Ministry for Primary Industries
Manatū Ahu Matua

Annual Report
Foodborne Disease in New Zealand

MPI Technical Paper No: 2015/35

ISBN No: 978-1-77665-068-2 (online)
ISSN No: 2253-3923 (online)

July 2015

New Zealand Government

Growing and Protecting New Zealand

ANNUAL REPORT
FOODBORNE DISEASE IN NEW ZEALAND 2014

E/S/R

THE SCIENCE BEHIND THE TRUTH

Prepared for Ministry for Primary Industries under project MRP/14/02 – Systematic reporting of epidemiology of potentially foodborne disease in New Zealand for year 2014, as part of overall contract for scientific services.

PUBLISHED: JUNE 2015
CLIENT REPORT: FW15016

www.surv.esr.cri.nz

This report is available at www.mpi.govt.nz

First published: 19 June 2015

Suggested citation:
Horn, B., Lopez, L., Cressey, P. and Roos, R.
Annual Report Concerning Foodborne Disease in New Zealand 2014,
2015: ESR Client Report FW15016, Christchurch, New Zealand.

Client Report FW15016

Acknowledgements

Particular thanks to the staff in the public health services in New Zealand who provide data from their regions. Thanks also to ESR staff Ange Bissielo for producing the maps in this report and Maurice Wilson, Joanne Hewitt and Brent Gilpin for assistance with data and its interpretation.

The authors also wish to acknowledge the New Zealand Ministry of Health as funders of the EpiSurv database.

Disclaimer

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INTRODUCTION

One of the aims of the Ministry for Primary Industries (MPI) is to protect New Zealand from biological risks, including reducing food-related risks to human health. Human health surveillance is an essential element of the monitoring and review component of MPI's risk management framework. In addition, evidence from notifications, case enquiries, outbreak investigations and other epidemiological studies of human enteric diseases are used as sources of data for risk profiles and assessments. There is ongoing interest in foodborne disease statistics within MPI and its stakeholders.

This report for the calendar year 2014 is intended to be part of a series providing a consistent source of data and method of presentation to allow monitoring of foodborne illness in New Zealand.

Human health surveillance data and foodborne disease

The information in this report concerns reported cases of notifiable disease and reported outbreaks collected in the EpiSurv database (for a description of EpiSurv, see Methods section of this report). There are a number of notifiable illnesses which may be caused by transmission of pathogens in foods, but it is important to remember that most of the information concerns the illness, not the mode of transmission. The information needs to be considered with two caveats:

1. Notified cases of illness and reported outbreaks represent a subset of all the cases and outbreaks that occur in New Zealand each year. Many sick individuals do not visit a GP or otherwise come to the attention of the medical system. By using these data as indicators, we are assuming that they are representative of all the cases and outbreaks that occur (see section on the Acute Gastrointestinal Illness study for a further discussion of this issue).
2. Foodborne transmission is only one of the routes by which humans are exposed to pathogens; other routes include water, animal contact and person to person. There are a number of indicators from which we can get information on the proportion of cases caused by foodborne transmission:
    - Reported risk factors: for a proportion of the notified cases, supplemental information is obtained by public health units (PHUs) on risk factors. This information should be interpreted with some caution as it is self-reported by cases, no external validation of this information is undertaken, and often the cases will report several potentially important risk factors. The quality of information from notifiable disease surveillance as an indication for foodborne disease transmission has been reviewed in more detail [1].
    - Outbreak reports: the circumstances of an outbreak (multiple cases from a single event) mean that an investigation is more likely to identify a source of exposure to the pathogen than investigation of sporadic cases. However, only a small proportion of outbreaks are reported, and experience shows that outbreaks associated with foodservice premises are more likely to be reported and investigated than outbreaks associated with other settings.
    - Expert opinion: based on their experience in laboratories and epidemiological investigations, as well as knowledge of factors influencing the risk, experts can provide estimates of the proportion of cases caused by foodborne transmission. Estimates for New Zealand have been developed for some foodborne diseases [2], as presented in relevant report sections. These are not fixed values; future changes to the New Zealand food chain may require the values to be amended.

- Overseas analyses and estimates: information for countries with similar food supplies to New Zealand can be helpful, especially for illnesses where a foodborne estimate was not developed from other studies. Five sets of published estimates are given in Table 1, for the USA [3], Canada [4], Australia [5, 6], England and Wales [7] and the Netherlands [8]. The estimates for Australia, Canada and the Netherlands are based on expert opinion, the estimates for England and Wales are based on outbreak analysis, while the US estimates are based on data from surveillance, risk factor studies and a literature review. It is worth noting that, although for most of the diseases included in this report foodborne transmission is considered significant, there are several illnesses (shigellosis, giardiasis, cryptosporidiosis, hepatitis A) where it is considered to be only a small proportion of the total.

Table 1. Overseas estimates of the food attributable proportion of selected illnesses due to microbial hazards

Hazard	Percentage foodborne (%)				
	USA (2011)	Canada (2015)	Australia (2005, 2014)	England and Wales (2002)	Netherlands[a] (2008)
Bacteria					
Bacillus cereus	100	99	100	100	90
Campylobacter spp.	80	62	77[b]	80	42
Clostridium perfringens	100	93	98[b]	94	91
Shiga toxin-producing *Escherichia coli* (STEC) O157:H7	68	61	56[b,c]	63	40
STEC non-O157	82	60	56[bc]	63	42
Listeria monocytogenes	99	77	98[b]	99	69
Salmonella non-typhoidal	94	63	72[b]	92	55
Shigella spp.	31	26	12[b]	8	NE
Staphylococcus aureus	100	78	100	96	87
Yersinia enterocolitica	90	83	75	90	NE
Parasites					
Cryptosporidium parvum	8	11	10	6	12
Giardia lamblia	7	7	5	10	13
Viruses					
Hepatitis A virus	7	30	12[b]	11	11
Norovirus	26	18	18[b]	NE	17
Sapovirus	<1	17	NE	0	NE

[a] The Dutch study also collected opinions on the proportion of disease due to travel. A proportion of this will also be foodborne.

[b] The 2014 Australian publication did not cover the full range of organisms covered in the 2005 publication. Estimates marked with a superscript are from the 2014 publication.

[c] Estimate was derived for total STEC

NE = not estimated

This report considers information for the 2014 calendar year. Information from the scientific literature and other sources concerning food safety in New Zealand for that year has been summarised. However, the time taken to publish scientific information is often lengthy, and it may be that additional information relevant to 2014 becomes available in the future.

Conditions included in this report

The conditions that have been selected for inclusion in the report are those that have:

1. The potential to be caused by foodborne transmission; and,
2. Available historical and current national data sources.

The potentially foodborne conditions included in this report are listed in Table 2. Data have been drawn from a number of sources including disease notification, hospitalisation, outbreak reports and laboratory surveillance databases.

Notifiable conditions were selected for inclusion in the report where it was considered that a significant proportion would be expected to be foodborne or the disease organism has been reported as the cause of foodborne outbreaks. Typhoid and paratyphoid fever are not included as the majority of cases acquire their infection overseas.

For some conditions (intoxications from the bacteria; *Bacillus cereus*, *Clostridium perfringens* and *Staphylococcus aureus*, and norovirus and sapovirus infections) not every case is notifiable; only those that are part of a common source outbreak or from a person in a high risk category (eg food handler, early childhood service worker, etc.). Such cases are notified under the heading of acute gastroenteritis.

For some conditions (campylobacteriosis, listeriosis, salmonellosis, VTEC/STEC infection, yersiniosis) the attribution of disease incidence to foodborne transmission was estimated by an expert consultation held on 5 June 2013 [2]. In the current report these food-attributable proportions have been used to estimate the number of food-associated cases of relevant diseases. The estimated proportion of travel-associated cases from reported risk factors were subtracted from the total cases before application of the food-associated proportion. Travel-associated cases are those where the individual reported being outside New Zealand during the incubation period for the disease.

Table 2. Potentially foodborne conditions included in the report

Disease	Type	Source(s)	ICD-10 code[a]
Bacillus cereus intoxication	Bacterium	N, O, H	A05.4 Foodborne *Bacillus cereus* intoxication
Campylobacteriosis	Bacterium	N, O, H	A04.5 *Campylobacter* enteritis
Ciguatera fish poisoning	Toxin	N, O, H	T61.0 Toxic effect: Ciguatera fish poisoning
Clostridium perfringens intoxication	Bacterium	N, O, H	A05.2 Foodborne *Clostridium perfringens* [*Clostridium welchii*] intoxication
Cryptosporidiosis	Protozoan	N, O, H	A07.2 Cryptosporidiosis
Giardiasis	Protozoan	N, O, H	A07.1 Giardiasis [lambliasis]
Histamine (scombroid) fish poisoning	Toxin	N, O, H	T61.1 Toxic effect: scombroid fish poisoning
Hepatitis A infection	Virus	N, O, H	B15 Acute hepatitis A
Listeriosis (total and perinatal)	Bacterium	N, O, H	A32 Listeriosis
Norovirus infection	Virus	N, O, H, L	A08.1 Acute gastroenteropathy due to Norwalk agent
Salmonellosis	Bacterium	N, O, H, L	A02.0 Salmonella enteritis
Sapovirus infection	Virus	N, O, L	No specific ICD-10 code
Shigellosis	Bacterium	N, O, H, L	A03 Shigellosis
Staphylococcus aureus intoxication	Bacterium	N, O, H	A05.0 Foodborne staphylococcal intoxication
Toxic shellfish poisoning	Toxin	N, O, H	T61.2 Other fish and shellfish poisoning
VTEC/STEC infection	Bacterium	N, O, H, L	A04.3 Enterohaemorrhagic *Escherichia coli* infection
Yersiniosis	Bacterium	N, O, H, L	A04.6 Enteritis due to *Yersinia enterocolitica*

Data sources: EpiSurv notifications (N), EpiSurv outbreaks (O), Ministry of Health hospitalisations (H), ESR laboratory data (L).
VTEC = Verotoxin-producing *Escherichia coli* STEC = Shiga toxin-producing *Escherichia coli*.
[a] International statistical classification of disease and related health problems 10th revision [9].

This report includes both notifiable diseases in the form of acute gastrointestinal illness and sequelae which are considered to result from these preceding infections (Table 3). The two sequelae included in the report, haemolytic uraemic syndrome (HUS) and Guillain-Barré syndrome (GBS), are severe illnesses and occasionally life threatening.

Table 3. Sequelae to potentially foodborne conditions included in the report

Disease	Source(s)	Comment
Guillain-Barré syndrome (GBS)	H (G61.0 Guillain-Barré syndrome)	Sequela to infection with *Campylobacter* [a]
Haemolytic uraemic syndrome (HUS)	H (D59.3 Haemolytic-uraemic syndrome)	Sequela to infection with VTEC/STEC

Data Sources: Ministry of Health hospitalisations (H).

[a] While there is evidence that GBS can be triggered by other microbial infections (eg cytomegalovirus, Epstein-Barr virus, *Mycoplasma pneumonia*), *Campylobacter* infection is the only recognised triggering organism that is potentially foodborne.

METHODS

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METHODS

This section includes descriptions of the data sources, analytical methods used and comments on quality of data, including known limitations.

The report uses the calendar year, 1 January to 31 December 2014, for the reporting period.

Data sources

The key sources of data used in this report are detailed in the following sections. The data sources have been selected on the basis of availability of data for the specified reporting period and their accessibility within the timeframe required for the report.

Some data, such as official cause of death, are not published until several years after the end of the year in which the event occurred (although deaths may be reported as part of the case notification data recorded in EpiSurv). For this reason these data are not available for inclusion in a report published soon after the end of the calendar year.

EpiSurv - the New Zealand notifiable disease surveillance system

Under the Health Act 1956 health professionals are required to inform their local Medical Officer of Health of any suspected or diagnosed notifiable disease. Since December 2007, laboratories have also been required to report notifiable disease cases to their local Medical Officer of Health.

Notification data are recorded using a web-based application (EpiSurv) available to staff at each of the 18 Public Health Units (PHUs) in New Zealand. The EpiSurv database is maintained and developed by the Institute of Environmental Science and Research (ESR) Ltd., which is also responsible for the collation, analysis and reporting of disease notifications on behalf of the Ministry of Health (MoH).

Data collected by PHUs depends on the specific disease, but usually includes demography, outcome, basis of diagnosis, risk factors and some clinical management information. Data on risk factors reflect the frequency of exposure in the incubation period for illness, and are not a measure of association with illness in comparison with the general population.

Further information about notifiable diseases can be found in the *Notifiable Diseases in New Zealand: Annual Report 2014* [10].

Laboratory-based surveillance

For a number of organisms (eg *Salmonella*, *Escherichia coli*), clinical laboratory isolates are forwarded to reference laboratories at ESR for confirmation and typing. The number of isolates forwarded differs by DHB and organism (eg almost all isolates are forwarded for *Salmonella* typing but not all *Yersinia* isolates are forwarded).

Prior to the introduction of processes for matching notifications and laboratory records, the number of laboratory-reported salmonellosis cases had always exceeded the number of notifications. The implementation of data integration processes in 2004 for notifications and laboratory results at ESR has addressed this problem.

Ministry of Health (MoH)

MoH collates national data on patients admitted and discharged from publicly funded hospitals. These data are stored as part of the National Minimum Dataset (NMDS). Cases are assigned disease codes using the tenth revision of the International Classification of Diseases (ICD-10) coding system [9]. Up to 99 diagnostic, procedure, and accident codes may be assigned to each admission. The first of

these is the principal or primary diagnosis, which is the condition that actually led to admission. This may differ from the underlying diagnosis.

Hospital admission data are only added to the NMDS after the patient is discharged. The number of hospitalisations presented for the reported year may be under-reported due to the delay in receiving discharge summaries.

Hospital admission data includes repeated admissions for patients with chronic notifiable diseases or diseases which have long-term health impacts (eg GBS). For some diseases, the criteria for notification (clinical and laboratory or epidemiological evidence) do not match those required for diagnostic coding. For these reasons hospitalisation numbers and notifications may differ.

In this report all hospitalisations, including readmissions, have been reported for all primary diseases. For the disease sequelae (GBS and HUS), readmissions within the calendar year were removed with reported case numbers representing unique cases, rather than total admissions.

Outbreak surveillance

ESR has operated an outbreak surveillance system as an additional module in EpiSurv since mid-1997. This enables PHUs to record and report outbreaks for national reporting and analysis. It should be noted that, due to the practicalities of collecting information and laboratory resource constraints, not all cases associated with outbreaks are recorded as individual cases of notifiable disease in EpiSurv. The terms ‘setting’ and ‘suspected vehicle’ are both used in outbreak reporting to describe likely implicated sources of exposure found in epidemiological or environmental investigations.

A new outbreak report form was introduced in October 2010. As a result, some variables reported previously are no longer available for analysis. For example, coding indicating the strength of evidence for concluding that an outbreak is foodborne was changed.

An outbreak has been classed as foodborne in this report if food was recorded as one of the likely modes of transmission applicable to the outbreak. It is important to note that a single outbreak may have multiple pathogens, modes of transmission, settings where exposure occurred, or settings where preparation of food was conducted. More information about the outbreak reporting system can be found in the Annual Summary of Outbreaks in New Zealand 2014 [11].

Laboratory investigation of outbreaks

PHUs may submit clinical, food or environmental samples associated with single cases or outbreaks of suspected food poisoning to ESR’s Public Health Laboratory (PHL). While faeces are the most common human clinical sample, on occasions other clinical samples, such as vomit, urine or breast milk, may be submitted. Wherever possible, samples are linked to associated EpiSurv records. Samples are analysed for possible causative agents, based on information on symptoms and incubation period. In this report, laboratory investigations are reported only for outbreaks classified as foodborne in EpiSurv.

The laboratory investigation section in this report only includes reports on samples submitted to ESR’s PHL. It should be noted that human faecal samples associated with outbreaks and sporadic cases may be tested by community laboratories, following submission by general practitioners or PHUs. If the pathogen identified is a notifiable disease, a notification will be generated and a case reported in EpiSurv. No information is available from community laboratories on the number of samples submitted for which no pathogen is detected.

Level of evidence for outbreaks

Foodborne outbreaks have been classified as having weak or strong evidence for any given suspected vehicle. Outbreaks with strong evidence included those with a statistically significant

elevated risk ratio or odds ratio (95% confidence) from an epidemiological investigation and/or laboratory evidence with the same organism and sub type detected in both disease cases and vehicle (to the highest available level of identification).

Outbreaks were classified as having weak evidence when they met one or more of the following criteria:

- compelling evidence with symptoms attributable to specific organism eg scombrotoxin, ciguatoxin etc.,
- other association but no microbial evidence for causal link ie organism detected at source but not linked directly to the vehicle or indistinguishable DNA or PFGE profiles,
- raised but not statistically significant relative risk or odds ratio,
- no evidence found but logical deduction given circumstances.

Statistics New Zealand

Data from the Statistics New Zealand website www.stats.govt.nz were used to calculate notification and hospitalisation population rates of disease. See analytical methods section for further details.

MPI project reports and other publications

MPI project reports, prepared by ESR or other providers, and publications from the general literature were used to provide specific contextual information on the prevalence of selected pathogens in specific food types.

Risk attribution

Information from a project on risk ranking was used to estimate the proportion of disease due to specific pathogens that can be attributed to transmission by food [2]. Attributable proportions were determined by expert consultation, using a modified double-pass Delphi, with a facilitated discussion between passes. Each expert was asked to provide a minimum (‘at least’), a most likely and a maximum (‘not more than’) estimate of the proportion of a number of microbial diseases that were due to transmission by food. Estimates presented in the current report are mean values from the second pass, incorporating a weighting scheme based on a self-assessment of expertise for each pathogen. The 2013 expert consultation did not consider *Bacillus cereus* intoxication. The estimate for the proportion of *Bacillus cereus* intoxication due to transmission by food is taken from the previous expert consultation which took place in 2005 [12].

Analytical methods

Key analytical methods used include:

Dates

Notification and outbreak data contained in this report are based on information recorded in EpiSurv as at 23 February 2015 and 10 March 2015, respectively. Changes made to EpiSurv data by PHU staff after these dates will not be reflected in this report. Consequently, future analyses of these data may produce revised results. Disease numbers are reported according to the date of notification. Laboratory results are reported according to the date the specimen was received.

Data used for calculating rates of disease

All population rates use Statistics New Zealand 2014 mid-year population estimates and are crude rates unless otherwise stated. At 30 June 2014, the New Zealand population was estimated to be 4,509,690. The mid-year population estimate for 2013 used in the analysis of trends has been updated since the previous report, following the release of the 2013 census data. This report uses 4,442,100 for the 2013 mid-year population estimate, compared to 4,471,040 used in 2013 report. Rates have not been calculated where there are fewer than five notified cases or hospitalisations in any category. Calculating rates from fewer than five cases produces unstable rates.

Geographical breakdown

This report provides rates for current District Health Boards (DHBs). The DHB populations have been derived from the Statistics New Zealand mid-year population estimates for Territorial Authorities in New Zealand.

Map classification scheme

The map classification break points for the disease have been selected to divide the data into three bands to show the range of rates among DHBs. The darkest colour represents the highest rates and the lightest colour the lowest rates. The grey speckled colour shows where there are insufficient data to calculate a rate (fewer than 5 cases).

Risk factors and source of infection

For many diseases an analysis of risk factors for the cases is reported. These risk factors are those included in the current EpiSurv case report forms. Often more than one risk factor is reported for each case. For some diseases the number of cases for which risk factors are unknown can be high.

The reporting of exposure to a risk factor does not imply that this was the source of the infection.

Statistical tests

Confidence intervals have been calculated for the disease rates and displayed on the graphs. The historical mean is calculated from the previous three years data (2011−2013).

Interpreting data

Data in this report may differ from those published in other reports depending on:

- the date of extraction of data
- the date used to aggregate data (eg date reported or date of onset of illness)
- filters used to extract the data

The information in this report shows disease trends by age group, sex, and place of residence (DHB).

Because of the low numbers of cases for some conditions and age groups, etc. the rates calculated in this report may be highly variable from year to year and it is necessary to interpret trends with caution.

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REPORTING

Reporting against targets

The performance targets for potentially foodborne diseases come under scrutiny by the Ministry for Primary Industries (MPI) on an annual basis. In 2014, MPI decided to continue with the three performance targets for potentially foodborne diseases established in 2013.

Performance targets

- Campylobacteriosis: maintain the 50% reduction in the incidence of foodborne campylobacteriosis over the period 2013–2014
- Salmonellosis: maintain the 30% reduction in the incidence of foodborne salmonellosis over the period 2013–2014
- Listeriosis: no increase in the incidence of foodborne listeriosis over the period 2013–2014

Rationale

The above diseases include the two most commonly notified, potentially foodborne diseases in New Zealand plus listeriosis, one of the most severe. This selection is based, in part, on the ESR foodborne illness attribution work which identified campylobacteriosis and listeriosis as creating the highest human health burden within New Zealand [13]. The inclusion of salmonellosis also allows for New Zealand comparability with US and UK monitoring programmes. A performance target for foodborne illness due to VTEC/STEC infections is not included as there is only weak association with foodborne outbreaks in New Zealand. Norovirus is not incorporated at this stage because of the large fluctuations that occur in annual statistics (norovirus infection is not a notifiable disease but may be notified as acute gastroenteritis during investigation of a common source outbreak) and, for most cases, a major transmission route (person-to-person) is likely to be outside of the influence of MPI.

MPI continues to closely monitor sources and potential pathways that are most often (albeit weakly) associated with foodborne illness in New Zealand.

Methodology, tools and reporting

Historical baseline data on the number of reported cases of the targeted foodborne diseases are available and MPI is supporting projects to increase the quality of data. The source of the data is the *Notifiable Diseases in New Zealand Annual Report,* by ESR [10]. MPI continues to fund active surveillance projects that provide primary information on food attribution such as the advanced attribution study of human C*ampylobacter* cases conducted by Massey University and Mid-Central Health within the Manawatu.

The measurement is adjusted for the proportion of cases reported as having travelled overseas during the likely incubation period. It is adjusted also for the proportion of disease estimated to be due to foodborne transmission. Estimates for the proportion of disease due to foodborne transmission were revised in 2013, through an expert elicitation process. The new estimates differ slightly from those used previously and have been applied retrospectively to all disease rate estimates presented in this section.

The annual incidence of campylobacteriosis and salmonellosis is reported in terms of calendar year totals of cases per 100,000 population (*Notifiable Diseases in New Zealand Annual Report,* ESR [10]). This allows for demographic changes within the New Zealand population to be appropriately captured. The proportion of infections acquired abroad is estimated through the EpiSurv programme

administered by ESR and MoH*. Estimates of the foodborne proportion of selected communicable diseases determined by the expert elicitation are approximately 0.6, 0.6 and 0.9 respectively for campylobacteriosis, salmonellosis and listeriosis.

From year to year, fluctuations in disease rates may occur due to modifications in clinical, laboratory and notification practices as well as changes in food exposures. These are highlighted and corrected for where possible.

Campylobacteriosis

Performance target

- Maintain the 50% reduction in the incidence of foodborne campylobacteriosis over the period 2013−2014

Measurement

The measurement used is the annual (calendar year) number (per 100,000 mid-year population estimate) of notified cases of human campylobacteriosis, with the baseline being the target set for 2008−2012. This target was a 50% reduction in the average incidence for 2004−2007. The estimated incidence of foodborne campylobacteriosis in 2014 is given in Table 4.

Table 4. Estimated proportion and incidence of foodborne campylobacteriosis for 2014

	Cases	Proportion (%)	Rate (per 100,000, mid year estimated population)
Total notified	6776		150.3
Estimated not travelled overseas	6290	92.8	139.5
Estimated foodborne transmission	4013	63.8 (44.1-83.2)[a]	89.0 (61.5-116.0)[b]

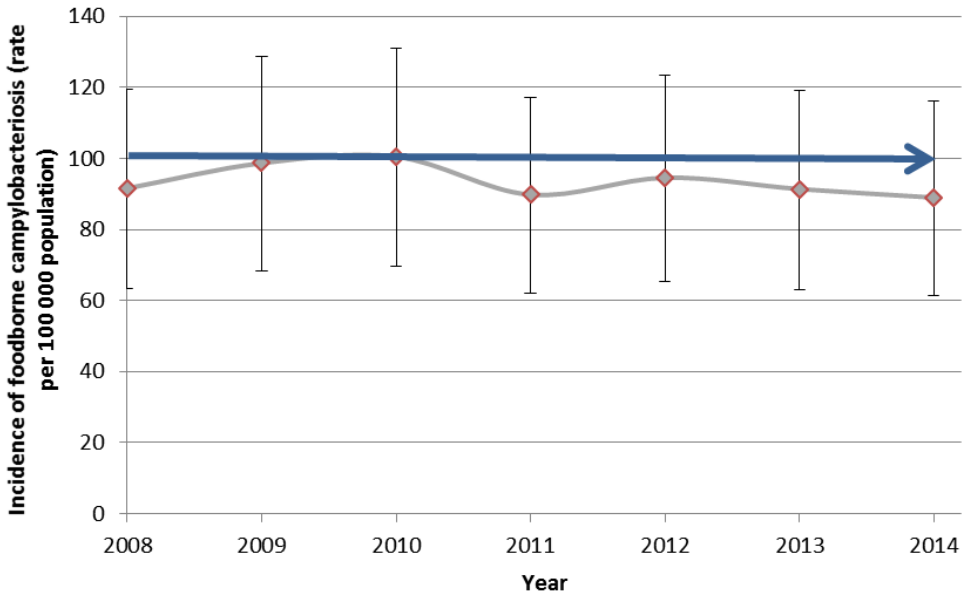
[a] Most likely (95th percentile credible interval) estimates of proportion foodborne, from expert consultation

[b] Most likely (95th percentile credible interval) estimates of foodborne rate

Presentation

The trend in relative rates (and ranges) compared with the 2013−2014 goal is shown in Figure 1.

Figure 1. Incidence of foodborne campylobacteriosis



The blue arrowed line represents the target incidence for the 2013 and 2014 years and is a continuation of the target for 2008−2012.

* Assuming that the cases for which travel information was provided are representative of all cases, a Poisson distribution can be used to estimate the total number of potentially travel related cases

Salmonellosis

Performance target

- Maintain the 30% reduction in the incidence of foodborne salmonellosis over the period 2013−2014

Measurement

The measurement used is the annual (calendar year) number (per 100,000 mid-year population estimate) of notified cases of human salmonellosis, with the baseline being 70% of the average rate for 2004−2007. The estimated incidence of foodborne salmonellosis in 2014 is given in Table 5.

Table 5. Estimated proportion and incidence of foodborne salmonellosis for 2014

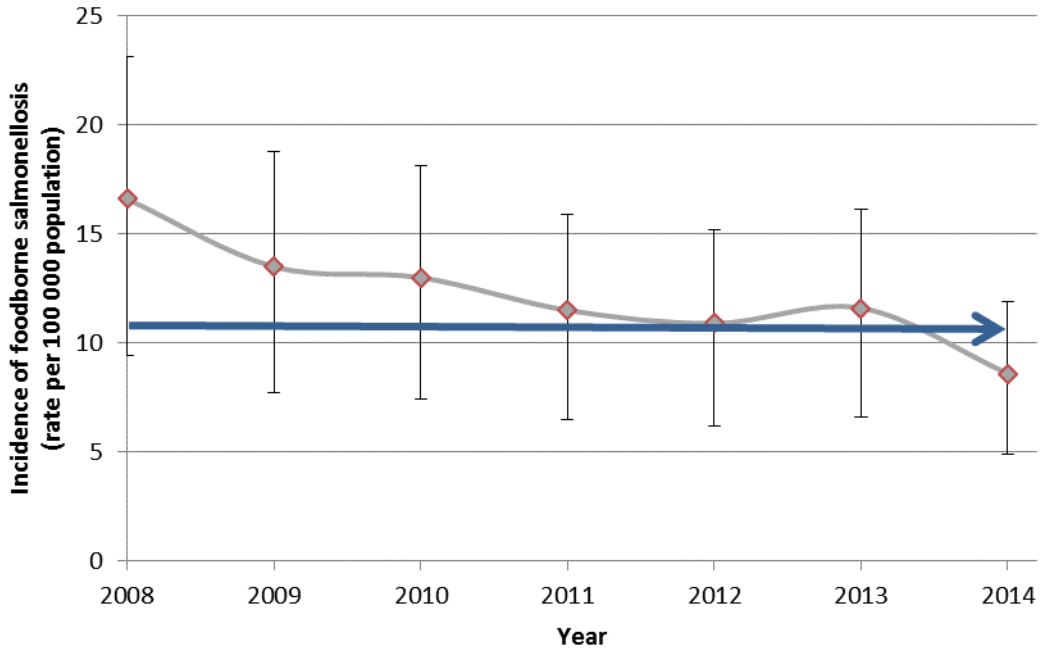
	Cases	Proportion (%)	Rate (per 100,000, mid year estimated population)
Total notified	954		21.2
Estimated not travelled overseas	623	65.3	13.8
Estimated foodborne transmission	387	62.1 (35.2-86.4)[a]	8.6 (4.9-11.9)[b]

[a] Most likely (95th percentile credible interval) estimates of proportion foodborne, from expert consultation
[b] Most likely (95th percentile credible interval) estimates of foodborne rate

Presentation

The trend in relative rates (and ranges) compared with the baseline and five year goal is shown in Figure 2.

Figure 2. Incidence of foodborne salmonellosis



The blue arrowed line represents the target incidence for the 2013 and 2014 years and is a continuation of the target for 2008−2012.

Listeriosis

Performance target

- No increase in the incidence of foodborne listeriosis over the period 2013−2014

Measurement

The measurement used is the annual (calendar year) number (per 100,000 population) of notified cases of human listeriosis, with the baseline being the average rate for 2004−2007. The estimated incidence of foodborne listeriosis in 2014 is given in Table 6.

Table 6. Estimated proportion and incidence of foodborne listeriosis for 2014

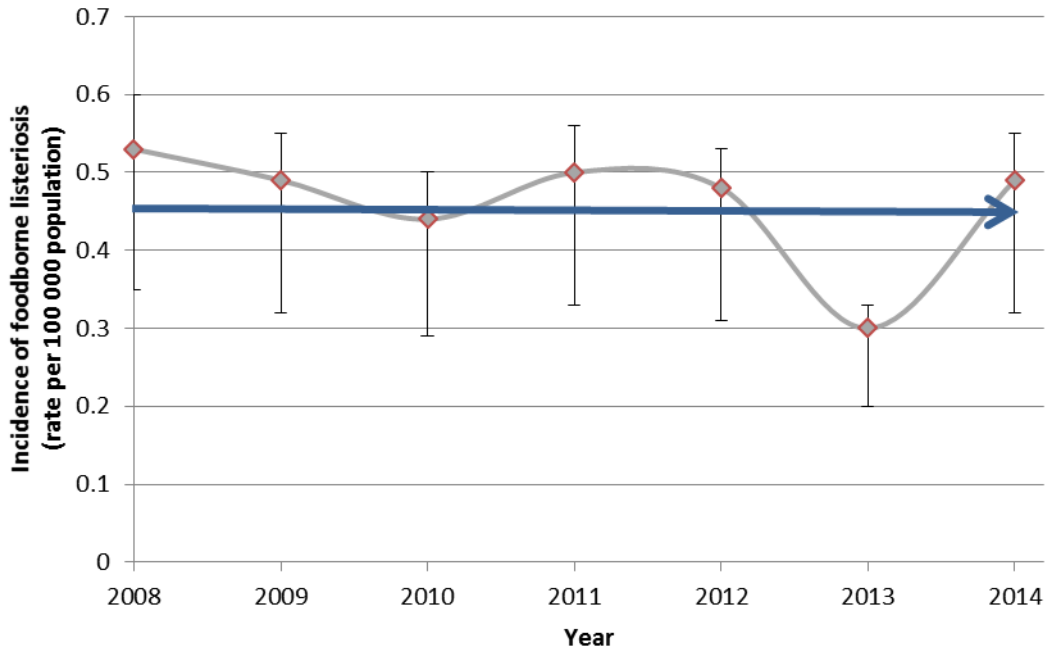
	Cases	Proportion (%)	Rate (per 100,000, mid year estimated population)
Total notified	25		0.6
Estimated not travelled overseas	25	100	0.6
Estimated foodborne transmission	22	87.8 (57.9-98.5)[a]	0.49 (0.32-0.55)[b]

[a] Most likely (95th percentile credible interval) estimates of proportion foodborne, from expert consultation
[b] Most likely (95th percentile credible interval) estimates of foodborne rate

Presentation

The trend in relative rates (and ranges) compared with the baseline and five year goal is shown in Figure 3.

Figure 3. Incidence of foodborne listeriosis



The blue arrowed line represents the target incidence for the 2013 and 2014 years and is a continuation of the target for 2008−2012.

Incidence and severity of selected foodborne conditions

This section includes a summary of the overall incidence for each potentially foodborne condition. For conditions with sufficient numbers (approximately 100 cases or more per year) a full analysis, drawn from notification, hospitalisation, mortality, and laboratory data has been carried out. For conditions with a smaller number of cases a more limited examination has been performed.

These data are followed by contextual information on the foodborne proportion of the overall incidence of illness. This section will include information on the following topics, where available:

- statement of estimated foodborne percentage and range provided by an expert elicitation process conducted in 2013. Note that these estimates are only available for some of the conditions included in this report;
- statement of estimated foodborne percentage and range for any specific foods provided by the same expert elicitation process;
- information on pathogen typing (principally from data generated by ESR's Enteric Reference Laboratory), where it is available and informative about foodborne disease;
- comments on specific food related incidents or outbreaks of the condition that were reported to the notification system during the calendar year;
- studies on foodborne attribution for the specific conditions conducted or published during the calendar year;
- information on the prevalence of the toxin or microbial hazard in particular foods as a result of surveys conducted during the calendar year; and,
- regulatory or other risk management actions in New Zealand that might be expected to affect the foodborne disease data.

Bacillus cereus intoxication

Case definition

Clinical description:	Gastroenteritis where either vomiting or profuse watery diarrhoea dominate.
Laboratory test for diagnosis:	Isolation of ≥10^3/g *Bacillus cereus* from a clinical specimen or ≥10^4 *B. cereus* from leftover food or detection of diarrhoeal toxin in a faecal sample.
Case classification:	
Probable	A clinically compatible illness.
Confirmed	A clinically compatible illness that is laboratory confirmed, OR a clinically compatible illness and a common exposure associated with a laboratory confirmed case.

Bacillus cereus intoxication cases reported in 2014 by data source

During 2014, three notifications of *B. cereus* intoxication were reported in EpiSurv. Note that not all cases of *B. cereus* intoxication are necessarily notifiable; only those where there is a suspected common source.

The ICD-10 code A05.4 was used to extract *B. cereus* intoxication hospitalisation data from the MoH NMDS database. There were no hospital admissions recorded in 2014 with *B. cereus* intoxication as the primary or other relevant diagnosis.

Expert consultation estimated that 97% (minimum = 90%, maximum = 100%) of *B. cereus* intoxication will be due to foodborne transmission [12]. The expert consultation also estimated that approximately 60% of the foodborne transmission would be due to consumption of rice.

Outbreaks reported as caused by *Bacillus cereus*

During 2014, a single outbreak of *B. cereus* was reported in EpiSurv, with three associated cases. This outbreak was associated with a food service setting. Testing by ESR's Public Health Laboratory found *Bacillus* diarrhoeal toxin in one of three of the clinical samples submitted.

Table 7. *B. cereus* outbreak reported, 2014

Measure	Foodborne *B. cereus* outbreaks	All *B. cereus* outbreaks
Outbreaks	1	1
Cases	3	3
Hospitalised cases	0	0

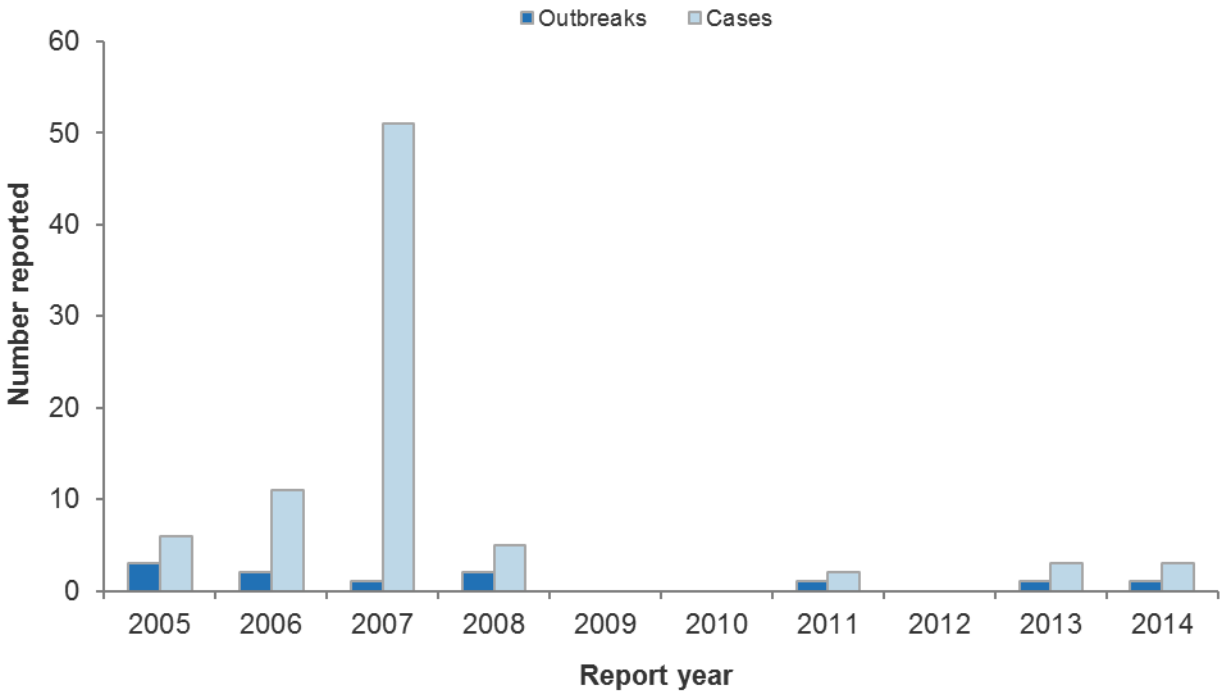
Table 8. Details of foodborne *B. cereus* outbreak, 2014

PHU	Month	Suspected vehicle	Exposure setting	Preparation setting	No. ill
Auckland	July	Unknown	Restaurant/cafe/bakery	Restaurant/cafe/bakery	3C

PHU: Public Health Unit, C: confirmed, P: probable.

Outbreaks of *B. cereus* are rare, with three outbreaks reported in the last six years (Figure 4). Between 2005 and 2008 there were one to three outbreaks reported a year. The largest outbreak, with 51 associated cases, was reported in 2007.

Figure 4. Foodborne *B. cereus* outbreaks and associated cases reported by year, 2005−2014



Recent surveys

Nil.

Relevant New Zealand studies and publications

Nil.

Relevant regulatory developments

Nil.

Campylobacteriosis

Summary data for campylobacteriosis in 2014 are given in Table 9.

Table 9. Summary of surveillance data for campylobacteriosis, 2014

Parameter	Value in 2014	Source
Number of notified cases	6776	EpiSurv
Notification rate (per 100,000)	150.3	EpiSurv
Hospitalisations (% of notifications)[a]	717 (10.6%)	MoH NMDS, EpiSurv
Deaths (%)[a]	0	EpiSurv
Estimated travel-related cases (%)[a]	486 (7.2%)	EpiSurv
Estimated food-related cases (%)[b]	4013 (63.8%)	Expert consultation

[a] Percentage of the number of notified cases. Cases hospitalised may not be notified on EpiSurv.
[b] For estimation of food-related cases the proportions derived from expert consultation exclude travel-related cases.

Case definition

Clinical description: An illness of variable severity with symptoms of abdominal pain, fever and diarrhoea, and often bloody stools.

Laboratory test for diagnosis: Isolation of *Campylobacter* from a clinical specimen.

Case classification:

Probable: A clinically compatible illness that is either a contact of a confirmed case of the same disease, or has had contact with the same common source - that is, is part of a common-source outbreak.

Confirmed: A clinically compatible illness that is laboratory confirmed.

Campylobacteriosis cases reported in 2014 by data source

During 2014, 6776 notifications (150.3 cases per 100,000 population) of campylobacteriosis and no resulting deaths were reported in EpiSurv.

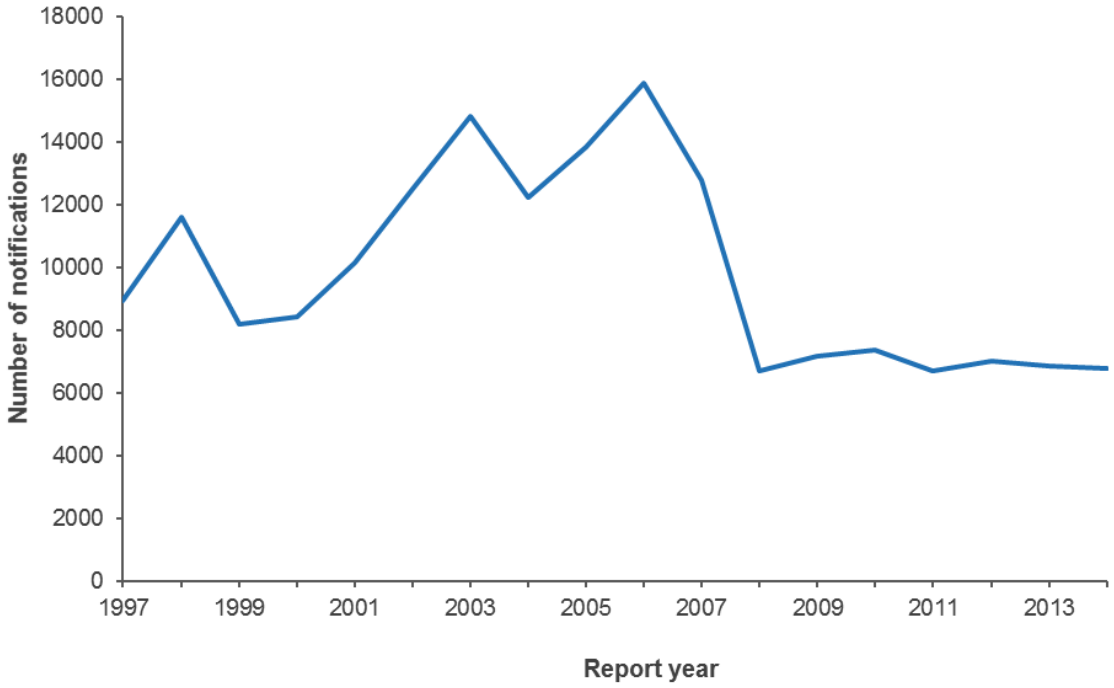
The ICD-10 code A04.5 was used to extract campylobacteriosis hospitalisation data from the MoH NMDS database. Of the 717 hospital admissions (15.9 admissions per 100,000 population) recorded in 2014, 606 were reported with campylobacteriosis as the principal diagnosis and 111 with campylobacteriosis as another relevant diagnosis.

It has been estimated by expert consultation that 63.8% (95th percentile credible interval: 44.1% to 83.2%) of campylobacteriosis incidence is due to foodborne transmission. It was further estimated that 75.4% of foodborne transmission would be due to transmission via poultry.

