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ANNUAL SUMMARY OF OUTBREAKS IN NEW ZEALAND 2008

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This report is available on the Internet at www.surv.esr.cri.nz

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EXECUTIVE SUMMARY

Characteristics

- There were 449 outbreaks reported in 2008 involving 6503 cases.
- The national reported outbreak rate was 10.5 outbreaks per 100 000 population.
- There were 180 hospitalisations and 13 deaths associated with outbreaks notified in 2008.

Distribution by Public Health Unit (PHU)

- The highest number of outbreaks was reported by Auckland, which represented 46.8% (210/449) of all outbreaks in 2008.
- The highest reported outbreak rate (30.9 outbreaks per 100 000 population) was observed in the West Coast.
- Auckland, Taranaki, Wanganui, West Coast, and Otago reported outbreak rates higher than the national rate.
- All PHUs reported at least one outbreak and only one outbreak was reported by each of Northland and Marlborough.

Type of outbreak

- Forty percent (40.8%, 183/449) of all outbreaks and 66.5% (4326/6503) of all associated cases were reported as linked to institutional outbreaks.
- Common source outbreaks represented 26.7% (120/449) of all outbreaks and 20.1% (1304/6503) of all associated cases, the majority of which resulted from a common event.
- Household outbreaks represented 24.9% (112/449) of all outbreaks and 8.6% (558/6503) of all associated cases.

Causal agents

- The causal agent (pathogen, toxin or chemical) was identified in 67.7% (304/449) of outbreaks involving 78.1% (5076/6503) of outbreak related cases.
- The remaining outbreaks where no organism was isolated were all recorded as gastroenteritis.
- Enteric agents were implicated in 95.3% (428/449) of outbreaks and 96.8% (6295/6503) of outbreak related cases.
- The most common implicated pathogen was norovirus (33.9% of outbreaks), followed by *Giardia* (11.1%), rotavirus (3.6%) and *Campylobacter* (3.6%).

Outbreak setting

- The most common settings where exposure or transmission occurred were the home environment (24.9%) and rest or retirement homes (19.6% of outbreaks).
- The highest number of outbreak related cases was recorded as occurring in rest homes (29.5%), acute care hospitals (13.6%) and hostels or boarding houses (11.8%).

Mode of transmission

- Person-to-person outbreaks were the most common mode of transmission, accounting for 69.5% (312/449) of outbreaks and 81.4% (5293/6503) of cases.
- Foodborne transmission was recorded in 19.8% (89/449) of outbreaks involving 18.5% (1206/6503) of cases.
- Environmental transmission was recorded in 18.9% (85/449) of outbreaks involving 33.7% (2190/6503) of cases.
- Multiple modes of transmission were identified in 30.7% (138/449) of outbreaks associated with 42.5% (2764/6503) of cases.

Recognition, investigation and control

- Over half of all outbreaks (58.0%, 244/421) were reported within one week of the onset of illness in the first case.
- The overall median reporting delay for outbreaks was four days.
- Outbreaks were most frequently identified when there was an increase in disease incidence (58.6% of outbreaks), cases had person-to-person contact with other cases (51.2%), cases were linked to a common source (37.6%) and cases attended a common event (21.8%).
- Outbreak control measures were undertaken in 94.0% (422/449) of outbreaks reported in 2008. The most common measures were health education and advice (75.1%, 337/449 outbreaks) and cleaning and disinfection (57.7%, 259/449).

1. INTRODUCTION

Outbreak surveillance in New Zealand has been conducted by ESR since 1996. The outbreak surveillance system was incorporated as a module within EpiSurv, the national notifiable disease surveillance system, in 1997.

Outbreak surveillance is undertaken for the following reasons[1]:

- to identify and control widely dispersed outbreaks
- to improve outbreak prevention
- to assess impact of outbreaks and set priorities
- to evaluate prevention strategies
- to improve investigation methods
- to improve public health training
- to improve understanding of emerging diseases
- to meet international reporting requirements.

2. METHODS

2.1. Outbreak definition

The Manual for Public Health Surveillance in New Zealand[2] 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.

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
- aingle cases where a specific contaminated source is identified.

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1 Lopez L, Baker M, Kieft C. *Annual Summary of Outbreaks in New Zealand 2000*. 2001, Institute of Environmental Science & Research Ltd (ESR).

2 *Manual for Public Health Surveillance*, 2005, Institute of Environmental Science & Research Ltd (ESR).

2.2. Data source

Outbreaks are reported to, or identified by, the local PHU. Data on each outbreak is recorded by the PHU on a standardised Outbreak Report Form within EpiSurv. PHUs are encouraged to enter early data as an interim report that can be finalised when further data is available. This data is sent daily to be collated within the national EpiSurv database by ESR on behalf of the Ministry of Health. The national database is supplemented by data from the ESR enteric reference, virology and public health laboratories. If an outbreak is first identified by these laboratory sources, the responsible PHU is requested to complete an Outbreak Report Form.

The Outbreak Report Form consists of the following sections:

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

The terms used in the Outbreak Report Form that relate to this report are defined in the glossary at the end of this report.

2.3. Data analysis

This report contains an analysis of data on outbreaks reported between 1 January 2008 and 31 December 2008 and recorded on EpiSurv as at 7 March 2009. Amendments made to outbreak data on EpiSurv after 7 March 2009 will not be reflected in this report.

The number and percentage of outbreaks and/or associated cases were ascertained. Rates were calculated using national and PHU population figures based on Statistics NZ population estimates for 2008.

The categories and subcategories analysed in this report were directly based on 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 using the outbreak report date and the date of onset of illness in the first case.

2.4. Data limitations

The available outbreak data is 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 between 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.

Measurement bias occurs when fields in an Outbreak Report Form are incomplete or incorrectly entered. For example, the date of onset of illness in the first case was not reported for 28 outbreaks in 2008.

Different methods of data analysis have been used in the Annual Summary of Outbreaks in New Zealand prior to 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 published past reports should be restricted to the period since 2005.

3. RESULTS

3.1. Characteristics of outbreaks

There were 449 outbreaks reported in 2008 compared to 493 outbreaks reported in 2007. The national rate of 10.5 outbreaks per 100 000 population in 2008 was slightly less than 2007 when there were 11.7 outbreaks per 100 000 population. Of the reports of outbreaks in 2008, 447 (99.6%) were classified as final while the remaining two were classified as interim. A total of 6503 cases were associated with outbreaks giving a national rate of 152.3 outbreak cases per 100 000 population. Of the total cases, 1774 (27.3%) were confirmed and 4729 (72.7%) were probable.

3.2. Distribution of outbreaks by PHU

The highest number of outbreaks (210) and associated cases (1538) was reported by the Auckland PHU, which represented 46.8% (210/449) of all outbreaks in 2008 (Table 1). Wellington had the second highest number of outbreaks (47) followed by Canterbury (40) and Otago (38). The highest outbreak rate (30.9 per 100,000) was observed in the West Coast (see Figure 1), although the West Coast only accounted for 2.2% (10/449) of all outbreaks reported. Other PHUs with an outbreak rate higher than the national rate (10.5 outbreaks per 100 000 population) were Otago (20.3), Taranaki (16.7), Auckland (14.7) and Wanganui (11.1). Only one outbreak was reported by each of Northland and Marlborough PHUs.

