Ministry for Primary Industries
Manatū Ahu Matua

# Foodborne Disease in New Zealand 2015

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Prepared for the Ministry for Primary Industries by
Lisa Lopez, Rebekah Roos, Peter Cressey & Beverly Horn (ESR) and Judi Lee (MPI)

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Publications Logistics Officer
Ministry for Primary Industries
PO Box 2526
WELLINGTON 6140

Email: brand@mpi.govt.nz
Telephone: 0800 00 83 33
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# Scientific Interpretative Summary

*This SIS is prepared by MPI to provide context to the following report for MPI risk managers and external readers*

# Annual report concerning foodborne disease in New Zealand 2015

## ESR Report FW16020

Foodborne illness is important to New Zealand and to MPI as the gatekeeper for New Zealand's food safety system, protecting the health and wellbeing of consumers here and overseas. Human health surveillance and its relationship to foodborne illness determine the strategic direction that MPI takes in relation to focus on food safety and the drive to reduce foodborne illness in the New Zealand population.

This report forms part of a series providing a consistent source of data annually to monitor trends on foodborne illness in New Zealand. The series can be found here

*Campylobacter* remains our top priority foodborne pathogen of concern and MPI has a performance target to reflect this. The current performance target is to reduce the number of human cases of foodborne campylobacteriosis by 10% by 2020.

It is important to note that some medical laboratories in New Zealand have recently implemented potentially more sensitive contemporary molecular test methods for disease causing bacteria. This appears to have had an impact on the disease incidence reported in the 2015 foodborne illness statistics. For example, the incidence of VTEC/STEC diagnoses increased when Auckland laboratories introduced new methods in June 2015. Care must therefore be taken when interpreting the data and comparing 2015 results with those from previous years.

Means of collation of the data is also an important consideration. The information within this report shows disease trends by age group, sex, and District Health Board (DHB) of the place of residence. Low numbers of cases for certain foodborne illnesses such as listeriosis means that the rates calculated within this report may be highly variable from year to year.

# ANNUAL REPORT
# FOODBORNE DISEASE IN NEW ZEALAND 2015


ESR THE SCIENCE BEHIND THE TRUTH

Prepared for Ministry for Primary Industries under project MRP/15/02 – Systematic reporting of epidemiology of potentially foodborne disease in New Zealand for year 2015, as part of an overall contract for scientific services.

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Client Report FW16020

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# INTRODUCTION

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# INTRODUCTION

The Ministry for Primary Industries (MPI) leads New Zealand's food safety system, protecting the health and wellbeing of consumers here and overseas. This includes 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 2015 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 appendix 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 [1].
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 [2].
    - 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 [3], 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 country-specific estimates are given in Table 1, for the USA [4], Canada [5], Australia [6, 7], England and Wales [8] and the Netherlands [9]. In addition, a WHO project to estimate the global burden of foodborne diseases derived estimates for 14 international regions [10, 11]. The estimates for Australia,

Canada, the Netherlands and the international WHO estimates 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 (%) | | | | | |
|---|---|---|---|---|---|---|
| | WHO (2015)[a] | USA (2011) | Canada (2015) | Australia (2005, 2014) | England and Wales (2002) | Netherlands[b] (2008) |
| **Bacteria** | | | | | | |
| *Bacillus cereus* | 100 | 100 | 99 | 100 | 100 | 90 |
| *Campylobacter* spp. | 51-76 | 80 | 62 | 77[c] | 80 | 42 |
| *Clostridium perfringens* | 100 | 100 | 93 | 98[c] | 94 | 91 |
| Shiga toxin-producing *Escherichia coli* (STEC) O157:H7 | 40-60[d] | 68 | 61 | 56[c,d] | 63 | 40 |
| STEC non-O157 | 40-60[d] | 82 | 60 | 56[c,d] | 63 | 42 |
| *Listeria monocytogenes* | 100 | 99 | 77 | 98[c] | 99 | 69 |
| *Salmonella* non-typhoidal | 46-76 | 94 | 63 | 72[c] | 92 | 55 |
| *Shigella* spp. | 7-36 | 31 | 26 | 12[c] | 8 | NE |
| *Staphylococcus aureus* | 100 | 100 | 78 | 100 | 96 | 87 |
| *Yersinia enterocolitica* | NE | 90 | 83 | 75 | 90 | NE |
| **Parasites** | | | | | | |
| *Cryptosporidium parvum* | 8-16 | 8 | 11 | 10 | 6 | 12 |
| *Giardia lamblia* | 11-14 | 7 | 7 | 5 | 10 | 13 |
| **Viruses** | | | | | | |
| Hepatitis A virus | 29-42 | 7 | 30 | 12[c] | 11 | 11 |
| Norovirus | 12-26 | 26 | 18 | 18[c] | NE | 17 |
| Sapovirus | NE | <1 | 17 | NE | 0 | NE |

[a] The WHO study estimated proportions for 14 international regions. Figures presented here are the range of those estimates.

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

[c] 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.

[d] Estimate was derived for total STEC

NE = not estimated

This report considers information for the 2015 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 2015 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 [3]. 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, L | 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 [12].

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.

### Changes in laboratory testing methodology

Changes in enteric testing methods and screening criteria have been introduced in some laboratories during 2015. Since 22 June 2015, all community faecal specimens in Northland, Waitemata, Auckland and Counties Manukau DHBs are screened by multiplex PCR for *Campylobacter, Shigella, Salmonella*, VTEC, *Giardia* and *Cryptosporidium*.

Where VTEC is detected by screening PCR, specimens are referred to the reference laboratory at ESR where confirmatory testing is performed using PCR, culture and serotyping. All community faecal specimens are now screened for VTEC/STEC when previously only those specimens from patients aged less than 5 years of age and those with haemolytic uraemic syndrome (HUS) or bloody diarrhoea recorded in the laboratory request were tested.

For these same DHBs, before June 2015, *Giardia* spp. and *Cryptosporidium* spp. were only screened for in those specimens where parasite screening was requested.

# REPORTING

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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 2015, MPI established a new performance target for Campylobacteriosis.

### Performance targets

- Campylobacteriosis: The number of human cases of foodborne campylobacteriosis reduced by 10% from 88.4 to 79.6 per 100,000 per head of population by the end 2020.

### Rationale

The above disease is the most commonly notified, potentially foodborne disease in New Zealand.

Specific targets previously seen for salmonellosis and listeriosis have been removed for 2015 and the monitoring and review of these two pathogens in relation to any foodborne illness in New Zealand is now covered by core business activities within MPI. This has been due to very little evidence of any significant ongoing foodborne illness associated with these pathogens that warrants application of a specific target.

A performance target for foodborne illness due to VTEC/STEC infections is not included as there has been little association with foodborne outbreaks in New Zealand. Norovirus is also 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 the major transmission route for norovirus is via the person-to-person pathway. The major transmission routes for VTEC/STEC and norovirus are 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 [13]. 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 is reported in terms of calendar year totals of cases per 100,000 population (*Notifiable Diseases in New Zealand Annual Report,* ESR [13]). 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[*]. The estimate of the foodborne proportion of campylobacteriosis determined by the expert elicitation is approximately 0.6.

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

- Campylobacteriosis: The number of human cases of foodborne campylobacteriosis reduced by 10% from 88.4 to 79.6 per 100,000 per head of population by the end 2020.

#### Measurement

The measurement used is the annual (calendar year) number (per 100,000 mid-year population estimate) of notified cases of human foodborne campylobacteriosis, with the baseline being the average foodborne rate for 2012 to 2014 (88.4 cases per 100,000 mid year population). The estimated incidence of foodborne campylobacteriosis in 2015 is given in Table 4.

**Table 4. Estimated proportion and incidence of foodborne campylobacteriosis for 2015**

| | Cases | Proportion (%) | Rate (per 100,000, mid year estimated population) |
|---|---|---|---|
| Total notified | 6218 | | 135.3 |
| Estimated not travelled overseas | 5702 | 91.7 | 124.1 |
| Estimated foodborne transmission | 3638 | 63.8 (44.1-83.2)[a] | 79.2 (54.7-103.2)[b] |

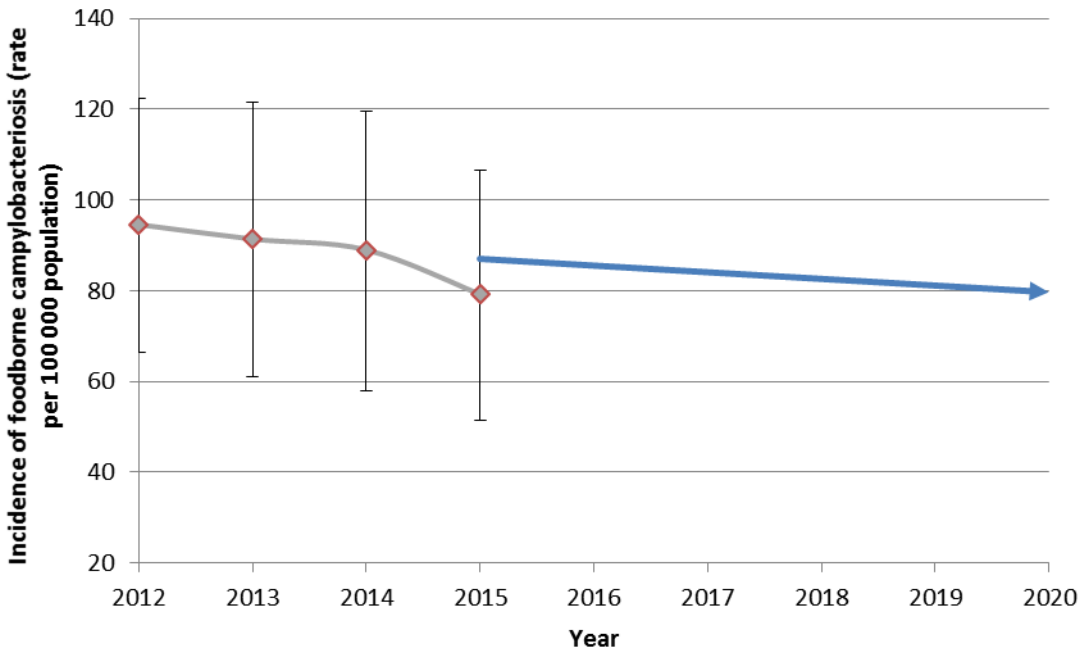
[a] Most likely (95th percentile credible interval) estimates of proportion foodborne, from expert consultation
[b] Most likely (95th percentile credible interval) estimates of foodborne rate

#### Presentation

The trend in relative rates (and ranges) compared with the 2015 to 2020 goal is shown in Figure 1. The estimated foodborne rates for 2012 to 2015 are calculated using the estimates of the proportion foodborne from the expert consultation in 2013.

[*] 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

**Figure 1. Incidence of foodborne campylobacteriosis**




The blue arrowed line represents the new target for 2015 to 2020.

## 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.

## 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 District Health Board (DHB) of the place of residence.

Because of the low numbers of cases for some foodborne illnesses such as listeriosis, 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.

# *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 2015 by data source

During 2015, no 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 Ministry of Health (MoH) National Minimum Dataset (NMDS). There was one hospital admission recorded in 2015 with *B. cereus* intoxication as the primary diagnosis.

Expert consultation estimated that 97% (minimum = 90%, maximum = 100%) of *B. cereus* intoxication will be due to foodborne transmission [14]. 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 2015, a single outbreak of *B. cereus* was reported in EpiSurv, with five associated cases (Table 5). This outbreak was associated with a community event. Testing by ESR's Public Health Laboratory found high *B. cereus* counts in the sushi food samples but no *B. cereus* was detected in the faecal samples. Testing of the food samples also found high *S. aureus* counts and presence of the Staphylococcal enterotoxin, both of these were also found in one of the faceal samples.

**Table 5. *B. cereus* outbreak reported, 2015**

| Measure | Foodborne *B. cereus* outbreaks | All *B. cereus* outbreaks |
|---|---|---|
| Outbreaks | 1 | 1 |
| Cases | 5 | 5 |
| Hospitalised cases | 0 | 0 |

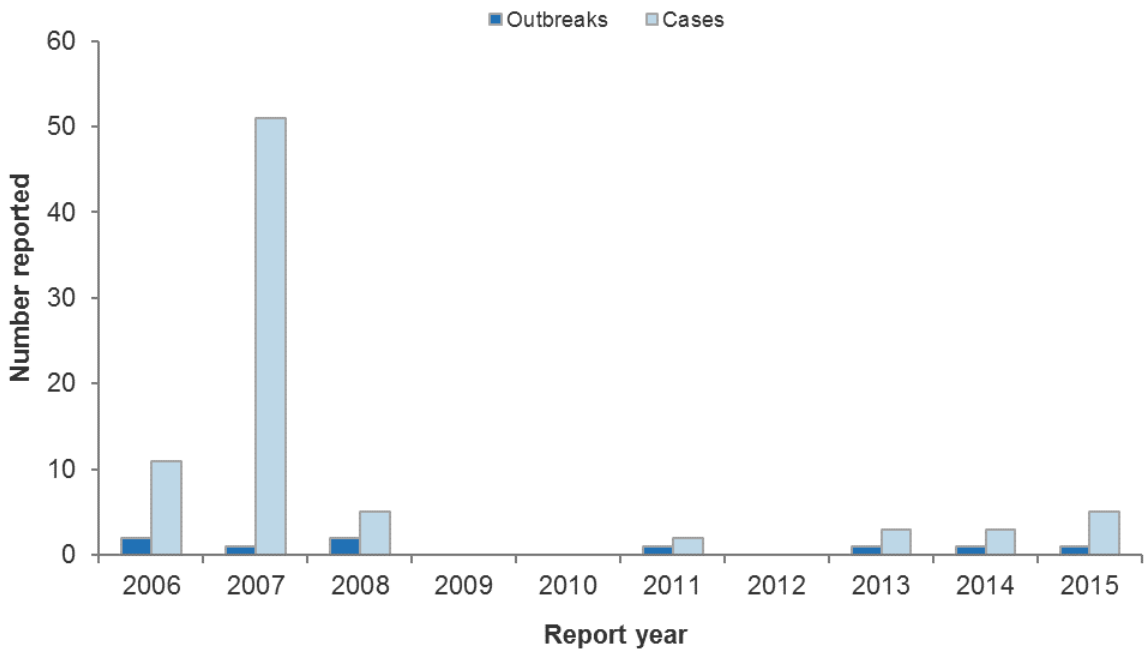
**Table 6. Details of foodborne *B. cereus* outbreak, 2015**

| PHU | Month | Suspected vehicle | Exposure setting | Preparation setting | No. ill |
|---|---|---|---|---|---|
| Auckland | Apr | Teriyaki chicken on rice | Community/church/sports gathering | Community/church/sports gathering | 3C, 2P |

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

Outbreaks of *B. cereus* are rare, with four outbreaks reported in the last seven years (Figure 2). The largest outbreak, with 51 associated cases, was reported in 2007.

**Figure 2. Foodborne *B. cereus* outbreaks and associated cases reported by year, 2006–2015**




### Recent surveys

Nil.

### Relevant New Zealand studies and publications

Nil.

### Relevant regulatory developments

Nil.

# Campylobacteriosis

Summary data for campylobacteriosis in 2015 are given in Table 7.

**Table 7. Summary of surveillance data for campylobacteriosis, 2015**

| Parameter | Value in 2015 | Source |
|---|---|---|
| Number of notified cases | 6218 | EpiSurv |
| Notification rate (per 100,000) | 135.3 | EpiSurv |
| Hospitalisations (% of notifications )[a] | 681 (11.1%) | MoH NMDS, EpiSurv |
| Deaths (%)[a] | 0 (0%) | EpiSurv |
| Estimated travel-related cases (%)[a] | 516 (8.3%) | EpiSurv |
| Estimated food-related cases (%)[b] | 3638 (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 2015 by data source

During 2015, 6218 notifications (135.3 cases per 100,000 population) of campylobacteriosis and no resulting deaths were reported in EpiSurv.

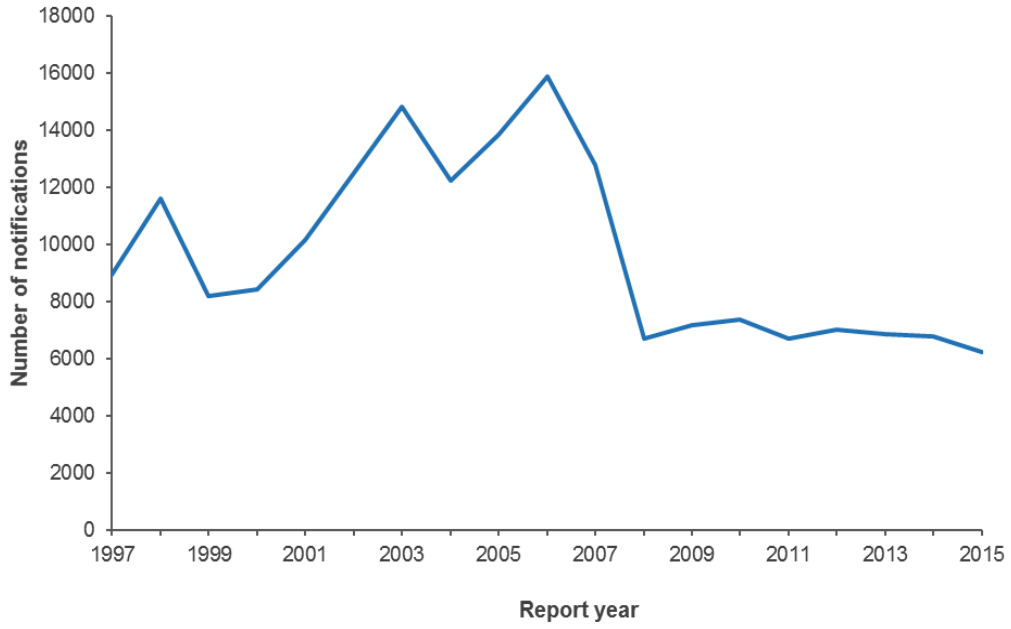
The ICD-10 code A04.5 was used to extract campylobacteriosis hospitalisation data from the MoH NMDS database. Of the 681 hospital admissions (14.8 admissions per 100,000 population) recorded in 2015, 564 were reported with campylobacteriosis as the principal diagnosis and 117 with campylobacteriosis as another relevant diagnosis.

It has been estimated by expert consultation that 63.8% (95$^{th}$ 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

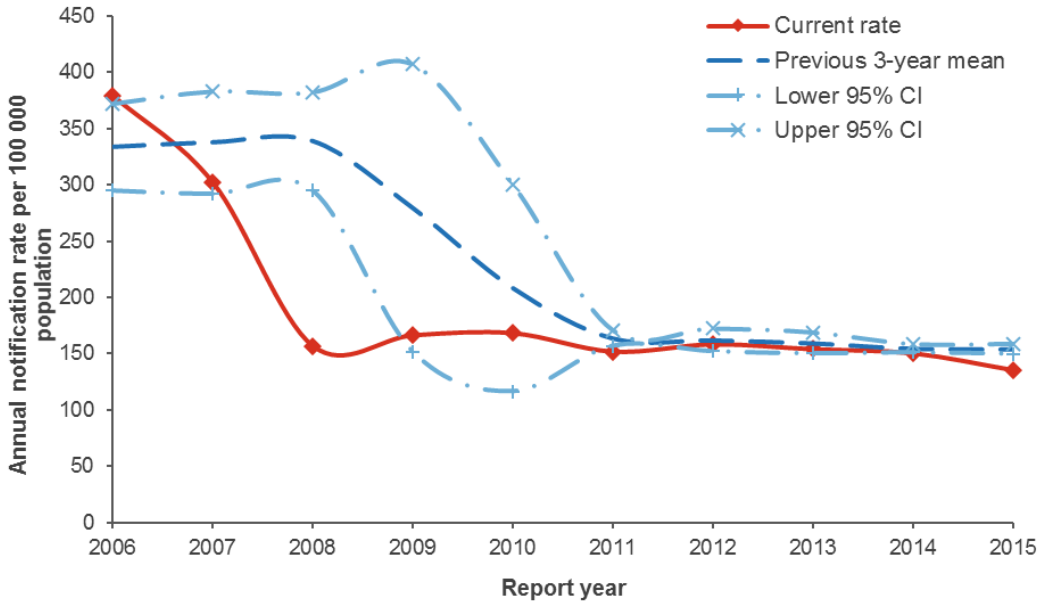
The number of campylobacteriosis notifications reported each year generally increased from 1997, up to the highest number recorded in 2006 (15873 cases). During 2007 and 2008, there was a significant decrease in the number of cases reported (Figure 3). The number of notifications has remained stable each year since 2008.

**Figure 3. Campylobacteriosis notifications by year, 1997–2015**



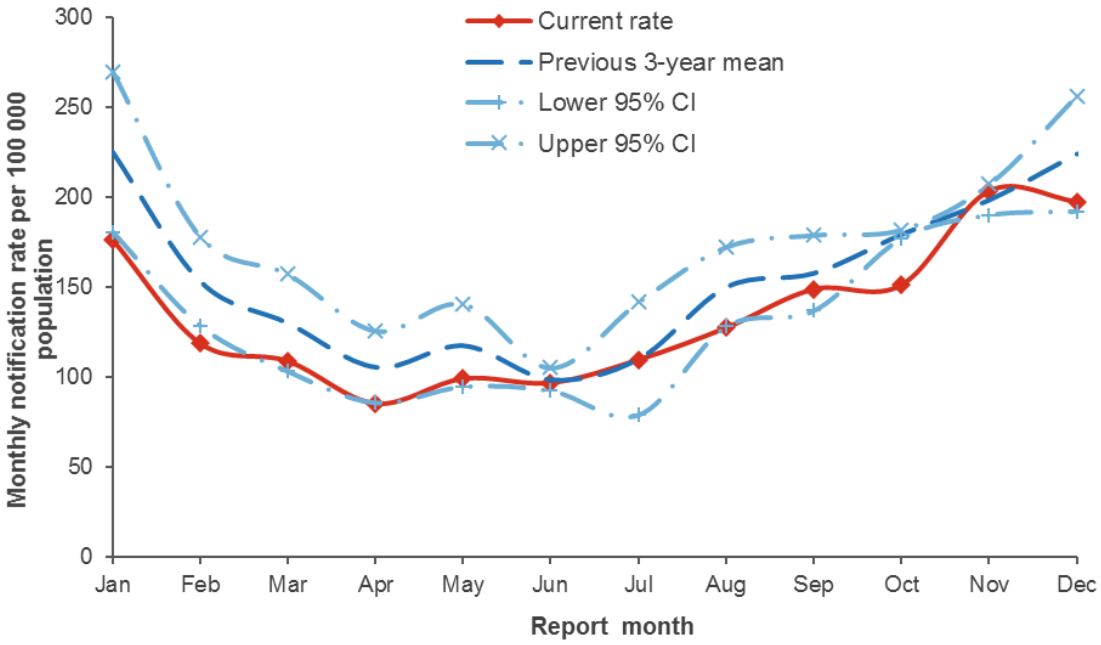

The campylobacteriosis annual rate trend (Figure 4) was very similar to the corresponding annual notification trend; with the notification rate remaining stable between 2008 and 2014. The notification rate was lower in 2015 (135 cases per 100,000 population) than the previous three year average (154 cases per 100,000).

**Figure 4. Campylobacteriosis notification rate by year, 2006–2015**



The number of notified cases of campylobacteriosis per 100,000 population by month for 2015 is shown in Figure 5. The monthly number of notifications in 2015 ranged from 327 notifications (April) to 779 notifications (November). The lowest notification rates occurred between February and July in 2015. Rates by month in 2015 followed a similar pattern as seen in the previous three years.

**Figure 5. Campylobacteriosis monthly rate (annualised), 2015**




Similar to previous years, the rate of notifications and hospitalisations for campylobacteriosis was higher for males (153.6 notifications and 15.9 admissions per 100,000 population) compared with females (117.6 notifications and 13.7 admissions per 100,000 population) in 2015 (Table 8).

