

Communicable Disease Control Branch,
Disease Surveillance & Investigation Section

2017 Annual Report

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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.

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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 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 infections 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.

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 Primary Industries and Regions SA, and environmental health officers (EHO) from local government, as well as 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):

- > 28,484 cases of influenza, including 96 influenza outbreaks in residential care facilities
- > 115 non-foodborne clusters of gastrointestinal disease, including 95 in residential care facilities
- > 15 *Salmonella* outbreak investigations
- > 36 cases of invasive meningococcal disease
- > 520 cases of Ross River virus infection
- > 313 cases of Shiga-toxin producing *Escherichia coli* infection
- > 23 cases of hepatitis A infection
- > 22 cases of *Legionella pneumophila* serogroup 1 infection
- > 22 cases of Q fever
- > 5 cases of typhoid fever
- > 5 cases of paratyphoid fever
- > 5 cases of *Listeria monocytogenes* infection
- > 1 case of measles.

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 31 January 2019 by the calculated onset date from 1 January to 31 December 2017. 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 31 January 2019 for cases notified from 1 January to 31 December 2017.

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.

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, rheumatic fever and rheumatic heart disease are reported elsewhere.

Enteric diseases

In 2017, gastrointestinal illnesses accounted for 14% of disease notifications in SA, compared to 29% of notifications in 2016. There were 5,659 cases of notifiable gastrointestinal disease reported in 2017.

Campylobacter infection was the most commonly reported notifiable gastrointestinal disease in SA and accounted for 55% of these notifiable diseases.

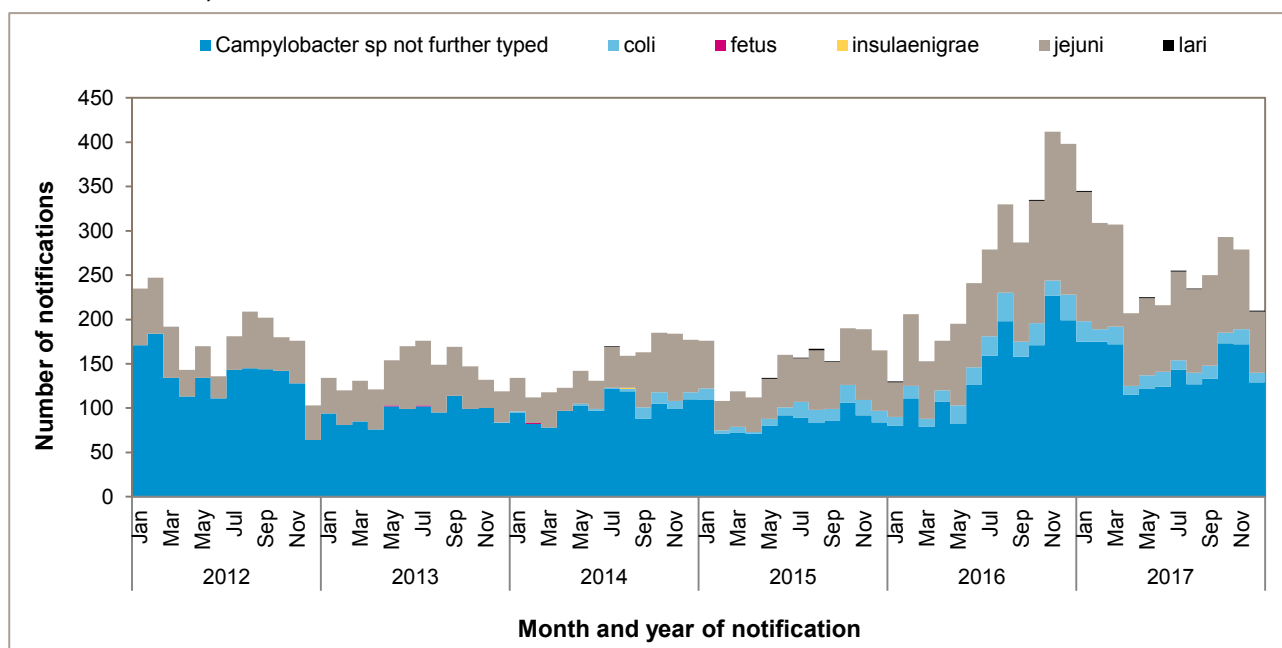
Botulism

There was one case of botulism notified in 2017, the first case since 2003. The case was a six-month-old male from metropolitan Adelaide (infant botulism).

Campylobacter infection

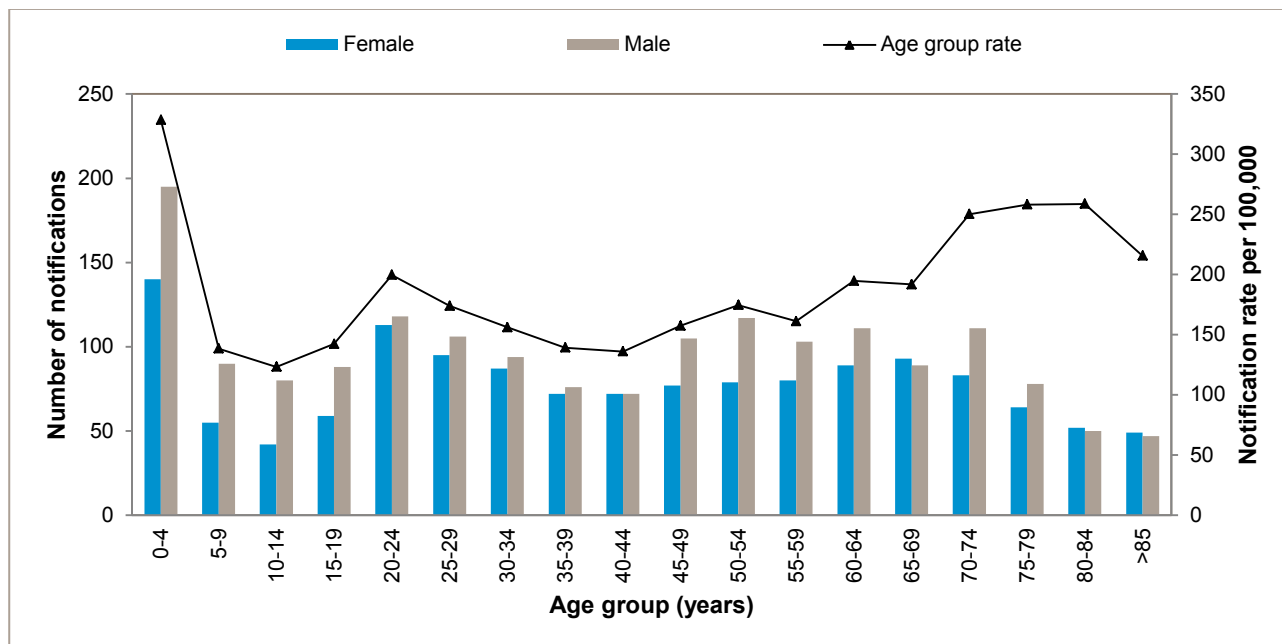
There were 3,114 notifications of *Campylobacter* infection in SA in 2017, consistent with 3,197 in 2016 and higher than the five-year average of 2,141 per annum for the period 2012 to 2016 (Figure 1).

Figure 1 Notified cases of *Campylobacter* infection by type, and month and year of illness onset, South Australia, 2012-2017



Fifty-five percent of *Campylobacter* notifications in 2017 were in males. There were higher rates of notification amongst males in the majority of five year age groups compared with females. The highest rate of campylobacteriosis notifications occurred in children aged less than five years of age and accounted for 11% of campylobacteriosis notifications. Notification rates were next highest in persons aged 70 to 84 years and accounted for 17% of campylobacteriosis notifications (Figure 2).

Figure 2 Notified cases of *Campylobacter* infection by age group and sex, South Australia, 2017



Since July 2014, diagnostic laboratories have introduced enteric nucleic acid test (NAT) testing; one laboratory commenced in June 2016. PCR testing is more sensitive than culture methods and a decrease in the proportion of culture positive only results has been observed. In 2017, 1,088 (35%) *Campylobacter* notifications tested positive by PCR only compared to 950 notifications (30%) in 2016. The introduction of PCR testing is likely to have contributed to the increase in *Campylobacter* notifications in 2016 and 2017.

In 2017, there were two outbreaks of campylobacteriosis investigated and linked with a restaurant and a wedding reception. ([Appendix 3](#)).

Cryptosporidiosis

There were 356 cases of cryptosporidiosis reported in 2017, similar with the 432 notifications reported in 2016 and higher than the a five-year average of 273 cases reported per annum for the period of 2012 to 2016. (Figure 3).

In 2017, cryptosporidiosis notifications were in 189 males and 167 females with an age range of less than 1 year to 80 years, and a median age of 19 years.

The highest number of cryptosporidiosis notifications occurred in children aged less than 10 years of age and these accounted for 39% of notifications. There were more females than males reported in the age groups between 20 and 39 years. (Figure 4).

In 2017, four outbreaks of cryptosporidiosis were investigated ([Appendix 3](#)). Two outbreaks were associated with public swimming pools, one outbreak with consumption of unpasteurised milk, and one outbreak with a petting zoo. All outbreaks were referred to Health Protection Programs or the Food and Controlled Drugs Branch for investigation and action.

Figure 3 Notified cases of cryptosporidiosis cases by month and year of illness onset, South Australia, 2012-2017

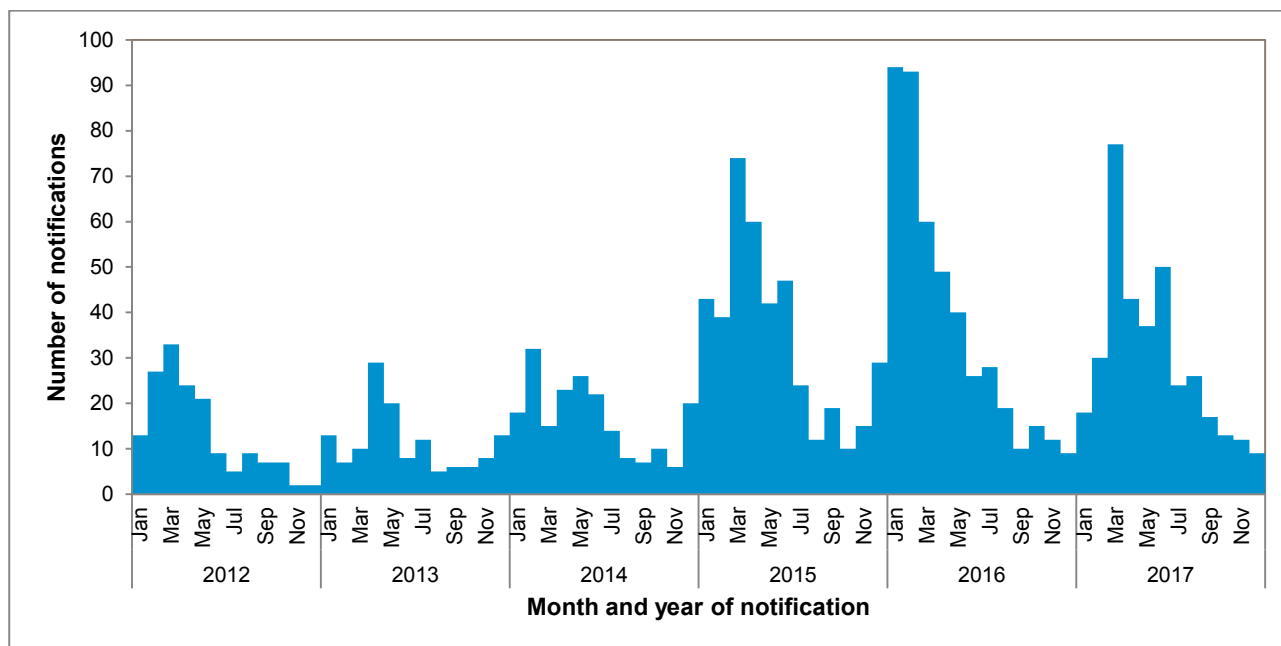
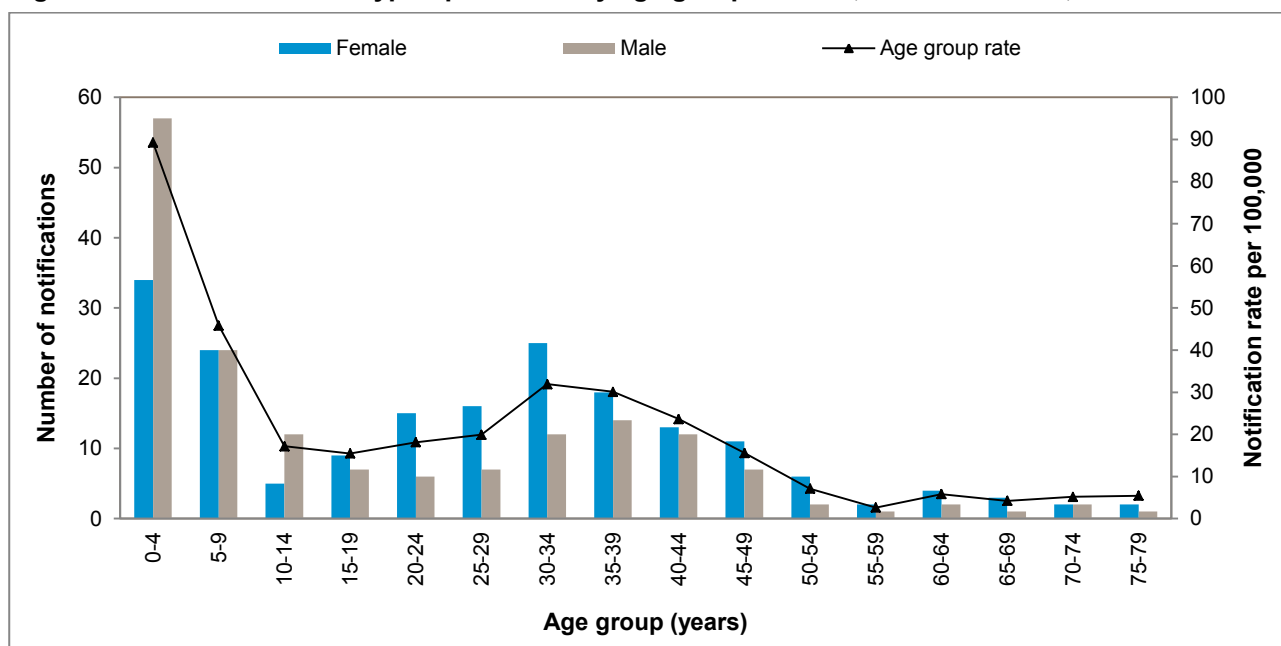


Figure 4 Notified cases of cryptosporidiosis by age group and sex, South Australia, 2017



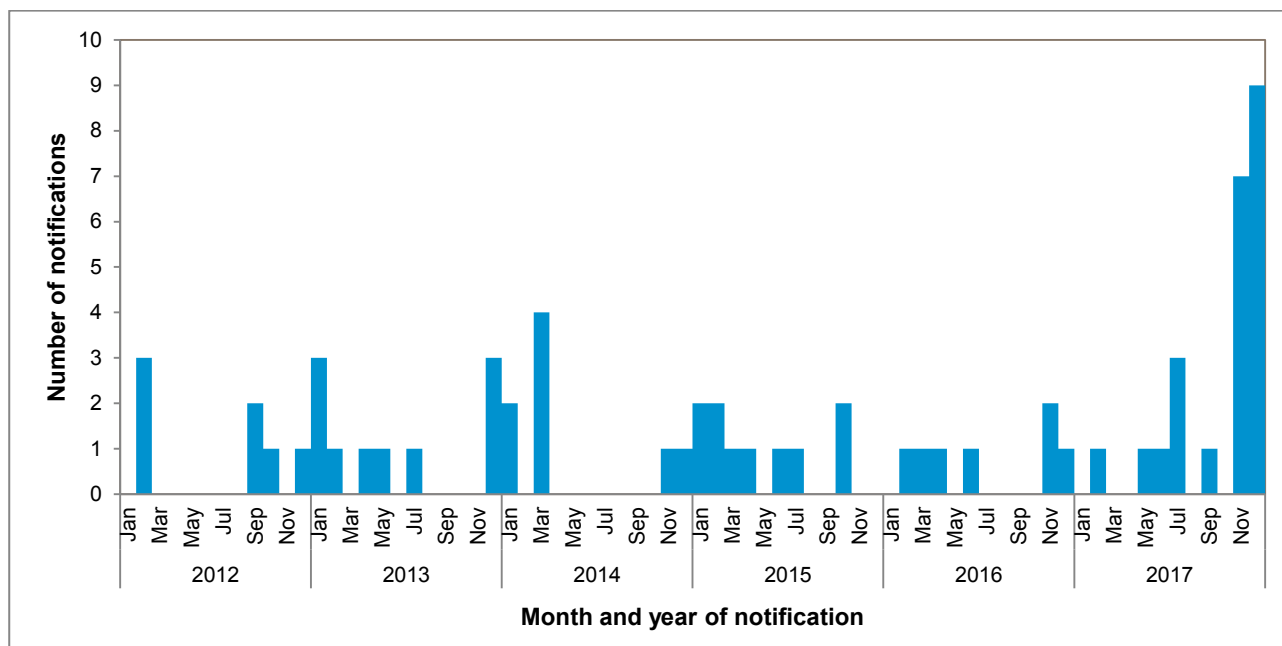
Hepatitis A

In 2017, there were 23 notifications of hepatitis A infection in SA, higher than the seven cases reported in 2016 and the five-year average of eight notifications per year for the period 2012 to 2016 (Figure 5). Eighteen of the notifications in 2017 were considered to be locally acquired. Countries of acquisition for the five overseas acquired cases in 2017 were India (1), Morocco (1), Pakistan (1), Saudi Arabia (1) and Venezuela (1).

In 2017, hepatitis A notifications were in 17 males and six females with an age range of less than 1 year to 65 years, and a median age of 34 years. Fourteen cases of hepatitis A (61%) were hospitalised due to their infection. All cases were unvaccinated and two were reported to identify as Aboriginal or Torres Strait Islander.

