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Monitoring the incidence and causes of disease potentially transmitted by food in Australia: Annual report of the OzFoodNet network, 2020–2022

The OzFoodNet Working Group



Australian Centre for Disease Control

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Abstract

This report summarises the incidence of enteric diseases potentially transmitted by food in Australia, and details outbreaks associated with food that occurred during 2020–2022. States and territories reported an increasing number of notifications, with a total of 48,030 notifications received in 2020; 51,294 in 2021; and 55,284 in 2022. Some foodborne diseases, particularly those commonly associated with overseas travel, observed large decreases during the reporting period compared to previous years due to measures implemented in response to the coronavirus disease 2019 (COVID-19) pandemic. The most commonly-notified conditions were campylobacteriosis (a mean of 38,403 notifications per year during 2020–2022) and salmonellosis (a mean of 10,992 notifications per year during 2020–2022). During the reporting period, a total of 285 gastrointestinal outbreaks, including 265 foodborne outbreaks, were reported. The remaining 20 outbreaks were due to environmental transmission (13 outbreaks); animal-to-person transmission (five outbreaks); and waterborne transmission (two outbreaks). Foodborne outbreaks affected 5,128 people, resulting in at least 687 hospital admissions and twelve deaths. *Salmonella* was the most common aetiological agent identified in foodborne outbreaks (n = 115/265; 43%), and restaurants were the most frequently reported food preparation setting (n = 130/265; 49%). Where a probable or confirmed source of the outbreak was identified, the most common causes were eggs (n = 37); seafood (n = 37); and poultry (n = 32).

Introduction

The burden of foodborne disease in Australia is significant, with an estimated 4.1 million people infected in Australia each year, costing an estimated $AUD2.44 billion per year.[1]

The OzFoodNet network was established in 2000 by the Australian Government Department of Health, Disability and Ageing to apply concentrated effort at a national level to investigate and understand foodborne disease; to describe more effectively its epidemiology; and to identify ways to minimise foodborne illness in Australia. The OzFoodNet network includes foodborne disease epidemiologists from each state and territory health department, and collaborators from the Australian Government Department of Agriculture, Fisheries and Forestry (Agriculture), Food Standards Australia New Zealand (FSANZ), and the Public Health Laboratory Network (PHLN). OzFoodNet is represented on the Communicable Diseases Network Australia (CDNA), which is Australia's peak body for communicable disease control.

The primary data sources used by OzFoodNet epidemiologists to understand the extent of foodborne disease in Australia include notifiable enteric disease data and reports of gastrointestinal disease outbreaks. This report provides an overview of the national enteric disease surveillance data from 1 January 2020 to 31 December 2022 and the findings from the investigations into gastrointestinal illness outbreaks caused by foodborne, animal-to-person, environmental or waterborne disease that were initiated in Australia between 1 January 2020 and 31 December 2022.

Methods

Population under surveillance

The OzFoodNet network covered all Australian states and territories, with an estimated population of 25,649,248 in 2020; of 25,685,412 in 2021; and of 26,014,399 in 2022, as at 30 June of each year.[2,3]

Data sources

Notified infections

All Australian states and territories have public health legislation requiring doctors and pathology laboratories to notify cases of infectious diseases that are important to public health. State and territory health departments record details of notified cases on surveillance databases. Under the auspices of the *National Health Security Act 2007*, surveillance data is aggregated into a national database known as the National Notifiable Diseases Surveillance System (NNDSS).[i] Nationally notifiable enteric diseases and conditions include botulism, campylobacteriosis, cholera, haemolytic uraemic syndrome (HUS), hepatitis A, hepatitis E, listeriosis, paratyphoid fever, salmonellosis, Shiga toxin-producing *Escherichia coli* (STEC) infection, shigellosis and typhoid fever.

Data for this report was extracted from NNDSS in July 2024 and analysed by calendar year using the date of diagnosis. Date of diagnosis was derived for each case from the earliest date supplied by the jurisdiction, which could be the date of onset of the case's illness, the date a specimen was collected, or the date that a health department received the notification. Notifications for the reporting period include those with a diagnosis date from 1 January 2020 to 31 December 2022. Data in this report is based on reported sex at birth only, as the NNDSS does not collect information on gender identity for all notifiable diseases and conditions. Data cleaning occurred in collaboration with states and territories where necessary.

Estimated resident populations for each state or territory and for each age group and sex, as at 30 June for each respective year, were used to calculate rates of notified infections.[2]

Due to the dynamic nature of NNDSS data, the data presented in this report are subject to change over time.

Change in laboratory methods

Changes in diagnostic laboratory testing procedures, including the increasing uptake of culture independent diagnostic testing (CIDT) using polymerase chain reaction (PCR) and introduction of new multiplex PCR tests (which can detect multiple enteric pathogens on one test), are suspected to have resulted in an increase in notifications since 2014 for several bacterial enteric diseases including campylobacteriosis, salmonellosis, shigellosis and STEC (see the OzFoodNet 2016 annual report for more information).[4] CIDT has been introduced at varying times depending on the individual laboratory. The extent to which this has increased notifications of each of these conditions remains unclear.

i For further information see https://www.cdc.gov.au/diseases/surveillance-systems-and-networks/national-notifiable-diseases-surveillance-system-nndss.

Enhanced national surveillance for listeriosis

In 2010, OzFoodNet commenced enhanced surveillance data collection on all notified cases of listeriosis in Australia, using a centralised database known as the National Enhanced Listeriosis Surveillance System (NELSS). The primary aim of NELSS is to detect clusters of infection to enable a timely public health investigation and response. In accordance with the Listeriosis National Guideline for Public Health Units,[ii] jurisdictional public health staff conduct case interviews at the time of diagnosis using a standardised questionnaire. Interview data (including food histories), along with information regarding the characterisation of *Listeria monocytogenes* isolates by molecular subtyping methods, are entered into NELSS by OzFoodNet epidemiologists. Commencing in 2016, whole genome sequencing with fortnightly national phylogenetic analysis has been conducted for all human *L. monocytogenes* isolates to identify potential clusters for investigation (data not included).

Enhanced national surveillance for hepatitis A

In July 2017, CDNA endorsed the commencement of hepatitis A enhanced surveillance data collection, which involved sequencing strains from all notified cases of hepatitis A nationally (see the 2017 OzFoodNet annual report for more information).[5] Enhanced surveillance commenced on 1 July 2017, with the objectives to:

- better understand hepatitis A molecular epidemiology in Australia through the conduct of national enhanced surveillance through genotyping and sequencing RNA from each case and recording specific risk factor information in a centralised database;
- understand the risk factors and molecular epidemiology of hepatitis A in Australia; and
- detect clusters of locally acquired hepatitis A to enable rapid public health action.

Enhanced surveillance of hepatitis A does not impact on jurisdictional public health surveillance practices: all confirmed cases of hepatitis A are followed up as per current jurisdictional surveillance practice, and the nationally agreed questionnaire (developed by OzFoodNet and the Hepatitis A Series of National Guidelines Working Group) is used when interviewing cases. De-identified case information, selected epidemiological and laboratory typing data are entered onto a centralised database by OzFoodNet epidemiologists. Commencing in 2022, routine genomic surveillance was conducted for human hepatitis A partial genome sequences to identify potential clusters for investigation (data not included).

Outbreaks of gastrointestinal disease including foodborne disease outbreaks

Gastrointestinal disease outbreaks may be notified to jurisdictional health departments from a range of sources including doctors, local councils, and members of the public, or may be identified by OzFoodNet epidemiologists through review of notifiable disease data. Outbreaks may impact a single jurisdiction or multiple jurisdictions. When multiple jurisdictions are involved in an investigation, OzFoodNet epidemiologists will determine whether there is a need to formally investigate the outbreak using the OzFoodNet *Guidelines for the epidemiological investigation of multi-jurisdictional outbreaks that are potentially foodborne*.[iii] A formal investigation impacting multiple jurisdictions is deemed a Multi-Jurisdictional Outbreak Investigation, or MJOI.

ii CDNA national guidelines for public health units. Listeriosis: https://www.cdc.gov.au/resources/publications/cdna-national-guidelines-listeriosis.

iii For further information see https://www.cdc.gov.au/resources/publications/ozfoodnet-guidelines-foodborne-outbreaks.

In 2016, OzFoodNet epidemiologists revised the terminology regarding the various modes of transmission of gastrointestinal disease outbreaks. Suspected foodborne, animal-to-person, and waterborne outbreak categories were redefined as probable outbreaks to more accurately reflect the level of evidence available to implicate a mode of transmission. For data analysis and reporting pre and post 2016, suspected and probable categories can be treated as equivalent. In addition, an environmental outbreak category was introduced, to differentiate waterborne outbreaks associated with drinking water from incidental exposure to contaminated water sources in the environment. Waterborne outbreaks from 2015 have been redefined using the 2016 case definitions to enable accurate historical comparisons in this report. Refer to Appendix A, Table A.1 for the definitions applied to reported gastrointestinal disease outbreaks from 2016 onwards.

Commencing in the 2013–2015 annual report,[6] person-to-person outbreaks and outbreaks of unknown transmission mode have been excluded from the OzFoodNet annual reports. These modes of transmission have historically accounted for the majority of outbreaks each year. This is a change in practice from previous annual reports and therefore the total number of outbreaks in this report cannot be directly compared with annual reports prior to 2013.

From 2018 onwards, point source outbreaks occurring within MJOIs and within large community outbreaks have been reported by OzFoodNet and included in annual reports, to improve understanding of the burden and variety of causes of point source outbreaks investigated by OzFoodNet that are connected to larger outbreaks.

In early 2021, the OzFoodNet Outbreak Register transitioned to a new centrally coordinated database. During the transition, several updates to the collected data fields were made, including the addition of new food category fields; a source field (suspected contaminated ingredient); and expanding evidence criteria to describe the implicated food vehicle. The changes implemented in early 2021 have been retrospectively applied to outbreak reports from 2020 to present a cohesive account of outbreak investigations during this multi-year reporting period. Readers should note that the change in reporting practices means that some reported elements cannot be directly compared with annual reports prior to 2020.

Surveillance and outbreak data limitations

Enteric disease surveillance data reported to health departments represent only a proportion of disease in the community, as these data rely on people seeking medical attention and undergoing appropriate laboratory testing to confirm a diagnosis. Research in Australia has estimated that only one in five people experiencing gastroenteritis seek medical attention.[7] Studies have shown that for every salmonellosis case notified to a health department in Australia there are an estimated seven salmonellosis infections in the community; for every notified STEC case there are an estimated eight STEC infections; and for every notified campylobacteriosis case there are an estimated ten campylobacteriosis infections in the community.[7,8]

The outbreak data within this report have limitations, including the potential for variation in the categorisation of features of outbreaks, depending on differing circumstances and investigator interpretation. Outbreaks are investigated by jurisdictional health departments, where resources and follow-up practices may vary from jurisdiction to jurisdiction. In addition, outbreaks of gastroenteritis are often not reported to health authorities, resulting in under-representation of the true burden of enteric disease outbreaks within Australia. Changes in the number of outbreaks over time should be interpreted with caution. The number of cases and outbreaks may differ from summaries previously published, as these may take time to finalise. Outbreaks presented in this report are included based on the investigation commencing within 2020–2022.

Data analysis

All analyses were conducted using Microsoft Excel for Microsoft 365.

Results

Notified infections

Between 2020 and 2022, OzFoodNet sites reported a year-on-year increase in the total number of notifications of 12 diseases or conditions that may be transmitted by food (Table 1). However, over this period, notifications of foodborne disease in Australia were impacted by the global response to the coronavirus disease 2019 (COVID-19) pandemic. In the five years prior to 2020, notifications for all notifiable gastrointestinal diseases in Australia increased gradually from 41,100 in 2015 to 56,215 in 2019 (noting this includes impacts of changing laboratory testing processes, amended surveillance case definitions, and additional diseases being made nationally notifiable in Australia). There was, however, a decrease in notifications observed following the start of the COVID-19 pandemic in early 2020, with the introduction of multiple public health measures. These measures included restrictions on travel (internationally, domestically, and locally), social gathering constraints, lockdowns which closed food businesses, and physical distancing. Additionally, some testing limitations were experienced in diagnostic laboratories for enteric pathogens as resources were diverted to higher priority investigations. The extent to which public health measures were implemented in Australia, and their duration, varied by state and territory. Most social distancing measures, including restricted international travel, eased nationally by early 2022.

Data from the NNDSS, including number of notifications and rate by month, jurisdiction, age group and sex, can be accessed on the National Notifiable Diseases Surveillance System (NNDSS) data visualisation tool.[iv] A summary of each notifiable enteric condition is provided in this report.

Table 1: Enteric disease notifications in Australia, 2020–2022

Disease	2020	2021	2022	Mean notifications 2020–2022	Mean notifications 2015–2019
Botulism	1	5	3	3	1
Campylobacteriosis[a]	33,542	39,426	42,241	38,403	29,134
Cholera	0	1	3	1	1
Hepatitis A	86	24	144	85	244
Hepatitis E	31	6	13	17	44
Haemolytic uraemic syndrome (HUS)	14	7	14	12	16
Listeriosis	43	44	89	59	70
Paratyphoid	38	4	52	31	84
Salmonellosis	12,011	10,668	10,298	10,992	16,017
Shigellosis	1,598	467	1,406	1,157	1,972
Shiga toxin-producing *Escherichia coli* (STEC) infection	578	625	843	682	443
Typhoid	88	17	178	94	148
Total	**48,030**	**51,294**	**55,284**	**51,536**	**48,174**

a New South Wales commenced notifications in April 2017.

iv https://www.cdc.gov.au/resources/apps-and-tools/nndss-data-visualisation-tool.

Botulism

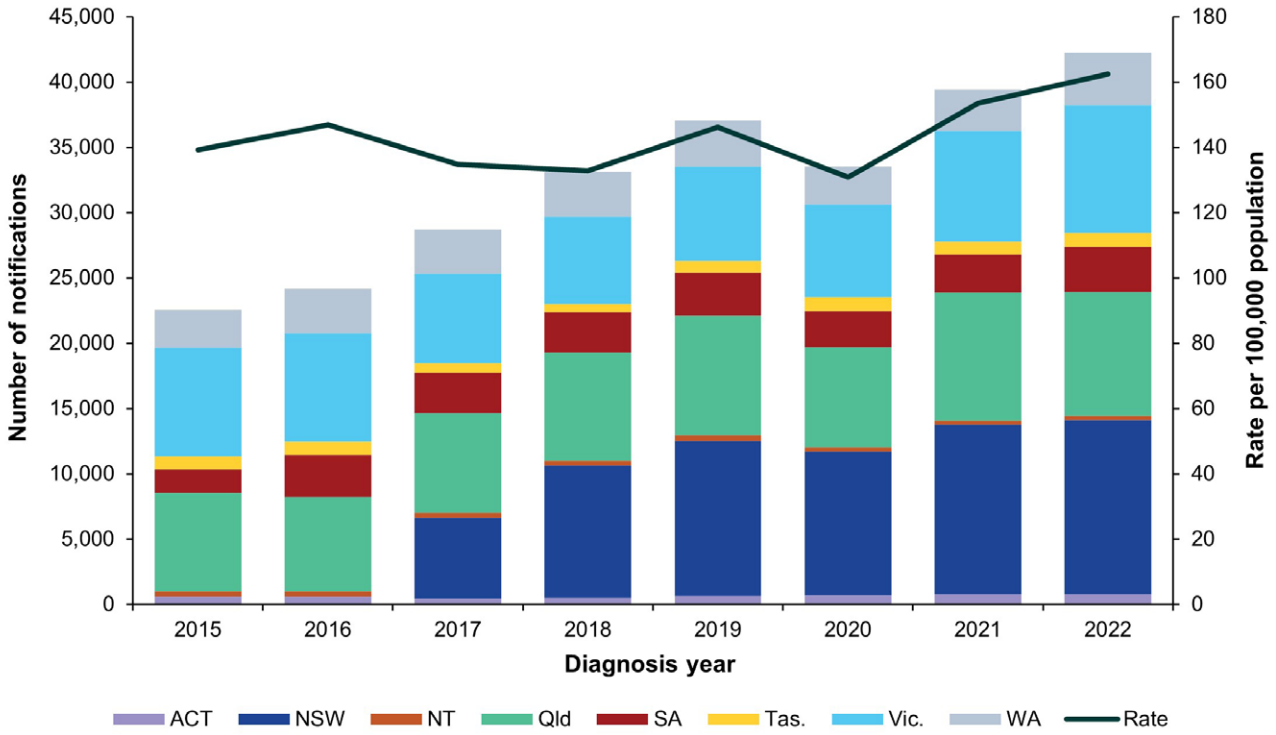
During 2020–2022, there were nine notifications of botulism reported by four jurisdictions: (New South Wales (n = 3); South Australia (n = 3); Victoria (n = 2); and Tasmania (n = 1)). Eight cases were infant botulism; one case was wound botulism associated with injecting drug use. This was the first case of wound botulism reported in Australia since botulism became notifiable in all jurisdictions of Australia in 2001.

Campylobacteriosis

A total of 115,209 notifications of *Campylobacter* infection were reported during 2020–2022, an increase of 26% over the reporting period to the highest number ever recorded in 2022 (Figure 1). The jurisdictional notification rates of campylobacteriosis ranged from 106 notifications per 100,000 population in Western Australia to 195 notifications per 100,000 population in Tasmania, both in 2020 (Table 2). Excluding New South Wales, only Northern Territory and Western Australia reported a mean 2020–2022 notification rate below their respective five-year historical mean rate (2015–2019). Similar to previous years, campylobacteriosis notifications were highest in the spring and summer months (October – January).

The mean campylobacteriosis notification rate for 2020–2022 was highest in the 0–4 years age group (236 notifications per 100,000 population), with higher rates in males compared to females across all age groups (Figure 2).

Figure 1: Campylobacteriosis notifications and rate per 100,000 population in Australia by jurisdiction of residence,[a,b] 2015–2022



a Campylobacteriosis became notifiable in New South Wales in April 2017.

b Notifications in New South Wales in 2017 have been excluded from the rate calculation to avoid comparisons of incomplete data. The rate for Australia before 2018 has been calculated using Australian Bureau of Statistics estimated resident population data for Australia minus New South Wales.

Table 2: Number of notifications and crude rates of campylobacteriosis in Australia by jurisdiction of residence, 2020–2022

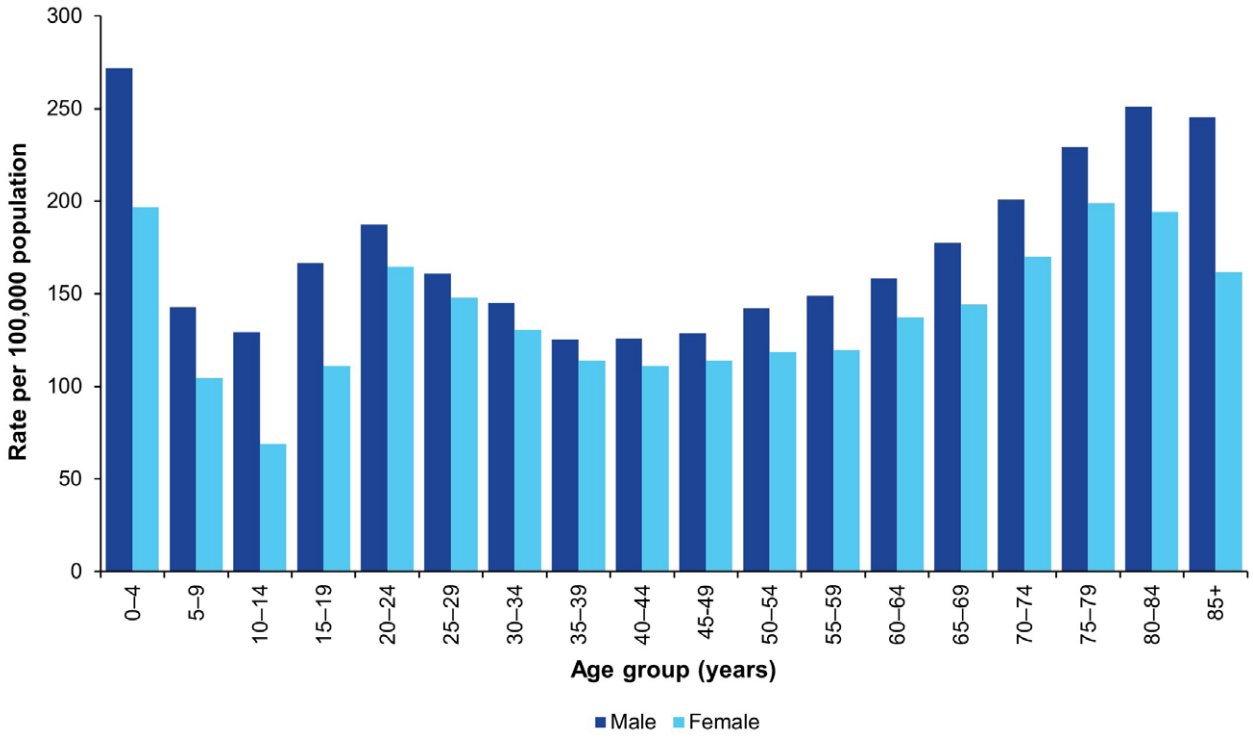
Category	Diagnosis year	ACT	NSW[a]	NT	Qld	SA	Tas.	Vic.	WA	Australia
Notified cases	2020	684	11,015	340	7,675	2,736	1,087	7,116	2,889	33,542
	2021	794	12,988	307	9,817	2,899	964	8,504	3,153	39,426
	2022	786	13,340	312	9,517	3,415	1,060	9,772	4,039	42,241
Rate[b]	2020	154	136	137	149	153	195	108	106	131
	2021	175	160	124	188	161	170	130	115	153
	2022	172	163	125	179	188	186	147	145	162
Mean historical rate[b]	2015–2019	137	—[a]	160	161	168	167	118	129	140[c]

a New South Wales commenced notifications in April 2017.

b Crude rate per 100,000 population per year.

c The mean rate calculation for Australia excludes notifications in New South Wales in 2017, to avoid comparisons of incomplete data, and uses Australian Bureau of Statistics estimated resident population data for Australia minus New South Wales for rates before 2018.

