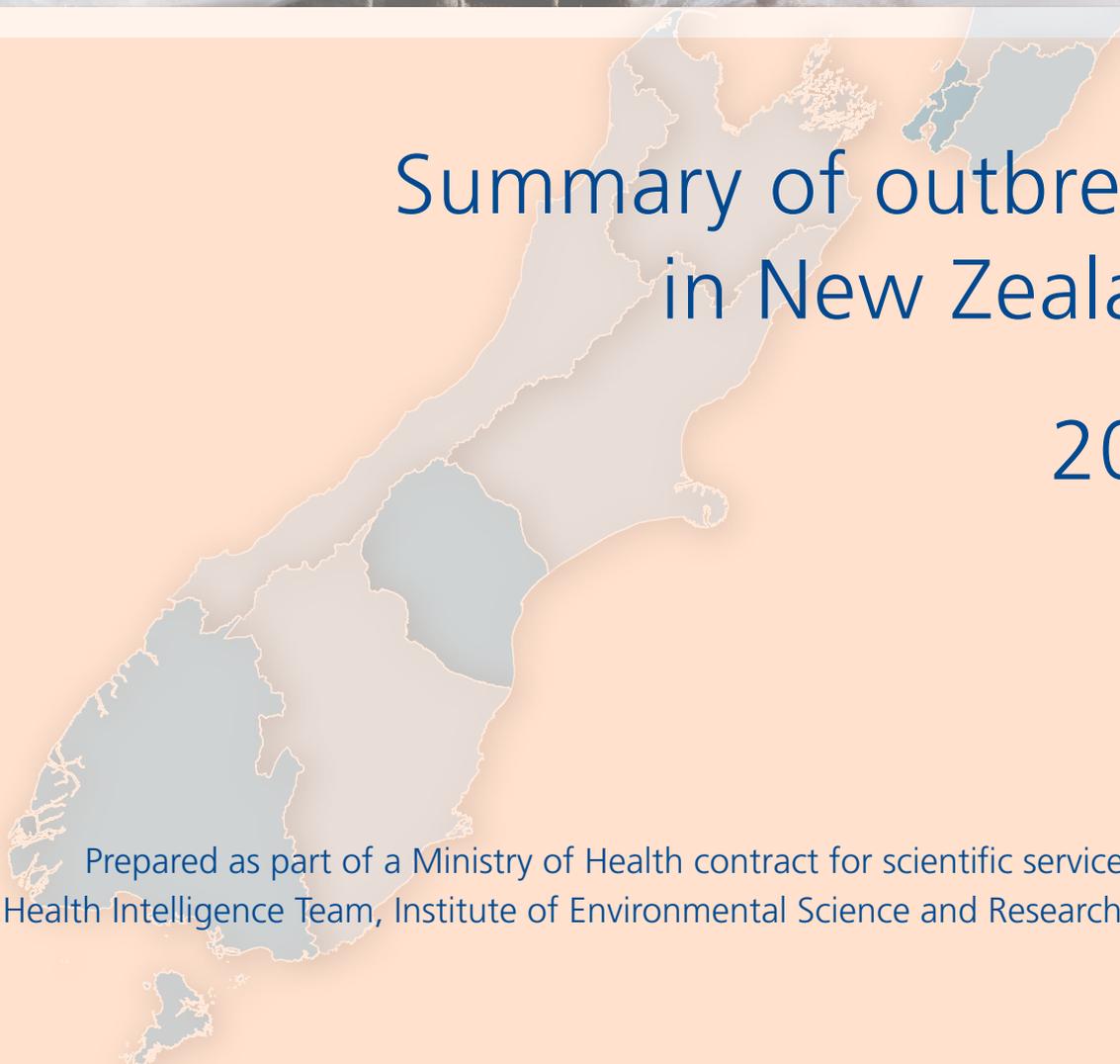


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SURVEILLANCE REPORT

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Summary of outbreaks in New Zealand

2012

Prepared as part of a Ministry of Health contract for scientific services by the Health Intelligence Team, Institute of Environmental Science and Research Limited

May 2013

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SUMMARY

SUMMARY

The following is a summary of the main findings of this report:

Incidence and outcomes

There were 716 outbreaks reported during 2012, involving 10 491 cases (3469 confirmed and 7022 probable cases). A total of 191 cases required hospitalisation and 40 cases died.

Public health units reporting the highest number of outbreaks per 100 000 population in 2012 were Waikato (42.4 outbreaks per 100 000 population), Otago (29.6 per 100 000) and Manawatu (28.3 per 100 000). The national rate was 16.2 outbreaks per 100 000 population.

Causal agents

The causal agent (pathogen, toxin or chemical) was identified in 74.9% (536/716) of outbreaks involving 81.0% (8495/10 491) of all outbreak-associated cases.

Enteric agents were implicated in 91.6% (656/716) of outbreaks. The most commonly identified enteric pathogen in outbreaks was norovirus (34.8%, 249/716) of outbreaks and 58.1% (6097/10 491) of the associated cases.

The most commonly implicated non-enteric agent was *Bordetella pertussis* in 4.6% (33/716) of outbreaks, followed by influenza and influenza-like illness virus in 2.2% (16/716) of outbreaks. Outbreaks due to influenza and influenza-like illness had the highest number of associated cases (762/10 491, 7.3%) for non-enteric agents and the highest number of associated deaths (24/40, 60.0%).

Outbreak settings

The most common settings where exposure to or transmission of causal agents occurred in long-term care facilities (26.1%, 187/716) followed by private home (25.7%, 184/716).

The highest percentage of outbreak-related cases occurred in long-term care facilities (44.1%, 4623/10 491), followed by childcare centres (13.2%, 1385/10 491) and acute-care hospitals (12.1%, 1268/10 491).

Modes of transmission

In 2012, the most commonly reported mode of transmission was person-to-person (81.0%, 580/716 outbreaks), followed by foodborne (15.4%, 110/716) and environmental (13.0% 93/716) modes of transmission. Multiple modes of transmission were implicated in 25.0% (179/716) of outbreaks.

Sources – foodborne outbreaks

There were 110 foodborne outbreaks with 967 associated cases reported in 2012, sixty three percent (69/110) of the outbreaks were linked to a pathogen or condition. Pathogens most commonly associated with foodborne outbreaks included norovirus (23.6%, 26/110), *Campylobacter* spp. and *Salmonella* spp. (10.0%, 11/110 outbreaks each).

Thirty of the 110 (27.3%) foodborne outbreaks had a source or vehicle identified. The main foods implicated in these 30 outbreaks were dairy and grains/beans (26.7%, 8 outbreaks each) and poultry and oils/sugar (23.3%, 7 outbreaks each), followed by shellfish-molluscs (16.7%, 5 outbreaks) and rice (13.3%, 4 outbreaks). The outbreaks with the highest number of cases were associated with outbreaks linked to grains/beans (30.1%, 81 cases) oils and sugar (29.0%, 78 cases) and poultry (17.8%, 48 cases). It should be noted that very few outbreaks have a suspected source confirmed by epidemiological or microbiological methods.

Recognition, reporting, investigation and control

Most outbreaks were recognised by increases in disease incidence (48.6%, 348/716), person-to-person contact with other cases (20.4%, 146/716) and attendance at a common event (12.8%, 92/716).

Just over half of all outbreaks (51.8%, 354/684 where information was available) were reported within one week of the onset of illness in the first case. The overall median reporting delay for outbreaks was 6.0 days.

Control measures were reported for 91.8% (657/716) of outbreaks in 2012. The most common measures undertaken were health education and advice regarding the source (81.9%, 538/657), followed by cleaning and disinfection (63.5%, 417/657).

Contributing factors

Contamination of food was the most common contributor to foodborne outbreaks (56.4%, 62/110) followed by time and temperature abuses (41.8%, 46/110). Unsafe sources accounted for 14.5% (16/110) of the outbreaks, including 8.2% (9/110) associated with the consumption of raw food.

Exposure to infected people was the primary contributing factor reported for almost all (97.6%, 566/580) person-to-person outbreaks, while consumption of untreated water (72.5%, 37/51 outbreaks) was the most common contributing factor linked to waterborne outbreaks. Exposure to a contaminated environment (72.0%, 67/93), and direct exposure to infected animals (89.5%, 51/57) were the most reported factors for environmental and zoonotic outbreaks respectively.

Emerging trends

In 2012, the most common outbreak settings were long-term care facilities and private homes, similar to that observed from 2006 to 2011. Since 2006, outbreaks in institutions have made up about 50% of all outbreaks reported annually. Prior to 2006 private homes and commercial food operators were the most commonly reported settings.

Over the last 10 years, substantial changes have occurred in the reporting of modes of outbreak transmission. Over this period, person-to-person transmission has become the most frequently reported mode, a change from foodborne transmission, which was often the most reported mode between 2001 and 2006. The proportion of foodborne outbreaks reported in 2012 (15.4%, 110/716) was less than in 2011 (21.0%, 122/581) and 2010 (23.3%, 141/606) but is similar to what was reported in 2009 (13.2%, 84/638).

Between 2001 and 2012, the proportion of outbreaks with person-to-person transmission reported increased considerably from the 2001 to 2003 period (range 20.2-33.9% of outbreaks) to the 2009 to 2012 period (range 73.6-84.6%). In 2012, the number of outbreaks with person-to-person transmission was more than three times higher than any other mode of transmission. Outbreaks attributed to environmental transmission in 2012 (13.0%, 93/716) have reduced slightly since 2010 (21.5%, 137/638) but are still higher than reported in 2001 (6.2%, 24/389).

Clostridium difficile emerged in 2012, with six outbreaks and 107 associated cases reported. Person to person transmission was the primary mode reported in all six of the outbreaks. The exposure settings identified were acute-care hospitals (5 outbreaks) and a long-term care facility (1). In 2010, one outbreak involving two cases of *C. difficile* was reported but no other outbreaks were reported between 2001 and 2011.

INTRODUCTION

INTRODUCTION

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 the 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 (e.g., 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
- 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 the EpiSurv database at each PHU via a secure web-based portal. The real-time data are 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 outbreak report form and the terms used in it are defined in a glossary at the end of this report. The form can also be found at: <http://www.surv.esr.cri.nz/episurv/index.php> and in the appendix at the end of this report.

Norovirus genotyping was carried out in the ESR Norovirus Reference Laboratory. Phylogenetic analysis was used for genotyping. Sequences were 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 was 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 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 to that reported elsewhere in the report.

Data analysis

This report contains an analysis of outbreak data reported between 1 January and 31 December 2012, and recorded on EpiSurv as at 22 February 2013. Any amendments made to outbreak data on EpiSurv after 22 February 2013 will not be reflected in this report.

Rates were calculated using national and PHU population figures based on the Statistics New Zealand mid-year population estimates for 2012.

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.

The new fields that were added to the Outbreak Report Form in October 2012 and used in this report are:

- mode of transmission: – primary and secondary modes are now reported
- contributing factors: – now identified as either confirmed or suspected.

Data limitations

The available outbreak data were 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 reporting at a regional level. For these reasons caution is advised when interpreting the data contained in this report.

New evidence categories were developed for use with the revised Outbreak Report Form released in 2010. Due to inconsistencies in the use of these categories in 2011 and 2012 these have not been analysed in this report.

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 versus suspected. As a result of these different analytical methods, comparisons of outbreak trends in past reports should be restricted to the period from 2005 onwards.

