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Communicable Disease Control Branch,  
Disease Surveillance & Investigation Section

# 2021 Annual Report

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SA Health

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## Disclaimer

The data presented in this report were correct at the time of publication. Minor discrepancies with previous reports may occur as data adjustments are made retrospectively.

## Abbreviations

APY	Anangu Pitjantjatjara Yankunytjatjara
ARF	acute rheumatic fever
CARAlert	National Alert System for Critical Antimicrobial Resistences
CDCB	Communicable Disease Control Branch
CJD	Creutzfeldt-Jakob disease
COVID-19	Coronavirus disease 2019
CPE	Carbapenemase producing <i>Enterobacterales</i>
EHO	environmental health officer
Hib	<i>Haemophilus influenzae</i> type b
HUS	haemolytic uraemic syndrome
IMD	invasive meningococcal disease
MERS	Middle East respiratory syndrome
MJOI	multi-jurisdictional outbreak investigation
MLVA	multi-locus variable tandem repeat analysis
NAT	nucleic acid test
NIDS	Notifiable Infectious Disease Surveillance Database
NIP	National Immunisation Program
NNDSS	National Notifiable Diseases Surveillance System
NSW	New South Wales
PCR	polymerase chain reaction
RHD	rheumatic heart disease
RRv	Ross River virus
RSV	respiratory syncytial virus
SA	South Australia
SARS	severe acute respiratory syndrome
STEC	Shiga toxin-producing <i>Escherichia coli</i>
STm	<i>Salmonella</i> Typhimurium
TB	tuberculosis
TTP	thrombotic thrombocytopenic purpura
WA	Western Australia

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## Summary

The collection and surveillance of notifiable conditions is conducted under the *South Australian Public Health Act 2011* and associated Regulations. Medical practitioners and laboratories are required to report cases of most notifiable conditions to the Communicable Disease Control Branch (CDCB).

CDCB conducts state-wide surveillance for notifiable diseases enabling analysis of health data. Specified data are provided regularly to the National Notifiable Diseases Surveillance System (NNDSS). Summaries of notifiable diseases in South Australia (SA) are published on the SA Health website. Included are counts of notified conditions and information about current cluster and outbreak investigations, in addition to historical data.

CDCB undertakes, frequently in conjunction with partner agencies, public health actions to prevent the further spread of disease. Public health management is in accordance with the Series of National Guidelines and local Disease Surveillance and Investigation Guidelines. See [www.health.gov.au/cdnasongs](http://www.health.gov.au/cdnasongs).

The *South Australian Public Health Act 2011* provides the legislative authority to investigate and control notifiable conditions. Partner agencies may have legislative authority under other Acts in SA such as the *Food Act 2001* (SA).

Additional expertise to investigate and control notifiable conditions may be utilised from other agencies including OzFoodNet Australia, Biosecurity Division of Department of Primary Industries and Regions SA, environmental health officers (EHOs) from local government, Health Protection and Regulation, Department of Health and Wellbeing, including Food Safety and Regulation Branch and Health Protection Programs, and SA Pathology.

Coronavirus disease 2019 (COVID-19) restrictions including the Declaration of a Major Emergency under the *Emergency Management Act 2004* continued in 2021, including enforcement of restrictions limiting public gatherings and a full community lockdown for seven days in July 2021. Interstate travel continued to be restricted. On 23 November 2021, SA opened its borders to interstate travel. A staged reopening of the international border commenced on 1 November 2021, with restrictions continuing until the end of 2021. These restrictions continued to result in a reduction in cases for a large range of other notifiable diseases for 2021 compared to pre-pandemic years.

Investigation and control activities included (but were not limited to):

- > 12,666 cases of COVID-19
- > 231 cases of Shiga-toxin producing *Escherichia coli* (STEC) infection
- > 103 cases of Ross River virus (RRv) infection
- > 96 cases of invasive group A streptococcal disease
- > 81 cases of *Vibrio parahaemolyticus* infection
- > 74 non-foodborne clusters of gastrointestinal disease, including 66 in residential care facilities
- > 68 cases of respiratory syncytial virus (RSV)
- > 38 cases of legionellosis, including eight cases of *Legionella pneumophila* serogroup 1 infection
- > 18 cases of Q fever
- > 12 cases of invasive meningococcal disease (IMD)
- > ten foodborne (or probable foodborne) cluster investigations including six *Salmonella*, two *Campylobacter* and two *Vibrio parahaemolyticus*.
- > two cases of hepatitis E infection
- > one case of typhoid fever
- > one case of *Listeria monocytogenes* infection.

## Methods

Notification data from laboratories and medical practitioners were entered into and extracted for analysis from the SA Notifiable Infectious Disease Surveillance database (NIDS). Enteric notifiable disease data were extracted by the calculated onset date from 1 January to 31 December 2021. The calculated onset date is the earliest date entered into NIDS and may be the following dates: specimen date, signature date, laboratory confirmed date, notification date, or the current system date. All other notifiable condition data were extracted and reported by notification date which represents the date the case was first reported to CDCB. Data were extracted on 12 January 2023 for cases notified from 1 January to 31 December 2021. COVID-19 data were extracted from the COVID-19 notification database on 27 March 2023. Deaths are reported by date of death.

SA continues to use the surveillance case definitions prepared by the Communicable Diseases Network Australia for the Australian NNDSS. All case definitions are used with the exception of varicella infection where clinical diagnoses without laboratory testing are accepted in SA. See <https://www1.health.gov.au/internet/main/publishing.nsf/Content/cdna-casedefinitions.htm>

Notification rates in 2021 were calculated using the June 2021 population data available in the December 2021 estimated resident population supplied by the [Australian Bureau of Statistics](#). All rates are represented as the rate per 100,000 population unless otherwise stated.

The data reported here are correct as of the time of publishing but are subject to change. Ongoing maintenance of datasets as investigations are finalised, new information is reported or as errors are resolved from data cleaning contributes to this variance. Data may vary slightly from that reported in previous SA annual reports and other reports.

Data are reported for the first time on invasive group A streptococcal disease, RSV, *Candida auris* (*C. auris*), Carbapenemase producing *Enterobacterales* (CPE), and acute rheumatic fever (ARF) and rheumatic heart disease (RHD).

Surveillance of *C. auris* and CPE has been conducted through the National Alert System for Critical Antimicrobial Resistances (CARAlert) since its establishment in 2016. *C. auris* became notifiable on 7 October 2021 and CPE on 24 October 2019 in South Australia. Data from the date the disease became notifiable in SA are included in this report.

People diagnosed with ARF and/or RHD are reported from the SA RHD register by date of diagnosis and region of primary clinic. Region of primary clinic is the area where the patient was most recently reported to receive the majority of the primary health care for their ARF or RHD. This may differ from the person's region of diagnosis.

Data related to mycobacterial diseases (excluding leprosy and tuberculosis), sexually transmitted infections and blood-borne viruses are reported elsewhere.

## Enteric diseases

In 2021, gastrointestinal illnesses accounted for 18% of disease notifications in SA, compared to 35% of notifications in 2020. There were 4,024 cases of notifiable gastrointestinal disease reported in 2021. Campylobacteriosis remained the most frequently notified enteric disease in SA accounting for 72% of these notifiable diseases, followed by salmonellosis (14%).

### Botulism

In 2021, there was one notified case of infant botulism in a male under the age of 12 months. The potential source of infection was dust exposure during travel to a regional area in SA. Botulism is a rare disease and between 2016 and 2020, two cases were reported in children under the age of 12 months, both of which were classified as infant botulism.

### Campylobacteriosis

There were 2,899 notified cases of campylobacteriosis in 2021, higher than the 2,737 notifications in 2020 and lower than the historical five-year average of 3,086 notifications from 2016 to 2020 (Figure 1).

In 2021, campylobacteriosis notifications were in 1,566 males and 1,333 females. The highest rates of campylobacteriosis in males were reported in older adults aged 80-84 years (313 per 100,000 population) (Figure 2). For females, the highest rates were reported in those aged 75-79 years (250 per 100,000 population). There were higher rates of notifications amongst males in most of the five-year age groups compared with females (Figure 2). The difference in rates between males and females was greatest in the age group 80-84 years, followed by 15-19 years and 0-4 years. Of the 1,251 notifications able to be speciated, 1,137 (83%) were *C. jejuni*, 208 (17%) were *C. coli*, five (<1%) cases of *C. lari* and one case each of *C. curvus*, *C. peloridis* and *C. upsaliensis*.

**Figure 1 Notified cases of campylobacteriosis, by month and year of illness onset, South Australia, 2016-2021**

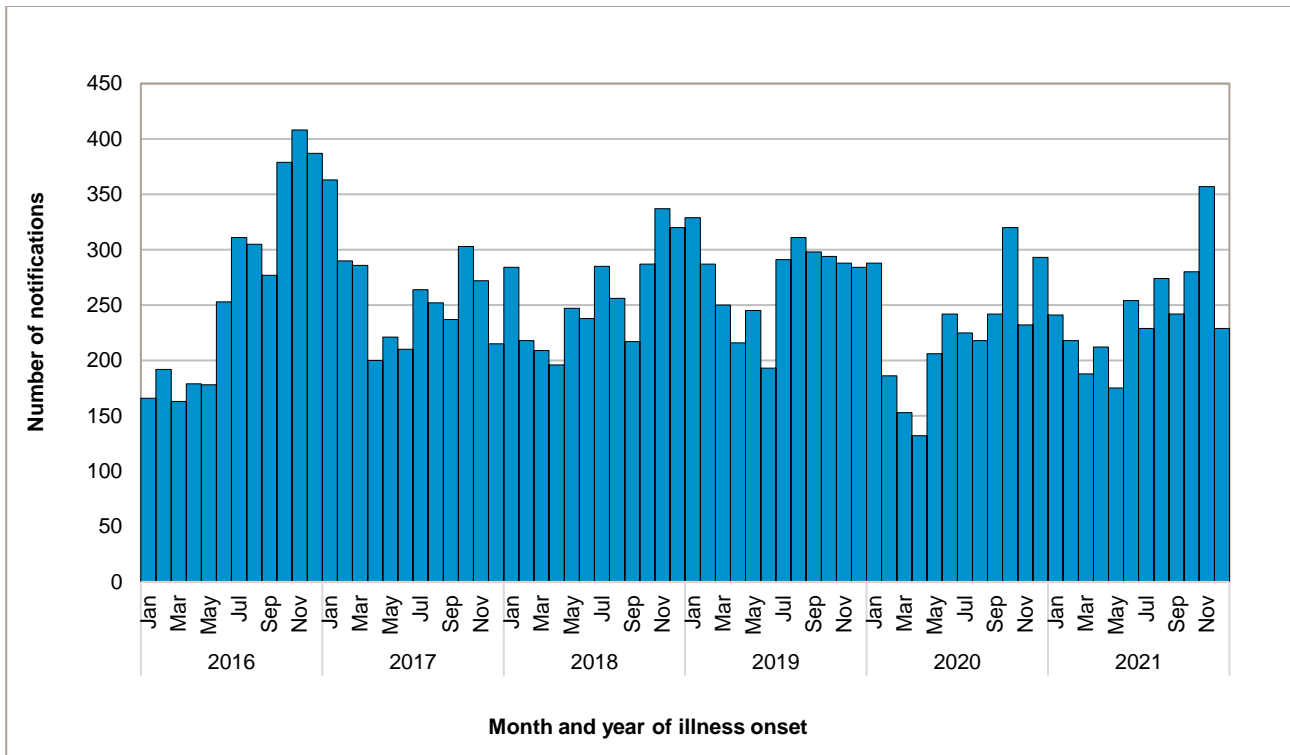
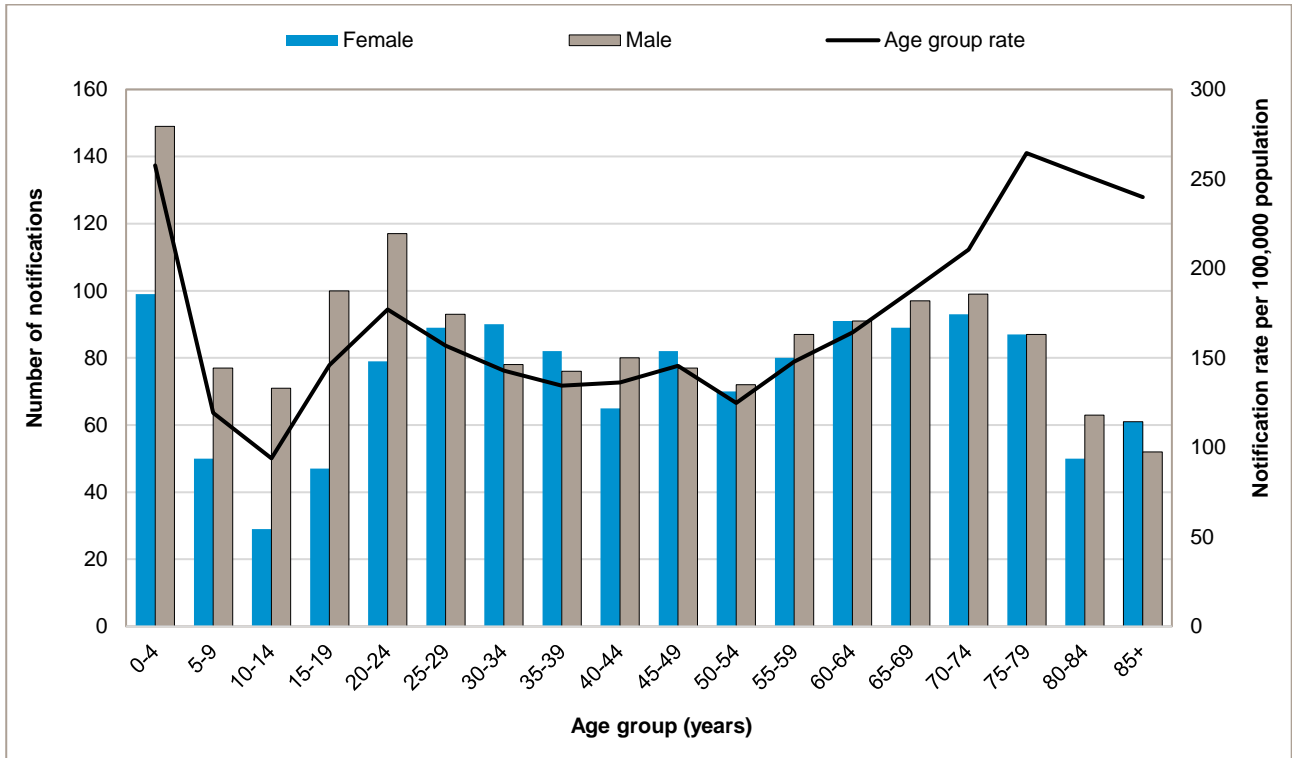


Figure 2 Notified cases of campylobacteriosis, by age group and sex, and notification rate by age group, South Australia, 2021



In 2021, three outbreaks of campylobacteriosis were investigated ([Appendix 3](#)).

### Cholera

In 2021, there were no cases of cholera notified. Cholera is a rarely reported disease in SA with no cases reported from 2016 to 2020.

### Cryptosporidiosis

There were 104 cases of cryptosporidiosis reported in 2021, lower than the 131 notifications reported in 2020 and lower than the historical five-year average of 248 cases from 2016 to 2020 (Figure 3).

In 2021, cryptosporidiosis was reported in 48 males and 56 females with a median age of 23 years (range 5 months-99 years). Cases were most frequently reported in children aged 0-4 years (23 per 100,000 population), followed by adults aged 25-29 years (11 per 100,000 population) (Figure 4).

Figure 3 Notified cases of cryptosporidiosis, by month and year of illness onset, South Australia, 2016-2021

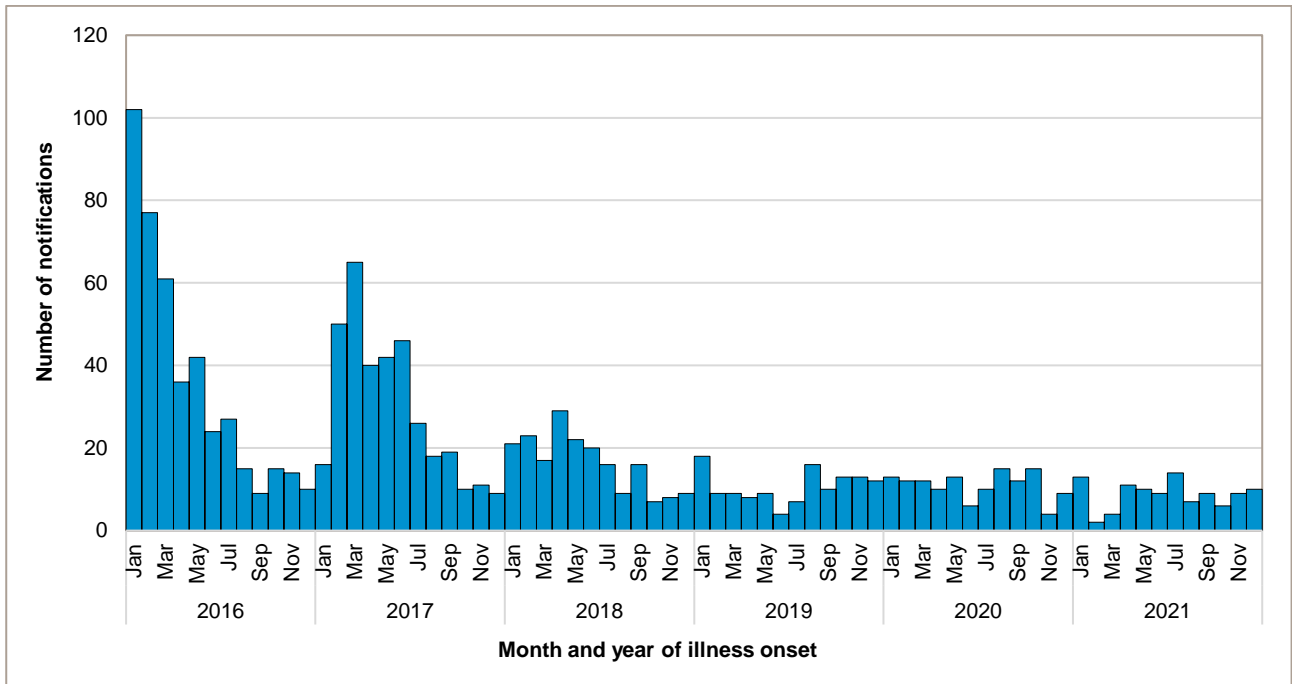
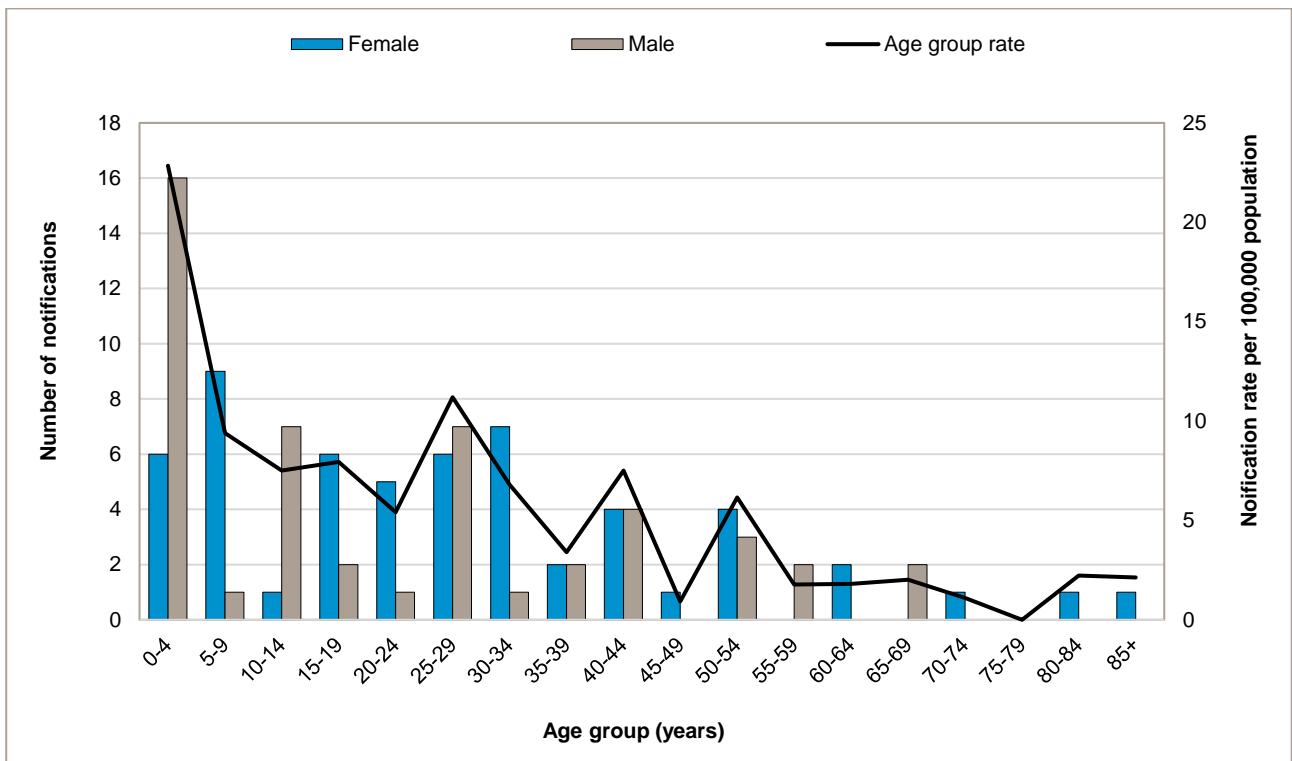


Figure 4 Notified cases of cryptosporidiosis, by age group and sex, and notification rate by age group, South Australia, 2021



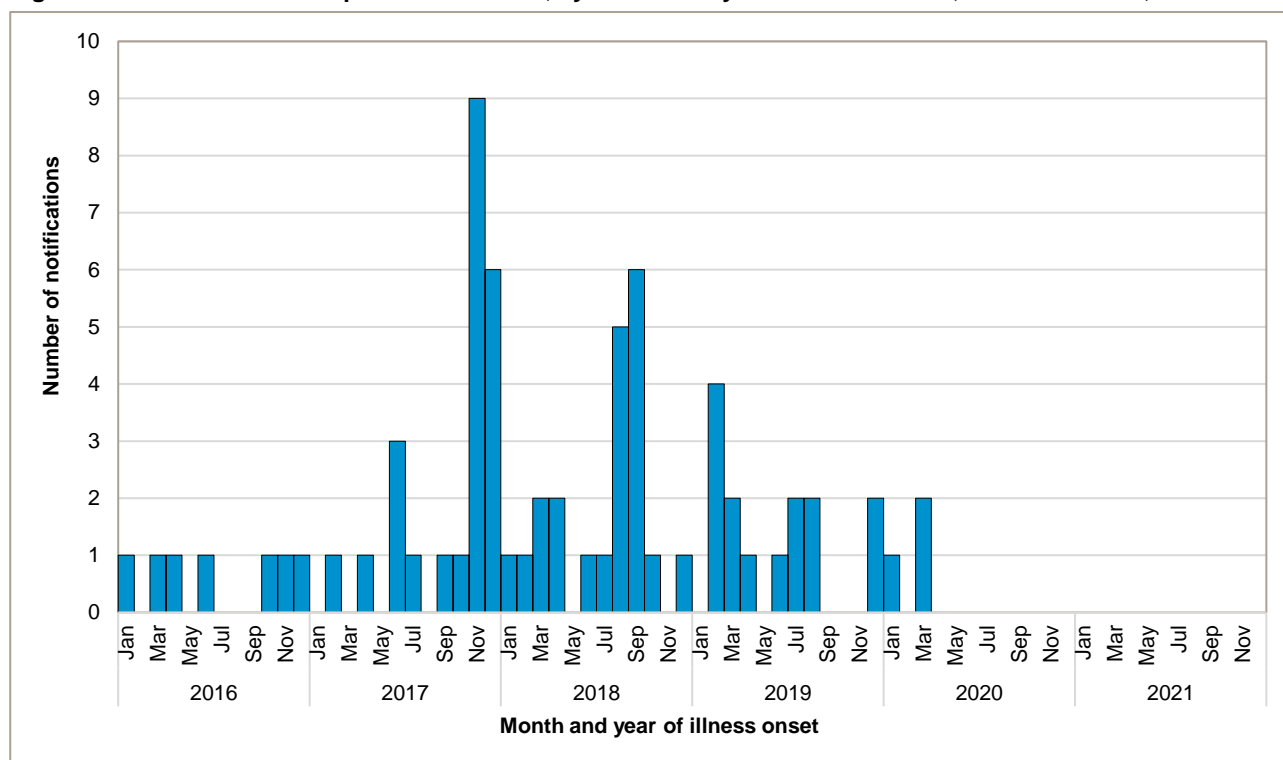
## Haemolytic uraemic syndrome

There were two notifications of haemolytic uraemic syndrome (HUS) in 2021. Haemolytic uraemic syndrome is a rarely reported condition with four cases notified from 2016 to 2020: three cases in 2017 and one case in 2020. Both HUS cases notified in 2021 were females aged 70-79 years and both were also positive for STEC infection. The two cases were not epidemiologically linked, and no source of infection was determined.

## Hepatitis A

In 2021, there were no notifications of hepatitis A infection, compared with three notifications in 2020 and a historical five-year average of 14 notifications from 2016 to 2020 (Figure 5).