**Table 8. Campylobacteriosis cases by sex, 2015**

| Sex | EpiSurv notifications | | Hospitalisations[a] | |
|---|---|---|---|---|
| | No. | Rate[b] | No. | Rate[b] |
| Male | 3466 | 153.6 | 360 | 15.9 |
| Female | 2749 | 117.6 | 320 | 13.7 |
| **Total** | **6218[c]** | **135.3** | **681** | **14.8** |

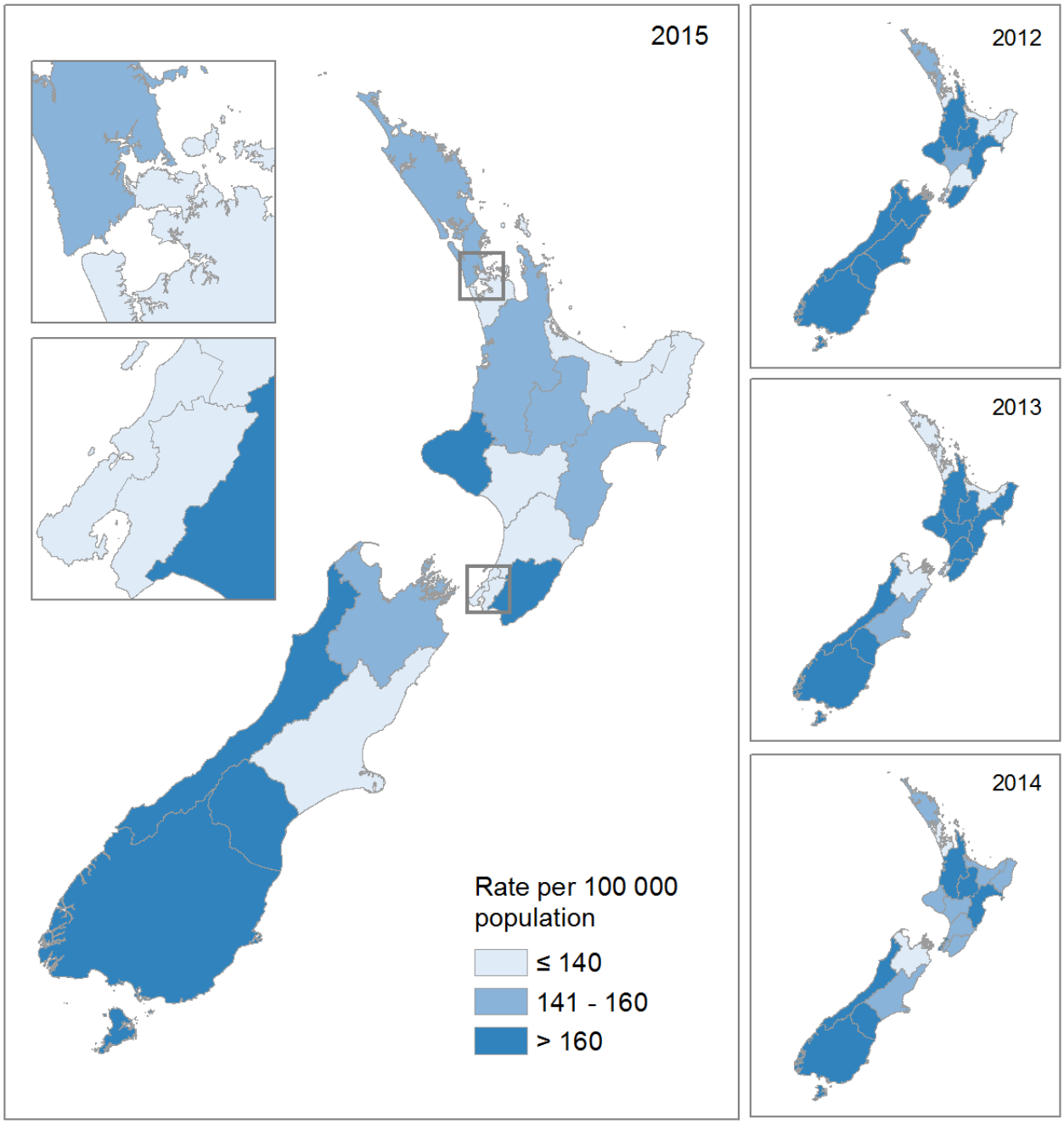
[a] MoH NMDS data for hospital admissions

[b] per 100,000 population

[c] Total includes 3 cases where sex was not reported

Campylobacteriosis rates varied throughout the country in 2015 as shown in Figure 6. The highest DHB rates were in the West Coast DHB (244.6 per 100,000 population, 80 cases) and South Canterbury DHB (215.0 per 100,000 population, 126 cases) which were higher than the other DHBs in the South Island (range 138.4-163.1 per 100,000 population). Taranaki DHB (194.1 per 100,000, 225 cases) had the highest rate for the North Island. The lowest rate in New Zealand was for Counties-Manukau (93.5 per 100,000, 488 cases) DHB. South Canterbury DHB consistently has high notification rates, having the highest campylobacteriosis notification rates every year between 2011 and 2014.

**Figure 6. Geographic distribution of campylobacteriosis notifications, 2012–2015**



The highest age-specific notification rates for campylobacteriosis in 2015 were for children aged 1 to 4 years (258.7 per 100,000 population, 638 cases) and infants aged less than 1 year (214.9 per 100,000, 127 cases) age groups. The highest hospitalisation rate was for the 70 years and over age group (42.1 admissions per 100,000 population), which was noticeably higher than any other age group, (Table 9).

**Table 9. Campylobacteriosis cases by age group, 2015**

| Age group (years) | EpiSurv notifications | | Hospitalisations[a] | |
|---|---|---|---|---|
| | No. | Rate[b] | No. | Rate[b] |
| <1 | 127 | 214.9 | 11 | 18.6 |
| 1 to 4 | 638 | 258.7 | 19 | 7.7 |
| 5 to 9 | 288 | 91.4 | 18 | 5.7 |
| 10 to 14 | 231 | 78.7 | 25 | 8.5 |
| 15 to 19 | 320 | 101.0 | 31 | 9.8 |
| 20 to 29 | 972 | 149.3 | 125 | 19.2 |
| 30 to 39 | 630 | 112.3 | 63 | 11.2 |
| 40 to 49 | 702 | 122.8 | 44 | 7.1 |
| 50 to 59 | 804 | 132.7 | 71 | 11.7 |
| 60 to 69 | 736 | 154.7 | 85 | 17.9 |
| 70+ | 766 | 170.7 | 189 | 42.1 |
| **Total** | **6218** | **135.3** | **681** | **14.8** |

[a] MoH NMDS data for hospital admissions

[b] per 100,000 of population

The risk factors recorded for campylobacteriosis notifications in 2015 are shown in Table 10. The most common risk factors reported were consumption of food from retail premises (47.2%) and contact with farm animals (39.1%).

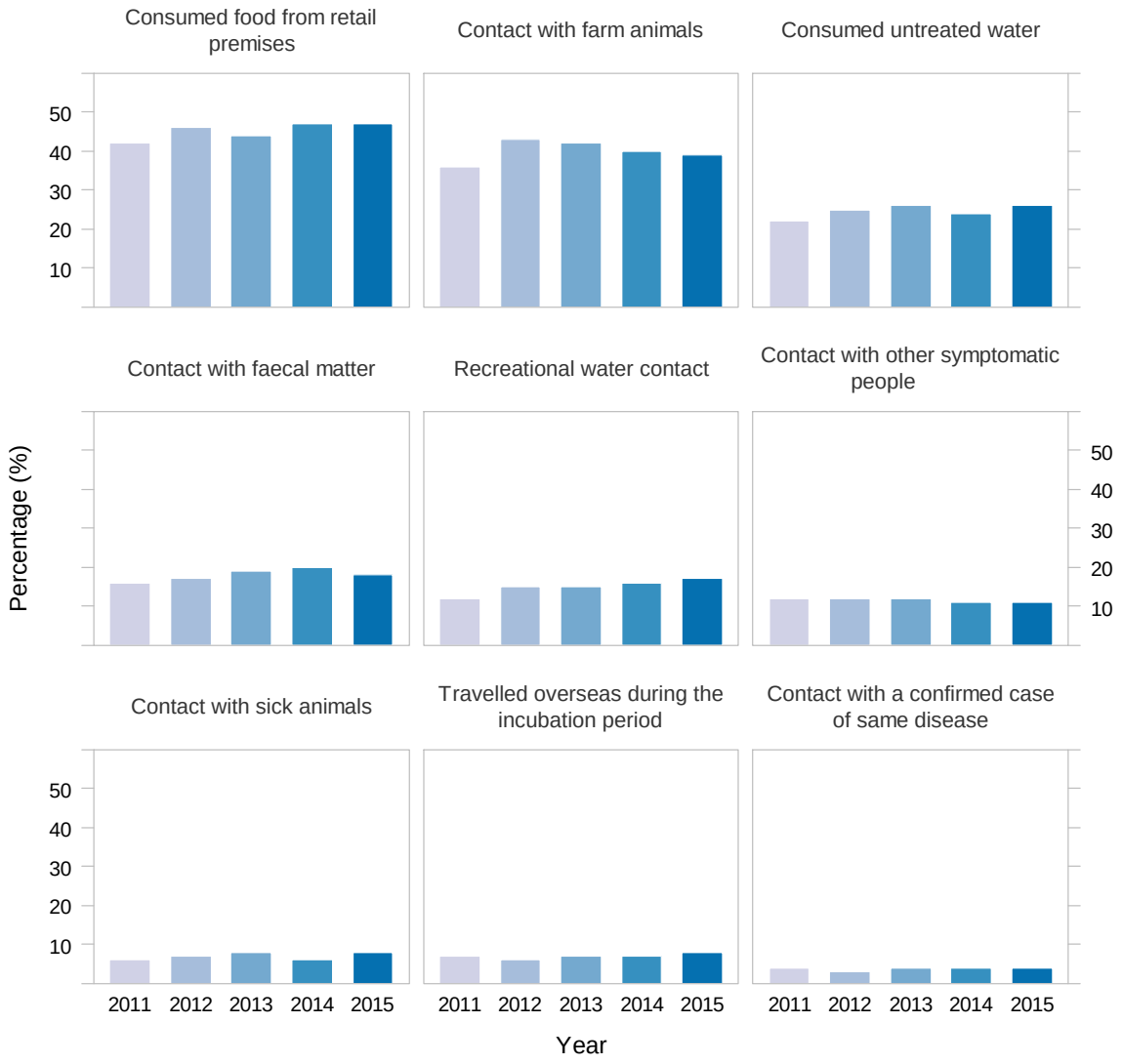
**Table 10. Exposure to risk factors reported for campylobacteriosis notifications, 2015**

| Risk factor | Notifications | | | |
|---|---|---|---|---|
| | Yes | No | Unknown | %[a] |
| Consumed food from retail premises | 1041 | 1164 | 4013 | 47.2 |
| Contact with farm animals | 933 | 1454 | 3831 | 39.1 |
| Consumed untreated water | 547 | 1542 | 4129 | 26.2 |
| Contact with faecal matter | 396 | 1826 | 3996 | 17.8 |
| Recreational water contact | 370 | 1868 | 3980 | 16.5 |
| Contact with other symptomatic people | 251 | 1963 | 4004 | 11.3 |
| Travelled overseas during the incubation period | 239 | 2633 | 3346 | 8.3 |
| Contact with sick animals | 170 | 1964 | 4084 | 8.0 |
| Contact with a confirmed case of same disease | 87 | 2029 | 4102 | 4.1 |

[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 2011 and 2015, 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 2015 compared to 2011–2014 (Figure 7).

**Figure 7. Percentage of cases with exposure to risk factors reported for campylobacteriosis and year, 2011–2015**




For cases where information on travel was provided in 2015, 8.3% (95% CI 7.3-9.4%) 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 2015. The resultant distribution has a mean of 517 cases (95% CI 440-601).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism was 7.2% (95% CI 6.8-7.7%).

### Outbreaks reported as caused by *Campylobacter* spp.

In 2015, 11 (57.9%) of the *Campylobacter* outbreaks and 46 (52.3%) of the associated cases were reported as foodborne (Table 11). 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 3.8% (19/501) of all enteric outbreaks and 1.2% (88/7433) of all associated cases reported in 2015.

**Table 11. *Campylobacter* spp. outbreaks reported, 2015**

| Measure | Foodborne *Campylobacter* spp. outbreaks | All *Campylobacter* spp. outbreaks |
|---|---|---|
| Outbreaks | 11 | 19 |
| Cases | 46 | 88 |
| Hospitalised cases | 1 | 3 |

During 2007 to 2013 and in 2015 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 (Figure 8). The increased number of cases in 2014 was due to three outbreaks with high numbers of associated cases (51, 32 and 17).

**Figure 8. Foodborne *Campylobacter* spp. outbreaks and associated cases reported by year, 2006–2015**

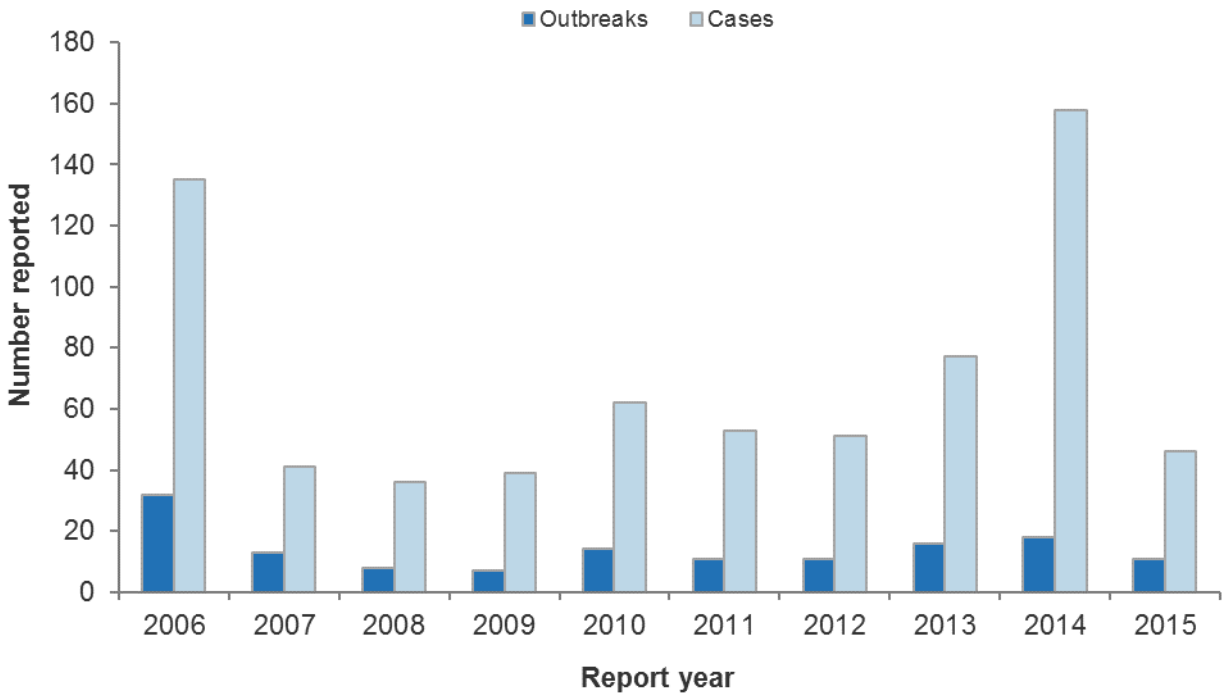


Table 12 contains details of the 11 foodborne *Campylobacter* spp. outbreaks reported in 2015. In all the *Campylobacter* spp. outbreaks with a suspected food vehicle (Table 12), the evidence for the implicated food was weak.

**Table 12. Details of foodborne *Campylobacter* spp. outbreaks, 2015**

| PHU | Month | Suspected vehicle | Exposure setting | Preparation setting | No. ill |
|---|---|---|---|---|---|
| Waikato | Jan | Undercooked chicken livers on BBQ | Home | Home | 1C, 1P |
| Waikato | Jan | Unknown | Home | Home | 2C |
| C and PH | Jan | Side salad | Restaurant/cafe/bakery | Restaurant/cafe/bakery | 1C, 5P |
| PH South | Jun | Meal including undercooked chicken | Home | Home | 2C |
| Toi Te Ora | Jun | Unknown | Restaurant/cafe/bakery School | Restaurant/cafe/bakery | 2C, 3P |
| Regional | Jul | Unknown | Restaurant/cafe/bakery | Restaurant/cafe/bakery | 3C, 2P |
| Toi Te Ora | Aug | Raw milk | Farm | Farm | 3C, 1P |
| Northland | Oct | Raw milk | Other food outlet | Other food outlet | 1C, 2P |
| PH South | Oct | Unknown | Community/church/sports gathering | Community/church/sports gathering | 3C |
| Regional | Dec | Raw milk[a] | Farm | Farm | 6C, 5P |
| Toi Te Ora | Dec | Unknown | Unknown | Unknown | 1C, 2P |

PHU: Public Health Unit, C and PH: Community and Public Health, Regional: Regional Public Health, PH South: Public Health South

C: confirmed, P: probable.

a: Not all the cases consumed raw milk.

During investigation of suspected foodborne illness outbreaks by ESR's Public Health Laboratory in 2015, a faecal sample were received from one of the foodborne outbreaks in Table 12. *Campylobacter* was not isolated from the clinical specimen.

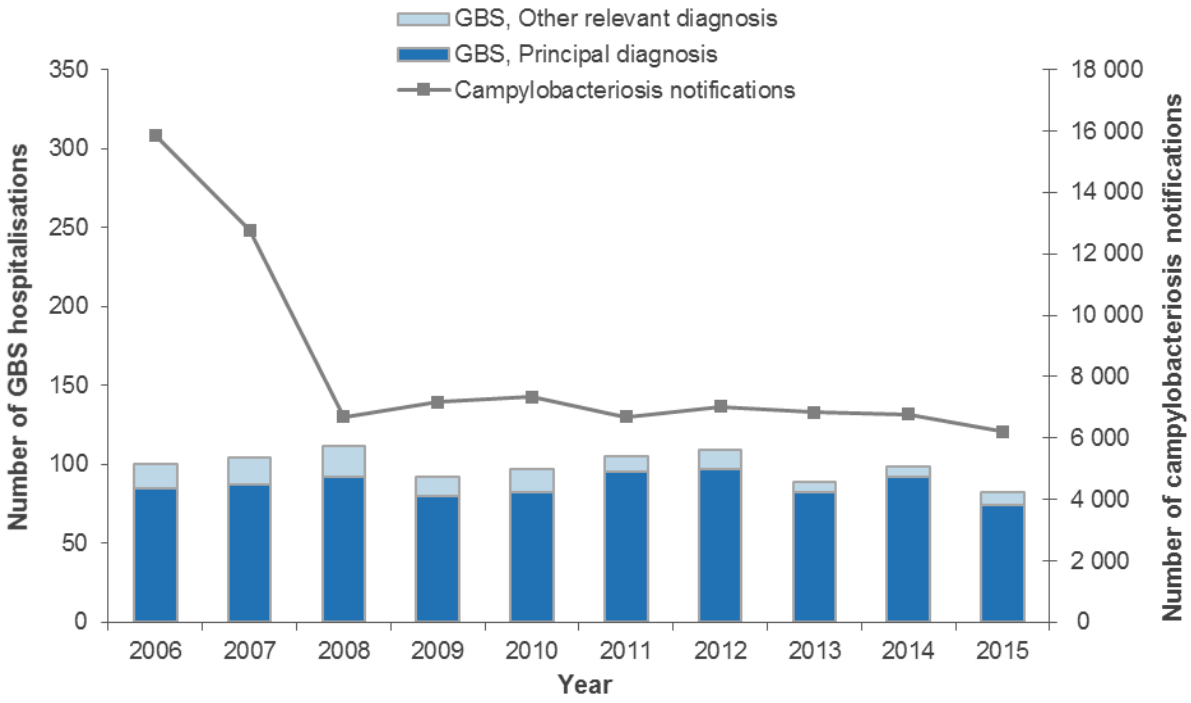
### Disease sequelae - Guillain-Barré syndrome

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. In a change from previous years, only GBS cases that were incident in 2015 were considered, rather than all cases that were hospitalised in 2015. That is, if a GBS cases hospitalised in 2015 had been hospitalised with GBS in a previous year, the 2015 admission was considered to be a readmission, rather than an incident case. Data for previous years have been recalculated to reflect this change. There were 82 incident hospitalised cases recorded in 2015 (1.8 admissions per 100,000 population), 74 were reported with GBS as the primary diagnosis and 8 with this condition as another relevant diagnosis.

Between 2006 and 2015, the number of incident hospitalised cases (any diagnosis code) for GBS ranged from 82 to 112 (Figure 9). The numbers of campylobacteriosis notifications during the same period are also included in Figure 9 for comparison.

**Figure 9. Guillain-Barré syndrome hospitalised cases, 2006–2015**




In 2015, the number of incident hospitalised cases due to GBS was markedly higher for males than for females (Table 13) which is consistent with the notification rates for campylobacteriosis in males and females (Table 8).

**Table 13. Guillain-Barré syndrome hospitalised cases by sex, 2015**

| Sex | Hospitalised cases[a] | |
|---|---|---|
| | No. | Rate[b] |
| Male | 49 | 2.2 |
| Female | 33 | 1.4 |
| **Total** | **82** | **1.8** |

[a] MoH NMDS data for hospital admissions

[b] per 100,000 population

In 2015, the highest rates of incident hospitalisation for GBS were in the 70 years and over age group, followed by the 60 to 69 years age group (Table 14).

**Table 14. Guillain-Barré syndrome hospitalised cases by age group, 2015**

| Age group (years) | Hospitalised cases | |
|---|---|---|
| | No. | Rate[b] |
| <5 | 1 | - |
| 5 to 9 | 1 | - |
| 10 to 14 | 6 | 2.0 |
| 15 to 19 | 1 | - |
| 20 to 29 | 9 | 1.4 |
| 30 to 39 | 5 | 0.9 |
| 40 to 49 | 9 | 1.4 |
| 50 to 59 | 15 | 2.5 |
| 60 to 69 | 16 | 3.4 |
| 70+ | 19 | 4.2 |
| **Total** | **82** | **1.8** |

[a] MoH NMDS data for hospital admissions

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

## Recent surveys

A survey of raw retail chicken portions and whole chicken carcasses was carried out from September 2010 to August 2011 [15]. In total 575 samples were collected, with 99 whole birds, and 476 portions sampled. The breakdown of portions was (skin on unless otherwise stated): 52 wings, 71 breasts, 82 thighs, 40 nibbles, 122 skinless boneless breasts, 106 skinless boneless thighs, and 3 portions categorised as "other". Of the 574 samples tested for the presence of *Campylobacter,* 456 (79.4%) were contaminated, with prevalence ranging from 86.8% for skinless and boneless thighs to 61.5% for wings. For whole chicken carcasses the prevalence was 78.8%. Many of the positive samples harboured *Campylobacter* at a concentration less than the limit of detection of the analytical method of quantification (50 CFU/sample for portions and 200 CFU/sample for whole chicken carcasses). The prevalence of *Campylobacter* in both portion and whole chicken carcass samples differed geographically, with the prevalence of *Campylobacter* in portion samples from Christchurch (71.1%) being lower than for Palmerston North (79.2%) and Auckland (88.5%). The prevalence of *Campylobacter* in portions and whole chicken carcasses also indicated a seasonal variation, with higher prevalence in the summer and autumn, compared to the winter and spring. The highest prevalence of *Campylobacter* in portions was 88.2% in autumn compared to 71.4% in winter.

New Zealand feed mills (*n* = 15) supplied a total of 58 samples of their finished animal feeds, and these were composited for each mill at the laboratory [16]. Although ruminant feeds were targeted in this survey, a proportion of feeds received were intended for other species, particularly poultry. *Campylobacter* was not detected in any feed sample.

## Relevant New Zealand studies and publications

### Journal papers

As part of a study to evaluate the suitability of the Manawatu region as a sentinel site for campylobacteriosis, the distribution of multilocus sequence types (STs) were compared for isolates from human, poultry and ruminant sources between the Manawatu and Canterbury regions [17].

