AUSTRALIAN COMMISSION
ON SAFETY AND QUALITY IN HEALTH CARE

AURA
Antimicrobial Use and Resistance in Australia

AURA 2021 - Highlights

Fourth Australian report on antimicrobial use and resistance in human health

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Level 5, 255 Elizabeth Street, Sydney NSW 2000
Telephone: (02) 9126 3600
Email: AURA@safetyandquality.gov.au
Website: www.safetyandquality.gov.au

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Introduction

Antimicrobial resistance (AMR) continues to be one of the greatest threats to human and animal health, and to food safety.

This level of concern is recognised by the World Health Organization and, in Australia, through the *National Antimicrobial Resistance Strategy – 2020 and Beyond*.

Resistance to antimicrobials occurs when bacteria change to protect themselves from these medicines. Overuse and inappropriate use of antimicrobials is a key factor in driving resistance.

Increasing resistance impacts on the effectiveness of treatments, as infections that could once be prevented or treated with antimicrobials can become life threatening, and impact on a range of treatments such transplantation and chemotherapy.

AMR reduces the number of antimicrobials available to treat infections; increases treatment times and costs; increases the potential for hospitalisation for conditions usually managed in the community; and, increases morbidity and mortality.

We all have a role to play in reducing AMR!

Why is AURA important and what is key in AURA 2021?

It is projected that 10,430 people in Australia will die between 2015 and 2050 as a result of AMR.

Stopping AMR requires a coordinated national effort, supported by data and evidence to support prevention and control strategies.

To do this, we need to know how people are using antimicrobials and which bacteria are developing resistance. It is also vital to monitor current strategies for preventing and controlling AMR, and to inform future strategies with this data.

What is the AURA Surveillance System and why is it important?

The Antimicrobial Use and Resistance in Australia (AURA) Surveillance System was established by the Australian Commission on Safety and Quality in Health Care to monitor and report on Australia's antimicrobial use and resistance patterns. AURA data can to be used to inform clinical and public health policy and practice.

While AMR continues to be a challenge to delivery of safe and effective health care, the data and information provided by AURA is a substantial tool to inform effective responses to reduce the impact of AMR.

The *Fourth Australian report on antimicrobial use and resistance in human health* (AURA 2021) provides the most comprehensive, current picture of AMR and in Australia.

AURA 2021 provides national patterns and trends in AMR and antimicrobial use (AU), across all levels of the Australian healthcare system, across the acute care and community sectors; and the public and private sectors.

AURA 2021 tells us that antimicrobials continue to be prescribed in Australia at much higher rates than most European countries and in Canada.

More than 10 million people in Australia (40.3%) had at least one antimicrobial dispensed under the Pharmaceutical Benefits Scheme (PBS) or the Repatriation Pharmaceutical Benefits Scheme (RPBS) in 2019.

More than 80% of people with acute bronchitis or acute sinusitis were prescribed antimicrobials when they are not recommended by current prescribing. Improved compliance with national and local prescribing guidelines is critical.

Antimicrobial use has increased in hospitals, and there has been no improvement, in overall appropriateness of prescribing, over time.

AURA 2021 shows the long term prevalence of inappropriate antimicrobial use and multidrug-resistance in aged care homes. This data, along with the importance of effective infection control and antimicrobial stewardship, provides the basis for comprehensive strategy development in aged care.

In gram-negative pathogens, it is of serious concern that resistances to common agents used for treatment in *Escherichia coli*, continue to increase. *Escherichia coli* is the most common cause of urinary tract infections (UTIs) and septicaemia in the community in otherwise healthy people.

Resistance to ciprofloxacin and other fluoroquinolones continues to rise in isolates from community-onset infections, despite restriction of access to these agents on the PBS. As a result, the availability of reliable oral antimicrobials for conditions such as UTIs, is substantially reduced, and can result in increased hospital admissions for intravenous (IV) treatment.

The surveillance data also identify more positive trends, such as that carbapenem resistance in *Enterobacterales* remains uncommon, and rates of resistance in *Enterobacterales* to most agents were lower in the community than in hospitals. However, rates in aged care homes were often as high as, or higher than, rates in hospitals.

