AUSTRALIAN COMMISSION ON SAFETY AND QUALITY IN HEALTH CARE

AURA Antimicrobial Use and Resistance in Australia

CARAlert THE NATIONAL ALERT SYSTEM FOR CRITICAL ANTIMICROBIAL RESISTANCE

CARAlert data update 13

1 May 2019–30 June 2019

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Data Summary

This report provides an update on data submitted to CARAlert for the reporting period: 1 May 2019 to 30 June 2019, and complements previous analyses of and updates on CARAlert data.

National overview

- There was a 4% decrease in critical antimicrobial resistances (CARs) reported, compared to the previous two-month reporting period (*n* = 273)
- Carbapenemase-producing Enterobacterales (CPE) remains the most frequently reported CAR, (*n* = 143, 52%), followed by azithromycin non-susceptible (low-level resistance, MIC ≤ 256 mg/L) *Neisseria gonorrhoeae* (*n* = 76, 28%)
- Multidrug-resistant *Shigella* species (*n* = 28, 10%) were the third most common CAR in this reporting period; the number reported this year to date, compared to the same period last year, has increased by 115.2%
- There were decreases in the number of reported daptomycin non-susceptible *Staphylococcus aureus* (*n* = 16, down 30%), and ceftriaxone non-susceptible *Salmonella* species (*n* = 4, down 56%)
- There were no reports of linezolid non-susceptible *Enterococcus* species or multidrug-resistant *Mycobacterium tuberculosis*
- The majority of CARs, excluding those from *N. gonorrhoeae*, were reported from public hospitals (*n* = 152); there were 18 from community settings, 11 from private hospitals, and two from aged care homes (one IMP-producing *E. cloacae* complex in Queensland and one NDM-producing *Klebsiella pneumoniae* in South Australia).

Carbapenemase-producing Enterobacterales

- IMP (55.2%), NDM (27.3%), and OXA-48-like (15.4%) types accounted for 97.8% of all CPE reported during this period
- Although the total number of CPE was the same (*n* = 143), there was an increase in the number of NDM-types and a decrease in IMP-types (NDM: *n* = 39 versus *n* = 28; IMP: *n* = 79 versus *n* = 95) compared to the previous two-month period
- The total number of CPE reported this year to date, compared to the same period last year, has increased by 47.4%
- There was an increase in the number of NDM-types from screening specimens compared to the previous two-month period (*n* = 22 versus *n* = 11)
- The increase in NDM screening isolates occurred in New South Wales, South Australia, Queensland and Western Australia
- There were increases in the number of NDM-types reported from clinical isolates for South Australia and New South Wales
- There was one report of a KPC-producing *K. pneumoniae* from Queensland; this is the second KPC-producing *K. pneumoniae* this year reported from a Queensland public hospital
- Three *Enterobacter cloacae* complex harbouring IMP-4 and mcr-9.1 were reported from Victoria; the significance of this finding is unclear
- There was one report of IMI-1 producing *E. cloacae* complex from Queensland
- Excluding confirmed CARs for which the setting was unknown, 12% of CPE were reported from settings other than public hospitals; 7.2% (*n* = 10), 2.9% (*n* = 4) and 1.4% (*n* = 2) respectively from private hospitals, community and aged care
- Nine hospitals had more than two notifications of IMP-types; these institutions were in New South Wales (*n* = 5), Victoria (*n* = 2), and Queensland (*n* = 2)
- One hospital in South Australia had six notifications of NDM-types; two were clinical isolates and four were screening isolates.
- Two hospitals in Victoria had more than two notifications of OXA-48-like types; one of these hospitals also had more than two notifications of IMP-types

- Two-year trends show an increase in NDM-types in South Australia and OXA-48-like types in Victoria
- There were sporadic reports of NDM-types in Western Australia; and no recent reports of CPE in Northern Territory, the Australian Capital Territory and Tasmania.

Azithromycin non-susceptible (low-level resistance, MIC ≤ 256 mg/L) *N. gonorrhoeae*

- There was a 4% increase in the number of this CAR reported (*n* = 76), compared to the previous two-month reporting period (*n* = 73)
- The majority of cases were reported from New South Wales (*n* = 39, 51%)
- This CAR was also reported from Victoria (*n* = 30), the Australian Capital Territory (*n* = 3),Queensland (*n* = 2) and Western Australia (*n* = 2)
- There was a 30% increase in reports from Victoria (*n* = 30), compared to the previous two-month reporting period (*n* = 23).

***Salmonella* and *Shigella* species**

- Ceftriaxone non-susceptible *Salmonella* species were reported from New South Wales (*n* = 2), South Australia (*n* = 1) and Western Australia (*n* = 1); all were non-typhoidal species
- The total number of multidrug-resistant *Shigella* species remained the same (*n* = 28) compared to the previous two-month reporting period; although the number of *S. flexneri* reported from Queensland declined (*n* =8 versus *n* =11)
- For the first time since March 2017, one multidrug-resistant *S. flexneri* was reported from the Northern Territory
- Multidrug-resistant *Shigella* species were also reported from New South Wales (n = 6), Victoria (*n* = 6) and South Australia (*n* = 2).

Additional CARs reported to CARAlert from 2019

Following system changes in late July 2019 to enable reporting of four new CARs to CARAlert, two reports were received from New South Wales:

- One *Candida auris* from a screen specimen in a private hospital, collected in May 2019
- One carbapenemase-producing (VIM) *Pseudomonas aeruginosa* from a clinical specimen in a public hospital, collected in June 2019.