Figure 2: Campylobacteriosis notification rate per 100,000 population in Australia by age group and sex,[a] 2020–2022



a Excludes cases missing date of birth so no age group could be calculated (n = 8) or cases with sex not defined (n = 84).

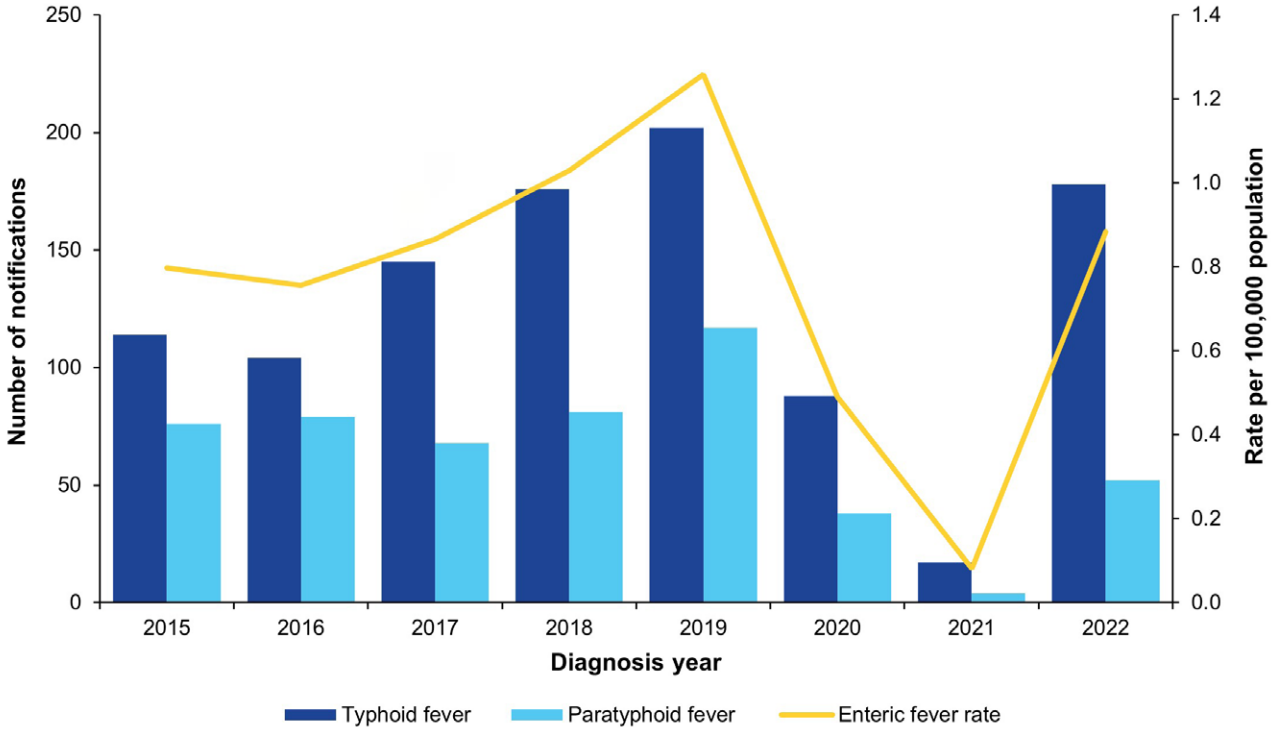
Cholera

Over the reporting period (2020–2022), there were four notifications of cholera. These notifications were reported by New South Wales (n = 3) and Queensland (n = 1). One notification was identified as being acquired in Australia, following contact with a returned traveller from Pakistan as the suspected source. The remaining three notifications were acquired overseas in India (n = 2) and Indonesia (n = 1).

Enteric fever

During 2020–2022, a total of 377 notifications of enteric fever were reported, of which 283 (75%) were typhoid and 94 (25%) were paratyphoid. There was a large decrease in notifications in 2020 and 2021, likely due to travel restrictions implemented in Australia during the COVID-19 pandemic (Figure 3). Notifications were slightly higher in males (n = 192/377; 51%) and the median age was 26 years.

Figure 3: Typhoid fever and paratyphoid fever notifications and enteric fever notification rate per 100,000 population in Australia, 2015–2022



Paratyphoid

During 2020–2022, there were respectively 38, 4 and 52 notifications of paratyphoid each year, compared to the five-year historical mean (2015–2019) of 84 (Table 3). Almost all paratyphoid notifications (n = 91/94; 97%) were caused by *S*. Paratyphi A infection, with the three remaining notifications being due to *S.* Paratyphi B infection.

Travel history information was available for all paratyphoid notifications over the reporting period (2020–2022); of these, 97% (n = 91/94) acquired their illness overseas. The most common overseas countries of acquisition were India (n = 60/91; 66%); Pakistan (n = 11/91; 12%); and Cambodia (n = 5/91; 5%). The source of infection was not identified for three infections acquired in Australia.

Table 3: Number of notifications of paratyphoid in Australia by jurisdiction of residence, 2020–2022

Diagnosis year	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
2020	1	15	1	2	1	0	18	0	38
2021	0	1	0	0	0	0	3	0	4
2022	2	15	0	5	5	0	24	1	52
Mean notifications 2015–2019	2	26	1	8	8	1	29	9	84

Typhoid

There were 88 notifications of typhoid fever in 2020, 17 notifications in 2021 and 178 notifications in 2022. This compares to the five-year historical mean (2015–2019) of 148 notifications (Table 4).

Travel history information was available for 98% of typhoid fever notifications (n = 278/283) over the reporting period (2020–2022); of these, 89% (n = 248/278) acquired their illness overseas. The majority of the overseas-acquired typhoid fever notifications were acquired in India (n = 158/248; 64%), followed by Pakistan (n = 51/248; 21%) and Bangladesh (n = 15/248; 6%).

Of notifications acquired in Australia (n = 30), approximately half were reported to have had contact with a confirmed case (n = 16/30; 53%), including household contacts that either acquired their infection overseas or were asymptomatic chronic carriers suspected to have acquired their infection overseas. Two of the 16 notifications resulted from contact at a restaurant with an asymptomatic food handler.

The remaining 14 Australian-acquired notifications included five people who reported contact with overseas travellers that were not confirmed cases of typhoid; the risk factors for the other nine people were unable to be determined.

Table 4: Number of notifications of typhoid in Australia by jurisdiction of residence, 2020–2022

Diagnosis year	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
2020	2	33	2	10	3	3	28	7	88
2021	0	3	0	5	1	1	6	1	17
2022	8	49	1	16	13	1	73	17	178
Mean notifications 2015–2019	4	51	1	24	7	1	46	15	148

Hepatitis A

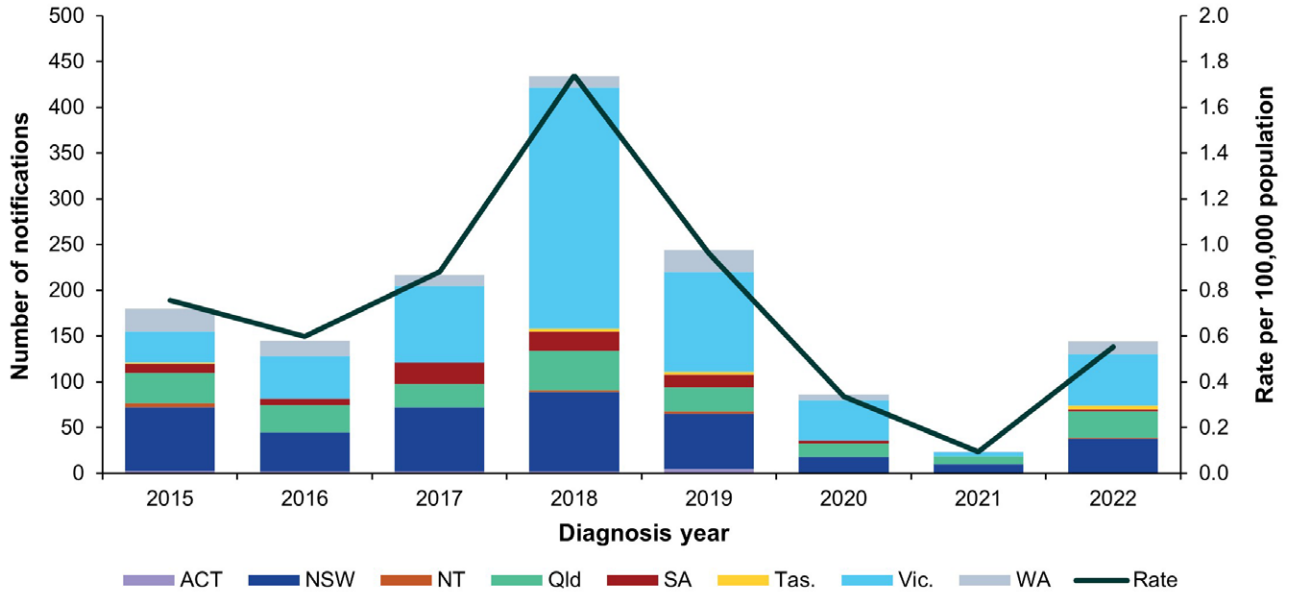
In 2020, there were 86 notifications of hepatitis A infection in Australia, which decreased to 24 notifications in 2021 and then increased to 144 notifications in 2022. This compares to the five-year historical mean (2015–2019) of 244 notifications (Table 5). Notifications decreased across 2018–2021 due to a decline in cases associated with a local Victorian community outbreak that peaked in 2018,[9] and likely also reflecting subsequent international travel restrictions implemented in Australia during the COVID-19 pandemic across all jurisdictions (Figure 4). During the reporting period (2020–2022), the median age of cases was 24 years (range 2–80 years); 63% of notifications were male (n = 159/254). Indigenous status was reported for 92% of hepatitis A cases (n = 233/254) during the reporting period (2020–2022). Of these, fewer than 1% of cases (n = 2/233) identified as being Aboriginal and/or Torres Strait Islander.

Over the reporting period (2020–2022), sixty-eight percent of hepatitis A infections (n = 172/253) were acquired overseas. The most common countries of reported acquisition included India (n = 55/172; 32%); Pakistan (n = 38/172; 22%); and Lebanon (n = 12/172; 7%). The country of acquisition was unknown for one notification, and 81 infections (32%) were reported to be acquired in Australia. Most notifications acquired in Australia were associated with contact with a confirmed case (n = 49/81; 60%), including 30 notifications linked to the continuing multi-year community outbreak in Victoria, and 14 notifications associated with two primary school outbreaks investigated in Queensland. One foodborne outbreak in 2021, identified as associated with consumption of imported medjool dates, affected six people;[10] one notification in 2020 was suspected to be linked to the 2018 multi-jurisdictional outbreak associated with consumption of imported frozen pomegranate arils. The sources of the remaining locally acquired infections (n = 25/81; 31%) were unable to be determined; however, contact with overseas travellers and/or consumption of imported foods were reported by some cases.

Table 5: Number of notifications of hepatitis A in Australia by jurisdiction of residence, 2020–2022

Diagnosis year	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
2020	0	18	0	15	3	0	44	6	86
2021	1	9	0	9	0	0	4	1	24
2022	1	37	1	29	2	4	56	14	144
Mean notifications 2015–2019	3	66	2	32	15	1	107	18	244

Figure 4: Hepatitis A notifications and rate per 100,000 population in Australia by jurisdiction of residence, 2015–2022



Hepatitis E

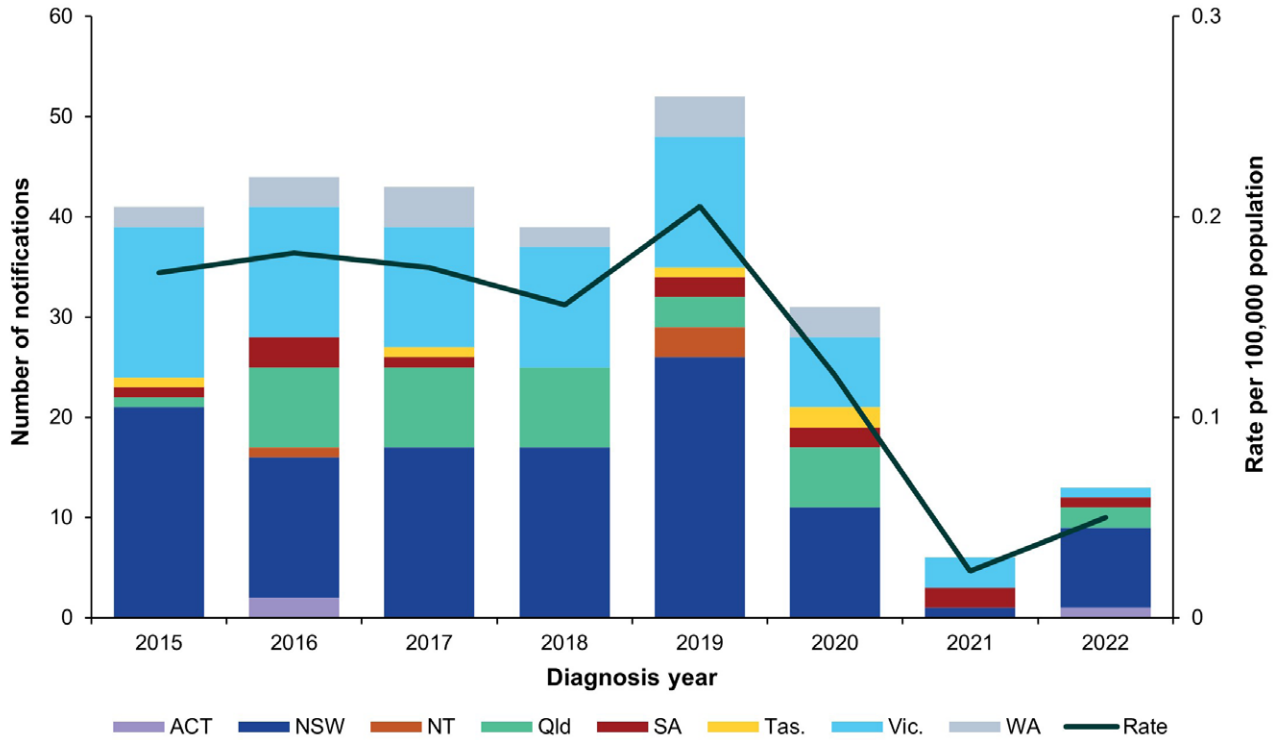
There were 50 notifications of hepatitis E during the reporting period (2020–2022) (Table 6). The median age of cases was 36 years (range 17–87 years) and 60% of notifications were male (n = 30). Indigenous status was reported for 96% of hepatitis E cases (n = 48/50) during the reporting period (2020–2022). Of these, one case identified as being Aboriginal and/or Torres Strait Islander.

Hepatitis E in Australia has traditionally been associated with overseas travel and notifications accordingly decreased during the COVID-19 pandemic (Figure 5). Over the reporting period (2020–2022), sixty-four percent of hepatitis E infections (n = 32/50) were acquired overseas. Of these, 66% (n = 21/32) reported travel to India and 22% (n = 7/32) travel to Pakistan. Eighteen notifications were reported to have been acquired in Australia, with the source of infection not confirmed for any of these cases.

Table 6: Number of notifications of hepatitis E in Australia by jurisdiction of residence, 2020–2022

Diagnosis year	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
2020	0	11	0	6	2	2	7	3	31
2021	0	1	0	0	2	0	3	0	6
2022	1	8	0	2	1	0	1	0	13
Mean notifications 2015–2019	0	19	1	6	1	1	13	3	44

Figure 5: Hepatitis E notifications and rate per 100,000 population in Australia by jurisdiction of residence, 2015–2022



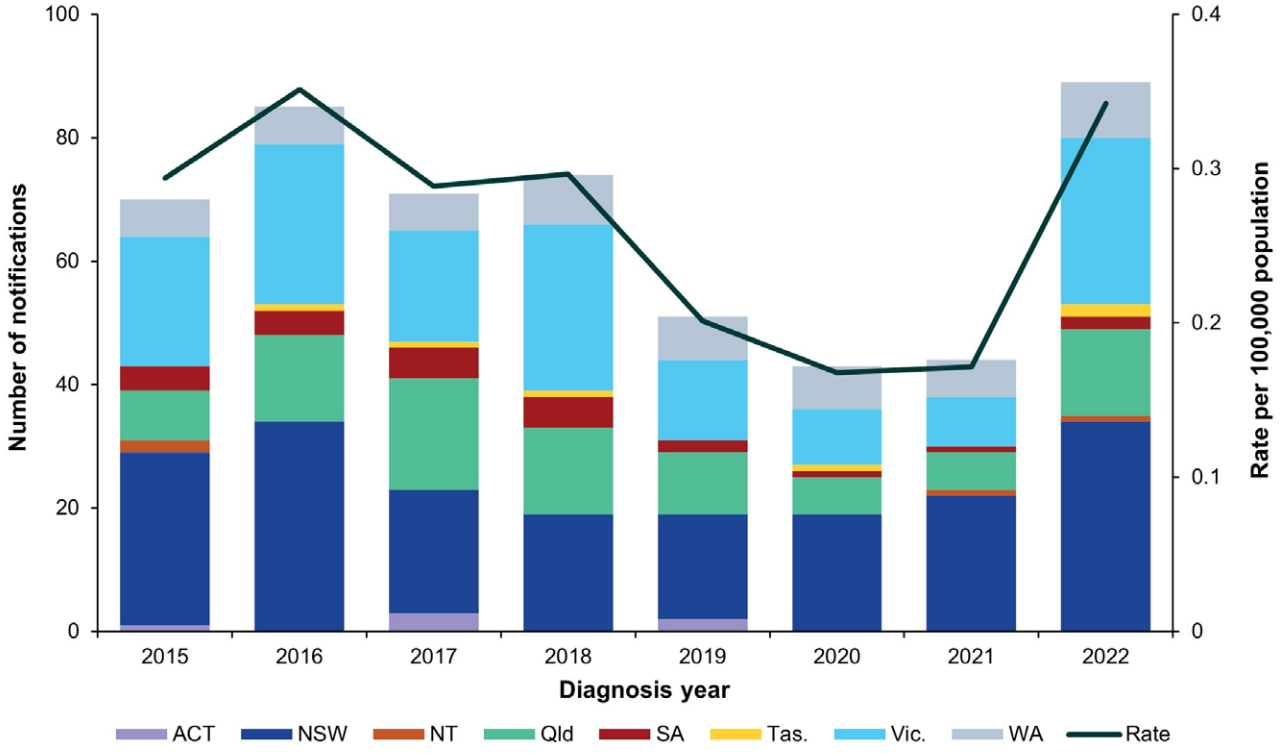
Listeriosis

Notifications of *Listeria monocytogenes* infection in 2020 and 2021 were respectively 43 and 44 cases, with the 2020 notification total constituting the lowest number of cases per year recorded in Australia since 1994; notifications increased to 89 cases in 2022, which was among the highest annual number of listeriosis notifications in Australia (Figure 6). The increase in 2022 was across multiple jurisdictions, with the largest increase observed in Victoria (Table 7). Indigenous status was reported for 98% of listeriosis cases (n = 172/176) during the reporting period (2020–2022). Of these, three cases identified as being Aboriginal and/or Torres Strait Islander. Multi-locus sequence typing (MLST) was determined in silico from whole genome sequencing data. There were a total of 30 different MLST types determined during the reporting period (2020–2022). The most common types identified were MLST 1 (n = 39) and MLST 3 (n = 24), which together accounted for over a third (38%) of all cases.