**Figure 5 Notified cases of hepatitis A infection, by month and year of illness onset, South Australia, 2016-2021**



## Hepatitis E

There were two notifications of hepatitis E infection in 2021, equal to the two notifications in 2020 and the historical five-year average of two notifications from 2016 to 2020. The notifications in 2021 were in two males aged 30-39 years and 60-69 years. Both infections were likely acquired in Australia. Of the 10 hepatitis E cases notified from 2016 to 2021, seven (70%) were acquired overseas.

## Listeriosis

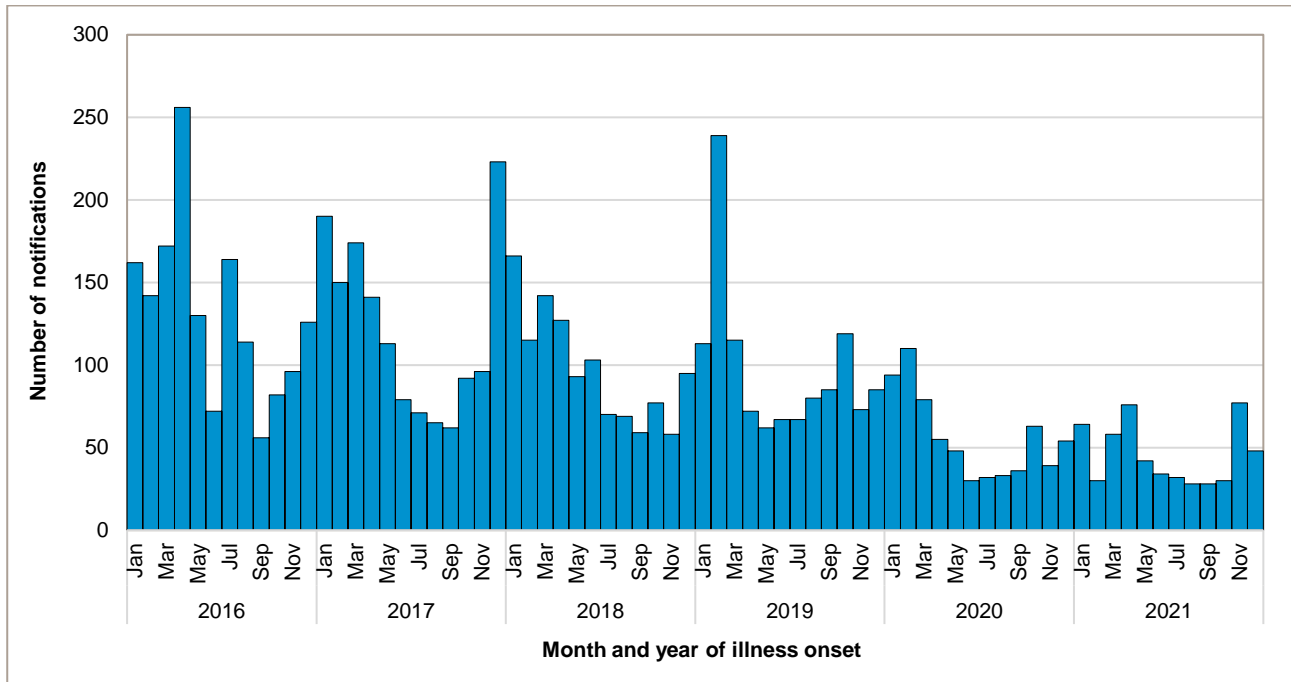
There was one notification of listeriosis in 2021, equal to one notification in 2020 and less than the historical five-year average of three cases from 2016 to 2020. In 2021 the case notified was a female who passed away who was aged 80-89 years with *L. monocytogenes* isolated in a blood culture. The case consumed several foods considered potentially high risk for listeriosis, however the source of her listeria infection was not identified. Further molecular typing did not identify any genomic links with cases notified in other jurisdictions.

## Salmonellosis (non-typhoidal)

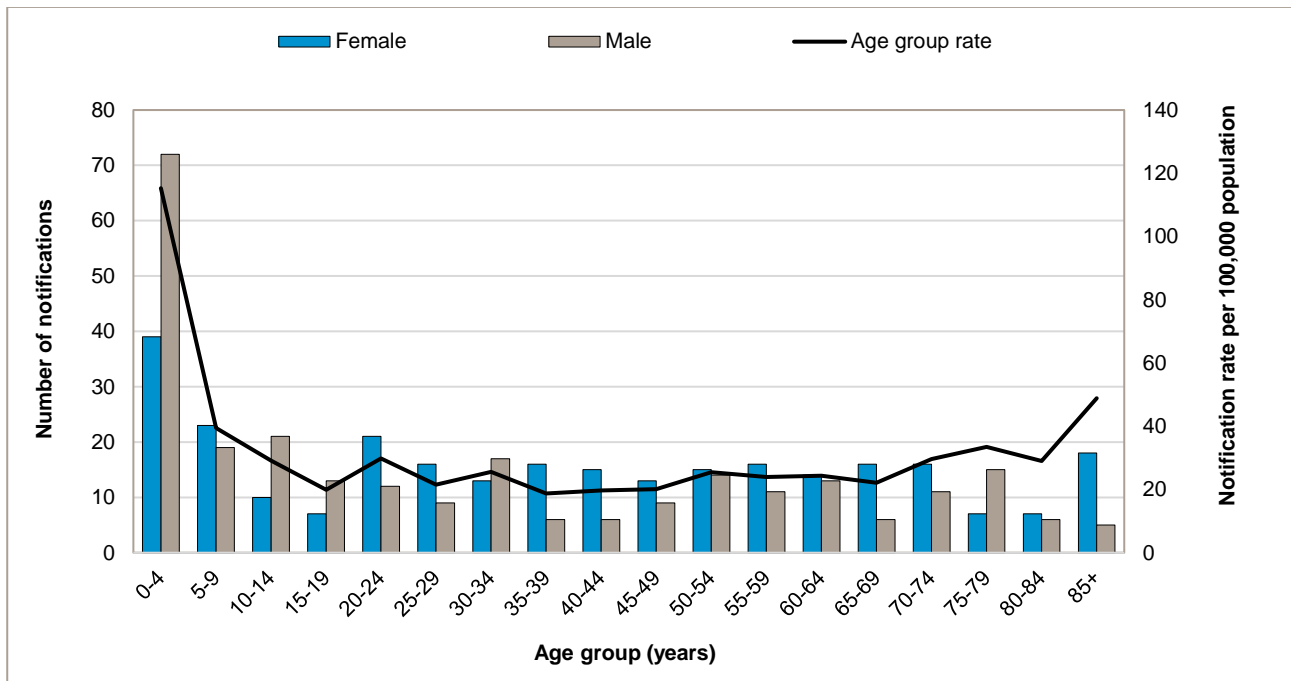
There were 547 notified cases of salmonellosis in 2021, less than the 673 cases notified in 2020 and below the historical five-year average of 1,210 notifications from 2016 to 2020 (Figure 6). There were 282 cases notified of salmonellosis in females and 265 notifications in males. The highest notification rate was in those aged 0-4 years, with a higher rate for males than females in that age group (145 and 83 per 100,000 population) (Figure 7). Overall higher notification rates were observed in females for all age groups except

individuals aged 0-4, 10-14, 15-19, 30-34, and 75-79 years. Salmonellosis accounted for 14% of all enteric infections notified in 2021.

**Figure 6 Notified cases of salmonellosis, by month and year of illness onset, South Australia, 2016-2021**



**Figure 7 Notified cases of salmonellosis, by age group and sex, and notification rate by age group, South Australia, 2021**



In 2021, 46% of all *Salmonella* notifications were *Salmonella* Typhimurium (Table 1). The most frequent non-Typhimurium *Salmonella* serovars were *Salmonella* not further typed (no serotype) (10%), *S. Saintpaul* (8%) and *S. Infantis* (5%). The number of *Salmonella* not further typed reflects a change in diagnostic testing practices and PCR testing across laboratories in SA. Furthermore, routine phage typing for *Salmonella* ceased at the end of 2020 in SA.

Lower numbers of *Salmonella* serovars acquired from overseas travel were notified in 2021. In 2021, there were four notifications of *S. Enteritidis* in SA, compared with 13 notifications in 2020 and a historical five-year average of 53 notifications from 2016 to 2020. All four cases acquired their infection in Australia with one case reporting interstate travel to multiple jurisdictions during their incubation

period. This contrasts to the five-year period 2016 to 2020 where 10% of SA cases acquired their infection in Australia and 90% were overseas acquired.

In 2021, six outbreaks of *Salmonella* infection were investigated compared with four outbreaks in 2020 and a historical five-year average of 11 outbreaks during the period 2016 to 2020 ([Appendix 3](#)). Five outbreaks were directly linked to eating at or takeaway from a bakery or restaurant and one was linked to primary production. Three *Salmonella* clusters were reported, and one multi-jurisdictional *Salmonella* Saintpaul outbreak led by New South Wales (NSW) was investigated.

**Table 1 Notified *Salmonella* serovars, by illness onset, South Australia, 2021 and historical five-year average 2016-2020**

Serovar	Number	%
S. Typhimurium	254	46%
S. Not further typed (no serotype)	53	10%
S. Saintpaul	42	8%
S. Infantis	28	5%
S. Virchow	24	4%
S. Hessarek	22	4%
S. Muenchen	9	2%
S. subsp 1 ser 4512:i:-	8	1%
S. Chester	8	1%
S. Bovismorbificans	6	1%
S. subsp 1 ser 4 12:i:-	6	1%
S. Reading	6	1%
Other	81	15%
<b>Total</b>	<b>547</b>	<b>100%</b>

### Shiga toxin-producing *Escherichia coli* (STEC)

There were 231 notifications of STEC infection in 2021, compared to 218 cases in 2020 and lower than the historical five-year average of 264 notifications from 2016 to 2020 (Figure 8). In 2021, there were 119 females and 76 males with a median age of 42 years (range 5 months–93 years) (Figure 9). The highest notification rates were in children aged 0-4 years (36 per 100,000 population). Overall rates were higher in females compared with males except in individuals aged 5-9 year and 60-64 years.



Figure 8 Notified cases of Shiga toxin-producing *E. coli* infection, by month and year of illness onset, and serogroup, South Australia, 2016-2021

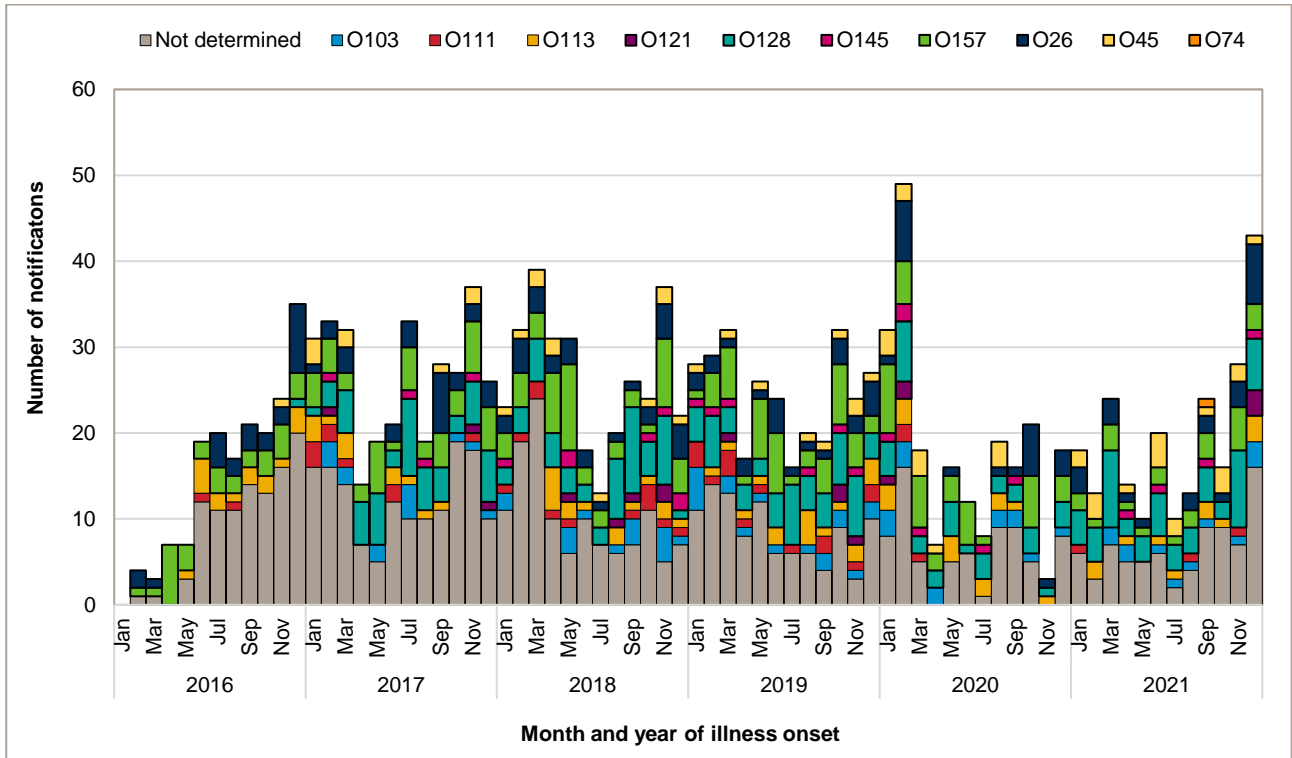
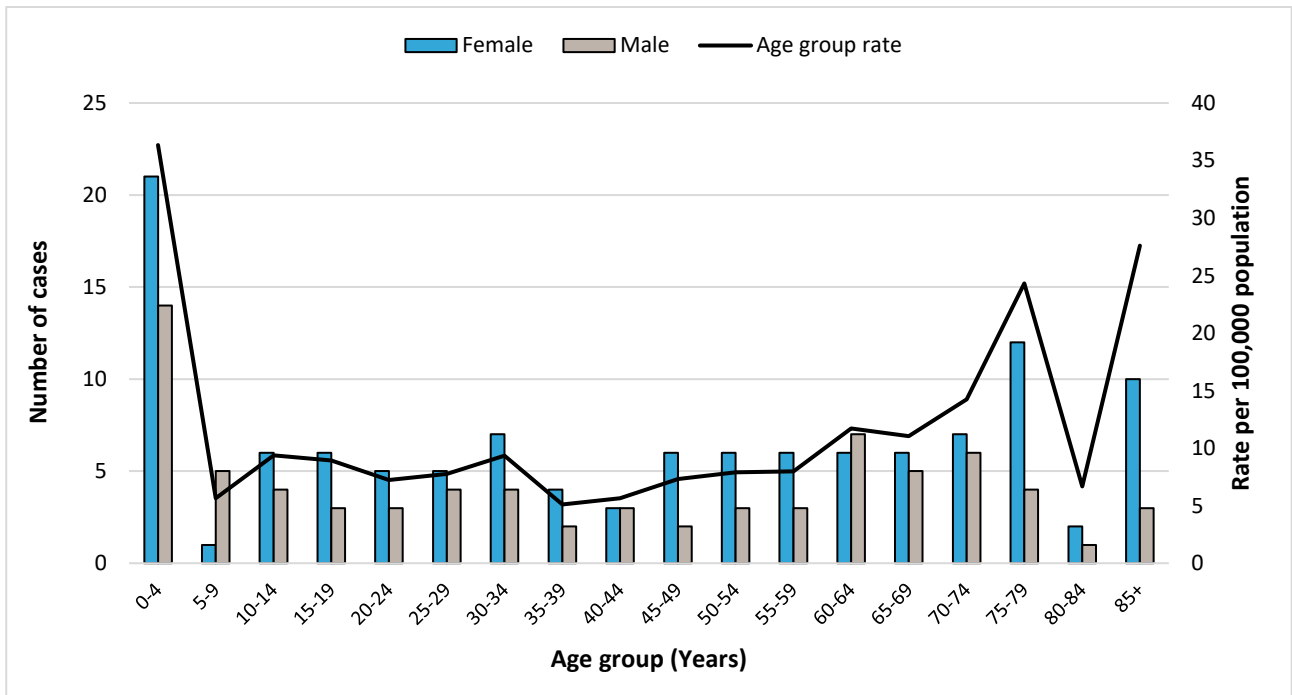


Figure 9 Notified cases of Shiga toxin-producing *E. coli* infection, by age group and sex, and notification rate by age group, South Australia, 2021



STEC testing is performed by only one laboratory in SA. In June 2016, testing practices changed to test all faeces samples for STEC as a component of a CR bacterial pathogen panel, where previously STEC testing was conducted only if requested or if blood was present in the sample. This change has contributed to a large increase in the number of STEC cases notified to CDCB since June 2016. Serogroups included on the PCR multiplex panel have varied over time. From 2016 to 31 January 2017, O26, O111, O113 and O157 were included. From 1 February 2017 to 31 December 2021, additional serogroups were added including O45, O103, O121, O128 and O145.

Of the 231 notifications, the three most common serogroups notified were O128 (23%), O157 (10%) and O26 (10%) (Figure 8). Thirty-three per cent of cases had a serogroup undetermined, either because the serogroup of the infection was not included on the multiplex PCR panel (25%) or because the amount of DNA in the specimen was below the limit of detection (8%). There were 22 (11%) individuals who were co-infected with two or more different serogroups of STEC.

### Shigellosis

Enteric PCR panel testing includes the detection of *Shigella* and shares the same target genes with non-notifiable enteroinvasive *Escherichia coli*; thus, differentiating between the two organisms is difficult. In SA, a probable case definition has been used for cases reported since 2014 to differentiate between confirmed *Shigella* culture notifications from probable *Shigella*/enteroinvasive *E. coli*.

In 2021, 73 cases of shigellosis were notified (11 confirmed and 62 probable), lower than in 2020 when 122 cases of shigellosis were notified (80 confirmed and 42 probable cases) and historical five-year average of 264 cases from 2016 to 2020 (62 confirmed and 202 probable cases) (Figure 10). Notifications of shigellosis were in 32 females and 41 males with a median age of seven years (range 5 months-58 years). The highest notification rate was in those aged 0-4 years, with a higher rate of notifications among males in this age group than females (28 compared to 19 per 100,000 population) (Figure 11).

**Figure 10 Notified cases of shigellosis, by confirmation status, and month and year of illness onset, South Australia, 2016-2021**

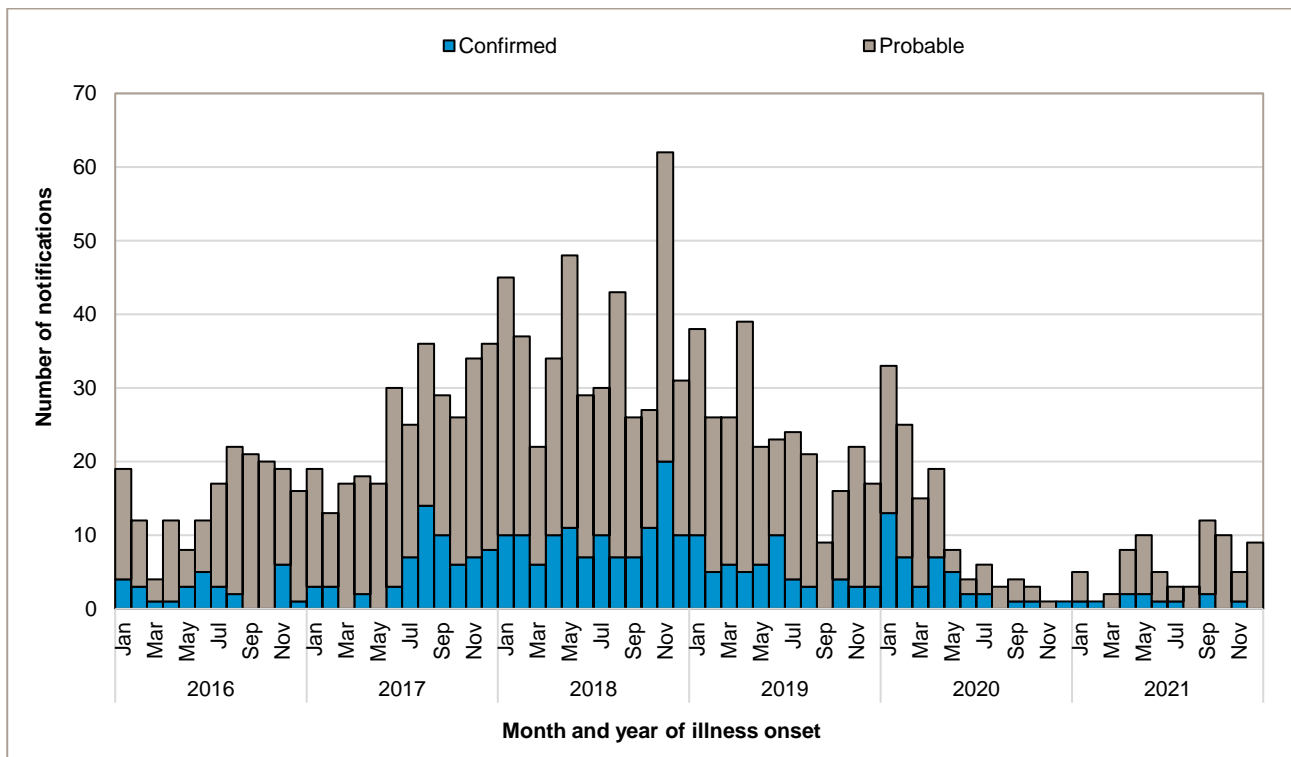
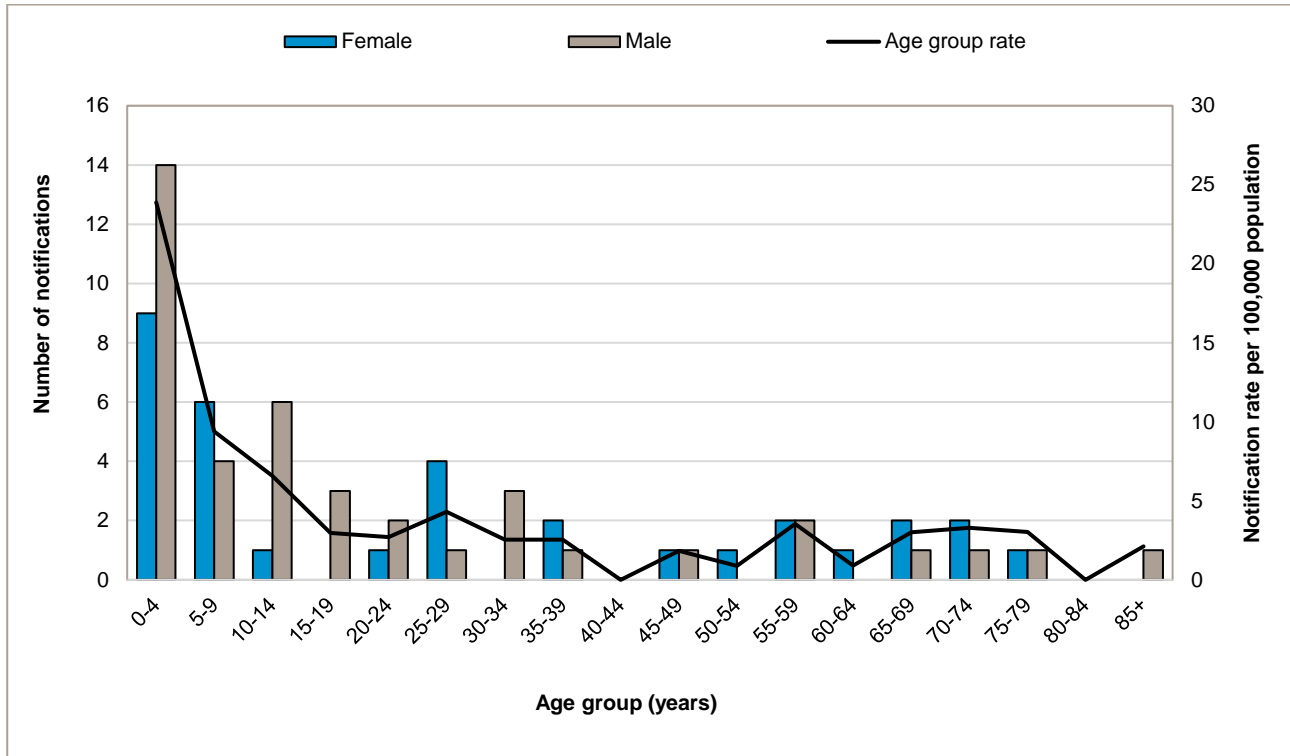


Figure 11 Notified cases of shigellosis, by age group and sex, and notification rate by age group, South Australia, 2021



Of the confirmed cases of shigellosis, there were six males and five females with a median age of seven years (range 1-58 years) (Figure 11). Eight (73%) confirmed cases of shigellosis were notified in people who identified as Aboriginal and Torres Strait Islander, compared with 22 confirmed cases (48%) in 2020. Of the eight cases who identified as Aboriginal and Torres Strait Islander, seven (88%) were residents of rural and remote areas. From 2017 through to mid-2020, a prolonged increase in shigellosis cases in the far north and far west of SA was reported. Overseas travel was reported by 18 (25%) cases of shigellosis in 2021 (one confirmed and 17 probable cases), compared with 21 (17%) cases (three confirmed and 18 probable) in 2020.

