ESR

SURVEILLANCE REPORT

Summary of outbreaks in New Zealand

2013

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SUMMARY

SUMMARY

Incidence and outcomes

In 2013, there was a decrease in the number of reported outbreaks and associated cases (652 outbreaks involving 7137 cases) compared with 2012 (719 outbreaks and 10 500 cases). A total of 113 outbreak-associated cases required hospitalisation and four cases died.

Public health units (PHUs) reporting the highest rate in 2013 were Waikato (42.9 outbreaks per 100 000 population), Otago (22.0 per 100 000) and Taranaki (21.7 per 100 000). The national rate was 14.6 outbreaks per 100 000 population.

Causal agents

The causal agent (pathogen, toxin or chemical) was identified in 78.7% (513/652) of outbreaks involving 81.9% (5848/7137) of all outbreak-associated cases.

Enteric agents were implicated in 94.3% (615/652) of outbreaks. Norovirus was the most commonly identified enteric pathogen accounting for 25.9% of outbreaks (169/652) and 51.6% of the associated cases (3685/7137). Two deaths were associated with norovirus outbreaks in 2013.

Cryptosporidium spp. was the second most commonly reported causal agent, accounting for 15.0% of outbreaks (98/652) and 7.7% of associated cases (547/7137). This is an increase from 2012 when outbreaks due to *Cryptosporidium* spp. represented only 6.6% of outbreaks (47/716) and it was the third most commonly reported pathogen behind norovirus and *Giardia* spp.

The most commonly implicated non-enteric agent was *Bordetella pertussis,* which was implicated in 3.1% (20/652) of outbreaks, followed by influenza and influenza-like illness in 1.1% (7/652) of outbreaks.

Outbreak settings

The most common outbreak settings were private homes (35.4%, 231/652) followed by long-term care facilities (22.2%, 145/652).

The outbreak settings with the most outbreak-related cases were long-term care facilities (43.9%, 3133/7137), followed by childcare centres (14.5%, 1033/7137) and private homes (11.0%, 782/7137).

Modes of transmission

In 2013, the most commonly reported modes of transmission were person-to-person transmission (82.5%, 538/652 outbreaks), followed by environmental (20.9%, 136/652) and foodborne (18.4%, 120/652). Multiple modes of transmission were implicated in 37.0% (241/652) of outbreaks.

Sources – foodborne outbreaks

There were 120 foodborne outbreaks with 778 associated cases reported in 2013 and 57.5% (69/120) of the outbreaks were linked to a pathogen or condition. The pathogens that were most commonly associated with foodborne outbreaks included norovirus and *Campylobacter* spp. (13.3%, 16/120 outbreaks each), *Giardia* spp. (8.3%, 10/120), *Clostridium perfringens* and *Salmonella* spp. (7.5%, 9/120 outbreaks each).

Thirty-two of the 120 (26.7%) foodborne outbreaks had a source or vehicle identified. The main foods implicated in these outbreaks were dairy (40.6%, 13 outbreaks) and poultry (31.3%, 10 outbreaks), followed by grains and beans (25.0%, 8 outbreaks) and fish (21.9%, 7 outbreaks). The outbreaks with the highest number of cases were linked to poultry (51.0%, 133 cases) and grains and beans (42.1%, 110 cases). *Campylobacter* spp. was the most commonly identified causal agent in poultry and dairy-related outbreaks (4 and 3 outbreaks respectively). It should be noted that in very few outbreaks is a source confirmed by epidemiological or microbiological methods.

Recognition, reporting, investigation and control

Most outbreaks were recognised by increases in disease incidence (43.1%, 281/652), person-to-person contact with other cases (25.6%, 167/652) or attendance at a common event (13.0%, 85/652).

For the 636 outbreaks where the timeliness of reporting data was available, less than half (45.3%, 288/636) were reported to the PHU within a week of the onset of illness in the first case. The overall median reporting delay for outbreaks was nine days.

Control measures were reported for 90.6% (591/652) of outbreaks in 2013. The most common measures undertaken were health education and advice regarding the source (83.2%, 492/591), followed by cleaning and disinfection (62.3%, 368/591).

Contributing factors

Time and temperature abuses were the most common contributor to foodborne outbreaks (45.8%, 55/120) followed by the contamination of food (40.8%, 49/120). Unsafe sources accounted for 20.8% (25/120) of the outbreaks, including 7.5% (9/120) that were associated with the consumption of raw food.

Emerging trends

In 2013, the most common outbreak settings were private homes and long-term care facilities, as was observed from 2006 to 2012. Since 2006, about half of all outbreaks reported annually were set in institutions and a quarter to a third were set in private homes. Prior to 2006, commercial food operators and private homes were the most commonly reported outbreak settings. An increase in institutional outbreaks may be partly explained by increases in long term care facilities due to the ageing population and in early childhood education facilities and Kohanga Reo due to the introduction of the funded 20 hours of childcare policy in 2007. The introduction of national guidelines for the "Management of Norovirus Outbreaks in Hospitals and Elderly Care Institutions" in early 2009 may have led to increased reporting of outbreaks. Since 2007 there has been an increase in norovirus outbreaks recorded. During this time there has been a decrease in numbers of outbreaks associated with food premises.

Over the last 10 years, substantial changes have occurred in the modes of outbreak transmission reported. Person-to-person transmission has become the most frequently reported mode; a change from foodborne transmission, which was often the most frequently reported mode between 2001 and 2006. The proportion of foodborne outbreaks reported in 2013 (18.4%, 120/652) is similar to what has been reported annually since 2007 (range: 13.2%–23.3%).

The proportion of outbreaks associated with person-to-person transmission increased considerably from the 2001–2003 period (range: 20.2%–33.9%) to the 2009–2013 period (range: 73.6%–84.6%). In 2013, the number of outbreaks where person-to-person transmission was identified was more than four times that of any other mode. It should also be noted that outbreaks attributed to environmental transmission (20.9%, 136/652), the second most common mode reported in 2013, surpassed the proportion of those attributed to foodborne transmission for the first time since 2009. This could in part be explained by the fact that over 60% of all outbreaks during 2013 were due to norovirus infection, cryptosporidiosis and giardiasis (see Table 2).

The number of outbreaks due to *Cryptosporidium* spp. has increased steadily from seven outbreaks in 2008 to 98 in 2013. This is the highest number since reporting began in 2001. For outbreaks due to cryptosporidiosis, the most common modes reported were person-to-person transmission (86 outbreaks, 471 cases) and environmental transmission (41 outbreaks, 298 cases). Of the environmental outbreaks, 25 (61.0%) were associated with exposure to a potentially contaminated swimming pool or spa pool.

INTRODUCTION

INTRODUCTION

This report summarises data on outbreaks that were reported to ESR during 2013.

Outbreak surveillance in New Zealand has been conducted by the Institute of Environmental Science and Research Ltd (ESR) on behalf of the Ministry of Health since 1996. The outbreak surveillance system collects data on disease outbreaks reported by public health units (PHUs). Since 1997, the outbreak surveillance system has been incorporated as a module within EpiSurv, the national notifiable disease surveillance system.

Investigating outbreaks provides information to [1]:

- halt an outbreak and prevent further illness
- prevent further outbreaks from the immediate source
- prevent further outbreaks from other similar sources
- address public concerns
- involve the public in disease control
- reduce direct and indirect costs
- identify new mechanisms of transmission of known illnesses
- identify new or emerging disease agents
- satisfy legal and international obligations
- improve investigation methods
- improve public health training.

METHODS

METHODS

Outbreak definition

The Guidelines for the Investigation and Control of Disease Outbreaks [1] states that the following types of outbreaks should be reported:

- two or more cases linked to a common source, in particular where the common source is exposure at a common event, food or water dispersed in the community, an environmental source, or a source in an institutional setting;
- a community-wide or person-to-person outbreak (except when the source has become well-established as a national epidemic and reporting it as a discrete event no longer serves a useful purpose);
- any other situation where outbreak investigation or control measures are being used or considered. This situation would include a single detected case of an illness that is exotic to New Zealand or has been eradicated (eg, dengue fever, poliomyelitis).

Outbreak reporting is encouraged for:

- a secondary case in an institution;
- household outbreaks – if there is a reasonable possibility that the outbreak resulted from a common source exposure for that household group.

Outbreak reporting is not usually required for:

- most secondary cases - these are identified as such in the outbreak report form as they are needed for public health action. There are a few exceptions to this eg measles, pertussis and where person-to-person spread of a foodborne illness originating from a common source has occurred;
- single cases where a specific contaminated source is identified.

Data sources

Outbreaks are reported to, or identified by, local PHUs. Data on each outbreak is recorded by the PHU on a standardised outbreak report form within EpiSurv. PHUs are encouraged to enter data early as an interim report that can be finalised when further data becomes available. Data is entered into EpiSurv at each PHU via a secure web-based portal. The real-time data is collated and analysed by ESR on behalf of the Ministry of Health. The national database is supplemented by data from ESR's Enteric Reference Laboratory, and virology and public health laboratories. If an outbreak is first identified by these laboratory sources, the appropriate PHU is asked to complete an outbreak report form.

The outbreak report form consists of the following sections:

- reporting authority (outbreak report date and interim or final report);
- condition and implicated pathogen, toxin or chemical (name of implicated agent and case definitions);
- outbreak demographics (number of cases, outbreak dates, age/sex of cases, incubation period and duration of illness);
- circumstances of exposure/transmission (means of outbreak recognition, setting, geographic location, mode of transmission and vehicle/source evidence);
- factors contributing to the outbreak (specific factors relating to foodborne, waterborne, person-to-person contact and environmental outbreaks;)
- management of the outbreak (control measures undertaken).

The terms used in the outbreak report form are defined in a glossary at the end of this report. The form can be found at: http://www.surv.esr.cri.nz/episurv/index.php and in the appendix of this report.

Data analysis

This report contains an analysis of outbreak data reported between 1 January and 31 December 2013, and recorded on the EpiSurv database as at 26 February 2014. Any amendments made to outbreak data on EpiSurv after 26 February 2014 will not be reflected in this report. Outbreaks reported at the end of the period may not have been finalised by the cut-off date, therefore the number of cases reported here may differ from that reported in the 2013 Notifiable and other diseases in New Zealand annual surveillance report.

This report does not include details about outbreaks of lead absorption (5 outbreaks), and poisoning arising from chemical contamination of the environment (2 outbreaks) reported into EpiSurv in 2013. Responsibility for the collection and reporting of lead absorption, chemical poisoning from the environment and hazardous substance notifications transferred from ESR to the Centre for Public Health Research, Massey University, in January 2013.

Rates were calculated using national and PHU population figures based on Statistics New Zealand mid-year population estimates for 2013.

The categories and subcategories used in this report were based on the fields in the outbreak report form with two exceptions: implicated food sources were grouped into one or more food categories, and reporting delay was calculated as the difference between the outbreak report date and the date of onset of illness for the first case.

Data limitations

The available outbreak data was restricted to the outbreaks recorded in EpiSurv by PHUs. Outbreaks are more likely to be reported if they involve unusual pathogens, notifiable diseases, a large number of cases or a well-defined setting. The differing availability of resources among PHUs may also impact on outbreak investigation and reporting at a regional level. Many reported outbreaks remain in the suspected category as no confirmatory evidence has been found. For these reasons, caution is advised when interpreting the data contained in this report.

Data quality issues including timeliness contribute to the limitations. Timeliness is discussed in this report on page 35. An annual report on data quality in EpiSurv is published separately.

Different methods of data analysis were used for the *Annual Summary of Outbreaks in New Zealand* reports before 2005. In 2003 and 2004, interim outbreak reports were excluded from analysis. In 2002, causal agents were categorised as laboratory-confirmed or suspected. As a result of these different analytical methods, comparisons with outbreak trends in past reports should be restricted to the period from 2005 onwards.

RESULTS

RESULTS

Characteristics of outbreaks

There were 652 reported outbreaks in 2013, a decrease from the 719 reported in 2012. The 2013 rate of 14.6 outbreaks per 100 000 population was lower than in 2012, when there were 16.2 outbreaks per 100 000 population. The majority (99.7%) of outbreaks reported were recorded as final reports, and only two outbreaks were recorded as interim reports. A total of 7137 cases were associated with outbreaks, 38.9% (2777/7137) of the cases were either clinically or laboratory confirmed and 61.1% (4360/7137) were probable cases. In 2013, the national rate was 159.6 outbreak cases per 100 000 population, a decrease from 2012 when the rate was 236.9 cases per 100 000 population.

