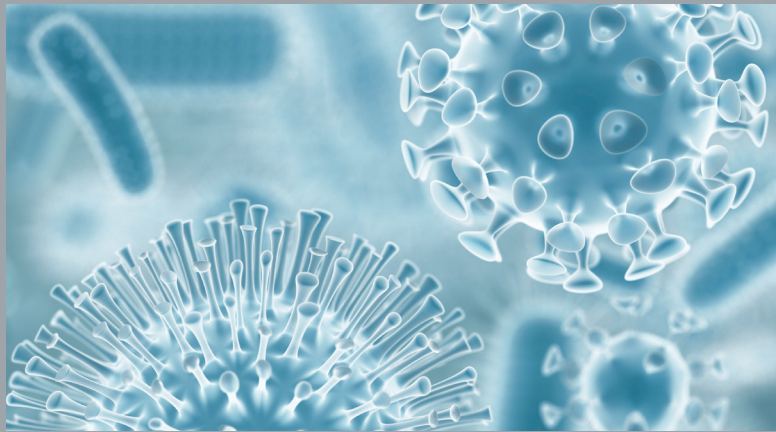


SURVEILLANCE REPORT SUMMARY OF OUTBREAKS IN NEW ZEALAND 2014



E/S/R

THE SCIENCE
BEHIND THE
TRUTH

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

PUBLISHED: JUNE 2015
CLIENT REPORT: FW15007

www.surv.esr.cri.nz

This report is available at www.surv.esr.cri.nz

First published: 29 June 2015

Suggested citation:

The Institute of Environmental Science and Research Ltd.

Annual Summary of Outbreaks in New Zealand 2014

Wallaceville, New Zealand

ISSN: 1176-3485

Client Report FW15007

Reproduction is authorised provided the source is acknowledged.

Acknowledgements

This report has been prepared by the Health Intelligence Team of the Institute of Environmental Science and Research Ltd. The production of this report was led by Shevaun Paine.

This report could not have been produced without the continued support of staff in the Public Health Services who provide data from their regions. The author would like to thank Joanne Hewitt for the norovirus section, Liza Lopez, Jill Sherwood and Don Bandaranayake at ESR, the Communicable Disease team at the Ministry of Health and Write Limited for their review of the draft report and the helpful feedback they provided.

Disclaimer

This report or document (“the Report”) is given by the Institute of Environmental Science and Research Limited (“ESR”) solely for the benefit of the Ministry of Health, Public Health Services Providers and other Third Party Beneficiaries as defined in the Contract between ESR and the Ministry of Health, and is strictly subject to the conditions laid out in that Contract.

Neither ESR nor any of its employees makes any warranty, express or implied, or assumes any legal liability or responsibility for use of the Report or its contents by any other person or organisation.

TABLE OF CONTENTS

List of figures	iv
List of tables	iv
Summary	3
Introduction	7
Methods	11
Outbreak definition	11
Data sources.....	11
Data analysis.....	12
Data limitations.....	12
Results	15
Characteristics of outbreaks	15
Distribution of outbreaks by public health unit	15
Multi-regional gastrointestinal outbreaks.....	16
Causal agents	17
Norovirus outbreaks—genotypes and outbreak setting	19
Hospitalisations and deaths associated with outbreaks.....	21
Outbreak settings	23
Modes of transmission	24
Foodborne outbreaks.....	26
Person-to-person outbreaks	31
Waterborne outbreaks	33
Environmental outbreaks.....	34
Zoonotic outbreaks.....	35
Outbreaks with overseas transmission	36
Outbreak recognition, investigation and control	37
Summary of trends.....	38
Glossary	45
References	49
Appendix	53
Outbreak Report Form (version: 2 October 2010).....	53

LIST OF FIGURES

Figure 1. Number of outbreaks per 100,000 population by PHU, 2014	16
Figure 2. Norovirus Reference Laboratory-confirmed norovirus outbreak typing by month, 2014	20
Figure 3. Norovirus Reference Laboratory-confirmed norovirus outbreak strains by setting, 2014.....	20
Figure 4. Percentage of outbreaks by pathogen category and mode of transmission, 2014	25
Figure 5. Number of outbreaks and associated cases by month, 2014	39
Figure 6. Outbreak rates and associated cases by year, 2005–2014	39
Figure 7. Percentage of outbreaks by pathogen or condition and year, 2005–2014.....	40

LIST OF TABLES

Table 1. Outbreaks and associated cases by PHU Office, 2014.....	15
Table 2. Outbreaks and associated cases by pathogen, 2014	18
Table 3. Hospitalised outbreak cases and total outbreak cases by pathogen or condition, 2014	22
Table 4. Outbreaks and associated cases by setting of exposure/transmission, 2014.....	23
Table 5. Outbreaks and associated cases by mode of transmission, 2014	24
Table 6. Foodborne outbreaks and associated cases by pathogen or condition, 2014.....	26
Table 7: Foodborne outbreaks and associated cases by implicated vehicle/source, 2014	27
Table 8. Foodborne outbreaks by causal agent and implicated vehicle/source, 2014	28
Table 9. Foodborne outbreaks and associated cases by setting of food preparation, 2014.....	29
Table 10. Foodborne outbreaks by contributing factor, 2014	30
Table 11. Person-to-person outbreaks and associated cases by pathogen or condition, 2014	32
Table 12. Waterborne outbreaks and associated cases by pathogen, 2014	33
Table 13. Waterborne outbreaks by contributing factor, 2014.....	33
Table 14. Environmental outbreaks and associated cases by pathogen or condition, 2014.....	34
Table 15. Zoonotic outbreaks and associated cases by pathogen or condition, 2014.....	35
Table 16. Outbreaks with overseas transmission by exposure location and pathogen, 2014.....	36
Table 17. Median reporting delay by outbreak type, 2014	37
Table 18. Outbreaks by means of recognition, 2014	37
Table 19. Outbreaks by control measures undertaken, 2014.....	38

SUMMARY

E/S/R

THE SCIENCE
BEHIND THE
TRUTH

SUMMARY

Outbreak and associated-case rate was high in 2014

In 2014, the number of reported outbreaks and associated cases increased (863 outbreaks involving 14,828 cases) when compared with 2013 (651 outbreaks involving 7143 cases). There were no changes to reporting criteria in 2014. A total of 332 outbreak-associated cases required hospitalisation and five cases died.

Public health units (PHUs) reporting the highest rate in 2014 were Manawatu (43.2 outbreaks per 100,000 population), Taranaki (28.7 per 100,000) and Otago (28.5 per 100,000). The national rate was 19.1 outbreaks per 100,000 population and the case rate was 328.8 cases per 100,000, both the highest rates reported since recording began in 1998.

Norovirus was the most common pathogen identified in outbreaks

The causal agent (pathogen, toxin or chemical) was identified in 71.8% (620/863) of outbreaks involving 80.5% (11,930/14,828) of all outbreak-associated cases.

Enteric agents were implicated in 95.0% (820/863) of outbreaks. Norovirus was the most commonly identified enteric pathogen accounting for 37.3% of all outbreaks (322/863) and 63.1% of the associated cases (9363/14,828). Four deaths were associated with norovirus outbreaks in 2014.

Giardia spp. was the second most commonly reported causal agent, accounting for 9.8% (85/863) of outbreaks and 2.1% (317/14,828) of associated cases. Rotavirus was the third most reported agent accounting for 5.6% of outbreaks (48/863) and 5.8% of associated cases (866/14,828). Rotavirus last featured in the top three identified pathogens in 2009 when it accounted for 5.0% of outbreaks (32/638).

The most commonly implicated non-enteric agent was measles, which was implicated in 2.2% (19/863) of outbreaks, followed by influenza and influenza-like illness in 1.6% (14/863) of outbreaks.

Long-term care facilities are the most commonly reported settings for outbreaks

The most common outbreak settings were long-term care facilities (34.9%, 301/863) followed by private homes (18.5%, 160/863) and childcare centres (15.5%, 134/863).

The outbreak settings with the most outbreak-related cases were long-term care facilities (57.5%, 8520/14,828), followed by childcare centres (13.8%, 2047/14,828) and acute-care hospitals (7.2%, 1070/14,828).

Person-to-person contact is the most commonly reported mode of transmission

In 2014, the most commonly reported modes of transmission were person-to-person transmission (87.6%, 756/863 outbreaks), followed by environmental (21.0%, 181/863) and foodborne (12.6%, 109/863). Multiple modes of transmission were implicated in almost a third (30.9%, 267/863) of outbreaks.

Norovirus and *Campylobacter* were the most common pathogens identified in foodborne outbreaks

In 2014, there were 109 foodborne outbreaks (with 1050 associated cases) reported. Of these outbreaks, 59.6% (65/109 outbreaks) were linked to a pathogen or condition. The pathogens most commonly associated with foodborne outbreaks included norovirus (16.5%, 18/109), *Campylobacter* spp. (16.5%, 18/109) and *Salmonella* spp. (6.4%, 7/109).

Consumption of poultry implicated in half of foodborne outbreaks with source identified

Of the 109 foodborne outbreaks, 30 (27.5%) had an identified source or vehicle. The main foods implicated in these outbreaks were poultry (46.7%, 14 outbreaks) and dairy (23.3%, 7 outbreaks), followed by oils/sugars (13.3%, 4 outbreaks). The outbreaks with the highest number of cases were linked to eating root vegetables (55.1%, 260 cases) and leafy vegetables (50.2%, 237 cases). *Campylobacter* spp. was the most commonly identified causal agent in poultry and dairy-related

outbreaks (7 and 5 outbreaks respectively). It should be noted that in very few outbreaks was a source confirmed by epidemiological or microbiological methods.

Control measures are put in place for 92% of outbreaks

Most outbreaks were recognised by increases in disease incidence (58.5%, 505/863), person-to-person contact with other cases (18.7%, 161/863) or attendance at a common event (9.2%, 79/863).

For the 852 outbreaks where dates to measure timeliness were available, just over half (57.2%, 487/852) of all outbreaks were reported to the PHU within a week of the onset of illness in the first case. The overall median reporting delay for outbreaks was five days.

Control measures were reported for 92.0% (794/863) of outbreaks in 2014. The most common measures undertaken were health education and advice regarding the source (79.2%, 629/794) and cleaning and disinfection (70.9%, 563/794).

Contamination of food contributes to most foodborne outbreaks

Contamination of food was the most common contributor to foodborne outbreaks (61.5%, 67/109), followed by time and temperature abuses (44.0%, 48/109). Unsafe sources accounted for 22.0% (24/109) of the outbreaks, including 9.2% (10/109) that were associated with drinking raw milk.