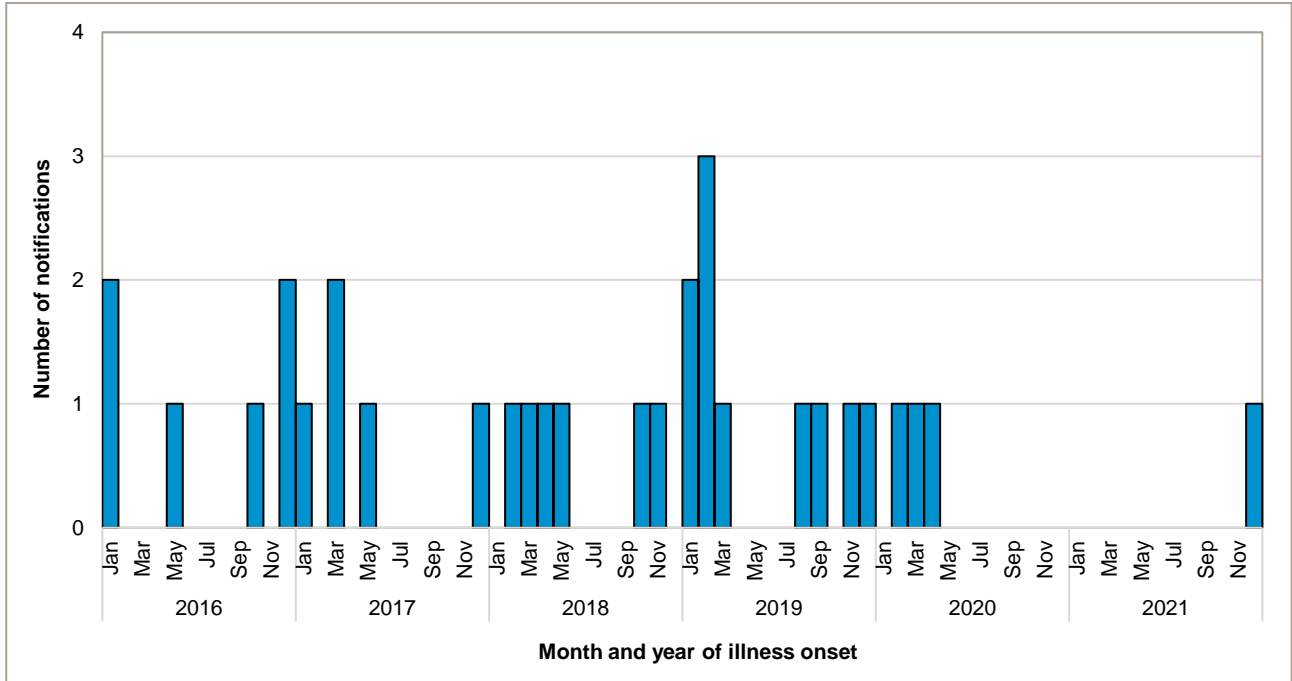
In 2021, of the 11 cases of shigellosis typed, *Shigella flexneri 2a* was the most common species and subtype reported (45%), while in 2020 the most common species and subtype reported was *Shigella sonnei* biotype g (45%). No cases of *Shigella sonnei* biotype g were reported in 2021. There were two multi-drug resistant (MDR) infections, of which one was subtyped as *Shigella flexneri 2a* and acquired in Pakistan. The other MDR infection was not further typed and a probable case (PCR only).

Since July 2014, CDCB has been receiving laboratory notifications for *Shigella* that are PCR positive. Different laboratories have introduced this test at different time points; specifically, one laboratory introduced PCR testing in July 2014, one in May 2015 and one in June 2016. Eighty-five per cent of the cases in 2021 were PCR positive only, 14% were PCR and culture positive and four per cent were culture positive only. This reflected an increase in PCR positive results only from 2020 when 60% were PCR positive only, 30% were PCR and culture positive, and 3% culture positive only.

**Typhoid**

There was one notification of *Salmonella* Typhi in 2021 compared to three in 2020 and a historical five-year average of six cases from 2016 to 2020 (Figure 12). In 2021, the case was in a female aged 60-69 years and her infection was acquired overseas (country undetermined).

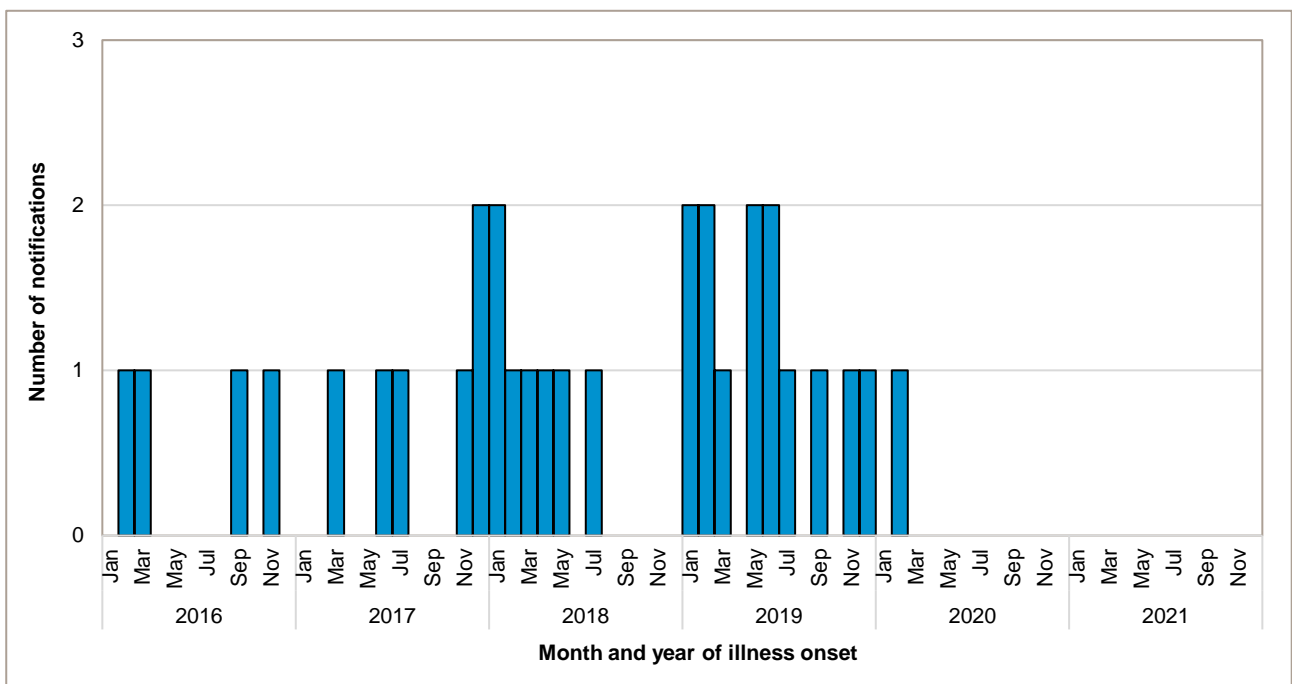
**Figure 12 Notified cases of *Salmonella* Typhi infection, by month and year of illness onset, South Australia, 2016-2021**



**Paratyphoid**

There were no notifications of *Salmonella* Paratyphi infection in 2021 compared with one case in 2021 and a historical five-year average of six cases from 2016 to 2020 (Figure 13).

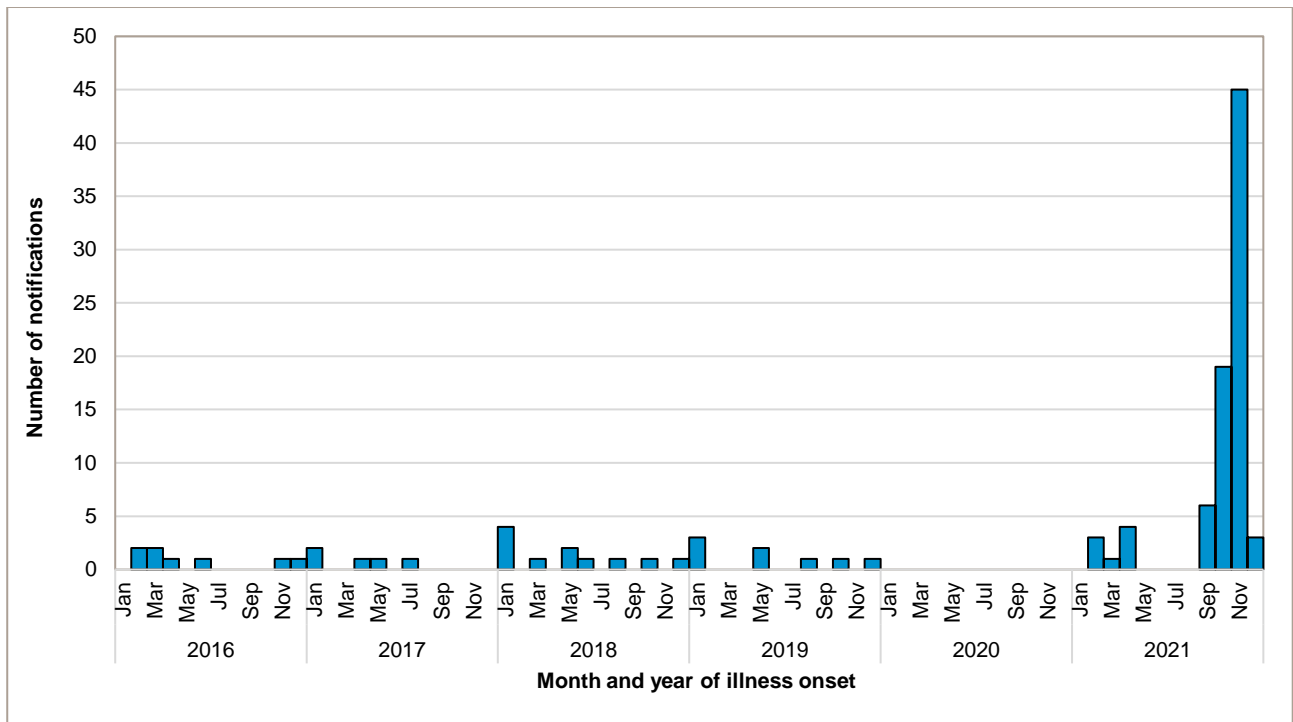
**Figure 13 Notified cases of *Salmonella* Paratyphi infection, by month and year of illness onset, South Australia, 2016-2021**



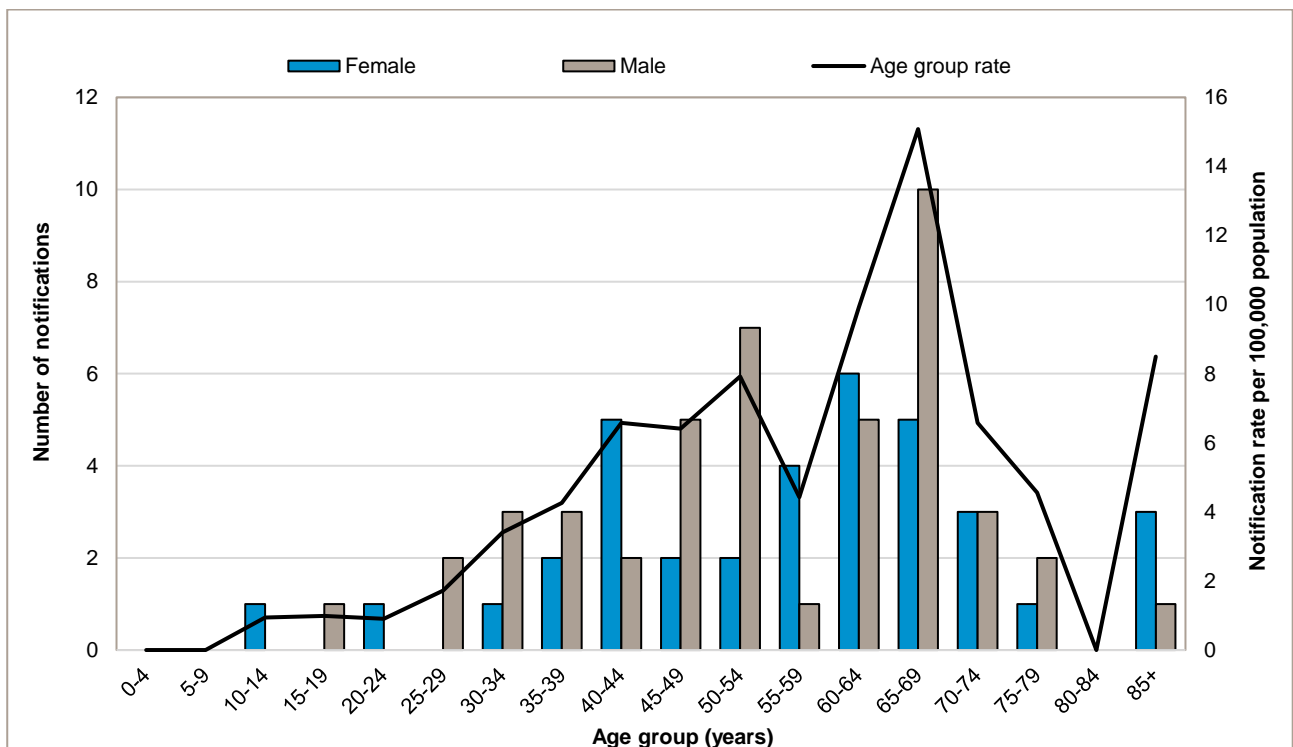
**Vibrio parahaemolyticus**

*Vibrio parahaemolyticus* infection became notifiable in SA on 18 February 2016. There were 81 notifications of *V. parahaemolyticus* in SA in 2021, compared to no notified cases in 2020 and a historical five-year average of six cases from 2016 to 2020 (Figure 14). *V. parahaemolyticus* infections were notified in 36 females and 44 males with a median age of 58 years (range 12-82 years). The highest notification rate was in adults aged 65-69 years (15 per 100,000 population). All notifications were locally acquired and linked to one of two outbreaks associated with the consumption of South Australian grown oysters (Figure 15).

**Figure 14 Notified cases of *Vibrio parahaemolyticus* infection, by month and year of illness onset, South Australia, 2016-2021**



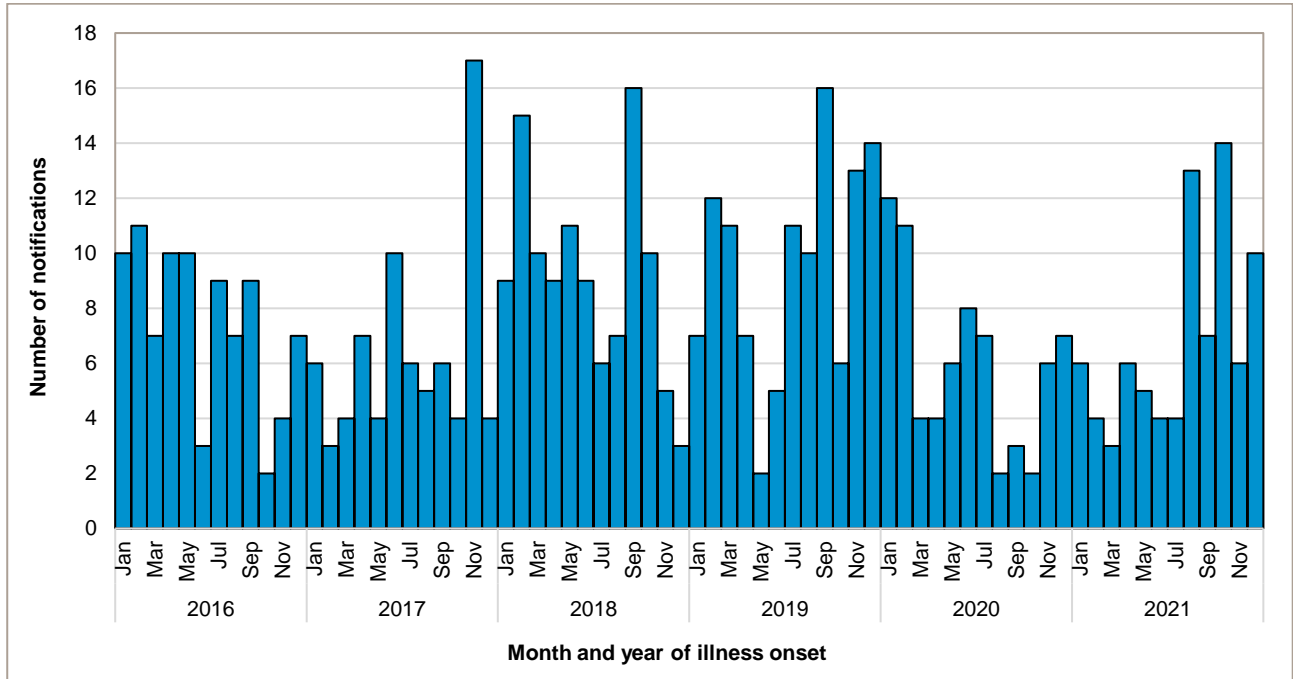
**Figure 15 Notified cases of *Vibrio parahaemolyticus* infection, by age group and sex, and notification rate by age group, South Australia, 2021**



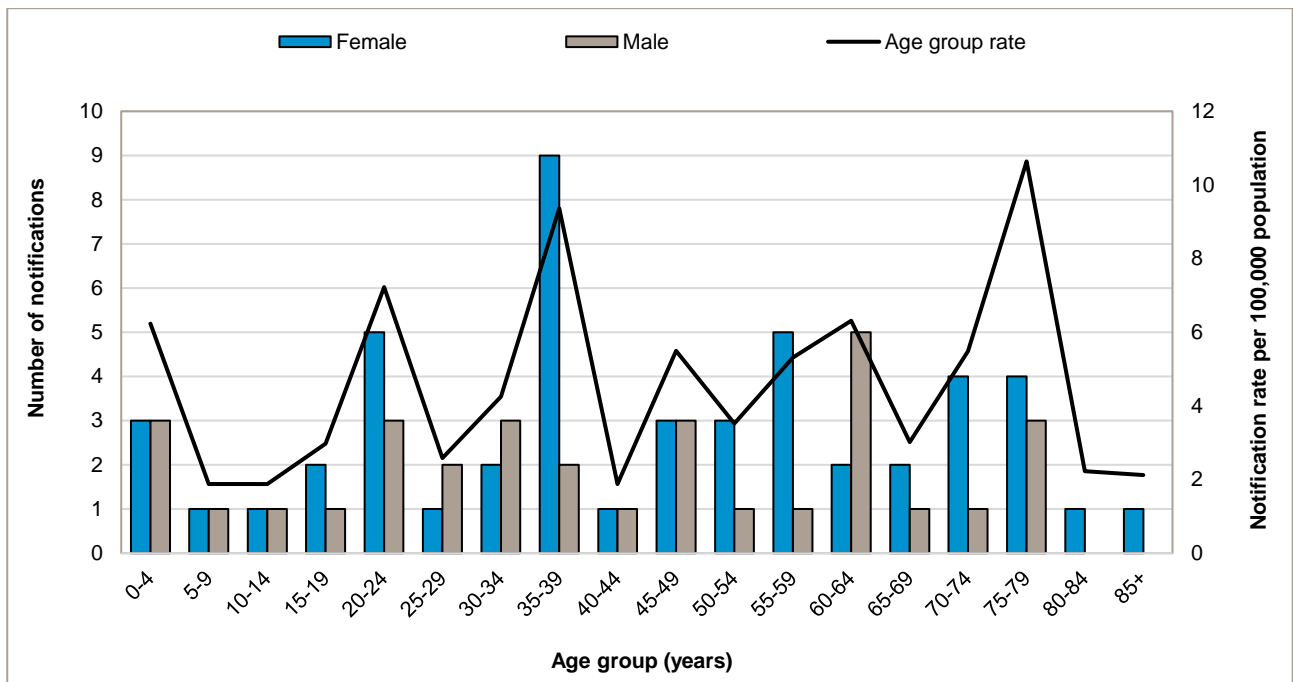
**Yersiniosis**

There were 82 cases of yersiniosis notified in 2021, compared to 72 in 2020 and a historical five-year average of 92 notifications from 2016 to 2020 (Figure 16). Notifications of yersiniosis were in 50 females and 32 males with a median age of 42 years (range 6 months-85 years) (Figure 17). All 82 cases were characterised as *Yersinia enterocolitica*.

**Figure 16 Notified cases of yersiniosis, by month and year of illness onset, South Australia, 2016-2021**



**Figure 17 Notified cases of yersiniosis by age group and sex, and notification rate by age group, South Australia, 2021**



## Quarantinable diseases

There were no cases of avian influenza in humans, Middle East respiratory syndrome (MERS), plague, severe acute respiratory syndrome (SARS), smallpox, viral haemorrhagic fever including Ebola virus infection, or yellow fever reported in 2021, or in the five-year period 2016 to 2020.

### Coronavirus disease 2019 (COVID-19)

The World Health Organization declared COVID-19 a pandemic on 11 March 2020 with the first case in SA notified on 30 March 2020. In 2021, 12,666 cases of COVID-19 were notified, compared with 579 in 2020 (Figure 18). On 23 November 2021, SA opened its borders to travellers in Australia. Following the border re-opening, case numbers increased steeply with 12,321 cases notified from 23 November to 31 December 2021, comprising 97% of the cases of COVID-19 notified in 2021.

In 2021, cases were notified in 6,384 females and 6,276 males (sex was unknown for six cases) with a median age of 29 years (range <1 month-105 years) (Figure 19). The highest notification rates were in adults aged 20-24 years (1,978 per 100,000 population). Older adults aged 70 years and over reported lower notification rates than other age groups (179 per 100,000 population). One hundred and fifty-nine (1%) cases identified as Aboriginal and/or Torres Strait Islander. There were four deaths attributed to COVID-19.

**Figure 18 Notified cases of COVID-19 by week and year of notification, South Australia, 2020-2021**

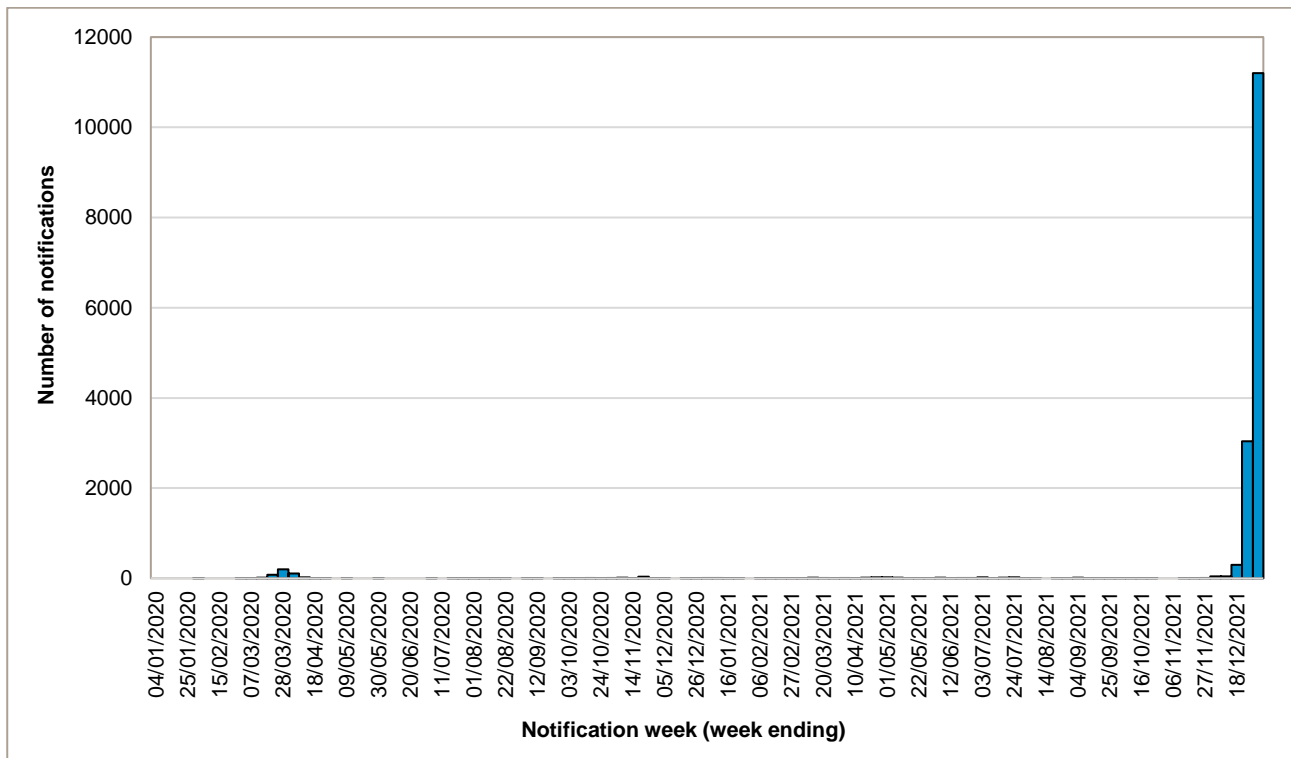
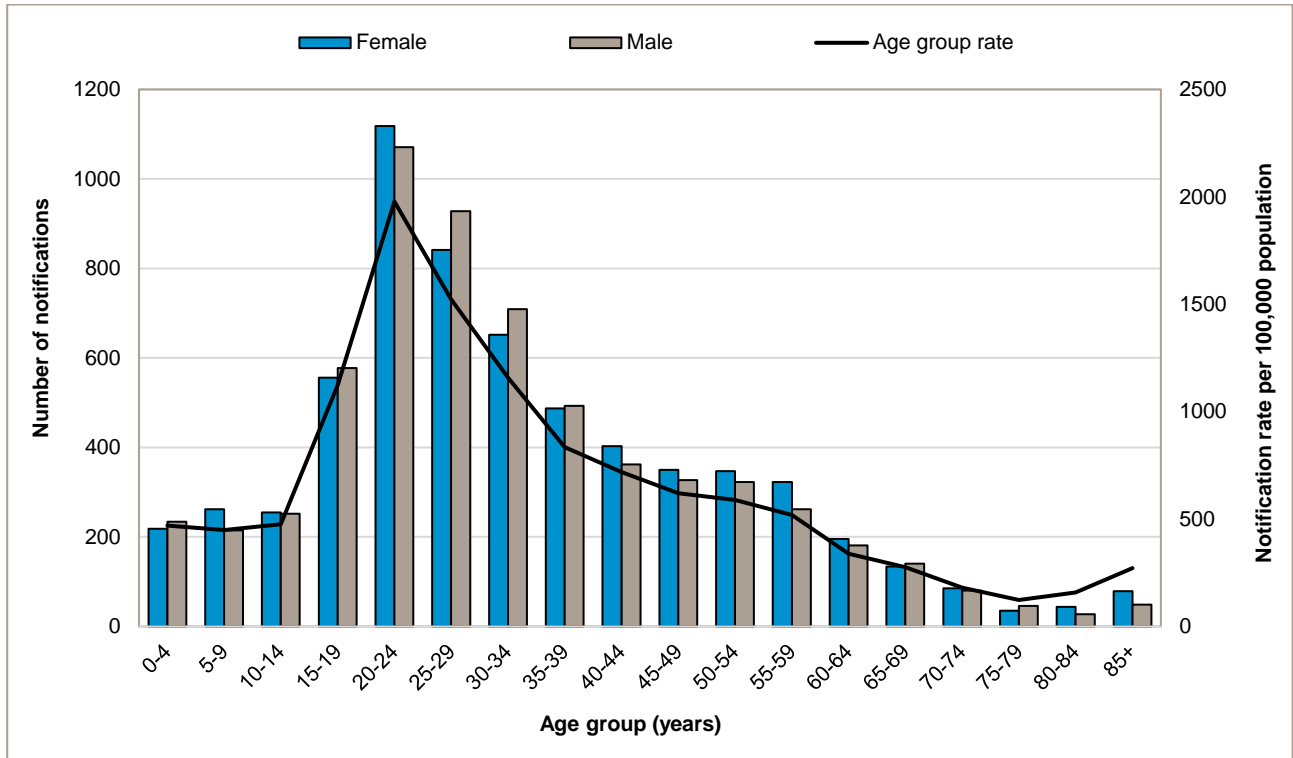


Figure 19 Notified cases of COVID-19 by age group and sex, and notification rate per age group, South Australia, 2021



Of the 12,666 cases notified, 6,248 (49%) were considered to be locally acquired (contact not identified), 5,405 (43%) were considered locally acquired contacts of a confirmed case or in a known cluster, 557 (4%) were acquired interstate, 344 (3%) were acquired overseas and 112 (1%) were missing a source of acquisition. On 21 February 2021, the first COVID-19 vaccination was administered in SA. In 2021 among COVID-19 cases notified aged 18 years and over, 596 people (6%) had received at least one COVID-19 vaccination, 7,617 (71%) had received two vaccinations, and 1,020 (9%) people had received three or more vaccinations. There were 1,531 (14%) individuals aged 18 years and over with no vaccine reported or where their vaccination status was unknown.