### Reports

Nil.

## Relevant regulatory developments

MPI carried out a review of the Poultry NMD Programme's *Campylobacter* Performance Target (CPT) Limits (enumeration and detection) [18]. MPI's preferred position is to keep the current Moving Window Enumeration Limit and Detection Limit, while considering additional measures to improve the performance of premises who more frequently do not meet the target and to assist new businesses.

# 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 2015 by data source

During 2015, one notification of ciguatera fish poisoning was 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 11 hospital admissions (0.2 admissions per 100,000 population) recorded in 2015, nine were reported with ciguatera fish poisoning as the primary diagnosis and two were 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.

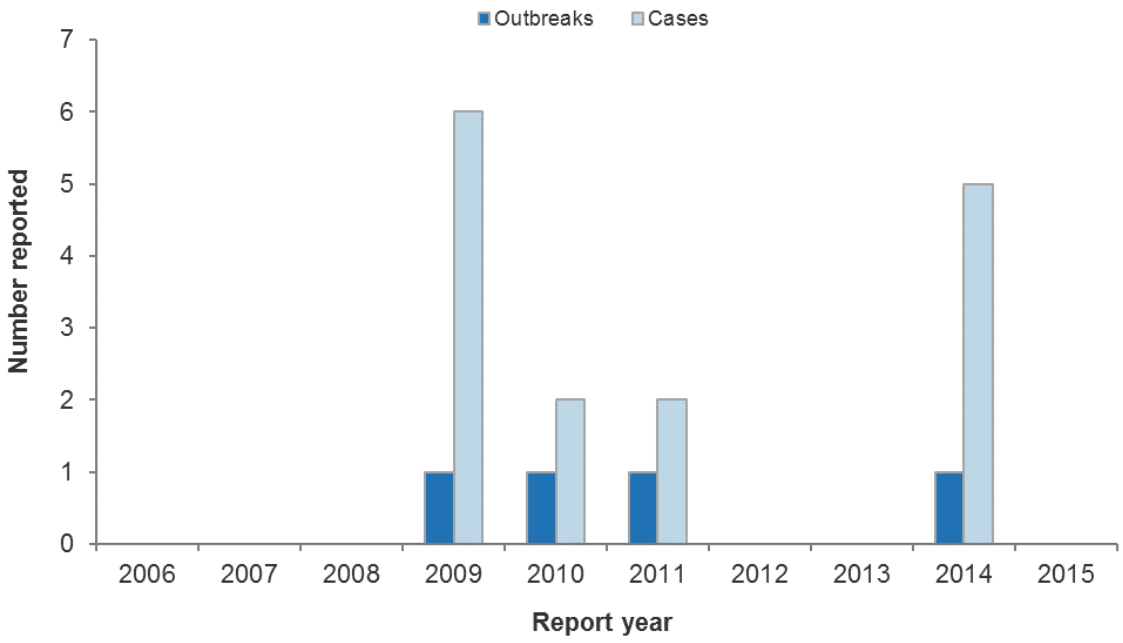
### Outbreaks reported as caused by ciguatera fish poisoning

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.

No outbreaks of suspected ciguatera fish poisoning were reported in 2015.

Over the 10-year period from 2006 to 2015, very few outbreaks of ciguatera fish poisoning were reported, with no more than one outbreak of ciguatera fish poisoning reported in any year (Figure 10).

**Figure 10. Ciguatera fish poisoning outbreaks and associated cases reported by year, 2006–2015**



### Recent surveys

Nil.

### Relevant New Zealand studies and publications

Nil.

### 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 2015 by data source

During 2015, four notifications (0.09 cases per 100,000 population) of *C. perfringens* intoxication and no reported deaths 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 2015 with *C. perfringens* intoxication as a diagnosis.

### Outbreaks reported as caused by *Clostridium perfringens*

There were five *C. perfringens* outbreaks with 67 associated cases reported in 2015, all were associated with a suspected or known foodborne source (Table 15). 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 15. *C. perfringens* outbreaks reported, 2015**

| Measure | Foodborne *C. perfringens* outbreaks | All *C. perfringens* outbreaks |
|---|---|---|
| Outbreaks | 5 | 5 |
| Cases | 67 | 67 |
| Hospitalised cases | 1 | 1 |

Between 2006 and 2015, the number of foodborne outbreaks associated with *C. perfringens* ranged from three (in 2009 and 2014) to 13 outbreaks (in 2006) (Figure 11). 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 11. Foodborne *C. perfringens* outbreaks and associated cases reported by year, 2006–2015**

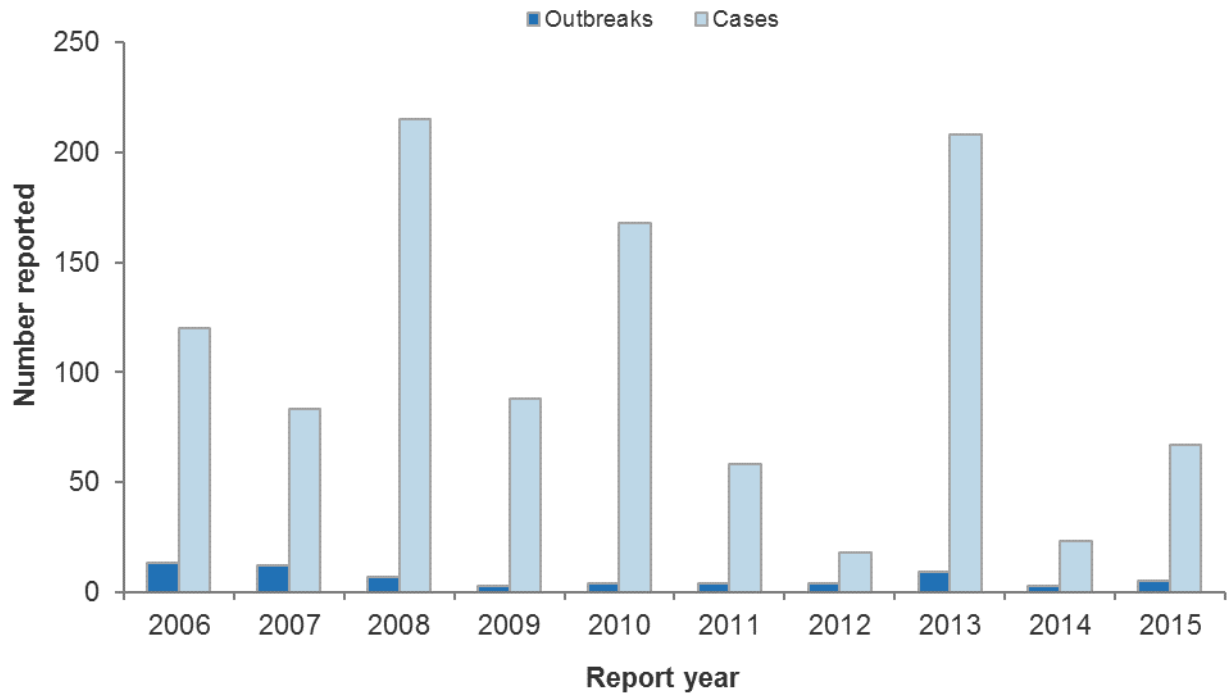



Table 16 contains details of the five foodborne *C. perfringens* outbreaks reported in 2015. All five *C. perfringens* outbreaks (Table 16) had strong evidence to implicate a suspected food vehicle.

**Table 16. Details of foodborne *C. perfringens* outbreaks, 2015**

| PHU | Month | Suspected vehicle | Exposure setting | Preparation setting | No. ill |
|---|---|---|---|---|---|
| Auckland | Jan | Lamb kebab | Restaurant/cafe/bakery | Restaurant/cafe/bakery | 1C, 1P |
| MidCentral | Apr | Roast pork and gravy | Restaurant/cafe/bakery | Restaurant/cafe/bakery | 5C, 28P |
| Hawke's Bay | Sep | Roast pork | School / home | Marae | 11C |
| Manukau | Nov | Left over home made chicken and vegetable soup | Home | Home | 3C |
| Nelson Marlborough | Dec | Beef sirloin | Gathering | Caterers | 18C |

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

During investigation of suspected foodborne illness outbreaks by ESR's Public Health Laboratory in 2015, samples were received from all outbreaks listed in Table 16. *C. perfringens* and *C. perfringens* enterotoxin were detected in faecal samples from four of the five outbreaks. *C. perfringens* and *C. perfringens* spores were detected in faecal samples from the remaining outbreak. Food samples were provided for the September and November outbreaks and *C. perfringens* was isolated from the pork and soup.

### Recent surveys

Nil.

### Relevant New Zealand studies and publications

### Journal papers

An investigation of a *Clostridium perfringens* outbreak at a Wanganui restaurant during April 2015 was reported [19]. Of the investigated foods, the highest risk ratio was for pork (4.4, 95$^{th}$ percentile confidence interval 0.7-26.7).

### Relevant regulatory developments

Nil.

# Cryptosporidiosis

Summary data for cryptosporidiosis in 2015 are given in Table 17.

**Table 17. Summary of surveillance data for cryptosporidiosis, 2015**

| Parameter | Value in 2015 | Source |
|---|---|---|
| Number of notified cases | 696 | EpiSurv |
| Notification rate (per 100,000) | 15.1 | EpiSurv |
| Hospitalisations (% of notifications)[a] | 30 (4.3%) | MoH NMDS, EpiSurv |
| Deaths | 0 | EpiSurv |
| Estimated travel-related cases (%)[a] | 72 (10.3%) | 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 2015 by data source

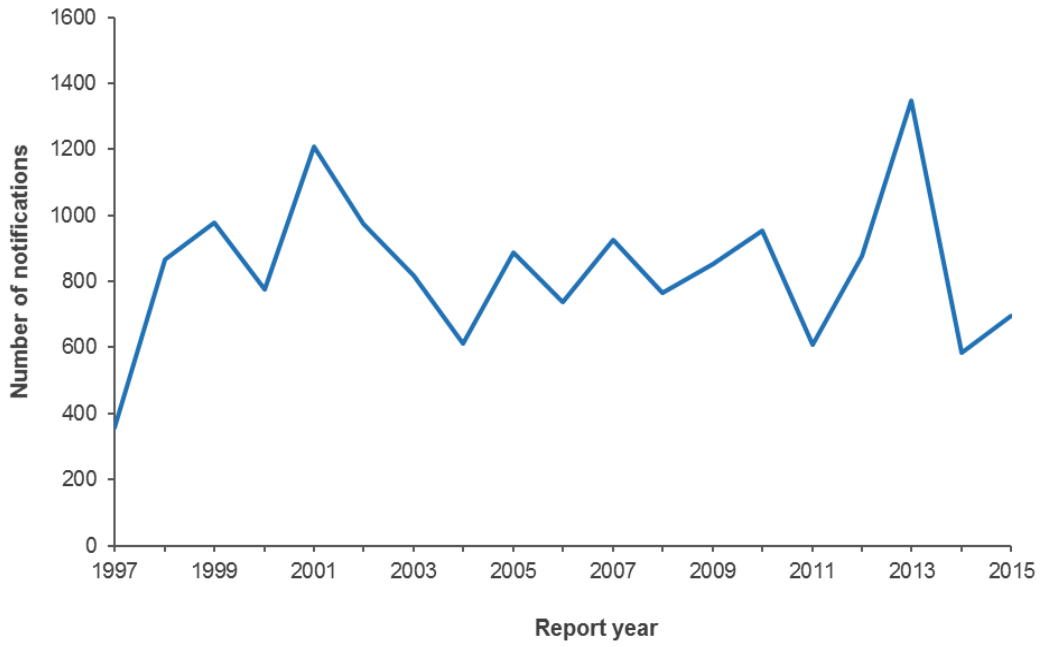
During 2015, 696 notifications (15.1 cases per 100,000 population) of cryptosporidiosis and no resulting deaths were reported in EpiSurv.

The ICD-10 code A07.2 was used to extract cryptosporidiosis hospitalisation data from the MoH NMDS database. Of the 30 hospital admissions (0.7 admissions per 100,000 population) recorded in 2015, 21 were reported with cryptosporidiosis as the principal diagnosis and nine with cryptosporidiosis as another relevant diagnosis.

### Notifiable disease data

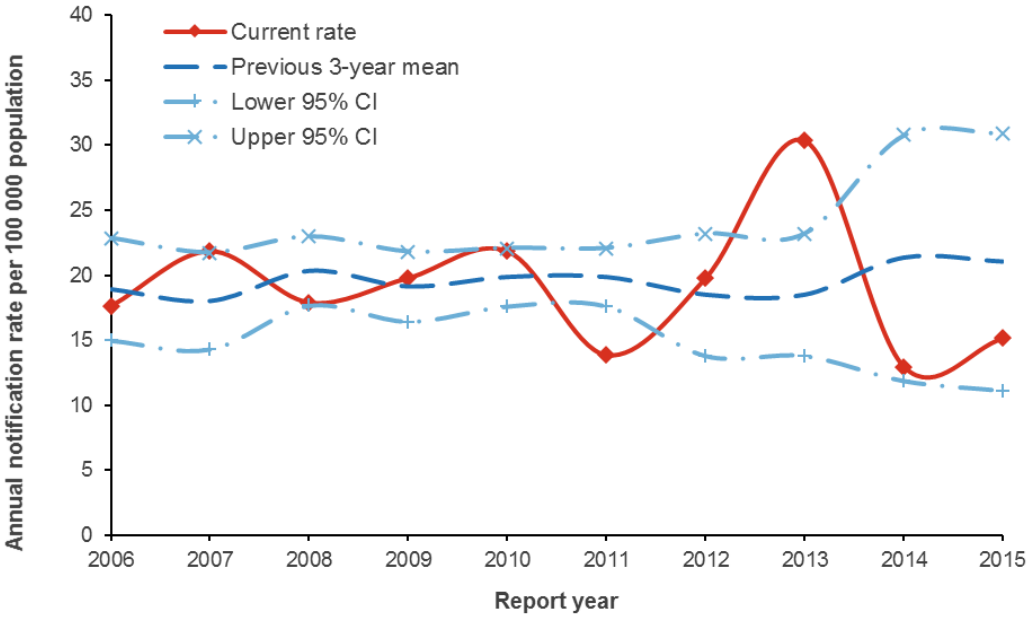
The highest recorded number of cryptosporidiosis notifications since cryptosporidiosis became a notifiable disease in 1996 was 1384 notifications in 2013. The notifications in 2015 (696) are consistant with the range (610–954) observed between 2004 and 2012 (Figure 12).

**Figure 12. Cryptosporidiosis notifications by year, 1997–2015**



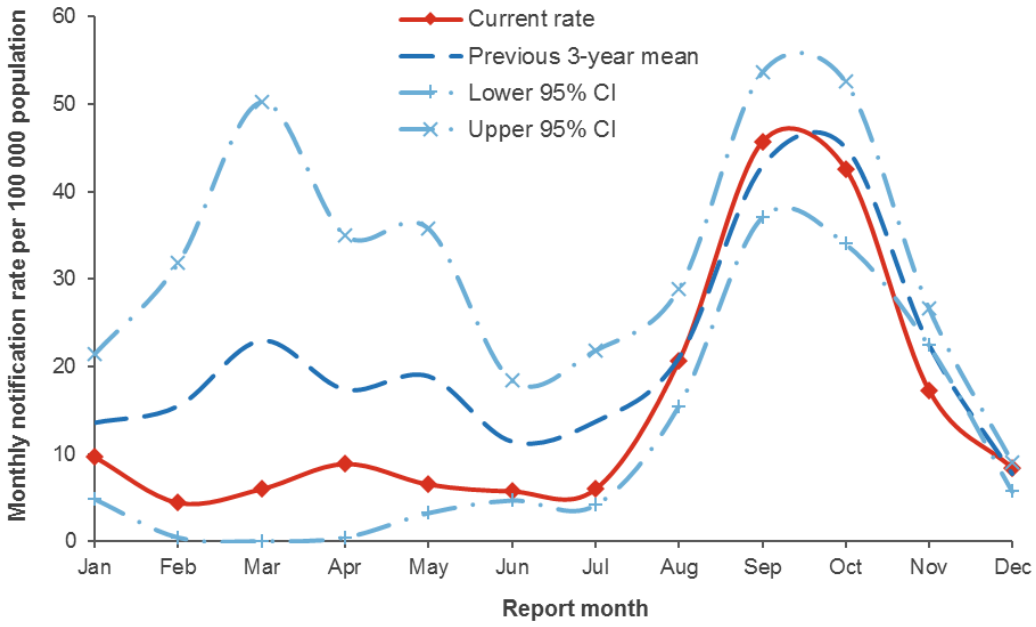

In 2014 and 2015 the notification rates were lower than the mean of the previous 3 years (Figure 13) due to the peak observed in 2013.

**Figure 13. Cryptosporidiosis notification rate by year, 2006–2015**



The number of notified cases of cryptosporidiosis reported per 100,000 population by month for 2015 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 and 2015 did not show the strong March to May peak seen in 2013 (Figure 14).

**Figure 14. Cryptosporidiosis monthly rate (annualised), 2015**




In 2015, the rate of notifications and hospitalisations for cryptosporidiosis was higher for females (16.3 notifications and 0.9 admissions per 100,000 population) compared with males (14.1 notifications and 0.4 admissions per 100,000 population). In 2014 the hospitalisation rate was the same for males and females (0.6 admissions per 100,000 population) (Table 18).

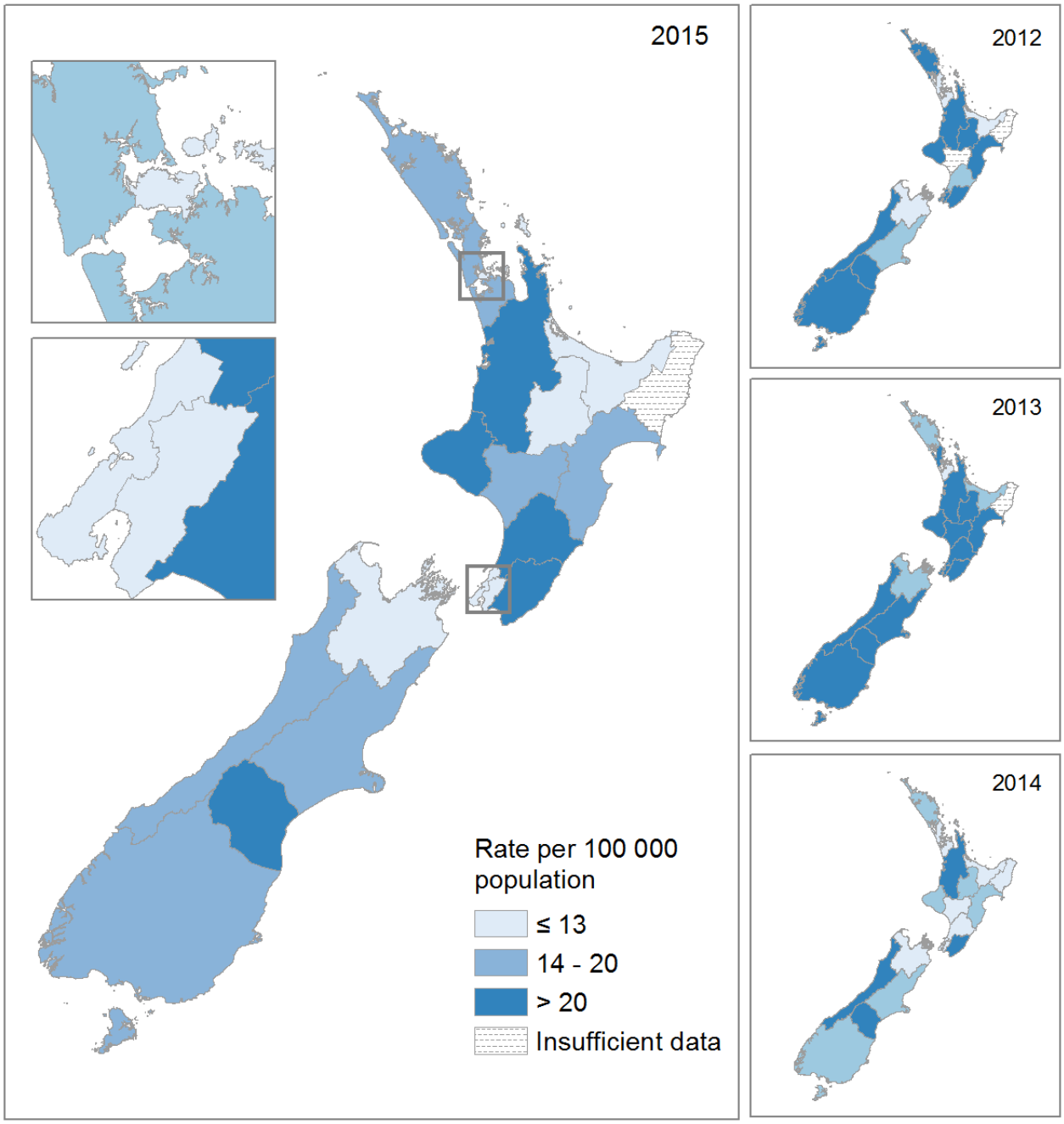
**Table 18. Cryptosporidiosis cases by sex, 2015**

| Sex | EpiSurv notifications | | Hospitalisations[a] | |
|---|---|---|---|---|
| | No. | Rate[b] | No. | Rate[b] |
| Male | 315 | 14.0 | 8 | 0.4 |
| Female | 381 | 16.3 | 22 | 0.9 |
| **Total** | **696** | **15.1** | **30** | **0.7** |

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

In 2015, the highest rates of cryptosporidiosis notifications were for Waikato (29.7 per 100,000, 116 cases), Wairarapa (25.5 per 100,000, 11 cases), Mid Central (24.4 per 100,000, 42 cases) and South Canterbury (23.9 per 100,000 population, 14 cases) DHBs. South Canterbury, Wairarapa and Waikato DHBs have consistently recorded higher rates of notification over the period 2012 to 2015 (Figure 15).

**Figure 15. Geographic distribution of cryptosporidiosis notifications, 2012–2015**



During 2015, the highest cryptosporidiosis age specific notification rates were for the 1 to 4 years age group (80.7 per 100,000 population, 199 cases), followed by 20 to 29 (19.0 per 100,000, 124 cases) and the less than 1 year (18.6 per 100,000, 11 cases) age groups (Table 19). The hospitalisation rate was also highest in the 1 to 4 years age group.

**Table 19. Cryptosporidiosis cases by age group, 2015**

| Age group | EpiSurv notifications | | Hospitalisations[a] | |
|---|---|---|---|---|
| | No. | Rate[b] | No. | Rate[b] |
| <1 | 11 | 18.6 | 3 | - |
| 1 to 4 | 199 | 80.7 | 6 | 2.4 |
| 5 to 9 | 89 | 28.2 | 6 | 1.9 |
| 10 to 14 | 41 | 14.0 | 1 | - |
| 15 to 19 | 44 | 13.9 | 1 | - |
| 20 to 29 | 124 | 19.0 | 4 | - |
| 30 to 39 | 80 | 14.3 | 5 | 0.9 |
| 40 to 49 | 55 | 8.8 | 0 | - |
| 50 to 59 | 24 | 4.0 | 2 | - |
| 60 to 69 | 16 | 3.4 | 1 | - |
| 70+ | 12 | 2.7 | 1 | - |
| **Total** | **696** | **15.1** | **30** | **0.7** |

[a] MoH NMDS data for hospital admissions

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

During 2015, the most commonly reported risk factors for cryptosporidiosis were contact with farm animals (65.0%), consumption of untreated water (42.4%) and contact with faecal matter (37.5%) (Table 20).

