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Data Summary

This report provides a brief update, and complements previous analyses of and updates on [CARAlert data](#). **Reporting period: 1 January 2019 and 28 February 2019**

National overview

- A total of 272 critical antimicrobial resistances (CARs) were reported in CARAlert, an increase of 8.8% compared to same period last year.
- Carbapenemase-producing Enterobacterales (CPE) was the most reported CAR, (n = 156, 57%), followed by azithromycin non-susceptible (low-level resistance, MIC \leq 256 mg/L) *Neisseria gonorrhoeae* (n = 71, 26.1%) and daptomycin non-susceptible *Staphylococcus aureus* (n = 23, 8.5%).
- The greatest increase in reported CARs compared to the same period in 2018 was for CPE (alone or in combination with ribosomal methyltransferase), which increased by 53%.
- Reported CARs which increased in number, compared to the previous two-month period, were: CPE (n = 156, up 16%), linezolid non-susceptible *Enterococcus* species (n = 2, up 100%), multidrug-resistant *Mycobacterium tuberculosis* (n = 2, up 100%) and daptomycin non-susceptible *S. aureus* (n = 23, up 9.5%).
- There was a decrease in the number of reported ceftriaxone non-susceptible *Salmonella* species (n = 4, down 33.3%) and multidrug-resistant *Shigella* species (n = 12, down 33.3%).
- The majority of CARs were reported from public hospitals (n = 183). There were 17 reports from private hospitals, 55 from community settings, and four from aged care homes (three daptomycin non-susceptible *S. aureus* and one CPE).

Carbapenemase-producing Enterobacterales (CPE):

- IMP (67.3%), NDM (20.5%), OXA-48-like (5.1%), and NDM+OXA-48-like (4.5%) types accounted for 97.4% of all CPE reported during this period. Non-IMP types, which are often acquired overseas, comprise approximately 1 in 3 CPE this reporting period.
- Forty-seven percent of CPE were from clinical specimens, although differences were seen between states and territories.
- The highest number of CPE reported was from Victoria (n = 70, 44.9%), which also had the highest proportion of screening isolates reported; one facility accounted for 62.9% of all CPE reported for this state.
- There was an increase in the number of NDM-types from screening specimens (n = 16) compared to the same period in 2018 (n = 6); and IMP types (n = 56) compared to the same period in 2018 (n = 22).
- CPE was reported across all sectors; public hospitals, n = 126 (80.8%), private hospitals n = 15 (9.6%), community, n = 8 (5.1%), aged care, n = 1 (0.6%).
- Nine hospitals had more than two notifications of IMP-types. These institutions were in New South Wales (n = 6), Victoria (n = 2), and Queensland (n = 1). Two of these institutions (one in New South Wales, and one in Victoria) also had more than two notifications of NDM-types.
- Two-year trends show an increase in IMP-types in New South Wales, and Victoria; an upward trend in both IMP- and NDM-types in Queensland; downward trends in CPE reports in the ACT, and sporadic reports in South Australia and Tasmania. There were no recent reports in the Northern Territory.

Azithromycin non-susceptible (low-level resistance, MIC \leq 256 mg/L) *Neisseria gonorrhoeae*:

- There was no change in the number of this CAR reported (n = 71), compared to the previous two-month reporting period.
- The majority of cases were reported from NSW (n = 49, 69%).
- There has been a notable reduction in reports from Victoria (n = 9), compared to the previous two-month reporting period (n = 30).

National summary

Table 1: Number of critical antimicrobial resistances, by state and territory, 1 January 2019–28 February 2019, and 2018

Species	Critical resistance	State or territory								Bi-monthly			Year to date		
		NSW	Vic	Qld	SA	WA	Tas	NT	ACT	2019	2018	Relative change	2019	2018	Relative change
										Jan-Feb	Nov-Dec				
Enterobacterales	Carbapenemase-producing Enterobacterales	50	63	28	3	3	1	0	0	148	130	▲ 13.8%	148	100	▲ 48.0%
	Carbapenemase and ribosomal methyltransferase-producing	1	7	0	0	0	0	0	0	8	5	▲ 60.0%	8	2	▲ 300.0%
	Ribosomal methyltransferase-producing	1	1	0	0	0	0	0	0	2	0	–	2	0	–
<i>Enterococcus</i> species	Linezolid non-susceptible	1	1	0	0	0	0	0	0	2	1	▲ 100.0%	2	3	▼ 33.3%
<i>Mycobacterium tuberculosis</i>	Multidrug-resistant – at least rifampicin- and isoniazid-resistant strains	0	2	0	0	0	0	0	0	2	1	▲ 100.0%	2	5	▼ 60.0%
<i>Neisseria gonorrhoeae</i>	Azithromycin non-susceptible (LLR < 256 mg/L)	49	9	4	0	5	0	0	4	71	71	0.0%	71	87	▼ 18.4%
	Azithromycin non-susceptible (HLR > 256 mg/L)	0	0	0	0	0	0	0	0	0	0	–	0	3	▼ 100.0%
	Ceftriaxone non-susceptible	0	0	0	0	0	0	0	0	0	1	▼ 100.0%	0	0	–
	Ceftriaxone non-susceptible and azithromycin non-susceptible (LLR < 256 mg/L)	0	0	0	0	0	0	0	0	0	0	–	0	0	–
	Ceftriaxone non-susceptible and azithromycin non-susceptible (HLR > 256 mg/L)	0	0	0	0	0	0	0	0	0	0	–	0	1	▼ 100.0%
<i>Salmonella</i> species	Ceftriaxone non-susceptible	0	1	2	0	1	0	0	0	4	6	▼ 33.3%	4	8	▼ 50.0%
<i>Shigella</i> species	Multidrug-resistant	3	0	7	1	1	0	0	0	12	18	▼ 33.3%	12	20	▼ 40.0

HLR = high-level resistance; LLR = low-level resistance; – = not applicable

* Relative change = absolute change between period in 2018 and same period in 2019, for each CAR, expressed as a percentage of 2018 base

Table 1 (continued)