Table 7: Number of notifications of listeriosis in Australia by jurisdiction of residence, 2020–2022

Diagnosis year	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
2020	0	19	0	6	1	1	9	7	43
2021	0	22	1	6	1	0	8	6	44
2022	0	34	1	14	2	2	27	9	89
Mean notifications 2015–2019	1	24	0	13	4	1	21	7	70

Figure 6: Listeriosis notifications and rate per 100,000 population in Australia by jurisdiction of residence, 2015–2022



Perinatal cases

There were 26 perinatal listeriosis notifications over the reporting period (2020–2022). In 2020, there were four notifications representing two birthing person/neonate pairs (both birthing person and neonate were notified); and one notification in a birthing person only. In 2021, there were four notifications representing two birthing person/neonate pairs. In 2022, there were ten notifications representing five birthing person/neonate pairs; six notifications in a birthing person only; and one notification in a neonate only.

The outcome of the 17 pregnancies were: continuing pregnancy (2020: n = 1; 2022: n = 9); miscarriage (2020: n = 1; 2022: n = 3);[v] neonatal death (2020: n = 1; 2021: n = 1);[vi] and neonatal survival (2022: n = 1).

There were no deaths reported among the pregnant people. Illnesses reported for the birthing person included bacteraemia/sepsis (n = 8); febrile gastroenteritis (n = 2); non-specific 'flu-like' symptoms (n = 2); localised wound infection (n = 1); fever and chills (n = 1); and chills and diarrhoea (n = 1). One birthing person reported no symptoms.

Non-perinatal cases

Over the reporting period (2020–2022), there were 150 non-perinatal listeriosis notifications. In 2020 and 2021, more notifications were from males (58% and 65% respectively); however, in 2022 more notifications were from females (57%). The increase in notifications in 2022 was accompanied by a decrease in the median age of notifications from 77 and 76 years in 2020 and 2021 respectively, to 68 years in 2022. In all years, a majority of cases was aged over 65 years (range 63–84%), with approximately one quarter to one half of cases aged over 80 years (range 26–47%).

During the reporting period (2020–2022), septicaemia was the most common clinical presentation and was associated with the greatest number of deaths (Table 8). Thirty-five non-perinatal cases died, with 20 deaths specifically attributed to listeriosis.

Between 2020 and 2022, one hundred and twenty-seven cases (85%) reported at least one illness or condition known to increase the risk of listeriosis, with cancer and heart disease the most commonly reported conditions (Table 9). Twenty-three cases, aged between 15–98 years, reported no known comorbidities. Eight of these cases reported taking medications that would increase their susceptibility to listeriosis such as corticosteroids; cyclosporine or other immunosuppressive drugs; antidiarrhoeal medications; antacids or other gastric acid medications; or antibiotics in the four weeks prior to illness. The remaining 15 cases did not report consuming any medications that would increase their susceptibility to listeriosis.

Table 8: Non-perinatal listeriosis notifications in Australia by clinical presentation,[a] 2020–2022

Nature of the illness	No. cases	Proportion of all cases (%)	Deaths
Septicaemia	123	82%	29
Meningitis	11	7%	1
Meningitis and septicaemia	8	5%	2
Other[b]	6	4%	1
Unknown	2	1%	2
Total	**150**	**100%**	**35**

a Data taken from the National Enhanced Listeriosis Surveillance System (NELSS).

b 'Other' includes: infected graft (n = 2); infected joint (n = 2); peritonitis (n = 1); and nil specific illness (n = 1).

v Miscarriage is defined as foetal death at less than 20 weeks gestation.

vi Neonatal death is defined as foetal death at greater than or equal to 20 weeks gestation.

Table 9: Immunocompromising conditions for non-perinatal listeriosis notifications in Australia, 2020–2022

Condition	No. cases	Proportion of all cases (%)[a]
Cancer	56	37%
Heart disease	52	35%
Rheumatological condition	31	21%
Diabetes	30	20%
Renal disease not requiring dialysis	23	15%
Blood disorder	18	12%
Chronic lung disease (excluding asthma)	18	12%
Liver disease	18	12%
Renal / kidney disease requiring dialysis	12	8%
Organ transplant	5	3%
No immunocompromising conditions	23	15%

a More than one comorbidity may be reported for each listeriosis notification.

Salmonellosis

From 2020 to 2022 the number of salmonellosis notifications per year decreased from 12,011 to 10,298 cases, and from 47 to 40 notifications per 100,000 population per year (Figure 7). The annual rates were below the five-year historical mean (2015–2019) of 65 notifications per 100,000 population per year, and continued the general decrease in salmonellosis notifications nationally since peaking to the highest on record in 2016. The decrease of notifications over the reporting period (2020–2022) can be attributed in part to the impact of the COVID-19 public health response including international travel restrictions implemented in Australia, and was despite two large outbreaks investigated in 2020 and 2021 that caused 1,063 and 585 cases of illness respectively (see foodborne outbreak section).

All jurisdictions saw rates fall below their respective five year means, with the largest decrease during the reporting period observed in Western Australia (66 to 34 notifications per 100,000 population per year) (Table 10). Consistent with previous years, the highest notification rates were observed in the Northern Territory, followed by Queensland. In 2022, all jurisdictions except the Northern Territory and Queensland had similar notification rates (28 to 36 notifications per 100,000 population) that were below the national average.

Over the reporting period (2020–2022), over half of the salmonellosis notifications were in females (n = 17,007/32,977; 52%). As in previous years, the notification rate was highest in the 0–4 years age group (194 notifications per 100,000 population; Figure 8). Consistent with seasonal patterns, infections were more common in summer and autumn, with the highest monthly counts observed in January to March.

Serotyping information was available for 89% of salmonellosis notifications (n = 29,490/32,977) during 2020–2022, with a total of 246 different serotypes identified. *Salmonella enterica* subsp. *enterica* ser. Typhimurium (*S*. Typhimurium) remained the most common serotype identified (n = 11,590/29,490; 39%), despite a lower mean annual number of cases in 2020–2022 than in the five-year historical mean (2015–2019) of 5,746 notifications. After having peaked nationally in 2014 (n = 7,787) reported cases of *S*. Typhimurium were reduced by more than half in 2022 (n = 3,228). The five most commonly reported serotypes during the reporting period (2020–2022) are shown in Table 11.

Figure 7: Salmonellosis notifications and rate per 100,000 population in Australia by jurisdiction of residence, 2015–2022

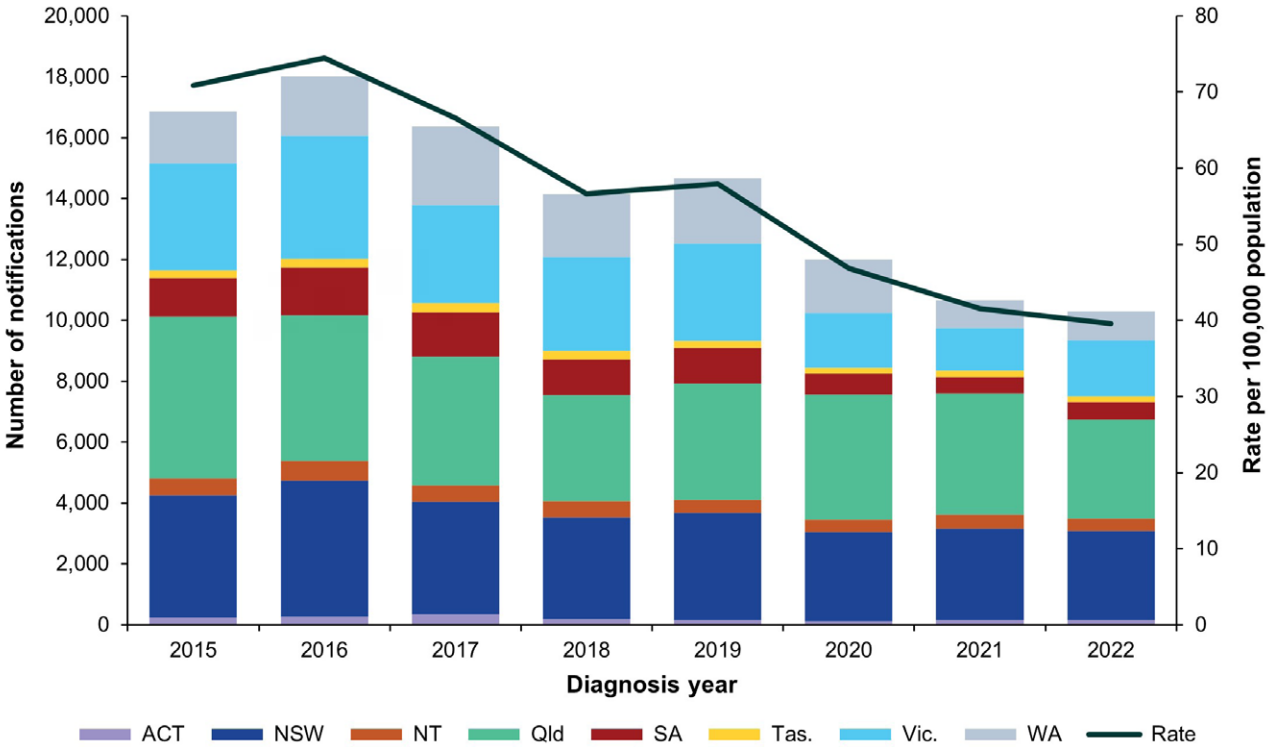
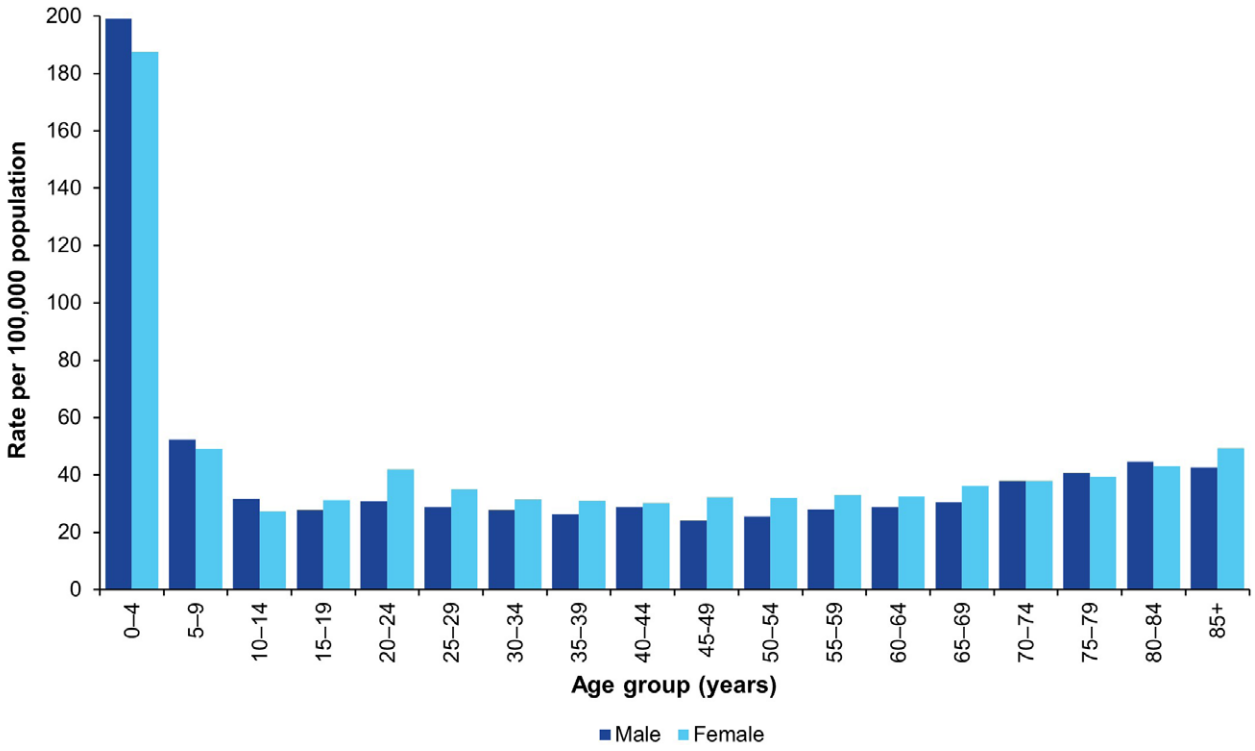


Table 10: Number of notifications and crude rates of salmonellosis in Australia by jurisdiction of residence, 2020–2022

Category	Diagnosis year	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
Notified cases	2020	119	2,933	407	4,117	673	190	1,811	1,761	12,011
	2021	152	3,018	460	3,970	547	204	1,393	924	10,668
	2022	151	2,932	410	3,252	570	195	1,838	950	10,298
Rate[a]	2020	27	36	164	80	38	34	27	65	47
	2021	34	37	185	76	30	36	21	34	42
	2022	33	36	164	61	31	34	28	34	40
Mean historical rate[a]	2015–2019	58	49	219	88	77	52	54	81	65

a Crude rate per 100,000 population per year.

Figure 8: Salmonellosis mean notification rate per 100,000 population in Australia by age group and sex,[a] 2020–2022



a Excludes notifications missing date of birth so no age group could be calculated (n = 4) or cases with sex not defined (n = 26).

Table 11: Number of notifications of the five most common *Salmonella* serotypes, and proportion by serotype of total *Salmonella* notifications, in Australia, 2020–2022

Serotype		2020	2021	2022	Mean notifications 2015–2019
S. Typhimurium	n	4,989	3,373	3,228	5,746
	%	45%	35%	36%	40%
S. Saintpaul	n	753	1,119	480	704
	%	7%	12%	5%	5%
S. Virchow	n	584	572	441	716
	%	5%	6%	5%	5%
S. Wangata	n	402	392	273	244
	%	4%	4%	3%	2%
S. Enteritidis	n	321	136	362	985
	%	3%	1%	4%	7%
Total serotyped	**n**	**11,002**	**9,519**	**8,969**	**14,377**

Salmonella Enteritidis

S. Enteritidis is a globally important *Salmonella* serotype that can infect the internal contents of eggs, posing a greater risk for food safety. For this reason, a travel history is sought from all notified cases, and cases who have not travelled outside Australia undergo further investigation to identify the likely source of infection. Previously *S*. Enteritidis was not considered endemic in Australian egg layer flocks.[11] In 2018, *S.* Enteritidis was detected in Australian poultry facilities in New South Wales for the first time.[12]

Over the reporting period (2020–2022), OzFoodNet sites reported 819 cases of *S*. Enteritidis infection, a mean of 273 notifications per year. This compares with the five-year historical mean (2015–2019) of 985 notifications. Consistent with other travel-related enteric infections in this report, including other *Salmonella* serotypes, the decrease in notifications of *S*. Enteritidis is attributed to the international travel restrictions implemented in Australia during the COVID-19 pandemic.

Travel histories were obtained for 77% of *S*. Enteritidis cases (n = 633/819) during the reporting period (2020–2022), which is a lower proportion than previous years (86% between 2015–2019). Of those cases during the reporting period (2020–2022) with completed travel history, 58% (n = 368/633) reported overseas travel and 42% (n = 265/633) were acquired in Australia. New South Wales reported the highest number of Australian acquired cases (n = 120/265; 45%); however these decreased each year from 77 in 2020 to 10 in 2022.

Of the *S*. Enteritidis notifications acquired overseas, 346 had available information on the country and/or region of travel. Similar to previous years, the most common reported overseas country of acquisition was Indonesia (n = 183/346; 53%), followed by Malaysia (n = 21/346; 6%), Thailand (n = 19/346; 5%), India (n = 16/346; 5%) and Singapore (n = 14/346; 4%). This may reflect travel practices rather than an increased risk.

Shigellosis

From 2015 to 2019, shigellosis notifications increased each year from 1,037 to 3,152 cases. The introduction of PCR testing in 2014, non-foodborne outbreaks amongst men who have sex with men (MSM) and amongst Aboriginal and/or Torres Strait Islander communities, and the change to the national shigellosis case definition in July 2018 to include probable cases that include detection of *Shigella* on PCR only, all likely contributed to this increase (Figure 9).[vii] In 2020, the number of national notifications and the national rate both approximately halved compared to the 2019 values, with 1,598 notifications and a rate of 6 notifications per 100,000 population in 2020. This decrease was maintained in 2021, with 467 notifications and a rate of 2 notifications per 100,000 population (Table 12). The decreases in 2020 and 2021 are reflective of public health measures to control COVID-19 which impacted both overseas and Australian transmission of shigellosis, including cases in Aboriginal and/or Torres Strait Islander people which were already decreasing following a peak of cases in 2018 caused by a large community outbreak of *S. flexneri* 2b. In 2022, the number of notifications nationally increased to 1,406, with a rate of 5 notifications per 100,000 population as international travel increased. As with previous years, the highest rates of shigellosis were reported by the Northern Territory with a mean 2020–2022 rate of 66 notifications per 100,000 population compared to the national mean 2020–2022 rate of 4 notifications per 100,000 population.

Over the reporting period (2020–2022), the majority of notifications were in males (n = 1,929/3,471; 56%), and the most affected age group was those aged 0–4 years (n = 684/3,471; 20%) (Figure 10).

Probable cases accounted for 55% of notifications during 2020–2022 (n = 1,913/3,471). The most common species reported among all shigellosis cases was *S. sonnei* (n = 867/3,471; 25%), followed by *S. flexneri* (n = 568/3,471; 16%). The remaining cases were *S. boydii* (n = 17/3,471; < 1%) and *S. dysenteriae* (n = 10/3,471; < 1%). Fifty-eight percent of cases (n = 2,015/3,471) were not speciated.

vii Shigellosis case definition: https://www.cdc.gov.au/resources/publications/surveillance-case-definition-shigellosis.

Over the reporting period (2020–2022), Indigenous status was recorded for 84% of shigellosis cases (n = 2,922/3,471). Of these, 30% (n = 886/2,922) identified as being Aboriginal and/or Torres Strait Islander. The largest number of cases among Aboriginal and/or Torres Strait Islander people occurred in the Northern Territory (n = 391/886; 44%), followed by Western Australia (n = 123/886; 29%), South Australia (n = 121/886; 14%) and Queensland (n = 92/886; 10%).

A higher burden of disease has been consistently observed amongst Aboriginal and/or Torres Strait Islander people between 2015 and 2022 (Figure 11). The higher risk of shigellosis in these populations is associated with close person-to-person contact and community outbreaks in conditions of crowding and poor sanitation and hygiene. Person-to-person transmission, particularly between young children, is common due to the low infectious dose. The mean 2020–2022 rate of shigellosis in Aboriginal and/or Torres Strait Islander peoples (30 notifications per 100,000 population per year) was 6.7 times higher than the overall national mean rate of shigellosis (4 notifications per 100,000 population per year). Of the 568 shigellosis notifications among Aboriginal and/or Torres Strait Islander people that were speciated (64%), the most common types were identified as *S. sonnei* biotype a (n = 195/568; 34%) and *S. flexneri* serotype 2b (n = 176/568; 31%), which both largely decreased over the reporting period, as well as *S. flexneri* serotype 2a (n = 114/568; 20%) which remained steady. Conversely, the majority of the 783 notifications from non-Indigenous people that were speciated (38%) were identified as *S. sonnei* biotype g (n = 408/783; 52.1%).