To further enhance surveillance, AURA 2021 includes a recommendation that the mechanisms currently used at state and territory, and national levels (such as the National Health Security Agreement) be considered to establish nationally consistent resistance surveillance definitions and response protocols that require key priority organisms to be notifiable.

As a further measure, a requirement could be considered for all laboratories receiving payments through the Medical Benefits Schedule for susceptibility testing to provide resistance data to Australian Passive AMR Surveillance (APAS).

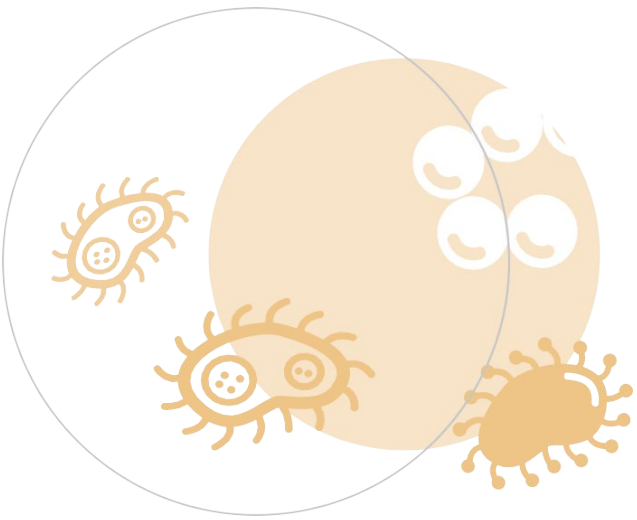
As a priority patient safety issue, action must be taken at organisational and practitioner levels to address the lack of improvement in the appropriateness of antimicrobial prescribing.

The Commission has recently strengthened the National Safety and Quality Health Service (NSQHS) Standards to require health service organisations to demonstrate that there has been review of antimicrobial prescribing and use, and that AMR surveillance data has been used to support appropriate prescribing.

Over time, AURA data provide increased capacity to identify patterns and trends in resistance in the priority organisms for Australia in acute care, residential aged care services and the community. These data continue to inform targeted responses to specific resistances in specific settings. The Commission will consult further with clinical and technical experts to provide this information in the most accessible form, whilst the One Health Surveillance System is developed.

The Commission will also work with the Aged Care Quality and Safety Commission and the Royal Australian College of General Practitioners to promote improved antimicrobial prescribing across the community sector to improve quality and safety of care, and reduce AMR.

This Report includes an overview of the key findings from AURA 2021.



Antimicrobials and antimicrobial resistance

Antibacterials (commonly referred to as antibiotics) are a type of antimicrobial designed to work on a specific bacterium or a group of bacteria.

If the antibacterial kills a small number of different types of bacteria, or stops them from multiplying, it is referred to as 'narrow spectrum'. If the antibacterial kills many different types of bacteria, it is called 'broad spectrum'. Broad-spectrum antibacterials are more likely to cause AMR.

Antibacterials do not fight infections caused by viruses, such as:

- Colds and flu
- Most coughs and bronchitis
- Most sore throats.

Prescribing antibacterials won't assist in the treatment of these infections – but it will increase the risks of AMR and patients experiencing side effects, such as candidiasis (thrush) and nausea.

Resistant bacteria can spread easily between people in the community, hospitals and other health services. Aged care homes are especially at risk, because residents live in close proximity to one another and there are high levels of antimicrobial prescribing. This can increase a resident's risk of being exposed to antimicrobial-resistant bacteria.

The main cause of AMR is using antimicrobials, so reducing their use is important. However, it is also important to take other actions to slow the spread of resistant bacteria, such as good hand hygiene by clinicians, patients and the community, and ensuring effective cleaning practices.

Unless AMR can be contained and new antimicrobials can be developed, the effects and cost of antimicrobial resistance will continue to increase – more people will become unwell for a longer amount of time with infections and complications that are harder to treat.

Key findings of AURA 2021

Antimicrobial use and appropriateness

Antimicrobial use in hospitals

Antimicrobial use has been gradually increasing since 2017 in Australian hospitals participating in surveillance. The reasons for this increase are not clear, but additional work will be undertaken to better understand the causes and to improve this situation.