		State or territory								Bi monthly			Year to date		
										2018	2019				
Species	Critical resistance	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Jan-Feb	Nov-Dec	Relative change	2019	2018	Relative change
<i>Staphylococcus aureus</i>	Daptomycin non-susceptible	3	9	3	0	8	0	0	0	23	21	▲ 9.5%	23	20	▲ 15.0%
	Daptomycin and vancomycin non-susceptible	0	0	0	0	0	0	0	0	0	1	▼ 100.0%	1	0	–
	Linezolid non-susceptible	0	0	0	0	0	0	0	0	0	1	▼ 100.0%	0	1	▼ 100.0%
	Vancomycin non-susceptible	0	0	0	0	0	0	0	0	0	0	–	0	0	–
<i>Streptococcus pyogenes</i>	Penicillin reduced susceptibility	0	0	0	0	0	0	0	0	0	0	–	0	0	–
	Total (reported by 31 March 2019)	108	93	44	4	18	1	0	4	272	256	▲ 6.3%	272	250	▲ 8.8%

* Relative change = absolute change between period in 2018 and same period in 2019, for each CAR, expressed as a percentage of 2018 base

Table 2: Number of critical antimicrobial resistance isolates, by setting, national, 1 January 2019–28 February 2019

Species	Critical resistance	Setting					Total
		Public hospital	Private hospital	Aged care home	Community	Unknown	
Enterobacterales	Carbapenemase-producing Enterobacterales	118	15	1	8	6	148
	Carbapenemase and ribosomal methyltransferase-producing	8	0	0	0	0	8
	Ribosomal methyltransferase-producing	2	0	0	0	0	2
<i>Enterococcus</i> species	Linezolid non-susceptible	2	0	0	0	0	2
<i>Mycobacterium tuberculosis</i>	Multidrug-resistant – at least rifampicin- and isoniazid-resistant strains	2	0	0	0	0	2
<i>Neisseria gonorrhoeae</i>	Azithromycin non-susceptible (LLR < 256 mg/L)	30*	0	0	39	2	71
	Azithromycin non-susceptible (HLR > 256 mg/L)	0	0	0	0	0	0
	Ceftriaxone non-susceptible	0	0	0	0	0	0
	Ceftriaxone non-susceptible and azithromycin non-susceptible (LLR < 256 mg/L)	0	0	0	0	0	0
	Ceftriaxone non-susceptible and azithromycin non-susceptible (HLR > 256 mg/L)	0	0	0	0	0	0
<i>Salmonella</i> species	Ceftriaxone non-susceptible	3	0	0	1	0	4
<i>Shigella</i> species	Multidrug-resistant	0	1	0	6	5	12
<i>Staphylococcus aureus</i>	Daptomycin non-susceptible	18	1	3	1	0	23
	Daptomycin and vancomycin non-susceptible	0	0	0	0	0	0
	Linezolid non-susceptible	0	0	0	0	0	0
	Vancomycin non-susceptible	0	0	0	0	0	0
<i>Streptococcus pyogenes</i>	Penicillin reduced susceptibility	0	0	0	0	0	0
	Total (reported by 31 March 2019)	183	17	4	55	13	272

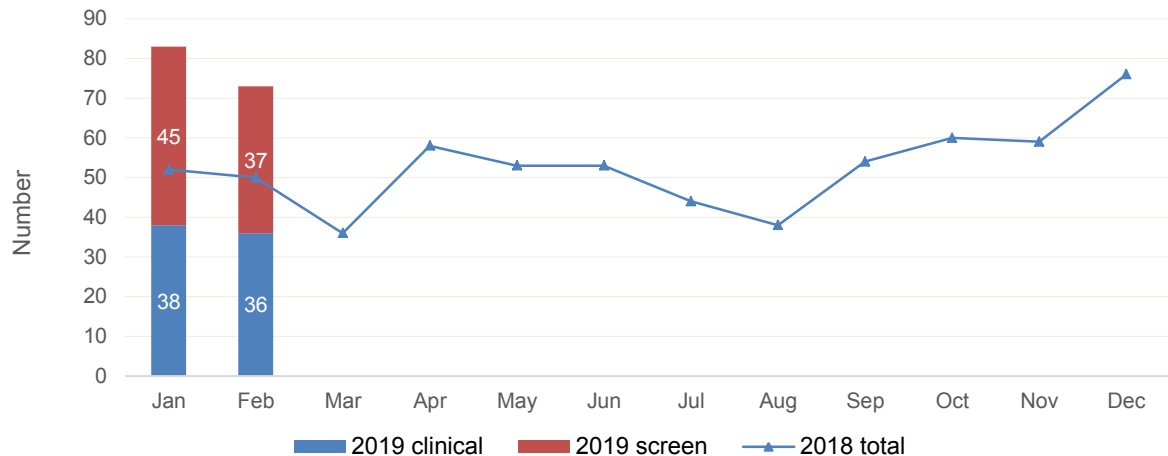
* Mostly sexual health clinics located within a hospital

Summary by CAR

Enterobacterales

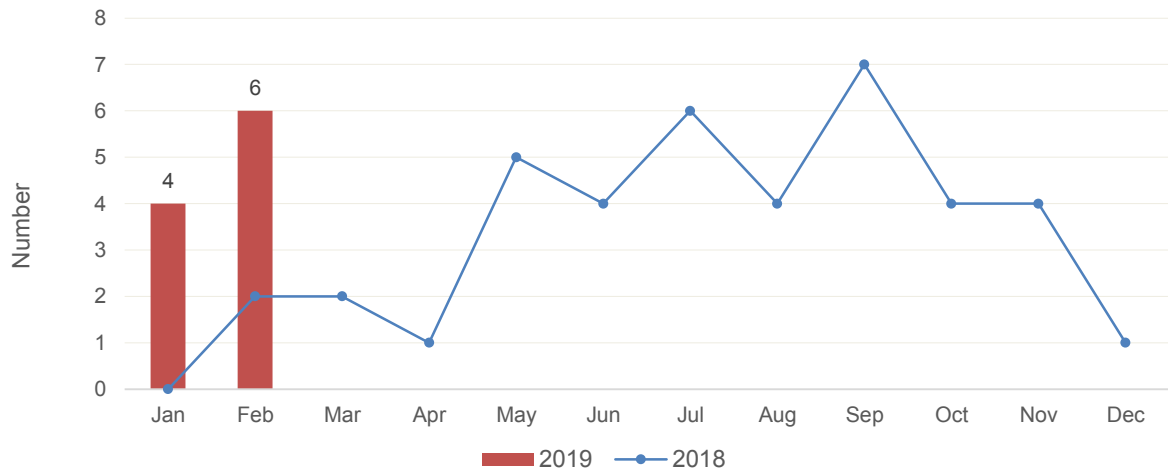
National data

Figure 1: Carbapenemase-producing Enterobacterales*, number reported by specimen type for 2019, compared with the total for previous year, national



