



Communicable Disease Control Branch,  
Disease Surveillance & Investigation Section

# 2019 Annual Report

June 2021



Government  
of South Australia

SA Health

This annual report was prepared by:

Trisha Rogers and Ann Weaver

Disease Surveillance & Investigation Section  
Communicable Disease Control Branch  
SA Health  
PO Box 6  
Rundle Mall SA 5000

Telephone: 1300 232 272

Web: [www.sahealth.sa.gov.au/SurveillanceNotifiableConditions](http://www.sahealth.sa.gov.au/SurveillanceNotifiableConditions)

### **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
CDCB	Communicable Disease Control Branch
CJD	Creutzfeldt-Jakob disease
EHO	environmental health officer
Hib	<i>Haemophilus influenzae</i> type b
HUS	haemolytic uraemic syndrome
IMD	invasive meningococcal disease
MDU	Microbiological Diagnostic Unit
MERS	Middle East respiratory syndrome
MJOI	multi-jurisdictional outbreak investigation
MLST	multi-locus sequence type
MLVA	multi-locus variable tandem repeat analysis
NAT	nucleic acid test
NIDS	Notifiable Infectious Disease Surveillance Database
NNDSS	National Notifiable Diseases Surveillance System
NSW	New South Wales
NT	Northern Territory
PCR	polymerase chain reaction
RDNC	reaction did not conform
RRv	Ross River virus infection
SA	South Australia
SARS	severe acute respiratory syndrome
SNPs	single-nucleotide polymorphisms
STEC	Shiga toxin-producing <i>Escherichia coli</i>
STm	<i>Salmonella</i> Typhimurium
TTP	thrombotic thrombocytopenic purpura
WGS	whole genome sequencing

## Contents

<i>List of Tables</i> .....	6
<i>List of Figures</i> .....	6
Summary .....	8
Methods .....	9
Enteric diseases .....	10
<i>Botulism</i> .....	10
<i>Campylobacter</i> infection .....	10
Cholera .....	11
Cryptosporidiosis .....	11
Hepatitis A .....	12
Hepatitis E .....	13
Listeriosis .....	13
<i>Salmonella</i> infection .....	13
Shiga toxin-producing <i>E. coli</i> infection (STEC) .....	14
Haemolytic uraemic syndrome .....	16
<i>Shigella</i> infection .....	16
Typhoid .....	17
Paratyphoid .....	17
<i>Vibrio parahaemolyticus</i> infection .....	18
Yersinosis .....	18
Quarantinable diseases .....	19
Other notifiable infectious diseases .....	19
Leprosy .....	19
Creutzfeldt-Jakob disease .....	19
Legionellosis .....	19
Vaccine preventable diseases .....	20
<i>Diphtheria</i> .....	20
<i>Haemophilus influenzae</i> infection (invasive) .....	20
Influenza .....	20
Invasive meningococcal disease (IMD) .....	22
Measles .....	23
Mumps .....	23
Pertussis (whooping cough) .....	24

Invasive pneumococcal disease.....	25
Rotavirus infection .....	27
Rubella.....	28
Tetanus.....	28
Varicella zoster virus .....	28
<b>Vector borne diseases .....</b>	<b>29</b>
Barmah Forest virus infection.....	29
Chikungunya virus infection.....	29
Dengue virus infection .....	29
Japanese encephalitis .....	30
Malaria .....	30
Ross River virus .....	31
Zika virus infection.....	32
<b>Zoonoses .....</b>	<b>32</b>
Brucellosis .....	32
Leptospirosis.....	32
Psittacosis (Ornithosis).....	32
Q fever .....	32
<b>Appendices .....</b>	<b>34</b>
Appendix 1: Notifiable conditions by count, South Australia, 2014 to 2019.....	34
Appendix 2: Notifiable conditions by rate per 100,000 population, South Australia, 2014 to 2019.....	36
Appendix 3: Summary of outbreaks reported in 2019.....	38

## List of Tables

Table 1 Ten most commonly notified <i>Salmonella</i> serovars or phage types, South Australia, 2018.....	14
Table 2 Notified cases of typhoid and paratyphoid by reported risk factor, South Australia, 2018.....	17
Table 3 Notified cases of <i>Vibrio parahaemolyticus</i> infection by risk factor, South Australia, 2018.....	18
Table 4 Five most commonly identified serotypes of invasive pneumococcal disease, South Australia, 2018 .....	27
Table 5 Notified cases of dengue virus infection by country of acquisition, South Australia, 2018 .....	30
Table 6 Notified cases of malaria infection by region and country of acquisition, South Australia, 2018.....	31
Table 7 Notified cases of Q fever by risk factor, South Australia, 2018 .....	33

## List of Figures

Figure 1 Notified cases of <i>Campylobacter</i> infection by type, and month and year of illness onset, South Australia, 2013-2018 .....	10
Figure 2 Notified cases of <i>Campylobacter</i> infection by age group and sex, South Australia, 2018.....	10
Figure 3 Notified cases of cryptosporidiosis cases by month and year of illness onset, South Australia, 2013-2018 .....	11
Figure 4 Notified cases of cryptosporidiosis by age group and sex, South Australia, 2018 .....	12
Figure 5 Notified cases of hepatitis A infection by month and year of illness onset, South Australia, 2013-2018 .....	12
Figure 6 Notified cases of <i>Salmonella</i> infection by month and year of illness onset, South Australia, 2013-2018 .....	13
Figure 7 Notified cases of <i>Salmonella</i> infection by age group and sex, South Australia, 2018 .....	14
Figure 8 Notified cases of STEC by serogroup a by month and year of illness onset, and serogroup South Australia, 2013-2018.....	15
Figure 9 Notified cases of STEC infection by age group and sex, South Australia, 2018 .....	15
Figure 10 Notified cases of shigellosis by confirmation status, and month and year of illness onset, South Australia, 2013-2018 .....	16
Figure 11 Notified cases of <i>Shigella</i> infection by age group and sex, South Australia, 2018 .....	16
Figure 12 Notified cases of yersiniosis by month and year of illness onset, South Australia, 2013-2018.....	18
Figure 13 Notified cases of legionellosis by serogroup, and month and year of notification, South Australia, 2013-2018 .....	19
Figure 14 Notified cases of invasive meningococcal disease by serotype, and month and year of notification, South Australia, 2013-2018.....	22
Figure 15 Notified cases of invasive meningococcal disease by age group and sex, South Australia, 2018 .....	22
Figure 16 Notified cases of invasive <i>Haemophilus influenzae</i> infection by type, and month and year of notification, South Australia, 2013-2018.....	20

Figure 17 Notified cases of influenza virus by type, and month and year of notification, South Australia, 2013-2018 .....	21
Figure 18 Notified cases of influenza by age group and sex, South Australia, 2018 .....	21
Figure 19 Notified cases of measles by genotype, and month and year of notification, South Australia, 2013-2018 .....	23
Figure 20 Notified cases of mumps by month and year of notification, South Australia, 2013-2018 .....	24
Figure 21 Notified cases of mumps by laboratory testing method and year, South Australia, 2013-2018.....	24
Figure 22 Notified cases of pertussis by month and year of notification, South Australia, 2013-2018 .....	25
Figure 23 Notified cases of pertussis by age group and sex, South Australia, 2018 .....	25
Figure 24 Notifications of invasive pneumococcal disease by month and year, South Australia, 2013-2018.....	26
Figure 25 Notified cases of invasive pneumococcal disease by age group and sex, South Australia, 2018 .....	26
Figure 26 Notified cases of rotavirus infection by month and year of notification, South Australia, 2012-2018 .....	27
Figure 27 Notified cases of varicella zoster virus infection by infection type, and month and year of notification, South Australia, 2013-2018 .....	28
Figure 28 Notified cases of dengue virus infection by month and year of notification, South Australia, 2013-2018 .....	29
Figure 29 Notified cases of Ross River virus infection by month and year of notification, South Australia, 2013-2018 .....	31
Figure 30 Notified cases of Q fever by month and year of notification, South Australia, 2013-2018 .....	32
Figure 31 Notified cases of Q fever by laboratory testing method and year of notification, South Australia, 2013-2018 .....	33

## 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. 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 South Australia (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 SA of Primary Industries and Regions SA, environmental health officers (EHO) from local government, Food Policy and Programs Branch, Health Protection Programs and Scientific Services Branch, and SA Pathology.

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

- > 27,093 cases of influenza, including 102 influenza outbreaks in residential care facilities
- > 294 cases of Shiga-toxin producing *Escherichia coli* infection
- > 66 non-foodborne clusters of gastrointestinal disease, including 62 in residential care facilities
- > 46 cases of Ross River virus infection
- > 27 cases of invasive meningococcal disease
- > 19 cases of *Legionella pneumophila* serogroup 1 infection
- > 14 cases of Q fever
- > 14 cases of hepatitis A infection
- > 13 foodborne cluster investigations, 10 *Salmonella* outbreak investigations, six non-foodborne or non-notifiable disease investigations and five multi-jurisdictional outbreak investigations
- > 13 cases of paratyphoid fever
- > 10 cases of typhoid fever
- > 4 cases of measles
- > 2 cases of *Listeria monocytogenes* infection
- > 2 cases of hepatitis E 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 on 03 February 2021 by the calculated onset date from 1 January to 31 December 2019. The calculated onset date is the earliest date entered into NIDS; this may be the 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 was extracted on 03 February 2021 for cases notified from 1 January to 31 December 2019.

SA continues to use the surveillance case definitions prepared by the Communicable Diseases Network Australia for the Australian National Notifiable Diseases Surveillance System (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>

Australian Bureau of Statistics estimated residential population counts for June of each year were used in crude rate calculations and are expressed per 100,000 population.

The data reported here is correct as of the time of publishing but is 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 related to mycobacterial diseases, sexually transmitted infections, blood-borne viruses, Carbapenemase-producing Enterobacterales, rheumatic fever and rheumatic heart disease are reported elsewhere.

## Enteric diseases

In 2019, gastrointestinal illnesses accounted for 14% of disease notifications in SA, compared to 32% of notifications in 2018. There were 5,330 cases of notifiable gastrointestinal disease reported in 2019.

*Campylobacter* infection was the most commonly reported notifiable gastrointestinal disease in SA and accounted for 62% of these notifiable diseases.

### Botulism

There was one case of infant botulism notified in 2019, compared to no cases in 2018, and higher than the five-year average of less than one case per annum for the period of 2014 to 2018. No source of infection was identified for the 2019 case.

### *Campylobacter* infection

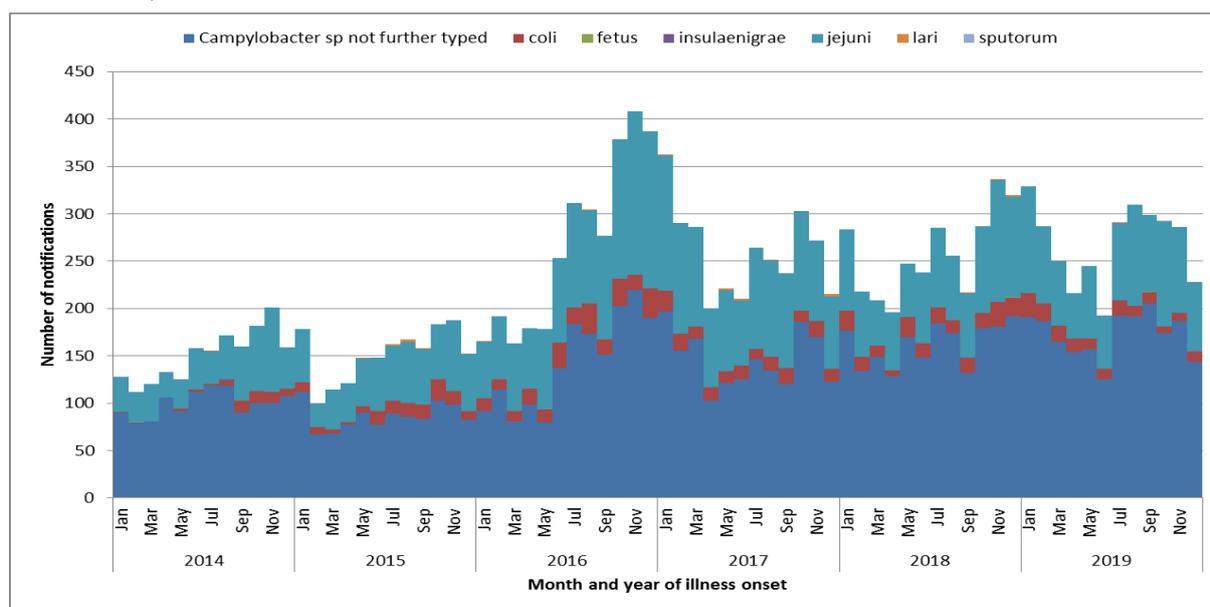
There were 3,287 notifications of *Campylobacter* infection in SA in 2019, consistent with 3,094 in 2018 and higher than the five-year average of 2,606 per annum for the period of 2014 to 2018 (Figure 1).

Fifty-four percent of *Campylobacter* notifications in 2019 were in males. There were higher rates of notification amongst males, compared to females, in the majority of five year age groups. The highest rate of campylobacteriosis notifications occurred in children aged less than five years of age and accounted for nine percent of campylobacteriosis notifications. Notification rates were next highest in persons aged 80 to 84 years and accounted for four percent of campylobacteriosis notifications (Figure 2).

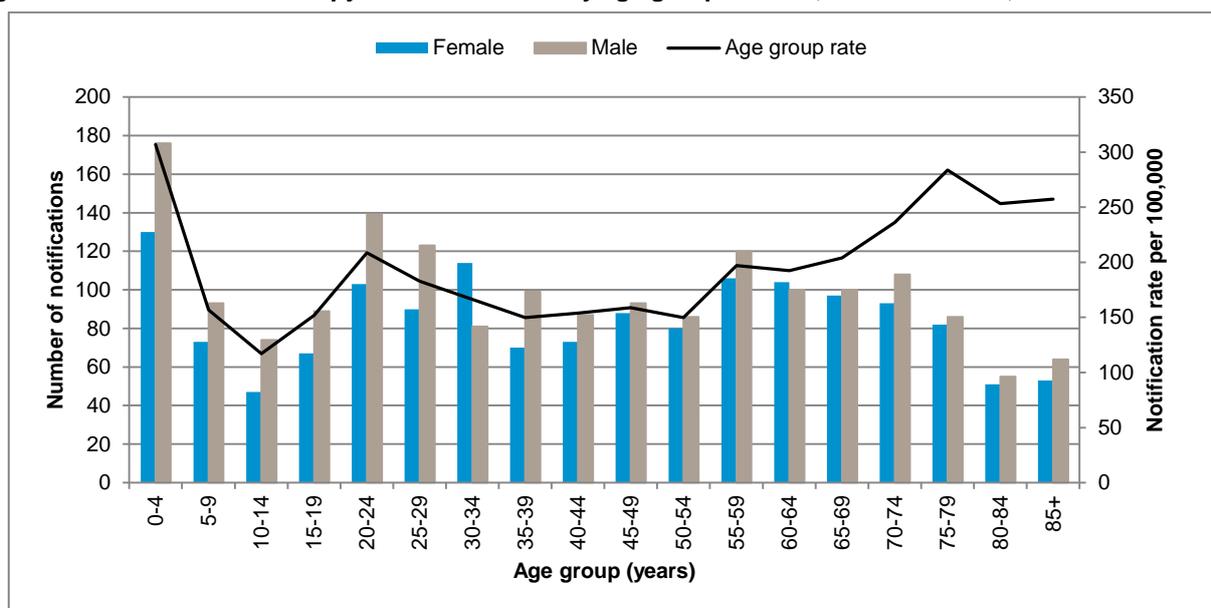
At different time points between July 2014 and June 2016, diagnostic laboratories have introduced enteric nucleic acid test (NAT) testing. Polymerase chain reaction (PCR) testing is more sensitive than culture methods and a decrease in the proportion of culture positive only results has been observed. In 2019, 1,309 (40%) *Campylobacter* notifications tested positive by PCR only compared to 1,206 notifications (39%) in 2018. The introduction of PCR testing is likely to have contributed to the increase in *Campylobacter* notifications from 2016 onwards.

In 2019, no outbreaks of campylobacteriosis were investigated ([Appendix 3](#)).

**Figure 1 Notified cases of *Campylobacter* infection by type, and month and year of illness onset, South Australia, 2014-2019**



**Figure 2 Notified cases of *Campylobacter* infection by age group and sex, South Australia, 2019**



### Cholera

There were no cases of cholera notified in 2019, similar to no cases in 2018, and the five-year average of less than one case per annum for the period of 2014 to 2018.

