA11, S01AA12, S01AE01, S01AE03	Ophthalmological antibiotics: chloramphenicol, framycetin (alternatively S03AA), gentamicin, tobramycin, ofloxacin, ciprofloxacin
S02AA01, S02AA15	Otological anti-infectives: chloramphenicol, ciprofloxacin

ATC = Anatomical Therapeutic Chemical; PBS = Pharmaceutical Benefits Scheme; RPBS = Repatriation Pharmaceutical Benefits Scheme

Table A1.3 Additional antimicrobials included in the analyses of PBS/RPBS data for aged care homes and older Australians, 2021–2024

ATC codes	Description
J01EA01, J01MA06, J01XE01, J01XX05*	Antibacterials for urinary tract infections: trimethoprim, norfloxacin, nitrofurantoin, methenamine hippurate
A01	Stomatological preparations
D01*	Antifungals for dermatological use
D06*	Antibiotics and chemotherapeutics for dermatological use
D11*	Other dermatological preparations
J02	Antimycotics for systemic use
J04	Antimycobacterials
S03	Ophthalmological and otological preparations

ATC = Anatomical Therapeutic Chemical; PBS = Pharmaceutical Benefits Scheme; RPBS = Repatriation Pharmaceutical Benefits Scheme

* Antimicrobials further analysed as a focus for antimicrobial use in aged care homes and older Australians

For reporting of age-standardised rates, the reference population was the Australian population in mid-2013 for consistency with previous AURA reports.[18-22] Where population data were used, the mid-year (30 June) estimates for each calendar year were used as provided by the Australian Bureau of Statistics (ABS).

For aged care analyses, population estimates for bed days were not available to estimate the rates of antimicrobial use. In the absence of this, the estimated population as described by the Australian Institute of Health and Welfare (AIHW) was used. Most of the analysis was restricted to older Australians aged 65 years and over as AIHW provides population data on older Australians who reside in aged care homes. According to the AIHW report[80], there were 185,000 older Australians in aged care at 30 June 2022, with an annual increase of approximately 2%.

For all analyses requiring population estimates in 2024, based on the AIHW estimate of 2% growth, it was assumed 195,000 older Australians resided in aged care homes. The community population was estimated based on the age-specific ABS estimates excluding the aged-care estimates. For analysis on rates of prescriptions per 100 people, it was assumed

that there were around 5,000 additional people aged less than 65 years who resided in aged care homes. The following estimates were used: 185,000 for 2021; 190,000 for 2022 and 195,000 for 2023 and 200,000 in 2024.

For analyses by location, postcode was used to stratify the data by state or territory and Statistical Area Level 3 (SA3) using the ABS Australian Statistical Geography Standard (AGSC)[81], and by Primary Health Network (PHN).[82] For SA3 analyses, some data were not published due to suppression of nominal populations or antimicrobial use.

Considerations for interpreting data

This report focusses on data on antimicrobials dispensed, or supplied, under the PBS/RPBS. Prescribing data can differ from dispensing data because not all prescriptions are dispensed, sometimes under the instruction of the treating doctor not to have the prescription filled unless the condition worsens. Similarly, dispensing data may differ from consumption data because not all prescriptions dispensed are consumed, as patients may not use any or all of the antimicrobials provided.

Antimicrobials dispensed under the RPBS in 2024 were not available for analyses in this report. Therefore, year-to-year comparison and trends should be interpreted with caution. However, the impact is likely to be minimal as approximately 1% of all J01 antibacterials supplied under the PBS/RPBS are estimated to be RPBS prescriptions.[51]

Other issues that need to be considered when interpreting PBS/RPBS data include the following.

- The principal source of dispensing data in the community in Australia is the PBS/RPBS. These data are estimated to capture more than 90% of all antimicrobial prescriptions dispensed in the community.[50]
- PBS/RPBS listings for some antimicrobials changed to restrict the maximum quantity and number of repeats from April 2020.[28]
- The defined daily dose (DDD) values determined by the WHO Collaborating Centre for Drug Statistics Methodology for 2024 have been applied in this report, causing slight variation with results presented in previous reports.
- PBS/RPBS listings for some antimicrobials changed to increase the maximum quantity per prescription between September 2023 and September 2024.[28, 45, 83]
- Percentages and other data relating to 2015 to 2024 may have changed compared to previous reports as more data have become available.