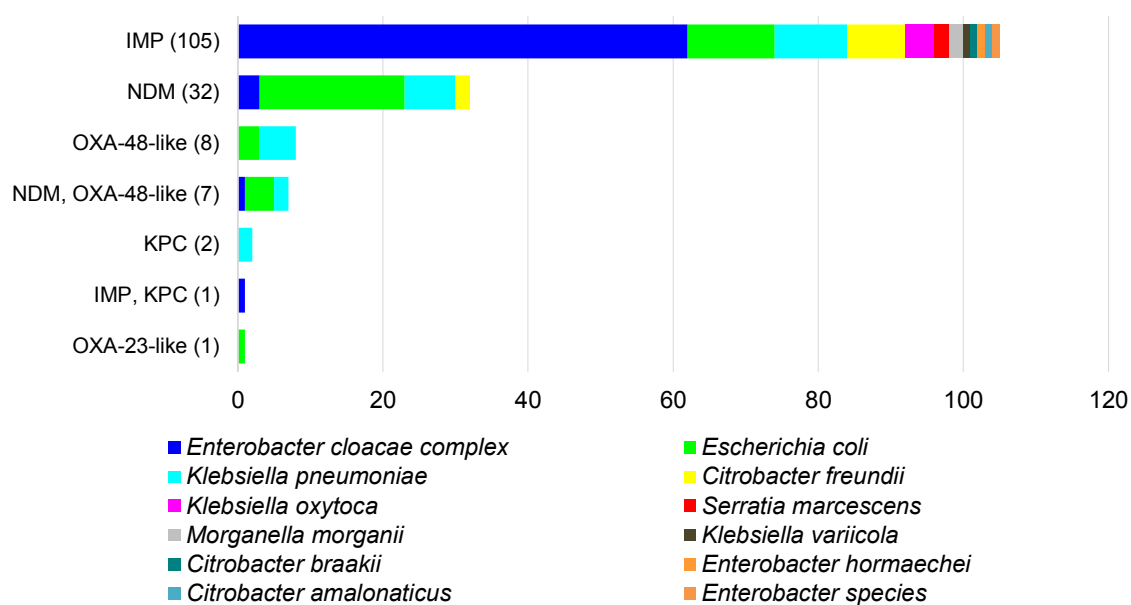
* Carbapenemase-producing alone or in combination with ribosomal methyltransferases

Figure 2: Ribosomal methyltransferase-producing Enterobacterales*, number reported for 2019 by month, compared with the previous year, national



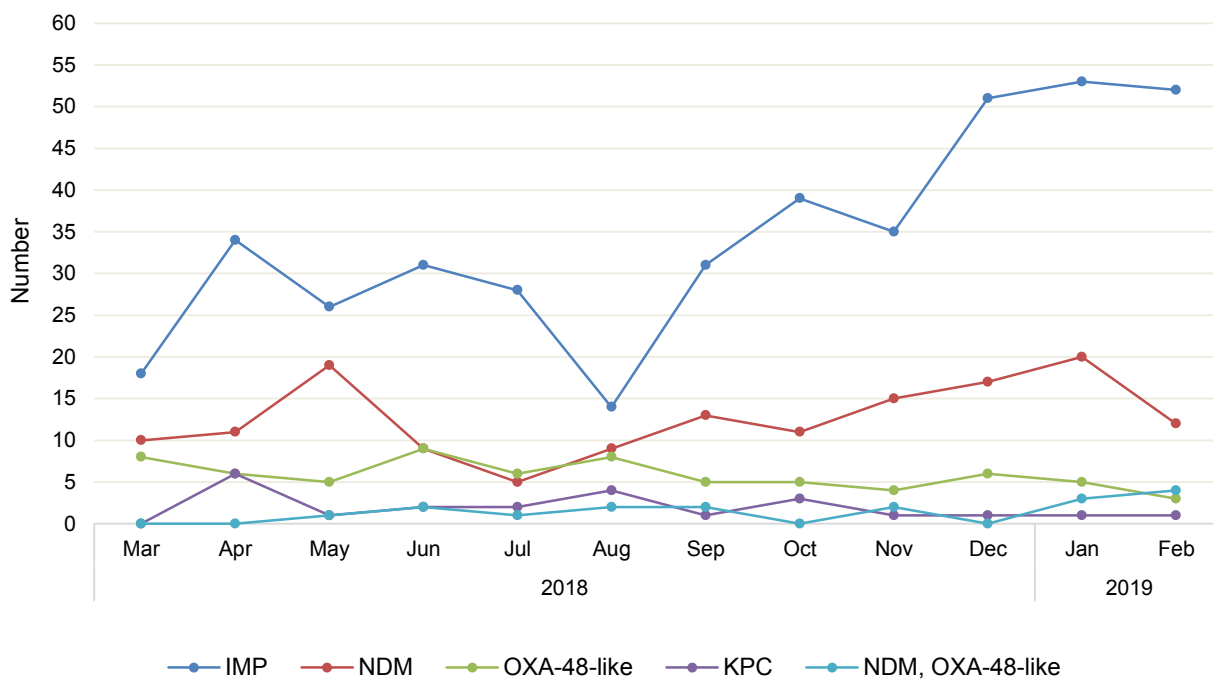
* Ribosomal methyltransferases alone, or in combination with carbapenemases

Figure 3: Carbapenemase-producing Enterobacterales*, number reported by carbapenemase type and species, national, 1 January 2019– 28 February 2019



* Carbapenemase-producing Enterobacterales ($n = 148$), carbapenemase- and ribosomal methyltransferase-producing Enterobacterales ($n = 8$)

Figure 4: Twelve-month trend for the top four reported carbapenemase types, national, 1 March 2018–28 February 2019



State and territory

Figure 5: Enterobacterales –carbapenemase-producing, number reported by state and territory, 1 January 2018–28 February 2019