National summary

Table 1: Number of critical antimicrobial resistances, by state and territory, 1 May 2019–30 June 2019, and 2018

Species	Critical resistance	State or territory								Bi-monthly			Year to date		
										2019	2019				
		NSW	Vic	Qld	SA	WA	Tas	NT	ACT	May-Jun	Mar-Apr	Relative change	2019	2018	Relative change
Candida auris	–	1	0	0	0	0	0	0	0	1	0	–	1	0	–
Enterobacterales	Carbapenemase-producing Enterobacterales	53	36	25	12	4	0	0	0	130	135	▼ 3.7%	418	292	▲ 43.2
	Carbapenemase and ribosomal methyltransferase-producing	1	8	0	0	1	0	0	0	10	9	▲ 11.1%	27	10	▲ 170%
	Ribosomal methyltransferase-producing	0	2	0	0	0	0	0	0	2	1	▲ 100.0%	5	4	▲ 25.0%
	Carbapenemase-producing and transmissible resistance to colistin	0	3	0	0	0	0	0	0	3	0	–	3	0	–
Enterococcus species	Linezolid non-susceptible	0	0	0	0	0	0	0	0	0	1	▼ 100.0%	4	9	▼ 55.6%
Mycobacterium tuberculosis	Multidrug-resistant – at least rifampicin- and isoniazid-resistant strains	0	0	0	0	0	0	0	0	0	4	▼ 100.0%	7	13	▼ 46.2%
Neisseria gonorrhoeae	Azithromycin non-susceptible (LLR < 256 mg/L)	39	30	2	0	2	0	0	3	76	73	▲ 4.1%	253	245	▲ 3.3%
	Azithromycin non-susceptible (HLR > 256 mg/L	0	1	0	0	0	0	0	0	1	0	–	1	6	▼ 83.3%
	Ceftriaxone non-susceptible	0	0	0	0	1	0	0	0	1	1	0.0%	3	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	2	▼ 100.0%

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)

Species	Critical resistance	State or territory								Bi monthly			Year to date		
										2019	2019				
		NSW	Vic	Qld	SA	WA	Tas	NT	ACT	May-Jun	Mar-Apr	Relative change	2019	2018	Relative change
Pseudomonas aeruginosa	Carbapenemase-producing	1	0	0	0	0	0	0	0	1	0		1	0	–
Salmonella species	Ceftriaxone non-susceptible	2	0	0	1	1	0	0	0	4	9	▼ 55.6%	18	34	▼ 47.1%
Shigella species	Multidrug-resistant	6	6	13	2	0	0	1	0	28	28	0.0%	71	33	▲ 115.2%
Staphylococcus aureus	Daptomycin non-susceptible	5	7	0	0	2	0	0	2	16	23	▼ 30.4%	62	59	▲ 5.1%
	Daptomycin and vancomycin non-susceptible	0	0	0	0	0	0	0	0	0	0	–	0	0	–
	Linezolid non-susceptible	0	0	0	0	0	0	0	0	0	0	–	0	1	▼ 100.0%
	Vancomycin non-susceptible	0	0	0	0	0	0	0	0	0	0	–	0	0	–
Streptococcus pyogenes	Penicillin reduced susceptibility	0	0	0	0	0	0	0	0	0	0	–	0	0	–
	Total (reported by 31 July 2019)	**108**	**93**	**40**	**15**	**11**	**0**	**1**	**5**	**273**	**284**	**▼ 3.9%**	**874**	**708**	**▲ 23.4%**

* 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 May 2019–30 June 2019

Species	Critical resistance	Setting					Total
		Public hospital	Private hospital	Aged care home	Community	Unknown	
Candida auris		0	1	0	0	0	1
Enterobacterales	Carbapenemase-producing	110	10	2	4	4	130
	Carbapenemase and ribosomal methyltransferase-producing	10	0	0	0	0	10
	Ribosomal methyltransferase-producing	2	0	0	0	0	2
	Transmissible resistance to colistin	0	0	0	0	0	0
	Transmissible resistance to colistin and carbapenemase-producing	3	0	0	0	0	3
Enterococcus species	Linezolid non-susceptible	0	0	0	0	0	0
Mycobacterium tuberculosis	Multidrug-resistant – at least rifampicin- and isoniazid-resistant	0	0	0	0	0	0
Neisseria gonorrhoeae	Azithromycin non-susceptible (LLR < 256 mg/L)	3	0	0	18	55*	76
	Azithromycin non-susceptible (HLR > 256 mg/L	0	0	0	1	0	1
	Ceftriaxone non-susceptible	0	0	0	1	0	1
	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
Pseudomonas aeruginosa	Carbapenemase-producing	1	0	0	0	0	1
Salmonella species	Ceftriaxone non-susceptible	4	0	0	0	0	4
Shigella species	Multidrug-resistant	12	0	0	10	6	28
Staphylococcus aureus	Daptomycin non-susceptible	10	0	0	4	2	16
	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
Streptococcus pyogenes	Penicillin reduced susceptibility	0	0	0	0	0	0
	Total (reported by 31 July 2019)	**155**	**11**	**2**	**38**	**67**	**273**

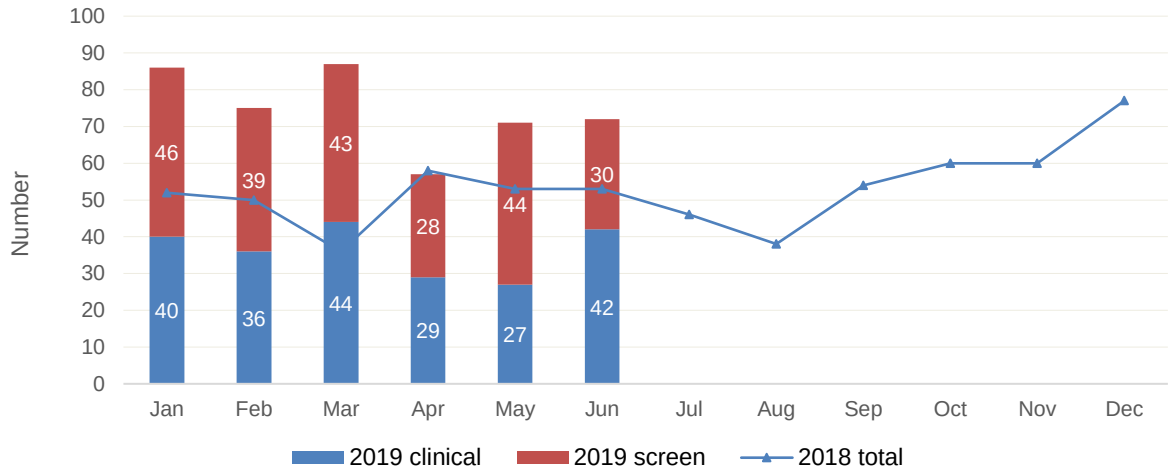
* Information on setting for *Neisseria gonorrhoeae* is often not available