## Vaccine preventable diseases

### Diphtheria

There were two notifications of diphtheria in 2021. Diphtheria is a rare disease and from 2016 to 2020, two sporadic cases of cutaneous diphtheria were reported: one case in 2018, and one case in 2020; both cases were acquired overseas in Papua New Guinea.

Of the cases reported in 2021, one case was a female aged 20–29 years who acquired their infection locally and was classified as respiratory diphtheria. The second case was a male aged 30–39 years who acquired their infection in Kiribati and was classified as cutaneous diphtheria. Both cases were hospitalised.

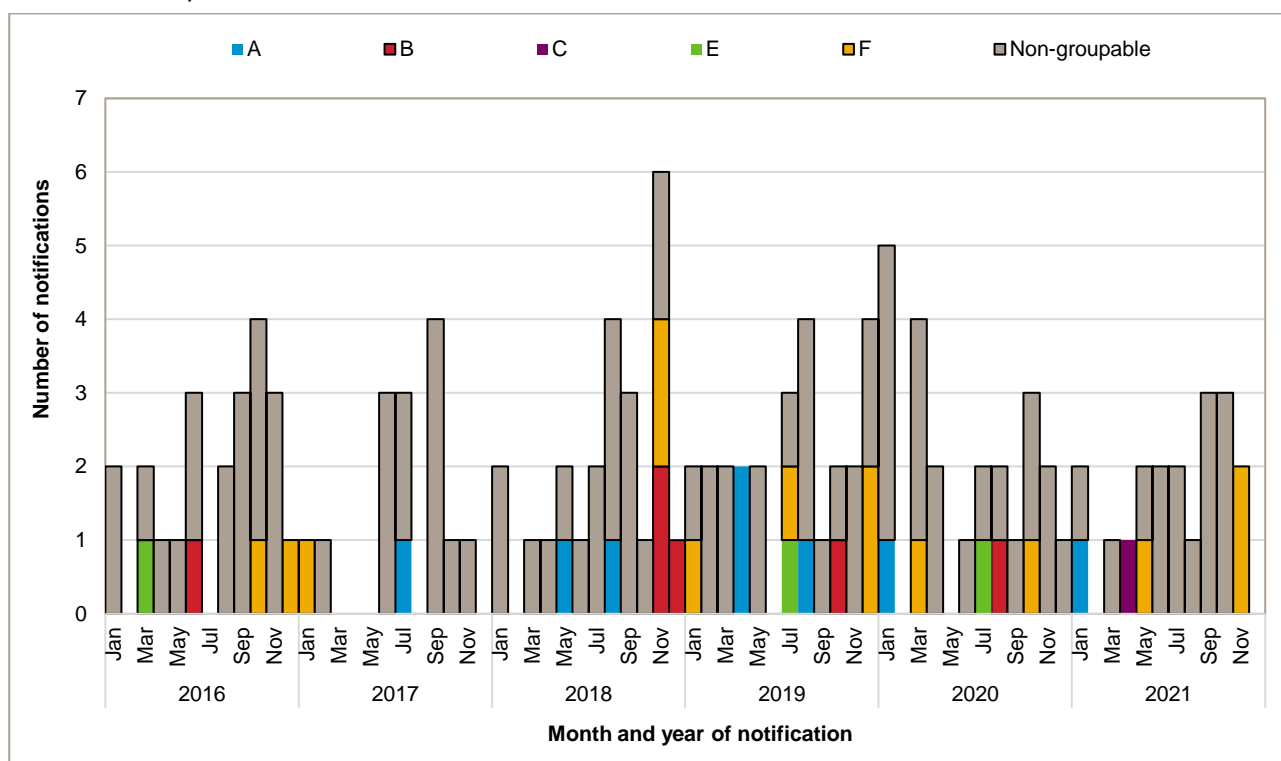
### Haemophilus influenzae (invasive)

In 2021, there were 19 notifications of invasive *H. influenzae* infection, less than the 23 notifications reported in 2020 and less than the historical five-year average of 21 notifications from 2016 to 2020 (Figure 20).

*H. influenzae* infection notifications comprised 10 females and nine males with a median age of 36 years (range less than one month-91 years). There was one reported death due to *H. influenzae* infection. Indigenous status was reported for all notified invasive *H. influenzae* cases in 2021. Three cases identified as Aboriginal and/or Torres Strait Islander in 2021, equal to the three cases in 2020.

Further laboratory tests attributed the cases to the following serogroups: one case to type A, one case to type C, three cases to type F and the remainder were non-groupable. No cases of type B (Hib) were reported in 2021, compared with one case reported in 2020 and a historical five-year average of two cases from 2016 to 2020. In 1993, Hib vaccination during infancy was introduced to the National Immunisation Program (NIP).

**Figure 20 Notified cases of invasive *Haemophilus influenzae* infection, by type, month and year of notification, South Australia, 2016-2021**



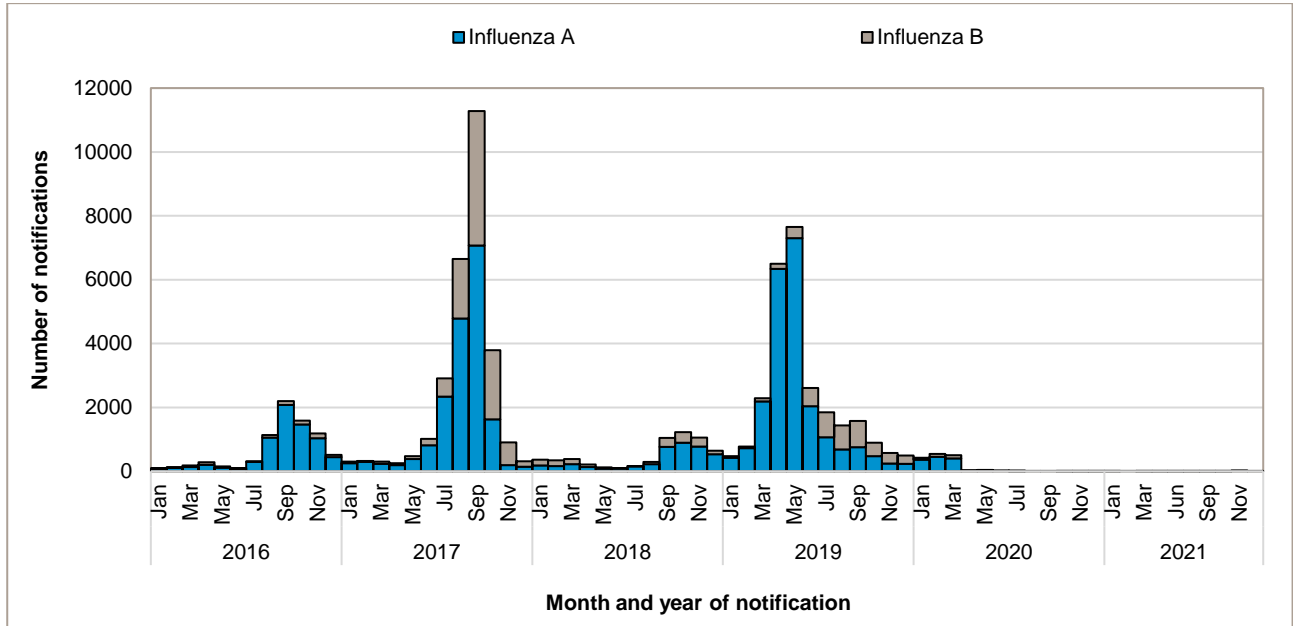
### Influenza

There were 40 notifications of laboratory-confirmed influenza in 2021, lower than 1,583 notifications in 2020 and a substantial decrease from the historical five-year average of 14,190 notifications from 2016 to 2020 (Figure 21).

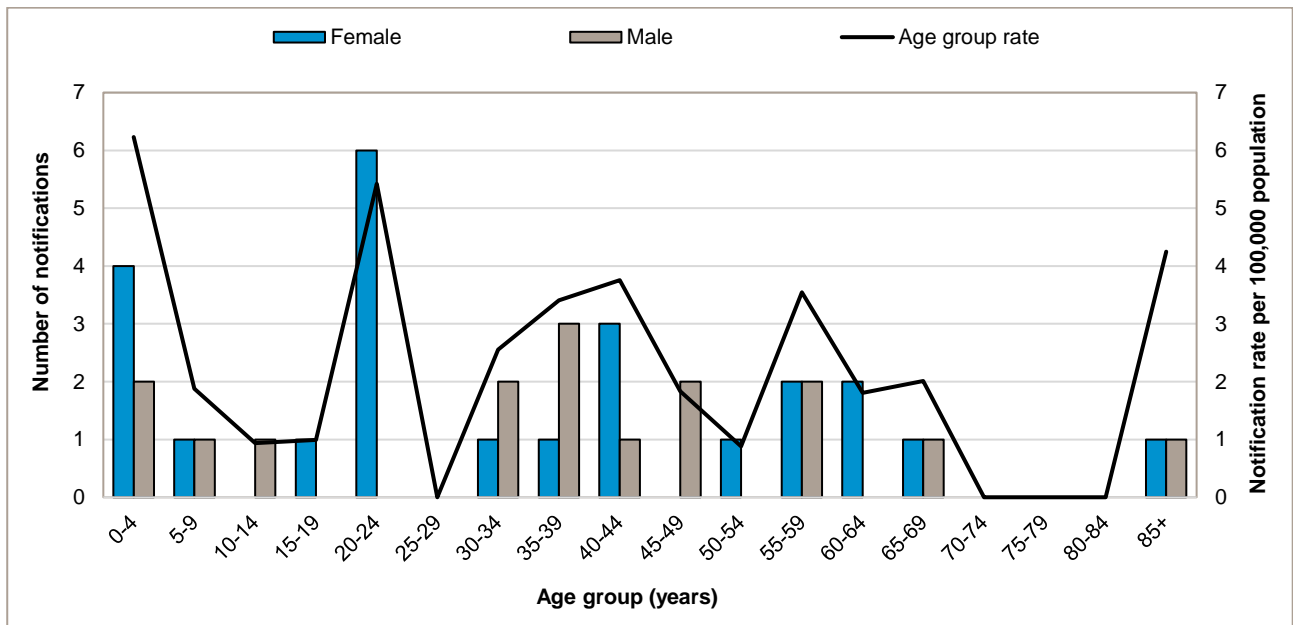
In 2021, influenza notifications were received from 24 females and 16 males, with a median age of 37 years (range two months-92 years). One case identified as Aboriginal; however, the completeness of Indigenous status (58%) was lower in 2021 than from 2016 to 2020 (range 72-87%). In 2021, there were no deaths reported due to influenza virus infection, compared to three deaths in 2020. In 2021, 62% were typed as influenza virus A and 38% typed as influenza virus B, compared to 79% influenza virus A and 21% influenza virus B in 2020.

No outbreaks of influenza were reported in 2021, compared to one outbreak in 2020. Influenza outbreaks in 2021 were lower than the historical five-year average of 49 influenza outbreaks from 2016 to 2020 ([Appendix 3](#)).

**Figure 21 Notified cases of influenza virus by type, month and year of notification, South Australia, 2016-2021**



**Figure 22 Notified cases of influenza virus by age group and sex, and notification rate per age group, South Australia, 2021**



**Meningococcal disease (invasive)**

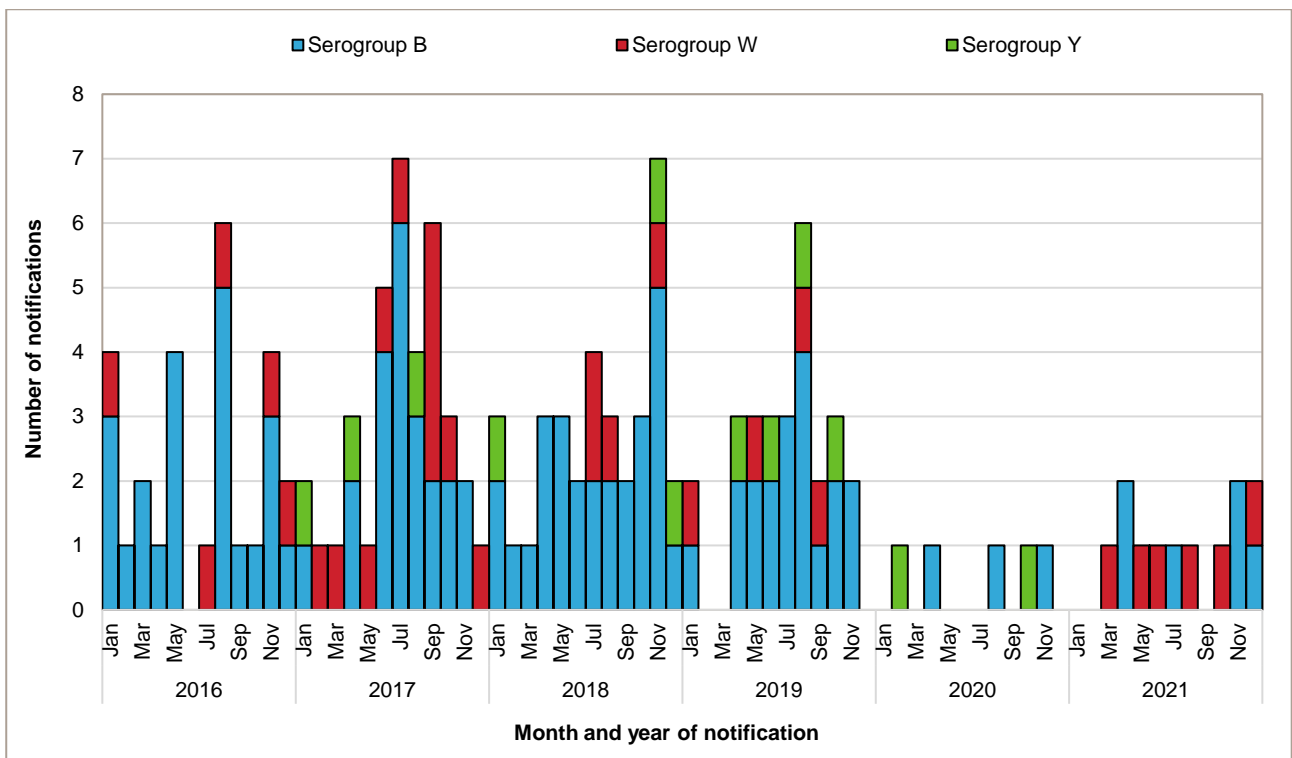
In 2021, there were 12 notified cases of invasive meningococcal disease (IMD), higher than the five cases notified in 2020 and lower than the historical five-year average of 26 cases notified from 2016 to 2020 (Figure 23).

IMD notifications were in five females and seven males with a median age of 21 years (range 4 months-80 years). Three cases occurred in children aged less than five years. Four cases identified as Aboriginal and/or Torres Strait Islander persons and resided in metropolitan Adelaide.

Of the 12 cases notified in 2021, six cases were caused by serogroup B and six cases by serogroup W. Three cases were reported as having died from IMD: one from infection with serogroup B and two from infection with serogroup W. Of the deaths, two were reported in adults aged 20-29 years and one in an adult 60-69 years of age.

All infants and children aged less than two years as well as adolescents aged 14 to 16 years in Australia are recommended and funded to receive meningococcal vaccines for serotypes A, C, W and Y. In South Australia, meningococcal B vaccine is also funded for infants, children and young adults in response to higher local rates and predominance of meningococcal B disease. None of the six cases caused by serogroup W had been vaccinated against that serogroup. Of the six cases caused by serogroup B, three had received at least one vaccination against that serogroup, while three cases had not received vaccination against serogroup B.

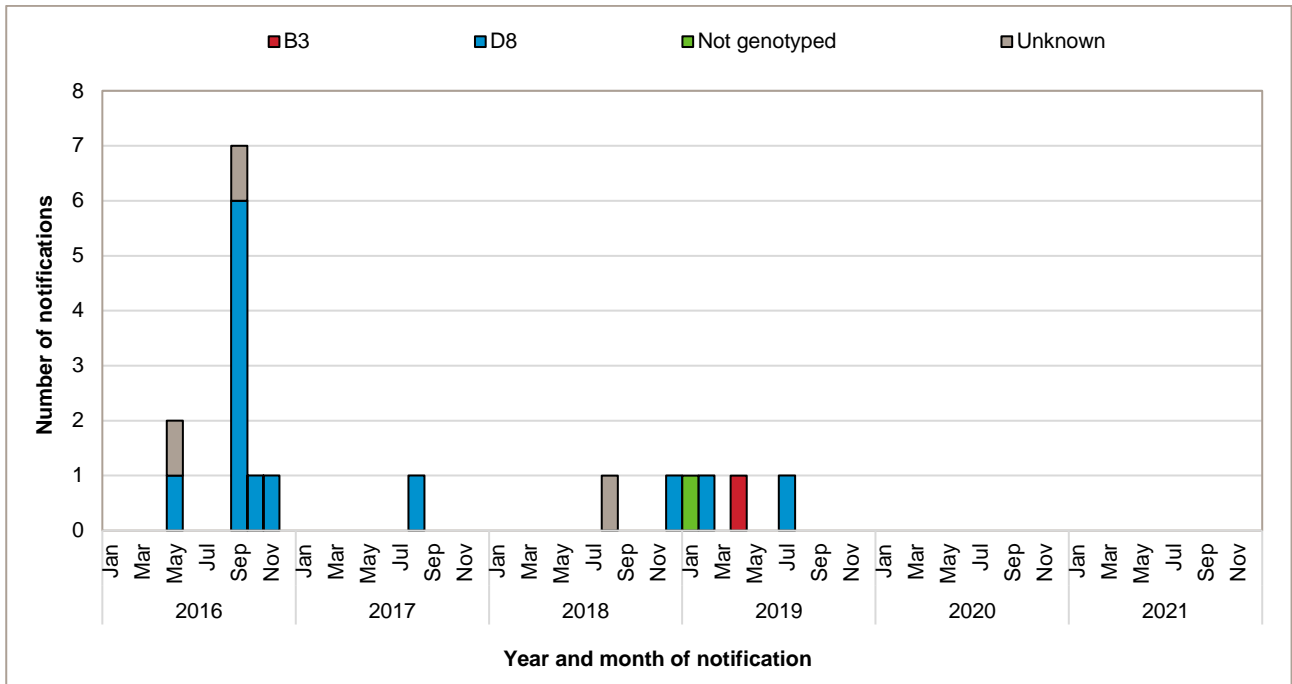
**Figure 23 Notified cases of invasive meningococcal disease by serotype, and month and year of notification, South Australia, 2016-2021**



**Measles**

There were no notified cases of measles in 2021, equal to no cases notified in 2020 and lower than the historical five-year average of four cases notified from 2016 to 2020 (Figure 24).

Figure 24 Notified cases of measles by genotype, month and year of notification, South Australia, 2016–2021



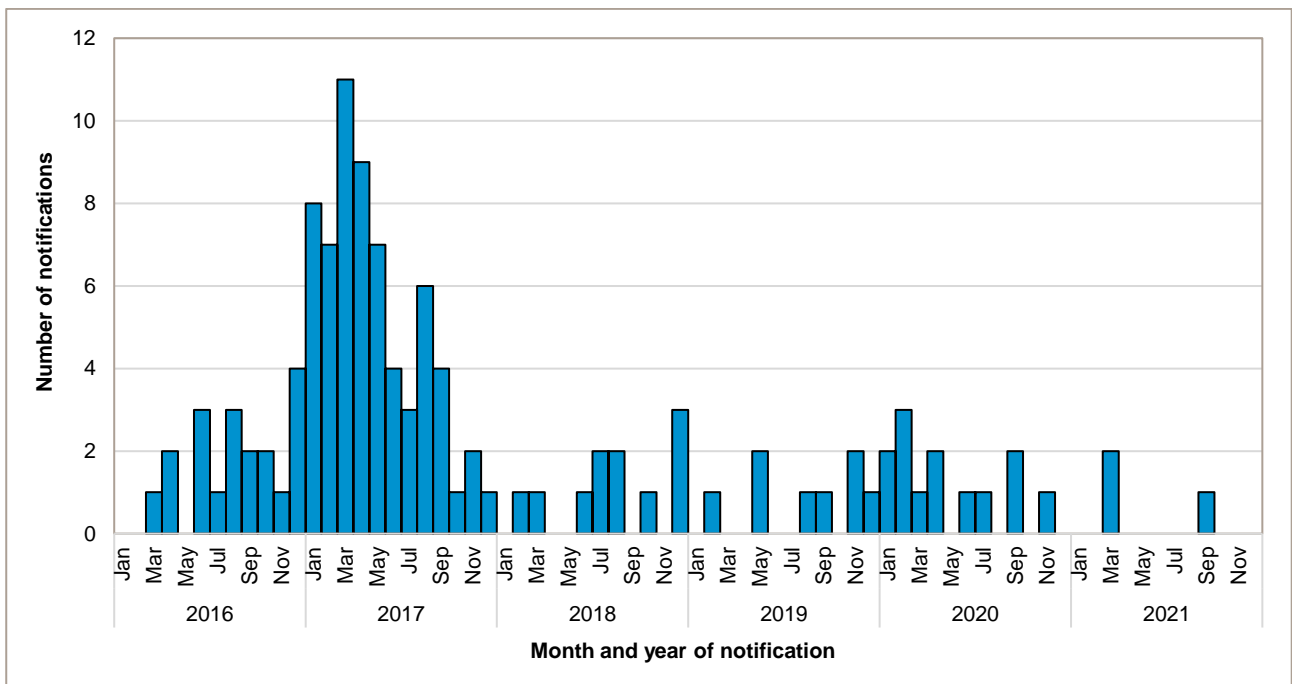
**Mumps**

Three cases of mumps were notified in 2021, lower than 13 cases reported in 2020 and lower than the historical five-year average of 23 cases notified from 2016 to 2020 (Figure 25). In 2017, an outbreak occurred in the Anangu Pitjantjatjara Yankunytjatjara (APY) Lands which largely accounted for the increase in cases seen in that year.