Figure 1: Outbreak rates by PHU, 2008

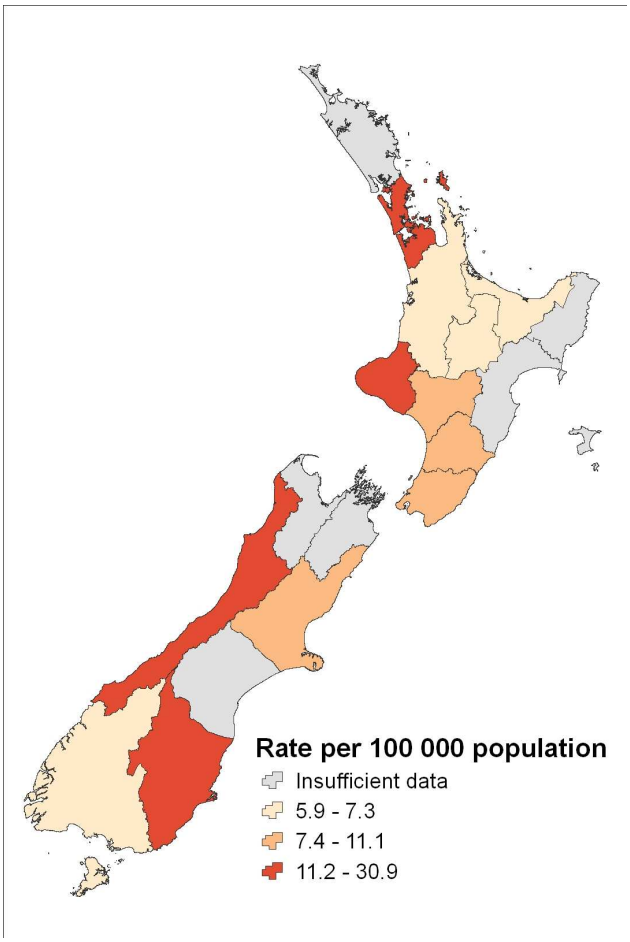


Table 1: Outbreaks and associated cases by PHU, 2008

PHU	No. of outbreaks	% of outbreaks (n=449)	No. of cases	% of cases (n=6503)	Outbreak rate[1]
Northland	1	0.2	10	0.2	0.6
Auckland[2]	210	46.8	1538	23.7	14.7
Waikato	22	4.9	222	3.4	6.2
Tauranga and Eastern Bay of Plenty	15	3.3	227	3.5	7.3
Gisborne	3	0.7	46	0.7	6.5
Rotorua and Taupo	6	1.3	34	0.5	5.9
Taranaki	18	4.0	349	5.4	16.7
Hawke's Bay	4	0.9	47	0.7	2.6
Wanganui	7	1.6	277	4.3	11.1
Manawatu	13	2.9	517	8.0	7.9
Wellington[3]	47	10.5	794	12.2	10.1
Nelson	4	0.9	120	1.8	4.4
Marlborough	1	0.2	3	0.0	2.2
West Coast	10	2.2	56	0.9	30.9
Canterbury	40	8.9	898	13.8	8.6
South Canterbury	3	0.7	110	1.7	3.6
Otago	38	8.5	1105	17.0	20.3
Southland	7	1.6	150	2.3	6.3
National	**449**	**100**	**6503**	**100**	**10.5**

[1] Crude rate of outbreaks per 100 000 population calculated using Statistics NZ population estimates for 2008
[2] Includes Northwest Auckland, Central Auckland and South Auckland health districts
[3] Includes Wellington, Hutt and Wairarapa health districts

3.3. Type of outbreak

In 2008 over a quarter (26.7%, 120/449 outbreaks) of all outbreaks, and 20.1% (1304/6503) of associated cases, were reported as a common source outbreak. Of these outbreaks, 66 (14.7%) reportedly resulted from a common event, 32 (7.1%) from a common source dispersed in the community and 22 (4.9%) from a common source in a specific site (see Table 2). Institutional outbreaks had the highest median number of cases per outbreak (15.0), accounting for 40.8% (183/449) of all outbreaks, and 66.5% (4326/6503) of outbreak associated cases. Household outbreaks accounted for 23.6% (106/449) of outbreaks but just 5.0% (327/6503) of outbreak cases. Community wide outbreaks, where transmission only occurred through person-to-person contact, represented 1.6% (7/449) of reported outbreaks.

Table 2: Outbreaks and associated cases by type of outbreak, 2008

Outbreak type	No. of outbreaks	% of outbreaks (n=449)	No. of cases	% of cases (n=6503)	Median cases per outbreak
Common event	66	14.7	647	9.9	3.5
Dispersed common source	32	7.1	299	4.6	3.0
Common site	22	4.9	358	5.5	6.0
Community wide	7	1.6	116	1.8	10.0
Institutional	183	40.8	4326	66.5	15.0
Household	106	23.6	327	5.0	2.0
Other outbreak type	14	3.1	330	5.1	6.0
Unknown outbreak type	19	4.2	100	1.5	3.0
Total	**449**	**100**	**6503**	**100**	**5.0**

3.4. Causal agent

The causal agent was identified in 304 (67.7%) outbreaks that were associated with 5076 (78.1%) cases. For each of these outbreaks only one causal agent was recorded. No specific pathogen was reported in the remaining 145 (32.3%) outbreaks, all of which were recorded as gastroenteritis outbreaks.

Enteric agents were implicated in the vast majority of outbreaks (94.7%, 425/449) and cases (96.3%, 6264/6503) (see Table 3). The most common causal agent implicated in outbreaks in 2008 was norovirus, which resulted in 152 (33.9%) outbreaks with 3917 (60.2%) associated cases. The median number of cases associated with each norovirus outbreak (15.5) was the highest of any enteric agent in 2008, (after Tutin poisoning which was only implicated in one outbreak involving 22 cases). The next most common causal agents associated with outbreaks were *Giardia* (11.1%), rotavirus (3.6%) and *Campylobacter* (3.6%). Outbreaks due to *Clostridium perfringens* had the second highest number of associated cases (215).

Non-enteric agents accounted for 24 (5.3%) outbreaks associated with 239 (3.7%) cases in 2008. The four agents involved in more than one outbreak were: *Bordetella pertussis* (6) *Leptospira* species (4), *Mycobacterium tuberculosis* (4) and Lead poisoning (2). The median number of cases associated with the two outbreaks of lead poisoning (52.0) was the highest of any non-enteric agent, and overall. The single outbreak of influenza-like illness had 26 associated cases.

The specific causal agents implicated in the various outbreak types are shown in Table 4. Common event outbreaks were mostly associated with norovirus (18 outbreaks). Outbreaks due to a common source dispersed in the community were most frequently linked to norovirus (9 outbreaks) and *Salmonella* (3), while outbreaks due to a common source in a specific site were mostly commonly due to *Campylobacter* (4), norovirus, *Giardia* and *Leptospira* species (3 outbreaks each). The majority of institutional outbreaks were caused by norovirus (92 outbreaks) or by rotavirus (12). *Giardia* was most commonly associated with household outbreaks (40) followed by norovirus (21) and *Salmonella* species (7).