Antimicrobials dispensed from most inpatient and some outpatient services, some community health services, and some Aboriginal and Torres Strait Islander health services may not be captured in the PBS/RPBS dataset. This may impact findings between states and territories as approximately 30% of the Northern Territory population identify as Aboriginal or Torres Strait Islander, compared to approximately 5% or less in other jurisdictions.[84]

Prescriptions may be dispensed privately or provided over-the-counter, meaning that the PBS/RPBS does not subsidise the cost of the medicine. Antimicrobials prescribed by medical practitioners, dental practitioners, nurse practitioners and optometrists may not be captured in the PBS/RPBS dataset if a prescription was issued privately:

- for a non-subsidised indication
- for travel
- with a quantity that exceeds the PBS/RPBS maximum
- with a number of repeats that exceeds the PBS/RPBS maximum.

Antimicrobials prescribed by other clinicians are not captured in the PBS/RPBS dataset as they are supplied privately. This includes pharmacist prescribing initiatives, which are not subsidised by the PBS/RPBS. Volumes of antimicrobial use for these programs are currently not reported.

Antimicrobials available over-the-counter or without a prescription are also not captured by the PBS/RPBS, such as antifungal treatments for oral or vaginal thrush and skin infections.

Analysis of antimicrobial use by sex in this report is as recorded by Services Australia. Analysis by 'female' and 'male' are included in this report, while analysis by gender and for people who identify as non-binary have not been included.

For aged care analyses in this report, people aged 65 years and over are referred to as 'older Australians'. It is important to note the diversity of this age group and the difference in population size across settings. The majority of people who reside in aged care homes are aged 85 years and over, while very few residents of aged care homes are aged less than 65 years. The healthcare needs of Australians across these settings are also likely to vary. Australians who reside in aged care homes may have higher-level care needs and be more likely to require treatment with antimicrobials compared with those who reside in the community.

Additionally for residents of aged care homes, the limitation of using population estimates rather than bed days is that use, as measured by volume measures, may be under-estimated if there were periods where an aged care home was not at capacity. Alternatively, use may be over-estimated, as measured by population rates, if there was significant turn-over of residents in the year. The lack of complete population capture also means all rates and proportions are estimates.

The capability to assess appropriateness of antimicrobial use in the PBS/RPBS dataset is limited. The diagnosis or condition of the patient and the indication for prescription is not captured by the PBS/RPBS but may be inferred with consideration to PBS/RPBS listings, WHO ATC Classifications and current evidence-based Australian therapeutic guidelines and resources on antimicrobial prescribing.

Further information on the PBS/RPBS can be found on the PBS website.[85] A more accurate estimate of the proportion of dispensing through the PBS/RPBS will provide a more complete picture of dispensing in Australia.

Appendix 2: Further analyses by local area

Further analyses of antimicrobials supplied under the Pharmaceutical Benefits Scheme (PBS)/Repatriation Pharmaceutical Benefits Scheme (RPBS) by Statistical Area Level 3 (SA3) and Primary Health Network (PHN) are included in this Appendix. These data can be used by health services, PHNs, general practitioners and other clinicians to review antimicrobial use in their local area and compare to other areas.

Appendix 2 is provided as a separate file on the Commission's website:

- Table A2.1: Number of PBS/RPBS antimicrobial prescriptions dispensed per 1,000 people, age-standardised rate by patient's SA3, 2015–2024
- Table A2.2: Number of PBS antimicrobial prescriptions dispensed per 1,000 people, by patient's age and SA3, 2024
- Table A2.3: Percentage of original PBS antimicrobial prescriptions with maximum repeats ordered for the most commonly used antimicrobials as a proportion of all original PBS antimicrobial prescriptions for the given antimicrobial ordered, by prescriber's SA3, 2024
- Table A2.4: Number of PBS antimicrobial prescriptions dispensed per 100,000 people in winter (June–August), age-standardised rate by prescriber's SA3, 2024
- Table A2.5: Number of PBS/RPBS antimicrobial prescriptions dispensed per 1,000 people, age-standardised rate by patient's PHN, 2019–2024
- Table A2.6: Number of PBS antimicrobial prescriptions dispensed per 1,000 people, by patient's age and PHN, 2024
- Table A2.7: Percentage of original PBS antimicrobial prescriptions with maximum repeats ordered for the most commonly used antimicrobials as a proportion of all original PBS antimicrobial prescriptions for the given antimicrobial ordered, by prescriber's PHN, 2024
- Table A2.8: Number of PBS antimicrobial prescriptions dispensed per 100,000 people in winter (June–August), age-standardised rate by prescriber's PHN, 2024.

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