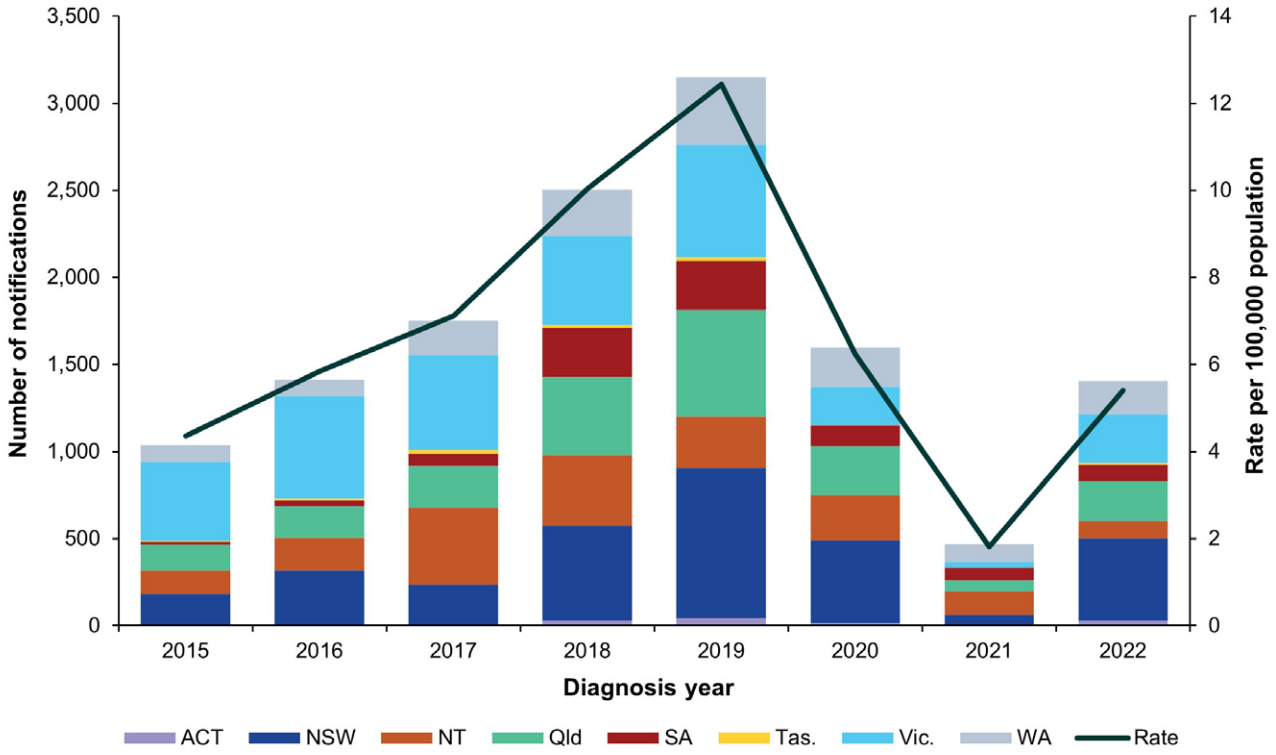
Travel history information was available for 57% of shigellosis notifications (n = 1,970/3,471) over the reporting period (2020–2022); of these, 47% (n = 919/1,970) acquired their illness overseas. The countries most frequently reported as the place of acquisition for shigellosis were India (n = 238/919; 22%), Indonesia (n = 179/919; 19%) and Pakistan (n = 88/919; 10%). Of the infections that were reported to have been acquired in Australia, males accounted for two-thirds of cases (n = 708/1,051; 67%). This is likely to be in part associated with male-to-male sexual transmission.

Table 12: Number of notifications and crude rates of shigellosis in Australia by jurisdiction of residence, 2020–2022

Category	Diagnosis year	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
Notified cases	2020	17	476	257	280	121	1	220	226	1,598
	2021	3	61	134	62	73	1	33	100	467
	2022	28	474	101	226	93	11	281	192	1,406
Rate[a]	2020	4	6	104	5	7	0.2	3	8	6
	2021	0.7	0.8	54	1	4	0.2	0.5	4	2
	2022	6	6	40	4	5	2	4	7	5
Mean historical rate[a]	2015–2019	4	5	119	7	8	3	9	8	8

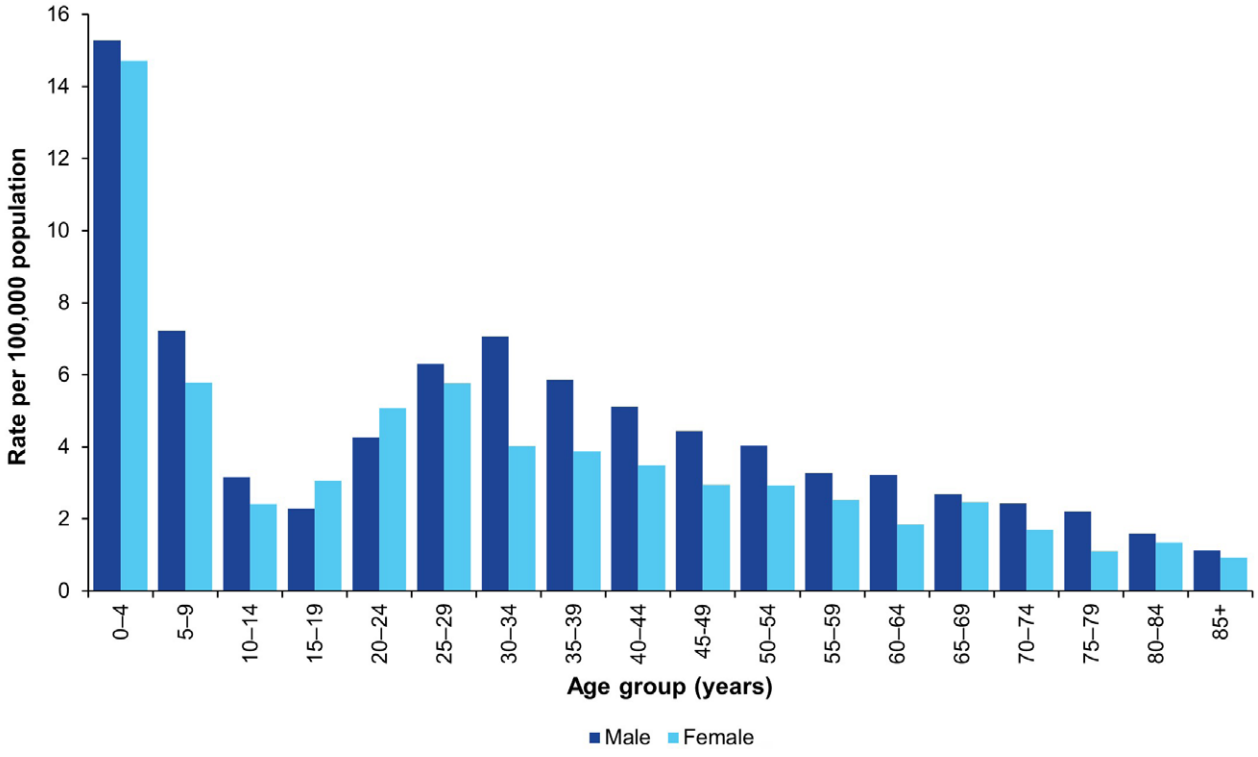
a Crude rate per 100,000 population per year.

Figure 9: Shigellosis notifications and rate per 100,000 population in Australia by jurisdiction of residence,[a] 2015–2022



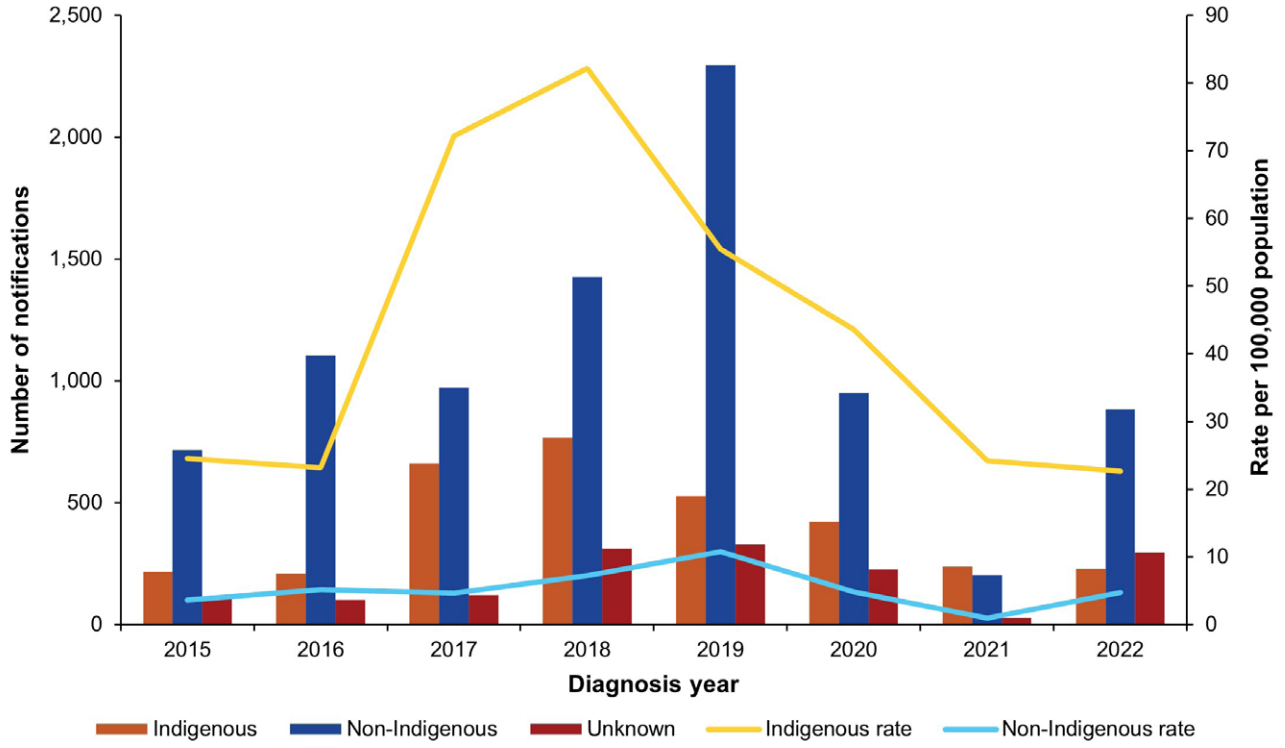
a The national shigellosis case definition changed on 1 July 2018 to include 'probable cases'.

Figure 10: Shigellosis notification rate per 100,000 population in Australia by age group and sex,[a] 2020–2022



a Excludes notifications missing date of birth so no age group could be calculated (n = 1) or cases with sex not defined (n = 1).

Figure 11: Shigellosis notifications and rates per 100,000 population in Australia by Indigenous status,[a] 2015–2022



a Cases with unknown Indigenous status were included as non-Indigenous in the rate calculations.

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

In 2020, there were 578 notifications of STEC infection in Australia, which increased to 625 notifications in 2021 and to 843 notifications in 2022 (Table 13). This compares to the five-year historical mean (2015–2019) of 443 notifications. Changes to the case definition for confirmed STEC notifications in 2016 and the increasing uptake of CIDT have contributed to the increase in STEC cases nationally.[viii] Notifications of STEC infection are strongly influenced by state and territory practices regarding the screening of stool specimens.[ix] South Australia reported the highest notification rates of STEC, with a mean annual 2020–2022 rate of 13 notifications per 100,000 population, compared to the national mean annual rate of 3 notifications per 100,000 population (Figure 12). The consistently higher rates observed in South Australia reflect the high routine testing of faecal samples for STEC by their primary laboratory, as well as SA reporting an ill person with multiple STEC serotype detections as separate notifications (compared to other jurisdictions reporting only one notification in such instances).

During the reporting period (2020–2022), STEC notifications peaked in children aged 0–4 years (n = 255/2,046; 12%) with the highest rate in adults among those aged over 85 years (6 notifications per 100,000 population) (Figure 13). Notifications were more common in females (n = 1,136/2,046; 56%) than in males (n = 909/2,046; 44%). Where known, the majority of notifications (n = 1,261/1,337; 94%) were acquired in Australia. Of the cases known to be acquired overseas (n = 76), Indonesia was the most commonly reported country of acquisition (n = 24/76; 32%).

viii Shiga toxin-producing *Escherichia coli* (STEC) case definition: https://www.cdc.gov.au/resources/publications/surveillance-case-definition-stec.

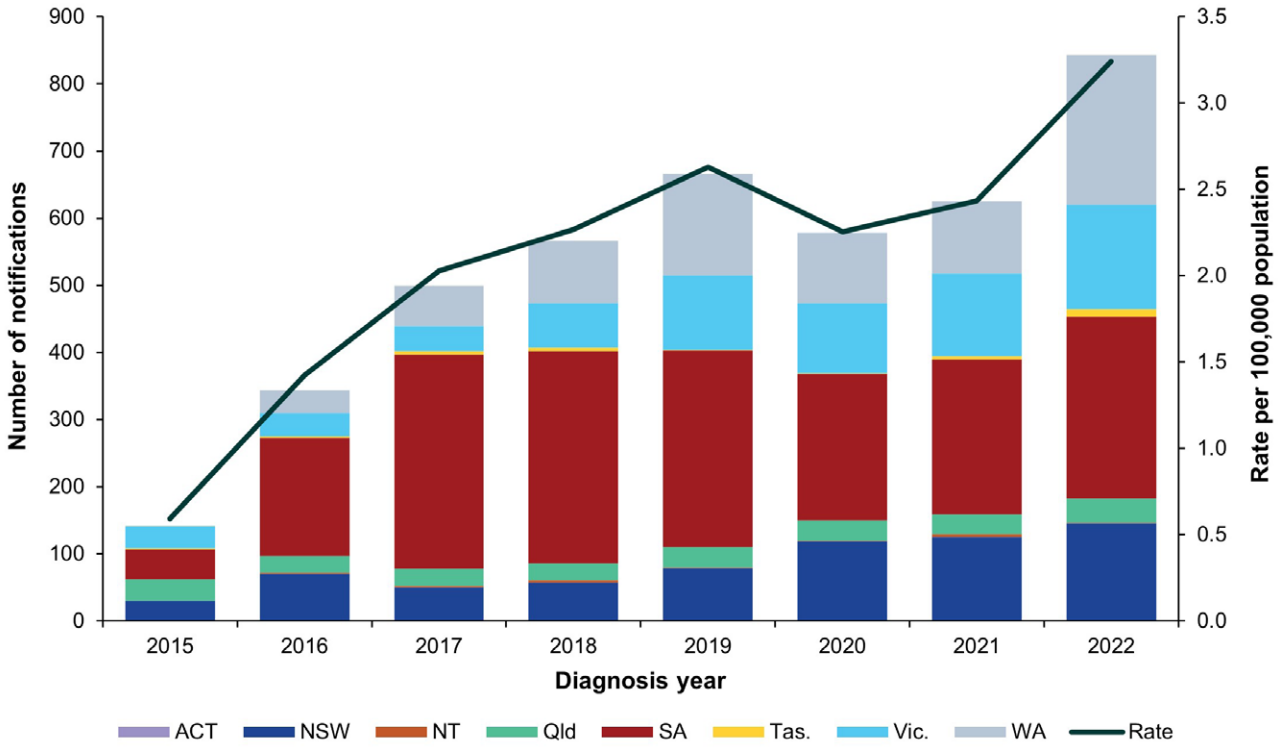
ix Note that historically, Victoria notified HUS cases with STEC infection as HUS only. However, as of 31 October 2022, Victoria now notify HUS cases with STEC infection as both HUS and STEC notifications, in line with all other Australian jurisdictions. For consistency, all Victorian HUS cases diagnosed with a STEC infection have been included in the STEC data presented here.

Table 13: Number of notifications and crude rates of Shiga toxin-producing *E. coli* (STEC) in Australia by jurisdiction of residence, 2020–2022

Category	Diagnosis year	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Australia
Notified cases	2020	0	119	1	30	218	1	104	105	578
	2021	1	124	4	30	231	4	124	107	625
	2022	0	146	1	35	271	12	155	223	843
Rate[a]	2020	0	1	0.4	0.6	12	0.2	2	4	2
	2021	0.2	2	2	0.6	13	0.7	2	4	2
	2022	0	2	0.4	0.7	15	2	2	8	3
Mean historical rate[a]	2015–2019	< 0.1	0.7	0.7	0.6	13	0.5	0.9	3	2

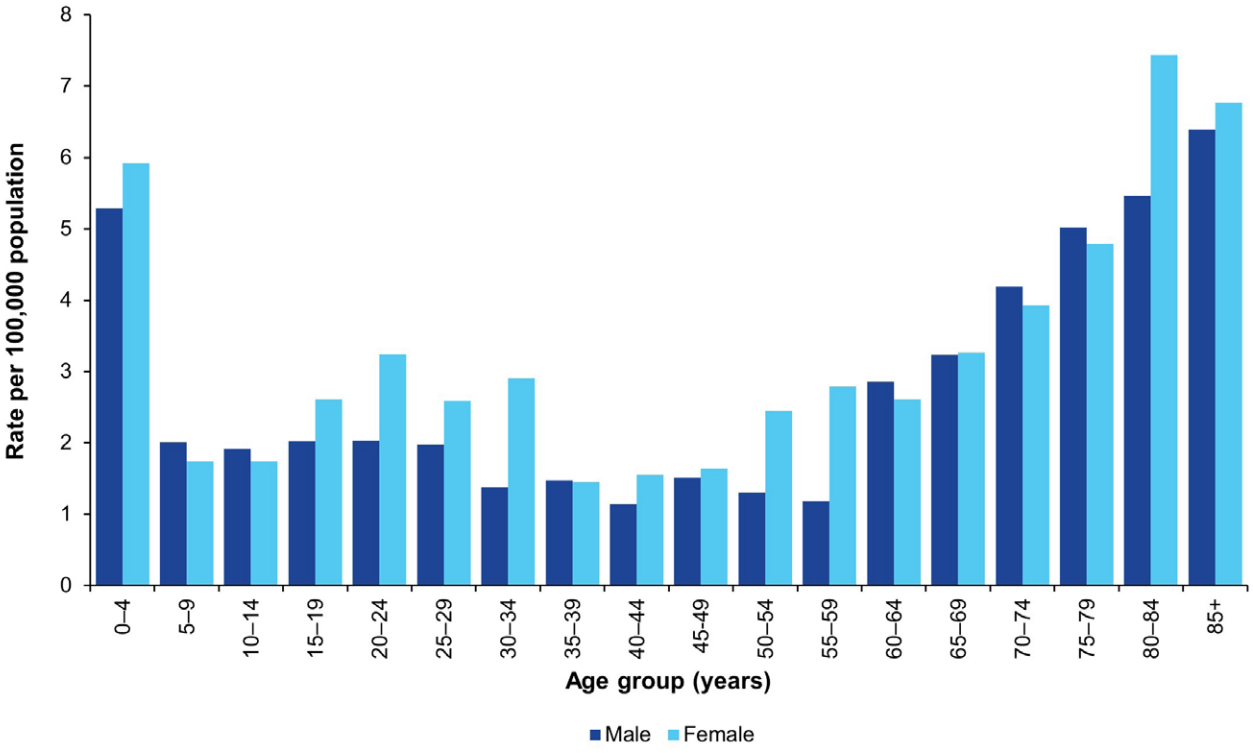
a Crude rate per 100,000 population per year.

Figure 12: Shiga toxin-producing *E. coli* (STEC) notifications and rate per 100,000 population in Australia by jurisdiction of residence,[a] 2015–2022



a Data includes haemolytic uraemic syndrome (HUS) cases where a STEC organism was isolated (see footnote ix).

Figure 13: Shiga toxin-producing *E. coli* (STEC) mean notification rate per 100,000 population in Australia by age group and sex,[a] 2020–2022



a Excluding one case with sex not defined.

Haemolytic uraemic syndrome (HUS)

During 2020–2022 there were 35 notifications of HUS, with 14, 7 and 14 notifications each year respectively, compared to the five-year historical mean (2015–2019) of 16 notifications per year. Consistent with previous years, HUS was most commonly reported in children aged less than five years (n = 10/35; 29%). The median age of cases was 23 years (range: 0–85 years) and notifications were similar between males (n = 18; 51%) and females (n = 17; 49%).