Distribution of outbreaks by public health unit

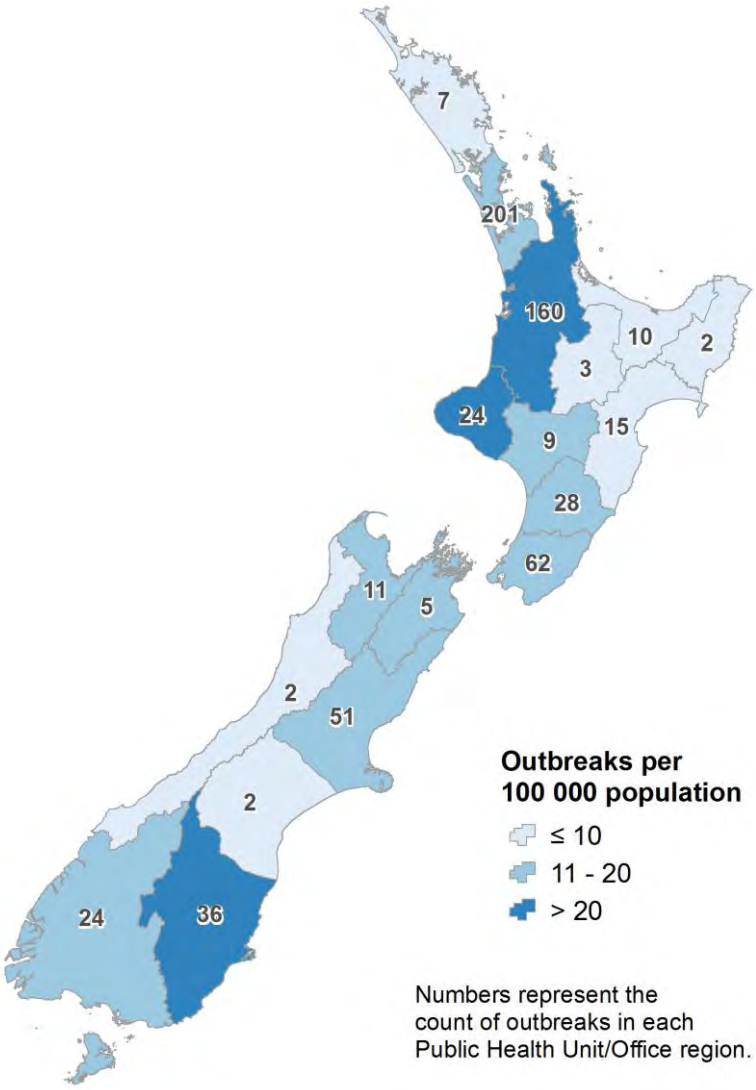
In 2013, the highest number of outbreaks and associated cases was reported by Auckland PHU, which represented 30.8% (201/652) of outbreaks and 20.1% (1437/7137) of associated cases (Table 1). Waikato PHU reported the second highest number of outbreaks (24.5%, 160/652 outbreaks), followed by Wellington (9.5%, 62/652 outbreaks), and Canterbury (7.8%, 51/652 outbreaks) PHUs. The highest outbreak rate (42.9 per 100 000 population) was reported by Waikato PHU (Figure 1) and the lowest rate for a PHU reporting at least five outbreaks, was Northland PHU (4.4 per 100 000 population).

Table 1. Outbreaks and associated cases by PHU, 2013

PHU	Outbreaks			Cases	
	Total	% of outbreaks (n=652)	Outbreak rate[1]	Total	% of cases (n=7137)
Northland	7	1.1	4.4	103	1.4
Auckland[2]	201	30.8	13.0	1437	20.1
Waikato	160	24.5	42.9	931	13.0
Bay of Plenty	10	1.5	4.7	120	1.7
Rotorua[3]	3	0.5	2.9	55	0.8
Taranaki	24	3.7	21.7	343	4.8
Hawke's Bay	15	2.3	9.6	401	5.6
Gisborne[3]	2	0.3	4.3	6	0.1
Whanganui	9	1.4	14.4	93	1.3
Manawatu	28	4.3	17.3	523	7.3
Wellington[4]	62	9.5	12.6	962	13.5
Marlborough	5	0.8	10.9	86	1.2
Nelson	11	1.7	11.5	197	2.8
West Coast[3]	2	0.3	6.1	24	0.3
Canterbury	51	7.8	10.7	885	12.4
South Canterbury[3]	2	0.3	1.8	45	0.6
Otago	36	5.5	22.0	533	7.5
Southland	24	3.7	19.2	393	5.5
Total	**652**	**100.0**	**14.6**	**7137**	**100.0**

[1] Crude rate of outbreaks per 100 000 population calculated using Statistics New Zealand population estimates for 2013.
[2] Auckland PHU covers Tamaki Makaurau-Auckland health district.
[3] Rates calculated where fewer than five outbreaks were recorded should be interpreted with caution.
[4] Includes Wellington, Hutt and Wairarapa health districts.

Figure 1. Number of outbreaks per 100 000 population by PHU, 2013



Multi-regional gastrointestinal outbreaks

Monitoring of gastrointestinal outbreaks is undertaken at a national level. Where a multi-regional outbreak is suspected, ESR will conduct epidemiological and microbiological investigations in conjunction with affected PHUs. In 2013, one multi-regional gastrointestinal outbreak was investigated at the national level (compared to 1 in 2012). An increase in verocytotoxin- or shiga toxin-producing *Escherichia coli* (VTEC/STEC) notifications reported into EpiSurv between January and June 2013 triggered an investigation. A hypothesis generating questionnaire was administered and food and water samples were collected from cases homes and tested by the ESR Public Health Laboratory. Although no single common source was identified, exposure to farm animals and consumption of rooftop collected water were the most commonly identified risk factors. The Ministry of Health and the Ministry for Primary Industries were both involved in an advisory capacity.

Causal agents

A causal agent was identified in 78.7% (513/652) of outbreaks involving 81.9% (5848/7137) of all outbreak associated cases. There were 21 outbreaks with two causal agents identified. No specific pathogen or condition was identified in the remaining 21.3% (139/652) of outbreaks, all of which were recorded as gastroenteritis outbreaks.

Enteric agents were implicated in the majority of outbreaks (94.3%, 615/652) and their associated cases (97.4%, 6948/7137) (Table 2). The most common single causal agent implicated in outbreaks in 2013 was norovirus, at 25.9% (169/652) of reported outbreaks. Outbreaks due to norovirus also had the highest proportion of associated cases (3685/7137, 51.6%). The next most common enteric causal agents were *Cryptosporidium* spp. (15.0% of outbreaks, 98/652), *Giardia* spp. (12.0% of outbreaks, 78/652) and *Campylobacter* spp. (6.1%, 40/652).

The enteric agents with the highest median number of associated cases were norovirus (18.0 cases per outbreak) and rotavirus (14.5 cases).

Non-enteric agents accounted for 5.5% (36/652) of outbreaks and 2.6% (187/7137) of the outbreak associated cases in 2013 (Table 2). Other pathogens and conditions reported were: *Bordetella pertussis* (3.1% of outbreaks, 20/652) and influenza and influenza-like illness (1.1% of outbreaks, 7/652). The median number of cases associated with *Mycoplasma pnuemoniae* outbreaks (1 outbreak involving 18 cases) was the highest for non-enteric outbreaks in 2013.

Table 2. Outbreaks and associated cases by pathogen, 2013

Pathogen or condition	Outbreaks[1]			Cases[1]	
	Total	% of outbreaks (n=652)	Median cases per outbreak	Total	% of cases (n=7137)
Enteric	**615**	**94.3**	**5.0**	**6948**	**97.4**
Norovirus	169	25.9	18.0	3685	51.6
Cryptosporidium spp.	98	15.0	3.0	547	7.7
Giardia spp.	78	12.0	3.0	333	4.7
Campylobacter spp.	40	6.1	3.0	170	2.4
Rotavirus	28	4.3	14.5	546	7.7
Salmonella spp.	18	2.8	3.0	98	1.4
VTEC/STEC infection	16	2.5	2.5	58	0.8
Shigella spp.	10	1.5	2.5	40	0.6
Clostridium perfringens	9	1.4	11.0	208	2.9
Sapovirus	8	1.2	10.0	159	2.2
Hepatitis A	5	0.8	3.0	54	0.8
Yersinia spp.	3	0.5	3.0	13	0.2
Clostridium difficile	3	0.5	3.0	19	0.3
Histamine fish poisoning	3	0.5	6.0	21	0.3
Salmonella Typhi	3	0.5	3.0	11	0.2
Astrovirus	2	0.3	8.5	17	0.2
Clostridium septicum	1	0.2	7.0	7	0.1
Salmonella Paratyphi	1	0.2	14.0	14	0.2
Staphylococcus aureus	1	0.2	2.0	2	0.0
Pathogen not identified[2]	139	21.3	6.0	1289	18.1
Non-enteric	**37**	**5.7**	**3.0**	**189**	**2.6**
Bordetella pertussis	20	3.1	3.0	60	0.8
Influenza and influenza-like illness[3]	7	1.1	5.0	66	0.9
Mycobacterium leprae[4]	3	0.5	3.0	9	0.1
Measles virus	2	0.3	7.0	14	0.2
Mycobacterium tuberculosis	2	0.3	9.0	18	0.3
Sulphur dioxide poisoning	1	0.2	2.0	2	0.0
Mycoplasma pneumoniae	1	0.2	18.0	18	0.3
Legionella pneumophila	1	0.2	2.0	2	0.0

[1] More than one enteric agent was reported in 21 outbreaks with 372 cases, therefore numbers may not sum to group totals.

[2] All enteric outbreaks with no identified pathogen were recorded as gastroenteritis.

[3] Includes outbreaks of influenza A (2 outbreaks with 5 cases), influenza B (4 outbreaks, 32 cases), and influenza B/rhinovirus (1 outbreak, 29 cases).

[4] Note that a confirmed diagnosis of leprosy may take many months and therefore these numbers may be revised when more information is available.

Norovirus outbreaks – genotypes and outbreak setting

Norovirus genotyping is carried out in the ESR Norovirus Reference Laboratory. Phylogenetic analysis is used for genotyping. Sequences are compared with those in the GenBank database and in the FBVE (foodborne viruses in Europe) database using the Norovirus Typing Tool [2].

A separate dataset generated from the ESR Norovirus Reference Laboratory is used for the analysis of norovirus outbreak strains. The number of outbreaks reported to the Reference Laboratory differs from the number recorded in Episurv, because not all samples from the norovirus outbreaks reported in EpiSurv are sent to ESR for analysis. For this reason, the number of norovirus- and sapovirus- associated outbreaks reported in this section differ from the number reported elsewhere in this report.

There were 157 ESR Norovirus Reference laboratory-confirmed norovirus outbreaks recorded in 2013. This is a decrease from 2012 and 2011 when 221 and 160 laboratory-confirmed outbreaks were reported. The highest number of outbreaks occurred in January (25 outbreaks) and the lowest number in May (8 outbreaks) (Figure 2).

The majority of ESR Norovirus Reference laboratory-confirmed norovirus outbreaks (54.1%, 85/157) occurred in long-term care facilities. Outbreaks were also commonly associated with commercial food operators (13.4%, 21/157), childcare centres (12.7%, 20/157), acute-care hospitals (5.1%, 8/157), private homes (4.5%, 7/157) and hostel/boarding houses (1.9%, 3/157). Other settings were reported for the remaining 13 outbreaks, the most common included travel on international flights and tramping huts (2 outbreaks each).

Norovirus genogroup II (GII) was identified in 70.1% (110/157) of outbreaks and norovirus genogroup I (GI) was identified in 28.7% (45/157) of outbreaks, and both norovirus GI and GII were detected in two (1.3%) outbreaks. In 2012, norovirus GII was identified in the vast majority of outbreaks (94.1%, 208/221).

The norovirus genotype was determined for all 157 laboratory-confirmed outbreaks. As in previous years, GII.4 was the most common genotype identified. However, unlike previous years, where GII.4 accounted for over 70% of outbreaks[*], in 2013 only 36.3% (57/157) of outbreaks were associated with GII.4. The GII.4 genotype continually evolves by mutation and/or recombination events to produce novel variants. In 2013, only the Sydney_2012 variant of GII.4 was identified, following its emergence and replacement of the New Orleans_2009 variant in 2012 [3]. In total, eight GI genotypes and eight GII genotypes (as defined by typing of the viral capsid) were identified in outbreaks in 2013. The second most common genotype identified in 2013 was GI.4 (14.6%, 23/157).

Most norovirus outbreak settings were associated with a variety of norovirus genotypes (Figure 3). The acute-care hospital setting was the exception where seven of the eight outbreaks were due to GII.4. The two outbreaks where both norovirus GI and GII were detected were associated with a long-term care facility (29 cases) and a scout camp (31 cases).

[*] GII has been the most commonly identified genotype in New Zealand and overseas since mid/late 1990s and accounted for 73.9% (161/218) of genotyped outbreaks in 2012.