Notifiable disease data

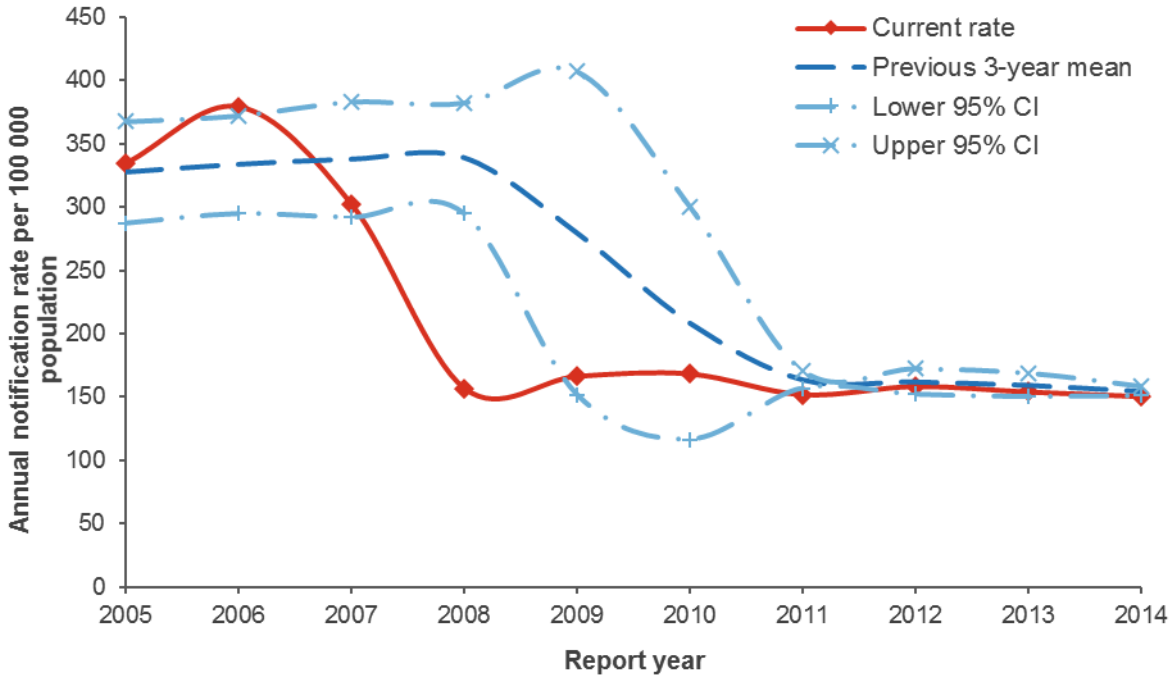
The number of campylobacteriosis notifications reported each year generally increased from 1997, up to the highest number recorded in 2006 (15873 cases). During 2007 and 2008, there was a significant decrease in the number of cases reported (Figure 5). The number of notifications has remained stable each year since 2008.

Figure 5. Campylobacteriosis notifications by year, 1997–2014



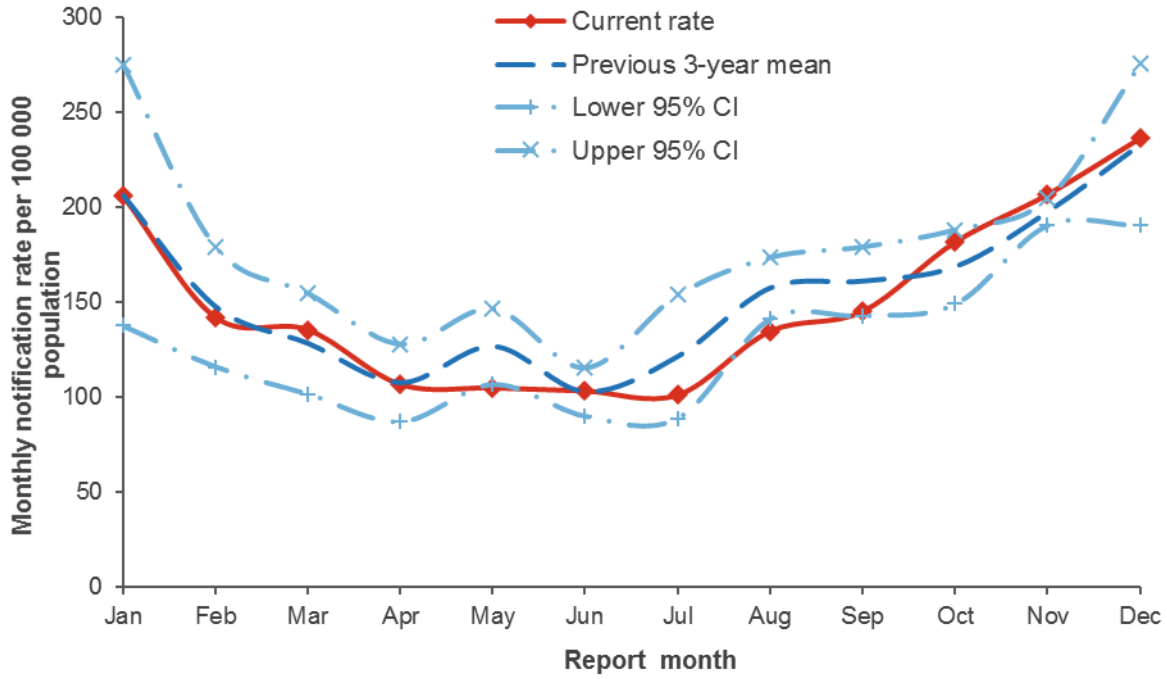
The campylobacteriosis annual rate trend (Figure 6) was very similar to the corresponding annual notification trend; with the notification rate remaining stable since 2008.

Figure 6. Campylobacteriosis notification rate by year, 2005–2014



The number of notified cases of campylobacteriosis per 100,000 population by month for 2014 is shown in Figure 7. The monthly number of notifications in 2014 ranged from 380 notifications (July) to 887 notifications (December). The lowest notification rates occurred between April and July in 2014. Rates by month in 2014 were consistent with the notification rates in the previous three years.

Figure 7. Campylobacteriosis monthly rate (annualised), 2014



In 2014, the rate of notifications and hospitalisations for campylobacteriosis was higher for males (172.8 cases per 100,000 population, 18.3 admissions per 100,000) compared with females (128.3 per 100,000, 13.6 admissions per 100,000) (Table 10).

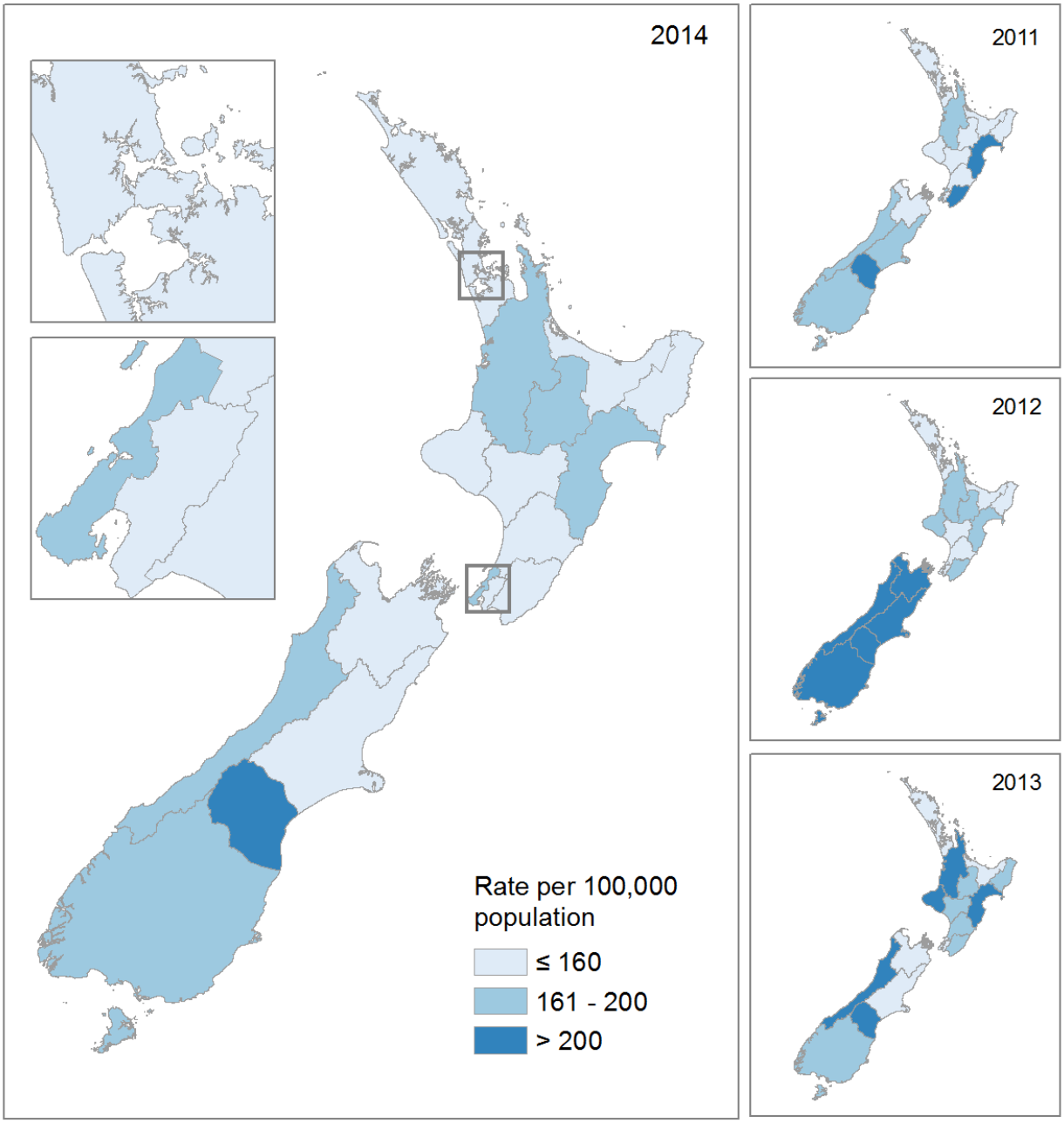
Table 10. Campylobacteriosis cases by sex, 2014

Sex	EpiSurv notifications		Hospitalisations[a]	
	No.	Rate[b]	No.	Rate[b]
Male	3819	172.8	404	18.3
Female	2952	128.3	313	13.6
Total	**6776**[c]	**150.3**	**717**	**15.9**

[a] MoH NMDS data for hospital admissions
[b] per 100,000 population
[c] Total includes 5 cases where sex was not reported

Campylobacteriosis rates varied throughout the country as shown in Figure 8. The highest DHB rate was in South Canterbury DHB (266.8 per 100,000 population, 155 cases) which was higher than the other DHBs in the South Island (range 135.6-186.0 per 100,000 population). Waikato (199.2 per 100,000, 764 cases), Hawkes Bay (184.4 per 100,000 population, 294 cases) and Capital & Coast (183.0 per 100,000, 543 cases) DHBs had the highest rates for the North Island. The lowest rate was for Counties-Manukau (101.5 per 100,000, 517 cases) DHB. South Canterbury DHB has featured in the highest quantile of campylobacteriosis notification rates every year between 2011 and 2014.

Figure 8. Geographic distribution of campylobacteriosis notifications, 2011–2014



The highest age-specific notification rates for campylobacteriosis in 2014 were for the 1 to 4 years (262.1.0 per 100,000 population, 655 cases) and the less than 1 year (236.0 per 100,000, 139 cases) age groups. The highest hospitalisation rate was for the 70 years and over age group, which was noticeably higher than 60 to 69 age group, who had a similar notification rate, and three times the rate for the 1–4 year olds (Table 11).

Table 11. Campylobacteriosis cases by age group, 2014

Age group (years)	EpiSurv notifications		Hospitalisations[a]	
	No.	Rate[b]	No.	Rate[b]
<1	139	236.0	11	18.7
1 to 4	655	262.1	35	14.0
5 to 9	315	102.8	23	7.5
10 to 14	239	80.8	12	4.1
15 to 19	358	114.2	36	11.5
20 to 29	1037	168.1	108	17.5
30 to 39	664	120.6	45	8.2
40 to 49	807	129.1	72	11.5
50 to 59	872	146.1	72	12.1
60 to 69	869	188.3	116	25.1
70+	819	188.7	187	43.1
Total	**6776**	**150.3**	**717**	**15.9**

[a] MoH NMDS data for hospital admissions
[b] per 100,000 of population

The risk factors recorded for campylobacteriosis notifications in 2014 are shown in Table 12. The most common risk factors reported were consumption of food from retail premises (47.4%) and contact with farm animals (39.6%).

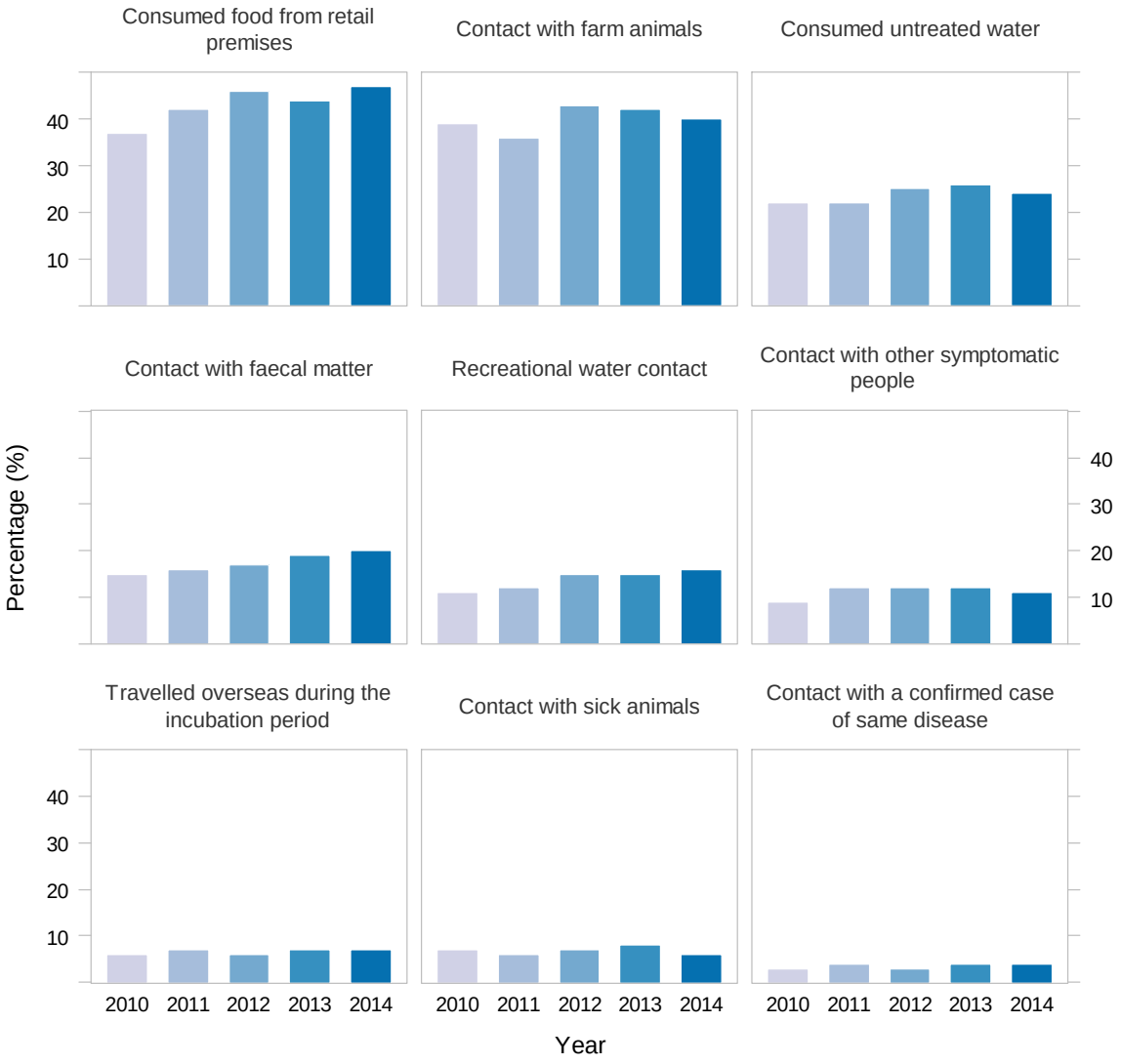
Table 12. Exposure to risk factors reported for campylobacteriosis notifications, 2014

Risk factor	Notifications			
	Yes	No	Unknown	%[a]
Consumed food from retail premises	1166	1292	4318	47.4
Contact with farm animals	1052	1603	4121	39.6
Consumed untreated water	556	1738	4482	24.2
Contact with faecal matter	488	1945	4343	20.1
Recreational water contact	403	2092	4281	16.2
Contact with other symptomatic people	275	2174	4327	11.2
Travelled overseas during the incubation period	230	2979	3567	7.2
Contact with sick animals	136	2175	4465	5.9
Contact with a confirmed case of same disease	83	2101	4592	3.8

[a] Percentage refers to the cases that answered "yes" out of the total number of cases for which this information was supplied. Cases may have more than one risk factor recorded.

Between 2010 and 2014, consumption of food from retail premises, contact with farm animals, and consumption of untreated water were consistently the most commonly reported risk factors for campylobacteriosis. The percentages of cases exposed to the reported risk factors were similar in 2014 compared to 2012–2013 (Figure 9).

Figure 9. Percentage of cases with exposure to risk factors reported for campylobacteriosis and year, 2010−2014



For cases where information on travel was provided in 2014, 7.2% (95% CI 6.3-8.1%) had travelled overseas during the incubation period. Assuming that the cases for which travel information was provided were representative of all campylobacteriosis cases, a Poisson distribution can be used to estimate the total number of potentially travel-related cases of campylobacteriosis in 2014. The resultant distribution has a mean of 486 cases (95% CI 412-564).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism was 7.0% (95% CI 6.5-7.4%).

Outbreaks reported as caused by *Campylobacter* spp.

In 2014, 18 (51.4%) of the *Campylobacter* outbreaks and 158 (65.6%) of the associated cases were reported as foodborne (Table 13). An outbreak has been classed as foodborne in this report if food was recorded as one of the likely modes of transmission applicable to the outbreak. It is important to note that a single outbreak may have multiple pathogens, modes of transmission, settings where exposure occurred, or settings where preparation of food was conducted. *Campylobacter* outbreaks accounted for 4.1% (35/820) of all enteric outbreaks and 1.6% (241/14235) of all associated cases reported in 2014.

Table 13. *Campylobacter* spp. outbreaks reported, 2014

Measure	Foodborne *Campylobacter* spp. outbreaks	All *Campylobacter* spp. outbreaks
Outbreaks	18	35
Cases	158	241
Hospitalised cases	7	28

During 2007 to 2013 the number of reported foodborne *Campylobacter* spp. outbreaks has ranged between seven and 16 outbreaks reported each year with between 36 and 77 annual outbreak-associated cases. The number of cases in 2014 increased to twice the number observed in 2013, the increase being due to three outbreaks with high numbers of associated cases (51, 32 and 17).

Figure 10. Foodborne *Campylobacter* spp. outbreaks and associated cases reported by year, 2005–2014

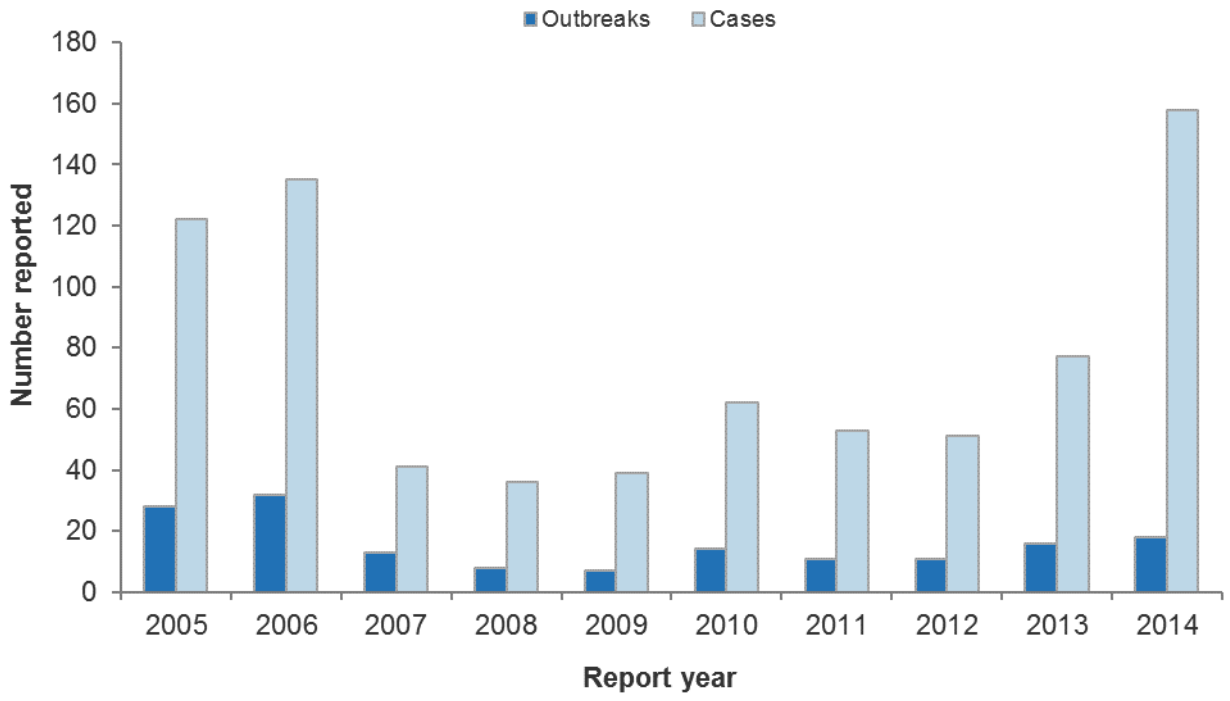


Table 14 contains details of the 18 foodborne *Campylobacter* spp. outbreaks reported in 2014.

Table 14. Details of foodborne *Campylobacter* spp. outbreaks, 2014

PHU	Month	Suspected vehicle	Exposure setting	Preparation setting	No. ill
Toi Te Ora	Jan	Cooked chicken livers	Restaurant/cafe/bakery	Restaurant/cafe/bakery	2C
Auckland	Feb	Unknown	Fast food restaurant	Fast food restaurant	2C
Waikato	Feb	Unknown	Home	Home	2C, 5P
C and PH	Mar	Raw milk	Other food outlet	Other food outlet	7C
C and PH	Apr	Raw milk	Farm	Farm	3C, 2P
MidCentral	May	Raw milk	Other food outlet	Other food outlet	6C
Waikato	Jun	Unknown	Home / Supermarket	Home	3C
MidCentral	Aug	Unknown[a]	Home / Other food outlet	Other food outlet	4C
Toi Te Ora	Sep	Raw milk	Home	Farm	2C
C and PH	Sep	Raw milk	Other food outlet	Other food outlet	2C
C and PH	Sep	Lambs fry	Long term care facility	Long term care facility	3C
Auckland	Sep	Chicken livers (pink in the middle)	Restaurant/cafe/bakery	Restaurant/cafe/bakery	1C, 1P
Regional	Sep	Chicken liver pâté	Restaurant/cafe/bakery	Restaurant/cafe/bakery	2C, 4P
Auckland	Oct	Raw chicken	Restaurant/cafe/bakery	Restaurant/cafe/bakery	2C, 2P
Auckland	Oct		Restaurant/cafe/bakery	Caterers	9C, 23P
Regional	Dec	Chicken liver pâté	Restaurant/cafe/bakery	Restaurant/cafe/bakery	51C
Regional	Dec	Chicken liver parfait	Restaurant/cafe/bakery	Restaurant/cafe/bakery	3C, 14P
MidCentral	Dec	Chicken liver pâté	Other food outlet	Restaurant/cafe/bakery	3C

PHU: Public Health Unit, C and PH: Community and Public Health, Regional: Regional Public Health, C: confirmed, P: probable.
a: A specific vehicle was not reported, but drinking raw milk was listed as one of suspected factors along with other risk factors.

The evidence was strong for the suspected food vehicle for the chicken liver pâté outbreak in December resulting in 51 confirmed notifications. A case control study found a relative risk of 7.6 (CI 2-29.3) from eating the pâté. For the other 17 *Campylobacter* spp. outbreaks with a suspected food vehicle (Table 14), the evidence for the implicated food was weak.

During investigation of suspected foodborne illness outbreaks by ESR's Public Health Laboratory in 2014, faecal samples were received from five of the foodborne outbreaks in Table 14 and a chicken liver sample received from one of the outbreaks. *Campylobacter* was isolated from the clinical specimens from three of the outbreaks, and the chicken liver submitted from the chicken liver parfait outbreak in December 2014.

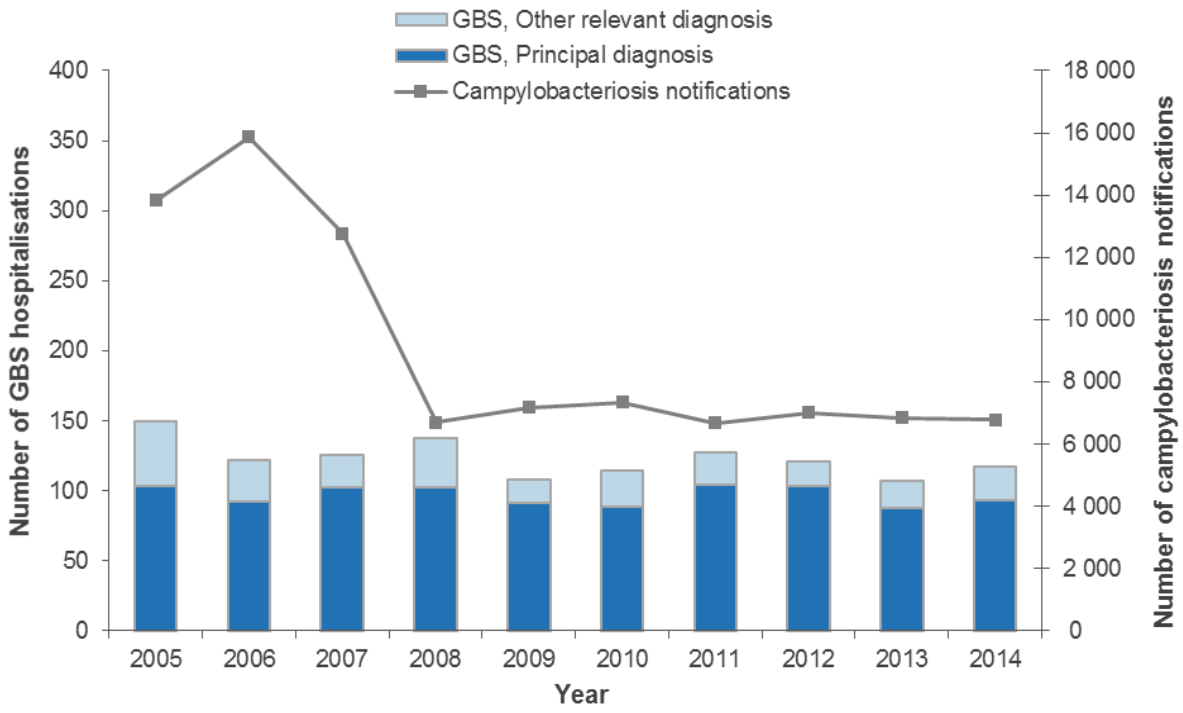
Disease sequelae - Guillain-Barré syndrome

Guillain-Barré syndrome (GBS) may be preceded by an infection with *Campylobacter jejuni*. Other respiratory or intestinal illnesses and other triggers may also precede an episode of GBS.

The ICD-10 code G61.0 was used to extract GBS hospitalisation data from the MoH NMDS database. There were 117 hospitalised cases recorded in 2014 (2.6 admissions per 100,000 population), 93 were reported with GBS as the primary diagnosis and 24 with this condition as another relevant diagnosis.

Between 2005 and 2014, the number of hospitalised cases (any diagnosis code) for GBS ranged from 107 to 150 (Figure 11). The numbers of campylobacteriosis notifications during the same period are also included in Figure 11 for comparison.

Figure 11. Guillain-Barré syndrome hospitalised cases, 2005–2014



In 2014, the number of hospitalised cases due to GBS was markedly higher for males than for females (Table 15) which is consistent with the notification rates for males and females (Table 10).

Table 15. Guillain-Barré syndrome hospitalised cases by sex, 2014

Sex	Hospitalised cases[a]	
	No.	Rate[b]
Male	78	3.5
Female	39	1.7
Total	**117**	**2.6**

[a] MoH NMDS data for hospital admissions
[b] per 100,000 population

In 2014, the highest rates of hospitalisation for GBS were in the 70 years and over age group, followed by the 60 to 69 years age group (Table 16).

Table 16. Guillain-Barré syndrome hospitalised cases by age group, 2014

Age group (years)	Hospitalised cases	
	No.	Rate[b]
<5	4	1.3
5 to 9	4	1.3
10 to 14	2	0.7
15 to 19	5	1.6
20 to 29	12	1.9
30 to 39	7	1.3
40 to 49	18	2.9
50 to 59	21	3.5
60 to 69	19	4.1
70+	25	5.8
Total	**117**	**2.6**

[a] MoH NMDS data for hospital admissions
[b] per 100,000 of population (rate not calculated when fewer than five cases reported)

Recent surveys

Nil.

Relevant New Zealand studies and publications

Journal papers

Campylobacter jejuni occurrence and concentration were compared in faecal samples from dairy cows (*n* = 990) from three farming systems (herd home, stand-off pad and pasture) [14]. *C. jejuni* prevalence was 55, 49 and 54% respectively in the three systems, with no significant differences between systems in *C. jejuni* concentrations. Typing of isolates (*n* = 30) revealed a dominance of ruminant types associated with human illness.

A cost-benefit analysis of food safety regulation of poultry production for the domestic New Zealand market demonstrated a positive benefit to cost ratio from reductions in incidence of campylobacteriosis, with gains of $57.4 million annually [15].

Reports

An assessment of microbiological risks associated with consumption of raw milk was published, including information on the prevalence of *Campylobacter* spp. in raw milk [16]. Two surveys found prevalence of 0.34 and 0.58%. The report also gave estimates of the number of cases of campylobacteriosis expected, based on different raw milk distribution scenarios.

Relevant regulatory developments

Nil.

Ciguatera fish poisoning

Case definition

Clinical description:	Gastroenteritis, possibly followed by neurologic symptoms.
Laboratory test for diagnosis:	Demonstration of ciguatoxin in implicated fish.
Case classification:	Not applicable.

Ciguatera fish poisoning cases reported in 2014 by data source

During 2014, three notifications of ciguatera fish poisoning were reported in EpiSurv. Note that not all cases of ciguatera fish poisoning are necessarily notifiable, only those where there is a suspected common source.

The ICD-10 code T61.0 was used to extract ciguatera fish poisoning hospitalisation data from the MoH NMDS database. Of the seven hospital admissions (0.2 admissions per 100,000 population) recorded in 2014, six were reported with ciguatera fish poisoning as the primary diagnosis and one was reported as another relevant diagnosis. It should be noted that EpiSurv and the MoH NMDS database are separate systems and hospital admission can occur without cases being notified.

Outbreaks reported as caused by ciguatera fish poisoning

It should be noted that all ciguatera fish poisoning outbreaks will be categorised as foodborne, as consumption of contaminated seafood is the only currently recognised transmission route for this disease.

One outbreak of suspected ciguatera fish poisoning was reported in 2014, involving five cases, one of which was admitted to hospital. The cases had symptoms consistent with ciguatera fish poisoning after consuming a meal containing a reef fish type that has been associated with ciguatera poison. No laboratory testing was conducted.

Table 17 contains details of the ciguatera fish poisoning outbreak reported in 2014.

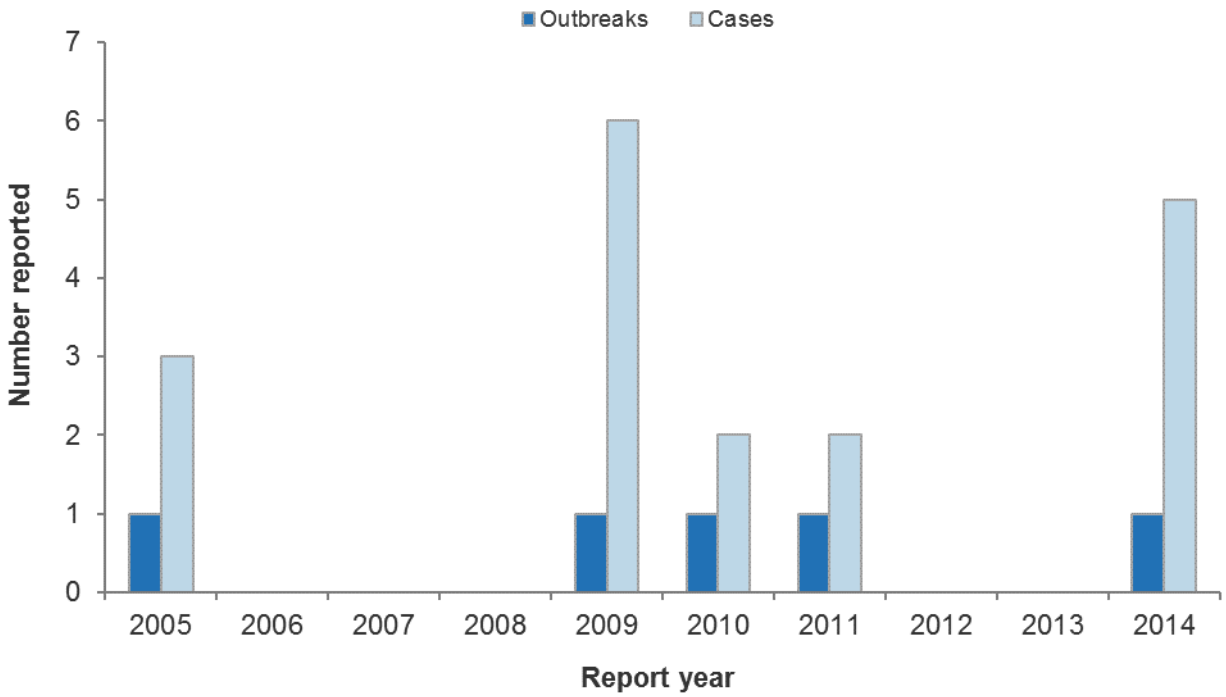
Table 17. Details of ciguatera fish poisoning outbreak, 2014

PHU	Month	Suspected vehicle	Exposure setting	Preparation setting	No. ill
Auckland	June	Salmon Cod (tropical fish)	Home / Supermarket	Home	5P

PHU: Public Health Unit, C: confirmed, P: probable.

Over the 10-year period from 2005 to 2014, very few outbreaks of ciguatera fish poisoning were reported, with no more than two outbreaks of ciguatera fish poisoning reported in any year (Figure 12).

Figure 12. Ciguatera fish poisoning outbreaks and associated cases reported by year, 2005–2014



Recent surveys

Nil.

Relevant New Zealand studies and publications

Journal papers

A globular form of the epiphytic dinoflagellate genus *Gambierdiscus* was isolated and cultured from waters around Northland, New Zealand [17]. The isolate was able to produce putative maitotoxin-3, but not maitotoxin-1 or ciguatoxin.

Relevant regulatory developments

Nil.

Clostridium perfringens intoxication

Case definition

Clinical description:	Gastroenteritis with profuse watery diarrhoea.
Laboratory test for diagnosis:	Detection of enterotoxin in faecal specimen or faecal spore count of ≥10^6/g or isolation of ≥10^5/g *Clostridium perfringens* in leftover food.
Case classification:	
Probable	A clinically compatible illness.
Confirmed	A clinically compatible illness that is laboratory confirmed, OR a clinically compatible illness and a common exposure associated with a laboratory confirmed case.

Clostridium perfringens intoxication cases reported in 2014 by data source

During 2014, no notifications of *C. perfringens* intoxication were reported in EpiSurv.

The ICD-10 code A05.2 was used to extract foodborne *C. perfringens* intoxication hospitalisation data from the MoH NMDS database. There were no hospital admissions recorded in 2014 with *C. perfringens* intoxication as a diagnosis.

Outbreaks reported as caused by *Clostridium perfringens*

There were three *C. perfringens* outbreaks with 23 associated cases reported in 2014, all were associated with a suspected or known foodborne source (Table 18). An outbreak has been classed as foodborne in this report if food was recorded as one of the likely modes of transmission applicable to the outbreak. It is important to note that a single outbreak may have multiple pathogens, modes of transmission, settings where exposure occurred, or settings where preparation of food was conducted.

Table 18. *C. perfringens* outbreaks reported, 2014

Measure	Foodborne *C. perfringens* outbreaks	All *C. perfringens* outbreaks
Outbreaks	3	3
Cases	23	23
Hospitalised cases	0	0

Between 2005 and 2014, the number of foodborne outbreaks associated with *C. perfringens* ranged from three (in 2009 and 2014) to 13 outbreaks (in 2006) (Figure 13). The number of cases associated with *C. perfringens* outbreaks has also varied markedly over time. The highest number of cases associated with foodborne outbreaks due to *C. perfringens* occurred in 2008 (215 cases). The second highest number of cases (208 cases) was reported in 2013.

Figure 13. Foodborne *C. perfringens* outbreaks and associated cases reported by year, 2005–2014

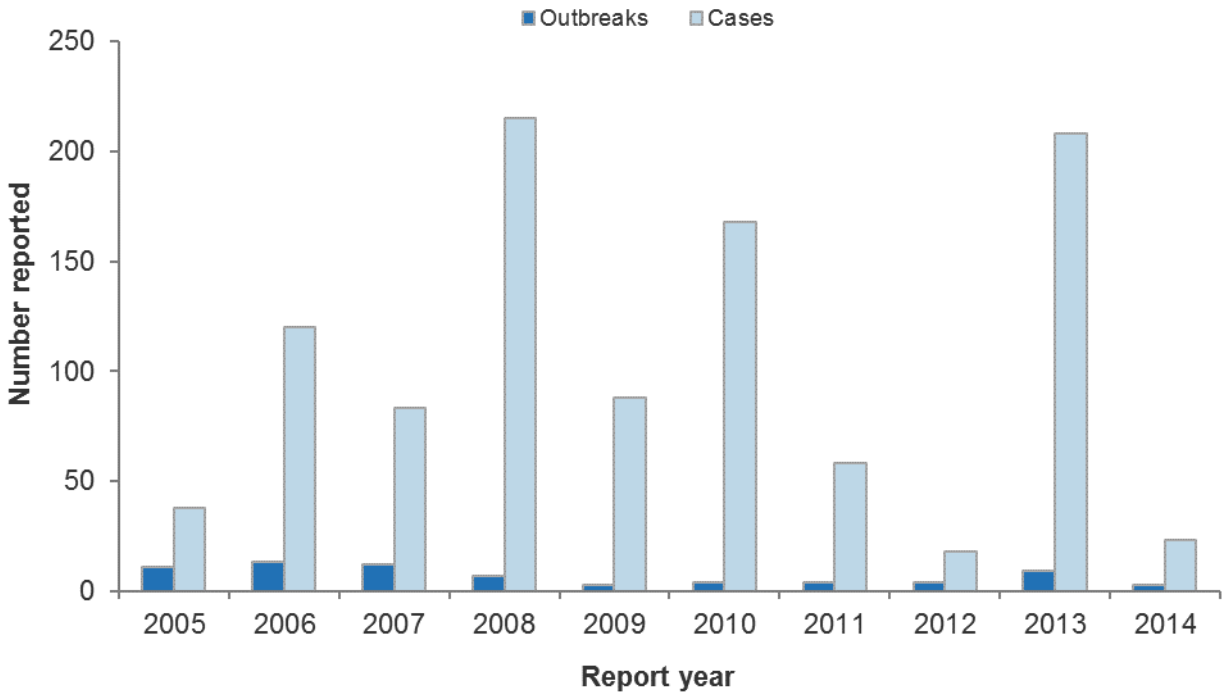


Table 19 contains details of the three foodborne *C. perfringens* outbreaks reported in 2014.

Of the three *C. perfringens* outbreaks with a suspected food vehicle (Table 19), strong evidence was found to implicate the suspected food vehicle for the August 2014 outbreak with *C. perfringens* found in both faecal and food samples and for the November outbreak due to a common meal. Evidence implicating a suspected food vehicle for the July outbreak was weak.

Table 19. Details of foodborne *C. perfringens* outbreaks, 2014

PHU	Month	Suspected vehicle	Exposure setting	Preparation setting	No. ill
Auckland	Jul	Indian chicken meal	Restaurant/cafe/bakery	Restaurant/cafe/bakery	1C 1P
C and PH	Aug	Gai soup	Takeaway	Restaurant/cafe/bakery	1C 3P
C and PH	Nov	Chicken salad	Restaurant/cafe/bakery	Restaurant/cafe/bakery	4C 13P

PHU: Public Health Unit, C and PH: Community and Public Health, C: confirmed, P: probable.

During investigation of suspected foodborne illness outbreaks by ESR's Public Health Laboratory in 2014, samples were received from all outbreaks listed in Table 19. *C. perfringens* and *C. perfringens* enterotoxin was detected in faecal samples from all of the three outbreaks. Food samples were provided for the August outbreak and *C. perfringens* was isolated from the Gai soup.

Recent surveys

Nil.

Relevant New Zealand studies and publications

Nil.

Relevant regulatory developments

Nil.

Cryptosporidiosis

Summary data for cryptosporidiosis in 2014 are given in Table 20.

Table 20. Summary of surveillance data for cryptosporidiosis, 2014

Parameter	Value in 2014	Source
Number of notified cases	584	EpiSurv
Notification rate (per 100,000)	12.9	EpiSurv
Hospitalisations (% of notifications)a	26 (4.5%)	MoH NMDS, EpiSurv
Deaths	0	EpiSurv
Estimated travel-related cases (%)a	62 (10.6%)	EpiSurv
Estimated food-related cases (%)	NE	

NE = not estimated, no information is available on the food attributable proportion of cryptosporidiosis in New Zealand.

[a] Percentage of the number of notified cases. Cases hospitalised may not be notified on EpiSurv.

Case definition

Clinical description: An acute illness that includes symptoms of diarrhoea (may be profuse and watery) and abdominal pain. The infection may be asymptomatic.

Laboratory test for diagnosis: Detection of *Cryptosporidium parvum* oocysts in a faecal specimen.

Case classification:

Probable: A clinically compatible illness that is either a contact of a confirmed case of the same disease, or has had contact with the same common source ie, is part of an identified common source outbreak.

Confirmed: A clinically compatible illness that is laboratory confirmed.

Cryptosporidiosis cases reported in 2014 by data source

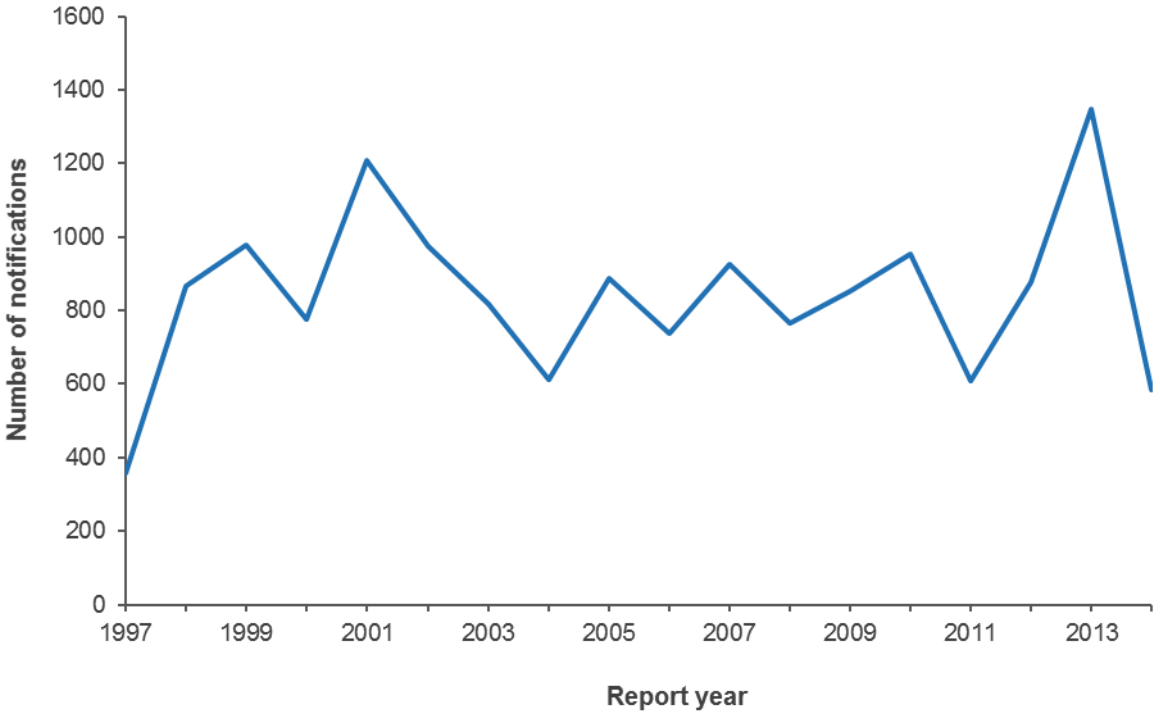
During 2014, 584 notifications (12.9 cases per 100,000 population) of cryptosporidiosis and no resulting deaths were reported in EpiSurv.