Changes in reporting make interpreting trends difficult

In 2014, the most common outbreak settings were long-term care facilities and private homes, which is similar to observations from 2006 to 2013. Since 2006, outbreaks in institutions have constituted about half, and those in private homes about a quarter to a third, of all outbreaks reported each year. Before 2006, commercial food operators and private homes were the most commonly reported settings. An increase in institutional outbreaks may be partly explained by increases in long-term care facilities due to the ageing population, and in early childhood education facilities and Te Kōhanga Reo due to the funded 20 hours of early childcare introduced in 2007. The introduction of national guidelines for the "Management of Norovirus Outbreaks in Hospitals and Elderly Care Institutions" in early 2009 may have led to increased reporting of outbreaks. Since 2007 the number of recorded norovirus outbreaks has increased. During this time, the numbers of outbreaks associated with food premises has decreased.

In the last 10 years, outbreaks involving person-to-person transmission have become the most frequently reported mode of transmission. This is a change from foodborne transmission, which was often the most frequent mode between 2001 and 2006. In 2014, the number of outbreaks with person-to-person transmission was more than four times higher than any other mode of transmission while the proportion of foodborne outbreaks reported (12.6%, 109/863) is the lowest since reporting began in 1998. Also, outbreaks attributed to environmental transmission (21.0%, 181/863) remained the second most common mode of transmission in 2014. From 2010 to 2012, outbreaks attributed to foodborne transmission were the second most common mode of transmission reported. The high number of environmental outbreaks could in part be explained by the fact that more than half of all outbreaks during 2014 were due to norovirus, giardiasis and rotavirus infections.

The number of outbreaks and associated cases linked to *Campylobacter* spp. has increased steadily since 2009. In 2009 there were 12 outbreaks (65 cases) compared with the 35 outbreaks (241 cases) in 2014. The highest number of outbreaks and cases associated with campylobacteriosis was reported in 2001 (56 outbreaks, 301 cases). A decrease in the total annual number of outbreaks and associated cases was observed from 2006 (47 outbreaks, 223 cases) to 2007 (20 outbreaks 54 cases). The decrease was most likely due to interventions put in place to reduce poultry associated foodborne campylobacteriosis in 2006.

INTRODUCTION

E/S/R

THE SCIENCE
BEHIND THE
TRUTH

INTRODUCTION

This report summarises data on outbreaks that were reported to the Institute of Environmental Science and Research Limited (ESR) during 2014.

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

Investigating outbreaks provides information to [1]:

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

METHODS

E/S/R

THE SCIENCE
BEHIND THE
TRUTH

METHODS

Outbreak definition

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

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

Outbreak reporting is encouraged for:

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

Outbreak reporting is not usually required for:

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

Data sources

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

The outbreak report form has the following sections:

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

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

Data analysis

This report contains an analysis of outbreak data reported between 1 January and 31 December 2014, and recorded on the EpiSurv database as at 10 March 2015. Any amendments made to outbreak data on EpiSurv after 10 March 2015 are not reflected in this report. Outbreaks reported at the end of the period may not have been finalised by the cut-off date. This means that the number of cases reported here may differ from that reported in the *Notifiable Diseases in New Zealand annual report 2014*.

This report does not include details about outbreaks of lead absorption (4 outbreaks), and hazardous substances injury (1 outbreak) reported into EpiSurv in 2014. Responsibility for the collection and reporting of lead absorption, chemical poisoning from the environment and hazardous substance notifications transferred from ESR to the Centre for Public Health Research, Massey University, in January 2013.

Rates were calculated using national and PHU population figures based on Statistics New Zealand mid-year population estimates for 2014.

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 date of onset of illness for the first case and the outbreak report date.

Data limitations

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

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

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

RESULTS

E/S/R

THE SCIENCE
BEHIND THE
TRUTH

RESULTS

Characteristics of outbreaks

There were 863 reported outbreaks in 2014, an increase from the 651 reported in 2013. The 2014 rate of 19.1 outbreaks per 100,000 population was higher than in 2013, when there were 14.7 outbreaks per 100,000 population and is the highest national rate since recording began in 1998. All of the outbreaks reported were recorded as final reports. A total of 14,828 cases were associated with outbreaks, 32.6% (4832/14,828) of the cases were either clinically or laboratory confirmed and 67.4% (9996/14,828) were probable cases. In 2014, the national rate was 328.8 outbreak cases per 100,000 population, more than double the rate in 2013 (160.8 cases per 100,000 population) and is the highest annual case rate reported since recording began in 1998.

Distribution of outbreaks by public health unit

In 2014, Auckland PHU reported the highest number of outbreaks and associated cases, which represented 33.7% (291/863) of outbreaks and 23.1% (3428/14,828) of associated cases (Table 1). Waikato PHU reported the second highest number of outbreaks (12.1%, 104/863 outbreaks), followed by Wellington (11.0%, 95/863 outbreaks), and Manawatu (8.0%, 69/863 outbreaks) PHUs. Manawatu PHU reported the highest outbreak rate (43.2 per 100,000 population) and the highest case rate (877.4 per 100,000 population) (Figure 1), while Northland PHU reported the lowest rate for a PHU reporting at least five outbreaks (9.0 per 100,000 population).

Table 1. Outbreaks and associated cases by PHU Office, 2014

PHU Office	Outbreaks			Cases		
	Total	% of outbreaks (n=863)	Outbreak rate ¹	Total	% of cases (n=14,828)	Case rate ¹
Northland	15	1.7	9.0	291	2.0	175.2
Auckland ²	291	33.7	19.1	3428	23.1	224.5
Waikato	104	12.1	25.7	1236	8.3	305.4
Bay of Plenty	20	2.3	9.2	504	3.4	231.8
Rotorua	10	1.2	9.7	194	1.3	187.3
Taranaki	33	3.8	28.7	493	3.3	428.8
Hawke's Bay	24	2.8	15.1	470	3.2	294.8
Gisborne ³	1	0.1	2.1	6	0.0	12.7
Whanganui	11	1.3	19.0	224	1.5	386.2
Manawatu	69	8.0	42.6	1420	9.6	877.4
Wellington ⁴	95	11.0	19.3	1641	11.1	333.9
Nelson Marlborough ⁵	26	3.0	18.2	640	4.3	446.9
West Coast ³	4	0.5	12.2	135	0.9	411.7
Canterbury	65	7.5	13.5	1840	12.4	382.0
South Canterbury	11	1.3	12.1	397	2.7	436.7
Otago	52	6.0	28.5	1075	7.2	589.0
Southland	32	3.7	25.1	834	5.6	654.6
Total	863	100.0	19.1	14,828	100.0	328.8

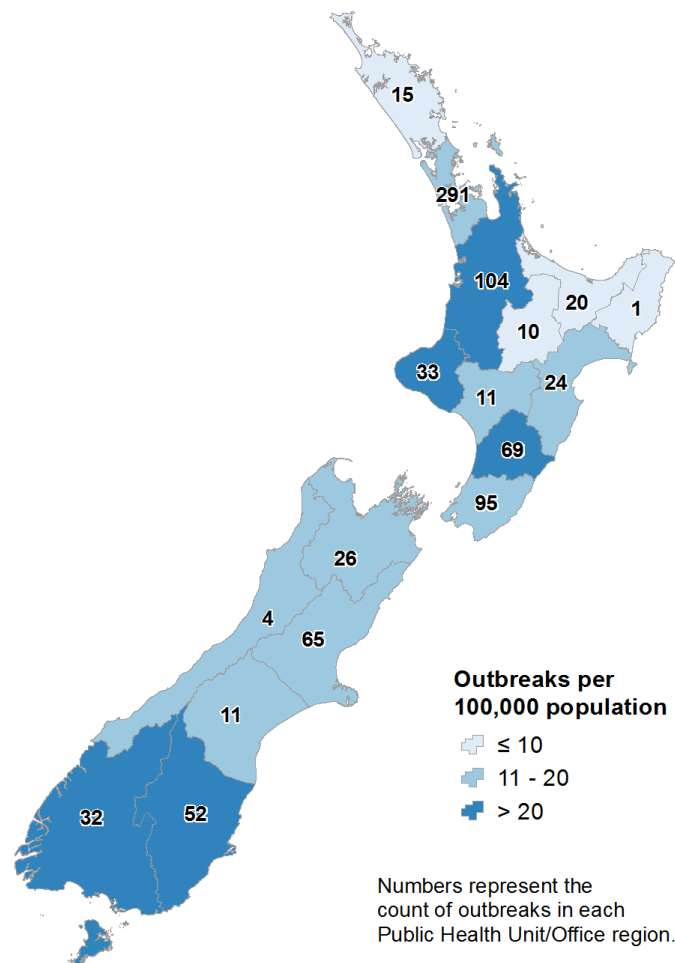
¹ Crude rate of outbreaks per 100,000 population is calculated using Statistics New Zealand population estimates for 2014.

² Auckland PHU covers the Tāmaki Makaurau-Auckland health district.

³ Rates calculated where fewer than five outbreaks were recorded should be interpreted with caution.

⁴ Includes Wellington, Hutt and Wairarapa health districts.

⁵ Includes both Nelson and Blenheim offices.

Figure 1. Number of outbreaks per 100,000 population by PHU, 2014

Multi-regional gastrointestinal outbreaks

Monitoring of gastrointestinal outbreaks is undertaken at a national and local level. Where a multi-regional outbreak is suspected, ESR will conduct epidemiological and microbiological investigations in conjunction with affected PHUs. In 2014, one multi-regional gastrointestinal outbreak was investigated at the national level (the same number as in 2013). A sharp increase in *Yersinia pseudotuberculosis* notifications reported during September 2014 triggered an investigation. PHU staff administered a hypothesis-generating questionnaire, the results of which showed that a high number of people had eaten fresh vegetables, fresh fruits, cold meats (deli meats) and dairy products. A case control study was conducted that showed that consumption of lettuce and carrots was strongly associated with illness. A total of 220 cases across 18 District Health Boards (DHBs) were reported between September and November 2014. The Ministry of Health and the Ministry for Primary Industries were also involved in the investigation and response.

Causal agents

A causal agent was identified in 71.8% (620/863) of outbreaks involving 80.5% (11,930/14,828) of all outbreak associated cases. In 17 of these outbreaks, two or more causal agents were identified. No specific pathogen or condition was identified in the remaining 28.2% (243/863) of outbreaks, all of which were recorded as gastroenteritis outbreaks.

Enteric agents were implicated in the majority of outbreaks (95.0%, 820/863) and their associated cases (96.0%, 14,235/14,828) (Table 2). The most common single causal agent implicated in outbreaks in 2014 was norovirus, at 37.3% (322/863) of reported outbreaks. Outbreaks due to norovirus also had the highest proportion of associated cases (63.1%, 9363/14,828). The next most common enteric causal agents were *Giardia* spp. (9.8% of outbreaks, 85/863) and rotavirus (5.6%, 48/863).

The enteric agents with the highest median number of associated cases in each outbreak were *C. difficile* (30.5 cases, 2 outbreaks) and norovirus (21.5 cases, 322 outbreaks).