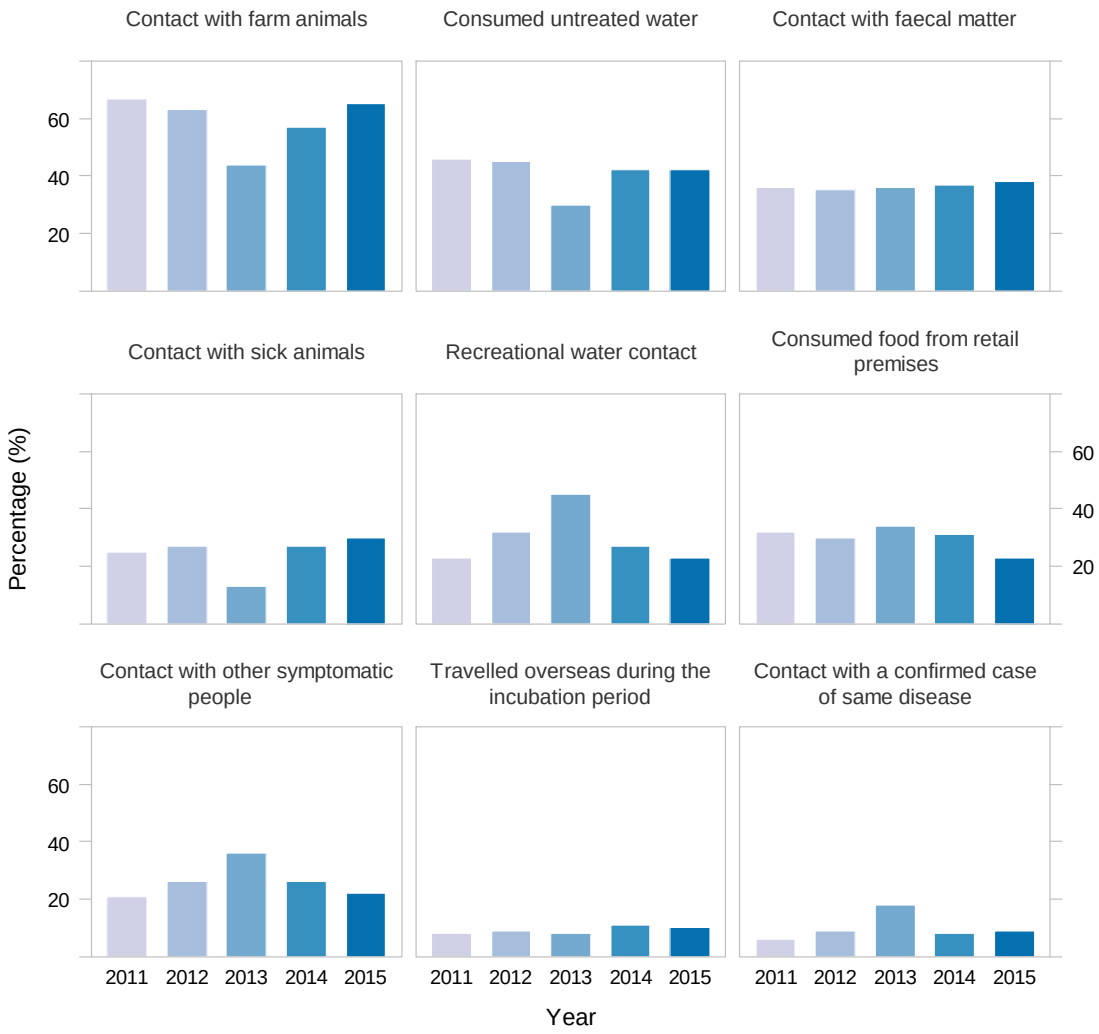
**Table 20. Exposure to risk factors reported for cryptosporidiosis notifications, 2015**

| Risk factor | Notifications | | | |
|---|---|---|---|---|
| | Yes | No | Unknown | %[a] |
| Contact with farm animals | 262 | 141 | 293 | 65.0 |
| Consumed untreated water | 144 | 196 | 356 | 42.4 |
| Contact with faecal matter | 139 | 232 | 325 | 37.5 |
| Contact with sick animals | 101 | 240 | 355 | 29.6 |
| Recreational water contact | 86 | 284 | 326 | 23.2 |
| Consumed food from retail premises | 80 | 268 | 348 | 23.0 |
| Contact with other symptomatic people | 83 | 296 | 317 | 21.9 |
| Travelled overseas during the incubation period | 50 | 436 | 210 | 10.3 |
| Contact with a confirmed case of same disease | 29 | 306 | 361 | 8.7 |

[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 2011 and 2015, the most commonly reported risk factor for cryptosporidiosis was contact with farm animals followed by consumption of untreated water and contact with faecal matter (Figure 16). 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 and 2015 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 16. Percentage of cases with exposure to risk factors reported for cryptosporidiosis and year, 2011–2015**




For cases where information on travel was provided, 10.3% (95% CI 7.8-13.4%) 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 2015. The resultant distribution has a mean of 72 cases (95% CI 47-101).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism was 9.4% (95% CI 8.3-10.6%).

### Outbreaks reported as caused by *Cryptosporidium* spp.

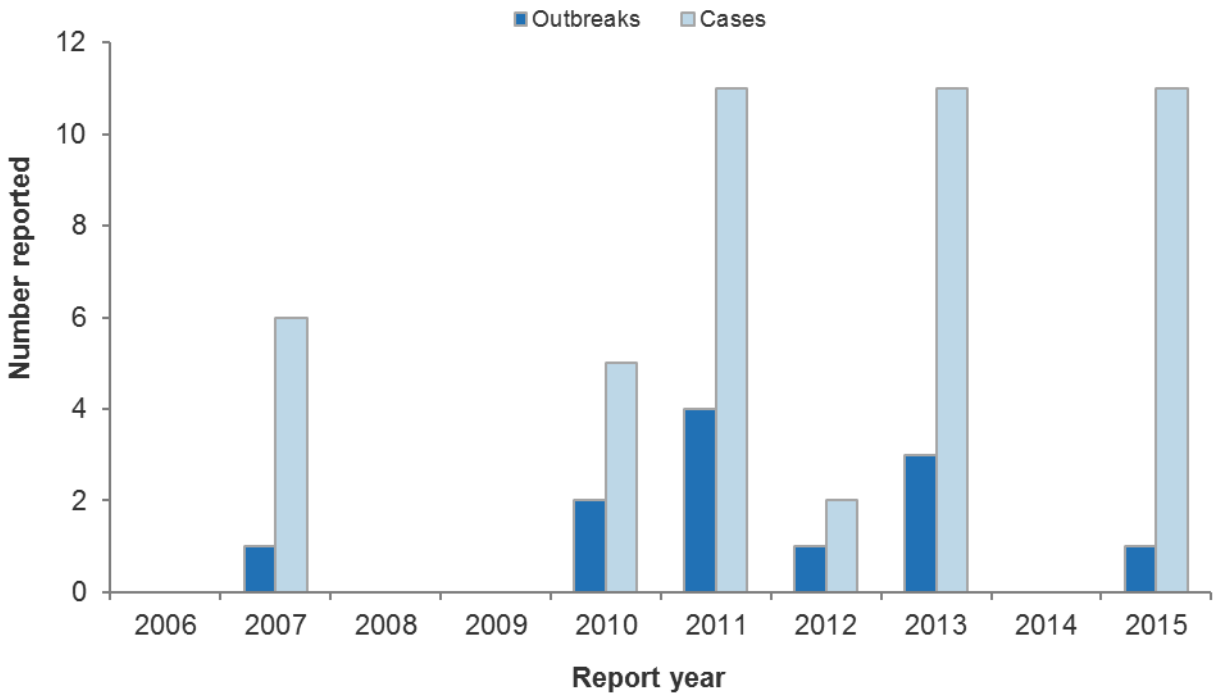
In 2015, one (4.8%) of the *Cryptosporidium* spp outbreaks and 11 (11.7%) of the associated cases were reported as foodborne (Table 21). An outbreak has been classed as foodborne in this report if food was recorded as one of the likely modes of transmission applicable to the outbreak. It is important 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 4.2% (21/501) of all enteric outbreaks and 1.3% (94/7433) of all associated cases.

**Table 21. *Cryptosporidium* spp. outbreaks reported, 2015**

| Measure | Foodborne *Cryptosporidium* spp. outbreaks | All *Cryptosporidium* spp. outbreaks |
|---|---|---|
| Outbreaks | 1 | 21 |
| Cases | 11 | 94 |
| Hospitalised cases | 0 | 2 |

Foodborne transmission is rarely reported for *Cryptosporidium* spp. outbreaks, with not more than four outbreaks reported each year in the ten year period, 2006−2015. The outbreaks in 2015 had the largest number of cases (11) associated with a single outbreak (Figure 17).

**Figure 17. Foodborne *Cryptosporidium* spp. outbreaks and associated cases reported by year, 2006–2015**




In the *Cryptosporidium* spp. outbreak with a suspected food vehicle (Table 22), strong evidence was found to implicate raw milk as the food vehicle. The cases all drank raw milk from the same supplier and the *Cryptosporidium* spp isolates from the cases faecal samples were found to be of the same type.

**Table 22. Details of the foodborne *Cryptosporidium* spp. outbreak, 2015**

| PHU | Month | Suspected vehicle | Exposure setting | Preparation setting | No. ill |
|---|---|---|---|---|---|
| Waikato | Oct | Raw milk | Other food outlet | Other food outlet | 7C 4P |

In 2015, no food or clinical samples were submitted to ESR's Public Health Laboratory relating to the food-associated *Cryptosporidium* spp. outbreak.

### Recent surveys

Nil.

### Relevant New Zealand studies and publications

### Journal papers

Analysis of faecal samples (n = 1283) from newborn calves on New Zealand dairy farms (n = 97) found a farm prevalence for *Cryptosporidium parvum* of 50.5%, *C. bovis* of 6.1%, while for 8.2% of farms *Cryptosporidium* species were isolated that could not be identified [20]. The dominant *C. parvum* genetic variants were geographically widespread and found in both bovine and human populations. Human samples were those submitted for genotyping to Massey University between 2003 and 2010 by diagnostic laboratories.

Using disease notification data, spatio-temporal clusters of cryptosporidiosis were detected across three time periods: (i) 1997–2000, (ii) 2001–2004, (iii) 2005–2008 [21]. There was substantial variation in the geographical location and timing of recurrent cryptosporidiosis clusters. Statistically significant cryptosporidiosis clusters were detected in spring, in areas with high livestock land use. The location and timing of cryptosporidiosis clusters suggest an influence of livestock production practices.

### Relevant regulatory developments

Nil.

# Giardiasis

Summary data for giardiasis in 2015 are given in Table 23.

**Table 23. Summary of surveillance data for giardiasis, 2015**

| Parameter | Value in 2015 | Source |
|---|---|---|
| Number of notified cases | 1510 | EpiSurv |
| Notification rate (per 100,000) | 32.9 | EpiSurv |
| Hospitalisations (% of notifications)[a] | 53 (3.5%) | MoH NMDS, EpiSurv |
| Deaths (%)[a] | 0 (0%) | EpiSurv |
| Estimated travel-related cases (%)[a] | 350 (23.2%) | 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 2015 by data source

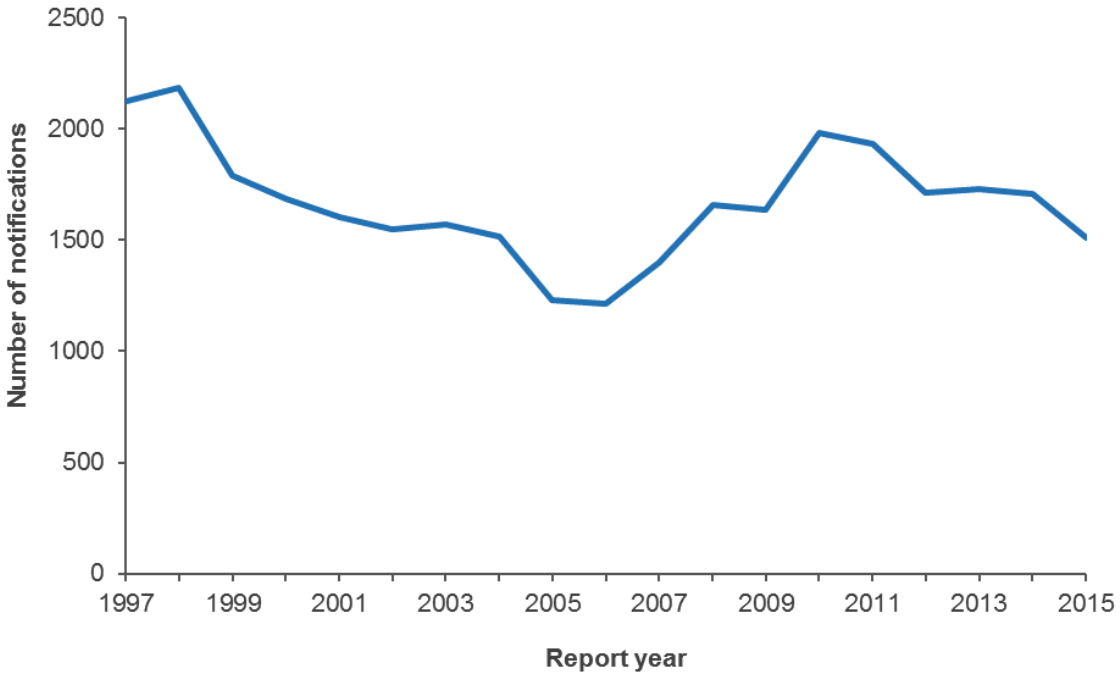
During 2015, 1510 notifications (32.9 cases per 100,000 population) of giardiasis and no resulting deaths were reported in EpiSurv.

The ICD-10 code A07.1 was used to extract giardiasis hospitalisation data from the MoH NMDS database. Of the 53 hospital admissions (1.2 admissions per 100,000 population) recorded in 2015, 33 were reported with giardiasis as the principal diagnosis and 20 with giardiasis as another relevant diagnosis.

### Notifiable disease data

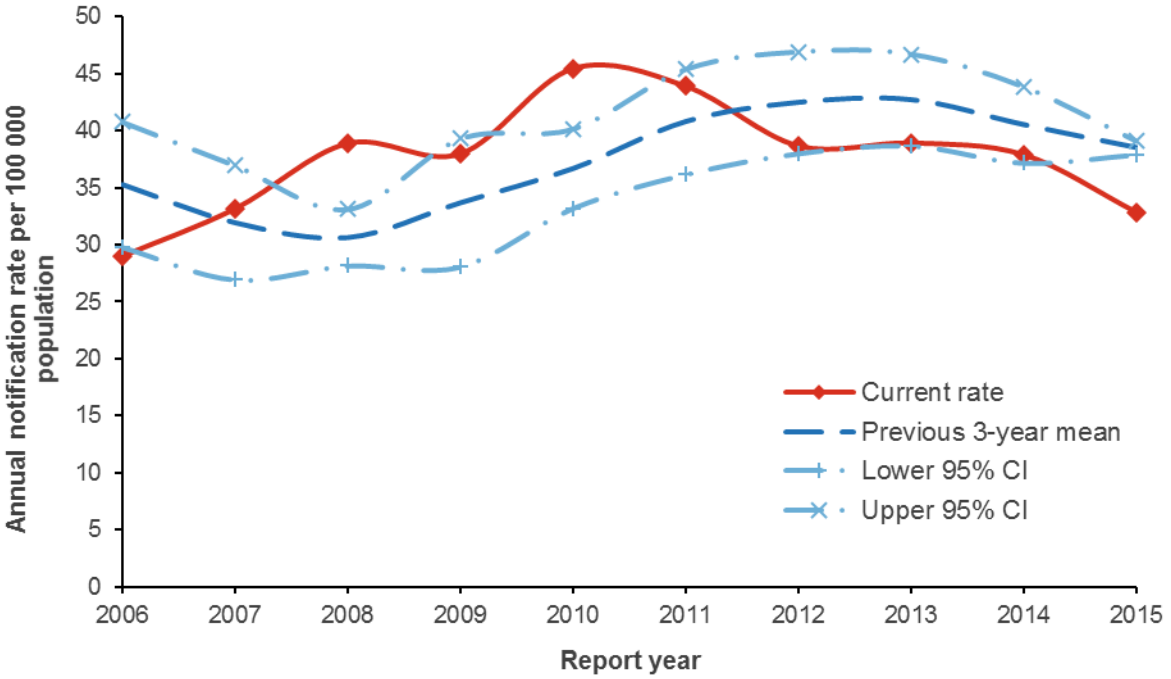
There was a steady decrease in the number of giardiasis cases reported each year from 1998 to 2006. An increasing trend in the number of notifications was observed from 2006 until 2010 followed by decreases in the number of notifications since 2010. The highest number of notifications since 1999 was reported in 2010 (1985 cases), followed by 2011 (1934 cases) (Figure 18).

**Figure 18. Giardiasis notifications by year, 1997–2015**



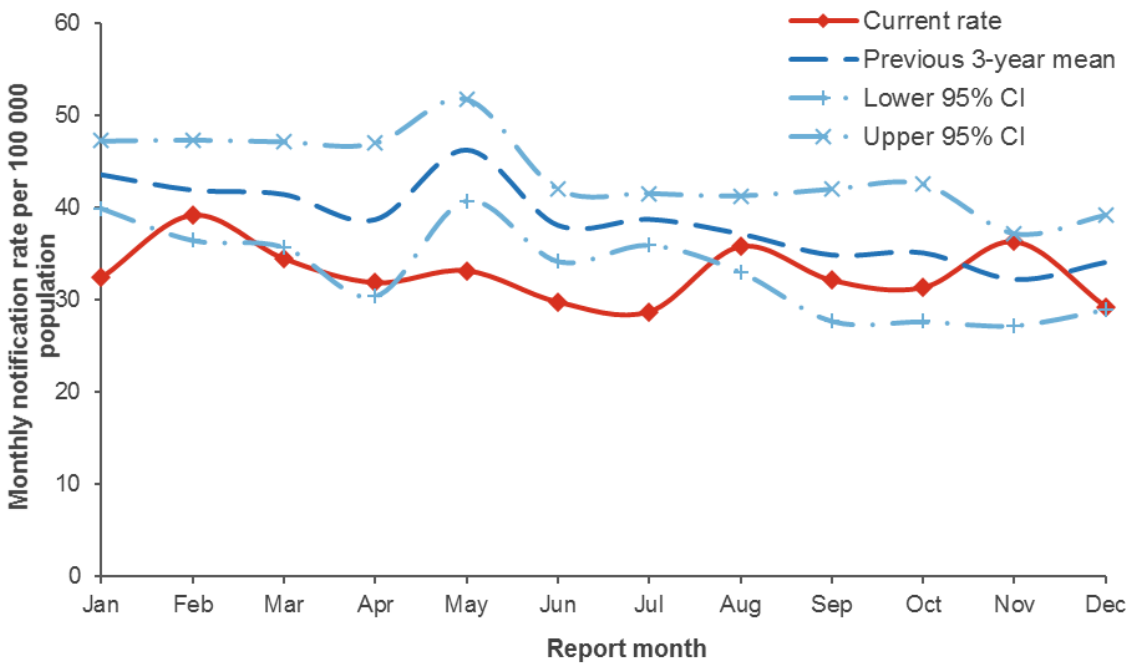

The giardiasis annual population rate trend was very similar to the corresponding annual notification trend. The 2015 notification rate was lower than 2012 to 2014 and maintained the downward trend since 2010. Between 2007 and 2010 there had been a generally increasing trend (Figure 19).

**Figure 19. Giardiasis notification rate by year, 2006–2015**



There was no strong seasonal pattern in the population rate of giardiasis notifications reported by month either historically or in 2015 (Figure 20). January, and the winter months of May to July had lower numbers of month specific notifications than seen in the previous three years.

**Figure 20. Giardiasis monthly rate (annualised), 2015**




In 2015 the number and rate for notifications were higher for males than females, however similar numbers of females and males were admitted to hospital (Table 24).

**Table 24. Giardiasis cases by sex, 2015**

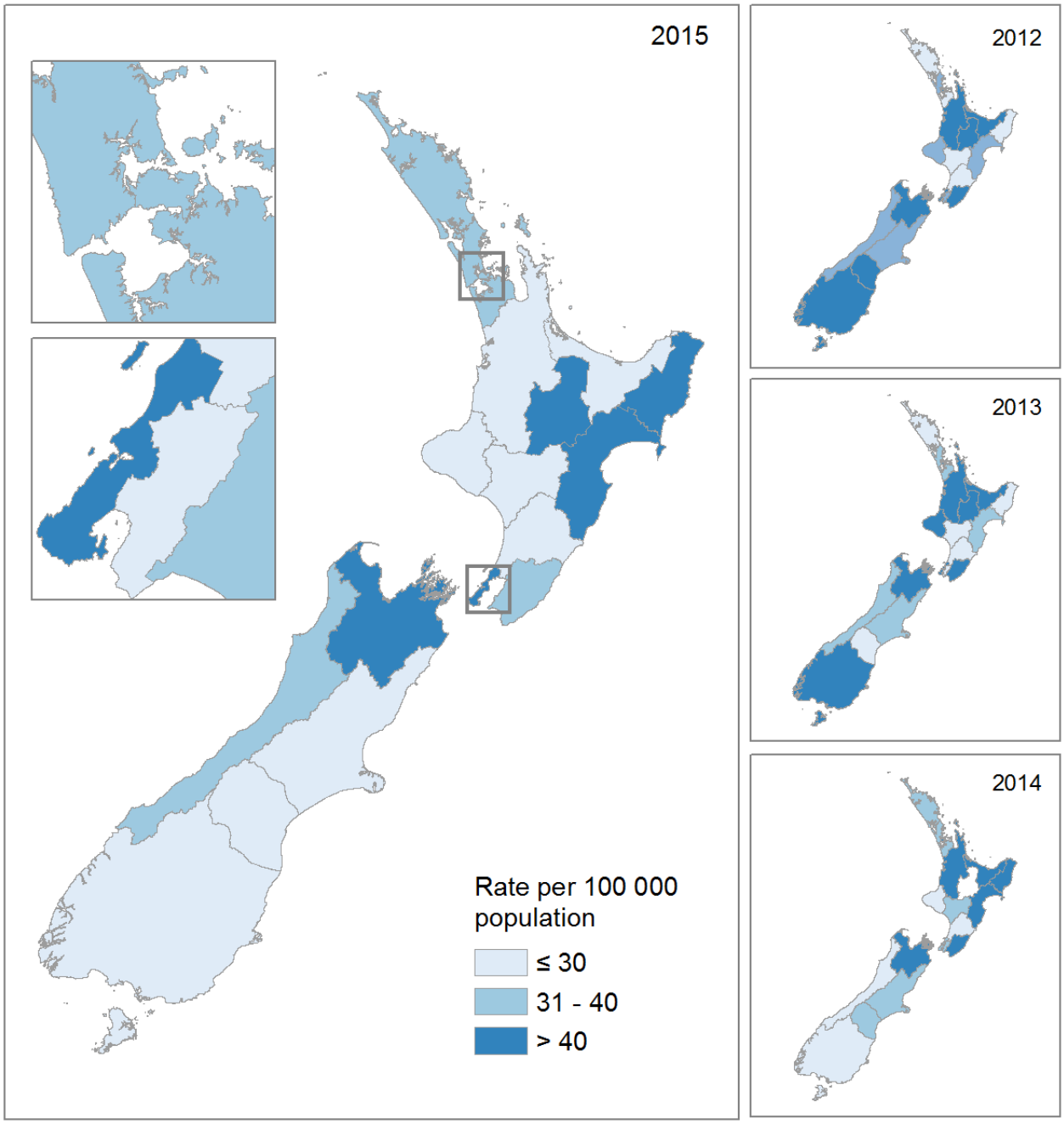
| Sex | EpiSurv notifications | | Hospitalisations[a] | |
|---|---|---|---|---|
| | No. | Rate[b] | No. | Rate[b] |
| Male | 793 | 35.1 | 28 | 1.2 |
| Female | 717 | 30.7 | 25 | 1.1 |
| **Total** | **1510** | **32.9** | **53** | **1.2** |

[a] MoH NMDS data for hospital admissions

[b] per 100,000 of population

Giardiasis rates varied throughout the country during 2015 (Figure 21). The highest rate was for Lakes DHB (57.3 per 100,000 population, 60 cases), followed by Capital and Coast DHB (51.8 per 100,000, 156 cases). The lowest rates were for Hutt Valley (13.9 per 100,000, 20 cases) and MidCentral (16.9 per 100,000 population, 29 cases) DHBs. Lakes, and Nelson Marlborough DHBs have consistently been in the highest quantile in the last four years.