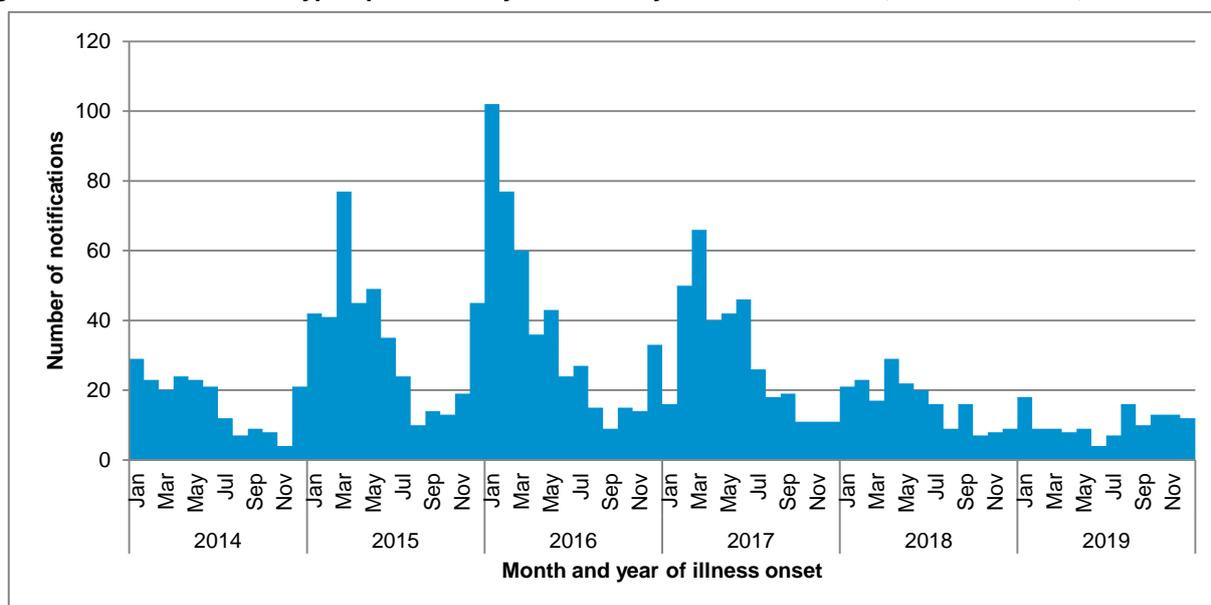
### Cryptosporidiosis

There were 128 cases of cryptosporidiosis reported in 2019, lower than the 197 notifications reported in 2018 and the five-year average of 326 cases reported per annum for the period of 2014 to 2018 (Figure 3).

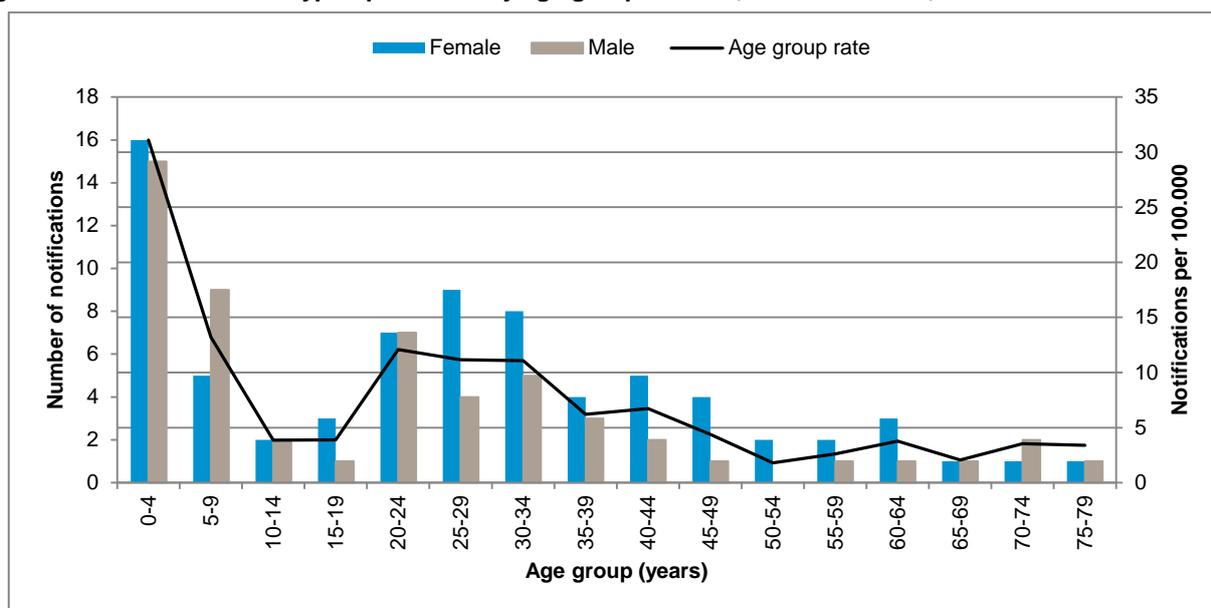
In 2019, cryptosporidiosis notifications were in 55 males and 73 females with an age range of less than one year to 79 years, and a median age of 24 years.

The highest number of cryptosporidiosis notifications occurred in children aged less than 10 years of age and these accounted for 35% of notifications. There were more notifications in males than females in children aged five to nine years, but more females than males were reported in cases aged greater than 15 years of age (Figure 4).

**Figure 3 Notified cases of cryptosporidiosis by month and year of illness onset, South Australia, 2014-2019**



**Figure 4 Notified cases of cryptosporidiosis by age group and sex, South Australia, 2019**



## Hepatitis A

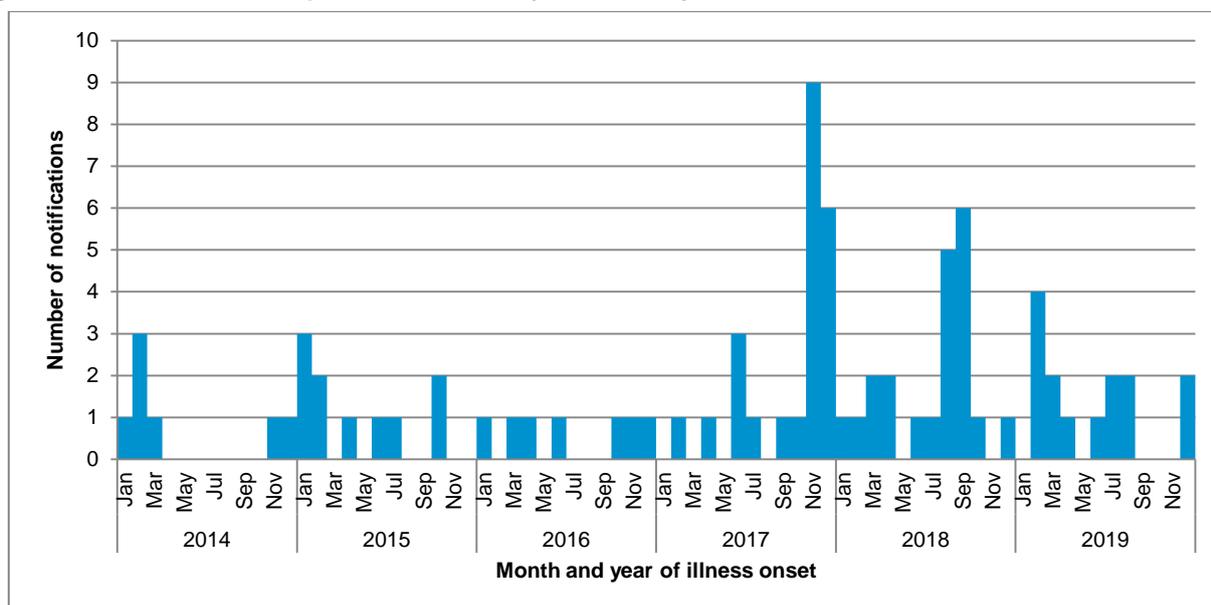
In 2019, there were 14 notifications of hepatitis A in SA, lower than the 21 notifications reported in 2018 but similar to the five-year average of 13.6 notifications per year for the period of 2014 to 2018 (Figure 5). Two of the notifications in 2019 were considered to be locally acquired. Countries of acquisition for the 12 overseas acquired cases in 2019 were six from India, three from Pakistan, two from Vanuatu and one from the United States of America.

In 2019, hepatitis A notifications were in three females and 11 males with an age range of four to 72 years, and a median age of 23 years. Seven cases of hepatitis A were hospitalised (50%) due to their infection. None of the cases identified as Aboriginal or Torres Strait Islander people. None of the cases were reported to be vaccinated against hepatitis A.

All cases of hepatitis A infection were interviewed and vaccination was recommended for all susceptible household contacts, as appropriate.

There were no outbreaks of locally acquired hepatitis A in SA in 2019 ([Appendix 3](#)).

**Figure 5 Notified cases of hepatitis A infection by month and year of illness onset, South Australia, 2014-2019**



## Hepatitis E

There were two cases of hepatitis E infection notified in 2019, compared to no notifications in 2018, and the five-year average of one notification per year for the period of 2014 to 2018. The cases were in two males and both were acquired overseas. One case each was acquired in India and Pakistan.

## Listeriosis

Two cases of listeriosis were notified in 2019, less than the five cases notified in 2018 and the five-year average of five cases per annum for the period of 2014 to 2018.

Listeriosis notifications were in a male and a female, both in their 60s. Both cases had pre-existing medical conditions and were hospitalised. There were no deaths reported in cases of listeriosis in 2019.

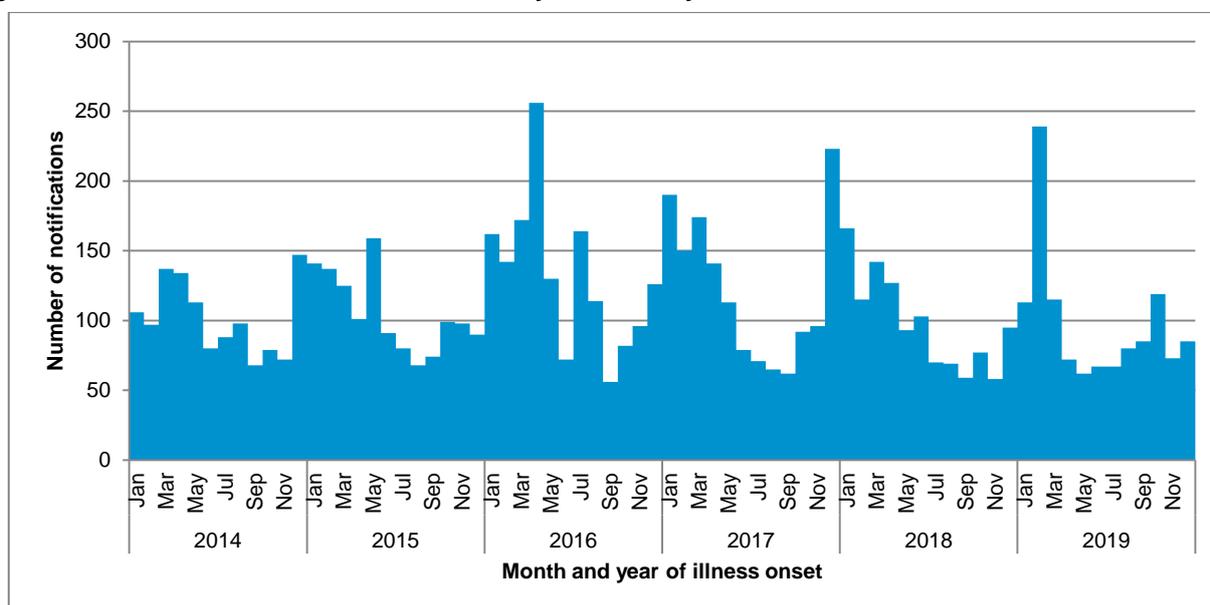
Further molecular based typing of all listeria isolates from 2019 cases was conducted at the Microbiological Diagnostic Unit (MDU) in Victoria. Based on molecular typing, it is unlikely that these cases were linked to each other or to cases in other jurisdictions.

## Salmonella infection

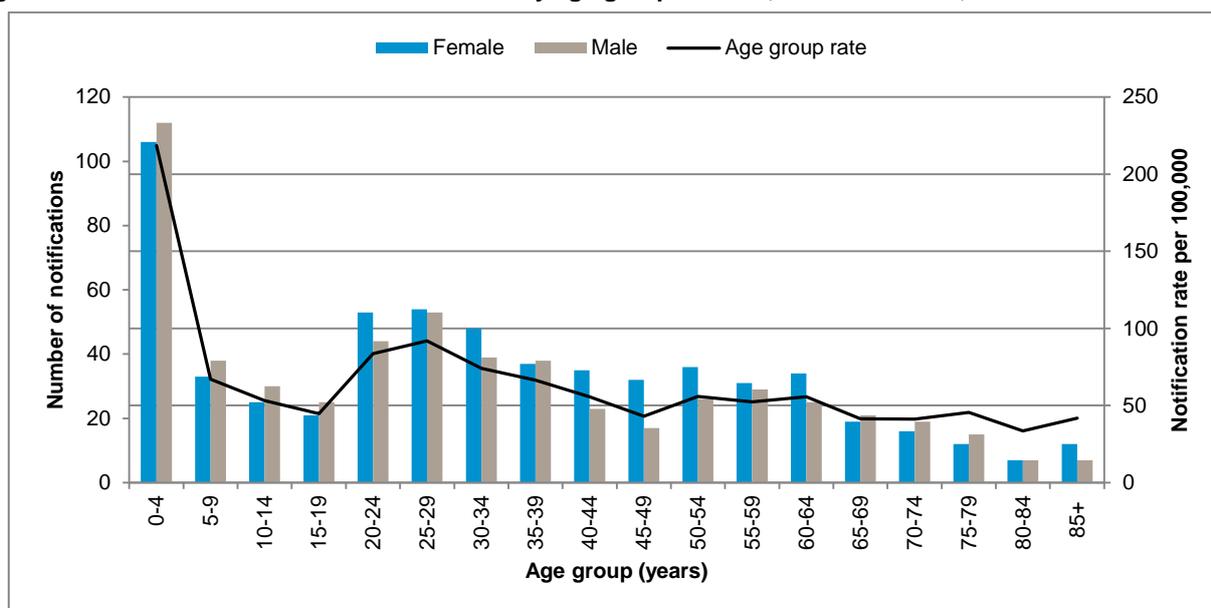
In 2019, there were 1,175 notifications of *Salmonella* infection in SA, consistent with 1,174 notifications in 2018 and below the five-year average of 1,337 notifications per year for the period 2014 to 2018 (Figure 6). Twenty-two per cent of gastrointestinal notifications this year were due to *Salmonella* infection.

In 2019, *Salmonella* infection notifications were in 570 males and 605 females with an age range of less than one year to 92 years, and a median age of 29 years. Cases reported this year were younger than the five-year median age of 31 years for the period 2014 to 2018 and consistent with more female cases being reported than males in the last five years. The highest number of salmonellosis notifications occurred in children aged less than five years of age and accounted for 18% of notifications (Figure 7).

**Figure 6 Notified cases of *Salmonella* infection by month and year of illness onset, South Australia, 2014-2019**



**Figure 7 Notified cases of *Salmonella* infection by age group and sex, South Australia, 2019**



In 2019, *Salmonella* Typhimurium phage types 9, 135 and 108 were the most common serotype or phage-type notified and accounted for 33% of notifications (Table 1).

There were 64 notifications of *Salmonella* Enteritidis infection reported in 2019, higher than the 48 notifications reported in the previous year. Among cases, 60 (94%) had travelled overseas during their exposure period; and 35 (58%) cases had travelled to Indonesia.

In 2019, 10 outbreaks of *Salmonella* infection were investigated ([Appendix 3](#)). Seven outbreaks were directly linked to eating at or takeaway from a bakery or restaurant. Of the remaining three outbreaks, two were linked to primary production and one was linked to a private residence or private function. In 2019, 13 *Salmonella* clusters were also investigated.

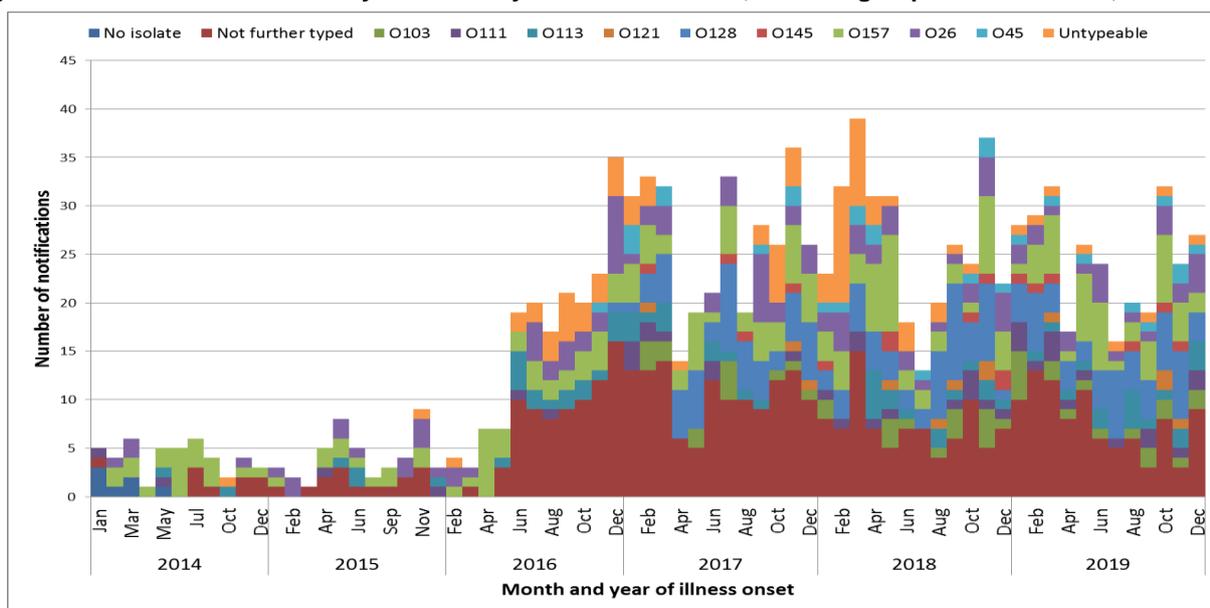
**Table 1 Ten most commonly notified *Salmonella* serovars or phage types, South Australia, 2019**

<i>Salmonella</i> serovar or phage type	Cases
<i>S. Typhimurium</i> 9	223
<i>S. Typhimurium</i> 135	94
<i>S. Typhimurium</i> 108	76
<i>S. Enteritidis</i>	64
<i>S. subspecies</i> 1 ser 4,5,12:i:-	43
<i>S. Infantis</i>	40
<i>S. Weltevreden</i>	35
<i>S. Saintpaul</i>	35
<i>S. Paratyphi</i> B var java	30
<i>S. Typhimurium</i> 12a	25
Other	510
<b>Total</b>	<b>1,175</b>

### Shiga toxin-producing *E. coli* infection (STEC)

In 2019, 294 notifications of STEC infection were reported, compared to 315 notifications in 2018 and higher than the five-year average of 180 notifications per annum for the period of 2014 to 2018 (Figure 8).