Non-enteric agents accounted for 5.1% (44/863) of outbreaks and 4.4% (655/14,828) of the outbreak associated cases in 2014 (Table 2). Non-enteric pathogens and conditions reported were: measles virus (2.2% of outbreaks, 19/863) and influenza and influenza-like-illness (1.6% of outbreaks, 14/863). The median number of cases associated with acute respiratory infection outbreaks (1 outbreak involving 27 cases) was the highest for non-enteric outbreaks in 2014. Other important non-enteric outbreaks in 2014 included the measles virus (19 outbreaks with a median of 3 cases) and influenza and influenza-like-illness (14 outbreaks with a median of 15 cases).

Table 2. Outbreaks and associated cases by pathogen, 2014

Pathogen or condition	Outbreaks ¹			Cases ¹	
	Total	% of outbreaks (n=863)	Median cases per outbreak	Total	% of cases (n=14,828)
Enteric	820	95.0	10	14,235	96.0
Norovirus	322	37.3	21.5	9363	63.1
<i>Giardia</i> spp.	85	9.8	3	317	2.1
Rotavirus	48	5.6	14	866	5.8
<i>Campylobacter</i> spp.	35	4.1	4	241	1.6
<i>Salmonella</i> spp. ²	23	2.7	3	116	0.8
<i>Cryptosporidium</i> spp.	20	2.3	3	60	0.4
Sapovirus	16	1.9	17	301	2.0
<i>Shigella</i> spp.	11	1.3	3	71	0.5
VTEC/STEC infection	10	1.2	3.5	35	0.2
<i>Yersinia</i> spp.	7	0.8	4	246	1.7
Astrovirus	5	0.6	13	131	0.9
<i>Clostridium perfringens</i>	3	0.3	4	23	0.2
<i>Clostridium difficile</i>	2	0.2	30.5	61	0.4
Hepatitis A	1	0.1	6	6	0.0
Histamine fish poisoning	1	0.1	2	2	0.0
<i>Salmonella</i> Paratyphi	1	0.1	2	2	0.0
<i>Salmonella</i> Typhi	1	0.1	2	2	0.0
Toxic shellfish poisoning	1	0.1	13	13	0.1
Ciguatera fish poisoning	1	0.1	5	5	0.0
<i>Bacillus cereus</i>	1	0.1	3	3	0.0
<i>Staphylococcus aureus</i>	1	0.1	4	4	0.0
Pathogen not identified ³	243	28.2	9	2898	19.5
Non-enteric	44	5.1	5.5	655	4.4
Measles virus	19	2.2	3	243	1.6
Influenza and influenza-like illness ⁴	14	1.6	15	304	2.1
<i>Mycobacterium tuberculosis</i>	3	0.3	4	18	0.1
Varicella zoster virus	2	0.2	22.5	45	0.3
<i>Bordetella pertussis</i>	2	0.2	5	10	0.1
Acute respiratory infection	1	0.1	27	27	0.2
<i>Neisseria meningitidis</i> B	1	0.1	2	2	0.0
Rubella virus	1	0.1	3	3	0.0
<i>Legionella pneumophila</i>	1	0.1	3	3	0.0

¹ More than one enteric agent was reported in 17 outbreaks with 559 cases including one outbreak involving 62 cases where both an enteric and a non-enteric agent were identified. This means that the numbers may not add up to the group totals.

² Includes nontyphoidal *Salmonella* species only. *Salmonella* Typhi and *Salmonella* Paratyphi are reported separately.

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

⁴ Includes outbreaks of influenza A (12 outbreaks with 291 cases), influenza B (1 outbreak, 7 cases), and influenza-like illness (1 outbreak, 6 cases).

Norovirus outbreaks—genotypes and outbreak setting

Norovirus genotyping is carried out in the ESR Norovirus Reference Laboratory (NRL). Phylogenetic analysis is used for genotyping. The Norovirus Typing Tool is used to compare sequences with those in the GenBank database and in the FBVE (foodborne viruses in Europe) database [2].

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

In 2014 there were 312 norovirus outbreaks confirmed by the NRL. This is an increase in laboratory-confirmed outbreaks from 2013 (157 outbreaks) and 2012 (221 outbreaks). The highest number of outbreaks occurred in March (58 outbreaks) and the lowest number in September (17 outbreaks) (Figure 2).

The majority (60.6%, 189/312) of norovirus outbreaks confirmed in the NRL occurred in long-term care facilities. Outbreaks were also associated with commercial food operators (11.5%, 36/312), childcare centres (9.0%, 28/312), acute-care hospitals (7.4%, 23/312), private homes* (3.2%, 10/312), schools (1.6%, 5/312), workplaces (1.3%, 4/312), and indoor play centres, camps and hostel/boardings houses (0.6%, 2/312 outbreaks each). Other settings were reported in 10 outbreaks. The setting was unknown in one outbreak.

Norovirus genogroup II (GII) was identified in 81.1% (253/312) of outbreaks, norovirus genogroup I (GI) was identified in 16.3% (51/312) of outbreaks, and both norovirus GI and GII were detected in eight (2.6%) outbreaks.

The norovirus genotype was determined for 98.4% (307/312) laboratory-confirmed outbreaks. GII.4 was the most common genotype identified and was associated with 67.8% (208/307) of genotyped outbreaks. A similar proportion was seen in the decade up to 2013, but differs from 2013 where only 36.3% (57/157) of outbreaks were due to GII.4. Novel variants of GII.4 emerge every 2 to 4 years, but the Sydney_2012 variant (that emerged in late 2012) was the only variant identified in 2014. In total, six GI genotypes and 11 GII genotypes (as defined by typing of the viral capsid) were identified in outbreaks in 2014. The second most common genotype identified in 2014 was GII.6 (7.2%, 22/307).

Most norovirus outbreak settings were associated with a variety of norovirus genotypes (Figure 3). However, a higher proportion of outbreaks were associated with GII.4 for the acute-care hospital setting and to a lesser extent, for the long-term care facility (91.3%, 21/23 and 74.2%, 138/186 of genotyped outbreaks respectively) compared to other settings (44.4%, 44/99).

Gastroenteritis outbreaks caused by other enteric viruses confirmed by the NRL

During 2014, the ESR NRL further analysed specimens from 95 gastroenteritis outbreaks (for which a pathogen had not been identified) for other enteric viral pathogens. Sapoviruses were identified in 18 outbreaks in the following settings: long-term care facilities (12 outbreaks), childcare centres (4 outbreaks), a hospital and a private home (1 outbreak each). Astroviruses were identified in four outbreaks in the following settings: long-term care facilities (2 outbreaks), a childcare centre (1 outbreak with astrovirus and *Giardia* spp. identified), and an overseas school trip (1 outbreak with astrovirus and *Salmonella* Infantis identified).

* Private home refers to occupied private dwellings

Figure 2. Norovirus Reference Laboratory-confirmed norovirus outbreak typing by month, 2014

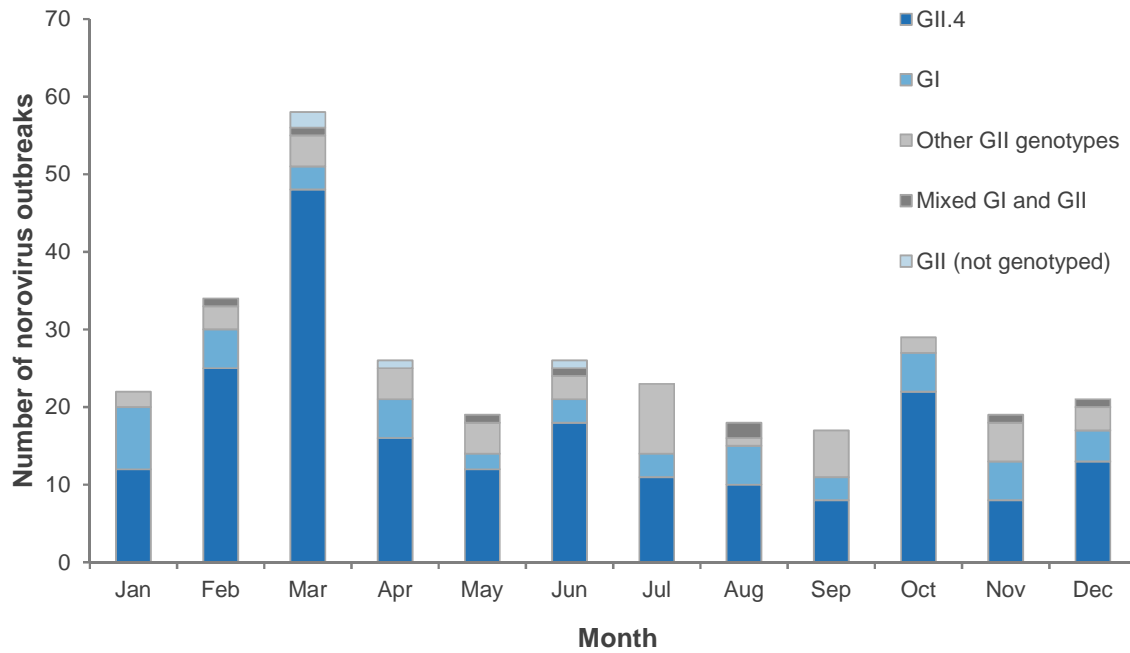
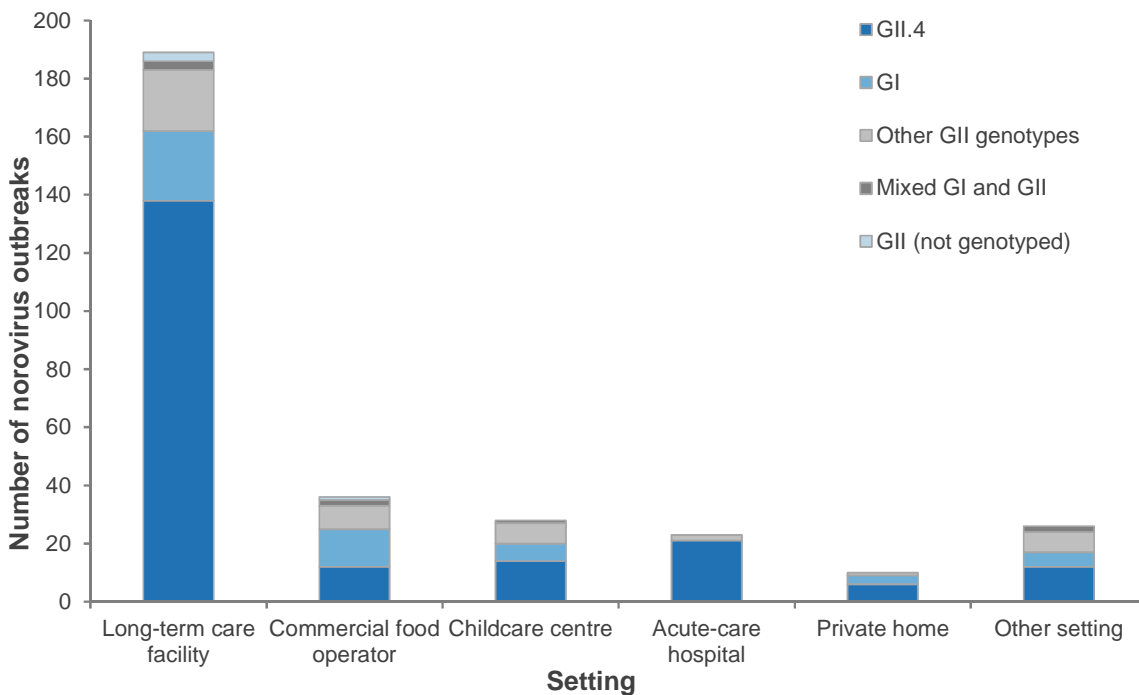