RESULTS

RESULTS

Characteristics of outbreaks

There were 716 outbreaks reported in 2012, an increase from the 581 reported in 2011. The national rate of 16.2 outbreaks per 100 000 population in 2012 was higher than 2011, when there were 13.2 outbreaks per 100 000 population. Of the outbreak reports in 2012, 99.7% (714/716) were classified as final, while the remaining two were classified as interim. A total of 10 491 cases were associated with outbreaks, 33.1% (3469/10 491) of the cases were confirmed and 66.9% (7022/10 491) were probable cases. In 2012, the national rate was 236.7 outbreak cases per 100 000 population, an increase from 2011 when the rate was 177.0 cases per 100 000 population.

Distribution of outbreaks by PHU

In 2012, the highest number of outbreaks and associated cases was reported by Auckland PHU, which represented 31.8% (228/716) of outbreaks and 22.4% (2 349/10 491) of associated cases (Table 1). Waikato PHU reported the second highest number of outbreaks (21.9%, 157 outbreaks), followed by Wellington (10.1%, 72 outbreaks), Manawatu and Canterbury (6.6%, 47 outbreaks each) PHUs. The highest outbreak rate (42.4 per 100 000 population) was reported by Waikato PHU (Figure 1) and the lowest rate for a PHU reporting at least five outbreaks, was from Rotorua PHU (6.8 per 100 000 population).

Table 1. Outbreaks and associated cases by PHU, 2012

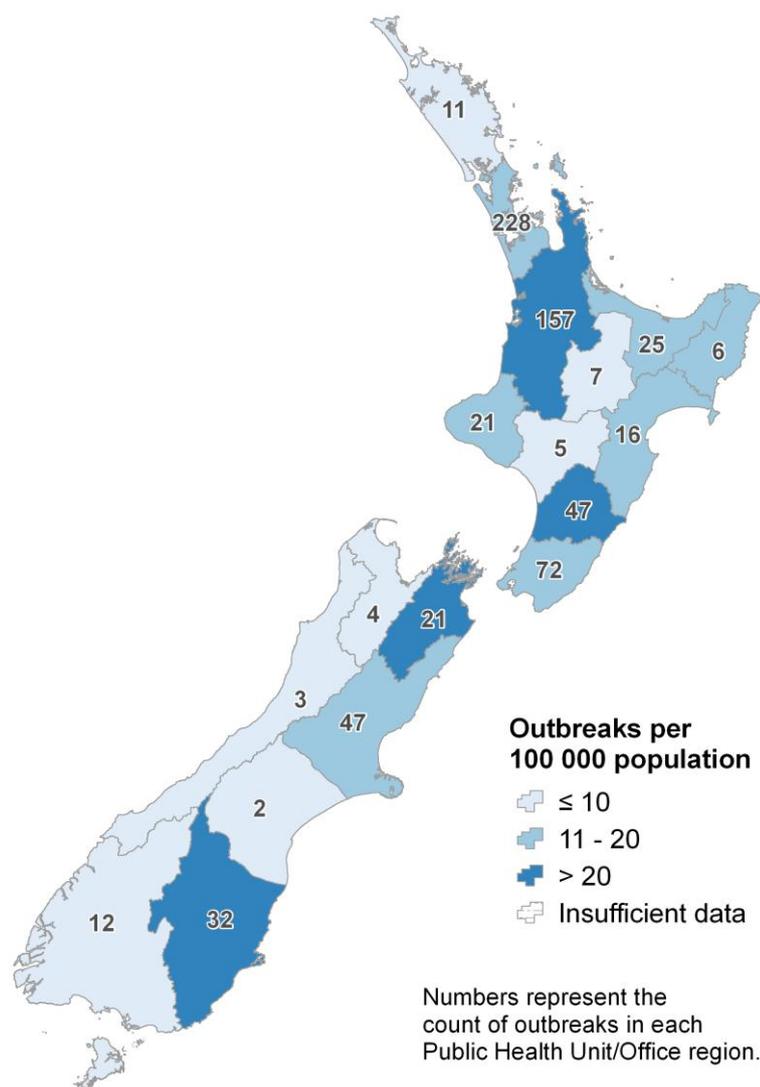
PHU	Outbreaks ¹			Cases ¹	
	Total	% of outbreaks (n=716)	Outbreak rate ¹	Total	% of cases (n=10 491)
Northland	11	1.5	6.9	246	2.3
Auckland ²	228	31.8	15.0	2349	22.4
Waikato	157	21.9	42.4	1207	11.5
Bay of Plenty	25	3.5	11.8	653	6.2
Rotorua	7	1.0	6.8	161	1.5
Taranaki	21	2.9	19.0	363	3.5
Hawke's Bay	16	2.2	10.3	427	4.1
Gisborne	6	0.8	12.8	134	1.3
Whanganui	5	0.7	8.7	68	0.6
Manawatu	47	6.6	28.3	628	6.0
Wellington ³	72	10.1	14.7	1613	15.4
Marlborough	21	2.9	22.6	497	4.7
Nelson ⁵	4	0.6	8.4	144	1.4
West Coast ⁵	3	0.4	9.1	34	0.3
Canterbury	47	6.6	10.0	1040	9.9
South Canterbury ⁵	2	0.3	1.2	77	0.7
Otago	32	4.5	29.6	667	6.4
Southland	12	1.7	9.7	183	1.7
Total	716	100.0	16.2	10 491	100.0

¹ Crude rate of outbreaks per 100 000 population calculated using Statistics New Zealand population estimates for 2012.

² Includes Northwest Auckland, Central Auckland and South Auckland health districts.

³ Includes Wellington, Hutt and Wairarapa health districts.

⁵ Rates calculated where fewer than five outbreaks were recorded should be interpreted with caution.

Figure 1. Number of outbreaks per 100 000 population by PHU, 2012

Causal agents

The causal agent was identified in 74.9% (536/716) of outbreaks involving 81.0% (8495/10 491) of all outbreak associated cases. Of these, 15 outbreaks with two causal agents were recorded. No specific pathogen or condition was identified in the remaining 25.1% (180/716) of outbreaks, all of which were recorded as gastroenteritis outbreaks.

Enteric agents were implicated in the vast majority of outbreaks (91.6%, 656/716) and their associated cases (90.3%, 9474/10 491) (Table 2). The most common single causal agent implicated in outbreaks in 2012 was norovirus, at 34.8% (249/716) of reported outbreaks. Outbreaks due to norovirus also had the highest proportion of associated cases (6097/10 491, 58.1%). The next most common enteric causal agents were *Giardia* spp. (9.6% of outbreaks, 69/716), *Cryptosporidium* spp. (6.6% of outbreaks, 47/581) and *Campylobacter* spp. (4.5%, 32/716).

The enteric agents with the highest median number of associated cases were Hepatitis A (30.0 cases per outbreak) and toxic shellfish poisoning (29.0 cases), with one outbreak each.

Non-enteric agents accounted for 8.4% (60/716) of outbreaks and 9.7% (1017/10 491) of the outbreak associated cases in 2012 (Table 2). The most common causal pathogens and conditions were: *Bordetella pertussis* (4.6% of outbreaks, 33/716), influenza and influenza-like-illness (2.2% of outbreaks, 16/716) and lead absorption (0.6% of outbreaks, 4/716). The median number of cases

associated with influenza and influenza-like-illness outbreaks (34.0 cases) was the highest of all agent types (enteric and non-enteric) in 2012.

Table 2. Outbreaks and associated cases by pathogen, 2012

Pathogen or condition	Outbreaks ¹			Cases ¹	
	Total	% of outbreaks (n=716)	Median cases per outbreak	Total	% of cases (n=10 491)
Enteric¹	656	91.6	7.0	9474	90.3
Norovirus	249	34.8	19.0	6097	58.1
<i>Giardia</i> spp.	69	9.6	3.0	284	2.7
<i>Cryptosporidium</i> spp.	47	6.6	3.0	164	1.6
<i>Campylobacter</i> spp.	32	4.5	3.0	282	2.7
<i>Salmonella</i> spp.	27	3.8	3.0	149	1.4
Rotavirus	23	3.2	15.0	360	3.4
<i>Shigella</i> spp.	12	1.7	2.5	43	0.4
<i>Clostridium difficile</i>	6	0.8	14.5	107	1.0
<i>Yersinia</i> spp.	5	0.7	3.0	14	0.1
<i>Clostridium perfringens</i>	4	0.6	4.5	18	0.2
<i>Escherichia coli</i> (EPEC)	3	0.4	23.0	63	0.6
Sapovirus	3	0.4	4.0	18	0.2
Astrovirus	2	0.3	2.5	5	0.0
<i>Aeromonas</i> spp.	1	0.1	8.0	8	0.1
Hepatitis A	1	0.1	30.0	30	0.3
Histamine fish poisoning	1	0.1	2.0	2	0.0
<i>Plesiomonas shigelloides</i>	1	0.1	3.0	3	0.0
<i>Salmonella</i> Paratyphi	1	0.1	2.0	2	0.0
<i>Salmonella</i> Typhi	1	0.1	2.0	2	0.0
<i>Staphylococcus aureus</i>	1	0.1	3.0	3	0.0
Toxic shellfish poisoning	1	0.1	29.0	29	0.3
VTEC/STEC infection	1	0.1	3.0	3	0.0
Pathogen not identified ²	180	25.1	6.0	1996	19.0
Non-enteric	60	8.4	4.5	1017	9.7
<i>Bordetella pertussis</i>	33	4.6	2.0	114	1.1
Influenza and influenza-like illness ³	16	2.2	34.0	762	7.3
Lead absorption	4	0.6	2.0	16	0.2
<i>Mycobacterium tuberculosis</i>	3	0.4	6.0	93	0.9
Carbon monoxide poisoning	1	0.1	5.0	5	0.0
Hepatitis B	1	0.1	2.0	2	0.0
<i>Legionella pneumophila</i>	1	0.1	19.0	19	0.2
<i>Listeria monocytogenes</i>	1	0.1	6.0	6	0.1

¹ More than one enteric agent was reported in 15 outbreaks with 208 cases.

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

³ Includes outbreaks of Influenza A(H3N2) (10 outbreaks with 570 cases), Influenza B (2 outbreaks, 75 cases), Influenza A (1 outbreak, 45 cases) and influenza-like-illness (3 outbreaks, 72 cases).

Norovirus outbreaks – genotypes and outbreak setting

Note: the number of outbreaks reported to the Norovirus Reference Laboratory differs from the number recorded in EpiSurv, because not all samples from 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 to that reported elsewhere in the report.

There were 221 ESR laboratory-confirmed norovirus outbreaks recorded in 2012. This is an increase from 2010 and 2011 when 123 and 160 laboratory-confirmed outbreaks were reported, but less than in 2009 (264 outbreaks). Almost half (49.3%, 109/221) of all outbreaks in 2012 were reported in the October-December quarter with 45 of these occurring in October. The lowest number reported was in January (4 outbreaks).

The majority of norovirus outbreaks (53.4%, 118/221) occurred in long-term care facilities. Outbreaks were also commonly associated with commercial food operators (15.8%, 35/221), child care centres (10.4%, 23/221), acute-care hospitals (11.3%, 25/221), private homes (3.6%, 8/221) and schools (1.4%, 3/221). One of the school outbreaks was associated with a school camping trip (i.e. hostel accommodation). Other outbreaks occurred in a military camp, a commercial camp, a residential centre, a hotel and on a cruise ship. Two norovirus outbreaks, one of which occurred at a large community gathering, were associated with the consumption of imported oysters contaminated with norovirus [3]. Another outbreak involving at least 52 cases was associated with the consumption of contaminated drinking water at a hotel.