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

Figure 5 Notified cases of hepatitis A infection by month and year of illness onset, South Australia, 2012-2017



There were two outbreaks of locally acquired hepatitis A in SA in 2017 ([Appendix 3](#)). Four cases were linked to a national outbreak with frozen berries the source of infection. Fourteen cases were linked to an outbreak where most of the cases were men who have sex with men (MSM) (Table 1).

Table 1 Notified cases of hepatitis A infection by reported risk factor, South Australia, 2017

Risk factor	Hepatitis A infection
MSM outbreak	14
Overseas travel	5
Frozen berries	4
Total	23

Hepatitis E

There was one case of hepatitis E infection notified in 2017, compared to three notifications in 2016, and the five-year average of one notification per year for the period 2012 to 2016. The case was a 64-year-old female with recent multi-country travel through Asia.

Listeriosis

Five cases of listeriosis were notified in 2017, consistent with four cases reported in 2016 and the five-year average of 4 cases per annum for the period 2012 to 2016.

Listeriosis notifications were in two males and three females with an age range of 31 to 89 years, and a median age of 72 years. All cases had pre-existing medical conditions and were hospitalised. There were no deaths reported in cases of listeriosis in 2017 and no links were identified between cases.

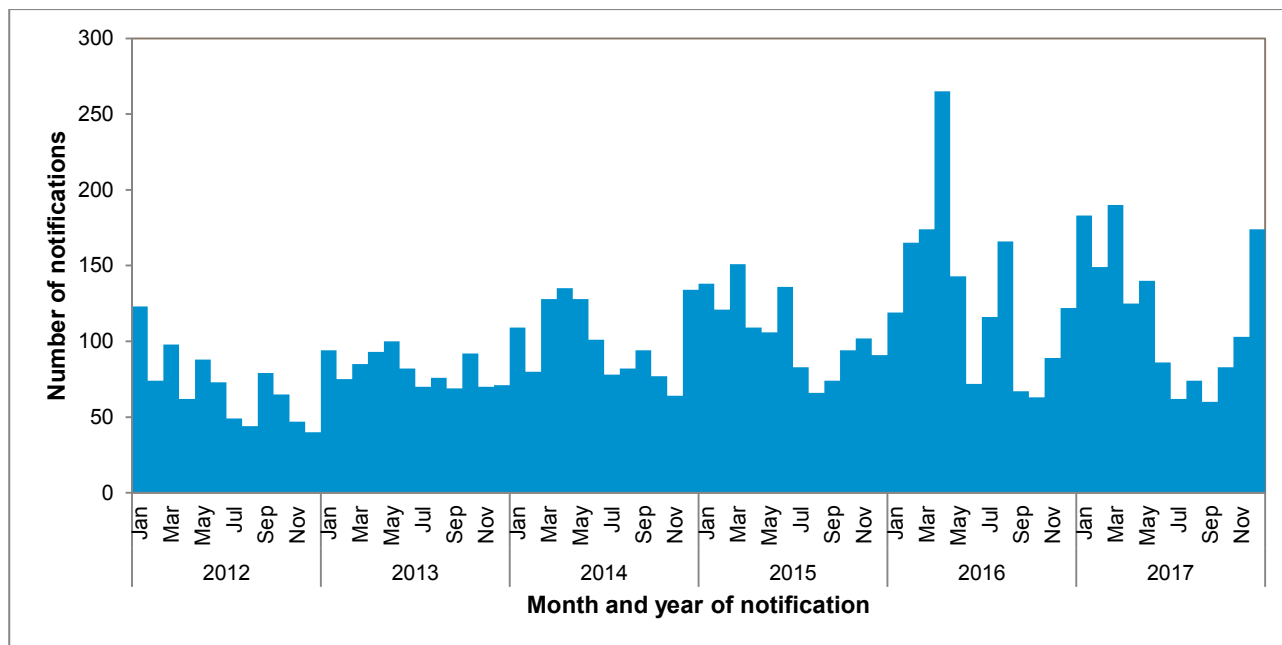
Phenotypic serotyping did not occur in 2017 due to a change in laboratory methods in SA.

All further typing for 2017 cases was molecular based typing conducted at the Microbiological Diagnostic Unit (MDU) in Victoria. South Australian cases in 2017 were not highly related to cases interstate or part of any multi-jurisdictional outbreaks based on whole genome sequencing.

Salmonella infection

In 2017, 1,456 notifications of *Salmonella* infection were notified, consistent with 1,571 notifications in 2016 and higher than the five-year average of 1,174 notifications per year for the period 2012 to 2016 (Figure 6). Twenty-six per cent of gastrointestinal notifications this year were due to *Salmonella* infection.

Figure 6 Notified cases of *Salmonella* infection by month and year of illness onset, South Australia, 2012-2017



In 2017, *Salmonella* infection notifications were in 627 males and 829 females with an age range of less than 1 year to 97 years, and a median age of 30 years. Cases reported this year were older than the five-year median age of 28 years for the period 2012 to 2016 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 17% of notifications (Figure 7).

In 2017, *Salmonella* Typhimurium phage types 9 and 135 were the most common serotype or phage-type notified and accounted for 39% of notifications. (Table 2).

There were 62 notifications of *Salmonella* Enteritidis infection reported in 2017, lower than the 76 notifications reported in the previous year. Among cases, 57 (92%) had travelled during their exposure period; 42 cases had travelled to Indonesia.

In 2017, 15 outbreaks of *Salmonella* infection were investigated ([Appendix 3](#)). Ten outbreaks were directly linked to eating at a café, restaurant or bakery. The remaining five outbreaks were linked to attending a school (2), an aged care facility (1), a private residence (1) and the community (1).

Figure 7 Notified cases of *Salmonella* infection by age group and sex, South Australia, 2017

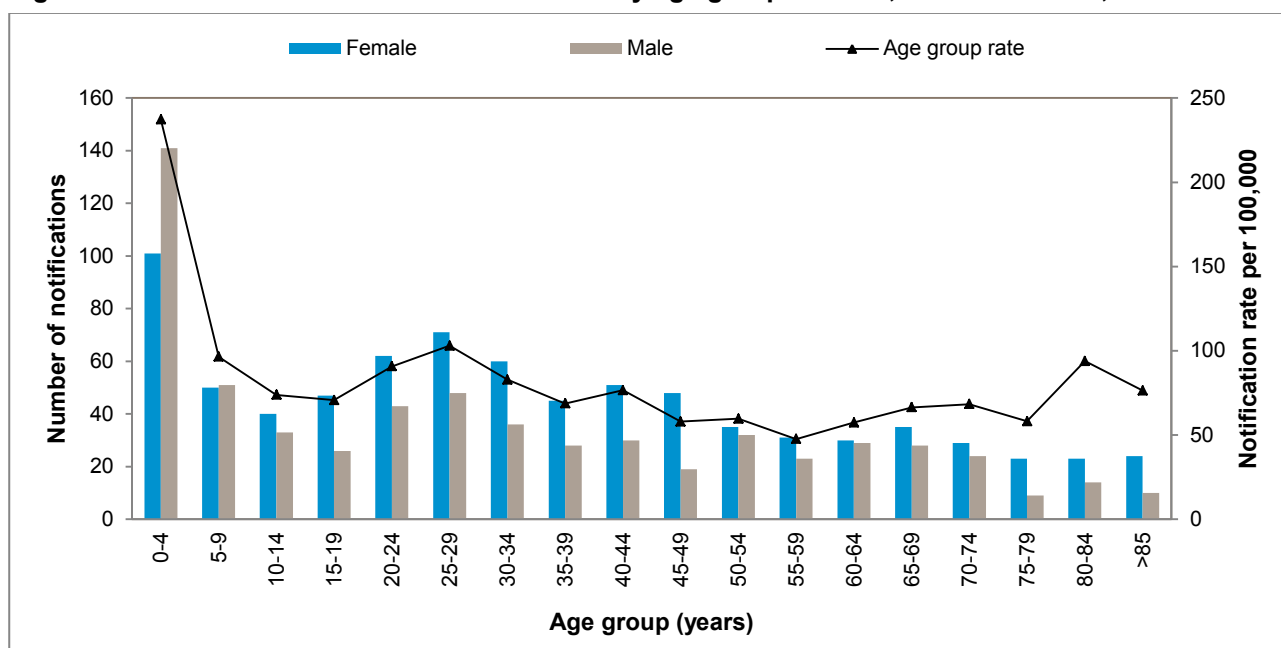


Table 2 Ten most commonly notified *Salmonella* serovars or phage types, South Australia, 2017

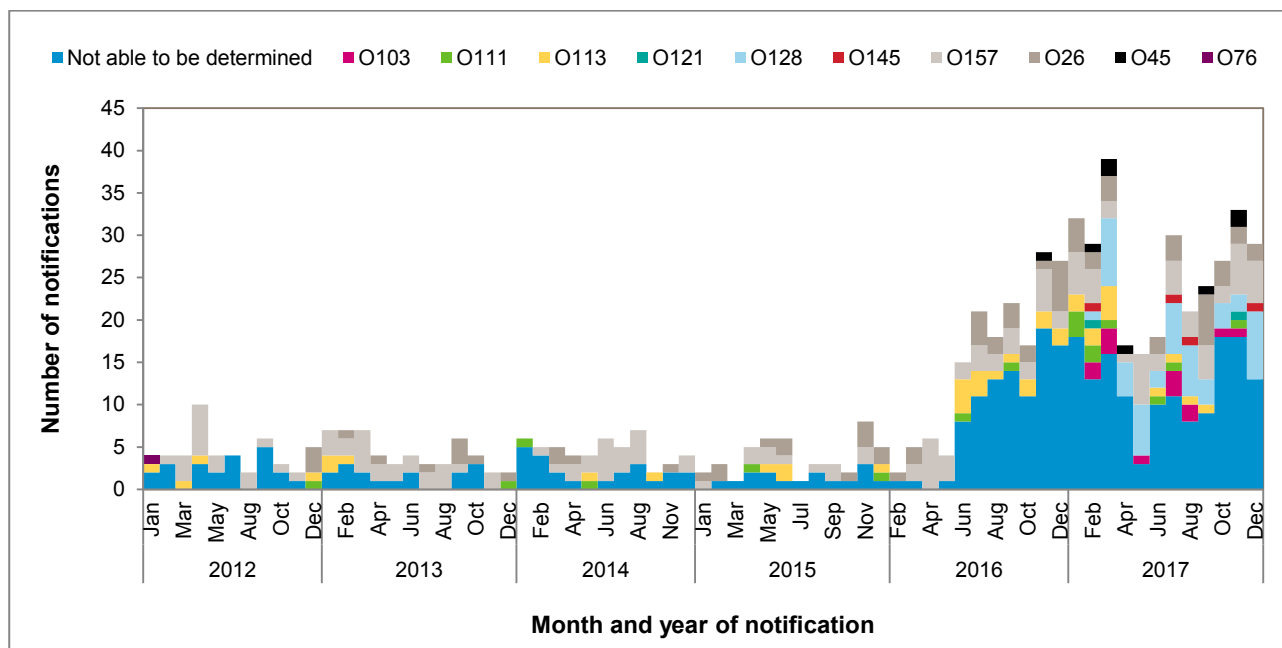
<i>Salmonella</i> serovar or phage type	Cases
<i>S. Typhimurium</i> 9	378
<i>S. Typhimurium</i> 135	190
<i>S. Typhimurium</i> 135a	66
<i>S. Enteritidis</i>	62
<i>S. Typhimurium</i> 12a	46
<i>S. Typhimurium</i> 108	42
<i>S. Virchow</i>	41
<i>S. subsp</i> 1 ser 4512:i:-	34
<i>S. Paratyphi</i> B var java	27
<i>S. Agona</i>	22
Other	548
Total	1456

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

In 2017, 313 notifications of STEC infection were reported, higher than the 176 notifications reported in 2016 and higher than the five-year average of 72 notifications per annum for the period 2012 to 2016 (Figure 8).

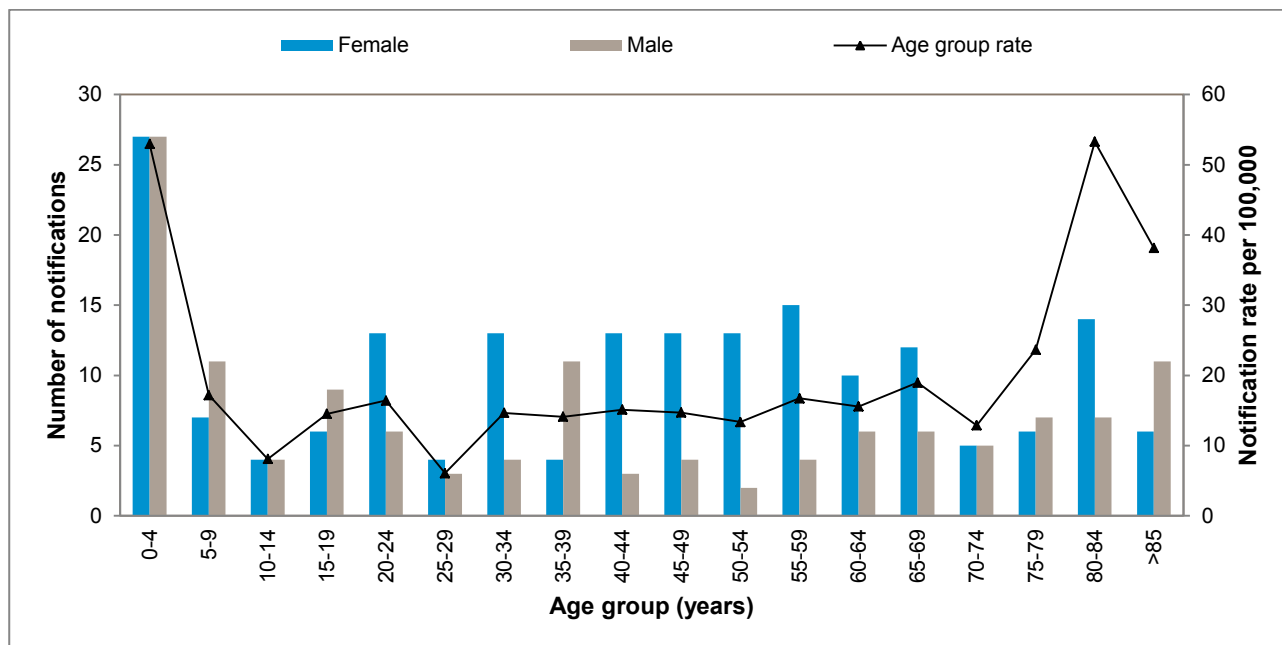
STEC testing is performed by only one laboratory in SA and in June 2016 this laboratory changed testing practices to test all faeces samples for STEC as a component of a NAT bacterial pathogen panel where previously testing was conducted only if STEC testing requested or if blood was present in the sample.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

Figure 8 Notified cases of STEC by serogroup a by month and year of illness onset, and serogroup South Australia, 2012-2017



Nineteen individuals were co-infected with two or more different serogroups of STEC, therefore in 2017 cases comprised of 125 males and 159 females with an age range of less than 1 year to 94 years, and a median age of 42 years (Figure 9).

Figure 9 Notified cases of STEC infection by age group and sex, South Australia, 2017



In 2017, STEC serogroups were determined by a multiplex panel of nine serogroups and testing identified 51 (16%) STEC O128 detections and 44 (14%) STEC O26 detections. Serogroups for 145 (46%) screening positive cases were unable to be determined because the serogroup was not included on the multiplex panel (126 cases) or because there was insufficient DNA in the sample (19 cases). Cluster detection of STEC serogroups not included in the multiplex panel is difficult.

In 2017, there was one outbreak of STEC O26 investigated and linked to an agricultural show ([Appendix 3](#)).

Haemolytic uraemic syndrome

In 2017, two notifications of haemolytic uraemic syndrome (HUS) were reported. One of the cases was a 1-year-old male who tested positive for STEC O103 and O26. Further investigations identified that this case was a sporadic case. The other case was an 81-year-old female who was undergoing chemotherapy. She did not experience any gastrointestinal symptoms and was not tested for STEC. Treating doctors considered the HUS was related to a non-infective cause.

Shigella infection

Enteric PCR panel testing includes the detection of *Shigella* and shares the same target genes with enteroinvasive *E. coli*; 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 2017, 299 cases of *Shigella* infection were notified; consisting of 62 confirmed cases and 237 probable cases. This compares with 29 confirmed cases notified in 2016 and a five-year average of 29 confirmed cases per annum for the period 2012 to 2016. (Figure 10).

In 2017, *Shigella* infection confirmed and probable notifications were in 134 males and 165 females with an age range of less than 1 year to 89 years, and a median age of 31 years. Of confirmed *Shigella* infection cases, there were 29 males and 33 females with an age range of 1 to 87 years and a median age of 31 years (Figure 11). Fifty-five percent of shigellosis cases in 2017 occurred in Aboriginal people compared with 17% in 2016 and 3% in 2015. The majority of these Aboriginal people were part of an outbreak of shigellosis in remote far-north and far-west regions of South Australia ([Appendix 3](#)).

Shigella flexneri 2b was the most common species and subtype notified; and accounted for 60% of notified cases.

Overseas travel was reported by 127 cases of *Shigella* infection in 2017; including 16 confirmed cases and 111 probable cases. Twenty-four percent of these cases had travelled to Indonesia.