Figure 3. Norovirus Reference Laboratory-confirmed norovirus outbreak strains by setting, 2014



Hospitalisations and deaths associated with outbreaks

Hospitalisation information was recorded for 66.9% (577/863) of outbreaks involving 63.6% (9436/14,828) of associated cases. Overall, 3.5% (332/9436) of outbreak-associated cases with hospitalisation information recorded were hospitalised. The number of cases hospitalised for outbreaks due to enteric pathogens (261 cases) was substantially higher than the number of cases hospitalised due to non-enteric pathogens (71 cases) (Table 3). A higher percentage of cases associated with non-enteric outbreaks were hospitalised (20.6%) compared with enteric outbreaks (13.2%). The non-enteric pathogen or condition with the highest proportion of hospitalised cases was *Neisseria meningitidis* B (100.0%, 2/2 cases), followed by *Bordetella pertussis* (40.0%, 2/5 cases) and influenza-like illness (33.3%, 2/6 cases). Of the enteric pathogens toxic shellfish poisoning (69.2%, 9/13 cases) represented the highest proportion of hospitalised cases.

Five deaths were associated with four different outbreaks in 2014. The deaths were associated with norovirus (4 deaths) and influenza A (1 death) infections.

Table 3. Hospitalised outbreak cases and total outbreak cases by pathogen or condition, 2014

Pathogen or condition	Outbreaks ¹	Cases ¹		
	Total	Total	No. of cases hospitalised ²	% of cases hospitalised
Enteric	81	1976	261	13.2
Norovirus	30	1160	105	9.1
<i>Yersinia</i> spp.	1	220	72	32.7
<i>Campylobacter</i> spp.	9	99	28	28.3
Rotavirus	16	398	21	5.3
Toxic Shellfish Poisoning	1	13	9	69.2
<i>Salmonella</i> spp. ³	4	14	7	50.0
VTEC/STEC infection	5	17	6	35.3
<i>Giardia</i> spp.	2	14	2	14.3
<i>Shigella</i> spp.	2	23	2	8.7
Astrovirus	1	12	1	8.3
Hepatitis A	1	6	1	16.7
<i>Salmonella</i> Paratyphi	1	2	1	50.0
Histamine (scombroid) fish poisoning	1	2	1	50.0
Sapovirus	1	25	1	4.0
Ciguatera fish poisoning	1	5	1	20.0
Pathogen not identified ⁴	9	181	9	5.0
Non-enteric	26	344	71	20.6
Measles virus	14	218	38	17.4
Influenza and influenza-like-illness ⁵	7	101	24	23.8
<i>Mycobacterium tuberculosis</i>	3	18	5	27.8
<i>Bordetella pertussis</i>	1	5	2	40.0
<i>Neisseria meningitidis</i> B	1	2	2	100.0
Total	107	2320	332	14.3

¹ More than one agent was reported in four outbreaks with 215 associated cases. This means the numbers may not add up to group totals.

² Hospitalisation information was recorded for 66.9% (577/863) of outbreaks, relating to 63.6% (9436/14,828) of cases.

³ Includes nontyphoidal *Salmonella* species only. *Salmonella* Typhi and *Salmonella* Paratyphi are reported separately.

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

⁵ Includes outbreaks of influenza A (5 outbreaks with 88 cases), influenza B (1 outbreak, 7 cases), and influenza-like illness (1 outbreak, 6 cases).

Outbreak settings

The most common outbreak settings recorded were long-term care facilities (34.9%, 301/863) followed by private homes (18.5%, 160/863), childcare centres (15.5%, 134/863) and restaurants/cafés/bakeries (8.0%, 69/863). Outbreaks in long-term care facilities had the highest number of associated cases (57.5%, 8520/14,828) (Table 4). Overall, 63.0% (544/863) of all outbreaks and 86.8% (12,867/14,828) of cases reported in 2014 were set in institutions. The setting was unknown in 3.2% (28/863) of outbreaks.

Table 4. Outbreaks and associated cases by setting of exposure/transmission, 2014

Outbreak setting	Outbreaks ¹		Cases ¹	
	Total	% of outbreaks (n=863)	Total	% of cases (n=14,828)
Institutions	544	63.0	12,867	86.8
Long-term care facility	301	34.9	8520	57.5
Childcare centre	134	15.5	2047	13.8
Hospital (acute-care)	53	6.1	1070	7.2
School	10	1.2	535	3.6
Camp	6	0.7	99	0.7
Hostel/boarding house	5	0.6	163	1.1
Hotel/motel	6	0.7	82	0.6
Prison	1	0.1	43	0.3
Marae	1	0.1	10	0.1
Other institution	28	3.2	444	3.0
Commercial food operators	104	12.1	995	6.7
Restaurant/café/bakery	69	8.0	592	4.0
Takeaway	14	1.6	50	0.3
Supermarket/delicatessen	10	1.2	249	1.7
Fast food restaurant	2	0.2	7	<0.1
Temporary or mobile food premises	2	0.2	4	<0.1
Caterer	1	0.1	15	0.1
Other food outlet	7	0.8	41	0.3
Workplace	17	2.0	131	0.9
Farm	9	1.0	33	0.2
Workplace	8	0.9	98	0.7
Other	196	22.7	1008	6.8
Private home	160	18.5	564	3.8
Community/church or sports gathering	6	0.7	56	0.4
Mode of travel ²	3	0.3	106	0.7
Petting zoo	2	0.2	4	<0.1
Other setting	33	3.8	312	2.1
Unknown setting	28	3.2	107	0.7

¹ More than one setting was recorded in 37 outbreaks with a total of 425 associated cases. This means the numbers might not add up to the group totals.

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

Modes of transmission

In 2014, the most commonly reported mode of transmission was person-to-person (87.6%, 756/863 outbreaks), followed by environmental (21.0% 181/863) and foodborne (12.6%, 109/863) modes (Table 5). Person-to-person transmission also accounted for the highest percentage of cases (94.3%, 13,976/14,828), followed by environmental transmission (26.9%, 3989/14,828). The mode of transmission was unknown in 3.7% (32/863) of outbreaks.

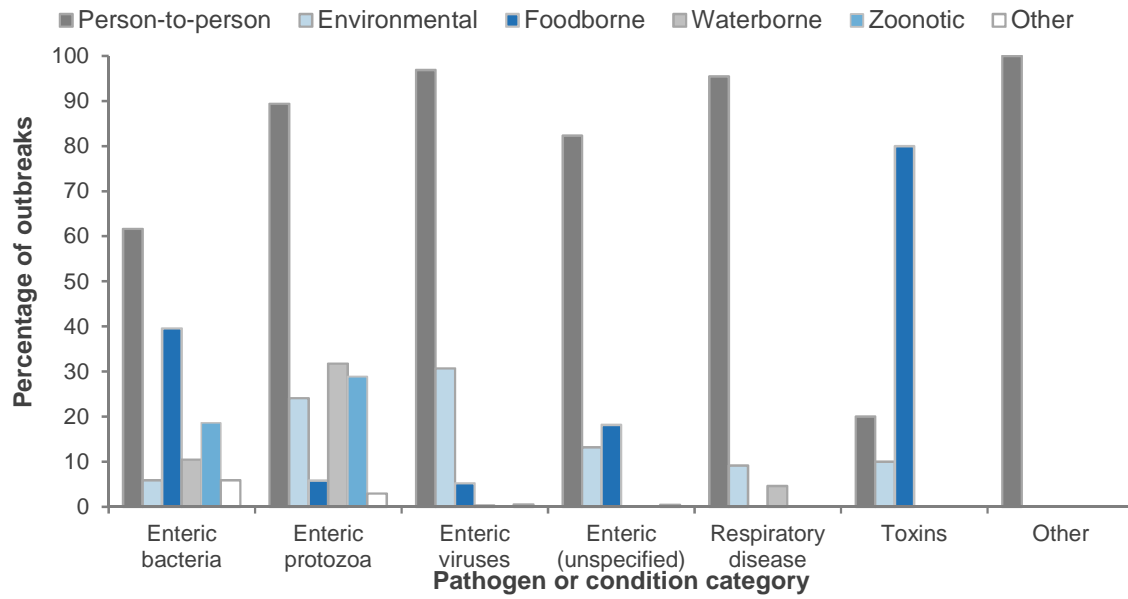
Table 5. Outbreaks and associated cases by mode of transmission, 2014

Mode of transmission	Outbreaks				Cases	
	Primary mode	Secondary mode	Total	% of outbreaks (n=863) ¹	Total	% of cases (n=14,828) ¹
Person-to-person	639	117	756	87.6	13,976	94.3
Environmental	13	168	181	21.0	3989	26.9
Foodborne	92	17	109	12.6	1050	7.1
Zoonotic	16	30	46	5.3	132	0.9
Waterborne	28	14	42	4.9	131	0.9
Other	7	3	10	1.2	53	0.4
Unknown	-	-	32	3.7	183	1.2

¹ More than one mode of transmission was recorded for 267 outbreaks involving 4514 associated cases. This means the totals may add up to more than 100%.

Note: No outbreaks with vectorborne, sexual contact or parenteral as mode(s) of transmission were reported in 2014.

Person-to-person was the most common mode of transmission for “other” pathogens (includes outbreaks of measles, rubella and varicella zoster viruses) (100.0%, 22/22), enteric viruses (96.9%, 373/385), followed by respiratory disease (95.5%, 21/22), enteric protozoa (89.4%, 93/104), unspecified enteric pathogens (82.3%, 200/243), and enteric bacteria (61.6%, 53/86) (Figure 4). Foodborne transmission contributed substantially to outbreaks due to toxins (80.0%, 8/10), enteric bacteria (39.5%, 34/86) and unspecified enteric pathogens (18.1%, 44/243) (Figure 4). Environmental transmission contributed to outbreaks of enteric viruses (30.6%, 118/385) and enteric protozoa (24.0%, 25/104). Waterborne transmission was the second highest mode of transmission for enteric protozoa (31.7%, 33/104) and the fourth highest for enteric bacteria (10.5%, 9/86). Zoonotic transmission was reported in 28.8% (30/104) of enteric protozoa outbreaks and 18.6% (16/86) of outbreaks due to enteric bacteria.