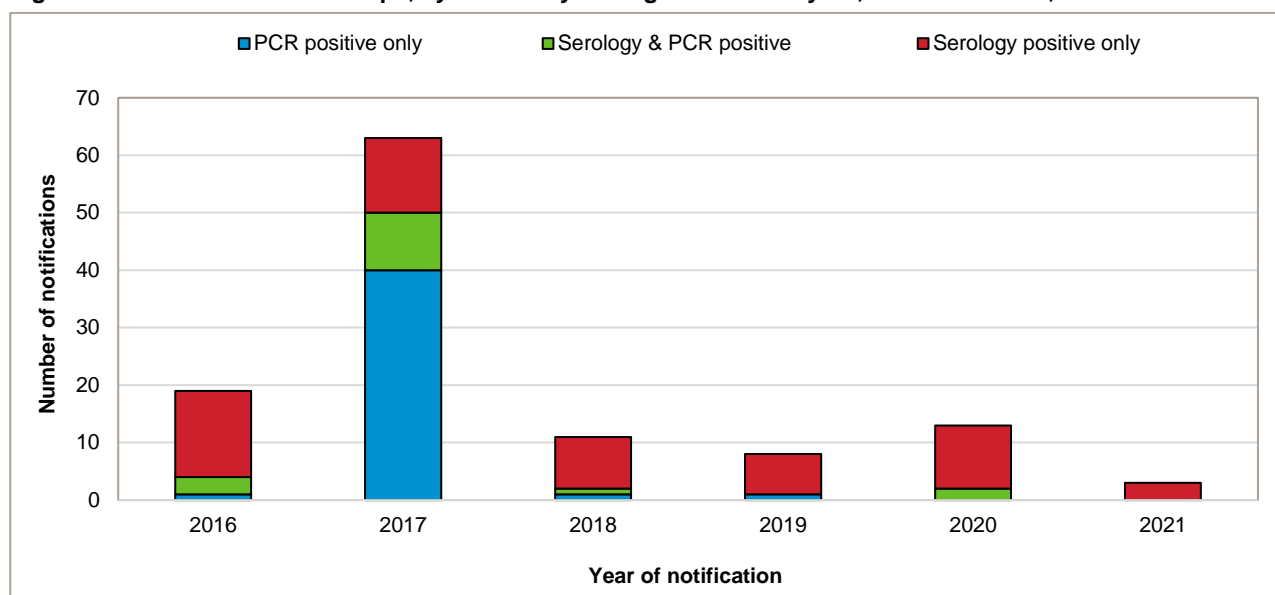
In 2021, mumps was notified in three females, including two adults aged 60-69 years and one aged 40-49 years. The three cases were reported as locally acquired. No cases had documented evidence of receiving a mumps containing vaccine.

In SA PCR testing to diagnose mumps was introduced in 2015. PCR testing increases the accuracy of diagnoses and is a less invasive test. In 2020 and 2021, no cases were diagnosed by PCR (Figure 26).

Figure 25 Notified cases of mumps by month and year of notification, South Australia, 2016-2021



**Figure 26 Notified cases of mumps, by laboratory testing method and year, South Australia, 2016-2021**



### Pertussis

In 2021, 33 cases of pertussis (whooping cough) were notified, lower than the 290 cases reported in 2020 and considerably lower than the historical five-year average of 1,009 cases from 2016 to 2020 (Figure 27).

Cases comprised 16 females and 17 males with a median age of 57 years (range 11 months-87 years). A lower median age of 34 years was reported over the 2016 to 2020 period. The highest notification rates were seen in adults aged 75-79 years (6 per 100,000 population) and children aged 0-4 years (5 per 100,000 population) (

Figure 28).

Public health follow-up of pertussis is prioritised for children aged under two years of age. Infants, particularly those aged less than 3 months of age, are at highest risk of severe disease and death from pertussis. Commonwealth reporting and vaccination information is collected for children aged under ten years of age. Of the five children aged less than ten years, four had received the full scheduled course for their age and one was partially vaccinated. Between 2016 and 2021, changes to funded immunisation programs included the re-introduction of the 18-month booster dose in 2016 and introduction of pertussis vaccination for pregnant women in 2018. These changes have likely contributed to a significant reduction in pertussis notifications, including among infants who are too young to be vaccinated, with a further decrease in notifications since the beginning of the COVID-19 pandemic.

**Figure 27 Notified cases of pertussis, by month and year of notification, South Australia, 2016-2021**

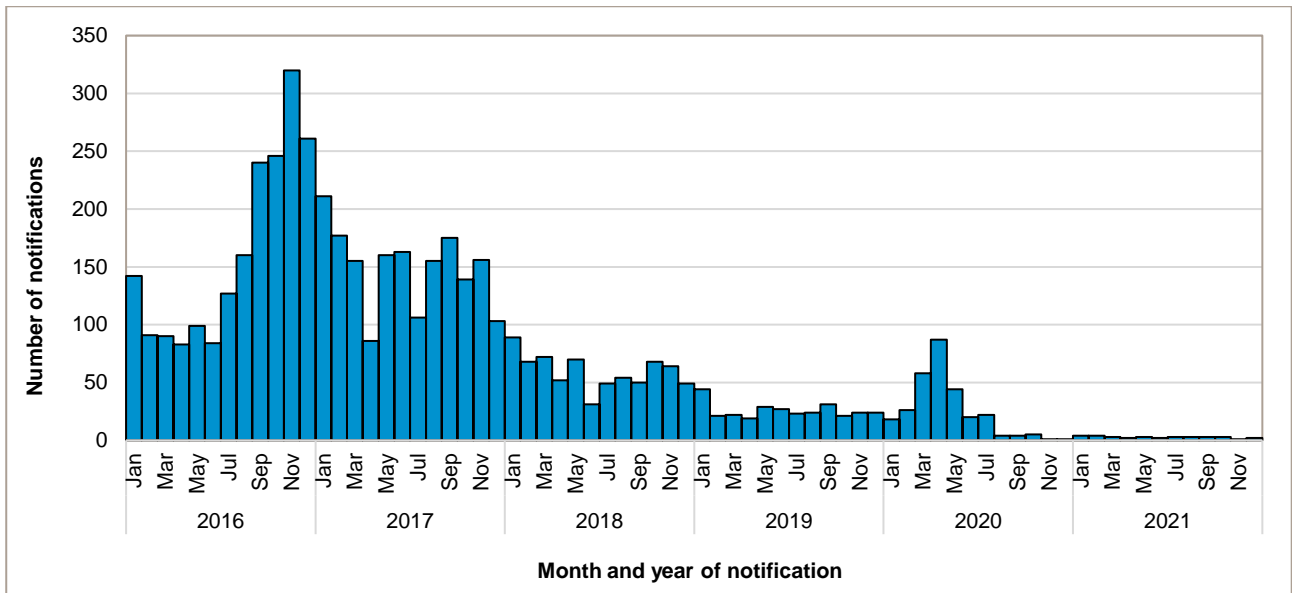
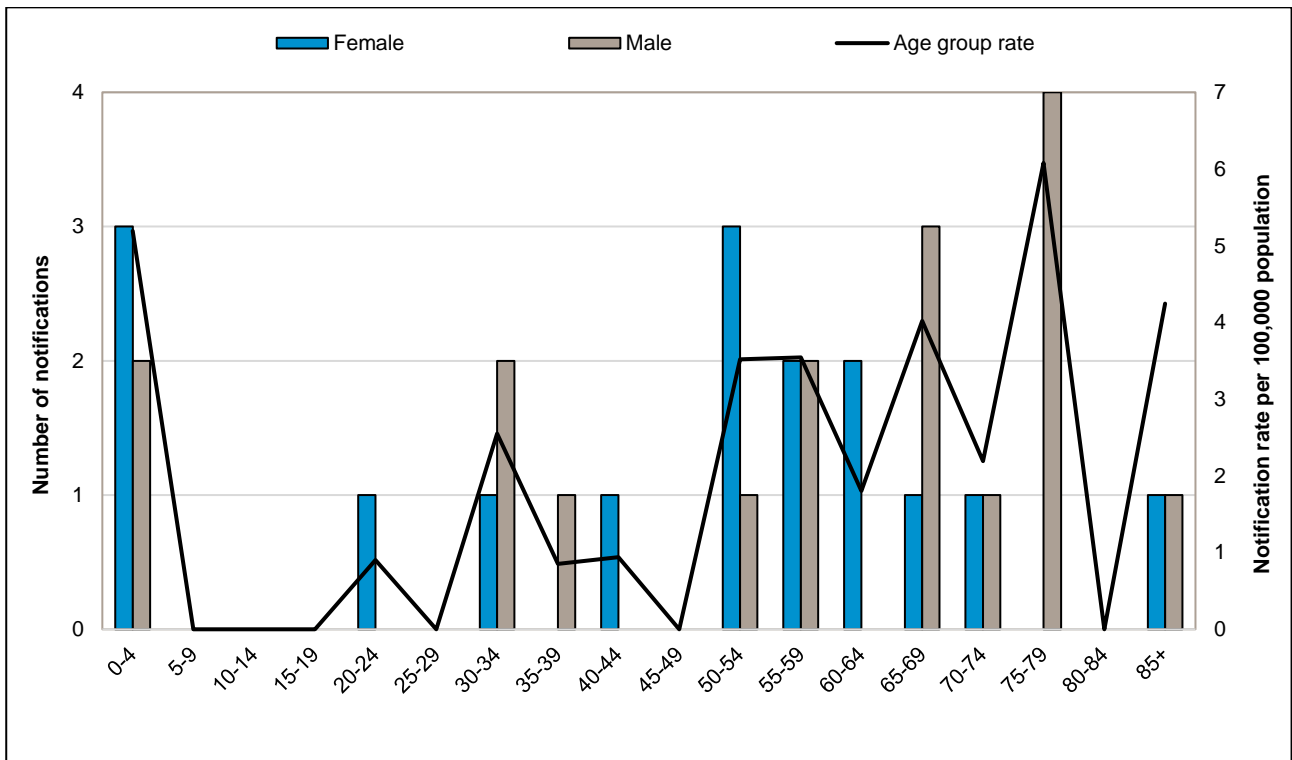


Figure 28 Notified cases of pertussis by age group and sex, and notification rate by age group, South Australia, 2021



**Pneumococcal disease (invasive)**

There were 158 notifications of invasive pneumococcal disease notified in 2021, higher than the 118 notifications in 2020, and almost equal to the historical five-year average of 159 notifications from 2016 to 2020 (

Figure 29).

Cases comprised 85 females and 73 males with a median age of 36 years (range <1 month–96 years). Notifications were highest in the 0-4 year age group (69 per 100,000 population) (Figure 30). Nineteen (12%) invasive pneumococcal disease notifications were reported in people who identified as Aboriginal and/or Torres Strait Islander and eight (5%) deaths reported.

**Figure 29 Notified cases of invasive pneumococcal disease by month and year, South Australia, 2016-2021**

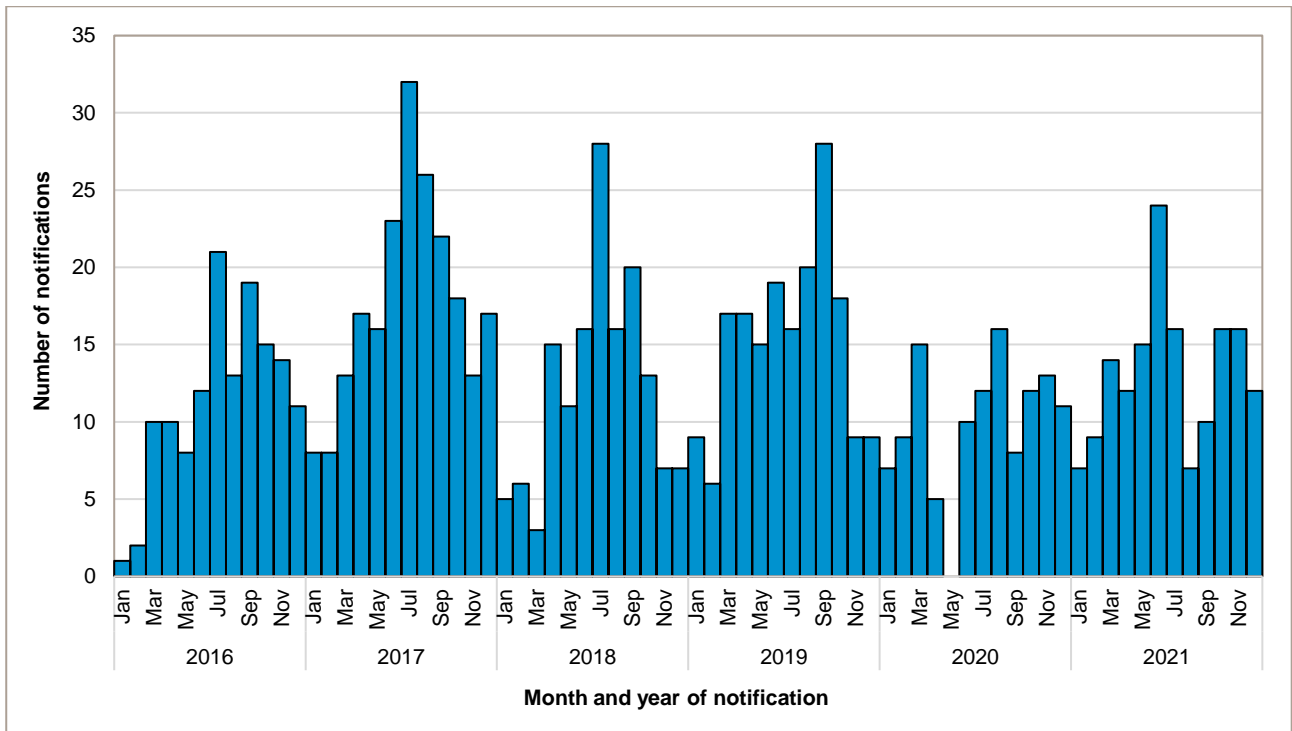
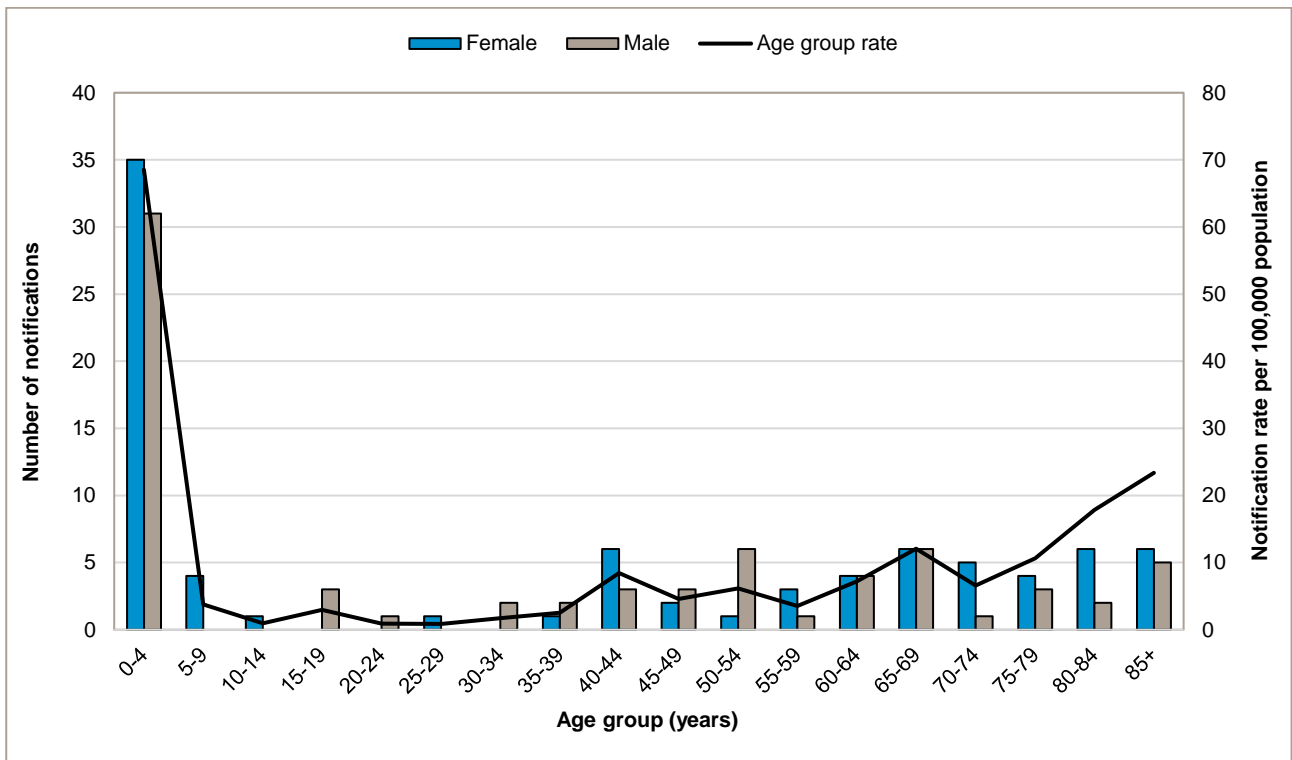


Figure 30 Notified cases of invasive pneumococcal disease by age group and sex, and notification rate by age group, South Australia, 2021



Further laboratory testing identified the pneumococcal serotype for 87 (55%) cases. Of the 71 cases not serotyped, 60 (85%) were diagnosed by PCR only, one (1%) was reported as non-typable, one (1%) not viable and seven (10%) were not referred for typing.

In 2021, serogroup 3 and 19F were the most frequently reported serotypes accounting for 12% of all notifications and 22% of isolates serotyped (Table 2). Both serogroups (3 and 19F) are included in the available 13-valent (13vPCV) and 23-valent (23vPPV) pneumococcal polysaccharide vaccines. Overall, 35% of cases were reported with serotypes included in the 23vPPV and 18% were those included in 13vPCV. This compared with 44% and 23% included in 23vPPV and 13vPCV in 2020.

Table 2 Most commonly identified serotypes of invasive pneumococcal disease, South Australia, 2021



Pneumococcal serotype	Number	%
Not serotyped	71	4
Serotype 3	10	6
Serotype 19F	9	6
Serotype 22F	8	5
Serotype 23B	6	4
Serotype 9N	6	4
Serotype 15A	5	3
Other serotypes	44	28
<b>Total</b>	<b>158</b>	<b>100%</b>

In 2021, of the 66 cases in children aged less than five years of age, 56 (85%) were reported as appropriately vaccinated for age, four (6%) partially vaccinated, three (5%) were too young and ineligible for vaccination and three (5%) unvaccinated.

Four cases were aged 50 years and over and identified as Aboriginal and/or Torres Strait Islander; all four cases had received at least one vaccine dose. Of the 32 non-Indigenous cases aged 70 years and over, 16 (50%) cases had received at least one vaccine dose against pneumococcal disease, 13 (41%) cases were not vaccinated against pneumococcal disease, and the vaccination status was unknown for three cases (9%). In 2021, 12 cases were recorded as vaccine failures as they tested positive for pneumococcal serotypes for which they were vaccinated in the previous five years. In 2020, five vaccine failures were reported.

Enhanced data for invasive pneumococcal disease notifications is collected and reported nationally elsewhere and informs vaccine development.

### Polio

There were no cases of polio reported in 2021 or in the five-year period from 2016 to 2020.

### Rotavirus

There were 495 cases of rotavirus infection notified in 2021, higher than the 363 notifications received in 2020 and lower than the historical five-year average of 691 notifications per year from 2016 to 2020 (

**Figure 31).** Notified cases of rotavirus comprised 246 females and 249 males with a median age of 2 years (range <1 month-93 years). The highest notification rate was in children aged 0-4 years (347 per 100,000 population) followed by children aged 5-9 years (33 per 100,000 population) (Figure 32).

In July 2018, the case definition for rotavirus changed to assist with differentiating cases of laboratory positive rotavirus that may be due to recent rotavirus vaccination (if the laboratory test cannot differentiate wild-type and vaccine derived rotavirus). If a case is less than eight months of age and had been vaccinated against rotavirus less than four weeks prior to being tested, the case is classified as probable. In 2021, 394 (80%) cases were confirmed and 101 (20%) classified as probable.

Figure 31 Notified cases of rotavirus infection, by confirmation status and month and year of notification, South Australia, 2016-2021

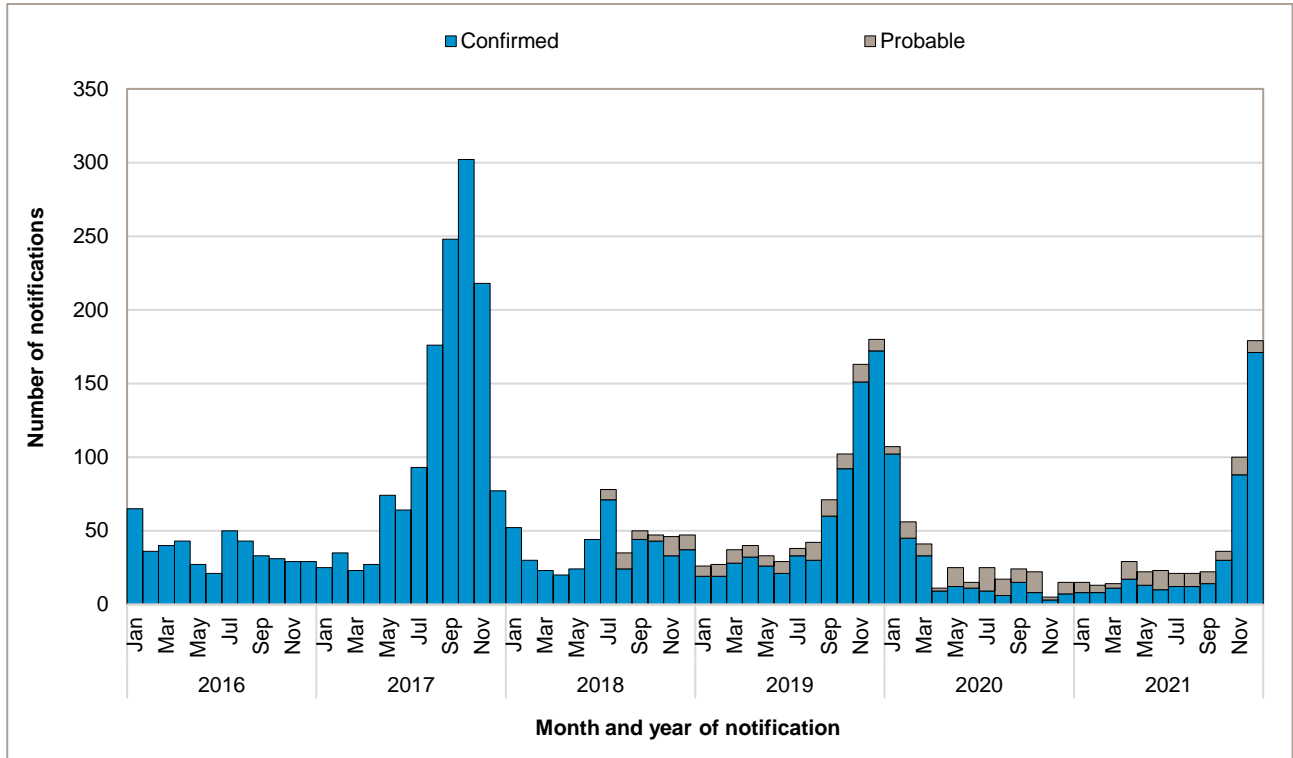
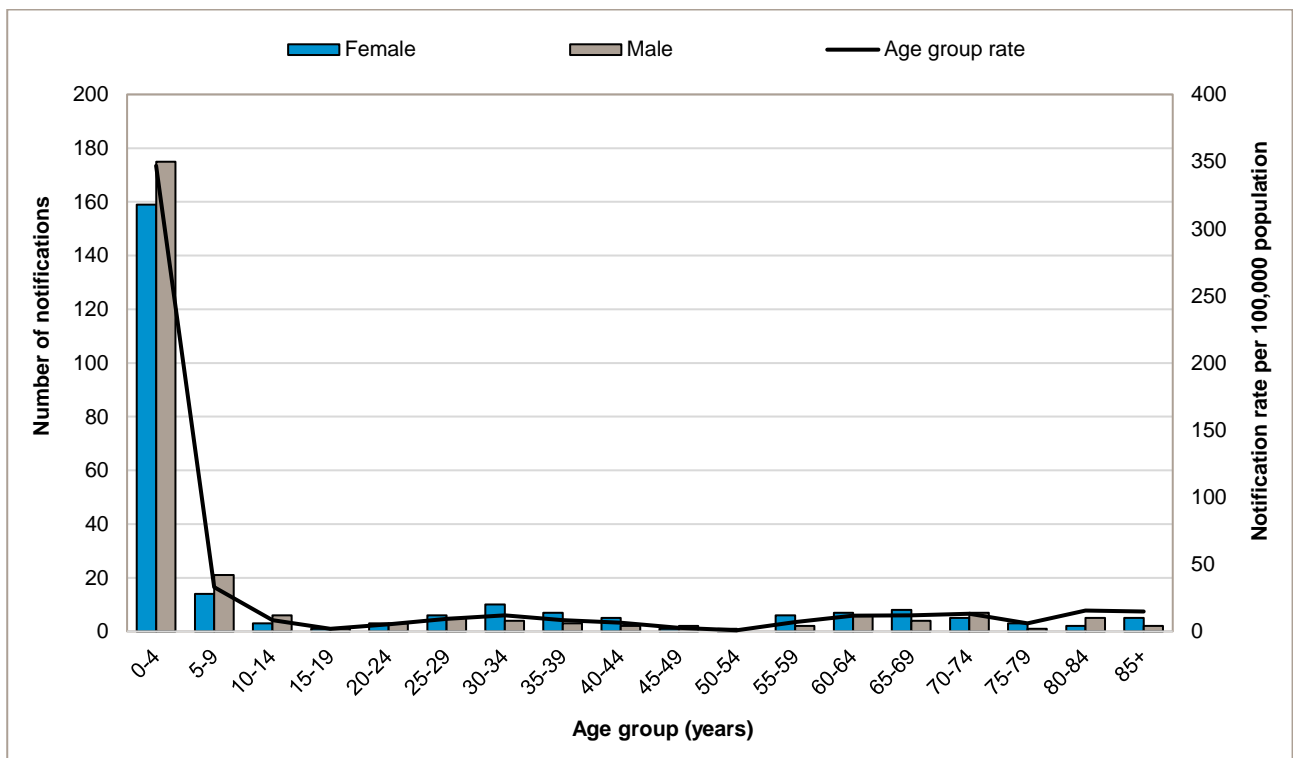


Figure 32 Notified cases of rotavirus infection by age group and sex, and notification rate by age group, South Australia, 2021



Rotavirus vaccines were added to the National Immunisation Program in 2007. Of the 243 (49%) cases aged less than two years, 215 (88%) cases were vaccinated against rotavirus. There were no outbreaks of rotavirus reported to CDCB in 2021.