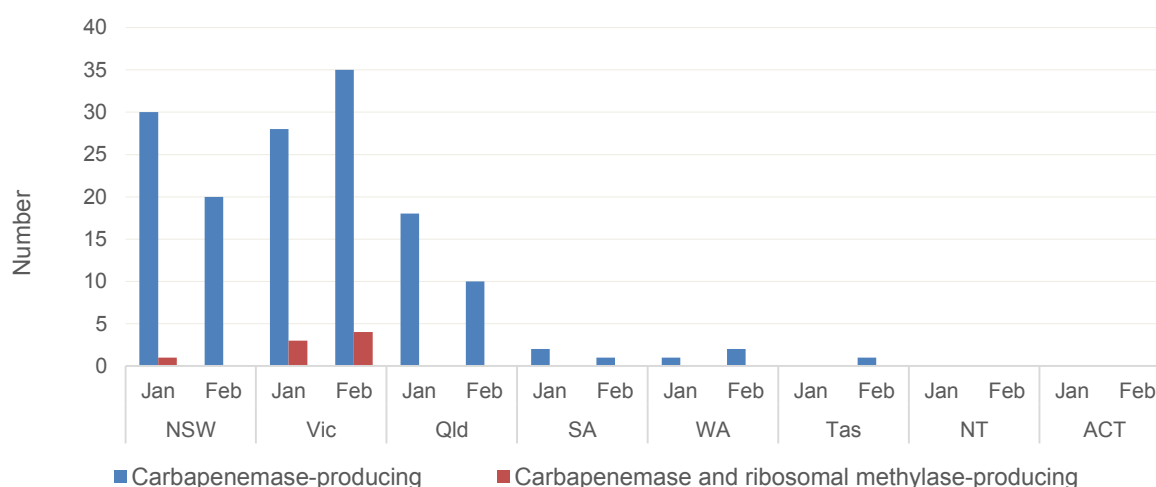


Figure 6: Two-year trend for the top four reported carbapenemase types, by state and territory and nationally, (three-month moving average), 1 March 2017–28 February 2019

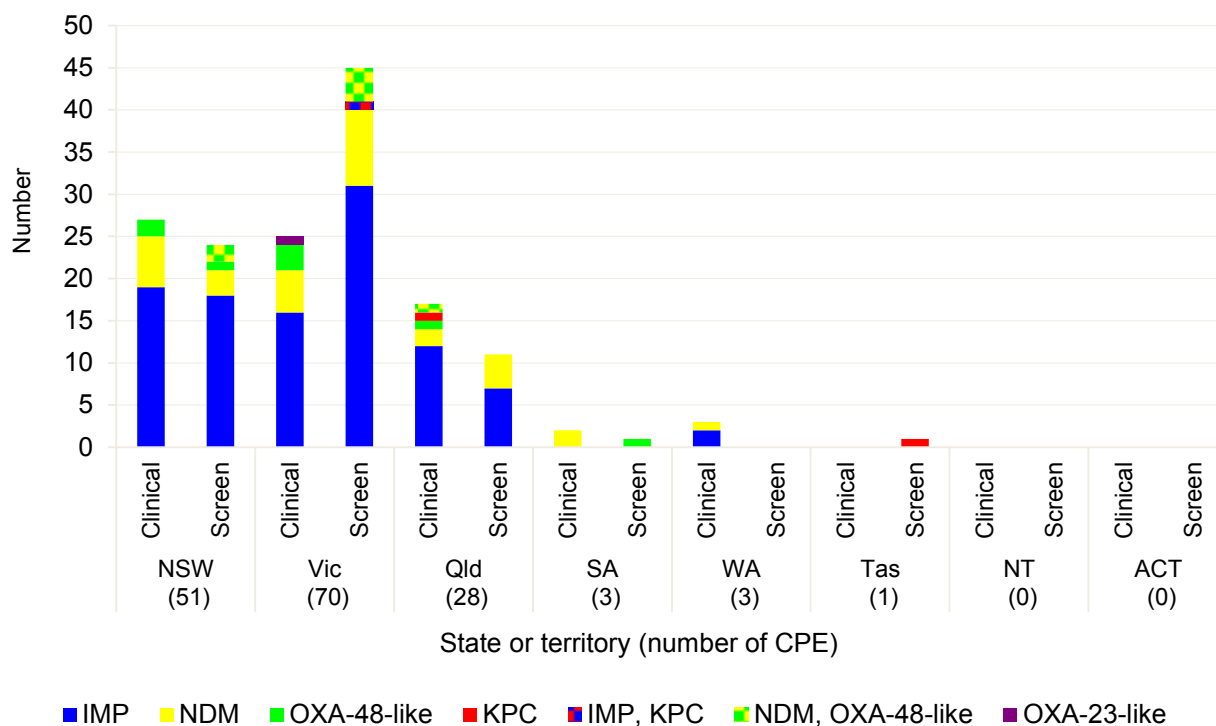
Type	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Australia
IMP	17 5	23 2	12 7	0 0	4 0	0 0	0 0	3 0	52 20
NDM	4 1	6 2	6 0	1 0	2 0	0 0	1 0	1 0	17 5
OXA-48-like	3 0	5 1	26 0	0 0	1 0	0 0	0 0	0 0	29 4
KPC	1 0	3 0	0 0	0 0	0 0	0 0	0 0	0 0	4 1
All types	25 9	33 10	38 9	2 0	6 1	1 0	1 0	3 1	77 36

Line graphs represent three-month moving average for the period 1 March 2017 to 28 February 2019, for each type, where maximum monthly average was greater than one.

Straight line in cell = no carbapenemase type for that state or territory during the reporting period

Blank cell = maximum monthly average was one or less

Figure 7: Carbapenemase-producing Enterobacterales*, number reported by carbapenemase type and specimen type, 1 January 2019–28 February 2019, state and territory



* Carbapenemase-producing Enterobacterales ($n = 148$), carbapenemase- and ribosomal methyltransferase-producing Enterobacterales ($n = 8$)

Notes:

1. An increase in screening isolates may be due to a change in screening practice or indicate that an outbreak is being managed
2. NDM-type is primarily associated with overseas acquisition; increases in NDM-type screening isolates may be due to increased overseas acquisition in local patients. Local transmission requires enhanced surveillance and response.