Figure 10 Notified cases of shigellosis by confirmation status, and month and year of illness onset, South Australia, 2012-2017

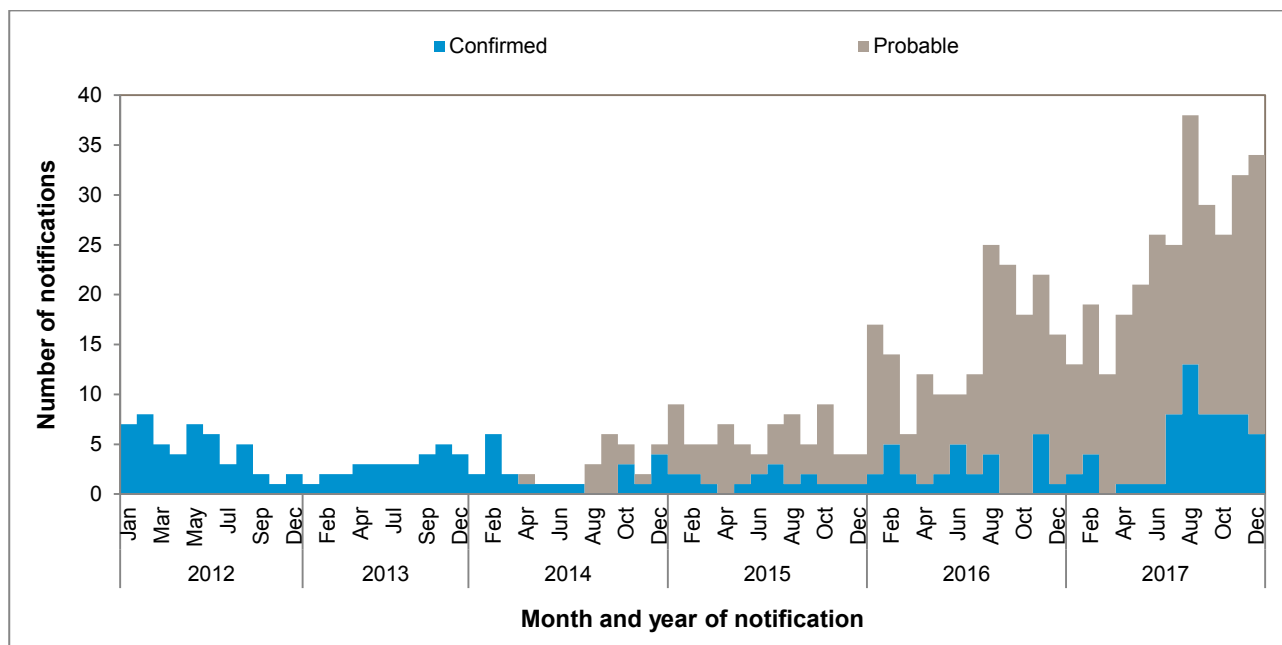
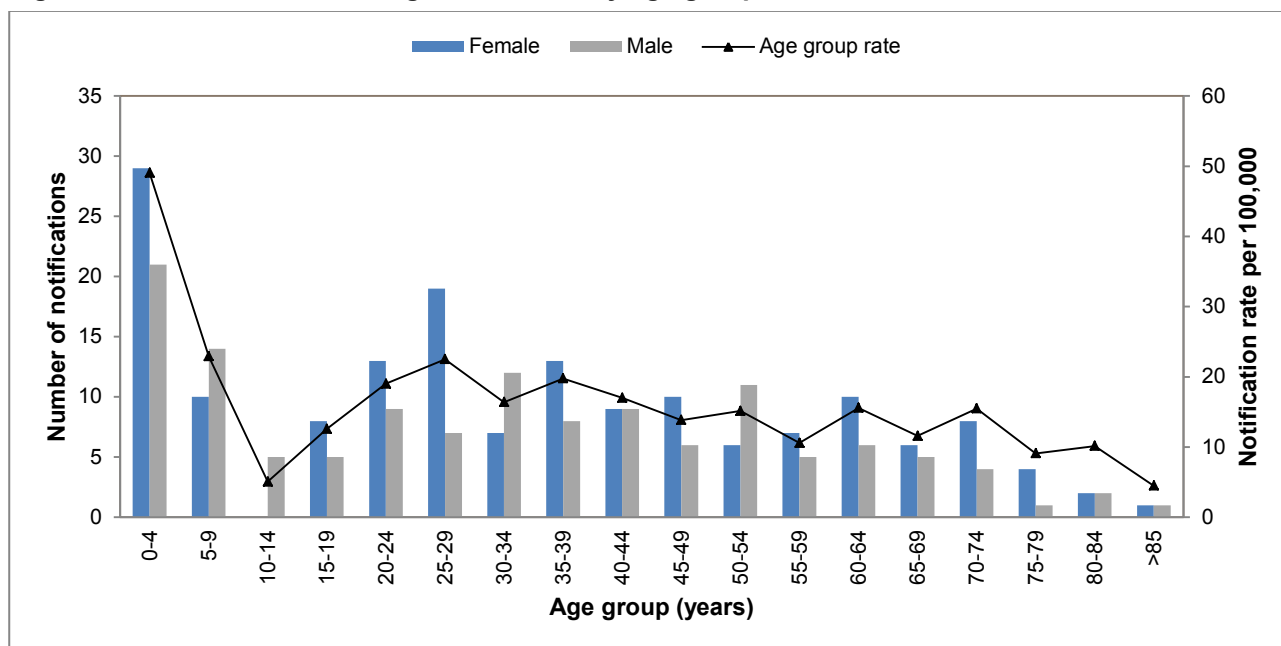


Figure 11 Notified cases of *Shigella* infection by age group and sex, South Australia, 2017



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 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. Most of the cases (79.3%) reported in 2017 were PCR positive only, 14.7% were culture and PCR positive, and 6% were culture positive only.

Typhoid

There were five cases of *Salmonella* Typhi infection notified in 2017, compared to six cases notified in 2016 and a five-year average of seven cases per annum for the period 2012 to 2016.

In 2017, *Salmonella* Typhi infection notifications were in three males and two females with an age range of 14 to 48 years, and a median age of 25 years. All cases were hospitalised and all five cases reported overseas travel to India during their incubation period. (Table 3).

All cases of *Salmonella* Typhi infection were interviewed and close household contacts were screened for carriage or infection. In 2016, no secondary cases were identified.

Paratyphoid

In 2017, there were five cases of *Salmonella* Paratyphi infection notified, compared to four cases notified in 2016 and the five-year average of five notifications per annum for the period 2012 to 2016.

In 2017, *Salmonella* Paratyphi infection notifications were in three males and two females with an age range of 4 to 57 years, and a median age of 36 years. Three cases of paratyphoid were hospitalised and all cases were acquired overseas (Table 3).

Contact tracing of *Salmonella* Paratyphoid cases occurred and no secondary cases were identified from household screening.

Table 3 Notified cases of typhoid and paratyphoid by reported risk factor, South Australia, 2017

Risk factor	Typhoid	Paratyphoid
Overseas travel		
India	5	1
Indonesia	0	1
Bangladesh	0	1
Bolivia	0	1
Overseas (country not specified)	0	1
Total	5	5

Vibrio parahaemolyticus infection

Vibrio parahaemolyticus infection became notifiable in SA on 18 February 2016. In 2017, there were five cases of *Vibrio parahaemolyticus* infection notified, lower than the eight cases notified in 2016. Cases were in three males and two females with an age range of 32 to 88 years and a median age of 68 years.

Three of the cases acquired their gastroenteritis overseas, with one case each acquired in Indonesia, Cambodia and Mauritius. There were two locally acquired cases in 2017, with one case having a wound infection following contact with seawater. There was one locally acquired case with gastroenteritis who reported eating raw oysters during their exposure period.

Table 4 Notified cases of *Vibrio parahaemolyticus* infection by risk factor, South Australia, 2017

Risk factor	Cases
Overseas travel	
Indonesia	1
Cambodia	1
Mauritius	1
Other	
Contact with seawater	1
Consumption of raw oysters	1
Total	5

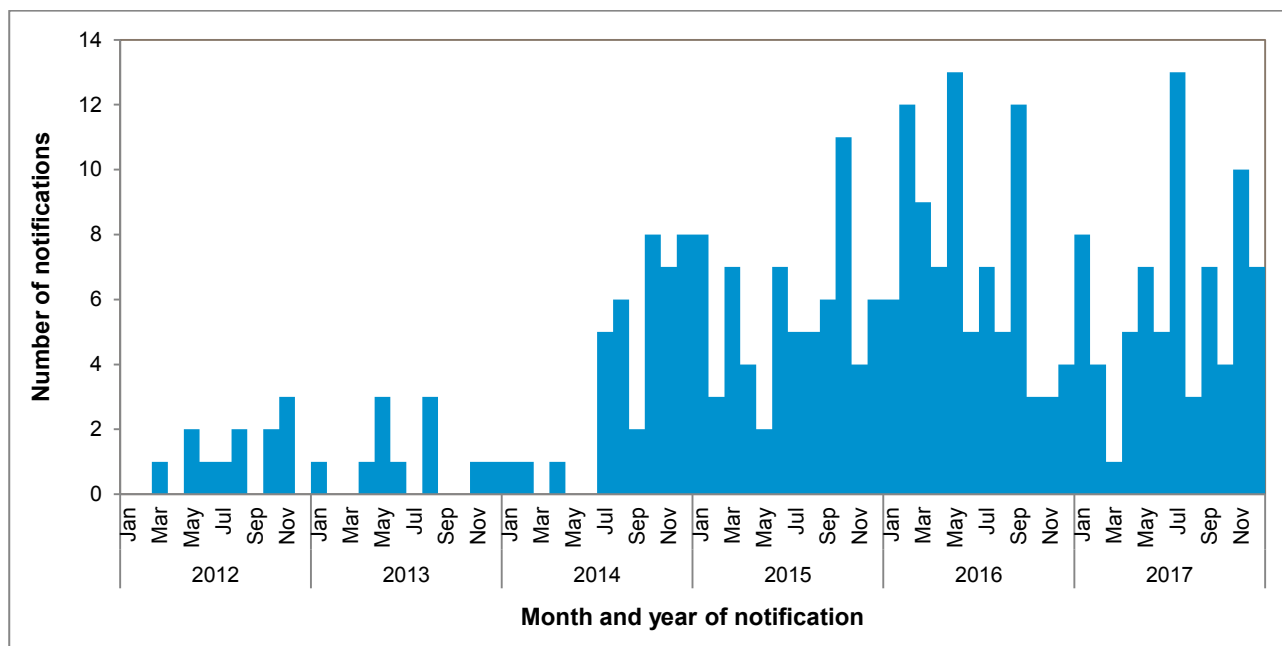
Yersinosis

In 2017, there were 74 notifications of *Yersinia* infection notified, lower than the 88 cases reported in 2016 and higher than the five-year average of 42 cases per annum for the period 2012 to 2016 (Figure 12).

In 2017, *Yersinia* infection notifications were in 31 males and 43 females, with an age range of less than 1 year to 82 years and a median age of 34 years. Of the 74 cases, 72 were characterised as *Y. enterocolitica*, one as *Y. pseudotuberculosis*, and one as *Y. frederiksenii*.

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, 2012-2017



Quarantinable diseases

There were no cases of cholera, avian influenza in humans, Middle East respiratory syndrome (MERS), plague, rabies, severe acute respiratory syndrome (SARS), smallpox, viral haemorrhagic fever including Ebola virus infection, or yellow fever reported in 2017.

Other notifiable infectious diseases

Leprosy

There was one case of leprosy reported in 2017. The case was a 28-year-old male who immigrated to Australia from Myanmar, where he acquired the infection. In the last five years there have been only two other cases of leprosy reported.

Creutzfeldt-Jakob disease

In 2017, four cases of Creutzfeldt-Jakob disease (CJD) were notified compared to two cases notified in 2016. Cases of CJD comprised three males and one female with a median age of 70 years. There were no links or common exposures identified between cases and all were described as sporadic cases of classical CJD.

Legionellosis

Forty cases of legionellosis were reported in 2017, higher than the 27 cases reported in 2016 and consistent with the five-year average of 39 notifications per annum for the period 2012 to 2016 (Figure 13). Laboratory tests attributed 22 cases to *Legionella pneumophila* serogroup 1, one case to *L. pneumophila* (not serogroup 1), and 17 cases to *L. longbeachae*.

The 22 notified cases of *L. pneumophila* serogroup 1 comprised of three females and 19 males with an age range of 26 to 79 years and a median age of 65 years. Cases reported this year were older than the five year median age of 62 years for the period 2012 to 2016 and consistent with more male cases being reported than females in the last five years. Cases predominantly resided in metropolitan Adelaide and 21 cases were hospitalised due to their infection.

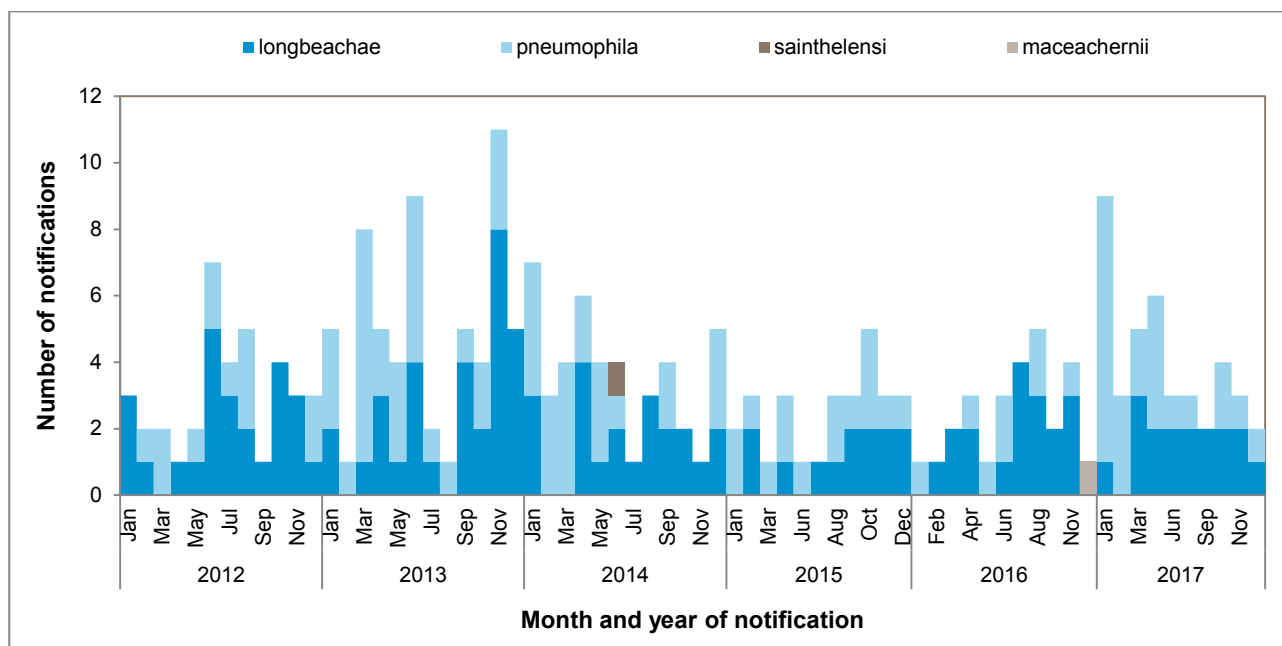
The *L. pneumophila* (not serogroup 1) case was a 67-year-old female from metropolitan Adelaide.

No deaths were attributed to *L. pneumophila* infection in 2017.

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

The 17 notified cases of *L. longbeachae* comprised of eight males and nine females with an age range of 42 to 82 years and a median age of 64 years. Cases resided across metropolitan Adelaide and rural SA. Eighty-two percent of cases were hospitalised. There was one death, and this was attributed to *L. longbeachae* infection.

Figure 13 Notified cases of legionellosis by serogroup, and month and year of notification, South Australia, 2012-2017



Invasive meningococcal disease (IMD)

There were 36 cases of invasive meningococcal disease notified in 2017, higher than the 27 cases reported in 2016 and the five-year average of 28 cases reported per annum for the period of 2012 to 2016. (Figure 14).

In 2017, invasive meningococcal disease notifications were in 18 males and 18 females with an age range of 0 to 78 years and a median age of 19 years. Cases this year were slightly younger than the five-year median age of 25 years. The highest number of notifications occurred in males aged 0 to 4 years. Notification rates were also highest in the 0 to 4 year age groups. (Figure 15).

Twenty-two cases (61%) resided in metropolitan Adelaide and 14 cases (39%) resided in rural or remote SA. Eight cases were reported to identify as Aboriginal or Torres Strait Islander origin.

Further laboratory testing attributed 22 cases to serogroup B, 11 cases to serogroup W and three cases to serogroup Y.

All cases were hospitalised and in 2017 and there were three deaths (two due to serogroup B and one due to serogroup W).

One cluster of three cases of meningococcal disease serogroup W was identified in remote South Australia. ([Appendix 3](#)).