Figure 4. Percentage of outbreaks by pathogen category and mode of transmission, 2014

Note: More than one mode of transmission was recorded for 267 outbreaks. This means the totals may add up to more than 100%.

Foodborne outbreaks

Causal agent

Of the 109 foodborne outbreaks in 2014 (with 1050 associated cases), 59.6% (65/109 outbreaks) were linked to a pathogen or condition (Table 6). Pathogens most commonly associated with foodborne outbreaks included norovirus and *Campylobacter* spp. (16.5%, 18/109 outbreaks each) and *Salmonella* spp. (6.4%, 7/109 outbreaks). Enteric bacteria (*Campylobacter* spp., *Salmonella* spp., *Shigella* spp., VTEC/STEC infection, and *Yersinia* spp.) were implicated in 32.1% (35/109) of the foodborne outbreaks, and enteric viruses (norovirus and rotavirus) were implicated in 18.3% (20/109) of the foodborne outbreaks.

Table 6. Foodborne outbreaks and associated cases by pathogen or condition, 2014

Pathogen or condition	Outbreaks		Cases	
	Total	% of outbreaks (n=109) ¹	Total	% of cases (n=1050) ¹
Norovirus	18	16.5	373	35.5
<i>Campylobacter</i> spp.	18	16.5	158	15.0
<i>Salmonella</i> spp.	7	6.4	44	4.2
<i>Giardia</i> spp.	6	5.5	27	2.6
<i>Shigella</i> spp.	4	3.7	32	3.0
VTEC/STEC infection	4	3.7	15	1.4
<i>Clostridium perfringens</i>	3	2.8	23	2.2
<i>Yersinia</i> spp.	2	1.8	232	22.1
Rotavirus	2	1.8	15	1.4
Toxic Shellfish Poisoning	1	0.9	13	1.2
Ciguatera fish poisoning	1	0.9	5	0.5
<i>Staphylococcus aureus</i>	1	0.9	4	0.4
<i>Bacillus cereus</i>	1	0.9	3	0.3
Histamine (scombroid) fish poisoning	1	0.9	2	0.2
Pathogen not identified ²	44	40.4	138	13.1

¹ More than one agent was reported in three foodborne outbreaks with 22 associated cases. This means totals may add up to more than 100%.

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

Vehicle/source implicated

Of the 109 foodborne outbreaks in 2014, 30 (27.5%) had a food source or vehicle of infection identified. The main foods implicated in these outbreaks were poultry (46.7%, 14 outbreaks) and dairy (23.3%, 7 outbreaks), followed by oils/sugars (13.3%, 4 outbreaks) (Table 7). The outbreaks with the highest number of associated cases were those linked to root vegetables (55.1%, 260 cases) and leafy vegetables (50.2%, 237 cases). It should be noted that very few outbreaks have a suspected source confirmed by epidemiological or microbiological methods. It is also important to appreciate that implicated foods are mostly associations. These could be spurious as they have not taken into account the prevalence of commonly consumed foods in the general population. Approximately a quarter of foodborne outbreaks have a source identified. Investigators will generally only report a source based on compelling evidence or other supporting data or previous experience suggesting the food vehicle is the likely source.

Table 7: Foodborne outbreaks and associated cases by implicated vehicle/source, 2014

Implicated vehicle/source	Outbreaks		Cases	
	Total	% of outbreaks (n=30) ¹	Total	% of cases (n=472) ¹
Poultry	14	46.7	137	29.0
Dairy	7	23.3	81	17.2
Oils/sugar	4	13.3	77	16.3
Vegetables (root)	3	10.0	260	55.1
Fruit/nut	3	10.0	75	15.9
Meat (beef)	3	10.0	45	9.5
Rice	3	10.0	24	5.1
Fish	3	10.0	12	2.5
Vegetables (leafy)	2	6.7	237	50.2
Meat (pork)	2	6.7	25	5.3
Grains/beans	1	3.3	54	11.4
Shellfish (molluscs)	1	3.3	13	2.8
Vegetables (stalk)	1	3.3	4	0.8
Meat (lamb)	1	3.3	3	0.6
Eggs	1	3.3	2	0.4

¹ More than one vehicle/source was implicated in seven foodborne outbreaks with 325 associated cases. This means the numbers may not add up to the group totals.

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

Foodborne outbreaks associated with poultry (46.7%, 14 outbreaks) and dairy (23.3%, 7 outbreaks) as possible vehicles or sources were most commonly due to *Campylobacter* spp. (poultry: 7 outbreaks, dairy: 5 outbreaks) (Table 8). Outbreaks of *Clostridium perfringens* were most commonly associated with meat dishes (poultry (2 outbreaks) and beef (1 outbreak)), as well as oils/sugars (2 outbreaks) and fruit/nuts (2 outbreaks). The foodborne outbreaks linked to histamine (scombroid) poisoning and ciguatera fish poisoning were associated with eating fish (1 outbreak each). One outbreak of toxic shellfish poisoning was linked to consumption of contaminated tuatua and mussels.

The largest foodborne outbreak was multi-regional and involved 220 cases (46.6%) across 18 DHBs. *Yersinia pseudotuberculosis* was identified as the causative agent in the outbreak which was attributed to consumption of contaminated lettuce and carrots. Auckland reported the largest foodborne outbreak within a single DHB where a food source was identified. The outbreak involved 54 cases (11.4%). Norovirus GII.4 Sydney 2012 strain was identified as the causative agent in the outbreak which was attributed to eating berry trifle served at a wedding. An epidemiological study carried out by the Auckland Regional Public Health Service identified that individuals who had consumed the berry trifle were almost twice as likely to develop illness than those who did not (risk ratio 1.88, $p < 0.05$).

Table 8. Foodborne outbreaks by causal agent and implicated vehicle/source, 2014

Implicated vehicle/source ¹	Pathogen or condition											
	<i>Campylobacter</i> spp.	Norovirus	<i>Clostridium perfringens</i>	VTEC/STEC infection	Ciguatera fish poisoning	Histamine (scombroid) poisoning	<i>Giardia</i> spp.	<i>Salmonella</i> spp.	Toxic shellfish poisoning	<i>Yersinia</i> spp.	Pathogen not identified ²	Total outbreaks
Poultry	7	1	2								4	14
Dairy	5	2		2								7
Oils/sugar		1	2								1	4
Vegetables (root)		1	1							1		3
Fruit/nut		1	2									3
Rice			1					1			1	3
Fish					1	1		1				3
Meat (beef)		1	1					1				3
Vegetables (leafy)			1							1		2
Meat (pork)		1									1	2
Grains/beans		1										1
Shellfish (molluscs)									1			1
Vegetables (stalk)			1									1
Meat (lamb)	1											1
Eggs							1					1
Total	13	3	2	2	1	1	1	1	1	1	6	30

¹ More than one vehicle/source was implicated in seven foodborne outbreaks with 325 associated cases. This means the numbers may not add up to the group totals.

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

Setting where contaminated foods/beverages were prepared

The settings where foods and beverages were prepared were recorded in 94.5% (103/109) of foodborne outbreaks and 75.0% (787/1050) of associated cases in 2014. The preparation settings most commonly associated with foodborne outbreaks included commercial food operators (65.1%, 71/109) and private homes (10.1%, 11/109) (Table 9). Foodborne outbreaks where the food was prepared in restaurants, cafés, or bakeries had the highest number of associated cases (38.7%, 406/1050), followed by food prepared in hotel/motels (5.3%, 56/1050) and by caterers (4.5%, 47/1050).

Table 9. Foodborne outbreaks and associated cases by setting of food preparation, 2014

Preparation setting	Outbreaks		Cases	
	Total	% of outbreaks (n=109)	Total	% of cases (n=1050)
Commercial food operators	71	65.1	524	49.9
Restaurant/café/bakery	48	44.0	406	38.7
Takeaway	9	8.3	26	2.5
Supermarket/delicatessen	3	2.8	13	1.2
Caterers	2	1.8	47	4.5
Fast food restaurant	2	1.8	7	0.7
Temporary or mobile service	2	1.8	4	0.4
Other food outlet	5	4.6	21	2.0
Institutions	8	7.3	94	9.0
Hotel/motel	4	3.7	56	5.3
Long-term care facility	3	2.8	29	2.8
Hospital (acute-care)	1	0.9	9	0.9
Other	24	22.0	169	16.1
Private home	11	10.1	38	3.6
Overseas manufacturer	2	1.8	4	0.4
Farm	3	2.8	12	1.1
Community/church gathering	3	2.8	40	3.8
Commercial food manufacturer	4	3.7	70	6.7
Workplace	1	0.9	5	0.5
Unknown preparation setting	6	5.5	263	25.0

Contributing factors

The factors contributing to foodborne outbreaks most commonly involved contamination of food (61.5%, 67/109) or time and temperature abuses (44.0%, 48/109). Contamination of food occurred most frequently by an infected food handler (43.1%, 47/109) or via cross-contamination with other food (42.2%, 46/109). The most common time and temperature abuses were improper storage prior to preparation (21.1%, 23/109), undercooking (20.2%, 22/109) and improper hot holding (14.7%, 16/109) (Table 10). Unsafe sources accounted for 22.0% (24/109) of the outbreaks, including 9.2% (10/109) that were associated with drinking raw milk. The majority of contributing factors reported were suspected only.

Table 10. Foodborne outbreaks by contributing factor, 2014

Contributing factor	Outbreaks ¹				Cases ¹	
	Confirmed	Suspected	Total	% of foodborne outbreaks (n=109)	Total	% of foodborne cases (n=1050)
Contamination of food	1	66	67	61.5	594	56.6
Contamination from an infected food handler	0	47	47	43.1	461	43.9
Cross contamination	1	45	46	42.2	445	42.4
Time/temperature abuse	5	43	48	44.0	269	25.6
Improper storage prior to preparation	1	22	23	21.1	135	12.9
Undercooking	2	20	22	20.2	155	14.8
Improper hot holding	2	14	16	14.7	89	8.5
Preparation too far in advance	2	10	12	11.0	94	9.0
Inadequate cooling or refrigeration	2	10	12	11.0	79	7.5
Inadequate reheating of previously cooked food	3	8	11	10.1	74	7.0
Inadequate thawing	0	7	7	6.4	45	4.3
Unsafe sources	7	17	24	22.0	357	34.0
Consumption of unpasteurised milk	4	6	10	9.2	41	3.9
Use of ingredients from unsafe sources	1	8	9	8.3	70	6.7
Consumption of raw food	2	3	5	4.6	247	23.5
Use of untreated water in food preparation	0	4	4	3.7	36	3.4
Other factors	1	0	1	0.9	13	1.2

¹ More than one contributing factor was recorded in 55 foodborne outbreaks with 702 associated cases. This means the numbers may not add up to the group totals.