Summary by CAR

Enterobacterales

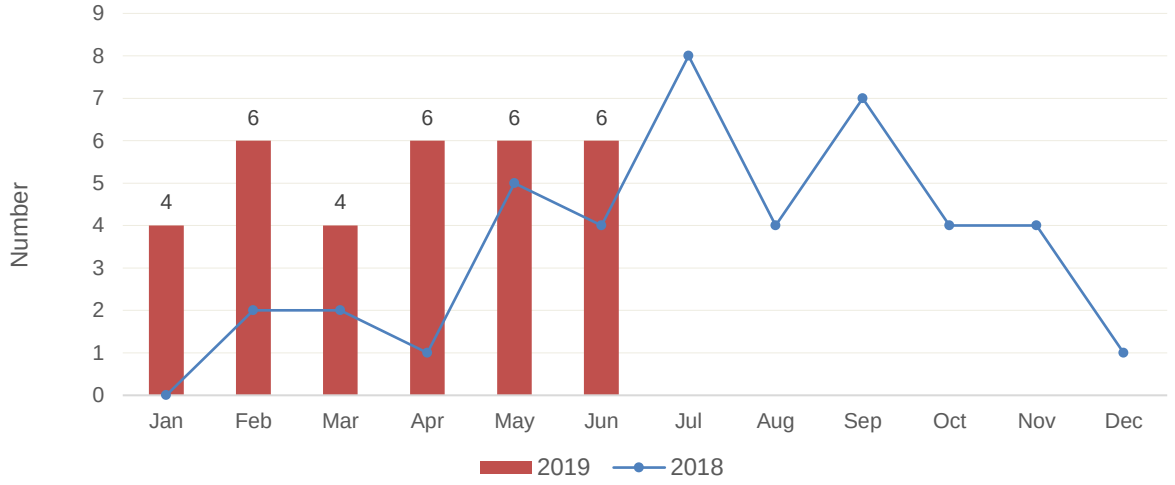
National data

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



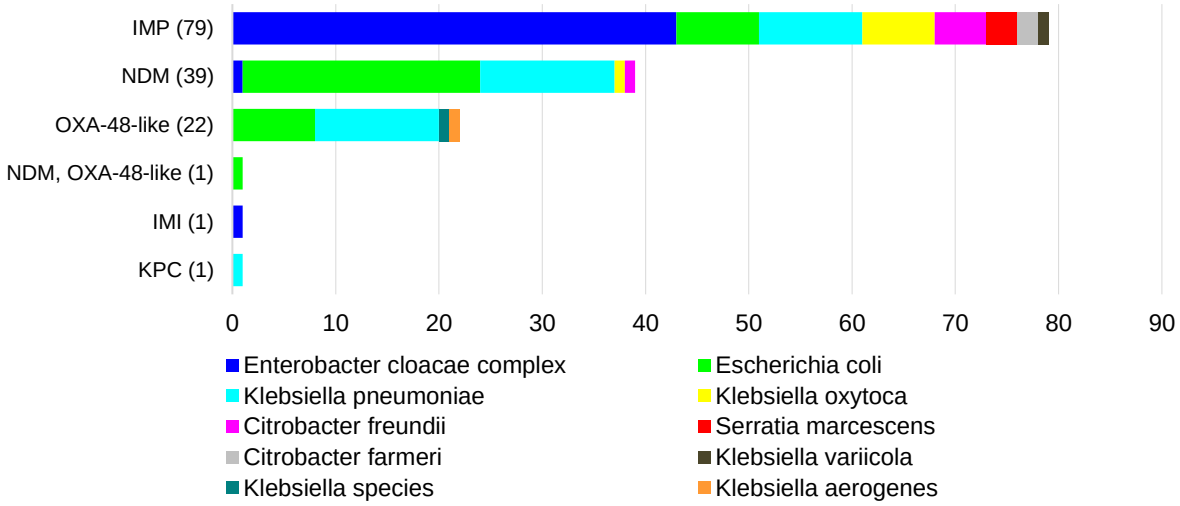
* Carbapenemase-producing alone or in combination with ribosomal methyltransferases

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



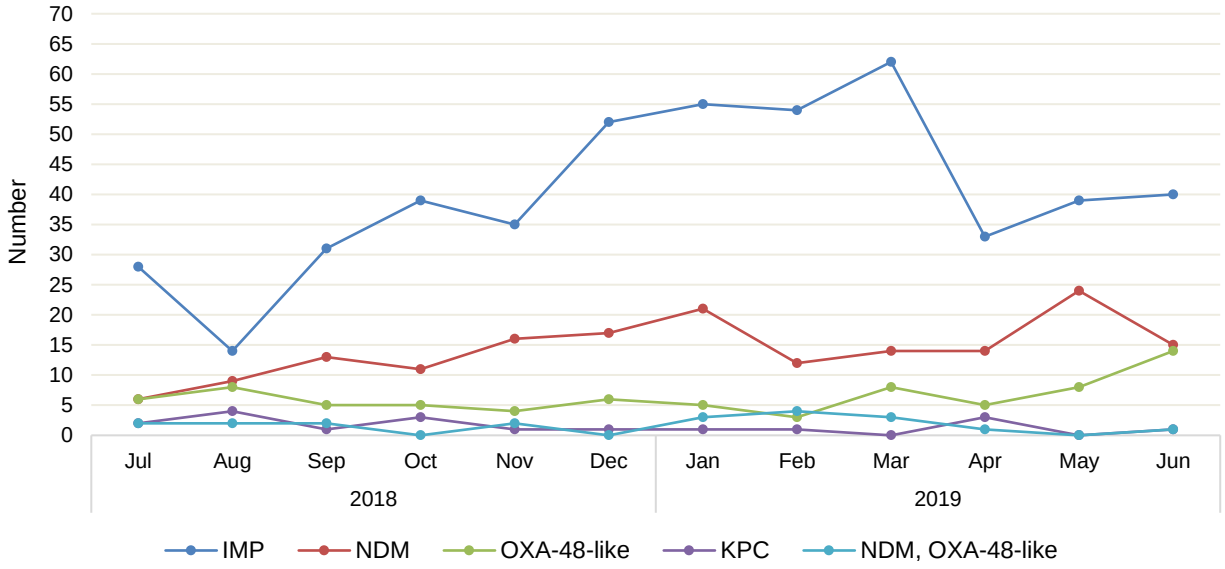
* Ribosomal methyltransferases alone, or in combination with carbapenemases

Figure 3: Carbapenemase-producing Enterobacterales*, number reported by carbapenemase type and species, national, 1 May 2019–30 June 2019



* Carbapenemase-producing (*n* = 130), carbapenemase- and ribosomal methyltransferase-producing (*n* = 10), carbapenemase-producing and transmissible resistance to colistin (*n* = 3)