The ICD-10 code A07.2 was used to extract cryptosporidiosis hospitalisation data from the MoH NMDS database. Of the 26 hospital admissions (0.6 admissions per 100,000 population) recorded in 2014, 22 were reported with cryptosporidiosis as the principal diagnosis and four with cryptosporidiosis as another relevant diagnosis.

Notifiable disease data

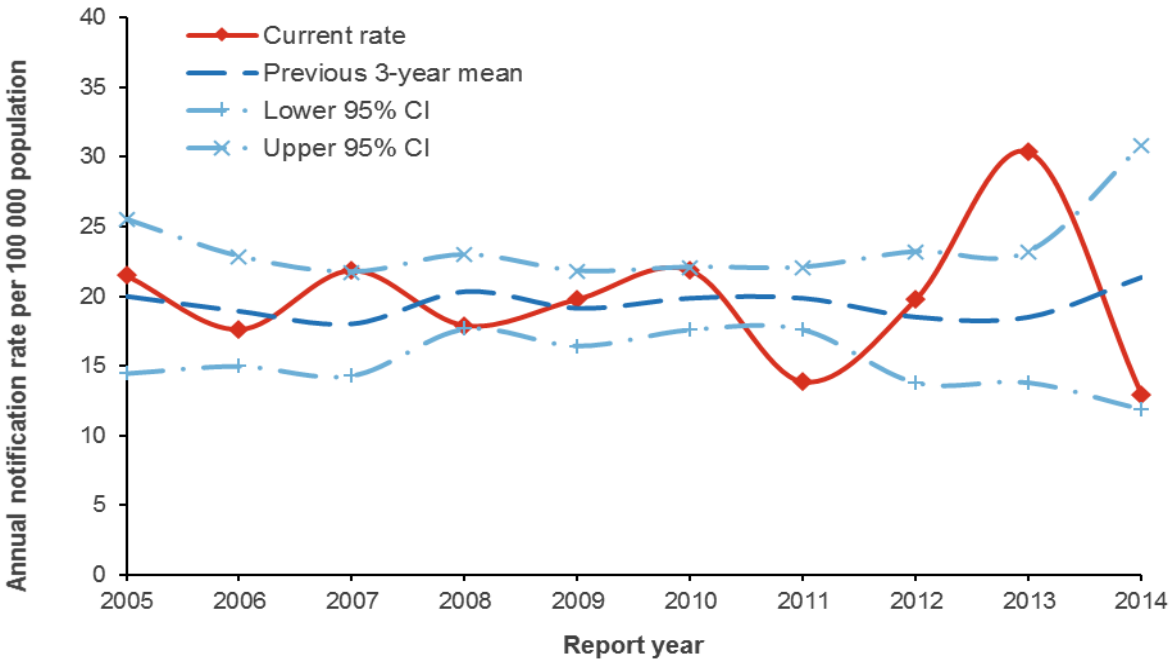
After the highest recorded number of cryptosporidiosis notifications (1384) in 2013 since cryptosporidiosis became a notifiable disease in 1996, the notifications in 2014 (584) have returned to just below the range (610–954) observed between 2004 and 2013 (Figure 14).

Figure 14. Cryptosporidiosis notifications by year, 1997–2014



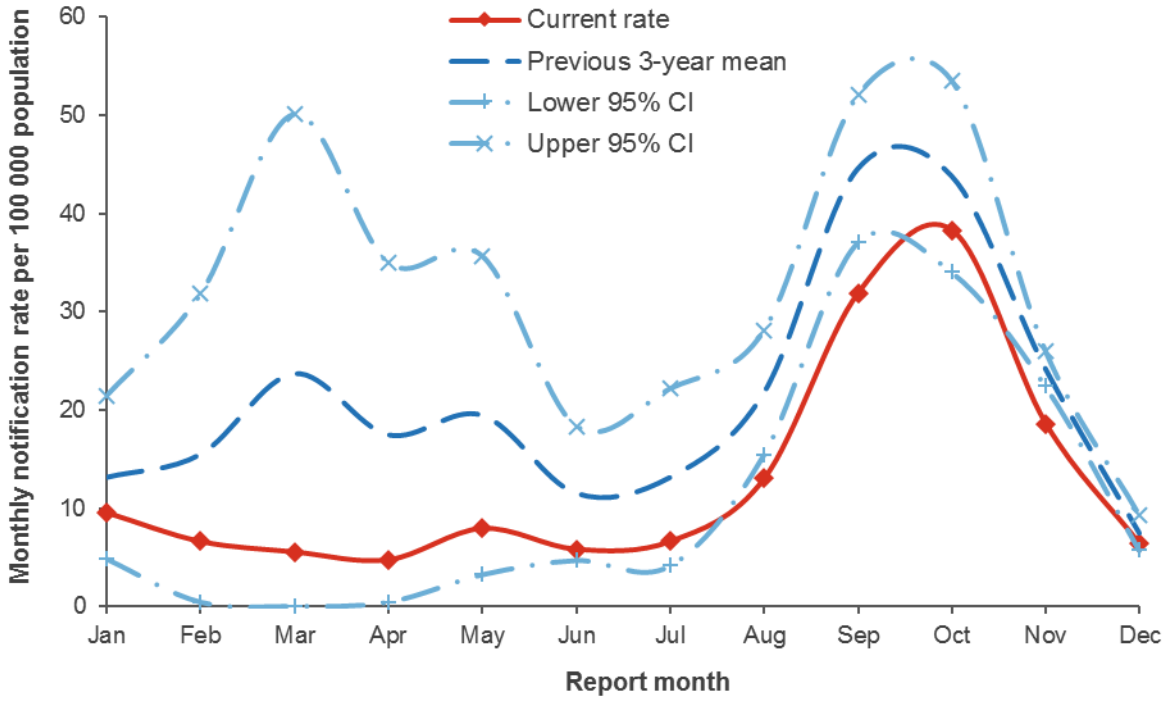
In 2014, notification rates were lower than the mean of the previous 3 years. The cryptosporidiosis annual population rate trend was very similar to the notification trend (Figure 15).

Figure 15. Cryptosporidiosis notification rate by year, 2005–2014



The number of notified cases of cryptosporidiosis reported per 100,000 population by month for 2014 was different compared to previous years. The spring peak in September/October was consistent with previous years, however the notification rate in the first half of 2014 did not show the strong March to May peak seen in 2013 (Figure 16). The monthly rates for 2014 are similar to those observed in 2011.

Figure 16. Cryptosporidiosis monthly rate (annualised), 2014



In 2014, the number of notifications and rates for cryptosporidiosis were slightly higher for females (13.5 per 100,000 population, 310 cases) compared to males (12.4 per 100,000, 274 cases). The number and rate of hospitalisations were the same for males and females (Table 21).

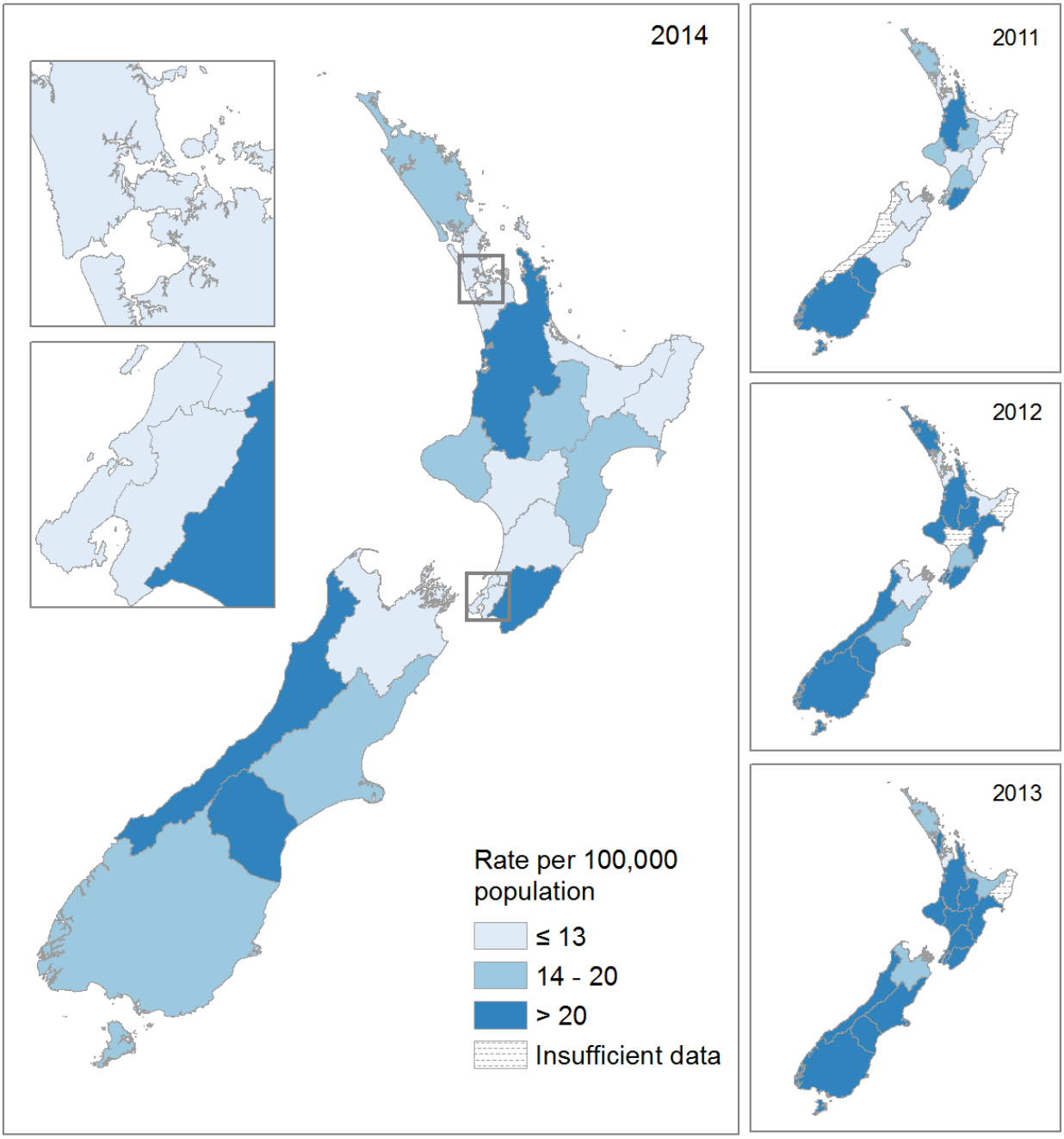
Table 21. Cryptosporidiosis cases by sex, 2014

Sex	EpiSurv notifications		Hospitalisations[a]	
	No.	Rate[b]	No.	Rate[b]
Male	274	12.4	13	0.6
Female	310	13.5	13	0.6
Total	**584**	**12.9**	**26**	**0.6**

[a] MoH NMDS data for hospital admissions
[b] per 100,000 of population

In 2014, the highest rates were for South Canterbury (34.4 per 100,000 population, 20 cases) and West Coast (27.4 per 100,000, 9 cases) DHBs. South Canterbury, West Coast, Wairarapa and Waikato DHBs have consistently recorded higher rates of notification over the period 2011 to 2014 (Figure 17).

Figure 17. Geographic distribution of cryptosporidiosis notifications, 2011-2014



During 2014, the highest cryptosporidiosis age specific notification rates were for the 1 to 4 years age group (67.2 per 100,000 population, 168 cases), followed by the less than 1 year (22.1 per 100,000, 13 cases) age group (Table 22). The hospitalisation rate was also highest in the 1 to 4 years age group.

Table 22. Cryptosporidiosis cases by age group, 2014

Age group	EpiSurv notifications		Hospitalisations[a]	
	No.	Rate[b]	No.	Rate[b]
<1	13	22.1	1	-
1 to 4	168	67.2	6	2.4
5 to 9	54	17.6	2	-
10 to 14	32	10.8	1	-
15 to 19	40	12.8	-	-
20 to 29	109	17.7	6	1.0
30 to 39	55	10.0	2	-
40 to 49	46	7.4	1	-
50 to 59	34	5.7	3	-
60 to 69	17	3.7	2	-
70+	15	3.5	2	-
Total	**584**	**12.9**	**26**	**0.6**

[a] MoH NMDS data for hospital admissions

[b] per 100,000 of population (rate not calculated when fewer than five cases reported)

During 2014, the most commonly reported risk factors for cryptosporidiosis were contact with farm animals (57.3%), consumption of untreated water (41.5%) and contact with faecal matter (37.3%) (Table 23).

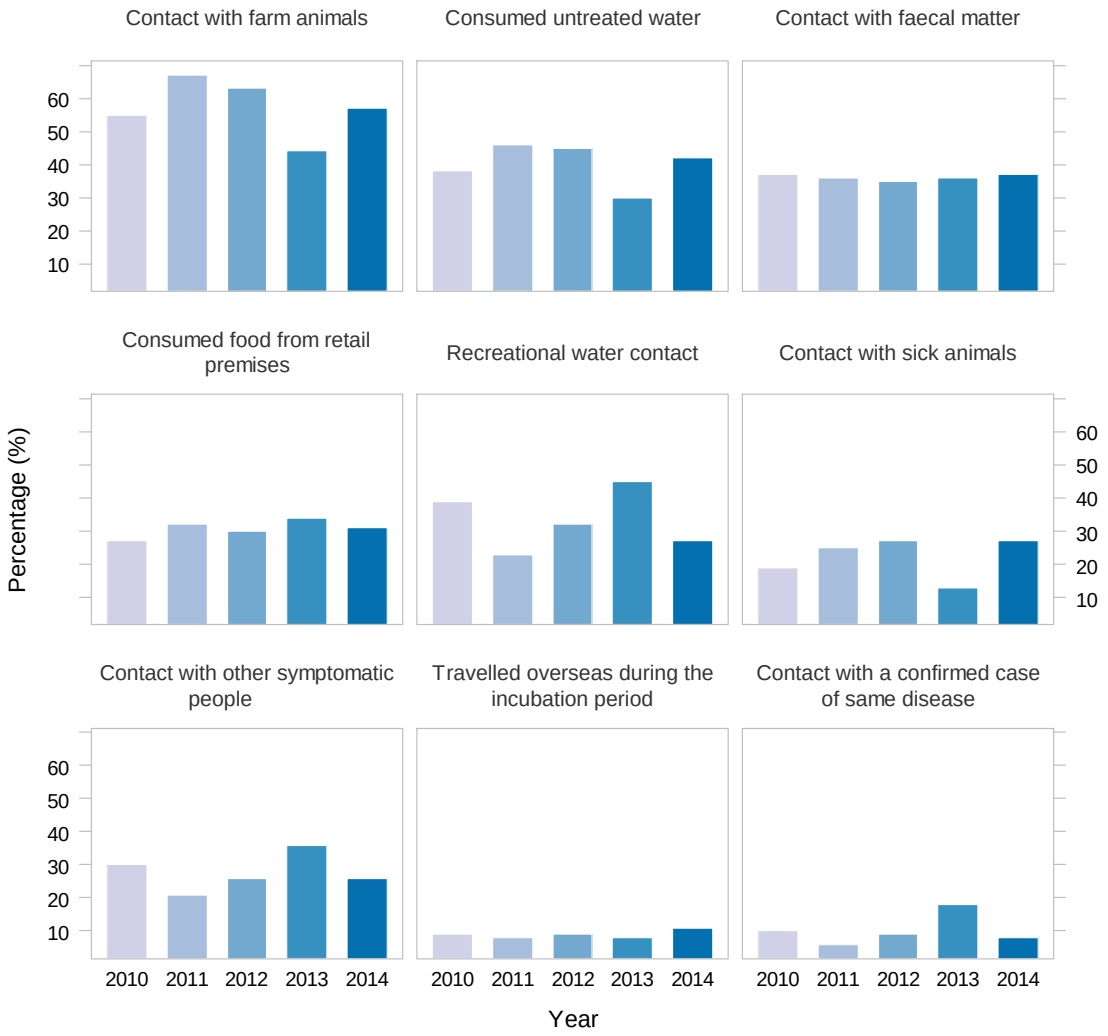
Table 23. Exposure to risk factors reported for cryptosporidiosis notifications, 2014

Risk factor	Notifications			
	Yes	No	Unknown	%[a]
Contact with farm animals	207	154	223	57.3
Consumed untreated water	124	175	285	41.5
Contact with faecal matter	122	205	257	37.3
Consumed food from retail premises	98	214	272	31.4
Contact with sick animals	81	217	286	27.2
Recreational water contact	93	250	241	27.1
Contact with other symptomatic people	83	243	258	25.5
Travelled overseas during the incubation period	42	354	188	10.6
Contact with a confirmed case of same disease	22	251	311	8.1

[a] Percentage refers to the cases that answered "yes" out of the total number of cases for which this information was supplied. Cases may have more than one risk factor recorded.

Between 2010 and 2014, the most commonly reported risk factor for cryptosporidiosis was contact with farm animals followed by consumption of untreated water (Figure 18). The percentage of cases reporting recreational water contact peaked in 2013 after increasing in 2011 and 2012, but has reduced as a risk factor in 2014 to close to the value for 2011. Similar trends are shown for contact with other symptomatic people and contact with a confirmed case of same disease.

Figure 18. Percentage of cases with exposure to risk factors reported for cryptosporidiosis and year, 2010–2014



For cases where information on travel was provided, 10.6% (95% CI 7.8-14.2%) had travelled overseas during the incubation period. Assuming that the cases for which travel information was provided were representative of all cryptosporidiosis cases, a Poisson distribution can be used to estimate the total number of potentially travel-related cases of cryptosporidiosis in 2014. The resultant distribution has a mean of 62 cases (95% CI 40-88).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism was 8.9% (95% CI 7.8-10.2%).

Outbreaks reported as caused by *Cryptosporidium* spp.

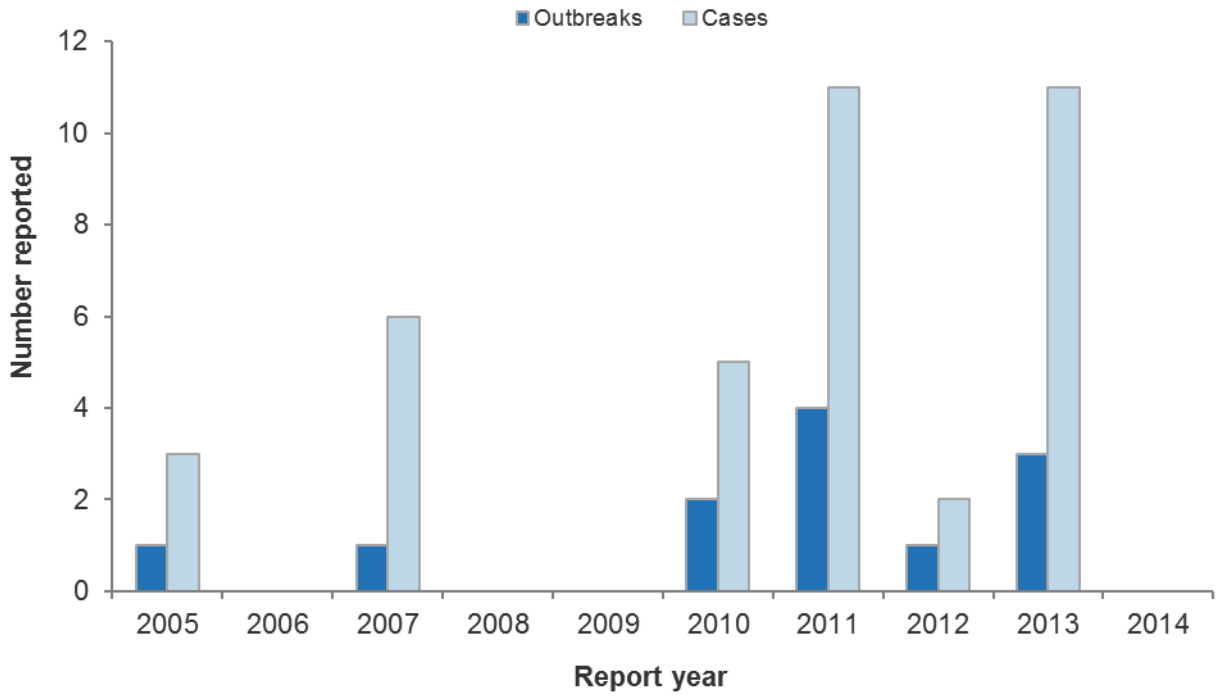
In 2014, no *Cryptosporidium* spp. outbreaks were reported as foodborne (Table 24). An outbreak has been classed as foodborne in this report if food was recorded as one of the likely modes of transmission applicable to the outbreak. It is important to note that a single outbreak may have multiple pathogens, modes of transmission, settings where exposure occurred, or settings where preparation of food was conducted. *Cryptosporidium* spp. outbreaks accounted for 2.3% (20/820) of all enteric outbreaks and 0.4% (60/14235) of all associated cases.

Table 24. *Cryptosporidium* spp. outbreaks reported, 2014

Measure	Foodborne *Cryptosporidium* spp. outbreaks	All *Cryptosporidium* spp. outbreaks
Outbreaks	0	20
Cases	0	60
Hospitalised cases	0	0

Foodborne transmission is rarely reported for *Cryptosporidium* spp. outbreaks, with not more than four outbreaks reported each year in the ten year period, 2005−2014. The largest number of outbreaks, with 11 associated cases, was reported in 2011 (Figure 19).

Figure 19. Foodborne *Cryptosporidium* spp. outbreaks and associated cases reported by year, 2005–2014



In 2014, no food or clinical samples were submitted to ESR's Public Health Laboratory relating to food-associated *Cryptosporidium* spp. outbreaks.

Recent surveys

Nil.

Relevant New Zealand studies and publications

Journal papers

Analysis of faecal samples (n = 1283) from calves on New Zealand dairy farms (n = 97) found a farm prevalence for *Cryptosporidium parvum* of 18% in 1-5 days-old calves and 52% in 9–21 days-old calves [18].

Relevant regulatory developments

Nil.

Giardiasis

Summary data for giardiasis in 2014 are given in Table 25.

Table 25. Summary of surveillance data for giardiasis, 2014

Parameter	Value in 2014	Source
Number of notified cases	1709	EpiSurv
Notification rate (per 100,000)	37.9	EpiSurv
Hospitalisations (% of notifications)[a]	67 (3.9%)	MoH NMDS, EpiSurv
Deaths (%)[a]	0 (0%)	EpiSurv
Estimated travel-related cases (%)[a]	330 (19.3%)	EpiSurv
Estimated food-related cases	NE	

NE = not estimated, no information is available on the food attributable proportion of giardiasis in New Zealand.

[a] Percentage of the number of notified cases. Cases hospitalised may not be notified on EpiSurv.

Case definition

Clinical description: An illness characterised by diarrhoea, abdominal cramps, bloating, flatulence, nausea, weight loss or malabsorption. The infection may be asymptomatic.

Laboratory test for diagnosis: Detection of *Giardia* cysts or trophozoites in a specimen from the human intestinal tract OR detection of *Giardia* antigen in faeces.

Case classification:

Probable: A clinically compatible illness that is either a contact of a confirmed case of the same disease, or has had contact with the same common source – that is, is part of a common-source outbreak.

Confirmed: A clinically compatible illness that is laboratory confirmed.

Giardiasis cases reported in 2014 by data source

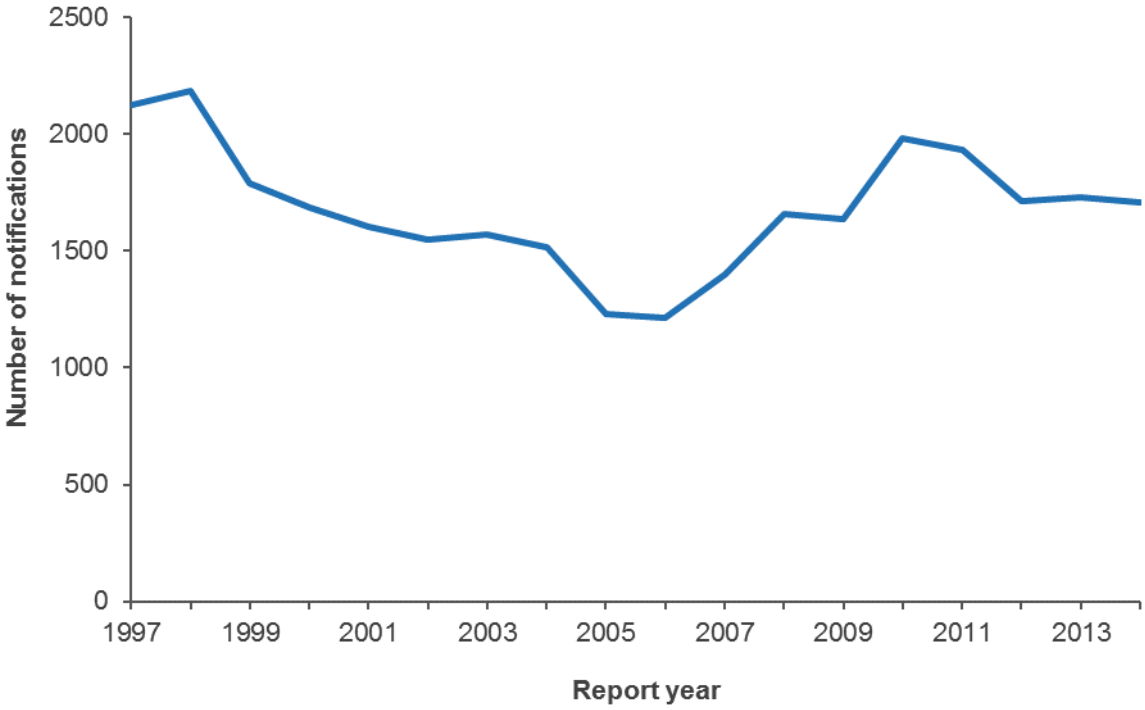
During 2014, 1709 notifications (37.9 cases per 100,000 population) of giardiasis and no resulting deaths were reported in EpiSurv.

The ICD-10 code A07.1 was used to extract giardiasis hospitalisation data from the MoH NMDS database. Of the 67 hospital admissions (1.5 admissions per 100,000 population) recorded in 2014, 42 were reported with giardiasis as the principal diagnosis and 25 with giardiasis as another relevant diagnosis.

Notifiable disease data

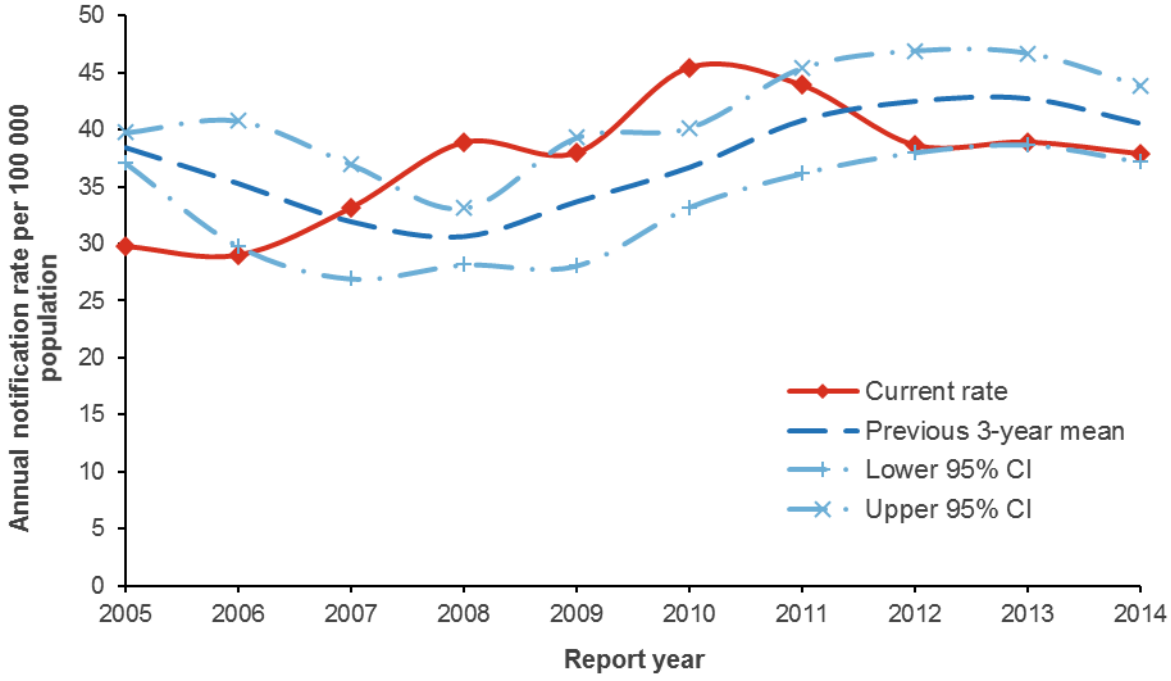
There was a steady decrease in the number of giardiasis cases reported each year from 1998 to 2006. Since 2006, an increasing trend in the number of notifications was observed although there has been a decrease in the number of notifications since 2010. The highest number of notifications since 1999 was reported in 2010 (1985 cases), followed by 2011 (1934 cases) (Figure 20).

Figure 20. Giardiasis notifications by year, 1997–2014



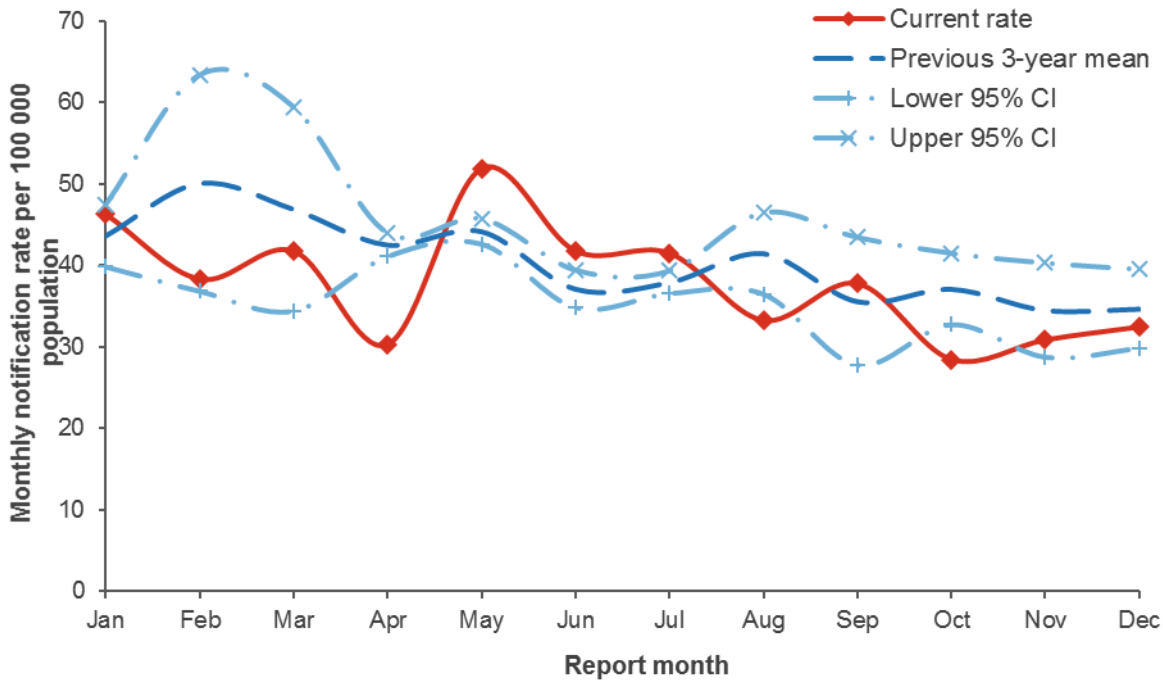
The giardiasis annual population rate trend was very similar to the corresponding annual notification trend. The 2014 notification rate was similar to 2012 and 2013 and maintained the downward trend since 2010. Between 2006 and 2010 there had been a generally increasing trend (Figure 21).

Figure 21. Giardiasis notification rate by year, 2005–2014



There was no strong seasonal pattern in the population rate of giardiasis notifications reported by month either historically or in 2014 (Figure 22).

Figure 22. Giardiasis monthly rate (annualised), 2014



In 2014 the number and rate for notifications were slightly higher for males than females, however more females than males were admitted to hospital (Table 26).

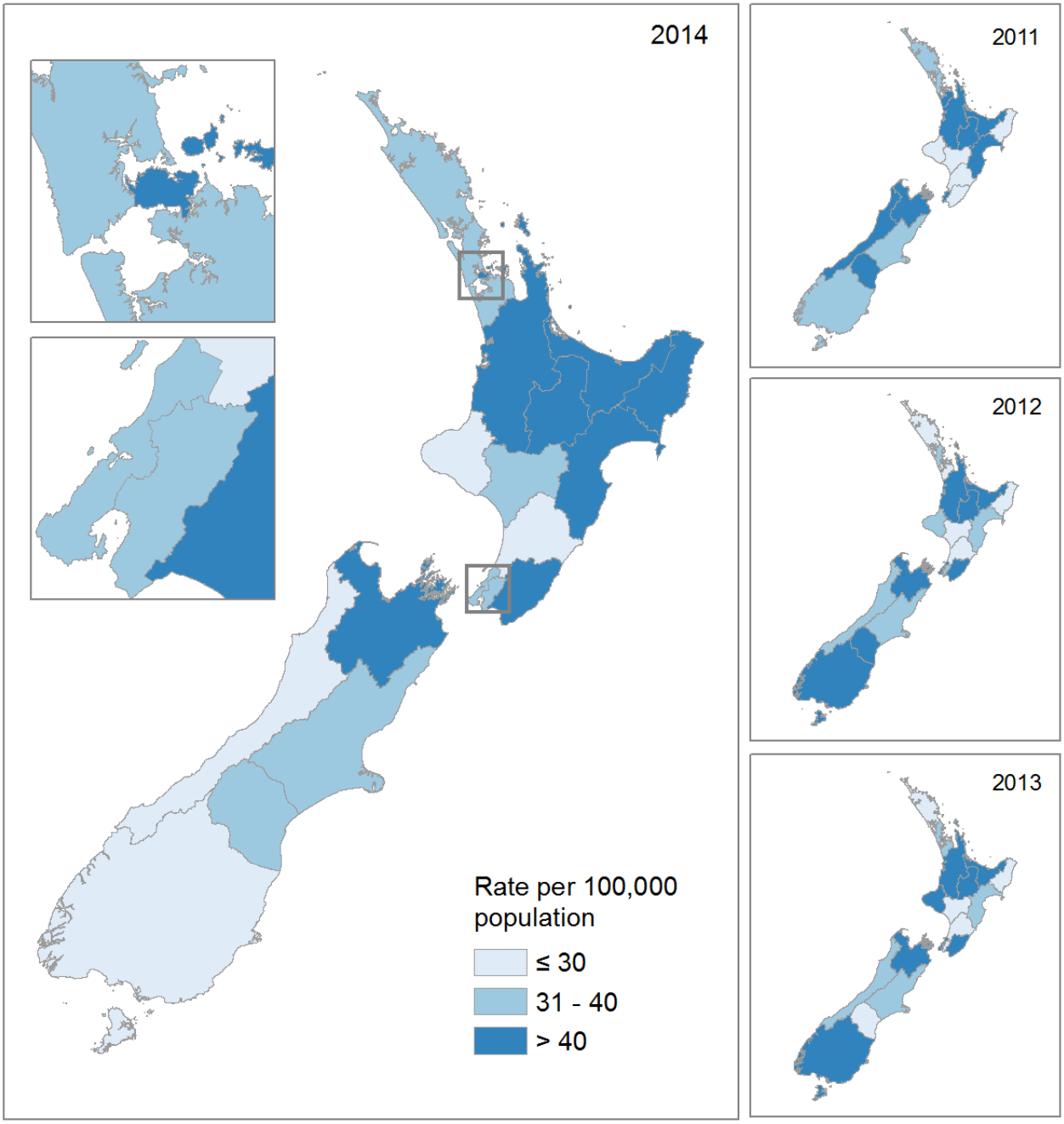
Table 26. Giardiasis cases by sex, 2014

Sex	EpiSurv notifications		Hospitalisations[a]	
	No.	Rate[b]	No.	Rate[b]
Male	876	39.6	27	1.2
Female	833	36.2	40	1.7
Total	**1709**	**37.9**	**67**	**1.5**

[a] MoH NMDS data for hospital admissions
[b] per 100,000 of population

Giardiasis rates varied throughout the country during 2014 (Figure 23). The highest rate was for Lakes DHB (74.3 per 100,000 population, 77 cases), followed by Hawkes Bay DHB (57.1 per 100,000, 91 cases). The lowest rates were for MidCentral (14.1 per 100,000, 24 cases) and West Coast (21.3 per 100,000 population, 7 cases) DHBs. Lakes, Waikato, Bay of Plenty and Nelson Marlborough DHBs have consistently been in the highest quantile in the last four years.

Figure 23. Geographic distribution of giardiasis notifications, 2011–2014



In 2014, the highest notification rate was for the 1 to 4 years age group (140.8 per 100,000 population, 352 cases), followed by the 30 to 39 years age group (66.8 per 100,000, 368 cases) (Table 27). The highest hospitalisation rate was also for the 1 to 4 years age group.

Table 27. Giardiasis cases by age group, 2014

Age group (years)	EpiSurv notifications		Hospitalisations[a]	
	No.	Rate[b]	No.	Rate[b]
<1	22	37.4	-	-
1 to 4	352	140.8	14	5.6
5 to 9	141	46.0	2	-
10 to 14	43	14.5	-	-
15 to 19	33	10.5	-	-
20 to 29	163	26.4	9	1.5
30 to 39	368	66.8	11	2.0
40 to 49	241	38.6	8	1.3
50 to 59	147	24.6	5	0.8
60 to 69	162	35.1	4	-
70+	36	8.3	14	3.2
Total	**1709**	**37.9**	**67**	**1.5**

[a] MoH NMDS data for hospital admissions
[b] per 100,000 of population (rate not calculated when fewer than five cases reported)

In 2014, the most commonly reported risk factors for notified giardiasis cases were contact with faecal matter (42.3%), contact with other symptomatic people (40.1%) and contact with recreational water (37.6%) (Table 28).

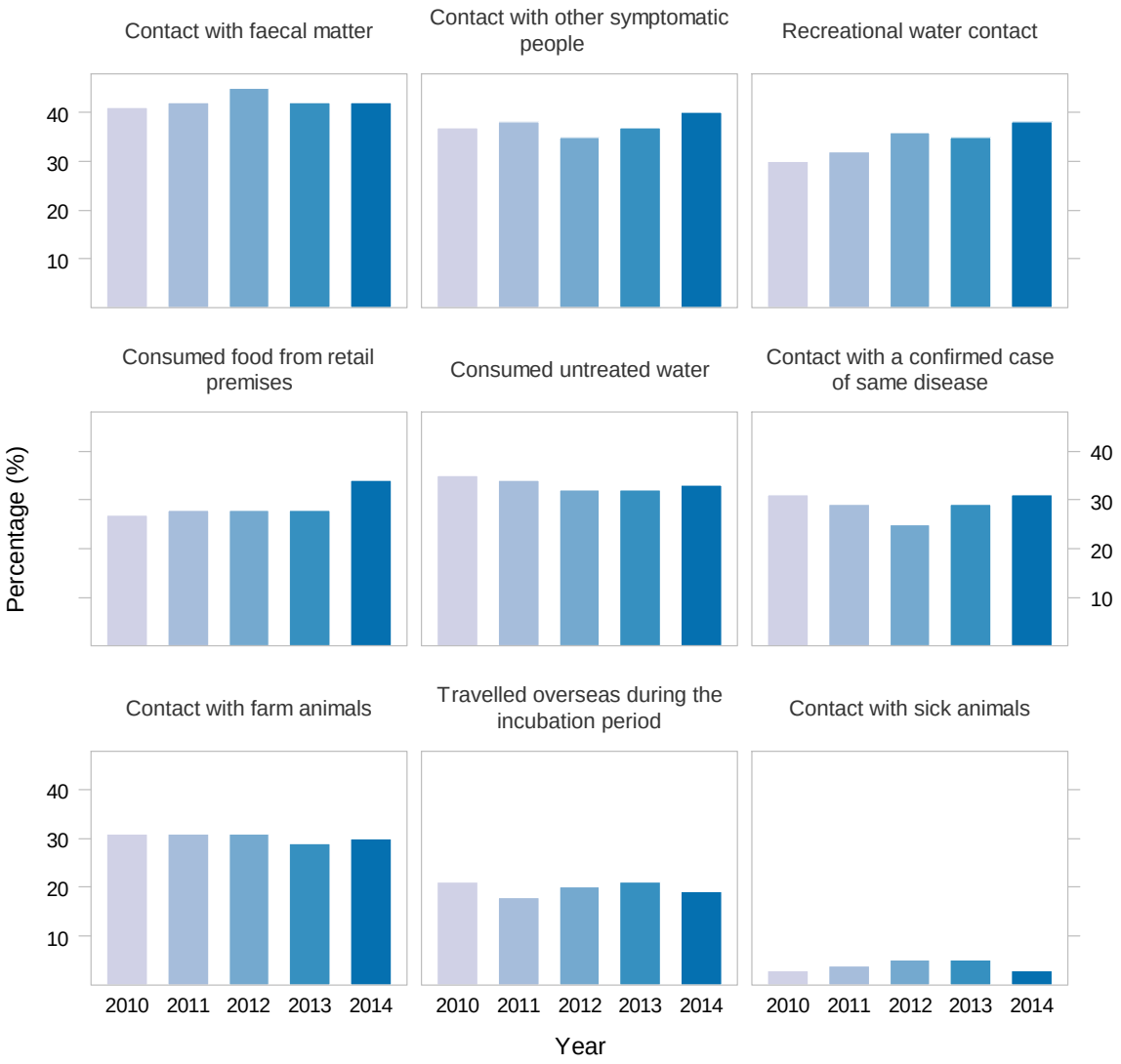
Table 28. Exposure to risk factors reported for giardiasis notifications, 2014

Risk factor	Notifications			
	Yes	No	Unknown	%[a]
Contact with faecal matter	315	429	965	42.3
Contact with other symptomatic people	301	450	958	40.1
Recreational water contact	281	466	962	37.6
Consumed food from retail premises	226	438	1045	34.0
Consumed untreated water	236	473	1000	33.3
Contact with a confirmed case of same disease	196	447	1066	30.5
Contact with farm animals	228	546	935	29.5
Travelled overseas during the incubation period	167	699	843	19.3
Contact with sick animals	22	705	982	3.0

[a] Percentage refers to the cases that answered "yes" out of the total number of cases for which this information was supplied. Cases may have more than one risk factor recorded.

Over the period 2010 to 2014 there has been a slight increase in the number of cases reporting recreational water contact (Figure 24). In 2014 there has been a slight increase in the reporting of consuming food from a retail outlet compared to the previous four years. The other risk factors show no clear trends over the five year time period.

Figure 24. Percentage of cases with exposure to risk factors reported for giardiasis and year, 2010−2014



For cases where information on travel was provided, 19.3% (95% CI 16.7-22.1%) had travelled overseas during the incubation period. Assuming that the cases for which travel information was provided were representative of all giardiasis cases, a Poisson distribution can be used to estimate the total number of potentially travel-related cases of giardiasis in 2014. The resultant distribution has a mean of 330 cases (95% CI 269-394).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism was 19.4% (95% CI 18.2-20.8%).

Outbreaks reported as caused by *Giardia* spp.

In 2014, there were 85 *Giardia* spp. outbreaks reported, six of these were associated with a suspected or known foodborne source (Table 29). An outbreak has been classed as foodborne in this report if food was recorded as one of the likely modes of transmission applicable to the outbreak. It is important to note that a single outbreak may have multiple pathogens, modes of transmission, settings where exposure occurred, or settings where preparation of food was conducted.

Table 29. Giardia spp. outbreaks reported, 2014

Measure	Foodborne *Giardia* spp. outbreaks	All *Giardia* spp. outbreaks
Outbreaks	6	85
Cases	27	317
Hospitalised cases	0	2

The highest number of foodborne *Giardia* spp. outbreaks and associated cases reported in the period from 2005 to 2014 was in 2013 (10 outbreaks and 36 associated cases). Between 2005 and 2014, two to six foodborne *Giardia* spp. outbreaks were reported each year, with the exception of 2009 when no outbreaks were reported and 2013. (Figure 25).