Norovirus genogroup II (GII) was identified in 94.1% (208/221) of outbreaks whereas norovirus genogroup I (GI) was identified in 4.1% (9/221) of outbreaks. Both norovirus GI and GII were detected in four (1.8%) outbreaks. The specific norovirus genotype was determined for 218/221 outbreaks as one GI and two GII noroviruses were unable to be further typed (genotyped).

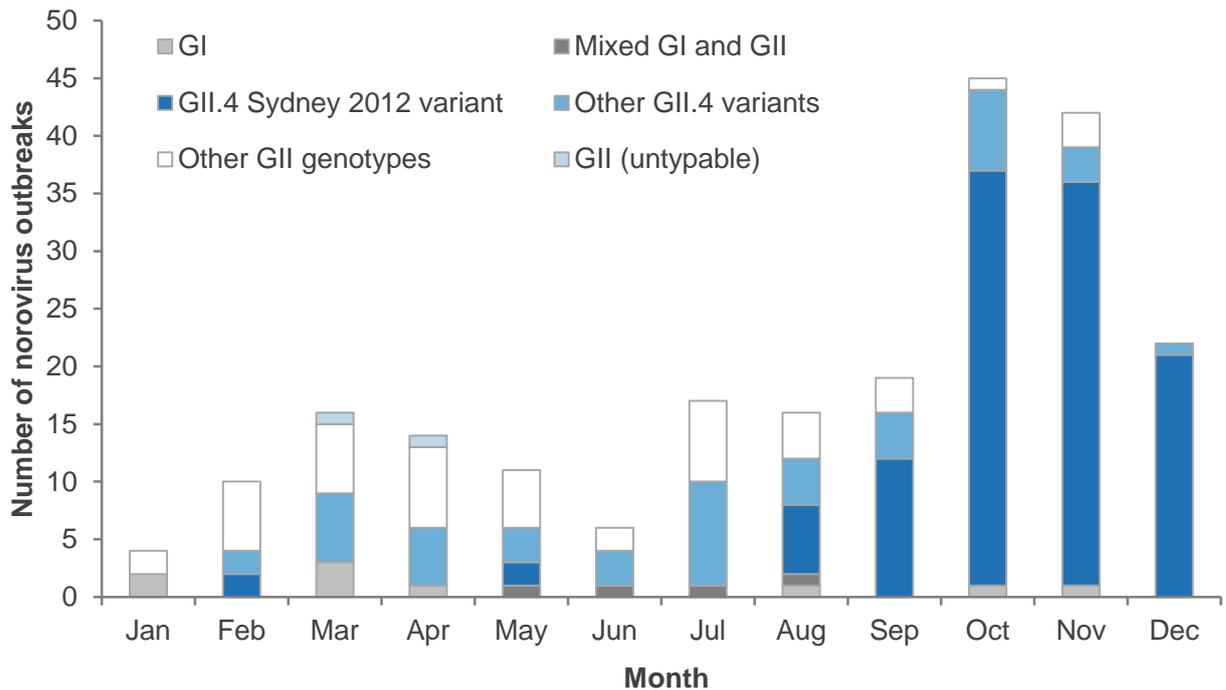
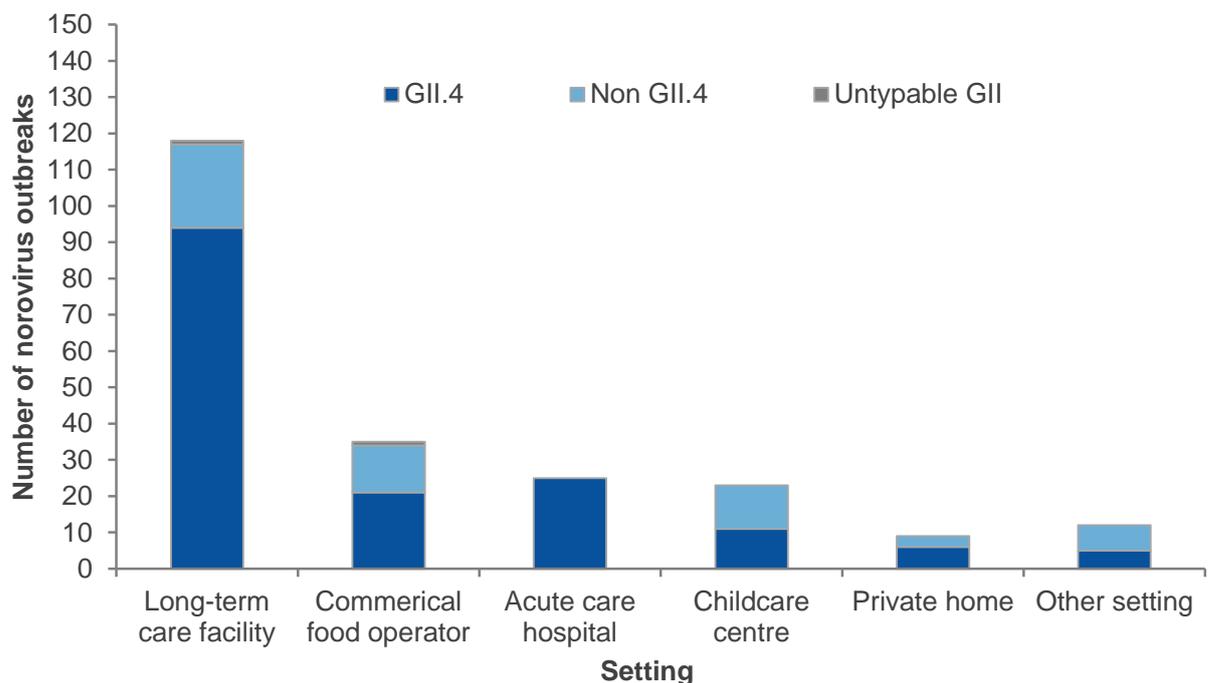
As in previous years, GII.4 was the most common genotype identified, accounting for 73.9% (161/218) of genotyped outbreaks in 2012 (including one outbreak where a GI genotype was also identified). GII.4 has been the most commonly reported genotype in New Zealand and overseas since the mid/late 1990s. GII.4 genotype continually evolves by mutation and/or recombination events to produce novel variants. Some of these variants, such as GII.4 New Orleans_2009 that emerged in 2009, cause global pandemics.

The G11.4 New Orleans_2009 variant had been the most frequently identified GII.4 since 2008. However, in February 2012, the GII.4 Sydney_2012 variant emerged in New Zealand and overseas, and by late 2012 had replaced the New Orleans_2009 variant as the predominant G11.4 variant. GII.4 Sydney_2012 was responsible for 84.4% (92/109) of New Zealand outbreaks between October and December 2012 (Figure 2). This GII.4 variant was also observed in Australia, Europe, USA and Asia in late 2012 [4]. Interestingly, the second most common genotype identified in 2011, the recombinant GII.12-G11.3 was only identified in three outbreaks in 2012.

Most norovirus outbreak settings were associated with a variety of norovirus genotypes (Figure 3). The acute-care hospital setting was the exception where all outbreaks (25/25) were due to GII.4 strains. The four outbreaks where both norovirus GI and GII were detected were associated with consuming contaminated drinking water in a hotel (GI.7 and GII.4 Sydney_2012), a childcare centre (GI.2 and GII.6), consumption of shellfish in a private home setting (GI.4 and GII.16) and at a community gathering (GI.3, GII.5 and GII.12).

Gastroenteritis outbreaks caused by other enteric viruses

During 2012, specimens from 84 norovirus-negative gastroenteritis outbreaks were analysed for the presence of astrovirus and sapovirus. Sapoviruses were identified in three outbreaks and of these, two occurred in childcare centres and one in a private home. Astrovirus was detected in one outbreak among travellers returning from an overseas resort.

Figure 2. Norovirus Reference Laboratory-confirmed norovirus outbreak typing by month, 2012**Figure 3. Norovirus Reference Laboratory-confirmed norovirus outbreak strains by setting, 2012**

Morbidity and mortality

Hospitalisation information was recorded for 62.7% (449/716) of outbreaks. A total of 191 (1.8%) outbreak-associated cases were hospitalised. The number of cases hospitalised for outbreaks due to enteric pathogens (154 cases) was substantially higher than the number of cases hospitalised due to non-enteric pathogens (37 cases) (Table 3). A higher percentage of cases associated with non-enteric outbreaks were hospitalised compared with enteric outbreaks (3.6% vs 1.6%). The non-enteric pathogen or condition with the highest proportion of hospitalised cases was *Legionella pneumophila* (100.0%, 19/19 cases), followed by *Listeria monocytogenes* (83.3%, 5/6 cases) and Hepatitis B (50.0%, 1/2 cases). Of the enteric pathogens, *Salmonella* Paratyphi (50.0%, 1/2 cases) and *C. difficile* (18.7%, 20/107 cases) represented the highest proportion of hospitalised cases.

Forty deaths were associated with 16 different outbreaks in 2012. The deaths were associated with outbreaks of influenza and influenza-like illness (24 deaths), norovirus (7 deaths), acute gastroenteritis with no pathogen identified (4 deaths), *L. monocytogenes* (3 deaths) and *L. pneumophila* (2 deaths).

Table 3. Hospitalised outbreak cases and total outbreak cases by pathogen or condition, 2012

Pathogen or condition	Outbreaks ¹	Cases ¹		
	Total	Total	No. of cases hospitalised	% of cases hospitalised
Enteric²	656	9474	154	1.6
Norovirus	249	6097	99	1.6
<i>Giardia</i> spp.	69	284	3	1.1
<i>Cryptosporidium</i> spp.	47	164	0	0.0
<i>Campylobacter</i> spp.	32	282	3	1.1
<i>Salmonella</i> spp.	27	149	9	6.0
Rotavirus	23	360	3	0.8
<i>Shigella</i> spp.	12	43	2	4.7
<i>Clostridium difficile</i>	6	107	20	18.7
<i>Yersinia</i> spp.	5	14	0	0.0
<i>Clostridium perfringens</i>	4	18	0	0.0
<i>Escherichia coli</i> (EPEC)	3	63	0	0.0
Sapovirus	3	18	0	0.0
Astrovirus	2	5	0	0.0
<i>Aeromonas</i> spp.	1	8	0	0.0
Hepatitis A	1	30	0	0.0
Histamine fish poisoning	1	2	0	0.0
<i>Plesiomonas shigelloides</i>	1	3	0	0.0
Salmonella Paratyphi	1	2	1	50.0
<i>Salmonella</i> Typhi	1	2	0	0.0
<i>Staphylococcus aureus</i>	1	3	0	0.0
Toxic shellfish poisoning	1	29	0	0.0
VTEC/STEC infection	1	3	0	0.0
Pathogen not identified ³	180	1996	15	0.8
Non-enteric	60	1017	37	3.6
<i>Bordetella pertussis</i>	33	114	1	0.9
Influenza and influenza-like-illness ⁴	16	762	9	1.2
Lead absorption	4	16	0	0.0
<i>Mycobacterium tuberculosis</i>	3	93	2	2.2
Carbon monoxide poisoning	1	5	0	0.0
Hepatitis B	1	2	1	50.0
<i>Legionella pneumophila</i>	1	19	19	100.0
<i>Listeria monocytogenes</i>	1	6	5	83.3
Total	716	10 491	191	1.8

¹ Hospitalisation information was recorded for 62.7% (449/716) of outbreaks, relating to 63.7% (6 685/10 491) of cases.