Some of the most commonly-used antibiotics in hospitals include: cefazolin, amoxicillin–clavulanic acid, flucloxacillin, doxycycline, amoxicillin and cefalexin.

The most common reasons for antibiotics being prescribed in hospitals in 2019 were:

- Preventing infections during surgery or for patients with a compromised immune system (known as prophylaxis)
- Community-acquired pneumonia
- Urinary tract infections
- Skin infections.

Key points

Antibiotics are being overprescribed in Australia and prescribers are not complying with *Therapeutic Guidelines: Antibiotic* – the national evidence-based prescribing guidelines.

Inappropriate prescribing in hospitals remains a problem, with nearly one-quarter of the prescriptions assessed found to be inappropriate

Many of the most commonly used antimicrobials in hospitals also have the highest rates of inappropriate prescribing; particularly cefalexin and amoxicillin–clavulanic acid. Appropriateness of prescribing varies, depending on the type of hospital.

Priorities

Inappropriate use of the broad-spectrum antibiotics cefalexin and amoxicillin–clavulanic acid increase the risk of AMR, as does non-compliance with national evidence-based prescribing guidelines.

Chronic obstructive pulmonary disease

Prescribing of antibiotics for respiratory conditions, including bronchitis and chronic obstructive pulmonary disease (COPD), is a priority area for improvement, as antibiotics are commonly inappropriately prescribed for these conditions.

Inappropriate use of antimicrobials in hospitals for the management of COPD in particular, has been shown to have been an issue since AURA reports in 2013. The greatest issue for treatment of COPD is the use of broad-spectrum antibiotics, when narrow-spectrum antibiotics would be more appropriate, and contribute less to AMR.

The Commission's AURA Team is working with clinical specialist groups to improve appropriate prescribing for these conditions.

Amoxicillin–clavulanic acid and cefalexin prescribing

Reducing inappropriate prescribing of these antibiotics and promoting use of narrow-spectrum antibiotics such as amoxicillin, will reduce the volume of broad-spectrum antibiotic use, and help to prevent and contain AMR.

Antimicrobial use in the community

Overall, the use of antimicrobials is decreasing in the community (including general practice, specialist outpatient clinics, dental clinics and aged care homes).

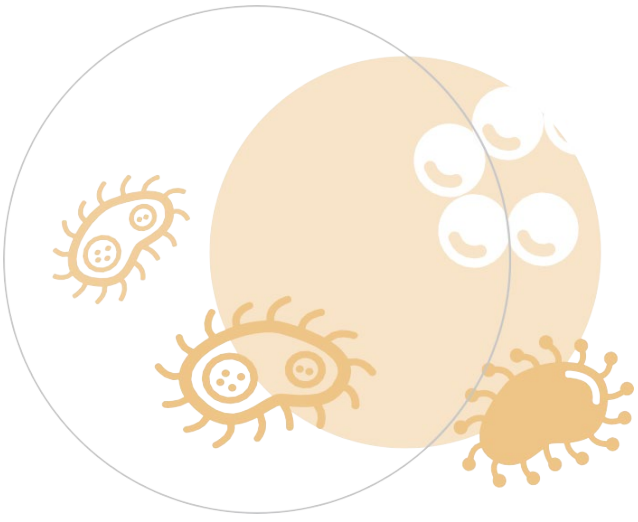
While this is a positive trend, antimicrobials continue to be overprescribed in the community, compared with national guideline recommendations.

81.5% of patients with acute bronchitis and 80.1% of patients with acute sinusitis attending NPS MedicineInsight participating practices continue to be prescribed antimicrobials for conditions for which there is no evidence of benefit.

Some antimicrobials were prescribed much more in winter, which suggests that they are being used to treat colds and flu, for which they have no benefit. Antimicrobials from the penicillin (e.g. Amoxil®) and cephalosporin (e.g. Keflex®) classes were the most commonly prescribed antimicrobials in the community.

There have been increases in the community since 2006 for some important resistances in Australia, such as methicillin resistance in *Staphylococcus aureus* (MRSA).