Table 3: Outbreaks and associated cases by agent type, 2008

Agent type	No. of outbreaks	% of outbreaks (n=449)	No. of cases	% of cases (n=6503)	Median cases per outbreak
Enteric					
Norovirus	152	33.9	3917	60.2	15.5
Giardia spp.	50	11.1	184	2.8	3.0
Rotavirus	16	3.6	128	2.0	5.5
Campylobacter spp.	16	3.6	109	1.7	3.0
Salmonella spp.	15	3.3	163	2.5	4.0
Clostridium perfringens	7	1.6	215	3.3	8.0
Cryptosporidium spp.	7	1.6	29	0.4	4.0
Shigella spp.	6	1.3	27	0.4	3.0
VTEC/STEC	4	0.9	25	0.4	4.5
Hepatitis A	3	0.7	31	0.5	9.0
Histamine (scombroid) fish poisoning	2	0.4	6	0.1	3.0
Tutin	1	0.2	22	0.3	22.0
Salmonella Typhi	1	0.2	5	0.1	5.0
Bacillus cereus	1	0.2	3	0.0	3.0
Blue Green Algae	1	0.2	2	0.0	2.0
Wax Ester Fish Poisoning	1	0.2	2	0.0	2.0
Unidentified pathogen[1]	145	32.3	1427	21.9	5.0
Total enteric	**428**	**95.3**	**6295**	**96.8**	**6.0**
Non-enteric					
Bordetella pertussis	6	1.3	21	0.3	2.0
Leptospira spp.	4	0.9	20	0.3	2.5
Mycobacterium tuberculosis	4	0.9	12	0.2	3.0
Lead poisoning	2	0.4	104	1.6	52.0
Influenza A H3	1	0.2	26	0.4	3.0
Influenza like illness	1	0.2	9	0.1	26.0
Mycoplasma pneumoniae	1	0.2	11	0.2	11.0
Carbon monoxide	1	0.2	3	0	9.0
Measles	1	0.2	2	0	2.0
Total non-enteric	**21**	**4.7**	**208**	**3.2**	**3.0**

[1] All outbreaks with no pathogen identified in 2008 were classified as gastroenteritis

Table 4: Outbreak type by agent type, 2008

Agent type	Outbreak Type								
	CEvt[1]	CDsp[2]	CSite[3]	Com[4]	Inst[5]	Hse[6]	Oth[7]	Unk[8]	Total
Enteric									
Norovirus	18	9	3	2	92	21	3	4	152
Giardia spp.	1	0	3	0	0	40	4	2	50
Campylobacter spp.	1	2	4	0	3	5	0	1	16
Rotavirus	0	0	0	0	12	3	1	0	16
Salmonella spp.	1	3	0	0	1	7	0	3	15
Clostridium perfringens	2	2	2	0	1	0	0	0	7
Cryptosporidium spp.	0	0	2	0	1	4	0	0	7
Shigella spp.	0	0	0	0	0	5	1	0	6
VTEC/STEC	1	1	0	0	0	2	0	0	4
Hepatitis A	0	0	0	1	1	1	0	0	3
Histamine (scombroid) fish poisoning	1	1	0	0	0	0	0	0	2
Bacillus cereus	1	0	0	0	0	0	0	0	1
Tutin	0	1	0	0	0	0	0	0	1
Blue Green Algae	0	0	1	0	0	0	0	0	1
Salmonella Typhi	0	0	0	0	0	1	0	0	1
Wax Ester Fish Poisoning	0	0	0	0	0	0	1	0	1
Unidentified pathogen	40	13	1	3	65	12	3	8	145
Total enteric	**66**	**32**	**16**	**6**	**176**	**101**	**13**	**18**	**428**
Non-enteric									
Bordetella pertussis	0	0	0	0	2	4	0	0	6
Leptospira spp.	0	0	3	0	0	0	0	1	4
Mycobacterium tuberculosis	0	0	0	1	1	1	1	0	4
Lead poisoning	0	0	2	0	0	0	0	0	2
Carbon monoxide	0	0	1	0	0	0	0	0	1
Mycoplasma pneumoniae	0	0	0	0	1	0	0	0	1
Influenza A H3	0	0	0	0	1	0	0	0	1
Influenza like illness	0	0	0	0	1	0	0	0	1
Measles	0	0	0	0	1	0	0	0	1
Total non-enteric	0	0	6	1	7	5	1	1	21
Total outbreaks	**66**	**32**	**22**	**7**	**183**	**106**	**14**	**19**	**449**

1 Common event
2 Common source dispersed in community
3 Common site
4 Community wide
5 Institutional
6 Household
7 Other
8 Unknown

3.5. Morbidity and mortality

There were 39 (11.8%) outbreaks reported in 2008 that involved the hospitalisation of cases. This was out of a total of 331 outbreaks where the number of cases hospitalised were recorded. A total of 180 outbreak associated cases were hospitalised. There were over ten-times more hospitalised cases for outbreaks due to enteric agents (167) compared to non-enteric agents (13). However, a higher percentage of cases associated with non-enteric outbreaks were hospitalised compared to enteric outbreaks (14.9% versus 4.2%) (Table 5). The agent with highest proportion of hospitalised cases was *M. tuberculosis* (60%, 6 cases), followed by carbon monoxide (33.3%, 1 case), and *Leptospira* species (22.2%, 4 cases). The enteric agent with the highest proportion of hospitalised cases was Hepatitis A (16.1%, 5 cases) followed by verotoxin producing *Escherichia coli* (VTEC) (16.0%, 4 cases), *Shigella* (14.8%, 4 cases) and *Salmonella* species (13.4%, 18 cases).

There were 13 deaths associated with outbreaks in 2008; the majority of which were due to norovirus (6 deaths) or gastroenteritis (3 deaths) and resulted from outbreaks set in rest homes (7 deaths) and/or hospitals (3 deaths). Two deaths were due to accidental carbon monoxide poisoning in a cabin from a gas cooker. An 86 year old man of Pacific ethnicity died, and was suspected to be the index case, in a household outbreak of *M. tuberculosis*. The remaining fatality, a 74 year old woman from Nelson, died during a national outbreak of *Salmonella* Mbandaka.

3.6. Outbreak setting

The most common outbreak setting was the home, which was recorded in a quarter of all outbreaks (112, 24.9%) but only involved 8.6% (558) of cases. The outbreak setting linked to the greatest number of cases was a rest or retirement home, which was recorded in 88 (19.6%) outbreaks with 1920 (29.5%) associated cases (see Table 6). Other common institutional settings were childcare centres (40 outbreaks), continuing care hospitals (35), and acute care hospitals (28). Commercial food operators were a common outbreak setting, which included restaurants/cafés (55 outbreaks), takeaway outlets (17), other food outlets (12), supermarkets/delicatessens (6) and caterers (4). The setting was unknown in 33 (7.3%) outbreaks.

Table 5: Hospitalised outbreak cases and total outbreak cases by agent type, 2008

Agent type	No. of outbreaks[1]	No. of associated cases[1]	No. of hospitalised cases	% of cases hospitalised
Enteric				
Norovirus	105	2236	88	3.9
Salmonella spp.	12	134	18	13.4
Hepatitis A	3	31	5	16.1
Shigella spp.	6	27	4	14.8
VTEC/STEC	4	25	4	16.0
Campylobacter spp.	16	109	3	2.8
Cryptosporidium spp.	6	27	1	3.7
Clostridium perfringens	5	191	0	0
Giardia spp.	47	170	0	0
Rotavirus	13	81	0	0
Salmonella Typhi	1	5	0	0
Bacillus cereus	1	3	0	0
Histamine (scombroid) fish poisoning	1	2	0	0
Unidentified pathogen[2]	96	936	44	4.7
Total enteric	**316**	**3977**	**167**	**4.2**
Non-enteric				
Mycobacterium tuberculosis	3	10	6	60.0
Leptospira spp.	3	18	4	22.2
Influenza A H3	1	26	1	3.8
Influenza like illness	1	9	1	11.1
Carbon monoxide	1	3	1	33.3
Bordetella pertussis	5	19	0	0.0
Measles	1	2	0	0.0
Total non-enteric	**15**	**87**	**13**	**14.9**
Total hospitalisations	**331**	**4064**	**180**	**4.4**