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

Figure 14 Notified cases of invasive meningococcal disease by serotype, and month and year of notification, South Australia, 2012-2017

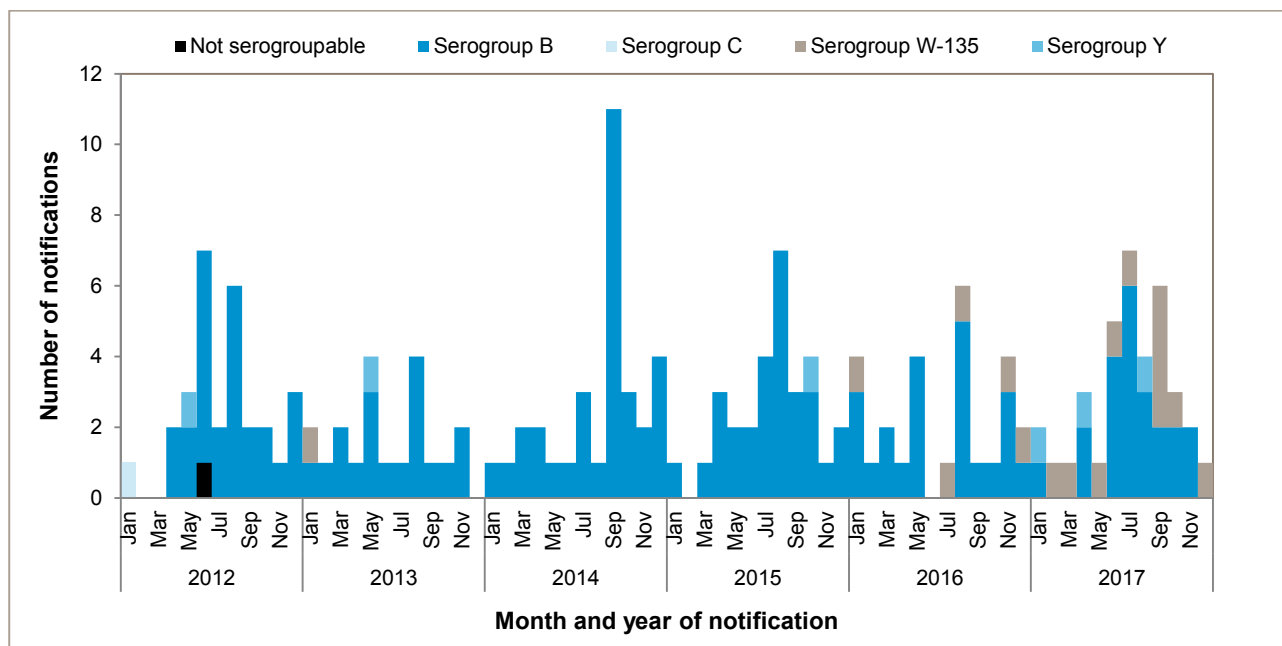
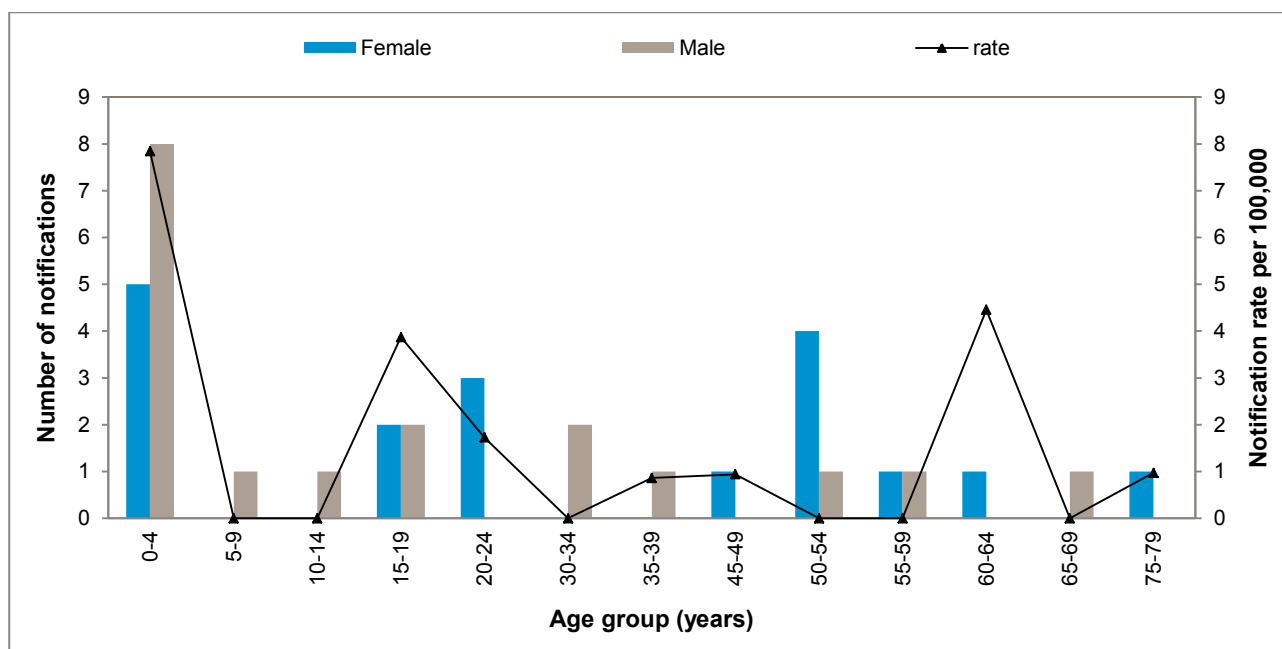


Figure 15 Notified cases of invasive meningococcal disease by age group and sex, South Australia, 2017



Vaccine preventable diseases

There were no cases of diphtheria, poliovirus infection or rubella reported in 2017. There were 35,430 cases of vaccine preventable diseases were notified in 2017. Influenza virus infection was the most commonly reported vaccine preventable disease in SA and accounted for 80% of these diseases.

Haemophilus influenzae infection (invasive)

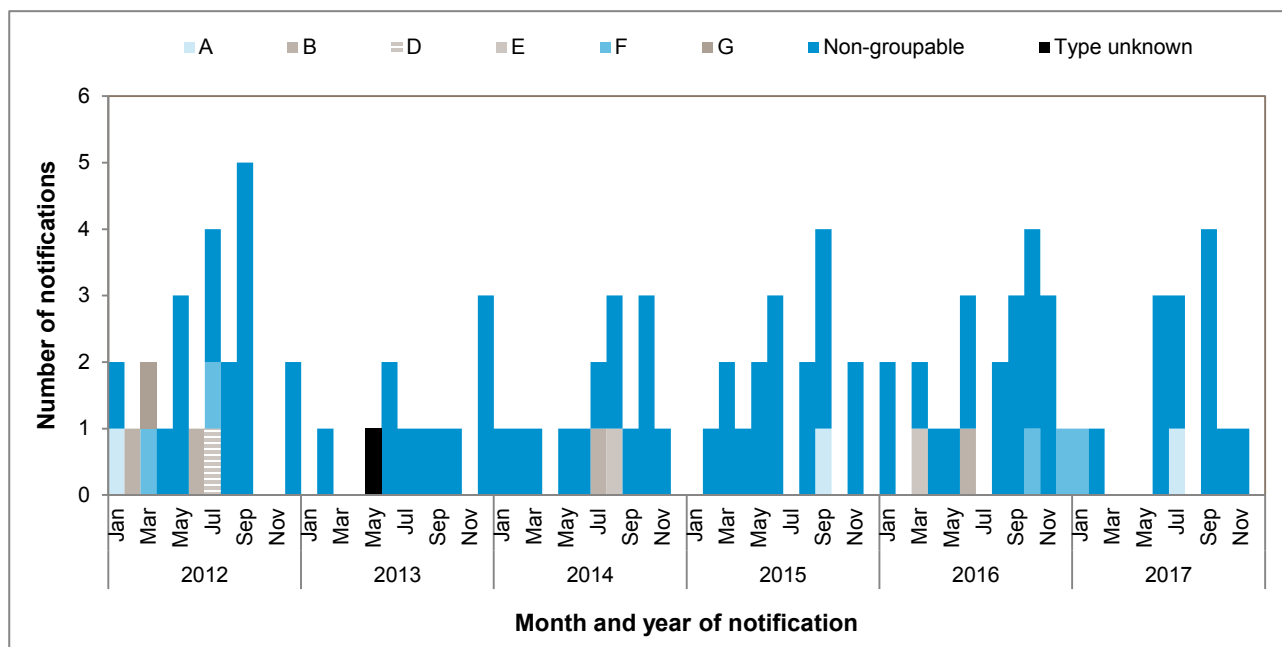
In 2017, there were 14 cases of invasive *H. influenzae* infection notified, lower than the 22 cases reported in 2016 and the five-year average of 18 cases reported per annum for the period of 2012 to 2016 (Figure 16).

In 2017, *H. influenzae* infection notifications comprised of six males and eight females with an age range of 4 to 91 years and a median age of 68 years. There was one death due to *H. influenzae* infection. Aboriginal

status was known for all cases, with two cases reported to identify as Aboriginal in 2017, which is consistent with two cases reported to identify as Aboriginal in 2016.

Further laboratory tests attributed one case to *H. influenzae* type A, one case to type F, and the remainder were non-groupable.

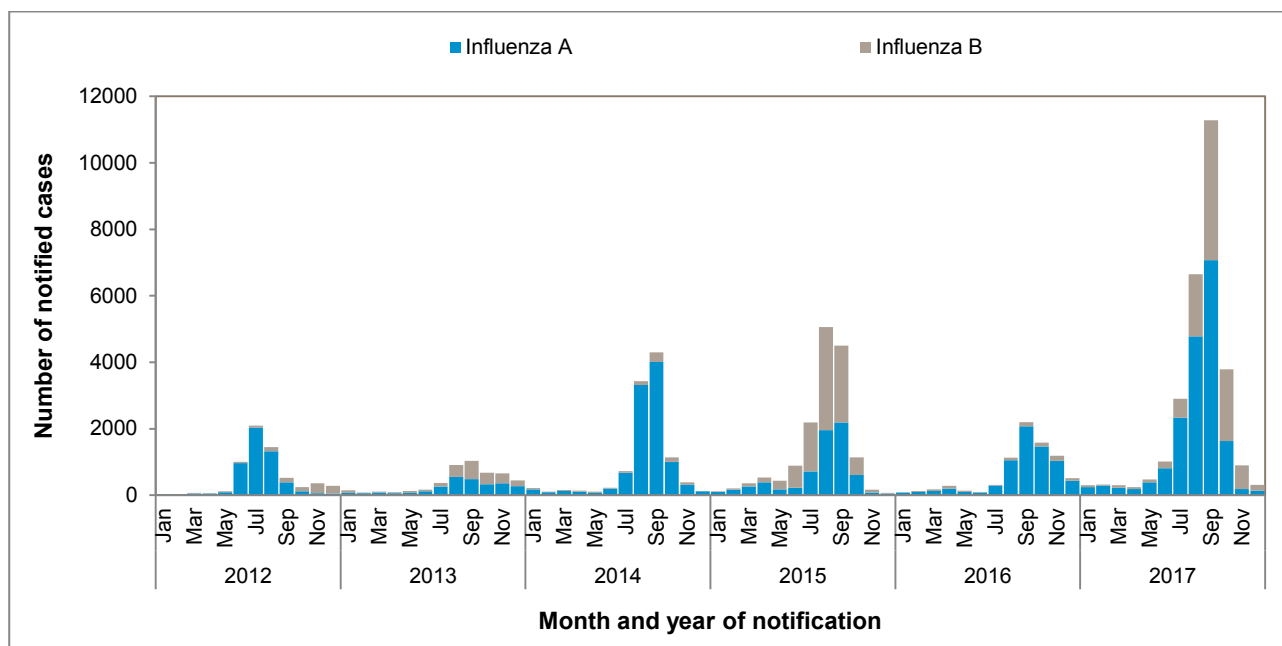
Figure 16 Notified cases of invasive *Haemophilus influenzae* infection by type, and month and year of notification, South Australia, 2012-2017



Influenza

There were 28,484 notifications of laboratory confirmed influenza notified in 2017. Notifications this year were three times higher than the five-year average of 9,131 notifications per annum for the period 2012 to 2016 (Figure 17).

Figure 17 Notified cases of influenza virus by type, and month and year of notification, South Australia, 2012-2017



In 2017, notifications of influenza virus were in 12,769 males and 15,709 females. For six cases, gender was not specified (including one non-binary case). Cases ranged in age from less than 1 year to 106 years with a median age of 37 years.

The highest number of influenza notifications occurred in children aged less than 10 years of age and accounted for 22% of notifications. Persons aged 85 or older accounted for 1,542 (5%) notifications. Notification rates were highest in the over 85 year age group, the less than 1 to 4 year age group and in the 5 to 9 year age group. Age distributions may in part reflect higher testing rates in vulnerable age group populations (Figure 18).

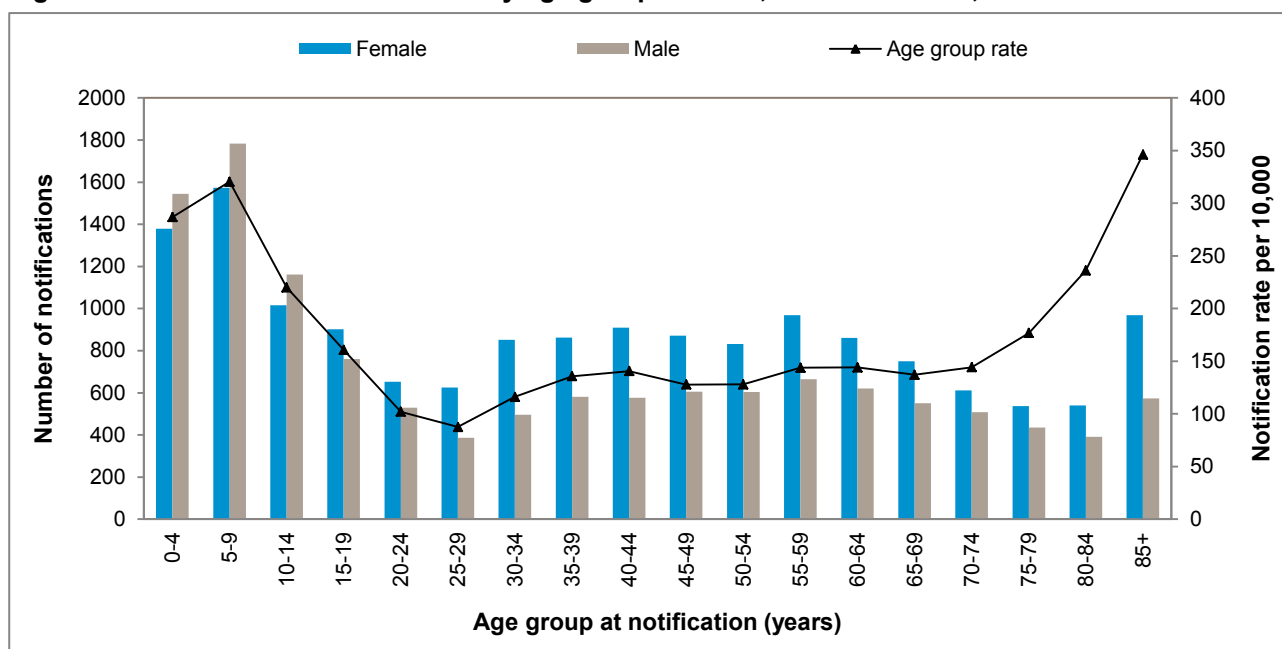
Among influenza notifications, 64% (18,295) were reported as influenza virus type A and 36% (10,189) of notifications were reported as influenza virus type B.

In 2017, there were 347 cases reported to identify as Aboriginal or Torres Strait Islander and this represented 1.2% of all notifications. The completeness of indigenous status data was 70%.

In 2017, there were 124 deaths reportedly due to influenza virus infection compared to 44 deaths in 2016.

There were 98 outbreaks of influenza reported to CDCB in 2017, 95 of these were in residential care facilities ([Appendix 3](#)).

Figure 18 Notified cases of influenza by age group and sex, South Australia, 2017

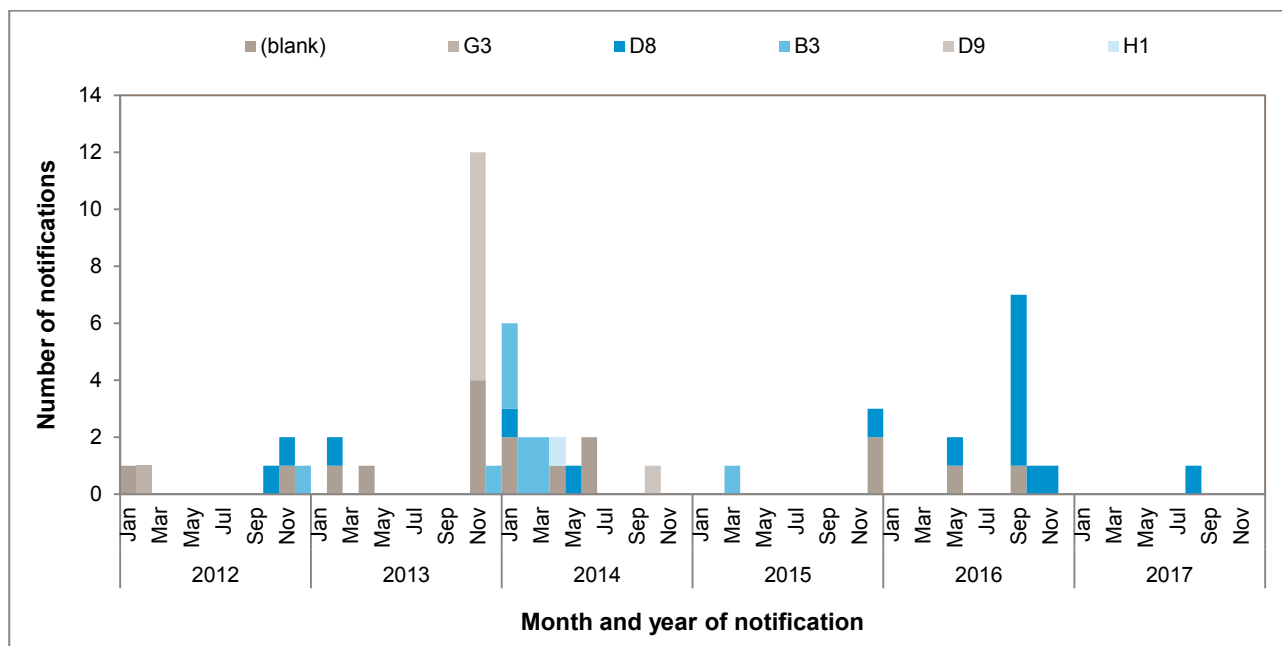


Measles

There was one notified case of measles in 2017, lower than the 11 cases notified in 2016 and the five-year average of 11 cases notified per annum for the period of 2012 to 2016. The case was a 28-year-old female who had travelled from Indonesia and had not been vaccinated. Further laboratory testing identified the measles as genotype D8 (Figure 19).

In accordance with national guidelines, immediate contact tracing occurred with 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, 2012-2017



Mumps

Sixty-three cases of mumps were notified in 2017, three times higher than the number of cases reported in 2016 and the five-year average of 17 cases reported per annum for the period of 2012 to 2016. (Figure 20).

In 2017, mumps notifications were in 30 males and 33 females with an age range of one year to 90 years, and a median age of 23 years. An outbreak in Anangu Pitjantjatjara Yankunytjatjara (the APY Lands) accounted for 71% of the cases reported in 2017 ([Appendix 3](#)).