When people go into hospital with a resistant infection they caught in the community, it makes their care more complex, which is why reducing resistance in the community is also important.



Coronavirus (COVID-19) and antimicrobial use

In 2020, there was a large drop in the amount of antimicrobials dispensed in Australia during the response to the coronavirus (COVID-19) pandemic.

The use of antimicrobials in the community in other countries, including the United States and New Zealand, also decreased during this time, without an increase in the number of people going to hospital for infections usually treated with antimicrobials in the community.

This suggests that it is possible to reduce levels of antimicrobial use without causing harm to patients. It is important to continue to work together to keep these lower levels of antimicrobial use, and help reduce the risk and impact of AMR.

Key points

There has been a gradual decrease in antibiotic dispensing in the community since 2015.

In patients aged under 65 years, the highest rate of dispensing was for children aged between two and four years.

Approximately 50% of all antibiotic prescriptions were ordered with repeats, when they may not be needed.

There have been distinct upward trends in some resistant bacteria in the community.

The large decrease in the amount of antimicrobials dispensed in Australia during the response to the COVID-19 pandemic must be sustained.

General practitioners play a crucial role in improving the appropriate use of antimicrobials and supporting the reduction of resistance in the community.

The Commission's AURA Team will continue to work with primary care providers to support appropriate reduction in antimicrobial prescribing.

Antimicrobial use in residential aged care services

Preventing and controlling infections in aged care homes is challenging, making them a high-risk environment for antimicrobial resistance.

Data from AURA show that, for some organisms, rates of antimicrobial resistance in aged care are as high, or higher, than rates in hospitals.

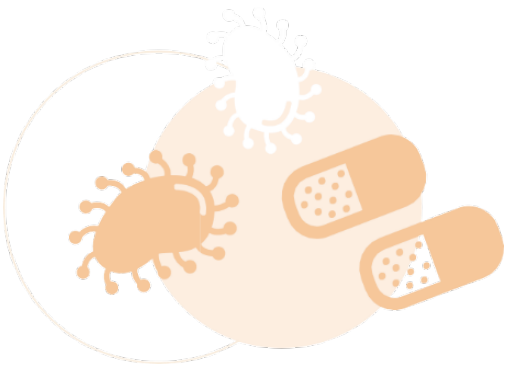
In services with frequent and inappropriate antimicrobial use, there is an increased risk for all residents of acquiring an antimicrobial-resistant infection.

Residents of aged care homes can be frail and vulnerable to infections. Their immune systems may not be as strong as younger people. This means a higher rate of infections, higher levels of unnecessary prescribing, and increased potential for antimicrobial-resistant bacteria to spread quickly.

Even those who are not receiving antimicrobial treatment are vulnerable because of the potential for infections to spread among the residents.

Other high-risk factors exclusive to aged care homes include:

- A close living environment and frequent contact with other residents, visitors and staff who may be infected
- Residents moving frequently in and out of hospitals
- Higher use of invasive devices such as urinary catheters
- Higher levels of infection and colonisation with multidrug-resistant organisms.



Key points

A large number of antimicrobial prescriptions in residential aged care services were for the prevention of infections – this is concerning because antimicrobials should rarely be used to prevent infection in this setting

Antimicrobials are being used in aged care for conditions where they are not required, such as urinary tract, soft tissue and skin infections Almost 1 in 6 antimicrobials in the aged care setting were prescribed for use "when required" – this may lead to unnecessarily long treatment duration and increase the risk of antimicrobial resistance.

Priorities

The AURA team at the Commission will continue to work to promote antimicrobial prescribing improvement programs, and support ongoing monitoring of antimicrobial use in residential aged care services.

The Commission will also continue to support the development and implementation of effective strategies to prevent and control antimicrobial-resistant infections in these settings. These may include:

- Promoting regular review of antimicrobial prescribing patterns by medical and nursing staff, to ensure these are consistent with Australian prescribing guidelines
- Policies that require dates to be set for review of antimicrobial treatment
- Education for staff who provide care to residents on the importance of preventing and controlling infections.