[1] Hospitalisation information was recorded for 73.7% (331/449) of outbreaks, relating to 62.5% (4064/6503) of cases

[2] All outbreaks with no pathogen identified in 2008 were classified as gastroenteritis

Table 6: Outbreaks and associated cases by setting of exposure/transmission, 2008

Outbreak setting	No. of outbreaks[1]	% of total outbreaks (n=449)	No. of cases[1]	% of total cases (n=6503)
Commercial food operators				
Restaurant/Café	55	12.2	547	8.4
Takeaway	17	3.8	373	5.7
Other food outlet	12	2.7	73	1.1
Supermarket/Deli	6	1.3	49	0.8
Caterer	4	0.9	78	1.2
Institutions				
Rest/Retirement Home	88	19.6	1920	29.5
Childcare centre	40	8.9	490	7.5
Hospital (continuing care)	35	7.8	756	11.6
Hospital (acute care)	28	6.2	886	13.6
Camp	9	2	138	2.1
Hostel/Boarding house	8	1.8	767	11.8
School	7	1.6	151	2.3
Hotel/Motel	6	1.3	31	0.5
Prison	2	0.4	20	0.3
Community				
Community/Church gathering	3	0.7	63	1
Swimming/Spa pool	3	0.7	8	0.1
Workplace				
Farm	14	3.1	60	0.9
Workplace	11	2.4	256	3.9
Abattoir	2	0.4	16	0.2
Home	112	24.9	558	8.6
Other setting	47	10.5	1229	18.9
Unknown setting	33	7.3	133	2

[1] More than one setting was recorded for 83 outbreaks with 1378 associated cases

3.7. Mode of transmission

In 2008, the most common reported mode of transmission was person-to-person (69.5%, 312/449 outbreaks), followed by foodborne (19.8%, 89/449) and environmental (18.9%, 85/449) (see Table 7). Person-to-person transmission also accounted for the highest percentage of cases (81.4%, 5293/6503). Environmental mode of transmission had the second highest percentage of cases (33.7%, 2190/6503). The mode of transmission was unknown in 65 (14.5%) outbreaks.

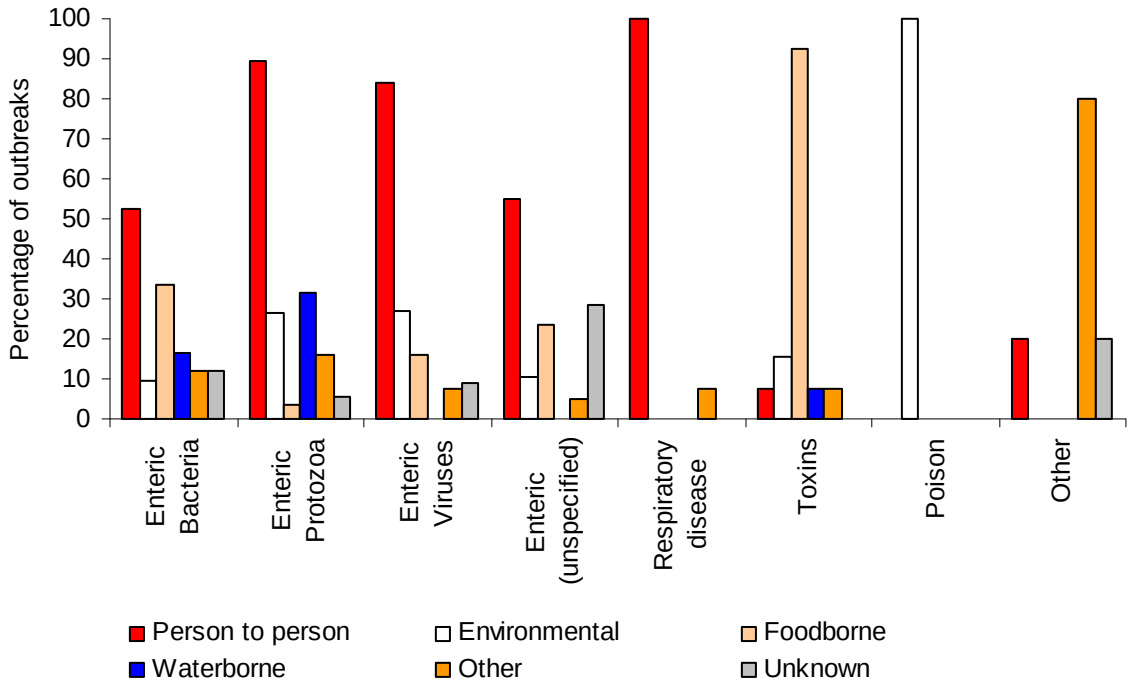
Table 7: Outbreaks and associated cases by mode of transmission, 2008

Transmission mode	No. of outbreaks[1]	% of total outbreaks (n=449)	No. of cases[1]	% of total cases (n=6503)
Person-to-person	312	69.5	5293	81.4
Foodborne	89	19.8	1206	18.5
Environmental	85	18.9	2190	33.7
Waterborne	26	5.8	159	2.4
Zoonotic	15	3.3	74	1.1
Other	25	5.6	769	11.8
Unknown	65	14.5	345	5.3

[1] More than one mode of transmission was recorded for 138 outbreaks with 2764 associated cases.

Person-to-person transmission was the most common mode of transmission for enteric bacteria (52.4%, 22/42), enteric protozoa (89.5%, 51/57), enteric viruses (84.2%, 144/171), unspecified enteric pathogens (55.2%, 80/145), and respiratory pathogens (100%, 13/13). Foodborne transmission was the principal mode of transmission for toxins (92.3%, 12/13) but also contributed substantially to outbreaks due to enteric bacteria (33.3%, 14/42) and unspecified enteric pathogens (23.4%, 34/145) (Figure 2). Environmental transmission was an important contributing factor in 27.4% (46/168) of outbreaks due to enteric viruses and 26.3% (15/57) of outbreaks due to enteric protozoa.

Figure 2: Percentage of outbreaks by agent type and mode of transmission[1], 2008



[1] More than one mode of transmission was recorded for some outbreaks therefore totals may add to greater than 100%.

3.8. Foodborne outbreaks

Causal agent

There were 89 foodborne outbreaks reported in 2008, 34 (38.2%) of which were not linked to a specific pathogen (see Table 8). Specific pathogens most commonly associated with foodborne outbreaks included norovirus (26 outbreaks), *Campylobacter* (8), *C. perfringens* (7), and *Salmonella* (4). Enteric viruses (norovirus and Hepatitis A) were implicated in 30.3% (27/89) of foodborne outbreaks, enteric bacteria (*Campylobacter*, *Salmonella*, *Escherichia coli* and *Shigella*) in 15.7% (14/89), enteric toxins (*C. perfringens*, histamine, *B. cereus*, tutin and wax ester fish poisoning) in 13.5% (12/89), and enteric protozoa (*Giardia*) in 2.2% (2/89).