**Figure 8 Notified cases of STEC by month and year of illness onset, and serogroup South Australia, 2014-2019**

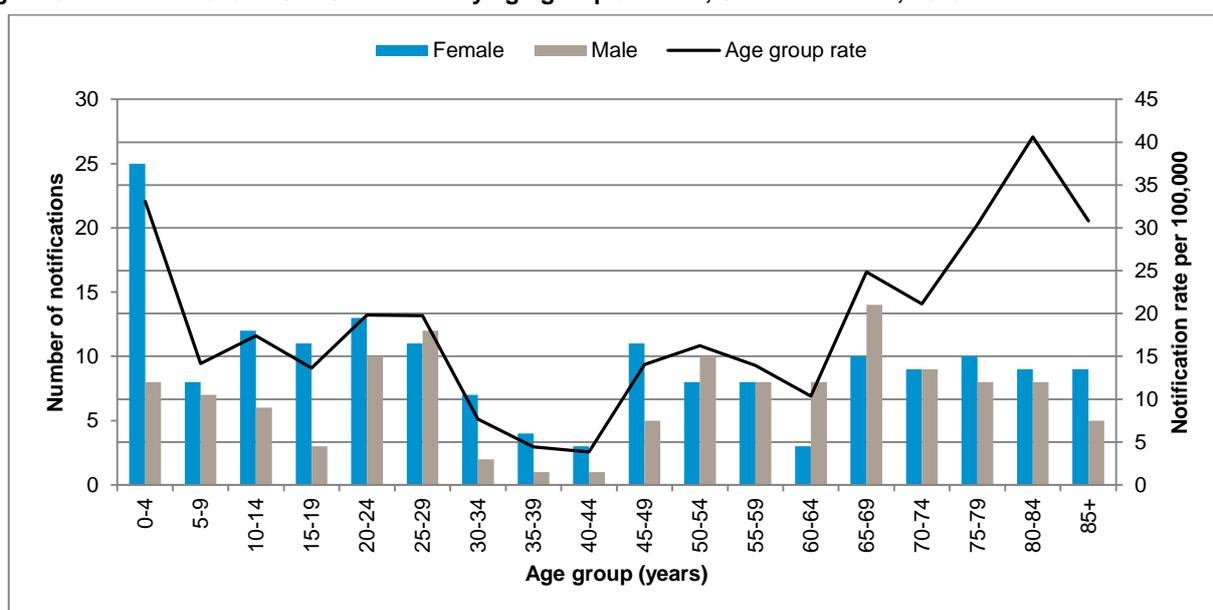


STEC testing is performed by only one laboratory in SA and in June 2016 this laboratory changed testing practices to test all faeces samples for STEC as a component of a NAT bacterial pathogen panel, where previously testing was conducted only if STEC testing was requested or if blood was present in the sample. This change has contributed to a large increase in the number of STEC cases notified to CDCB since June 2016.

Thirty five individuals were co-infected with two or more different serogroups of STEC. In 2019, cases comprised of 104 males and 142 females with an age range of less than one year to 97 years, and a median age of 46.5 years (Figure 9).

In 2019, STEC serogroups were determined by a multiplex panel of nine serogroups and testing identified 53 (18%) cases of STEC O128 infection and 46 (16%) cases of STEC O157 infection. Serogroups for 102 (35%) screening positive cases were unable to be determined because the serogroup was not included in the multiplex panel (94 cases) or because there was insufficient DNA in the sample (8 cases). Cluster detection of STEC serogroups not included in the multiplex panel is difficult.

**Figure 9 Notified cases of STEC infection by age group and sex, South Australia, 2019**



## Haemolytic uraemic syndrome

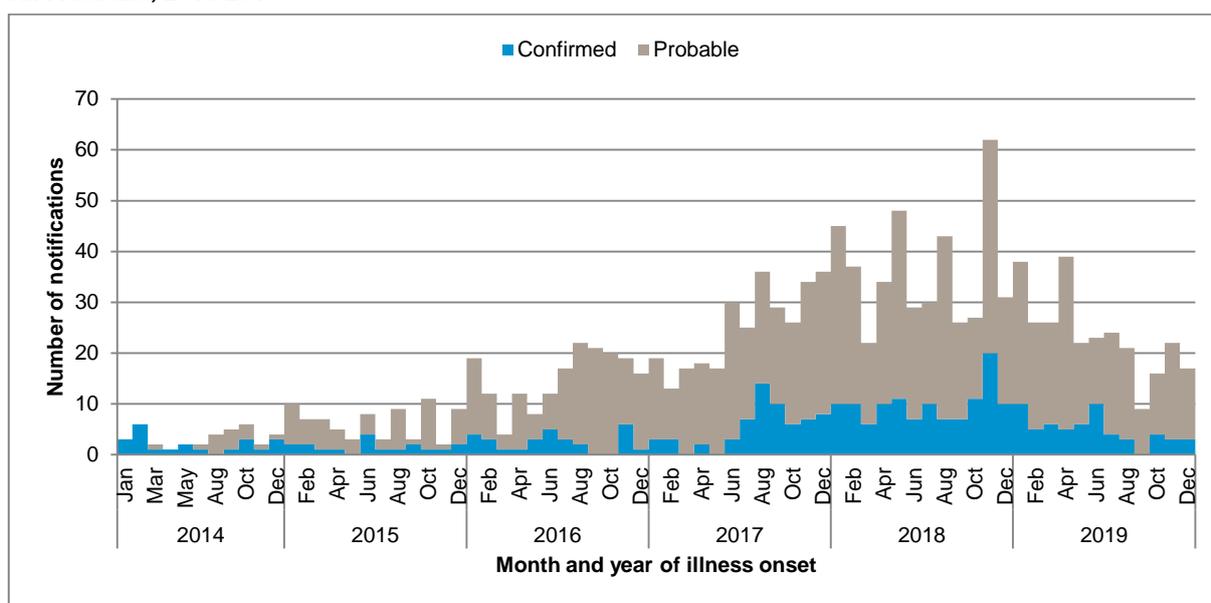
In 2019, there were no notifications of haemolytic uraemic syndrome (HUS) reported, similar to the no notifications reported in 2018 and lower than the five-year average of 1.4 notifications per annum for the period of 2014 to 2018.

## Shigella infection

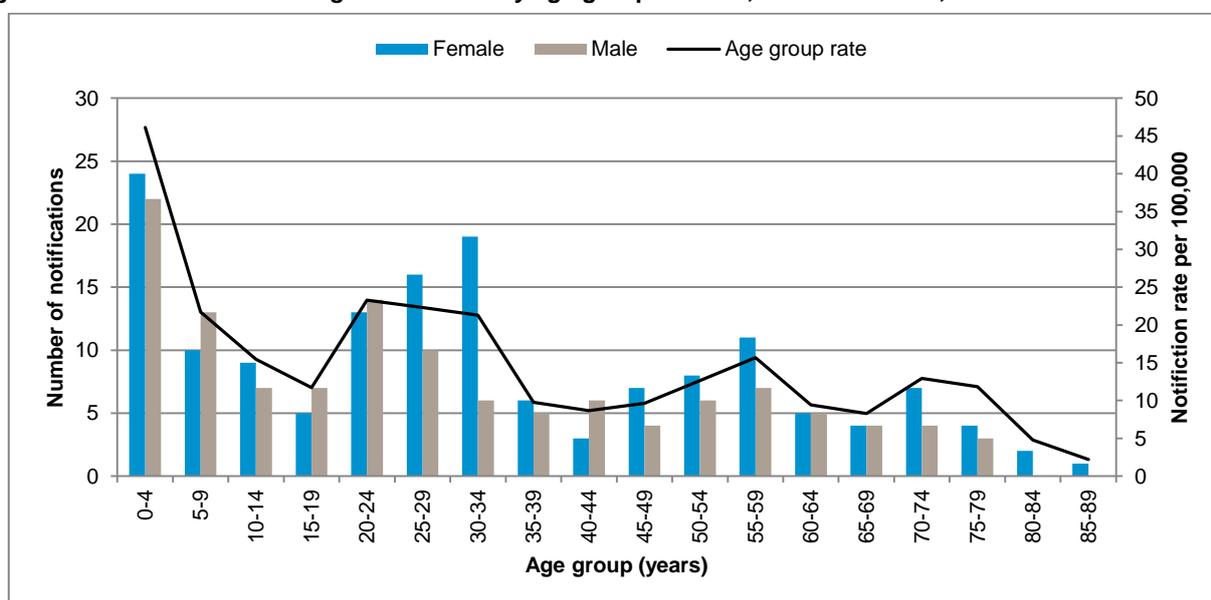
Enteric PCR panel testing includes the detection of *Shigella* and shares the same target genes with enteroinvasive *E. coli*; thus differentiating between the two organisms is difficult. In SA, a probable case definition has been used for cases reported since 2014 to differentiate confirmed *Shigella* culture notifications from probable *Shigella*/enteroinvasive *E. coli*. In 2019, 283 cases of *Shigella* infection were notified, consisting of 59 confirmed cases and 224 probable cases. In 2018, 119 confirmed cases and 315 probable cases were notified. The five-year average of confirmed cases is 50 cases per annum for the period of 2014 to 2018 (Figure 10).

In 2019, *Shigella* infections (confirmed and probable) were in 156 females and 127 males with an age range of less than one year to 87 years, and a median age of 28 years. Of the confirmed *Shigella* cases, there were 35 females and 24 males with an age range of less than one year to 79 years and a median age of 31 years (Figure 11).

**Figure 10 Notified cases of shigellosis by confirmation status, and month and year of illness onset, South Australia, 2014-2019**



**Figure 11 Notified cases of Shigella infection by age group and sex, South Australia, 2019**



Fifty-seven percent of shigellosis cases in 2019 occurred in people who identify as Aboriginal and Torres Strait Islander people compared with 68% in 2018. The majority of these Aboriginal and Torres Strait Islander people were part of an outbreak of shigellosis in remote far-north and far-west regions of SA that began in June 2017 and ended in December 2019.

*Shigella flexneri* 2b was the most common species and subtype notified; and accounted for 34% of notified cases.

Overseas travel was reported by 112 cases of *Shigella* infection in 2019; including 14 confirmed cases and 98 probable cases. Of confirmed cases, 28% of *Shigella* cases reported overseas travel, compared to only eight percent in 2018.

Since July 2014, CDCB has been receiving laboratory notifications for *Shigella* that are PCR positive. Different laboratories in SA have introduced this test at different time points; specifically one laboratory introduced the test in July 2014, one in May 2015 and one in June 2016. In 2017, there were no major changes to laboratory testing, making this the first year over the past four years with no laboratory testing changes relevant to *Shigella*. Most of the cases (79%) reported in 2019 were PCR positive only, 20% were culture and PCR positive, and one percent were culture positive only.

## Typhoid

There were 10 cases of *Salmonella* Typhi infection notified in 2019, compared to six cases notified in 2018 and a five-year average of seven cases per annum for the period 2014 to 2018.

In 2019, *Salmonella* Typhi infection notifications were in six females and four males with an age range of three to 52 years, and a median age of 23 years. All cases were hospitalised and all 10 cases reported overseas travel during their incubation period (seven cases reported travel to India, two cases to Pakistan and one case to mainland south-east Asia) (Table 2).

All cases of *Salmonella* Typhi infection were interviewed and close household contacts were screened for carriage or infection. In 2019, no secondary cases were identified.

## Paratyphoid

In 2019, there were 13 cases of *Salmonella* Paratyphi infection notified, higher than the seven cases notified in 2018 and the five-year average of six notifications per annum for the period 2014 to 2018.

In 2019, *Salmonella* Paratyphi infection notifications were in four females and nine males with an age range of less than one to 71 years, and a median age of 29 years. Six cases of paratyphoid were hospitalised and 10 of the 13 cases were acquired overseas (Table 2). Three cases reported no overseas travel and the source of infection could not be identified.

Contact tracing of *Salmonella* Paratyphoid cases occurred and one secondary case was identified from the screening of contacts.

**Table 2 Notified cases of typhoid and paratyphoid by likely country of acquisition, South Australia, 2019**

Likely country of acquisition	Typhoid	Paratyphoid
Locally acquired	0	3
India	7	6
Indonesia	0	1
Mainland south-east Asia	1	1
Nepal	0	1
Pakistan	2	0
Thailand	0	1
<b>Total</b>	<b>10</b>	<b>13</b>

## Vibrio parahaemolyticus infection

*Vibrio parahaemolyticus* infection became notifiable in SA on 18 February 2016. In 2019, there were eight cases of *V. parahaemolyticus* infection notified, lower than the 11 cases notified in 2018 and similar to the three-year average of eight cases per annum for the period 2016 to 2018. Cases were in five females and three males with an age range of 35 to 58 years and a median age of 49 years.

Five of the cases acquired *V. parahaemolyticus* infection overseas (all had gastroenteritis), with three cases acquired in Indonesia, one case in Malaysia and one in Viet Nam (Table 3). There were three locally acquired cases in 2019, all of which were cases with gastroenteritis and all cases reported eating raw oysters during their incubation period.

**Table 3 Notified cases of *Vibrio parahaemolyticus* infection by risk factor, South Australia, 2019**

Risk factor	Cases
<b>Overseas travel</b>	
Indonesia	3
Malaysia	1
Viet Nam	1
<b>Other</b>	
Consumption of raw oysters	3
<b>Total</b>	<b>8</b>

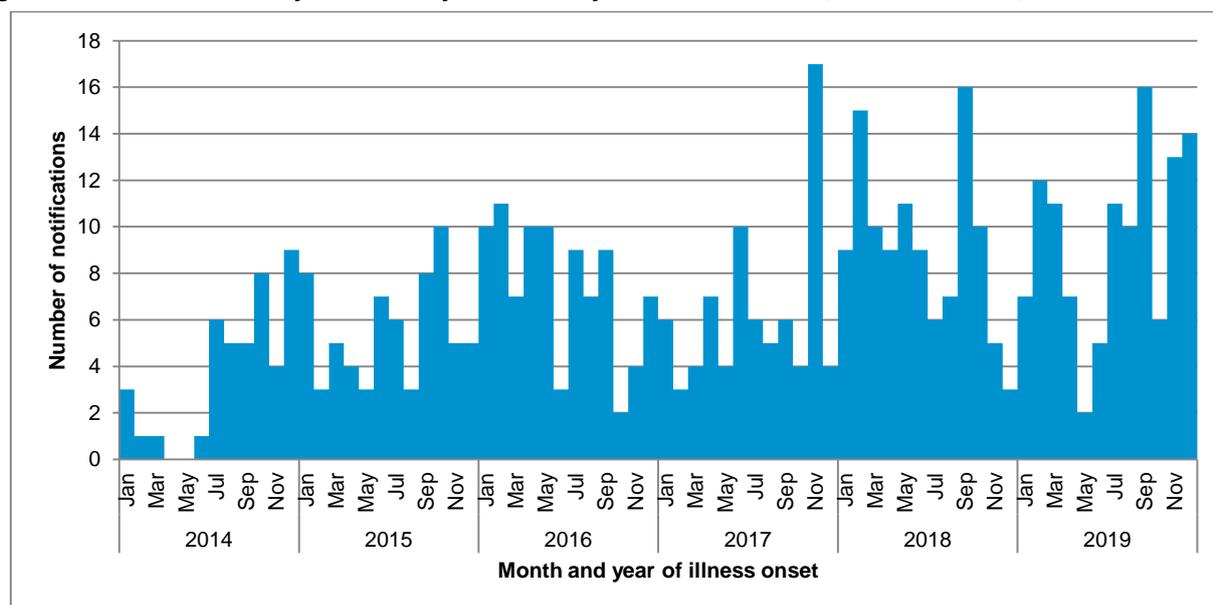
## Yersinosis

In 2019, there were 112 notifications of *Yersinia* infection reported, similar to the 110 cases reported in 2018 and higher than the five-year average of 77 cases per annum for the period 2014 to 2018 (Figure 12).

In 2019, *Yersinia* infection notifications were in 38 males and 74 females, with an age range of one year to 90 years and a median age of 42 years. Of the 112 cases, all were characterised as *Y. enterocolitica*.

The introduction of PCR testing by one laboratory in July 2014 and another laboratory in December 2015 has contributed to the increase in cases over the period. In June 2016, the main public health laboratory commenced using a PCR panel for enteric bacteria which did not include testing for *Yersinia*. Whilst the sensitivity of the surveillance system has increased with the introduction of PCR testing, further laboratory testing to characterise isolates by biotype has ceased, which impedes the detection of clusters.

**Figure 12 Notified cases of yersiniosis by month and year of illness onset, South Australia, 2014-2019**



## 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 2019.

## Other notifiable infectious diseases

### Leprosy

There were no cases of leprosy notified in SA in 2019, similar to no notifications in 2018 and the five-year average of less than one case per year from 2014 to 2019.

### Creutzfeldt-Jakob disease

Four cases of Creutzfeldt-Jakob disease (CJD) were notified in 2019, similar to six cases notified in 2018 and the five-year average of four cases per year from 2014 to 2018. Cases of CJD comprised of one female and three males with a median age of 72 years. There were no links or common exposures identified between cases and all were classified as sporadic cases of classical CJD.