Figure 8: Top four reported carbapenemase-producing Enterobacterales type by specimen type and state and territory, 1 January 2019–28 February 2019

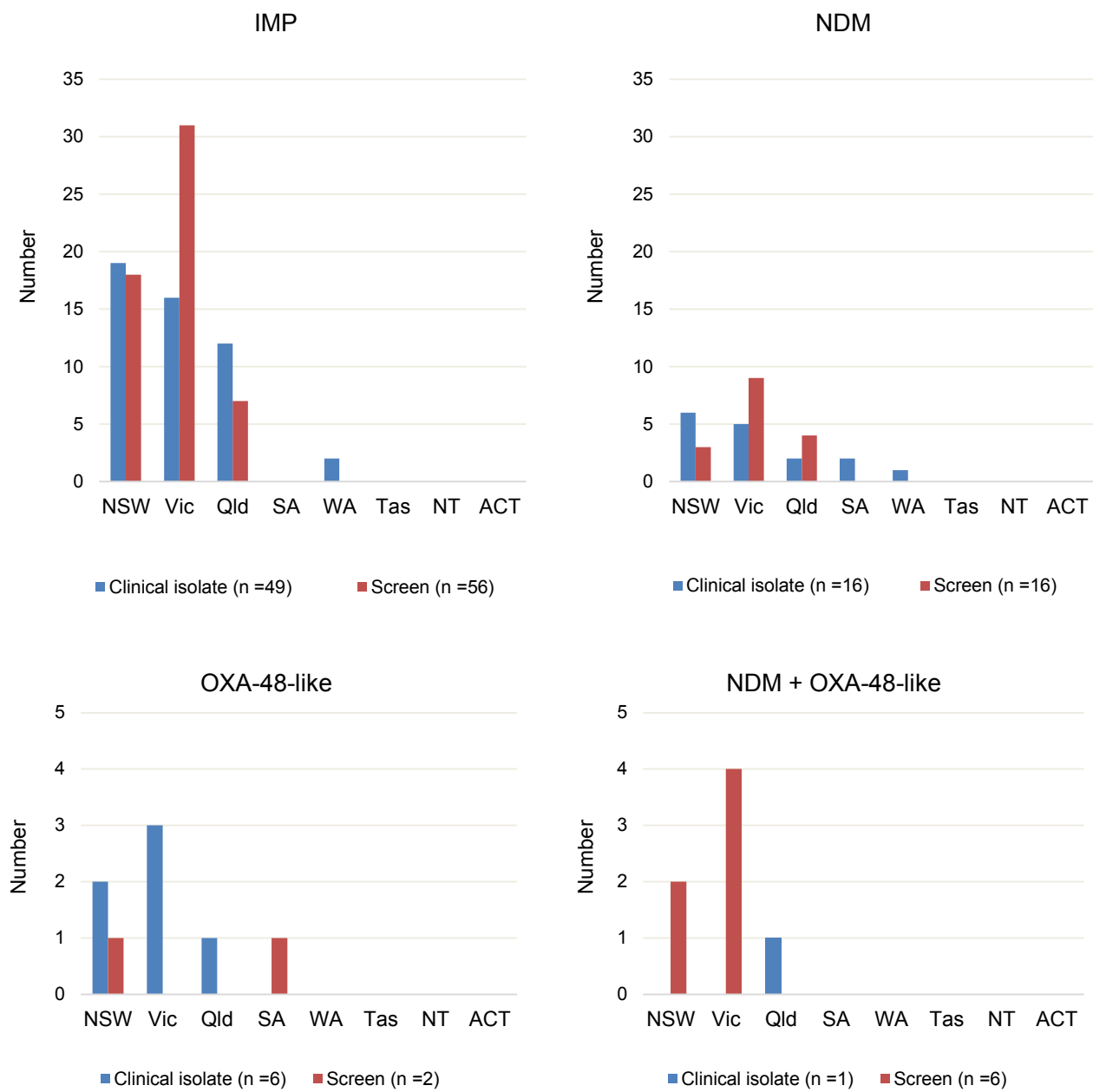


Table 3: Top four carbapenemase types, number reported by setting and state and territory, 1 January 2019–28 February 2019

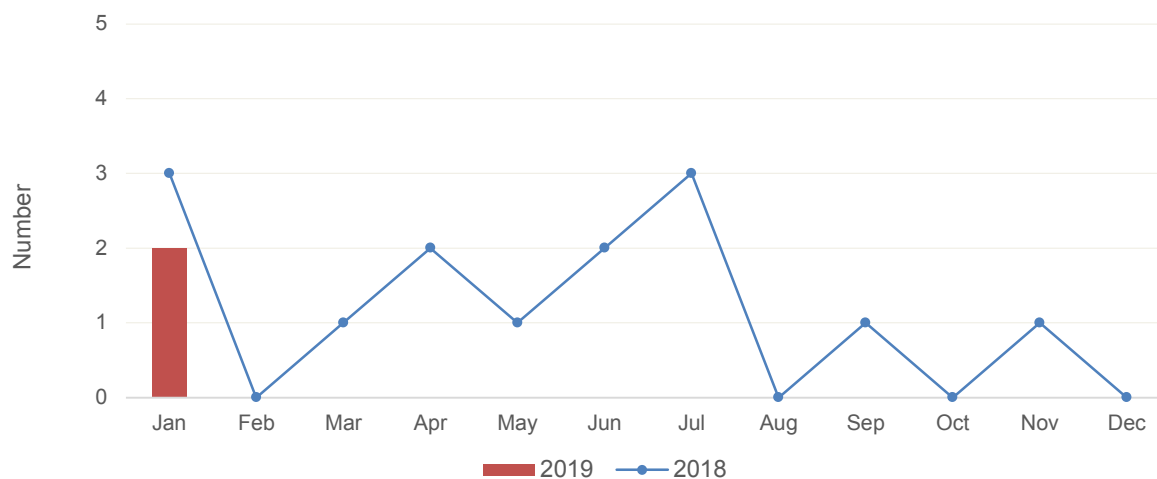
Carbapenemase type	Setting	State or territory								Total
		NSW	Vic	Qld	SA	WA	Tas	NT	ACT	
IMP	Total	37	47	19	0	2	0	0	0	105
	Public hospital	36	45	8	0	1	0	0	0	90
	Private hospital	1	1	10	0	0	0	0	0	12
	Aged care home	0	0	1	0	0	0	0	0	1
	Community	0	1	0	0	1	0	0	0	2
	Unknown	0	0	0	0	0	0	0	0	0
NDM	Total	9	14	6	2	1	0	0	0	32
	Public hospital	7	12	4	0	0	0	0	0	23
	Private hospital	1	1	0	0	0	0	0	0	2
	Aged care home	0	0	0	0	0	0	0	0	0
	Community	0	1	0	2	0	0	0	0	3
	Unknown	1	0	2	0	1	0	0	0	4
OXA-48-like	Total	3	3	1	1	0	0	0	0	8
	Public hospital	3	0	0	1	0	0	0	0	4
	Private hospital	0	0	1	0	0	0	0	0	1
	Aged care home	0	0	0	0	0	0	0	0	0
	Community	0	2	0	0	0	0	0	0	2
	Unknown	0	1	0	0	0	0	0	0	1
NDM, OXA-48-like	Total	2	4	1	0	0	0	0	0	7
	Public hospital	2	4	0	0	0	0	0	0	6
	Private hospital	0	0	0	0	0	0	0	0	0
	Aged care home	0	0	0	0	0	0	0	0	0
	Community	0	0	1	0	0	0	0	0	1
	Unknown	0	0	0	0	0	0	0	0	0

Note: Carbapenemase type(s) as reported.