Figure 4: Twelve–month trend for the top four reported carbapenemase types, national, 1 July 2018–30 June 2019



State and territory

Figure 5: Carbapenemase-producing Enterobacterales, number reported by state and territory, 1 May 2019–30 June 2019

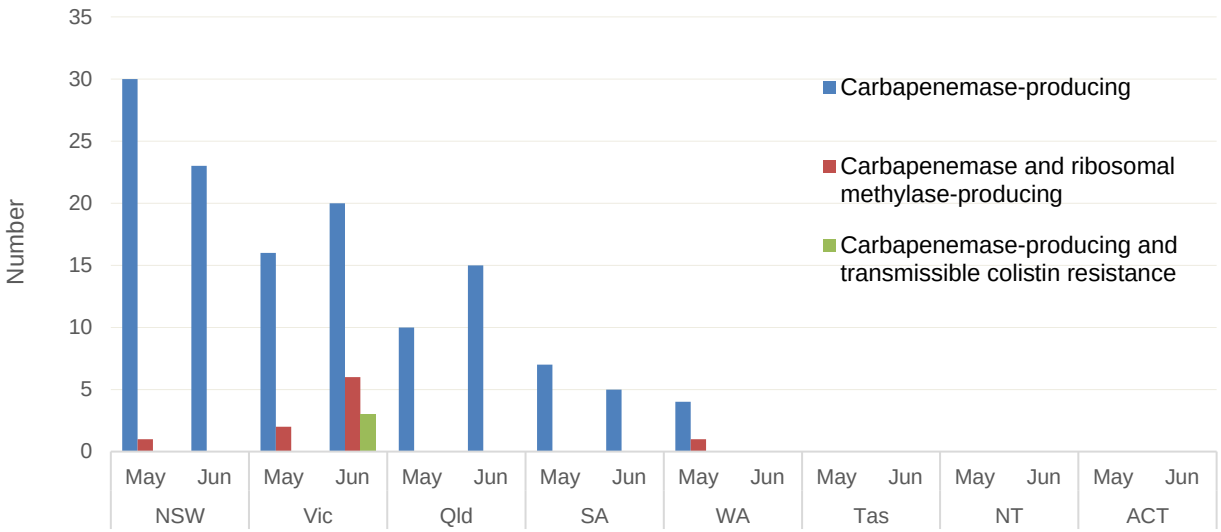


Figure 6: Two-year trend for the top four reported carbapenemase types, by state and territory and nationally, (three-month moving average), 1 July 2017–30 June 2019

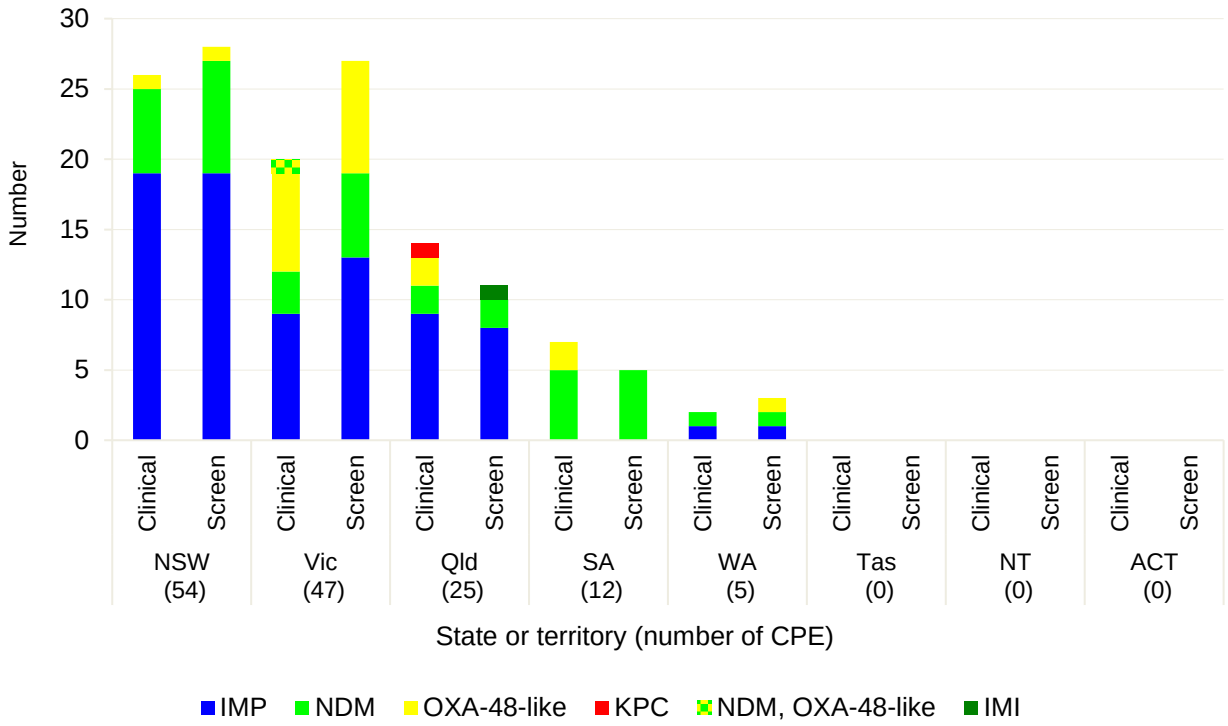
Type	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Australia
IMP	20 5	23 2	12 7	0 0	4 0	0 0	0 0	2 0	57 20
NDM	5 2	7 3	6 1	3 0	2 0	0 0	1 0	1 0	18 6
OXA-48-like	3 1	6 1	26 0	1 0	1 0	0 0	0 0	0 0	29 4
KPC	1 0	3 0	0 0	0 0	0 0	0 0	0 0	0 0	4 1
All types	28 9	35 11	38 9	4 0	6 1	1 0	1 0	2 0	83 36

Line graphs represent three-month moving average for the period 1 July 2017 to 30 June 2019, for each type, where maximum monthly average was greater than one.