### Legionellosis

Forty-five cases of legionellosis were notified in 2019, higher than the 32 cases reported in 2018 and the five-year average of 34 notifications per annum for the period 2014 to 2018 (Figure 13).

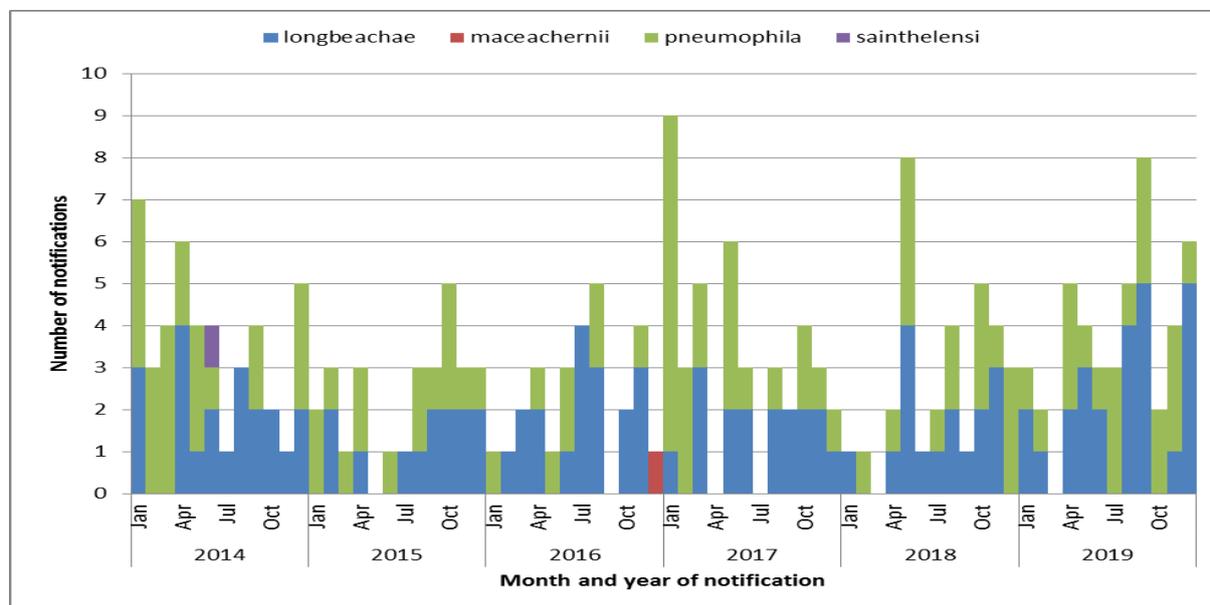
Laboratory tests attributed 20 cases to *Legionella pneumophila*, with 19 typed as serogroup 1 and one typed as not serogroup 1. Twenty-five cases were further typed to be *L. longbeachae*.

The 19 notified cases of *L. pneumophila* serogroup 1 comprised of seven females and 12 males with an age range of 27 to 87 years and a median age of 61 years. Seventeen cases were hospitalised and no cases were reported to have died from the infection.

All cases of *L. pneumophila* are referred to Health Protection Programs, SA Health for environmental investigation. No links or common sources were identified.

The 25 notified cases of *L. longbeachae* comprised of nine females and 16 males with an age range of 24 to 91 years and a median age of 69 years. Cases resided across metropolitan Adelaide and rural SA. Seventeen cases reported hospitalisation and no deaths were reported.

**Figure 13 Notified cases of legionellosis by serogroup, and month and year of notification, South Australia, 2014-2019**



## Vaccine preventable diseases

There were no cases of polio reported in 2019.

### Diphtheria

There were no cases of diphtheria infection notified in 2019, compared to one case of cutaneous diphtheria notified in 2018, and the five-year average of less than one notification per year for the period of 2014 to 2018.

### Haemophilus influenzae infection (invasive)

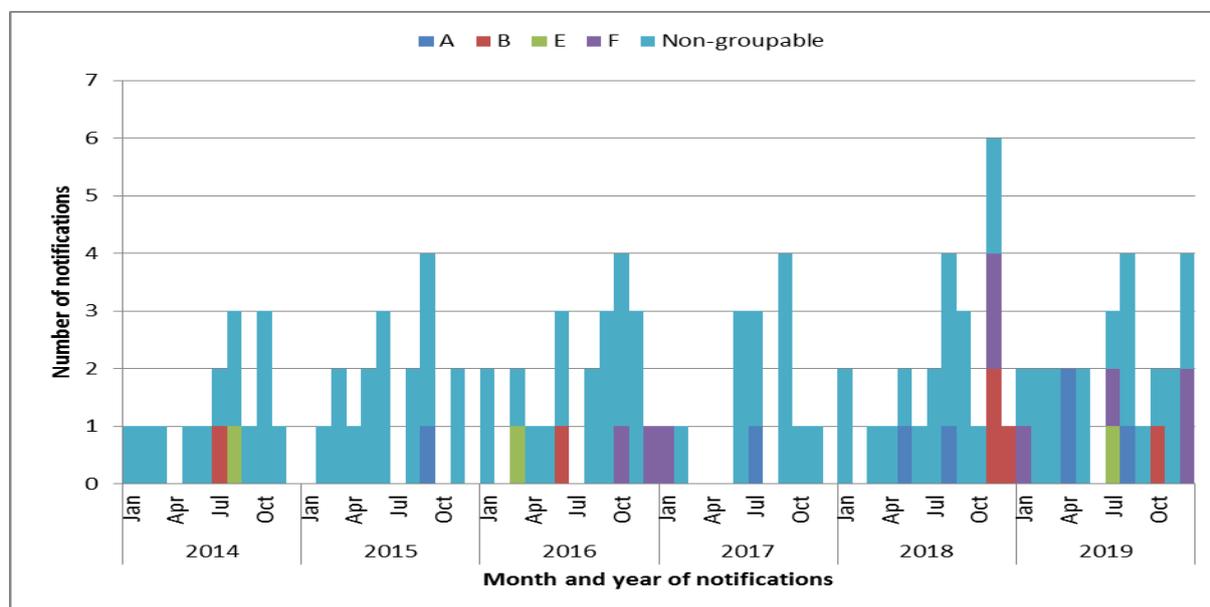
In 2019, there were 26 cases of invasive *H. influenzae* infection notified, similar to the 24 cases reported in 2018 and the five-year average of 18 cases reported per annum for the period 2014 to 2018 (Figure 14).

In 2019, *H. influenzae* infection notifications comprised of 13 females and 13 males with an age range of less than one to 93 years and a median age of 65 years. There were two deaths due to *H. influenzae* infection. Four cases identified as Aboriginal or Torres Strait Islander peoples in 2019, similar to the four cases in 2018.

Further laboratory tests attributed the cases to the following groups: three cases to type A, one case to type B (HiB), one case to type E, four cases to type F and the remainder were non-groupable. The one case of HiB in 2019 was lower than the three cases reported in 2018 and similar to the five-year average of one case per annum for the period of 2014 to 2018.

The case of HiB in 2019 was a male in his 60s from metropolitan Adelaide. The case was not vaccinated against HiB. In accordance with national guidelines, contact tracing of all close contacts occurred and clearance antibiotics were given, where appropriate.

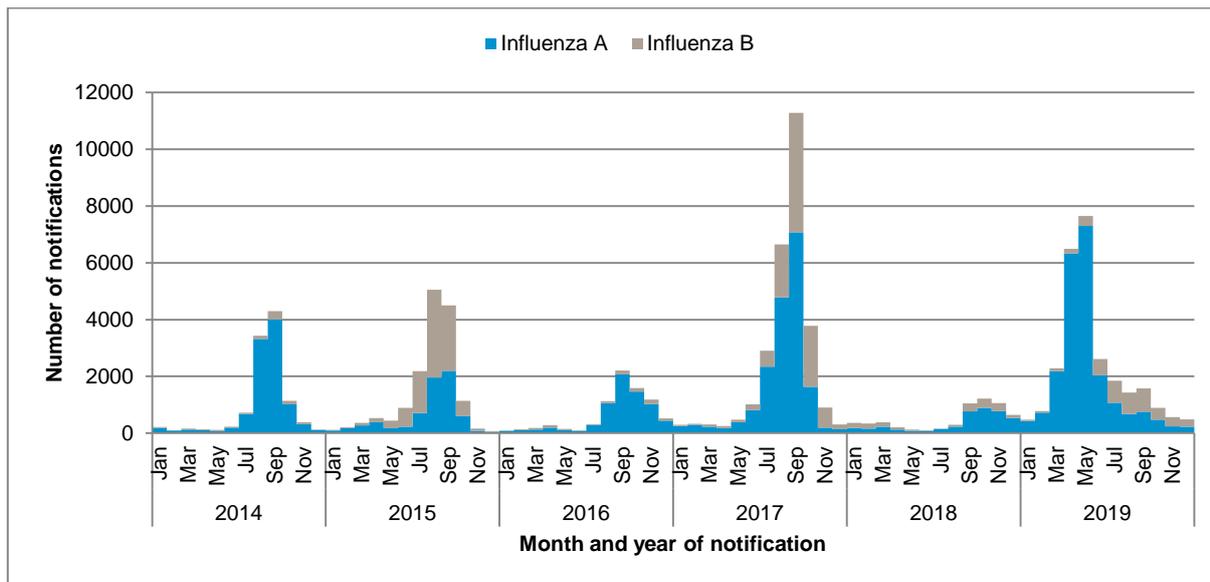
**Figure 14 Notified cases of invasive *Haemophilus influenzae* infection by type, and month and year of notification, South Australia, 2014-2019**



### Influenza

There were 27,093 notifications of laboratory confirmed influenza in 2019, significantly higher than the previous year with 5,929 notifications for 2018 and higher than the five-year average of 13,795 notifications per annum for 2014 to 2018 (Figure 15).

**Figure 15 Notified cases of influenza virus by type, and month and year of notification, South Australia, 2014-2019**



In 2019, notifications of influenza were in 14,886 females and 12,207 males. Cases ranged in age from less than one to 105 years with a median age of 31 years.

The highest number of influenza notifications occurred in children aged less than 10 years of age and accounted for 25% of notifications (lower than in 2018 when 28% of notifications were in children aged less than 10 years). Notification rates in 2019 were also highest in this age group. Persons aged 85 or older accounted for five percent of all notifications in 2019, higher than three percent in 2018 (Figure 16).

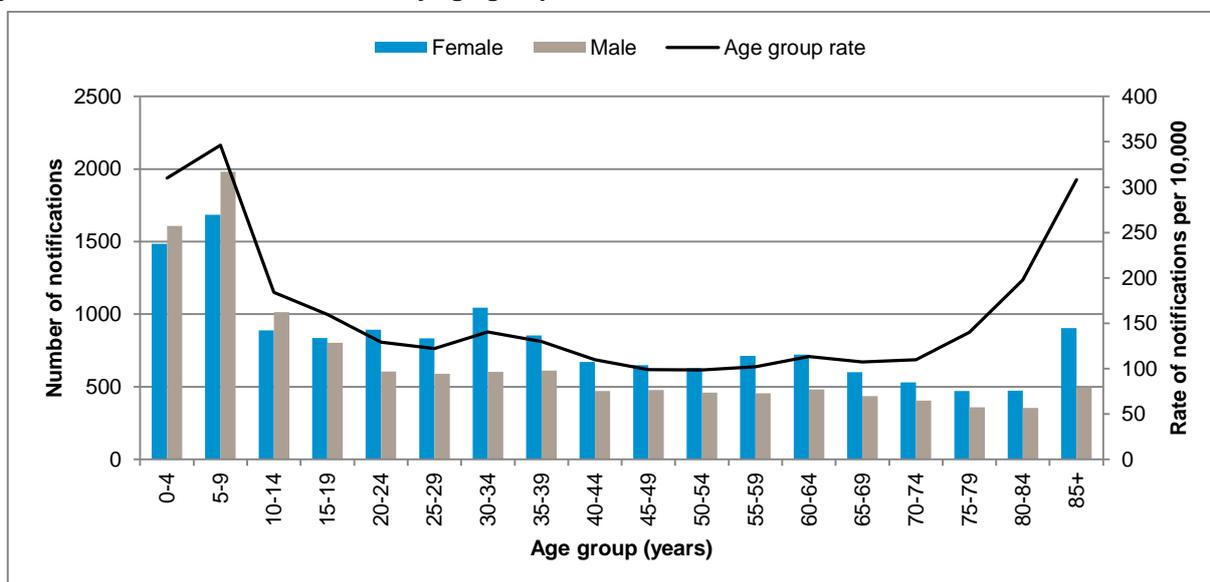
Among influenza notifications in 2019, 83% (22,446) were reported as influenza virus type A and 17% (4,647) were reported as influenza virus type B, compared to 70% type A and 30% type B in 2018.

In 2019, there were 1,341 cases that reported to identify as Aboriginal or Torres Strait Islander peoples and this represented 1.4% of all influenza notifications. The completeness of indigenous status data was 74%, similar to previous years.

In 2019, there were 119 deaths reported due to influenza virus infection, compared to 15 deaths in 2018 and 124 deaths in 2017.

In 2019 there were 107 outbreaks of influenza reported to CDCB, 102 of these were in residential care facilities and five in other high-risk settings ([Appendix 3](#)). Influenza outbreaks in 2019 were markedly higher than in 2018, during which 10 outbreaks were reported, all in residential care facilities.

**Figure 16 Notified cases of influenza by age group and sex, South Australia, 2019**



## Invasive meningococcal disease (IMD)

There were 27 cases of invasive meningococcal disease notified in 2019, lower than the 34 cases reported in 2018 and the five-year average of 32 cases reported per annum for the period 2014 to 2018 (Figure 17).

In 2019, IMD notifications were in 17 females and 10 males with an age range of less than one to 101 years. The median age of cases in 2019 was 18 years, similar to the five-year median age of 20 years. The highest number of notifications occurred in females in the age group less than one to four years. Notification rates were also highest in the less than one to four year age group (Figure 18).

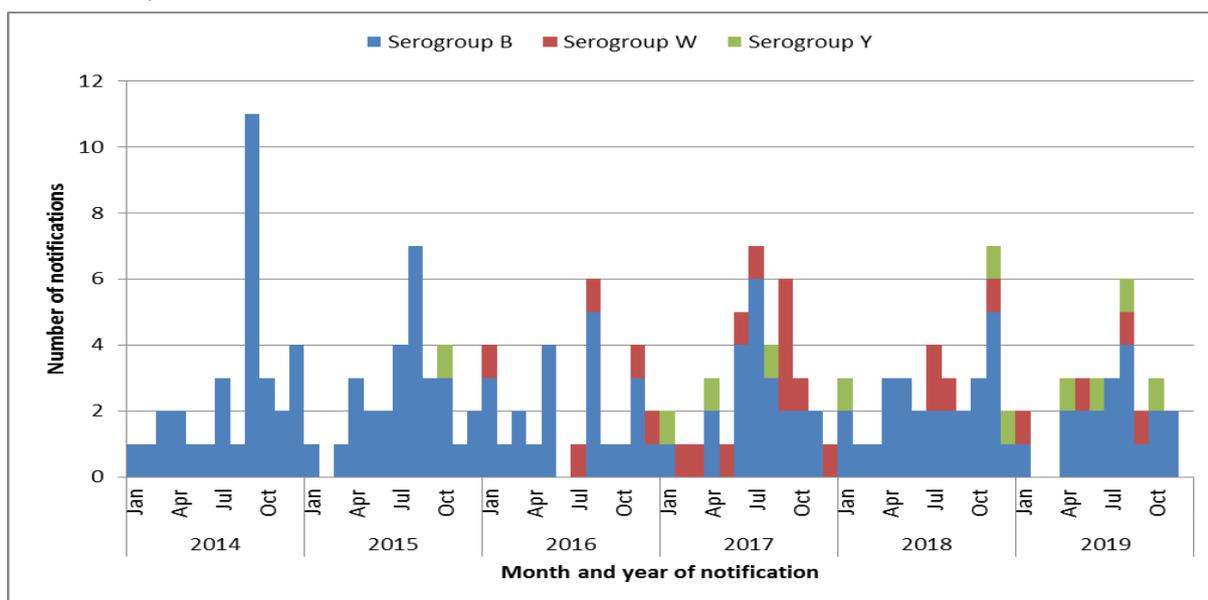
Twenty-one cases (78%) resided in metropolitan Adelaide and six cases (22%) resided in rural or remote SA. Three cases identified as Aboriginal or Torres Strait Islander peoples.

Further laboratory testing attributed 19 cases to serogroup B, four cases to serogroup W and four cases to serogroup Y.