**Rubella**

There were no cases of rubella notified in SA in 2021, with only one notification in the five-year period 2016-2020, which was notified in 2020. No cases of congenital rubella have been reported since 2013.

**Tetanus**

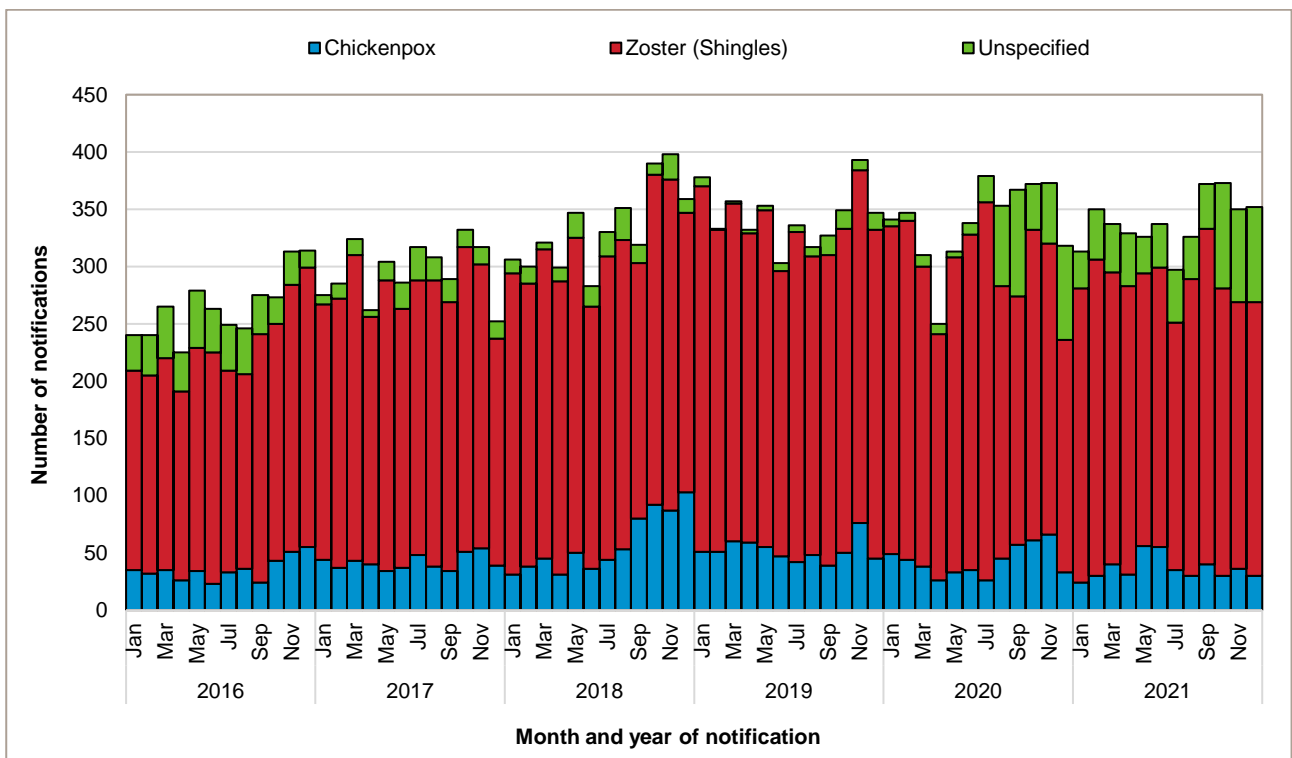
There were no cases of tetanus notified in SA in 2021. There were three cases notified from 2016 to 2020: two cases in 2017 and one case in 2019.

**Varicella zoster virus**

In 2021, there were 4,062 cases of varicella zoster virus infection (including chickenpox, shingles and unspecified), almost equal to the 4,061 cases notified in 2020 and higher than the historical five-year average of 3,784 notifications per year from 2016 to 2020. Of these, 437 (11%) were chickenpox, 3,013 (74%) were herpes zoster (shingles) and 612 (15%) were classified as unspecified varicella zoster infection (Figure 33).

Among cases of varicella cases notified there were 2,175 females, 1,886 males and one sex not stated. The median age of chickenpox cases was 10 years (range one month-91 years). The median age for varicella zoster cases was 58 years (range 11 months-101 years).

**Figure 33 Notified cases of varicella zoster virus infection, by infection type, month and year of notification, South Australia, 2016-2021**



In November 2016, a National Shingles Vaccination Program was commenced as an ongoing program for persons aged 70 years, with a five-year catch-up program for persons aged 71-79 years. Previously the shingles vaccine was only available on the private market.

There were seven outbreaks of varicella zoster reported to CDCB in 2021. All reports were from preschool and primary school settings ([Appendix 3](#)).

## Vector borne diseases

No cases of West Nile virus (Kunjin variant) or Murray Valley encephalitis were reported in 2021 and from 2016 to 2020.

### Barmah Forest virus

In 2021, two cases of Barmah Forest virus infection were notified, less than the five cases notified in 2020 and the historical five-year average of four cases per year from 2016 to 2020. Cases comprised two females aged 20-29 years and 70-79 years residing in regional SA. From December 2013 to November 2016, changes in laboratory testing procedures and case definition impacted the number of notifications compared with previous years.

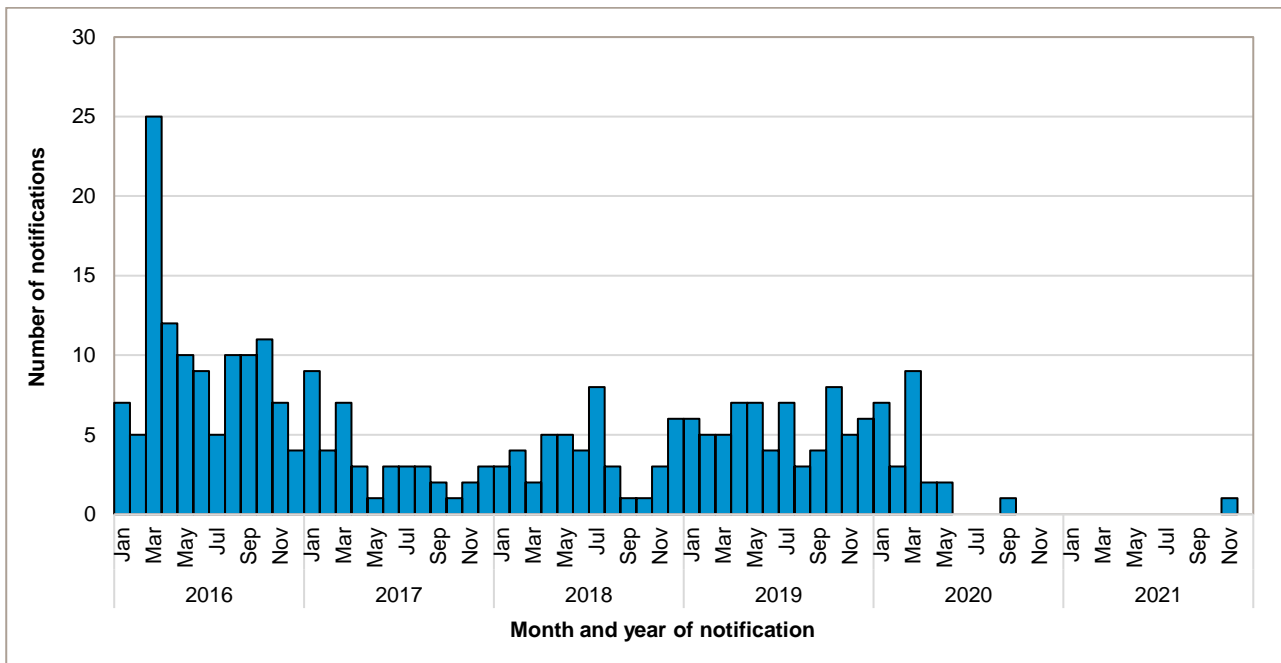
### Chikungunya virus

One case of chikungunya virus infection was notified in SA in 2021, less than the six cases notified in 2020 and the historical five-year average of four cases per year from 2016 to 2020. The case in 2021 was a male aged 30-39 years who reported travel to Papua New Guinea prior to illness onset.

### Dengue virus

In 2021, there was one case of dengue virus infection notified in SA, lower than the 24 cases in 2020, and lower than the historical five-year average of 58 notifications per year from 2016 to 2020 (Figure 34). The case notified was a female aged 10-19 years who acquired their infection overseas following travel to India.

**Figure 34 Notified cases of dengue virus infection, by month and year of notification, South Australia, 2016-2021**



### Japanese encephalitis

There were no cases of Japanese encephalitis notified in SA in 2021, compared with one overseas acquired notification in 2020. No cases were reported for the period 2016 to 2019.

### Malaria

Eight cases of malaria were notified in 2021, slightly lower than the 10 cases reported in 2020 and lower than the historical five-year average of 21 cases per year from 2016 to 2020. Malaria infections were in seven males and one female with a median age of 36 years (range 17-59 years). All cases were acquired overseas with seven (88%) acquired in Africa, and one (12%) in the Western Pacific region (Table 3).

Five cases were caused by *Plasmodium falciparum* and included two acquired in Liberia, two in Uganda and one in Sierra Leone. Of the three other cases, one case was caused by *P. malariae* and acquired in Papua New Guinea, one case was caused by *P. ovale* and acquired in Uganda, and one case was caused by *P. vivax* and acquired in Guinea.

**Table 3 Notified cases of malaria infection, by region and country of acquisition, South Australia, 2021**

Region and country of acquisition	<i>P. falciparum</i>	<i>P. malariae</i>	<i>P. ovale</i>	<i>P. vivax</i>	Total
<b>Africa</b>	<b>5</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>7</b>
Guinea	0	0	0	1	1
Liberia	2	0	0	0	2
Sierra Leone	1	0	0	0	1
Uganda	2	0	1	0	3
<b>Western Pacific</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>
Papua New Guinea	0	1	0	0	1
<b>Total</b>	<b>5</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>8</b>

### Ross River virus (RRv)

There were 103 notifications of RRv in 2021, higher than the 58 cases reported in 2020 and lower than the historical five-year average of 156 notifications per year from 2016 to 2020 (In 2016 a revised case definition which provides stricter criteria for classification of laboratory results for confirmed cases was implemented which may have led to a reduction in the number of notifications after 2016 compared with previous years.

Figure 35). Notifications of RRv infection were reported in 58 females and 45 males with a median age of 51 years (range 4-76 years). Medical notifications and case interviews may elicit the most likely location of exposure. Medical notifications were received for 90% of cases notified in 2021. Exposure during interstate travel was reported for 10 cases (10%). Thirty (28%) cases either reported travel to, or were residents of, locations along the Murray River. In 2016 a revised case definition which provides stricter criteria for classification of laboratory results for confirmed cases was implemented which may have led to a reduction in the number of notifications after 2016 compared with previous years.

**Figure 35 Notified cases of Ross River virus infection, by month and year of notification, South Australia, 2016-2021**

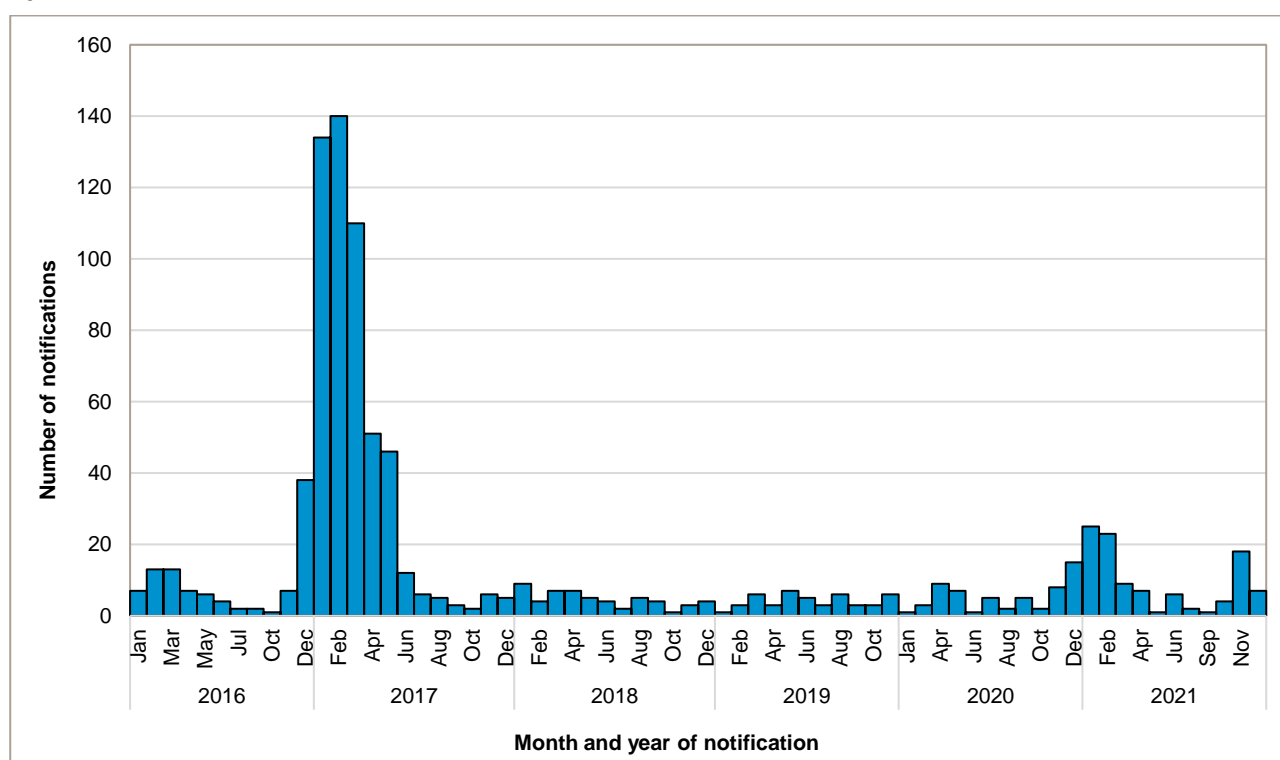
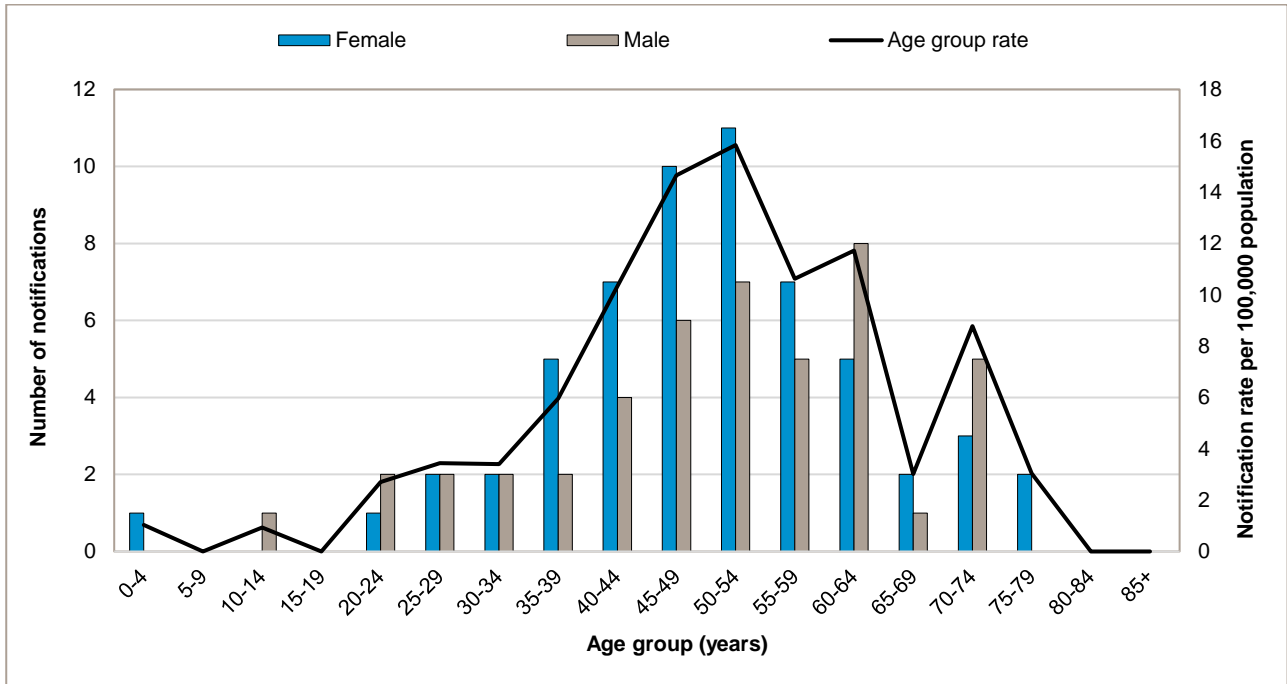


Figure 36 Notified cases of Ross River virus infection by age group and sex, and notification rate by age group, South Australia, 2021



Zika virus

There were no cases of Zika virus infection notified in SA in 2021. There were two notifications for the five-year period 2016-2020, both notified in 2016.

## Zoonoses

No cases of anthrax, lyssavirus, rabies, Hendra virus infection, or tularaemia were reported in 2021 or during the period 2016 to 2020.

### Brucellosis

There were no cases of brucellosis notified in SA in 2021. For the period 2016 to 2020 there was one case notified in 2017.

### Leptospirosis

There were no cases of leptospirosis notified in SA in 2021. For the period 2016 to 2020, there were seven notifications: two in 2016, one in 2017, two in 2019 and two in 2020.

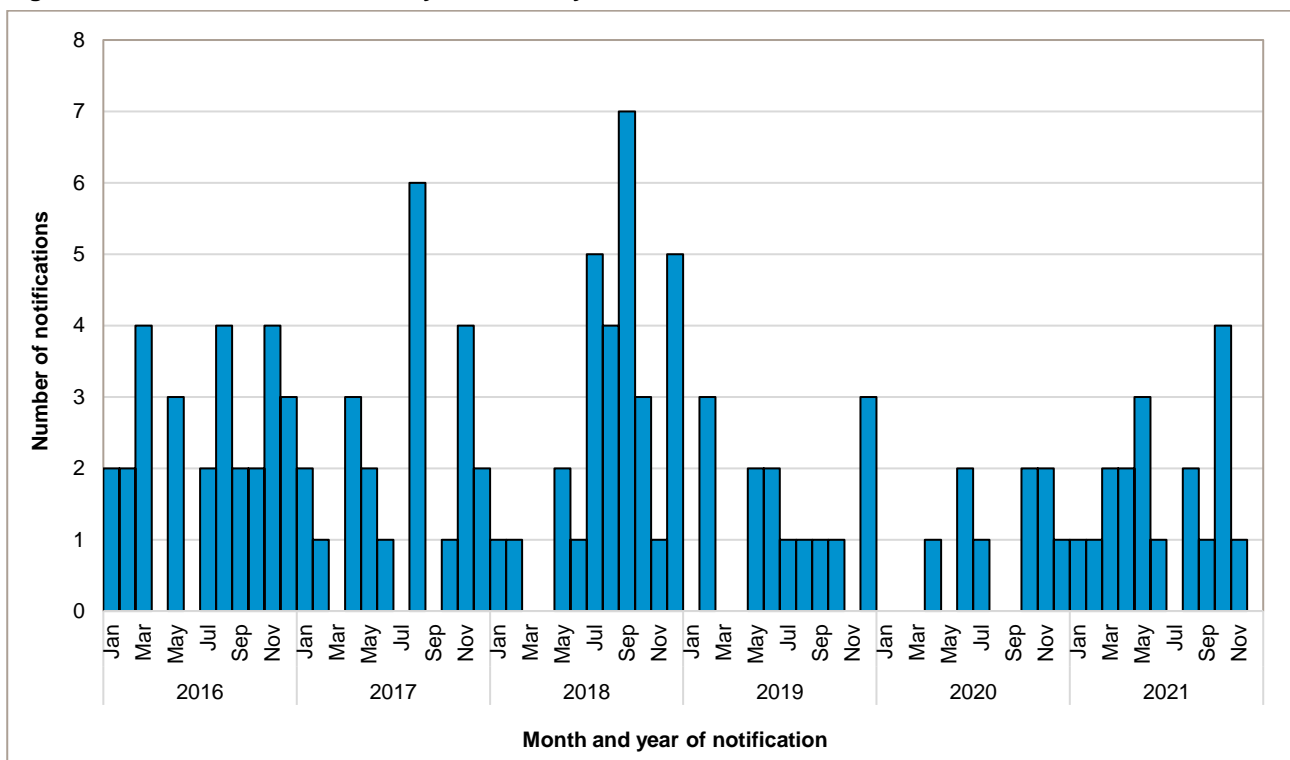
### Psittacosis (Ornithosis)

There were no cases of psittacosis (ornithosis) notified in SA in 2021. For the period 2016 to 2020 there were three notifications: one in 2017, one in 2019 and one in 2020.

### Q fever

There were 18 cases of Q fever notified in 2021, higher than the nine cases notified in 2020 and lower than the historical five-year average of 21 cases per year from 2016 to 2020 (Figure 37). Cases comprised one female and 17 males with a median age of 38 years (range 17-71 years). Fourteen cases were hospitalised.

**Figure 37 Notified cases of Q fever by month and year of notification, South Australia, 2016-2021**



The most common risk factor reported was residing or working on a farm (Table 4).

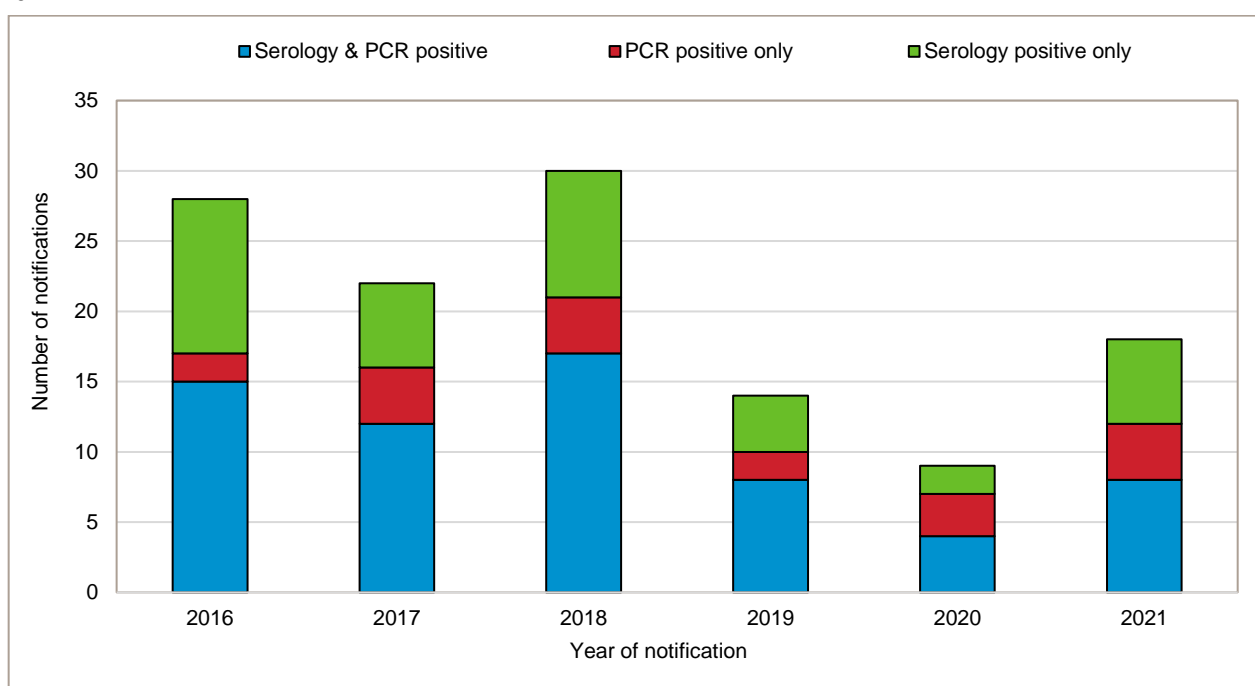
**Table 4 Notified cases of Q fever by risk factor, South Australia, 2021**

Risk factor	Number	%
Residing/working on farm/station	12	67
Working at an abattoir/butcher	3	17
Non-farm animal exposure	1	6
Visiting a farm	1	6
No risk factor identified	1	6
<b>Total</b>	<b>18</b>	<b>100</b>

There has been an increase in the use of PCR testing for Q fever. Of the 18 cases notified, seven cases were diagnosed by PCR and serological testing (39%), seven were diagnosed by serological testing only (39%), and four were diagnosed by PCR testing only (22%) (

Figure 38).

**Figure 38 Notified cases of Q fever by laboratory testing method and year of notification, South Australia, 2016-2021**





## Other notifiable diseases

### Candida auris

*Candida auris* became notifiable on 7 October 2021. No cases were notified in 2021.