**Figure 21. Geographic distribution of giardiasis notifications, 2012–2015**



In 2015, the highest notification rate was for the 1 to 4 years age group (114.3 per 100,000 population, 282 cases), followed by the 30 to 39 years age group (53.1 per 100,000, 298 cases) (Table 25). The highest hospitalisation rate was also for the 1 to 4 years age group.

**Table 25. Giardiasis cases by age group, 2015**

| Age group (years) | EpiSurv notifications | | Hospitalisations[a] | |
|---|---|---|---|---|
| | No. | Rate[b] | No. | Rate[b] |
| <1 | 27 | 45.7 | 2 | - |
| 1 to 4 | 282 | 114.3 | 9 | 3.6 |
| 5 to 9 | 114 | 36.2 | 1 | - |
| 10 to 14 | 43 | 14.7 | 3 | - |
| 15 to 19 | 25 | 7.9 | 1 | - |
| 20 to 29 | 144 | 22.1 | 9 | 1.4 |
| 30 to 39 | 298 | 53.1 | 6 | 1.1 |
| 40 to 49 | 230 | 36.9 | 5 | 0.8 |
| 50 to 59 | 153 | 25.3 | 7 | 1.2 |
| 60 to 69 | 146 | 30.7 | 5 | 1.1 |
| 70+ | 47 | 10.5 | 5 | 1.1 |
| **Total** | **1510** | **32.9** | **53** | **1.2** |

[a] MoH NMDS data for hospital admissions

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

In 2015, the most commonly reported risk factor for notified giardiasis cases was contact with faecal matter (43.8%). Consuming food from retail premises, contact with recreational water, consumption of untreated water and contact with other symptomatic people all had similar rates of reporting with between 33% and 35% of notifications reporting each of these risk factors (Table 26).

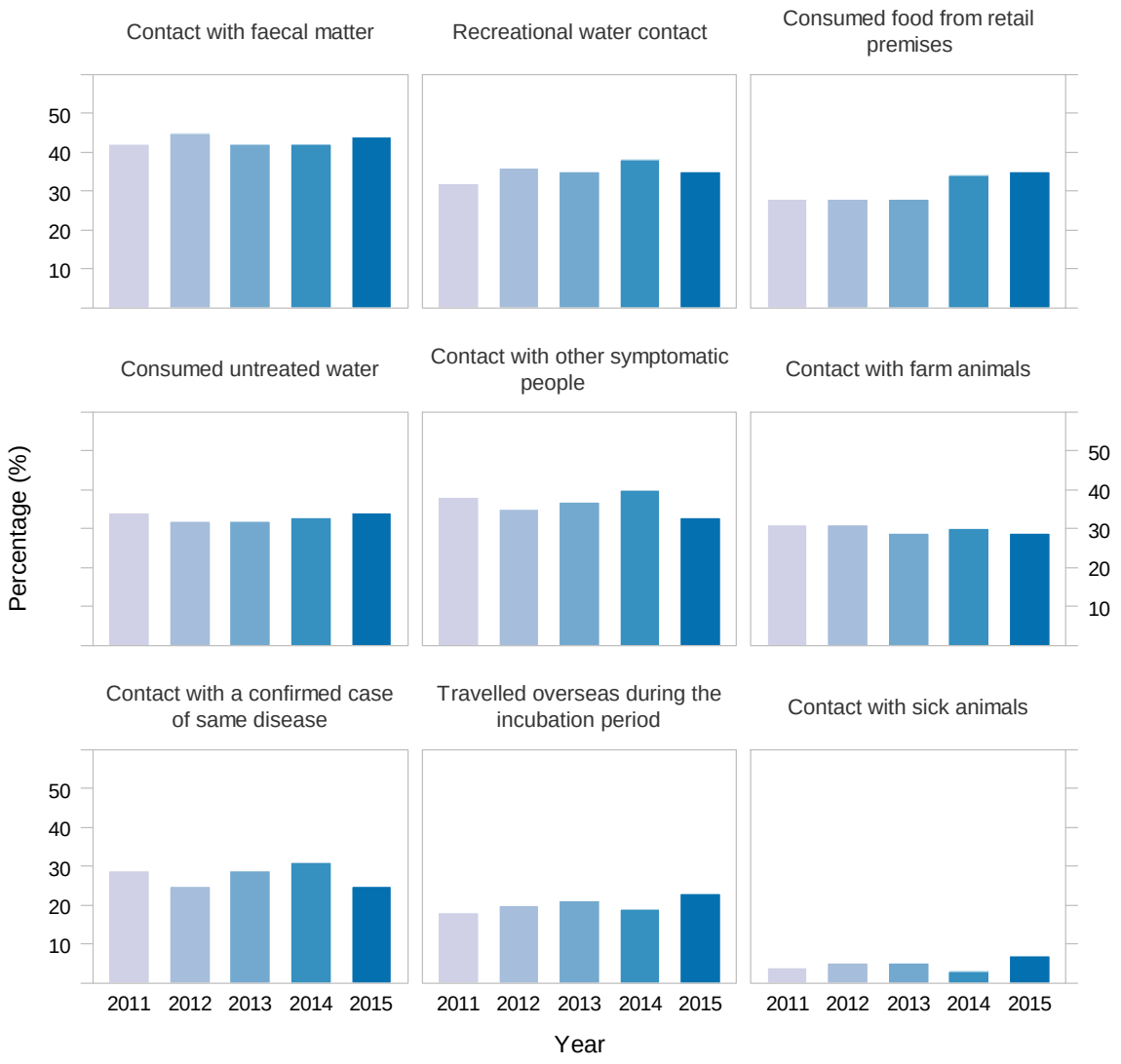
**Table 26. Exposure to risk factors reported for giardiasis notifications, 2015**

| Risk factor | Notifications | | | |
|---|---|---|---|---|
| | Yes | No | Unknown | %[a] |
| Contact with faecal matter | 298 | 382 | 830 | 43.8 |
| Consumed food from retail premises | 209 | 391 | 910 | 34.8 |
| Recreational water contact | 233 | 441 | 836 | 34.6 |
| Consumed untreated water | 208 | 410 | 892 | 33.7 |
| Contact with other symptomatic people | 223 | 445 | 842 | 33.4 |
| Contact with farm animals | 199 | 498 | 813 | 28.6 |
| Contact with a confirmed case of same disease | 146 | 433 | 931 | 25.2 |
| Travelled overseas during the incubation period | 190 | 628 | 692 | 23.2 |
| Contact with sick animals | 45 | 599 | 866 | 7.0 |

[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.

In 2014 and 2015 there has been a slight increase in the reporting of consuming food from a retail outlet compared to the previous three years (Figure 22). The other risk factors show no clear trends over the five year time period.

**Figure 22. Percentage of cases with exposure to risk factors reported for giardiasis and year, 2011–2015**




For cases where information on travel was provided in 2015, 23.2% (95% CI 20.4-26.3%) 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 2015. The resultant distribution has a mean of 351 cases (95% CI 293-416).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism was 20.8% (95% CI 19.4%-22.2%).

### Outbreaks reported as caused by *Giardia* spp.

In 2015, there were 45 *Giardia* spp. outbreaks reported, two of these were associated with a suspected or known foodborne source (Table 27). 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. *Giardia* spp. outbreaks accounted for 9.0% (45/501) of all enteric outbreaks and 2.8% (207/7433) of all associated cases.

**Table 27. Giardia spp. outbreaks reported, 2015**

| Measure | Foodborne *Giardia* spp. outbreaks | All *Giardia* spp. outbreaks |
|---|---|---|
| Outbreaks | 2 | 45 |
| Cases | 30 | 207 |
| Hospitalised cases | 0 | 0 |

The highest number of foodborne *Giardia* spp. outbreaks and associated cases reported in the period from 2006 to 2015 was in 2013 (10 outbreaks and 36 associated cases). Between 2006 and 2015, two to six foodborne *Giardia* spp. outbreaks were reported each year, with the exception of 2009 when no outbreaks were reported and 2013. (Figure 23). For the last three years the number of cases has been in the range 27 to 36 cases, which is higher than in the preceeding seven years.

**Figure 23. Foodborne *Giardia* spp. outbreaks and associated cases reported by year, 2006–2015**

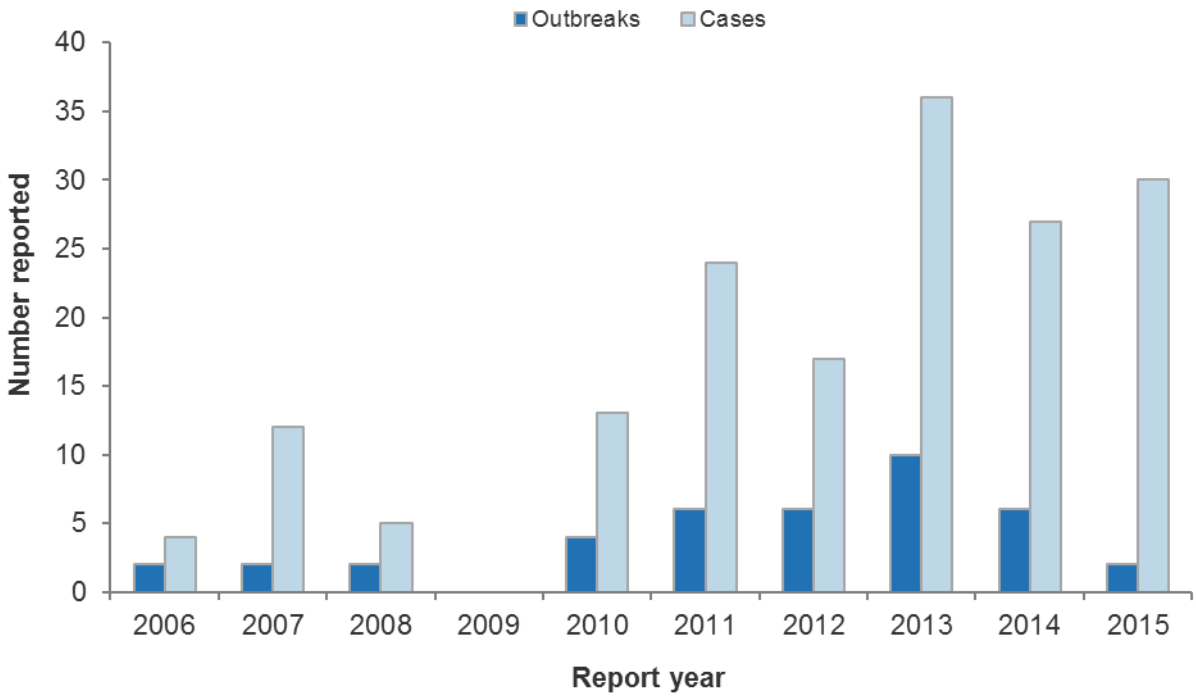


Table 28 contains details of the two foodborne *Giardia* spp. outbreaks reported in 2015. For both outbreaks the evidence for foodborne transmission was weak and the May outbreak was associated with a school trip to Nepal.

**Table 28. Details of foodborne *Giardia* spp. outbreaks, 2015**

| PHU | Month | Suspected vehicle | Exposure setting | Preparation setting | No. ill |
|---|---|---|---|---|---|
| Waikato | Mar | Unknown | Home / Marae | Home / Marae | 1C, 3P |
| C and PH | May | Unknown | Other setting | Overseas | 8C 18P |

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

In 2015, 21 clinical samples were submitted to ESR's Public Health Laboratory relating to the May food-associated *Giardia* spp. outbreak. *Giardia* spp. was found in 4 faceal specimens. *Campylobacter* and *Shigella* spp. were also found in this group of faceal specimens.

### Recent surveys

Nil.

### Relevant New Zealand studies and publications

### Journal papers

Using disease notification data, spatio-temporal clusters of giardiasis were detected across three time periods: (i) 1997–2000, (ii) 2001–2004, (iii) 2005–2008 [21]. There was substantial variation in the geographical location and timing of recurrent giardiasis clusters. Statistically significant (P<0·05) giardiasis clusters tended to occur in predominantly urban areas with little apparent seasonal influence.

### Relevant regulatory developments

Nil.

# Hepatitis A

Summary data for hepatitis A in 2015 are given in Table 29.

**Table 29. Summary of surveillance data for hepatitis A, 2015**

| Parameter | Value in 2015 | Source |
|---|---|---|
| Number of notified cases | 47 | EpiSurv |
| Notification rate (per 100,000) | 1.0 | EpiSurv |
| Hospitalisations[b] (% of notifications)[a] | 27 (57%) | MoH NMDS, EpiSurv |
| Deaths (%)[a] | 0 (0%) | EpiSurv |
| Travel-related cases (%)[a] | 24 (51.1%) | 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.

[b] Hospitalisations with acute hepatitis A as the principal diagnosis.

### 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 virus-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 2015 by data source

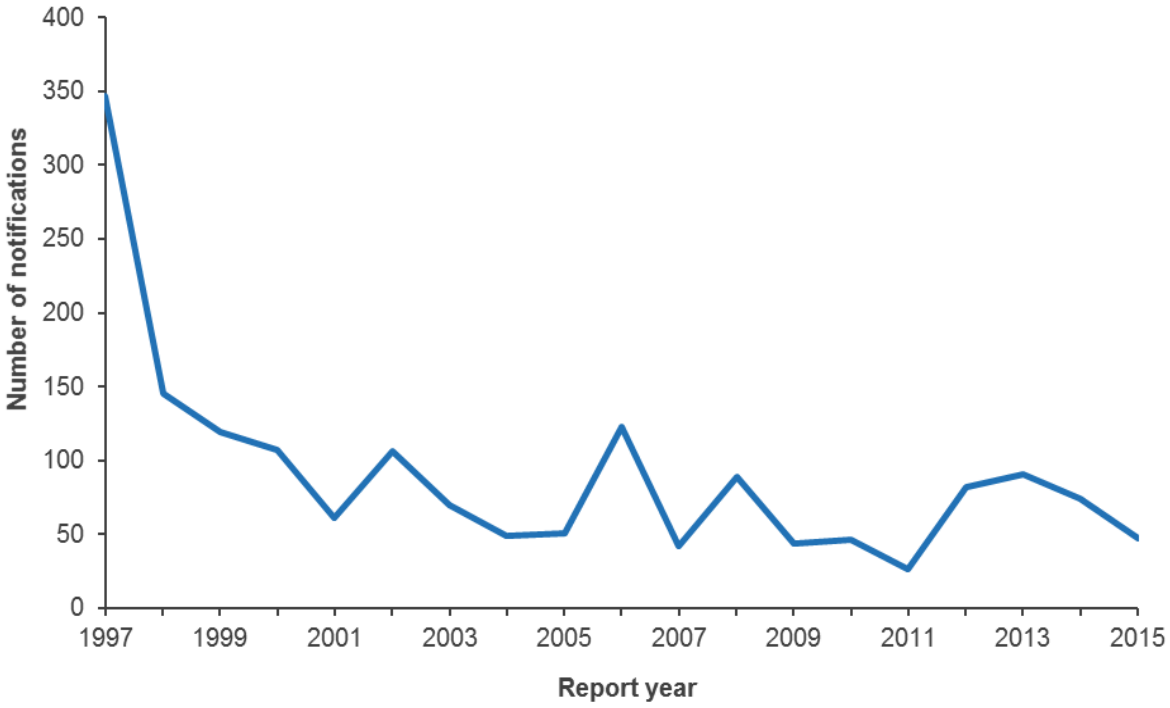
During 2015, 47 notifications (1.0 cases per 100,000 population) of hepatitis A and no resulting deaths were reported in EpiSurv.

The ICD-10 code B15 was used to extract acute hepatitis A hospitalisation data from the MoH NMDS database. Of the 64 hospital admissions (1.4 admissions per 100,000 population) recorded in 2015, 27 were reported with acute hepatitis A as the principal diagnosis and 37 with acute hepatitis A as another relevant diagnosis.

### Notifiable disease data

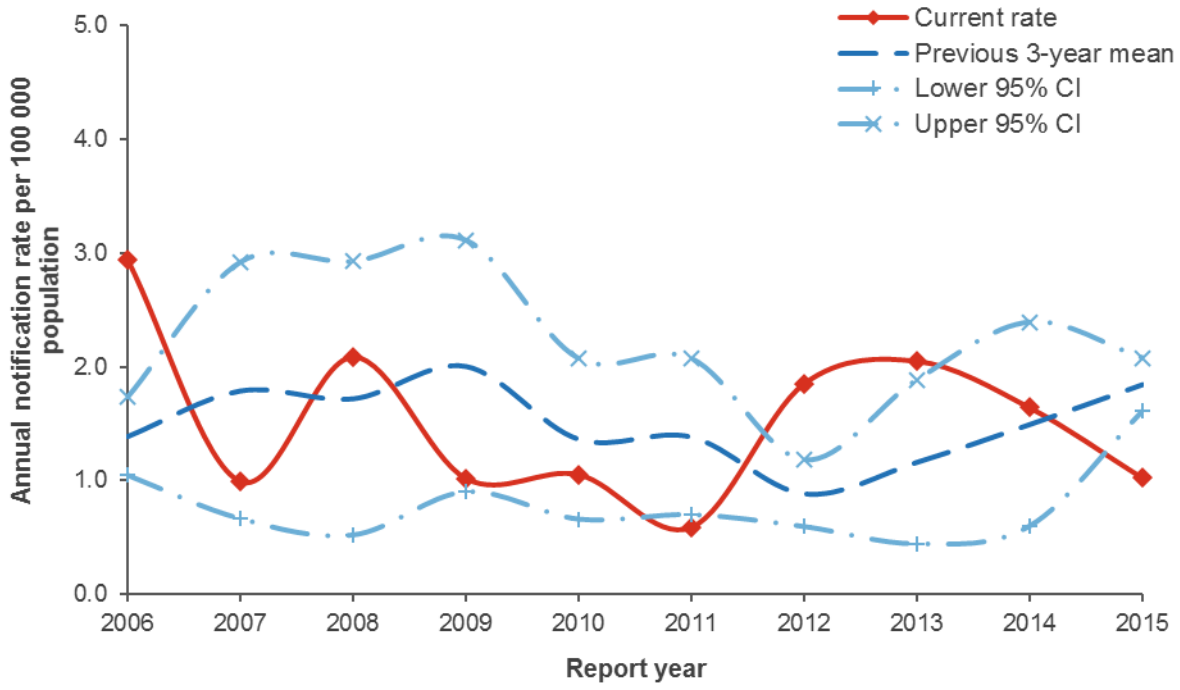
Between 2001 and 2015, the annual number of notifications has remained in the range of 26 (2011) to 123 (2006), having decreased from 347 in 1997 (Figure 24).

**Figure 24. Hepatitis A notifications by year, 1997–2015**




Hepatitis A notification rates varied throughout the 10-year period, 2006–2015 in the range 0.6 to 2.9 per 100,000 population (Figure 25). The lowest notification rate for the ten year period was in 2011, after which the rate showed an increasing trend in 2012 and 2013, followed by a decrease in 2014 and 2015.

**Figure 25. Hepatitis A notification rate by year, 2006–2015**



In 2015, the number and rate of hepatitis A notifications and hospital admissions was higher for females than males (Table 30). In 2014 the notifications for male and females was similar (1.6-1.7 per 100,000) with more male hospitalisations (19 admissions) compared to females (14 admissions).

**Table 30. Hepatitis A cases by sex, 2015**

| Sex | EpiSurv notifications | | Hospitalisations[a] | |
|---|---|---|---|---|
| | No. | Rate[b] | No. | Rate[b] |
| Male | 19 | 0.8 | 8 | 0.4 |
| Female | 28 | 1.2 | 19 | 0.8 |
| **Total** | **47** | **1.0** | **27** | **0.6** |

[a] MoH NMDS data for hospital admissions with hepatitis A as a primary diagnosis.

[b] per 100,000 of population

In 2015, the highest notification rate was for the 20 to 39 years age group (1.6 per 100,000, 19 cases) with lower rates for the less than 20 and 40 to 59 age group (both 1.0 per 100,000). Hospitalisation rates were similar for the less than 20, 20 to 39 and 40 to 59 age groups (Table 31).

**Table 31. Hepatitis A cases by age group, 2015**

| Age group (years) | EpiSurv notifications | | Hospitalisations[a] | |
|---|---|---|---|---|
| | No. | Rate[b] | No. | Rate[b] |
| <20 | 12 | 1.0 | 7 | 0.6 |
| 20 to 39 | 19 | 1.6 | 9 | 0.7 |
| 40 to 59 | 12 | 1.0 | 8 | 0.7 |
| 60+ | 4 | 0.4 | 3 | - |
| **Total** | **47** | **1.0** | **27** | **0.6** |

[a] MoH NMDS data for hospital admissions with Hepatitis A as a primary diagnosis

[b] per 100,000 of population

The most commonly reported risk factor for hepatitis A in 2015 was travelling overseas during the incubation period (51.1%) (Table 32).

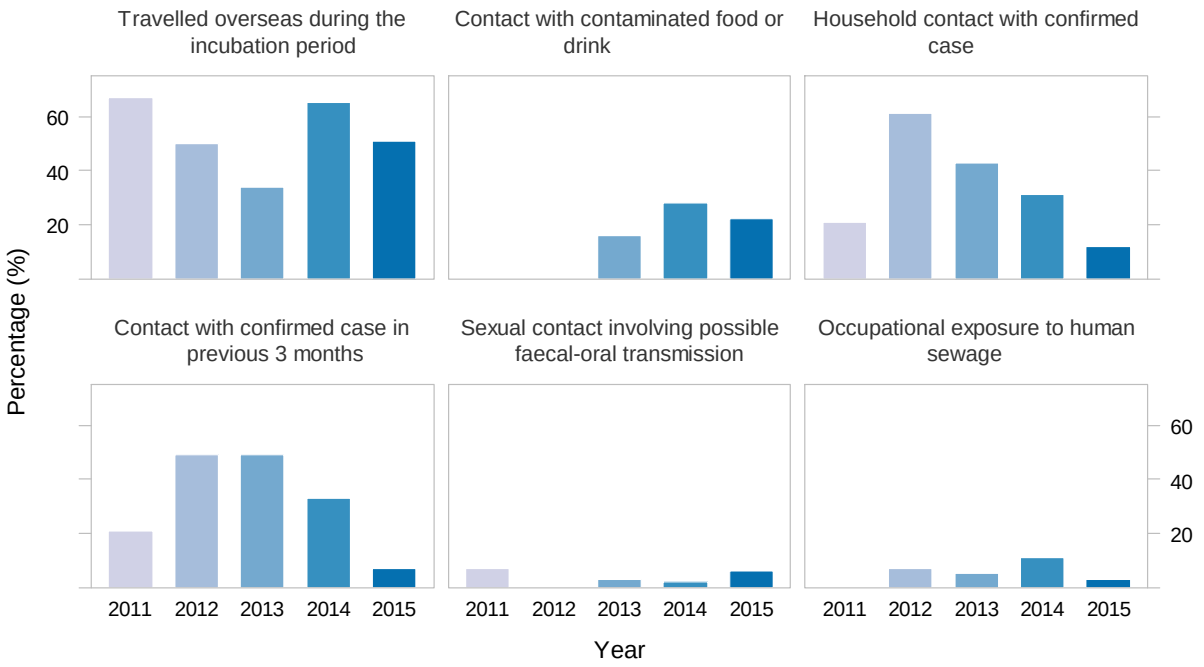
**Table 32. Exposure to risk factors reported for hepatitis A notifications, 2015**

| Risk Factor | Notifications | | | |
|---|---|---|---|---|
| | Yes | No | Unknown | %[a] |
| Travelled overseas during the incubation period | 24 | 23 | 0 | 51.1 |
| Contact with contaminated food or drink | 4 | 14 | 29 | 22.2 |
| Household contact with confirmed case | 5 | 36 | 6 | 12.2 |
| Contact with confirmed case in previous 3 months | 3 | 38 | 6 | 7.3 |
| Sexual contact involving possible faecal-oral transmission | 2 | 33 | 12 | 5.7 |
| Occupational exposure to human sewage | 1 | 34 | 12 | 2.9 |

[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.