² More than one enteric agent was reported in 15 outbreaks with a total of 208 associated cases.

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

⁴ Includes outbreaks of Influenza A(H3N2) (10 outbreaks with 570 cases and 5 hospitalisations), Influenza B (2 outbreaks, 75 cases), Influenza A (1 outbreak, 45 cases) and Influenza-like-illness (3 outbreaks, 72 cases and 4 hospitalisations).

Outbreak settings

The most common outbreak settings recorded were long-term care facilities (26.1%, 187/716) followed by private homes (25.7%, 184/716) and childcare centres (12.4%, 89/716). Outbreaks set in long-term care facilities also had the highest number of associated cases (44.1%, 4623/10 491) (Table 4). Overall, 51.5% (369/716) of all outbreaks and 78.3% (8211/10 491) of cases reported in 2012 were set in institutions. Other common outbreak settings were commercial food operators, including restaurants/cafés (9.2%, 66/716) and takeaway outlets (2.7%, 19/716). The outbreak setting was unknown in 4.7% (34/716) of the outbreaks.

Table 4. Outbreaks and associated cases by setting of exposure/transmission, 2012

Outbreak setting	Outbreaks ¹		Cases ¹	
	Total	% of outbreaks (n=716)	Total	% of cases (n=10 491)
Institutions	369	51.5	8211	78.3
Long-term care facility	187	26.1	4623	44.1
Childcare centre	89	12.4	1385	13.2
Hospital (acute-care)	57	8.0	1268	12.1
School	11	1.5	457	4.4
Camp	9	1.3	148	1.4
Hostel/boarding house	2	0.3	48	0.5
Marae	1	0.1	28	0.3
Prison	1	0.1	12	0.1
Hotel/motel	1	0.1	12	0.1
Other institution	14	2.0	409	3.9
Commercial food operators	99	13.8	596	5.7
Restaurant/café/bakery	66	9.2	375	3.6
Takeaway	19	2.7	114	1.1
Fast food restaurant	4	0.6	13	0.1
Supermarket/delicatessen	2	0.3	4	0.0
Caterers	1	0.1	4	0.0
Temporary or food premises	1	0.1	3	0.0
Other food outlet	6	0.8	83	0.8
Workplace	28	3.9	280	2.7
Workplace	15	2.1	239	2.3
Farm	14	2.0	45	0.4
Other	8	1.1	193	1.8
Private home	184	25.7	709	6.8
Community/church or sports gathering	7	1.0	190	1.8
Mode of travel ²	3	0.4	369	3.5
Petting zoo	1	0.1	3	0.0
Other setting	27	3.8	220	2.1
Unknown setting	34	4.7	152	1.4

¹ More than one setting was recorded in some outbreaks.

² Includes outbreaks where the exposure setting was recorded as a cruise ship (2) and tour bus (1).

Modes of transmission

In 2012, the most commonly reported mode of transmission was person-to-person (81.0%, 580/716 outbreaks), followed by foodborne (15.4%, 110/716) and environmental (13.0% 93/716) modes (Table 5). Person-to-person transmission also accounted for the highest percentage of cases (90.9%, 9540/10 491), followed by the environmental mode of transmission (14.0%, 1473/10 491). The mode of transmission was unknown in 6.1% (44/716) of outbreaks.

Table 5. Outbreaks and associated cases by mode of transmission, 2012

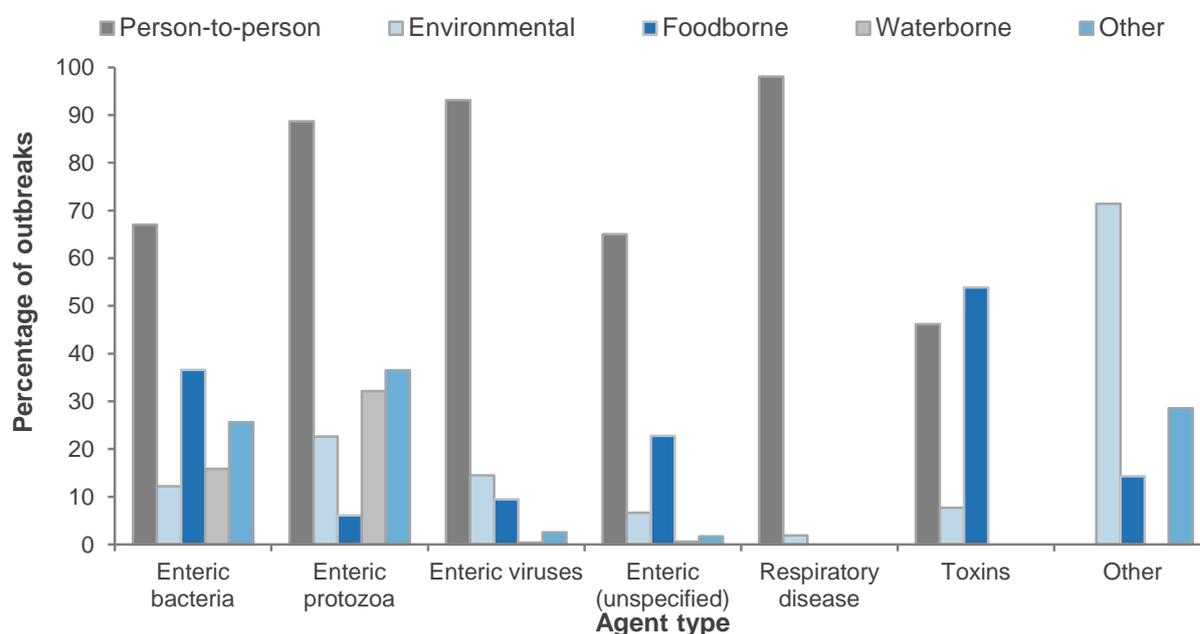
Mode of transmission	Outbreaks ¹				Cases ¹	
	Primary mode	Secondary mode	Total	% of outbreaks	Total	% of cases
Person-to-person	453	127	580	81.0	9540	90.9
Foodborne	92	18	110	15.4	967	9.2
Environmental	27	66	93	13.0	1473	14.0
Zoonotic	33	24	57	8.0	195	1.9
Waterborne	27	24	51	7.1	379	3.6
Sexual contact	1	-	1	0.1	2	0.0
Other	5	10	15	2.1	159	1.5
Unknown	-	-	44	6.1	195	1.9

¹ More than one mode of transmission was recorded for 179 outbreaks and a total of 2183 associated cases, therefore totals add to more than 100%.

Note: No outbreaks with vectorborne or parenteral as a mode of transmission were reported in 2012.

Person-to-person was the most common mode of transmission for enteric bacteria (67.1%, 55/82), enteric protozoa (88.7%, 102/115), enteric viruses (93.1%, 257/276), unspecified enteric pathogens (65.0%, 117/180) and respiratory disease (98.1%, 52/53) (Figure 4). Foodborne transmission contributed substantially to outbreaks due to toxins (53.8%, 7/13), enteric bacteria (36.6%, 30/82) and unspecified enteric pathogens (22.8%, 41/180) (Figure 4). Waterborne was the second highest mode of transmission for enteric protozoa (32.2%, 37/115) and the third highest for enteric bacteria (15.9%, 13/82). Environmental transmission contributed substantially to outbreaks of enteric protozoa (22.6%, 26/115) and enteric viruses (14.5%, 40/276). Zoonotic transmission was reported in 31.3% (36/115) of enteric protozoa outbreaks and 24.4% (20/82) of outbreaks due to enteric bacteria.

Figure 4. Percentage of outbreaks by agent type and mode of transmission, 2012



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 110 foodborne outbreaks in 2012 with 967 associated cases, 62.7% (69/110) of which were linked to a pathogen or condition (Table 6). Pathogens most commonly associated with foodborne outbreaks included norovirus (23.6%, 26/110), *Campylobacter* spp. and *Salmonella* spp. (10.0%, 11/110 outbreaks each). Enteric bacteria (*Aeromonas* spp., *Campylobacter* spp., *Escherichia coli* (EPEC), *Plesiomonas shigelloides*, *Salmonella* spp., *S. Paratyphi*, and *Shigella* spp.) were implicated in 27.3% (30/110) of the foodborne outbreaks, and enteric viruses (norovirus) in 23.6% (26/110) of the foodborne outbreaks.

Table 6. Foodborne outbreaks and associated cases by pathogen or condition, 2012

Pathogen or condition	Outbreaks		Cases	
	Total	% of outbreaks (n=110)	Total	% of cases (n=967)
Norovirus	26	23.6	549	56.8
<i>Campylobacter</i> spp.	11	10.0	51	5.3
<i>Salmonella</i> spp.	11	10.0	100	10.3
<i>Giardia</i> spp.	6	5.5	17	1.8
<i>Clostridium perfringens</i>	4	3.6	18	1.9
<i>Shigella</i> spp.	4	3.6	10	1.0
<i>Escherichia coli</i> (EPEC)	3	2.7	63	6.5
Toxic shellfish poisoning	1	0.9	29	3.0
<i>Aeromonas</i> spp.	1	0.9	8	0.8
<i>Listeria monocytogenes</i>	1	0.9	6	0.6
<i>Plesiomonas shigelloides</i>	1	0.9	3	0.3
<i>Staphylococcus aureus</i>	1	0.9	3	0.3
<i>Cryptosporidium</i> spp.	1	0.9	2	0.2
<i>Salmonella</i> Paratyphi	1	0.9	2	0.2
Histamine (Scombroid) fish poisoning	1	0.9	2	0.2
Pathogen not identified ¹	41	37.3	163	16.9
Total²	110	100.0	967	100.0

¹ All enteric outbreaks with no identified pathogen were recorded as gastroenteritis.

² Two agents were reported in four foodborne outbreaks with 59 associated cases, therefore totals add to more than 100%.

Vehicle/source implicated

Thirty of the 110 (27.3%) foodborne outbreaks in 2012 had a source or vehicle identified. The main foods implicated in these outbreaks were dairy and grains/beans (26.7%, 8 outbreaks each) and poultry and oils/sugar (23.3%, 7 outbreaks each), followed by shellfish (molluscs) (16.7%, 5 outbreaks) and rice (13.3%, 4 outbreaks) (Table 7). The outbreaks with the highest number of associated cases were those linked to grains/beans (26.7%, 81 cases) oils/sugar (29.0%, 78 cases) and poultry (17.8%, 48 cases).

Table 7: Foodborne outbreaks and associated cases by implicated vehicle/source, 2012

Implicated vehicle/source	Outbreaks ¹		Cases	
	Total	% of outbreaks (n=30)	Total	% of cases (n=269)
Dairy	8	26.7	27	10.0
Grains/beans	8	26.7	81	30.1
Poultry	7	23.3	48	17.8
Oils/sugar	7	23.3	78	29.0
Shellfish (molluscs)	5	16.7	74	27.5
Rice	4	13.3	13	4.8
Vegetables (root)	3	10.0	35	13.0
Meat (pork)	3	10.0	15	5.6
Meat (beef)	3	10.0	14	5.2
Fish	2	6.7	6	2.2
Fruit/nut	2	6.7	9	3.3
Vegetables (leafy)	4	13.3	24	8.9
Eggs	1	3.3	2	0.7
Vegetables (stalk)	1	3.3	2	0.7
Total	30	100.0	269	100.0

¹ More than one vehicle/source was implicated in some outbreaks.

Note: Mixed foods were assigned to multiple categories based on the groupings published by Painter et al 2009 [5]. Only explicit ingredients were assigned to a category. All foods within a mixed item were given equal priority.