STEC infection was identified in the majority of HUS cases reported between 2020–2022 (n = 24/35; 69%). Of the remaining 11 cases, eight were from an unknown cause, and one each was caused by invasive *Streptococcus pneumoniae*, typhoid, and probable shigellosis with a history of a diarrhoeal illness. Three HUS deaths occurred, all reported in 2022 and all associated with STEC infection. Two deaths were in cases aged in their 70s and one was aged under five years old.

Outbreaks of gastrointestinal disease

During 2020–2022, a total of 285 outbreaks of gastrointestinal illness caused by foodborne, environmental, animal-to-person or waterborne disease were reported by OzFoodNet sites (Table 14). These outbreaks affected 5,301 people, with 709 hospitalisations and 12 associated deaths. The majority of gastrointestinal disease outbreaks (n = 265/285; 93%) were a result of foodborne transmission. Confirmed and probable outbreaks are reported together within this report.

Table 14: Gastrointestinal disease outbreaks in Australia by transmission mode,[a] 2020–2022

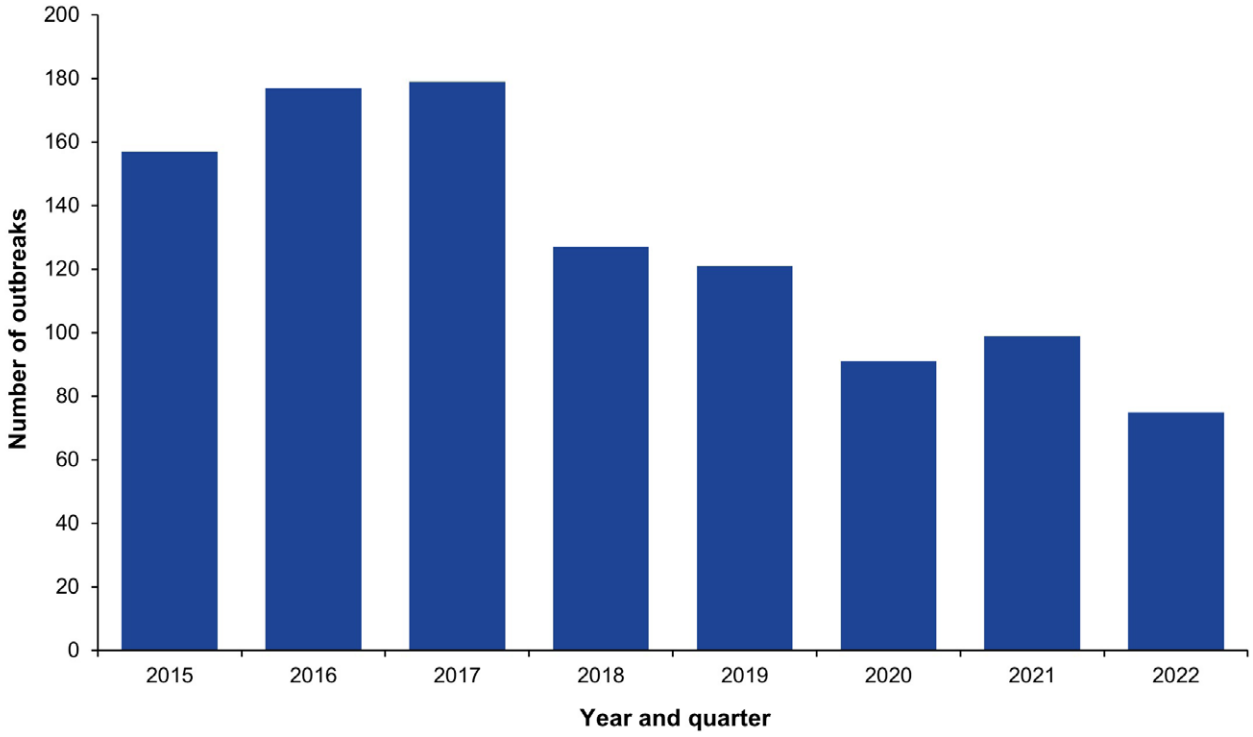
Year	Category	Foodborne	Environmental	Animal-to-person	Waterborne	Total	Five-year historical mean
2020	Outbreaks	91	9	2	0	102	167
	Number ill	2,191	58	43	0	2,292	
	Hospitalised	268	8	10	0	286	
	Fatalities	8	0	0	0	8	
2021	Outbreaks	99	2	2	1	104	153
	Number ill	1,913	21	5	15	1,954	
	Hospitalised	246	2	0	0	248	
	Fatalities	1	0	0	0	1	
2022	Outbreaks	75	2	1	1	79	136
	Number ill	1,024	14	3	14	1,055	
	Hospitalised	173	0	0	2	175	
	Fatalities	3	0	0	0	3	

a Includes confirmed and probable outbreaks.

Foodborne outbreaks

During 2020–2022, OzFoodNet sites reported 91, 99 and 75 foodborne outbreaks respectively, which were all lower than the five-year historical mean (2015–2019) of 152 outbreaks per year (Figure 14). During this reporting period, foodborne outbreaks impacted a mean of 19 persons per outbreak. New South Wales reported the highest number of foodborne outbreaks across the reporting period (n = 89/265; 34%) (Table 15). Refer to Appendix B, Tables B.1 to B.3 for details on individual outbreaks.

Figure 14: Foodborne outbreaks in Australia by year,[a] 2015–2022



a Year of the outbreak is based on the month in which the investigation into the outbreak commenced; the month of onset of the first case; or the month of notification of the first case.

Table 15: Foodborne outbreaks in Australia by jurisdiction, 2020–2022

Year	Jurisdiction[a]	Number of outbreaks	Number ill	Mean number of persons ill per outbreak	Number hospitalised	Number of fatalities
2020	MJOI	1	1,063	1,063	132	0
	Multi-jurisdictional[b]	1	6	6	6	0
	ACT	2	38	19	0	0
	NSW	31	226	7	14	2
	NT	2	5	3	0	0
	Qld	12	107	9	28	0
	SA	3	12	4	6	0
	Tas.	2	17	9	0	0
	Vic.	17	234	14	33	2
	WA	20	483	24	49	4
	Total	**91**	**2,191**	**24**	**268**	**8**
2021	MJOI	2	853	427	153	0
	ACT	2	217	109	2	0
	NSW	27	244	9	29	0
	NT	2	24	12	0	0
	Qld	24	188	8	24	0
	SA	9	67	7	21	1
	Tas.	2	21	11	1	0
	Vic.	11	160	15	10	0
	WA	20	139	7	6	0
	Total	**99**	**1,913**	**19**	**246**	**1**
2022	MJOI	1	221	221	85	0
	Multi-jurisdictional[b]	1	37	37	0	0
	ACT	4	93	23	2	0
	NSW	31	372	12	40	0
	NT	4	24	6	7	0
	Qld	17	146	9	15	0
	SA	2	9	5	2	0
	Tas.	5	22	4	3	0
	Vic.	4	45	11	11	2
	WA	6	55	9	8	1
	Total	**75**	**1,024**	**14**	**173**	**3**
2020–2022	**—**	**265**	**5,128**	**19**	**687**	**12**

a ACT: Australian Capital Territory; NSW: New South Wales; NT: Northern Territory; Qld: Queensland; SA: South Australia; Tas.: Tasmania; Vic.: Victoria; WA: Western Australia; MJOI: formal OzFoodNet multi-jurisdictional outbreak investigation.

b An outbreak impacting multiple jurisdictions but was not deemed a formal MJOI.

Aetiologies

Consistent with previous years, *Salmonella* was the most commonly identified aetiological agent in foodborne outbreaks during all years of the reporting period (2020–2022), responsible for 43% of all foodborne outbreaks (n = 115/265) and 59% of all cases of foodborne illness identified during outbreaks (n = 3,019/5,128; Table 16). The number of *Salmonella* outbreaks reported each year in 2020–2022 (range: 29-48 per year) was lower than the five-year historical mean (2015–2019) of 80 *Salmonella* outbreaks. *S.* Typhimurium was the most commonly identified serotype in outbreaks in all years of the reporting period, accounting for 74% of *Salmonella* outbreaks (n = 85/115) reported during 2020–2022.

Table 16: Foodborne outbreaks in Australia by aetiology, 2020–2022

	2020		2021		2022	
Aetiological agent	**Outbreaks**	**Number ill**	**Outbreaks**	**Number ill**	**Outbreaks**	**Number ill**
Bacillus cereus	1	3	0	0	0	0
Campylobacter	5	38	6	23	10	58
Cannabinoids	1	4	1	5	2	14
Ciguatoxin	4	16	10	43	3	19
Clostridium perfringens	8	92	5	76	4	17
Cryptosporidium	0	0	1	27	0	0
Hepatitis A	0	0	1	6	0	0
Histamine poisoning	5	12	3	6	5	16
Jimsonweed (*Datura stramonium*)	0	0	0	0	1	221
Lead poisoning	1	5	0	0	0	0
Listeria monocytogenes	1	6	0	0	1	2
Mushroom poisoning	2	9	0	0	0	0
Norovirus	4	162	5	296	5	117
Salmonella	38	1,618	48	1,038	29	363
Shiga toxin-producing *Escherichia coli*	0	0	1	2	0	0
Tetrodotoxin	0	0	1	2	0	0
Thebaine	0	0	0	0	1	37
Vibrio parahaemolyticus	0	0	2	289	0	0
Mixed/multiple aetiology	0	0	1	2	0	0
Unknown	21	226	14	98	14	160
Total	**91**	**2,191**	**99**	**1,913**	**75**	**1,024**

Food commodity

A food vehicle was identified in 65% of foodborne outbreaks (n = 171/265) in the reporting period (2020–2022). Outbreaks were then categorised as being attributable to selected broad two-level food categories to describe the implicated food vehicle, noting this categorisation does not describe the determined source or contaminated ingredient (if available). The most commonly identified first level commodities were meats (n = 40/265; 15%) and seafood (n = 38/265; 14%; Table 17).

Table 17: Foodborne outbreaks in Australia by food commodity, 2020–2022

Level one and level two commodity categories[a]	2020–2022			
	Outbreaks		Number ill	
	n	%	n	%
Meats	**40**	**15%**	**565**	**11%**
Poultry	24	9%	321	6%
Offal	6	2%	59	1%
Beef	4	2%	60	1%
Pork	2	1%	24	< 1%
Game meat	1	< 1%	7	< 1%
Lamb	1	< 1%	34	1%
Multiple meat categories	1	< 1%	54	1%
Other	1	< 1%	6	< 1%
Seafood	**38**	**14%**	**432**	**8%**
Fish	32	12%	117	2%
Bivalve molluscs	2	1%	289	6%
Crustaceans	2	1%	21	< 1%
Cephalopods	1	< 1%	3	< 1%
Multiple seafood categories	1	< 1%	2	< 1%
Miscellaneous	**29**	**11%**	**266**	**5%**
Multiple foods	15	6%	149	3%
Composite food	11	4%	68	1%
Herbs/spices	2	1%	42	1%
Sauces	1	< 1%	7	< 1%
Specialty/ethnic	**17**	**6%**	**308**	**6%**
Rolls	7	3%	220	4%
Sushi	3	1%	18	< 1%
Other	7	3%	70	1%
Eggs	**16**	**6%**	**158**	**3%**
Single food	6	2%	65	1%
Composite food	5	2%	21	< 1%
Sauce/dressing	4	2%	67	1%
Multiple egg categories	1	< 1%	5	< 1%
Desserts	**13**	**5%**	**312**	**6%**
Raw egg based desserts	9	3%	79	2%
Cake	2	1%	13	< 1%
Pie	1	< 1%	5	< 1%
Other	1	< 1%	215	4%

Level one and level two commodity categories[a]	2020–2022			
	Outbreaks		Number ill	
	n	%	n	%
Produce	**6**	**2%**	**850**	**17%**
Fresh vegetable	5	2%	844	16%
Fresh fruit	1	< 1%	6	< 1%
Salads	**3**	**1%**	**1,078**	**21%**
Lettuce	1	< 1%	4	< 1%
Other	2	1%	1,074	21%
Dairy	**2**	**1%**	**6**	**< 1%**
Ice cream/yoghurt	1	< 1%	4	< 1%
Milk/cream	1	< 1%	2	< 1%
Grains	**1**	**< 1%**	**3**	**< 1%**
Rice	1	< 1%	3	< 1%
Mixed/multiple categories	**6**	**2%**	**40**	**1%**
Unknown	**94**	**35%**	**1,110**	**22%**
Total	**265**	**100%**	**5,128**	**100%**

a Level one and level two commodity categories presented in this table include categories with at least one reported response. Level one and level two categories not linked to an outbreak during the reporting period are not displayed.

Source

A source or suspected contaminated ingredient in the implicated food vehicle was reported in over half of the foodborne outbreaks (n = 137/265; 52%) in the reporting period (2020–2022). Over 40 different sources were described, and these were broadly grouped for this report. Of outbreaks with a source reported, the most common groups were eggs (n = 37/137; 27%), seafood (n = 37/137; 27%); and poultry (n = 32/137; 23%).

Eggs

Eggs were implicated as the confirmed or suspected source for 37 foodborne outbreaks during the reporting period (2020–2022). These outbreaks occurred in Western Australia (n = 16); Queensland (n = 8); New South Wales (n = 6); South Australia (n = 4); Northern Territory (n = 2); and Victoria (n = 1). Egg-associated outbreaks decreased from 17 in 2020 to 15 in 2021 and five in 2022. These outbreaks affected 437 people during the reporting period, of whom 98 people were admitted to hospital; one associated death was reported. Egg-associated outbreaks comprised 34 *S*. Typhimurium outbreaks and three *S*. Enteritidis outbreaks. The setting of preparation was most commonly reported as a restaurant/café (n = 24/37; 65%). The most commonly implicated foods in egg-associated outbreaks were desserts containing raw or undercooked eggs (n = 12/37; 32%); egg dishes (n = 12/37; 32%); and sauces made with raw eggs (n = 8/37; 22%).

Seafood

Seafood was implicated as the confirmed or suspected source in 37 foodborne outbreaks during the reporting period (2020–2022). The commodities consisted of fish (n = 32); oysters (n = 2); prawns (n = 2); and squid (n = 1).

The most common aetiological agent associated with seafood outbreaks was ciguatoxin (n = 17), primarily reported in Queensland (n = 16). Outbreaks were due to the consumption of fish purchased from a seafood vendor/retailer (n = 10) or from private/recreational catches (n = 7).

Histamine poisoning was the second most common aetiological agent associated with seafood outbreaks (n = 13), with outbreaks in New South Wales (n = 9); Queensland (n = 3); and Tasmania (n = 1). Unlike ciguatoxin, the majority of histamine poisoning-associated outbreaks had a reported food preparation setting of restaurants/takeaway (n = 11/13; 85%).

The remaining aetiological agents identified were *Vibrio parahaemolyticus* in two outbreaks attributed to oysters, and one outbreak each attributed to *Campylobacter*, *Salmonella* and tetrodotoxin. Two remaining outbreaks were reported as having been caused by an unknown aetiological agent.

Poultry

Poultry was implicated as the confirmed or suspected source in 32 foodborne outbreaks during the reporting period (2020–2022). Aetiological agents identified in outbreaks associated with poultry included *Salmonella* (n = 17); *Campylobacter* (n = 10); and *Clostridium perfringens* (n = 3); the latter agent was also commonly reported in other meat outbreaks. Six *Salmonella* outbreaks were part of a large multi-jurisdictional outbreak of *S*. Typhimurium linked to chicken (see multi-jurisdictional foodborne outbreak investigations section). Two outbreaks had an unknown aetiological agent. Various food vehicles were identified as the cause: the most common were chicken kebabs (n = 6); chicken or duck liver pate/parfait (n = 5); and chicken sushi (n = 3).

Settings

Restaurants were the most commonly reported food preparation setting during the reporting period (2020–2022), accounting for 49% of all foodborne outbreaks (n = 130/265) and 24% of the total number of people reportedly affected (n = 1,220/5,128; Table 18).

Table 18: Foodborne outbreaks in Australia by setting prepared, 2020–2022

	2020–2022			
	Outbreaks		Number ill	
Setting prepared	n	%	n	%
Aged care	15	6%	138	3%
Bakery	5	2%	25	< 1%
Camp	1	< 1%	7	< 1%
Child care	3	1%	60	1%
Commercial caterer	11	4%	372	7%
Commercially manufactured	1	< 1%	2	< 1%
Fair/festival/mobile service	1	< 1%	74	1%
Grocery store/delicatessen	5	2%	44	1%
Imported food	1	< 1%	6	< 1%
Institution	4	2%	100	2%
Military	1	< 1%	8	< 1%
National franchised fast food	2	1%	19	< 1%
Primary production	30	11%	1,260	25%
Private caterer	3	1%	32	1%
Private residence	19	7%	162	3%
Restaurant/café	130	49%	1,220	24%
Take-away	25	9%	293	6%
Other	3	1%	76	1%
Unknown	5	2%	1,230	24%
Total	**265**	**100%**	**5,128**	**100%**

Point source outbreaks (within multi-jurisdictional and large community outbreaks)

From 2018 onwards, point source outbreaks occurring within MJOIs, or within large community outbreaks, have been reported to the OzFoodNet Outbreak Register. Point source outbreaks are smaller, contained outbreaks that have occurred as part of a larger outbreak.

There were five point source outbreaks reported in 2020–2022, reported by Queensland (n = 4) and New South Wales (n = 1; Appendix C, Table C.1). All four of the Queensland point source outbreaks were associated with restaurants, and were related to three MJOIs. The remaining point source outbreak, reported in New South Wales, was at a takeaway associated with a larger community outbreak of *Salmonella* Typhimurium attributed to chicken.

All reports of illness, hospitalisation, or death occurring within a point source outbreak are included within the totals reported for the overarching outbreak.

Multi-jurisdictional foodborne outbreak investigations

OzFoodNet undertook four formal MJOIs during 2020–2022. An additional three multi-jurisdictional outbreaks were investigated during this period; however, they were determined by OzFoodNet as not meeting the criteria for a formal MJOI response.

Formal OzFoodNet MJOIs

Salmonella Typhimurium MLVA 05-16-13-11-490

In February 2020, OzFoodNet commenced a MJOI into cases of *S*. Typhimurium multi-locus variable number tandem repeat analysis (MLVA) 05-16-13-11-490. OzFoodNet Queensland initiated an investigation in January 2020 following three reported cases of the MLVA which had rarely been reported prior to this outbreak. Nationally, a total of 1,063 confirmed outbreak cases were reported, with the majority of cases reported from Queensland (n = 687; 65%), followed by New South Wales (n = 228; 21%); Victoria (n = 96; 9%); South Australia (n = 21; 2%); the Australian Capital Territory (n = 13; 1%); Tasmania (n = 9; < 1%); the Northern Territory (n = 6; < 1%); and Western Australia (n = 3; < 1%). Onset/specimen collection dates ranged from 17 January 2020 to 19 May 2020. Case numbers peaked in the first week of February and remained steady throughout February before declining in March. Among the 1,063 cases, 633 (59.5%) were female. The median age of cases was 33 years (range < 1–92 years). There were 132 cases hospitalised (20%) among 652 cases that had hospitalisation status data recorded.

During the investigation, 1,021 food samples and 103 environmental swabs/samples were collected nationally and tested for *Salmonella*. None of these samples detected the outbreak strain of *S.* Typhimurium. Although lacking microbiological evidence, the epidemiological evidence based on both binomial probability analysis and a case-control study strongly supported the hypothesis that a bagged/packaged salad product was the likely cause of this outbreak (odds ratio [OR]: 9.2; *p* value < 0.001). However, the case-control study was unable to establish an epidemiological link to an individual salad item or brand. Despite being one of the largest foodborne salmonellosis outbreaks reported in Australia, the investigation was unable to confirm the source of infection.