Person-to-person outbreaks

Causal agents

In 2014, there were 756 person-to-person outbreaks (primary and secondary mode of transmission) with 13,976 associated cases. A causal agent was linked in 73.5% (556/756) of these outbreaks (Table 11). The most common causal agent was norovirus, which was recorded in 41.3% (312/756) of person-to-person outbreaks and involved 66.4% (9275/13,976) of outbreak-associated cases. Other common pathogens included *Giardia* spp. (9.9%, 75/756) and rotavirus (6.2%, 47/756). Enteric viruses (astrovirus, hepatitis A, norovirus, rotavirus, and sapovirus) were implicated in 49.5% (374/756) of person-to-person outbreaks and enteric protozoa (*Giardia* spp. and *Cryptosporidium* spp.) were implicated in 12.4% (93/756) of outbreaks.

The most commonly identified pathogen in person-to-person outbreaks with 20 or more associated cases was norovirus, accounting for 73.4% (174/237) of these outbreaks. The two largest person-to-person outbreaks reported in 2014 were also attributed to norovirus. The largest outbreak involved 147 cases and was spread by person-to-person transmission throughout a long-term care facility in Hamilton. The second largest outbreak, reported from an Auckland primary school involved 135 cases and was also spread through person-to-person contact.

Table 11. Person-to-person outbreaks and associated cases by pathogen or condition, 2014

Pathogen or condition	Outbreaks ¹				Cases	
	Primary mode	Secondary mode	Total	% of outbreaks (n=756) ²	Total	% of cases (n=13,976) ²
Norovirus	287	25	312	41.3	9275	66.4
<i>Giardia</i> spp.	42	33	75	9.9	289	2.1
Rotavirus	45	2	47	6.2	864	6.2
Measles virus	19	0	19	2.5	243	1.7
<i>Salmonella</i> spp. ³	10	9	19	2.5	61	0.4
<i>Cryptosporidium</i> spp.	5	14	19	2.5	56	0.4
Sapovirus	16	0	16	2.1	301	2.2
Influenza and influenza-like-illness ⁴	14	0	14	1.9	304	2.2
<i>Campylobacter</i> spp.	10	3	13	1.7	48	0.3
VTEC/STEC infection	4	5	9	1.2	30	0.2
<i>Shigella</i> spp.	3	3	6	0.8	21	0.2
<i>Yersinia</i> spp.	3	1	4	0.5	20	0.1
Astrovirus	2	1	3	0.4	97	0.7
<i>Mycobacterium tuberculosis</i>	3	0	3	0.4	18	0.1
<i>Clostridium difficile</i>	2	0	2	0.3	61	0.4
Varicella zoster virus	2	0	2	0.3	45	0.3
<i>Bordetella pertussis</i>	2	0	2	0.3	10	0.1
Acute respiratory infection	1	0	1	0.1	27	0.2
Hepatitis A	1	0	1	0.1	6	0.0
Rubella virus	1	0	1	0.1	3	0.0
<i>Salmonella</i> Typhi	1	0	1	0.1	2	0.0
<i>Neisseria meningitidis</i> B	1	0	1	0.1	2	0.0
<i>Salmonella</i> Paratyphi	1	0	1	0.1	2	0.0
Pathogen not identified ⁵	174	26	200	26.5	2723	19.5

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

² Two agents were reported in 15 person-to-person outbreaks with 532 cases. This means totals may add up to more than 100%.

³ Includes nontyphoidal *Salmonella* species only. *Salmonella* Typhi and *Salmonella* Paratyphi are reported separately.

⁴ Includes outbreaks of influenza A (12 outbreaks with 291 cases), influenza B (1 outbreak, 7 cases), and influenza-like illness (1 outbreak, 6 cases).

⁵ All enteric outbreaks with no identified pathogen were recorded as gastroenteritis.

Contributing factors

Exposure to infected people was the primary contributing factor for 98.4% (744/756 outbreaks) of person-to-person outbreaks reported in 2014. Other contributing factors reported included poor hygiene (37.2%, 281/756), a compromised immune system (7.5%, 57/756), inadequate vaccination cover (3.8%, 29/756), excessively crowded living conditions (2.6%, 20/756) and inadequate vaccination effectiveness (0.8%, 6/756).

Waterborne outbreaks

Causal agents

There were 42 waterborne outbreaks with 131 associated cases in 2014, all of which were linked to a specific pathogen (Table 12). The most commonly reported waterborne pathogens were *Giardia* spp. (54.8%, 23/42 outbreaks) and *Cryptosporidium* spp. (23.8%, 10/42 outbreaks), followed by *Campylobacter* spp. (9.5%, 4/42). Enteric protozoa (*Giardia* spp. and *Cryptosporidium* spp.) were implicated in 78.6% (33/42) of waterborne outbreaks and enteric bacteria (*Campylobacter* spp., *Salmonella* spp., *Yersinia* spp. and VTEC/STEC infection) were implicated in 21.4% (9/42) of waterborne outbreaks. Three pathogens (*Giardia* spp. *Yersinia* spp. and rotavirus) were implicated in one outbreak involving 12 cases.

Table 12. Waterborne outbreaks and associated cases by pathogen, 2014

Pathogen or condition	Outbreaks ¹				Cases	
	Primary mode	Secondary mode	Total	% of outbreaks (n=42) ²	Total	% of cases (n=131) ²
<i>Giardia</i> spp.	15	8	23	54.8	77	58.8
<i>Cryptosporidium</i> spp.	6	4	10	23.8	26	19.8
<i>Campylobacter</i> spp.	3	1	4	9.5	14	10.7
<i>Salmonella</i> spp.	2	0	2	4.8	7	5.3
VTEC/STEC infection	1	1	2	4.8	4	3.1
Rotavirus	1	0	1	2.4	12	9.2
<i>Yersinia</i> spp.	1	0	1	2.4	12	9.2
<i>Legionella pneumophila</i>	1	0	1	2.4	3	2.3

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

² Three pathogens were reported in one waterborne outbreak involving 12 cases. This means the totals may add up to more than 100%.

Contributing factors

The most common contributing factor linked to waterborne outbreaks was untreated water (92.9%, 39/42 outbreaks) followed by an inadequately treated water supply (21.4%, 9/42) (Table 13). Most of the contributing factors associated with waterborne outbreaks were reported as suspected only (92.3%, 48/52).

Table 13. Waterborne outbreaks by contributing factor, 2014

Contributing factor	Outbreaks				Cases	
	Confirmed	Suspected	Total	% of outbreaks (n=42) ¹	Total	% of cases (n=131) ¹
Untreated drinking-water supply ²	2	37	39	92.9	125	95.4
Inadequately treated water supply	1	8	9	21.4	25	19.1
Recent or ongoing treatment process failure	0	1	1	2.4	12	9.2
Source water quality inferior to normal	1	1	2	4.8	9	6.9
Contamination of post treatment water storage	0	1	1	2.4	2	1.5

¹ Seven outbreaks involving 32 cases had two or more contributing factors. This means the totals may add up to more than 100%.

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

Note: No outbreaks with other sources of post-treatment contamination were reported in 2014.

Environmental outbreaks

Causal agents

There were 181 environmental outbreaks with 3989 associated cases reported in 2014. Of these outbreaks, 82.3% (149/181) were linked to a specific causal agent (Table 14). The most common causal agent identified in environmental outbreaks was norovirus (54.7%, 99/181), followed by *Giardia* spp. (10.5%, 19/181). Even so, environmental transmission was the secondary mode reported in the majority (94.9%, 94/99) of the norovirus outbreaks. Norovirus also accounted for the highest proportion of associated cases (76.4%, 3046/3989). *Salmonella* spp. (66.7%, 2/3) and *Cryptosporidium* spp. (50.0%, 3/6) were responsible for the highest proportion of outbreaks where environmental transmission was the primary mode reported. Enteric viruses (norovirus, rotavirus, sapovirus and astrovirus) were implicated in 65.7% (119/181) of the environmental outbreaks, while enteric protozoa (*Giardia* spp. and *Cryptosporidium* spp.) were implicated in 13.8% (25/181) of the environmental outbreaks.

Table 14. Environmental outbreaks and associated cases by pathogen or condition, 2014

Pathogen or condition	Outbreaks ¹				Cases	
	Primary mode	Secondary mode	Total	% of outbreaks (n=181) ²	Total	% of cases (n=3989) ²
Norovirus	5	94	99	54.7	3046	76.4
<i>Giardia</i> spp.	4	15	19	10.5	84	2.1
Rotavirus	0	14	14	7.7	300	7.5
<i>Cryptosporidium</i> spp.	3	3	6	3.3	15	0.4
Sapovirus	0	5	5	2.8	103	2.6
<i>Salmonella</i> spp.	2	1	3	1.7	28	0.7
Astrovirus	0	2	2	1.1	25	0.6
<i>Clostridium difficile</i>	0	1	1	0.6	58	1.5
Influenza A	0	1	1	0.6	15	0.4
<i>Campylobacter</i> spp.	0	1	1	0.6	4	0.1
<i>Legionella pneumophila</i>	0	1	1	0.6	3	0.1
VTEC/STEC infection	0	1	1	0.6	2	0.1
Pathogen not identified ³	0	32	32	17.7	507	12.7

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

² Two pathogens were reported in four environmental outbreaks involving 201 cases. This means totals may add up to more than 100%.

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

Contributing factors

The major contributing factors to environmental outbreaks were exposure to contaminated environment(s)[†] (95.6%, 173/181), exposure to infected animals (7.7%, 12/181), exposure to other recreational waters (6.6%, 12/181) and exposure to contaminated swimming/spa pools (6.1%, 11/181). At least one contributing factor was recorded for each outbreak.

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

Zoonotic outbreaks

Causal agents

There were 46 zoonotic outbreaks, with 132 associated cases in 2014. All were linked to a specific pathogen (Table 15). *Giardia* spp. was the most commonly identified pathogen and was linked to 45.7% (21/46) of zoonotic outbreaks and 47.0% (62/132) of the associated cases. Enteric protozoa (*Cryptosporidium* spp. and *Giardia* spp.) were implicated in 65.2% (30/46) of the zoonotic outbreaks and enteric bacteria (*Campylobacter* spp., *Salmonella* spp. and VTEC/STEC infection and *Yersinia* spp.) were implicated in 34.8% (16/46) of the zoonotic outbreaks.

Table 15. Zoonotic outbreaks and associated cases by pathogen or condition, 2014

Pathogen or condition	Outbreaks ¹				Cases	
	Primary mode	Secondary mode	Total	% of outbreaks (n=46)	Total	% of cases (n=132)
<i>Giardia</i> spp.	10	11	21	45.7	62	47.0
<i>Cryptosporidium</i> spp.	4	5	9	19.6	25	18.9
<i>Salmonella</i> spp.	0	7	7	15.2	20	15.2
<i>Campylobacter</i> spp.	0	4	4	8.7	11	8.3
VTEC/STEC infection	1	3	4	8.7	10	7.6
<i>Yersinia</i> spp.	1	0	1	2.2	4	3.0

¹ Includes outbreaks where zoonotic transmission was either the primary or secondary mode of transmission reported.