Figure 2. Norovirus Reference Laboratory-confirmed norovirus outbreak typing by month, 2013

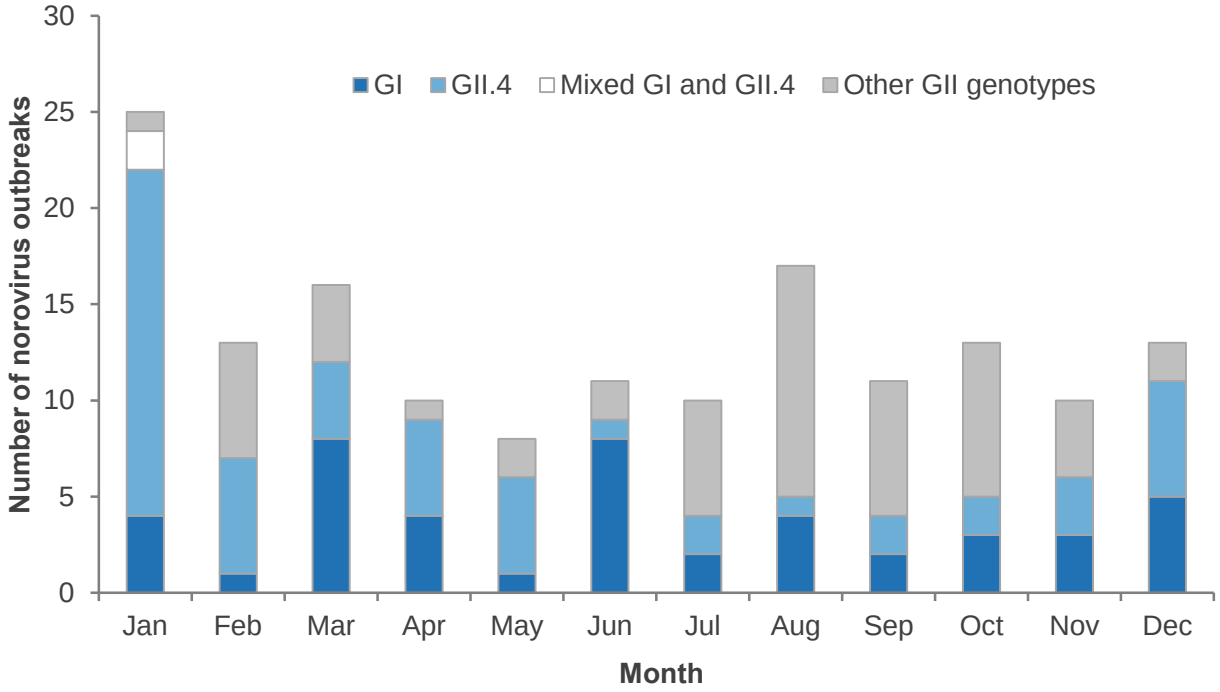
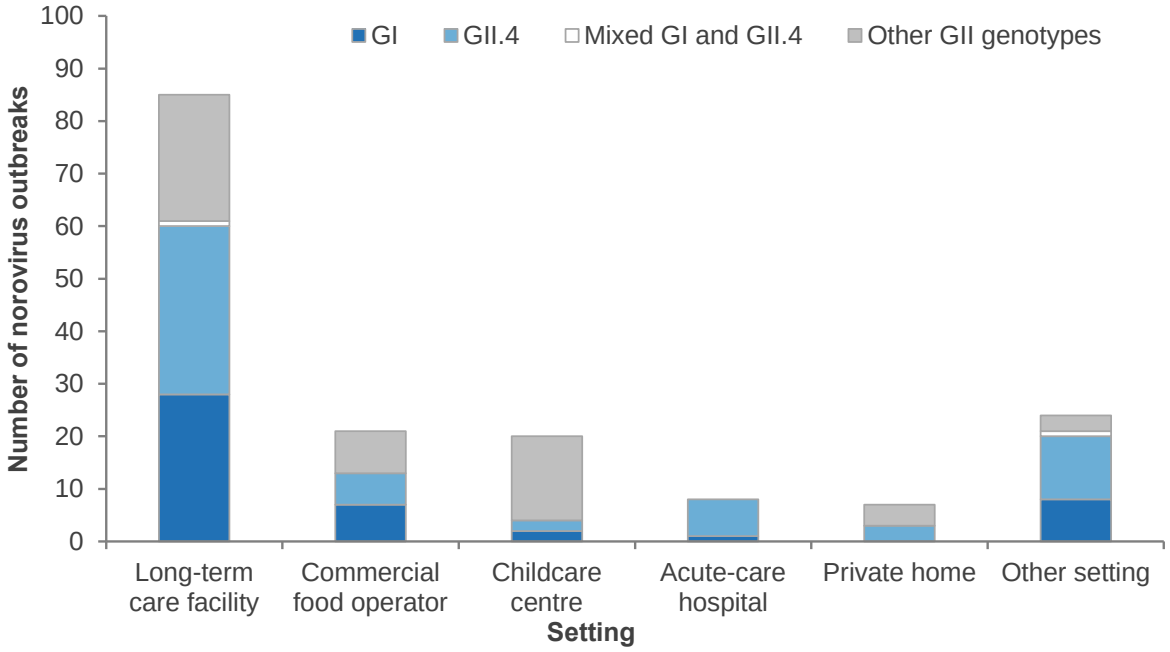


Figure 3. Norovirus Reference Laboratory-confirmed norovirus outbreak strains by setting, 2013



Gastroenteritis outbreaks caused by other enteric viruses

During 2013, specimens from 75 norovirus-negative gastroenteritis outbreaks were further analysed for other enteric viral pathogens. Astroviruses were identified in three outbreaks in the following settings: commercial food operator, childcare centre and private home. Sapoviruses were identified in ten outbreaks in the following settings: childcare centres (4 outbreaks), long-term care facilities (3 outbreaks) and a commercial food operator (1 outbreak). Multiple pathogens were identified in two outbreaks: one outbreak set in a long-term care facility (astrovirus and sapovirus were identified) and another set in a childcare centre (astrovirus, sapovirus, norovirus and *Cryptosporidium* spp. were identified). Rotaviruses were identified in 12 outbreaks set in long-term care facilities (8 outbreaks) and childcare centres (4 outbreaks).

Hospitalisations and deaths associated with outbreaks

Hospitalisation information was recorded for 65.2% (425/652) of outbreaks involving 70.8% (5050/7137) of associated cases. Overall, 2.2% (113/5050) of outbreak-associated cases were hospitalised. The number of cases hospitalised for outbreaks due to enteric pathogens (104 cases) was substantially higher than the number of cases hospitalised due to non-enteric pathogens (9 cases) (Table 3). A higher percentage of cases associated with non-enteric outbreaks were hospitalised compared with enteric outbreaks (5.8% vs. 2.1%). The non-enteric pathogen or condition with the highest proportion of hospitalised cases was *Legionella pneumophila* (100.0%, 2/2 cases), followed by *Mycobacterium tuberculosis* (16.7%, 3/18 cases) and measles virus* (14.3%, 2/14 cases). Of the enteric pathogens *Clostridium difficile* (93.8%, 15/16 cases) represented the highest proportion of hospitalised cases.

Four deaths were associated with three different outbreaks in 2013. The deaths were associated with norovirus and sapovirus infections (2 deaths each).

* Note: Two outbreaks of measles virus were reported in late December 2013 and were on-going as at the cut-off date for this report (26 February 2014). Because of this, the case numbers linked to the outbreaks reported here are different to individual case notifications for measles reported in the 2013 Notifiable and other diseases in New Zealand report.

Table 3. Hospitalised outbreak cases and total outbreak cases by pathogen or condition, 2013

Pathogen or condition	Outbreaks[1]	Cases[1]		
	Total	Total	No. of cases hospitalised[2]	% of cases hospitalised
Enteric	**401**	**4895**	**104**	**2.1**
Norovirus	120	2716	43	1.6
Clostridium difficile	2	16	15	93.8
Cryptosporidium spp.	59	363	12	3.3
Rotavirus	18	384	9	2.3
Salmonella spp.	13	70	7	10.0
VTEC/STEC infection	9	40	7	17.5
Salmonella Typhi	3	11	6	54.5
Campylobacter spp.	31	138	5	3.6
Giardia spp.	47	204	3	1.5
Shigella spp.	7	21	3	14.3
Clostridium perfringens	7	154	1	0.6
Hepatitis A	2	15	1	6.7
Yersinia spp.	2	10	1	10.0
Histamine fish poisoning	3	21	1	4.8
Clostridium septicum	1	7	1	14.3
Sapovirus	6	117	0	0.0
Pathogen not identified[3]	85	888	2	0.2
Non-enteric	**24**	**155**	**9**	**5.8**
Mycobacterium tuberculosis	2	18	3	16.7
Measles virus	1	14	2	14.3
Mycoplasma pneumoniae	1	18	2	11.1
Legionella pneumophila	1	2	2	100.0
Bordetella pertussis	10	31	0	0.0
Influenza and influenza-like illness[3]	6	64	0	0.0
Mycobacterium leprae	2	6	0	0.0
Sulphur dioxide poisoning	1	2	0	0.0
Total	**425**	**5050**	**113**	**2.2**

[1] More than one agent was reported in 21 outbreaks with a total of 372 associated cases, therefore numbers may not sum to group totals.

[2] Hospitalisation information was recorded for 65.2% (425/652) of outbreaks, relating to 70.8% (5050/7137) of cases.

[3] All enteric outbreaks with no identified pathogen were recorded as gastroenteritis.

[4] Includes outbreaks of influenza A (2 outbreaks with 5 cases), influenza B (4 outbreaks, 32 cases), and influenza B/rhinovirus (1 outbreak, 29 cases).

[5] Note that a confirmed diagnosis of leprosy may take many months and therefore these numbers may be revised when more information is available.

Outbreak settings

The most common outbreak settings recorded were private homes (35.4%, 231/652) followed by long-term care facilities (22.2%, 145/652), childcare centres (10.9%, 71/652) and restaurants/cafés/bakeries (8.3%, 54/652). Outbreaks in long-term care facilities had the highest number of associated cases (43.9%, 3133/7137) (Table 4). Overall, 42.8% (279/652) of all outbreaks and 72.2% (5152/7137) of cases reported in 2013 were set in institutions. Other common outbreak settings were farms (3.4%, 22/652) and takeaway outlets (2.1%, 14/652). The setting was unknown in 4.1% (27/652) of outbreaks.

Table 4. Outbreaks and associated cases by setting of exposure/transmission, 2013

Outbreak setting	Outbreaks[1]		Cases[1]	
	Total	% of outbreaks (n=652)	Total	% of cases (n=7137)
Institutions	**279**	**42.8**	**5152**	**72.2**
Long-term care facility	145	22.2	3133	43.9
Childcare centre	71	10.9	1033	14.5
Hospital (acute-care)	28	4.3	378	5.3
School	13	2.0	308	4.3
Camp	5	0.8	58	0.8
Hostel/boarding house	4	0.6	170	2.4
Hotel/motel	2	0.3	5	0.1
Prison	1	0.2	7	0.1
Other institution	12	1.8	221	3.1
Commercial food operators	**81**	**12.4**	**536**	**7.5**
Restaurant/café/bakery	54	8.3	341	4.8
Takeaway	14	2.1	44	0.6
Fast food restaurant	2	0.3	6	0.1
Supermarket/delicatessen	2	0.3	8	0.1
Caterer	4	0.6	115	1.6
Temporary or mobile food premises	1	0.2	7	0.1
Other food outlet	5	0.8	17	0.2
Workplace	**28**	**4.3**	**136**	**1.9**
Farm	22	3.4	97	1.4
Workplace	6	0.9	39	0.5
Other	**274**	**42.0**	**1348**	**18.9**
Private home	231	35.4	782	11.0
Community/church or sports gathering	4	0.6	126	1.8
Mode of travel[2]	3	0.5	36	0.5
Petting zoo	1	0.2	4	0.1
Other setting	46	7.1	439	6.2
Unknown setting	**27**	**4.1**	**221**	**3.1**

[1] More than one setting was recorded in 51 outbreaks with a total of 458 associated cases, therefore numbers might not add to the totals.

[2] Includes outbreaks where the exposure setting was recorded as an aircraft (2) and tour bus (1).

Modes of transmission

In 2013, the most commonly reported mode of transmission was person-to-person (82.5%, 538/652 outbreaks), followed by environmental (20.9% 136/652) and foodborne (18.4%, 120/652) modes (Table 5). Person-to-person transmission also accounted for the highest percentage of cases (91.4%, 6521/7137), followed by environmental transmission (23.5%, 1676/7137). The mode of transmission was unknown in 2.3% (15/652) of outbreaks.