Salmonella Saintpaul

In January 2021, OzFoodNet commenced a MJOI into cases of *S*. Saintpaul. In early January, Queensland and New South Wales reported an increase in *S*. Saintpaul notifications. At the same time, a ready-to-eat coleslaw product was recalled from stores following an isolation of *S*. Saintpaul in New South Wales. In total, 585 confirmed outbreak cases of *S*. Saintpaul were identified, with specimen collection dates ranging from 15 December 2020 to 12 May 2021. Queensland had the highest number of confirmed cases notified (n = 220; 38%); followed by New South Wales (n = 214; 37%); Victoria (n = 101; 17%); South Australia (n = 17; 3%); Tasmania (n = 17; 3%); the Australian Capital Territory (n = 13; 2%); Western Australia (n = 2; < 1%); and the Northern Territory (n = 1; < 1%). Of confirmed cases, 55% were female (n = 322) and the median age was 32 years (range: 0–95 years). Twenty-nine percent of confirmed cases were hospitalised (n = 126) for their illness and there were no deaths reported. Outbreak cases peaked in most jurisdictions in late December 2020 and early January 2021.

An investigation was conducted into the coleslaw product that was the subject of the recall. One ingredient, spring onions, was found to be positive for *S*. Saintpaul and later confirmed as the outbreak strain by phylogenetic analysis. The spring onions were sourced from a Queensland farm. An environmental assessment was conducted at the farm and several control measures were recommended to address issues that would have the potential to introduce contamination; however, no *S*. Saintpaul was detected in any samples collected. The epidemiological investigation found illness to be strongly associated with consumption of spring onions and supermarket salads containing spring onions. This was Australia's largest *S*. Saintpaul outbreak. It is considered likely that a contamination event occurred on the farm that affected a limited (but still large) amount of crop. As a product with a short shelf like, after one or two weeks when that crop left circulation, the amount of contamination in the food chain quickly dropped followed by a decrease in cases.

Vibrio parahaemolyticus

In November 2021, OzFoodNet commenced a MJOI into cases of *V. parahaemolyticus*.[13] In September 2021, an increase in locally acquired *V. parahaemolyticus* notifications was detected in South Australia, then in Western Australia and in Victoria in October 2021. A high proportion of cases reported consuming oysters, with traceback indicating that South Australian-grown oysters were being commonly consumed. A total of 268 outbreak cases were reported, including cases residing in all jurisdictions, with the highest proportion of cases from South Australia (n = 76; 28%), followed by Victoria (n = 69; 26%); Queensland (n = 59; 22%); Western Australia (n = 33; 12%); New South Wales (n = 26; 10%); the Australian Capital Territory (n = 3; 1%); Tasmania (n = 1; < 1%); and the Northern Territory (n = 1; < 1%). The median age of cases was 52 years (range: 1–90 years). There were more males reported (n = 152, 57%) than females (n = 115, 43%), with one case as an unstated sex. Of 206 cases with available information, 51 cases (25%) presented to an emergency department for their illness and 27 cases (13%) were hospitalised. There were no deaths reported.

Of 206 cases interviewed, 97% (n = 199) reported consumption of oysters in the seven days before onset, including 92% that consumed at least some of the oysters raw (n = 189). The traceback of oysters was complex, but indicated that oysters had been sourced from different growing areas in South Australia. The largest proportion of oyster exposures (n = 173) were traced back to oysters from one growing region in South Australia containing multiple growers, with the oysters unable to be definitively linked to a single grower. A total of 117 oyster samples were tested for *V. parahaemolyticus*, with positive detections in 14 samples. All 14 positive oyster samples were able to be traced to the one predominate implicated growing region in South Australia. A national recall of raw Pacific oysters from this growing region occurred on 19 November 2021. Additional control measures implemented included media alerts; closure of specific harvesting areas; and compliance orders to implement *Vibrio* control programs to improve traceability and post-production temperature control.

Baby spinach contamination

In December 2022, OzFoodNet commenced a MJOI into cases of illness associated with baby spinach contamination. During 14–16 December 2022, following two reports from emergency department clinicians, New South Wales identified multiple events of anticholinergic syndrome, including four households reporting consumption of baby spinach purchased from the same supermarket chain. Toxicology advice indicated the anticholinergic syndrome was typical of tropane alkaloid poisoning, akin to illness caused by consumption of toxic weeds such as *Datura*. A media statement was released on 15 December 2022, followed by a product recall on 16 December 2022 of brands supplied by the identified source farm of the baby spinach.

There were 225 outbreak cases identified nationally across New South Wales (n = 155; 69%); Victoria (n = 45; 20%); the Australian Capital Territory (n = 13; 6%); Queensland (n = 7; 3%); and South Australia (n = 5; 2%); 85 of the outbreak cases had been referred to hospital or were in hospital at the time of call to the Poisons Information Centre. Where case exposure information was available, 147 were confirmed to have consumed a recalled product. The product was traced back to a harvest from a single field on a single Victorian farm. The weed was identified as thornapple, also known as jimsonweed (*Datura stramonium*). Jimsonweed is prohibited to be sold as food because it contains tropane alkaloids. Following the incident, production at the farm was ceased while appropriate actions were undertaken to remove the potential for further contamination events.

Other multi-jurisdictional investigations

Listeria monocytogenes

In March 2020, Australia was alerted to a listeriosis outbreak in the United States of America (USA) and Canada which was linked to enoki mushrooms. In total, six cases diagnosed in Australia, from three jurisdictions, were identified as MLST 7 and related on whole genome phylogenetic analysis to an outbreak reference sequence.

Australian diagnosed cases reported illness onset dates ranging from October 2017 to February 2020. The median age of cases was 75 years (range 4–85 years); 67% were female; all cases were hospitalised; there were no deaths. All cases reported at least one immunocompromising condition; none were pregnant. Two of the six cases (33%) reported overseas travel on separate cruise ships during their incubation periods. As a result, the place of acquisition could not be confirmed for these two cases; however, investigations revealed that both cruise ships may have plausibly been supplied food sourced from the USA. The remaining four cases did not report overseas travel.

Consumption of enoki mushrooms was able to be confirmed for one case (onset in February 2020); two other cases reported consuming mushrooms, but the type of mushroom was not specified. Two retail samples of enoki mushrooms, collected in Queensland in April 2020 in response to the investigation, yielded *L. monocytogenes* and were highly related genomically to the outbreak reference sequence. Enumeration was performed on both samples which yielded 5.0×10^3 colony-forming units per gram (CFU/g) and 2.9×10^4 CFU/g. *L. innocua* was also isolated from both samples. A consumer recall was conducted in Australia in response to the *L. monocytogenes* finding. Australia's traceback investigation identified that the enoki mushrooms were imported from South Korea, from one of the two South Korean suppliers linked to the international outbreak.

In total, this international outbreak resulted in 54 cases of listeriosis (36 in the USA; 12 in Canada; and six in Australia); additional environmental detections from imported enoki mushrooms were identified in France.[14]

Salmonella Typhimurium

In October 2021, Queensland reported an increase in *S*. Typhimurium MLVA 03-14-09/10-08-523, with the investigation determining consumption of chicken as the suspected source. OzFoodNet sites shared their whole genome sequencing data, enabling cross-jurisdictional phylogenetic analysis. Multiple genomic clusters were identified, spanning six jurisdictions across the course of the investigation. Where MLVA information was available, multiple distinct MLVA profiles corresponded to these genomic clusters. Concurrently, *S*. Typhimurium was detected in multiple poultry samples, including raw poultry and flash-fried frozen products, that were collected during jurisdictional investigations. Genomic comparisons linked these isolates back to a single poultry producer and confirmed their close genomic link to human cases. The appropriate jurisdictional food safety agency worked with the producer to improve control measures.

At least 115 cases from six reported outbreaks were identified as related to this broader investigation; however, additional cases that were genomically related were not able to be linked to outbreaks. A decrease in associated notifications was reported by February 2022. This broader investigation was not recorded as an outbreak in the OzFoodNet Outbreak Register, noting the difficulty in defining cases and the limited case details available.

Thebaine toxicity

In November 2022, multiple reports were received of people that presented to emergency departments across Australia with symptoms of significant toxicity. There were 37 cases of illness reported from seven jurisdictions, and one additional case in New Zealand, among people who had consumed homemade poppy seed tea. All cases had clinical and epidemiological evidence or blood test results consistent with thebaine toxicity. Thebaine is a natural chemical found in poppy seeds which can be toxic in high concentrations. Samples of poppy seeds recovered from cases and from supermarkets were found to have high thebaine levels up to 7,650 mg/kg. Consumer recalls of several brands of poppy seeds were conducted to remove the affected product from the market.

Animal-to-person outbreaks

Animals were the source of five gastrointestinal outbreaks (including confirmed and probable outbreaks) reported in 2020–2022 (Table 16). One outbreak of *S*. Typhimurium in 2020 was associated with exposure to backyard chickens from Queensland; this outbreak affected 38 individuals, including some from interstate. There were also two outbreaks in South Australia, at a child care centre and in the community, both from exposure to pet chickens and with a total of eight people ill, with aetiological agents identified as *Campylobacter* and *S*. Typhimurium respectively. One additional outbreak in South Australia, of *S*. Infantis, was suspected to have been caused by exposure to cows at an agricultural show. *Cryptosporidium* was the identified agent in the remaining outbreak, affecting two people working at a dairy farm. Animal-to-person outbreaks are rarely identified in Australia, with a total of ten reported in the previous five years (2015–2019).

Waterborne outbreaks

Waterborne outbreaks (including confirmed and probable outbreaks) are rare in Australia, with a total of seven reported in the previous five years (2015–2019). Two waterborne outbreaks were reported in 2020–2022: a *S*. Adelaide outbreak affecting 15 attendees at a camp in Western Australia following consumption of bore water, and a STEC outbreak affecting 14 children at a camp in Western Australia related to water supply from a stream potentially contaminated by runoff from farms (Table 16).

Environmental outbreaks

Thirteen environmental outbreaks (including confirmed and probable outbreaks) were reported in 2020–2022, affecting 135 people (Table 16). Ten were *Cryptosporidium* outbreaks following exposure at swimming pools, including nine in Western Australia as part of a large community outbreak in early 2020. Additionally, there were three *S*. Typhimurium outbreaks reported in Queensland. One affected ten children and was associated with a contaminated carpet at a child care centre; one affected 11 children at a recreational park; and one affected 11 attendees at a resort. The source of contamination was unknown for the other two environmental outbreaks. The majority of environmental outbreaks reported over time have been *Cryptosporidium* outbreaks associated with swimming pools.

Requirements for the review/follow-up of swimming pools and other swimming facilities, when a single case or cluster of cases of cryptosporidiosis is identified as possibly associated with a facility, vary by state and territory. As a result, not every instance will be reported as an outbreak and therefore may not be recorded in this report. Data on environmental and probable environmental outbreaks should be interpreted with caution.

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Appendix A: OzFoodNet outbreak transmission mode definitions

Table A.1: Revised OzFoodNet definitions for modes of outbreak transmission implemented in 2016

Mode[a]	Definition
Foodborne	An incident where two or more persons experience a similar illness after consuming a common food or meal and analytical epidemiological evidence and/or microbiological evidence (including food and/or environmental) implicates the meal or food as the source of illness; or the aetiology of the outbreak can only result through foodborne transmission (for example *Listeria monocytogenes*, ciguatera fish poisoning).
Probable foodborne	An incident where two or more persons experience a similar illness after consuming a common food or meal and compelling descriptive epidemiological evidence implicates the meal or food as the suspected source of illness. This includes outbreaks where the mode of transmission is suspected to be from an ill food handler to food to person.
Waterborne	An incident where two or more persons experience a similar illness after the consumption of water from a common source and analytical epidemiological evidence and/or microbiological evidence implicates the drinking water supply as the source of illness. This does not include outbreaks associated with accidental consumption of water during recreational water exposures (environmental transmission).
Probable waterborne	An incident where two or more persons experience a similar illness after consumption of water from a common source and compelling descriptive epidemiological evidence implicates the drinking water supply as the source of illness. This does not include outbreaks associated with accidental consumption of water during recreational water exposures (environmental transmission).
Animal-to-person	An incident where two or more persons experience a similar illness after exposure to animals and analytical epidemiological evidence and/or microbiological evidence implicates the animal as the source of illness.
Probable animal-to-person	An incident where two or more persons experience a similar illness after exposure to animals and compelling descriptive epidemiological evidence implicates the animals as the suspected source of illness.
Environmental	An incident where two or more persons experience a similar illness following exposure to a contaminated environment and epidemiological evidence and/or microbiological evidence implicates a specific environmental source as the cause of illness. This includes recreational exposure to water.
Probable environmental	An incident where two or more persons experience a similar illness following exposure to a contaminated environment and compelling descriptive epidemiological evidence identifies a specific environmental source as the suspected cause of illness but the exact source of contamination is unknown. This includes recreational exposure to water.

a Confirmed and probable outbreaks are reported together within this report.

Appendix B: Foodborne and probable foodborne outbreak summaries, Australia, 2020–2022

Table B.1: Foodborne and probable foodborne outbreak summary for OzFoodNet sites, Australia, 2020

Jurisdiction[a]	Month[b]	Setting prepared	Agent responsible[c]	No. ill	No. hospitalised	No. fatalities	Evidence[d]	Epidemiological study	Responsible vehicle	Commodity	Source
MJOI	Feb	Unknown	*Salmonella* Typhimurium, MLVA 05-16-13-11-490	1,063	132	Unknown	A	Case control study	Bagged / packaged salad	Salads: other	Unknown
Multi-jurisdictional	Mar	Primary production	*Listeria monocytogenes*, MLST 7	6	6	0	DM	Descriptive case series	Enoki mushrooms (imported)	Produce: fresh vegetable	Enoki mushrooms (imported)
ACT	Nov	Restaurant / café	*Clostridium perfringens*	4	0	0	DM	Descriptive case series	Pork belly bánh mì; chicken liver pate	Specialty / ethnic: rolls; meats: offal	Pork belly; chicken
ACT	Dec	Restaurant / café	*Clostridium perfringens*	34	0	0	D	Cohort study	Lamb sous vide	Meats: lamb	Lamb
NSW	Jan	Child care	Unknown	8	0	0	D	No formal study	Pasta dish	Miscellaneous: composite food	Unknown
NSW	Jan	Private residence	*Salmonella* Typhimurium	11	0	0	D	No formal study	Homemade custard containing egg	Desserts: raw egg based desserts	Eggs
NSW	Jan	Private residence	*Salmonella* Typhimurium	2	0	0	D	No formal study	Unknown	Unknown	Unknown
NSW	Jan	Restaurant / café	*Salmonella* Typhimurium	24	0	0	AE	Case control study	Chicken wrap	Miscellaneous: composite food	Unknown
NSW	Jan	Take-away	Histamine poisoning	3	0	0	D	No formal study	Seared kingfish steaks	Seafood: fish	Kingfish
NSW	Feb	Aged care	Unknown	12	Unknown	0	D	No formal study	Unknown	Unknown	Unknown
NSW	Feb	Commercial caterer	Norovirus	43	0	0	D	No formal study	Unknown	Unknown	Unknown
NSW	Feb	Restaurant / café	Unknown	6	1	0	D	Descriptive case series	Unknown	Unknown	Unknown
NSW	Feb	Restaurant / café	Unknown	4	Unknown	0	D	No formal study	Steak or chicken schnitzel with chips	Miscellaneous: multiple foods	Unknown

Jurisdiction[a]	Month[b]	Setting prepared	Agent responsible[c]	No. ill	No. hospitalised	No. fatalities	Evidence[d]	Epidemiological study	Responsible vehicle	Commodity	Source
NSW	Feb	Restaurant / café	Unknown (suspected toxin)	3	0	0	D	No formal study	Calamari	Seafood: cephalopods	Squid
NSW	Feb	Take-away	Unknown	9	1	0	D	No formal study	Vietnamese rolls (pork, chicken, salad)	Specialty / ethnic: rolls	Unknown
NSW	Apr	Private residence	*Bacillus cereus*	3	1	1	DM	Descriptive case series	Rice	Grains: rice	Rice
NSW	May	Private residence	*Salmonella* Typhimurium	4	2	0	D	No formal study	Homemade raw egg-based dessert	Desserts: raw egg based desserts	Eggs
NSW	Jun	Primary production	Lead poisoning	5	1	0	D	Descriptive case series	Saffron substitute	Miscellaneous: herbs / spices	Saffron substitute
NSW	Jun	Restaurant / café	Unknown	2	0	0	D	Descriptive case series	Iranian stew with offal	Specialty / ethnic: other	Offal
NSW	Jul	Take-away	Histamine poisoning	3	1	0	D	No formal study	Tuna steak	Seafood: fish	Tuna
NSW	Jul	Take-away	Unknown	2	0	0	D	No formal study	Slow cooked beef burrito	Specialty / ethnic: other	Unknown
NSW	Aug	Restaurant / café	*Salmonella* Typhimurium	3	3	0	D	Descriptive case series	Portuguese chicken burger	Miscellaneous: composite food	Unknown
NSW	Aug	Restaurant / café	Histamine poisoning	2	1	0	D	No formal study	Tuna steak sandwich	Seafood: fish	Tuna
NSW	Aug	Take-away	Unknown	15	0	0	D	Descriptive case series	Lamb, chicken and beef snack boxes or kebab wrap	Miscellaneous: multiple foods	Unknown
NSW	Sep	Restaurant / café	*Campylobacter jejuni*	3	1	0	D	No formal study	Unknown	Unknown	Unknown
NSW	Sep	Restaurant / café	Unknown	21	1	0	D	No formal study	Beef rendang	Specialty / ethnic: other	Unknown
NSW	Sep	Restaurant / café	Unknown	2	0	0	D	No formal study	Seafood & vegetable tempura, or sashimi	Miscellaneous: multiple foods	Unknown
NSW	Sep	Take-away	Unknown	10	0	0	D	No formal study	BBQ chicken	Meats: poultry	Chicken

Jurisdiction[a]	Month[b]	Setting prepared	Agent responsible[c]	No. ill	No. hospitalised	No. fatalities	Evidence[d]	Epidemiological study	Responsible vehicle	Commodity	Source
NSW	Sep	Take-away	Unknown	3	0	0	D	No formal study	Beef burrito and beef nachos	Miscellaneous: composite food	Unknown
NSW	Sep	Take-away	Unknown (suspected viral)	8	0	0	D	No formal study	Sushi	Specialty / ethnic: sushi	Unknown
NSW	Oct	Restaurant / café	*Campylobacter*	2	1	0	D	No formal study	Poached chicken salad & baked potatoes with chilli mayonnaise	Miscellaneous: multiple foods	Unknown
NSW	Oct	Restaurant / café	*Campylobacter*	2	0	0	D	No formal study	Unknown	Unknown	Unknown
NSW	Oct	Take-away	*Salmonella* Senftenberg	5	0	0	DME	Descriptive case series	Chicken kebab	Meats: poultry	Chicken
NSW	Nov	Aged care	*Salmonella*	4	0	1	D	No formal study	Unknown	Unknown	Unknown
NSW	Nov	Restaurant / café	Histamine poisoning	2	0	0	D	No formal study	Kingfish	Seafood: fish	Kingfish
NT	Feb	Restaurant / café	*Salmonella* Typhimurium	2	0	0	D	Descriptive case series	Egg dishes	Eggs: composite food	Eggs
NT	Dec	Primary production	Unknown (suspected histamine poisoning)	3	0	0	D	Descriptive case series	Spanish mackerel	Seafood: fish	Spanish mackerel
Qld	Feb	Restaurant / café	*Salmonella* Hvittingfoss	4	0	0	DM	Descriptive case series	Wilted rocket salad containing butter sauce and parmesan	Salads: Lettuce	Unknown
Qld	Jun	Primary production	Histamine poisoning	2	2	0	DM	Descriptive case series	Yellow fin tuna	Seafood: fish	Yellow fin tuna
Qld	Jul	Private residence	Ciguatoxin (ciguatera fish poisoning)	9	5	0	DM	Descriptive case series	Spanish mackerel	Seafood: fish	Fish
Qld	Aug	Unknown	*Salmonella* Saintpaul	15	6	0	D	Descriptive case series	Unknown	Unknown	Unknown
Qld	Sep	National franchised fast food	*Salmonella* Typhimurium, MLVA 03-12-12-09-523	13	3	0	D	Descriptive case series	Mexican food (Unspecified)	Miscellaneous: multiple foods	Unknown