Cases reporting overseas travel during the incubation period has been variable over the period 2011 to 2015 (Figure 26). The percentage of cases reporting household contact with a confirmed case and contact with a confirmed case in the previous three months has showed a consistant decrease since 2012 and 2013 respectively.

**Figure 26. Hepatitis A risk factors by percentage of cases and year, 2011–2015**




In 2015, all 74 hepatitis A cases provided information on international travel, and 51% (95% CI 36-66%) 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 48.8% (95% CI 42.9-54.7%).

### Outbreaks reported as caused by hepatitis A virus

One outbreak caused by hepatitis A virus with seven cases was reported in 2015. The outbreak was associated with a suspected or known foodborne source (Table 33). 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 33. Hepatitis A outbreaks reported, 2015**

| Measure | Foodborne hepatitis A outbreaks | All hepatitis A outbreaks |
|---|---|---|
| Outbreaks | 1 | 2 |
| Cases | 7 | 9 |
| Hospitalised cases | 5 | 5 |

Foodborne hepatitis A virus outbreaks are rare with only four outbreaks reported in the period 2006 to 2015 (2006, 2008, 2010 and 2015) (Figure 27). 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, 2010 and 2015 (2, 3 and 7 cases respectively).

**Figure 27. Foodborne hepatitis A virus outbreaks and associated cases reported by year, 2006–2015**

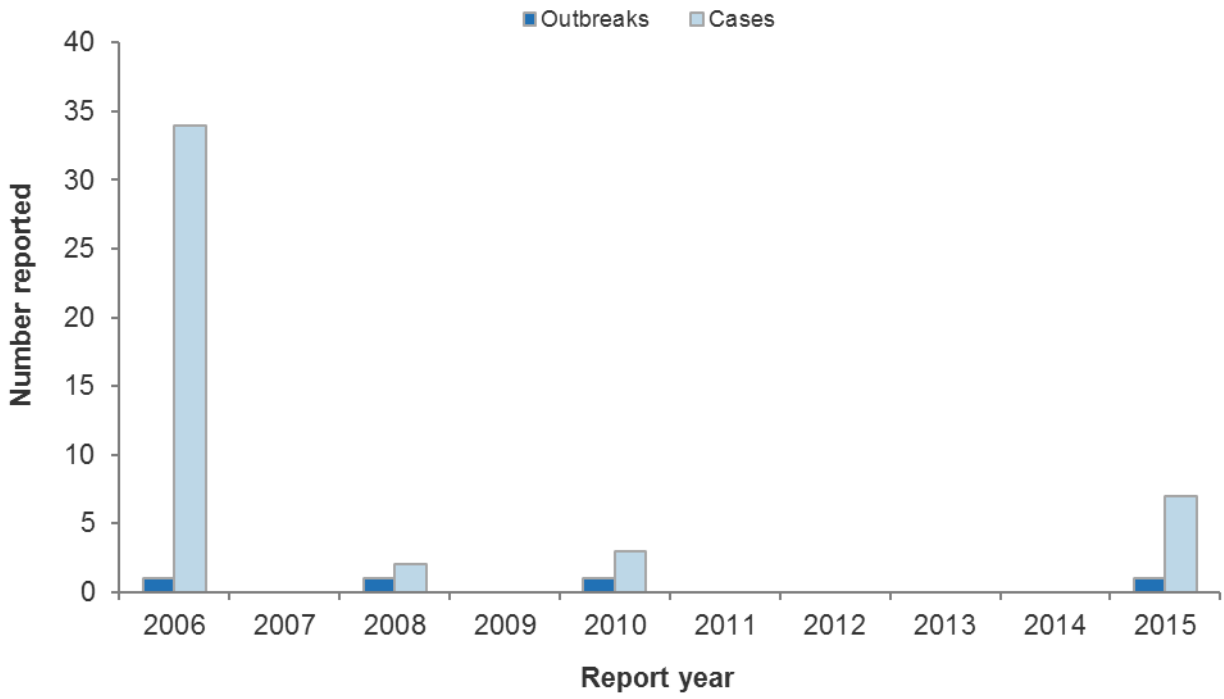



Table 34 contains details of the foodborne hepatitis A outbreak reported in 2015. Food and clinical samples were submitted to ESR's Enteric Virology Laboratory relating to the frozen berry associated hepatitis A virus outbreak. Hepatitis A virus from clinical samples (faecal and serum) were genotyped and using sequence analysis, similarities between cases in the New Zealand berry outbreak were determined. Frozen berries were identified as a common exposure factor. No hepatitis A virus was detected in the berry samples submitted for analysis.

**Table 34. Details of the foodborne hepatitis A virus outbreak, 2015**

| PHU | Month | Suspected vehicle | Exposure setting | Preparation setting | No. ill |
|---|---|---|---|---|---|
| Auckland | Mar | Frozen strawberries and blackberries | Supermarket/delicatessen/home | Home | 7C |

PHU: Public Health Unit,, C: confirmed

During 2015 it was possible to test for hepititas A virus in the following foods: bivalve molluscan shellfish, soft berry fruit and leafy salads.

### Recent surveys

Nil.

### Relevant New Zealand studies and publications

Nil.

### Relevant regulatory developments

MPI, in collaboration with FSANZ, issued a guidance document on thermal inactivation of hepatitis A virus in berries [22]. The guidance document includes recommendations to cook food to 85°C for 1 minute to inactivate hepatitis A virus, but recognises that the extent of virus inactivation is influenced by the food matrix.

An emergency food standard was issued related to the importation of frozen berry fruits [23]. While the testing requirements in the food standard related to *E. coli*, the standard was intended to detect faecal contamination.

# 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 2015 by data source

No cases of histamine (scombroid) fish poisoning were reported in EpiSurv during 2015. Note that not every case of histamine (scombroid) fish poisoning is necessarily notifiable, only those where there is a suspected common source.

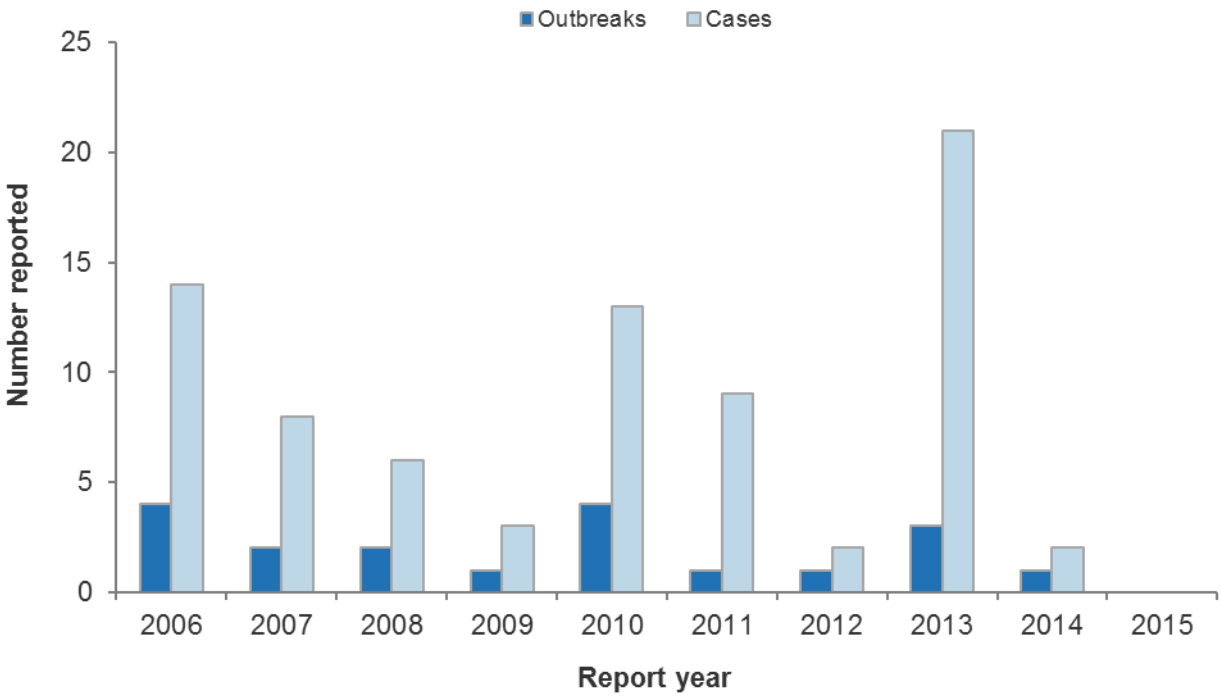
The ICD-10 code T61.1 was used to extract scombroid fish poisoning hospitalisation data from the MoH NMDS database. Of the ten hospital admissions (0.2 admissions per 100,000 population) recorded in 2015, all were reported with scombroid fish poisoning as the principal diagnosis.

### Outbreaks reported as caused by histamine (scombroid) fish poisoning

No histamine (scombroid) fish poisoning outbreaks were reported in 2015. 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.

Between 2006 and 2014 the number of histamine (scombroid) fish poisoning outbreaks reported each year ranged from one to four (Figure 28). 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 28. Histamine (scombroid) fish poisoning outbreaks and associated cases reported by year, 2006–2015**




In 2015, smoked fish and fish pâté samples were submitted to ESR's Public Health Laboratory relating to a Regional Public Health histamine fish poisoning case. The fish had high levels of histamine present. As this was a single case, this was not recorded as part of an outbreak.

### Recent surveys

Nil.

### Relevant New Zealand studies and publications

Nil.

### Relevant regulatory developments

Nil.

# Listeriosis

Summary data for listeriosis in 2015 are given in Table 35.

**Table 35. Summary of surveillance data for listeriosis, 2015**

| Parameter | Value in 2015 | Source |
|---|---|---|
| Number of notified cases[a] | 26 | EpiSurv |
| Notification rate (per 100,000) | 0.6 | EpiSurv |
| Hospitalisations | 32 | MoH NMDS |
| Deaths (%)[b] | 4 (15.4%) | EpiSurv |
| Travel-related cases (%)[b] | 2 (11.8%) | EpiSurv |
| Estimated food-related cases (%)[c] | 21 (87.8%) | Expert consultation |

[a] Includes non-perinatal (18) and perinatal cases (8).

[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 2015 by data source

During 2015, 26 notifications (0.6 cases per 100,000 population) of listeriosis were reported in EpiSurv, of which eight were perinatal. Twenty six 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 32 hospital admissions (0.7 admissions per 100,000 population) recorded in 2015, 19 were reported with listeriosis as the principal diagnosis and 13 with listeriosis as another relevant diagnosis.

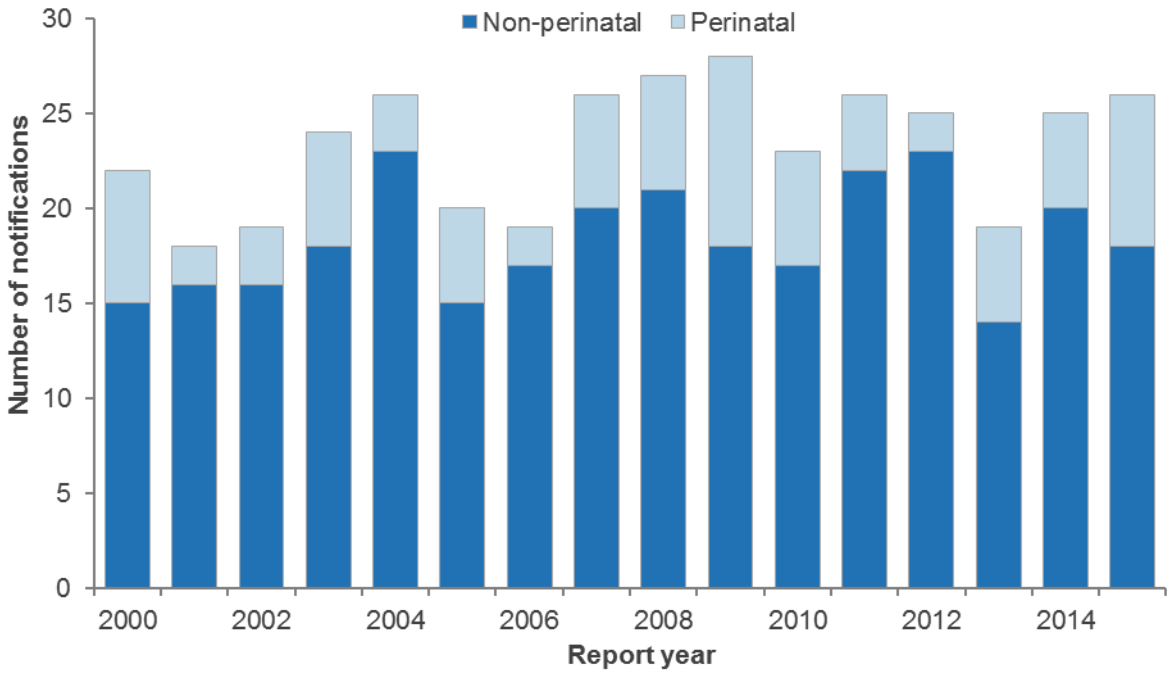
One death resulting from non-perinatal listeriosis and three perinatal deaths were recorded in EpiSurv in 2015.

It has been estimated by expert consultation that 87.8% (95$^{th}$ 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 2000 and 2015, the number of listeriosis notifications has fluctuated between 18 (2001) and 28 (2009) each year (Figure 29). In 2015, eight notifications were reported as perinatal. Because of the low numbers of listeriosis cases, the rates calculated in this report may be highly variable from year to year and it is necessary to interpret trends with caution.

**Figure 29. Listeriosis non-perinatal and perinatal notifications by year, 2000–2015**




In 2015, the rate of notifications for listeriosis was similar for females (0.6 per 100,000 population, 15 cases) and males (0.5 per 100,000, 11 cases). The number and rate of hospitalisations were the same for males and females (Table 36). It should be noted that notification case details for perinatal cases are those for the mother, so the female cases will include all 8 perinatal cases.

**Table 36. Listeriosis cases by sex, 2015**

| Sex | EpiSurv notifications | | Hospitalisations[a] | |
|---|---|---|---|---|
| | No. | Rate[b] | No. | Rate[b] |
| Male | 11 | 0.5 | 16 | 0.7 |
| Female | 15 | 0.6 | 16 | 0.7 |
| **Total** | **26** | **0.6** | **32** | **0.7** |

[a] MoH NMDS data for hospital admissions

[b] per 100,000 of population

In 2015, rates for listeriosis were highest in the 60 years and over age group for both the notifications (1.3 per 100,000 population, 12 cases) and hospitalisations (1.3 per 100,000, 12 admissions) (Table 37). Six hospitalisations were recorded for children aged between 1 and 4 years old.

**Table 37. Listeriosis cases by age group, 2015**

| Age group (years) | EpiSurv notifications | | Hospitalisations[a] | |
|---|---|---|---|---|
| | No.[b] | Rate[c] | No. | Rate[c] |
| <20 | 2 | - | 12 | 1.0 |
| 20 to 39 | 9 | 0.7 | 5 | 0.4 |
| 40 to 59 | 3 | - | 3 | - |
| 60+ | 12 | 1.3 | 12 | 1.3 |
| **Total** | **26** | **0.6** | **32** | **0.7** |

[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 2015, the most common risk factors reported for non-perinatal listeriosis cases were having an underlying illness (82.4%), admission to hospital for another illness (38.9%) and received immunosuppressive drugs (35.7%) (Table 38).

**Table 38. Exposure to risk factors reported for listeriosis (non-perinatal) notifications, 2015**

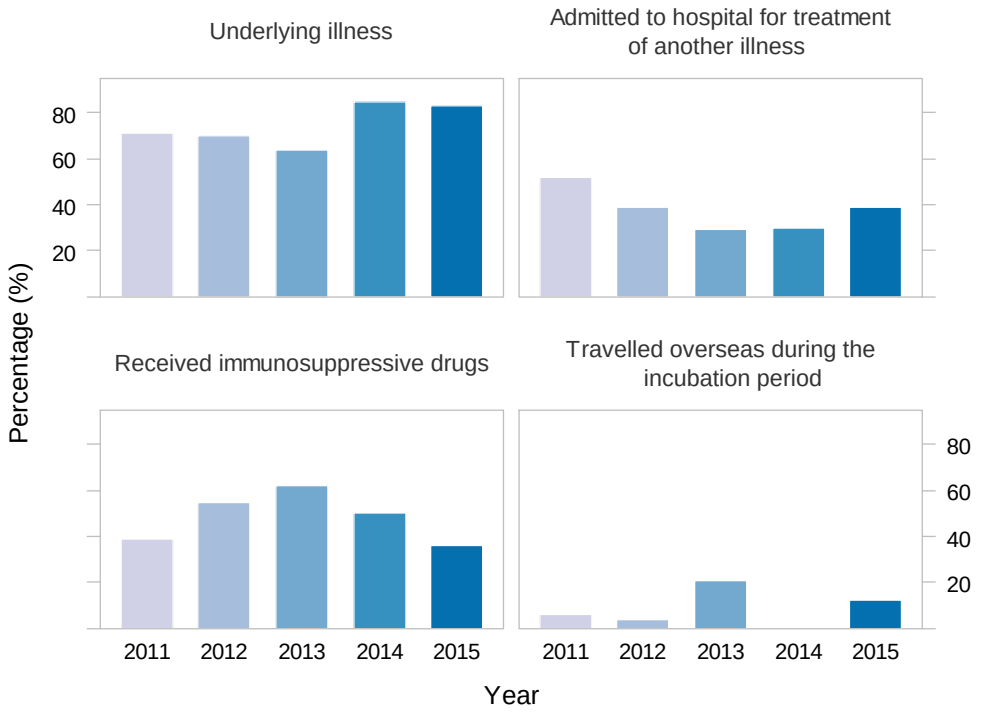
| Risk factor | Notifications | | | |
|---|---|---|---|---|
| | Yes | No | Unknown | %[a] |
| Underlying illness | 14 | 3 | 1 | 82.4 |
| Admitted to hospital for treatment of another illness | 7 | 11 | 0 | 38.9 |
| Received immunosuppressive drugs | 5 | 9 | 4 | 35.7 |
| Travelled overseas during the incubation period | 2 | 15 | 1 | 11.8 |

[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.

Having an underlying illness was the risk factor most commonly associated with listeriosis cases each year between 2011 and 2015. There was an increasing trend over the period 2011–2013 in the percentage of cases reporting having received immunosuppressive drugs, followed by a decrease in the proportion of cases reporting this risk factor in 2014 and 2015 (Figure 30).

**Figure 30. Percentage of cases with exposure to risk factors reported for listeriosis (non-perinatal) and year, 2011–2015**




### Outbreaks reported as caused by *Listeria* spp.

There were no *Listeria* spp. outbreaks reported in 2015. Since 2006 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 26 isolates of *L. monocytogenes* during 2015.

Table 39 shows the number of isolates and percentage of *L. monocytogenes* serotypes reported by the Special Bacteriology Laboratory at ESR between 2011 and 2015. The annual number of isolates identified to be serotype O4 or serotype O1/2 has been in the range of 11 to 16 isolates over the period 2011 to 2015, with the exception of only 7 O4 isolates in 2013.

**Table 39. *L. monocytogenes* serotypes identified by the Special Bacteriology Laboratory, 2011–2015**

| Serotype | 2011 | | 2012 | | 2013 | | 2014 | | 2015 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| O4 | 15 | 57.7 | 12 | 48.0 | 7 | 36.8 | 16 | 57.1 | 11 | 42.3 |
| O1/2 | 11 | 42.3 | 13 | 52.0 | 12 | 63.2 | 12 | 42.9 | 15 | 57.7 |
| **Total** | **26** | | **25** | | **19** | | **28** | | **26** | |

### Recent surveys

*A microbiological survey of seed sprouts (and shoots) available in New Zealand*

A quantitative microbiological survey of ready-to-eat packaged seed sprouts and shoots, available from supermarkets, independent sellers and farmer's markets in New Zealand, was carried out between April and August 2014 [24]. Fifty different lots/batches of various types of seed sprouts and shoots were purchased. Fifty composite samples (each from the same batch of seed sprouts and shoots) were tested for the presence or absence of *Listeria* spp. and *Listeria monocytogenes.* When any of the composite samples were positive for *Listeria* spp. each of the individual subsamples was tested to enumerate the concentrations of *Listeria* spp. and *L. monocytogenes*. *L. monocytogenes* was detected in one composite sample of sunflower seed sprouts at a concentration of <100 CFU/g. *Listeria* spp. (excluding *L. monocytogenes*) were detected in six composite samples (6/50) of seed sprouts and shoots. *L. innocua* was detected in three different composite samples of soybean sprouts, one composite sample of chickpea sprouts, and one composite sample of alfalfa and broccoli sprouts, all at a concentration of <100 CFU/g. *L. seeligeri* was detected in one composite sample of soybean sprouts at a concentration of <100 CFU/g.

*A microbiological survey of ready-to-eat fruit salads available in New Zealand*

A microbiological survey of fresh-cut retail fruit salads (non-retorted, ready-to-eat) available in supermarkets and online retail stores in New Zealand was conducted during 2013-2014 [25]. Seventy five batches were sampled, covering a range of types of fruit salad. At the end of the products shelf-life, composite samples from five salads from the same batch were tested for the presence of *Listeria* spp. (including *L. monocytogenes*). Enumeration of *Listeria* strains in the five individual salad samples were conducted when *Listeria* strains were detected in composite samples. *Listeria monocytogenes* was detected in four batches at concentrations of < 100 CFU/g; three batches of melon product and one batch of a mixed fruit product also containing melon. The *Listeria monocytogenes* serotypes detected in the fruit salads were either O1/2 or O4.

*A microbiological survey of processed animal feeds – a pilot study*

New Zealand feed mills (*n* = 15) supplied a total of 58 samples of their finished animal feeds, and these were composited for each mill at the laboratory [16]. Although ruminant feeds were targeted in this survey, a proportion of feeds received were intended for other species, particularly poultry. *Listeria monocytogenes* was not detected in any feed sample.

### Relevant New Zealand studies and publications

Nil.

### Relevant regulatory developments

Nil.

# 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 2015 by data source

During 2015, 147 individual notifications (3.2 cases per 100,000 population) of norovirus with no associated deaths 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. In 2015 there were 4893 cases associated notified outbreaks.

The ICD-10 code A08.1 was used to extract norovirus infection hospitalisation data from the MoH NMDS database. Of the 290 hospital admissions (6.3 admissions per 100,000 population) recorded in 2015, 120 were reported with norovirus infection as the principal diagnosis and 170 with norovirus infection as another relevant diagnosis. Of the 290 hospital admissions, 162 were in the 70+ age group.

It has been estimated by expert consultation that 32.7% (95$^{th}$ 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 2015, 18/196 (9.2%) of the norovirus outbreaks and 212/4893 (4.3%) of the associated cases were reported as foodborne (Table 40). 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 39.1% (196/501) of all enteric outbreaks and 65.8% (4893/7433) of all associated cases reported in 2015.

**Table 40. Norovirus outbreaks reported, 2015**

| Measure | Foodborne norovirus infection outbreaks | All norovirus infection outbreaks |
|---|---|---|
| Outbreaks | 18 | 196 |
| Cases | 212 | 4893 |
| Hospitalised cases | 3 | 60 |

Between 2006 and 2015 the number of foodborne norovirus outbreaks reported each year was variable, ranging from 10 (2007) to 30 (2009) (Figure 31).The total number of cases associated with these outbreaks each year ranged from 131 (2005) to 618 cases (2008).