Note: Historically, Australia has predominantly seen IMP-type carbapenemases. However a slow but gradual increase in other types, including NDM, has been observed since the establishment of CARAlert in 2016. Prompt identification and enhanced response to cases with the NDM-type is required to prevent local transmission of CPE.

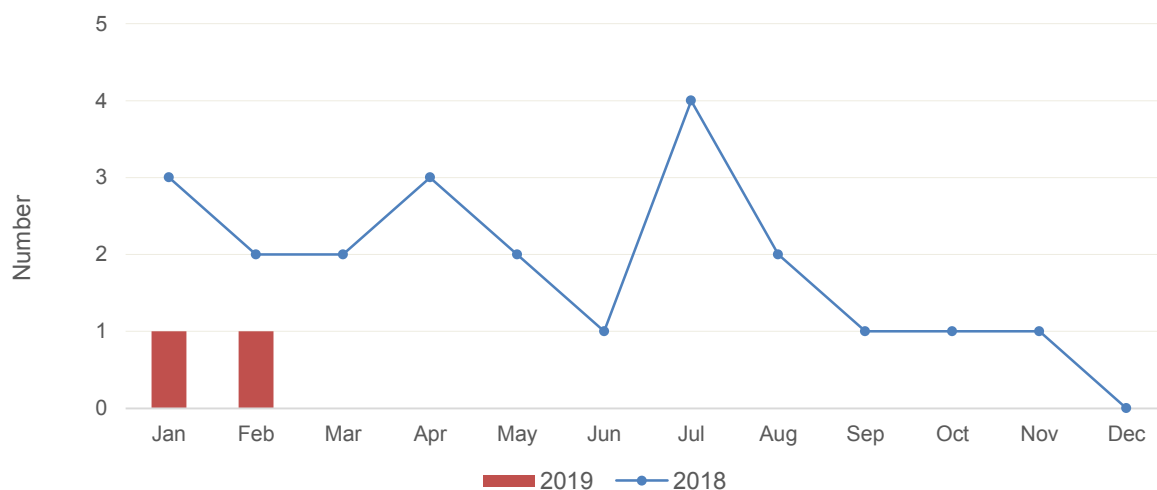
Enterococcus species

Figure 9: Linezolid non-susceptible *Enterococcus* species, number reported by for 2019 by month, compared with the previous year, national



Mycobacterium tuberculosis

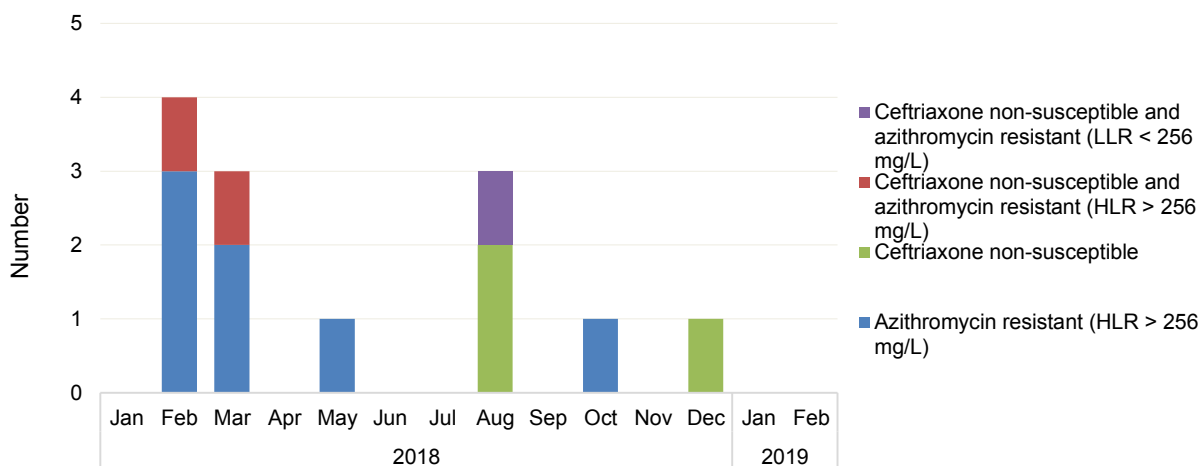
Figure 10: Multidrug-resistant *Mycobacterium tuberculosis*, number reported for 2019 by month, compared with the previous year, national



Neisseria gonorrhoeae

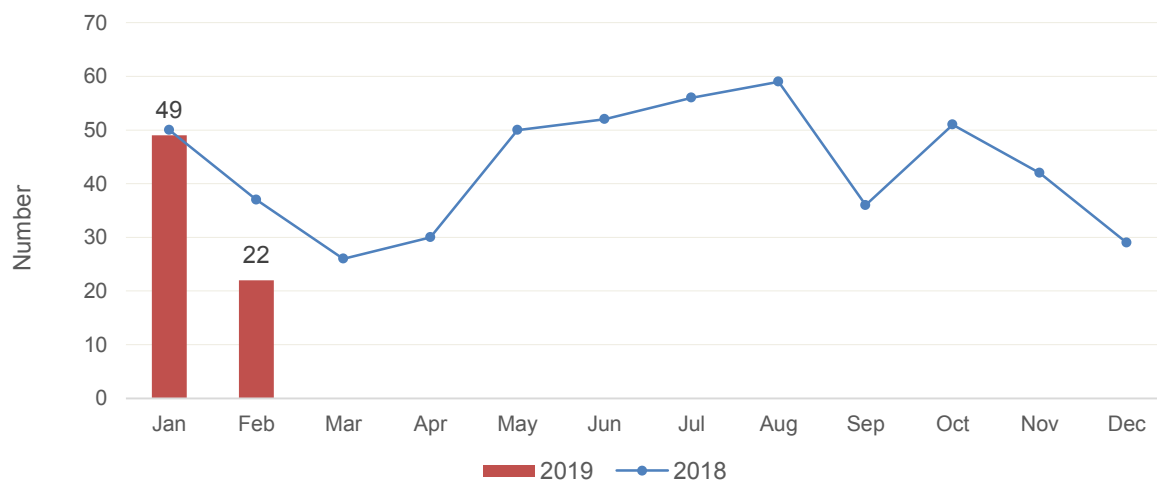
National data

Figure 11: Ceftriaxone non-susceptible and/or azithromycin non-susceptible *Neisseria gonorrhoeae* (HLR > 256 mg/L), number reported by month, 1 January 2018–28 February 2019