### Carbapenemase producing *Enterobacterales*

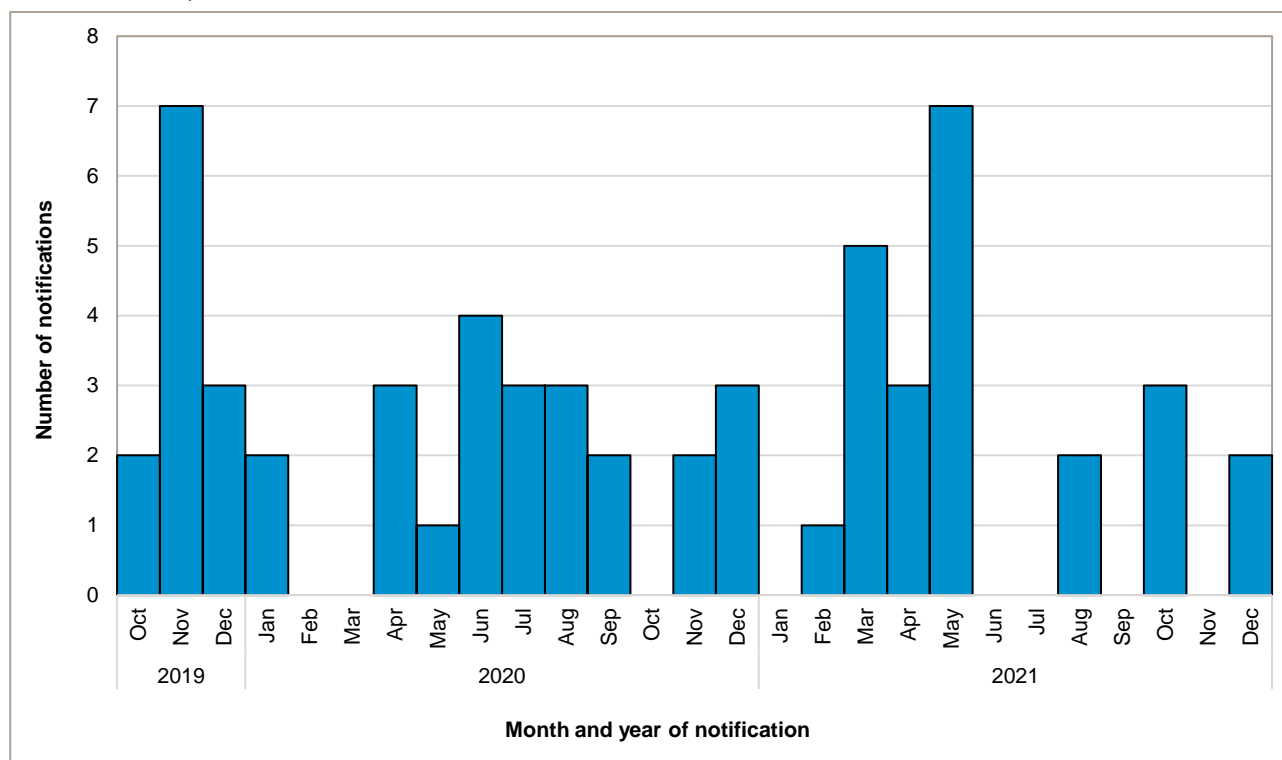
Carbapenemase producing *Enterobacterales* (CPE) became notifiable in SA on 24 October 2019.

In 2021, there were 23 notifications of CPE, equal to the 23 cases notified in 2020. Twelve cases were notified from the date CPE became notifiable in SA in 2019 (

Figure 39). Cases comprised 13 females and ten males with a median age of 66 years (range 26-92 years). Four (17%) CPE cases were detected through targeted screening in healthcare settings.

Eight distinct species were identified in 2021 with *E. coli* (43%) the most common species identified (Table 5). The predominant types of carbapenemases found in CPE characterised through whole genome sequencing were New-Delhi metallo-β-lactamase (NDM) (65%), followed by oxacillinases (OXA) (17%), imipenemase (IMP) (13%) and imipenem hydrolyzing β-lactamase (IMI) (4%).

**Figure 39 Notified cases of Carbapenemase-producing *Enterobacterales* by month and year of notification, South Australia, 2019-2021**



**Table 5 Carbapenemase producing *Enterobacterales* by species, South Australia, 2021**

Species	Number	%
<i>Escherichia coli</i>	10	43
<i>Klebsiella pneumoniae</i>	5	22
<i>Enterobacter cloacae</i>	3	13
<i>Citrobacter</i>	1	4
<i>Enterobacter</i>	1	4
<i>Klebsiella aerogenes</i>	1	4
<i>Klebsiella variicola</i>	1	4
<i>Raoultella</i>	1	4
<b>Total</b>	<b>23</b>	<b>100</b>

**Creutzfeldt-Jakob disease (CJD)**

Three cases of Creutzfeldt-Jakob disease (CJD) were notified in 2021, lower than the seven cases notified in 2020 and lower than the historical five-year average of five cases per year from 2016 to 2020. Cases of CJD comprised one female and two males. There was one case in each of the following age groups: 60-69 years, 70-79 years and 80-89 years.

**Group A streptococcus (invasive)**

Invasive group A streptococcus became notifiable in SA on 7 October 2021. From this date, 14 cases of invasive group A streptococcus were notified. Cases notified included six females and eight males with a median age of 60 years (range 1-87 years). In 2021, four cases (29%) were notified in people who identified as Aboriginal and/or Torres Strait Islander. Reporting of invasive group A streptococcus burden is limited by incomplete data in 2021.

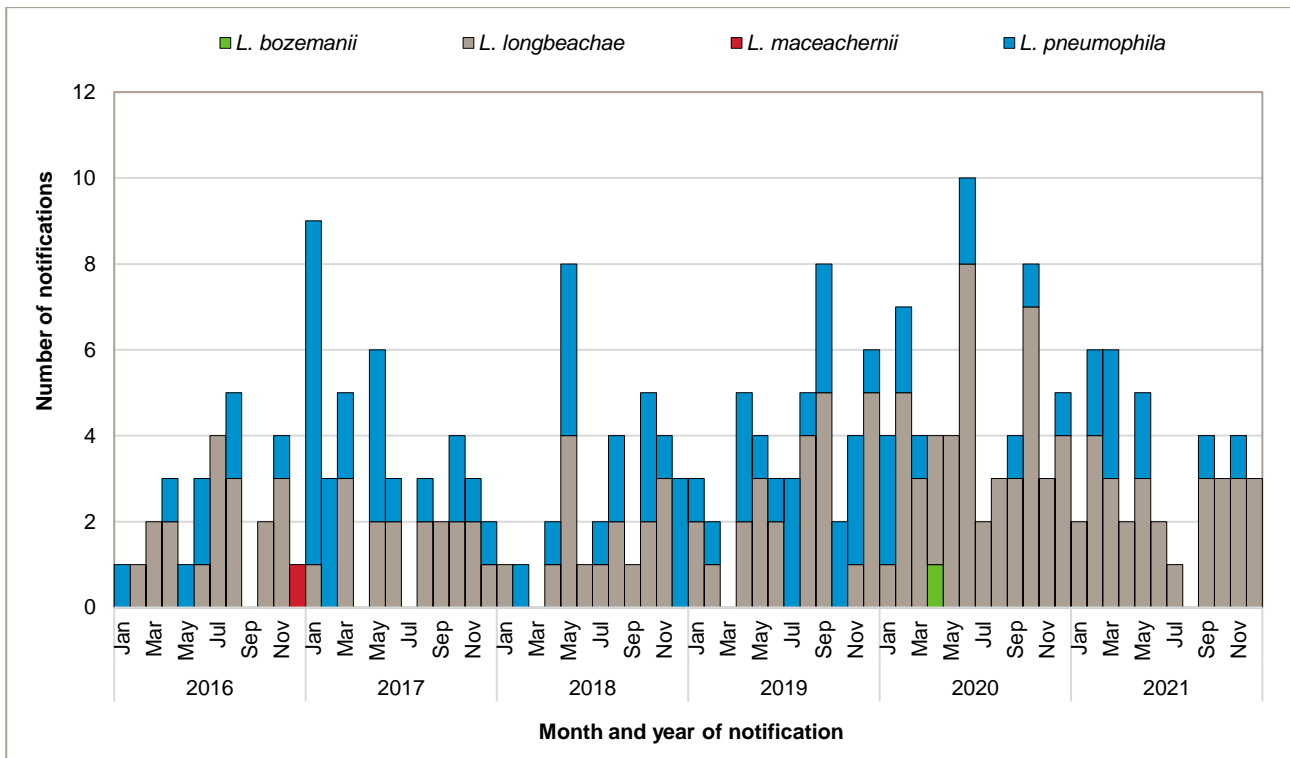
**Legionellosis**

There were 38 notifications of legionellosis in 2021, less than the 58 notifications in 2020 and less than the historical five-year average of 40 cases per year from 2016 to 2020 (Figure 40). Of the cases, the most frequently reported causative species were *L. longbeachae* (76%) followed by *L. pneumophila* serogroup 1 (21%) and *L. pneumophila* serogroup 2 (3%).

The eight notifications of *L. pneumophila* serogroup 1 comprised two females and six males with a median age of 69 years (range 52-83 years). Four notifications resided in metropolitan Adelaide and seven cases were hospitalised. The notification of *L. pneumophila* serogroup 2 was in a male aged 70-79 years from metropolitan Adelaide who was hospitalised. All cases were sporadic, and no clusters or common sources were identified.

The 29 notified cases of *L. longbeachae* comprised 15 females and 14 males with a median age of 72 years (range 32-92 years). Sixty-nine per cent were from metropolitan Adelaide and 76% of cases were hospitalised. No deaths were attributed to *L. pneumophila* or *L. longbeachae*.

**Figure 40 Notified cases of legionellosis by serogroup, and month and year, South Australia, 2016-2021**



**Leprosy**

There were no cases of leprosy notified in SA in 2021. One case was notified in 2017 during the five-year historical period 2016 to 2020.

**Acute rheumatic fever (ARF) and rheumatic heart disease (RHD)**

There were 53 notifications of acute rheumatic fever (ARF) and rheumatic heart disease (RHD), higher than the 49 notifications in 2020 and historical five-year average of 41 notifications per year from 2016 to 2020 (Figure 41). Of the ARF and/or RHD notifications, 28 were female and 25 males with a median age of 15 years (range 4-76 years) (Figure 42). The highest notification rate was in individuals aged 5-14 years which accounted for 43% of all notifications. In 2021, 85% of cases notified were persons who identified as Aboriginal and/or Torres Strait Islander. Approximately half (49%) of ARF and/or RHD diagnoses reported the region of primary clinic as remote SA, followed by urban (40%) and regional (11%) SA.

In 2021, there were 29 ARF notifications, including 26 (90%) first known episodes and three (10%) recurrences. Of the 24 notifications of RHD, eight (33%) were classified as severe RHD when first diagnosed, seven (29%) moderate RHD, six (25%) mild RHD and three (13%) borderline RHD. Most diagnoses of RHD (75%) did not have a previous ARF episode recorded on the [SA Rheumatic Heart Disease Register](#).

**Figure 41 Notified cases of acute rheumatic fever and rheumatic heart disease, by classification and month and year, South Australia, 2016-2021**

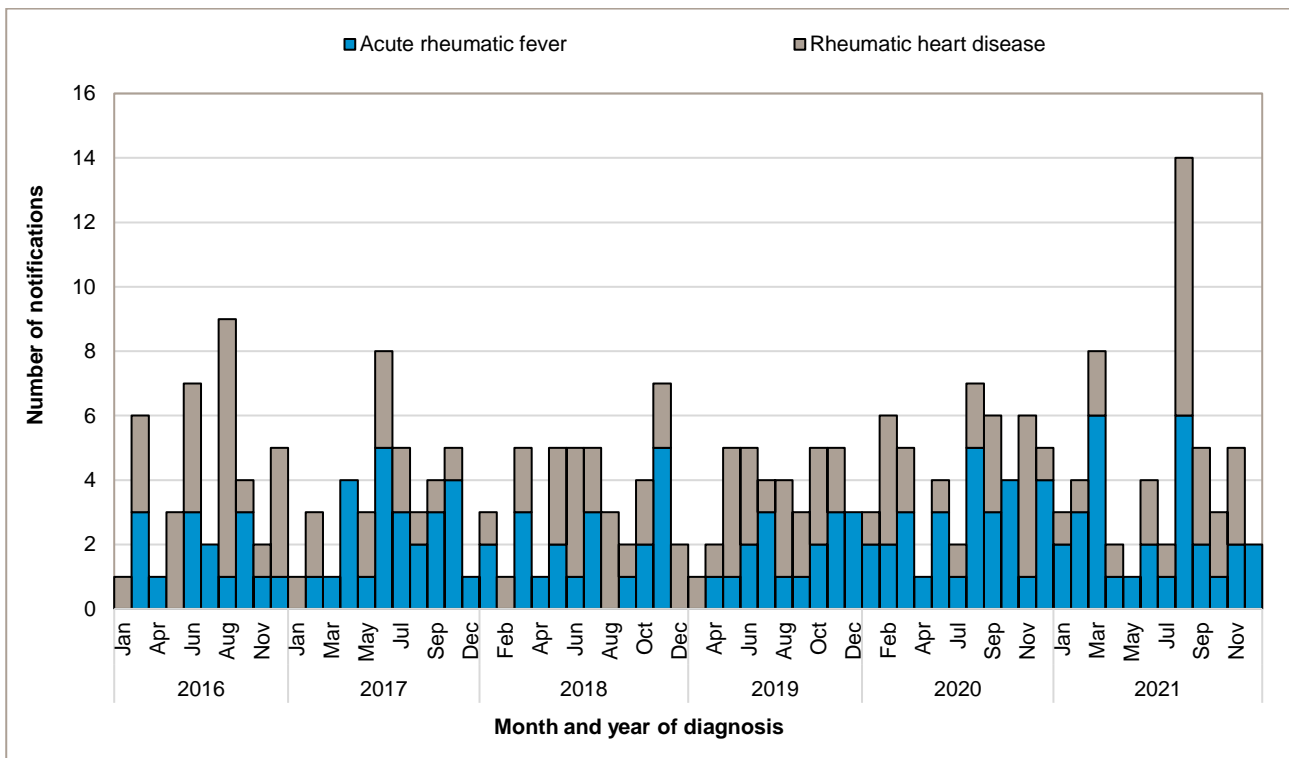
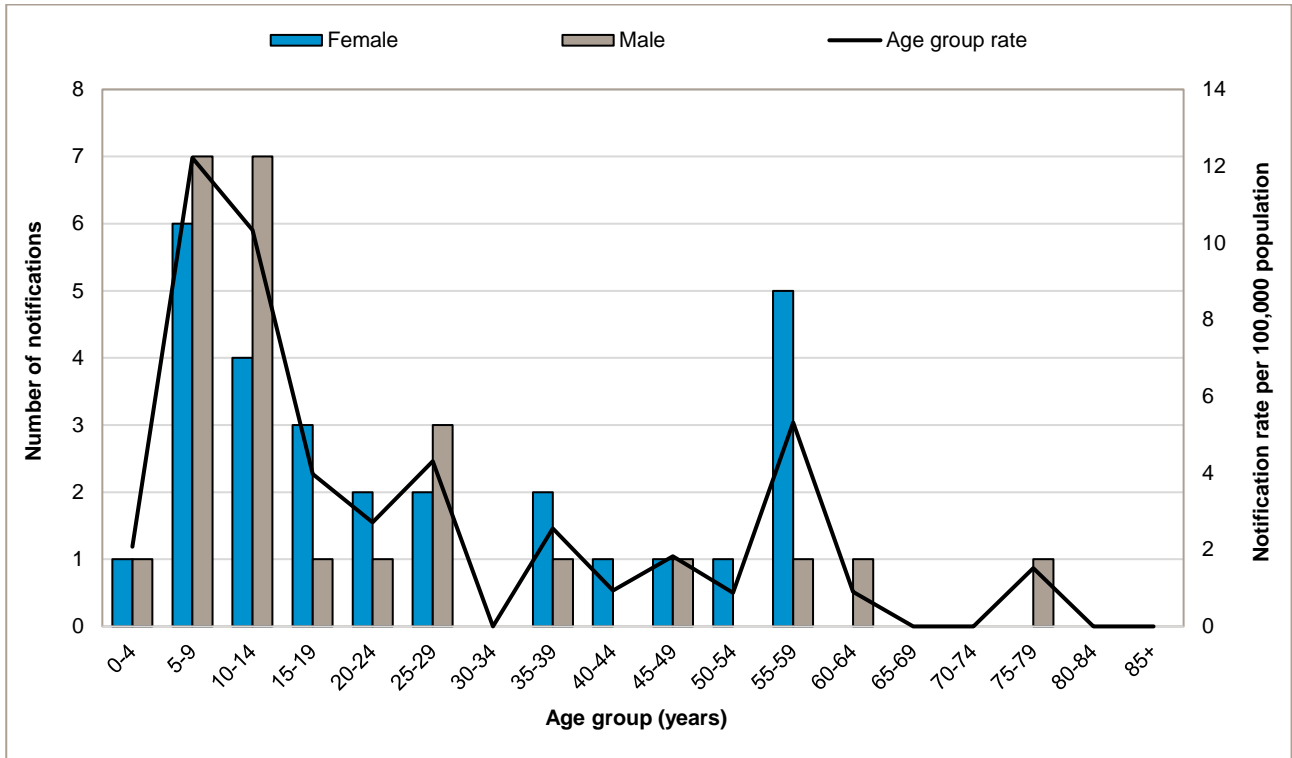


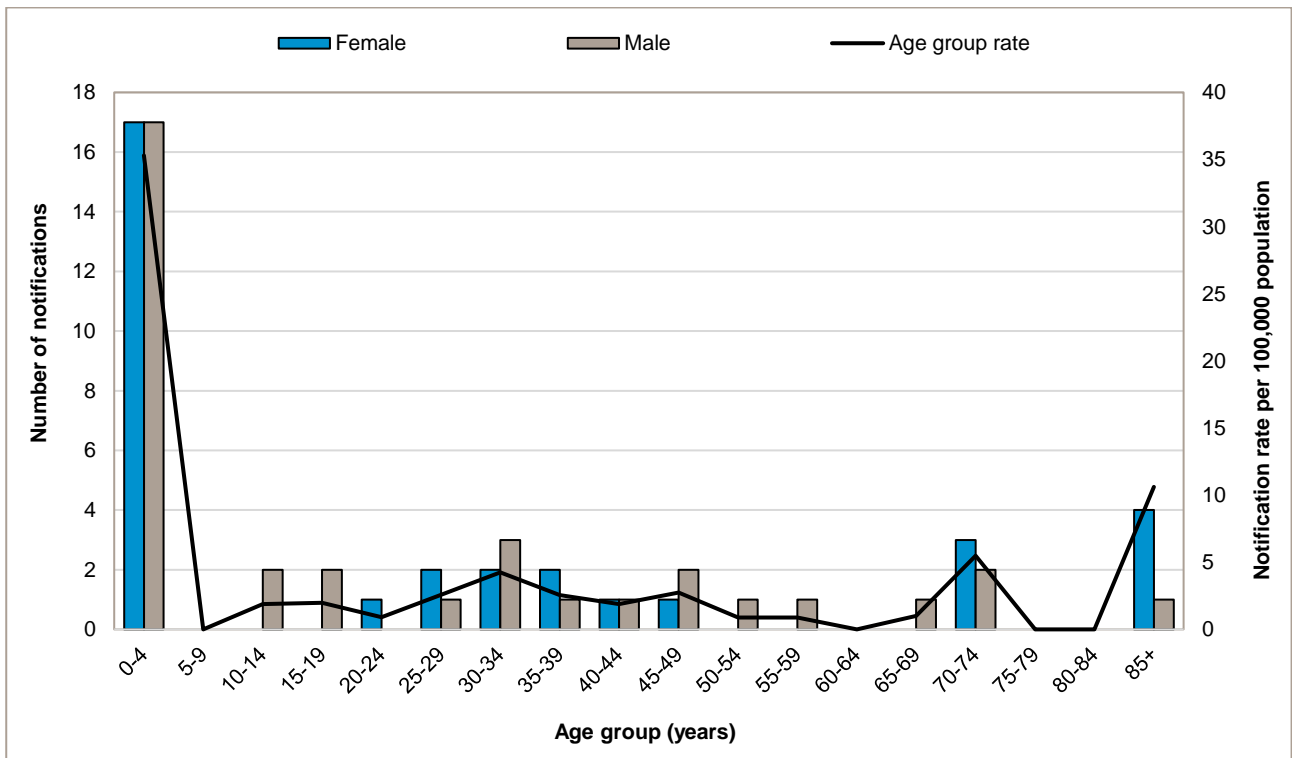
Figure 42 Notified cases of acute rheumatic fever and rheumatic heart disease by age group and sex, and notification rate by age group, South Australia, 2021



**Respiratory syncytial virus (RSV)**

RSV became notifiable in SA on 7 October 2021 and following that date 68 cases of RSV were notified. Cases notified included 33 females and 35 males with a median age of seven years (range 2 months-90 years). Overall, the highest notification rate occurred in children aged 0-4 years (35 per 100,000 population), comprising 51% of notifications in 2021 (Figure 43). Understanding and reporting RSV disease burden in SA is limited by incomplete data in 2021.

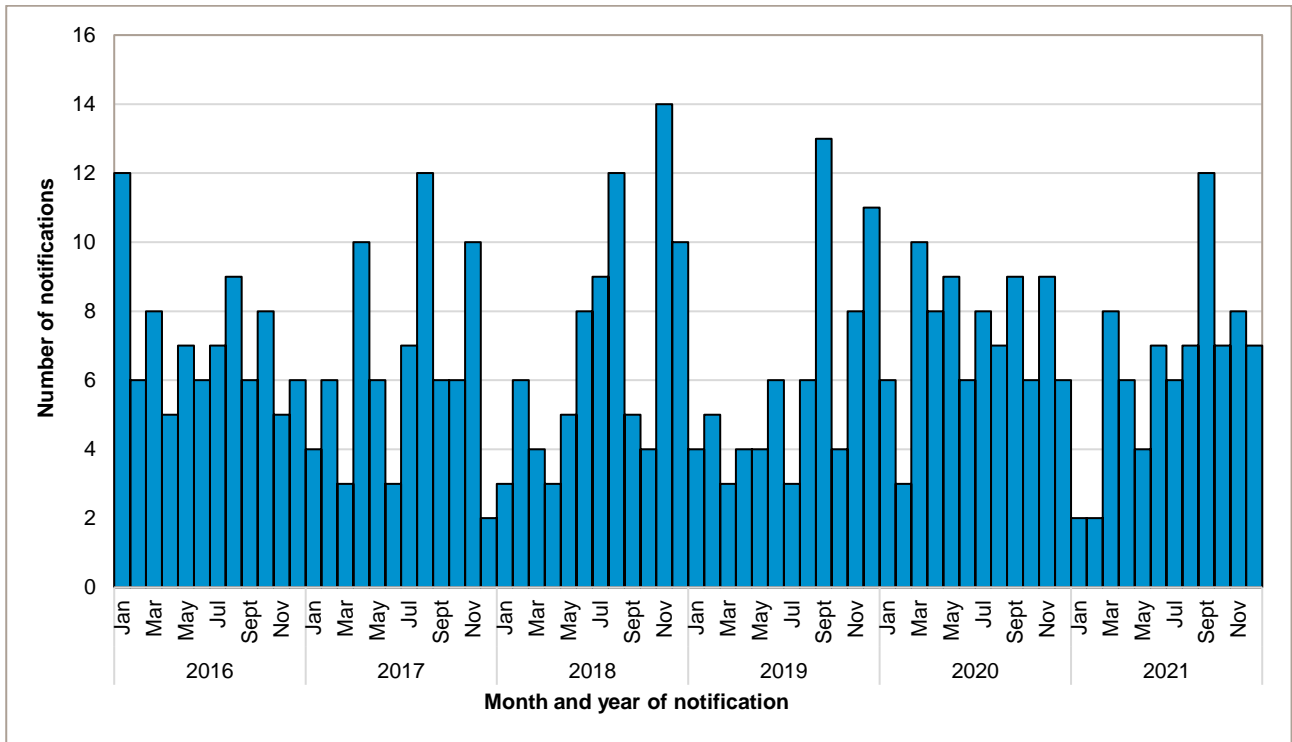
Figure 43 Notified cases of respiratory syncytial virus by sex, and age group, and notification rate per age group, South Australia, 2021



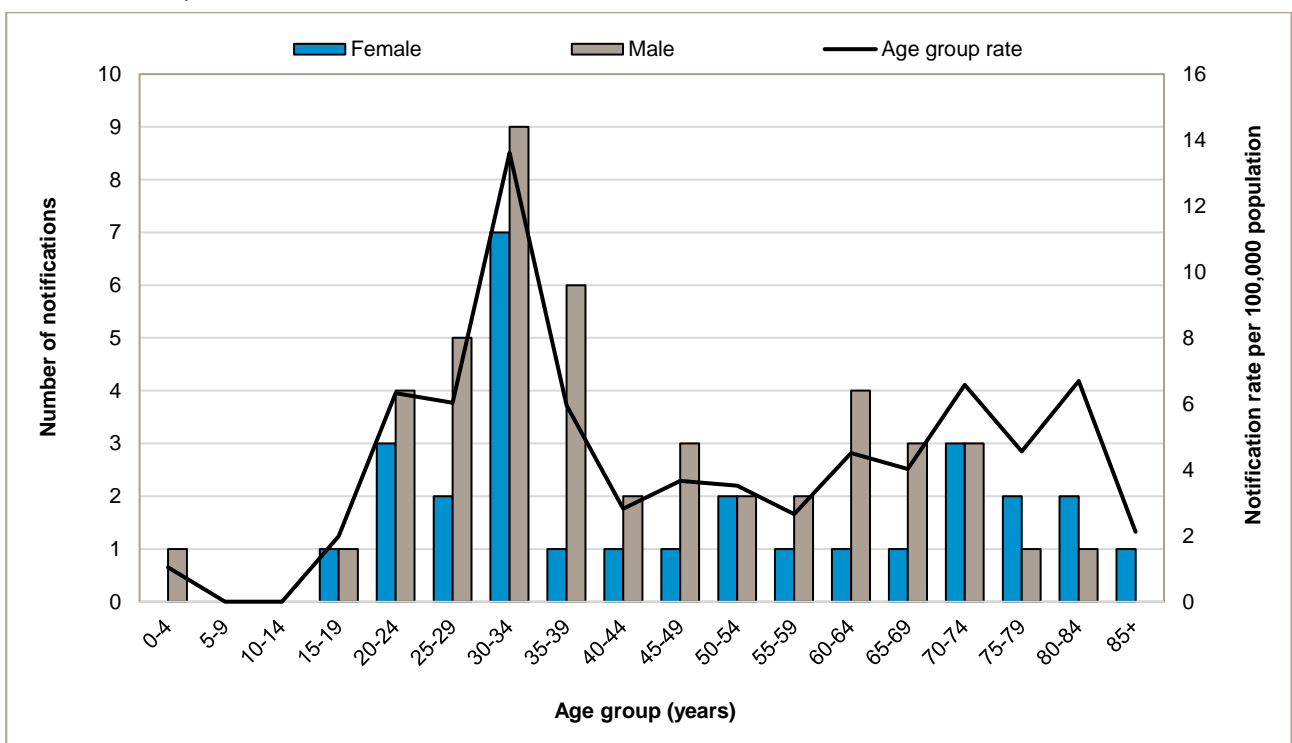
**Tuberculosis (TB)**

In 2021, there were 76 TB cases notified, lower than 87 notifications in 2020 and slightly lower than the historical five-year average of 80 cases per year from 2016 to 2020 (Figure 44). Cases notified included 29 females and 47 males with a median age of 36 years (range 1 month-86 years). Males accounted for 62% of notifications in 2021, higher than the proportion of males notified from 2016 to 2020 (52%). The highest notification rate occurred in adults aged 30-34 years (14 per 100,000 population) (Figure 45). The majority (91%) of TB cases were born overseas, five (7%) were notified in Australian-born non-Indigenous persons and two (3%) cases were notified in Australian-born persons with unknown Indigenous status.