Straight green 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, by state and territory, 1 May 2019–30 June 2019



* Carbapenemase-producing (n = 130), carbapenemase- and ribosomal methyltransferase-producing (*n* = 10), carbapenemase-producing and transmissible resistance to colistin (*n* = 3)

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, by state and territory, 1 May 2019–30 June 2019

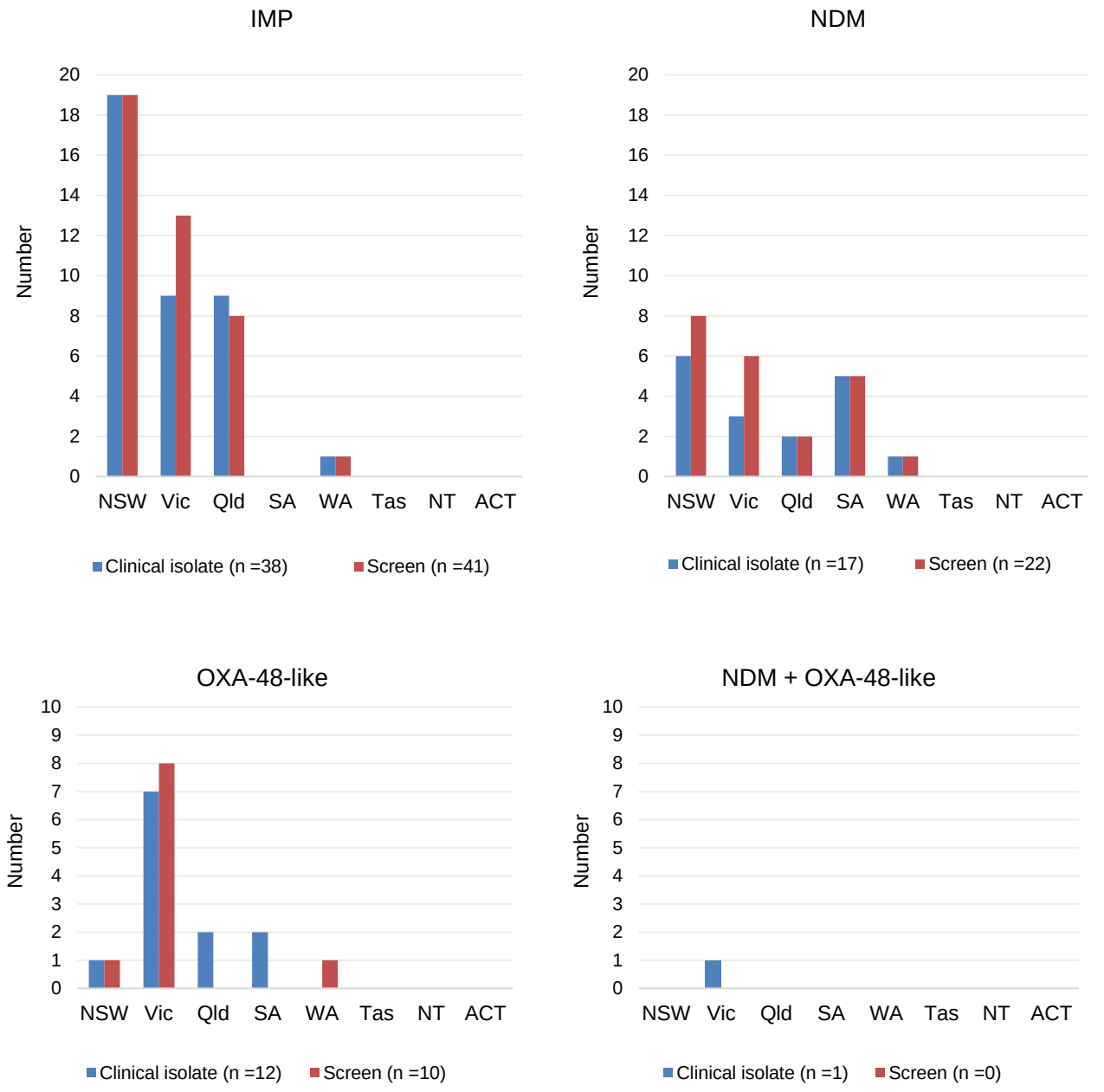
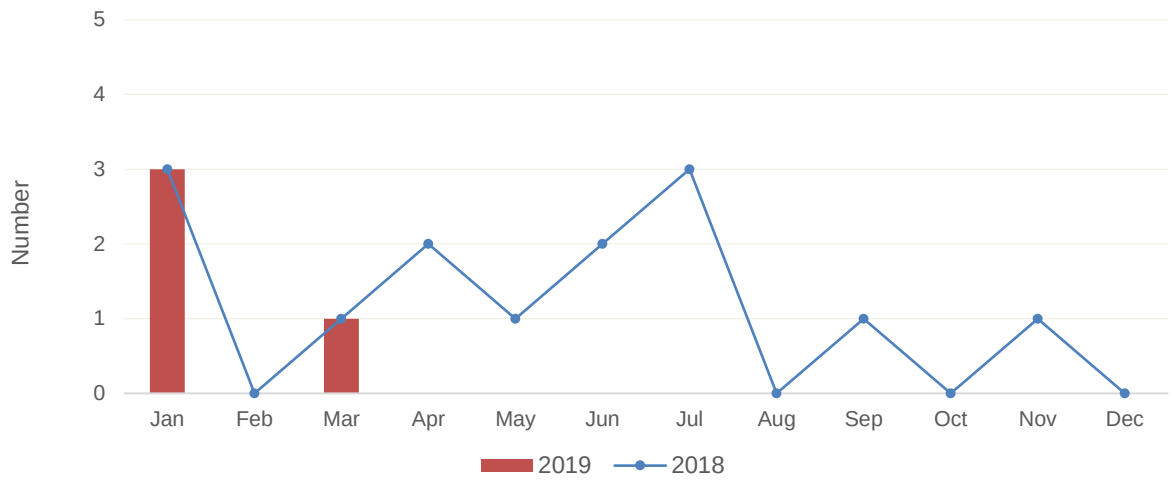


Table 3: Top four carbapenemase types, number reported by setting, by state and territory, 1 May 2019–30 June 2019