Table 8: Foodborne outbreaks and associated cases by agent type, 2008

Agent type	No. of outbreaks	% of outbreaks (n=89)	No. of cases	% of cases (n=1206)
Norovirus	26	29.2	600	49.8
Campylobacter spp.	8	9.0	36	3.0
Clostridium perfringens	7	7.9	215	17.8
Salmonella spp.	4	4.5	121	10.0
Histamine (scombroid) fish poisoning	2	2.2	6	0.5
Giardia spp.	2	2.2	5	0.4
Tutin	1	1.1	22	1.8
VTEC/STEC	1	1.1	14	1.2
Shigella spp.	1	1.1	10	0.8
Bacillus cereus	1	1.1	3	0.2
Hepatitis A	1	1.1	2	0.2
Wax Ester Fish Poisoning	1	1.1	2	0.2
Unidentified pathogen[1]	34	38.2	170	14.1
Total	**89**	**100**	**1206**	**100**

[1] All outbreaks with no pathogen identified in 2008 were classified as gastroenteritis

Vehicle / source implicated

Of the 89 foodborne outbreaks in 2008, six (6.7%) outbreaks had a definite source identified and 48 (53.9%) had a suspected source identified. The actual definite or suspected sources were listed in 94.4% (51/54) of these outbreaks. No source was identified for 28 outbreaks, and for seven outbreaks the source was recorded as unknown. The main foods implicated in these outbreaks were shellfish (12 outbreaks), meat (lamb, beef or pork) (10) and fish (9) (Table 9). The highest number of cases was associated with outbreaks linked to seafood (includes fish, shellfish and other seafood, 254 cases) and meat (122).

Of the six outbreaks where a definite source was identified, the largest involved 67 cases from eleven different health districts that became ill after consuming raw flour contaminated with *S.* Typhimurium phage type 42. An outbreak occurred in the Coromandel Peninsula after 22 cases consumed comb honey that was contaminated with high levels of tutin. Eleven cases suffered from *Camplyobacter* infection after consuming poorly prepared chicken liver paté at a restaurant in Wellington. An outbreak of norovirus with 10 associated cases was linked to raw oysters. A party of five became ill after consuming a takeaway meal of roast beef, crackling and vegetables, no specific pathogen was isolated however critical control point failures were identified at the implicated restaurant. Two cases suffered from wax ester fish poisoning after consuming oilfish purchased at a fish store in Auckland.

There were twelve individual outbreaks linked to norovirus or gastroenteritis where oysters were the suspected source. Of these, eleven outbreaks and 94 associated cases involved oysters supplied by a single distributor and were reported in July by the Auckland Regional Public Health Service.

The largest reported foodborne outbreak occurred at a Massey University in Palmerston North where 288 cases were infected by norovirus. The likely source of the outbreak was contaminated food and / or fomites within a food court on campus. The initial infection was followed by secondary person-to-person spread of the virus.

Table 9: Foodborne outbreaks and associated cases by implicated vehicle / source, 2008

Implicated vehicle / source	No. of outbreaks[1]	% of outbreaks (n=89)	No. of cases	% of cases (n=1206)
Shellfish (oysters)	12	13.5	102	8.5
Meat (lamb, beef, pork)	10	11.2	122	10.1
Fish	9	10.1	29	2.4
Rice/noodles/pasta	8	9	75	6.2
Poultry	7	7.9	94	7.8
Fresh produce	6	6.7	88	7.3
Eggs	4	4.5	38	3.2
Infected food handler	3	3.4	67	5.6
Sandwich/burger	3	3.4	15	1.2
Seafood (not further specified)	2	2.2	125	10.4
Pulses/Lentils	2	2.2	24	2
Dairy	2	2.2	4	0.3
Flour	1	1.1	67	5.6
Honey	1	1.1	22	1.8
Water	1	1.1	4	0.3
Unspecified food source[2]	3	3.4	324	26.9
No vehicle / source identified	35	39.3	238	19.7

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

[2] A common meal, premises or setting may have been implicated but no specific food items were recorded.

Foodborne outbreaks with seafood, fish or shellfish as a possible vehicle or source (23 outbreaks) were frequently linked to norovirus (10 outbreaks) (Table 10). Foodborne outbreaks with meat (other than poultry) as a possible vehicle or source (10 outbreaks) were most commonly associated with *C. perfringens* (4).

Table 10: Foodborne outbreaks by causal agent and implicated vehicle / source, 2008

Implicated vehicle / source[1]	Norovirus	Campylobacter spp.	Clostridium perfringens	Salmonella spp.	Other[2]	Unidenified Pathogen[3]	Total number of outbreaks
Shellfish (oysters)	8	0	0	0	0	4	12
Meat (lamb, beef, pork)	1	1	4	0	1	3	10
Fish	2	0	0	1	3	3	9
Rice/noodles/pasta	3	0	3	0	1	1	8
Poultry	1	2	1	0	1	2	7
Fresh produce	1	1	0	0	0	4	6
Eggs	1	1	0	1	0	1	4
Infected food handler	2	0	0	1	0	0	3
Sandwich/burger	0	0	1	0	0	2	3
Seafood (not further specified)	0	0	1	0	0	1	2
Pulses/Lentils	0	0	2	0	0	0	2
Dairy	0	1	0	0	0	1	2
Flour	0	0	0	1	0	0	1
Honey	0	0	0	0	1	0	1
Water	0	1	0	0	0	0	1
Unspecified food source[4]	1	0	0	1	0	1	3
No vehicle / source identified	13	1	0	0	5	16	35
Total	**26**	**8**	**7**	**4**	**10**	**34**	**89**

1 More than one vehicle / source was implicated in some outbreaks
2 Includes all causal agents listed in Table 9 that were implicated in less than three foodborne outbreaks
3 All outbreaks with no pathogen identified in 2008 were classified as gastroenteritis
4 A common meal, premises or setting may have been implicated but no specific food items were recorded.

Contributing factors

The factors contributing to foodborne outbreaks most commonly involved either time and temperature abuses or contamination of food (both 19.1%, 17/89). Time / temperature abuse includes factors such as inadequate cooling or refrigeration of food, improper hot holding and inadequate reheating of previously cooked food (see Table 11). Contamination of food may occur via cross-contamination with other food, via an infected food handler, or from chemical contamination. Factors contributing to foodborne outbreaks were unknown in 39 outbreaks (43.8%).

Table 11: Foodborne outbreaks by contributing factor, 2008

Contributing factor	No. of outbreaks[1]	% of foodborne outbreaks (n=89)
Time/temperature abuse	***17***	***19.1***
Inadequate cooling or refrigeration	11	12.4
Inadequate reheating of previously cooked food	9	10.1
Preparation too far in advance	7	7.9
Improper storage prior to preparation	7	7.9
Improper hot holding	7	7.9
Undercooking	3	3.4
Contamination of food	***17***	***19.1***
Cross contamination	10	11.2
Contamination from an infected food handler	9	10.1
Chemical contamination	2	2.2
Unsafe sources	***7***	***7.9***
Use of ingredients from unsafe sources	3	3.4
Consumption of raw food	2	2.2
Use of unpasteurised milk in food preparation	1	1.1
Use of untreated water in food preparation	1	1.1
Other factors	***18***	***20.2***
Unknown factors	***39***	***43.8***

[1] More than one contributing factor was recorded for some outbreaks

3.9. Person-to-person outbreaks

Causal agents

There were 312 person-to-person outbreaks with 5293 associated cases in 2008, 80 (25.6%) of which were not linked to a specific pathogen (Table 12). The most common causal agent was norovirus, which was recorded in 40.1% (125/312) of person-to-person outbreaks involving 69.8% (3697/5293) of cases. Other common pathogens included *Giardia* (14.4%) and rotavirus (5.1%). Enteric viruses (norovirus, rotavirus and Hepatitis A) were implicated in 46.2% (144/312) of person-to-person outbreaks, enteric protozoa (*Cryptosporidium* and *Giardia*) in 16.3% (51/312), enteric bacteria (*Campylobacter*, *Salmonella*, *S.* Typhi, *Shigella* and *E. coli*) in 7.1% (22/312), respiratory pathogens (*B. pertussis*, *M. tuberculosis*, *M. pneumoniae* and Influenza) in 4.2% (13/312) and other casual agents (measles) in 0.3% (1/312).