Foodborne outbreaks associated with grains and beans or dairy (26.7%, 8 outbreaks each), oils and sugar (23.3%, 7 outbreaks) or shellfish molluscs (16.7%, 5 outbreaks) as possible vehicles or sources were most commonly associated with norovirus (grains and beans: 4 outbreaks, dairy, oils and sugars and shellfish: 3 outbreaks each) (Table 8). All five foodborne outbreaks linked to *Campylobacter* spp. were associated with dairy (60.0%, 3/5 outbreaks) or poultry (40.0%, 2/5 outbreaks).

The largest foodborne outbreak was reported from Auckland and involved 46 cases (17.1%). Norovirus was identified as the causative agent in the outbreak which was attributed to consumption of pasta salad at a catered school event. An epidemiological study carried out by the Auckland Regional Public Health Service identified that the 'pasta salad' was the highest risk item with a risk ratio of 12.2.

Table 8. Foodborne outbreaks by causal agent and implicated vehicle/source, 2012

Implicated vehicle/source ¹	Pathogen or condition										
	Norovirus	<i>Salmonella</i> spp.	<i>Campylobacter</i> spp.	<i>E. Coli</i> (EPEC)	<i>C. perfringens</i>	<i>Cryptosporidium</i> spp.	<i>L. monocytogenes</i>	<i>Shigella</i> spp.	Toxic shellfish poisoning	Pathogen not identified ²	Total number of outbreaks
Dairy	3		3			1				2	8
Grains/beans	4	1			1					2	8
Oils/sugar	3	1			1					2	7
Poultry	2	1	2	1						2	7
Shellfish (molluscs)	3							1		1	5
Rice	1				2					1	4
Vegetables (leafy)	1	1			1					1	4
Vegetables (root)	1	1		1						1	3
Meat (beef)		1					1			1	3
Meat (pork)		2								1	3
Fish								1		1	2
Fruit/nut	2										2
Eggs										1	1
Vegetables (stalk)					1						1
Total	8	6	5	2	2	1	1	1	1	6	30

¹ More than one vehicle/source was implicated in some outbreaks.

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 90.0% (99/110) of foodborne outbreaks and 95.8% (926/967) of associated cases in 2012. The preparation settings most commonly associated with foodborne outbreaks included commercial food operators (61.8%, 68/110), private homes (15.5%, 17/110) and institutions (9.1%, 10/110) (Table 9). Foodborne outbreaks where the food was prepared in restaurants, cafés, or bakeries had the highest number of cases associated with them (23.6%, 228/967), followed by acute-care hospitals (15.6%, 151/967) and food prepared by caterers and private homes (10.2%, 99/967 each).

Table 9. Foodborne outbreaks and associated cases by setting of food preparation, 2012

Preparation setting	Outbreaks ¹		Cases	
	Total	% of outbreaks (n=110)	Total	% of cases (n=967)
Commercial food operators	68	61.8	490	50.7
Restaurant/café/bakery	45	40.9	228	23.6
Takeaway	12	10.9	93	9.6
Caterers	5	4.5	99	10.2
Fast food restaurant	2	1.8	7	0.7
Temporary or mobile food premise	1	0.9	3	0.3
Supermarket/delicatessen	1	0.9	2	0.2
Other food outlet	2	1.8	58	6.0
Institutions	10	9.1	354	36.6
Long-term care facility	4	3.6	90	9.3
Hospital (acute-care)	1	0.9	151	15.6
Childcare centre	1	0.9	24	2.5
Marae	1	0.9	28	2.9
School	1	0.9	46	4.8
Camp	1	0.9	6	0.6
Other institution	1	0.9	9	0.9
Other	25	22.7	142	14.7
Private home	17	15.5	99	10.2
Overseas manufacturer	5	4.5	24	2.5
Commercial food manufacturer	4	3.6	47	4.9
Community gathering	2	1.8	11	1.1
Workplace	1	0.9	10	1.0
Farm	1	0.9	2	0.2
Unknown preparation setting	11	10.0	41	4.2

¹ More than one preparation setting was recorded for some outbreaks.

Contributing factors

The factors contributing to foodborne outbreaks most commonly involved either contamination of food (56.4%, 62/110) or time and temperature abuses (41.8%, 46/110). Contamination of food occurred via cross-contamination with other food (43.6%, 48/110) or via an infected food handler (26.4%, 29/110). The most common time and temperature abuses were undercooking (19.1%, 21/110), inadequate reheating of previously cooked food (16.4%, 18/110), improper storage prior to preparation (12.7%, 14/110) and improper hot holding (8.2%, 9/110) (Table 10). Unsafe sources accounted for 14.5% (16/110) of the outbreaks, including 8.2% (9/110) associated with the consumption of raw food.

Table 10. Foodborne outbreaks by contributing factor, 2012

Contributing factor	Outbreaks ¹				Cases	
	Confirmed	Suspected	Total	% of foodborne outbreaks (n=110)	Total	% of foodborne cases (n=967)
Contamination of food	3	59	62	56.4	626	64.7
Cross contamination	1	47	48	43.6	423	43.7
Contamination from an infected food handler	2	27	29	26.4	273	28.2
Chemical contamination	0	1	1	0.9	3	0.3
Time/temperature abuse	7	39	46	41.8	271	28.0
Undercooking	2	19	21	19.1	109	11.3
Inadequate reheating of previously cooked food	1	17	18	16.4	130	13.4
Improper storage prior to preparation	2	12	14	12.7	145	15.0
Improper hot holding	1	8	9	8.2	99	10.2
Preparation too far in advance	3	3	6	5.5	23	2.4
Inadequate cooling or refrigeration	3	3	6	5.5	23	2.4
Inadequate thawing	0	3	3	2.7	8	0.8
Unsafe sources	4	12	16	14.5	147	15.2
Consumption of raw food	3	6	9	8.2	99	10.2
Use of untreated water in food preparation	0	2	2	1.8	4	0.4
Use of unpasteurised milk in food	0	3	3	2.7	9	0.9
Use of ingredients from unsafe sources	1	3	4	3.6	79	8.2
Other factors	0	17	17	15.5	94	9.7

¹ More than one contributing factor was recorded for some outbreaks.

Person-to-person outbreaks

Causal agents

In 2012, there were 580 person-to-person outbreaks with 9540 associated cases and 60.7% (352/580) of these were linked to a causal agent type (Table 11). The most common causal agent was norovirus, which was recorded in 39.8% (231/580) of person-to-person outbreaks and involved 61.4% (5860/9540) of outbreak associated cases. Other common pathogens included *Giardia* spp. (10.3%, 60/580) and *Cryptosporidium* spp. (7.4%, 43/580). Enteric viruses (norovirus, rotavirus, and sapovirus) were implicated in 44.3% (257/580) of person-to-person outbreaks and enteric protozoa (*Giardia* spp. and *Cryptosporidium* spp.) in 17.6% (102/580) of outbreaks.

The most commonly identified pathogen in outbreaks with 20 or more associated cases was norovirus, accounting for 71.0% (115/162) of the person-to-person outbreaks. The two largest person-to-person outbreaks were also attributed to norovirus. The largest outbreak involved 261 cases and occurred on a cruise ship that had travelled from Australia to Milford sound. The second largest outbreak was reported in Auckland and involved 214 cases exposure occurred in an acute-care hospital setting.

Table 11. Person-to-person outbreaks and associated cases by pathogen or condition, 2012

Pathogen	Outbreaks				Cases	
	Primary mode	Secondary mode	Total	% of outbreaks (n=580)	Total	% of cases (n=9 540)
Norovirus	215	16	231	39.8	5860	61.4
<i>Giardia</i> spp.	32	28	60	10.3	252	2.6
<i>Cryptosporidium</i> spp.	10	33	43	7.4	153	1.6
<i>Bordetella pertussis</i>	31	2	33	5.7	114	1.2
Rotavirus	23	0	23	4.0	360	3.8
<i>Campylobacter</i> spp.	6	15	21	3.6	78	0.8
Influenza and influenza-like-illness	15	1	16	2.8	762	8.0
<i>Salmonella</i> spp.	6	10	16	2.8	64	0.7
<i>Shigella</i> spp.	5	4	9	1.6	37	0.4
<i>Clostridium difficile</i>	6	0	6	1.0	107	1.1
<i>Yersinia</i> spp.	3	2	5	0.9	14	0.1
Sapovirus	3	0	3	0.5	18	0.2
<i>Mycobacterium tuberculosis</i>	3	0	3	0.5	93	1.0
Hepatitis A	0	1	1	0.2	30	0.3
<i>Escherichia coli</i> (EPEC)	0	1	1	0.2	12	0.1
<i>Aeromonas</i> spp.	0	1	1	0.2	8	0.1
<i>Escherichia coli</i> O157:H7	1	0	1	0.2	3	0.0
<i>Salmonella</i> Typhi	1	0	1	0.2	2	0.0
Astrovirus	1	0	1	0.2	2	0.0
Pathogen not identified ¹	101	16	117	20.2	1 724	18.1
Total²	453	127	580	100.0	9540	100.0

¹ All enteric outbreaks with no identified pathogen were recorded as gastroenteritis.

² Two agents were reported in 12 person-to-person outbreaks with 153 cases, therefore totals add to more than 100%.

³ Includes outbreaks of Influenza A(H3N2) (10 outbreaks with 570 cases), Influenza B (2 outbreaks, 75 cases), Influenza A (1 outbreak, 45 cases) and influenza-like-illness (3 outbreaks, 72 cases).

Contributing factors

Exposure to infected people was the primary contributing factor for 97.6% (566/580) of person-to-person outbreaks reported. Other contributing factors reported included poor hygiene (37.6%, 218/580), a compromised immune system (8.4%, 49/580), inadequate vaccination cover (5.0%, 29/580), excessively crowded living conditions (3.1%, 18/580) and inadequate vaccination effectiveness (1.4%, 8/580).

Waterborne outbreaks

Causal agents

There were 51 waterborne outbreaks with 379 associated cases in 2012, 98.0% (50/51) of which were linked to a specific pathogen (Table 12). The most commonly reported waterborne pathogens were *Giardia* spp. and *Cryptosporidium* spp. (37.3%, 19/51, each), followed by *Campylobacter* spp. (19.6%, 10/51). Enteric protozoa (*Giardia* spp. and *Cryptosporidium* spp.) were implicated in 72.5% (37/51) of waterborne outbreaks and enteric bacteria (*Campylobacter* spp. and *Salmonella* spp.) in 25.5% (13/51) of waterborne outbreaks.

Table 12. Waterborne outbreaks and associated cases by pathogen, 2012

Pathogen	Outbreaks				Cases	
	Primary mode	Secondary mode	Total	% of outbreaks (n=51)	Total	% of cases (n=379)
<i>Giardia</i> spp.	12	7	19	37.3	65	17.2
<i>Cryptosporidium</i> spp.	10	9	19	37.3	64	16.9
<i>Campylobacter</i> spp.	3	7	10	19.6	190	50.1
<i>Salmonella</i> spp.	2	1	3	5.9	16	4.2
Norovirus	1	0	1	2.0	53	14.0
Pathogen not identified ¹	0	1	1	2.0	2	0.5
Total	27	23	51	100.0	379	100.0

¹ All enteric outbreaks with no identified pathogen were recorded as gastroenteritis.

² Two agents were reported in two waterborne outbreaks with 11 cases, therefore totals add to more than 100%.