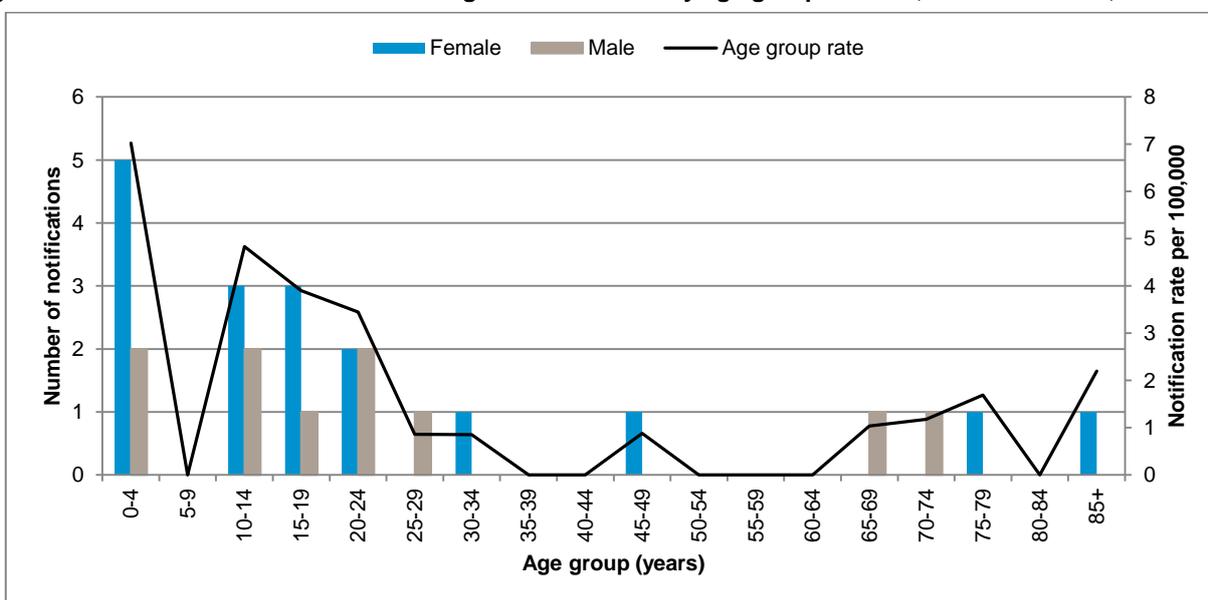
All cases were hospitalised in 2019. One case died due to the disease (serogroup W). Two of the cases of had an epidemiological link (serogroup B).

In accordance with national guidelines, contact tracing occurred for all cases; clearance antibiotics were provided for close contacts as well as vaccination, where appropriate.

**Figure 17 Notified cases of invasive meningococcal disease by serotype, and month and year of notification, South Australia, 2014-2019**



**Figure 18 Notified cases of invasive meningococcal disease by age group and sex, South Australia, 2019**

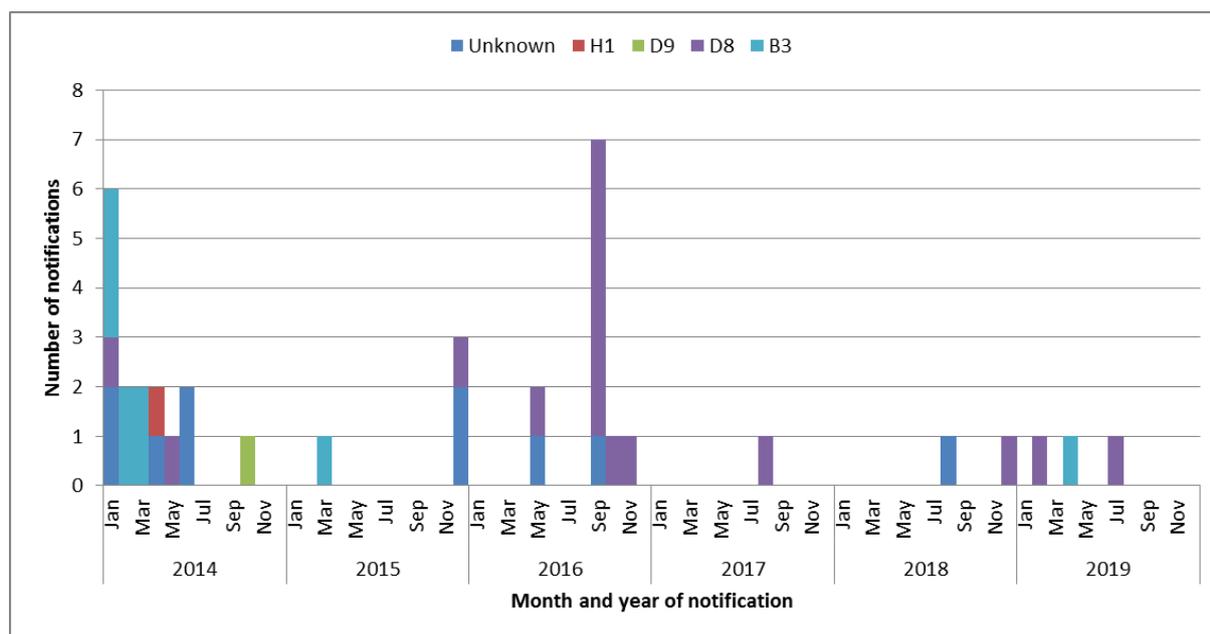


## Measles

There were four notified cases of measles in 2019, higher than the two cases notified in 2018 and lower than the five-year average of seven cases notified per annum for the period of 2014 to 2018. Cases were in three females and one male with an age range of 19 to 21 years and a median of 20 years. One case acquired the infection after travel to Romania. A second case was locally acquired, but had an overseas travel link. The remaining two cases were locally acquired with the epidemiological link unable to be established. Two cases were identified as genotype D8, one was genotype B3 and one was not genotyped. Three of the four cases were not vaccinated against measles (Figure 19).

In accordance with national guidelines, immediate contact tracing occurred for all cases; vaccination or immunoglobulin was provided as appropriate for identified susceptible contacts. Where appropriate, isolation of some susceptible contacts was required.

**Figure 19 Notified cases of measles by genotype, and month and year of notification, South Australia, 2014-2019**



## Mumps

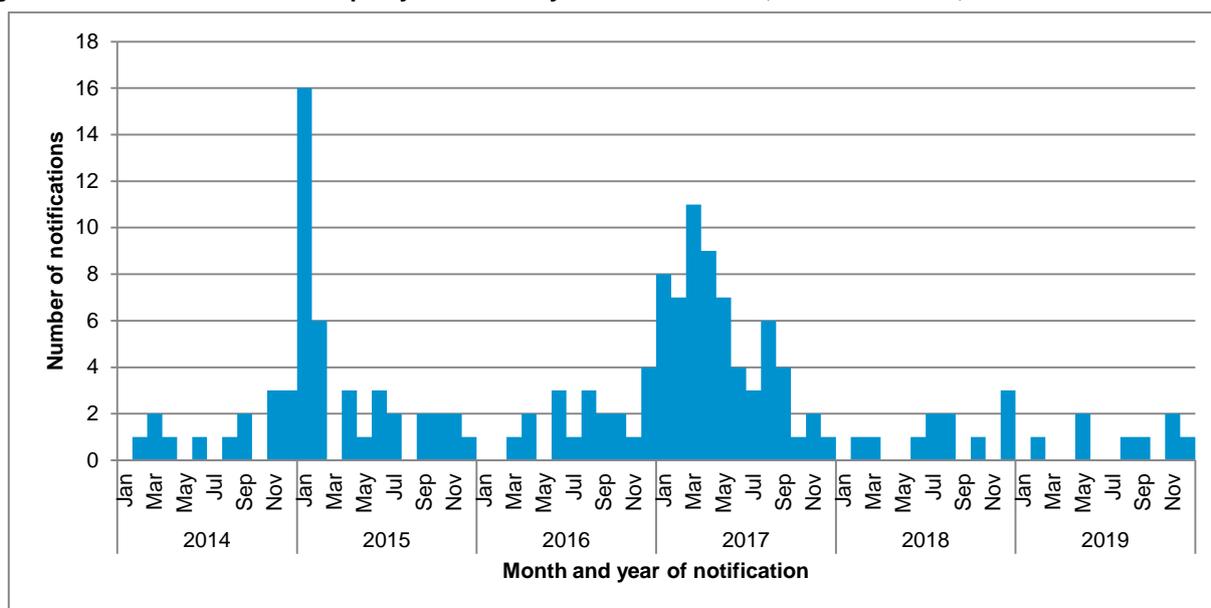
Eight cases of mumps were notified in 2019, lower than the 11 cases reported in 2018 and three times lower than the five-year average of 29 cases reported per annum for the period of 2014 to 2018 (Figure 20). In 2017, an outbreak of mumps occurred in the Anangu Pitjantjatjara Yankunytjatjara (APY) Lands which largely accounted for the increase in cases seen.

In 2019, mumps notifications were in four females and four males with an age range of 23 to 71 years and a median age of 51 years.

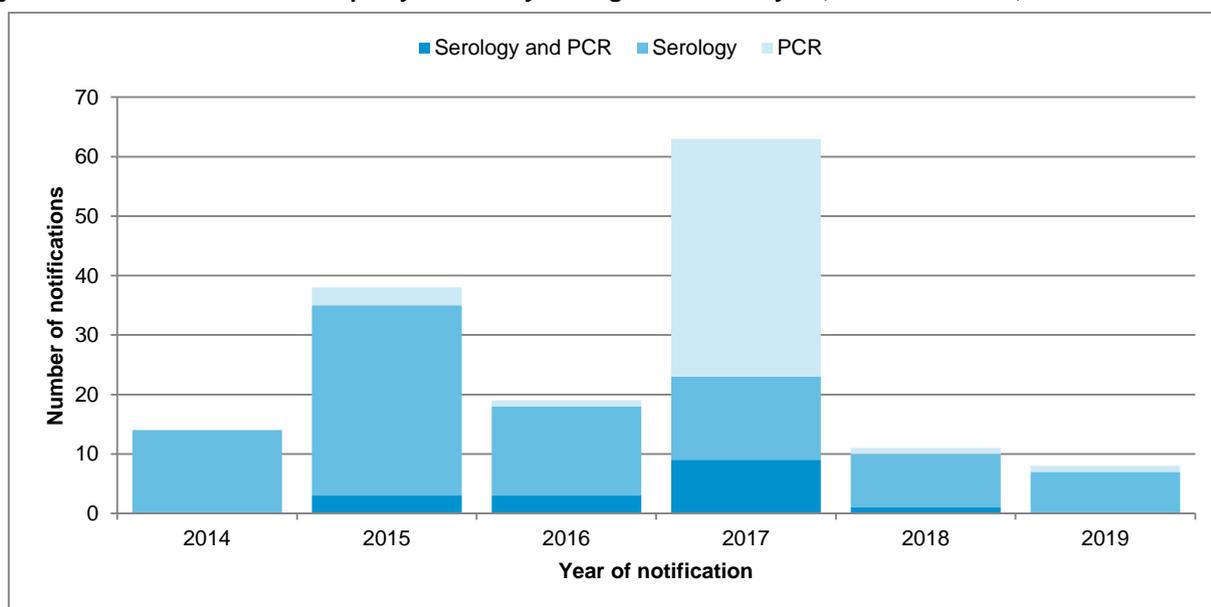
In 2019, one case had documented evidence of receiving two mumps containing vaccines.

PCR testing to diagnose mumps in SA was introduced in 2015. PCR testing increases the accuracy of diagnoses and is a less invasive test. In 2019, one case was diagnosed by PCR, compared to two cases in 2018, 49 cases in 2017, and four cases in 2016. The proportion of diagnosis confirmation by PCR testing is expected to increase (Figure 21).

**Figure 20 Notified cases of mumps by month and year of notification, South Australia, 2014-2019**



**Figure 21 Notified cases of mumps by laboratory testing method and year, South Australia, 2014-2019**

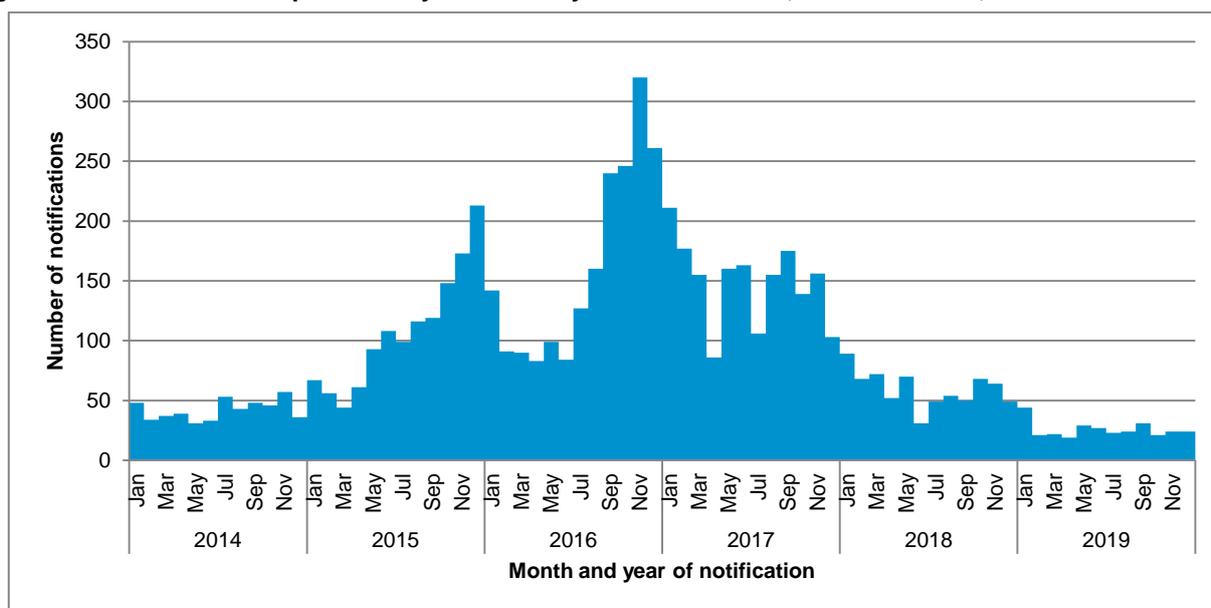


### Pertussis (whooping cough)

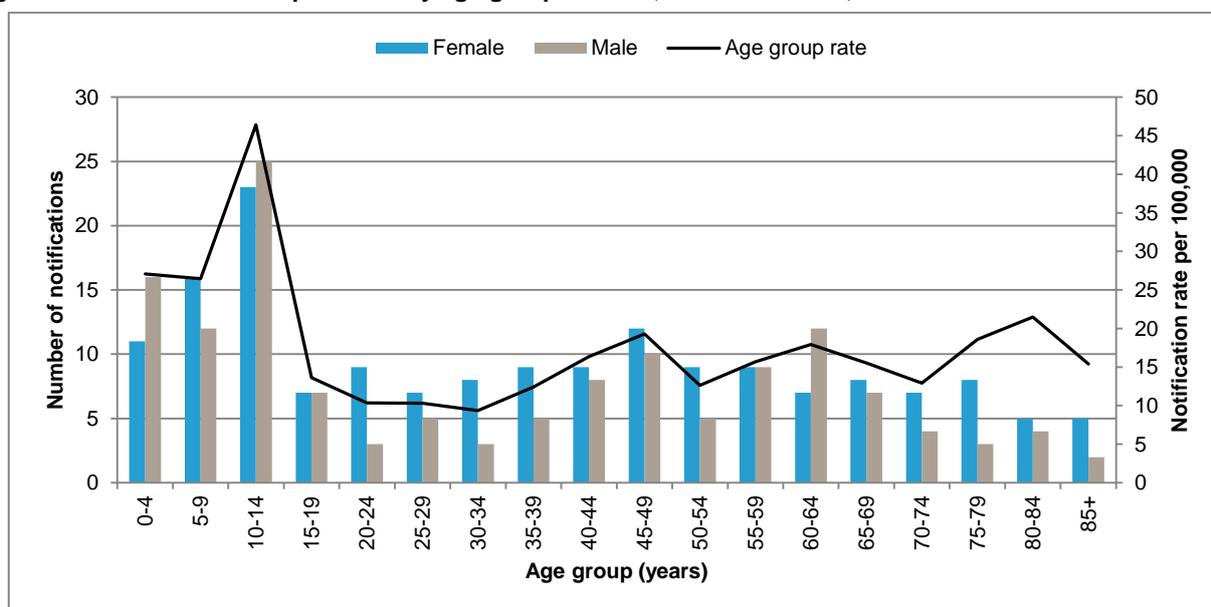
In 2019, 309 cases of pertussis were notified, 2.3 times lower than the 716 cases reported in 2018 and 1.7 times lower than the five-year average of 1,249 cases reported per annum for the period 2014 to 2018 (Figure 22).

In 2019, notifications of pertussis comprised of 169 females and 140 males. Higher numbers of notifications in females have been seen in previous years. The age range of notifications in 2019 was less than one year to 95 years. The median age for 2019 was 35 years, higher than the median age of 17 years for 2014 to 2018. The pertussis notifications and notification rates were highest in children aged 10 to 14 years (Figure 23). Pertussis vaccination is recommended for pregnant women. No cases were aged less than six months.