Table 5. Outbreaks and associated cases by mode of transmission, 2013

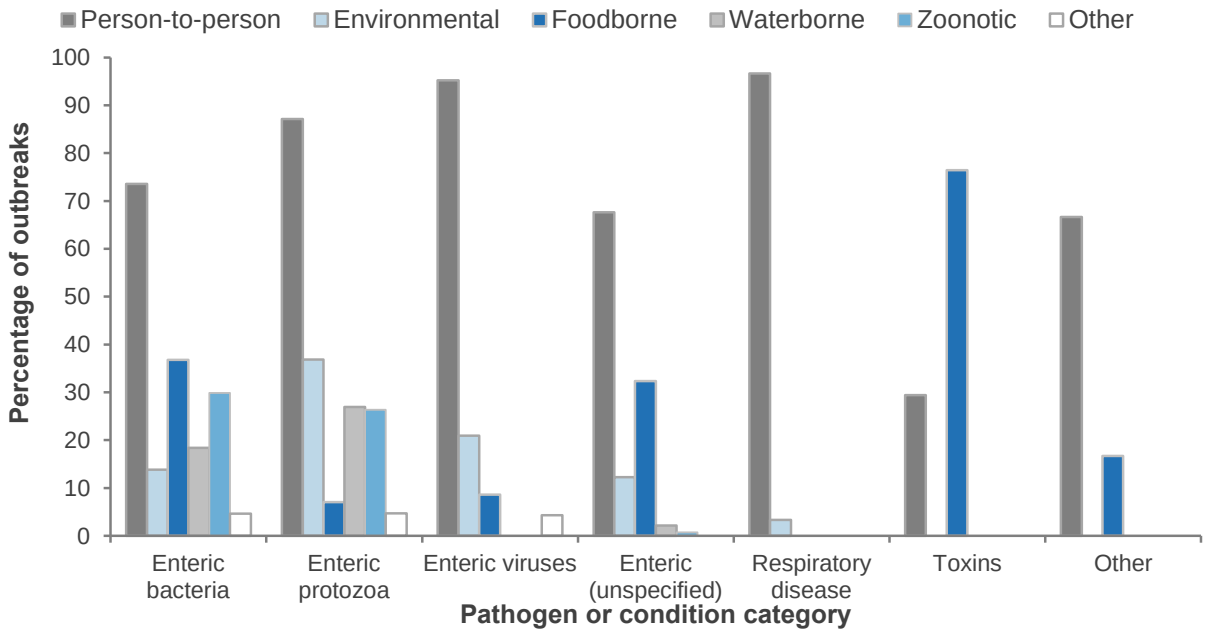
Mode of transmission	Outbreaks				Cases	
	Primary mode	Secondary mode	Total	% of outbreaks (n=652)[1]	Total	% of cases (n=7137)[1]
Person-to-person	382	156	538	82.5	6521	91.4
Environmental	51	85	136	20.9	1676	23.5
Foodborne	100	20	120	18.4	778	10.9
Zoonotic	32	37	69	10.6	314	4.4
Waterborne	38	24	62	9.5	227	3.2
Other	8	12	20	3.1	299	4.2
Unknown	-	-	15	2.3	79	1.2

[1] More than one mode of transmission was recorded for 241 outbreaks and 2429 associated cases, therefore totals add to more than 100%.

Note: No outbreaks with vectorborne, sexual contact or parenteral as mode(s) of transmission were reported in 2013.

Person-to-person was the most common mode of transmission for respiratory disease (96.7%, 29/30), followed by enteric viruses (95.2%, 200/210), enteric protozoa (87.1%, 149/171), enteric bacteria (73.6%, 64/87), and unspecified enteric pathogens (67.6%, 94/139) (Figure 4). Foodborne transmission contributed substantially to outbreaks due to toxins (76.5%, 13/17), enteric bacteria (36.8%, 32/87) and unspecified enteric pathogens (32.4%, 45/139) (Figure 4). Environmental transmission contributed to outbreaks of enteric protozoa (36.8%, 63/171) and enteric viruses (21.0%, 44/210). Waterborne transmission was the third highest mode of transmission for enteric protozoa (26.9%, 46/171) and the fourth highest for enteric bacteria (18.4%, 16/87). Zoonotic transmission was reported in 29.9% (26/87) of enteric bacteria outbreaks and 26.3% (45/171) of outbreaks due to enteric protozoa.

Figure 4. Percentage of outbreaks by pathogen category and mode of transmission, 2013



Note: More than one mode of transmission was recorded for some outbreaks therefore totals may add to more than 100%.

Foodborne outbreaks

Causal agent

There were 120 foodborne outbreaks in 2013 with 778 associated cases, 62.5% (75/120 outbreaks) of which were linked to a pathogen or condition (Table 6). Pathogens most commonly associated with foodborne outbreaks included norovirus and *Campylobacter* spp. (13.3%, 16/120 outbreaks each) and *Giardia* spp. (8.3%, 10/120 outbreaks). Enteric bacteria (*Campylobacter* spp., *Salmonella* spp., *Shigella* spp., *S.* Typhi, *S.* Paratyphi, VTEC/STEC infection, and *Yersinia* spp.) were implicated in 26.7% (32/120) of the foodborne outbreaks, and enteric viruses (norovirus, rotavirus and sapovirus) were implicated in 15.0% (18/120) of the foodborne outbreaks.

Table 6. Foodborne outbreaks and associated cases by pathogen or condition, 2013

Pathogen or condition	Outbreaks		Cases	
	Total	% of outbreaks (n=120)[1]	Total	% of cases (n=778)[1]
Norovirus	16	13.3	172	22.1
Campylobacter spp.	16	13.3	77	9.9
Giardia spp.	10	8.3	36	4.6
Clostridium perfringens	9	7.5	208	26.7
Salmonella spp.	9	7.5	45	5.8
Shigella spp.	4	3.3	21	2.7
Histamine (scombroid) fish poisoning	3	2.5	21	2.7
Cryptosporidium spp.	3	2.5	11	1.4
VTEC/STEC infection	2	1.7	4	0.5
Rotavirus	1	0.8	41	5.3
Salmonella Paratyphi	1	0.8	14	1.8
Clostridium septicum	1	0.8	7	0.9
Sapovirus	1	0.8	2	0.3
Sulphur dioxide poisoning	1	0.8	2	0.3
Staphylococcus aureus	1	0.8	2	0.3
Yersinia spp.	1	0.8	2	0.3
Pathogen not identified[2]	45	37.5	143	18.4

[1] Two agents were reported in five foodborne outbreaks with 33 associated cases, therefore totals add to more than 100%.

[2] All enteric outbreaks with no identified pathogen were recorded as gastroenteritis.

Vehicle/source implicated

Thirty-two of the 120 (26.7%) foodborne outbreaks in 2013 had a source or vehicle of infection identified. The main foods implicated in these outbreaks were dairy (40.6%, 13 outbreaks) and poultry (31.3%, 10 outbreaks each), followed by grains and beans (25.0%, 8 outbreaks) and fish (21.9%, 7 outbreaks) (Table 7). The outbreaks with the highest number of associated cases were those linked to poultry (51.0%, 133 cases) and grains and beans (42.1%, 110 cases). It should be noted that very few outbreaks have a suspected source confirmed by epidemiological or microbiological methods. It is also important to appreciate that implicated foods are mostly associations. These could be spurious as they have not taken into account the prevalence of commonly consumed foods in the general population. Only around 25% of foodborne outbreaks have a source identified. Investigators will generally only report a source based on compelling evidence or other supporting data or previous experience suggesting the food vehicle is the likely source.

Table 7: Foodborne outbreaks and associated cases by implicated vehicle/source, 2013

Implicated vehicle/source	Outbreaks		Cases	
	Total	% of outbreaks (n=32)[1]	Total	% of cases (n=261)[1]
Dairy	13	40.6	51	19.5
Poultry	10	31.3	133	51.0
Grains/beans	8	25.0	110	42.1
Fish	7	21.9	36	13.8
Meat (pork)	6	18.8	51	19.5
Oils/sugar	6	18.8	22	8.4
Meat (beef)	5	15.6	16	6.1
Eggs	4	12.5	23	8.8
Vegetables (stalk)	4	12.5	12	4.6
Vegetables (root)	4	12.5	12	4.6
Meat (lamb)	3	9.4	11	4.2
Shellfish (molluscs)	3	9.4	11	4.2
Shellfish (crustaceans)	2	6.3	8	3.1
Vegetables (leafy)	2	6.3	8	3.1
Rice	2	6.3	5	1.9
Fruit/nut	1	3.1	8	3.1

[1] More than one vehicle/source was implicated in 16 foodborne outbreaks with 33 associated cases, therefore numbers may not sum to group totals.

Note: Mixed foods were assigned to multiple categories based on the groupings published by Painter et al 2009 [4]. Only explicit ingredients were assigned to a category. All foods within a mixed item were given equal priority.

Foodborne outbreaks associated with poultry (31.3%, 10 outbreaks) and dairy (40.6%, 13 outbreaks) as possible vehicles or sources were most commonly due to *Campylobacter* spp. (poultry: 4 outbreaks, dairy: 3 outbreaks) (Table 8). Outbreaks of *Clostridium perfringens* were most commonly associated with meat dishes (poultry and lamb: 2 outbreaks each, beef and pork: 1 outbreak each). All three foodborne outbreaks linked to histamine (scombroid) poisoning were associated with fish.

The largest foodborne outbreak was reported in Auckland and involved 78 cases (29.9%). *C. perfringens* was identified as the causative agent in the outbreak which was attributed to the consumption of a chicken pasta dish served at a church event. An epidemiological study carried out by the Auckland Regional Public Health Service identified that the chicken pasta dish, prepared by professional caterers, was the highest risk item with a risk ratio of 9.2.

Table 8. Foodborne outbreaks by causal agent and implicated vehicle/source, 2013

Implicated vehicle/source[1]	Pathogen or condition												
	Campylobacter spp.	*Clostridium perfringens*	Histamine (scombroid) poisoning	Norovirus	*Giardia* spp.	*Cryptosporidium* spp.	*Clostridium septicum*	*Salmonella* spp.	*Shigella* spp.	Sulphur dioxide poisoning	VTEC/STEC infection	Pathogen not identified[2]	Total number of outbreaks
Dairy	3			2	2	1				1	1	5	**13**
Poultry	4	2					1					4	**10**
Grains/beans		1		2				1		1		3	**8**
Fish			3	1					1			2	**7**
Meat (pork)		1						1				4	**6**
Oils/sugar	1	1		2								2	**6**
Meat (beef)	1	1								1		2	**5**
Eggs				1				1				2	**4**
Vegetables		1		1								2	**4**
Vegetables (root)	1	1		1								1	**4**
Meat (lamb)		2										1	**3**
Shellfish				1					1			1	**3**
Shellfish				1								1	**2**
Vegetables				1								1	**2**
Rice												2	**2**
Fruit/nut				1									**1**
Total	**7**	**5**	**3**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**10**	**32**

[1] More than one vehicle/source was implicated in 16 foodborne outbreaks with 33 associated cases, therefore numbers may not sum to group totals.

[2] All enteric outbreaks with no identified pathogen were classified as gastroenteritis.

Setting where contaminated foods/beverages were prepared

The settings where foods and beverages were prepared were recorded in 81.7% (98/120) of foodborne outbreaks and 83.9% (653/778) of associated cases in 2013. The preparation settings most commonly associated with foodborne outbreaks included commercial food operators (58.3%, 70/120) and private homes (15.8%, 19/120) (Table 9). Foodborne outbreaks where the food was prepared in restaurants, cafés, or bakeries had the highest number of associated cases (32.9%, 256/778), followed by food prepared by caterers (16.1%, 125/778) and community/church/sport gatherings (15.6%, 121/778).

Table 9. Foodborne outbreaks and associated cases by setting of food preparation, 2013

Preparation setting	Outbreaks[1]		Cases[1]	
	Total	% of outbreaks (n=120)	Total	% of cases (n=778)
Commercial food operators	**70**	**58.3**	**467**	**60.0**
Restaurant/café/bakery	46	38.3	256	32.9
Takeaway	13	10.8	48	6.2
Caterers	5	4.2	125	16.1
Fast food restaurant	1	0.8	2	0.3
Other food outlet	6	5.0	42	5.4
Institutions	**5**	**4.2**	**53**	**6.8**
Long-term care facility	2	1.7	35	4.5
Camp	1	0.8	12	1.5
School	1	0.8	4	0.5
Other institution	1	0.8	2	0.3
Other	**31**	**25.8**	**243**	**31.2**
Private home	19	15.8	72	9.3
Overseas manufacturer	5	4.2	27	3.5
Farm	4	3.3	17	2.2
Community/church gathering	2	1.7	121	15.6
Commercial food manufacturer	2	1.7	8	1.0
Unknown preparation setting	**17**	**14.2**	**98**	**12.6**

[1] Two preparation settings were recorded in one foodborne outbreak with six associated cases, therefore numbers may not sum to group totals.

Contributing factors

The factors contributing to foodborne outbreaks most commonly involved time and temperature abuses (45.8%, 55/120) or contamination of food (40.8%, 49/120). The most common time and temperature abuses were improper storage prior to preparation (21.7%, 26/120), inadequate reheating of previously cooked food and undercooking (19.2%, 23/120 each) (Table 10). Contamination of food occurred via cross-contamination with other food (30.8%, 37/120) or via an infected food handler (20.0%, 24/120). Unsafe sources accounted for 20.8% (25/120) of the outbreaks, including 7.5% (9/120) that were associated with the consumption of raw food. The majority of contributing factors reported were suspected only.