Antimicrobial resistance

Antimicrobial resistance in hospitals

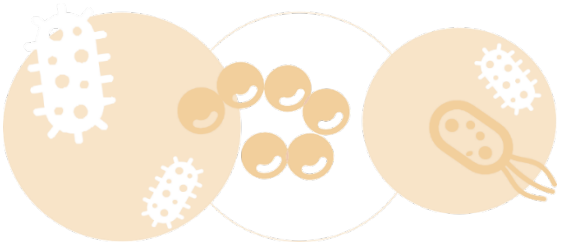
Data on AMR are contributed to AURA by the Australian Group on Antimicrobial Resistance (AGAR), APAS, the National Notifiable Diseases Surveillance System and the National Neisseria Network. National rates of resistance for many priority organisms reported to AURA in 2018 and 2019 did not change substantially from 2017.

However, several changes in resistance are important to consider in the context of infection prevention and control, and antimicrobial prescribing. In 2019, these included:

- The increased resistance in *E. coli*, to ciprofloxacin and other fluoroquinolones in community isolates
- Whilst carbapenem resistance in *Enterobacterales* remained uncommon, rates in aged care homes were often as high as, or higher than, rates in hospitals, and it is found more often in the *Enterobacter* cloacae complex than in *E. coli* or *Klebsiella pneumoniae*
- In *Enterococcus faecium*, the overall rates of vancomycin resistance declined nationally, but were still above 40%
- In *Neisseria gonorrhoeae*, rates of azithromycin resistance have declined since 2017, with resistance at 4.6% in 2019. However, the total number of notifiable cases has continued to increase over that period
- In *Salmonella*, ciprofloxacin resistance in typhoidal species (*Salmonella* Typhi and *Salmonella* Paratyphi) exceeded 78%, confirming that ciprofloxacin should no longer be relied on for empirical treatment
- In *S. aureus*, patterns of methicillin resistance continued to evolve. Community-associated methicillin-resistant *S. aureus* has become prominent everywhere, but especially in remote and very remote regions. This demonstrates a need for a renewed focus on infection prevention and control in both community and acute settings
- In *Shigella sonnei*, resistance to ceftriaxone, ciprofloxacin and ampicillin increased rapidly compared with the 2017
- In *Streptococcus agalactiae*, resistance to erythromycin and clindamycin has steadily increased to around 33%
- Macrolide resistance in *Streptococcus pyogenes* doubled from 2017 to 9% in 2019, reducing the utility of these second-line agents

Critical antimicrobial resistances (CARs) reported to the National Alert System for Critical Antimicrobial Resistance (CARAlert) remained very low, overall. CARs are resistances to last-line antimicrobials. In 2019 and 2020 key findings from CARAlert included:

- Carbapenemase-producing *Enterobacterales* (CPE) was the most commonly reported critical antimicrobial resistance (CAR)
- Three carbapenemase types (IMP, NDM and OXA-48-like) accounted for 96% of all *Enterobacterales* with a confirmed carbapenemase, either alone or in combination, in both 2019 and 2020
- CARs reported from aged care settings were predominantly CPE or daptomycin-nonsusceptible *Staphylococcus aureus*
- Of CARs reported from bloodstream specimens, 83% were CPE. Oral therapies may not be available for many of these infections, and hospital-based intravenous therapy is the only treatment option
- There were large increases in multidrug-resistant *Shigella* species from 2018 to 2019, followed by a small decline in 2020
- There were sporadic reports of ceftriaxone-nonsusceptible *Neisseria gonorrhoeae*
- *Candida auris* was reported from three states and territories in 2019 and 2020
- There was a sharp fall in the monthly number of CARs reported from April 2020 onwards, notably in reports of multidrug-resistant *Shigella* species.
- This fall corresponded with the introduction of COVID-19 restrictions throughout Australia.



Antimicrobial resistance in the far north of Australia

The HOTspots resistance surveillance program, which monitors AMR in the far north of Australia, provided data for inclusion in AURA 2021 for that region, including resistance data from the Northern Territory into AURA, for the first time.