Contributing factors

Almost all (93.5%, 43/46) zoonotic outbreaks recorded direct exposure to infected animals as a contributing factor. Multiple settings were identified in 11 outbreaks. The most common setting for a zoonotic outbreak was a private home (84.8%, 39/46 outbreaks), although 11 of these identified another setting as well. The second most common setting for zoonotic outbreaks was farms (15.2%, 7/46 outbreaks) and five of these also identified another setting. Petting zoos were identified as the setting in two outbreaks involving a total of four cases.

Outbreaks with overseas transmission

In 2014, 22 outbreaks with overseas transmission were reported involving 208 cases. Travel to Fiji was associated with the most outbreaks (18.2%, 4 outbreaks), followed by India, Indonesia, Thailand and Vietnam (2 outbreaks each). All other overseas exposure locations listed in Table 16 were associated with a single outbreak each. The majority of cases associated with overseas transmission were infected with norovirus (42.8%, 89/208 cases), followed by *Shigella* spp. (31.3%, 65/208 cases).

Table 16. Outbreaks with overseas transmission by exposure location and pathogen, 2014

Destination	Pathogen or condition ¹						
	<i>Shigella</i> spp.	<i>Salmonella</i> spp.	<i>Giardia</i> spp.	Measles virus	Norovirus	Astrovirus	Total
Australia					1		1
Cambodia	1						1
China, People's Republic of		1					1
Fiji	2		2				4
India	1	1	1			1	2
Indonesia	1		1				2
Morocco	1						1
Nepal	1						1
North Africa and the Middle East ²			1				1
Pakistan	1						1
Philippines				1			1
Rarotonga		1					1
Samoa	1						1
Thailand		2					2
Vietnam		1	1				2
Total outbreaks	9	6	6	1	1	1	22
Total cases	65	56	16	4	89	22	208

¹ Three pathogens were reported in one outbreak with 22 cases. This means the numbers might not add up to the totals.

² Specific countries visited were not reported.

Outbreak recognition, investigation and control

Timeliness of reporting

For the 98.7% (852/863) of outbreaks where the timeliness of reporting data was available, just over half (57.2%, 487/852) were reported to a PHU within a week of the onset of illness in the first case. A further 32.2% (274/852) 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 (5.0 days), environmental outbreaks (6.0 days) and zoonotic outbreaks (21.5 days).

Table 17. Median reporting delay by outbreak type, 2014

Outbreak type	No. of outbreaks ^{1,2}	Median reporting delay (days)
Person-to-person	746	5.0
Environmental	178	6.0
Foodborne	109	4.0
Zoonotic	46	21.5
Waterborne	42	23.5
Other mode	10	21.5
Total	852	5.0

¹ More than one mode of transmission was recorded for 267 outbreaks. This means the numbers do not add up to the group total.

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

Recognition of outbreaks

In 2014, 58.5% (505/863) of outbreaks were identified through an increase in disease incidence and 18.7% (161/863) by cases having person-to-person contact with other cases (Table 18). Other frequent means of outbreak recognition included cases attending a common event (9.2%, 79/863) or being linked to a common source (5.8%, 50/863).

Table 18. Outbreaks by means of recognition, 2014

Means of recognition	No. of outbreaks	% of total outbreaks (n=863)
Increase in disease incidence	505	58.5
Cases had person to person contact with other case(s)	161	18.7
Cases attended common event	79	9.2
Cases linked to common source (eg, food, water, environmental site)	50	5.8
Common organism type/strain characteristics between cases	30	3.5
Other means	38	4.4

Control measures

In 2014, the outbreak control measures undertaken were reported in 92.0% (794/863) of outbreaks. The most common measures were health education and advice regarding the source (79.2%, 629/794) and cleaning and disinfection (70.9%, 563/794) (Table 19). No control measures were taken in 7.2% (62/863) of outbreaks.

Table 19. Outbreaks by control measures undertaken, 2014

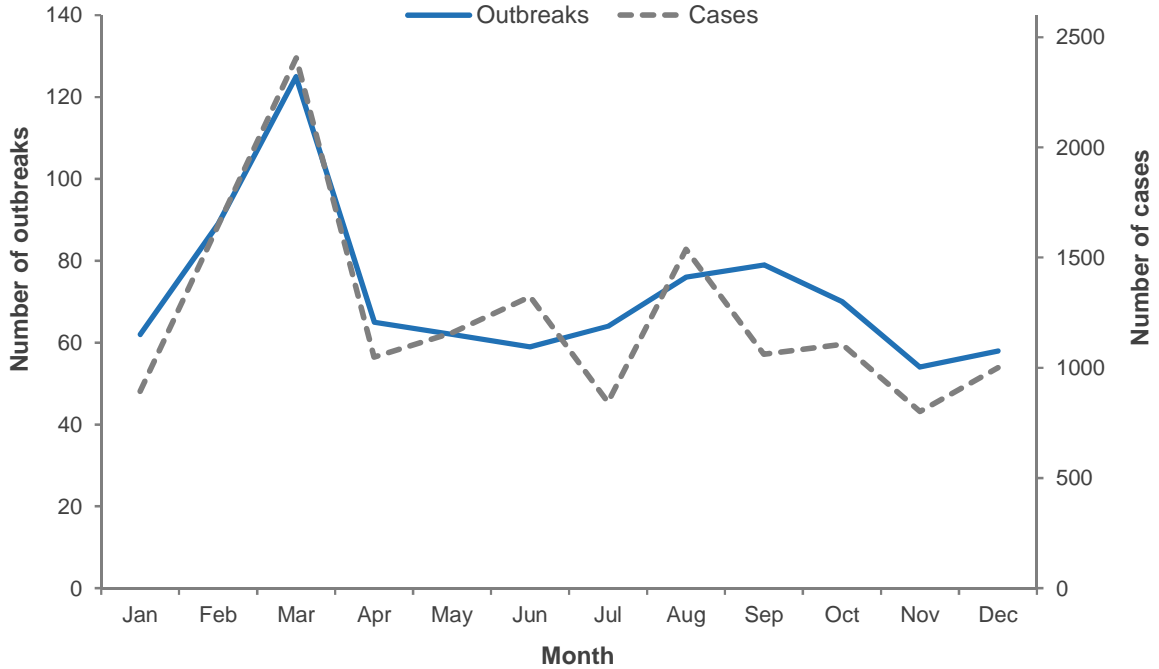
Outbreak control measure	No. of outbreaks ¹	% of total outbreaks (n=794)
Source	767	96.6
Health education and advice	629	79.2
Cleaning, disinfection	563	70.9
Exclusion	529	66.6
Isolation	464	58.4
Modification of procedures	311	39.2
Health warning	206	25.9
Closure	182	22.9
Treatment	70	8.8
Removal	32	4.0
Contacts and potential contacts	207	26.1
Health education and advice	206	25.9
Chemoprophylaxis	5	0.6
Vaccination	4	0.5
Vehicle and vector	10	1.3
Removal	7	0.9
Treatment	3	0.4
Other control measures	108	13.6
No control measures	62	7.2

¹ More than one control measure was recorded for some outbreaks. This means the numbers may not add up to the group totals.

Summary of trends

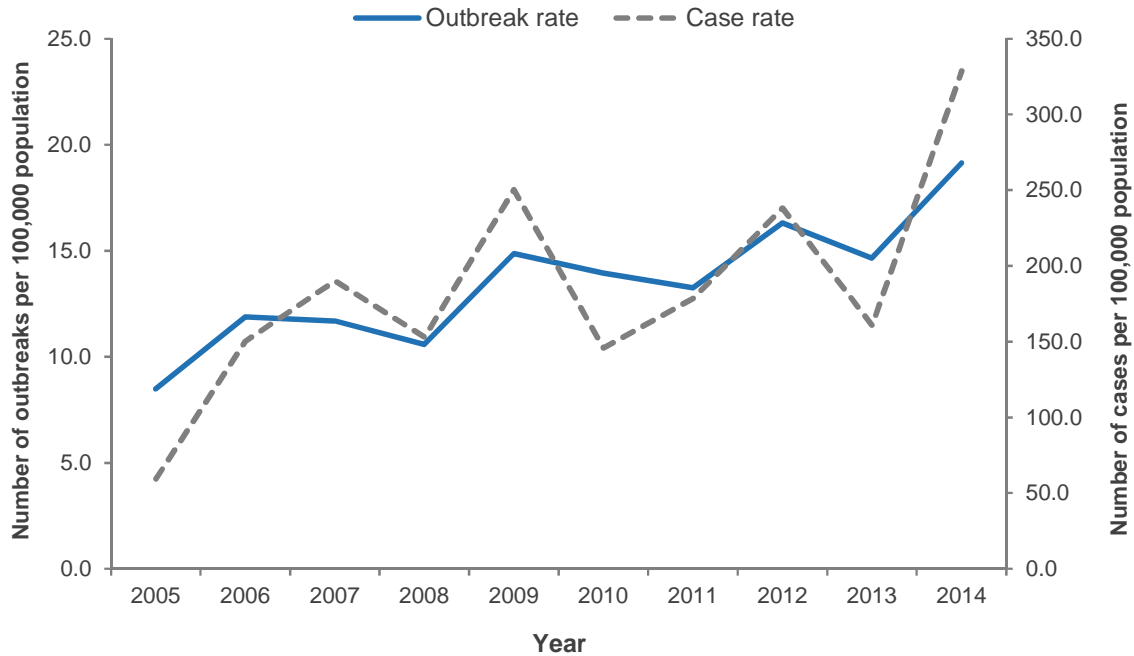
In 2014, the highest number of outbreaks and outbreak-related cases was reported in March (125 outbreaks, 2406 cases) followed by February (89 outbreaks, 1647 cases). The remaining months were more or less stable for the rest of the year (range of 54–79 outbreaks) (Figure 5). The March peak was largely driven by an increase in norovirus outbreaks (61 outbreaks, 1618 cases), which accounted for nearly half of all outbreaks reported that month. In 2013, the highest number of outbreaks and associated cases (74 outbreaks, 1048 cases) was reported in January. This high number was also driven by an increase in norovirus outbreaks (41 outbreaks, 890 cases).