Jurisdiction[a]	Month[b]	Setting prepared	Agent responsible[c]	No. ill	No. hospitalised	No. fatalities	Evidence[d]	Epidemiological study	Responsible vehicle	Commodity	Source
Qld	Sep	Primary production	Ciguatoxin (ciguatera fish poisoning)	2	0	0	DM	Descriptive case series	Spanish mackerel	Seafood: fish	Spanish mackerel
Qld	Oct	Primary production	Ciguatoxin (ciguatera fish poisoning)	2	0	0	D	Descriptive case series	Coral trout	Seafood: fish	Coral trout
Qld	Oct	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-20-11-10-523	4	2	0	D	Descriptive case series	Eggs benedict	Eggs: composite food	Eggs
Qld	Nov	Private residence	Norovirus	20	2	0	D	Descriptive case series	Unknown	Unknown	Unknown
Qld	Nov	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-17-09-12-523	8	4	0	D	Descriptive case series	Aioli	Eggs: sauce / dressing	Eggs
Qld	Dec	Primary production	Ciguatoxin (ciguatera fish poisoning)	3	1	0	DM	Descriptive case series	Spanish mackerel	Seafood: fish	Spanish mackerel
Qld	Dec	Restaurant / café	Norovirus	25	3	0	D	Point source cohort	Sandwiches	Miscellaneous: multiple foods	Unknown
SA	Jan	Take-away	*Salmonella* Typhimurium, MLVA 03-15-08-11-550	5	3	0	DM	Descriptive case series	Unknown	Unknown	Unknown
SA	Mar	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-15-08-10/11-550	5	2	0	D	Descriptive case series	Unknown	Unknown	Unknown
SA	Apr	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-17-10-13-523	2	1	0	D	Descriptive case series	Unknown (suspected chicken)	Unknown	Unknown
Tas.	Jun	Restaurant / café	*Campylobacter jejuni*	13	0	0	D	Descriptive case series	Poultry liver pate (duck/ chicken)	Meats: offal	Poultry liver
Tas.	Sep	Private residence	Cannabinoids	4	0	0	DM	Descriptive case series	Roast vegetables & meat	Miscellaneous: multiple foods	Tetrahydro-cannabinol oil
Vic.	Jan	Commercial caterer	*Clostridium perfringens*	25	0	0	A	Case control study	Thai chicken curry	Meats: poultry	Chicken

Jurisdiction[a]	Month[b]	Setting prepared	Agent responsible[c]	No. ill	No. hospitalised	No. fatalities	Evidence[d]	Epidemiological study	Responsible vehicle	Commodity	Source
Vic.	Feb	Restaurant / café	*Clostridium perfringens*	6	0	0	D	Descriptive case series	Chicken curry	Meats: poultry	Chicken
Vic.	Feb	Restaurant / café	*Salmonella* Ohio	12	2	0	DM	Descriptive case series	Roast duck	Meats: poultry	Duck
Vic.	Mar	Commercial caterer	Unknown (suspected *Clostridium perfringens*)	10	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
Vic.	Mar	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-13-10-08-523	7	2	0	DM	Descriptive case series	Chicken sushi	Specialty / ethnic: sushi	Chicken
Vic.	Apr	Aged care	*Clostridium perfringens*	3	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
Vic.	Apr	Restaurant / café	Unknown (suspected *Clostridium perfringens*)	14	0	0	D	Descriptive case series	Curries	Miscellaneous: multiple foods	Unknown
Vic.	May	Primary production	*Salmonella* Enteritidis	17	8	1	DET	Descriptive case series	Eggs	Eggs: single food	Eggs
Vic.	May	Private residence	Fungal toxin	5	5	1	D	Descriptive case series	Mushrooms	Produce: fresh vegetable	Mushrooms
Vic.	May	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-10-09-14-523	68	9	0	DM	Descriptive case series	Bánh mì rolls	Specialty / ethnic: rolls	Unknown
Vic.	Jun	Private residence	Fungal toxin	4	0	0	D	Descriptive case series	Cordyceps fungus	Specialty / ethnic: other	Fungus
Vic.	Sep	Aged care	*Clostridium perfringens*	7	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
Vic.	Sep	Aged care	*Clostridium perfringens*	6	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
Vic.	Sep	Restaurant / café	Unknown (suspected toxin)	7	0	0	D	Descriptive case series	Lobster noodle dish	Miscellaneous: composite food	Unknown
Vic.	Oct	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-14-10/11-08-523	17	6	0	AM	Cohort study, Case control study	Chicken burger	Meats: poultry	Chicken
Vic.	Dec	Aged care	*Campylobacter jejuni*	18	1	0	D	Descriptive case series	Unknown	Unknown	Unknown

Jurisdiction[a]	Month[b]	Setting prepared	Agent responsible[c]	No. ill	No. hospitalised	No. fatalities	Evidence[d]	Epidemiological study	Responsible vehicle	Commodity	Source
Vic.	Dec	Military	Unknown	8	0	0	D	Descriptive case series	Wraps	Miscellaneous: multiple foods	Salad ingredients
WA	Jan	Aged care	*Clostridium perfringens*	7	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
WA	Jan	Aged care	*Salmonella* Typhimurium, MLVA 03-17-09-12-523	7	1	2	D	Descriptive case series	Unknown	Unknown	Unknown
WA	Feb	Aged care	*Salmonella* Typhimurium, MLVA 03-17-09-12/13-523 / 03-19-09-12-523	18	3	2	D	Descriptive case series	Unknown	Unknown	Unknown
WA	Feb	Bakery	*Salmonella* Typhimurium, MLVA 03-18-09-12-523	3	2	0	D	Descriptive case series	Unknown	Unknown	Unknown
WA	Feb	Fair / festival / mobile service	Norovirus	74	0	0	A	Point source cohort	Chicken sliders	Meats: poultry	Unknown
WA	Feb	Primary production	*Salmonella* Typhimurium, MLVA 03-13-12-10-523	8	0	0	DM	Descriptive case series	Eggs	Eggs: single food	Eggs
WA	Feb	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-10-15-10-496	5	1	0	D	Descriptive case series	Hollandaise sauce; poached eggs	Eggs: sauce / dressing; Eggs: single food	Eggs
WA	Mar	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-13-11-10-523	10	1	0	DM	Descriptive case series	Breakfast egg dishes	Eggs: single food	Eggs
WA	Mar	Take-away	*Salmonella* Typhimurium, MLVA 03-17-09-12-523	12	8	0	D	Descriptive case series	Beef lasagne	Meats: beef	Eggs
WA	Apr	Take-away	*Salmonella* Typhimurium, MLVA 03-18-08-12-523	107	12	0	DM	Descriptive case series	Bánh mì with egg butter	Specialty / ethnic: rolls	Eggs
WA	May	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-17-09-12-523	9	3	0	D	Descriptive case series	Tiramisu	Desserts: raw egg based desserts	Eggs

Jurisdiction[a]	Month[b]	Setting prepared	Agent responsible[c]	No. ill	No. hospitalised	No. fatalities	Evidence[d]	Epidemiological study	Responsible vehicle	Commodity	Source
WA	Jun	Institution	*Salmonella* Typhimurium, MLVA 03-11-15-10-523	49	4	0	AM	Case control study	Raw egg mayonnaise	Eggs: sauce / dressing	Eggs
WA	Jul	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-12-12-10-523	7	3	0	A	Case control study	Chicken nuggets	Meats: poultry	Unknown
WA	Sep	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-17-09-12-523	9	2	0	D	Descriptive case series	Tiramisu	Desserts: raw egg based desserts	Eggs
WA	Oct	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-10-16-12-496	4	2	0	D	Descriptive case series	Raw egg sauces	Eggs: sauce / dressing	Eggs
WA	Oct	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-17-09/10-12-523	17	2	0	D	Descriptive case series	Tiramisu	Desserts: raw egg based desserts	Eggs
WA	Nov	Restaurant / café	Unknown (suspected viral)	42	0	0	D	Case control study	Unknown	Unknown	Unknown
WA	Dec	Commercial caterer	*Salmonella* Typhimurium, MLVA 04-13-08/09-00-490	54	4	0	A	Case control study	Roast pork; roast beef	Meats: pork; beef	Pork; beef
WA	Dec	Commercial caterer	Unknown	37	1	0	D	Case control study	Unknown	Unknown	Unknown
WA	Dec	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-17-09-12-523	4	0	0	D	Descriptive case series	Tiramisu	Desserts: raw egg based desserts	Eggs

Note:

a MJOI: multi-jurisdictional outbreak investigation; ACT: Australian Capital Territory; NSW: New South Wales; NT: Northern Territory; Qld: Queensland; SA: South Australia; Tas.: Tasmania; Vic.: Victoria; WA: Western Australia.

b Month of outbreak is the month of onset of the first case or month of notification of the first case or the month the investigation into the outbreak commenced.

c MLST: multi-locus sequence type; MLVA: multi-locus variable number tandem repeat analysis.

d A: analytical epidemiological association between illness and one or more foods; D: descriptive evidence implicating the suspected vehicle or suggesting foodborne transmission; M: microbiological confirmation or laboratory detection of aetiological agent in the suspected vehicle and cases; E: environmental microbiological confirmation of aetiological agent detection in collected environmental or equipment samples / swabs; T: traceback evidence confirms cases were exposed to a widely distributed source from a single point of manufacture / origin.

Table B.2: Foodborne and probable foodborne outbreak summary for OzFoodNet sites, Australia, 2021

Jurisdiction[a]	Month[b]	Setting prepared	Agent responsible[c]	No. ill	No. hospitalised	No. fatalities	Evidence[d]	Epidemiological study	Responsible vehicle	Commodity	Source
MJOI	Jan	Primary production	*Salmonella* Saintpaul	585	126	0	AMT	Case control study	Spring onion	Produce: fresh vegetable	Spring onion
MJOI	Nov	Primary production	*Vibrio parahaemolyticus*	268	27	0	DMT	Descriptive case series	Oysters	Seafood: bivalve molluscs	Oysters
ACT	Apr	Restaurant / café	*Salmonella* Infantis	2	1	0	DE	Descriptive case series	Salmon dish	Seafood: fish	Unknown
ACT	Nov	Restaurant / café	Norovirus	215	1	0	D	Case control study	Donuts	Desserts: other	Donuts
NSW	Jan	Restaurant / café	*Salmonella* Johannesburg	8	1	0	DME	No formal study	Chicken choila	Meats: poultry	Unknown
NSW	Feb	Restaurant / café	*Salmonella* Typhimurium	15	1	0	DT	Case control study	Multiple dishes	Miscellaneous: multiple foods	Eggs
NSW	Mar	Grocery store / delicatessen	*Salmonella* Typhimurium	5	2	0	D	Descriptive case series	Unknown	Unknown	Unknown
NSW	Mar	Primary production	Histamine poisoning	2	0	0	D	No formal study	Tuna steak	Seafood: fish	Tuna
NSW	Mar	Private residence	*Cryptosporidium*	27	2	0	A	Case-case study	Salad leaves	Produce: fresh vegetable	Bagged salad
NSW	Apr	Commercial caterer	*Salmonella* Typhimurium	7	0	0	D	No formal study	Unknown	Unknown	Unknown
NSW	May	Restaurant / café	*Campylobacter jejuni*, Shiga toxin producing *E. coli*	2	0	0	D	Descriptive case series	Lamb's fry	Meats: offal	Unknown
NSW	May	Restaurant / café	Histamine poisoning	2	0	0	D	Descriptive case series	Raw kingfish sashimi; oysters	Seafood: fish; seafood: bivalve molluscs	Kingfish; oysters
NSW	Jun	Other - Multiple settings	*Salmonella* Typhimurium	22	6	0	DM	Descriptive case series	Sushi; chicken	Specialty / ethnic: sushi; meats: poultry	Chicken
NSW	Jun	Restaurant / café	Unknown	2	0	0	D	No formal study	Calamari with garlic mushrooms; ribs	Seafood: cephalopods; meats: beef	Unknown

Jurisdiction[a]	Month[b]	Setting prepared	Agent responsible[c]	No. ill	No. hospitalised	No. fatalities	Evidence[d]	Epidemiological study	Responsible vehicle	Commodity	Source
NSW	Jun	Restaurant / café	Unknown	3	0	Unknown	D	No formal study	Crab; feta and spinach tortellini	Miscellaneous: composite food	Unknown
NSW	Jun	Restaurant / café	Unknown	6	1	0	D	Cohort study	Unknown	Unknown	Unknown
NSW	Jun	Take-away	*Salmonella* Enteritidis	4	0	0	D	Descriptive case series	BBQ chicken; salad	Meats: poultry; salads; other	Chicken
NSW	Jun	Unknown	*Salmonella* Hvittingfoss	70	Unknown	0	D	Case-case study	Unknown	Unknown	Unknown
NSW	Aug	Imported food	Hepatitis A	6	4	0	DM	Descriptive case series	Medjool dates	Produce: fresh fruit	Medjool dates
NSW	Sep	Private residence	Cannabinoids	5	5	0	D	No formal study	Homemade slice	Miscellaneous: composite food	Cannaboid oil
NSW	Sep	Restaurant / café	Unknown	10	0	0	D	No formal study	Unknown	Unknown	Unknown
NSW	Oct	Restaurant / café	*Campylobacter*	3	1	0	D	No formal study	Chicken wrap	Meats: poultry	Chicken
NSW	Oct	Take-away	*Salmonella*	3	1	0	D	No formal study	Unknown	Unknown	Unknown
NSW	Nov	Restaurant / café	*Salmonella* Senftenberg	3	0	0	D	Descriptive case series	Chicken kebab	Meats: poultry	Chicken
NSW	Nov	Restaurant / café	*Salmonella* Senftenberg	2	Unknown	0	D	No formal study	Chicken & mixed kebab	Miscellaneous: multiple foods	Chicken
NSW	Nov	Restaurant / café	*Salmonella* Typhimurium	9	2	0	D	Descriptive case series	Eggs Benedict	Eggs: composite food	Eggs
NSW	Nov	Restaurant / café	Unknown	4	1	0	D	No formal study	Unknown	Unknown	Unknown
NSW	Nov	Take-away	Histamine poisoning	2	0	0	D	No formal study	Tuna cheeseburger	Seafood: fish	Tuna
NSW	Dec	Private residence	Unknown	10	1	0	D	No formal study	Unknown	Unknown	Unknown
NSW	Dec	Restaurant / café	*Campylobacter*	7	1	0	D	No formal study	Pate	Meats: offal	Chicken liver
NSW	Dec	Take-away	Unknown	5	0	0	D	No formal study	Unknown	Unknown	Unknown

Jurisdiction[a]	Month[b]	Setting prepared	Agent responsible[c]	No. ill	No. hospitalised	No. fatalities	Evidence[d]	Epidemiological study	Responsible vehicle	Commodity	Source
NT	Aug	Restaurant / café	Unknown	9	0	0	D	Descriptive case series	Cabbage curry	Specialty / ethnic: other	Cabbage (unspecified)
NT	Oct	Commercial caterer	Norovirus	15	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
Qld	Feb	Primary production	Ciguatoxin (ciguatera fish poisoning)	3	0	0	DM	Descriptive case series	Spanish mackerel	Seafood: fish	Fish
Qld	Feb	Primary production	Ciguatoxin (ciguatera fish poisoning)	2	0	0	D	Descriptive case series	Spanish mackerel	Seafood: fish	Fish
Qld	Feb	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-11-10-08-523	2	2	0	D	Descriptive case series	Beef tartare; kingfish tartare	Meats: beef; seafood: fish	Raw meat
Qld	Feb	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-15-10-13-523	10	3	0	D	Descriptive case series	Tiramisu	Desserts: raw egg based desserts	Eggs
Qld	Mar	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-13-13-09-523	5	0	0	D	Descriptive case series	Key lime tart containing meringue topping	Desserts: Pie	Eggs
Qld	Mar	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-17-09-12-523	15	2	0	D	Descriptive case series	Unknown	Unknown	Unknown
Qld	May	Restaurant / café	*Salmonella* Typhimurium, MLVA 04-16-11-00-517	8	0	0	D	Descriptive case series	Sandwiches	Miscellaneous: composite food	Eggs
Qld	Jun	Private residence	*Salmonella* Enteritidis	2	0	0	DE	Descriptive case series	Eggs	Eggs: single food	Eggs
Qld	Jun	Restaurant / café	*Clostridium perfringens*	3	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
Qld	Jul	Restaurant / café	*Clostridium perfringens*	7	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
Qld	Aug	Primary production	Ciguatoxin (ciguatera fish poisoning)	3	0	0	D	Descriptive case series	Spanish mackerel	Seafood: fish	Fish
Qld	Aug	Primary production	Ciguatoxin (ciguatera fish poisoning)	2	0	0	DM	Descriptive case series	Green jobfish	Seafood: fish	Fish

Jurisdiction[a]	Month[b]	Setting prepared	Agent responsible[c]	No. ill	No. hospitalised	No. fatalities	Evidence[d]	Epidemiological study	Responsible vehicle	Commodity	Source
Qld	Aug	Primary production	Ciguatoxin (ciguatera fish poisoning)	5	0	0	DM	Descriptive case series	Spanish mackerel	Seafood: fish	Fish
Qld	Aug	Private residence	Tetrodotoxin poisoning	2	2	0	D	Descriptive case series	Golden toadfish	Seafood: fish	Fish
Qld	Oct	Bakery	*Salmonella* Typhimurium, MLVA 04-15-11-00-490	6	1	0	D	Descriptive case series	Asian pork rolls / bánh mì	Specialty / ethnic: rolls	Unknown
Qld	Oct	Primary production	Ciguatoxin (ciguatera fish poisoning)	2	0	0	DM	Descriptive case series	Spanish mackerel	Seafood: fish	Fish
Qld	Oct	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-14-10-08-523	9	1	0	DT	Descriptive case series	Chicken dishes	Meats: poultry	Chicken
Qld	Nov	Primary production	Ciguatoxin (ciguatera fish poisoning)	2	0	0	DM	Descriptive case series	Spanish mackerel	Seafood: fish	Fish
Qld	Nov	Restaurant / café	*Salmonella* Birkenhead	8	1	0	D	Case - Case study	Unknown	Unknown	Unknown
Qld	Nov	Unknown	*Salmonella* Typhimurium, MLVA 03-14-09-08-523	58	6	0	D	Descriptive case series	Multiple foods containing chicken	Meats: poultry	Chicken
Qld	Dec	Primary production	Ciguatoxin (ciguatera fish poisoning)	2	0	0	DM	Descriptive case series	Spanish mackerel	Seafood: fish	Fish
Qld	Dec	Primary production	Ciguatoxin (ciguatera fish poisoning)	19	5	0	DM	Descriptive case series	Pickhandle barracuda	Seafood: fish	Fish
Qld	Dec	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-14-10-08-523	3	0	0	DT	Descriptive case series	Chicken dishes	Meats: poultry	Chicken
Qld	Dec	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-16-09/10-11-523	10	1	0	D	Descriptive case series	Tiramisu	Desserts: raw egg based desserts	Eggs
SA	Jan	Restaurant / café	*Campylobacter jejuni*	6	1	0	D	Cohort study	Chicken liver parfait	Meats: offal	Chicken
SA	Mar	Primary production	*Vibrio parahaemolyticus*	21	3	0	DT	Descriptive case series	Oysters	Seafood: bivalve molluscs	Oysters

Jurisdiction[a]	Month[b]	Setting prepared	Agent responsible[c]	No. ill	No. hospitalised	No. fatalities	Evidence[d]	Epidemiological study	Responsible vehicle	Commodity	Source
SA	Apr	Bakery	*Salmonella* Typhimurium, MLVA 03-14-10-08-523	7	6	0	D	Descriptive case series	Unknown	Unknown	Eggs
SA	May	Primary production	*Salmonella* Typhimurium, MLVA 03-11-09/10-08-523	9	3	0	DT	Descriptive case series	Eggs	Eggs: single food	Eggs
SA	Oct	Aged care	*Campylobacter*	3	1	1	D	Descriptive case series	Unknown	Unknown	Unknown
SA	Nov	Bakery	*Salmonella* Typhimurium, MLVA 03-13-10-08-523	5	0	0	DT	Descriptive case series	Unknown	Unknown	Eggs
SA	Nov	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-15-08-11-550	7	3	0	D	Descriptive case series	Unknown	Unknown	Unknown
SA	Dec	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-14-10-11-523	6	3	0	DT	Descriptive case series	Unknown	Unknown	Eggs
SA	Dec	Take-away	*Salmonella* Typhimurium, MLVA 03-09-07-13-523	3	1	0	DT	Descriptive case series	Chicken sushi	Specialty / ethnic: sushi	Chicken
Tas.	Dec	Restaurant / café	Unknown (suspected toxin)	9	1	0	D	Cohort study	Unknown	Unknown	Unknown
Tas.	Dec	Restaurant / café	Unknown (suspected viral)	12	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
Vic.	Feb	Take-away	*Clostridium perfringens*	6	0	0	DM	Descriptive case series	Meat curry	Meats: other	Meat
Vic.	Mar	Aged care	*Clostridium perfringens*	23	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
Vic.	Mar	Restaurant / café	Unknown	11	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
Vic.	Apr	Camp	*Salmonella* Saintpaul	7	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
Vic.	Apr	Restaurant / café	Norovirus	28	1	0	D	Descriptive case series	Unknown	Unknown	Unknown
Vic.	May	Aged care	Unknown (suspected *Clostridium perfringens*)	6	0	0	D	Descriptive case series	Unknown	Unknown	Unknown