Table 10. Foodborne outbreaks by contributing factor, 2013

Contributing factor	Outbreaks[1]				Cases[1]	
	Confirmed	Suspected	Total	% of foodborne outbreaks (n=120)	Total	% of foodborne cases (n=778)
Time/temperature abuse	**3**	**52**	**55**	**45.8**	**404**	**51.9**
Improper storage prior to preparation	3	23	26	21.7	257	33.0
Inadequate reheating of previously cooked food	1	22	23	19.2	245	31.5
Undercooking	0	23	23	19.2	108	13.9
Inadequate cooling or refrigeration	3	13	16	13.3	173	22.2
Improper hot holding	1	12	13	10.8	207	26.6
Preparation too far in advance	2	9	11	9.2	152	19.5
Inadequate thawing	0	3	3	2.5	7	0.9
Contamination of food	**1**	**48**	**49**	**40.8**	**306**	**39.3**
Cross contamination	0	37	37	30.8	182	23.4
Contamination from an infected food handler	1	23	24	20.0	204	26.2
Chemical contamination	0	2	2	1.7	4	0.5
Unsafe sources	**2**	**23**	**25**	**20.8**	**100**	**12.9**
Consumption of raw food	1	8	9	7.5	45	5.8
Consumption of unpasteurised milk	1	7	8	6.7	33	4.2
Use of untreated water in food preparation	0	7	7	5.8	26	3.3
Use of ingredients from unsafe sources	0	5	5	4.2	17	2.2
Other factors	**0**	**28**	**28**	**23.3**	**103**	**13.2**

[1] More than one contributing factor was recorded in 54 foodborne outbreaks with 395 associated cases, therefore numbers may not sum to group totals.

Person-to-person outbreaks

Causal agents

In 2013, there were 538 person-to-person outbreaks with 6521 associated cases. A causal agent was linked in 82.5% (444/538) of these outbreaks (Table 11). The most common causal agent was norovirus, which was recorded in 29.6% (159/538) of person-to-person outbreaks and involved 55.6% (3623/6521) of outbreak-associated cases. Other common pathogens included *Cryptosporidium* spp. (16.0%, 86/538) and *Giardia* spp. (12.3%, 66/538). Enteric viruses (astrovirus, hepatitis A, norovirus, rotavirus, and sapovirus) were implicated in 37.2% (200/538) of person-to-person outbreaks and enteric protozoa (*Giardia* spp. and *Cryptosporidium* spp.) were implicated in 27.7% (149/538) of outbreaks.

The most commonly identified pathogen in person-to-person outbreaks with 20 or more associated cases was norovirus, accounting for 75.5% (80/106) of these outbreaks. However, the largest person-to-person outbreak reported in 2013 was attributed to *Cryptosporidium* spp. The outbreak involved 100 cases and was spread by community person-to-person transmission throughout Hawke's Bay. The second largest outbreak was reported in Palmerston North and involved 96 cases. Both norovirus and rotavirus were identified in this outbreak, which occurred in a childcare centre.

Table 11. Person-to-person outbreaks and associated cases by pathogen or condition, 2013

Pathogen or condition	Outbreaks[1]				Cases	
	Primary mode	Secondary mode	Total	% of outbreaks (n=538)[2]	Total	% of cases (n=6521)[2]
Norovirus	142	17	159	29.6	3623	55.6
Cryptosporidium spp.	39	47	86	16.0	471	7.2
Giardia spp.	26	40	66	12.3	275	4.2
Rotavirus	27	1	28	5.2	546	8.4
Campylobacter spp.	9	18	27	5.0	110	1.7
Bordetella pertussis	16	4	20	3.7	60	0.9
VTEC/STEC infection	4	10	14	2.6	52	0.8
Salmonella spp.	5	7	12	2.2	79	1.2
Shigella spp.	6	3	9	1.7	26	0.4
Sapovirus	7	1	8	1.5	159	2.4
Influenza and influenza-like-illness[3]	7	0	7	1.3	66	1.0
Hepatitis A	5	0	5	0.9	54	0.8
Clostridium difficile	3	0	3	0.6	19	0.3
Salmonella Typhi	2	1	3	0.6	11	0.2
Mycobacterium leprae	3	0	3	0.6	9	0.1
Mycobacterium tuberculosis	2	0	2	0.4	18	0.3
Astrovirus	2	0	2	0.4	17	0.3
Yersinia spp.	1	1	2	0.4	11	0.2
Clostridium perfringens	0	1	1	0.2	43	0.7
Mycoplasma pneumoniae	1	0	1	0.2	18	0.3
Pathogen not identified[4]	80	14	94	17.5	1136	17.4

[1] Includes outbreaks where person-to-person transmission was either the primary or secondary mode of transmission reported.

[2] Two agents were reported in 16 person-to-person outbreaks with 325 cases, therefore totals add to more than 100%.

[3] Includes outbreaks of influenza A (2 outbreaks with 5 cases), influenza B (4 outbreaks, 32 cases), and influenza B/rhinovirus (1 outbreak, 29 cases).

[4] All enteric outbreaks with no identified pathogen were recorded as gastroenteritis.

Contributing factors

Exposure to infected people was the primary contributing factor for 98.3% (529/538 outbreaks) of person-to-person outbreaks reported in 2013. Other contributing factors reported included poor hygiene (39.2%, 211/538), a compromised immune system (3.7%, 20/538), inadequate vaccination cover (3.0%, 16/538), excessively crowded living conditions (2.2%, 12/538) and inadequate vaccination effectiveness (0.4%, 2/538).

Waterborne outbreaks

Causal agents

There were 62 waterborne outbreaks with 227 associated cases in 2013, 95.2% (59/62 outbreaks) of which were linked to a specific pathogen (Table 12). The most commonly reported waterborne pathogens were *Giardia* spp. (41.9%, 26/62 outbreaks) and *Cryptosporidium* spp. (33.9%, 21/62 outbreaks), followed by *Campylobacter* spp. (16.1%, 10/62). Enteric protozoa (*Giardia* spp. and *Cryptosporidium* spp.) were implicated in 74.2%, (46/62) of waterborne outbreaks and enteric bacteria (*Campylobacter* spp., *Salmonella* spp. and VTEC/STEC infection) were implicated in 25.8% (16/62) of waterborne outbreaks. Both *Giardia* spp. and *Cryptosporidium* spp. were implicated in 1 outbreak involving two cases. Also *Campylobacter* spp and VTEC were implicated in one outbreak involving two cases.

Table 12. Waterborne outbreaks and associated cases by pathogen, 2013

Pathogen or condition	Outbreaks[1]				Cases	
	Primary mode	Secondary mode	Total	% of outbreaks (n=62)[2]	Total	% of cases (n=227)[2]
Giardia spp.	17	9	26	41.9	100	44.1
Cryptosporidium spp.	11	10	21	33.9	66	29.1
Campylobacter spp.	4	6	10	16.1	31	13.7
VTEC/STEC infection	4	2	6	9.7	23	10.1
Salmonella spp.	1	0	1	1.6	4	1.8
Pathogen not identified[3]	2	1	3	4.8	23	10.1

[1] Includes outbreaks where waterborne transmission was either the primary or secondary mode of transmission reported.

[2] Two agents were reported in five waterborne outbreaks involving 20 cases, therefore totals add to more than 100%.

[3] All enteric outbreaks with no identified pathogen were recorded as gastroenteritis.

Contributing factors

The most common contributing factor linked to waterborne outbreaks was untreated water (77.4%, 48/62 outbreaks) followed by an inadequately treated water supply (40.3%, 25/62) (Table 13). Most of the contributing factors associated with waterborne outbreaks were reported as suspected only (91.7%, 77/84).

Table 13. Waterborne outbreaks by contributing factor, 2013

Contributing factor	Outbreaks				Cases	
	Confirmed	Suspected	Total	% of outbreaks (n=62)[1]	Total	% of cases (n=227)[1]
Untreated drinking-water supply[2]	3	45	48	77.4	17	78.0
Inadequately treated water supply	3	22	25	40.3	99	43.6
Recent or on-going treatment process failure	1	4	5	8.1	23	10.1
Source water quality inferior to normal	0	4	4	6.5	15	6.6
Other sources of post treatment contamination	0	2	2	3.2	8	3.5

[1] 17 outbreaks involving 73 cases had two or more contributing factors, therefore totals add to more than 100%.

[2] Includes surface water with no treatment, roof-collected rainwater with no treatment, groundwater not assessed as secure and no treatment.

Note: No outbreaks with contamination of post-treatment water storage were reported in 2013.

Environmental outbreaks

Causal agents

There were 136 environmental outbreaks with 1676 associated cases reported in 2013, of which 87.5% (119/136) were linked to a specific causal agent (Table 14). The most common causal agent identified in environmental outbreaks was *Cryptosporidium* spp., (30.1%, 41/136) followed by norovirus (28.7%, 39/136), although environmental transmission was the secondary mode reported in the majority (87.2%, 34/39) of the norovirus outbreaks. Norovirus also accounted for the highest proportion of associated cases (57.7%, 967/1676). *Cryptosporidium* spp. was responsible for the highest number of outbreaks (70.7%, 29/41) where environmental transmission was the primary mode reported followed by *Giardia* spp. (60.0%, 15/25). Enteric protozoa (*Giardia* spp. and *Cryptosporidium* spp.) were implicated in 46.3% (63/136) of the environmental outbreaks and enteric viruses (hepatitis A, norovirus and rotavirus) were implicated in 32.4% (44/136) of the environmental outbreaks.

Table 14. Environmental outbreaks and associated cases by pathogen or condition, 2013

Pathogen or condition	Outbreaks[1]				Cases	
	Primary mode	Secondary mode	Total	% of outbreaks (n=136)[2]	Total	% of cases (n=1676)[2]
Cryptosporidium spp.	29	12	41	30.1	298	17.8
Norovirus	5	34	39	28.7	967	57.7
Giardia spp.	15	10	25	18.4	121	7.2
Campylobacter spp.	3	5	8	5.9	32	1.9
Rotavirus	0	6	6	4.4	221	13.2
VTEC/STEC infection	0	3	3	2.2	8	0.5
Hepatitis A	0	1	1	0.7	12	0.7
Shigella spp.	0	1	1	0.7	3	0.2
Legionella pneumophila	1	0	1	0.7	2	0.1
Pathogen not identified[3]	1	16	17	12.5	225	13.4

[1] Includes outbreaks where environmental transmission was either the primary or secondary mode of transmission reported.

[2] Two agents were reported in six environmental outbreaks involving 213 cases, therefore totals add to more than 100%.

[3] All enteric outbreaks with no identified pathogen were recorded as gastroenteritis.

Contributing factors

The major contributing factors to environmental outbreaks were exposure to contaminated environment(s)* (63.2%, 86/136), exposure to contaminated swimming/spa pool (23.5%, 32/136), exposure to other recreational waters (16.9%, 23/136) and exposure to infected animals (13.2%, 18/136). At least one contributing factor was recorded for all of the outbreaks.

Zoonotic outbreaks

Causal agents

There were 69 zoonotic outbreaks with 314 associated cases in 2013, 98.6% (68/69) of which were linked to a specific pathogen (Table 15). *Cryptosporidium* spp. was the most commonly identified pathogen and was linked to 37.7% (26/69) of zoonotic outbreaks and 47.5% (149/314) of the associated cases. Enteric protozoa (*Cryptosporidium* spp. and *Giardia* spp.) were implicated in 65.2% (45/69) of the zoonotic outbreaks and enteric bacteria (*Campylobacter* spp., *Salmonella* spp. and VTEC/STEC infection) were implicated in 37.7% (26/69) of the zoonotic outbreaks.

Table 15. Zoonotic outbreaks and associated cases by pathogen or condition, 2013

Pathogen or condition	Outbreaks[1]				Cases	
	Primary mode	Secondary mode	Total	% of outbreaks (n=69)[2]	Total	% of cases (n=314)[2]
Cryptosporidium spp.	10	16	26	37.7	149	47.5
Giardia spp.	9	12	21	30.4	101	32.2
Campylobacter spp.	8	10	18	26.1	71	22.6
VTEC/STEC infection	5	1	6	8.7	22	7.0
Salmonella spp.	2	2	4	5.8	27	8.6
Yersinia spp.	1	0	1	1.4	8	2.5
Pathogen not identified[3]	0	1	1	1.4	4	1.3

[1] Includes outbreaks where zoonotic transmission was either the primary or secondary mode of transmission reported.
[2] Two agents were reported in eight zoonotic outbreaks involving 68 cases, therefore totals add to more than 100%.
[3] All enteric outbreaks with no identified pathogen were recorded as gastroenteritis.

Contributing factors

Almost all (92.8%, 64/69) zoonotic outbreaks recorded direct exposure to infected animals as a contributing factor. Multiple settings were identified in 16 outbreaks. The most common setting for a zoonotic outbreak was a private home (69.6%, 48/69 outbreaks), although 12 of these identified another setting as well. The second most common setting for zoonotic outbreaks was farms (27.5%, 19/69 outbreaks) and nine of these also identified another setting.

* Includes exposure to contaminated land , air (including ventilation) and built environments (including dwellings).

Outbreaks with overseas transmission

In 2013, 16 outbreaks with overseas transmission were reported involving 104 cases. Travel to Fiji was associated with the most outbreaks (25.0%, 4 outbreaks), followed by Samoa (3 outbreaks), Indonesia and Rarotonga (2 outbreaks each). All other overseas exposure locations listed in Table 16 were associated with a single outbreak each. The majority of cases associated with overseas transmission were infected with norovirus (26.9%, 28/104 cases), followed by *Giardia* spp. and *Shigella* spp. (16.3%, 17/104 cases).