Figure 25. Foodborne *Giardia* spp. outbreaks and associated cases reported by year, 2005–2014

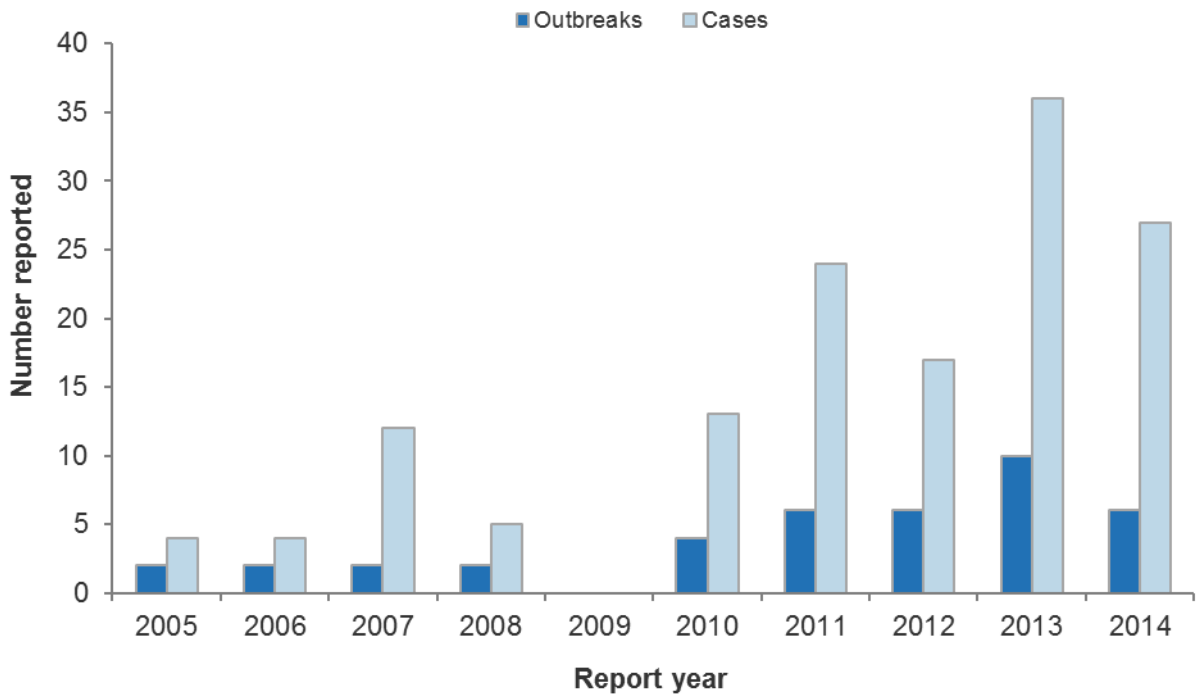


Table 30 contains details of the six foodborne *Giardia* spp. outbreaks reported in 2014. For all six the evidence for foodborne transmission was weak.

Table 30. Details of foodborne *Giardia* spp. outbreaks, 2014

PHU	Month	Suspected vehicle	Exposure setting	Preparation setting	No. ill
MidCentral	Jan	Unknown	Farm / Home	Home	5C
Waikato	Feb	Free range eggs	Home	Home	1C 1P
Auckland	Apr	Unknown	Farm	Community, church, sports gathering	3C
Waikato	Jul	Unknown	Home	Home	2C 1P
Auckland	Aug	Water	Community, church, sports gathering	Community, church, sports gathering	3C 9P
Public Health South	Aug	Unknown	Other setting / Hotel/motel	Hotel/motel	2C

PHU: Public Health Unit, C: confirmed, P: probable.

In 2014, no food or clinical samples were submitted to ESR's Public Health Laboratory relating to food-associated *Giardia* spp. outbreaks.

Recent surveys

Nil.

Relevant New Zealand studies and publications

Nil.

Relevant regulatory developments

Nil.

Hepatitis A

Summary data for hepatitis A in 2014 are given in Table 31.

Table 31. Summary of surveillance data for hepatitis A, 2014

Parameter	Value in 2014	Source
Number of notified cases	74	EpiSurv
Notification rate (per 100,000)	1.6	EpiSurv
Hospitalisations (% of notifications)a	49 (66.2%)	MoH NMDS, EpiSurv
Deaths (%)a	0 (0%)	EpiSurv
Travel-related cases (%)a	46 (64.8%)	EpiSurv
Estimated food-related cases	NE	

NE = not estimated, no information is available on the food attributable proportion of hepatitis A in New Zealand.

[a] Percentage of the number of notified cases. Cases hospitalised may not be notified on EpiSurv.

Case definition

Clinical description: Following a prodrome of fever, malaise, anorexia, nausea or abdominal discomfort, there is jaundice, elevated serum aminotransferase levels and sometimes an enlarged tender liver. Children are often asymptomatic and occasionally present with atypical symptoms, including diarrhoea, cough, coryza or arthralgia. Jaundice is very unusual in children younger than 4 years, and 90% of cases in the 4–6 years age group are anicteric.

Laboratory test for diagnosis: Positive hepatitis A-specific IgM in serum (in the absence of recent vaccination).

Case classification:

Probable: A clinically compatible illness that is epidemiologically linked to a confirmed case.

Confirmed: A clinically compatible illness that is laboratory confirmed.

Hepatitis A cases reported in 2014 by data source

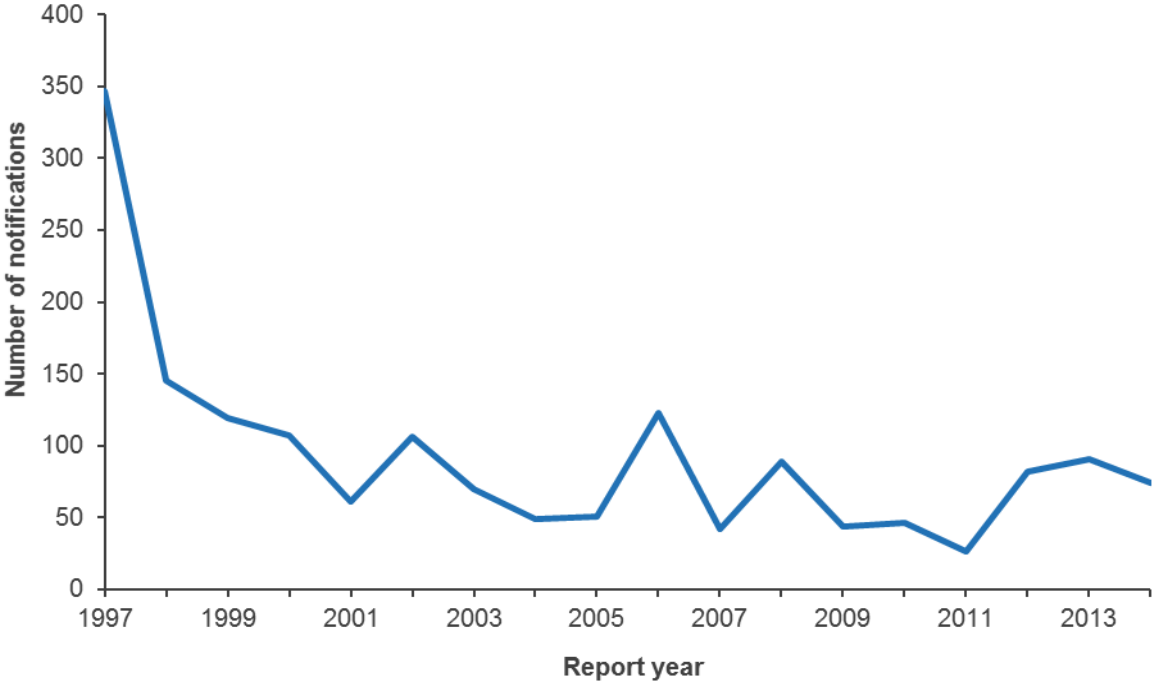
During 2014, 74 notifications (1.6 cases per 100,000 population) of hepatitis A and no resulting deaths were reported in EpiSurv.

The ICD-10 code B15 was used to extract acute hepatitis A hospitalisation data from the MoH NMDS database. Of the 49 hospital admissions (1.1 admissions per 100,000 population) recorded in 2014, 33 were reported with acute hepatitis A as the principal diagnosis and 16 with acute hepatitis A as another relevant diagnosis.

Notifiable disease data

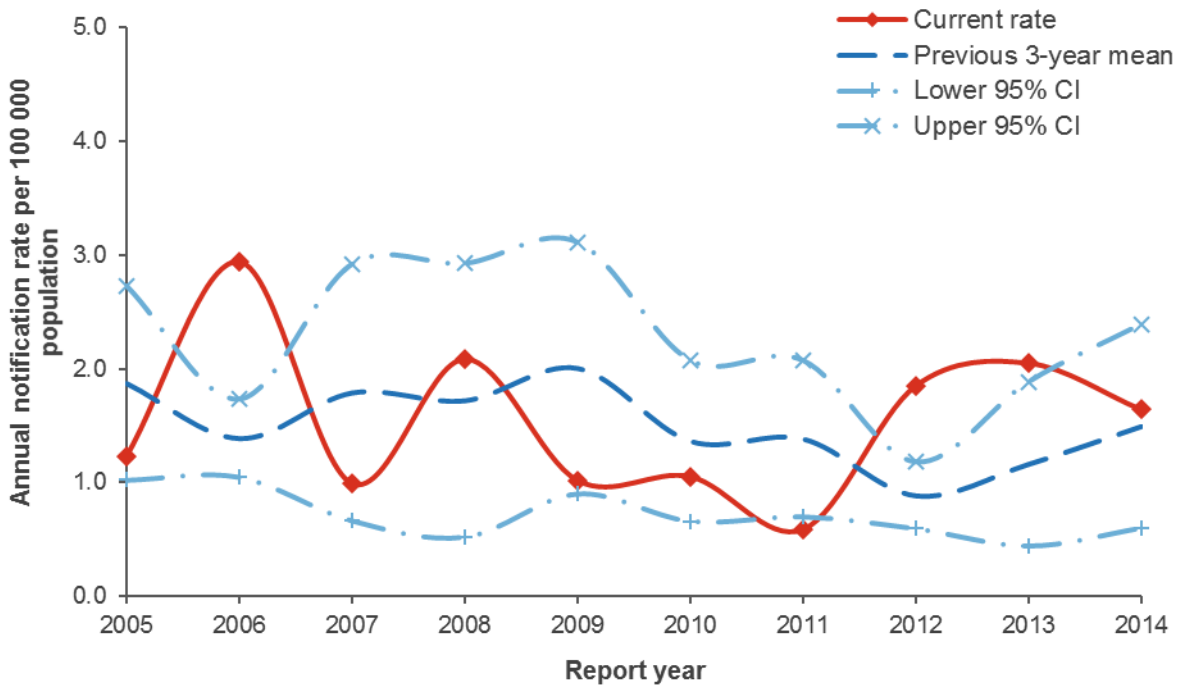
Between 2001 and 2014, the annual number of notifications has remained in the range of 26 (2011) to 123 (2006), having decreased from 347 in 1997 (Figure 26). The number of notifications for 2014 is in the middle of the recent range.

Figure 26. Hepatitis A notifications by year, 1997–2014



Hepatitis A notification rates varied throughout the 10-year period, 2005–2014 (Figure 27). The notification rate trend is very similar to the corresponding annual notification trend, showing an increasing trend in 2012 and 2013, following the lowest rate for the ten year period in 2011, followed by a decrease in 2014. The highest hepatitis A notification rate for the period was in 2006 (2.9 per 100,000 population).

Figure 27. Hepatitis A notification rate by year, 2005–2014



In 2014, the number and rate of hepatitis A notifications was similar for males and females, while hospitalisations were higher for males compared to females (Table 32).

Table 32. Hepatitis A cases by sex, 2014

Sex	EpiSurv notifications		Hospitalisations[a]	
	No.	Rate[b]	No.	Rate[b]
Male	36	1.6	31	1.4
Female	38	1.7	18	0.8
Total	**74**	**1.6**	**49**	**1.1**

[a] MoH NMDS data for hospital admissions
[b] per 100,000 of population

In 2014, the highest notification rate was for the 20 to 39 years age group (2.2 per 100,000, 26 cases), followed by the less than 20 years age group (2.0 per 100,000 population, 24 cases). The hospitalisation rate was highest for the 20 to 39 years age group (1.5 per 100,000, 17 cases), but similar for the less than 20 years, 40 to 59 years and 60+ years age groups (9-12 cases) (Table 33).

Table 33. Hepatitis A cases by age group, 2014

Age group (years)	EpiSurv notifications		Hospitalisations[a]	
	No.	Rate[b]	No.	Rate[b]
<20	24	2.0	12	1.0
20 to 39	26	2.2	17	1.5
40 to 59	14	1.1	11	0.9
60+	10	1.1	9	1.0
Total	**74**	**2.0**	**39**	**0.9**

[a] MoH NMDS data for hospital admissions
[b] per 100,000 of population

The most commonly reported risk factor for hepatitis A in 2014 was travelling overseas during the incubation period (64.8%) (Table 34).

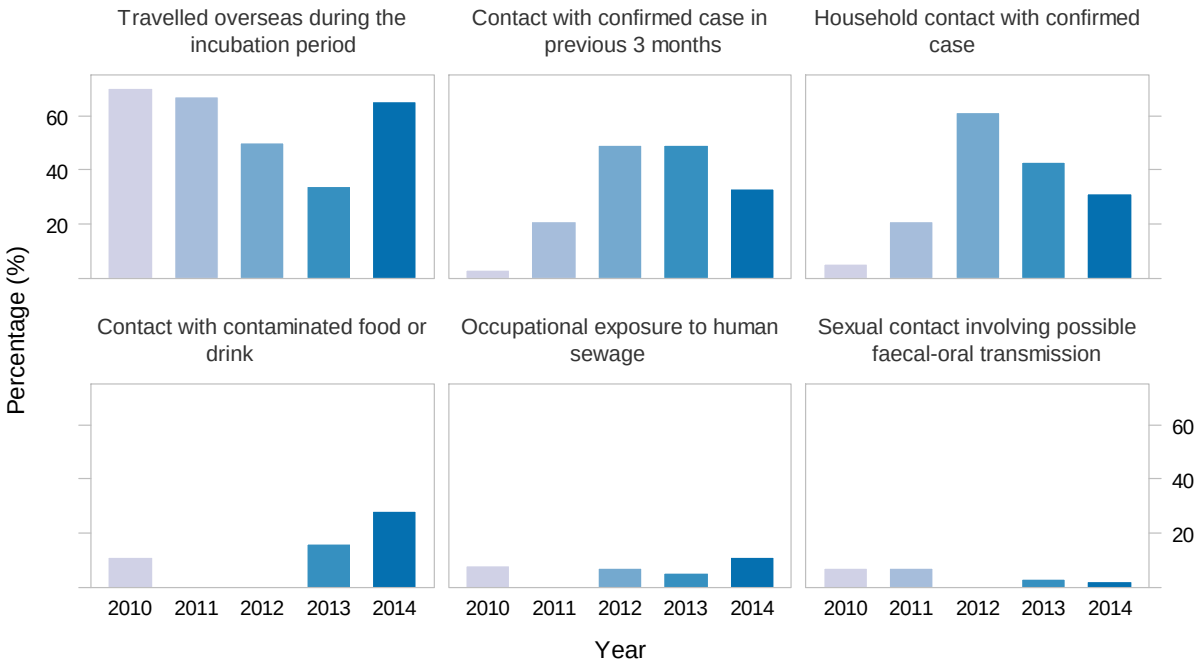
Table 34. Exposure to risk factors reported for hepatitis A notifications, 2014

Risk Factor	Notifications			
	Yes	No	Unknown	%[a]
Travelled overseas during the incubation period	46	25	3	64.8
Contact with confirmed case in previous 3 months	12	24	38	33.3
Household contact with confirmed case	16	35	23	31.4
Contact with contaminated food or drink	7	18	49	28.0
Occupational exposure to human sewage	4	34	36	10.5
Sexual contact involving possible faecal-oral transmission	1	43	30	2.3

[a] Percentage refers to the cases that answered "yes" out of the total number of cases for which this information was supplied. Cases may have more than one risk factor recorded.

A decreasing trend in cases reporting overseas travel during the incubation period, seen in the period 2011 to 2013, was largely reversed in 2014, with the proportion of cases reporting this risk factor similar to 2010–2011 (Figure 28). In 2012 and 2013, the percentage of cases reporting household contact with a confirmed case and contact with a confirmed case in the previous three months showed an increase compared to previous years, but the proportion of cases reporting these risk factors decreased in 2014. Contact with contaminated food or drink or occupational exposure to human sewage has been reported by a very small, but increasing, proportion of cases each year.

Figure 28. Hepatitis A risk factors by percentage of cases and year, 2010−2014



In 2014, most hepatitis A cases (71/74) provided information on international travel, and 64.8% (95% CI 52.5-75.5%) had travelled overseas during the incubation period. If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism was 50.0% (95% CI 44.0-56.0%).

Outbreaks reported as caused by hepatitis A virus

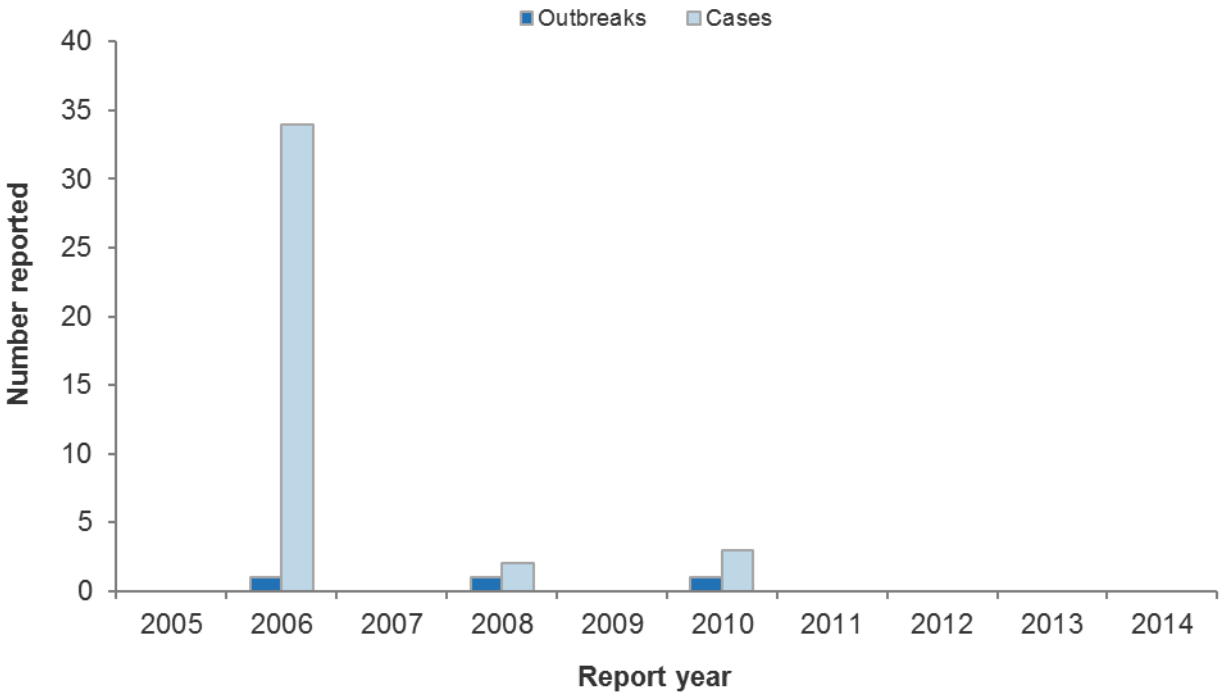
One outbreak caused by hepatitis A virus with six cases was reported in 2014. The outbreak was not associated with a suspected or known foodborne source (Table 35). An outbreak has been classed as foodborne in this report if food was recorded as one of the likely modes of transmission applicable to the outbreak. It is important to note that a single outbreak may have multiple pathogens, modes of transmission, settings where exposure occurred, or settings where preparation of food was conducted.

Table 35. Hepatitis A outbreaks reported, 2014

Measure	Foodborne hepatitis A outbreaks	All hepatitis A outbreaks
Outbreaks	0	1
Cases	0	6
Hospitalised cases	0	1

Foodborne hepatitis A virus outbreaks are rare with only three outbreaks reported in the period 2005 to 2014 (2006, 2008 and 2010) (Figure 29). Although occurring infrequently, foodborne outbreaks of hepatitis A virus can be associated with many cases (34 cases for the outbreak reported in 2006), although this was not so for the food-associated outbreaks in 2008 and 2010 (2 cases and 3 cases respectively).

Figure 29. Foodborne hepatitis A virus outbreaks and associated cases reported by year, 2005–2014



In 2014, no food or clinical samples were submitted to ESR's Public Health Laboratory relating to food-associated hepatitis A virus outbreaks. It should be noted that viral analyses are performed by ESR's Norovirus Reference Laboratory. The food types that can be analysed are currently limited.

Recent surveys

Nil.

Relevant New Zealand studies and publications

Nil.

Relevant regulatory developments

Nil.

Histamine (scombroid) fish poisoning

Case definition

Clinical description:	Tingling and burning sensation around mouth, facial flushing, sweating, nausea and vomiting, headache, palpitations, dizziness and rash.
Laboratory test for diagnosis:	Detection of histamine levels ≥ 50mg/100 g fish muscle.
Case classification:	Not applicable.

Histamine (scombroid) fish poisoning cases reported in 2014 by data source

Two cases of histamine (scombroid) fish poisoning and no resulting deaths were reported in EpiSurv during 2014. Note that not every case of histamine (scombroid) fish poisoning is necessarily notifiable, only those where there is a suspected common source.

The ICD-10 code T61.1 was used to extract scombroid fish poisoning hospitalisation data from the MoH NMDS database. Of the six hospital admissions recorded in 2014, five were reported with scombroid fish poisoning as the principal diagnosis and one was reported with scombroid fish poisoning as another relevant diagnosis.

Outbreaks reported as caused by histamine (scombroid) fish poisoning

One histamine (scombroid) fish poisoning outbreak was reported in 2014 involving two associated cases, including one case which was hospitalised (Table 36). It should be noted that all histamine (scombroid) fish poisoning outbreaks will be categorised as foodborne, as consumption of contaminated fish is the only currently recognised transmission route for this disease.

Table 36. Histamine (scombroid) fish poisoning outbreaks reported, 2014

Measure	Foodborne histamine fish poisoning outbreaks	All histamine fish poisoning outbreaks
Outbreaks	1	1
Cases	2	2
Hospitalised cases	1	1

Between 2005 and 2014 the number of histamine (scombroid) fish poisoning outbreaks reported each year ranged from one to four (Figure 30). The highest number of outbreaks was reported in 2006 (4 outbreaks, 14 cases) and 2010 (4 outbreaks, 13 cases). The highest total number of associated cases was reported in 2013 (21 cases).

Figure 30. Histamine (scombroid) fish poisoning outbreaks and associated cases reported by year, 2005–2014

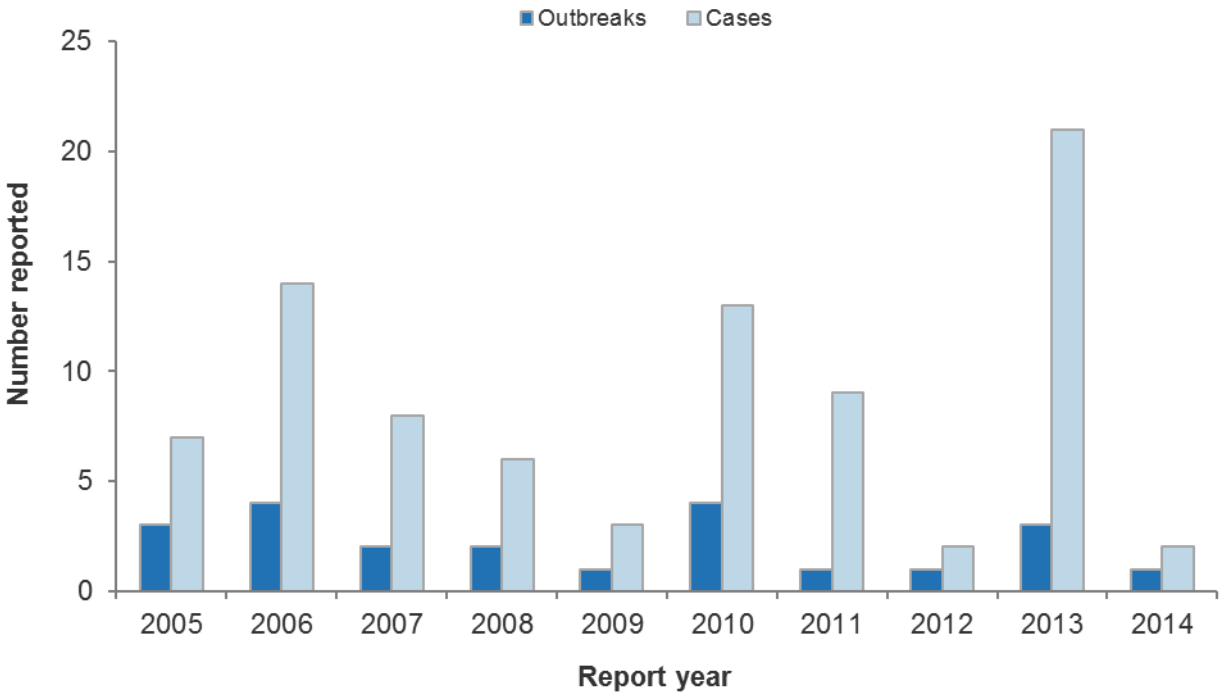


Table 37 contains details of the histamine fish poisoning outbreak reported in 2014.

Table 37. Details of histamine (scombroid) fish poisoning outbreak, 2014

PHU	Month	Suspected vehicle	Exposure setting	Preparation setting	No. ill
Auckland	Feb	Smoked tuna	Other food outlet	Other food outlet	2P

PHU: Public Health Unit, C: confirmed, P: probable.

In 2014, one smoked fish sample was submitted to ESR's Public Health Laboratory relating to the Auckland histamine fish poisoning outbreak. The left over fish had high levels of histamine present (650 mg/kg).

Recent surveys

Nil.

Relevant New Zealand studies and publications

Nil.

Relevant regulatory developments

Nil.

Listeriosis

Summary data for listeriosis in 2014 are given in Table 38.

Table 38. Summary of surveillance data for listeriosis, 2014

Parameter	Value in 2014	Source
Number of notified cases[a]	25	EpiSurv
Notification rate (per 100,000)	0.6	EpiSurv
Hospitalisations (% of notifications)[b]	27 (108%)	MoH NMDS, EpiSurv
Deaths (%)[b]	5 (20%)	EpiSurv
Travel-related cases (%)[b]	0	EpiSurv
Estimated food-related cases (%)[c]	22 (87.8%)	Expert consultation

[a] Includes non-perinatal (20) and perinatal cases (5).
[b] Percentage of the number of notified cases. Cases hospitalised may not be notified on EpiSurv.
[c] For estimation of food-related cases the proportions derived from expert consultation exclude travel-related cases.

Case definition

Clinical description: Listeriosis most commonly presents with diarrhoea, often associated with fever, myalgia and vomiting. Bacteraemia most often occurs in pregnant women (usually in the third trimester), the elderly and immunosuppressed. In pregnant women, the foetus may become infected, sometimes leading to miscarriage, stillbirth, premature delivery, new-born septicaemia or meningitis. The elderly and immunosuppressed may present with septicaemia, meningitis or pyogenic foci of infection.

Laboratory test for diagnosis: Isolation of *Listeria monocytogenes* from a normally sterile site, including the foetal gastrointestinal tract.

Case classification:

Probable: Not applicable.

Confirmed: A clinically compatible illness that is laboratory confirmed.

Cases can be further classified, if appropriate, as follows:

Perinatal: A case occurring in an infant from 7 days before birth until 7 days after birth.

Listeriosis cases reported in 2014 by data source

During 2014, 25 notifications (0.6 cases per 100,000 population) of listeriosis were reported in EpiSurv, of which five were perinatal. Twenty eight cultures of *L. monocytogenes* were received and serotyped by the ESR Special Bacteriology Laboratory.

The ICD-10 code A32 was used to extract listeriosis hospitalisation data from the MoH NMDS database. Of the 27 hospital admissions (0.6 admissions per 100,000 population) recorded in 2014, 14 were reported with listeriosis as the principal diagnosis and 13 with listeriosis as another relevant diagnosis.

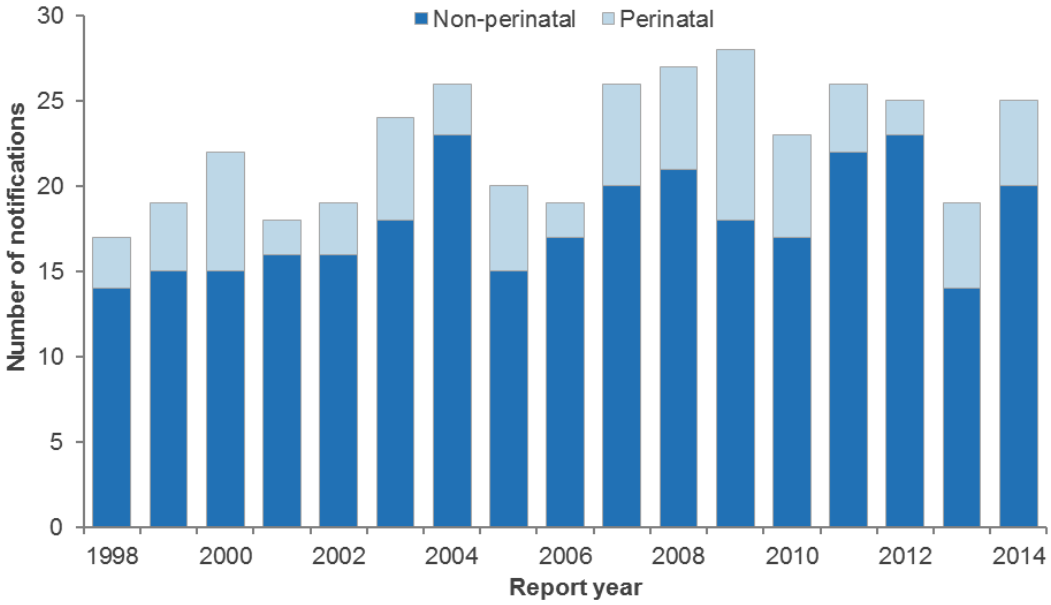
Three deaths resulting from non-perinatal listeriosis and two perinatal deaths were recorded in EpiSurv in 2013.

It has been estimated by expert consultation that 87.8% (95th percentile credible interval: 57.9% to 98.5%) of listeriosis incidence is due to foodborne transmission. It was further estimated that approximately 55% of foodborne transmission was due to consumption of ready-to-eat meats.

Notifiable disease data

Between 1997 and 2014, the number of listeriosis notifications has fluctuated between 17 (1998) and 28 (2009) each year, with the exception of 35 notifications reported in 1997 (Figure 31). In 2014, five notifications were reported as perinatal, which is comparable to previous years.

Figure 31. Listeriosis non-perinatal and perinatal notifications by year, 1997–2014



In 2014, the rate of notifications for listeriosis was similar for females (0.6 per 100,000 population, 13 cases) and males (0.5 per 100,000, 12 cases). The number and rate of hospitalisations were slightly higher for males than females (Table 39). It should be noted that case details for perinatal cases are those for the mother, so the female cases will include all 5 perinatal cases.

Table 39. Listeriosis cases by sex, 2014

Sex	EpiSurv notifications		Hospitalisations[a]	
	No.	Rate[b]	No.	Rate[b]
Male	12	0.5	15	0.7
Female	13	0.6	12	0.5
Total	**25**	**0.6**	**27**	**0.6**

[a] MoH NMDS data for hospital admissions
[b] per 100,000 of population

In 2014, notification rates for listeriosis were highest in the 60 years and over age group for both the notifications (1.9 per 100,000 population, 17 cases) and hospitalisations (1.7 per 100,000, 15 admissions) (Table 40). The three non-perinatal deaths reported in 2014 were in the 60 years and over age group.

Table 40. Listeriosis cases by age group, 2014

Age group (years)	EpiSurv notifications		Hospitalisations[a]	
	No.[b]	Rate[c]	No.	Rate[c]
<20	0	-	0	-
20 to 39	5	0.4	8	0.7
40 to 59	3	-	4	-
60+	17	1.9	15	1.7
Total	**25**	**0.6**	**27**	**0.6**

[a] MoH NMDS data for hospital admissions
[b] For perinatal cases the age reported is the mother's age
[c] per 100,000 of population (rate not calculated when fewer than five cases reported)

During 2014, the most common risk factors reported for non-perinatal listeriosis cases were having an underlying illness (85.0%) and received immunosuppressive drugs (50.0%) (Table 41).

Table 41. Exposure to risk factors reported for listeriosis (non-perinatal) notifications, 2014

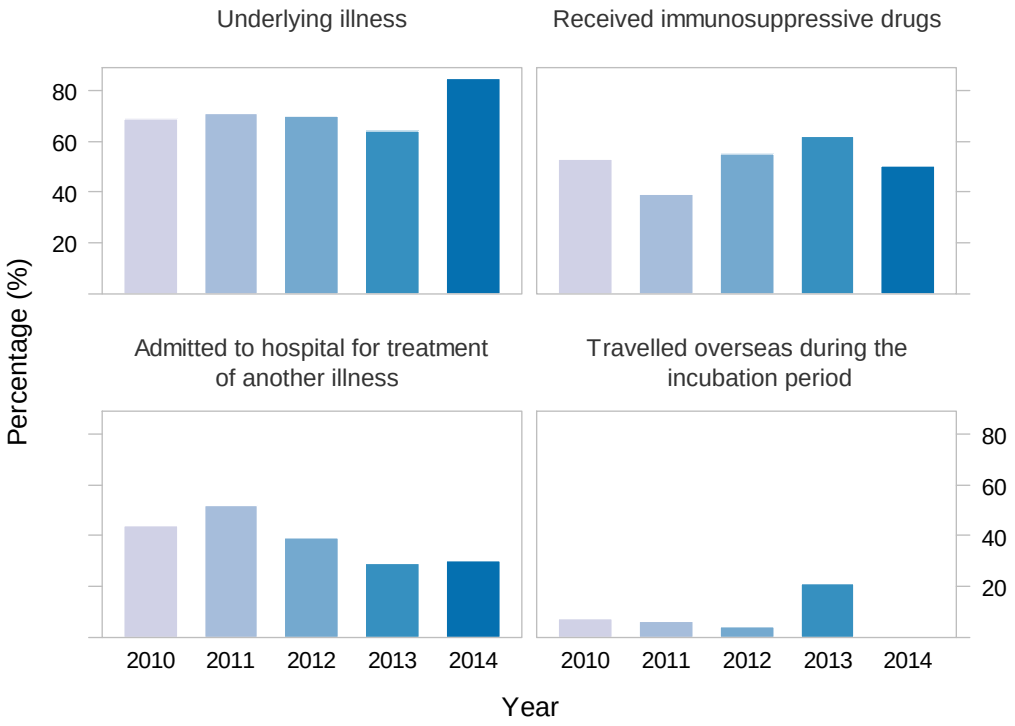
Risk factor	Notifications			
	Yes	No	Unknown	%[a]
Underlying illness	17	3	0	85.0
Received immunosuppressive drugs	8	8	4	50.0
Admitted to hospital for treatment of another illness	6	14	0	30.0
Travelled overseas during the incubation period	0	16	4	0.0

[a] Percentage refers to the cases that answered "yes" out of the total number of cases for which this information was supplied. Cases may have more than one risk factor recorded.

[b] Travel information is collected for all cases, while information on other risk factors is only collected for non-perinatal cases.

Having an underlying illness was the risk factor most commonly associated with listeriosis cases each year between 2010 and 2014. There was an increasing trend over the period 2011–2013 in the percentage of cases reporting having received immunosuppressive drugs, although there was a decrease in the proportion of cases reporting this risk factor in 2014 (Figure 32).

Figure 32. Percentage of cases with exposure to risk factors reported for listeriosis (non-perinatal) and year, 2010−2014



Outbreaks reported as caused by *Listeria* spp.

There were no *Listeria* spp. outbreaks reported in 2014. Since 2005 there have been two *Listeria* spp. outbreaks reported. There was an outbreak with two associated cases in 2009 and a foodborne outbreak with six associated cases in 2012. An outbreak has been classed as foodborne in this report if food was recorded as one of the likely modes of transmission applicable to the outbreak. It is important to note that a single outbreak may have multiple pathogens, modes of transmission, settings where exposure occurred, or settings where preparation of food was conducted.

Listeria monocytogenes types commonly reported

ESR's Special Bacteriology Laboratory reported receiving 28 isolates of *L. monocytogenes* during 2014.

Table 42 shows the number of isolates and percentage of *L. monocytogenes* serotypes reported by the Special Bacteriology Laboratory at ESR between 2010 and 2014. The number of isolates of serotype O4 decreased each year in the period 2010 to 2013, but reversed this trend in 2014.

Table 42. *L. monocytogenes* serotypes identified by the Special Bacteriology Laboratory, 2010–2014

Serotype	2010		2011		2012		2013		2014	
	No.	%	No.	%	No.	%	No.	%	No.	%
O4	16	72.7	15	57.7	12	48.0	7	36.8	16	57.1
O1/2	6	27.3	11	42.3	13	52.0	12	63.2	12	42.9
Total	**22**		**26**		**25**		**19**		**28**	

Recent surveys

Nil

Relevant New Zealand studies and publications

Journal papers

Listeria monocytogenes isolates from seafood-processing plants (*n* = 31), seafood (n=5), other processed food (*n* = 10) and human listeriosis cases (*n* = 6) were characterised and compared using multi-virulence-locus sequence typing (MVLST) [19]. Isolates from mussels and their processing environments had identical sequence types to sporadic listeriosis cases in New Zealand.

Proteomic analysis was used to compare a New Zealand seafood-associated strain, a New Zealand clinical strain and a US dairy-associated strain [20]. The clinical strain had 53.4% and 53.9% protein profile similarity with the dairy and seafood-associated strains, respectively.

Reports

An assessment of microbiological risks associated with consumption of raw milk was published, including information on the prevalence of *L. monocytogenes* in raw milk [16]. Two surveys found prevalence of 0.68 and 4.09%. The report also gave estimates of the number of cases of listeriosis expected, based on different raw milk distribution scenarios.

Relevant regulatory developments

During 2014, the Australia New Zealand Food Standards Code was amended with respect to limits for *L. monocytogenes* in ready-to-eat foods. The amendment came into effect in New Zealand on 18 September 2014. MPI issued two fact sheets to support the amendment [21, 22].

Norovirus infection

Case definition

Clinical description:	Gastroenteritis usually lasting 12–60 hours.
Laboratory test for diagnosis:	Detection of norovirus in faecal or vomit specimen or leftover food (currently there is a limited range of foods able to be tested for norovirus).
Case classification:	
Probable	A clinically compatible illness.
Confirmed	A clinically compatible illness that is laboratory confirmed, OR a clinically compatible illness and a common exposure associated with a laboratory confirmed case.

Norovirus infection cases reported in 2014 by data source

During 2014, 115 notifications (2.6 cases per 100,000 population) of norovirus with one associated death were reported in EpiSurv. It should be noted that not every case of norovirus infection is notifiable; only those that are part of a common source outbreak or from a person in a high risk category.

The ICD-10 code A08.1 was used to extract norovirus infection hospitalisation data from the MoH NMDS database. Of the 393 hospital admissions (8.7 admissions per 100,000 population) recorded in 2014, 126 were reported with norovirus infection as the principal diagnosis and 267 with norovirus infection as another relevant diagnosis. Of the 393 hospital admissions, 272 were in the 70+ age group.

It has been estimated by expert consultation that 32.7% (95th percentile credible interval: 10.0% to 66.4%) of norovirus infections are due to foodborne transmission. It was further estimated that approximately 24% of norovirus infections due to foodborne transmission were due to consumption of seafood.

Outbreaks reported as caused by norovirus

In 2014, 18/322 (5.6%) of the norovirus outbreaks and 373/9363 (4.0%) of the associated cases were reported as foodborne (Table 43). No deaths were associated with foodborne norovirus outbreaks in 2014. An outbreak has been classed as foodborne in this report if food was recorded as one of the likely modes of transmission applicable to the outbreak. It is important to note that a single outbreak may have multiple pathogens, modes of transmission, settings where exposure occurred, or settings where preparation of food was conducted. Norovirus outbreaks accounted for 37.3% (322/863) of all outbreaks and 63.1% (9363/14828) of all associated cases reported in 2014.

Table 43. Norovirus outbreaks reported, 2014

Measure	Foodborne norovirus infection outbreaks	All norovirus infection outbreaks
Outbreaks	18	322
Cases	373	9363
Hospitalised cases	1	105

Between 2005 and 2014 the number of foodborne norovirus outbreaks reported each year was variable, ranging from 10 (2007) to 30 (2009) (Figure 33).The total number of cases associated with these outbreaks each year ranged from 131 (2005) to 618 cases (2008).

Figure 33. Foodborne norovirus outbreaks and associated cases reported by year, 2005–2014

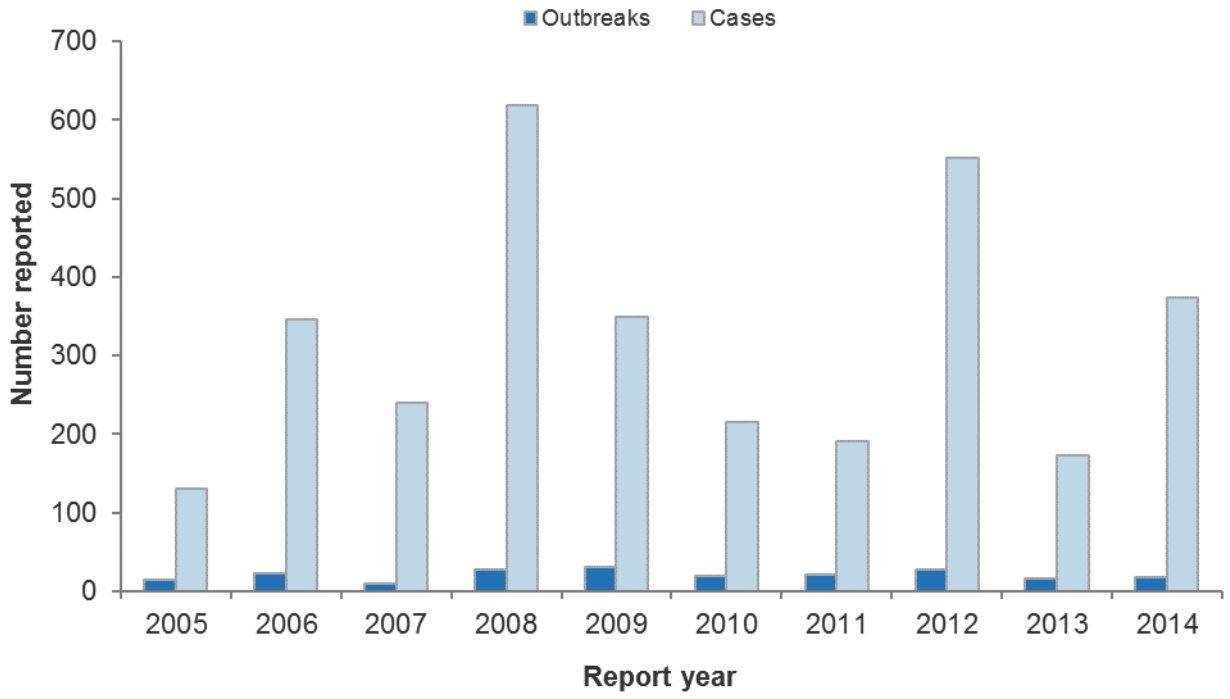


Table 44 contains details of the 18 foodborne norovirus outbreaks reported in 2014, including three with a suspected food vehicle identified. In the Auckland outbreak in which berry trifle was implicated, an epidemiological investigation found a significantly elevated relative risk associated with consumption of the berry trifle. The evidence for the suspected food was weak in the other two cases with a suspected food vehicle.