Carbapenemase type	Setting	State or territory								Total
		NSW	Vic	Qld	SA	WA	Tas	NT	ACT	
IMP	**Total**	**38**	**22**	**17**	**0**	**2**	**0**	**0**	**0**	**79**
	Public hospital	38	22	7	0	1	0	0	0	68
	Private hospital	0	0	8	0	0	0	0	0	8
	Aged care home	0	0	1	0	0	0	0	0	1
	Community	0	0	1	0	0	0	0	0	1
	Unknown	0	0	0	0	1	0	0	0	1
NDM	**Total**	**14**	**9**	**4**	**10**	**2**	**0**	**0**	**0**	**39**
	Public hospital	13	7	2	9	2	0	0	0	33
	Private hospital	0	1	1	0	0	0	0	0	2
	Aged care home	0	0	0	1	0	0	0	0	1
	Community	1	1	0	0	0	0	0	0	2
	Unknown	0	0	1	0	0	0	0	0	1
OXA-48-like	**Total**	**2**	**15**	**2**	**2**	**1**	**0**	**0**	**0**	**22**
	Public hospital	2	14	1	2	0	0	0	0	19
	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	1	0	0	1	0	0	0	2
NDM, OXA-48-like	**Total**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
	Public hospital	0	1	0	0	0	0	0	0	1
	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	0	0	0	0	0	0	0
	Unknown	0	0	0	0	0	0	0	0	0

Enterococcus species

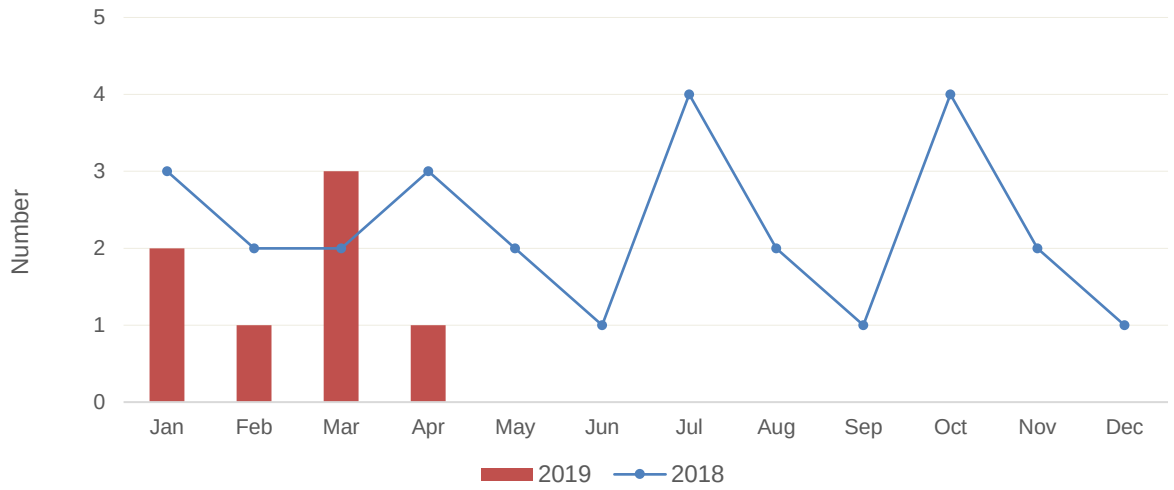
Figure 9: Linezolid non-susceptible *Enterococcus* species, number reported for 2019, by month, compared with the previous year, national



Note: No linezolid non-susceptible *Enterococcus* species were reported in the two-month period (May–June 2019).

Mycobacterium tuberculosis

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

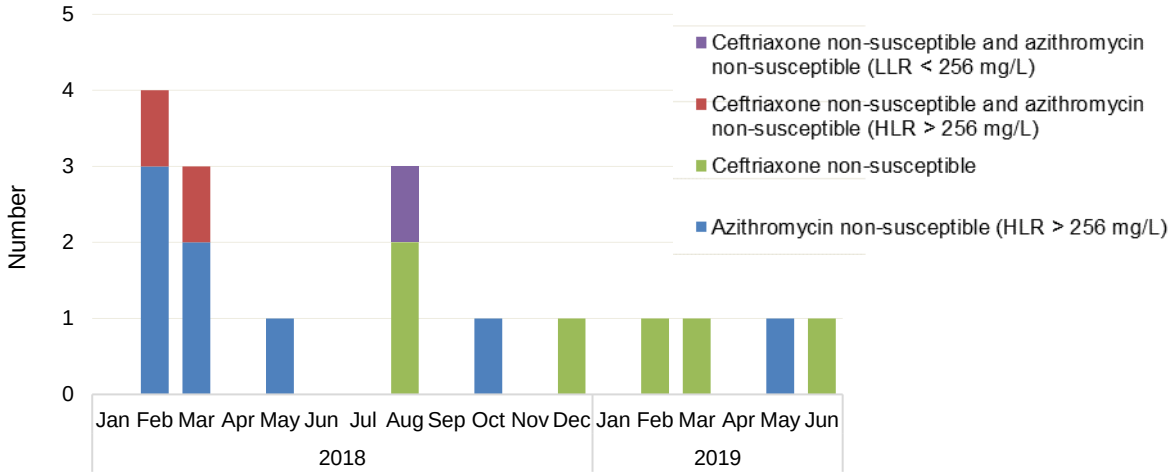


Note: No multidrug-resistant *Mycobacterium tuberculosis* were reported in the two-month period (May–June 2019).

Neisseria gonorrhoeae

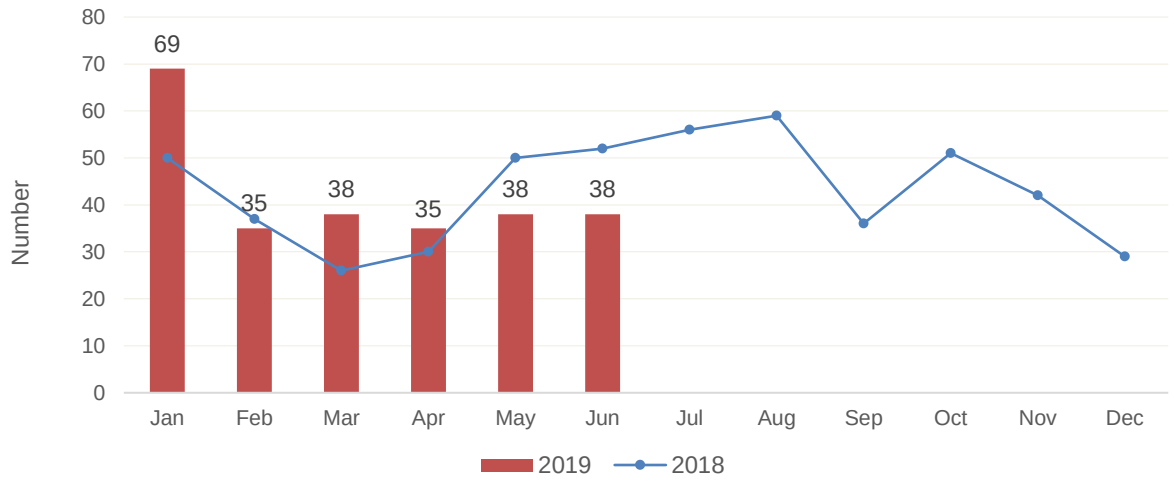
National data

Figure 11: Ceftriaxone non-susceptible and/or azithromycin non-susceptible (HLR > 256 mg/L) *Neisseria gonorrhoeae,* number reported by month, 1 January 2018–30 June 2019