Table 16. Outbreaks with overseas transmission by exposure location and pathogen, 2013

Destination	Pathogen or condition[1]									
	Cryptosporidium spp.	*Giardia* spp.	Hepatitis A	Measles virus	Norovirus	*Salmonella* spp.	*Salmonella* Paratyphi[1]	*Salmonella* Typhi	*Shigella* spp.[1]	Total
Australia				1						1
Fiji	3	1								4
India		1								1
Indonesia		1				1				2
Pakistan		1								1
Rarotonga		1			1					2
Samoa			1					1	1	3
United Kingdom					1					1
Viet Nam							1		1	1
Total outbreaks	**3**	**5**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**16**
Total cases	**8**	**17**	**12**	**14**	**28**	**2**	**14**	**6**	**17**	**104**

[1] Two agents were reported in one outbreak with 14 cases, therefore numbers might not add to the totals.

Outbreak recognition, investigation and control

Timeliness of reporting

For the 97.5% (636/652) of outbreaks where the timeliness of reporting data was available, just under half (45.3%, 288/636) were reported to a PHU within a week of the onset of illness in the first case. A further 37.6% (239/636) of outbreaks were reported from 7 to 30 days (inclusive) after the onset of illness in the first case.

Reporting delay (the time between the date of onset of illness in the first case and the date of reporting) varied among the different modes of transmission (Table 17). The shortest median reporting delay (4.0 days) was associated with foodborne outbreaks, followed by person-to-person (10.0 days), environmental outbreaks (14.0 days) and zoonotic outbreaks (20.0 days).

Table 17. Median reporting delay by outbreak type, 2013

Outbreak type	No. of outbreaks[1,2]	Median reporting delay (days)
Person-to-person	523	10.0
Environmental	136	14.0
Foodborne	120	4.0
Zoonotic	68	20.0
Waterborne	62	21.5
Other mode	20	12.5
Total	**636**	**9.0**

[1] More than one mode of transmission was recorded for some outbreaks therefore numbers do not sum to the group total.
[2] Outbreaks were excluded if the date of onset of illness in the first case was missing.

Recognition of outbreaks

In 2013, 43.1% (281/652) of outbreaks were identified through an increase in disease incidence and 25.6% (167/652) by cases having person-to-person contact with other cases (Table 18). Other frequent means of outbreak recognition included cases attending a common event (13.0%, 85/652) or being linked to a common source (10.9%, 71/652).

Table 18. Outbreaks by means of recognition, 2013

Means of recognition	No. of outbreaks	% of total outbreaks (n=652)
Increase in disease incidence	281	43.1
Cases had person to person contact with other case(s)	167	25.6
Cases attended common event	85	13.0
Cases linked to common source (eg, food, water, environmental site)	71	10.9
Common organism type/strain characteristics between cases	15	2.3
Other means	33	5.1

Control measures

The outbreak control measures undertaken were reported in 90.6% (591/652) of outbreaks in 2013. The most common measures were health education and advice regarding the source (83.2%, 492/591) and cleaning and disinfection (62.3%, 368/591) (Table 19). No control measures were taken in 10.3% (61/591) of outbreaks.

Table 19. Outbreaks by control measures undertaken, 2013

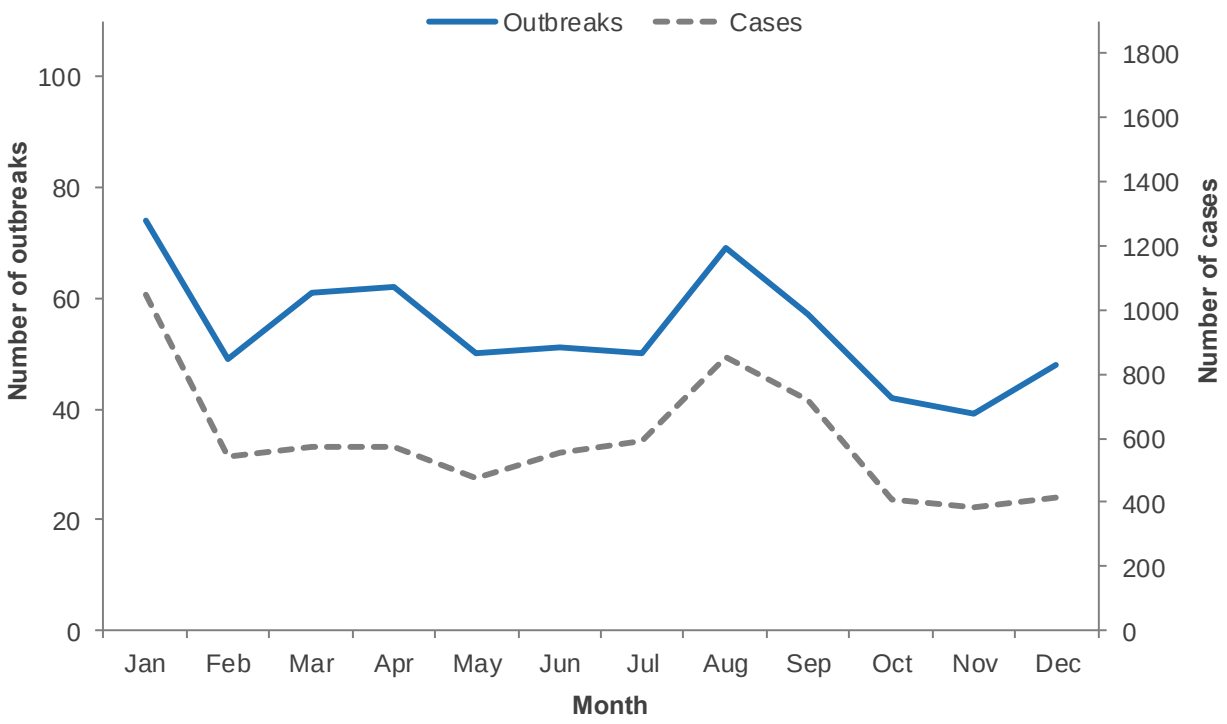
Outbreak control measure	No. of outbreaks[1]	% of total outbreaks (n=591)
Source	**572**	**96.8**
Health education and advice	492	83.2
Cleaning, disinfection	368	62.3
Exclusion	331	56.0
Isolation	223	37.7
Modification of procedures	153	25.9
Health warning	149	25.2
Closure	102	17.3
Treatment	72	12.2
Removal	22	3.7
Contacts and potential contacts	**146**	**24.7**
Health education and advice	144	24.4
Vaccination	6	1.0
Chemoprophylaxis	5	0.8
Vehicle and vector	**10**	**1.7**
Removal	6	1.0
Treatment	5	0.8
Other control measures	**89**	**15.1**
No control measures	**61**	**10.3**

[1] More than one control measure was recorded for some outbreaks, therefore numbers may not sum to group totals.

Summary of trends

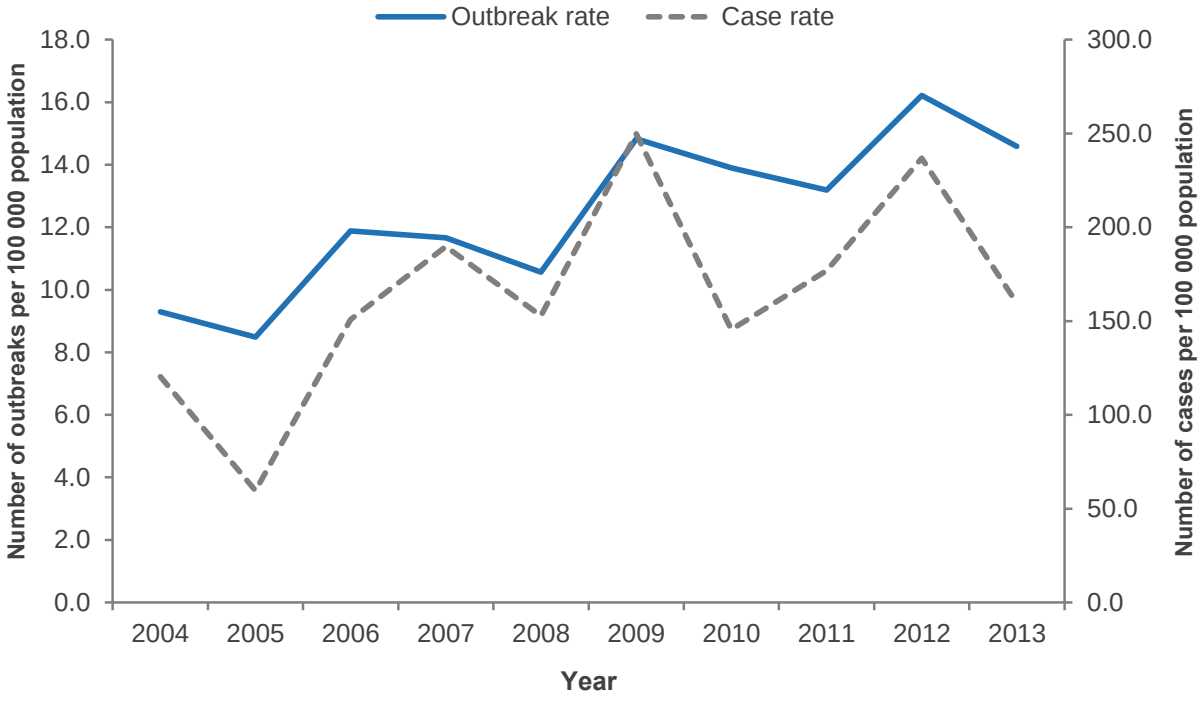
In 2013, the highest number of outbreaks and outbreak-related cases was reported in January (74 outbreaks, 1048 cases). The monthly number of outbreaks (range: 39–62) was more or less stable for the remainder of the year apart from another peak in August (69 outbreaks, 851 cases) (Figure 5). The January peak was largely driven by an increase in norovirus outbreaks (41 outbreaks, 890 cases), while outbreaks of gastroenteritis (no pathogen identified) and norovirus (combined a total of 31 outbreaks, 539 cases) were most commonly reported in the August peak.

Figure 5. Number of outbreaks and associated cases by month, 2013



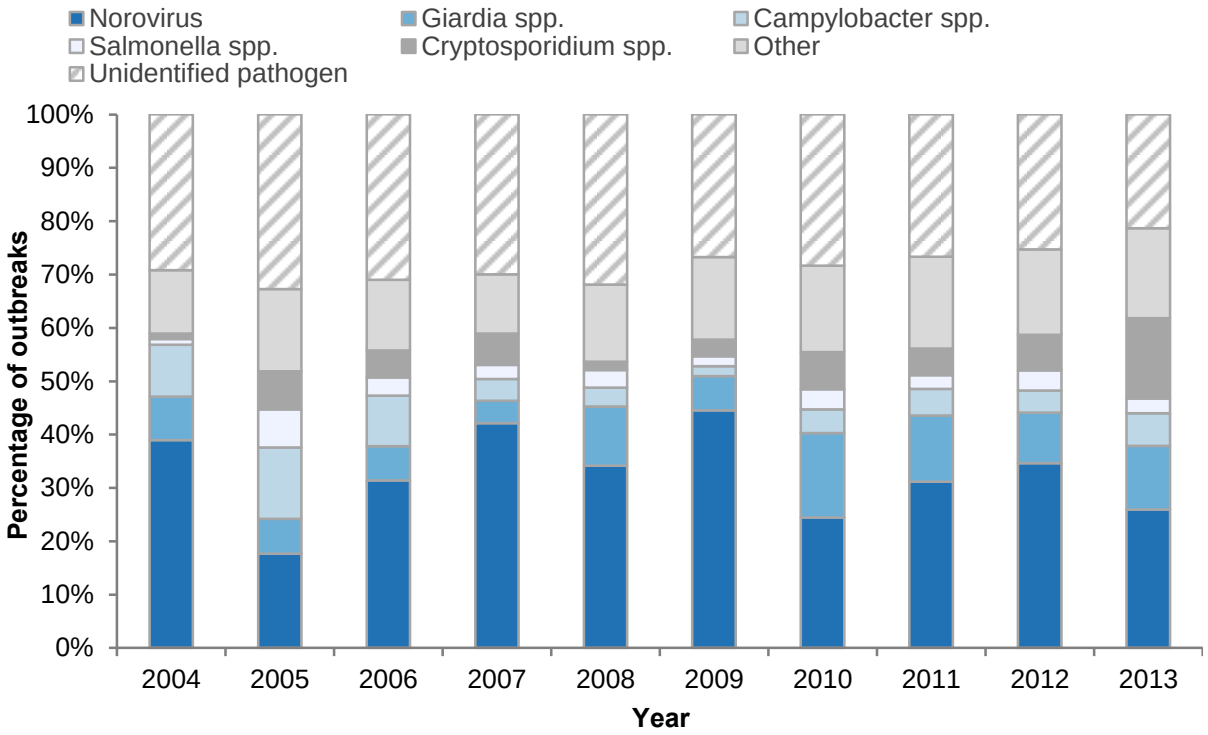
Since 2005, both the outbreak rate and the case rate have tracked upwards. The national annual outbreak rate for 2013 (14.6 outbreaks per 100 000 population) has decreased slightly from the rate in 2012 (16.2 outbreaks per 100 000) which was the highest annual rate reported since recording began in 2001 (Figure 6). In 2012 the highest number of outbreaks and associated cases (106 outbreaks, 1818 cases) was reported in November. There were 50 outbreaks and 838 associated cases reported in December. The 2009 outbreak case rate remains the highest annual outbreak case rate (249.8 per 100 000 population).