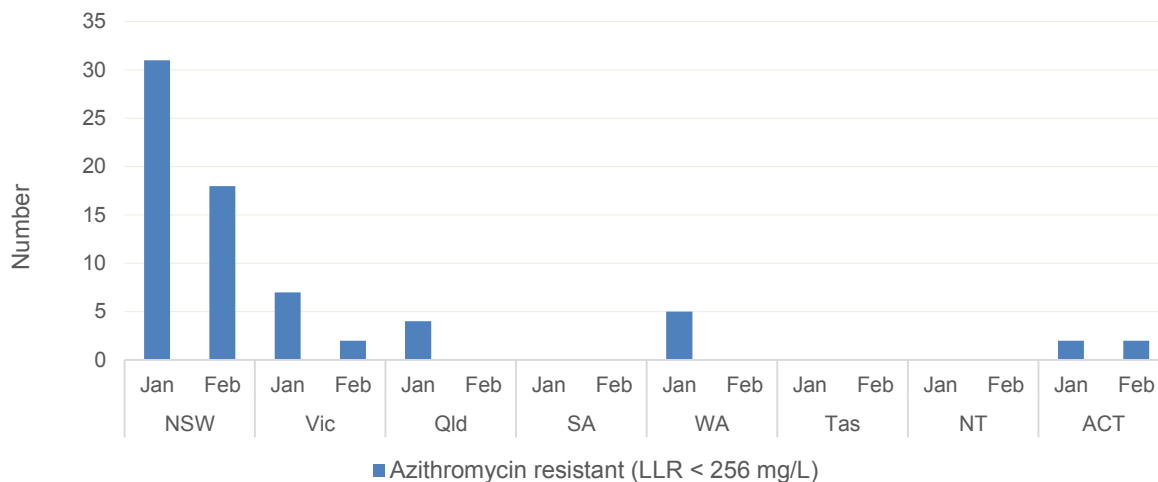
Note: No ceftriaxone non-susceptible *Neisseria gonorrhoeae* were reported in this reporting period (January–February 2019).

Figure 12: Azithromycin non-susceptible (LLR < 256 mg/L) *Neisseria gonorrhoeae*, number reported for 2019 by month, compared with the previous year, national



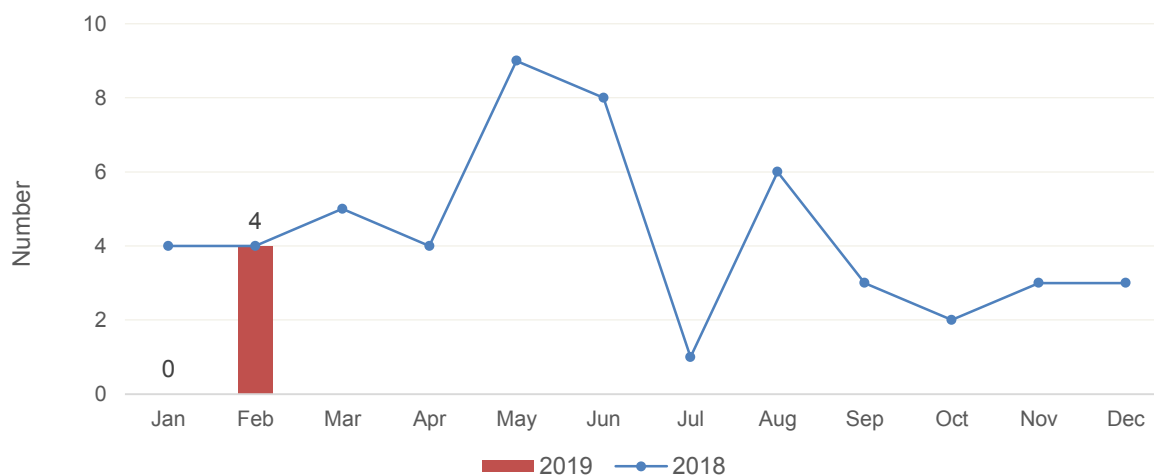
State and territory

Figure 13: *Neisseria gonorrhoeae*, number reported by state and territory, 1 January 2018–28 February 2019



Salmonella species

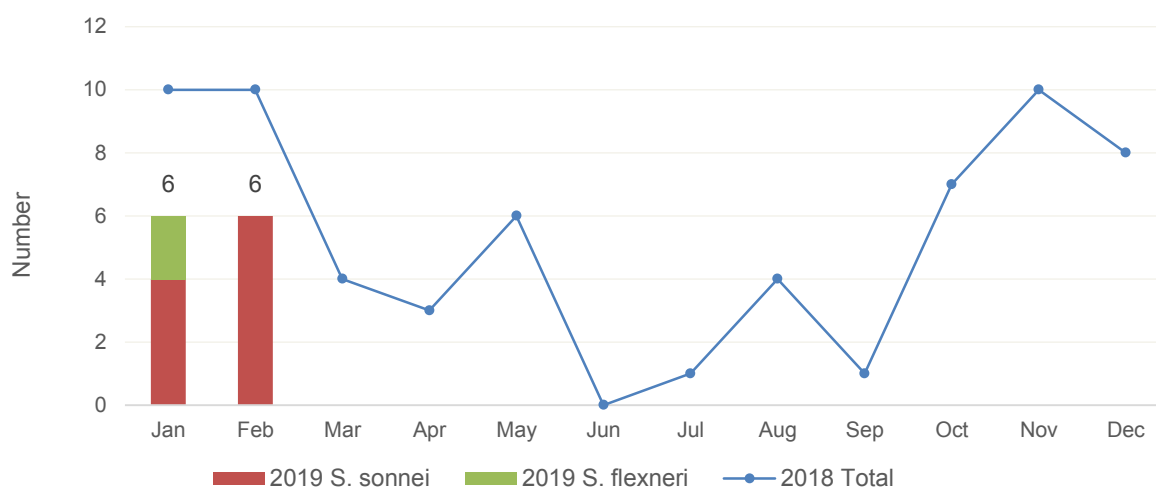
Figure 14: Ceftriaxone non susceptible *Salmonella* species, number reported for 2019 by month, compared with the previous year, national



Note: No ceftriaxone non-susceptible typhoidal species were reported in this reporting period (January–February 2019).