In 2017, 30 cases (48%) 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 2017, 49 cases were diagnosed by PCR, compared with four cases in 2016, and five cases in 2015. 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, 2012-2017

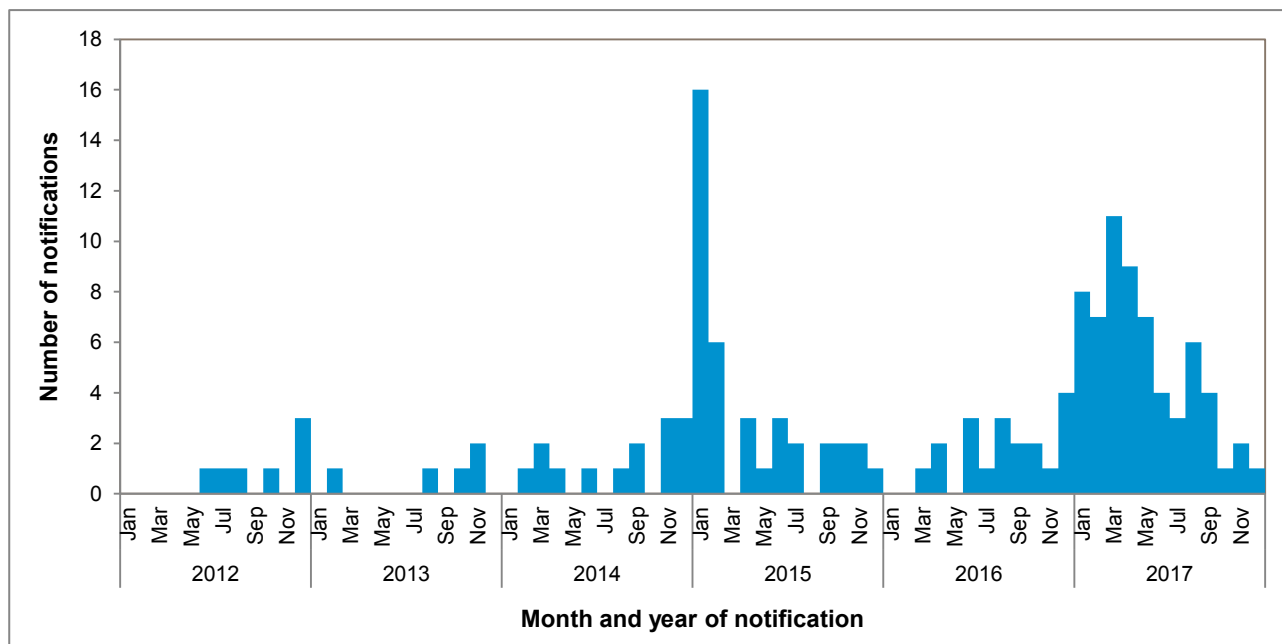
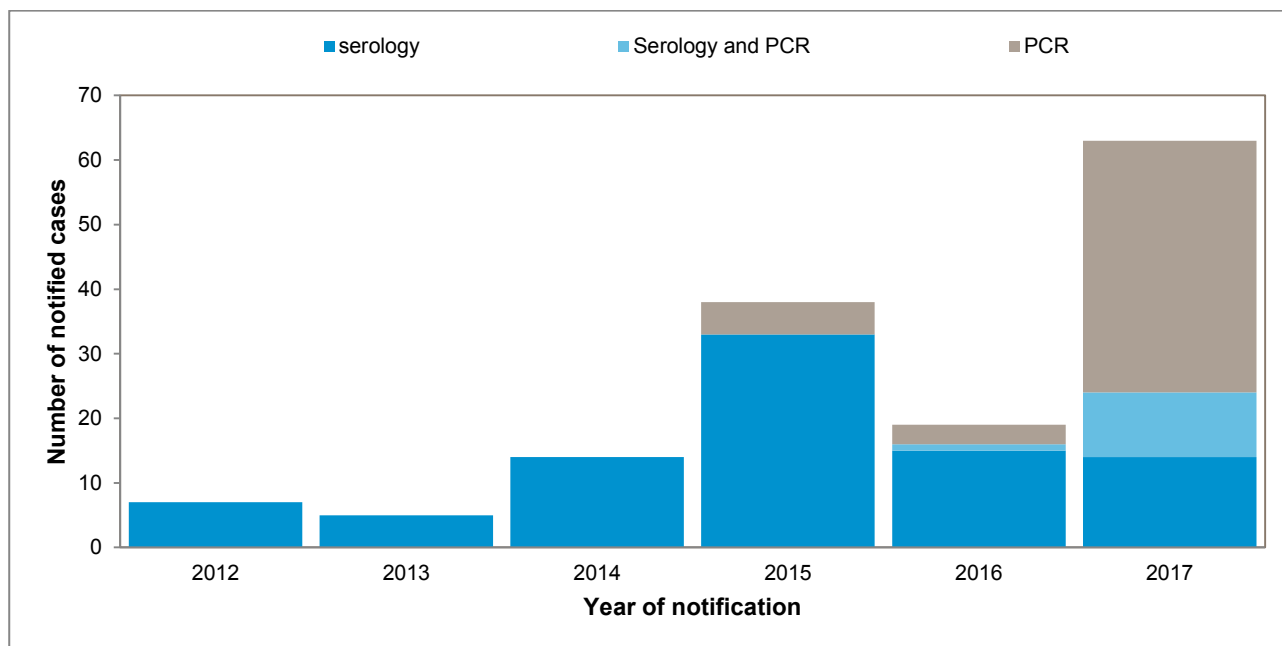


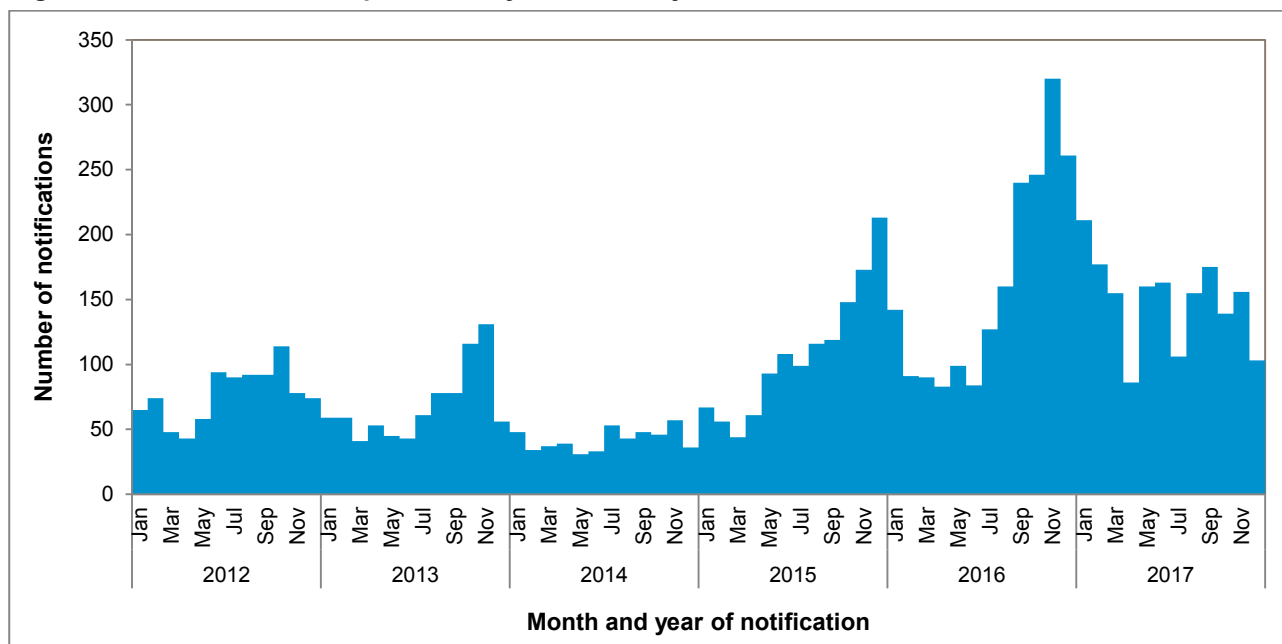
Figure 21 Notified cases of mumps by laboratory testing method and year, South Australia, 2012-2017



Pertussis (whooping cough)

In 2017, 1,786 cases of pertussis were notified, lower than the 1,943 reported in 2016 but higher than the five-year average of 1,097 cases reported per annum for the period of 2012 to 2016 (Figure 22).

Figure 22 Notified cases of pertussis by month and year of notification, South Australia, 2012-2017

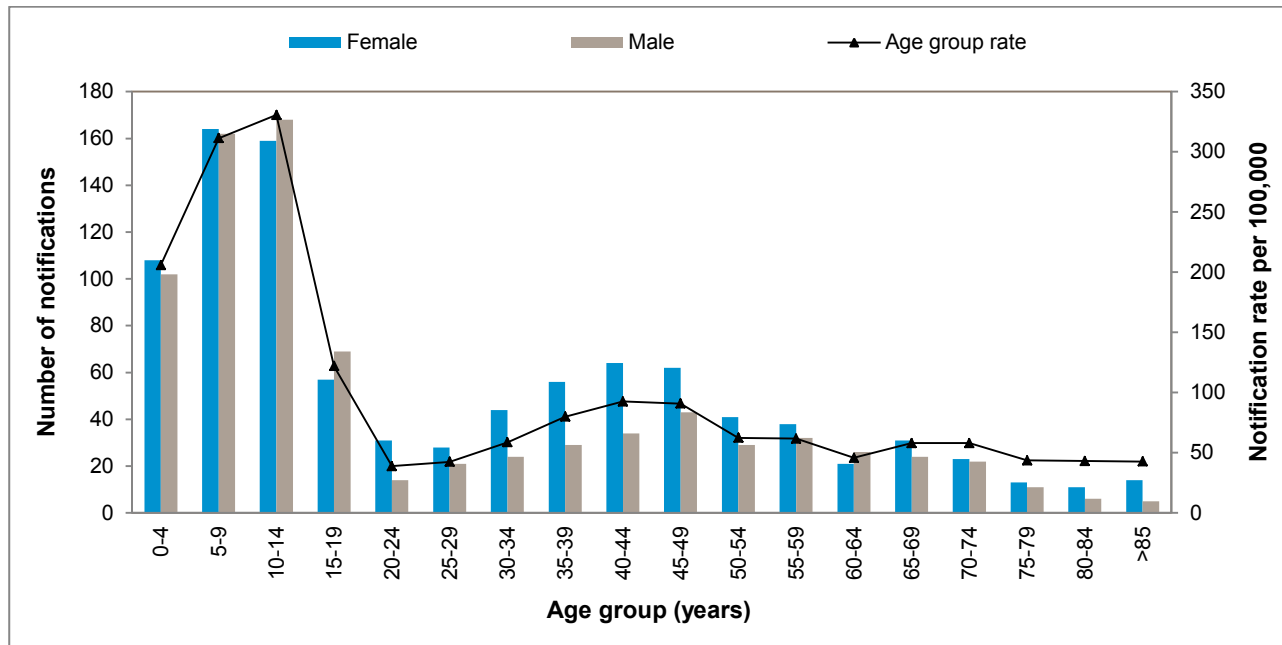


In 2017, notifications of pertussis comprised of 821 males and 965 females with an age range of less than one year to 103 years and a median age of 15 years. The median age of notified cases this year was younger than the five-year median age of 19 years for the period 2012 to 2016 and consistent with more female cases being reported than males in the last five years. (Figure 23).

The pertussis notifications were highest in children aged 5 to 9 years and children aged 10 to 14 years and these age groups combined accounted for 653 (37%) notifications. The notification rate was highest in the 10 to 14 year age group.

Pertussis vaccination is recommended for pregnant women. Of the 26 cases aged less than six months, 13 (50%) cases had documented evidence of maternal vaccination during pregnancy. Nineteen of these cases were vaccinated to age at time of infection, six cases had no known receipt of previous vaccination at time of infection and one case was too young to be vaccinated at time of infection.

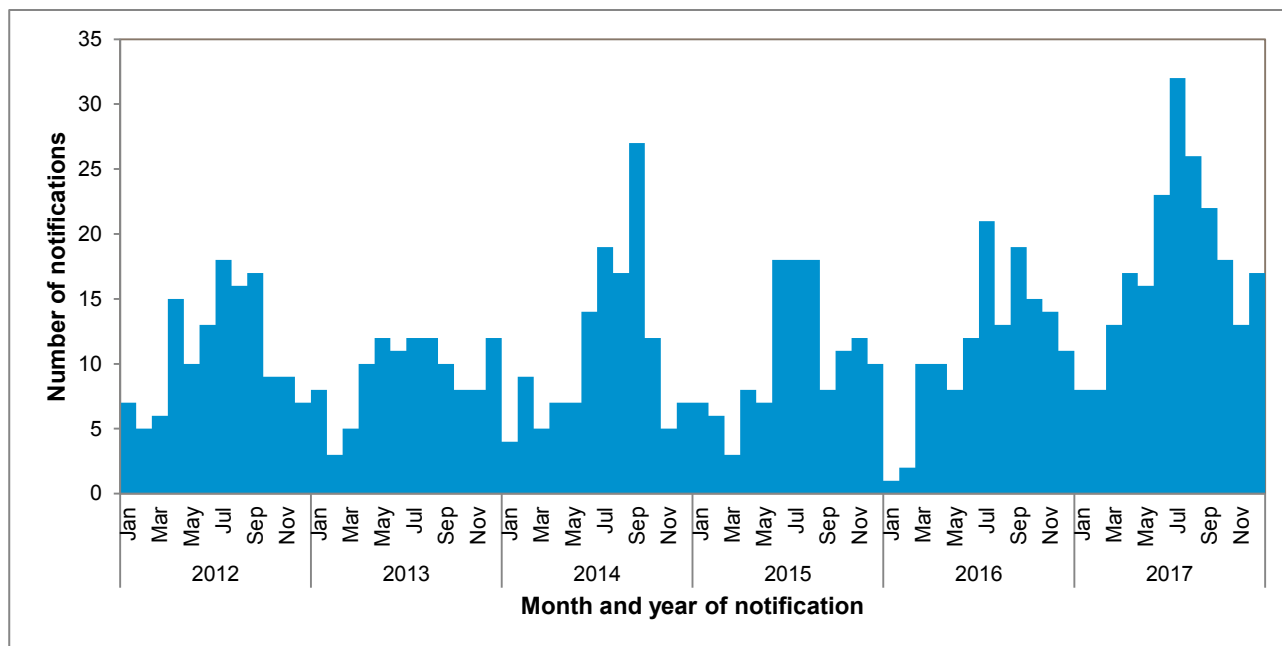
Figure 23 Notified cases of pertussis by age group and sex, South Australia, 2017



Invasive pneumococcal disease

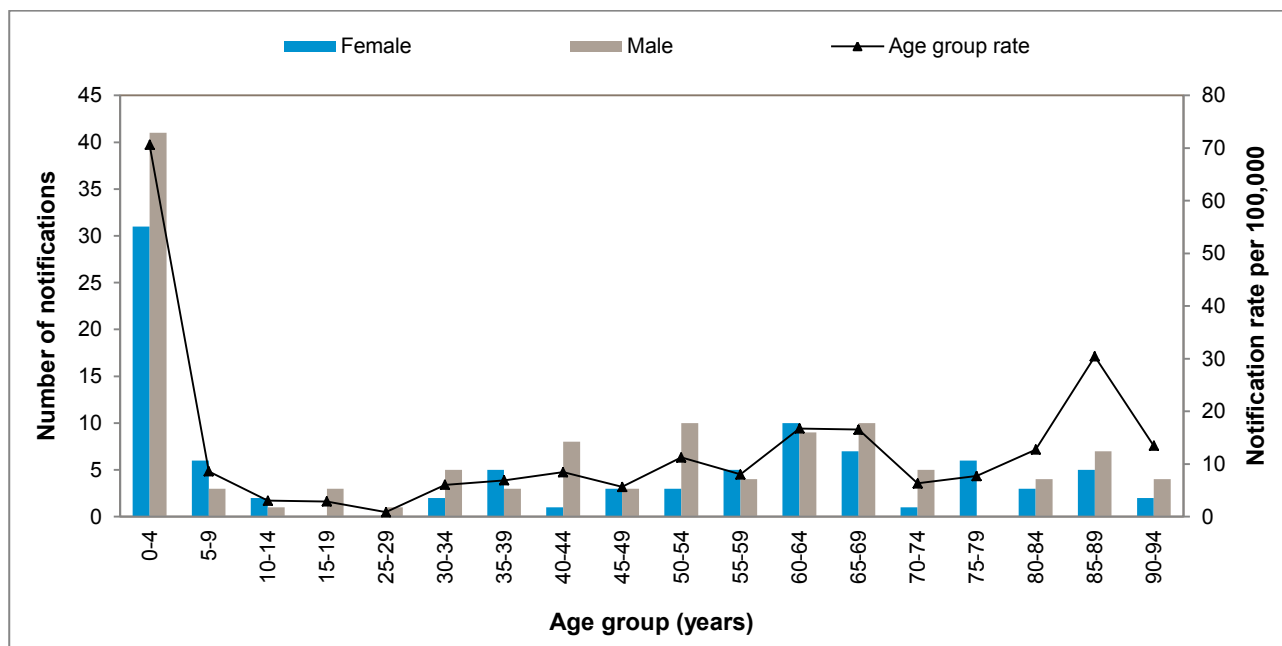
There were 213 notifications of invasive pneumococcal disease (IPD) reported in 2017, higher than the 136 notifications in 2016 and the five-year average of 128 notifications per annum for the period of 2012 to 2016 (Figure 24).

Figure 24 Notifications of invasive pneumococcal disease by month and year, South Australia, 2012-2017



Cases comprised of 121 males and 92 females with an age range of less than 1 year to 93 years and a median age of 40 years. In 2017 the median age of cases was younger than the five-year median age of 52 years (Figure 25).

Figure 25 Notified cases of invasive pneumococcal disease by age group and sex, South Australia, 2017



In 2017, there were 26 cases who were reported to identify as Aboriginal or Torres Strait Islander.