Contributing factors

The most common contributing factor linked to waterborne outbreaks was untreated water (72.5%, 37/51 outbreaks) followed by an inadequately treated water supply (29.4%, 15/51) (Table 13). Most of the contributing factors associated with waterborne outbreaks were reported as suspected only (80.9%, 55/68).

Table 13. Waterborne outbreaks by contributing factor, 2012

Contributing factor	Outbreaks ¹				Cases	
	Confirmed	Suspected	Total	% of outbreaks (n=51)	Total	% of cases (n=379)
Untreated drinking-water supply ²	3	34	37	72.5	177	46.7
Inadequately treated water supply	3	12	15	29.4	204	53.8
Source water quality inferior to normal	3	5	8	15.7	238	62.8
Recent or on-going treatment process failure	4	2	6	11.8	228	60.2
Contamination of post treatment water	0	2	2	3.9	5	1.3

¹ 12 outbreaks involving 248 cases had two or more contributing factors.

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 other sources of post-treatment contamination were reported in 2012.

Environmental outbreaks

Causal agents

Ninety three environmental outbreaks with 1473 associated cases were reported in 2012, of which 87.1% (81/93) were linked to a specific causal agent (Table 14). The most common causal agent identified in environmental outbreaks was norovirus, which accounted for 43.0% (40/93) of environmental outbreaks and 79.2% (1167/1473) of associated cases. However, environmental transmission was the secondary mode reported in the majority (97.5%, 39/40) of these outbreaks, *Giardia* spp. was responsible for the highest number of outbreaks (85.7%, 12/14) where environmental transmission was the primary mode reported. Enteric viruses (norovirus and sapovirus) were implicated in 43.0% (40/93) of environmental outbreaks and enteric protozoa (*Giardia* spp. and *Cryptosporidium* spp.) in 28.0% (26/93) of environmental outbreaks.

Table 14. Environmental outbreaks and associated cases by pathogen or condition, 2012

Pathogen	Outbreaks ¹				Cases	
	Primary mode	Secondary mode	Total	% of outbreaks (n=93)	Total	% of cases (n=1 473)
Norovirus	1	39	40	43.0	1167	79.2
<i>Giardia</i> spp.	12	2	14	15.1	64	4.3
<i>Cryptosporidium</i> spp.	4	8	12	12.9	38	2.6
<i>Campylobacter</i> spp.	3	4	7	7.5	35	2.4
Lead absorption	4	0	4	4.3	16	1.1
<i>Salmonella</i> spp.	1	2	3	3.2	14	1.0
Sapovirus	0	1	1	1.1	3	0.2
<i>Legionella pneumophila</i>	1	0	1	1.1	19	1.3
<i>Clostridium difficile</i>	0	1	1	1.1	47	3.2
Carbon monoxide poisoning	1	0	1	1.1	5	0.3
Pathogen not identified ²	0	12	12	12.9	122	8.3
Total²	27	66	93	100.0	1473	100.0

¹ Three outbreaks involved more than one pathogen therefore individual pathogen and outbreak numbers may not sum to group totals.

² 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) (72.0%, 67/93), exposure to infected animals (16.1%, 15/93) and other recreational waters (15.1%, 14/93). At least one contributing factor was recorded for all (100.0%) of the outbreaks.

Zoonotic outbreaks

Causal agents

There were 57 zoonotic outbreaks with 195 associated cases in 2012, 96.5% (55/57) of which were linked to a specific pathogen (Table 15). *Cryptosporidium* spp. was the most commonly identified pathogen linked to 49.1% (28/57) of zoonotic outbreaks and 48.2% (94/195) of the associated cases. Enteric protozoa (*Cryptosporidium* spp. and *Giardia* spp.) were implicated in 63.2% (36/57) of the zoonotic outbreaks and enteric bacteria (*Campylobacter* spp., *Salmonella* spp. and *Yersinia* spp.) were implicated in 35.1% (20/57) of the zoonotic outbreaks.

Table 15. Zoonotic outbreaks and associated cases by pathogen or condition, 2012

Pathogen or condition	Outbreaks				Cases	
	Primary mode	Secondary mode	Total	% of outbreaks (n=57)	Total	% of cases (n=195)
<i>Cryptosporidium</i> spp.	18	10	28	49.1	94	48.2
<i>Campylobacter</i> spp.	8	7	15	26.3	52	26.7
<i>Giardia</i> spp.	3	6	9	15.8	38	19.5
<i>Salmonella</i> spp.	3	0	3	5.3	11	5.6
<i>Yersinia</i> spp.	1	1	2	3.5	6	3.1
Norovirus	0	1	1	1.8	4	2.1
Pathogen not identified ¹	1	1	2	3.5	5	2.6
Total²	33	24	57	100.0	195	100.0

¹ All enteric outbreaks with no identified pathogen were recorded as gastroenteritis.

² Two pathogens were reported in three zoonotic outbreaks with 15 cases, therefore totals add to more than 100%.

Contributing factors

Almost all (89.5%, 51/57) zoonotic outbreaks recorded direct exposure to infected animals as a contributing factor. Multiple settings were identified in 10 outbreaks. The most common setting for a zoonotic outbreak was in a private home (42 outbreaks), although seven of these identified another setting as well. The second most common setting for zoonotic outbreaks was farms (11 outbreaks) and one of these also identified another setting.

Sexual contact outbreaks

One outbreak of Hepatitis B involving two cases was reported in 2012. Sexual contact was considered the primary mode of transmission while inadequate vaccination cover, exposure to an infected person and unprotected sexual activity were also reported as factors contributing to this outbreak.

Outbreaks with overseas transmission

In 2012, 23 outbreaks with overseas transmission were reported involving 443 cases. Travel to Australia or Samoa was associated with the most outbreaks (21.7%, 5 outbreaks each), followed by Fiji (3 outbreaks), Indonesia, Singapore and the United States of America (2 outbreaks each). All other overseas destinations listed in Table 16 were associated with a single outbreak each. The majority of cases associated with overseas transmission were infected with norovirus (58.9%, 261/443 cases), followed by *Giardia* spp. (6.8%, 30/443 cases). The pathogen was not identified in two outbreaks that involved 117 cases.

Table 16. Outbreaks with overseas transmission by destination and pathogen, 2012

Destination	Pathogen								Total
	Astrovirus	<i>Cryptosporidium</i> spp.	<i>Giardia</i> spp.	Norovirus	<i>Salmonella</i> spp.	<i>Shigella</i> spp.	<i>Salmonella</i> Paratyphi	Pathogen not identified ¹	
Australia		2	2	1					5
Ecuador								1	1
Fiji			2			1			3
India							1		1
Indonesia			1		1				2
Mexico						1			1
Samoa	1		1			3			5
Singapore		1			1				2
United States of America		1	1						2
Unknown ¹								1	1
Total outbreaks	1	4	7	1	2	5	1	2	23
Total cases	3	16	30	261	4	10	2	117	443

¹ One outbreak occurred on a cruise ship in international waters, the exact location was unknown.

Outbreak recognition, investigation and control

Timeliness of reporting

For the 684 outbreaks where the timeliness of reporting data was available, just over half (51.8%, 354/684) were reported to the PHU within a week of the onset of illness in the first case. A further 36.1% (247/684) 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 and environmental outbreaks (7.0 days each) and zoonotic outbreaks (13.0 days).

Table 17. Median reporting delay by outbreak type, 2012

Outbreak type ¹	No. of outbreaks ²	Median reporting delay (days)
Person-to-person	556	7.0
Foodborne	107	4.0
Environmental	85	7.0
Zoonotic	54	13.0
Waterborne	46	17.0
Sexual contact	1	86.0
Other mode	14	7.0
Total	684	6.0

¹ More than one mode of transmission was recorded for some outbreaks.

² Outbreaks were excluded if the date of onset of illness in the first case was missing.

Recognition of outbreaks

In 2012, 48.6% (348/716) of outbreaks were identified through an increase in disease incidence and 20.4% (146/716) by cases having person-to-person contact with other cases (Table 18). Other frequent means of outbreak recognition included cases attending a common event (12.8%, 92/716) or being linked to a common source (10.8%, 77/716).

Table 18. Outbreaks by means of recognition, 2012

Means of recognition	No. of outbreaks	% of total outbreaks (n=716)
Increase in disease incidence	348	48.6
Cases had person-to-person contact with other case(s)	146	20.4
Cases attended common event	92	12.8
Cases linked to common source (eg, food, water, environmental site)	77	10.8
Common organism type/strain characteristics between cases	13	1.8
Other means	40	5.6

Control measures

The outbreak control measures undertaken were reported in 91.8% (657/716) of outbreaks in 2012. The most common measures were health education and advice regarding the source (81.9%, 538/657) and cleaning and disinfection (63.5%, 417/657) (Table 19). No control measures were taken in 8.2% (54/657) of outbreaks.

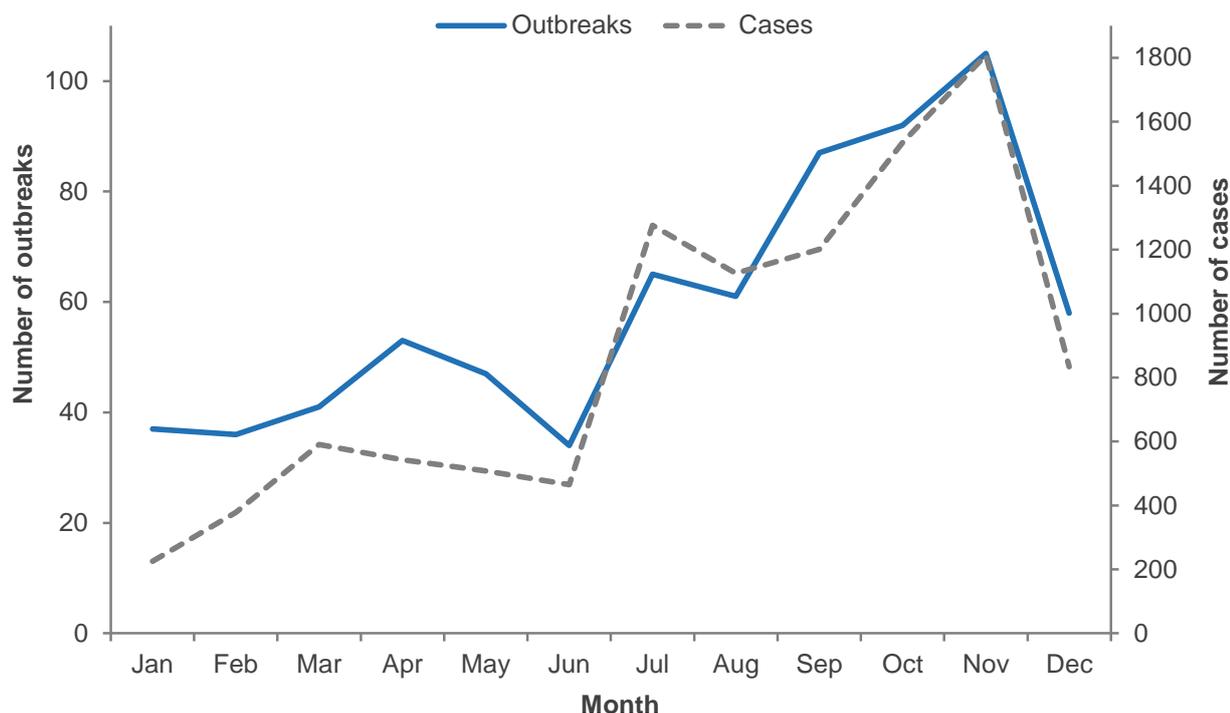
Table 19. Outbreaks by control measures undertaken, 2012