Table 44. Details of foodborne norovirus outbreaks, 2014

PHU	Month	Suspected vehicle	Exposure setting	Preparation setting	No. ill
Taranaki	Feb	Unknown	Restaurant/cafe/bakery	Restaurant/cafe/bakery	1C, 12P
Public Health South	Mar	Unknown	Other setting	Commercial food manufacturer	1C, 7P
Auckland	Mar	Raw milk	Home	Farm	2C, 3P
Auckland	Apr	Berry Trifle - frozen raspberries, custard, sponge.	Restaurant/cafe/bakery	Restaurant/cafe/bakery	10C, 44P
Auckland	Apr	Unknown	Hotel/motel	Hotel/motel	3C, 28P
Regional Public Health	Apr	Unknown	Caterers	Caterers	3C, 12P
C and PH	May	Unknown	Restaurant/cafe/bakery	Restaurant/cafe/bakery	5C
Regional Public Health	May	Unknown	Restaurant/cafe/bakery	Restaurant/cafe/bakery	1C, 2P
Nelson Marlborough	Jul	Unknown	Other setting	Commercial food manufacturer	6C
Auckland	Jul	Unknown	Restaurant/cafe/bakery	Restaurant/cafe/bakery	2C
Auckland	Aug	Unknown	Restaurant/cafe/bakery	Restaurant/cafe/bakery	6C, 97P
Waikato	Aug	Unknown	Community, church, sports gathering	Community, church, sports gathering	25C
Auckland	Sep	Unknown	Other setting	Commercial food manufacturer	5C, 38P
Auckland	Oct	Unknown	Restaurant/cafe/bakery	Restaurant/cafe/bakery	3C, 2P
Regional Public Health	Oct	Chicken and asparagus rolls, all types of beef, chicken and ham sandwiches prepared by an asymptomatic worker who had sick children at home	Workplace / Restaurant/cafe/bakery	Restaurant/cafe/bakery	3C, 20P
Auckland	Nov	Unknown	Restaurant/cafe/bakery	Restaurant/cafe/bakery	2C, 1P
Auckland	Dec	Unknown	Long term care facility	Long term care facility	3C, 12P
MidCentral	Dec	Unknown	Restaurant/cafe/bakery	Restaurant/cafe/bakery	14C

PHU: Public Health Unit, C and PH: Community and Public Health, C: confirmed, P: probable.

Table 45 shows the number of hospitalised cases and total cases by genotype for the 18 foodborne norovirus outbreaks reported during 2014. The majority of the outbreaks were due to GII.4 (5 outbreaks, 148 cases) and GI.6 (3 outbreaks, 23 cases).

Table 45. Norovirus genotypes reported in foodborne outbreaks, 2014

Norovirus	Outbreaks	Total cases	Hospitalised cases
GII.4	5	148	1
GI.6	3	23	0
GII type not further specified	3	57	0
GI and GII	1	103	0
GII.21/GII.3	1	14	0
GI.3	1	13	0
GII.7	1	5	0
GI.2	1	3	0
GII.6	1	2	0
Genotype unknown	1	5	0

During investigation of suspected foodborne illness outbreaks by ESR's Public Health Laboratory in 2014, samples were received relating to 10 of the 18 food-associated norovirus outbreaks identified in Table 44. It should be noted that viral analyses are performed by ESR's Norovirus Reference Laboratory. The food types that can be analysed are currently limited. Norovirus was detected in faecal samples from cases associated with all of these 10 foodborne outbreaks. A faecal specimen from a food handler associated with one outbreak was submitted for analysis and norovirus was detected. Food samples (raw milk, mayonnaise) were submitted for analysis for two of these outbreaks but norovirus was not detected.

Norovirus types commonly reported

Norovirus genotyping data from ESR's Norovirus Reference Laboratory are shown in Table 46. The data relates to outbreaks not individual cases.

In 2014, genogroup II (GII) was identified in 253/312 (81.1%) outbreaks compared to 110/157 (70.1%) in 2013 and 208/221 (94.1%) in 2012. In 2014, genogroup I (GI) was identified in 51/312 (16.3%) outbreaks compared to 45/157 (28.7%) in 2013. Genotypes from both norovirus GI and GII were identified in 8 outbreaks. As in previous years, GII.4 was the predominant norovirus genotype identified (203/312, 65.1% outbreaks). This was followed by GII.6 (22/312, 7.1% outbreaks) and GI.4 (17/312, 5.4% outbreaks).

Table 46. Norovirus genotypes identified in outbreaks by the Norovirus Reference Laboratory, 2010–2014

Norovirus genotypes	2010	2011	2012	2013	2014
Genogroup I	**17**	**10**	**9**	**45**	**51**
GI untyped	1	0	1	0	1
GI.1	0	0	0	1	0
GI.2	0	1	5	1	12
GI.3	2	3	0	12	17
GI.4	3	1	1	23	0
GI.5	0	1	0	1	1
GI.6	10	4	2	4	10
GI.7	0	0	0	1	1
GI.8	1	0	0	0	0
GI.9	0	0	0	2	9
Genogroup II	**106**	**149**	**208**	**110**	**253**
GII untyped	7	2	2	0	4
GII.1	1	1	1	0	0
GII.2	3	3	1	13	2
GII.3	11	2	0	0	1
GII.4	58	111	160	55	203
GII.5	1	0	0	1	0
GII.6	5	3	30	4	22
GII.7	14	5	1	18	6
GII.8	0	0	0	0	1
GII.13	2	2	0	0	0
GII.17	0	0	0	0	2
GII.20	4	0	0	0	1
GII.Pb/GII.3	0	3	2	0	0
GII.P12/GII.3	0	14	3	2	0
GII.P16/GII.2	0	0	5	0	0
GII.P16/GII.13	0	0	0	9	2
Other GII recombinants	0	3	3	8	9
Mixed GI and GII	**0**	**2**	**4**	**2**	**8**
Total outbreaks	**123**	**161**	**221**	**157**	**312**

Recent surveys

Nil.

Relevant New Zealand studies and publications

Reports

Evaluation of Faecal Source Tracking Methods as an Indicator for Human Faecal Contamination in Shellfish Growing Areas

A review of current Faecal Source Tracking (FST) methods and evaluation of their efficacy to predict the source of microbial contamination in the environment, with particular emphasis in predicting the presence of enteric viruses in New Zealand shellfish growing areas, was conducted [23].

Relevant regulatory developments

Nil.

Salmonellosis

Summary data for salmonellosis in 2014 are given in Table 47.

Table 47. Summary of surveillance data for salmonellosis, 2014

Parameter	Value in 2014	Source
Number of notified cases	954	EpiSurv
Notification rate (per 100,000)	21.2	EpiSurv
Hospitalisations (% of notifications)[a]	113 (11.8%)	MoH NMDS, EpiSurv
Deaths (%)[a]	0	EpiSurv
Estimated travel-related cases (%)[a]	331 (34.7%)	EpiSurv
Estimated food-related cases (%)[b]	387 (62.1%)	Expert consultation

[a] Percentage of the number of notified cases. Cases hospitalised may not be notified on EpiSurv.
[b] For estimation of food-related cases the proportions derived from expert consultation exclude travel-related cases.

Case definition

Clinical description: Salmonellosis presents as gastroenteritis, with abdominal pains, diarrhoea (occasionally bloody), fever, nausea and vomiting. Asymptomatic infections may occur.

Laboratory test for diagnosis: Isolation of *Salmonella* species from any clinical specimen.

Case classification:

Probable: A clinically compatible illness that is either a contact of a confirmed case of the same disease, or has had contact with the same common source – that is, is part of a common-source outbreak.

Confirmed: A clinically compatible illness that is laboratory confirmed.

Salmonellosis cases reported in 2014 by data source

The salmonellosis cases presented here exclude disease caused by *S.* Paratyphi and *S.* Typhi.

During 2014, 954 notifications (21.2 cases per 100,000 population) of salmonellosis and no resulting deaths were reported in EpiSurv. The Enteric Reference Laboratory at ESR reported 958 cases infected with non-typhoidal *Salmonella* (21.2 cases per 100,000).

The ICD-10 code A02.0 was used to extract salmonellosis hospitalisation data from the MoH NMDS database. Of the 113 hospital admissions (2.5 admissions per 100,000 population) recorded in 2014, 89 were reported with salmonellosis as the principal diagnosis and 24 with salmonellosis as another relevant diagnosis.

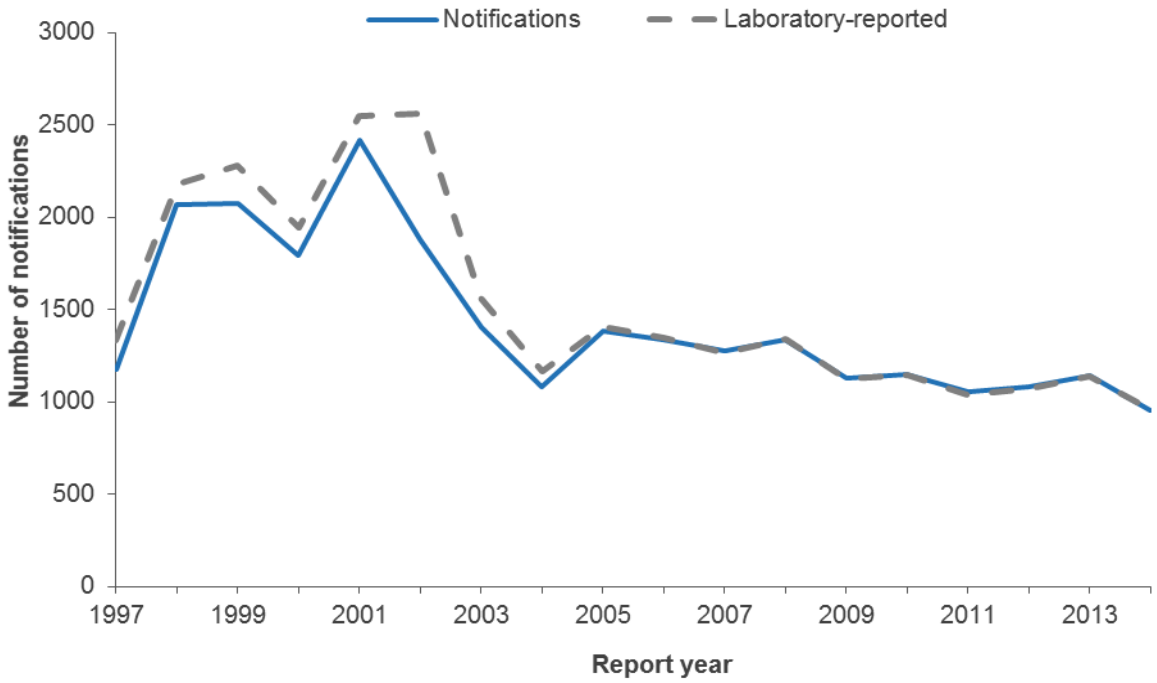
It has been estimated by expert consultation that 62.1% (95th percentile credible interval: 35.2% to 86.4%) of salmonellosis incidence is due to foodborne transmission. It was further estimated that approximately 19% of foodborne transmission was due to transmission via poultry.

Notifiable disease data

Annual notifications were stable between 2009 and 2013, but decreased in 2014 to the lowest level since the notification system was implemented. Following a generally increasing trend of salmonellosis notifications from 1997 to 2001 there was a sharp fall in notifications between 2001 and 2004. The notifications continued to decline until 2009, but at a slower rate. The lowest number of notifications was reported in 2014 (954 cases) (Figure 34).

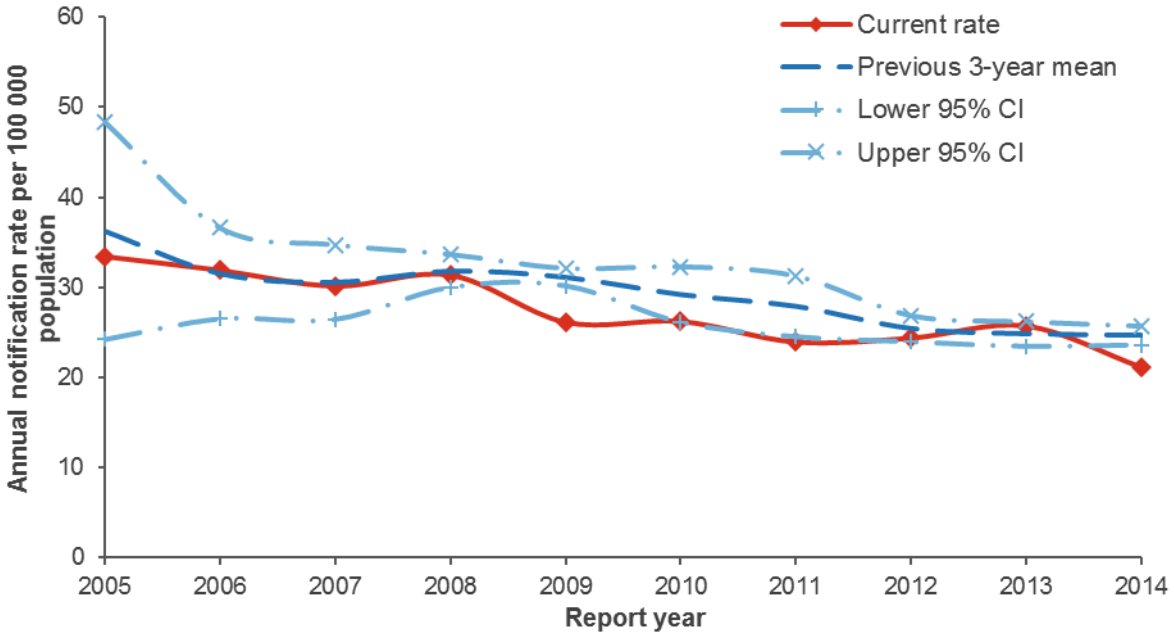
Integration of notification and laboratory data at ESR and the introduction of electronic laboratory reporting of notifiable diseases have reduced the differences between the number of notifications and laboratory reported cases seen prior to 2005.

Figure 34. Salmonellosis notifications and laboratory-reported cases by year, 1997–2014



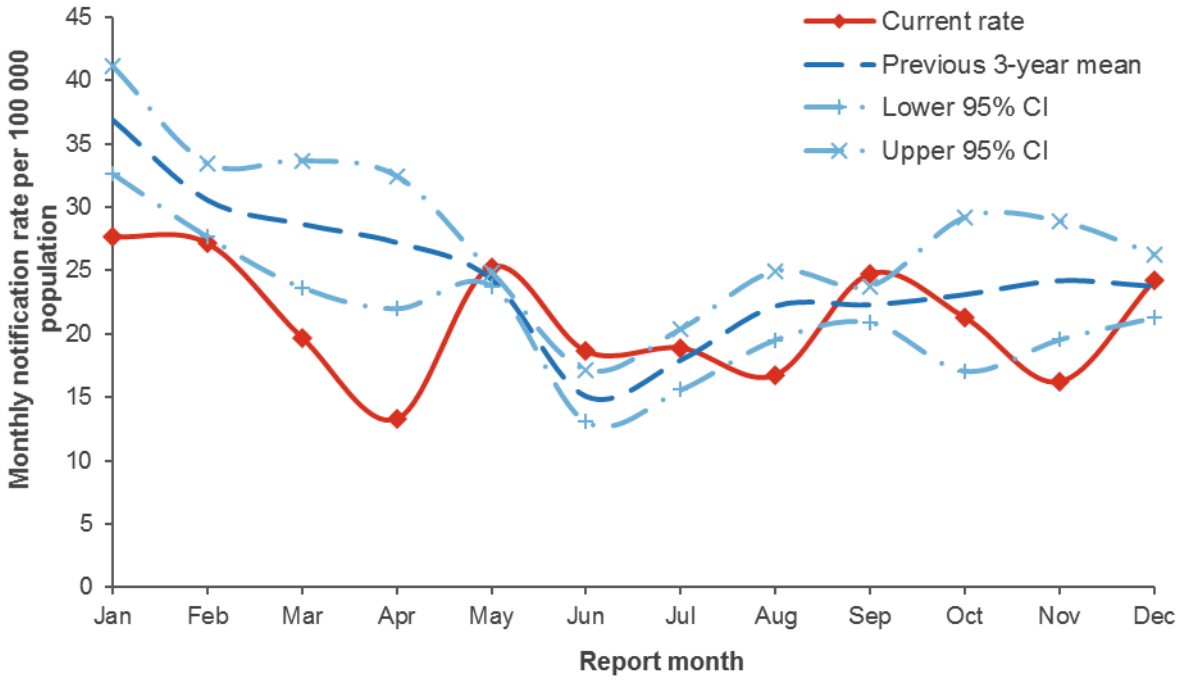
Between 2005 and 2014, the salmonellosis annual notification rate followed a generally decreasing trend with the lowest notification rate in 2014 (21.2 per 100,000 population) (Figure 35).

Figure 35. Salmonellosis notification rate by year, 2005–2014



The number of notified cases of salmonellosis per 100,000 population by month for 2014 is shown in Figure 36. The overall pattern for 2014 was somewhat different to the historical mean with two pronounced troughs in April and November and peak rates seen in different months to the usual.

Figure 36. Salmonellosis monthly rate (annualised), 2014



In 2014, the number and rate of notifications were very similar for males and females. Hospitalisation numbers and rates for salmonellosis showed a similar pattern to the notifications (Table 48).

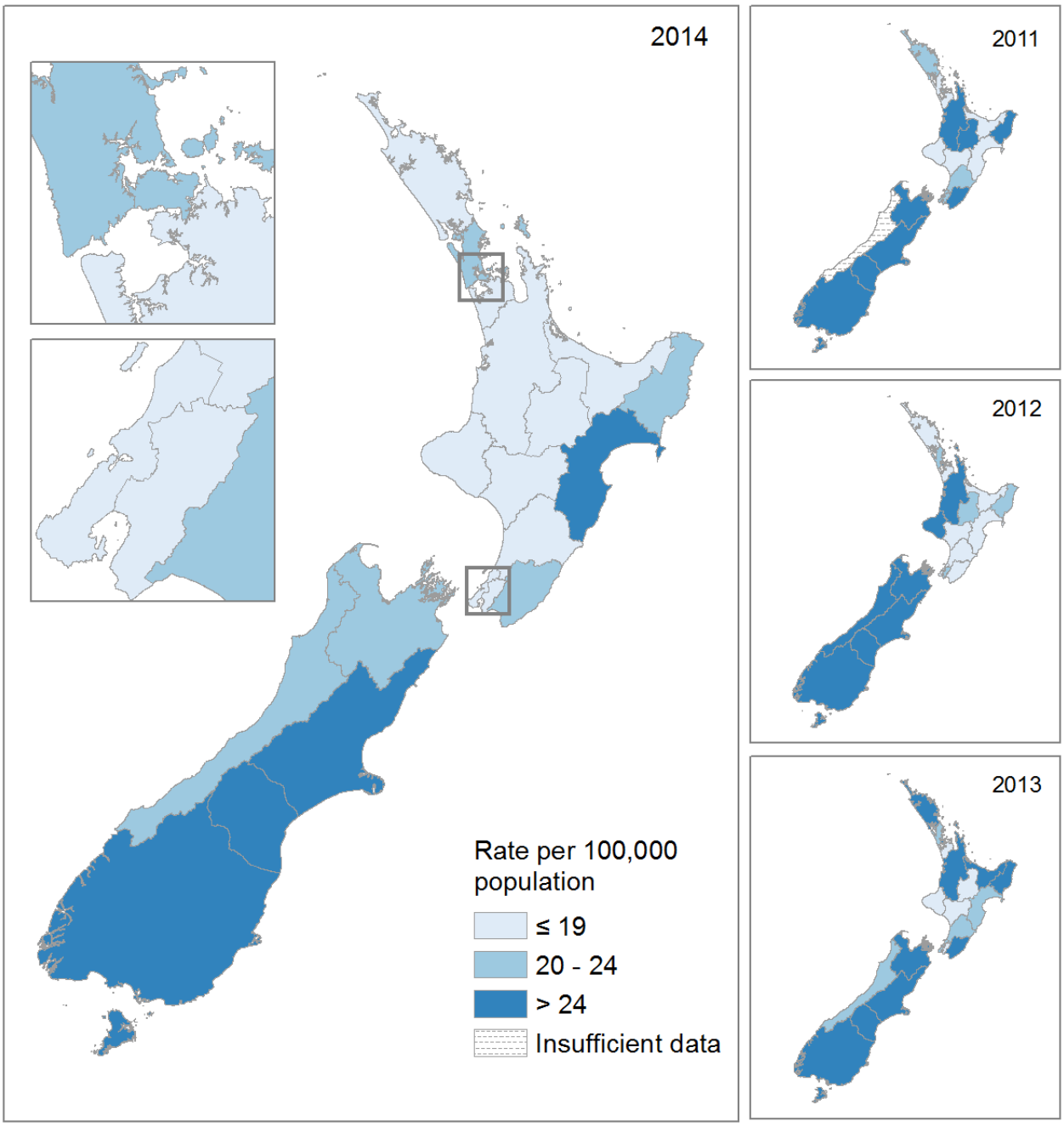
Table 48. Salmonellosis cases by sex, 2014

Sex	EpiSurv notifications		Hospitalisations[a]	
	No.	Rate[b]	No.	Rate[b]
Male	467	21.1	55	2.5
Female	487	21.2	58	2.5
Total	**954**	**21.2**	**113**	**2.5**

[a] MoH NMDS data for hospital admissions
[b] per 100,000 of population

Rates of salmonellosis varied throughout the country as illustrated in Figure 37. The highest salmonellosis notification rate in 2014 was for Southern DHB (38.4 per 100,000 population, 119 cases), followed by Canterbury DHB (28.4 per 100,000, 146 cases), South Canterbury DHB (27.5 per 100,000, 16 cases) and Hawke's Bay DHB (25.7 per 100,000, 41 cases). Canterbury, South Canterbury and Southern DHBs had consistently high salmonellosis notification rates between 2010 and 2014 compared to the rest of the country.

Figure 37. Geographic distribution of salmonellosis notifications, 2011–2014



In 2014, notification rates of salmonellosis were highest for the less than 1 year age group (79.8 cases per 100,000 population, 3.4 admissions per 100,000) and the 1 to 4 years age group (68.0 cases per 100,000, 3.6 admissions per 100,000) compared to other age groups (Table 49). However, the highest hospitalisation rates were in the 60+ age groups (4.6 and 5.3 admissions per 100,000).

Table 49. Salmonellosis cases by age group, 2014

Age group	EpiSurv notifications		Hospitalisations[a]	
	No.	Rate[b]	No.	Rate[b]
<1	47	79.8	2	3.4
1 to 4	170	68.0	9	3.6
5 to 9	47	15.3	-	0.0
10 to 14	36	12.2	2	0.7
15 to 19	47	15.0	2	0.6
20 to 29	148	24.0	17	2.8
30 to 39	85	15.4	12	2.2
40 to 49	86	13.8	9	1.4
50 to 59	129	21.6	16	2.7
60 to 69	90	19.5	21	4.6
70+	68	15.7	23	5.3
Total	**954**	**21.2**	**113**	**2.5**

[a] MoH NMDS data for hospital admissions
[b] per 100,000 of population

The most commonly reported risk factors for notified salmonellosis cases during 2014 were consumption of food from retail premises (50.8%) and travelling overseas during the incubation period of the organism (34.7%) (Table 50).

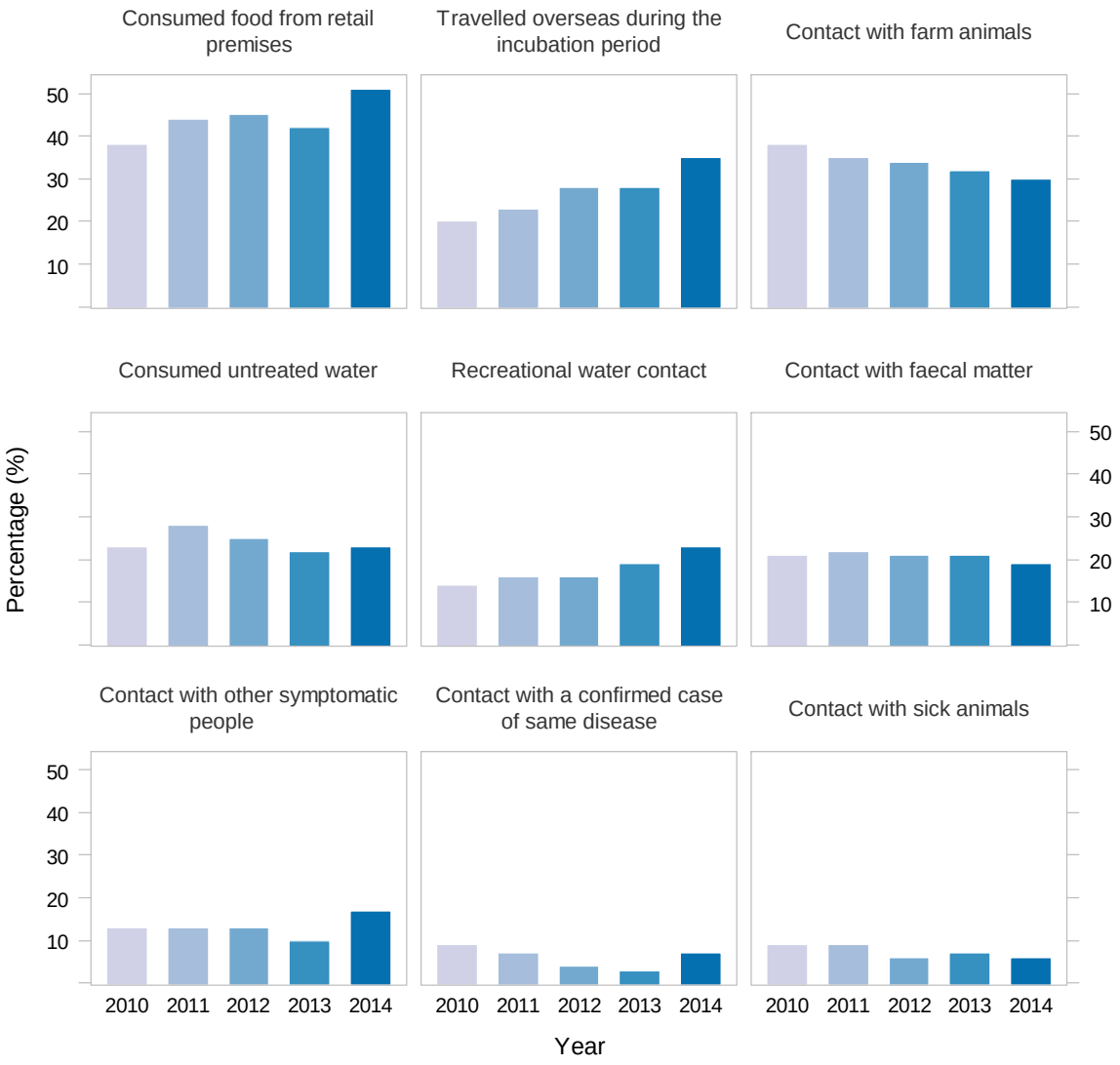
Table 50. Exposure to risk factors reported for salmonellosis notifications, 2014

Risk factor	Notifications			
	Yes	No	Unknown	%[a]
Consumed food from retail premises	220	213	521	50.8
Travelled overseas during the incubation period	192	361	401	34.7
Contact with farm animals	132	308	514	30.0
Recreational water contact	99	337	518	22.7
Consumed untreated water	86	296	572	22.5
Contact with faecal matter	82	344	528	19.2
Contact with other symptomatic people	73	358	523	16.9
Contact with a confirmed case of same disease	25	329	600	7.1

[a] Percentage refers to the cases that answered "yes" out of the total number of cases for which this information was supplied. Cases may have more than one risk factor recorded.

Between 2010 and 2014 the risk factors associated with salmonellosis have generally occurred in the same order of importance and to a similar magnitude each year (Figure 38). The most commonly reported risk factor for salmonellosis cases each year was consumption of food from retail premises. In the past five years there was an increasing trend in the percentage of cases reporting overseas travel during the incubation period, while the percentage of cases reporting contact with farm animals has decreased over the last five years. There also appears to be an increasing trend of cases reporting recreational water contact.

Figure 38. Percentage of cases with exposure to risk factors reported for salmonellosis and year, 2010−2014



For cases where information on travel was provided, 34.7% (95% CI 30.8-38.9%) had travelled overseas during the incubation period. Assuming that the cases for which travel information was provided were representative of all salmonellosis cases, a Poisson distribution can be used to estimate the total number of potentially travel related cases of salmonellosis in 2014. The resultant distribution has a mean of 331 cases (95% CI 275-391).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 24.7% (95% CI 23.1-26.4%).

Outbreaks reported as caused by *Salmonella*

In the following sections the term *Salmonella* refers to serotypes of *Salmonella enterica* subspecies *enterica*, excluding *S.* Typhi and *S.* Paratyphi.

In 2014, there were 23 *Salmonella* outbreaks reported, of which seven were reported as foodborne (Table 51). An outbreak has been classed as foodborne in this report if food was recorded as one of the likely modes of transmission applicable to the outbreak. It is important to note that a single outbreak may have multiple pathogens, modes of transmission, settings where exposure occurred, or settings where preparation of food was conducted. Six of the seven hospitalisations due to *Salmonella* were associated with foodborne outbreaks.

Table 51. *Salmonella* outbreaks reported, 2014

Measure	Foodborne *Salmonella* spp. outbreaks	All *Salmonella* spp. outbreaks
Outbreaks	7	23
Cases	44	116
Hospitalised cases	6	7

The number of foodborne *Salmonella* outbreaks reported between 2005 and 2014 ranged from four (2008) to 18 (2005), (Figure 39). The total number of cases associated with the outbreaks has varied over the same period with peaks in 2005, 2008 and 2012.

Figure 39. Foodborne *Salmonella* outbreaks and associated cases reported by year, 2005–2014

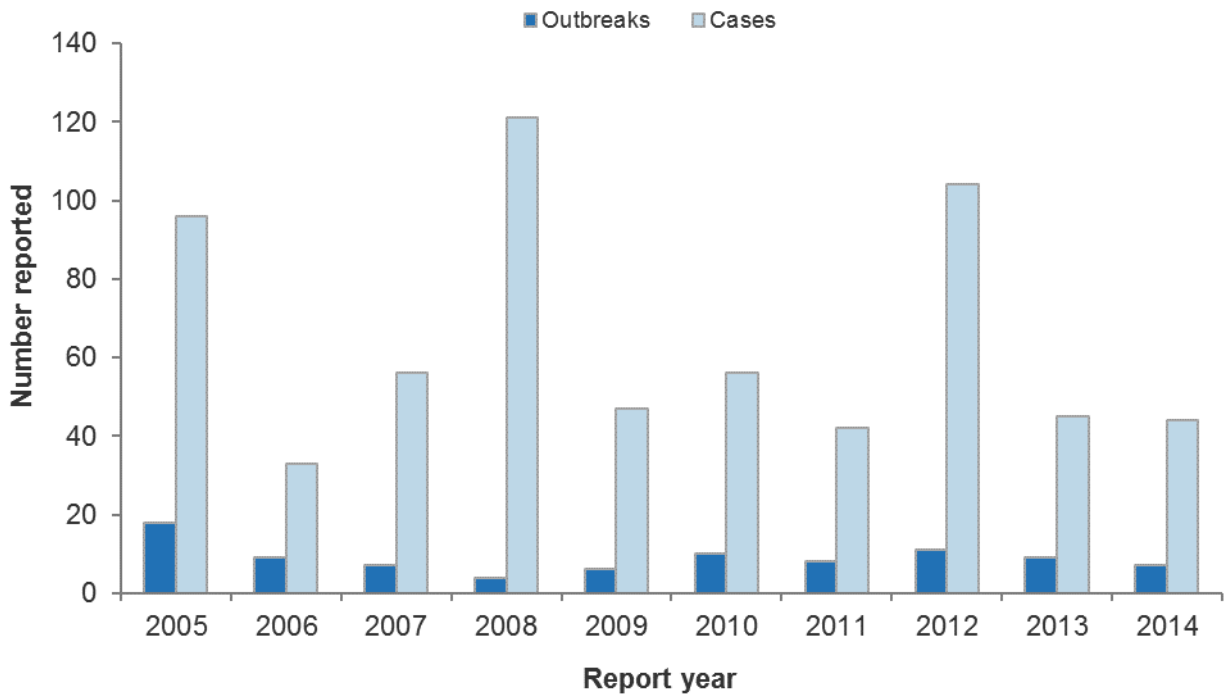


Table 52 contains details of the seven foodborne *Salmonella* outbreaks reported in 2014.

For all foodborne *Salmonella* outbreaks the evidence linking the outbreak to a suspected food was weak.

Table 52. Details of foodborne *Salmonella* outbreaks, 2014

PHU	Month	Suspected vehicle	Exposure setting	Preparation setting	No. ill
Auckland	Feb	Fried rice, beef stir fry and battered fish	Home	Takeaway	4C, 1P
Waikato	Feb	Unknown	Home	Home	1C, 1P
Waikato	Apr	Unknown	Home	Home	3C
Auckland	May	Unknown	Unknown	Unknown	4C, 18P
Regional Public Health	May	Unknown	Other setting	Unknown	4C
Waikato	May	Unknown	Unknown	Unknown	1C, 1P
C and PH	Aug	Unknown	Unknown	Unknown	6C

PHU: Public Health Unit, C and PH: Community and Public Health, C: confirmed, P: probable.

During investigation of suspected foodborne illness outbreaks by ESR's Public Health Laboratory in 2014, samples were submitted relating to two of the foodborne *Salmonella* outbreaks identified in Table 52. Only faecal samples were received, with *Salmonella* detected in both instances.

Salmonella types commonly reported

1. Human isolates

Isolates from 958 cases infected with non-typhoidal *Salmonella* were typed by the ESR Enteric Reference Laboratory during 2014. Of these cases, 392 (40.9%) were *Salmonella* Typhimurium.

Table 53 shows the number of cases by *Salmonella* type reported by the Enteric Reference Laboratory at ESR. The most common serotypes identified in 2014 were *S.* Typhimurium phage type 56 variant (prior to 2012 known as RDNC-May 06 (72 cases), *S*. Infantis (56 cases) and *S.* Typhimurium phage type 101 (41 cases).

Table 53. *Salmonella* serotypes and subtypes identified by the Enteric Reference Laboratory, 2010–2014

Serotype[a]	2010	2011	2012	2013	2014
S. Typhimurium	**594**	**495**	**459**	**481**	**392**
1	36	54	35	30	22
12a	35	28	26	15	20
56 variantb	85	73	73	122	72
101	70	50	26	26	41
135	48	47	44	48	35
156	35	29	21	17	9
160	107	66	58	69	27
Other or unknown	152	134	157	134	166
S. Enteritidis	**113**	**134**	**125**	**137**	**116**
1		10	6	19	14
1b	5	8	9	14	5
11c	49	56	52	27	39
Other or unknown	59	60	58	77	58
Other serotypes	**437**	**410**	**460**	**523**	**450**
S. Agona	12	20	11	11	15
S. Brandenburg	47	34	34	52	35
S. Infantis	54	65	52	70	56
S. Mississippi	9	13	12	20	21
S. Montevideo	13	1	26	11	7
S. Saintpaul	34	31	27	43	26
S. Stanley	28	28	22	31	34
S. Virchow	16	18	17	15	5
S. Weltevreden	23	16	24	28	31
S. enterica (I) ser. 4,[5],12 : i : -	21	21	38	27	22
Other or unknown	169	157	195	199	198
Total	**1144**	**1039**	**1044**	**1141**	**958**

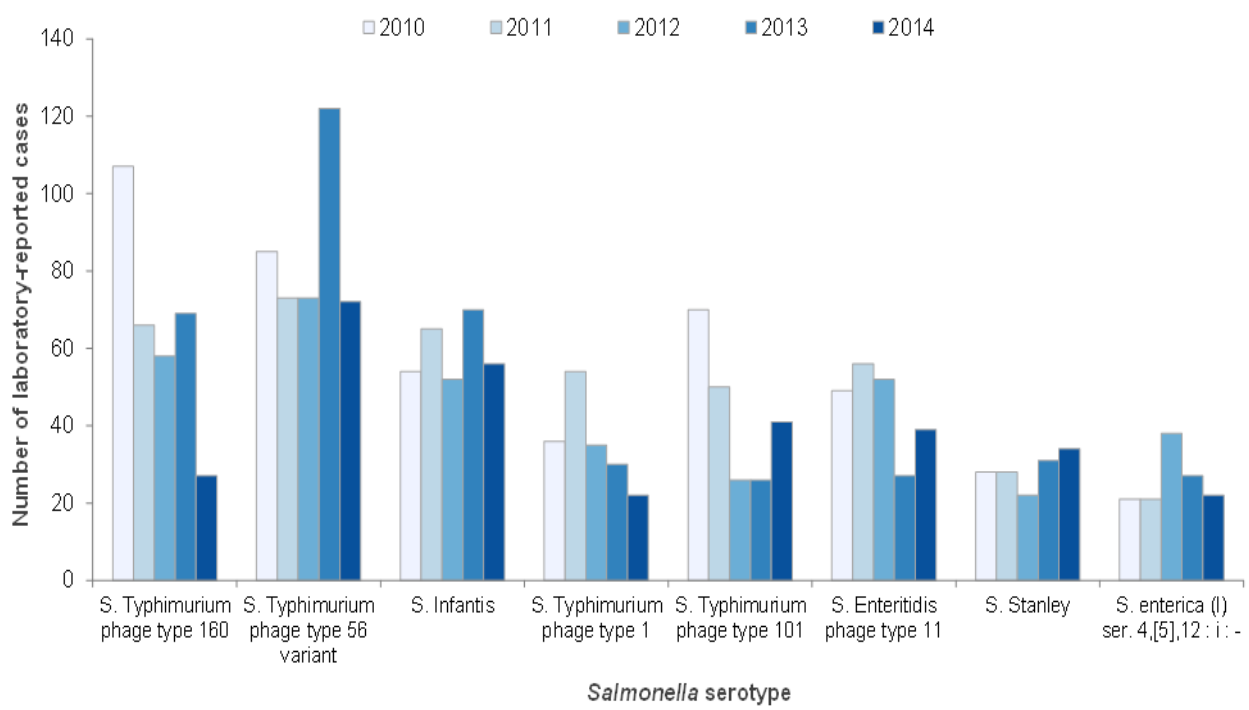
[a] Excludes *S.* Paratyphi and *S.* Typhi.

[b] Prior to 2013, *S.* Typhimurium phage type 56 variant was known as *S.* Typhimurium RDNC-May 06.

[c] Prior to 2012, *S.* Enteritidis phage type 11 was known as a 9a. Further typing was performed on isolates previously confirmed as *S.* Enteritidis phage type 9a, however, typing results revealed that some isolates previously reported as *S.* Enteritidis phage type 9a were phage type 11.

Figure 40 shows the annual trend for selected *Salmonella* serotypes in recent years. *S.* Typhimurium phage type 56 variant showed a large increase in 2013, with numbers of isolates returning to previous levels in 2014. Serotypes with a decreasing trend in the last five years were *S.* Typhimurium phage type 160 and *S.* Typhimurium phage type 1.

Figure 40. Percentage of laboratory-reported cases for selected Salmonella types by year, 2010–2014



2. Non-human isolates

A total of 729 non-human *Salmonella* isolates were typed by the Enteric Reference Laboratory during 2014. *S.* Brandenburg was the most commonly isolated serotype in non-human samples during 2014. Some caution should be exercised with respect to trends in non-human typing data as the basis for sample selection may differ from year to year (Table 54).

Table 54. *Salmonella* serotypes and subtypes from non-human sources identified by the Enteric Reference Laboratory, 2010−2014

Serotype	2010	2011	2012	2013	2014	Major sources, 2014
S. Typhimurium	**574**	**656**	**421**	**358**	**220**	
1	57	39	57	26	13	Bovine (10)
9	45	23	9	39	9	Bovine (8)
56 variant[a]	39	42	33	79	38	Equine (11), feline (8), bovine (7)
101	88	91	53	57	48	Bovine (36)
RDNC	41	38	33	32	16	Bovine (10)
Unknown or other	304	423	236	125	96	
Other serotypes	**646**	**783**	**600**	**609**	**509**	
S. Agona	25	77	26	42	17	Bovine (4)
S. Anatum	6	6	10	28	23	Environmental (8)
S. Brandenburg	238	203	113	197	129	Bovine (53), ovine (52)
S. Hindmarsh	56	65	77	56	77	Ovine (70)
S. Infantis	34	78	78	67	27	Food (12), miscellaneous (8)
S. Mbandaka	16	25	35	26	20	Environmental (7), meat/bone meal (5)
S. Saintpaul	12	16	13	22	22	Reptile (7), avian (5)
Other or unknown serotypes	259	313	248	171	194	
Total	**1220**	**1439**	**1021**	**967**	**729**	

[a] *Salmonella* Typhimurium phage type 56 variant was previously known as *S.* Typhimurium phage type RDNC-May 06. Further characterisation by the *Salmonella* Reference Unit at Colindale (Public Health England) identified this phage type to be a 56 variant.

3. Outbreak types

Table 55 shows the number of hospitalised cases and total cases by subtype for the seven foodborne *Salmonella* outbreaks reported during 2014. A *Salmonella* subtype was determined for three of the seven foodborne *Salmonella* outbreaks in 2014. No subtype was determined for the largest outbreak (22 cases).

Table 55. *Salmonella* subtypes reported in foodborne outbreaks, 2014

Pathogen and subtype	Outbreaks	Total cases	Hospitalised cases
S. Infantis	1	5	4
S. Enteritidis phage type 1	1	2	0
S. Typhimurium phage type 193	1	3	0
S. Newport	1	22	0
S. Typhimurium phage type 120	1	4	1
S. Corvallis	1	2	1
S. Typhimurium phage type 155	1	6	0

Recent surveys

Nil.

Relevant New Zealand studies and publications

Journal papers

Analysis of faecal samples (*n* = 1283) from calves on New Zealand dairy farms (*n* = 97) found *Salmonella* in faecal samples from three 1-5 days-old calves and four 9-21 days-old calves [18].

A widespread salmonellosis outbreak in 2012 linked to consumption of hummus made from contaminated tahini imported into New Zealand from Turkey was summarised [24]. Three tahini-associated serotypes were detected in cases who had consumed tahini and pulsed-filed gel electrophoresis (PFGE) typing showed that clinical profiles were indistinguishable from the tahini-associated profiles.

Reports

An assessment of microbiological risks associated with consumption of raw milk was published, including information on the prevalence of *Salmonella* spp. in raw milk [16]. Two surveys were reported, neither of which detected *Salmonella* spp. in raw milk. The report also gave estimates of the number of cases of salmonellosis expected, based on different raw milk distribution scenarios.

Relevant regulatory developments

Nil.

Sapovirus infection

Case definition

Clinical description:	Gastroenteritis usually lasting 2-6 days.
Laboratory test for diagnosis:	Detection of sapovirus in faecal or vomit specimen or leftover food (currently shellfish is the only food able to be tested for sapovirus).
Case classification:	
Probable	A clinically compatible illness.
Confirmed	A clinically compatible illness that is laboratory confirmed, OR a clinically compatible illness and a common exposure associated with a laboratory confirmed case.

Sapovirus infection cases reported in 2014 by data source

In 2014, six notifications of sapovirus infection and no resulting deaths were reported in EpiSurv. It should be noted that not every case of sapovirus infection is notifiable; only those that are part of a common source outbreak or from a person in a high risk category.

Outbreaks reported as caused by sapovirus

In 2014, 16 sapovirus outbreaks were reported in EpiSurv with 301 associated cases and no deaths. None of the outbreaks was reported to be foodborne (Table 56). An outbreak has been classed as foodborne in this report if food was recorded as one of the likely modes of transmission applicable to the outbreak. It is important to note that a single outbreak may have multiple pathogens, modes of transmission, settings where exposure occurred, or settings where preparation of food was conducted.

Laboratory testing for sapovirus began in New Zealand in 2009. Since 2009 specimens from gastroenteritis outbreaks found to be negative for norovirus have been tested for the presence of sapovirus. Viral analyses are performed by ESR's Norovirus Reference Laboratory. The food types that can be analysed are currently limited. In 2014, sapovirus was identified in 18 (18.9%) of the reported 95 norovirus-negative gastroenteritis outbreaks. This was higher than the number of sapovirus outbreaks reported in 2013 (8 outbreaks from 75 norovirus-negative outbreaks, 10.7%).

Table 56. Sapovirus outbreaks reported, 2014

Measure	Foodborne sapovirus outbreaks	All sapovirus outbreaks
Outbreaks	0	16
Cases	0	301
Hospitalised cases	0	1

There was one foodborne sapovirus outbreak in 2013 with two associated cases, no foodborne sapovirus outbreaks in 2012, one foodborne sapovirus outbreak in 2011 with 14 cases and two foodborne sapovirus outbreaks reported in 2010 with 24 associated cases.