Thirteen deaths (6%) were attributed to invasive pneumococcal disease in 2017 compared with four deaths (3%) attributed to invasive pneumococcal disease in 2016.

Further laboratory testing identified the pneumococcal serotype for 140 cases (60%). Seventy-three cases were not serotyped; 62 were not serotyped because they were diagnosed by PCR and serotyping was not conducted for a further 11 cases. In 2017, serogroup 3 was the most common serotype notified and accounted for 8% of notifications.

Table 5 Five most commonly identified serotypes of invasive pneumococcal disease, South Australia, 2017

Pneumococcal serotype	Notifications (%)
Not serotyped	73
Serotype 3	18
Serotype 22F	17
Serotype 19A	15
Serotype 9N	14
Serotype 15A	8
Other	68
Total	213

In 2017, 98 cases (46%) were attributed to serotypes included in registered pneumococcal vaccines. Of the 50 cases aged less than five years, regarding pneumococcal vaccination, 42 cases were appropriately vaccinated for age, two cases were partially vaccinated for age and six cases were too young for vaccination.

Of the 54 cases aged over 65 years, three were reported to identify as Aboriginal or Torres Strait Islander, 18 cases had received at least one pneumococcal vaccination, 18 cases were not vaccinated against pneumococcal disease and the vaccination status was unknown for 18 cases.

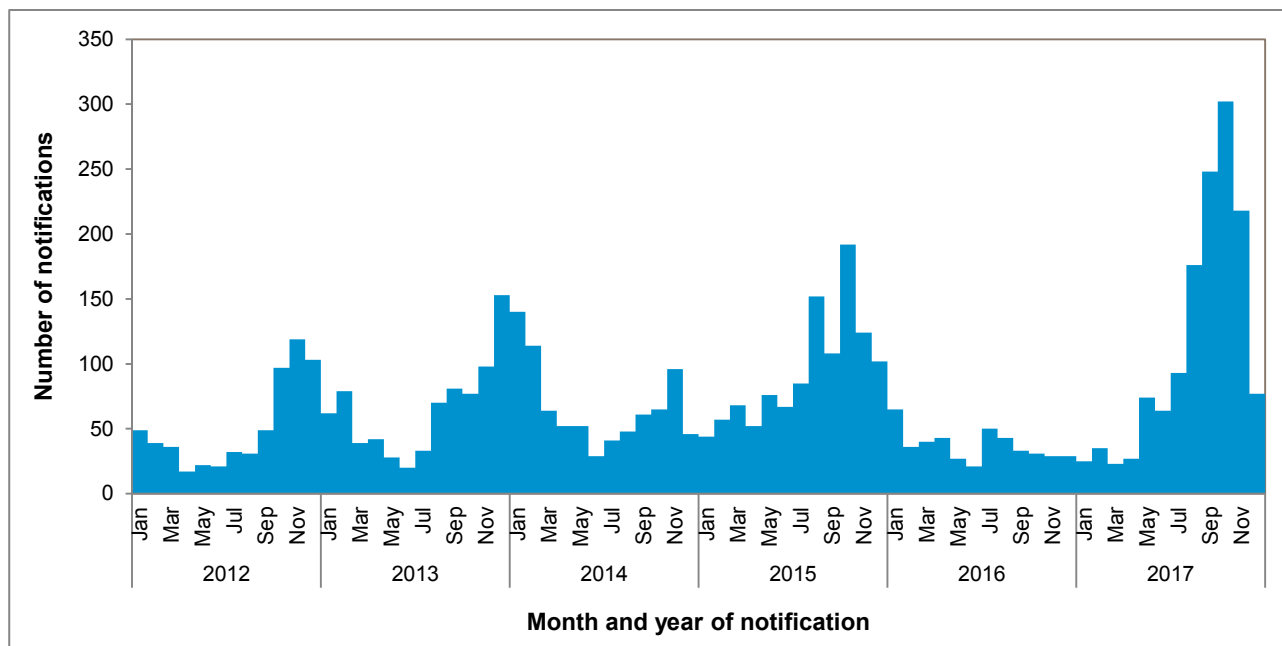
In 2017, 13 cases were confirmed as vaccinated against pneumococcal disease and identified as due to a serotype which is included in the vaccine and were recorded as a vaccine failure. In 2016, eight vaccine failures were reported.

Enhanced data for IPD notifications is collected and reported nationally elsewhere and informs vaccine development.

Rotavirus infection

There were 1,362 cases of rotavirus infection reported in 2017. Notifications this year represented a threefold increase on the number of notifications reported in 2016 (435 cases) and were higher than the five-year average of 753 notifications per annum for the period 2012 to 2016 (Figure 26).

Figure 26 Notified cases of rotavirus infection by month and year of notification, South Australia, 2012-2017



Notified cases of rotavirus comprised of 666 males and 696 females with an age range of less than 1 year to 99 years with 482 (35%) cases aged less than two years. Of the cases aged less than two years, 424 (88%) cases were vaccinated for age.

There were 12 outbreaks of rotavirus reported to CDCB in 2017. One community wide outbreak was reported in the APY Lands and remote rural regions (92 cases) and the remaining 11 outbreaks were reported by aged care facilities ([Appendix 3](#)).

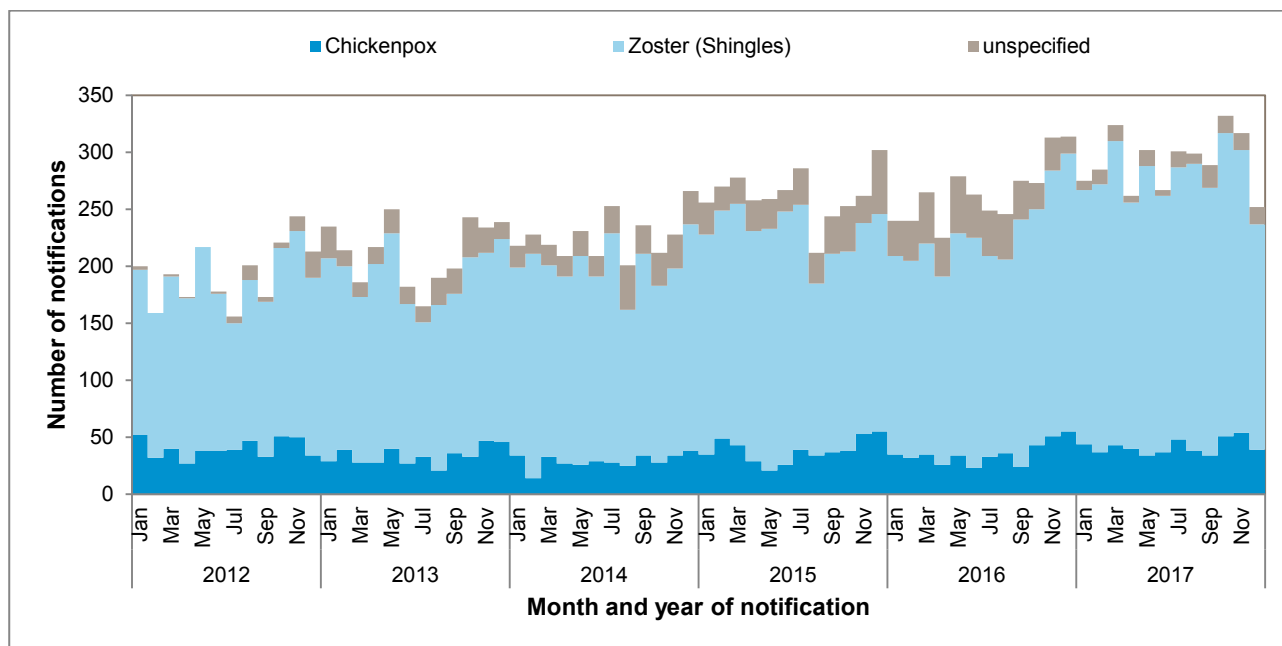
Tetanus infection

There were two cases of tetanus infection reported in 2017, consistent with low numbers of this disease reported in the last five years. The first case was a one year old male who had not been vaccinated against tetanus and recovered. The second case was an 85 year old female with no recent vaccinations who died due to the disease.

Varicella zoster virus

In 2017, 3,505 cases of varicella zoster virus infection were notified, higher than the 3,182 cases notified in 2016 and the five-year average of 2,784 notifications per annum for the period of 2012 to 2016 (Figure 27).

Figure 27 Notified cases of varicella zoster virus infection by infection type, and month and year of notification, South Australia, 2012-2017



Among cases of varicella zoster notified there were 1,553 males and 1,951 females (one case identified as non-binary) with an age range of less than 1 year to 106 years. Medical notification characterised 499 infections as chickenpox and 2,858 as shingles and the clinical manifestation for 148 remained unspecified. The median age of chickenpox cases was 11 years and the median age of shingles cases was 58 years.

In November 2016, a National Shingles Vaccination Program was commenced as an ongoing program for 70 year olds, 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

Barmah Forest virus infection

Three cases of Barmah Forest virus infection were reported in 2017, less than the five cases reported in 2016. From December 2013 to November 2016, changes in laboratory testing procedures affected the number of notifications compared with previous years.

Cases comprised two males and one female with an age range of 24 to 65 years. All three cases resided in rural South Australia.

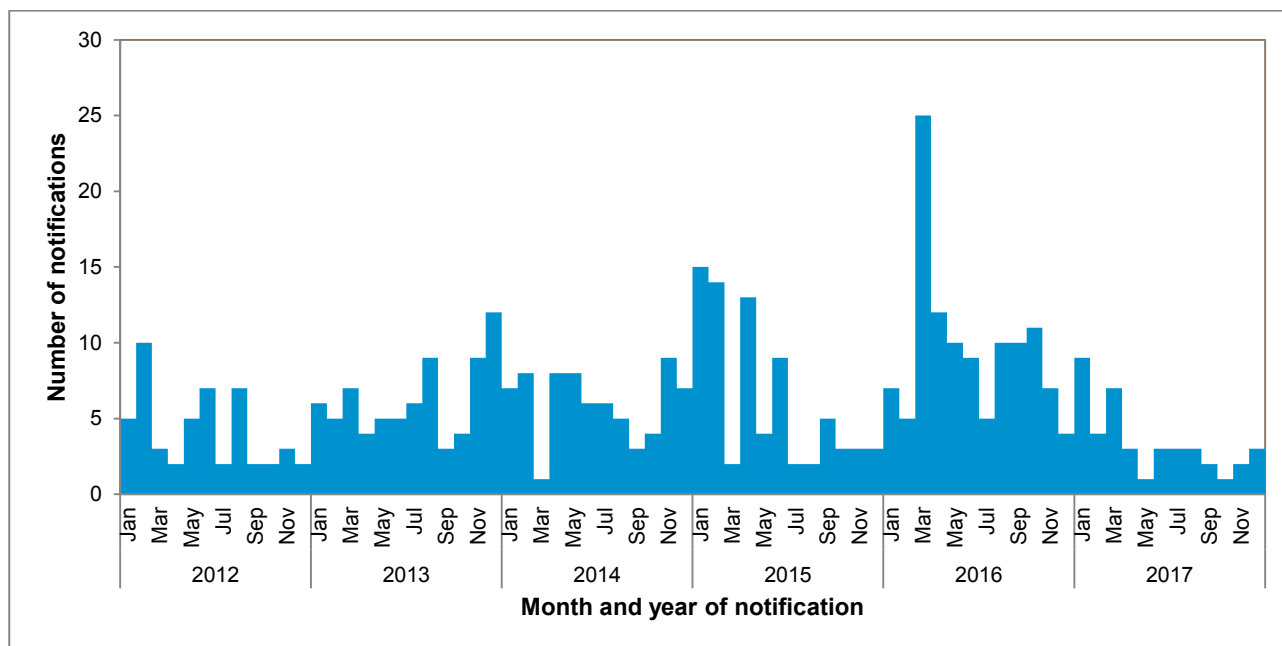
Chikungunya virus infection

In 2017, one case of chikungunya virus infection was notified, a marked decrease compared with seven cases notified in 2016 and lower than the five-year average of five cases reported per annum for the period of 2012 to 2016. The case was a 41-year-old male who reported travel to the Philippines prior to illness.

Dengue virus infection

There were 41 cases of dengue virus infection reported in 2017. This represented a 65% decrease on the number of notifications reported in 2016 and lower than the five-year average of 77 notifications per annum for the period 2012 to 2016 (Figure 28).

Figure 28 Notified cases of dengue virus infection by month and year of notification, South Australia, 2012-2017



In 2017, notifications of dengue virus infection were in 21 males and 20 females with an age range of 9 to 63 years and a median age of 40 years.

All cases were acquired overseas. South East Asia was the most commonly reported region of exposure (68%) followed by the Western Pacific (17%) and the Indian subcontinent (12%).

Table 6 Notified cases of dengue virus infection by country of acquisition, South Australia, 2017

Country of acquisition	Cases (%)
Indonesia	14 (34)
Thailand	7 (17)
India	4 (10)
Malaysia	3 (7)
Fiji	2 (5)
Papua New Guinea	2 (5)
Vietnam	2 (5)
Congo	1 (2)
Philippines	1 (2)
Singapore	1 (2)
Solomon Islands	1 (2)
Sri Lanka	1 (2)
Vanuatu	1 (2)
South-east Asia, not further defined	1 (2)
Total	41

Malaria

Eight cases of malaria were reported in 2017; similar to the 10 cases reported in 2016 the five-year average of seven cases reported per annum for the period of 2012 to 2016.

In 2017, malaria notifications were in six males and two females with an age range of 3 to 61 years with a median age of 18 years. All cases were acquired overseas.

Five cases were caused by *Plasmodium falciparum* and reported exposures in Sudan, Uganda, Cote d'Ivoire,

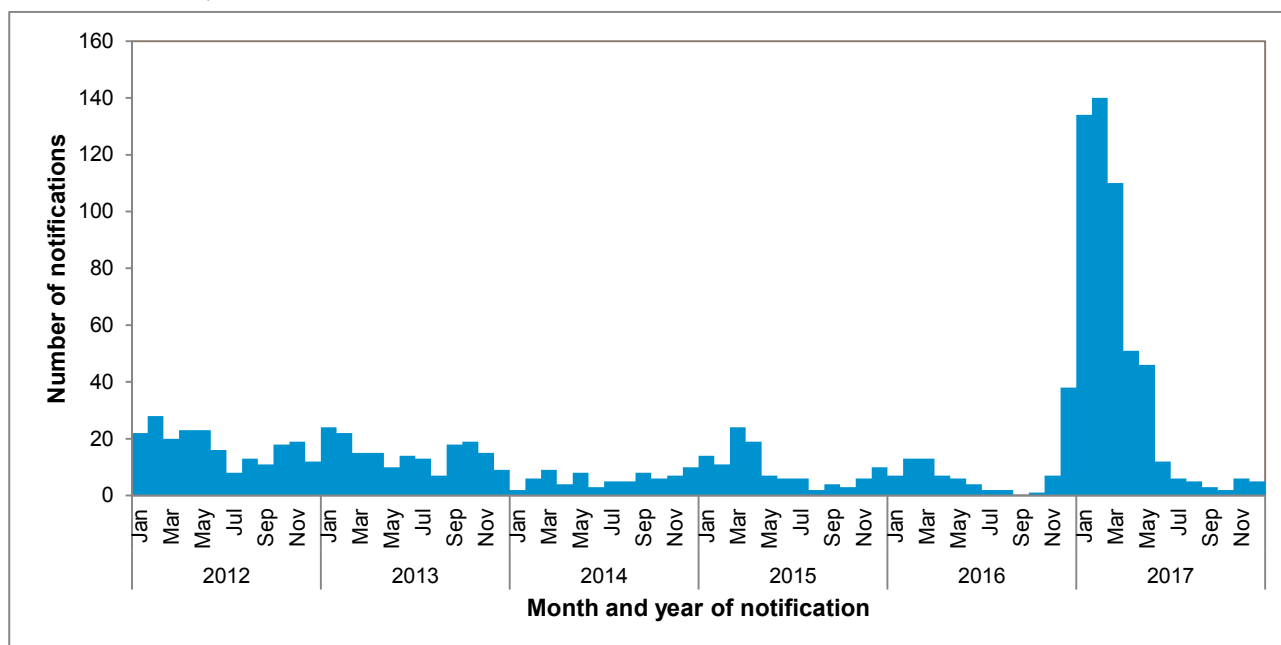
and Pakistan. Three cases were caused by *P. vivax* and reported exposures in Burundi, India and Sudan.

Ross River virus

There were 520 cases of Ross River virus infection (RRV) reported in 2017, higher than the 100 cases reported in 2016 and the five-year average of 136 notifications per annum for the period 2012 to 2016. Similar to Barmah Forest virus infection, changes in laboratory testing procedures affected the number of notifications of RRV between December 2013 and November 2016. An increase in notifications was observed from late November 2016 onwards corresponding with the reintroduction of serological testing of single specimens by one laboratory. (Figure 29).

In 2017, notifications of RRV infection were in 278 males and 242 females with an age range of seven to 87 years and a median age of 48 years. Medical notification may elicit the suspected location of exposure and in 2017, medical notifications were received for 95% of cases. Exposure during interstate travel was reported for 31 cases (6%). Notifications for 205 (40%) cases either reported travel to or were residents of locations along the River Murray.

Figure 29 Notified cases of Ross River virus infection by month and year of notification, South Australia, 2012-2017



Zoonoses

No cases of anthrax, lyssavirus, Hendra virus infection, rabies, or tularaemia were reported in 2017.

Brucellosis

One case of brucellosis was reported in 2017, the last case was reported in 2012. The case was a 34-year-old female who acquired their infection in Vietnam.