HOTspots shows that resistance rates of some important pathogens are higher in this region than in other parts of the country. MRSA is prevalent in northern Australia, and in 2019, aggregate rates for northern Australia were 27.7% for blood isolates, compared with 17.7% nationally. Rates were higher for skin and soft tissue isolates (34.7%) than for blood isolates, and higher for community-based isolates (41.1%) than for hospital-based isolates (31.9%). Rates were higher in far north Western Australia (46.9%) than in the Northern Territory (34.6%) and far north Queensland (29.6%).

Clostridioides difficile infection (CDI)

AURA 2021 provided key data from the first five years (2013–2018) of the *C. difficile* Antimicrobial Resistance Surveillance (CDARS) study, highlighting the importance of *C. difficile* infection surveillance in Australia, and areas for action.

Over the survey period, the majority of *C. difficile* in Australia did not show reduced susceptibility to antimicrobials recommended for treatment of CDI (vancomycin, metronidazole and fidaxomicin). Resistance to carbapenems and fluoroquinolones was low, and multidrug resistant *C. difficile* was 'uncommon. However, clindamycin resistance was common.

Key points

AURA 2021 data provide increased capacity to identify patterns and trends in resistance in the priority organisms for Australia in acute care, residential aged care services and the community. These data inform targeted responses to specific resistances in specific settings. The Commission's AURA Team will consult further with clinical and technical experts to provide this information in the most accessible form.

The Commission's AURA team will aim to work with key partners to integrate resistance data, such as the HOTspots and CDARS data, so as to inform implementation of Australia's National AMR Strategy, and state, territory and private sector AMR response strategies.

Priorities

Ongoing monitoring and prevention and control strategies to ensure that levels of CARs continue to remain low in Australia

Enhancing surveillance of CDI by promoting surveillance by all states and territories, and national reporting on CDI surveillance to highlight important emerging strains of *C. difficile*.

Promoting harmonisation of laboratory susceptibility testing methods to contribute to reducing the impact that different testing methods have on reporting of resistance, and improve the national surveillance effort.

The Commission AURA Team will continue its work with Therapeutic Guidelines Limited to inform prescribing guidelines, and promote AURA findings, in relation to AMR, through clear communications with prescribers

How does AURA support the prevention and control of resistant infections?

Understanding antimicrobial resistance through data collection

The more we understand prescribing patterns, resistance rates and trends over time, the better we can guide improvements in how health services manage infection prevention and control and antimicrobial prescribing.

AURA provides an overall picture of patterns and trends in antimicrobial use and resistance rates in Australia through regular reports.

Sharing information with health professionals and consumers

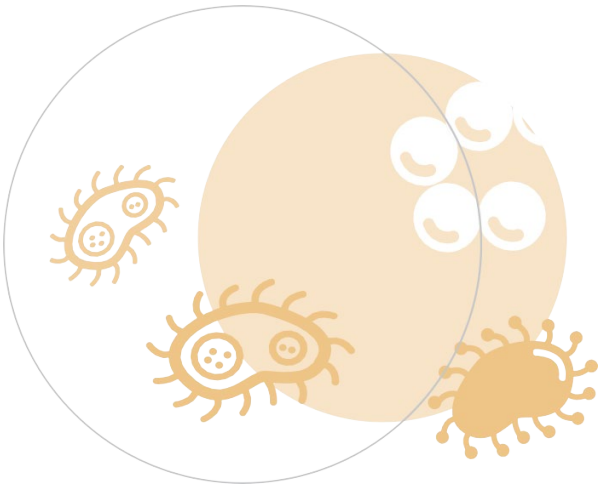
AURA helps support clinician and consumer awareness and understanding, by providing information on appropriate use of antimicrobials, the risks of AMR, and the actions they can take to help tackle this public health challenge.