Outbreak control measure	No. of outbreaks ¹	% of total outbreaks (n=657)
Source	637	97.0
Health education and advice	538	81.9
Cleaning, disinfection	417	63.5
Exclusion	357	54.3
Isolation	306	46.6
Modification of procedures	182	27.7
Health warning	171	26.0
Closure	151	23.0
Treatment	77	11.7
Removal	22	3.3
Vehicle and vector	20	3.0
Removal	14	2.1
Treatment	9	1.4
Contacts and potential contacts	134	20.4
Health education and advice	128	19.5
Chemoprophylaxis	11	1.7
Vaccination	9	1.4
Other control measures	145	22.1
No control measures	54	8.2

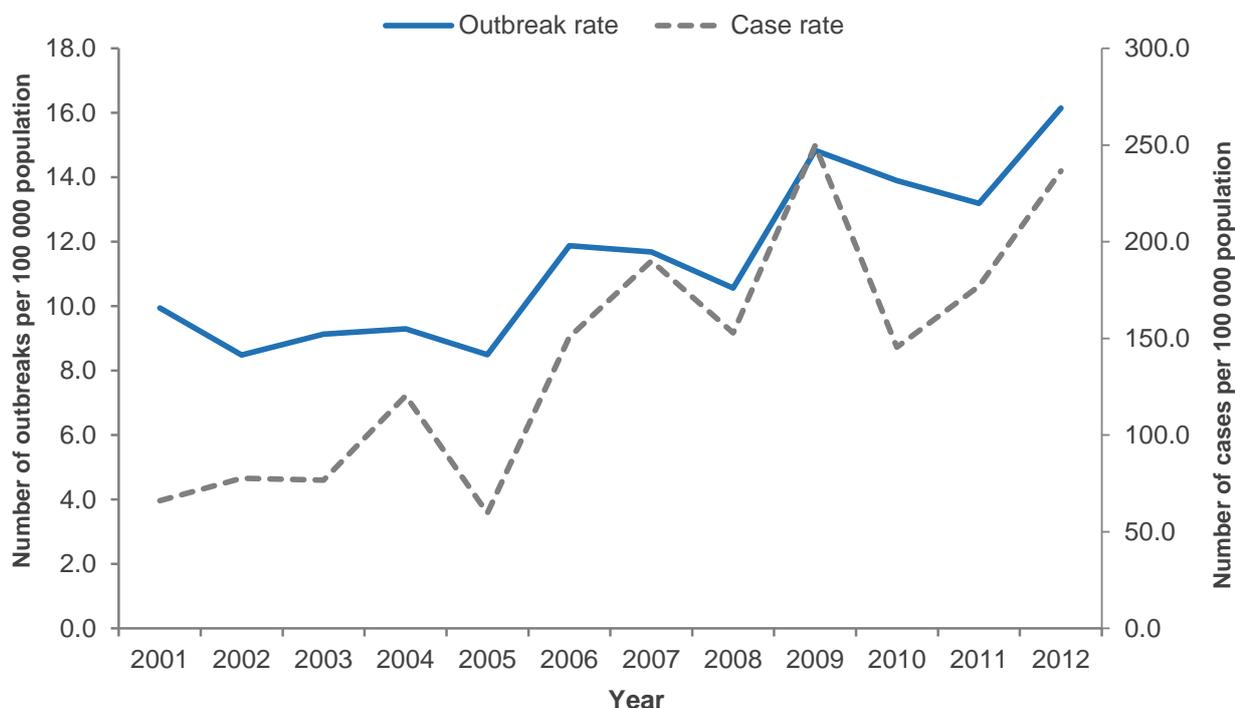
¹ More than one control measure was recorded for some outbreaks.

Summary of trends

In 2012, the highest number of outbreaks and outbreak-related cases were reported in November (105 outbreaks, 1809 cases). The November peak was largely driven by an increase in norovirus outbreaks (52 outbreaks, 1350 cases). The number of outbreaks and outbreak-related cases reported each month was consistently lower in the first half of the year compared with monthly counts in the second half of the year (Figure 5).

Figure 5. Number of outbreaks and associated cases by month, 2012

Since 2005, both the outbreak rate and the case rate have tracked upwards. The national annual outbreak rate for 2012 (16.2 outbreaks per 100 000 population) was the highest annual rate since recording began in 2001 (Figure 6). However, the 2009 outbreak case rate remains the highest annual outbreak case rate (249.8 per 100 000 population). The 2012 outbreak case rate was the second highest since 2001 (236.7 per 100 000 population)

Figure 6. Outbreak rates and associated cases by year, 2001–2012

Since 2001, the number of outbreaks linked to an identified causal agent has remained close to 70% (range 66.3-74.9%). In 2012, 74.9% (536/716) 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

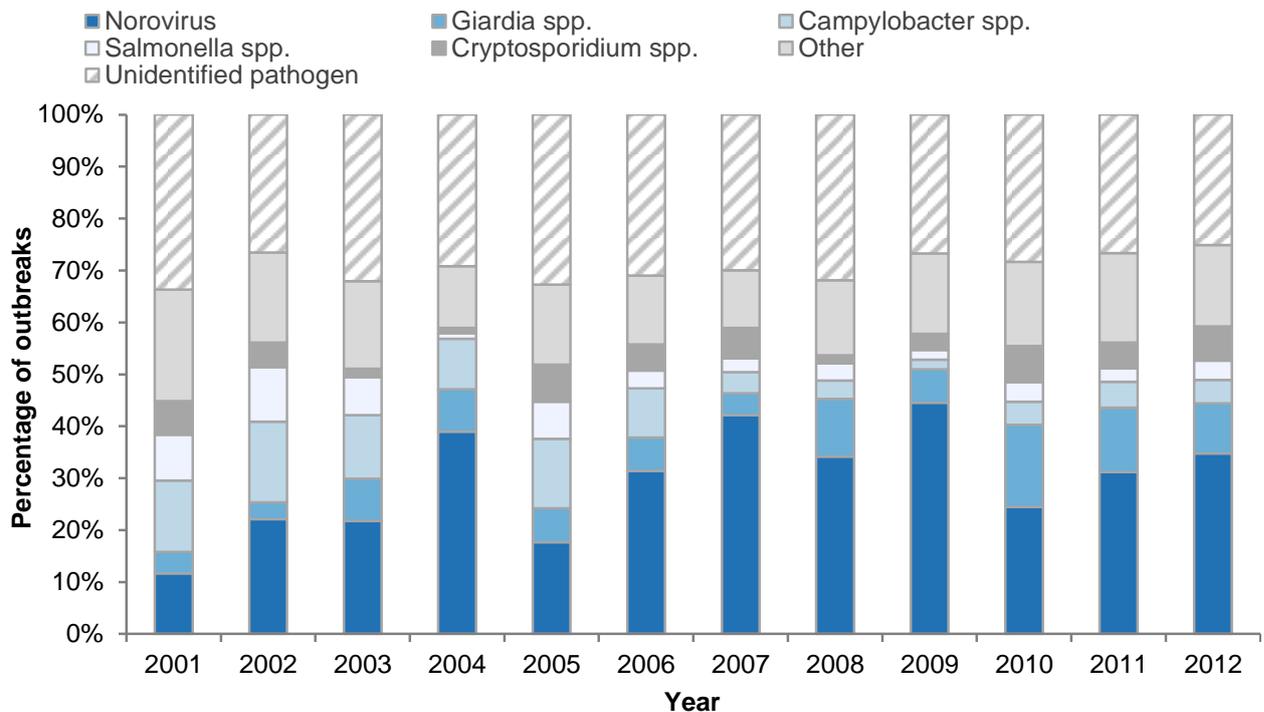
varied considerably from year to year (Figure 7). In 2012 there were 249 norovirus outbreaks reported with 6097 associated cases, the second highest number observed since reporting began in 2001 (the highest number was in 2009 with 285 outbreaks and 7428 cases). The number of reported rotavirus outbreaks has decreased from 36 in 2011 (606 cases) to 23 in 2012 (360 cases).

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 69 outbreaks and 284 cases in 2012.

By contrast, the number of outbreaks and the number of cases linked to *Campylobacter* have decreased since 2006. The number of outbreaks decreased by a third between 2006 and 2012 (from 47 to 32 outbreaks), while the number of associated cases increased slightly (from 221 cases to 282). *Campylobacter* has consistently remained one of the five most commonly reported causal agents for outbreaks every year since 2001.

Clostridium difficile emerged as an outbreak pathogen in 2012 with six outbreaks and 107 associated cases reported. Person-to-person transmission was the primary mode reported in all six of the outbreaks. The exposure settings identified were acute-care hospitals (5 outbreaks) and a long-term care facility (1 outbreak). In 2010 one outbreak involving two cases was reported, but there were no other reported outbreaks between 2001 and 2011.

Figure 7. Percentage of outbreaks by pathogen or condition and year, 2001–2012



In 2012, the most common outbreak settings were in long-term care facilities and private homes, which is similar to observations from 2006 to 2011. Since 2006, outbreaks set in institutions have constituted about half of all outbreaks reported annually. Prior to this period, private homes and commercial food operators were the most commonly reported settings.

Over the last 10 years, substantial changes to the reporting of modes of outbreak transmission have taken place. In this time, person-to-person transmission has become the most frequently reported mode a change from foodborne transmission, which was often the most frequent mode between 2001 and 2006. The proportion of foodborne outbreaks reported in 2012 (15.4%, 110/716) has reduced from levels in 2011 (21.0%, 122/581) and 2010 (23.3%, 141/606), but is similar to 2009 (13.2, 84/638). From 2001 to 2012, the proportion of outbreaks with person-to-person transmission reported has increased considerably from the 2001-2003 period (20.2-33.9%) to the 2009-2012 period (73.6-84.6%). In 2012, the number of outbreaks with person-to-person transmission was more than three times higher than any other mode of transmission. Outbreaks attributed to environmental transmission in 2012 (13.0% 93/716) have reduced

slightly since 2010 (21.5% 137/638) but still represent a higher proportion of outbreaks than reported in 2001 (6.2%, 24/389).

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 15.9% and 15.2% in 2010 and 2011 respectively, to 23.3% in 2012. It is important to note that very few outbreaks have a suspected source confirmed by epidemiological or laboratory methods and in 2012, only 27.3% (30/110) of the foodborne outbreaks had recorded that a source had been identified.

In 2012, 23 outbreaks involving 443 cases had overseas transmission. Although this is similar to the number of outbreaks recorded in 2011 (24 outbreaks) there were over four times the number of associated cases (104 cases in 2011). In 2012, travel to Australia and Samoa (5 outbreaks each) and Fiji (3 outbreaks) were the most commonly reported destinations. Between 2006 and 2010, the annual number of outbreaks with overseas transmission reported ranged from 5 to 15, with total outbreak associated cases ranging from 30 to 289. No country was associated with more than two outbreaks during this period.

The median delay between date of onset of illness in the first case and the outbreak report date in 2012 was 6.0 days which was less than 2011 (7.0 days) and 2010 (7.5 days), but more than 2008 and 2009 (4.0 days respectively).

Health education and advice related to the outbreak source has been the most common control measure used since 2001 and was provided in 81.9% (538/657) of the outbreaks reported in 2012. Between 2007 and 2012, cleaning and disinfection as a control measure 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 no control measures were reported being undertaken decreased from 27.8% (108/389) in 2001 to 8.2% (54/657) of outbreaks in 2012.