Leptospirosis

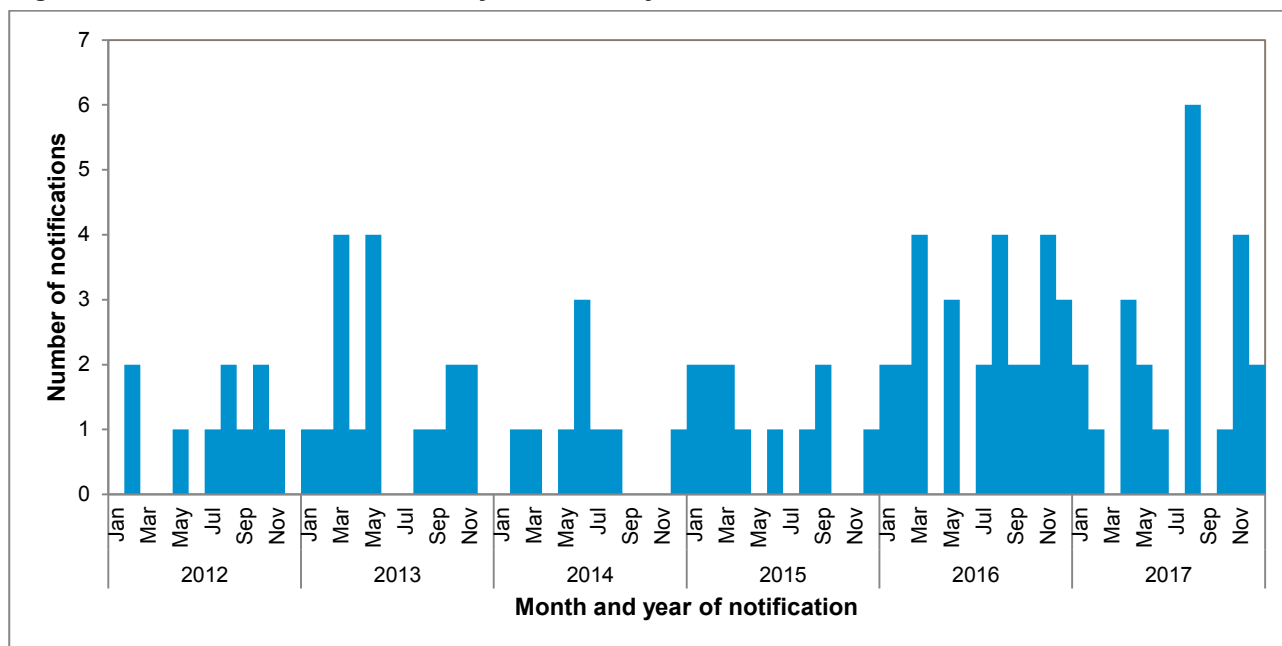
One case of leptospirosis was reported in 2017, compared to two cases reported in 2016. The case was a 46-year-old male who was hospitalised and reported exposure to rats during his incubation period. Further laboratory testing identified the infection as due to *Leptospira hardjo*.

Q fever

There were 22 cases of Q fever notified in 2017, which is lower than the 28 cases reported in 2016 but higher than the five-year average of 15 cases per annum for the period 2012 to 2016 (Figure 30).

Cases comprise of 19 males and three females with an age range of 20 to 71 years. Fourteen cases were hospitalised.

Figure 30 Notified cases of Q fever by month and year of notification, South Australia, 2012-2017



Twelve cases of Q fever (55%) reported residing or working on a farm, four cases reported employment transporting livestock, three cases reported indirect exposure to an abattoir. Three cases had no risk factors identified for acquiring Q fever. Two cases reported being vaccinated for Q fever, 6 years and 15 years respectively, prior to illness.

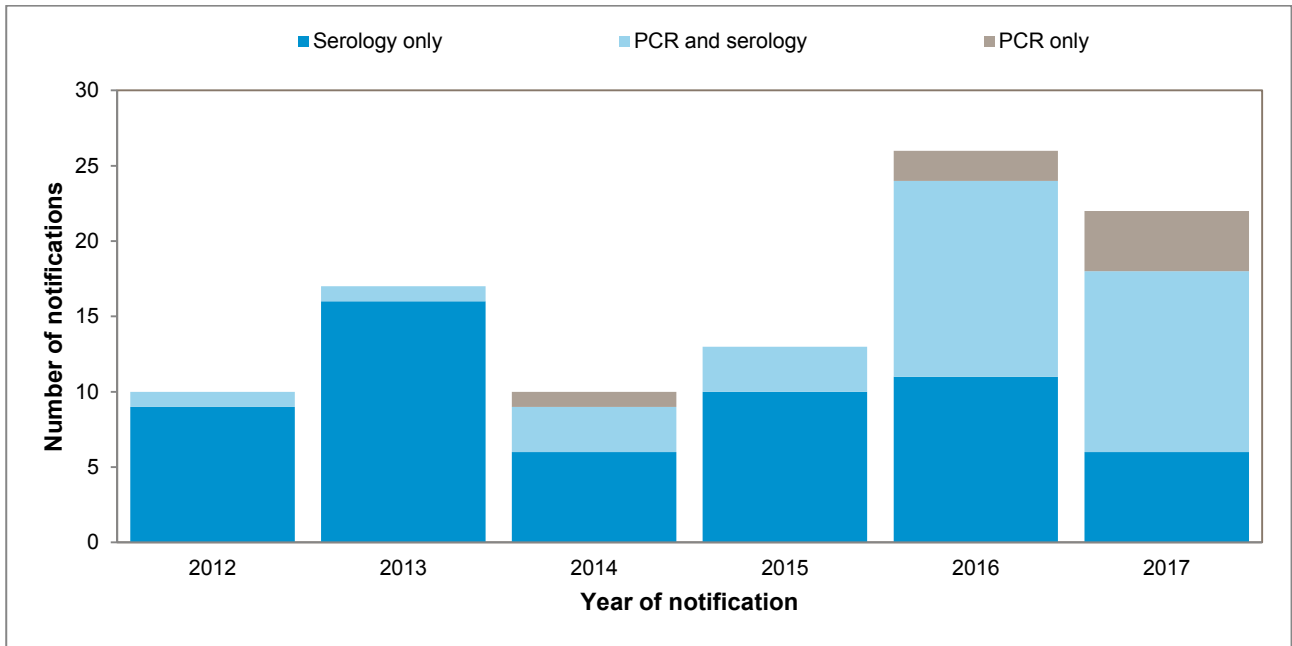
Table 7 Notified cases of Q fever by risk factor, South Australia, 2017

Risk factor	Cases (%)
Residing/working on farm	12 (55)
Livestock transport	4 (18)
Indirect exposure to an abattoir	3 (13)
No risk factor identified	3 (13)
Total	22

There has been an increase in the use of PCR testing for Q fever. Of the 22 cases notified, 12 cases were diagnosed by PCR and serological testing (55%), six were diagnosed by serological testing only (27%) and four were diagnosed by PCR testing only (18%).

Six of the 12 cases diagnosed by PCR and serological testing (50%) had positive PCR samples collected before any serologically positive samples were collected. The introduction of PCR testing is likely to be responsible for part of the increase in Q fever notifications in 2016 and 2017 (Figure 31).

Figure 31 Notified cases of Q fever by laboratory testing method and year of notification, South Australia, 2012-2017



Psittacosis (Ornithosis)

One case of psittacosis was reported in 2017, this is the second case reported in the last five years. The case was a 46 year old male who was hospitalised and reported exposure to birds during his incubation period.

Appendices

Appendix 1: Notifiable conditions by count, South Australia, 2012 to 2017

Notifiable condition	2012	2013	2014	2015	2016	5 year mean	2017
Enteric Diseases							
Botulism	0	0	0	0	0	0	1
<i>Campylobacter</i> infection	2,164	1,722	1,806	1,818	3,197	2,141	3,114
Cryptosporidiosis	162	135	224	419	432	273	356
Hepatitis A	7	11	7	10	7	8	23
Hepatitis E	0	0	0	1	3	1	1
Listeriosis	4	2	6	4	4	4	5
Paratyphoid	3	6	2	9	4	5	5
<i>Salmonella</i> infection	843	975	1,219	1,263	1,571	1,174	1456
Shiga toxin-producing <i>E. coli</i> infection (STEC)	45	53	45	45	176	72	313
HUS/TTP infection	0	1	4	0	1	1	2
<i>Shigella</i> infection	48	29	37	77	182	75	299
Typhoid	3	8	9	8	6	7	5
<i>Vibrio parahaemolyticus</i> infection	NN	NN	NN	NN	8	-	5
Yersinosis	13	10	43	67	88	42	74
Quarantinable diseases							
Cholera	2	0	0	1	0	1	0
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
Rabies	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
Other infectious notifiable diseases							
Creutzfeldt-Jakob disease	1	4	3	5	2	3	4
Legionellosis	37	60	44	28	27	39	40
Leprosy	0	1	1	0	0	0	1
Meningococcal disease (invasive)	29	20	32	30	27	28	36
Vaccine preventable diseases							
Diphtheria	0	1	0	0	0	0	0
<i>Haemophilus influenzae</i> (invasive)	19	11	13	16	22	18	14
<i>Haemophilus influenzae</i> type b (invasive)	4	0	2	1	2	2	0
Influenza A	5,135	2,641	9,962	6,915	7,030	6,337	18295
Influenza B	1,132	2,179	1,088	8,744	821	2,794	10189
Measles	6	16	16	4	11	11	1
Mumps	7	5	14	38	19	17	63

Notifiable condition	2012	2013	2014	2015	2016	5 year mean	2017
Pertussis	922	820	505	1,297	1,943	1,097	1786
Pneumococcal disease (invasive)	132	111	133	126	136	128	213
Polio virus infection	0	0	0	0	0	0	0
Rotavirus	615	782	808	1,127	435	753	1362
Rubella	2	2	2	2	0	2	0
Rubella - congenital	0	1	0	0	0	0	0
Tetanus	1	1	0	0	0	0	2
Varicella zoster (unspecified)	72	239	288	365	415	276	148
Varicella zoster (chickenpox)	481	407	350	459	427	425	499
Varicella zoster (shingles)	1,775	1,908	2,072	2,332	2,340	2,083	2,858
Vectorborne diseases						0	
Barmah Forest virus infection	50	77	0	1	5	27	3
Chikungunya virus infection	0	9	7	2	7	5	1
Dengue virus infection	50	75	72	75	115	77	41
Japanese encephalitis virus infection	0	1	0	0	0	0	0
Kunjin virus infection	0	0	0	0	0	0	0
Malaria	8	8	6	2	10	7	8
Murray Valley encephalitis infection	0	0	0	0	0	0	0
Ross River virus infection	213	181	73	112	100	136	520
Zika virus infection	1	0	0	1	2	1	0
Zoonoses							
Anthrax	0	0	0	0	0	0	0
Australian bat lyssavirus infection	0	0	0	0	0	0	0
Brucellosis	1	0	0	0	0	0	1
Hendra virus infection	NN	NN	NN	NN	0	0	0
Hydatid Disease	NN	NN	NN	NN	0	0	0
Leptospirosis	2	2	1	0	2	1	1
Lyssavirus (NEC)	0	0	0	0	0	0	0
Psittacosis/Ornithosis	1	0	0	1	0	0	1
Q Fever	10	17	9	12	28	15	22
Tularaemia	0	0	0	0	0	0	0
Grand Total	14,001	12,530	18,903	25,418	19,605	18,091	41768

NN = not notifiable; NEC = not elsewhere classified

Appendix 2: Notifiable conditions by rate per 100,000 population, South Australia, 2012 to 2017

Notifiable condition	2012	2013	2014	2015	2016	2017
Enteric Diseases						
Botulism	0	0	0	0	0	0
<i>Campylobacter</i> infection	130.8	103.1	107.1	107	187.1	180.7
Cryptosporidiosis	9.8	8.1	13.3	24.7	25.3	20.7
Hepatitis A	0.4	0.7	0.4	0.6	0.4	1.3
Hepatitis E	0	0	0	0.1	0.2	0.1
Listeriosis	0.2	0.1	0.4	0.2	0.2	0.3
Paratyphoid	0.2	0.4	0.1	0.5	0.2	0.3
<i>Salmonella</i> infection	50.9	58.4	72.3	74.4	91.9	84.5
Shiga toxin-producing <i>E. coli</i> infection (STEC)	2.7	3.2	2.7	2.6	10.2	18.2
HUS/TTP infection	0.1	0	0.2	0.1	0	0.1
<i>Shigella</i> infection	2.9	1.7	2.2	4.5	10.7	17.3
Typhoid	0.2	0.5	0.5	0.5	0.4	0.3
<i>Vibrio parahaemolyticus</i> infection	NN	NN	NN	NN	0.5	0.3
Yersinosis	0.8	0.6	2.6	3.9	5.1	4.3
Quarantinable diseases						
Cholera	0.1	0	0	0.1	0	0
Influenza (avian in humans)	0	0	0	0	0	0
Middle East respiratory syndrome coronavirus MERS-CoV)	0	0	0	0	0	0
Plague	0	0	0	0	0	0
Rabies	0	0	0	0	0	0
Severe acute respiratory syndrome (SARS)	0	0	0	0	0	0
Smallpox	0	0	0	0	0	0
Viral haemorrhagic fever	0	0	0	0	0	0
Yellow Fever	0	0	0	0	0	0
Other infectious notifiable diseases						
Creutzfeldt-Jakob disease	0.1	0.2	0.2	0.3	0.1	0.2
Legionellosis	2.2	3.6	2.6	1.6	1.6	2.3
Leprosy	0	0.1	0.1	0	0	0.1
Meningococcal disease (invasive)	1.8	1.2	1.9	1.8	1.6	2.1
Vaccine preventable diseases						
Diphtheria	0	0.1	0	0	0	0
<i>Haemophilus influenzae</i> (invasive)	1.1	0.7	0.8	0.9	1.2	0.8
<i>Haemophilus influenzae</i> type b (invasive)	0.2	0	0.1	0.1	0.1	0
Influenza A	310.3	158.1	591	407.1	411.5	1061.5
Influenza B	68.4	130.4	64.5	514.8	48.1	591.2
Measles	0.4	1	0.9	0.2	0.6	0.1
Mumps	0.4	0	0.8	2.2	1.1	3.7
Pertussis	55.7	49.1	30	76.4	113.7	103.6
Pneumococcal disease (invasive)	8	6.6	7.9	7.4	8	12.4
Polio virus infection	0	0	0	0	0	0
Rotavirus	37.2	46.8	47.9	66.3	25.5	79.0
Rubella	0.1	0.1	0.1	0.1	0	0
Rubella - congenital	0	0.1	0	0	0	0

Notifiable condition	2012	2013	2014	2015	2016	2017
Tetanus	0.1	0.1	0	0	0	0.1
Varicella zoster (unspecified)	4.4	14.3	17.1	21.5	24.3	8.6
Varicella zoster (chickenpox)	29.1	24.4	20.8	27	25	29.0
Varicella zoster (shingles)	107.3	114.2	122.9	137.3	137	165.8
Vectorborne diseases						
Barmah Forest virus infection	3	4.6	0	0.1	0.3	0.2
Chikungunya virus infection	0	0.5	0.4	0.1	0.4	0.1
Dengue virus infection	3	4.5	4.3	4.4	6.7	2.4
Japanese encephalitis virus infection	0	0.1	0	0	0	0
Kunjin virus infection	0	0	0	0	0	0
Malaria	0.5	0.5	0.4	0.1	0.6	0.5
Murray Valley encephalitis infection	0	0	0	0	0	0
Ross River virus infection	12.9	10.8	4.3	6.6	5.9	30.2
Zika virus infection	0.1	0	0	0.1	0.1	0
Zoonoses						
Anthrax	0	0	0	0	0	0
Australian bat lyssavirus infection	0	0	0	0	0	0
Brucellosis	0.1	0	0	0	0	0.1
Hendra virus infection	NN	NN	NN	NN	0	0
Hydatid Disease	NN	NN	NN	NN	0	0
Leptospirosis	0.1	0.1	0.1	0	0.1	0.1
Lyssavirus (NEC)	-	0	0	0	0	0
Psittacosis/Ornithosis	0.1	0	0	0.1	0	0.1
Q Fever	0.6	1	0.5	0.7	1.6	1.3
Tularaemia	0	0	0	0	0	0

NN = Not notifiable; NEC = not otherwise classified

Appendix 3: Summary of outbreaks reported in 2017

2017 Outbreak Investigations by disease type.

Campylobacter– Restaurant – March

One confirmed case of *Campylobacter jejuni* was reported with a medical notification indicating others ill after attendance at a wedding. The wedding reception was held at a restaurant. Contact was made with the case, bride and mother of the bride, with reports of approximately 11 others unwell with gastroenteritis of a total of 102 attendees at the wedding. The organiser did not wish to provide contact details for attendees at the wedding, so an analytical epidemiological study could not be undertaken. An environmental health officer (EHO) inspected the premises and identified several high risk foods, including a chicken liver parfait and a chicken galantine. Recommendations were provided to the restaurant to have a higher temperature/time combination to ensure thorough cooking of the chicken galantine.

Campylobacter– Restaurant – October

Reports of gastroenteritis were received from two separate groups that attended the same restaurant one day apart. Five of 10 people were ill from one group and eight out of nine were ill from the second group. Two of 13 ill people were confirmed with *Campylobacter* by PCR only (no confirmed culture results were reported for the cases). Both groups ate shared platters with charcuterie, olives, duck terrine, chicken pate, cornichons and hummus. An inspection of the premises identified inadequate cooking of the chicken pate and *Campylobacter coli* was detected in pate collected from the premises.

Cryptosporidiosis – Public Pool - February

There was an increase in cryptosporidiosis notifications in a metropolitan region of SA between February and April 2017. A total of 69 cases were identified in the region during the investigation period and 25 of 68 cases interviewed reported exposure to the same public water park. Affected pools were decontaminated.

Cryptosporidiosis – Public Pool - June

There was an increase in cryptosporidiosis notifications in a metropolitan region of SA between June and July 2017. Thirty-four cases were included in the investigation with eight cases reporting exposure to one public swimming pool and six to another public pool. The public pool with eight cases exposed was decontaminated.

Cryptosporidiosis – Petting Zoo - June

Cryptosporidiosis notifications were above expected numbers in winter 2017. During the period of increase, six cases reported animal exposure at the same petting zoo within a one month period of each other. The venue was referred to SA Health's Health Protection and Programs for follow up regarding hand washing facilities and signage.