Figure 6. Outbreak rates and associated cases by year, 2004–2013



Since 2001, the number of outbreaks linked to an identified causal agent has remained close to 70% (range 66.3–78.7%). In 2013, 78.7% (513/652) of outbreaks were linked to an identified pathogen or condition. Since 2004, the causal agent associated with the greatest number of outbreaks and outbreak cases has been norovirus, although the number and percentage of norovirus outbreaks and cases has varied considerably from year to year. In 2013, 169 norovirus outbreaks were reported with 3685 associated cases. This figure is lower than the number observed in 2012 (249 outbreaks and 6097 cases) and in 2009 (285 outbreaks and 7429 cases) when numbers peaked, but is the fifth highest number of outbreaks and cases recorded since reporting began in 2001 (Figure 7). The number of reported rotavirus outbreaks increased from 23 in 2012 (360 cases) to 28 in 2013 (546 cases).

Figure 7. Percentage of outbreaks by pathogen or condition and year, 2004–2013



The number of outbreaks due to *Cryptosporidium* spp. has increased steadily from seven outbreaks in 2008 to 98 in 2013. This is the highest number reported since reporting began in 2001. The most common modes of transmission (primary and secondary) reported for *Cryptosporidium* spp. outbreaks in 2013 were person-to-person (86 outbreaks, 471 cases) and environmental transmission (41 outbreaks, 298 cases). Of the environmental outbreaks, 25 (61.0%) were associated with exposure to a suspected contaminated swimming pool or spa pool.

The number of outbreaks due to *Giardia* spp. has increased since 2007 (21 outbreaks, 111 cases). It peaked in 2010 (97 outbreaks, 378 cases) and decreased to 78 outbreaks and 333 cases in 2013.

The number of outbreaks and associated cases linked to *Campylobacter* spp. has increased steadily since 2009 (12 outbreaks, 65 cases vs. 40 outbreaks, 170 cases in 2013). The highest number of outbreaks and cases associated with campylobacteriosis was reported in 2001 (56 outbreaks, 301 cases). The number of outbreaks and associated cases reported annually due to *Campylobacter* spp. decreased by more than half from 2006 to 2007 (47 outbreaks, 223 cases vs. 20 outbreaks 54 cases), this was most likely due to interventions put in place in New Zealand to reduce the incidence of poultry associated foodborne campylobacteriosis in 2006 [5]. *Campylobacter* has consistently remained one of the five most commonly reported causal agents for outbreaks since 2001.

Clostridium difficile emerged as an outbreak pathogen in 2010 when one outbreak involving two cases was reported. This number increased in 2012 when six outbreaks with 107 associated cases were reported. In 2013, there were three outbreaks with 19 associated cases, although norovirus was also identified in one of the outbreaks involving 13 cases. Person-to-person transmission was the primary mode reported in all three outbreaks. The exposure settings identified were acute-care hospital, long-term care facility and a private home (1 outbreak each).

In 2013, the most common outbreak settings were long-term care facilities and private homes, which is similar to observations from 2006 to 2012. Since 2006, outbreaks in institutions have constituted about half and those in private homes about a quarter to a third of all outbreaks reported annually. Prior to this period, commercial food operators and private homes were the most commonly reported settings.

In the last 10 years, outbreaks involving person-to-person transmission have become the most frequently reported mode of transmission. This is a change from foodborne transmission, which was often the most frequent mode between 2001 and 2006. The proportion of foodborne outbreaks reported in 2013 (18.4%, 120/652) is more or less the same as what has been reported annually since 2007 (range: 13.2%–23.3%). The proportion of outbreaks with person-to-person transmission reported has increased considerably from the 2001–2003 period (20.2%–33.9%) to the 2009–2013 period (73.6%–84.6%). In 2013, the number of outbreaks with person-to-person transmission was more than four times higher than any other mode of transmission. Also, outbreaks attributed to environmental transmission (20.9%, 136/652) became the second most common mode of transmission in 2013, surpassing the proportion of those attributed to foodborne transmission for the first time since 2009.

Since 2001, poultry has been one of the most commonly implicated food sources reported in foodborne outbreaks. The proportion of outbreaks attributed to poultry has increased from 15.2% in 2011 to 31.3% in 2013. However, in 2012 and 2013 outbreaks implicating dairy represented the largest proportion of foodborne outbreaks where a source was reported (40.6% and 26.7% in 2013 and 2012 respectively). It is important to note that very few outbreaks have a suspected source confirmed by epidemiological or laboratory methods and in 2013, only 26.7% (32/120) of the foodborne outbreaks recorded that a source had been identified. In some outbreaks multiple sources can be implicated.

In 2013, 16 outbreaks involving 104 cases had identified overseas transmission. This is similar to the annual number of outbreaks with overseas transmission reported since 2010 (range: 15–24 outbreaks), although a larger number of associated cases were reported in 2012 (443 cases). In 2013, travel in Fiji (4 outbreaks) and Samoa (3 outbreaks) were the most commonly reported countries of exposure. Between 2006 and 2010, the annual number of outbreaks with overseas transmission reported ranged from 5 to 15, with the total number of outbreak associated cases ranging from 30 to 289. No country was associated with more than two outbreaks during this period.

The median delay between the date of onset of illness in the first case and the outbreak report date in 2013 was 9.0 days, which is longer than the delay reported between 2008 and 2012 (range 4.0–7.5 days). This increase is most likely due to the leprosy outbreaks. There were three reported in 2013 (2 with first and last dates). The reporting delay for these was 683 and 928 days respectively. The median delay for person-to-person outbreaks increased from 7.0 in 2012 to 10.0 in 2013.

Health education and advice related to the outbreak source has been the most common control measure used since 2001 and was provided in 83.2% (492/591) of the outbreaks with a control measure reported in 2013. Between 2007 and 2013, cleaning and disinfection was the second most common control measure reported, a change from modification of procedures pertaining to the source, which was the second most common control measure undertaken between 2001 and 2006. The proportion of outbreaks where it was reported that no control measures were being undertaken decreased from 27.8% (108/389) in 2001 to 10.3% (61/591) of outbreaks in 2013.

GLOSSARY

GLOSSARY

Common event outbreak

An outbreak due to the exposure of a group of persons to a noxious influence that is common to the individuals in the group, where the exposure is brief and essentially simultaneous and all resultant cases develop within one incubation period of the disease. Cases therefore have exposures that are grouped in place and time (synonymous with point source outbreak).

Common site outbreak

An outbreak due to the exposure of a group of persons to a noxious influence that is common to the individuals in the group, where exposures have occurred at the same place (or site) but over a longer time period than those of common event outbreaks (i.e. grouped in place but not in time).

Common source outbreak

An outbreak due to the exposure of a group of persons in the community to a noxious influence that is common to the individuals in the group. These outbreaks are subcategorised into common event (where exposures are grouped in time and place), dispersed common source (grouped in time but not in place) and common site (grouped in place but not in time).

Community-wide outbreak

An outbreak that occurs among individuals in a community where transmission predominantly occurs by direct exposure of susceptible people to infectious people (synonymous with person-to-person outbreak).

Contamination

The presence of a disease-causing agent on a body surface, in clothes, bedding, toys or other inanimate articles or substances, including water and food.

Dispersed common source outbreak

Outbreak due to the exposure of a group of persons in the community to a noxious influence that is common to the individuals in the group, where the exposures are not grouped in place (and may or may not be grouped in time). These outbreaks are often due to a distributed vehicle of infection transmission, such as a commercially prepared food item or a water supply.

EpiSurv

The national notifiable disease surveillance system managed by ESR to record data on notifiable diseases and outbreaks reported by public health units.

ESR

Institute of Environmental Science and Research Limited.

Environment

All factors that are external to the individual human host.

Exposure

Proximity and/or contact with a potential source of a disease agent in such a manner that effective transmission of the agent and harmful or protective effects of the agent may occur.

Household outbreak

An outbreak confined to members of a single household.

Institutional outbreak

An outbreak confined to the population of a specific residential or other institutional setting, such as a hospital, long-term care facility, prison, childcare centre or school.

Outbreak

Two or more cases of a specific disease or health-related condition linked to a common source, in particular, where the common source is exposure at a common event, or food or water dispersed in a community, an environmental source or a source in an institutional setting; OR a community-wide or person-to-person outbreak; OR any other situation where the outbreak investigation or control measures are being used or considered.

Source (of illness)

The person, animal, object or substance from which a disease agent passes to a host.

Transmission of illness

Any mechanism by which a disease agent is spread through the environment or to another person. Mechanisms are defined as either direct or indirect.

Vehicle

An inanimate intermediate in the indirect transmission of a pathogen from a reservoir or infected host to a susceptible host; vehicles include foods, clothing, instruments.

REFERENCES

REFERENCES

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APPENDIX

APPENDIX

Outbreak Report Form (version: 2 October 2010)

OUTBREAK REPORT FORM

Outbreak Summary **Outbreak No.** _____

Reporting Authority

Officer responsible for investigation _____ **Date outbreak reported** _____

○ **Interim report** ○ **Final report - date finalised** _____ ○ **Not an outbreak**

Name of outbreak (optional) _____

Condition and Implicated Contaminant

Implicated contaminant (pathogen) _____ ☐ **Unknown**

subtype _____

Condition (disease) _____ **Other, specify** _____

Other known condition/implicated pathogen ○ Yes ○ No

Implicated contaminant (pathogen) _____ ☐ **Unknown**

subtype _____

Condition (disease) _____ **Other, specify** _____

CASE DEFINITION(S)

Laboratory confirmed case

_____

Clinically confirmed case

_____

Probable case

_____

Outbreak Demographics

Number of people exposed _____ ○ Actual ○ Approx ☐ Unknown

Number of cases (as per case defn above)

	Lab confirmed	_____	Number Hospitalised	_____
	Clinically confirmed	_____	Number Died	_____
	Probable	_____		
	Total	_____		
Outbreak dates	Onset of illness in first case	_____		
	Onset of illness in last case	_____	or ☐ Outbreak ongoing	
Age of cases	Number for which age recorded	_____		
	Median age (years)	_____	Range (years)	_____
Sex of cases	Number of males	_____	Number of females	_____
Incubation period	Median _____ ○ days ○ hrs		Range _____ ○ days ○ hrs	
Duration of illness	Median _____ ○ days ○ hrs		Range _____ ○ days ○ hrs	

Outbreak Summary **Outbreak No.**

Circumstances of Exposure/Transmission

How was the outbreak first recognised?

- Increase in disease incidence
- Cases had person to person contact with other cases(s)
- Cases attended common event
- Common organism type/strain characteristics between cases
- Cases linked to common source (eg food, water, environmental site)
- Other means (specify) _____

Were these cases part of a well-defined exposed group (eg Common event, institutional, environmental, household) Yes No Unknown

If yes, date of exposure _____ If exposure >1 day, date exposure ended _____

Description of exposure event _____

First setting where exposure occurred Setting unknown ☐

Food premises	**Institution**	**Workplace/Community/Other**
Restaurant/café/bakery	Hostel/boarding house	Workplace
Takeaway	Hotel/motel	Farm
Supermarket/delicatessen	Long term care facility	Petting zoo
Temporary or mobile service	Hospital (acute care)	Home
Fast food restaurant	Prison	Community, church, sports gathering
Caterers	Camp	Cruise ship, airline, tour bus, train
Other food outlet	School Childcare centre	Other setting
	Marae	
	Other institution	