Norovirus was identified as the causal agent in 95% (66/69) of the person-to-person outbreaks where the causal agent was identified and there were 20 or more associated cases. The three largest person-to-person outbreaks were attributed to norovirus and occurred at Dunedin Public Hospital (354 cases), Massey University (288) in Palmerston North and aboard the Sun Princess cruise ship (229 cases).

Table 12: Person-to-person outbreaks and associated cases by agent type, 2008

Agent type	No. of outbreaks	% of outbreaks (n=312)	No. of cases	% of cases (n=5293)
Norovirus	125	40.1	3697	69.8
Giardia spp.	45	14.4	163	3.1
Rotavirus	16	5.1	128	2.4
Campylobacter spp.	7	2.2	20	0.4
Salmonella spp.	7	2.2	18	0.3
Cryptosporidium spp.	6	1.9	27	0.5
Bordetella pertussis	6	1.9	21	0.4
Shigella spp.	5	1.6	25	0.5
Mycobacterium tuberculosis	4	1.3	12	0.2
Hepatitis A	3	1.0	31	0.6
VTEC/STEC	2	0.6	5	0.1
Influenza A H3	1	0.3	26	0.5
Influenza like illness	1	0.3	9	0.2
Clostridium perfringens	1	0.3	16	0.3
Mycoplasma pneumoniae	1	0.3	11	0.2
Salmonella Typhi	1	0.3	5	0.1
Measles	1	0.3	2	0.0
Unidentified pathogen[1]	80	25.6	1077	20.3
Total	**312**	**100**	**5293**	**100**

[1] All outbreaks with no pathogen identified in 2008 were classified as gastroenteritis

Contributing factors

Exposure to infected people was the primary contributing factor reported for 87.2% (272/312) of person-to-person outbreaks reported in 2008. Other contributing factors reported included poor hygiene of cases (16.0%, 50/312), excessively crowded living conditions (3.8%, 12/312) and inadequate vaccination coverage (1.3%, 4/312).

3.10. Waterborne outbreaks

Causal agents

There were 26 waterborne outbreaks with 159 associated cases reported in 2008. The most commonly reported pathogen was *Giardia* (14 outbreaks) followed by *Campylobacter* (5) and *Cryptosporidium* (4) (Table 13). Enteric protozoa (*Giardia* and *Cryptosporidium*) were implicated in 69.2% (18/26) of waterborne outbreaks and enteric bacteria (*Campylobacter, Escherichia* and *Shigella*) in 26.9% (7/26). An enteric toxin, blue green algae, was reported for one waterborne outbreak where cases had been swimming in untreated recreational water.

Table 13: Waterborne outbreaks and associated cases by agent type, 2008

Agent type	No. of outbreaks	% of outbreaks (n=26)	No. of cases	% of cases (n=159)
Giardia spp.	14	53.8	63	39.6
Campylobacter spp.	5	19.2	69	43.4
Cryptosporidium spp.	4	15.4	17	10.7
VTEC/STEC	1	3.8	6	3.8
Blue Green Algae	1	3.8	2	1.3
Shigella spp.	1	3.8	2	1.3
Total	**26**	**100**	**159**	**100**

Contributing factors

The most common contributing factor linked to waterborne outbreaks was contamination of a water source (16 outbreaks) followed by an untreated water supply (13) (Table 14).

Table 14: Waterborne outbreaks by contributing factor, 2008

Contributing factor	No. of outbreaks[1]	% of total outbreaks (n=26)
Contamination of water source	16	61.5
Untreated water supply	13	50.0
Contamination of reservoir(s)/holding tank(s)	3	11.5
Other factors	1	3.8
Unknown factors	4	15.4

[1] More than one contributing factor was recorded for some outbreaks

3.11. Environmental outbreaks

Causal agents

There were 85 environmental outbreaks with 2190 associated cases in 2008, 15 (17.6%) of which were not linked to a specific pathogen (see Table 15). The most common causal agent identified in environmental outbreaks was norovirus, which was recorded in 48.2% (41/85) of environmental outbreaks and associated with 76.5% (1675/2190) cases. Enteric viruses (norovirus and rotavirus) were implicated in 54.1% (46/85) of environmental outbreaks, enteric protozoa (*Cryptosporidium* and *Giardia*) in 17.6% (15/85), enteric bacteria (*Campylobacter, E. coli* and *Shigella*) in 4.7% (4/85). Lead or carbon monoxide poisoning were associated with three environmental outbreaks, blue green algae and *C. perfringens* were associated with one environmental outbreak each.

Table 15: Environmental outbreaks and associated cases by agent type, 2008

Agent type	No. of outbreaks	% of outbreaks (n=85)	No. of cases	% of cases (n=2190)
Norovirus	41	48.2	1675	76.5
Giardia spp.	11	12.9	55	2.5
Rotavirus	5	5.9	46	2.1
Cryptosporidium spp.	4	4.7	17	0.8
Lead poisoning	2	2.4	104	4.7
Campylobacter spp.	2	2.4	4	0.2
VTEC/STEC	1	1.2	6	0.3
Blue Green Algae	1	1.2	2	0.1
Carbon monoxide	1	1.2	3	0.1
Clostridium perfringens	1	1.2	16	0.7
Shigella spp.	1	1.2	2	0.1
Unidentified pathogen[1]	15	17.6	260	11.9
Total	**85**	**100**	**2190**	**100**

[1] All outbreaks with no pathogen identified in 2008 were classified as gastroenteritis

Contributing factors

The major contributing factor associated with environmental outbreaks was exposure to a contaminated environment, which was recorded in 89.4% (76/85) of environmental outbreaks. The other contributing factors were exposure to infected animals or animal products (12.9%, 11/85), untreated recreational water (5.9%, 5/85) and contaminated swimming pools (3.5%, 3/85).

3.12. Zoonotic outbreaks

Causal agents

There were 15 zoonotic outbreaks with 74 associated cases reported in 2008. The most common casual agent identified in zoonotic outbreaks was *Giardia* which was linked to 40% (6/15) of the zoonotic outbreaks and 43.2% (32/74) of associated cases (see Table 16). Enteric protozoa (*Cryptosporidium* and *Giardia*) were implicated in 46.7% (7/15) of zoonotic outbreaks and enteric bacteria (*Campylobacter*, *Escherichia* and *Salmonella*) in 33.3% (5/15).

Table 16: Zoonotic outbreaks and associated cases by agent type, 2008

Agent type	No. of outbreaks	% of outbreaks (n=15)	No. of cases	% of cases (n=74)
Giardia spp.	6	40.0	32	43.2
Leptospira spp.	3	20.0	18	24.3
VTEC/STEC	2	13.3	9	12.2
Campylobacter spp.	2	13.3	6	8.1
Cryptosporidium spp.	1	6.7	6	8.1
Salmonella spp.	1	6.7	3	4.1
Total	**15**	**100**	**74**	**100**

Contributing factors

Exposure to infected animals or animal products and to infected people was reported as a contributing factor for all zoonotic outbreaks in 2008. Other contributing factors included exposure to other infected people (66.7%, 10/15) and contamination of source water (40.0%, 6/15). The most common settings for zoonotic outbreaks were on a farm (10 outbreaks) and in the home (9 outbreaks). For 10 of the 15 zoonotic outbreaks specific animals were implicated as potential source vehicles, these included cows, calves, horses, cats and dogs.