Cryptosporidiosis – Unpasteurised Milk – July

An increase in cases of cryptosporidiosis was noted in a metropolitan region of Adelaide, prompting investigation with hypothesis generating interviews. Seven cases of cryptosporidiosis reported consumption of raw (unpasteurised) milk in their incubation period; five of which named a common source for the milk (two declined to provide details). Cases ranged in age from 3 to 70 years of age (median 17 years). In a binomial analysis conducted comparing the proportion of unpasteurised milk consumption in South Australian cases of cryptosporidiosis interviewed between 1 June and 21 July 2017 (7/50) with what would normally be expected in the general healthy population (using data from the Victorian Food Frequency survey), the likelihood that 7 of 50 cases consumed unpasteurised milk due to chance alone was 0.0001, or 1 in 10 000. A consumer level recall of the raw cow's milk was co-ordinated by Food Standards Australia New Zealand (FSANZ) on 22 July 2017 following online and farm gate sale of the milk. Orders were issued to the vendor under both the *Food Act 2001* (SA) and the *South Australian Public Health Act 2011* to mitigate the risk posed to public health from the sale of raw cow's milk.

Hepatitis A – National outbreak Frozen Berries – May

A multi-jurisdictional outbreak investigation (MJOI) commenced on 25 May 2017 in response to three cases of locally acquired hepatitis A, genotype IA, with the same sequence type notified in three different jurisdictions (1 in Victoria, 1 in SA and 1 in Queensland) with onsets of illness between January and April 2017. The sequence was the same as cases of locally acquired hepatitis A linked to frozen berries in 2015. SA was the lead epidemiologist and lead agency on the outbreak; therefore all cases in the multi-jurisdictional outbreak are included in this summary.

A total of ten confirmed cases of hepatitis A from four jurisdictions (4 in Queensland, 3 in SA, 2 in New South Wales and 1 in Victoria) were identified with the same outbreak sequence, between 1 January 2017 and 11 September 2017. Seven of the 10 confirmed cases recalled eating frozen mixed berries in their incubation period. There was one probable outbreak case; a household contact of a confirmed outbreak case with a clinically compatible illness and was likely to be due to secondary transmission.

The environmental investigation included the identification of hepatitis A virus in one opened packet of frozen mixed berries collected from a case's household, and in two of eight sealed packets of frozen mixed berries submitted for testing. Trace back evidence also identified that the source of the berries in the implicated product were the same source as the frozen berries linked to the 2015 multi-jurisdictional outbreak of hepatitis A (of the same genotype and sequence type). The implicated product was withdrawn from the market and a national consumer level recall was co-ordinated by Food Standards Australia and New Zealand (FSANZ) on 2 June 2017.

Hepatitis A – MSM community - November

There was an outbreak of locally acquired Hepatitis A Virus in SA, similar to increases identified in Victoria and New South Wales. In SA, there were 14 confirmed outbreak cases with genotype IA infection with one of the three outbreak sequences. One case had the cluster 3 sequence (V16-25801), one case had the cluster 2 sequence (RIVM-HAV16-090) and 12 cases had the cluster 1 sequence (UK_VRD_521_2016). Onsets for cases ranged from September to December 2017. Thirteen of the cases were males and 10 reported having male to male sex during their acquisition period, with six attending sex on premise venues. A hepatitis A vaccination campaign was launched, targeting men who have sex with men who use sexual health clinics, those who are part of the pre-exposure prophylaxis-expanded South Australia (PrEPX-SA) trial for HIV prevention and there was also a vaccination clinic run at the main sex on premises venue in SA. SA Health provided one dose of hepatitis A vaccine as an outbreak response measure. To 29 January 2018, 324 people have been vaccinated as part of the vaccination program.

Meningococcal infection – Remote Community - September

There was one invasive meningococcal infection cluster identified in September caused by *Neisseria meningitidis* serogroup W. The cluster comprised of two males and one female with a median age of 7 years. All cases were aboriginal. This was part of a much larger cluster with cases also observed in the Northern Territory and Western Australia.

Mumps – Remote Community - January

SA experienced an outbreak of mumps between December 2016 and September 2017, consisting of 49 cases. There were 18 males and 31 females, with a median age of 22 years. Twenty-three cases had records of receiving two or more MMR vaccinations. Forty-six of the 49 cases identified as Aboriginal. Genotyping was performed on five samples, and all were identified as genotype G. This genotype is not included in the MMR vaccine.

Rotavirus – Remote Community - May

An increase in rotavirus cases was noted in several rural and remote regions of SA, between April and the end of September 2017. A total of 91 cases were identified in the outbreak region. Forty-nine cases (54%) were persons of Aboriginal origin. The median age of cases was four years (range less than one year to 95 years of age). The increase occurred in regions where there were concurrent increases in shigellosis. Transmission of the rotavirus was presumed to be person to person transmission.

Salmonella Typhimurium phage type 135a – Restaurant – January

Six cases of STm phage type 135a (MLVA 03-14-10-10-523) reported eating at the same café between 27 and 31 December 2016. Cases ate a variety of different foods and the environmental inspection identified the production and use of a raw egg aioli onsite for several foods. The premises decided to cease production of their own aioli and use a commercial product instead. Eggs were the suspected source of the outbreak.

Salmonella Typhimurium phage type 9 – Restaurant – January

Six cases of STm phage type 9 (MLVA 03-15-06-11-550) reported eating at the same restaurant between 19 and 28 January 2017. All cases consumed egg dishes (eggs benedict, scrambled eggs or poached eggs). Several food and environmental samples were taken and no *Salmonella* was detected. Eggs were the suspected source of the outbreak.

Salmonella Typhimurium phage type 135a – Restaurant – February

Nine cases of STm phage type 135a (MLVA 03-14-09-11-523) reported eating at the same restaurant between 28 January and 2 February 2017. Cases ate a variety of different foods. Several food and environmental samples were taken and no *Salmonella* was detected. Cross contamination from eggs was the suspected source of the outbreak.

Salmonella Typhimurium phage type 135a – Restaurant – February

Four cases of STm phage type 135a (MLVA 03-14-09-11-523) reported eating at the same restaurant between 7 January and 5 February 2017. Cases ate a variety of foods, with two specifying that aioli was part of the meal. An environmental inspection identified concerns around house-made raw egg sauces used in the rolls and baguettes. Several food and environmental samples were taken and one sample from a stab mixer was positive for STm phage type 135a (MLVA 03-14-09-11-523). Eggs were the suspected source of the outbreak.

Salmonella Typhimurium phage type 12A – Restaurant – March

Thirteen cases of STm phage type 12A (MLVA 05-15-17-09-490) reported eating at the same restaurant between 2 and 10 March 2017. Cases reported eating a variety of foods including salads, savoury slices and smoothies. Multiple food and environmental samples were collected and no *Salmonella* was detected.

Salmonella Typhimurium phage type 135a – Bakery – March

An increase in cases of STm phage type 135a was noted in March 2017 and cases were identified for interview. A total of 14 cases of STm (12 further typed as phage type 135a, one as untypeable and one as phage type 135) reported consumption of pork pies in their incubation period. Seven of the cases purchased their pies directly from the bakery that produced them, six from independent supermarkets and one as part of a meal from a hotel. All 14 cases had the same MLVA type of 03-14-09-11-523. Six cases were hospitalised for their illness (43%) and the median age of cases was 62 years (range 19-89 years). An inspection of the bakery premises identified problems with the production of the pies including application of a post-cook raw egg wash to the pies, inadequate storage temperature for the pies and inadequate cleaning and sanitising of equipment used to prepare the pies. Several food and environmental samples were taken, and three food samples were positive for STm phage type 135a. An emergency order was issued to the premises and a recall occurred on 22 March 2017. A return to work plan was completed for the premises to allow recommencement of pork pie production with a modified process. Eggs were the likely source of the outbreak.

Salmonella Hessarek – Community – March

An increase in cases of *Salmonella* Hessarek was noted and cases notified from March onwards were identified for hypothesis generating interviews. To the end of December 2017, there were 15 cases notified with *S. Hessarek* with all 15 reporting consumption of eggs in their incubation period, and 10 have named the same brand of eggs. Samples of the named brand of eggs were taken with one sample positive for *Salmonella* Hessarek in the contents of the eggs. The environmental health team are communicating with primary industries regarding this result. The investigation is also continuing into 2018.

Salmonella Typhimurium phage type 135 – Aged Care Facility – March

Twelve residents and one staff member from an aged care facility were positive for STM phage type 135 (STM 135), with illness onset between 28 March and 22 April 2017. One resident had no gastroenteritis symptoms, but was positive for STM 135 from a urine specimen collected on 23 April 2017. Three residents were hospitalised, one died.

A nested case-control study (11 cases with gastroenteritis, 22 controls) was conducted using the food histories obtained from the facility. Four items from the menu in the previous week had elevated odds ratios (OR): butter chicken on 22 March (OR undefined, 95% Confidence Interval [CI] 4.75 – undefined, $P=0.0003$); country chicken pie on 23 March (OR undefined, 95% CI 1.6 – undefined, $P=0.02$); crumbed fish on 24 March (OR 8.3, 95% 0.83 – 397, $P=0.04$); and scrambled eggs on 27 March (OR 6.25, 95%CI 0.75 – 55.75, $P=0.04$).

All thirteen cases had the same MLVA pattern of 03-16-09-12-523. Food processes in the kitchen were reviewed and a total of 20 food and environmental samples were taken. No *Salmonella* was detected in any of the samples collected from the site. Information on eggs (stamps) used at the site indicated they were from an interstate jurisdiction that was also seeing the same MLVA pattern in humans. Eggs were the suspected source of the outbreak.

Salmonella Birkenhead – School - March

Gastroenteritis was reported amongst a school group that had attended a camp interstate. Sixteen of 120 attendees were unwell, with five students and one staff member confirmed with *Salmonella* infection (five further typed as *S. Birkenhead* and one not further typed as the case was diagnosed by PCR only with no culture). An inspection was conducted of the motel premises that provided daily food for the attendees and where the group resided for the camp, with no issues identified. No high risk environmental or animal contact activities were identified as possible routes of disease transmission. The transmission route for this outbreak remains unknown.

Salmonella Typhimurium phage type 9 – School – May

Reports of gastroenteritis at an out of school hours care (OSHC) facility were received by CDCB and an investigation was launched. Hypothesis generating interviews were conducted with seven cases reporting gastroenteritis after attending OSHC in the week 24 to 28 April 2017. Six of the seven cases reported making and/or eating cupcakes at the OSHC. An online survey was sent to parents of 158 attendees at the OSHC facility, 35% of people responded (55/158). In total there were 24 children who reported gastroenteritis after attending the OSHC, and twelve of the cases were confirmed with STM phage type 9 (MLVA 03-23-12-10-523). Several of the online survey responses were incomplete with a maximum of 35 valid responses available for analysis for some exposures. On univariate analysis, four items had significant raised odds ratios (OR): apple cupcakes on 27 April OR 15.33, 95% confidence intervals (CI) 1.11 – 787, $p=0.019$; watermelon on 27 April OR 11.5, 95% CI 1.28-140, $p=0.012$; plain cupcakes on 26 April OR 8.53, 95% CI 1.28 – 65.3, $p=0.021$ and cocktail sausages on 27 April OR 6.3, 95% CI 1.02 – 41). The environmental investigation identified inadequate sanitation procedures in the kitchen and for equipment used when the children were baking. Some of the children also reported consuming uncooked cake mixture. Eggs in the cupcakes were the suspected source of the outbreak.

Salmonella Typhimurium phage type 8 – Private residence – May

A medical notification was received reporting that several people were unwell after a common meal at a private residence. Five people shared a meal and all five were reported to be unwell with gastroenteritis the day after the meal. Four of the five ill people were family members within the one household, and the additional attendee did not share any other meals in common with the family. The host of the meal was interviewed and it was identified that the meal included a chocolate mousse made with raw eggs. Three of the attendees (two family members and the additional non-household attendee) were confirmed to have STm phage type 8 infections (MLVA 03-27-16-11-523). Eggs were the suspected source of the outbreak.

Salmonella Typhimurium 135 – Takeaway – August

Four cases of STm 135 (MLVA 03-14-10-08-523) reported purchasing meals from the same takeaway vendor and consuming the meals at home. Meals included a variety of stir fry dishes including different meats, vegetables and rice or noodles. Three of the cases reported purchasing the meals in the same two day period and one case was unable to recall the date of purchase. Two cases purchased additional meals that they stored in their freezer at home. Two frozen meals (a beef and black bean dish, and a chicken satay and rice dish) from two separate cases were submitted for testing. STm 135 (MLVA 03-14-10-08-523) was identified in the beef and black bean dish. The chicken satay dish did not detect *Salmonella*. The council EHO inspected the premises in response to the salmonellosis cases and identified cross contamination risks within the kitchen. The premises also ceased the use of raw eggs in their kitchen.

Salmonella Newport – Takeaway – November

Twelve cases of *S. Newport* reported consumption of pork and/or chicken Vietnamese rolls from a takeaway restaurant. Cases ate food from the venue between 18 October and 27 November 2017. Several food and environmental samples were submitted and all were negative for *Salmonella*. The environmental inspection identified issues with cleaning, storage, and skills and knowledge around food handling.

Salmonella Typhimurium 9 – Takeaway – December

Nineteen cases of STm phage type 9 (MLVA 03-22-16-10-523) reported consumption of sushi from a single premises. The majority of cases (17/19; 90%) consumed cooked tuna sushi rolls, with others reporting consumption of chicken sushi rolls. The median age of cases was seven years (range 2 to 49 years) and eight cases were hospitalised (42%). An EHO inspected the premises and issues were identified with cleaning, sanitisation, temperature control and cross contamination. Eggs were the suspected source of the outbreak.

Salmonella Typhimurium 135 – Bakery – December

Seventy-three people with gastroenteritis reported consumption of sandwiches, rolls and wraps from the same bakery. Sixty-nine of the cases were confirmed *Salmonella* cases; 67 typed as STm phage type 135, (65 with MLVA 03-14-11-08-523; one with MLVA 03-14-12-08-523 and one without an MLVA type); one case was PCR positive only and one case did not undergo phage typing as the isolate was tested interstate. There was one secondary case reported, in a child who lived in the same household of three others who had consumed food from the bakery and tested positive for *Salmonella*. There were 49 (71%) females and 20 males. The median age of cases was 37 years (range 2-76 years) and 13 cases (19%) were hospitalised. One confirmed case of STm 135 died during the outbreak. Sixty five of the 68 primary *Salmonella* cases (96%) consumed chicken containing sandwiches/rolls/wraps. Cases consumed food from the bakery between 12/12/2017 and 24/12/2017. The environmental inspection of the premises identified significant issues with skills and knowledge in food preparation and a lack of adequate cleaning and sanitisation. The source of the *Salmonella* is suspected cross contamination with eggs. Several food and environmental samples from the premises were submitted and all were negative for *Salmonella*. Two improvement notices were issued to the bakery.

Shigella – Remote Community - May

An increase in shigellosis cases from April onwards was noted in the remote far north and far west regions of SA, which then also included two regional towns in the south of the state. There were concurrent increases in shigellosis in neighbouring remote areas of the Northern Territory and Western Australia. To the end of 2017, there were 84 shigellosis cases notified in the affected regions; 51 of the cases were probable shigellosis cases diagnosed by PCR only and 33 were culture confirmed cases, with 32 typed as *S. flexneri* 2b and one as *S. flexneri* 2a. The majority of the cases identified as Aboriginal (83/84; 99%). The median age of cases was 27 years (range 1 to 83 years). Sixty-one per cent of the cases were females and 22 cases were hospitalised. The cases are ongoing in 2018 and the CDCB is working with stakeholders to reduce cases through early detection, case treatment, health promotion and reporting of malfunctioning health hardware within the home.

STEC O26 – Agricultural Show - September

There was an increase in children notified with STEC in September. There were two cases typed with STEC O26 with similar onset dates and had experienced bloody diarrhoea. An investigation was launched. Both cases reported animal exposures at an agricultural show. Interviews were expanded to include all STEC cases with onsets between 1 and 26 September 2017, excluding people who were overseas for their entire incubation period, hospital inpatients for their entire incubation period and asymptomatic migrant health screens. Sixteen of 18 people that met these criteria were able to be interviewed. Six cases of STEC O26 reported exposure to the same agricultural show in their incubation period. Exposure to the show occurred on different days and included different animal contact areas of the show, including the petting zoo, cattle, sheep and pig pavilions. No common food items were identified for these six cases. The median age of cases was five years (range 8 months to 17 years) and none of the cases developed haemolytic uraemic syndrome (HUS) or were hospitalised. The cases of other STEC serotypes that were interviewed did not report exposure to the agricultural show. Isolates from all six cases were later able to be cultured and underwent phylogenetic analysis with whole genome sequencing. Cases were clustered together with a single nucleotide polymorphism (SNP) distance of ≤ 5 between isolates indicating a common source of infection for the cases.

Outbreaks Reported by Aged Care Facilities in 2017

Month reported	Agent identified	Number of facilities affected
January	Gastroenteritis, organism not detected	1
	Norovirus	4
	Influenza	1
February	Gastroenteritis, organism not detected	3
	Norovirus	2
	Influenza	2
March	Gastroenteritis, organism not detected	3
	Norovirus	1
	Salmonella	1
	Influenza	1
April	Gastroenteritis, organism not detected	3
	Norovirus	3
	Influenza	2
May	Gastroenteritis, organism not detected	3
	Norovirus	2
	Influenza	2
June	Gastroenteritis, organism not detected	1
	Norovirus	7
	Influenza	3
July	Norovirus	7
	Rotavirus	2
	Influenza	11
August	Gastroenteritis, organism not detected	2
	Norovirus	4
	Rotavirus	5
	Influenza	21
September	Gastroenteritis, organism not detected	3
	Norovirus	4
	Rotavirus	1
	Influenza	39
October	Gastroenteritis, organism not detected	1
	Norovirus	14
	Rotavirus	3
	Influenza	9
November	Gastroenteritis, organism not detected	4
	Norovirus	5
	Influenza	2
December	Gastroenteritis, organism not detected	1
	Norovirus	6
	Influenza	1

For more information

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