**Figure 44 Notified cases of tuberculosis, by month and year, South Australia, 2016-2021**



**Figure 45 Notified cases of tuberculosis by age group and sex, and notification rate by age group, South Australia, 2021**



In 2021, a high proportion (87%) of TB cases were identified based on the clinical presentation of the case, followed by screening (12%) and lastly through contact tracing and epidemiological investigation (1%). Sixty-six (87%) notified cases were laboratory confirmed as TB. Of these, 25 (33%) notifications were detected through PCR only, 17 (22%) by culture other than sputum, 15 (20%) by sputum culture and microscopy, and nine (12%) by sputum culture only. The remaining ten cases were diagnosed using clinical and radiological evidence only (Table 6). Three cases (4%) were classified as multidrug resistant (MDR) TB. There were no cases of extensively drug-resistant (XDR) TB reported in 2021.

**Table 6 Tuberculosis laboratory testing, South Australia, 2021**

Laboratory results	Number	%
Sputum culture positive and microscopy positive	15	20
Sputum culture positive (microscopy negative)	9	12
Sputum culture positive (microscopy not done or unknown)	0	0
Other culture positive	17	22
Nucleic acid testing positive only <sup>(a)</sup>	25	33
Unproven <sup>(b)</sup>	10	13
<b>Total</b>	<b>76</b>	<b>100</b>

(a) Cases with a positive nucleic acid test result without a positive culture result.

(b) Cases with no positive culture result or no positive nucleic acid test result.

## Appendices

## Appendix 1: Notifiable diseases and conditions by count, South Australia, 2016–2021

Disease or condition	2016	2017	2018	2019	2020	5-year average	2021
<b>Enteric diseases</b>							
Botulism	0	1	0	1	0	0	1
Campylobacteriosis	3,198	3,113	3,094	3,286	2,737	3,086	2,899
Cholera	0	0	0	0	0	0	0
Cryptosporidiosis	432	352	197	128	131	248	104
Hepatitis A	7	23	21	14	3	14	0
Hepatitis E	3	1	0	2	2	2	2
Listeriosis	4	5	5	2	1	3	1
Paratyphoid	4	6	7	13	1	6	0
Salmonellosis	1,572	1,456	1,174	1,177	673	1,210	547
Shiga toxin-producing <i>E. coli</i> infection	176	318	316	294	218	264	231
Haemolytic uraemic syndrome / thrombotic thrombocytopenic purpura infection	1	2	0	0	1	1	2
Shigellosis	182	300	434	283	122	264	73
Typhoid	6	5	6	10	3	6	1
<i>Vibrio parahaemolyticus</i>	8	5	11	8	0	6	81
Yersiniosis	89	76	110	114	72	92	82
<b>Quarantinable diseases</b>							
Coronavirus disease 2019	NN	NN	NN	NN	579	N/A	12666
Influenza (avian in humans)	0	0	0	0	0	0	0
Middle East respiratory syndrome coronavirus	0	0	0	0	0	0	0
Plague	0	0	0	0	0	0	0
Severe acute respiratory syndrome	0	0	0	0	0	0	0
Smallpox	0	0	0	0	0	0	0
Viral haemorrhagic fever	0	0	0	0	0	0	0
Yellow fever	0	0	0	0	0	0	0
<b>Other diseases</b>							
<i>Candida auris</i>	NN	NN	NN	NN	NN	N/A	0
Carbapenemase producing <i>Enterobacterales</i>	NN	NN	NN	13	23	N/A	23
Creutzfeldt-Jakob disease	2	4	6	4	7	5	3
Invasive group A streptococcus	NN	NN	NN	NN	NN	N/A	14
Legionellosis	27	40	32	45	58	40	38
Leprosy	0	1	0	0	0	0	0
Respiratory syncytial virus	NN	NN	NN	NN	NN	N/A	68
Rheumatic fever/rheumatic heart disease	40	38	43	37	49	41	43
Tuberculosis	85	75	83	71	87	78	76
<b>Vaccine preventable diseases</b>							
Diphtheria	0	0	1	0	1	0	2
<i>Haemophilus influenzae</i> (invasive)	21	14	21	25	22	21	19
<i>Haemophilus influenzae</i> type b (invasive)	1	0	3	1	1	1	0
Influenza A	7,036	18,296	4,181	22,446	1,256	10,643	25
Influenza B	821	10,190	1,748	4,647	327	3,547	15

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Disease or condition	2016	2017	2018	2019	2020	5-year average	2021
Meningococcal disease (invasive)	27	36	34	27	5	26	12
Measles	11	1	2	4	0	4	0
Mumps	19	63	11	8	13	23	3
Pertussis	1,943	1,786	716	309	290	1,009	33
Pneumococcal disease (invasive)	136	213	147	183	118	159	158
Polio	0	0	0	0	0	0	0
Rotavirus	447	1362	496	788	363	691	495
Rubella	0	0	0	0	1	0	0
Rubella (congenital)	0	0	0	0	0	0	0
Tetanus	0	2	0	1	0	1	0
Varicella zoster (unspecified)	414	194	194	97	408	261	612
Varicella zoster (chickenpox)	427	499	690	623	513	550	437
Varicella zoster (shingles)	2,341	2,858	3,119	3,406	3,141	2,973	3,013
<b>Vectorborne diseases</b>							
Barmah Forest virus	5	3	4	5	5	4	2
Chikungunya virus	7	1	2	3	6	4	1
Dengue virus	115	41	45	67	24	58	1
Japanese encephalitis virus	0	0	0	0	1	0	0
Malaria	10	8	34	42	10	21	8
Murray Valley encephalitis	0	0	0	0	0	0	0
Ross River virus	100	520	55	46	58	156	103
West Nile virus (Kunjin variant)	0	0	0	0	0	0	0
Zika virus	2	0	0	0	0	0	0
<b>Zoonoses</b>							
Anthrax	0	0	0	0	0	0	0
Australian bat lyssavirus	0	0	0	0	0	0	0
Brucellosis	0	1	0	0	0	0	0
Hendra virus	0	0	0	0	0	0	0
Leptospirosis	2	1	0	2	2	1	0
Lyssavirus (NEC)	0	0	0	0	0	0	0
Psittacosis	0	1	0	1	0	0	0
Q Fever	28	22	30	14	9	21	18
Rabies	0	0	0	0	0	0	0
Tularaemia	0	0	0	0	0	0	0
<b>Grand Total</b>	<b>19,749</b>	<b>41,933</b>	<b>17,072</b>	<b>38,247</b>	<b>11,341</b>		<b>21,922</b>

NA = Not applicable; NN = not notifiable; NEC = not elsewhere classified



## Appendix 2: Notifiable diseases and conditions by rate per 100,000 population, South Australia, 2016–2021

Disease or condition	2016	2017	2018	2019	2020	5-year average	2021
<b>Enteric diseases</b>							
Botulism	0.0	0.0	0.0	0.1	0.0	0.0	0.1
Campylobacteriosis	187.1	180.7	177.6	187.7	154.3	177.5	163.5
Cholera	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cryptosporidiosis	25.3	20.7	11.3	7.3	7.3	14.4	5.9
Hepatitis A	0.4	1.3	0.0	0.8	0.2	0.5	0.0
Hepatitis E	0.2	0.1	0.0	0.1	0.1	0.1	0.1
Listeriosis	0.2	0.3	0.3	0.1	0.1	0.2	0.1
Paratyphoid	0.2	0.3	0.4	0.7	0.1	0.3	0.0
Salmonellosis	91.9	84.5	74.7	67.1	38.0	71.2	30.8
Shiga toxin-producing <i>E. coli</i> infection	10.2	18.2	18.0	16.8	12.3	15.1	13.0
Haemolytic uraemic syndrome / thrombotic thrombocytopenic purpura infection	0.0	0.1	0.0	0.1	0.1	0.1	0.1
Shigellosis	10.7	17.3	25.3	16.2	6.9	15.3	4.1
Typhoid	0.4	0.3	0.3	0.6	0.2	0.4	0.1
<i>Vibrio parahaemolyticus</i>	0.5	0.3	0.6	0.5	0.0	0.4	4.6
Yersiniosis	5.1	4.3	6.3	6.4	4.0	5.2	4.6
<b>Quarantinable diseases</b>							
Coronavirus disease 2019	NN	NN	NN	NN	32.7	N/A	714.3
Influenza (avian in humans)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle East respiratory syndrome coronavirus	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plague	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Severe acute respiratory syndrome	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Smallpox	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Viral haemorrhagic fever	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yellow fever	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Other diseases</b>							
<i>Candida auris</i>	NN	NN	NN	NN	NN	N/A	0.0
Carbapenemase producing <i>Enterobacterales</i>	NN	NN	NN	0.7	1.3	N/A	1.3
Creutzfeldt-Jakob disease	0.1	0.2	0.3	0.2	0.4	0.2	0.2
Invasive group A streptococcus	NN	NN	NN	NN	NN	N/A	0.8
Legionellosis	1.6	2.3	1.8	2.6	3.3	2.3	2.1
Leprosy	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Respiratory syncytial virus	NN	NN	NN	NN	NN	N/A	3.8
Rheumatic fever/rheumatic heart disease	2.3	2.2	2.5	2.1	2.8	2.4	3.0
Tuberculosis	5.0	4.4	4.8	4.1	4.9	4.6	4.3
<b>Vaccine preventable diseases</b>							
Diphtheria	0.0	0.0	0.1	0.0	0.1	0.0	0.1
<i>Haemophilus influenzae</i> (invasive)	1.2	0.8	1.4	1.5	1.2	1.2	1.1
<i>Haemophilus influenzae</i> type b (invasive)	0.1	0.0	0.2	0.1	0.1	0.1	0.0
Influenza A	411.5	1061.5	240.8	1281.4	70.9	613.2	1.4
Influenza B	48.1	591.2	100.7	265.2	18.5	204.7	0.8
Meningococcal disease (invasive)	0.6	0.1	0.1	0.2	0.3	0.3	0.7

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Disease or condition	2016	2017	2018	2019	2020	5-year average	2021
Measles	1.6	2.1	2.0	1.5	0.0	1.4	0.0
Mumps	1.1	3.7	0.6	0.5	0.7	1.3	0.2
Pertussis	113.7	103.6	41.2	17.6	16.4	58.5	1.9
Pneumococcal disease (invasive)	8.0	12.4	8.5	10.5	6.7	9.2	8.9
Polio	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rotavirus	25.5	79.0	28.6	45.0	20.5	39.7	28.0
Rubella	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Rubella - congenital	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tetanus	0.0	0.1	0.0	0.1	0.0	0.0	0.0
Varicella zoster (unspecified)	24.3	11.3	11.2	5.5	23.0	15.1	34.6
Varicella zoster (chickenpox)	25.0	29.0	39.7	37.8	29.0	32.1	24.7
Varicella zoster (shingles)	137.0	165.8	179.6	194.4	177.3	170.8	170.2
<b>Vectorborne diseases</b>							
Barmah Forest virus	0.3	0.2	0.0	0.3	0.3	0.2	0.1
Chikungunya virus	0.4	0.1	0.0	0.2	0.3	0.2	0.1
Dengue virus	6.7	2.4	0.0	3.9	1.4	2.9	0.1
Japanese encephalitis virus	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Malaria	0.6	0.5	0.0	2.4	0.6	0.8	0.5
Murray Valley encephalitis	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ross River virus	5.9	30.2	0.0	2.6	3.3	8.4	5.8
West Nile virus (Kunjin variant)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zika virus	0.1	0.0	0.0	0.0	0.0	0.0	0.0
<b>Zoonoses</b>							
Anthrax	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Australian bat lyssavirus	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brucellosis	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Hendra virus	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Leptospirosis	0.1	0.1	0.0	0.1	0.1	0.1	0.0
Lyssavirus (NEC)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Psittacosis	0.0	0.1	0.0	0.1	0.0	0.0	0.0
Q Fever	1.6	1.3	0.0	0.8	0.5	0.8	1.0
Rabies	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tularaemia	0.0	0.0	0.0	0.0	0.0	0.0	0.0

NA = Not applicable; NN = not notifiable; NEC = not elsewhere classified

### Appendix 3: Summary of outbreaks and clusters in 2021 by disease type

There were 96 outbreaks or clusters reported in 2021 (excluding COVID-19 outbreaks). This included 11 outbreaks with gastrointestinal symptoms where the mode of transmission was foodborne: seven outbreaks with *Salmonella* detected (including one multi-jurisdictional outbreak), two outbreaks with *Campylobacter* detected and two outbreaks with *V. parahaemolyticus* detected. Three *Salmonella* clusters were reported.

There were 74 outbreaks with gastrointestinal symptoms where the mode of transmission was non-foodborne or not established: 54 outbreaks with norovirus detected and 20 with no agent identified. Of these 74 outbreaks, 66 (89%) were reported in aged care facilities (Table 7). One outbreak of *Campylobacter* occurred in a childcare centre with probable zoonotic (animal-to-person) transmission.

Seven varicella outbreaks were reported in five schools and two childcares.

**Table 7 Gastrointestinal outbreaks reported by aged care facilities, by month and agent, South Australia, 2021**

Month reported	Agent identified	Number of facilities affected
January	Gastroenteritis, organism not detected	3
	Norovirus	4
February	Gastroenteritis, organism not detected	4
	Norovirus	1
March	Gastroenteritis, organism not detected	2
	Norovirus	1
April	Gastroenteritis, organism not detected	0
	Norovirus	1
May	Gastroenteritis, organism not detected	0
	Norovirus	0
June	Gastroenteritis, organism not detected	1
	Norovirus	2
July	Gastroenteritis, organism not detected	1
	Norovirus	4
August	Gastroenteritis, organism not detected	1
	Norovirus	6
September	Gastroenteritis, organism not detected	0
	Norovirus	12
October	Gastroenteritis, organism not detected	2
	Norovirus	8
November	Gastroenteritis, organism not detected	3
	Norovirus	2
December	Gastroenteritis, organism not detected	3
	Norovirus	5

#### Campylobacter – Restaurant – January 2021

An outbreak investigation was conducted after reports of illness in a group of work colleagues that had a lunch function at a restaurant on 18 December 2020. There were three cases of *Campylobacter*, two further typed as *C. jejuni*, and three other people with diarrhoea in the following week after the function. A cohort study was conducted and 28 of 32 attendees replied (response rate 88%). The cohort study did not identify any single food item with a significant association with illness, as most people ate some of every food on the set menu. The set menu included a chicken liver parfait. EHOs inspected the restaurant and noted that the cook temperature for the parfait was insufficient. The business was advised to take corrective actions.

### **Campylobacter – Aged care facility – October 2021**

Three cases of *Campylobacter* that were PCR positive only (i.e., no growth on culture) were reported in residents at the same aged care facility, with onsets on 3 October 2021 and 4 October 2021. One case was hospitalised and died (not attributed to *Campylobacter*). There were 70 residents at the facility and no staff reported illness. All cases ate from the facility menu with no specialised diets and no meals consumed that were from outside of the facility. Cases did not have contact with any animals at the facility. An EHO inspected the facility, and no major issues were identified other than turnover of kitchen staff at the time prior to onset of illness amongst cases.

### **Campylobacter – Childcare centre – December 2021**

An outbreak of *Campylobacter* was identified in attendees of a childcare centre, with three reported cases, including two that were further typed as *C. jejuni*. The three cases were all in the same nursery room, aged 11 months to 1 year. Onsets of illness for cases were staggered over almost a two-week period (1 December 2021, 4 December 2021 and 12 December 2021). Chickens had been introduced to an outdoor area that the children had exposure to from late November 2021. An EHO attended the childcare centre and provided advice in line with the SA Health [animal contact guidelines](#). The mode of transmission was classified as probable zoonotic (animal-to-person transmission).

### **Salmonella Saintpaul – Multi-Jurisdictional Outbreak Investigation (MJOI 2021-001) – January 2021**

In January 2021 there was an MJOI of *S. Saintpaul* cases led by NSW that included 17 confirmed cases with the same genetic outbreak strain from South Australian residents. Nationally there were 580 cases (to 28 May 2021 when the MJOI was stood down) with the same genetic outbreak strain, the majority of which were residents of NSW and Queensland. Foods eaten at more than expected levels as determined by binomial analysis on cases nationally ( $P < 0.05$ ) included spring onions, cabbage, parsley, pre-made pasta salad and pre-made potato salad. *S. Saintpaul* was identified in a pre-made coleslaw and spring onion raw ingredient in NSW. All on farm testing for fresh produce suppliers was *S. Saintpaul* not detected. In SA, retail samples of ready to eat salads were tested and no *Salmonella* was detected.

### **Salmonella Typhimurium MLVA 03-14-10-08-523 – Bakery – April 2021**

An increase in STm MLVA 03-14-10-08-523 was identified, with the majority of cases resident in the same metropolitan local government area. In total, 16 cases were reported in the area between 1 April 2021 and 31 May 2021. Of these 16 cases, seven consumed food and beverages from the same local bakery, including one case that was potentially a secondary infection within a household. A variety of foods (including pies, soup, cakes, and coffee) were consumed by cases from the bakery in the first two weeks of April. Six cases were hospitalised. An EHO inspected the bakery and identified issues around egg handling, cleaning and sanitation, and skills and knowledge of food handlers. Recommendations for improvements and follow up inspections occurred. Cross contamination from eggs was the likely source.

### **Salmonella Typhimurium MLVA 03-11-09/10-08-523 – Primary produce – May 2021**

Nine cases of STm MLVA 03-11-09/10-08-523 were notified between 1 April 2021 and 31 May 2021. Seven cases were able to be contacted for interview and six reported eating eggs in their incubation period. Five cases recalled eating the same egg brand, including three consuming eggs at home and two ate egg dishes at different restaurants that trace back was able to identify as having the same brand and from a common egg producer. Egg dishes consumed were various types of potentially undercooked eggs, including poached and runny fried eggs. EHOs inspected the commercial restaurant venues where eggs were consumed, and an audit of the egg farm was undertaken.

### **Salmonella Typhimurium MLVA 03-13-10-08-523 – Bakery – November 2021**

An increase in STm MLVA 03-13-10-08-523 was identified, with a high proportion of cases in the same metropolitan region. Five cases consumed food from a common local bakery on 23 October 2021 and 24 October 2021. A variety of foods were eaten by cases at the bakery, including several sweet items that contained custard. No cases were hospitalised. An EHO inspected the bakery and minor issues were identified and rectified. Through the notifiable contaminants data collected by Food Standards and Surveillance at SA Health, it was noted that unpasteurised egg pulp in September 2021 and October 2021

was positive for STm 03-13-10-08-523, from the same egg producer that was identified as the brand of eggs used at the bakery. Cross contamination from eggs was the likely source.

### **Salmonella Typhimurium MLVA 03-15-08-11-550 – Restaurant – November 2021**

An increase in STm MLVA 03-15-08-11-550 was identified, with seven cases reporting consumption of food from a common restaurant between 3 November 2021 and 10 November 2021. A variety of foods were eaten by cases at the restaurant, including cold rolls, spring rolls, hot pot, fried rice, and several other dishes including chicken, pork, quail and prawns. Three cases were hospitalised. An EHO inspected the restaurant where cleaning and pest control issues were identified and then rectified.

### **Salmonella Typhimurium MLVA 03-09-07-13-523 – Take-away – December 2021**

An increase in STm MLVA 03-09-07-13-523 was identified, with three cases reporting consumption of food from a common take-away venue in November 2021. All three cases consumed teriyaki chicken sushi. One case was hospitalised. An EHO inspected the venue and identified issues with cleaning and sanitising, and hand washing practices. Traceback of the chicken supply at the venue identified a link to an interstate producer that had reported the same MLVA in recent product sampling.

### **Salmonella Typhimurium MLVA 03-14-10-11-523 – Restaurant – December 2021**

An increase in STm MLVA 03-14-10-11-523 notifications was identified in December 2021. Four cases were linked to a common restaurant venue, with foods consumed between 26 November and 1 December, including a food handler at the venue. A range of foods were consumed by cases that ate at the venue. Issues were identified with sanitising, handwashing, and cross contamination in the venue. Two other cases were linked to a common venue, both eating on 4 December 2021, and both consumed salt and pepper squid with aioli. Aioli was made in-house with raw eggs. Issues were identified with cleaning and sanitising. The same egg supplier was identified in both restaurant venues.

### **Varicella virus (Chickenpox) – School – May 2021**

An outbreak of chickenpox was reported in six children attending the same reception to year 12 school. Four cases were confirmed by laboratory testing and all four had been vaccinated. There were no immunocompromised staff/students or pregnant staff identified at the school that required further public health action. Information was provided to the school.

### **Varicella virus (Chickenpox) – School – June 2021**

An outbreak of chickenpox was reported in one staff member and 13 children attending the same primary school. Five cases were confirmed by laboratory testing and four of these had been vaccinated. There were no immunocompromised staff/students or pregnant staff identified at the school that required further public health action. Information was provided to the school.

### **Varicella virus (Chickenpox) – Childcare centre – June 2021**

An outbreak of chickenpox was reported in four children attending the same childcare centre. Three cases were confirmed by laboratory testing and one of these had been vaccinated, with the other two confirmed cases being too young for varicella vaccination. There were no immunocompromised staff/students or pregnant staff identified at the childcare centre that required further public health action. Information was provided to the childcare centre.

### **Varicella virus (Chickenpox) – School – August 2021**

An outbreak of chickenpox was reported in 33 children attending the same primary school. Two cases were confirmed by laboratory testing, and one was vaccinated. There were no immunocompromised staff/students or pregnant staff identified at the school that required further public health action. Information was provided to the school.

### **Varicella virus (Chickenpox) – Childcare centre – September 2021**

An outbreak of chickenpox was reported in one staff member and three children attending the same childcare centre, with three cases confirmed by laboratory testing or medical notification. None of the confirmed cases had been vaccinated, with the two confirmed cases in children too young to be vaccinated.

There were no immunocompromised staff/students or pregnant staff identified at the childcare centre that required further public health action. Information was provided to the childcare centre.

#### **Varicella virus (Chickenpox) – School – November 2021**

An outbreak of chickenpox was reported in 13 children attending the same primary school with no cases confirmed by laboratory testing or medical notification. There were no immunocompromised staff/students or pregnant staff identified at the school that required further public health action. Information was provided to the school.

#### **Varicella virus (Chickenpox) – School – December 2021**

An outbreak of chickenpox was reported in 21 children attending the same primary school, with three cases confirmed by laboratory testing. There were no immunocompromised staff/students or pregnant staff identified at the school that required further public health action. Information was provided to the school.

#### **Vibrio parahaemolyticus – Primary produce – March 2021**

An investigation into an increased number of locally acquired cases of *V. parahaemolyticus* was initiated in SA in March 2021. Cases were also identified in other jurisdictions, with a total of 21 cases reported in the outbreak between 1 February and 30 April 2021, including eight cases in SA, 12 cases in Victoria and one case in Western Australia (WA). Nineteen cases (90%) reported eating oysters in their incubation period, including 16 (84%) cases that ate oysters uncooked. Traceback identified a common source of oysters in a South Australian growing region.

#### **Vibrio parahaemolyticus – Multi-Jurisdictional Outbreak Investigation (MJOI 2021-002) – Primary produce – November 2021**

In September 2021, an increase in locally acquired *V. parahaemolyticus* notifications was identified in SA. Cases increased in several jurisdictions triggering a MJOI led by SA. In total 268 cases were identified in Australia with the highest proportion of cases in SA (28%), followed by Victoria (26%) and Queensland (22%). Case investigation identified 97% of cases reported consumption of oysters before their illness onset. Trace back by food regulators implicated SA grown oysters as the source resulting in temporary closure of oyster bays and a national food recall in November 2021. In response to the outbreak, SA growers implemented a *Vibrio* control program including ensuring infrastructure was available for adequate post-harvest temperature control and improved traceability of oysters.

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## For more information

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