3.13. Outbreaks with overseas transmission

There were seven outbreaks in 2008 with overseas transmission involving 54 cases. Four outbreaks were linked to *Giardia* and one to *Salmonella*. The remaining two outbreaks were not linked to a specific pathogen (see Table 17). The country most commonly associated with the outbreaks was Samoa (2).

Table 17: Outbreaks with overseas transmission by destination, 2008

Agent type	Australia	Germany	Nepal	Cook Islands	Samoa	Tanzania	No. of outbreaks
Giardia spp.	1	1	0	1	0	1	4
Salmonella spp.	0	0	0	0	1	0	1
Unidentified pathogen[1]	0	0	1	0	1	0	2
Total	**1**	**1**	**1**	**1**	**2**	**1**	**7**

[1] All outbreaks with no pathogen identified in 2008 were classified as gastroenteritis

3.14. Outbreak recognition, investigation and control

Timeliness of reporting

For the 421 outbreaks where timeliness data was available, the majority were reported to the PHU within one week of the first onset of illness (58.0%, 244/421), while 29.2% (123/421) of outbreaks were reported between 7 and 30 days (inclusive) after the onset, and 6.9% (28/421) of outbreaks were reported between 31 and 60 days after the onset. Twenty-five (5.9%) outbreaks were reported more than 60 days after the first onset of illness.

Reporting delay (time between date of onset of illness in the first case and the report date) varied between different outbreak types (see Table 18). The shortest median reporting delay (2.0 days) was associated with a common event, followed by dispersed common source outbreaks (3.0) and institutional outbreaks (4.0). The longest median reporting delay (15.0 days) was observed for community wide outbreaks.

Table 18: Median reporting delay by outbreak type, 2008

Outbreak type	No. of outbreaks[1]	Median reporting delay (days)
Common event	65	2.0
Dispersed common source	31	3.0
Common site	20	13.5
Community wide	6	15.0
Institutional	177	4.0
Household	97	13.0
Other outbreak type	11	21.0
Unknown outbreak type	14	3.0
Total	**421**	**4.0**

[1] Outbreaks were excluded if the date of onset of illness in the first case was either missing

Recognition of outbreaks

Almost 60% (263/449) of outbreaks were identified when there was an increase in disease incidence. Other frequent means of outbreak recognition included: when cases had person-to-person contact with other cases (51.2%); when cases were linked to a common source (37.6%) and when cases attended a common event (21.8%) (see Table 19). There was more than one means of recognition for 55.7% (250/449) of outbreaks.

Table 19: Outbreaks by means of recognition, 2008

Means of recognition	No. of outbreaks[1]	% of total outbreaks (n=449)
Increase in disease incidence	263	58.6
Cases had person-to-person contact with other cases	230	51.2
Cases linked to common source	169	37.6
Cases attended common event	98	21.8
Common organism type/strain characteristics in cases	29	6.5
Other means	39	8.7
Unknown means	5	1.1

[1] More than one means of recognition was recorded for some outbreaks.

Control measures

Outbreak control measures were known to have been undertaken in 94.0% (422/449) of outbreaks reported in 2008, it was unknown whether control measures were taken in 25 outbreaks. The most common measures undertaken were health education and advice regarding the source (337 outbreaks), followed by cleaning and disinfection (259) (see Table 20).

Table 20: Outbreaks by control measures undertaken, 2008

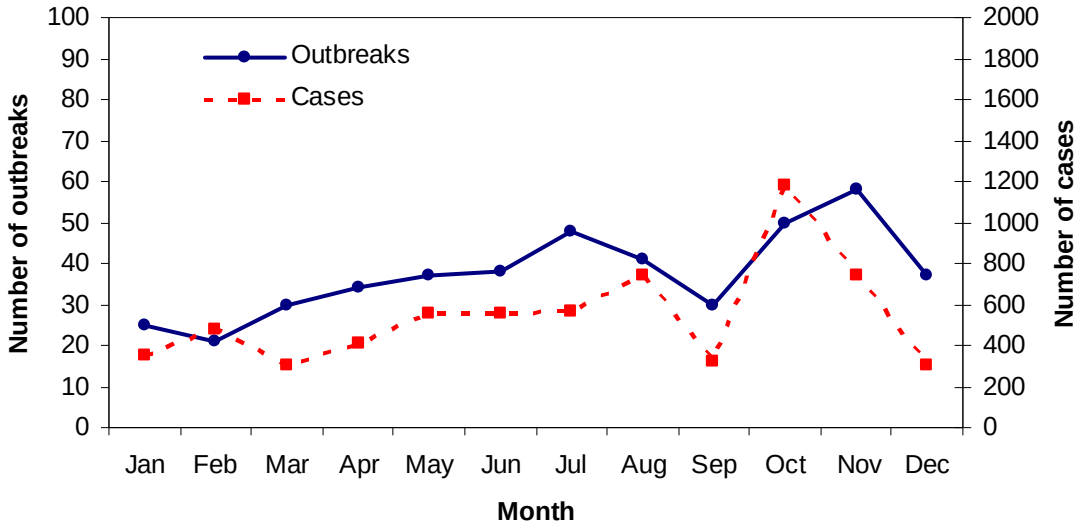
Outbreak control measure	No. of outbreaks[1]	% of total outbreaks (n=449)
Source		
Health education and advice	337	75.1
Cleaning, disinfection	259	57.7
Exclusion	178	39.6
Isolation	153	34.1
Modification of procedures	112	24.9
Closure	76	16.9
Health warning	53	11.8
Treatment	34	7.6
Removal	19	4.2
Vehicle and vector		
Removal	6	1.3
Treatment	4	0.9
Contacts and potential contacts		
Health education and advice	57	12.7
Chemoprophylaxis	12	2.7
Vaccination	5	1.1
Other control measures	66	14.7
No control measures	27	6.0
Unknown control measures	25	5.6

[1] More than one control measure was recorded for some outbreaks

3.15. Summary of trends

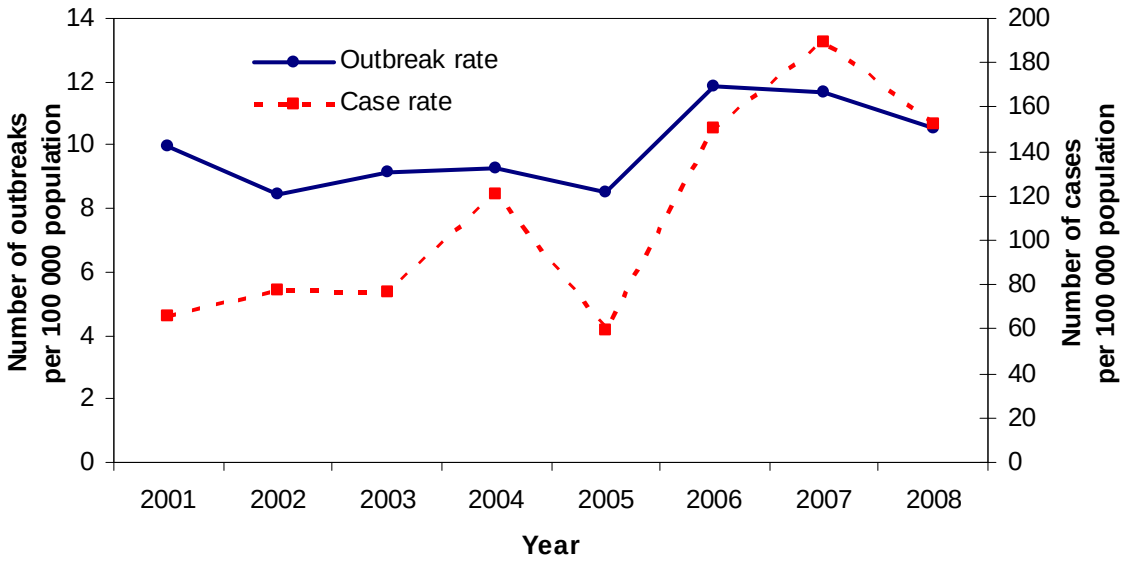
In 2008, the highest number of outbreaks were reported in November (58 outbreaks) followed by October (50) and July (48). The highest number of outbreak related cases occurred in October (1179 cases) and November (744) (see Figure 3).