Recent surveys

Nil.

Relevant New Zealand studies and publications

Nil.

Relevant regulatory developments

Nil.

Shigellosis

Summary data for shigellosis in 2014 are given in Table 57.

Table 57. Summary of surveillance data for shigellosis, 2014

Parameter	Value in 2014	Source
Number of notified cases	128	EpiSurv
Notification rate (per 100,000)	2.8	EpiSurv
Hospitalisations (% of notifications)[a]	18 (14.1%)	MoH NMDS, EpiSurv
Deaths (% of notifications)[a]	1 (0.8%)	EpiSurv
Estimated travel-related cases (%)[a]	78 (61.0%)	EpiSurv
Estimated food-related cases (%)	NE	

NE = not estimated, no information is available on the food attributable proportion of shigellosis in New Zealand.

[a] Percentage of the number of notified cases. Cases hospitalised may not be notified on EpiSurv.

Case definition

Clinical description: Acute diarrhoea with fever, abdominal cramps, blood or mucus in the stools and a high secondary attack rate among contacts.

Laboratory test for diagnosis: Isolation of any *Shigella* spp. from a stool sample or rectal swab and confirmation of genus.

Case classification:

Probable: A clinically compatible illness that is either a contact of a confirmed case of the same disease, or has had contact with the same common source ie, is part of an identified common source outbreak.

Confirmed: A clinically compatible illness that is laboratory confirmed.

Shigellosis cases reported in 2014 by data source

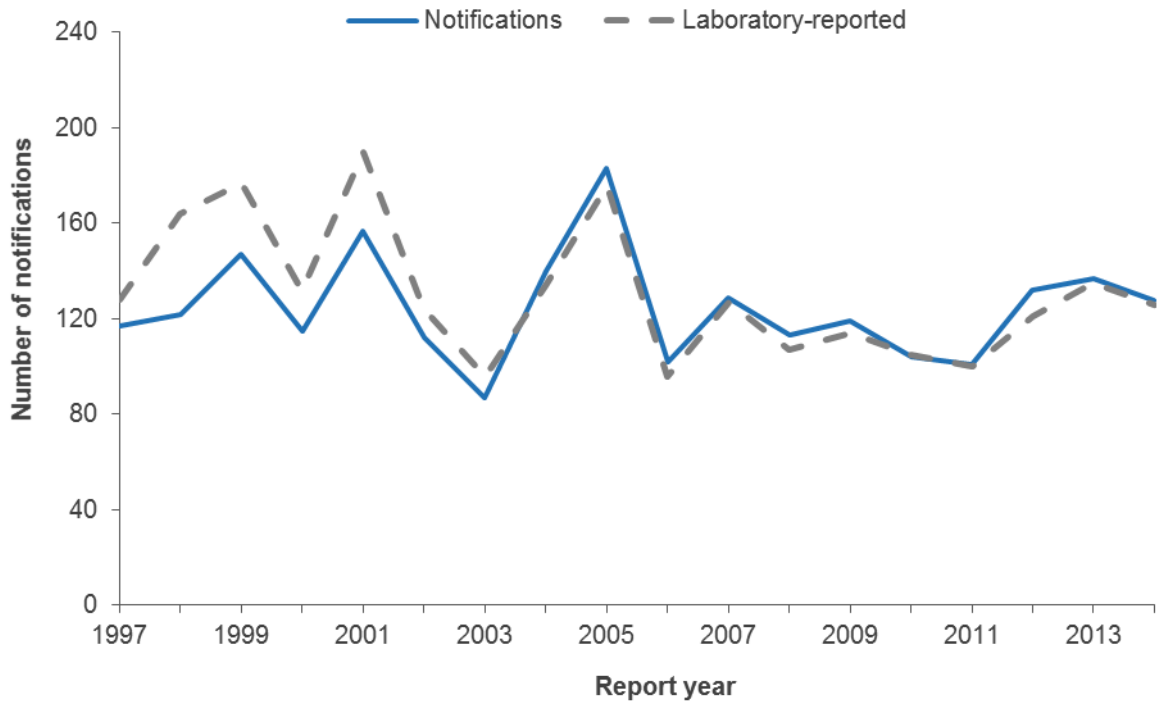
During 2014, 128 notifications (2.8 cases per 100,000 population) of shigellosis and one resulting death was reported in EpiSurv. The Enteric Reference Laboratory at ESR reported 126 cases (2.8 per 100,000 population) infected with *Shigella* in 2014.

The ICD-10 code A03 was used to extract shigellosis hospitalisation data from the MoH NMDS database. Of the 18 hospital admissions (0.4 admissions per 100,000 population) recorded in 2014, 12 were reported with shigellosis as the principal diagnosis and six with shigellosis as another relevant diagnosis.

Notifiable disease data

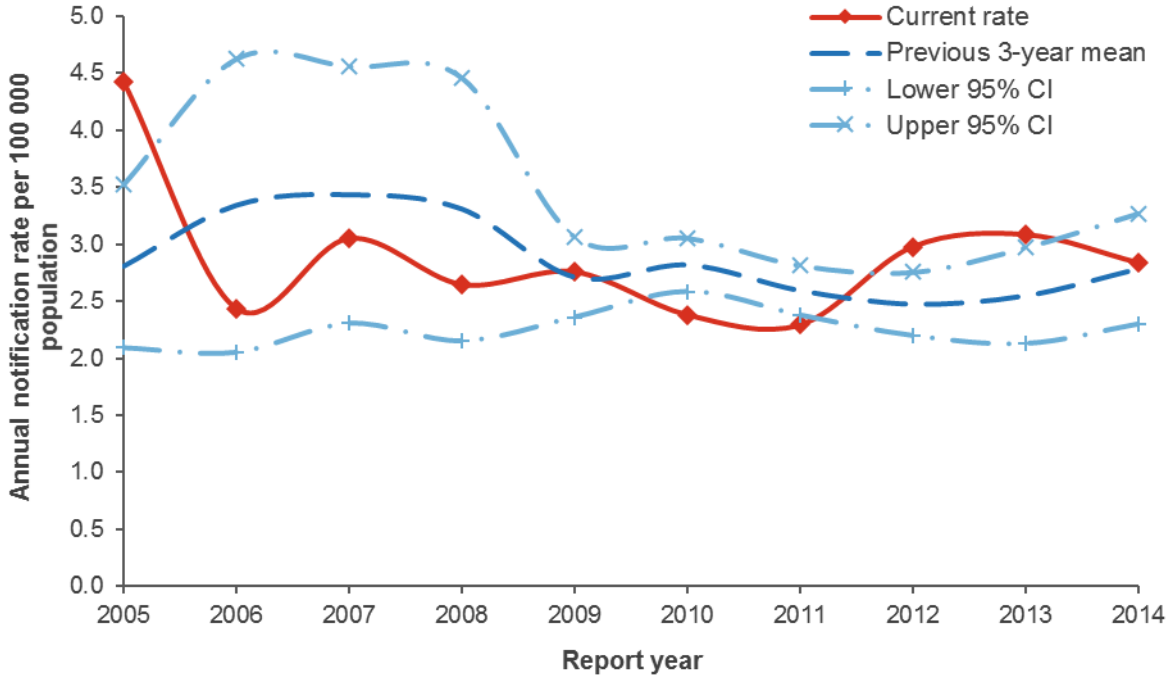
The number of notifications and laboratory reported cases of shigellosis was variable from year to year with the highest peak in notifications in 2005 (183 cases). Between 2006 and 2014 the number of notifications has been in the range of 102 to 137 cases (Figure 41).

Figure 41. Shigellosis notifications and laboratory-reported cases by year, 1997–2014



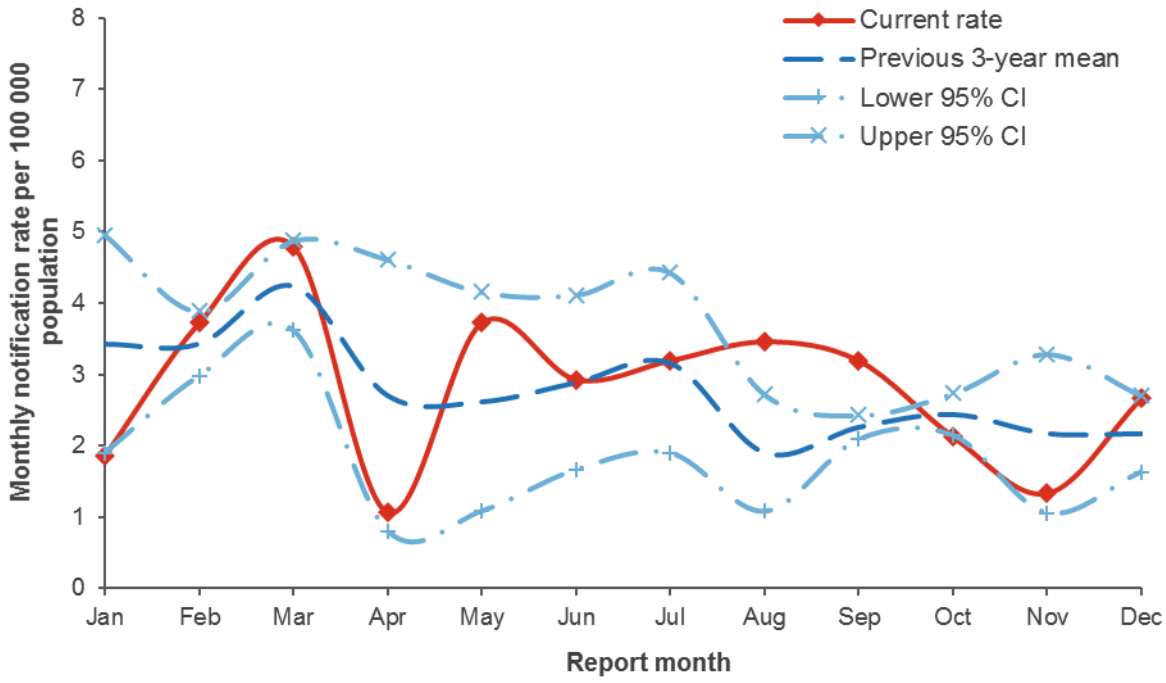
The shigellosis rate for 2014 shows a decrease compared to the previous two years, but the rate for 2014 is very similar to the previous 3-year mean (Figure 42).

Figure 42. Shigellosis notification rate by year, 2005–2014



The number of notified cases of shigellosis per 100,000 population by month for 2014 is shown in Figure 43. In 2014, the shigellosis notification rate showed two pronounced troughs in April and November and a higher than recent rate in August and September.

Figure 43. Shigellosis monthly rate (annualised), 2014



In 2014, the rates of notification and hospitalisation for shigellosis were higher for males compared to females (Table 58). This is the reverse of the pattern seen in 2013.

Table 58. Shigellosis cases by sex, 2014

Sex	EpiSurv notifications		Hospitalisations[a]	
	No.	Rate[b]	No.	Rate[b]
Male	75	3.4	11	0.5
Female	53	2.3	7	0.3
Total	**128**	**2.8**	**18**	**0.4**

[a] MoH NMDS data for hospital admissions
[b] per 100,000 of population

Shigellosis rates of notification were highest for those in the 1 to 4 years age group. Rates of notification were very consistent for all age groups in the range 20 to 59 years. The hospitalisation rates were not defined for any age group due to the small number of cases in each group (Table 59).

Table 59. Shigellosis cases by age group, 2014

Age group	EpiSurv notifications		Hospitalisations[a]	
	No.	Rate[b]	No.	Rate[b]
<1	2	-	0	-
1 to 4	10	4.0	0	-
5 to 9	10	3.3	1	-
10 to 14	2	-	1	-
15 to 19	5	1.6	1	-
20 to 29	21	3.4	3	-
30 to 39	19	3.5	4	-
40 to 49	21	3.4	1	-
50 to 59	19	3.2	1	-
60 to 69	13	2.8	4	-
70+	6	1.4	2	-
Total	**128**	**2.8**	**18**	**0.4**

[a] MoH NMDS data for hospital admissions
[b] per 100,000 of population (rate not calculated when fewer than five cases reported)

The most commonly reported risk factor for shigellosis cases in 2014 was overseas travel during the incubation period (61.0%), followed by contact with faecal matter (32.3%) and contact with other symptomatic people (27.8%) (Table 60).

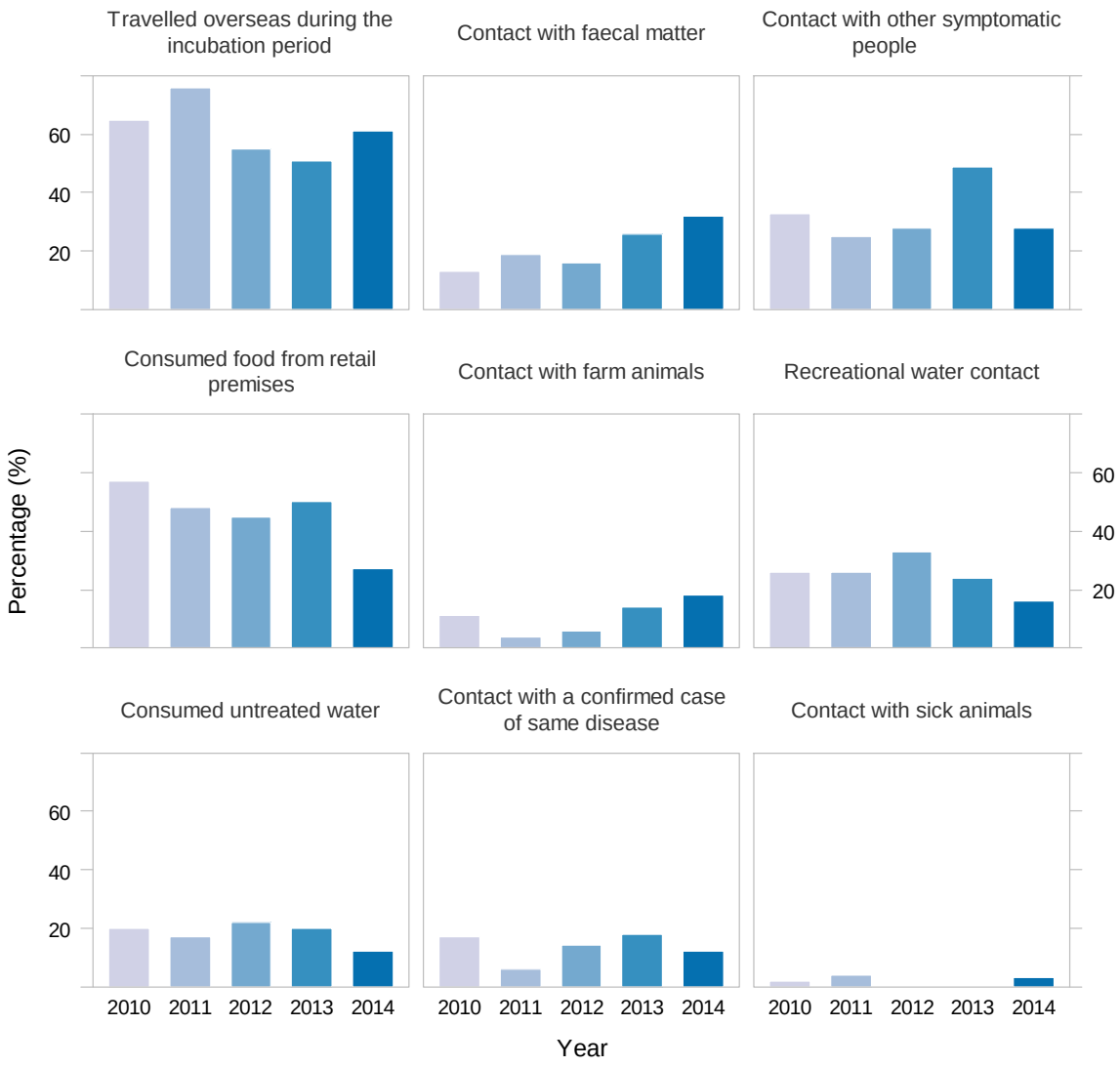
Table 60. Exposure to risk factors reported for shigellosis notifications, 2014

Risk factor	Notifications			
	Yes	No	Unknown	%[a]
Travelled overseas during the incubation period	72	46	10	61.0
Contact with faecal matter	10	21	97	32.3
Contact with other symptomatic people	10	26	92	27.8
Consumed food from retail premises	7	19	102	26.9
Contact with farm animals	6	28	94	17.6
Recreational water contact	5	26	97	16.1
Consumed untreated water	3	22	103	12.0
Contact with a confirmed case of same disease	3	22	103	12.0

[a] Percentage refers to the cases that answered "yes" out of the total number of cases for which this information was supplied.
Cases may have more than one risk factor recorded.

During the period 2010–2014, overseas travel during the incubation period has been the leading reported risk factor for shigellosis (Figure 44). During this period contact with faecal matter and contact with farm animals have increased as reported risk factors, while the consuming food from retail premises and recreational water contact have been less frequently reported as risk factors.

Figure 44. Percentage of cases by exposure to risk factors associated with shigellosis and year, 2010–2014



For cases where information on travel was provided, 61.0% (95% CI 51.6-69.7%) had travelled overseas during the incubation period. Assuming that the cases for which travel information was provided were representative of all shigellosis cases, a Poisson distribution can be used to estimate the total number of potentially travel related cases of shigellosis in 2014. The resultant distribution has a mean of 78 cases (95% CI 55-105).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 57.7% (95% CI 52.8-62.4%).

Outbreaks reported as caused by *Shigella* spp.

In 2014, there were 11 *Shigella* spp. outbreaks reported and four of these were reported to be foodborne (Table 61). An outbreak has been classed as foodborne in this report if food was recorded as one of the likely modes of transmission applicable to the outbreak. It is important to note that a single outbreak may have multiple pathogens, modes of transmission, settings where exposure occurred, or settings where preparation of food was conducted. Both of the hospitalisations due to *Shigella* spp. were associated with foodborne outbreaks.

Table 61. *Shigella* spp. outbreaks reported, 2014

Measure	Foodborne *Shigella* spp. outbreaks	All *Shigella* spp. outbreaks
Outbreaks	4	11
Cases	32	71
Hospitalised cases	2	2

Foodborne shigellosis outbreaks are relatively rare. In the four year period 2011–2014, four foodborne outbreaks have been reported each year (with 27, 10, 21 and 32 cases, respectively). From 2005 to 2010 there were no more than two outbreaks reported each year (Figure 45).

Figure 45. Foodborne *Shigella* spp. outbreaks and associated cases reported by year, 2005–2014

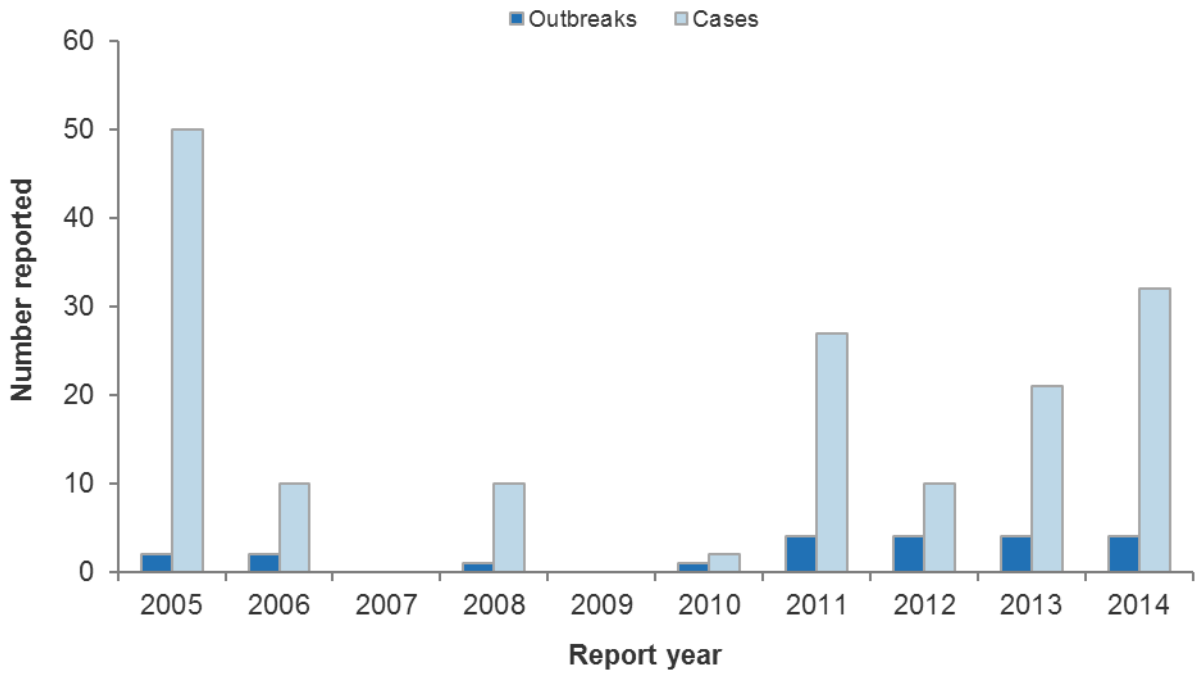


Table 62 contains details of the foodborne *Shigella* spp. outbreaks reported in 2014. The evidence linking any of these outbreaks to specific foods or food in general was weak.

Table 62. Details of foodborne *Shigella* spp. outbreaks, 2014

PHU	Month	Suspected vehicle	Exposure setting	Preparation setting	No. ill
Auckland	Feb	Unknown	Hotel/motel	Hotel/motel	1C, 1P
Regional Public Health	May	Unknown	Unknown	Unknown	6C, 1P
Auckland	Aug	Unknown	Other setting	Unknown	1C, 1P
Taranaki	Dec	Unknown	Hotel/motel	Hotel/motel	1C, 20P

PHU: Public Health Unit, C: confirmed, P: probable.

No clinical or food samples were submitted to ESR's Public Health Laboratory relating to the *Shigella* spp. outbreaks listed in Table 62.

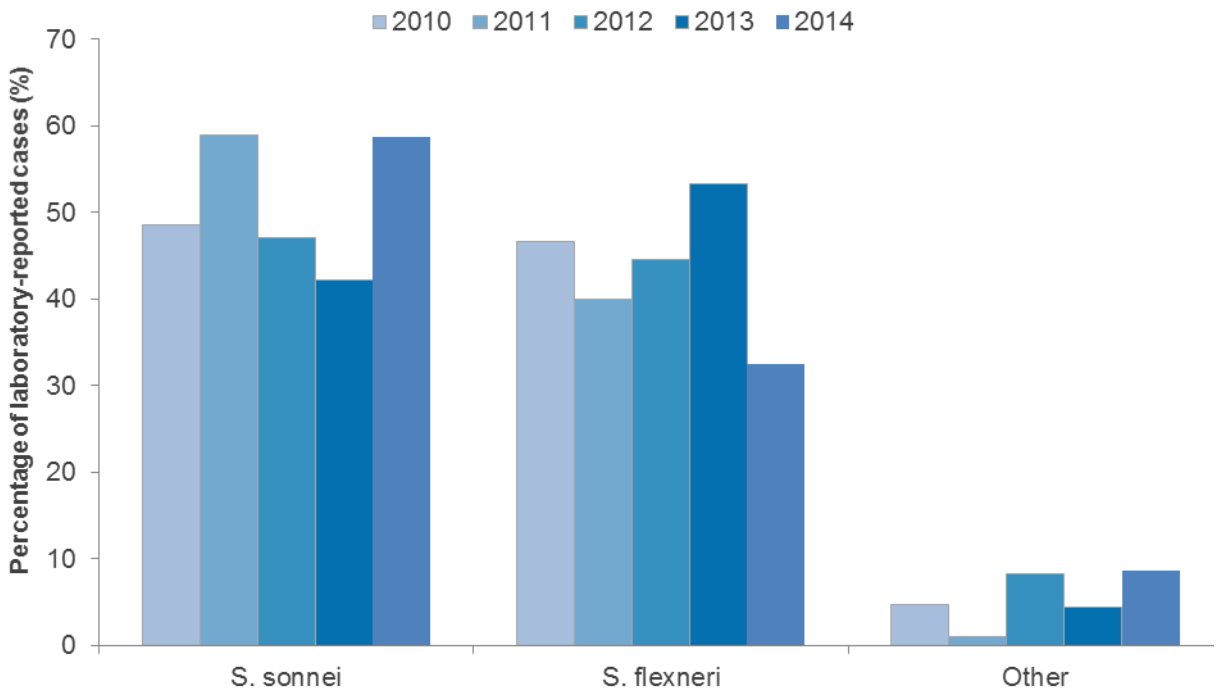
Shigella types commonly reported

In 2014, the Enteric Reference Laboratory at ESR reported 126 cases infected with *Shigella* spp. *Shigella sonnei* biotype a and biotype g were the predominant subtypes confirmed in 2014 (Table 63). The increasing trend in the percentage of cases infected with *S. flexneri* and a decreasing trend for infection with *S. sonnei* seen in recent years was reversed in 2014. Infection with *S. sonnei* was more common than *S. flexneri* in 2014 (Figure 46).

Table 63. Shigella species and subtypes identified by the Enteric Reference Laboratory, 2010–2014

Species	2010	2011	2012	2013	2014
S. sonnei	**51**	**59**	**57**	**57**	**74**
biotype a	27	38	27	35	32
biotype f	1	1	3	1	6
biotype g	23	20	27	21	36
S. flexneri	**49**	**40**	**54**	**72**	**41**
1	4	4	1	6	7
2a	21	15	10	12	11
2b	10	1	3	2	6
3a	6	5	3	10	4
Other	8	13	31	32	13
Other	**5**	**1**	**10**	**6**	**11**
S. boydii	4	0	7	5	9
S. dysenteriae	1	1	3	1	1
Shigella species not identified	0	0	0	0	1
Total	**105**	**100**	**121**	**135**	**126**

Figure 46. Percentage of laboratory-reported cases by *Shigella* species and year, 2010–2014



Recent surveys

Nil.

Relevant New Zealand studies and publications

Nil.

Relevant regulatory developments

Nil.

Staphylococcus aureus intoxication

Case definition

Clinical description:	Gastroenteritis with sudden onset of vomiting or diarrhoea.
Laboratory test for diagnosis:	Detection of enterotoxin in faecal or vomit specimen or in leftover food or isolation of ≥10^3/gram coagulase-positive *S. aureus* from faecal or vomit specimen or ≥10^5 from leftover food.
Case classification:	
Probable	A clinically compatible illness.
Confirmed	A clinically compatible illness that is laboratory confirmed, OR a clinically compatible illness and a common exposure associated with a laboratory confirmed case.

Staphylococcus aureus intoxication cases reported in 2014 by data source

During 2014, there was one notification of *S. aureus* intoxication and no resulting deaths reported in EpiSurv. Note that not every case of *S. aureus* intoxication is necessarily notifiable, only those where there is a suspected common source.

The ICD-10 code A05.0 was used to extract foodborne staphylococcal intoxication hospitalisation data from the MoH NMDS database. There was one hospital admission recorded in 2014 with *S. aureus* intoxication recorded as the principal diagnosis.

Outbreaks reported as caused by *Staphylococcus aureus*

In 2014, one foodborne *S. aureus* outbreak was reported with four associated cases (Table 64). An outbreak has been classed as foodborne in this report if food was recorded as one of the likely modes of transmission applicable to the outbreak. It is important to note that a single outbreak may have multiple pathogens, modes of transmission, settings where exposure occurred, or settings where preparation of food was conducted.

Table 64. *S. aureus* outbreaks reported, 2014

Measure	Foodborne *S. aureus* outbreaks	All *S. aureus* outbreaks
Outbreaks	1	1
Cases	4	4
Hospitalised cases	0	0

The number of foodborne outbreaks associated with *S. aureus* reported each year between 2005 and 2014 ranged from zero to five (Figure 47). No *S. aureus* outbreaks were reported in EpiSurv in four of the last ten years.

Figure 47. Foodborne *S. aureus* outbreaks and associated cases reported by year, 2005–2014

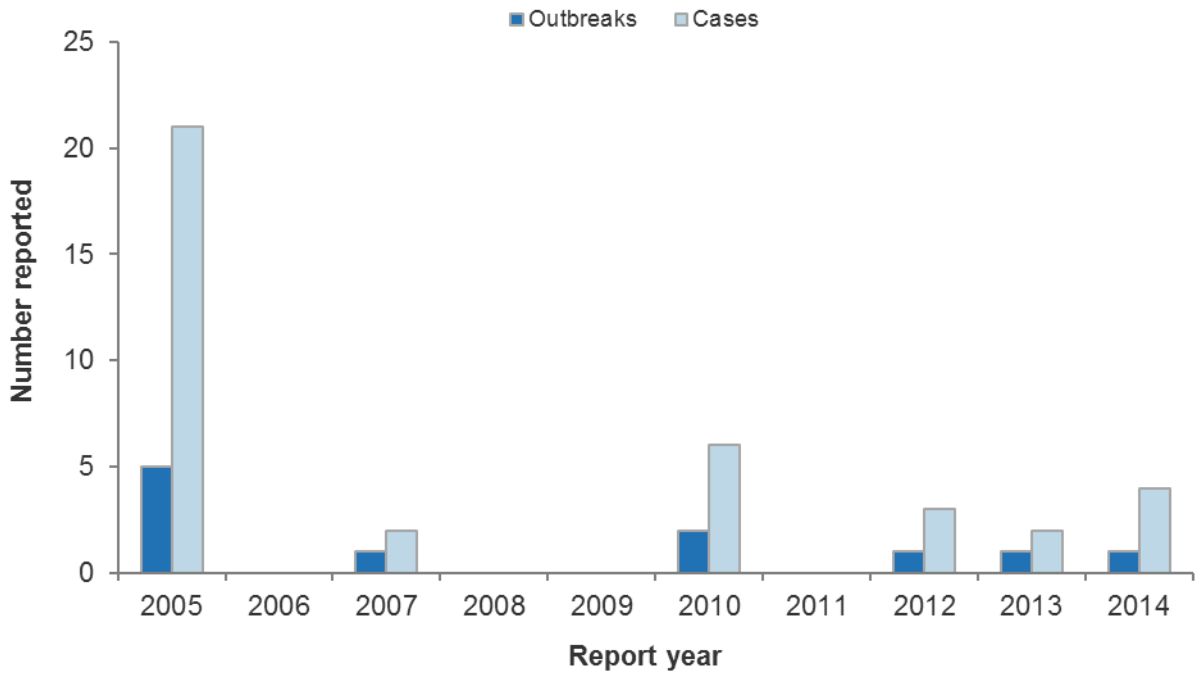


Table 65 contains details of the single foodborne *S. aureus* outbreak reported in 2014. No suspected food vehicle was listed for this outbreak.

Table 65. Details of foodborne *S. aureus* outbreak, 2014

PHU	Month	Suspected vehicle	Exposure setting	Preparation setting	No. ill
Taranaki	May	Unknown	Restaurant/cafe/bakery	Restaurant/cafe/bakery	1C, 3P

PHU: Public Health Unit, C: confirmed, P: probable.

In 2014, faecal specimens were submitted to ESR's Public Health Laboratory relating to the food-associated *S. aureus* outbreak listed in Table 65. Staphylococcal enterotoxin was not detected.

Recent surveys

Nil.

Relevant New Zealand studies and publications

Reports

An assessment of microbiological risks associated with consumption of raw milk was published, including information on the prevalence of *S. aureus* in raw milk [16]. Two surveys found prevalence of 74.1 and 79.9%.

Relevant regulatory developments

Nil.

Toxic shellfish poisoning

Case definition

Due to the diverse nature of toxins that may cause toxic shellfish poisoning, no consistent clinical description is provided for this condition. Depending on the toxin involved, toxic shellfish poisoning may result in various combinations of gastrointestinal, neurosensory, neurocerebellar/neuromotor, general neurological and other symptoms.

Suspected:

Amnesic shellfish poisoning (ASP): Vomiting or diarrhoea occurring within 24 hours of consuming shellfish AND no other probable cause identified by microbiological examination of faecal specimen from the case or microbiological testing of leftover food AND/OR one or more of the neurological symptoms from group C (see below) occurring within 48 hours of consuming shellfish.

Diarrhoeic shellfish poisoning (DSP): Vomiting or diarrhoea occurring within 24 hours of consuming shellfish AND no other probable cause identified by microbiological examination of faecal specimen from the case or microbiological testing of leftover food.

Neurotoxic shellfish poisoning (NSP): Two or more of the neurological symptoms from groups A and B (see below) occurring within 24 hours of consuming shellfish.

Paralytic shellfish poisoning (PSP): Paraesthesia occurring within 12 hours of consuming shellfish AND one of the neurological symptoms from group B (see below).

Toxic shellfish poisoning type unspecified (TSP): Vomiting or diarrhoea occurring within 24 hours of consuming shellfish AND no other probable cause identified by microbiological examination of faecal specimen from the case or microbiological testing of leftover food OR any of the neurological symptoms from groups A and B (see below) occurring within 24 hours of consuming shellfish OR one or more of the neurological signs/symptoms from group C (see below) occurring within 48 hours of consuming shellfish.

Clinical symptoms for assigning status

Group A

- paraesthesia - ie numbness or tingling around the mouth, face or extremities
- alteration of temperature sensation

Group B

- weakness such as trouble rising from seat or bed
- difficulty swallowing
- difficulty breathing
- paralysis
- clumsiness
- unsteady walking
- dizziness/vertigo
- slurred/unclear speech
- double vision

Group C

- confusion
- memory loss
- disorientation
- seizure
- coma

Probable:

Meets case definition for suspect case AND detection of relevant biotoxin at or above the regulatory limit in shellfish obtained from near or same site (not leftovers) within seven days of collection of shellfish consumed by case. Current levels are as follows:

ASP: 20 ppm domoic acid/100 g shellfish

DSP: 20 g/100 g or 5 MU/100 g shellfish

(MU = mouse units)

NSP: 20 MU/100 g shellfish

PSP: 80 g/100 g shellfish

Confirmed:

Meets case definition for suspect case AND detection of TSP biotoxin in leftover shellfish at a level resulting in the case consuming a dose likely to cause illness. Current dose levels are as follows:

ASP: 0.05 mg/kg body weight
DSP: ingestion of 48 µg or 12 MU
NSP: 0.3 MU/kg body weight
PSP: 10 MU/kg body weight (≅ 2µg/kg body weight)

Toxic shellfish poisoning cases reported in 2014

During 2014, 18 notifications (0.4 cases per 100,000 population) of toxic shellfish poisoning and no resulting deaths were reported in EpiSurv.

The ICD-10 code T61.2 was used to extract hospitalisation data for 'other fish and shellfish poisoning' from the MoH NMDS database. Of the 29 hospital admissions (0.64 admissions per 100,000 population) reported in 2014, all were reported with 'other fish and shellfish poisoning' as the primary diagnosis. Note that this ICD-10 code includes shellfish and other fish. It should be noted that EpiSurv and the MoH NMDS database are separate systems and hospital admission can occur without cases being notified.

Outbreaks reported as caused by toxic shellfish poisoning

In 2014, one toxic shellfish poisoning outbreak was reported (Table 66) in which cases had symptoms consistent with PSP. It should be noted that all toxic shellfish poisoning outbreaks will be categorised as foodborne, as consumption of contaminated shellfish is the only currently recognised transmission route for this disease.

Table 66. Details of foodborne PSP outbreak, 2014

PHU	Month	Suspected vehicle	Exposure setting	Preparation setting	No. ill
Toi Te Ora	Dec	Shellfish tuatua and mussels - recreational collection	Other setting	Commercial food manufacturer	1C, 12P

PHU: Public Health Unit, C: confirmed, P: probable.

In 2014, samples of tuatua and mussels samples were submitted to ESR's Public Health Laboratory relating to toxic shellfish poisoning outbreak summarised in Table 66. Toxin associated with PSP was detected in all samples.

Recent surveys

Nil.

Relevant New Zealand studies and publications

Nil.

Relevant regulatory developments

Nil.

VTEC/STEC infection

Summary data for VTEC/STEC infection in 2014 are given in Table 67.

Table 67. Summary of surveillance data for VTEC/STEC infection, 2014

Parameter	Value in 2014	Source
Number of notified cases	187	EpiSurv
Notification rate (per 100,000)	4.1	EpiSurv
Hospitalisations (% of notifications)a	12 (6.4%)	MoH NMDS, EpiSurv
Deaths (% of notifications)a	1 (0.5%)	EpiSurv
Estimated travel-related cases (%)a	12 (6.3%)	EpiSurv
Estimated food-related cases (%)b	52 (29.9%)	Expert consultation

[a] Percentage of the number of notified cases. Cases hospitalised may not be notified on EpiSurv.

[b] For estimation of food-related cases the proportions derived from expert consultation exclude travel-related cases. The expert elicitation derived separate estimates of the foodborne proportion for O157 VTEC/STEC and non-O157 VTEC/STEC. The estimate for O157 VTEC/STEC, the dominant serotype, has been used to estimate the number of food-related cases.

Case definition

Clinical description: Diarrhoea resulting from infection with VTEC/STEC may range from mild, watery and non-bloody to almost pure bloody diarrhoea with abdominal cramping. The disease is distinguishable from other causes of gastroenteritis by its high incidence of bloody diarrhoea (profuse rectal bleeding without fever sometimes clouds the diagnosis), severity (approximately 40% of cases are hospitalised) and frequency of complications. Haemolytic uraemic syndrome (HUS) complicates 8–10% of VTEC/STEC infections in children; this syndrome includes haemolytic anaemia, thrombocytopenia and acute renal failure. Of children with HUS, 12–30% will have severe sequelae, including renal and cerebral impairment. Elderly patients with VTEC infections may suffer thrombotic thrombocytopenic purpura (TTP), which is similar to HUS but with greater neurological involvement.

Laboratory test for diagnosis: Isolation of Shiga toxin (verotoxin) producing *Escherichia coli* OR detection of the genes associated with the production of Shiga toxin in *E. Coli.*

Case classification:

Probable Not applicable.

Confirmed A clinically compatible illness that is laboratory confirmed.

VTEC/STEC infection cases reported in 2014 by data source

During 2014, 187 notifications (4.1 cases per 100,000 population) of VTEC/STEC infection and one resulting death were reported in EpiSurv. The Enteric Reference Laboratory at ESR reported 193 cases (4.3 cases per 100,000) infected with VTEC/STEC in 2014.

The ICD-10 code A04.3 was used to extract enterohaemorrhagic *E. coli* infection hospitalisation data from the MoH NMDS database. Of the 12 hospital admissions (0.3 admissions per 100,000 population) recorded in 2014, 7 were reported with enterohaemorrhagic *E. coli* infection as the principal diagnosis and 5 with enterohaemorrhagic *E. coli* infection as another relevant diagnosis.

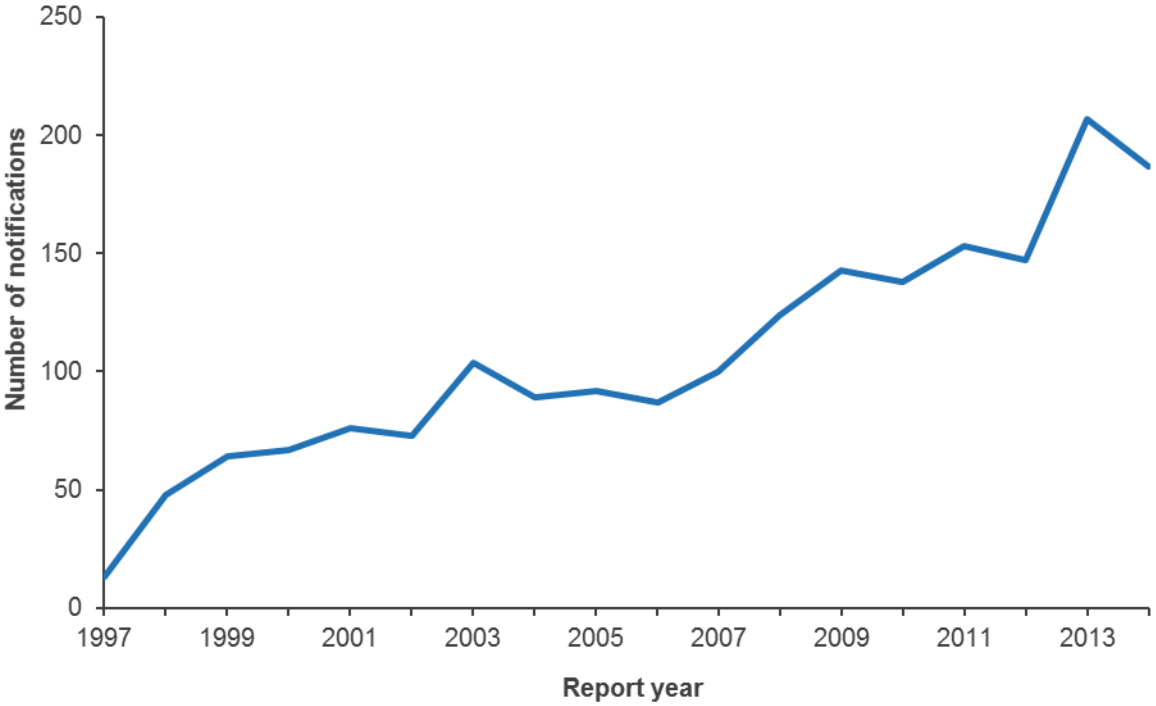
It has been estimated by expert consultation that 29.9% (95th percentile credible interval; 3.5% to 60.7%) of O157 VTEC/STEC incidence and 34.0% (95th percentile credible interval: 3.5% to 63.5%) of non-O157 incidence is due to foodborne transmission. The expert consultation also estimated that

approximately 30% of foodborne VTEC/STEC transmission was due to red meat, irrespective of serotype.

Notifiable disease data

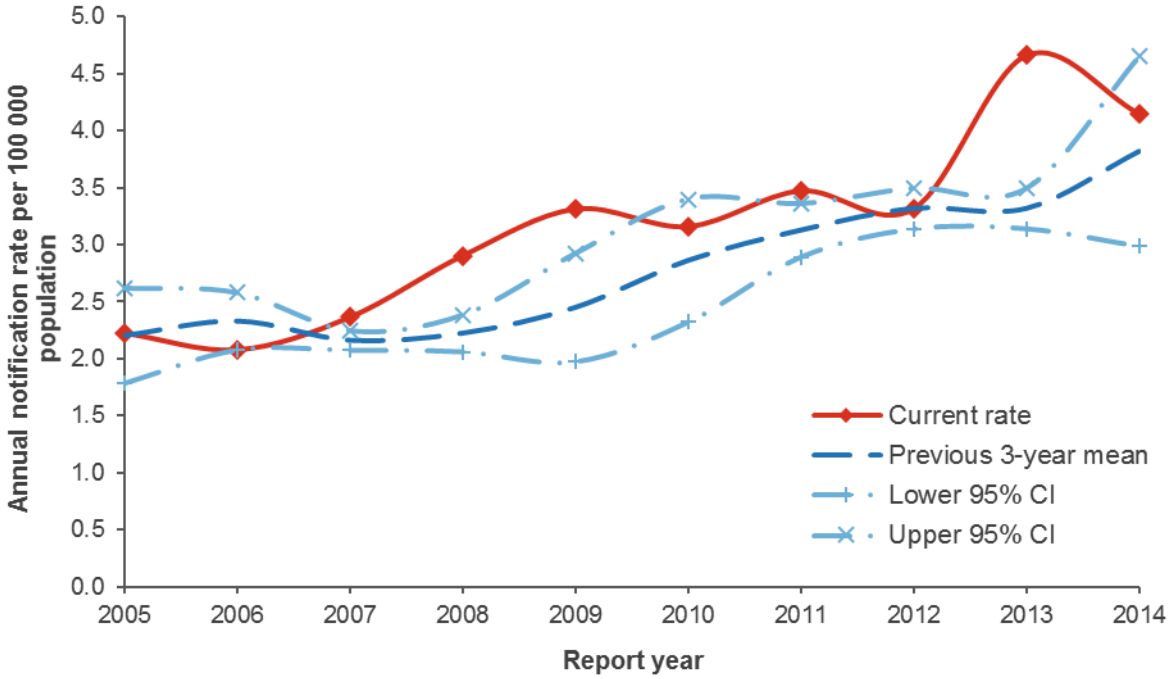
In 2014, there was a decrease in VTEC/STEC infection notifications following an increasing trend in the number of VTEC/STEC infection notifications reported since the condition became notifiable. The highest number of notifications since 1997 was reported in 2013 (207 cases) (Figure 48).