Jurisdiction[a]	Month[b]	Setting prepared	Agent responsible[c]	No. ill	No. hospitalised	No. fatalities	Evidence[d]	Epidemiological study	Responsible vehicle	Commodity	Source
Vic.	May	Primary production	Ciguatoxin (ciguatera fish poisoning)	3	0	0	D	Descriptive case series	Grouper fish	Seafood: fish	Grouper fish
Vic.	May	Restaurant / café	Norovirus	28	1	0	A	Cohort study	Dolmades	Specialty / ethnic: other	Unknown
Vic.	Oct	Aged care	Unknown	6	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
Vic.	Nov	Take-away	*Salmonella* Typhimurium, MLVA 03-14-10-08-523	40	8	0	DT	Descriptive case series	Chicken	Meats: poultry	Chicken
Vic.	Dec	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-14-10-08-523	2	0	0	DT	Descriptive case series	Chicken	Meats: poultry	Chicken
WA	Jan	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-10-16-12-496	2	1	0	D	Descriptive case series	Breakfast egg dishes	Eggs: composite food	Eggs
WA	Jan	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-14-11-10-523	6	0	0	D	Descriptive case series	Raw egg sauces	Eggs: sauce / dressing	Eggs
WA	Feb	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-18-09-12-523	5	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
WA	Mar	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-17-09-12-523	2	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
WA	Mar	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-17-09-12-523	3	1	0	D	Descriptive case series	Unknown	Unknown	Unknown
WA	Mar	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-18-09-12-523	7	2	0	D	Descriptive case series	Unknown	Unknown	Unknown
WA	Apr	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-17-09-12-523	4	1	0	D	Descriptive case series	French toast	Eggs: composite food	Eggs
WA	Apr	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-17-09-12-523	5	1	0	D	Descriptive case series	Tiramisu	Desserts: raw egg based desserts	Eggs

Jurisdiction[a]	Month[b]	Setting prepared	Agent responsible[c]	No. ill	No. hospitalised	No. fatalities	Evidence[d]	Epidemiological study	Responsible vehicle	Commodity	Source
WA	May	Restaurant / café	*Salmonella* Infantis	2	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
WA	Jun	Private residence	*Salmonella* Typhimurium, MLVA 04-16/17-10-00-490	8	0	0	D	Descriptive case series	Pork dish	Meats: pork	Pork meat: head, offal and intestines
WA	Jun	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-17-10-12-523	2	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
WA	Jun	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-20-09-12-523	4	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
WA	Jul	Restaurant / café	Unknown	5	0	0	D	Descriptive case series	Kebabs	Meats: poultry	Chicken
WA	Aug	Grocery store / delicatessen	*Campylobacter*	2	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
WA	Aug	Private residence	*Salmonella* Typhimurium, MLVA 03-17-19-12-523	24	0	0	A	Case control study	Multiple foods	Miscellaneous: multiple foods	Unknown
WA	Sep	Grocery store / delicatessen	*Campylobacter*	2	0	0	D	Descriptive case series	Cooked prawns	Seafood: crustaceans	Prawns
WA	Nov	Primary production	Shiga toxin producing *E. coli*	2	0	0	DM	Descriptive case series	Unpasteurised goats' milk	Dairy: milk / cream	Unpasteurised goats milk
WA	Nov	Restaurant / café	Norovirus	10	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
WA	Dec	Institution	*Clostridium perfringens*	37	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
WA	Dec	Institution	*Salmonella* Saintpaul	7	0	0	D	Descriptive case series	Smoked kangaroo meat	Meats: game meat	Smoked kangaroo meat

Note:

a MJOI: multi-jurisdictional outbreak investigation; ACT: Australian Capital Territory; NSW: New South Wales; NT: Northern Territory; Qld: Queensland; SA: South Australia; Tas.: Tasmania; Vic.: Victoria; WA: Western Australia.

b Month of outbreak is the month of onset of the first case or month of notification of the first case or the month the investigation into the outbreak commenced.

c MLST: multi-locus sequence type; MLVA: multi-locus variable number tandem repeat analysis.

d A: analytical epidemiological association between illness and one or more foods; D: descriptive evidence implicating the suspected vehicle or suggesting foodborne transmission; M: microbiological confirmation or laboratory detection of aetiological agent in the suspected vehicle and cases; E: environmental microbiological confirmation of aetiological agent detection in collected environmental or equipment samples / swabs; T: traceback evidence confirms cases were exposed to a widely distributed source from a single point of manufacture / origin.

Table B.3: Foodborne and probable foodborne outbreak summary for OzFoodNet sites, Australia, 2022

Jurisdiction[a]	Month[b]	Setting prepared	Agent responsible[c]	No. ill	No. hospitalised	No. fatalities	Evidence[d]	Epidemiological study	Responsible vehicle	Commodity	Source
MJOI	Dec	Primary production	Jimsonweed (*Datura stramonium*)	221	85	0	DM	Descriptive case series	Baby Spinach	Produce: fresh vegetable	Baby Spinach
Multi-jurisdictional	Nov	Primary production	Thebaine toxicity	37	Unknown	0	DMT	Descriptive case series	Poppy Seeds	Miscellaneous: herbs / spices	Poppy Seeds
ACT	Feb	Restaurant / café	*Salmonella* Typhimurium	11	1	0	DE	No formal study	Unknown	Unknown	Unknown
ACT	Apr	Take-away	*Salmonella* Agona	12	1	0	DE	Descriptive case series	Chicken kebab	Meats: poultry	Chicken
ACT	Jun	Restaurant / café	*Salmonella* Virchow	2	0	0	DE	Descriptive case series	Chicken kebab	Meats: poultry	Chicken
ACT	Nov	Commercial caterer	Norovirus	68	0	0	D	Cohort study	Unknown	Unknown	Unknown
NSW	Jan	Restaurant / café	*Salmonella* Typhimurium	10	0	0	D	No formal study	Charcoal chicken	Meats: poultry	Chicken
NSW	Feb	Aged care	*Salmonella* Bareilly	3	Unknown	Unknown	D	No formal study	Unknown	Unknown	Unknown
NSW	Feb	Restaurant / café	*Campylobacter* coli	2	2	0	D	No formal study	Duck in plum sauce	Meats: poultry	Duck
NSW	Feb	Restaurant / café	*Campylobacter jejuni*	2	1	0	D	No formal study	Chicken schnitzel burger	Miscellaneous: composite food	Chicken
NSW	Feb	Restaurant / café	Norovirus	4	0	0	D	No formal study	Unknown	Unknown	Unknown
NSW	Feb	Restaurant / café	*Salmonella* Typhimurium	9	6	0	D	Descriptive case series	Caramel Cheesecake	Desserts: cake	Eggs
NSW	Feb	Restaurant / café	*Salmonella* Typhimurium	4	0	0	D	No formal study	Unknown	Unknown	Unknown
NSW	Mar	Child care	*Salmonella* Typhimurium	48	2	0	DE	No formal study	Unknown	Unknown	Unknown
NSW	Mar	Institution	*Salmonella* Typhimurium	7	0	0	D	No formal study	Unknown	Unknown	Unknown
NSW	Apr	Aged care	*Salmonella* Typhimurium	15	2	Unknown	D	No formal study	Unknown	Unknown	Unknown
NSW	May	Grocery store / delicatessen	*Salmonella* Hvittingfoss	19	Unknown	0	D	Descriptive case series	Tiger prawns	Seafood: crustaceans	Tiger prawns

Jurisdiction[a]	Month[b]	Setting prepared	Agent responsible[c]	No. ill	No. hospitalised	No. fatalities	Evidence[d]	Epidemiological study	Responsible vehicle	Commodity	Source
NSW	May	Restaurant / café	*Salmonella* Typhimurium	10	Unknown	0	D	No formal study	Vietnamese pork roll	Specialty / ethnic: rolls	Unknown
NSW	May	Restaurant / café	*Salmonella* Typhimurium	12	0	0	DE	Descriptive case series	Unknown	Unknown	Unknown
NSW	May	Restaurant / café	Histamine poisoning	3	0	0	D	No formal study	Battered kingfish	Seafood: fish	Kingfish
NSW	May	Take-away	Histamine poisoning	5	0	0	DM	Descriptive case series	Tuna cheeseburger	Seafood: fish	Tuna
NSW	Jul	Restaurant / café	*Campylobacter jejuni*	3	1	0	D	No formal study	Unknown	Unknown	Unknown
NSW	Jul	Restaurant / café	Unknown	3	0	0	D	No formal study	Unknown	Unknown	Unknown
NSW	Aug	Restaurant / café	*Campylobacter*	8	0	0	D	No formal study	Unknown	Unknown	Unknown
NSW	Aug	Restaurant / café	*Campylobacter*	5	1	0	D	No formal study	Unknown	Unknown	Unknown
NSW	Aug	Restaurant / café	*Salmonella* Typhimurium	5	0	0	DE	Descriptive case series	Unknown	Unknown	Unknown
NSW	Aug	Restaurant / café	*Salmonella* Typhimurium	4	2	0	D	No formal study	Deep fried ice cream	Dairy: Ice-cream / yoghurt	Eggs
NSW	Oct	Restaurant / café	*Campylobacter*	3	1	0	D	No formal study	Unknown	Unknown	Unknown
NSW	Oct	Restaurant / café	Unknown	7	0	0	D	No formal study	Unknown	Unknown	Unknown
NSW	Nov	Restaurant / café	Unknown	12	0	0	D	No formal study	Unknown	Unknown	Unknown
NSW	Dec	Commercial caterer	*Salmonella* Typhimurium	76	20	0	DE	Cohort study	Unknown	Unknown	Unknown
NSW	Dec	National franchised fast food	Unknown	6	0	0	D	No formal study	Unknown	Unknown	Unknown
NSW	Dec	Other - Function	Unknown	27	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
NSW	Dec	Restaurant / café	*Campylobacter*	2	2	0	D	No formal study	Satay chicken	Meats: poultry	Chicken

Jurisdiction[a]	Month[b]	Setting prepared	Agent responsible[c]	No. ill	No. hospitalised	No. fatalities	Evidence[d]	Epidemiological study	Responsible vehicle	Commodity	Source
NSW	Dec	Restaurant / café	Unknown	16	0	0	D	No formal study	Pulled Pork Nachos	Meats: pork	Pork
NSW	Dec	Restaurant / café	Unknown	39	0	0	D	Descriptive case series	Beef Brisket	Meats: beef	Beef
NSW	Dec	Restaurant / café	Unknown	3	0	0	D	No formal study	Unknown	Unknown	Unknown
NT	Feb	Restaurant / café	Unknown (suspected toxin)	4	0	0	D	No formal study	Meat and Vegetables	Miscellaneous: multiple foods	Unknown
NT	May	Bakery	*Salmonella* Lansing	4	3	0	D	Descriptive case series	Black forest cake	Desserts: cake	Unknown
NT	Jul	Restaurant / café	Unknown	10	0	0	D	No formal study	Curries and rice	Miscellaneous: multiple foods	Unknown
NT	Nov	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-14-10-08-523	6	4	0	D	Descriptive case series	Raw egg aioli, Beetroot hummus	Eggs: sauce / dressing; Speciality / ethnic: other	Eggs
Qld	Feb	Primary production	Ciguatoxin (Ciguatera fish poisoning)	2	0	0	D	Descriptive case series	Coral trout	Seafood: fish	Fish
Qld	Apr	Restaurant / café	*Clostridium perfringens*	4	0	0	DM	Descriptive case series	Butter chicken	Meats: poultry	Chicken
Qld	May	Restaurant / café	Histamine poisoning	2	0	0	DM	Descriptive case series	Kingfish	Seafood: fish	Fish
Qld	May	Unknown	*Salmonella* Hvittingfoss	24	5	0	D	Descriptive case series	Unknown	Unknown	Unknown
Qld	Jul	Primary production	Ciguatoxin (Ciguatera fish poisoning)	3	0	0	DM	Descriptive case series	Coral trout	Seafood: fish	Fish
Qld	Aug	Other - Sports club	Norovirus	27	1	0	D	Cohort study	Unknown	Unknown	Unknown
Qld	Aug	Primary production	*Salmonella* Enteritidis	19	8	0	DMT	Descriptive case series	Eggs	Eggs: single food	Eggs
Qld	Aug	Restaurant / café	*Clostridium perfringens*	3	0	0	D	Descriptive case series	Pulled beef	Meats: beef	Beef
Qld	Aug	Restaurant / café	*Clostridium perfringens*	6	0	0	DM	Descriptive case series	Slow cooked beef	Meats: beef	Beef

Jurisdiction[a]	Month[b]	Setting prepared	Agent responsible[c]	No. ill	No. hospitalised	No. fatalities	Evidence[d]	Epidemiological study	Responsible vehicle	Commodity	Source
Qld	Sep	Restaurant / café	*Clostridium perfringens*	4	0	0	D	Descriptive case series	Pork belly Bánh mì	Specialty / ethnic: rolls	Pork
Qld	Oct	Restaurant / café	*Campylobacter*	2	Unknown	0	D	Descriptive case series	Pan fried duck breast	Meats: poultry	Duck
Qld	Oct	Restaurant / café	Unknown	10	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
Qld	Oct	Take-away	Ciguatoxin (Ciguatera fish poisoning)	14	1	0	D	Descriptive case series	Spanish mackerel	Seafood: fish	Fish
Qld	Nov	Take-away	Histamine poisoning	4	0	0	DM	Descriptive case series	Spanish mackerel	Seafood: fish	Fish
Qld	Dec	Commercial caterer	Norovirus	8	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
Qld	Dec	Restaurant / café	Norovirus	10	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
Qld	Dec	Restaurant / café	Unknown	4	0	0	D	Descriptive case series	Tacos	Specialty / ethnic: other	Unknown
SA	Mar	Restaurant / café	*Salmonella* Enteritidis	3	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
SA	Dec	Take-away	*Salmonella* Saintpaul	6	2	0	D	Descriptive case series	Unknown	Unknown	Unknown
Tas.	Feb	Private residence	*Salmonella* Typhimurium	11	0	0	A	Cohort study	Egg & potato salad	Salads: other	Unknown
Tas.	Apr	Restaurant / café	*Salmonella* Typhimurium	3	0	0	D	Descriptive case series	Chicken salad rolls	Miscellaneous: composite food	Unknown
Tas.	May	Restaurant / café	Histamine poisoning	2	0	0	DM	Descriptive case series	Tuna tataki	Seafood: fish	Tuna
Tas.	Jun	Restaurant / café	*Campylobacter jejuni*	2	2	0	D	Descriptive case series	Chicken liver parfait	Meats: offal	Chicken liver
Tas.	Sep	Private residence	*Salmonella* Mississippi	4	1	0	D	Case control study	Unknown	Unknown	Unknown
Vic.	Feb	Take-away	Unknown	7	0	0	D	Descriptive case series	Unknown	Unknown	Unknown

Jurisdiction[a]	Month[b]	Setting prepared	Agent responsible[c]	No. ill	No. hospitalised	No. fatalities	Evidence[d]	Epidemiological study	Responsible vehicle	Commodity	Source
Vic.	Mar	Commercial caterer	*Campylobacter jejuni*	29	2	0	A	Other: retrospective nested case-control study	Duck breast brioche canape containing duck liver parfait	Meats: offal	Duck breast or duck liver parfait
Vic.	Mar	Commercially manufactured	*Listeria monocytogenes*, MLST 3	2	2	2	DME	Descriptive case series	Pre-prepared sandwiches	Miscellaneous: composite food	Unknown
Vic.	Jul	Private residence	Cannabinoids	7	7	0	DM	Descriptive case series	Pesto	Miscellaneous: sauces	Tetrahydro-cannabinol
WA	Feb	Child care	*Salmonella* Oranienburg	4	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
WA	Feb	Restaurant / café	*Salmonella* Typhimurium, MLVA 03-18-09-12-523	3	0	0	D	Descriptive case series	Unknown	Unknown	Unknown
WA	Jun	Private caterer	Cannabinoids	7	2	0	DM	Descriptive case series	Multiple dishes	Miscellaneous: multiple foods	Tetrahydro-cannabinol
WA	Nov	Grocery store / delicatessen	*Salmonella* Typhimurium, MLVA 03-18-08-12-523	16	5	0	D	Descriptive case series	Pork bánh mì	Specialty / ethnic: rolls	Eggs
WA	Dec	Private caterer	*Salmonella* Typhimurium, MLVA 04-14-13/14-00-490	13	1	1	D	Descriptive case series	Unknown	Unknown	Unknown
WA	Dec	Private caterer	Unknown	12	0	0	D	Descriptive case series	Unknown	Unknown	Unknown

Note:

a MJOI: multi-jurisdictional outbreak investigation; ACT: Australian Capital Territory; NSW: New South Wales; NT: Northern Territory; Qld: Queensland; SA: South Australia; Tas.: Tasmania; Vic.: Victoria; WA: Western Australia.

b Month of outbreak is the month of onset of the first case or month of notification of the first case or the month the investigation into the outbreak commenced.

c MLST: multi-locus sequence type; MLVA: multi-locus variable number tandem repeat analysis.

d A: analytical epidemiological association between illness and one or more foods; D: descriptive evidence implicating the suspected vehicle or suggesting foodborne transmission; M: microbiological confirmation, or laboratory detection, of aetiological agent in the suspected vehicle and cases; E: environmental microbiological confirmation of aetiological agent detection in collected environmental or equipment samples / swabs; T: traceback evidence confirms cases were exposed to a widely distributed source from a single point of manufacture / origin.

Appendix C: Point source foodborne outbreaks within larger outbreaks

Table C.1: Point source foodborne and probable foodborne outbreaks within multi-jurisdictional outbreaks and large community outbreaks, summary for OzFoodNet sites, Australia, 2020–2022

Year	Jurisdiction[a]	Month[b]	Setting prepared	Agent responsible[c]	No. ill[d]	No. hospitalised[d]	No. fatalities[d]	Evidence[e]	Epidemiological study	Responsible vehicle	Commodity	Source
2020	Qld	Feb	Restaurant / café	*Salmonella* Typhimurium, MLVA 05-16-13-11-490	22	4	0	D	Descriptive case series	Salad (Unspecified)	Salads: other	Unknown
2021	NSW	Jun	Take-away	*Salmonella* Typhimurium	10	5	0	DM	Descriptive case series	Sushi	Specialty / ethnic: sushi	Chicken
2021	Qld	Jan	Restaurant / café	*Salmonella* Saintpaul	4	1	0	DT	Descriptive case series	Unknown	Unknown	Spring onion
2021	Qld	Jan	Restaurant / café	*Salmonella* Saintpaul	5	1	0	DT	Descriptive case series	Unknown	Unknown	Spring onion
2021	Qld	Nov	Restaurant / café	*Vibrio parahaemolyticus*	6	1	0	DT	Descriptive case series	Oysters	Seafood: bivalve molluscs	Oysters

Note:

a NSW: New South Wales; Qld: Queensland.

b Month of outbreak is the month of onset of the first case or month of notification of the first case or the month the investigation into the outbreak commenced.

c MLVA: multi-locus variable number tandem repeat analysis.

d Note: counts of ill persons, hospitalisations and deaths reported within point source outbreaks have already been included within the respective overarching larger outbreak and should not be added to the values reported in Appendix B, Tables B.1 to B.3.

e D: descriptive evidence implicating the suspected vehicle or suggesting foodborne transmission; M: microbiological confirmation or laboratory detection of aetiological agent in the suspected vehicle and cases; T: traceback evidence confirms cases were exposed to a widely distributed source from a single point of manufacture / origin.