**Figure 31. Foodborne norovirus outbreaks and associated cases reported by year, 2006–2015**

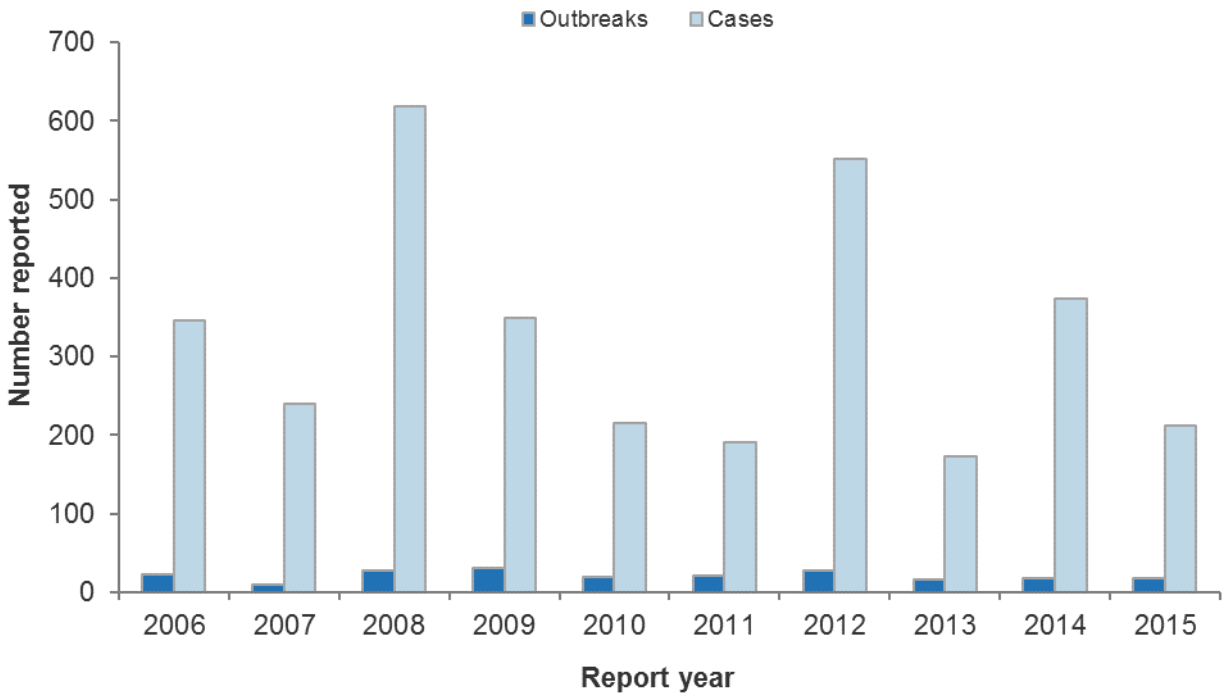



Table 41 contains details of the 18 foodborne norovirus outbreaks reported in 2015, including five with a suspected food vehicle identified. The evidence for the suspected food was weak in sixteen of the outbreaks. In the remaining two outbreaks (Taranaki in May, Toi Te Ora in December), the outbreaks were strongly associated with preparation of food by a norovirus infected food handler.

During investigation of suspected foodborne illness outbreaks by ESR's Public Health Laboratory and the Enteric Virus/Norovirus Reference Laboratory in 2015, samples were received relating to all of the food-associated norovirus outbreaks identified in Table 41. Norovirus was detected in faecal samples from cases associated with 17 of the 18 of foodborne outbreaks.

## Table 41. Details of foodborne norovirus outbreaks, 2015

| PHU | Month | Suspected vehicle | Exposure setting | Preparation setting | No. ill |
|---|---|---|---|---|---|
| Auckland | Jan | Butter Chicken | Restaurant/cafe/bakery | Restaurant/cafe/bakery | 2C |
| Auckland | Jan | Thai meal | Restaurant/cafe/bakery | Restaurant/cafe/bakery | 1C, 1P |
| Auckland | Feb | Unknown | School | School | 14P |
| Auckland | Feb | Seafood dish | Restaurant/cafe/bakery | Restaurant/cafe/bakery | 1C, 1P |
| Mid Central | Mar | Unknown | Home | Home | 1C, 1P |
| Regional | Mar | Unknown | Caterers | Caterers | 1C, 7P |
| Mid Central | Mar | Unknown | Long term care facility | Long term care facility | 35C, 1P |
| Mid Central | Apr | Chicken Souvlaki | Temporary or mobile service | Temporary or mobile service | 2C, 2P |
| Auckland | Apr | Unknown | Restaurant/cafe/bakery | Restaurant/cafe/bakery | 2C |
| Taranaki | May | Unknown | Restaurant/cafe/bakery | Restaurant/cafe/bakery | 3C, 10P |
| Auckland | May | Unknown | Takeaway | Takeaway | 1C, 1P |
| Regional | Jun | Unknown | Childcare centre | Other setting | 4C, 20P |
| Auckland | Jun | Unknown | Long term care facility | Long term care facility | 1C, 5P |
| Auckland | Sep | Unknown | School | School | 8C, 30P |
| Auckland | Sep | Unknown | Long term care facility | Long term care facility | 13C |
| Tairawhiti District HB | Oct | Mud flat Pipi | Other setting | Home | 2C |
| Auckland | Nov | Unknown | Long term care facility | Long term care facility | 4C, 30P |
| Toi Te Ora | Dec | Unknown | Workplace | Restaurant/cafe/bakery | 8C |

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

Table 42 shows the number of hospitalised cases and total cases by genotype for the 18 foodborne norovirus outbreaks reported during 2015. The outbreaks are due to a variety of genotypes, with no genotypes being noticeably more prevalent than the others. This is in contrast to 2014 when the highest number of the outbreaks were due to GII.4 (5 outbreaks, 148 cases).

**Table 42. Norovirus genotypes reported in foodborne outbreaks, 2015**

| Norovirus | Outbreaks | Total cases | Hospitalised cases |
|---|---|---|---|
| GII.P7/GII.6 | 3 | 19 | 1 |
| GII.2 | 3 | 16 | 0 |
| GII.P12/GII.3 | 2 | 26 | 0 |
| GI.P7/GII.17 | 1 | 38 | 0 |
| GII.6 | 1 | 36 | 0 |
| GII.4 | 1 | 34 | 0 |
| GII.7 | 1 | 13 | 0 |
| GII.17 | 1 | 8 | 0 |
| GI.2 | 1 | 2 | 0 |
| GI.P2/GII.17 | 1 | 2 | 2 |
| GI.3 | 1 | 2 | 0 |
| Genotype unknown | 1 | 2 | 0 |

During 2015 it was possible to test for norovirus in the following foods; bivalve molluscan shellfish, soft berry fruit and leafy salads.

### Norovirus types commonly reported

Norovirus genotyping data from ESR's Norovirus Reference Laboratory are shown in Table 43. The data relates to outbreaks not individual cases and includes all outbreaks, including those which are not associated with foodborne transmission.

In 2015, norovirus genogroup II (GII) was identified in 167/184 (90.8%) outbreaks. In the previous four years GII was identified in between 70.1% (2013) and 94.1% (2012) of outbreaks. In 2015, genogroup I (GI) was identified in 13/184 (7.1%) outbreaks. Genotypes from both norovirus GI and GII were identified in 4 outbreaks. As in previous years, GII.4 was the predominant norovirus genotype identified (90/184, 48.9% of outbreaks). This was followed by GII.6 (19/184, 10.3% of outbreaks) and GII.P12/GII.3 (18/184, of 9.8% outbreaks).

**Table 43. Norovirus genotypes identified in outbreaks by the Norovirus Reference Laboratory, 2011–2015**

| Norovirus genotypes | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| **Genogroup I** | **10** | **9** | **45** | **51** | **13** |
| GI untyped | 0 | 1 | 0 | 1 | 0 |
| GI.1 | 0 | 0 | 1 | 0 | 0 |
| GI.2 | 1 | 5 | 1 | 12 | 7 |
| GI.3 | 3 | 0 | 12 | 17 | 2 |
| GI.4 | 1 | 1 | 23 | 0 | 0 |
| GI.5 | 1 | 0 | 1 | 1 | 2 |
| GI.6 | 4 | 2 | 4 | 10 | 2 |
| GI.7 | 0 | 0 | 1 | 1 | 0 |
| GI.8 | 0 | 0 | 0 | 0 | 0 |
| GI.9 | 0 | 0 | 2 | 9 | 0 |
| **Genogroup II** | **149** | **208** | **110** | **253** | **167** |
| GII untyped | 2 | 2 | 0 | 4 | 5 |
| GII.1 | 1 | 1 | 0 | 0 | 0 |
| GII.2 | 3 | 1 | 13 | 2 | 14 |
| GII.3 | 2 | 0 | 0 | 1 | 2 |
| GII.4 | 111 | 160 | 55 | 203 | 90 |
| GII.5 | 0 | 0 | 1 | 0 | 0 |
| GII.6 | 3 | 30 | 4 | 22 | 19 |
| GII.7 | 5 | 1 | 18 | 6 | 2 |
| GII.8 | 0 | 0 | 0 | 1 | 1 |
| GII.13 | 2 | 0 | 0 | 0 | 0 |
| GII.17 | 0 | 0 | 0 | 2 | 6 |
| GII.20 | 0 | 0 | 0 | 1 | 0 |
| GII.Pb/GII.3 | 3 | 2 | 0 | 0 | 0 |
| GII.P12/GII.3 | 14 | 3 | 2 | 0 | 18 |
| GII.P16/GII.2 | 0 | 5 | 0 | 0 | 0 |
| GII.P16/GII.13 | 0 | 0 | 9 | 2 | 0 |
| Other GII recombinants | 3 | 3 | 8 | 9 | 10 |
| **Mixed GI and GII** | **2** | **4** | **2** | **8** | **4** |
| **Total outbreaks** | **161** | **221** | **157** | **312** | **184** |

### Recent surveys

Nil.

### Relevant New Zealand studies and publications

### Journal papers

An international collaboration, including a New Zealand-specific component, derived estimates of the proportion of norovirus outbreaks that were due to foodborne transmission [26]. It was estimated that 13% of norovirus outbreaks in New Zealand were due to foodborne transmission.

### Relevant regulatory developments

Nil.

# Salmonellosis

Summary data for salmonellosis in 2015 are given in Table 44.

**Table 44. Summary of surveillance data for salmonellosis, 2015**

| Parameter | Value in 2015 | Source |
|---|---|---|
| Number of notified cases | 1051 | EpiSurv |
| Notification rate (per 100,000) | 22.9 | EpiSurv |
| Hospitalisations (% of notifications)[a] | 172 (16.4%) | MoH NMDS, EpiSurv |
| Deaths (%)[a] | 0 | EpiSurv |
| Estimated travel-related cases (%)[a] | 325 (30.9%) | EpiSurv |
| Estimated food-related cases (%)[b] | 451 (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 2015 by data source

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

During 2015, 1051 notifications (22.9 cases per 100,000 population) of salmonellosis and no resulting deaths were reported in EpiSurv. The Enteric Reference Laboratory at ESR reported 1053 cases infected with non-typhoidal *Salmonella* (22.9 cases per 100,000) on the basis of clinical isolates received.

The ICD-10 code A02.0 was used to extract salmonellosis hospitalisation data from the MoH NMDS database. Of the 172 hospital admissions (3.7 admissions per 100,000 population) recorded in 2015, 141 were reported with salmonellosis as the principal diagnosis and 31 with salmonellosis as another relevant diagnosis.

It has been estimated by expert consultation that 62.1% (95$^{th}$ 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.

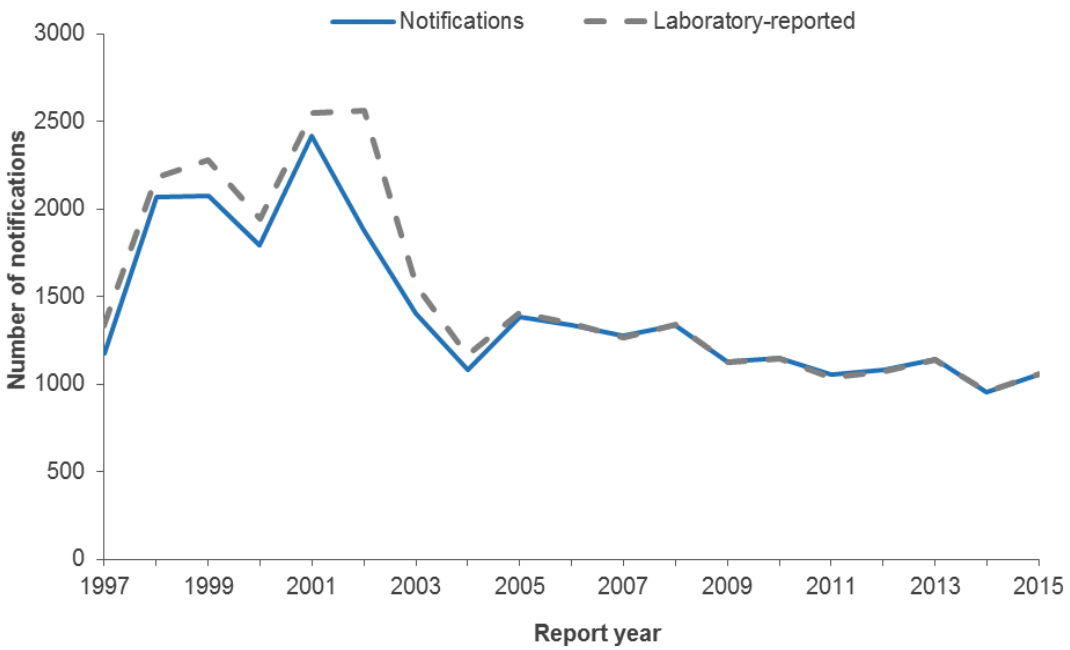
### Notifiable disease data

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 have continued to decline since

2005 but at a much slower rate. The lowest number of notifications was reported in 2014 (954 cases) (Figure 32).

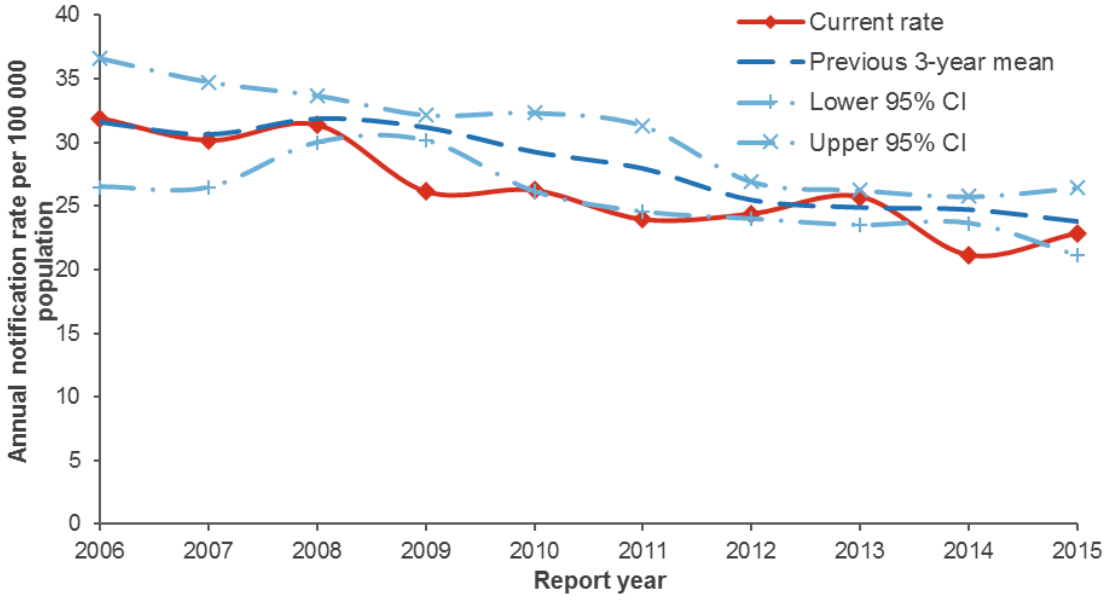
Integration of notification and laboratory data at ESR and the introduction of electronic laboratory reporting of notifiable diseases have reduced the differences between the number of notifications and laboratory reported cases seen prior to 2005.

**Figure 32. Salmonellosis notifications and laboratory-reported cases by year, 1997–2015**



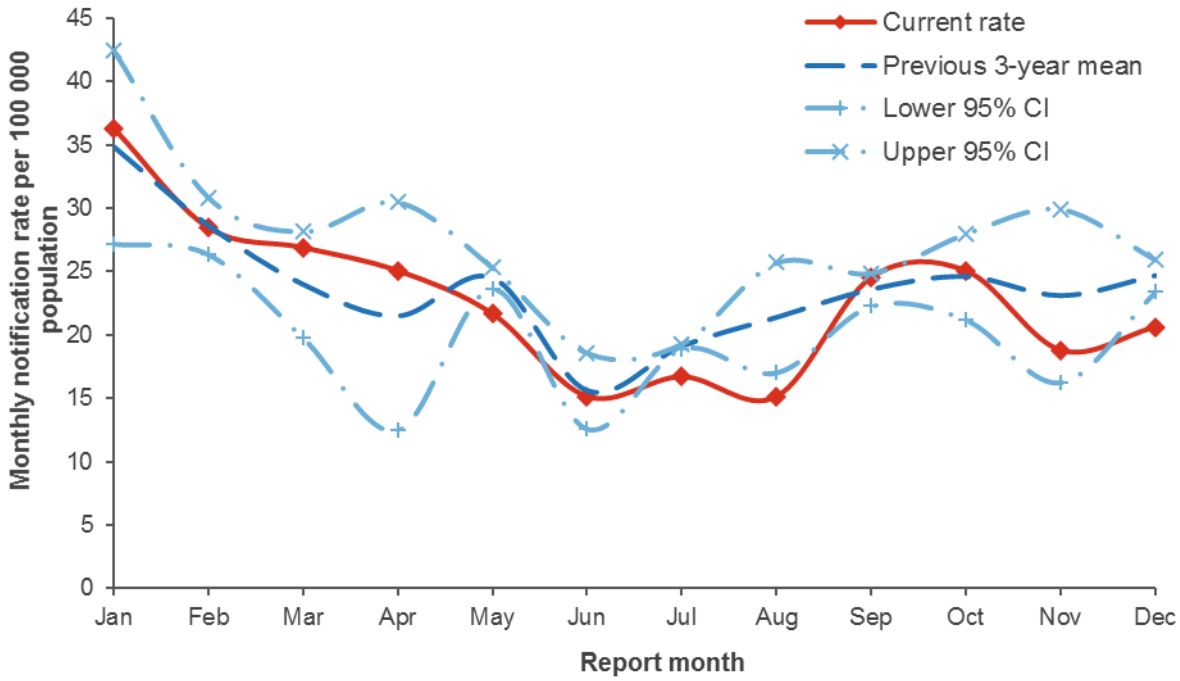

Between 2006 and 2015, the salmonellosis annual notification rate followed a generally decreasing trend with the lowest notification rate in 2014 (21.2 per 100,000 population) (Figure 33).

**Figure 33. Salmonellosis notification rate by year, 2006–2015**



The number of notified cases of salmonellosis per 100,000 population by month for 2015 is shown in Figure 34. The overall pattern for 2015 was similar to the previous three year mean with a peak in January and lowest notification rates June to August.

**Figure 34. Salmonellosis monthly rate (annualised), 2015**




In 2015, the number and rate of notifications and hospitalisations were very similar for males and females (Table 45). This is the same as observed in 2014.

**Table 45. Salmonellosis cases by sex, 2015**

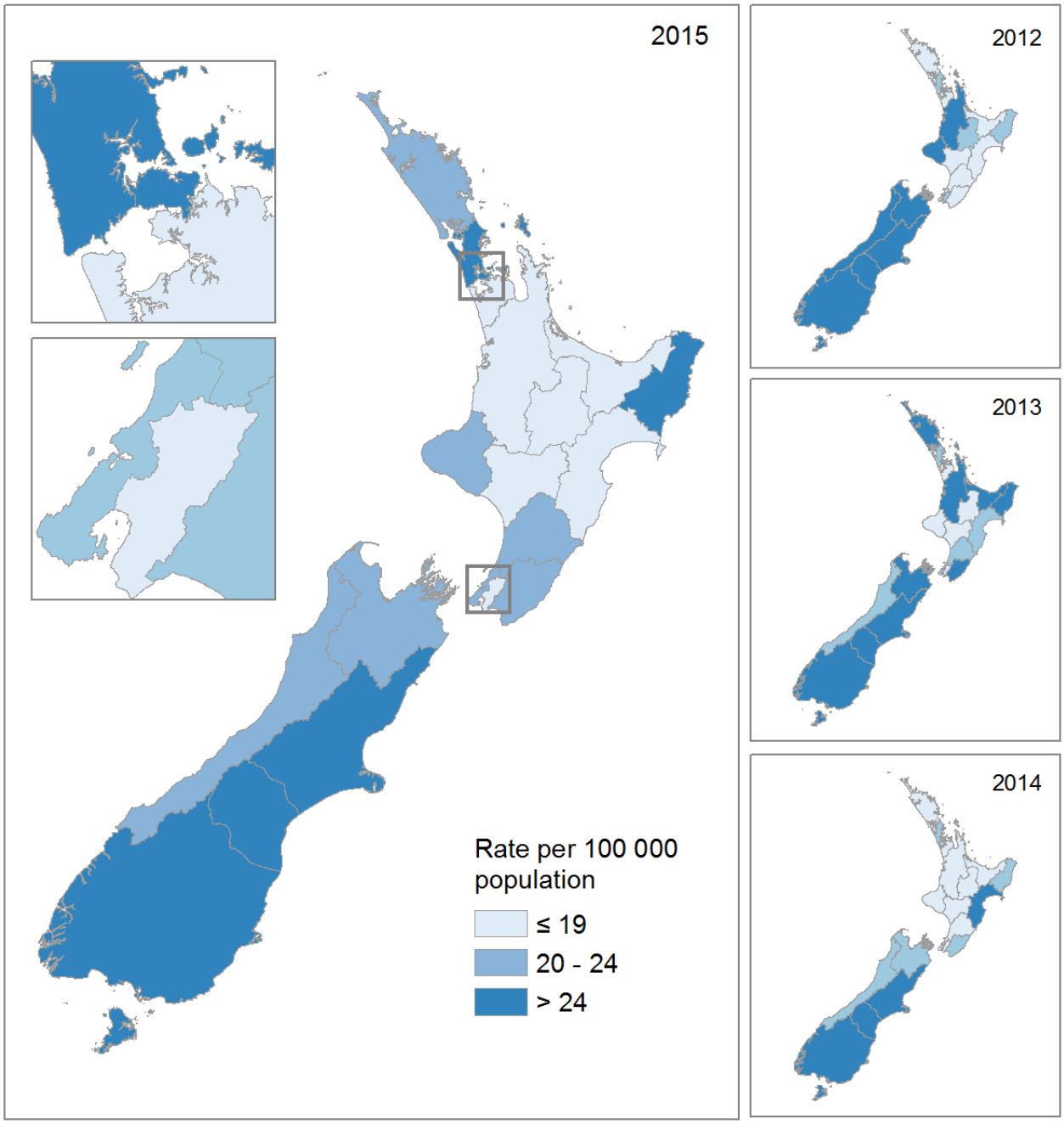
| Sex | EpiSurv notifications | | Hospitalisations[a] | |
|---|---|---|---|---|
| | No. | Rate[b] | No. | Rate[b] |
| Male | 516 | 22.9 | 75 | 3.3 |
| Female | 535 | 22.9 | 72 | 3.1 |
| **Total** | **1051** | **22.9** | **147** | **3.2** |

[a] MoH NMDS data for hospital admissions

[b] per 100,000 of population

Rates of salmonellosis varied throughout the country as illustrated in Figure 35. The highest salmonellosis notification rate in 2015 was for South Canterbury DHB (44.4 per 100,000 population, 26 cases), followed by Southern DHB (43.3 per 100,000, 136 cases), Canterbury DHB (29.5 per 100,000, 155 cases) and Tairawhiti DHB (27.4 per 100,000, 13 cases). Canterbury, South Canterbury and Southern DHBs had consistently high salmonellosis notification rates between 2011 and 2015 compared to the rest of the country.