Figure 48. VTEC/STEC infection notifications by year, 1997–2014



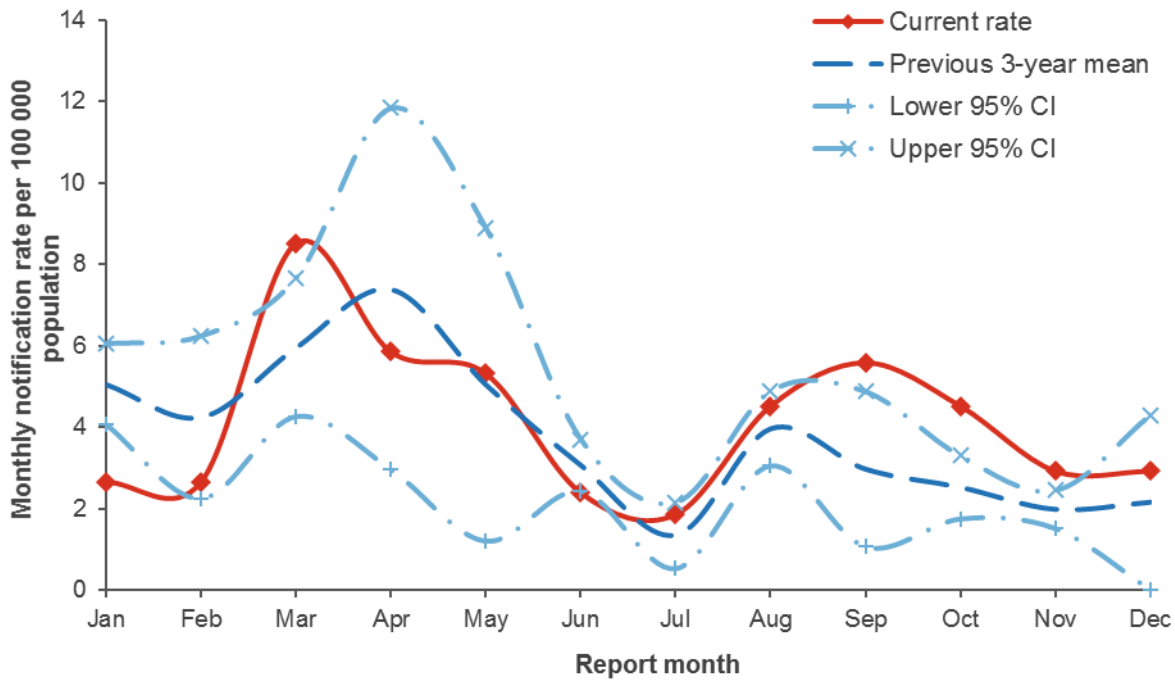
There was a decrease in the VTEC/STEC infection annual notification rate in 2014 following a marked increase seen in 2013, compared to the previous three years (Figure 49).

Figure 49. VTEC/STEC infection notification rate by year, 2005–2014



The number of notified cases of VTEC/STEC infection per 100,000 population by month for 2014 are shown in Figure 50. The 2014 monthly notification rate trend was similar to the trend in recent years with the exception of a defined peak in autumn that to split into two separate peaks. The spring peak also appears to have occurred slightly later in 2014, compared to the historical mean.

Figure 50. VTEC/STEC infection monthly rate (annualised), 2014



In 2014, notification rates were higher for females than males. Hospitalisation rates were also higher for females than for males (Table 68).

Table 68. VTEC/STEC infection cases by sex, 2014

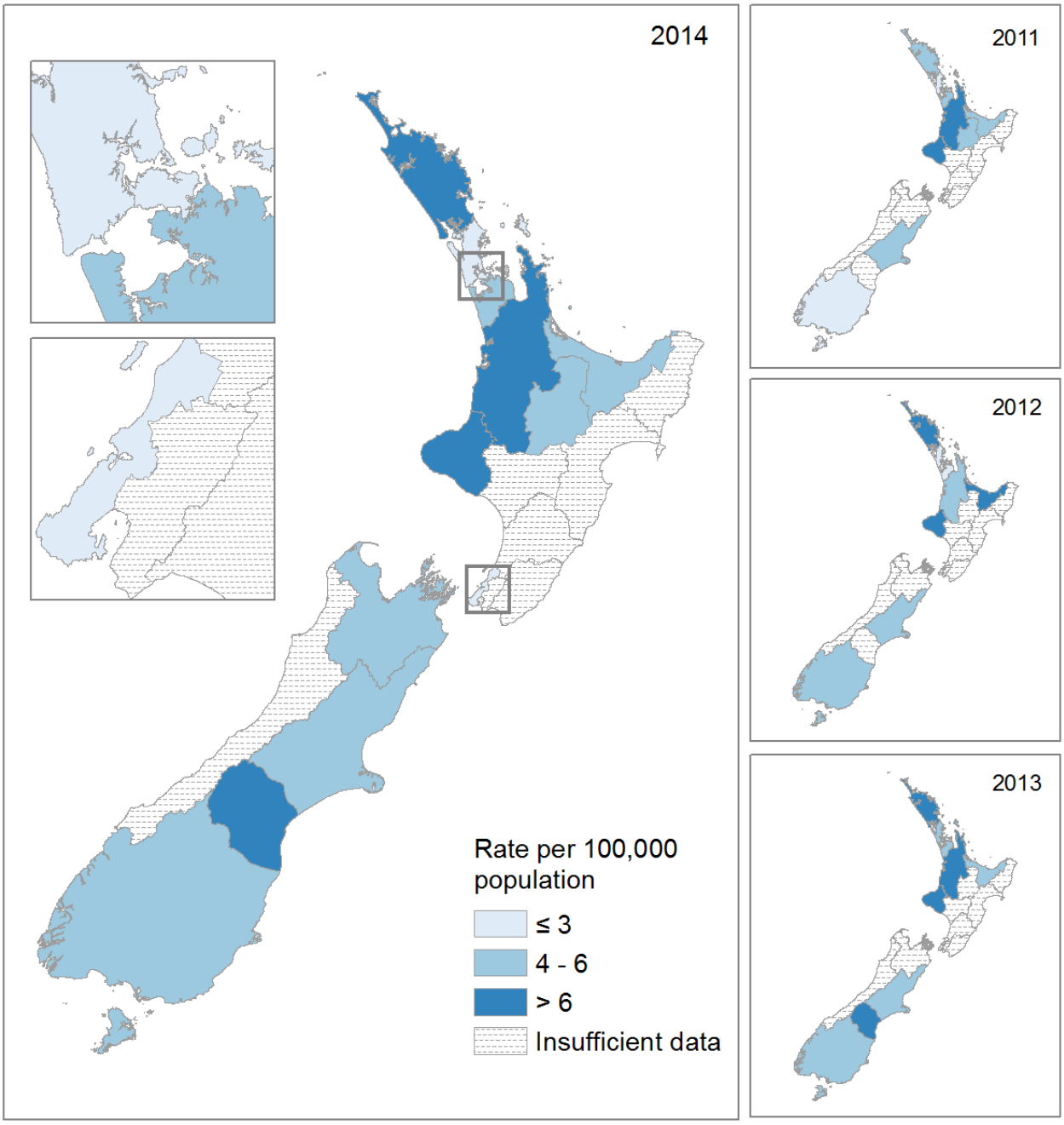
Sex	EpiSurv notifications		Hospitalisations[a]	
	No.	Rate[b]	No.	Rate[b]
Male	80	3.6	5	0.2
Female	107	4.7	7	0.3
Total	**187**	**4.1**	**12**	**0.3**

[a] MoH NMDS data for hospital admissions

[b] per 100,000 of population

Rates of VTEC/STEC infection varied throughout the country as illustrated in Figure 51. In 2014, the highest rates of VTEC/STEC infection were for South Canterbury (12.0 per 100,000, seven cases), Waikato (10.2 per 100,000, 39 cases), and Northland (6.6 per 100,000, 11 cases) DHBs. Note that rates were not calculated for 7 DHBs where there were insufficient (less than 5) cases notified in 2014.

Figure 51. Geographic distribution of VTEC/STEC infection notifications, 2011–2014



In 2014, the VTEC/STEC infection notification rate was highest for the 1 to 4 years age group (28.8 per 100,000 population, 72 cases), followed by the less than 1 year age group (18.7 per 100,000, 11 cases). The number of hospitalisations ranged between zero and five for each of the age groups (Table 69).

Table 69. VTEC/STEC infection cases by age group, 2014

Age group (years)	EpiSurv notifications		Hospitalisations[a]	
	No.	Rate[b]	No.	Rate[b]
<1	11	18.7	0	-
1 to 4	72	28.8	5	2.0
5 to 9	17	5.5	0	-
10 to 14	6	2.0	0	-
15 to 19	10	3.2	1	-
20 to 29	17	2.8	0	-
30 to 39	11	2.0	0	-
40 to 49	11	1.8	1	-
50 to 59	10	1.7	0	-
60 to 69	13	2.8	2	-
70+	9	2.1	3	-
Total	**187**	**4.1**	**12**	**0.3**

[a] MoH NMDS data for hospital admissions
[b] per 100,000 of population (rate not calculated when fewer than five cases reported)

It should be noted that VTEC/STEC infection cases are reported using a different report form to other enteric diseases, resulting in an expanded range of risk factors. In 2014, the most commonly reported risk factors for VTEC/STEC infection cases were consumption of dairy products (86.7%), consumption of raw fruit/vegetables (85.5%), and contact with household pets (84.9%) (Table 70).

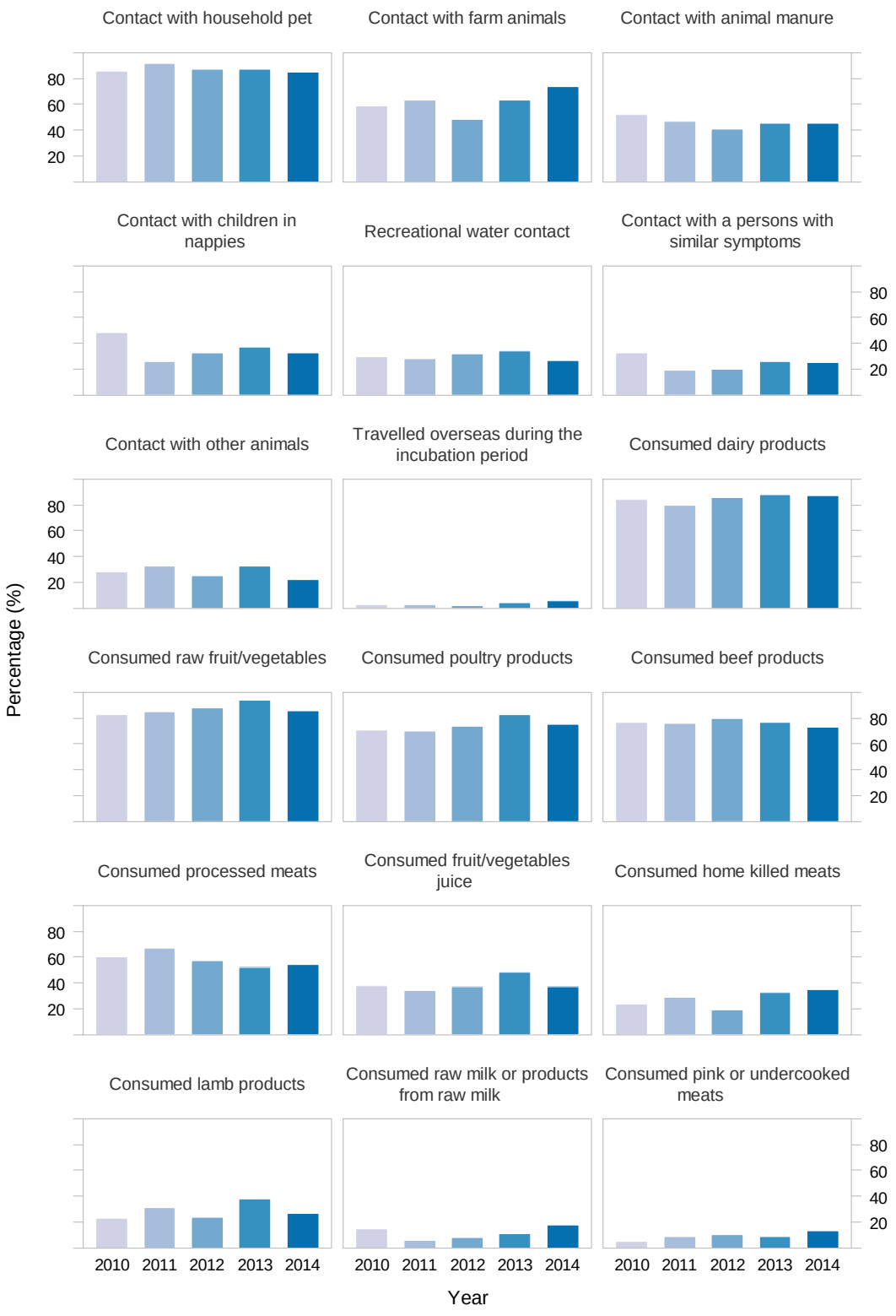
Table 70. Exposure to risk factors reported for notifications of VTEC/STEC infection, 2014

Risk factor	Notifications			
	Yes	No	Unknown	%[a]
Consumed dairy products	104	16	67	86.7
Consumed raw fruit/vegetables	106	18	63	85.5
Contact with household pets	73	13	101	84.9
Consumed poultry products	84	28	75	75.0
Contact with farm animals	62	22	103	73.8
Consumed beef products	82	31	74	72.6
Consumed processed meats	62	53	72	53.9
Contact with animal manure	28	34	125	45.2
Consumed fruit/vegetables juice	39	66	82	37.1
Consumed home killed meats	39	74	74	34.5
Contact with children in nappies	38	77	72	33.0
Recreational water contact	35	93	59	27.3
Consumed lamb products	28	77	82	26.7
Contact with persons with similar symptoms	32	95	60	25.2
Contact with other animals	15	52	120	22.4
Consumed raw milk or products from raw milk	22	102	63	17.7
Consumed pink or undercooked meats	14	98	75	12.5
Travelled overseas during the incubation period	9	134	44	6.3

[a] Percentage refers to the cases that answered "yes" out of the total number of cases for which this information was supplied. Cases may have more than one risk factor recorded.

Between 2010 and 2014, the risk factors reported by VTEC/STEC infection cases generally occurred in the same order of importance and to a similar magnitude (Figure 52). The most commonly reported risk factors (excluding consumption of various commonly-consumed foods) were contact with household pets and contact with farm animals. The foods with the highest reporting frequency by cases were raw fruit and vegetables, and dairy products, followed closely by beef and poultry products, and processed meats.

Figure 52. Percentage of cases with exposure to risk factors reported for VTEC/STEC infection and year, 2010−2014



For cases where information on travel was provided, 6.3% (95% CI 3.1-12.0%) had travelled overseas during the incubation period. Assuming that the cases for which travel information was provided were representative of all VTEC/STEC infection cases, a Poisson distribution can be used to estimate the total number of potentially travel-related cases of VTEC/STEC infection in 2014. The resultant distribution has a mean of 12 cases (95% CI 3-24).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 4.1% (95% CI 2.6-6.2%).

Outbreaks reported as caused by VTEC/STEC

Of the 10 VTEC/STEC outbreaks in 2014, four were reported as foodborne outbreaks with 15 associated cases, including three cases that were hospitalised (Table 71). An outbreak has been classed as foodborne in this report if food was recorded as one of the likely modes of transmission applicable to the outbreak. It is important to note that a single outbreak may have multiple pathogens, modes of transmission, settings where exposure occurred, or settings where preparation of food was conducted.

Table 71. VTEC/STEC outbreaks reported, 2014

Measure	Foodborne VTEC/STEC outbreaks	All VTEC/STEC outbreaks
Outbreaks	4	10
Cases	15	35
Hospitalised cases	3	6

Over the period from 2005 to 2014 no more than four foodborne outbreaks of VTEC/STEC were reported each year with no outbreaks reported for 4 of the years (Figure 53). With the exception of an outbreak in 2008 with 14 associated cases, no outbreak in this period had more than five associated cases.

Figure 53. Foodborne VTEC/STEC outbreaks and associated cases reported by year, 2005–2014

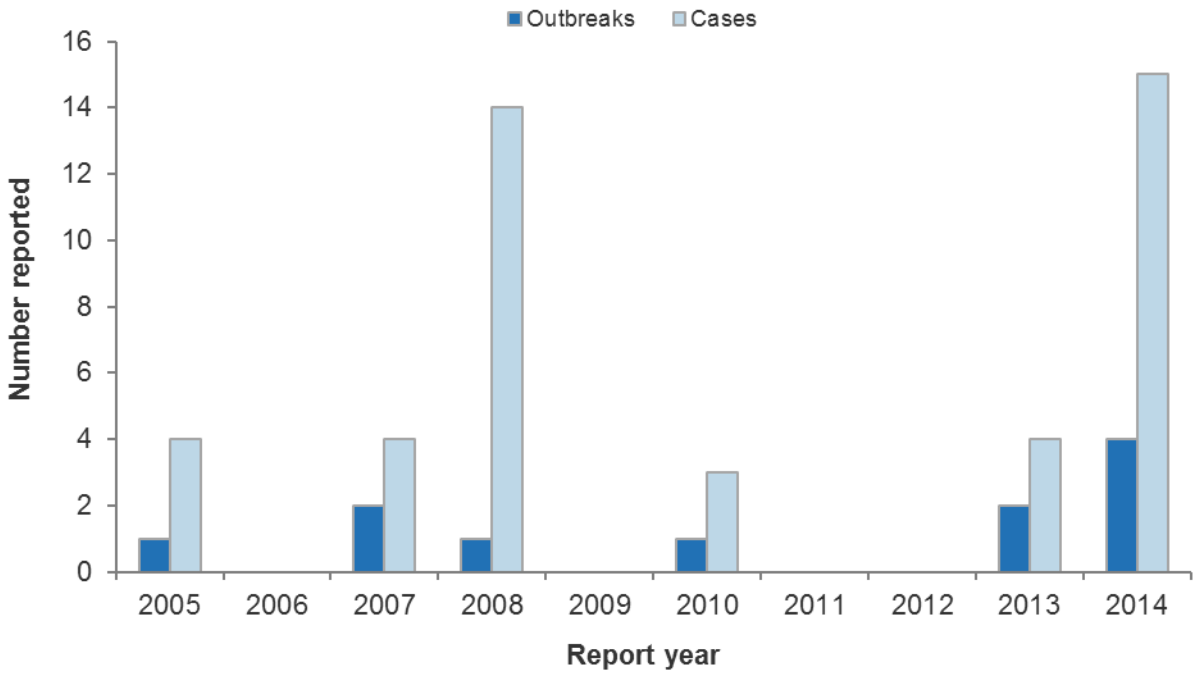


Table 72 contains details of the foodborne VTEC/STEC outbreaks reported in 2014. The evidence linking any of these outbreaks to specific foods or food in general was weak. The serotypes from all four outbreaks were identified as E.coli O157:H7.

Table 72. Details of foodborne VTEC/STEC outbreaks reported, 2014

PHU	Month	Suspected vehicle	Exposure setting	Preparation setting	No. ill
Waikato	Jan	Unknown	Home	Home	1C, 2P
Auckland	Mar	Raw milk	Home	Farm	2C, 3P
Community and Public Health	Apr	Raw milk	Farm	Farm	3C, 2P
Waikato	Sep	Unknown[a]	Home	Home	2C

PHU: Public Health Unit, C: confirmed, P: probable.

a: A specific vehicle was not reported, but drinking raw milk was listed as one of suspected factors along with other risk factors.

In 2014, food and faecal samples were submitted to ESR's Public Health Laboratory relating to one of the food-associated VTEC/STEC outbreaks listed in Table 72 (Auckland). E.coli O157:H7 was isolated from faeces, but not from the associated raw milk sample.

VTEC/STEC types commonly reported

A total of 193 cases infected with VTEC/STEC were reported by the ESR Enteric Reference Laboratory in 2014. Of these, 170 (88.1%) isolates were identified as *E. coli* O157:H7, 21 as non-O157:H7 and for two isolates VTEC could not be isolated although verocytotoxin was detected by PCR. Of the 21 non-O157:H7 isolates, three were typed as O176:HNM and two each as O26:HNM, O38:H26, O68:HNM, O182:HNM and ONT:HNM. The remaining eight isolates were all unique serotypes (Table 73). The number of non-O157 VTEC/STEC cases in 2014 was similar to 2013, although the percentage of non-O157:H7 cases was slightly higher than in 2013, due the lower overall number of VTEC/STEC isolates typed (Figure 54).

Table 73. VTEC/STEC subtypes identified by the Enteric Reference Laboratory, 2010–2014

Serotype	2010	2011	2012	2013	2014
O157	**115**	**139**	**119**	**192**	**170**
O157:H7	115	139	119	192	170
Non-O157	**13**	**14**	**23**	**22**	**21**
O26:HNM					2
O38:H26					2
O68:HNM					2
O84:H2	1	2			1
O121:H19				2	
O128:H2	1	2		1	
O176:HNM	2	1	1		3
O182:HNM					2
ONT:HNM			9	1	2
ONT:H11			2	1	
Other types[a]	9	9	11	17	
Unable to be typed				**1**	**2**
Total	**128**	**153**	**142**	**215**	**193**

[a] Single cases following types were identified

2010: ONT:H21, ONT:H23, ORough:HNT, ORough:H7, O77:HNM, O123:H8, ONT:HRough, O68:HNM, ONT:H2

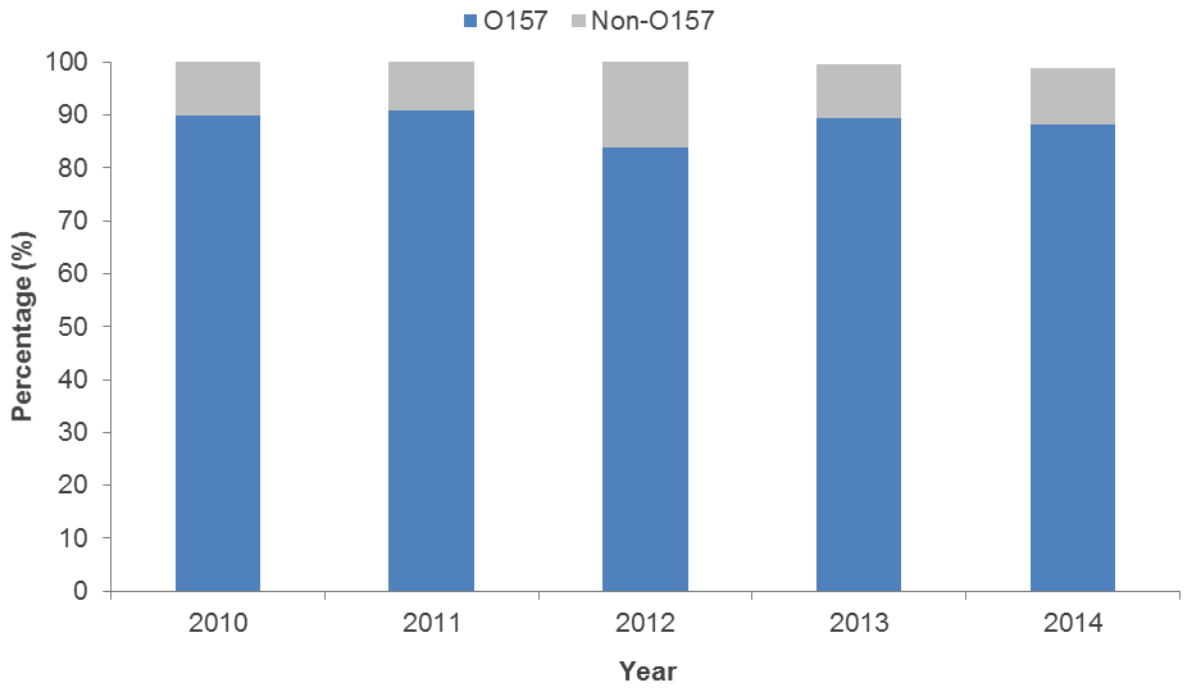
2011: O103:H2, O123:HNM, O131:HRough, O146:H21, O178:H23, O26:H11, O84:HNM, ONT:H2, ORough:H2

2012: O26:H7, O26:H11, O38:H26, O68:HNM, O84:HNM, O128:HNM, O146:H21, O146:HRough, O176:HRough, O180:HNM, ONT:H7

2013: O26:M11, O38:H26, O84:HNM, O84:HNT, O103:H25, O116:H11, O121:HNT, O123:HMN, O145:H34, O156:H25, O163:H19, O177:HNM, O179:H8, O182:HNM, ONT:H2, ORough:H2, ORough:HNM

2014: O6:H7, O26:H11, O108:H25, O146:H21, ONT:H2, ONT:H6, ONT:H21

Figure 54. Percentage of *E. coli* O157 and non-O157 laboratory-reported cases by year, 2010–2014



Most human isolates of O157:H7 are further genotyped by pulsed-field gel electrophoresis (PFGE). Table 74 summarises PFGE typing of human O157:H7 isolates each year from 2010 to 2014.

Table 74. PFGE genotypes of human *E. coli* O157:H7 isolates, 2010-2014

Genotype	Number of isolates				
	2010	2011	2012	2013	2014
Xb0097	20	19	12	30	22
Xb0168	8	12	14	7	13
Xb0079	9	24	24	29	12
Xb0049	7	8	4	8	7
Xb0456					5
Xb0110	1	1	2	5	4
Xb0233			1	10	4
Xb0343		1		1	4
Xb0370	7	3	8	2	4
Xb0014	1	4	5	2	4
Xb0117	2	6	2	12	4
Other types	60	60	46	83	38
Total	**115**	**138**	**118**	**189**	**172**

PFGE pattern designations are sequential numbers given to each different PFGE patterns, with pattern numbers assigned in the order the patterns are identified. During 2014, the PFGE pattern database was reviewed, and some pattern designations changed. Isolates reported previously may now have a different PFGE pattern designation from that previously reported

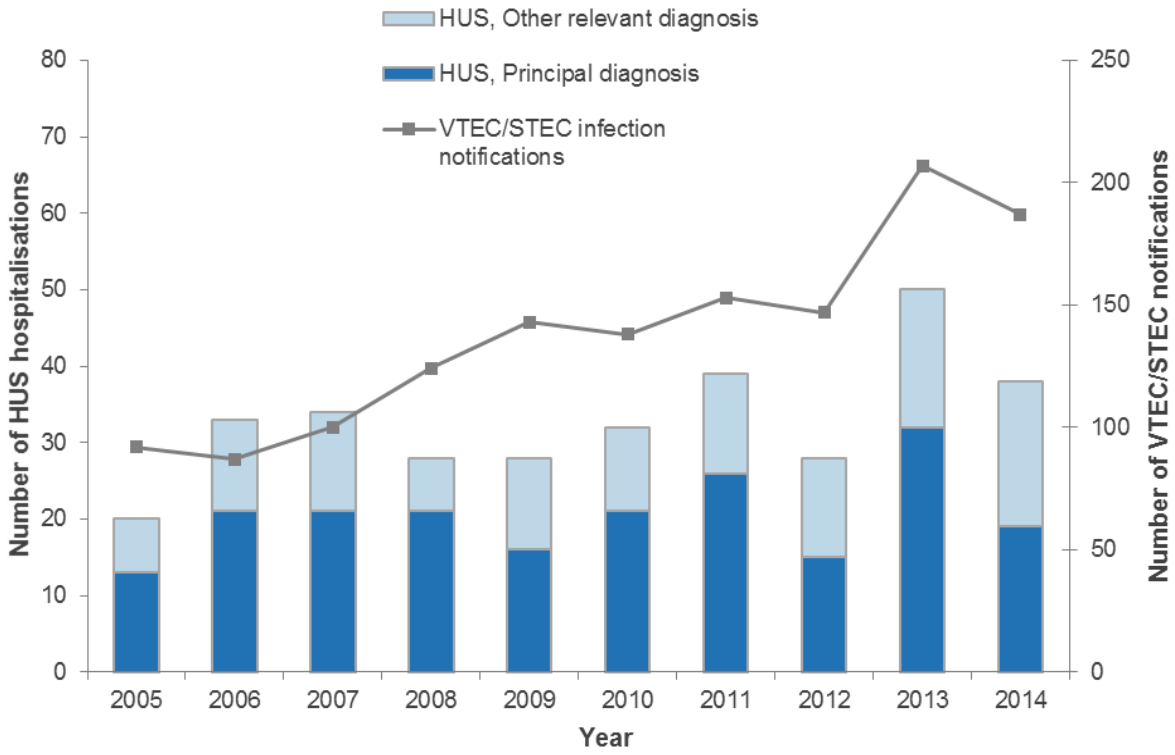
Disease sequelae – haemolytic uraemic syndrome (HUS)

HUS is a serious sequela that may result from a VTEC/STEC infection.

The ICD-10 code D59.3 was used to extract HUS hospitalisation data from the MoH NMDS database. Of the 38 hospital admissions recorded in 2014 (0.8 per 100,000 population), 19 were reported with HUS as the primary diagnosis and 19 with HUS as another relevant diagnosis.

Between 2005 and 2014, the number of hospitalised cases (any diagnosis code) of HUS each year ranged from 20 to 50 (Figure 55). In 2014, the number of hospitalised cases decreased to 38 from a high of 50 in 2013. This decrease corresponded with a decrease in the number of VTEC/STEC notifications.

Figure 55. Haemolytic-uraemic syndrome (HUS) hospitalised cases, 2005–2014



In 2014, the number of female hospitalised cases due to HUS was greater than the number of male cases (Table 75). In 2013, the number of female hospitalised cases was the approximately twice the number of male cases.

Table 75. Haemolytic uraemic syndrome hospitalised cases by sex, 2014

Sex	Hospitalised cases[a]	
	No.	Rate[b]
Male	17	0.8
Female	21	0.9
Total	**38**	**0.8**

[a] MoH NMDS data for hospital admissions
[b] per 100,000 of population

In 2014, the highest age-specific rates of hospitalised cases due to HUS were in the less than 5 years age group (Table 76).

Table 76. Haemolytic uraemic syndrome hospitalised cases by age group, 2014

Age group (years)	Hospitalised cases [a]	
	No.	Rate[b]
<5	19	6.2
5 to 9	0	0.0
10 to 14	1	0.3
15 to 19	1	0.3
20 to 29	3	0.5
30 to 39	2	0.4
40 to 49	4	0.6
50 to 59	3	0.5
60 to 69	2	0.4
70+	3	0.7
Total	**38**	**0.8**

[a] MoH NMDS data for hospital admissions

[b] per 100,000 of population (rate not calculated when fewer than five cases reported)

Haemolytic uraemic syndrome cases reported to the New Zealand Paediatric Surveillance Unit (NZPSU)

During 2014, 14 cases of HUS were reported to the NZPSU, of which 11 had a diarrhoeal prodrome. The median age at presentation of cases was 3.9 years (range 1.2 to 13 years). Six cases had *E. coli* O157:H7 isolated from their stools. Four of the 11 cases with a diarrhoeal prodrome lived on a farm or had visited a farm in the previous two weeks.

Note: the details given above are from an advance excerpt from the NZPSU Annual Report, which had not been published at the time of finalisation of the current report. The source reference provided here is the website where NZPSU Annual Reports are published: http://dnmeds.otago.ac.nz/departments/womens/paediatrics/research/nzpsu/about/annual-reports.html

Recent surveys

Summary of data from the 2013 Super 6 and O157 Bobby season

A total of 450 meat enrichment broths were submitted to ESR's Enteric Reference Laboratory (ERL) during the 2013 bobby (very young) calf season (1/7/2013 until 31/10/2013) for "Super 6" (436) and/or O157 (14) testing [25]. Thirty pure cultures of presumptive Escherichia coli O157 were submitted to ERL for confirmation by the primary laboratories performing the O157 IMS themselves. Sixty-three percent of the broths submitted for "Super 6" testing originated from the South Island, compared to only 36% in 2012.

PFGE analysis of meat isolates of E. coli O157:H7 in New Zealand (2013)

This report describes the results of PFGE analysis of 55 E. coli O157:H7 isolates from meat received by ESR during the period 1 January 2013 to 31 December 2013 [26]. All of the isolates were analysed by PFGE using both XbaI and BlnI. When the two PFGE types were combined, 41 XbaI:BlnI types were observed.

Relevant New Zealand studies and publications

Journal papers

Young calves (<7 days, *n* = 299) from the North Island of New Zealand were sampled (recto-anal mucosal swabs) and tested for the presence of STEC virulence markers (*stx1, stx2, eae, ehxA*) [27]. STEC were isolated from 8/299 (2.6%) of calves.

Pulsed-field gel electrophoresis (PFGE) and Shiga toxin-encoding bacteriophage insertion (SBI) typing were used to compare human and bovine STEC O157:H7 isolates from the North and South Islands of New Zealand and from Australia and the United States [28]. Population structure differed substantially between the North and South Islands and showed evidence of finer scale spatial structuring, consistent with highly localised transmission, rather than disseminated foodborne outbreaks.

Reports

An assessment of microbiological risks associated with consumption of raw milk was published, including information on the prevalence of STEC (O157:H7 and non-O157) in raw milk [16]. Two surveys were reported, with *E. coli* O157:H7 detected in one survey at a prevalence of 0.28%, while non-O157 STEC were detected in both surveys, at prevalences of 1.01 and 0.28%. The report also gave estimates of the number of cases of STEC infection expected, based on different raw milk distribution scenarios.

Relevant regulatory developments

Nil.

Yersiniosis

Summary data for yersiniosis in 2014 are given in Table 77.

Table 77. Summary of surveillance data for yersiniosis, 2014

Parameter	Value in 2014	Source
Number of notified cases	682	EpiSurv
Notification rate (per 100,000)	15.1	EpiSurv
Hospitalisations (% of notifications)a	50 (7.3%)	MoH NMDS
Deaths	0	EpiSurv
Estimated travel-related cases (%)a	55 (8%)	EpiSurv
Estimated food-related cases (%)b	396 (63.2%)	Expert consultation

[a] Percentage of the number of notified cases. Cases hospitalised may not be notified on EpiSurv.
[b] For estimation of food-related cases the proportions derived from expert consultation exclude travel-related cases.

Case definition

Clinical description: In children under 5 years old, *Y. enterocolitica* infection typically causes diarrhoea, vomiting, fever and occasionally abdominal pain. In contrast, older children and adults are more likely to experience abdominal pain as the prominent symptom. Bacteraemia and sepsis may occur in immunocompromised individuals. *Y. pseudotuberculosis* is more likely to cause mesenteric adenitis and septicaemia than *Y. enterocolitica*.

Laboratory test for diagnosis: Isolation of *Yersinia enterocolitica* or *Y. pseudotuberculosis* from blood or faeces OR detection of circulating antigen by ELISA or agglutination test.

Case classification:

Probable: A clinically compatible illness that is epidemiologically linked to a confirmed case or has had contact with the same common source – that is, is part of a common-source outbreak.

Confirmed: A clinically compatible illness that is laboratory confirmed.

Yersiniosis cases reported in 2014 by data source

During 2014, 682 notifications (15.1 cases per 100,000 population) of yersiniosis and no resulting deaths were reported in EpiSurv.

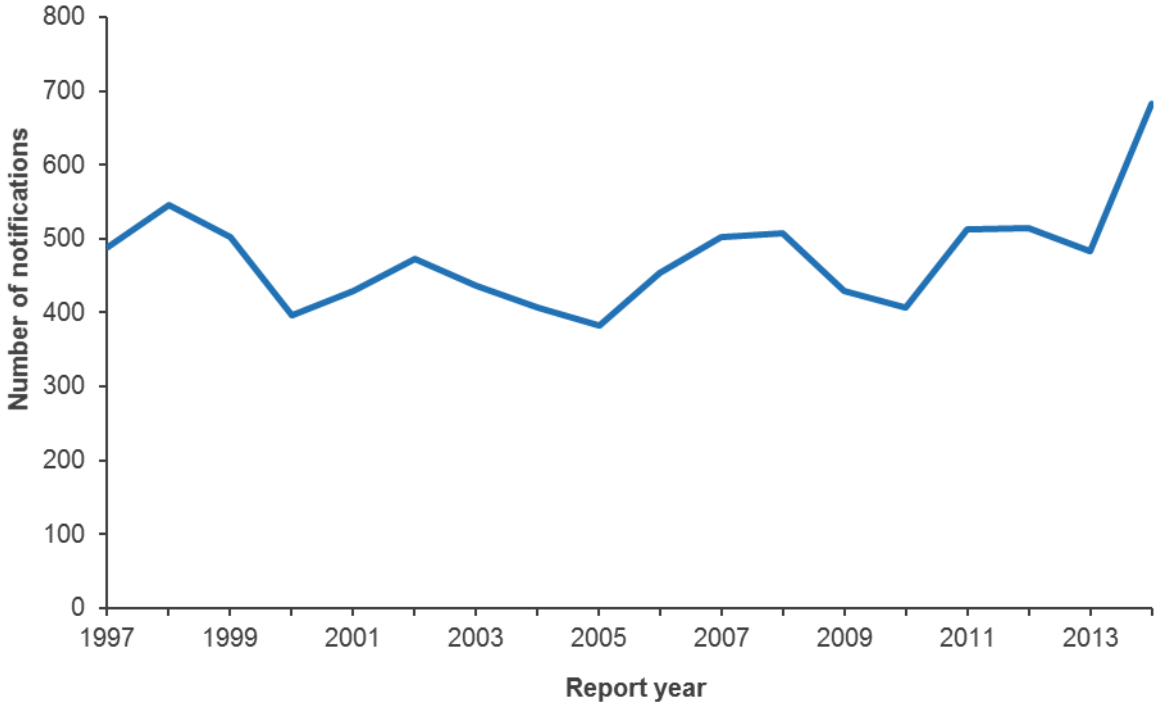
The ICD-10 code A04.6 was used to extract yersiniosis hospitalisation data from the MoH NMDS database. Of the 50 hospital admissions (1.1 admissions per 100,000 population) recorded in 2014, 26 were reported with yersiniosis as the principal diagnosis and 24 with yersiniosis as another relevant diagnosis.

It has been estimated by expert consultation that 63.2% (95th percentile credible interval: 29.0% to 91.5%) of yersiniosis incidence is due to foodborne transmission. Approximately 70% of foodborne transmission was estimated to be due to consumption of pork.

Notifiable disease data

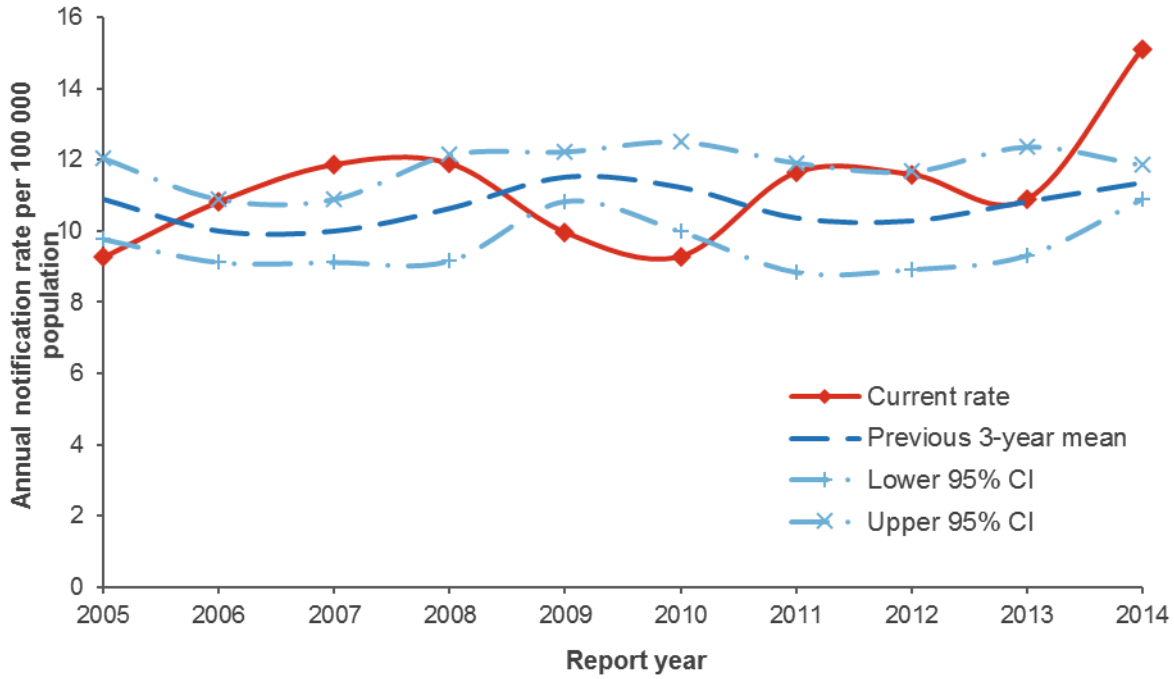
Yersiniosis became notifiable in 1996, with the highest number of notifications reported in 2014 (682). Since 1998, the annual number of notifications reported has been between 383 notifications (2005) and 682 notifications (2014) (Figure 56).

Figure 56. Yersiniosis notifications by year, 1997–2014



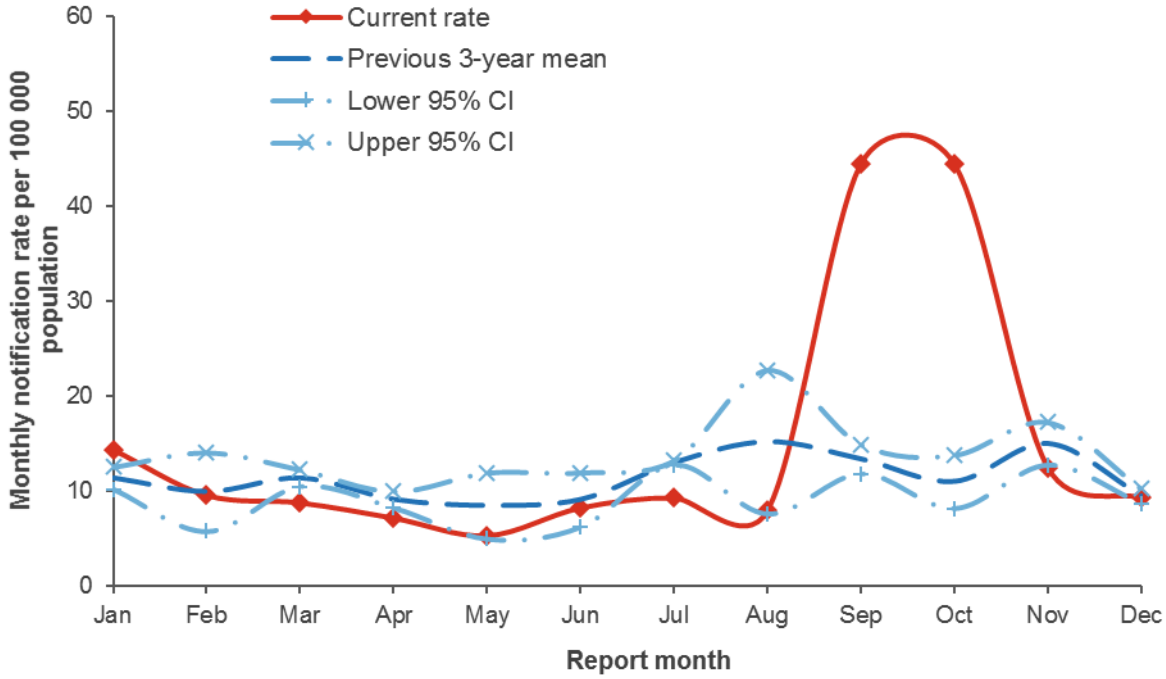
The yersiniosis annual notification rate has remained stable (ranging from 9.3 to 11.9 per 100,000) between 2005 and 2013, but increased markedly in 2014 (Figure 57).

Figure 57. Yersiniosis notification rate by year, 2005–2014



The number of notified cases of yersiniosis per 100,000 population by month for 2014 is shown in Figure 58. The 2014 monthly notification rate trend was similar to the mean monthly rate in previous years, with the exception of a large peak in notifications during September and October, associated with a single large outbreak (220 cases).