LLR: Low level resistance; HLR: High level resistance

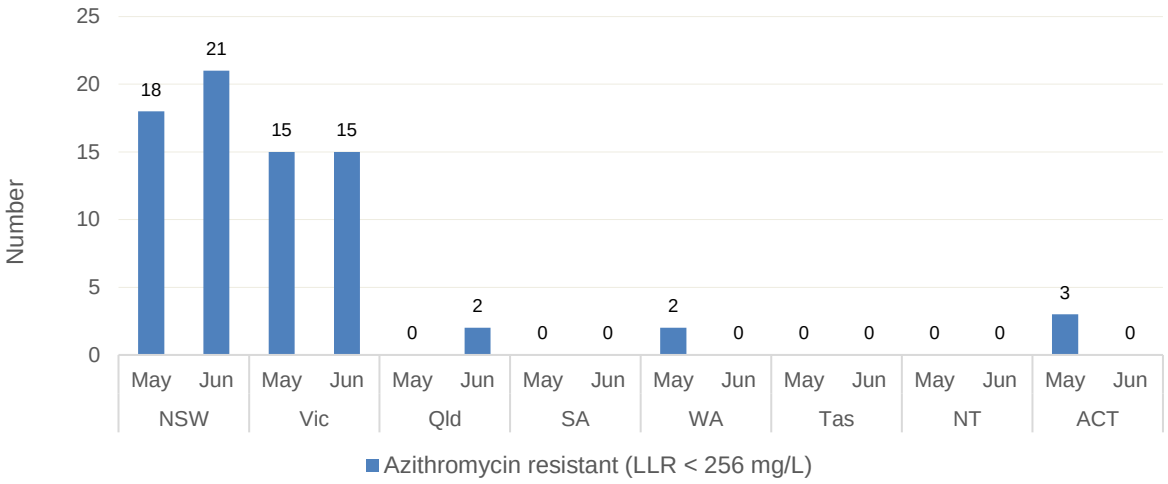
Figure 12: Azithromycin non-susceptible (LLR < 256 mg/L) *Neisseria gonorrhoeae,* number reported for 2019 by month, compared with the previous year, national



LLR: Low level resistance

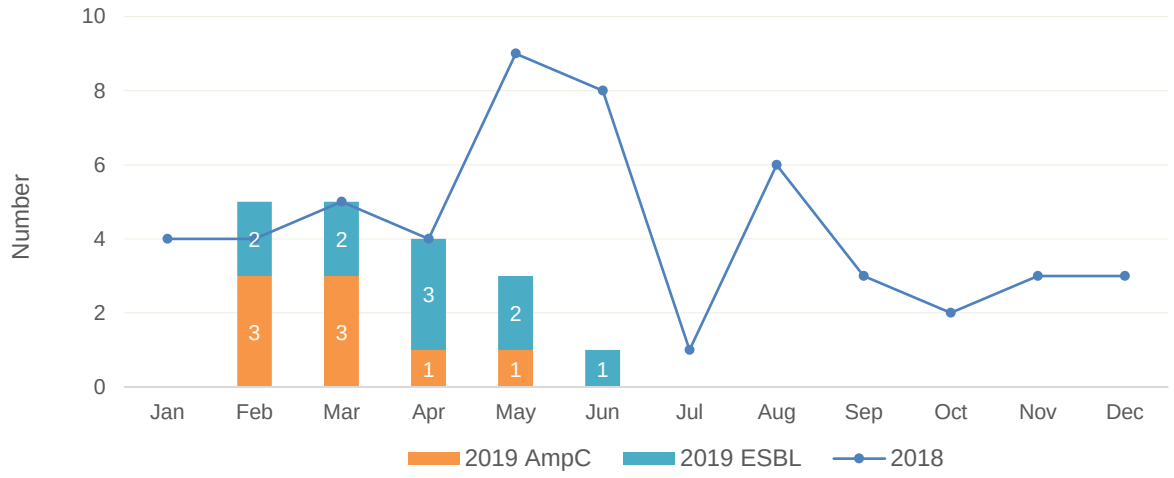
State and territory

Figure 13: Azithromycin non-susceptible (LLR < 256 mg/L) *Neisseria gonorrhoeae,* number reported by state and territory, 1 May 2019–30 June 2019



Salmonella species

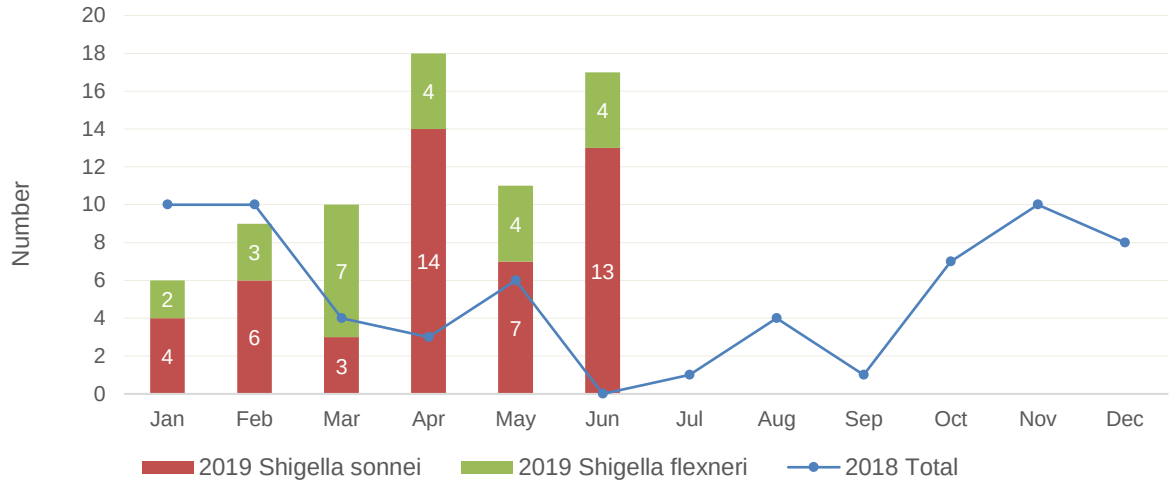
Figure 14: Ceftriaxone non susceptible *Salmonella* species, number reported for 2019 by month, compared with the previous year, national



Note: Non-typhoidal *Salmonella* species (n = 4), typhoidal *Salmonella* species (n = 0) reported in the two-month period (May–June 2019).