Figure 3: Number of outbreaks and associated cases by month, 2008



The national annual outbreak rate for 2008 (10.5 outbreaks per 100 000 population) was slightly lower than the rates for 2007 and 2006 (11.7 and 11.9 per 100 000 population respectively) and greater than the rates for 2001 to 2005 (Figure 4). Similarly, the national outbreak case rate of 152.3 cases per 100 000 population in 2008 was lower than the 2007 case rate (189.6 cases per 100 000 population) but higher than all other years since 2001.

Figure 4: Rate of outbreaks and associated cases by year, 2001-2008

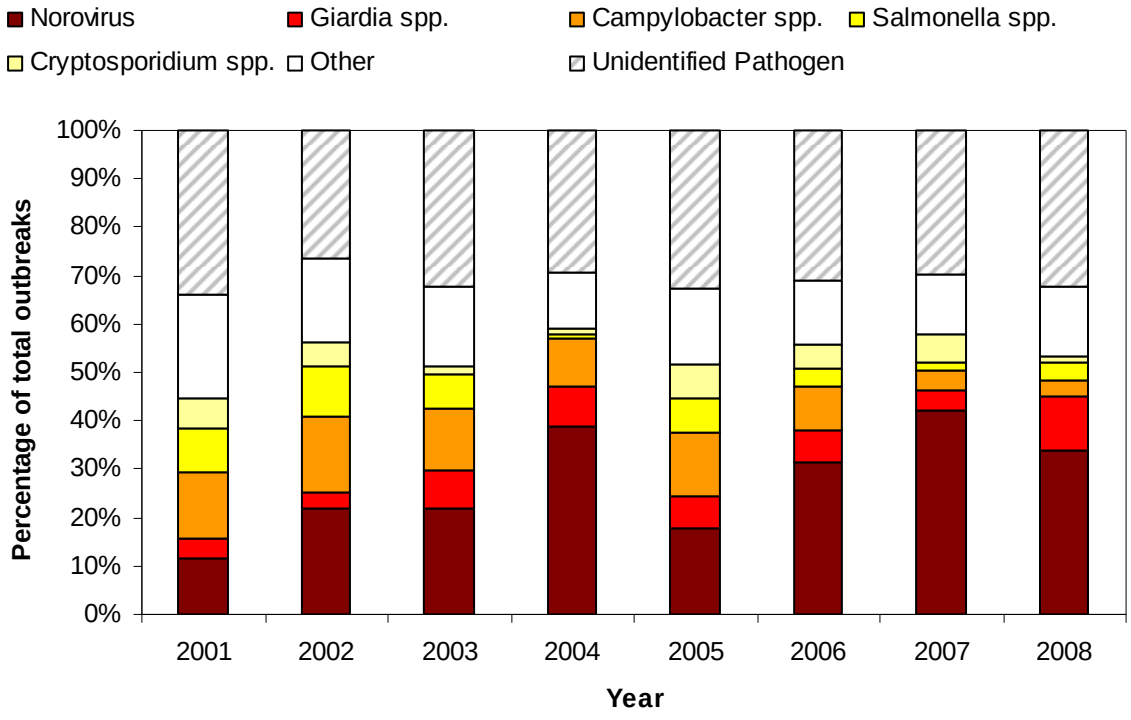


Common event outbreaks were consistently the most frequent outbreak type between 2001 and 2005. Since 2005 the number (and proportion) of institutional outbreaks has increased from 41 (11.7%) in 2005 to 183 (40.8%) in 2008. From 2005 to 2008 institutional outbreaks were therefore the most common outbreak type. Household outbreaks were also an important outbreak type accounting for over 20% of all outbreaks since 2005.

Since 2001 the number of outbreaks linked with an identified casual agent has remained close to 70% (range 66.1% to 73.4%). In 2008, 67.7% (304/449) of outbreaks were linked with an identified agent. From 2002 to 2006 the most commonly reported causal agent linked to outbreaks was norovirus followed by *Campylobacter* (see Figure 5). The number of norovirus linked outbreaks and associated cases increased markedly between 2005 (62 outbreaks and 1165 cases) and 2007 (207 outbreaks and 5932 cases), although there were slightly fewer norovirus outbreaks in 2008 (152 outbreaks and 3917 cases). The number of *Giardia* outbreaks more than doubled between 2007 (21 outbreaks and 111 cases) and 2008 (50 outbreaks and 184 cases).

In contrast, since 2006 the number of outbreaks linked to *Campylobacter* has decreased by 66% and the number of associated cases by more than 50% (2006: 47 outbreaks and 221 cases; 2008: 16 outbreaks and 109 cases). In 2008 there also were far fewer outbreaks linked to *Cryptosporidium* (7 outbreaks and 29 cases) compared with the previous three years where there were 25 or more outbreaks and greater than 100 cases annually.

Figure 5: Percentage of outbreaks by agent type and year, 2001-2008



In 2008, the most common outbreak setting was the home, although rest or retirement homes, hospitals (both continuing care and acute) and hostels or boarding houses all had a higher proportion of associated cases. This is similar to 2007, 2006 and 2004 when the home and rest or retirement homes were the two most common settings. In 2005, and prior to 2004, restaurants/cafés and the home had been the most common outbreak settings

The principal modes of transmission from 2001 to 2006 were foodborne and person-to-person transmission. Between 2005 and 2007, the number of outbreaks linked to foodborne transmission fell from 170 to 74, whilst the number of outbreaks linked to environmental transmission increased from 22 to 91. In 2008, person-to-person remained the most common mode of transmission, foodborne closely followed by environmental were the next two most common modes of transmission.

In 2008, seven outbreaks involving 54 cases had overseas transmission. This is similar to 2007, when there were seven outbreaks involving 25 cases that had overseas transmission. No country was associated with more than two outbreaks a year in 2007 or in 2008.

The median delay between date of onset of illness in the first case and the outbreak report date was calculated as 4.0 days for 2008, this delay was one day less than the median delay for the previous five years.

Health education and advice related to the outbreak source has been the most common control measure since 2001. Between 2001 and 2006 modification of procedures pertaining to the source had been the second most common control measure undertaken. In 2007 and 2008 cleaning and disinfection was more commonly reported than modification of procedures. The proportion of outbreaks where it was reported that no control measures were undertaken decreased from 27.8% of outbreaks in 2001 to 3.5% in 2005, but has since increased to 6.0% in 2008.

GLOSSARY [3]

Common event outbreak
An outbreak due to 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 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). In the Outbreak Report Form, these outbreaks are called *common source in a specific place*.

Common source outbreak
Outbreak due to 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
Outbreak of individuals in the 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 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 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 that which is external to the individual human host.

[3] Adapted from *Disease Outbreak Manual*. 2002, Institute of Environmental Science & Research Ltd (ESR).

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
Outbreak confined to members of a single household.

Institutional outbreak
Outbreak confined to the population of a specific residential or other institutional setting, such as a hospital, rest home, prison or boarding school.

Outbreak
An epidemic limited to a localised increase in the incidence of a disease, such as in a town or closed institution.

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.