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 & Research Limited.

Environment

All factors which 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 _____	
<input type="radio"/> Interim report		<input type="radio"/> Final report - date finalised _____	
<input type="radio"/> Not an outbreak			
Name of outbreak (optional) _____			
Condition and Implicated Contaminant			
Implicated contaminant (pathogen) _____		<input type="checkbox"/> Unknown	
subtype _____			
Condition (disease) _____		Other, specify _____	
Other known condition/implicated pathogen <input type="radio"/> Yes <input type="radio"/> No			
Implicated contaminant (pathogen) _____		<input type="checkbox"/> Unknown	
subtype _____			
Condition (disease) _____		Other, specify _____	
CASE DEFINITION(S)			
Laboratory confirmed case			

Clinically confirmed case			

Probable case			

Outbreak Demographics			
Number of people exposed _____		<input type="radio"/> Actual <input type="radio"/> Approx <input type="checkbox"/> 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 <input type="checkbox"/> 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 _____ <input type="radio"/> days <input type="radio"/> hrs	
		Range _____ <input type="radio"/> days <input type="radio"/> hrs	
Duration of illness		Median _____ <input type="radio"/> days <input type="radio"/> hrs	
		Range _____ <input type="radio"/> days <input type="radio"/> hrs	

Outbreak Summary	Outbreak No. _____
Circumstances of Exposure/Transmission	
How was the outbreak first recognised?	
<input type="radio"/> Increase in disease incidence <input type="radio"/> Cases had person to person contact with other cases(s)	
<input type="radio"/> Cases attended common event <input type="radio"/> Common organism type/strain characteristics between cases	
<input type="radio"/> Cases linked to common source (eg food, water, environmental site)	
<input type="radio"/> Other means (specify) _____	
Were these cases part of a well-defined exposed group (eg Common event, institutional, environmental, household) <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Unknown	
If yes, date of exposure _____ If exposure >1 day, date exposure ended _____	
Description of exposure event _____	
First setting where exposure occurred	
Setting unknown <input type="checkbox"/>	
<input type="radio"/> Food premises <input type="radio"/> Institution <input type="radio"/> Workplace/Community/Other	
<input type="radio"/> Restaurant/café/bakery <input type="radio"/> Hostel/boarding house <input type="radio"/> Workplace	
<input type="radio"/> Takeaway <input type="radio"/> Hotel/motel <input type="radio"/> Farm	
<input type="radio"/> Supermarket/delicatessen <input type="radio"/> Long term care facility <input type="radio"/> Petting zoo	
<input type="radio"/> Temporary or mobile service <input type="radio"/> Hospital (acute care) <input type="radio"/> Home	
<input type="radio"/> Fast food restaurant <input type="radio"/> Prison <input type="radio"/> Community, church, sports gathering	
<input type="radio"/> Caterers <input type="radio"/> Camp <input type="radio"/> Cruise ship, airline, tour bus, train	
<input type="radio"/> Other food outlet <input type="radio"/> School <input type="radio"/> Childcare centre <input type="radio"/> Other setting	
<input type="radio"/> Marae <input type="radio"/> Other institution	
Setting name _____	
Setting Address	
Number _____ Street _____ Suburb _____	
Town/City _____ Post Code _____ <input type="checkbox"/> GeoCode _____	
Second setting where exposure occurred	
Setting unknown <input type="checkbox"/>	
<input type="radio"/> Food premises <input type="radio"/> Institution <input type="radio"/> Workplace/Community/Other	
<input type="radio"/> Restaurant/café/bakery <input type="radio"/> Hostel/boarding house <input type="radio"/> Workplace	
<input type="radio"/> Takeaway <input type="radio"/> Hotel/motel <input type="radio"/> Farm	
<input type="radio"/> Supermarket/delicatessen <input type="radio"/> Long term care facility <input type="radio"/> Petting zoo	
<input type="radio"/> Temporary or Mobile Service <input type="radio"/> Hospital (acute care) <input type="radio"/> Home	
<input type="radio"/> Fast food restaurant <input type="radio"/> Prison <input type="radio"/> Community, church, sports gathering	
<input type="radio"/> Caterers <input type="radio"/> Camp <input type="radio"/> Cruise ship, airline, tour bus, train	
<input type="radio"/> Other food outlet <input type="radio"/> School <input type="radio"/> Childcare centre <input type="radio"/> Other setting	
<input type="radio"/> Marae <input type="radio"/> Other institution	
Setting name _____	
Setting Address	
Number _____ Street _____ Suburb _____	
Town/City _____ Post Code _____ <input type="checkbox"/> GeoCode _____	

Outbreak Summary	Outbreak No.
Circumstances of Exposure/Transmission contd	
Mode of transmission (indicate the primary mode and all secondary modes)	
<input type="checkbox"/> Foodborne, from consumption of contaminated food or drink (excluding water)	
Mode <input type="radio"/> primary <input type="radio"/> secondary	Level of evidence <input type="radio"/> 1 <input type="radio"/> 2a <input type="radio"/> 2b <input type="radio"/> 3a <input type="radio"/> 3b <input type="radio"/> 3c <input type="radio"/> 4
<input type="checkbox"/> Waterborne, from consumption of contaminated drinking water	
Mode <input type="radio"/> primary <input type="radio"/> secondary	Level of evidence <input type="radio"/> 1 <input type="radio"/> 2a <input type="radio"/> 2b <input type="radio"/> 3a <input type="radio"/> 3b <input type="radio"/> 3c <input type="radio"/> 4
<input type="checkbox"/> Person to person spread, from (non-sexual) contact with an infected person (including droplets)	
Mode <input type="radio"/> primary <input type="radio"/> secondary	Level of evidence <input type="radio"/> 1 <input type="radio"/> 2a <input type="radio"/> 2b <input type="radio"/> 3a <input type="radio"/> 3b <input type="radio"/> 3c <input type="radio"/> 4
<input type="checkbox"/> Sexual, from sexual contact with an infected person	
Mode <input type="radio"/> primary <input type="radio"/> secondary	Level of evidence <input type="radio"/> 1 <input type="radio"/> 2a <input type="radio"/> 2b <input type="radio"/> 3a <input type="radio"/> 3b <input type="radio"/> 3c <input type="radio"/> 4
<input type="checkbox"/> Parenteral, from needle stick injury or reuse of contaminated injection equipment	
Mode <input type="radio"/> primary <input type="radio"/> secondary	Level of evidence <input type="radio"/> 1 <input type="radio"/> 2a <input type="radio"/> 2b <input type="radio"/> 3a <input type="radio"/> 3b <input type="radio"/> 3c <input type="radio"/> 4
<input type="checkbox"/> Environmental, from contact with an environmental source (eg swimming)	
Mode <input type="radio"/> primary <input type="radio"/> secondary	Level of evidence <input type="radio"/> 1 <input type="radio"/> 2a <input type="radio"/> 2b <input type="radio"/> 3a <input type="radio"/> 3b <input type="radio"/> 3c <input type="radio"/> 4
<input type="checkbox"/> Zoonotic, from contact with an infected animal	
Mode <input type="radio"/> primary <input type="radio"/> secondary	Level of evidence <input type="radio"/> 1 <input type="radio"/> 2a <input type="radio"/> 2b <input type="radio"/> 3a <input type="radio"/> 3b <input type="radio"/> 3c <input type="radio"/> 4
<input type="checkbox"/> Vectorborne, from contact with an insect vector	
Mode <input type="radio"/> primary <input type="radio"/> secondary	Level of evidence <input type="radio"/> 1 <input type="radio"/> 2a <input type="radio"/> 2b <input type="radio"/> 3a <input type="radio"/> 3b <input type="radio"/> 3c <input type="radio"/> 4
<input type="checkbox"/> Other mode of transmission (specify) _____	
Mode <input type="radio"/> primary <input type="radio"/> secondary	Level of evidence <input type="radio"/> 1 <input type="radio"/> 2a <input type="radio"/> 2b <input type="radio"/> 3a <input type="radio"/> 3b <input type="radio"/> 3c <input type="radio"/> 4
Mode of transmission unknown <input type="checkbox"/>	
Vehicle/source of common source outbreak	
Was a specific contaminated food, water or environmental vehicle/source identified? <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Unknown	
If yes,	
Source 1 _____	
Level of evidence <input type="radio"/> 1 <input type="radio"/> 2a <input type="radio"/> 2b <input type="radio"/> 3a <input type="radio"/> 3b <input type="radio"/> 3c <input type="radio"/> 4	
Food category _____	ESR Updated <input type="checkbox"/> Date _____
Source 2 _____	
Level of evidence <input type="radio"/> 1 <input type="radio"/> 2a <input type="radio"/> 2b <input type="radio"/> 3a <input type="radio"/> 3b <input type="radio"/> 3c <input type="radio"/> 4	
Food category _____	ESR Updated <input type="checkbox"/> Date _____
Source 3 _____	
Level of evidence <input type="radio"/> 1 <input type="radio"/> 2a <input type="radio"/> 2b <input type="radio"/> 3a <input type="radio"/> 3b <input type="radio"/> 3c <input type="radio"/> 4	
Food category _____	ESR Updated <input type="checkbox"/> Date _____

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

Outbreak Summary	Outbreak No.
Factors Contributing to Outbreak	
Environmental outbreak (tick all that apply)	
<input type="checkbox"/> Exposure to contaminated land	<input type="radio"/> Confirmed <input type="radio"/> Suspected
<input type="checkbox"/> Exposure to contaminated air (including ventilation)	<input type="radio"/> Confirmed <input type="radio"/> Suspected
<input type="checkbox"/> Exposure to contaminated built environments (inc dwellings)	<input type="radio"/> Confirmed <input type="radio"/> Suspected
<input type="checkbox"/> Exposure to infected animals or animal products	<input type="radio"/> Confirmed <input type="radio"/> Suspected
<input type="checkbox"/> Exposure to contaminated swimming/spa pools	<input type="radio"/> Confirmed <input type="radio"/> Suspected
<input type="checkbox"/> Exposure to contaminated other recreational water	<input type="radio"/> Confirmed <input type="radio"/> Suspected
Other outbreaks	
<input type="checkbox"/> Other risk factor, specify _____	<input type="radio"/> Confirmed <input type="radio"/> Suspected
Management of the Outbreak	
Was there any specific action taken to control the outbreak?	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Unknown
If yes, list the control measures undertaken (tick all that apply)	
Source	Specify
<input type="checkbox"/> Closure	_____
<input type="checkbox"/> Modification of procedures	_____
<input type="checkbox"/> Cleaning, disinfection	_____
<input type="checkbox"/> Removal	_____
<input type="checkbox"/> Treatment	_____
<input type="checkbox"/> Exclusion	_____
<input type="checkbox"/> Isolation	_____
<input type="checkbox"/> Health education and advice	_____
<input type="checkbox"/> Health warning	_____
Vehicles and vectors	
<input type="checkbox"/> Removal	_____
<input type="checkbox"/> Treatment	_____
Contacts and potential contacts	
<input type="checkbox"/> Chemoprophylaxis	_____
<input type="checkbox"/> Vaccination	_____
<input type="checkbox"/> Health education and advice	_____
Other control measures (specify)	

Outbreak Summary	Outbreak No.
Management of the Outbreak	
Was insufficient information supplied to complete the form? <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Unknown	
Other comments on outbreak	
Please attach a copy of written report if prepared.	
<p>Level of Evidence Codes</p> <ul style="list-style-type: none"> 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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