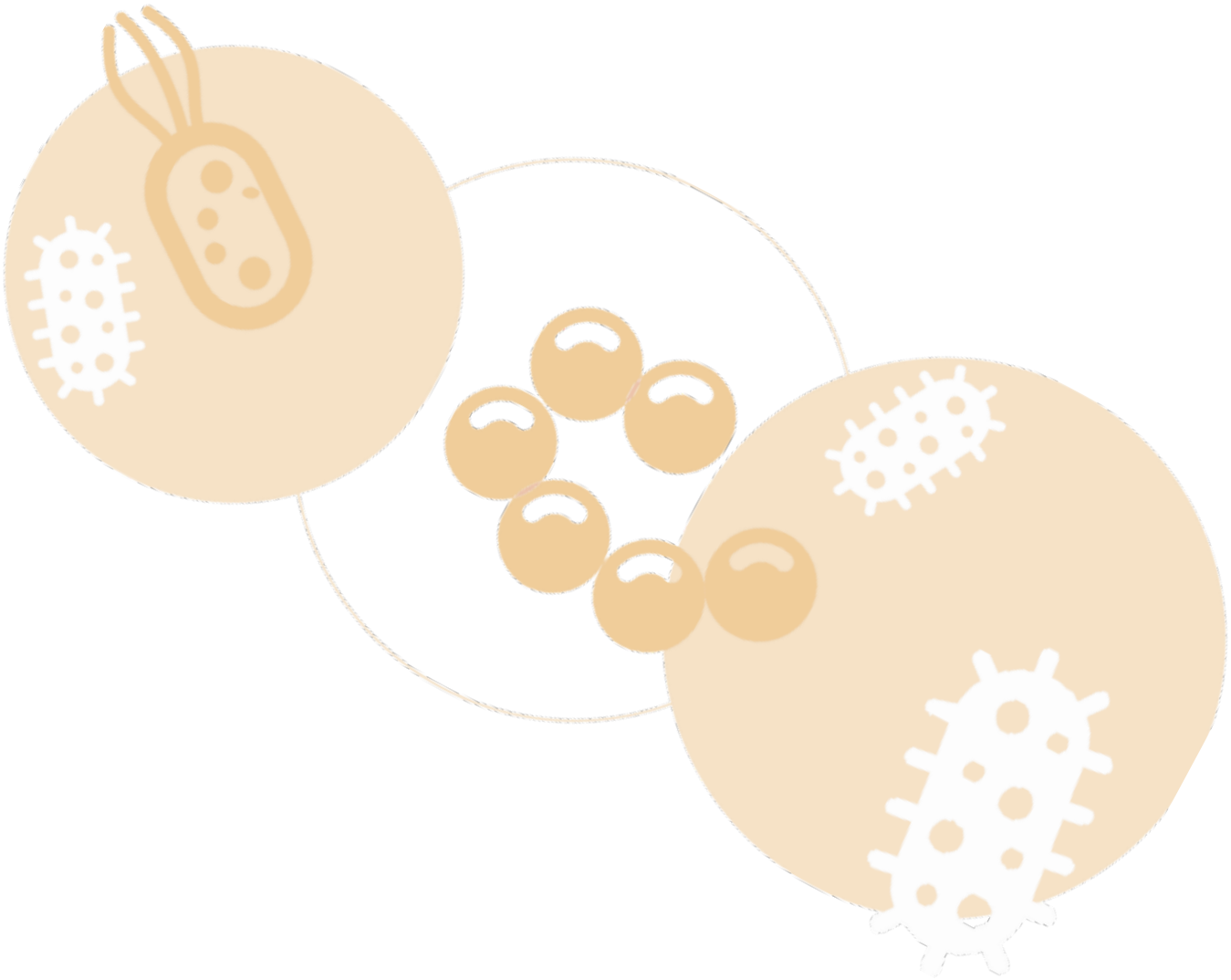
Health professionals can use information from AURA to better understand which organisms may be developing resistance to antimicrobials in their local area, and therefore which conditions may require a different treatment approach.

Health services and system managers can use information from AURA to complement their own organisational data to identify where they may be using antimicrobials differently to others, and where they may not be prescribing, or using, antimicrobials consistent with national guidelines. The data can be used as part of local review to identify the reasons for these differences, and further improve treatments.

Working with health professionals, hospitals and aged care to improve antimicrobial resistance

The Commission's AURA Team will continue to work closely with health care workers and health and aged care services to promote the use AURA data to reduce AMR and promote safe use of antimicrobials. We will continue to collaborate with partner organisations such as NPS MedicineWise to ensure communication with healthcare consumers are provided in the most meaningful way.





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