Figure 5. Number of outbreaks and associated cases by month, 2014



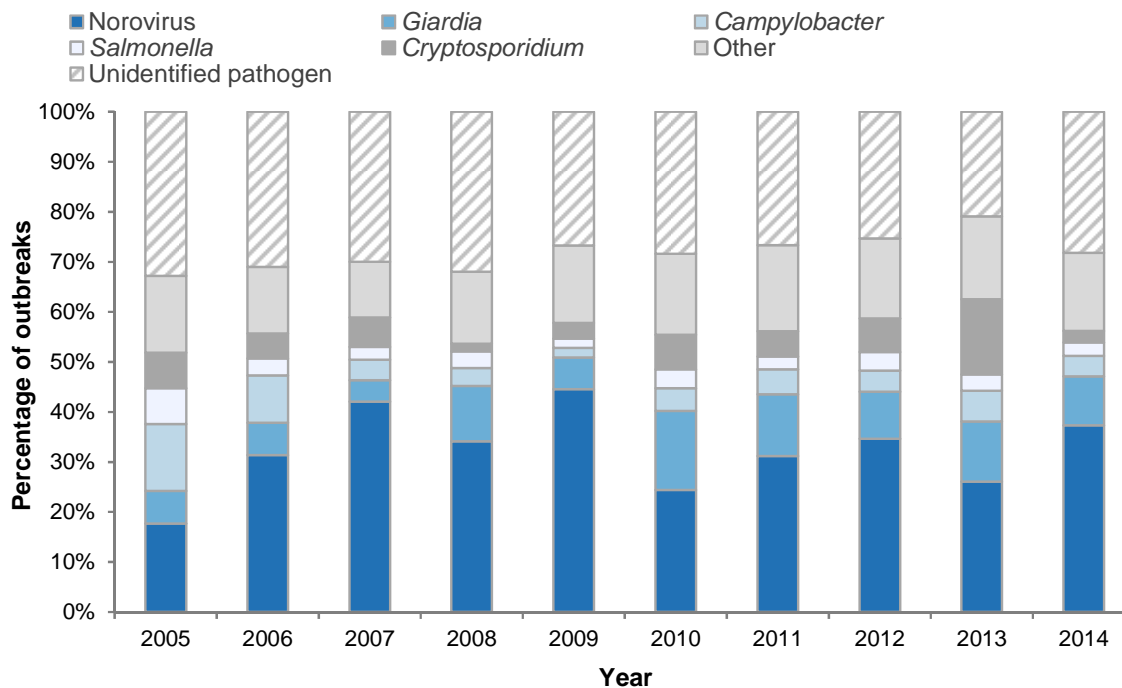
Since 2005, both the outbreak rate and the case rate have tracked upwards. The national annual outbreak rate for 2014 (19.1 outbreaks per 100,000 population) has increased from the rate in 2013 (14.7 outbreaks per 100,000) (Figure 6), and is the highest annual rate reported since recording began in 1998. The 2014 outbreak case rate is the highest annual outbreak case rate recorded (328.8 per 100,000 population).

Figure 6. Outbreak rates and associated cases by year, 2005–2014



Since 2001, the number of outbreaks linked to an identified causal agent has remained close to 70% (range 66.3%–78.7%). In 2014, 71.8% (620/863) of outbreaks were linked to an identified pathogen or condition. Since 2004, the causal agent associated with the greatest number of outbreaks and outbreak cases has been norovirus, although the number and percentage of norovirus outbreaks and cases has varied considerably from year to year. In 2014, 322 norovirus outbreaks were reported with 9363 associated cases. This figure is almost double the number of outbreaks observed in 2013 (170 outbreaks and 3689 cases) (Figure 7), and is the highest number of outbreaks and cases recorded since reporting began 1998. Prior to 2014 the highest number of norovirus outbreaks and cases was reported in 2009 (285 outbreaks and 7429 cases), when norovirus outbreaks accounted for almost half (44.5%, 285/640 outbreaks) of the total outbreaks reported. The number of reported rotavirus outbreaks has progressively increased each year from 23 in 2012 (360 cases) to 48 in 2014 (866 cases).

Figure 7. Percentage of outbreaks by pathogen or condition and year, 2005–2014



The number of outbreaks due to *Cryptosporidium* spp. decreased in 2014 (20 outbreaks, 60 cases) after a progressive increase from seven outbreaks in 2008 to a peak of 98 outbreaks with 547 associated cases in 2013. This is the highest number reported since reporting began in 2001. The most common modes of transmission (primary and secondary) reported for *Cryptosporidium* spp. outbreaks in 2014 were person-to-person (19 outbreaks, 56 cases) and waterborne transmission (10 outbreaks, 26 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 slightly to 85 outbreaks and 317 cases in 2014.

The number of outbreaks and associated cases linked to *Campylobacter* spp. has increased steadily since 2009. The number of outbreaks has almost tripled (from 13 in 2009 to 35 outbreaks in 2014), while the number of associated cases (from 69 in 2009 to 241 in 2014) has almost quadrupled. The number of outbreaks and associated cases reported annually decreased by more than half from 2006 (47 outbreaks, 221 cases) to 2007 (20 outbreaks 54 cases). This decrease was most likely due to interventions put in place in New Zealand to reduce the incidence of poultry associated foodborne campylobacteriosis in 2006 [5]. Before these interventions, the highest number of outbreaks and cases associated with campylobacteriosis was reported in 2001 (54 outbreaks, 293 cases).

Campylobacter has consistently remained one of the five most commonly reported causal agents for outbreaks since 2001. In 2014, the most common modes of primary and secondary transmission reported for *campylobacter* spp. outbreaks were foodborne (18 outbreaks, 158 cases) and person-to-person (13 outbreaks, 48 cases). Thirteen of the foodborne outbreaks had a food source implicated, with the most common vehicles reported as chicken liver/chicken liver paté (5 outbreaks, 79 cases) and raw or unpasteurised milk (5 outbreaks, 22 cases).

Clostridium difficile emerged as an outbreak pathogen in 2010 when one outbreak involving two cases was reported. This number increased in 2012 when six outbreaks with 107 associated cases were reported. In 2014, there were two outbreaks with 61 associated cases, although norovirus was also identified in one of the outbreaks involving 58 cases. Person-to-person transmission within an acute-care hospital exposure setting was the primary mode reported in both outbreaks.

In 2014, the most common outbreak settings were long-term care facilities and private homes, which is similar to observations from 2006 to 2013. Since 2006, outbreaks in institutions have constituted about half of all outbreaks reported annually and those in private homes about a quarter to a third. Before 2006, commercial food operators and private homes were the most commonly reported settings.

In the last 10 years, outbreaks involving person-to-person transmission have become the most frequently reported mode of transmission. This is a change from foodborne transmission, which was often the most frequent mode between 1998 and 2006 (ranging from: 28.3%–52.9%). The proportion of foodborne outbreaks reported in 2014 (12.6%, 109/863) is the lowest since reporting began in 1998. Between 2007 and 2013 the proportion of foodborne outbreaks reported each year ranged from 13.2% to 23.3%. The proportion of outbreaks with person-to-person transmission reported has increased considerably from the 2001–2003 period (20.2%–33.9%) to the 2009–2014 period (73.6%–87.6%). In 2014, the number of outbreaks with person-to-person transmission was more than four times higher than any other mode of transmission. Also, outbreaks attributed to environmental transmission (21.0%, 181/863) remained the second most common mode of transmission in 2014. In outbreaks reported from 2010 to 2012 foodborne transmission was the second most common mode of transmission reported.

Since 1998, poultry has been one of the most commonly implicated food sources reported in foodborne outbreaks. The proportion of foodborne outbreaks attributed to poultry has increased from 15.2% in 2011 to 46.7% in 2014. However, in 2013 (40.6%) and 2012 (26.7%) outbreaks implicating dairy represented the largest proportion of foodborne outbreaks where a source was reported. It is important to note that very few outbreaks have a suspected source confirmed by epidemiological or laboratory methods. In 2014, only 27.5% (30/109) of the foodborne outbreaks recorded an identified food source. In some outbreaks multiple sources can be implicated.

In 2014, 22 outbreaks involving 208 cases had identified overseas transmission. This is similar to the annual number of outbreaks with overseas transmission reported since 2010 (ranging from 15 to 24 outbreaks), although a larger number of associated cases were reported in 2012 (443 cases). In 2013 and 2014, travel in Fiji (4 outbreaks respectively) was the most commonly reported country of exposure. Between 2006 and 2010, the annual number of outbreaks with overseas transmission reported ranged from 5 to 15, with the total number of outbreak-associated cases ranging from 30 to 289. No country was associated with more than two outbreaks during this period.

The median delay between the date of onset of illness in the first case and the outbreak report date in 2014 was 5.0 days. This delay is shorter than the delay that was reported for 2013 (9.0 days), but similar to what was reported between 2008 and 2012 (ranging from 4.0 to 7.5 days). The median delay for person-to-person outbreaks decreased in 2014 (5.0 days) when compared to previous years (ranging from 7.0 to 10.0 days between 2010 and 2013).

Health education and advice related to the outbreak source has been the most common control measure used since 2001 and was provided in 96.6% (767/794) of the outbreaks with a control measure reported in 2014. Between 2007 and 2014, cleaning and disinfection was the second most common control measure reported, a change from modification of procedures pertaining to the source, which was the second most common control measure between 2001 and 2006. The proportion of outbreaks reporting no control measures decreased from 27.8% (108/389) of outbreaks in 2001 to 7.2% (62/863) of outbreaks in 2014.

GLOSSARY

E/S/R

THE SCIENCE
BEHIND THE
TRUTH

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 (ie. 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 among individuals in a community where transmission is predominantly 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 such as 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.

Environment

All factors that are external to the individual human host.

EpiSurv

The national notifiable disease surveillance system that ESR manages to record data about notifiable diseases and outbreaks reported by public health units.

ESR

Institute of Environmental Science and Research Limited.

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 and instruments.

REFERENCES

E/S/R

THE SCIENCE
BEHIND THE
TRUTH

REFERENCES

1. ESR, 2012. *Guidelines for the investigation and control of disease outbreaks*. Wellington. Institute of Environmental Science and Research Ltd.
2. Kroneman A, Vennema H, Deforche K, et al., 2011. An automated genotyping tool for enteroviruses and noroviruses. *Journal of Clinical Virology*. 51(2): pp. 121-5.
3. Eden JS, Hewitt J, Lim KL, et al., 2014. The emergence and evolution of the novel epidemic norovirus GII.4 variant Sydney 2012. *Virology*. 450-451: pp. 106-13.
4. Painter JA, Ayers T, Woodruff R, et al., 2009. Recipes for foodborne outbreaks: a scheme for categorizing and grouping implicated foods. *Foodborne Pathogen and Disease*. 6(10): pp. 1259-64.
5. Sears A, Baker MG, Wilson N, et al., 2011. Marked campylobacteriosis decline after interventions aimed at poultry, New Zealand. *Emerging Infectious Diseases*. 17(6): pp. 1007-15.

APPENDIX

E/S/R

THE SCIENCE
BEHIND THE
TRUTH

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)	

E/S/R

THE SCIENCE
BEHIND THE
TRUTH