Shigella species

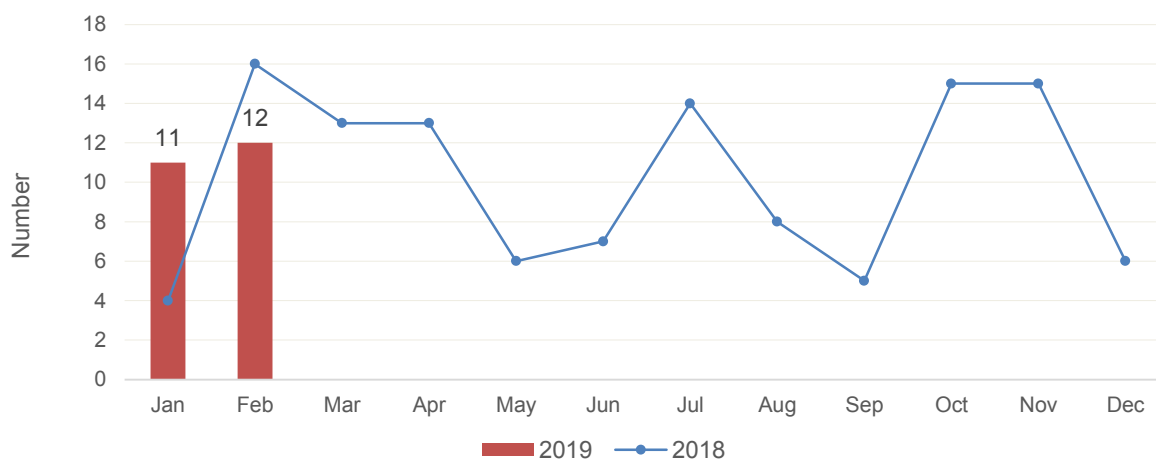
Figure 15: Multidrug-resistant *Shigella* species, number reported for 2019 by month, compared with the previous year, national



Staphylococcus aureus

National data

Figure 16: Daptomycin non-susceptible *Staphylococcus aureus*, number reported for 2019 by month, compared with the previous year, national



Note: No linezolid non-susceptible *S. aureus* or vancomycin non-susceptible *S. aureus* were reported in the two-month period (January–February 2019).

State and territory

Table 4. Daptomycin non-susceptible *Staphylococcus aureus*, number reported by setting and state and territory, 1 January 2018–28 February 2019

Setting	State or territory								Total
	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	
Total	3	9	3	0	8	0	0	0	23
Public hospital	3	5	2	0	8	0	0	0	18
Private hospital	0	1	0	0	0	0	0	0	1
Aged care home	0	2	1	0	0	0	0	0	3
Community	0	1	0	0	0	0	0	0	1
Unknown	0	0	0	0	0	0	0	0	0

Appendix

Data Notes

The following are important considerations for interpreting CARAlert data:

1. The data are based on the date that the isolate with the confirmed CAR was collected.
2. States and territories refer to the state or territory where the CAR was detected. If place of residence is unknown or overseas, the state or territory of the originating laboratory is reported.
3. Comparison between reports may be influenced by delayed detection or late submissions of CARs.
4. Number of CARs reported does not always equal the number of patients, as patients may have more than one CAR, or species, detected in a specimen.
5. Cut-off date for data that are included in updates and reports is four weeks after the end of each reporting period.
6. National summary data is provided; comparison across states and territories is provided for organisms where there are large numbers reported and a comparison is meaningful.
7. Authorised officers in each state and territory health department can access the CARAlert web portal directly for further information about their jurisdiction, including the name of the public hospital where a patient with a confirmed CAR was cared for, and to extract reports on their data.

About CARAlert

CARAlert is a component of the Antimicrobial Use and Resistance in Australia (AURA) Surveillance System. CARAlert was established by the Australian Commission on Safety and Quality in Health Care in March 2016.

The AURA Surveillance System provides essential information to develop and implement strategies to prevent and contain antimicrobial resistance in human health and improve antimicrobial use across the acute and community healthcare settings. AURA also supports the National Safety and Quality Health Service (NSQHS) Standard Preventing and Controlling Healthcare-Associated Infection and Australia's National Antimicrobial Resistance Strategy (2015–2019). Funding for AURA is provided by the Australian Government Department of Health and state and territory health departments.

Critical antimicrobial resistances (CARs) are resistance mechanisms known to be a serious threat to the effectiveness of last-line antimicrobial agents. CARs can result in significant morbidity and mortality.

The CARs reported under CARAlert are listed in Table 2. The CARs were drawn from the list of high-priority organisms and antimicrobials which are the focus of the AURA Surveillance System.¹

Table 2: List of critical antimicrobial resistances reported to CARAlert

Species	Critical Resistance
Enterobacterales	Carbapenemase-producing, and/or ribosomal methyltransferase-producing
<i>Enterococcus</i> species	Linezolid non-susceptible
<i>Mycobacterium tuberculosis</i>	Multidrug-resistant – resistant to at least rifampicin and isoniazid
<i>Neisseria gonorrhoeae</i>	Ceftriaxone or azithromycin non-susceptible
<i>Salmonella</i> species	Ceftriaxone non-susceptible
<i>Shigella</i> species	Multidrug-resistant
<i>Staphylococcus aureus</i>	Vancomycin, linezolid or daptomycin non-susceptible
<i>Streptococcus pyogenes</i>	Penicillin reduced susceptibility

Note: Enterobacterales (new taxonomy)

The CARAlert system is based on the following routine processes used by pathology laboratories for identifying and confirming potential CARs:

1. Collection and routine testing – the isolate is collected from the patient and sent to the originating laboratory for routine testing
2. Confirmation – if the originating laboratory suspects that the isolate is a CAR, it sends the isolate to a confirming laboratory that has the capacity to confirm the CAR
3. Submission to the CARAlert system – the confirming laboratory advises the originating laboratory of the result of the test, and the originating laboratory reports back to the health service that cared for the patient from whom the specimen was collected; the confirming laboratory then submits the details of the resistance and organism into the secure CARAlert web portal.

¹ Australian Commission on Safety and Quality in Health Care (ACSQHC). AURA 2017: Second Australian report on antimicrobial use and resistance in human health. Sydney: ACSQHC; 2017.

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