Figure 58. Yersiniosis monthly rate (annualised), 2014



The yersiniosis notification rate was slightly higher for males (15.5 per 100,000 population, 342 cases) than for females (14.8 per 100,000, 340 cases) in 2014. The hospitalisation rate was the same for females and males (Table 78).

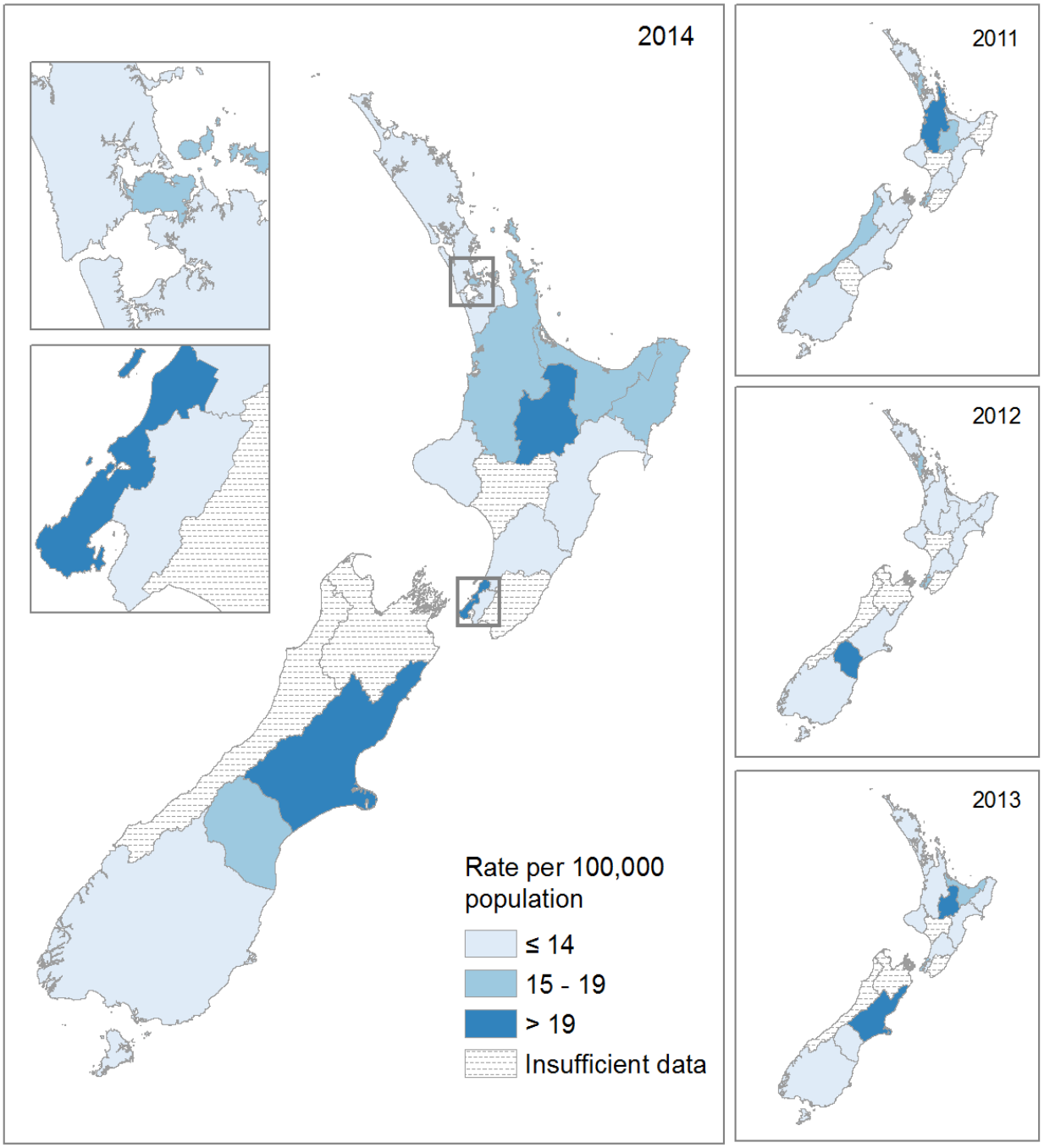
Table 78. Yersiniosis cases by sex, 2014

Sex	EpiSurv notifications		Hospitalisations[a]	
	No.	Rate[b]	No.	Rate[b]
Male	342	15.5	25	1.1
Female	340	14.8	25	1.1
Total	**682**	**15.1**	**50**	**1.1**

[a] MoH NMDS data for hospital admissions
[b] per 100,000 of population

Yersiniosis notification rates varied spatially and temporally throughout New Zealand over the last four years as illustrated in Figure 59. In 2014, the highest rates were for the Canterbury (35.4 per 100,000 population, 182 cases) and Lakes (25.1 per 100,000, 26 cases) DHBs.

Figure 59. Geographic distribution of yersiniosis notifications, 2011–2014



In 2014, the highest yersiniosis notification rates were for the less than 1 year (47.5 per 100,000 population, 28 cases) and 1 to 4 years (41.6 per 100,000, 104 cases) age groups. Notification rates for the under five year olds were more than twice the rates for any other age group (Table 79). Half of the hospitalised cases were aged over 50 years.

Table 79. Yersiniosis cases by age group, 2014

Age group (years)	EpiSurv notifications		Hospitalisations[a]	
	No.	Rate[b]	No.	Rate[b]
<1	28	47.5	5	8.5
1 to 4	104	41.6	3	-
5 to 9	26	8.5	1	-
10 to 14	28	9.5	0	-
15 to 19	26	8.3	0	-
20 to 29	117	19.0	9	1.5
30 to 39	88	16.0	3	-
40 to 49	82	13.1	4	-
50 to 59	73	12.2	6	1.0
60 to 69	63	13.7	4	-
70+	47	10.8	15	3.5
Total	**682**	**15.1**	**50**	**1.1**

[a] MoH NMDS data for hospital admissions

[b] per 100,000 of population (rate not calculated when fewer than five cases reported)

In 2014, the most commonly reported risk factors for yersiniosis notifications were consumption of food from retail premises (64.9%), followed by contact with faecal matter (24.6%), contact with farm animals (22.6%) and recreational water contact (19.7%) (Table 80).

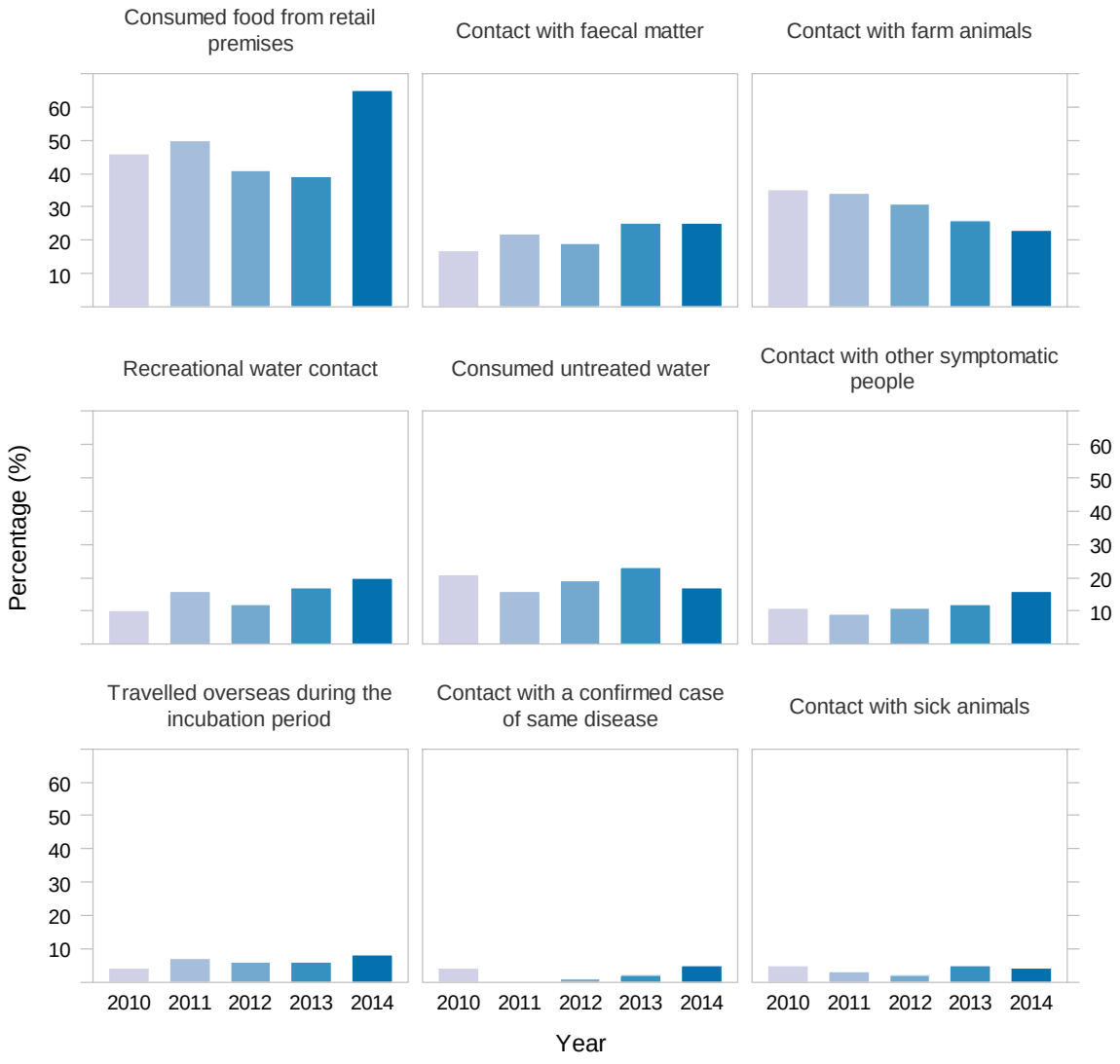
Table 80. Exposure to risk factors reported for yersiniosis notifications, 2014

Risk factor	Notifications			
	Yes	No	Unknown	%[a]
Consumed food from retail premises	239	129	314	64.9
Contact with faecal matter	83	255	344	24.6
Contact with farm animals	84	288	310	22.6
Recreational water contact	70	286	326	19.7
Consumed untreated water	51	251	380	16.9
Contact with other symptomatic people	53	280	349	15.9
Travelled overseas during the incubation period	30	346	306	8.0
Contact with a confirmed case of same disease	11	218	453	4.8
Contact with sick animals	13	328	341	3.8

[a] Percentage refers to the cases that answered "yes" out of the total number of cases for which this information was supplied. Cases may have more than one risk factor recorded.

Between 2010 and 2014, the most commonly reported risk factor for yersiniosis cases was consumption of food from retail premises, followed by contact with farm animals (Figure 60). There has been a decrease in the proportion of cases reporting contact with farm animals between 2010 and 2014, while recreational water contact and contact with other symptomatic people appear to be increasing as reported risk factors.

Figure 60. Percentage of cases with exposure to risk factors reported for yersiniosis and year, 2010−2014



For cases where information on travel was provided, 8.7% (95% CI 6.0-12.3%) had travelled overseas during the incubation period. Assuming that the cases for which travel information was provided were representative of all yersiniosis cases, a Poisson distribution can be used to estimate the total number of potentially travel related cases of yersiniosis in 2014. The resultant distribution has a mean of 59 cases (95% CI 36-88). However this estimate will be likely to be too high, due to the occurrence of a large domestic outbreak of yersiniosis (220 cases) in which overseas travel was not a risk factor.

If data from the last four years are considered, the estimated proportion of cases travelling overseas within the incubation period of the organism was 7.0% (95% CI 5.6-8.8%).

Outbreaks reported as caused by *Yersinia* spp.

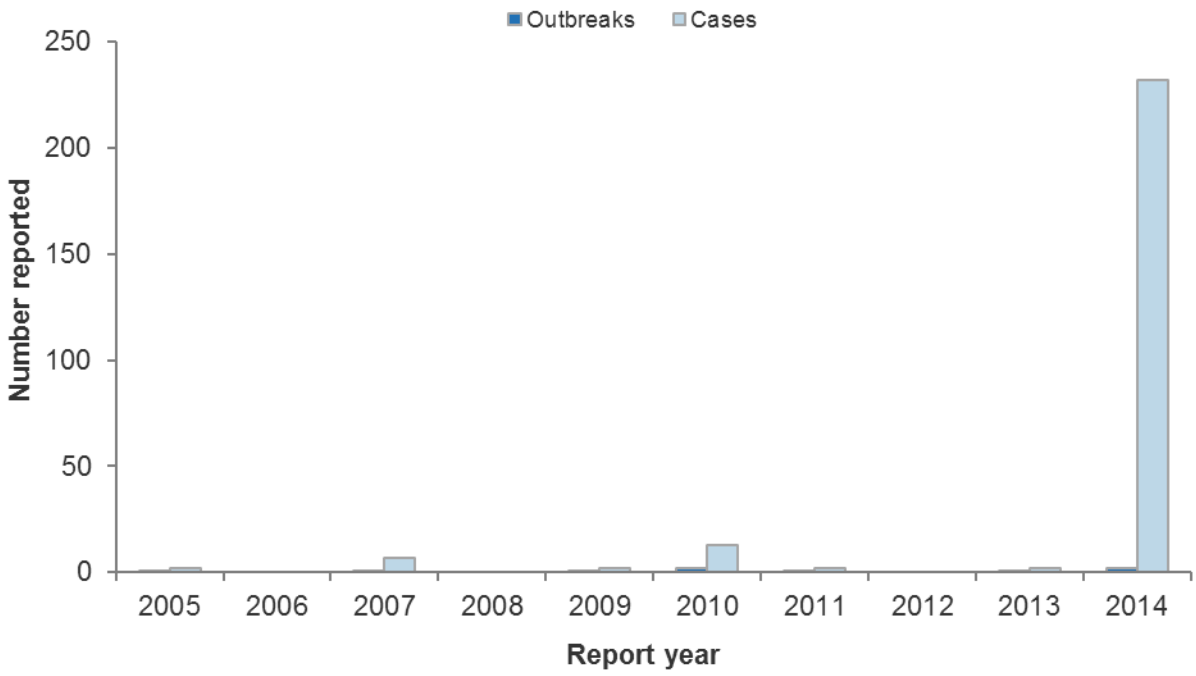
During 2014, there were seven *Yersinia* spp. outbreaks, with a total of 246 cases, reported in EpiSurv. There were two *Yersinia* spp. outbreaks associated with a suspected foodborne source in 2014 (Table 81). All hospitalised outbreak cases were associated with the foodborne outbreaks. The larger of these two outbreaks (220 cases) was quite extensively studied, including carrying out of a case-control study [29]. An outbreak has been classed as foodborne in this report if food was recorded as one of the likely modes of transmission applicable to the outbreak. It is important to note that a single outbreak may have multiple pathogens, modes of transmission, settings where exposure occurred, or settings where preparation of food was conducted.

Table 81. *Yersinia* spp. outbreaks reported, 2014

Measure	Foodborne *Yersinia* spp. outbreaks	All *Yersinia* spp. outbreaks
Outbreaks	2	7
Cases	232	246
Hospitalised cases	72	72

Between 2005 and 2013 very few foodborne *Yersinia* spp. outbreaks were reported in EpiSurv (two or less each year, with a total number of associated cases ranging from 2 to 13). The number of foodborne outbreaks in 2014 was not unusual (2), but the number of cases involved (232) is an order of magnitude greater than has been previously seen in New Zealand (Figure 61).

Figure 61. Foodborne *Yersinia* spp. outbreaks and associated cases reported by year, 2005–2014



In 2014, food samples were submitted to ESR's Public Health Laboratory relating to the large food-associated *Yersinia* spp. outbreak summarised in Table 81. *Yersinia* spp. were not isolated from any food samples.

Yersinia types commonly reported

In 2014, clinical laboratories submitted 628 isolates for *Yersinia* spp. confirmation and typing to the Enteric Reference Laboratory at ESR. Notifiable *Yersinia* spp. (ie *Yersinia enterocolitica* (YE) and *Y. pseudotuberculosis* (YTB)) were identified in 90% of these isolates. Note that the case status in EpiSurv is changed to "not a case" for *Yersinia* isolates that are identified by ERL as non-notifiable (ie not YE or YTB) and these cases no longer appear in the reported notification data.

The number of notifiable *Yersinia* spp. cases identified by the Enteric Reference Laboratory at ESR each year is shown in Table 82. Between 2010 and 2014, the largest proportion of cases was due to *Y. pseudotuberculosis*. These cases were predominantly associated with a single large outbreak of yersiniosis. An increase in the number of cases being reported with YE biotype 1A and YE biotype 2 was also observed compared to the previous year (Figure 62).

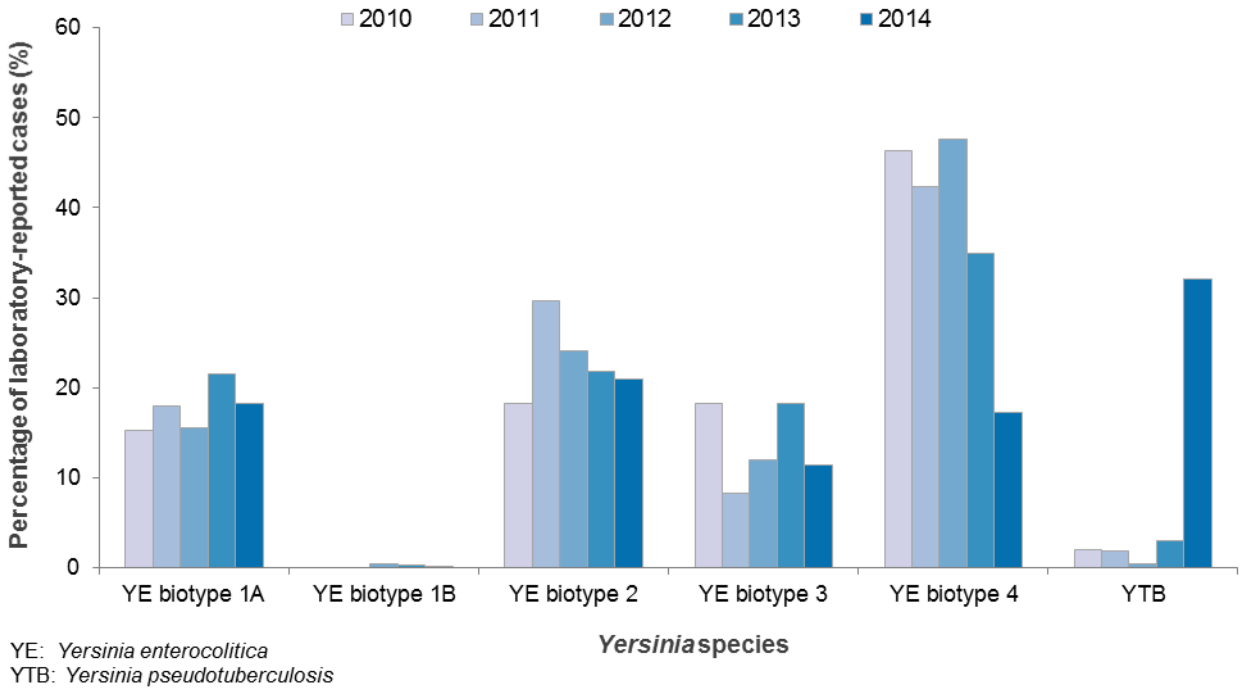
These numbers need to be interpreted with some caution as

a) not all clinical laboratories forward isolates to ERL for confirmation and biotyping,
b) the number of isolates forwarded for confirmation and typing, as a percentage of all notifications, has changed during this period and
c) the isolation and identification of *Yersinia* spp. are highly sensitive to the methods used by laboratories.

Table 82. Notifiable *Yersinia* spp. identified by the Enteric Reference Laboratory, 2010–2014

Species	2010	2011	2012	2013	2014
Yersinia enterocolitica	**252**	**433**	**443**	**405**	**384**
biotype 1A	39	79	69	90	103
biotype 1B	0	0	2	1	1
biotype 2	47	131	107	91	118
biotype 3	47	36	53	76	64
biotype 4	119	187	212	146	97
biotype not identified	-	-	-	1	1
Yersinia pseudotuberculosis	**5**	**8**	**2**	**13**	**181**
Total	**257**	**441**	**445**	**418**	**565**

Figure 62. Percentage of laboratory-reported cases of notifiable *Yersinia* spp. by species and year, 2010–2014



YE: *Yersinia enterocolitica*
YTB: *Yersinia pseudotuberculosis*

Recent surveys

Nil.

Relevant New Zealand studies and publications

Journal papers

In a study comparing 432 New Zealand *Yersinia enterocolitica* isolates obtained from human patients between 2002 and 2010, pulsed-filed gel electrophoresis (PFGE) was shown to have poor discriminatory power across the clinically important *Yersinia enterocolitica* biotypes 2, 3 and 4 [30]. Four known outbreaks of yersiniosis would not have been recognised by PFGE typing. However, a previously unrecognised potential yersiniosis outbreak, associated with a rare PFGE genotype, was identified.

Reports

Following an unprecedented outbreak of yersiniosis in New Zealand believed to be due to foodborne transmission of an indistinguishable strain of *Yersinia pseudotuberculosis* a case-control study was conducted [29]. Preliminary results for 72 cases and 85 controls showed significantly higher odds of infection following exposure to lettuce or carrots.

Relevant regulatory developments

Nil.

SUMMARY TABLES

SUMMARY TABLES

This appendix brings together data from different sources as summary tables to facilitate comparisons between conditions.

Table 83. Number of cases and rate per 100,000 population of selected notifiable diseases in New Zealand, 2013–2014

Disease	2013		2014		Change [b,c]
	Cases	Rates	Cases	Rates	
Campylobacteriosis	6837	153.9	6776	150.3	←
Cryptosporidiosis	1348	30.3	584	12.9	←
Gastroenteritisa	558	12.6	755	16.7	→
Giardiasis	1729	38.9	1709	37.9	←
Hepatitis A	91	2.0	74	1.6	←
Listeriosis	19	0.4	25	0.6	→
Salmonellosis	1143	25.7	954	21.2	←
Shigellosis	137	3.1	128	2.8	←
VTEC/STEC infection	205	4.6	187	4.1	←
Yersiniosis	484	10.9	682	15.1	→

[a] Cases of acute gastroenteritis from a common source or foodborne intoxication eg staphylococcal intoxication.

[b] ← = Significant decrease, → = Significant increase, ▫ = No change, ← = Not significant decrease, → = Not significant increase, NA = not applicable

[c] Fisher's exact tests were used to determine statistical significance. Results are considered statistically significant when the *P* value is less than or equal to 0.05.

Table 84. Deaths due to selected notifiable diseases recorded in EpiSurv, 1997-2014

Disease	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Campylobacteriosis	2	2	1	3	1	1	0	0	1	1	1	0	0	0	0	0	1	0
Gastroenteritis	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
Giardiasis	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Listeriosis - non perinatal	2	0	1	2	1	0	2	3	1	0	2	3	2	3	1	4	2	3
Listeriosis - perinatal	6	0	2	4	1	3	2	2	4	1	2	2	2	4	0	2	4	2
Salmonellosis	2	2	1	7	2	1	0	0	1	1	1	1	1	0	0	0	0	0
Shigellosis	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
VTEC/STEC infection	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Yersiniosis	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

Note: The numbers in this table are those recorded in EpiSurv where the notifiable disease was the primary cause of death.
Information on deaths is most likely to be reported by Public Health Services when it occurs close to the time of notification and investigation.

Table 85. MoH mortality data for selected notifiable diseases, 2010-2012

Disease	ICD 10 Codes	2010		2011		2012[a]	
		Und[b]	Cont[c]	Und[b]	Cont[c]	Und[b]	Cont[c]
Campylobacteriosis	A04.5	0	4	0	2	0	0
Hepatitis A	B15	0	2	0	0	0	0
Listeriosis	A32	3	0	0	1	4	1
Salmonellosis	A02	0	1	0	0	1	0
Shigellosis	A03	0	0	0	0	0	0
Yersiniosis	A04.6	0	0	0	0	2	0

[a] Latest year that data are available.
[b] Underlying – main cause of death.
[c] Contributory – selected contributory cause of death (not main cause of death).

Table 86. MoH Hospitalisations data for selected notifiable diseases, 2012-2014

Disease	ICD 10 Codes	2012		2013		2014	
		Principal diagnosis	Other relevant diagnosis	Principal diagnosis	Other relevant diagnosis	Principal diagnosis	Other relevant diagnosis
Campylobacteriosis	A04.5	548	117	591	128	606	111
Cryptosporidiosis	A07.2	42	12	38	21	22	4
Giardiasis	A07.1	27	23	24	23	42	25
Hepatitis A	B15	35	4	29	10	33	16
Listeriosis	A32	14	14	13	11	14	13
Salmonellosis	A02	129	47	128	40	110	40
Shigellosis	A03	12	8	26	3	12	6
Toxic shellfish poisoning	T61.2	19	1	9	2	29	0
VTEC/STEC infection	A04.3	56	23	46	50	52	34
Yersiniosis	A04.6	19	25	29	18	26	24

Note: hospital admission data may include multiple admissions (to the same or different hospitals) for the same case and admissions may relate to cases first diagnosed in previous years.

Table 87. Number of cases and rate per 100,000 population of selected notifiable diseases by ethnic group, 2014

Disease	Ethnic group											
	Māori		Pacific peoples		Asian		MELAA[a]		European or Other		Total[b]	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Campylobacteriosis	506	75.2	139	50.1	313	61.3	43	86.4	5363	178.9	6776	150.3
Cryptosporidiosis	57	8.5	10	3.6	17	3.3	4	NC	472	15.7	584	12.9
Gastroenteritis[c]	56	8.3	19	6.8	56	11.0	2	NC	541	18.0	755	16.7
Giardiasis	120	17.8	16	5.8	91	17.8	46	92.4	1301	43.4	1709	37.9
Hepatitis A	1	NC	21	9.7	20	3.9	2	NC	20	0.7	74	1.6
Listeriosis	2	NC	3	NC	5	1.0	1	NC	14	0.5	25	0.6
Salmonellosis	103	15.3	41	14.8	86	16.8	6	12.1	657	21.9	954	21.2
Shigellosis	4	NC	29	10.5	17	3.3	1	NC	67	2.2	128	2.8
VTEC/STEC infection	20	3.0	1	NC	11	2.2	1	NC	148	4.9	187	4.1
Yersiniosis	52	7.7	31	11.2	128	25.1	8	16.1	440	14.7	682	15.1

[a] Middle Eastern/Latin American/African.

[b] Total includes cases where ethnicity was unknown.

[c] Cases of acute gastroenteritis from a common source or foodborne intoxication eg staphylococcal intoxication.

Note: Denominator data used to determine disease rates for ethnic groups is based on the proportion of people in each ethnic group from the estimated resident 2013 census population applied to the 2014 mid year population estimates from Statistics New Zealand. Ethnicity is prioritised in the following order: Māori, Pacific peoples, Asian, MELAA and European or Other Ethnicity (including New Zealander). Where fewer than five cases have been notified, a rate has not been calculated and the cell marked NC.

Table 88. Number of cases and rates of selected notifiable diseases per 100,000 population by sex, 2014

Disease	Sex					
	Male		Female		Total[a]	
	Cases	Rate	Cases	Rate	Cases	Rate
Campylobacteriosis	3819	172.8	2952	128.3	6776	150.3
Cryptosporidiosis	274	12.4	310	13.5	584	12.9
Gastroenteritis[b]	322	14.6	433	18.8	755	16.7
Giardiasis	876	39.6	833	36.2	1709	37.9
Hepatitis A	36	1.6	38	1.7	74	1.6
Listeriosis – non perinatal	12	0.5	8	0.3	20	0.4
Salmonellosis	467	21.1	487	21.2	954	21.2
Shigellosis	75	3.4	53	2.3	128	2.8
VTEC/STEC infection	80	3.6	107	4.7	187	4.1
Yersiniosis	342	15.5	340	14.8	682	15.1

[a] Total includes cases where sex was unknown.

[b] Cases of acute gastroenteritis from a common source or foodborne intoxication eg staphylococcal intoxication.

Table 89. Number of cases and rates of selected notifiable diseases per 100,000 population by age group, 2014

	<1		1 to 4		5 to 9		10 to 14		15 to 19		20 to 29		30 to 39		40 to 49		50 to 59		60 to 69		70+		Total	
Disease	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**
Campylobacteriosis	139	236.0	655	262.1	315	102.8	239	80.8	358	114.2	1,037	168.1	664	120.6	807	129.1	872	146.1	869	188.3	819	188.7	6776	150.3
Cryptosporidiosis	13	22.1	168	67.2	54	17.6	32	10.8	40	12.8	109	17.7	55	10.0	46	7.4	34	5.7	17	3.7	15	3.5	584	12.9
Gastroenteritis	38	64.5	155	62.0	18	5.9	6	2.0	25	8.0	68	11.0	75	13.6	81	13.0	78	13.1	59	12.8	138	31.8	755	16.7
Giardiasis	22	37.4	352	140.8	141	46.0	43	14.5	33	10.5	163	26.4	368	66.8	241	38.6	147	24.6	162	35.1	36	8.3	1709	37.9
Hepatitis A	1		4		9	2.9	3		7	2.2	16	2.6	10	1.8	7	1.1	7	1.2	5	1.1	5	1.2	74	1.6
Listeriosis	0		0		0		0		0		1		4		1		2		7	1.5	10	2.3	25	0.6
Salmonellosis	47	79.8	170	68.0	47	15.3	36	12.2	47	15.0	148	24.0	85	15.4	86	13.8	129	21.6	90	19.5	68	15.7	954	21.2
Shigellosis	2		10	4.0	10	3.3	2		5	1.6	21	3.4	19	3.5	21	3.4	19	3.2	13	2.8	6	1.4	128	2.8
VTEC/STEC infection	11	18.7	72	28.8	17	5.5	6	2.0	10	3.2	17	2.8	11	2.0	11	1.8	10	1.7	13	2.8	9	2.1	187	4.1
Yersiniosis	28	47.5	104	41.6	26	8.5	28	9.5	26	8.3	117	19.0	88	16.0	82	13.1	73	12.2	63	13.7	47	10.8	682	15.1

[a] Cases of acute gastroenteritis from a common source or foodborne intoxication eg staphylococcal intoxication.

Note: Where fewer than five cases have been notified a rate has not been calculated and the cell has been left blank.
Rates for each disease have been divided into three bands and shaded to indicate the age groups with highest, medium and lowest rates of disease. Shadings used are:

- Fewer than 5 cases in a cell or less than a national total of 50 cases for the year
- First (lowest) band
- Second (middle) band
- Third (highest) band

Table 90. Number of cases of selected notifiable diseases by District Health Board, 2014

Disease	District Health Board																				
	Northland	Waitemata	Auckland	Counties Manukau	Waikato	Lakes	Bay of Plenty	Tairawhiti	Taranaki	Hawke's Bay	Whanganui	MidCentral	Hutt Valley	Capital & Coast	Wairarapa	Nelson Marlborough	West Coast	Canterbury	South Canterbury	Southern	Total
Campylobacteriosis	248	754	587	517	764	173	327	73	170	294	88	259	211	543	61	194	61	738	155	559	6776
Cryptosporidiosis	31	54	33	31	81	14	23	5	19	25	8	20	9	29	11	17	9	85	20	60	584
Gastroenteritisa	2	63	85	45	15	13	19	0	5	2	22	142	85	197	4	6	4	39	1	8	755
Giardiasis	57	217	196	167	171	77	92	24	25	91	24	24	45	118	21	58	11	184	21	90	1709
Hepatitis A	5	16	8	18	2	1	2	0	0	3	2	2	9	2	0	0	0	3	1	0	74
Listeriosis	1	2	4	7	0	0	3	0	0	0	0	3	0	1	0	0	0	1	0	3	25
Salmonellosis	27	134	112	82	58	18	38	10	15	41	9	23	18	41	9	31	7	146	16	119	954
Shigellosis	2	14	29	33	8	2	2	0	3	2	0	1	2	12	0	0	0	6	2	10	128
VTEC/STEC infection	11	17	14	16	39	6	9	0	7	2	3	3	3	6	1	7	0	22	7	14	187
Yersiniosis	10	57	73	55	58	26	41	7	9	17	4	10	19	65	2	2	3	182	11	31	682

[a] Cases of acute gastroenteritis from a common source or foodborne intoxication eg staphylococcal intoxication.

Table 91. Rate per 100,000 population of selected notifiable diseases by District Health Board, 2014

Disease	Northland	Waitemata	Auckland	Counties Manukau	Waikato	Lakes	Bay of Plenty	Tairawhiti	Taranaki	Hawke's Bay	Whanganui	MidCentral	Hutt Valley	Capital & Coast	Wairarapa	Nelson Marlborough	West Coast	Canterbury	South Canterbury	Southern	Total
Campylobacteriosis	149.4	134.0	124.4	101.5	199.2	167.0	150.4	155.0	147.8	184.4	141.5	152.1	147.1	183.0	142.5	135.6	186.0	143.4	266.8	180.4	150.3
Cryptosporidiosis	18.7	9.6	7.0	6.1	21.1	13.5	10.6	10.6	16.5	15.7	12.9	11.7	6.3	9.8	25.7	11.9	27.4	16.5	34.4	19.4	12.9
Gastroenteritis		11.2	18.0	8.8	3.9	12.5	8.7		4.3		35.4	83.4	59.3	66.4		4.2		7.6		2.6	16.7
Giardiasis	34.3	38.6	41.5	32.8	44.6	74.3	42.3	51.0	21.7	57.1	38.6	14.1	31.4	39.8	49.1	40.5	21.3	35.8	36.1	29.0	37.9
Hepatitis A	3.0	2.8	1.7	3.5									6.3								1.6
Listeriosis				1.4																	0.6
Salmonellosis	16.3	23.8	23.7	16.1	15.1	17.4	17.5	21.2	13.0	25.7	14.5	13.5	12.6	13.8	21.0	21.7	21.3	28.4	27.5	38.4	21.2
Shigellosis		2.5	6.1	6.5	2.1									4.0				1.2		3.2	2.8
VTEC/STEC infection	6.6	3.0	3.0	3.1	10.2	5.8	4.1		6.1					2.0		4.9		4.3	12.0	4.5	4.1
Yersiniosis	6.0	10.1	15.5	10.8	15.1	25.1	18.9	14.9	7.8	10.7		5.9	13.2	21.9				35.4	18.9	10.0	15.1

[a] Cases of acute gastroenteritis from a common source or foodborne intoxication eg staphylococcal intoxication.

Rates for each disease have been divided into three bands and shaded to indicate DHBs with the highest, middle and lowest rates of disease. Shadings used are:

- Fewer than 5 cases in a cell or less than a national total of 50 cases for the year
- First (lowest) band
- Second (middle) band
- Third (highest) band

Table 92. Number of cases of selected notifiable diseases by year, 1987–2000

Disease	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Campylobacteriosis	2921	2796	4187	3850	4148	5144	8101	7714	7442	7635	8924	11 572	8161	8418
Cryptosporidiosis[a]										119	357	866	977	775
Gastroenteritis[a b]										555	310	492	601	727
Giardiasis[a]										1235	2127	2183	1793	1688
Hepatitis A	158	176	134	150	224	288	257	179	338	311	347	145	119	107
Listeriosis	12	7	10	16	26	16	11	8	13	10	35	17	19	22
Salmonellosis	1140	1128	1860	1619	1244	1239	1340	1522	1334	1141	1177	2069	2077	1795
Shigellosis	143	145	137	197	152	124	128	185	191	167	117	122	147	115
VTEC/STEC infection[c]							3	3	6	7	13	48	64	67
Yersiniosis[a]										330	488	546	503	396

[a] Acute gastroenteritis, cryptosporidiosis, giardiasis, VTEC/STEC infection and yersiniosis were added to the Health Act 1956 notification schedule in June 1996.
[b] Cases of acute gastroenteritis from a common source or foodborne intoxication eg staphylococcal intoxication.
[c] The first case of VTEC/STEC infection confirmed in New Zealand was reported in October 1993 [31].
Note: cell is blank where data are unavailable.

Table 93. Number of cases of selected notifiable diseases by year, 2001–2014

Disease	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Campylobacteriosis	10 145	12 493	14 788	12 215	13 836	15 873	12 778	6694	7177	7346	6686	7016	6837	6776
Cryptosporidiosis	1208	975	817	611	888	737	924	764	854	954	610	877	1348	584
Gastroenteritis[a]	942	1088	1030	1363	560	938	625	687	713	493	570	765	559	774
Giardiasis	1604	1547	1570	1514	1231	1214	1402	1660	1639	1985	1934	1714	1729	1709
Hepatitis A	61	106	70	49	51	123	42	89	44	46	26	82	91	74
Listeriosis	18	19	24	26	20	19	26	27	28	23	26	25	19	25
Salmonellosis	2417	1880	1401	1081	1382	1335	1275	1339	1128	1146	1055	1081	1143	954
Shigellosis	157	112	87	140	183	102	129	113	119	104	101	132	137	128
VTEC/STEC infection	76	73	104	89	92	87	100	124	143	138	153	147	205	187
Yersiniosis	429	472	436	407	383	453	502	508	430	406	513	514	484	682

[a] Cases of acute gastroenteritis from a common source or foodborne intoxication eg staphylococcal intoxication.

Table 94. Rate per 100,000 population of selected notifiable diseases in New Zealand and other selected countries

Disease	Country/Region (publication year of report)						
	New Zealand (2014)	Australia[a] (2014)	USA[b] (2014)	Canada[d] (2012)	UK[e] (2013)	EU Total[e] (2013)	Other high
Campylobacteriosis	150.3	126.7	13.5	5.7	104.0	64.8	174 (Czech Republic)[e] 126 (Luxembourg)[e]
Cryptosporidiosis	12.9	10.4	2.4[c]	NN	10.5[f]	3.3[f]	12.1 (Ireland)[f]
Giardiasis	37.9	NN	5.9[c]	NN	6.7[f]	5.5[f]	21.3 (Bulgaria)[f] 19.0 (Estonia)[f]
Hepatitis A	1.6	1.0	0.5[c]	NN	0.6[f]	2.7[f]	66.8 (Bulgaria)[f] 17.9 (Romania)[f]
Listeriosis	0.6	0.3	0.2	0.4	0.3	0.4	1.1 (Finland)[e] 1.0 (Spain)[e]
Salmonellosis	21.2	70.7	15.5	19.9	13.2	20.4	93.1 (Czech Republic)[e] 70.3 (Slovakia)[e]
Shigellosis	2.8	4.6	5.8	2.8	3.3[f]	1.6[f]	10.6 (Bulgaria)[f] 8.3 (Slovakia)[f]
VTEC/STEC infection	4.1	0.5	2.4[g]	1.4[h]	1.8	1.6	12.3 (Ireland)[e] 7.1 (Netherlands)[e]
Yersiniosis	15.1	NN	0.3	0.9	0.1[f]	1.9[f]	10.1 (Finland)[e] 8.8 (Lithuania)[e]

NN: Not notifiable

[a] National Notifiable Diseases Surveillance System (NNDSS) http://www9.health.gov.au/cda/source/CDA-index.cfm

[b] FoodNet – Foodborne Diseases Active Surveillance Network http://www.cdc.gov/foodnet/

[c] Centers for Disease Control and Prevention. Summary of notifiable disease http://www.cdc.gov/mmwr/mmwr_nd/index.html (CDC data presented here relate to the 2012 year).

[d] National Enteric Surveillance Program (NESP) http://www.nml-lnm.gc.ca/NESP-PNSME/index-eng.htm

[e] European Food Safety Authority and European Centre for Disease Prevention and Control (ECDC). The European Union Summary Report on Trends and Sources of Zoonoses, Zoonotic Agents and Food-borne Outbreaks in 2013 http://www.efsa.europa.eu/en/efsajournal/doc/3547.pdf

[f] European Centre for Disease Prevention and Control (ECDC). Annual epidemiological report on communicable diseases in Europe http://ecdc.europa.eu/en/Pages/home.aspx (ECDC data presented here relate to the 2012 year).

[g] Includes both *Escherichia coli* O157 and non-O157.

[h] *Escherichia coli* O157 only.

Table 95. Foodborne outbreaks and associated cases by pathogen/condition, 2014

Pathogen/Condition	Outbreaks (n = 109)		Cases (n = 1050)	
	No.	%[a]	No.	%[b]
Norovirus	18	16.5	373	35.5
Campylobacter spp.	18	16.5	158	15.0
Salmonella spp.	7	6.4	44	4.2
Giardia spp.	6	5.5	27	2.6
Shigella spp.	4	3.7	32	3.0
VTEC/STEC infection	4	3.7	15	1.4
Clostridium perfringens	3	2.8	23	2.2
Yersinia 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
Staphylococcus aureus	1	0.9	4	0.4
Bacillus cereus	1	0.9	3	0.3
Histamine (scombroid) fish poisoning	1	0.9	2	0.2
Pathogen not identified[c]	44	40.4	138	13.1
Total[d]	**113**	**104**	**1084**	**103**

[a] Percentage of outbreaks for each pathogen/condition, calculated using the total number of foodborne outbreaks (109). An outbreak has been classed as foodborne in this report if food was recorded as one of the likely modes of transmission applicable to the outbreak. It is important to note that a single outbreak may have multiple pathogens, modes of transmission, settings where exposure occurred, or settings where preparation of food was conducted.

[b] Percentage of cases for each pathogen/condition, calculated using the total number of associated cases (1050).

[c] All outbreaks with no pathogen identified in 2014 were recorded as gastroenteritis.

[d] Two agents were reported in three foodborne outbreaks with 22 associated cases, therefore percentage totals add to more than 100%.

Table 96. Foodborne outbreaks and associated cases by exposure setting, 2014

Exposure setting	Outbreaks (n = 109)[c]		Cases (n = 1050)[c]	
	No.	%[a]	No.	%[b]
Commercial food operators	**72**	**66.1**	**745**	**71.0**
Restaurant/café/bakery	46	42.2	429	40.9
Takeaway	9	8.3	25	2.4
Other food outlet	6	5.5	24	2.3
Supermarket/delicatessen	6	5.5	241	23.0
Temporary or mobile food premise	2	1.8	4	0.4
Caterers	1	0.9	15	1.4
Institutions	**8**	**7.3**	**94**	**9.0**
Hotel/motel	4	3.7	56	5.3
Long-term care facility	4	3.7	38	3.6
Other	**29**	26.6	**209**	19.9
Private home	16	14.7	58	5.5
Farm	3	2.8	13	1.2
Community/church gathering	2	1.8	37	3.5
Workplace	2	1.8	28	2.7
Other setting[d]	7	6.4	78	7.4
Unknown exposure setting	**5**	**4.6**	**39**	**3.7**

[a] Percentage of outbreaks for each exposure setting, calculated using the total number of foodborne outbreaks (109). An outbreak has been classed as foodborne in this report if food was recorded as one of the likely modes of transmission applicable to the outbreak. It is important to note that a single outbreak may have multiple pathogens, modes of transmission, settings where exposure occurred, or settings where preparation of food was conducted.

[b] Percentage of cases for each exposure setting, calculated using the total number of associated cases (1050).

[c] More than one exposure setting was recorded for six outbreaks involving 42 cases.

[d] Includes one outbreak (2 cases) where transmission occurred overseas (Cambodia).

Table 97. Foodborne outbreaks and associated cases by preparation setting, 2014

Preparation setting	Outbreaks (n = 109)		Cases (n = 1050)	
	No.	%[a]	No.	%[b]
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
Other food outlet	5	4.6	21	2.0
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
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	**22**	**20.2**	**165**	**15.7**
Private home	11	10.1	38	3.6
Commercial food manufacturer	4	3.7	70	6.7
Farm	3	2.8	12	1.1
Community/church gathering	3	2.8	40	3.8
Overseas manufacturer	2	1.8	4	0.4
Workplace	1	0.9	5	0.5
Unknown preparation setting	**6**	**5.5**	**263**	**25.0**
Total[c]	**109**	**100**	**1050**	**100**

[a] Percentage of outbreaks for each preparation setting, calculated using the total number of foodborne outbreaks (109). An outbreak has been classed as foodborne in this report if food was recorded as one of the likely modes of transmission applicable to the outbreak. It is important to note that a single outbreak may have multiple pathogens, modes of transmission, settings where exposure occurred, or settings where preparation of food was conducted.

[b] Percentage of cases for each implicated vehicle/source, calculated using the total number of associated cases (1050).

[C] More than one preparation setting was implicated for some outbreaks therefore sum of individual preparation setting numbers exceed total number of outbreaks/cases reported.

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