Setting name _____

Setting Address Number _____ Street _____ Suburb _____

Town/City _____ Post Code _____ ☐ GeoCode ____

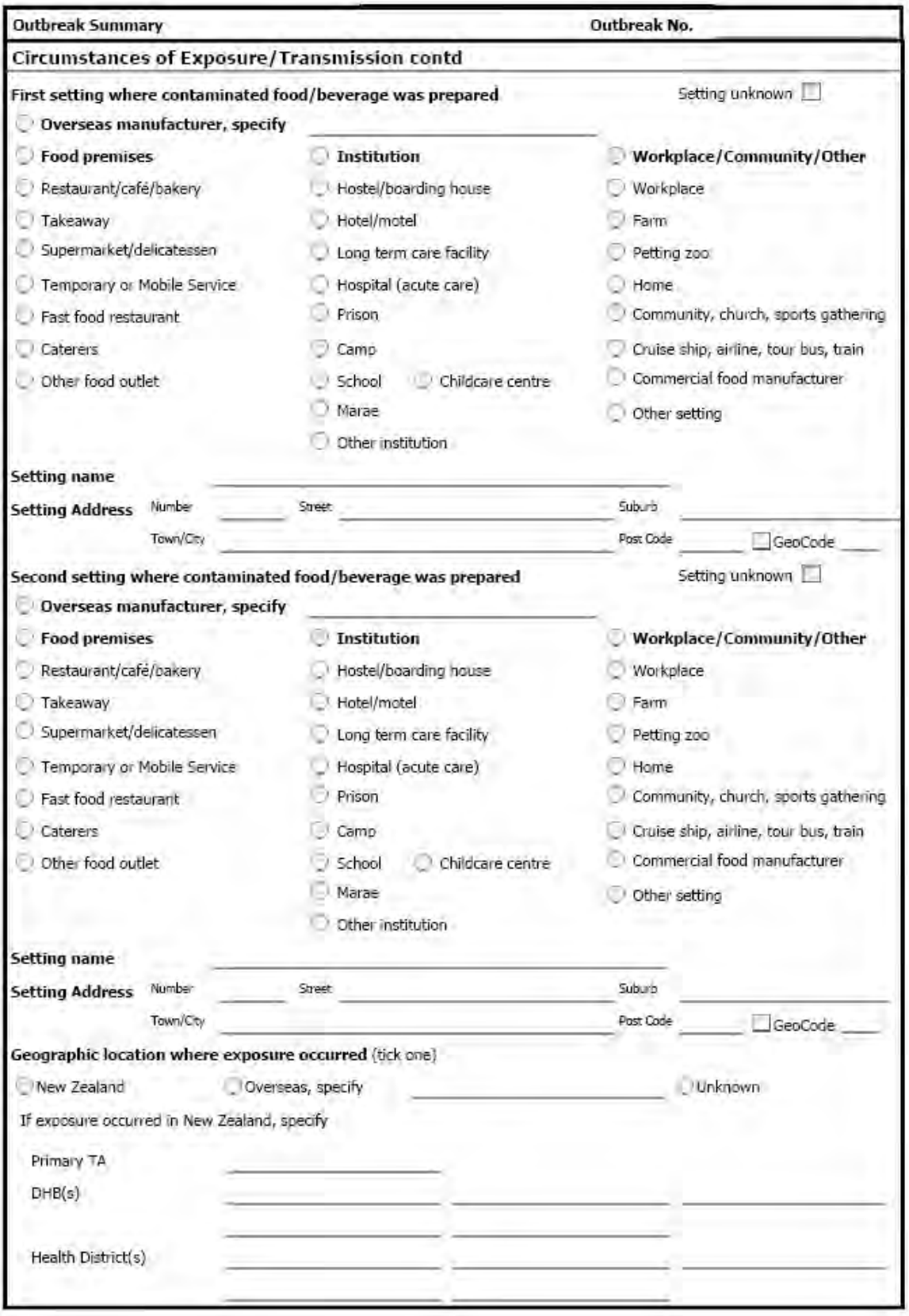
Second setting where exposure occurred Setting unknown ☐

Food premises	**Institution**	**Workplace/Community/Other**
Restaurant/café/bakery	Hostel/boarding house	Workplace
Takeaway	Hotel/motel	Farm
Supermarket/delicatessen	Long term care facility	Petting zoo
Temporary or Mobile Service	Hospital (acute care)	Home
Fast food restaurant	Prison	Community, church, sports gathering
Caterers	Camp	Cruise ship, airline, tour bus, train
Other food outlet	School Childcare centre	Other setting
	Marae	
	Other institution	

Setting name _____

Setting Address Number _____ Street _____ Suburb _____

Town/City _____ Post Code _____ ☐ GeoCode



Outbreak Summary **Outbreak No.**

Circumstances of Exposure/Transmission contd

First setting where contaminated food/beverage was prepared Setting unknown ☐

- ○ **Overseas manufacturer, specify** _____

Food premises	**Institution**	**Workplace/Community/Other**
○ Restaurant/café/bakery	○ Hostel/boarding house	○ Workplace
○ Takeaway	○ Hotel/motel	○ Farm
○ Supermarket/delicatessen	○ Long term care facility	○ Petting zoo
○ Temporary or Mobile Service	○ Hospital (acute care)	○ Home
○ Fast food restaurant	○ Prison	○ Community, church, sports gathering
○ Caterers	○ Camp	○ Cruise ship, airline, tour bus, train
○ Other food outlet	○ School ○ Childcare centre	○ Commercial food manufacturer
	○ Marae	○ Other setting
	○ Other institution	

Setting name _____

Setting Address Number _____ Street _____ Suburb _____

Town/City _____ Post Code _____ ☐ GeoCode ____

Second setting where contaminated food/beverage was prepared Setting unknown ☐

- ○ **Overseas manufacturer, specify** _____

Food premises	**Institution**	**Workplace/Community/Other**
○ Restaurant/café/bakery	○ Hostel/boarding house	○ Workplace
○ Takeaway	○ Hotel/motel	○ Farm
○ Supermarket/delicatessen	○ Long term care facility	○ Petting zoo
○ Temporary or Mobile Service	○ Hospital (acute care)	○ Home
○ Fast food restaurant	○ Prison	○ Community, church, sports gathering
○ Caterers	○ Camp	○ Cruise ship, airline, tour bus, train
○ Other food outlet	○ School ○ Childcare centre	○ Commercial food manufacturer
	○ Marae	○ Other setting
	○ Other institution	

Setting name _____

Setting Address Number _____ Street _____ Suburb _____

Town/City _____ Post Code _____ ☐ GeoCode ____

Geographic location where exposure occurred (tick one)

○ New Zealand ○ Overseas, specify _____ ○ Unknown

If exposure occurred in New Zealand, specify

Primary TA _____

DHB(s) _____ _____ _____

_____ _____

Health District(s) _____ _____ _____

_____ _____

Outbreak Summary **Outbreak No.** _____

Circumstances of Exposure/Transmission contd

Mode of transmission (indicate the primary mode and all secondary modes)

☐ Foodborne, from consumption of contaminated food or drink (excluding water)
Mode ○ primary ○ secondary Level of evidence ○ 1 ○ 2a ○ 2b ○ 3a ○ 3b ○ 3c ○ 4

☐ Waterborne, from consumption of contaminated drinking water
Mode ○ primary ○ secondary Level of evidence ○ 1 ○ 2a ○ 2b ○ 3a ○ 3b ○ 3c ○ 4

☐ Person to person spread, from (non-sexual) contact with an infected person (including droplets)
Mode ○ primary ○ secondary Level of evidence ○ 1 ○ 2a ○ 2b ○ 3a ○ 3b ○ 3c ○ 4

☐ Sexual, from sexual contact with an infected person
Mode ○ primary ○ secondary Level of evidence ○ 1 ○ 2a ○ 2b ○ 3a ○ 3b ○ 3c ○ 4

☐ Parenteral, from needle stick injury or reuse of contaminated injection equipment
Mode ○ primary ○ secondary Level of evidence ○ 1 ○ 2a ○ 2b ○ 3a ○ 3b ○ 3c ○ 4

☐ Environmental, from contact with an environmental source (eg swimming)
Mode ○ primary ○ secondary Level of evidence ○ 1 ○ 2a ○ 2b ○ 3a ○ 3b ○ 3c ○ 4

☐ Zoonotic, from contact with an infected animal
Mode ○ primary ○ secondary Level of evidence ○ 1 ○ 2a ○ 2b ○ 3a ○ 3b ○ 3c ○ 4

☐ Vectorborne, from contact with an insect vector
Mode ○ primary ○ secondary Level of evidence ○ 1 ○ 2a ○ 2b ○ 3a ○ 3b ○ 3c ○ 4

☐ Other mode of transmission (specify) _____
Mode ○ primary ○ secondary Level of evidence ○ 1 ○ 2a ○ 2b ○ 3a ○ 3b ○ 3c ○ 4

Mode of transmission unknown ☐

Vehicle/source of common source outbreak

Was a specific contaminated food, water or environmental vehicle/source identified? ○ Yes ○ No ○ Unknown

If yes,

Source 1 _____
Level of evidence ○ 1 ○ 2a ○ 2b ○ 3a ○ 3b ○ 3c ○ 4
Food category _____ ESR Updated ☐ Date _____

Source 2 _____
Level of evidence ○ 1 ○ 2a ○ 2b ○ 3a ○ 3b ○ 3c ○ 4
Food category _____ ESR Updated ☐ Date _____

Source 3 _____
Level of evidence ○ 1 ○ 2a ○ 2b ○ 3a ○ 3b ○ 3c ○ 4
Food category _____ ESR Updated ☐ Date _____

Outbreak Summary	Outbreak No.	
Factors Contributing to Outbreak		
Foodborne outbreak (tick all that apply)		
☐ Inadequate reheating of previously cooked food	◯ Confirmed	◯ Suspected
☐ Improper storage prior to presentation	◯ Confirmed	◯ Suspected
☐ Inadequate thawing	◯ Confirmed	◯ Suspected
☐ Preparation too far in advance	◯ Confirmed	◯ Suspected
☐ Undercooking	◯ Confirmed	◯ Suspected
☐ Improper hot holding	◯ Confirmed	◯ Suspected
☐ Inadequate or slow cooling or refrigeration	◯ Confirmed	◯ Suspected
☐ Cross contamination due to improper handing or storage	◯ Confirmed	◯ Suspected
☐ Cross contamination from an infected food handler	◯ Confirmed	◯ Suspected
☐ Chemical contamination	◯ Confirmed	◯ Suspected
☐ Use of ingredient from an unsafe source	◯ Confirmed	◯ Suspected
☐ Use of untreated water in food preparation	◯ Confirmed	◯ Suspected
☐ Consumption of unpasteurised milk	◯ Confirmed	◯ Suspected
☐ Consumption of raw food	◯ Confirmed	◯ Suspected
☐ Other factors, specify _____	◯ Confirmed	◯ Suspected
Waterborne outbreak (tick all that apply)	(Pre latest form revision: ☐ Untreated water supply)	
☐ Surface water with no treatment	◯ Confirmed	◯ Suspected
☐ Roof collected rainwater with no treatment	◯ Confirmed	◯ Suspected
☐ Groundwater not assessed as secure and with no treatment	◯ Confirmed	◯ Suspected
☐ Source water quality inferior to normal,	◯ Confirmed	◯ Suspected
If source water quality inferior to normal, specify _____		
☐ Inadequately treated water supply	◯ Confirmed	◯ Suspected
☐ Recent or ongoing treatment process failure	◯ Confirmed	◯ Suspected
☐ Contamination of post treatment water storage	◯ Confirmed	◯ Suspected
☐ Post treatment contamination (other)	◯ Confirmed	◯ Suspected
If post treatment contamination (other), specify _____		
Specify the WINZ supply code of the implicated water supply _____		
Person to person outbreak (tick all that apply)		
☐ Inadequate vaccination cover	◯ Confirmed	◯ Suspected
☐ Inadequate vaccination effectiveness	◯ Confirmed	◯ Suspected
☐ Exposure to infected person	◯ Confirmed	◯ Suspected
☐ Poor hygiene of cases	◯ Confirmed	◯ Suspected
☐ Excessively crowded living conditions	◯ Confirmed	◯ Suspected
☐ Unprotected sexual activity	◯ Confirmed	◯ Suspected
☐ Compromised immune system	◯ Confirmed	◯ Suspected

Outbreak Summary **Outbreak No.**

Factors Contributing to Outbreak

Environmental outbreak (tick all that apply)

☐ Exposure to contaminated land	○ Confirmed	○ Suspected
☐ Exposure to contaminated air (including ventilation)	○ Confirmed	○ Suspected
☐ Exposure to contaminated built environments (inc dwellings)	○ Confirmed	○ Suspected
☐ Exposure to infected animals or animal products	○ Confirmed	○ Suspected
☐ Exposure to contaminated swimming/spa pools	○ Confirmed	○ Suspected
☐ Exposure to contaminated other recreational water	○ Confirmed	○ Suspected

Other outbreaks

☐ Other risk factor, specify _____	○ Confirmed	○ Suspected

Management of the Outbreak

Was there any specific action taken to control the outbreak? ○ Yes ○ No ○ Unknown

If yes, list the control measures undertaken (tick all that apply)

Source	**Specify**
☐ Closure	_____
☐ Modification of procedures	_____
☐ Cleaning, disinfection	_____
☐ Removal	_____
☐ Treatment	_____
☐ Exclusion	_____
☐ Isolation	_____
☐ Health education and advice	_____
☐ Health warning	_____
Vehicles and vectors	
☐ Removal	_____
☐ Treatment	_____
Contacts and potential contacts	
☐ Chemoprophylaxis	_____
☐ Vaccination	_____
☐ Health education and advice	_____

Other control measures (specify)

_____

Outbreak Summary **Outbreak No.**

Management of the Outbreak

Was insufficient information supplied to complete the form? ○ Yes ○ No ○ Unknown

Other comments on outbreak

Please attach a copy of written report if prepared.

Level of Evidence Codes

1 Elevated risk ratio or odds ratio with 95% confidence intervals not including 1 AND laboratory evidence

2a Elevated relative risk or odds ratio with 95% confidence intervals not including 1

2b Laboratory evidence, same organism and sub type detected in both cases and vehicle (to the highest level of identification)

3a Compelling evidence, symptomatology attributable to specific organism e.g. scrombrotoxin, ciguatoxin etc

3b Other association i.e. organism detected at source but not linked directly to the vehicle or indistinguishable DNA or PFGE profiles

3c Raised but not statistically significant relative risk or odds ratio

4 No evidence found but logical deduction given circumstances

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