**Figure 22 Notified cases of pertussis by month and year of notification, South Australia, 2014-2019**



**Figure 23 Notified cases of pertussis by age group and sex, South Australia, 2019**

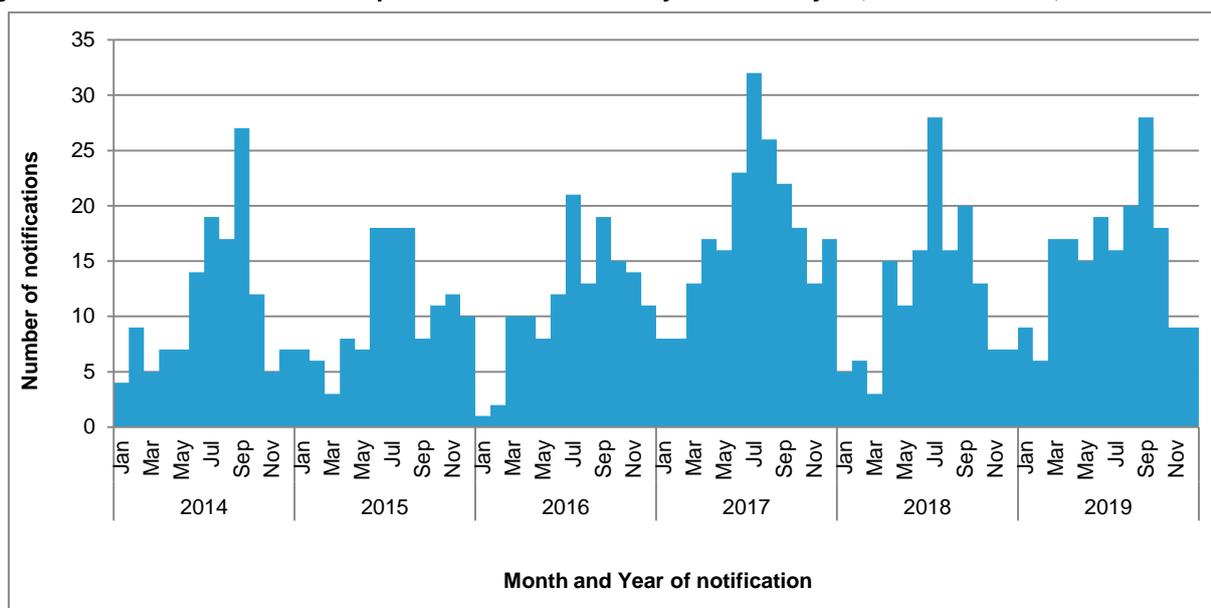


### Invasive pneumococcal disease

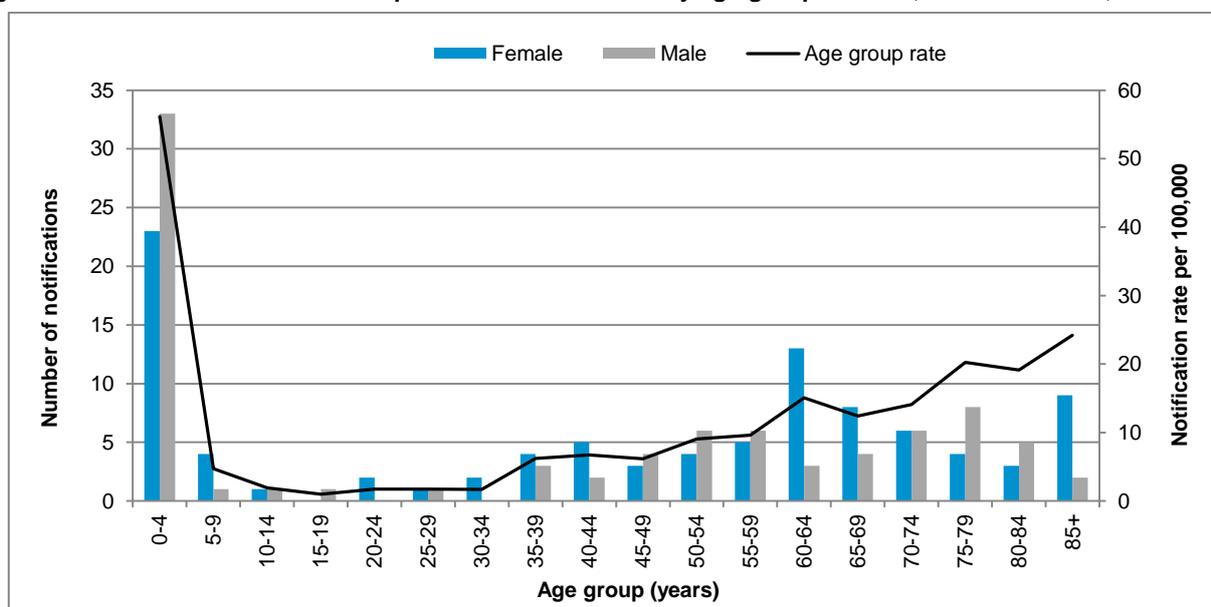
There were 183 notifications of invasive pneumococcal disease notified in 2019, higher than the 147 notifications in 2018, and higher than the five-year average of 151 notifications per annum for the period 2014 to 2018 (Figure 24).

Cases comprised of 97 females and 86 males with an age range of less than one year to 95 years and a median age of 50 years. The median age in 2019 was similar to the five-year median age for the period 2014 to 2018. However, it was the first time, over the 2014 to 2019 period, that there were more females than males with a female to male ratio of 1:0.9 in 2019, compared to an average of 1:1.3 for the five-year period of 2014 to 2018. Notifications were highest in the less than one to four year age group, as were notification rates (Figure 25).

**Figure 24 Notifications of invasive pneumococcal disease by month and year, South Australia, 2014-2019**



**Figure 25 Notified cases of invasive pneumococcal disease by age group and sex, South Australia, 2019**



In 2019, 25 cases of invasive pneumococcal disease reported to identify as Aboriginal or Torres Strait Islander peoples.

Nine deaths (5%) were attributed to invasive pneumococcal disease in 2019, compared to two deaths (1%) attributed to invasive pneumococcal disease in 2018.

Further laboratory testing identified the pneumococcal serotype for 129 (70%) cases. Of the 54 cases not serotyped, 12 were diagnosed by PCR only, three were not typeable and the remaining 39 were unviable, insufficient or not referred for typing. In 2019, serogroup 3 was the most common serotype identified and accounted for 15% of all notifications or 22% of isolates serotyped (Table 4).

**Table 4 Five most commonly identified serotypes of invasive pneumococcal disease, South Australia, 2018**

Pneumococcal serotype	Notifications (%)
Not serotyped	54 (30)
Serotype 3	28 (15)
Serotype 22F	15 (8)
Serotype 9N	10 (5)
Serotype 19A	9 (5)
Serotype 19F	8 (4)
Other serotypes	59 (32)
<b>Total</b>	<b>183</b>

In 2019, 92 cases (50%) were attributed to serotypes included in vaccines available on the National Immunisation Program. This is higher than 2018, when 41% of cases were attributed to serotypes included in vaccines available on the National Immunisation Program.

In 2019, there were 56 cases in persons aged less than five years. Of these, 44 were reported as appropriately vaccinated for age, eight were partially vaccinated and four were too young for vaccination.

Of the 55 cases aged 65 years and over, two were reported to identify as Aboriginal or Torres Strait Islander peoples but neither had been vaccinated against pneumococcal disease and both had serotypes included in the vaccine for on the National Immunisation Program for this age group (Pneumovax<sup>®</sup>23). Of the remaining 53 cases, 26 cases had received at least one vaccination against pneumococcal disease, 24 cases were not vaccinated against pneumococcal disease, and the vaccination status was unknown for five cases.

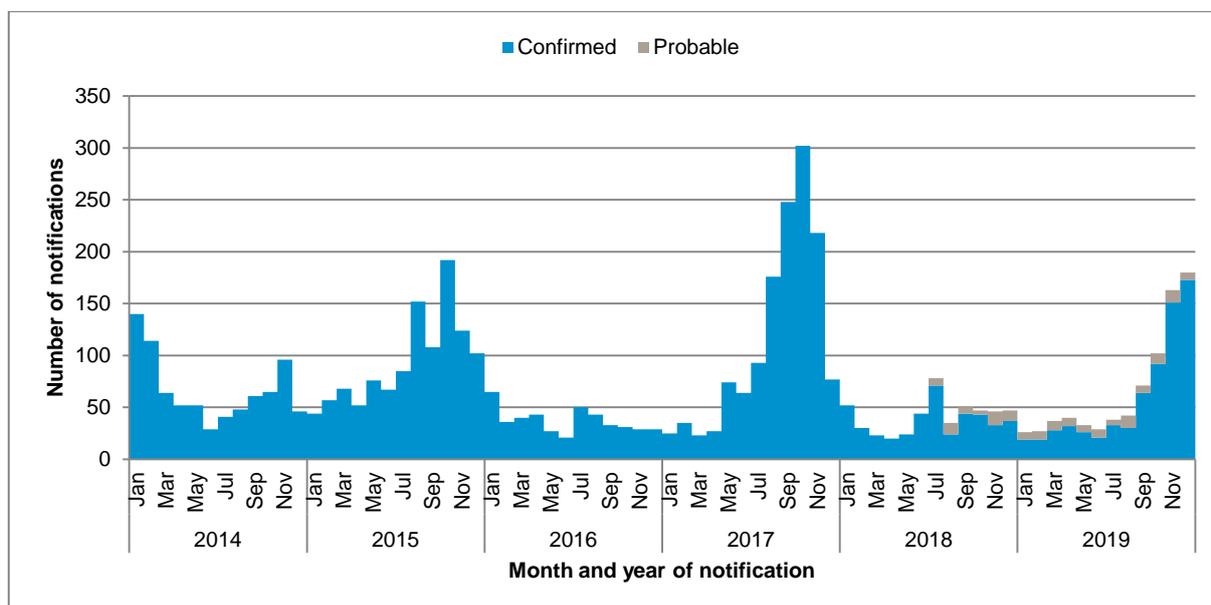
In 2019, 13 cases were recorded as vaccine failures as they tested positive for pneumococcal serotypes for which they were vaccinated. In 2018, five vaccine failures were reported.

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

### Rotavirus infection

There were 788 cases of rotavirus infection notified in 2019, higher than the 496 notifications received in 2018 and lower than the five-year average of 848 notifications per annum for the period 2014 to 2018 (Figure 26).

**Figure 26 Notified cases of rotavirus infection by confirmation status and, month and year of notification, South Australia, 2014-2019**



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 now classified as probable. Thirteen percent of total cases in 2019 were classified as probable (Figure 26).

Notified cases of rotavirus comprised of 405 females and 383 males with an age range of less than one year to 97 years with 331 (42%) cases aged less than two years. Of the cases aged less than two years, 303 (95%) cases were vaccinated for age against rotavirus.

There were four outbreaks of rotavirus reported to CDCB in 2019. All four reports were from aged care facilities ([Appendix 3](#)).

## Rubella

There were no cases of rubella notified in SA in 2019, similar to no notifications in 2018 and the five-year average of less than one case per year from 2014 to 2018. No cases of congenital rubella have been reported since 2013.

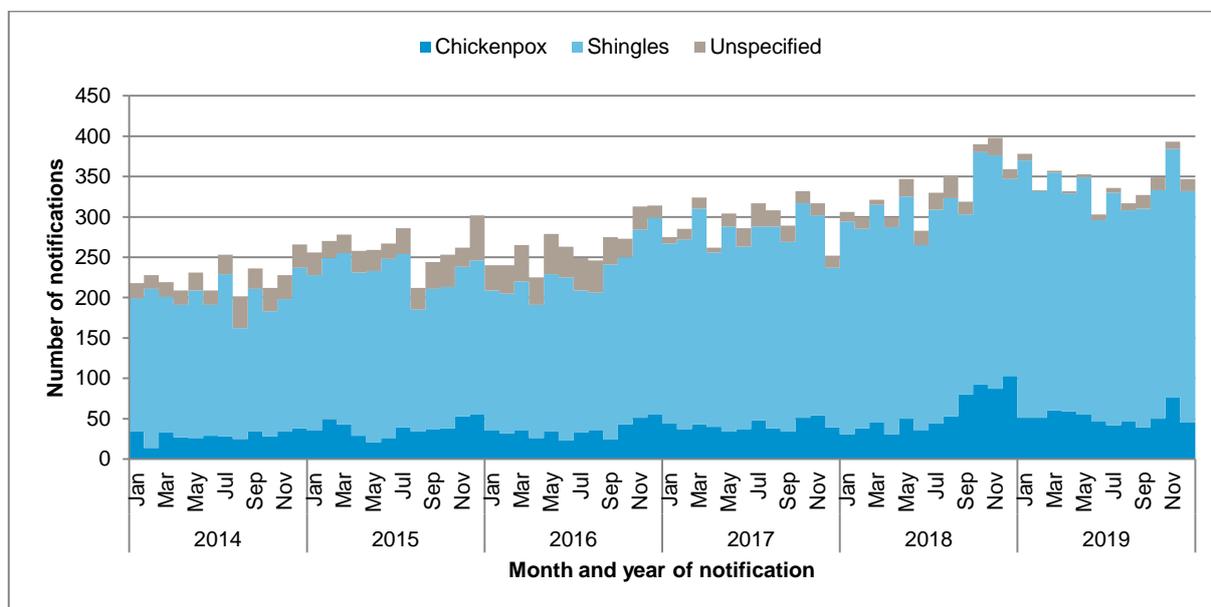
## Tetanus

There was one case of tetanus notified in SA in 2019, compared to no notifications in 2018 and the five-year average of less than one case per year from 2014 to 2018. The case was in a male in his 70s who had not been vaccinated against tetanus and recovered.

## Varicella zoster virus

In 2019, there were 4,125 cases of varicella zoster virus infection notified, higher than the 4,003 cases notified in 2018 and the five-year average of 3,320 notifications per annum for the period of 2014 to 2018 (Figure 27).

**Figure 27 Notified cases of varicella zoster virus infection by infection type, and month and year of notification, South Australia, 2014-2019**



Among cases of varicella zoster notified there were 2,260 females and 1,865 males with an age range of less than one to 106 years. Medical notifications characterised 622 infections as chickenpox (15%) and 3,406 as shingles (83%) and the clinical manifestation for 97 cases (2%) remained unspecified. The median age of chickenpox cases was 10 years and the median age of shingles cases was 57 years.

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 to 79 years. Previously shingles vaccine was only available on the private market.

## Vector borne diseases

No cases of Japanese encephalitis, Kunjin virus (West Nile virus) or Murray Valley encephalitis were reported in 2019.

### Barmah Forest virus infection

In 2019, five cases of Barmah Forest virus infection were notified in SA, similar to the four cases notified in 2018 and higher than the five-year average of three cases per annum for the period 2014 to 2018. From December 2013 to November 2016, changes in laboratory testing procedures affected the number of notifications compared with previous years. Cases comprised of two males and three females with an age range of 25 to 78 years. One case resided in metropolitan Adelaide and the remaining four cases lived in rural SA.

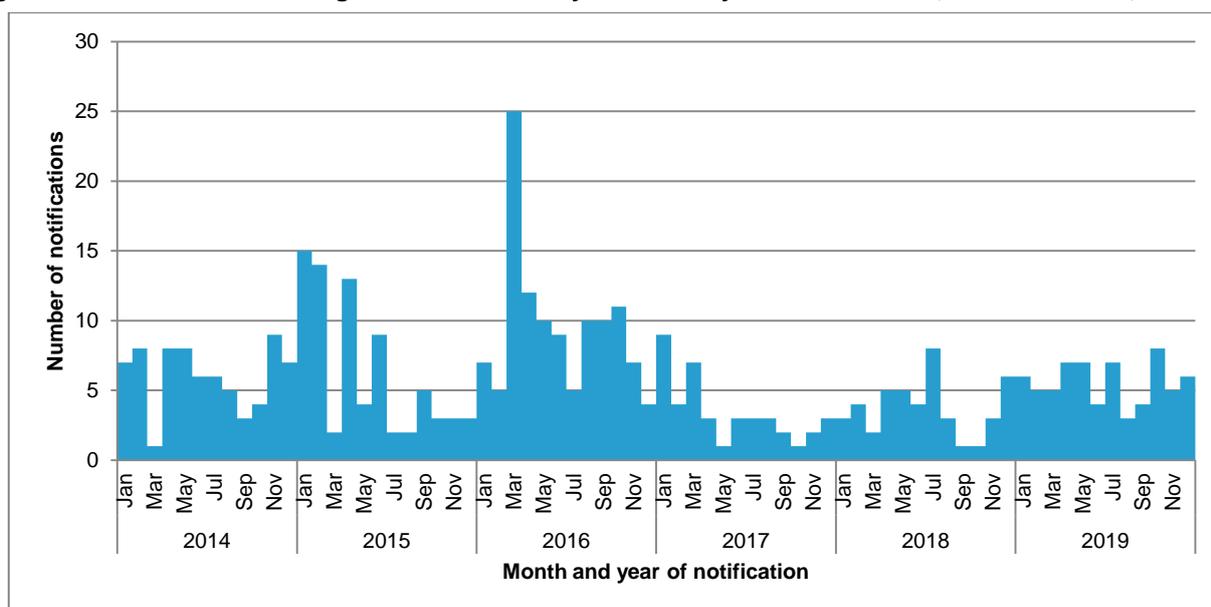
### Chikungunya virus infection

In 2019, three cases of chikungunya virus infection were notified in SA, similar to two cases notified in 2018 and similar to the five-year average of four cases reported per annum for the period 2014 to 2018. The cases were in one female and two males with an age range of 26 to 41 years. All three cases reported overseas travel (Brazil, India and Thailand) prior to illness onset.

### Dengue virus infection

There were 67 cases of dengue virus infection notified in 2019, higher than the 45 cases in 2018, and similar to the five-year average of 70 notifications per annum for the period 2014 to 2018 (Figure 28).

**Figure 28 Notified cases of dengue virus infection by month and year of notification, South Australia, 2014-2019**



In 2019, notifications of dengue virus infection were in 32 females and 35 males with an age range of one to 72 years and a median age of 41 years.

All cases were acquired overseas. South-east Asia was the most commonly reported region of exposure (66%), followed by southern central Asia (19%) and Oceania (9%) (Table 5).

**Table 5 Notified cases of dengue virus infection by country of acquisition, South Australia, 2019**

Country of acquisition	Cases
Indonesia	15
Thailand	10
India	8
South-east Asia, not further defined	5
Cambodia	4
Philippines	4
Fiji	3
Sri Lanka	3
Viet Nam	3
Maldives	2
South Sudan	2
Bangladesh	1
Burma (Myanmar)	1
China	1
East Timor	1
Malaysia	1
Mexico	1
Pakistan	1
Tuvalu	1
<b>Total</b>	<b>45</b>

### Japanese encephalitis

There were no cases of Japanese encephalitis infection notified in SA in 2019, similar to no notifications in 2018 and the five-year average of less than one case per year from 2014 to 2018.