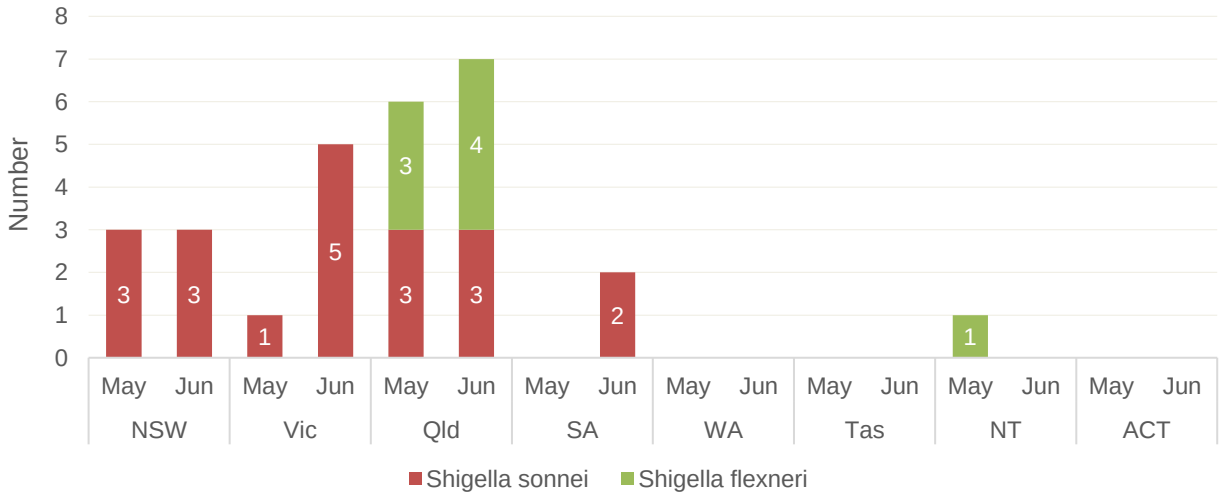
Shigella species

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



State and territory

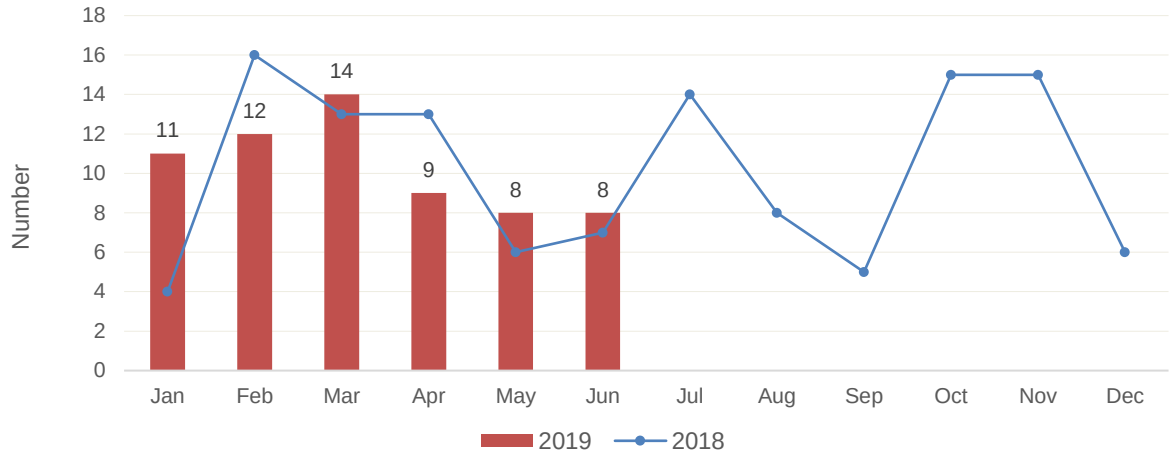
Figure 16: Multidrug-resistant *Shigella* species, number reported by state and territory, 1 May 2019–30 June 2019



Staphylococcus aureus

National data

Figure 17: 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 (May–July 2019).

State and territory

Table 4. Daptomycin non-susceptible *Staphylococcus aureus,* number reported by setting and state and territory, 1 May 2019–30 June 2019

	State or territory								
Setting	**NSW**	**Vic**	**Qld**	**SA**	**WA**	**Tas**	**NT**	**ACT**	**Total**
Total	**5**	**7**	**0**	**0**	**2**	**0**	**0**	**2**	**16**
Public hospital	5	2	0	0	2	0	0	1	10
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	3	0	0	0	0	0	1	4
Unknown	0	2	0	0	0	0	0	0	2

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 offers in each states 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
Acinetobacter baumannii complex	Carbapenemase-producing*
*Candida auris**	
Enterobacterales	Carbapenemase-producing, and/or ribosomal methyltransferase-producing
Neisseria gonorrhoeae	Transmissible colistin resistance*
Enterococcus species	Linezolid resistant
Mycobacterium tuberculosis	Multidrug-resistant (resistant to at least rifampicin and isoniazid)
Neisseria gonorrhoeae	Ceftriaxone non-susceptible or azithromycin non-susceptible
Salmonella species	Ceftriaxone non-susceptible
Shigella species	Multidrug-resistant
Staphylococcus aureus†	Vancomycin, linezolid or daptomycin non-susceptible
Streptococcus pyogenes	Penicillin reduced susceptibility
Pseudomonas aeruginosa	Carbapenemase-producing*

* If the specimen with a confirmed CAR was collected in 2019, if can be submitted retrospectively

† For CARAlert, *S. aureus* includes *S. argenteus*

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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