### Malaria

Forty-two cases of malaria were notified in 2019, a substantial increase compared to the 34 cases reported in 2018 and the five-year average of 12 cases reported per annum for the period 2014 to 2018.

In 2019, malaria infections were in 28 males and 14 females with an age range of two to 68 years and a median age of 29 years.

All cases were acquired overseas. Thirty-five cases (83%) were reported to have been acquired in Africa, with 10 cases (24%) reported as acquired in Tanzania (Table 6).

Thirty-five cases were caused by *Plasmodium falciparum*, 34 of these cases were acquired in Africa, with the remaining case acquired in Thailand. Six cases were caused by *P. vivax*, five cases were acquired in Papua New Guinea, and the remaining case acquired in India. One case was caused by *P. malariae*, this case was acquired in Tanzania.

**Table 6 Notified cases of malaria infection by region and country of acquisition, South Australia, 2019**

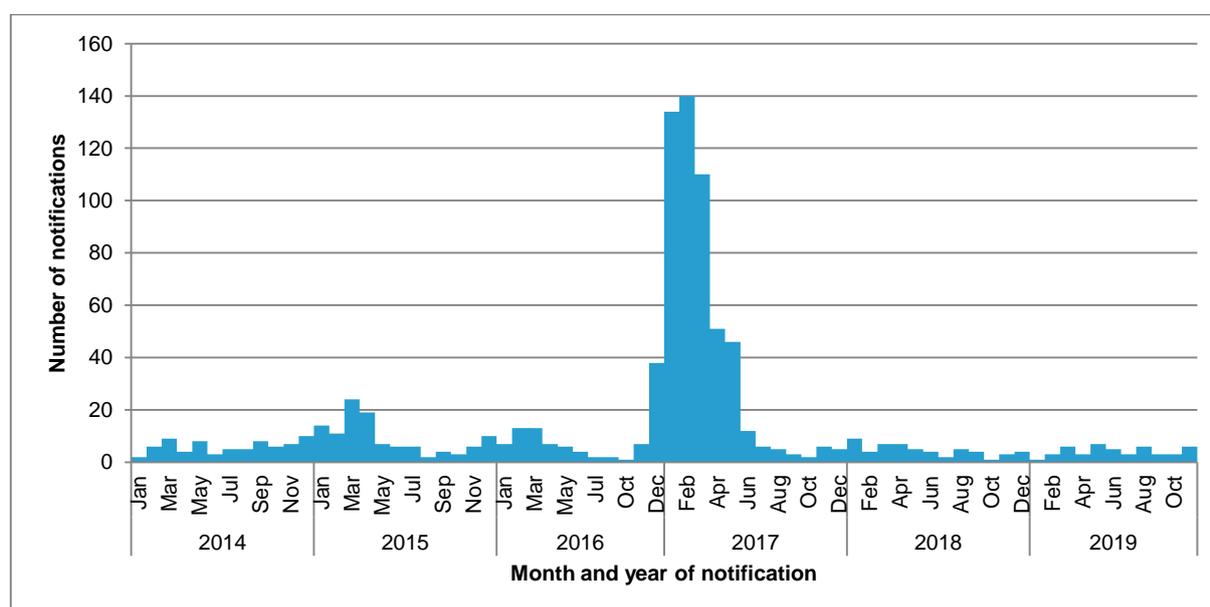
Region and country of acquisition	<i>P. falciparum</i>	<i>P. malariae</i>	<i>P. vivax</i>	Total
<b>Africa</b>	<b>34</b>	<b>1</b>	<b>0</b>	<b>35</b>
Burundi	4	0	0	4
Central African Republic	1	0	0	1
Central and West Africa, not further defined	1	0	0	1
Democratic Republic of Congo	1	0	0	1
Guinea	3	0	0	3
Kenya	4	0	0	4
Rwanda	1	0	0	1
South Sudan	1	0	0	1
Sub-Saharan Africa, not further defined	1	0	0	1
Tanzania	9	1	0	10
Uganda	8	0	0	8
<b>South East Asia</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>
Thailand	1	0	0	1
<b>Indian Subcontinent</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>
India	0	0	1	1
<b>Western Pacific</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>5</b>
Papua New Guinea	0	0	5	5
<b>Total</b>	<b>35</b>	<b>1</b>	<b>6</b>	<b>42</b>

## Ross River virus

There were 46 cases of Ross River virus infection (RRV) notified in 2019, lower than the 55 cases reported in 2018 and much lower than the five-year average of 172 cases notifications per annum for the period 2014 to 2018 (Figure 29).

In 2019, notifications of RRV infection were in 21 females and 25 males with an age range of 17 to 80 years and a median age of 54 years. Medical notification may elicit the suspected location of exposure and in 2019 medical notifications were received for 87% of cases. Exposure during interstate travel was reported for seven cases (15%). Notifications for 11 (24%) cases either reported travel to, or were residents of, locations along the Murray River.

**Figure 29 Notified cases of Ross River virus infection by month and year of notification, South Australia, 2014-2019**



## Zika virus infection

There were no cases of Zika virus infection notified in SA in 2019, similar to no notifications in 2018 and the five-year average of less than one case per year from 2014 to 2018.

## Zoonoses

No cases of anthrax, brucellosis, lyssavirus, Hendra virus infection, rabies or tularaemia were reported in 2019.

### Brucellosis

There were no cases of Brucellosis notified in SA in 2019, similar to no notifications in 2018, and lower than the five-year average of less than one case per year from 2014 to 2018.

### Leptospirosis

There were two cases of Leptospirosis notified in SA in 2019, higher than no notifications in 2018, and higher than the five-year average of less than one case per year from 2014 to 2018.

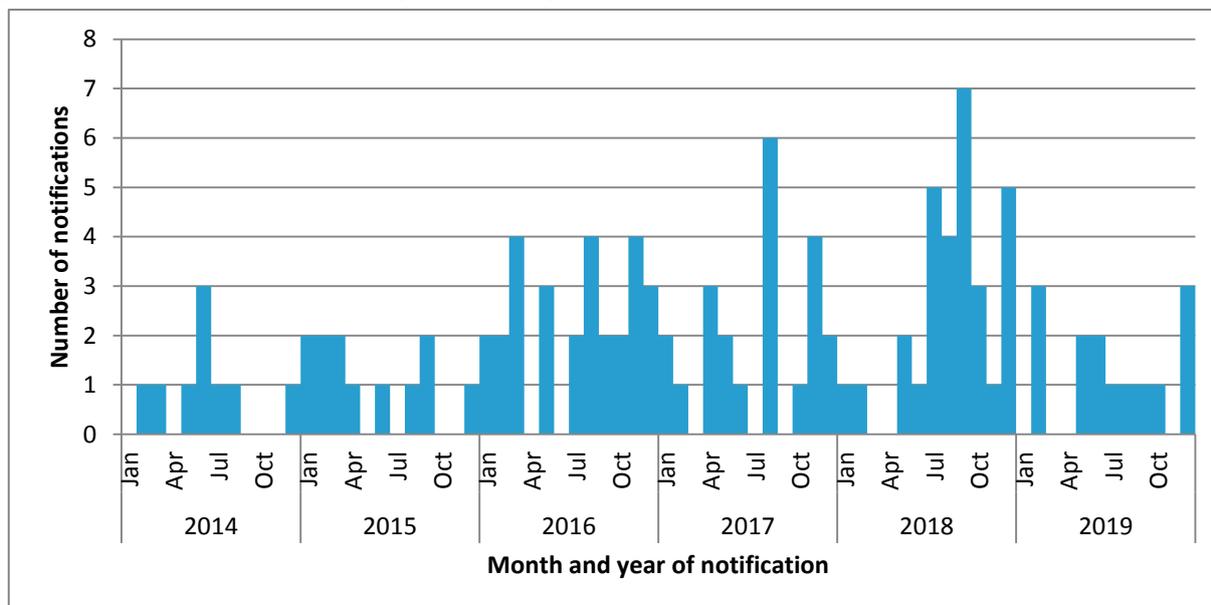
### Psittacosis (Ornithosis)

There was one case of psittacosis (ornithosis) notified in SA in 2019, compared to no notifications in 2018, and then five-year average of less than one case per year from 2014 to 2018.

### Q fever

There were 14 cases of Q fever notified in 2019, lower than the 30 cases notified in 2018 and lower than the five-year average of 20 cases per annum for the period 2014 to 2018 (Figure 30). Cases comprised of three females and 11 males with an age range of 22 to 74 years and a median age of 48 years. Ten cases were hospitalised.

**Figure 30 Notified cases of Q fever by month and year of notification, South Australia, 2014-2019**



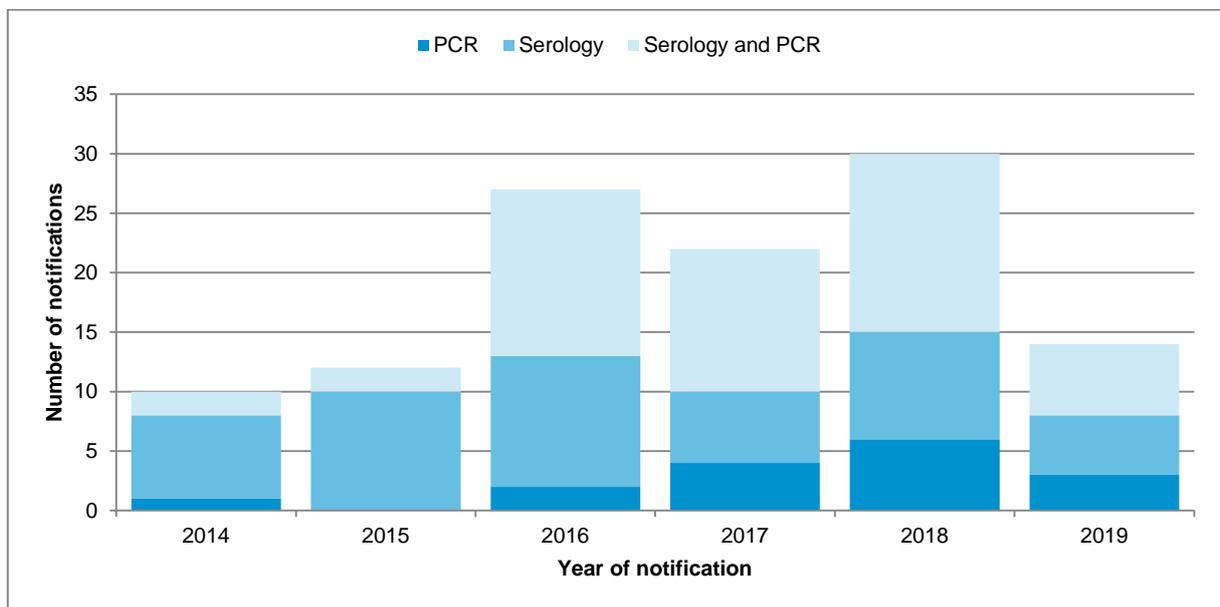
Ten cases of Q fever (71%) reported residing or working on a farm, one case reported employment transporting livestock, one case reported working at an abattoir and one case reported wildlife exposure. One case had no risk factors identified for acquiring Q fever (Table 7). One case reported being vaccinated for Q fever 16 years prior to illness.

**Table 7 Notified cases of Q fever by risk factor, South Australia, 2019**

Risk factor	Cases (%)
Residing/working on farm	10 (71)
Livestock transport	1 (7)
Working at an abattoir	1 (7)
Wildlife exposure	1 (7)
No risk factor identified	1 (7)
<b>Total</b>	<b>14</b>

There has been an increase in the use of PCR testing for Q fever. Of the 14 cases notified, six cases were diagnosed by PCR and serological testing (43%), five were diagnosed by serological testing only (36%) and three were diagnosed by PCR testing only (21%). The introduction of PCR testing is likely to be responsible for part of the increase in Q fever notifications since 2016 (Figure 31).

**Figure 31 Notified cases of Q fever by laboratory testing method and year of notification, South Australia, 2014-2019**



## Appendices

### Appendix 1: Notifiable conditions by count, South Australia, 2014 to 2019

Notifiable condition	2014	2015	2016	2017	2018	5 year mean	2019
<b>Enteric diseases</b>							
Botulism	0	0	0	1	0	0.2	1
<i>Campylobacter</i> infection	1,806	1,818	3,198	3,113	3,094	2605.8	3,287
<i>Cholera</i>	0	1	0	0	0	0.2	0
Cryptosporidiosis	224	419	432	356	197	325.6	128
Hepatitis A	7	10	7	23	21	13.6	14
Hepatitis E	0	1	3	1	0	1	2
Listeriosis	6	4	4	5	5	4.8	2
Paratyphoid	2	9	4	6	7	5.6	13
<i>Salmonella</i> infection	1,219	1,263	1,572	1456	1,174	1336.8	1,175
Shiga toxin-producing <i>E. coli</i> infection (STEC)	45	45	176	318	315	179.8	294
Haemolytic Uraemic Syndrome(HUS) / Thrombotic Thrombocytopenic Purpura (TTP) infection	4	0	1	2	0	1.4	0
<i>Shigella</i> infection	37	77	182	300	434	206	283
Typhoid	9	8	6	5	6	6.8	10
<i>Vibrio parahaemolyticus</i> infection	NN	NN	8	5	11	8	8
Yersinosis	43	67	88	76	110	76.8	112
<b>Quarantinable diseases</b>							
Influenza (avian in humans)	0	0	0	0	0	0	0
Middle East respiratory syndrome coronavirus (MERS-CoV)	0	0	0	0	0	0	0
Plague	0	0	0	0	0	0	0
Severe acute respiratory syndrome (SARS)	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 infectious notifiable diseases</b>							
Creutzfeldt-Jakob disease	3	5	2	4	6	4	4
Legionellosis	44	28	27	40	32	34.2	45
Leprosy	1	0	0	1	0	0.4	0
<b>Vaccine preventable diseases</b>							
Diphtheria	0	0	0	0	1	0.2	0
<i>Haemophilus influenzae</i> (invasive)	14	17	21	14	21	17.4	25
<i>Haemophilus influenzae</i> type b (invasive)	1	0	1	0	3	1	1
Influenza A	9,962	6,915	7,030	18,295	4,181	9276.6	22,446
Influenza B	1,088	8,744	821	10189	1748	4518	4,647
Meningococcal disease (invasive)	32	30	27	36	34	31.8	27
Measles	16	4	11	1	2	6.8	4
Mumps	14	38	19	63	11	29	8
Pertussis	505	1,297	1,943	1786	716	1249.4	309
Pneumococcal disease (invasive)	133	126	136	213	147	151	183
Polio virus infection	0	0	0	0	0	0	0
Rotavirus	808	1,127	447	1362	496	848	788
Rubella	2	2	0	0	0	0.8	0
Rubella - congenital	0	0	0	0	0	0	0

Notifiable condition	2014	2015	2016	2017	2018	5 year mean	2019
Tetanus	0	0	0	2	0	0.4	1
Varicella zoster (unspecified)	288	365	414	194	194	291	97
Varicella zoster (chickenpox)	350	459	427	499	690	485	622
Varicella zoster (shingles)	2,072	2,332	2,341	2,858	3,119	2544.4	3,406
<b>Vectorborne diseases</b>							
Barmah Forest virus infection	0	1	5	3	4	2.6	5
Chikungunya virus infection	7	2	7	1	2	3.8	3
Dengue virus infection	72	75	115	41	45	69.6	67
Japanese encephalitis virus infection	1	0	0	0	0	0.2	0
Kunjin virus infection	0	0	0	0	0	0	0
Malaria	6	2	10	8	34	12	42
Murray Valley encephalitis infection	0	0	0	0	0	0	0
Ross River virus infection	73	112	100	520	55	172	46
Zika virus infection	0	1	2	0	0	0.6	0
<b>Zoonoses</b>							
Anthrax	0	0	0	0	0	0	0
Australian bat lyssavirus infection	0	0	0	0	0	0	0
Brucellosis	0	0	0	1	0	0.2	0
Hendra virus infection	NN	NN	0	0	0	0	0
Leptospirosis	1	0	2	1	0	0.8	2
Lyssavirus (NEC)	0	0	0	0	0	0	0
Psittacosis/Ornithosis	0	1	0	1	0	0.4	1
Q Fever	9	12	28	22	30	20.2	14
Rabies	0	0	0	0	0	0	0
Tularaemia	0	0	0	0	0	0	0
<b>Grand Total</b>	<b>18,904</b>	<b>25,417</b>	<b>19,617</b>	<b>41822</b>	<b>16,945</b>	<b>24541</b>	<b>38,122</b>

NN = not notifiable; NEC = not elsewhere classified

## Appendix 2: Notifiable conditions by rate per 100,000 population, South Australia, 2014 to 2019

Notifiable condition	2014	2015	2016	2017	2018	5 year mean	2019
<b>Enteric diseases</b>							
Botulism	0.0	0.0	0.0	0.0	0.0	0.0	0.1
<i>Campylobacter</i> infection	107.1	107.0	187.1	180.7	177.6	151.9	187.7
Cholera	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Cryptosporidiosis	13.3	24.7	25.3	20.7	11.3	19.1	7.3
Hepatitis A	0.4	0.6	0.4	1.3	0.0	0.5	0.8
Hepatitis E	0.0	0.1	0.2	0.1	0.0	0.1	0.1
Listeriosis	0.4	0.2	0.2	0.3	0.3	0.3	0.1
Paratyphoid	0.1	0.5	0.2	0.3	0.4	0.3	0.7
<i>Salmonella</i> infection	72.3	74.4	91.9	84.5	74.7	79.6	67.1
Shiga toxin-producing <i>E. coli</i> infection (STEC)	2.7	2.6	10.2	18.2	18.0	10.3	16.8
Haemolytic Uraemic Syndrome(HUS) / Thrombotic Thrombocytopenic Purpura (TTP) infection	0.2	0.1	0.0	0.1	0.0	0.1	0.1
<i>Shigella</i> infection	2.2	4.5	10.7	17.3	25.3	12.0	16.2
Typhoid	0.5	0.5	0.4	0.3	0.3	0.4	0.6
<i>Vibrio parahaemolyticus</i> infection	NN	NN	0.5	0.3	0.6	0.5	0.5
Yersinosis	2.6	3.9	5.1	4.3	6.3	4.4	6.4
<b>Quarantinable diseases</b>							
Influenza (avian in humans)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle East respiratory syndrome coronavirus (MERS-CoV)	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 (SARS)	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 infectious notifiable diseases</b>							
Creutzfeldt-Jakob disease	0.2	0.3	0.1	0.2	0.3	0.2	0.2
Legionellosis	2.6	1.6	1.6	2.3	1.8	2.0	2.6
Leprosy	0.1	0.0	0.0	0.1	0.0	0.0	0.0
<b>Vaccine preventable diseases</b>							
Diphtheria	0.0	0.0	0.0	0.0	0.1	0.0	0.0
<i>Haemophilus influenzae</i> (invasive)	0.8	0.9	1.2	0.8	1.4	1.0	1.5
<i>Haemophilus influenzae</i> type b (invasive)	0.1	0.1	0.1	0.0	0.2	0.1	0.1
Influenza A	591.0	407.1	411.5	1061.5	240.8	542.4	1281.4
Influenza B	64.5	514.8	48.1	591.2	100.7	263.9	265.2
Measles	0.9	0.2	0.6	0.1	0.1	0.4	0.2
Meningococcal disease (invasive)	1.9	1.8	1.6	2.1	2.0	1.9	1.5
Mumps	0.8	2.2	1.1	3.7	0.6	1.7	0.5
Pertussis	30.0	76.4	113.7	103.6	41.2	73.0	17.6
Pneumococcal disease (invasive)	7.9	7.4	8.0	12.4	8.5	8.8	10.5
Polio virus infection	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rotavirus	47.9	66.3	25.5	79.0	28.6	49.5	45.0
Rubella	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Rubella - congenital	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tetanus	0.0	0.0	0.0	0.1	0.0	0.0	0.1
Varicella zoster (unspecified)	17.1	21.5	24.3	8.6	0.0	14.3	5.5

Notifiable condition	2014	2015	2016	2017	2018	5 year mean	2019
Varicella zoster (chickenpox)	20.8	27.0	25.0	29.0	0.0	20.4	37.8
Varicella zoster (shingles)	122.9	137.3	137.0	165.8	0.0	112.6	194.4
<b>Vectorborne diseases</b>							
Barmah Forest virus infection	0.0	0.1	0.3	0.2	0.0	0.1	0.3
Chikungunya virus infection	0.4	0.1	0.4	0.1	0.0	0.2	0.2
Dengue virus infection	4.3	4.4	6.7	2.4	0.0	3.6	3.9
Japanese encephalitis virus infection	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Kunjin virus infection	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Malaria	0.4	0.1	0.6	0.5	0.0	0.3	2.4
Murray Valley encephalitis infection	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ross River virus infection	4.3	6.6	5.9	30.2	0.0	9.4	2.6
Zika virus infection	0.0	0.1	0.1	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 infection	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brucellosis	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Hendra virus infection	NN	NN	0.0	0.0	0.0	0.0	0.0
Leptospirosis	0.1	0.0	0.1	0.1	0.0	0.1	0.1
Lyssavirus (NEC)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Psittacosis/Ornithosis	0.0	0.1	0.0	0.1	0.0	0.0	0.1
Q Fever	0.5	0.7	1.6	1.3	0.0	0.8	0.8
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

NN = not notifiable; NEC = not elsewhere classified

## Appendix 3: Summary of outbreaks reported in 2019

### 2019 outbreak investigations by disease type

#### ***Salmonella* Typhimurium phage type 108 – Childcare centre – January**

The outbreak occurred in a child care facility in a regional area of SA and included 15 confirmed cases of *Salmonella* (12 typed as STm 108 MLVA 04-11-12-00-517, one with a slightly different MLVA of 04-12-12-00-517 and two were positive for *Salmonella* by PCR, but no culture was obtained for further typing). All ill people were children at the facility with no staff reporting illness. Onsets of illness ranged from 27 December 2018 to 9 February 2019. An EHO inspected the facility on multiple occasions and an infection control nurse and public health doctor from SA health visited the facility. Food and environmental samples were taken with no *Salmonella* detected. Recommendations were made to the facility regarding cleaning, infection control practices and separation of staff duties. The investigation was unable to determine if the transmission mode was foodborne, environmental or person to person. One further case of STm 108 (MLVA 04-11-12-00-517) was notified in a child that attended the same facility with an onset of illness in May; this case was a single case with no others ill at the time.

#### ***Salmonella* Typhimurium phage type 9 – Restaurant – January**

Five cases of STm phage type 9, MLVA 03-16-06-11-550 reported consumption of food from the same restaurant in January 2019. Cases ate a variety of different foods including salads, egg dishes and burgers. An EHO inspected the premises and issues were identified relating to the handling of eggs, the production of raw egg products, and cleaning and sanitising. Food and environmental samples were collected from the premises and no *Salmonella* was detected.

#### ***Salmonella* Hessarek – Primary Production – January**

Notifications of *Salmonella* Hessarek were elevated in January, prompting an investigation. Twelve of 13 cases notified in the year were interviewed and seven reported consuming the same brand of eggs which was also linked to an outbreak in 2017 where *S. Hessarek* was isolated from egg contents.

#### ***Salmonella* Typhimurium phage type 9 – Bakery – February**

Seventy-eight cases of *Salmonella* were linked to consumption of food from one of three linked bakery premises. The majority of the cases (n=74) were further typed as STm phage type 9 and MLVA 03-15-08-11-550, with the remaining four unable to be typed as no culture was obtained. Cases ate at the bakeries between 6 and 12 February, with 75 cases (96%) reporting consumption of a Vietnamese style meat roll. EHOs inspected the premises and identified shared foods and equipment between the premises. Multiple food and environmental samples across all three premises were positive for STm phage type 9 MLVA 03-15-08-11-550. Issues with cleaning and sanitising practises were identified.

#### ***Salmonella* Typhimurium phage type 9 – Restaurant – February**

Eleven cases of *Salmonella* Typhimurium with MLVA 03-23-12-10-523 (10 with phage type 9 and one with phage type RDNC (reaction did not conform)) reported consumption of food from the same restaurant over a three-day period in January-February 2019. Nine cases reported consumption of a raw egg based sauce (aioli, tartare or mayonnaise). An EHO inspected the premises and identified issues with the preparation of raw egg based sauces, hand hygiene, cross-contamination, hygiene and sanitation. Environmental samples were collected with no *Salmonella* detected. The premises ceased production of raw egg based sauces.

#### ***Salmonella* Typhimurium phage type 135a – Restaurant – February**

Three cases of STm 135a with MLVA 03-14-10-11-523 reported eating at the same restaurant in the first week of February. The cases all consumed different foods and attended on different days. An EHO inspected the premises and no issues were identified.

### **Salmonella Typhimurium phage type 12a – Restaurant – February**

Twelve people were unwell with gastroenteritis after eating at the same sushi restaurant on the same day in February. Eleven of the cases were confirmed with STm 12a, MLVA 04-18-11-00-490. A range of different types of sushi and sashimi were consumed by cases. An EHO inspected the premises and recommendations were made regarding cleaning, sanitising and minimising cross-contamination. Environmental and food samples were submitted with no *Salmonella* detected.

### **Salmonella Enteritidis – Multi-Jurisdictional Outbreak Investigation – March**

Nationally, 234 confirmed cases were part of this multi-jurisdictional outbreak investigation (MJOI) with onsets between May 2018 and July 2019. One South Australian case was confirmed on whole genome sequencing (WGS) as part of this outbreak, with an onset in January 2019. The case spent part of her incubation period in New South Wales (NSW), where the majority of the confirmed MJOI cases were reported (190/234; 81%). The source of the outbreak was eggs, with multiple farms affected (13 in NSW and 1 in Victoria). Control measures included prohibition orders in restaurants (as several point source events were identified), egg recalls and biosecurity directions on farm including quarantine. Recalled eggs were distributed in SA.

### **Salmonella Heidelberg – Multi-Jurisdictional Outbreak Investigation – March**

Nationally, 58 confirmed cases were part of this MJOI with onsets between November 2018 and May 2019. Six South Australian cases were confirmed on WGS to be part of this MJOI. No clear hypothesis was developed for this outbreak and no control or prevention measures undertaken.

### **Salmonella Typhimurium phage type 135 – Restaurant – April**

There was an increase in *Salmonella* cases in a regional area of SA. Cases were interviewed and 14 people diagnosed with STm phage type 135 (MLVA 03-12-09-11-523) reported eating food prepared by the same food premises at one of two venues. Cases ate a variety of foods including Mexican style meat and rice bowls and salads. An EHO inspected the premises and identified issues around temperature control, cleaning and sanitising, storage and skills and knowledge of safe food handling. Corrective actions were recommended.

### **Salmonella Typhimurium phage type 9 – Restaurant – May**

Five people with STm phage type 9, MLVA 03-24-13-10-523 reported eating at the same restaurant. Four of the five cases ate at the venue on the same day, but were not known to each other. All cases consumed breakfast meals containing eggs. An EHO inspected the premises and issues were identified around handling of raw eggs and food handler hygiene. Corrective actions were advised. Food and environmental samples were collected and no *Salmonella* was identified.

### **Listeria monocytogenes – Multi-Jurisdictional Outbreak Investigation – July**

Nationally, four confirmed cases were part of this MJOI associated with cold smoked salmon, with onsets between February and July 2019. There were no South Australian cases included in this MJOI. The industry regulator reviewed *Listeria* management within the seafood industry in Tasmania where the salmon was produced and produced enhanced guidance for the manufacture of smoked fish.

### **Cryptosporidium – Vacation care – August**

An increase in cryptosporidiosis notifications in a large regional town in SA was observed in late July. Three cases attended the same vacation care program. A cohort study was undertaken to identify the likely source of the illness, based on child and staff attendance at each of the excursions during vacation care. A total of eight individuals experienced gastroenteritis, with three cases confirmed with cryptosporidiosis. No significant statistical associations were identified, but the suspected source of illness was contact with cows during an excursion to a dairy farm. EHOs contacted the farm and a copy of SA Health's *Animal Contact Guidelines* was provided to the vacation care provider.

### **Salmonella Typhimurium phage type 108 – Community – September**

There were 32 cases of STm phage type 108 with onsets between 1 August and 13 November 2019; with 31 with the MLVA 03-13-09-11-523 and one with 03-13-09-10-523. Twenty one of the cases reported direct exposure to a chick hatchery program run by a single business or taking chickens home after a program was run at several childcare centres, schools and an aged care facility. Of these cases, 16 were aged less than five years of age, three were of primary school age and two were adults. One additional case had exposure to chickens from a different hatching business who received eggs from the same producer. WGS was conducted for 29 of the 32 cases and all were clustered within five SNPs (single-nucleotide polymorphisms) of each other suggesting they were highly related. The local hatchery business accounting for most of the cases was inspected and swabs taken; all were *Salmonella* not detected. An information circular was distributed to all child care services and primary schools across the state, highlighting the risks of using animals for educational purposes and providing a link to the *Animal Contact Guidelines*.

### **Unknown pathogen – Train – September**

An outbreak of gastroenteritis was reported amongst people on board a commercial holiday rail service, with onsets of illness from 8 September to 9 October 2019. A total of 114 cases were reported, with four people requiring hospitalisation. Cases were reported from multiple jurisdictions. One person tested positive for norovirus. A series of recommendations were made with regards to hand hygiene, cleaning on-board the train and staff and passenger management. The investigation was unable to determine if the transmission mode was foodborne, environmental or person to person.

### **Salmonella Typhimurium phage type 9 – Private Residence – September**

Five extended family members from two different households were unwell with *Salmonella* Typhimurium (four with phage type 9, one as untypeable, and all with MLVA 03-17-08-11-550) after a common meal. The cases were all children and they were all hospitalised. The only meal they all ate together in the seven days before illness onset included a home-made chocolate mousse made with raw eggs.

### **Salmonella Typhimurium phage type 12a – Childcare Centre – September**

There was an outbreak of *Salmonella* Typhimurium phage type 12a, MLVA 04-15-11-00-463 at a childcare centre. Three cases were identified in children who attended the centre and one case was reported in the mother of one of the children. The mode of transmission remains unknown, but was suspected to be person-to-person based on the gap in onset dates amongst all four cases. An environmental inspection was conducted and recommendations were provided.

### **Salmonella Weltevreden – Multi-Jurisdictional Outbreak Investigation – October**

Nationally, there were 83 confirmed cases as part of the MJOI to end of December 2019. Thirty South Australian residents were confirmed on WGS with the *S. Weltevreden* MJOI outbreak strain, with illness onset since 1 September 2019. Twenty-eight of the confirmed South Australian cases reported consumption of the same brand of frozen meals before onset of their illness. Additionally, there were three SA cases of suspected food poisoning that reported consumption of the same brand of frozen meals before onset of gastrointestinal illness. The outbreak strain was identified in six samples of the frozen meals collected and tested in SA. Product recalls occurred on 19 October 2019 and 28 October 2019 with media releases from SA Health to inform the public.

### **Norovirus – Workplace – November**

There was an outbreak associated with a workplace, with 40 out of approximately 125 people reporting gastroenteritis. Nine people were tested and seven were positive for norovirus. A catering company was referred to an EHO and infection prevention and control measures were implemented at the worksite. The investigation was unable to determine if the transmission mode was foodborne, environmental or person to person.

### **Salmonella Saintpaul– Primary Production – September**

There were 45 cases as part of the investigation in SA with onsets from 23 October 2019 to 22 March 2020. A case control study (with 12 cases) identified an adjusted odds ratio of 29 (95% Confidence Intervals 2.5-333; p=0.007) for consumption of papaya. Retail samples of papaya from SA were positive for *Salmonella* Saintpaul. WGS has linked human cases (n=14) from SA, plus human isolates from interstate (Northern Territory (NT), Victoria, NSW and Queensland) with papaya samples from SA and from a farm in NT. Information was shared with other jurisdictions and EHOs provided food businesses with advice on handling and preparation of tropical fruits. Social media messaging from SA Health was distributed about safe handling of fresh salad and tropical fruit.

### **Norovirus – Restaurant – November**

An outbreak of gastroenteritis was reported with 16 people ill out of a group of 38 that attended a common event at restaurant. Three people submitted specimens and two were positive for norovirus. Unwell people consumed a variety of food from the menu and food brought in by the group, with no common items identified. There were also reports of others ill in the community. The local EHO was informed. The investigation was unable to determine if the transmission mode was foodborne, environmental or person to person.

### **Norovirus – Restaurant – November**

Twenty people out of a group of 36 that attended a lunch at a restaurant and a catered wedding function the day before reported gastroenteritis. Two people submitted specimens and both were positive for norovirus. An EHO inspected the restaurant premises. The investigation was unable to determine if the transmission mode was foodborne, environmental or person to person.

### **Salmonella Enteritidis – Multi-Jurisdictional Outbreak Investigation – December**

Nationally, eight confirmed cases of *S. Enteritidis* MLST (multilocus sequence type) 1972 were confirmed as part of this MJOI to the end of January 2020. One South Australian resident was identified with the outbreak strain of *S. Enteritidis* MLST 1972. The outbreak strain was identified in a retail chicken sample collected in NSW, sourced from Queensland. The South Australian case consumed chicken out of the home, and traceback information on chicken consumed by the case was shared with NSW and Queensland food authorities. Traceback on the positive chicken sample led to sampling on a farm in Queensland. No *Salmonella* was detected from 66 farm samples and 19 samples from the processing plant.

## Outbreaks Reported by Aged Care Facilities in 2019

Month reported	Agent identified	Number of facilities affected
<b>January</b>	Gastroenteritis, organism not detected	2
	Norovirus	3
	Influenza	2
<b>February</b>	Gastroenteritis, organism not detected	2
	Norovirus	2
<b>March</b>	Gastroenteritis, organism not detected	1
	Norovirus	3
	Rotavirus	1
	Influenza	10
<b>April</b>	Gastroenteritis, organism not detected	1
	Influenza	33
<b>May</b>	Gastroenteritis, organism not detected	2
	Norovirus	1
	Influenza	32
<b>June</b>	Gastroenteritis, organism not detected	1
	Norovirus	2
	Influenza	2
<b>July</b>	Norovirus	1
	Rotavirus	1
	Influenza	7
<b>August</b>	Gastroenteritis, organism not detected	2
	Norovirus	1
	Influenza	3
<b>September</b>	Gastroenteritis, organism not detected	1
	Norovirus	8
	Influenza	5
<b>October</b>	Gastroenteritis, organism not detected	3
	Norovirus	6
	Influenza	5
<b>November</b>	Gastroenteritis, organism not detected	3
	Norovirus	7
	Rotavirus	1
	Influenza	2
<b>December</b>	Gastroenteritis, organism not detected	2
	Norovirus	8
	Rotavirus	1
	Influenza	1

---

## For more information

**Communicable Disease Control Branch  
Public Health and Clinical Systems**

**PO Box 6**

**Rundle Mall SA 5000**

**Telephone: 1300 232 272**

[www.sahealth.sa.gov.au](http://www.sahealth.sa.gov.au)

**OFFICIAL**



[www.ausgoal.gov.au/creative-commons](http://www.ausgoal.gov.au/creative-commons)



**Government  
of South Australia**

SA Health