**Figure 35. Geographic distribution of salmonellosis notifications, 2012–2015**



In 2015, notification rates and hospitalisation rates of salmonellosis were highest for infants aged less than 1 year (103.2 cases and 15.2 admissions per 100,000 population) and children aged 1 to 4 years (77.4 cases and 10.5 admissions per 100,000 population) when compared to other age groups (Table 46).

**Table 46. Salmonellosis cases by age group, 2015**

| Age group | EpiSurv notifications | | Hospitalisations[a] | |
|---|---|---|---|---|
| | No. | Rate[b] | No. | Rate[b] |
| <1 | 61 | 103.2 | 9 | 15.2 |
| 1 to 4 | 191 | 77.4 | 26 | 10.5 |
| 5 to 9 | 67 | 21.3 | 9 | 2.9 |
| 10 to 14 | 32 | 10.9 | 1 | - |
| 15 to 19 | 30 | 9.5 | 2 | - |
| 20 to 29 | 157 | 24.1 | 10 | 1.5 |
| 30 to 39 | 113 | 20.2 | 12 | 2.1 |
| 40 to 49 | 113 | 18.2 | 18 | 2.9 |
| 50 to 59 | 132 | 21.8 | 16 | 2.6 |
| 60 to 69 | 98 | 20.6 | 26 | 5.5 |
| 70+ | 56 | 12.5 | 18 | 4.0 |
| **Total** | **1051** | **22.9** | **147** | **3.2** |

[a] MoH NMDS data for hospital admissions

[b] per 100,000 of population

The most commonly reported risk factors for notified salmonellosis cases during 2015 were consumption of food from retail premises (42.9%), travelling overseas during the incubation period of the organism (30.9%) and contact with farm animals (29.9%) (Table 47).

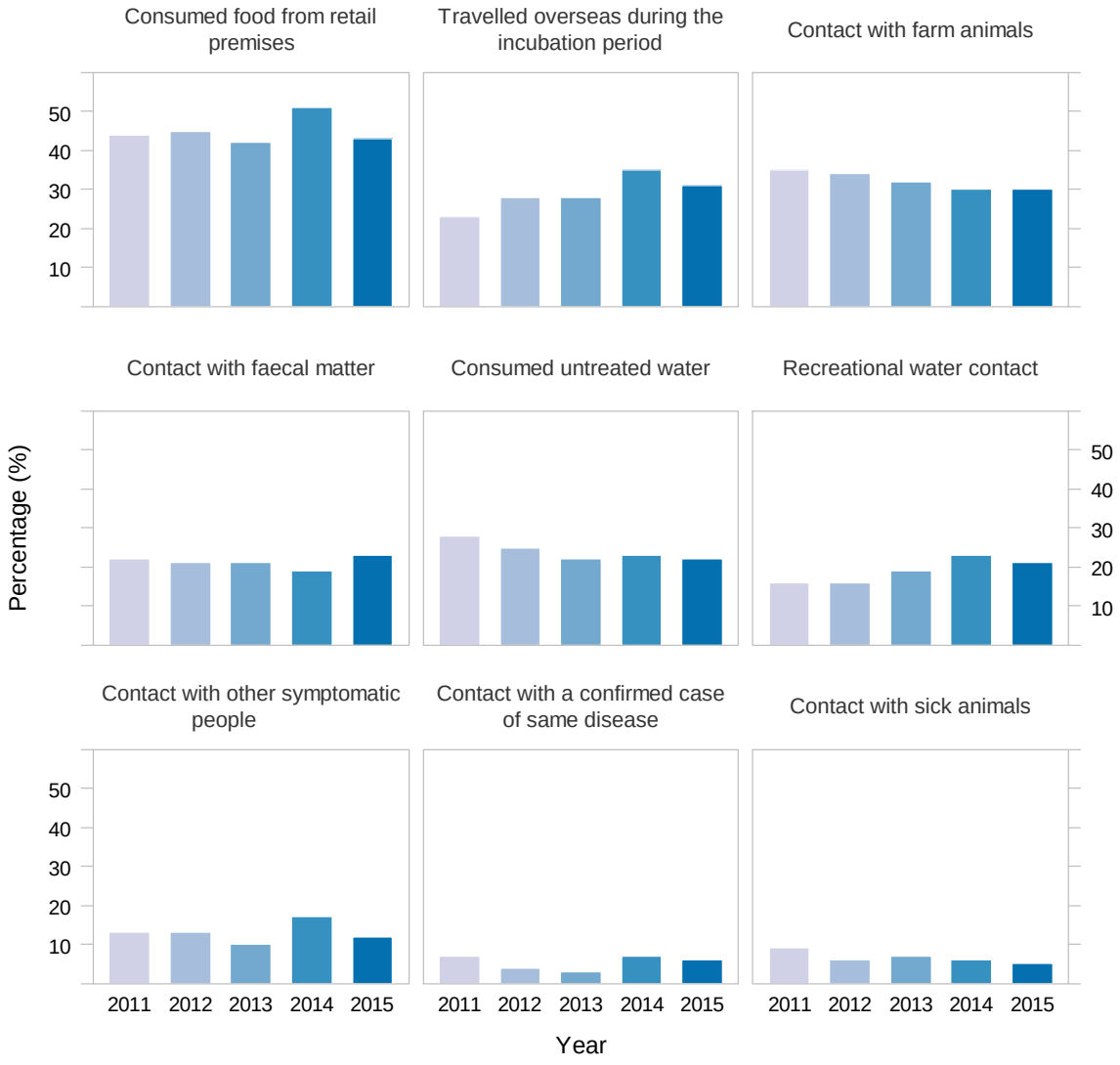
**Table 47. Exposure to risk factors reported for salmonellosis notifications, 2015**

| Risk factor | Notifications | | | |
|---|---|---|---|---|
| | Yes | No | Unknown | %[a] |
| Consumed food from retail premises | 228 | 303 | 520 | 42.9 |
| Travelled overseas during the incubation period | 268 | 600 | 183 | 30.9 |
| Contact with farm animals | 171 | 400 | 480 | 29.9 |
| Contact with faecal matter | 122 | 416 | 513 | 22.7 |
| Consumed untreated water | 105 | 369 | 577 | 22.2 |
| Recreational water contact | 109 | 422 | 520 | 20.5 |
| Contact with other symptomatic people | 68 | 501 | 482 | 12.0 |
| Contact with a confirmed case of same disease | 31 | 451 | 569 | 6.4 |
| Contact with sick animals | 28 | 491 | 532 | 5.4 |

[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.

The most commonly reported risk factor for salmonellosis cases each year was consumption of food from retail premises (Figure 36). In the period 2011 to 2014 there was an increasing trend in the percentage of cases reporting overseas travel during the incubation period, this this has not continued to increase in 2015.

**Figure 36. Percentage of cases with exposure to risk factors reported for salmonellosis and year, 2011–2015**




For cases where information on travel was provided in 2015, 30.9% (95% CI 27.8-34.1%) 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 2015. The resultant distribution has a mean of 325 cases (95% CI 275-377).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 30.1% (95% CI 28.4-31.9%).

### 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 2015, there were 18 *Salmonella* outbreaks reported, of which three were reported as foodborne (Table 48). 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. Two of the six hospitalisations due to *Salmonella* were associated with foodborne outbreaks.

**Table 48. *Salmonella* outbreaks reported, 2015**

| Measure | Foodborne *Salmonella* spp. outbreaks | All *Salmonella* spp. outbreaks |
|---|---|---|
| Outbreaks | 3 | 18 |
| Cases | 30 | 101 |
| Hospitalised cases | 2 | 6 |

The number of foodborne *Salmonella* outbreaks reported between 2006 and 2015 ranged from three (2015) to 11 (2012), (Figure 37). The total number of cases associated with the outbreaks has varied over the same period with peaks in 2008 (121 cases) and 2012 (104 cases).

**Figure 37. Foodborne *Salmonella* outbreaks and associated cases reported by year, 2006–2015**

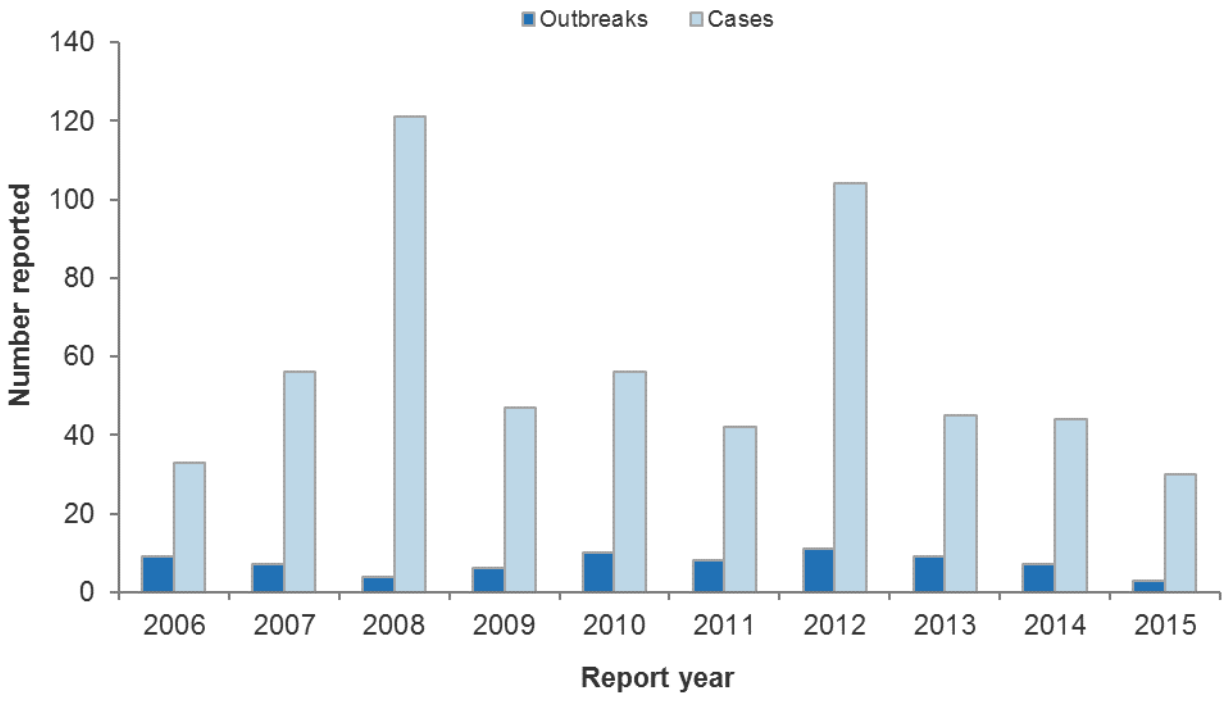


Table 49 contains details of the three foodborne *Salmonella* outbreaks reported in 2015. For all foodborne *Salmonella* outbreaks the evidence linking the outbreak to a suspected food was weak.

**Table 49. Details of foodborne *Salmonella* outbreaks, 2015**

| PHU | Month | Suspected vehicle | Exposure setting | Preparation setting | No. ill |
|---|---|---|---|---|---|
| Waikato | Jan | Unknown | Home | Home | 2C |
| Northland | Jan | Unknown | Restaurant/café/bakery | Restaurant/café/bakery | 25C, 1P |
| Auckland | Oct | Unknown | Home | Home | 1C, 1P |

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

During investigation of the 2015 Northland suspected foodborne illness outbreak a roof water sample was submitted to ESR's Public Health Laboratory. No *Salmonella* was detected in the water sample.

### *Salmonella* types commonly reported

#### 1. Human isolates

Isolates from 1053 cases infected with non-typhoidal *Salmonella* were typed by the ESR Enteric Reference Laboratory during 2015. Of these cases, 447 (39%) were *Salmonella* Typhimurium.

Table 50 shows the number of cases by *Salmonella* type reported by the Enteric Reference Laboratory at ESR. The most common serotypes identified in 2015 were *S.* Typhimurium phage type 56 variant (prior to 2012 known as RDNC-May 06 (96 cases), *S.* Typhimurium phage type 135 (64 cases, *S.* Typhimurium phage type 101 (56 cases), *S*. Infantis (52 cases) and *S*. Brandenburg (52 cases).

## Table 50. *Salmonella* case serotypes and subtypes identified by the Enteric Reference Laboratory, 2011–2015

| Serotype[a] | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| **S. Typhimurium** | **495** | **459** | **481** | **392** | **447** |
| 1 | 54 | 35 | 30 | 22 | 38 |
| 9 | 24 | 11 | 13 | 17 | 27 |
| 12a | 28 | 26 | 15 | 20 | 18 |
| 56 variant[b] | 73 | 73 | 122 | 72 | 96 |
| 101 | 50 | 26 | 26 | 41 | 56 |
| 135 | 47 | 44 | 48 | 35 | 64 |
| 156 | 29 | 21 | 17 | 9 | 27 |
| 160 | 66 | 58 | 69 | 27 | 9 |
| Other or unknown | 134 | 157 | 134 | 166 | 112 |
| **S. Enteritidis** | **134** | **125** | **137** | **116** | **110** |
| 1 | 10 | 6 | 19 | 14 | 17 |
| 1b | 8 | 9 | 14 | 5 | 4 |
| 11[c] | 56 | 52 | 27 | 39 | 45 |
| Other or unknown | 60 | 58 | 77 | 58 | 44 |
| **Other serotypes** | **410** | **460** | **523** | **450** | **496** |
| *S.* Agona | 20 | 11 | 11 | 15 | 12 |
| *S.* Bovismorbificans | 3 | 8 | 8 | 4 | 23 |
| *S.* Brandenburg | 34 | 34 | 52 | 35 | 52 |
| *S.* Infantis | 65 | 52 | 70 | 56 | 52 |
| *S.* Mississippi | 13 | 12 | 20 | 21 | 16 |
| *S.* Montevideo | 1 | 26 | 11 | 7 | 3 |
| *S.* Saintpaul | 31 | 27 | 43 | 26 | 37 |
| *S.* Stanley | 28 | 22 | 31 | 34 | 25 |
| *S.* Thompson | 7 | 2 | 16 | 5 | 32 |
| *S.* Virchow | 18 | 17 | 15 | 5 | 16 |
| *S.* Weltevreden | 16 | 24 | 28 | 31 | 18 |
| *S.* enterica (I) ser. 4,[5],12 : i : - | 21 | 38 | 27 | 22 | 22 |
| Other or unknown | 157 | 195 | 199 | 198 | 188 |
| **Total** | **1039** | **1044** | **1141** | **958** | **1053** |

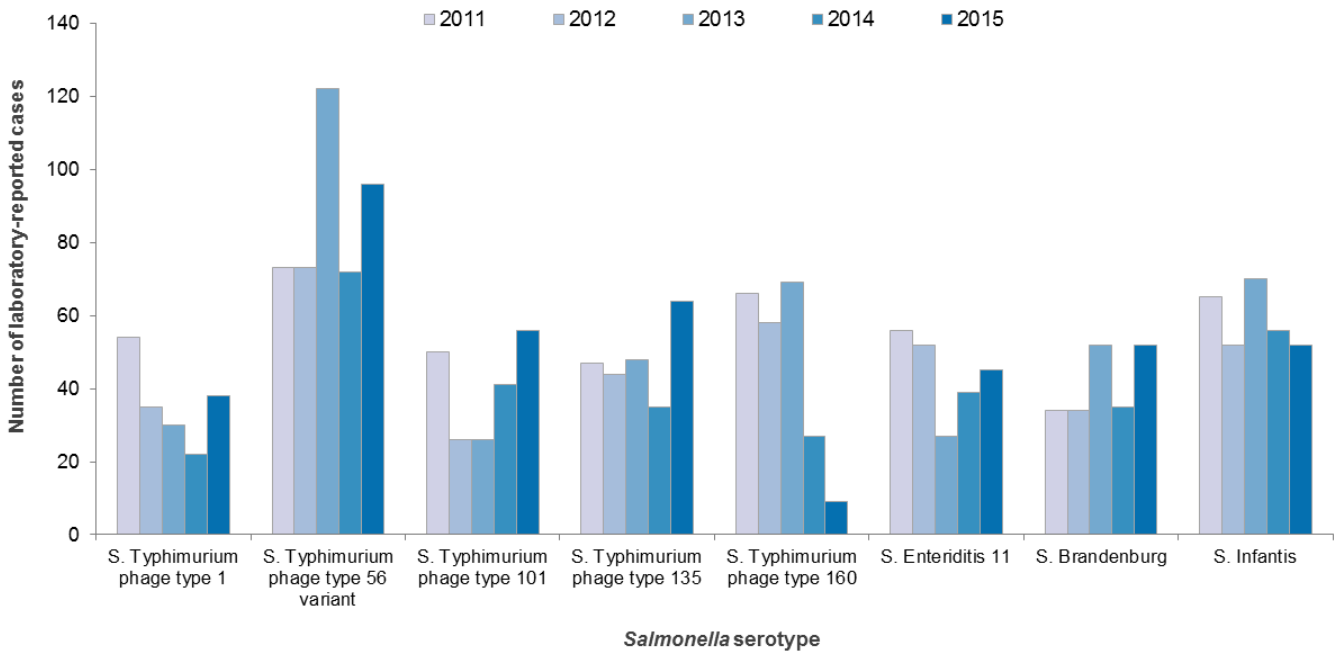
[a] Excludes *S.* Paratyphi and *S.* Typhi.

[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 38 shows the annual trend for selected *Salmonella* serotypes in recent years. *S.* Typhimurium phage type 56 variant showed a large increase in cases in 2013, with numbers of isolates returning to previous levels in 2014 before increasing again in 2015. *S.* Typhimurium phage type 160 has continued with a decreasing trend with only 9 cases serotyped in 2015. While *S.* Typhimurium phage type 1 had shown a decreasing trend in 2011–2014, an increased number of cases were serotyped in 2015 compared to the previous three years.

**Figure 38. Number of laboratory-reported cases for selected Salmonella types by year, 2011–2015**



## 2. Non-human isolates

A total of 637 non-human *Salmonella* isolates were typed by the Enteric Reference Laboratory during 2015. *S.* Typhimurium and *S.* Brandenburg continued to be the most commonly isolated serotypes in non-human samples during 2015 (Table 51). 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 51. *Salmonella* serotypes and subtypes from non-human sources identified by the Enteric Reference Laboratory, 2011–2015**

| Serotype | 2011 | 2012 | 2013 | 2014 | 2015 | Major sources, 2015 |
|---|---|---|---|---|---|---|
| **S. Typhimurium** | **656** | **421** | **358** | **220** | **258** | |
| 1 | 39 | 57 | 26 | 13 | 16 | Bovine (11) |
| 9 | 23 | 9 | 39 | 9 | 9 | Bovine (3), ovine (4) |
| 12a | 100 | 50 | 12 | 12 | 19 | Bovine (18) |
| 56 variant[a] | 42 | 33 | 79 | 38 | 56 | Bovine (12), feline (12), avian(7), environmental poultry(7), equine(7) |
| 101 | 91 | 53 | 57 | 48 | 32 | Bovine (27) |
| 135 | 7 | 12 | 15 | 12 | 18 | Bovine (11) |
| RDNC | 38 | 33 | 32 | 16 | 41 | Bovine (34) |
| Unknown or other | 316 | 174 | 98 | 72 | 67 | |
| **Other serotypes** | **783** | **600** | **609** | **509** | **379** | |
| *S.* Agona | 77 | 26 | 42 | 17 | 22 | Bovine (6), meat/bone meal (6) |
| *S.* Anatum | 6 | 10 | 28 | 23 | 6 | Poutry Feed (3) |
| *S.* Bovismorbificans | 1 | 3 | 14 | 13 | 71 | Bovine (64) |
| *S.* Brandenburg | 203 | 113 | 197 | 129 | 102 | Bovine (44), ovine (35) |
| *S.* Hindmarsh | 65 | 77 | 56 | 77 | 49 | Ovine (45) |
| *S.* Infantis | 78 | 78 | 67 | 27 | 14 | No major source |
| *S.* Mbandaka | 25 | 35 | 26 | 20 | 10 | No major source |
| *S.* Saintpaul | 16 | 13 | 22 | 22 | 12 | Reptile (5) |
| S. Seftenberg | 25 | 8 | 12 | 19 | 15 | Avian (8) |
| Other or unknown serotypes | 287 | 237 | 145 | 162 | 78 | |
| **Total** | **1439** | **1021** | **967** | **729** | **637** | |

[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 52 shows the number of hospitalised cases and total cases by subtype for the three foodborne *Salmonella* outbreaks reported during 2015. A *Salmonella* subtype was determined for two of the three foodborne *Salmonella* outbreaks in 2015. No *S.* Thompson subtype was determined for the largest outbreak (26 cases).

**Table 52. *Salmonella* subtypes reported in foodborne outbreaks, 2015**

| Pathogen and subtype | Outbreaks | Total cases | Hospitalised cases |
|---|---|---|---|
| *S*. Typhimurium phage type 56 variant | 1 | 2 | 1 |
| *S.* Thompson | 1 | 26 | 1 |
| *S*. Typhimurium phage type RDNC-Sep15 | 1 | 2 | 0 |

### Recent surveys

*A microbiological survey of seed sprouts (and shoots) available in New Zealand*

A quantitative microbiological survey of ready-to-eat packaged seed sprouts and shoots, available from supermarkets, independent sellers and farmer's markets in New Zealand, was carried out between April and August 2014 [24]. Fifty different lots/batches of various types of seed sprouts and shoots were purchased. Fifty composite samples (each from the same batch of seed sprouts and shoots) were tested for the presence or absence of *Salmonella* spp. When any of the composite samples were positive for *Salmonella* spp. each of the individual subsamples was tested to enumerate the concentrations of *Salmonella* spp. *Salmonella* Adelaide was detected in 2 out of 5 individual subsamples from 1 composite set of alfalfa sprouts and snow pea shoots with counts of 0.04 MPN/g.

*A microbiological survey of ready-to-eat fruit salads available in New Zealand*

A microbiological survey of fresh-cut retail fruit salads (non-retorted, ready-to-eat) available in supermarkets and online retail stores in New Zealand was conducted during 2013-2014 [25]. Seventy five batches were sampled, covering a range of types of fruit salad. At the end of the products shelf-life, composite samples from five salads from the same batch were tested for the presence of *Salmonella* spp. *Salmonella* spp. were not detected in any of the samples.

*A microbiological survey of processed animal feeds – a pilot study*

New Zealand feed mills (*n* = 15) supplied a total of 58 samples of their finished animal feeds, and these were composited for each mill at the laboratory [16]. Although ruminant feeds were targeted in this survey, a proportion of feeds received were intended for other species, particularly poultry. *Salmonella* Agona (a serotype reported previously in cases of foodborne illness in New Zealand) and *S*. Orion (a serotype that causes very few illnesses in New Zealand) were the only two *Salmonella* serotypes isolated from samples which were submitted by two different feed mills.

### Relevant New Zealand studies and publications

#### Journal papers

An investigation in a *Salmonella* Thompson outbreak associated with a Northland bakery was reported [27]. A food handler working in the bakery tested positive for *Salmonella*. No food samples were tested.

### Reports

*Horizontal transfer and growth of Salmonella enterica in chicken (Gallus gallus) eggs in New Zealand*

MPI produced a report considering evidence on horizontal transfer of *Salmonella enterica* from the surface of eggs to the interior and the growth of the organism in eggs under various temperature regimes [28]. The report concluded that, "Notwithstanding the data gaps and uncertainty in the evidence currently available, there is sufficient scientific evidence to suggest that contamination levels in eggs will increase if eggs are stored at >15°C for more than 21 days, or if the eggs are held at, or closely below, 15°C for more than 35 days. It would therefore appear prudent to maintain the current requirements for handling and storage of eggs.

It is also important to recognize that while temperature is an important determinant for the storage life of eggs, other factors such as the use of vaccination of flocks and implementation of HACCP-based risk management programmes (RMP) along the food chain will affect the ultimate risk to the consumer."

*Risk profile: Salmonella (non typhoidal in and on eggs)*

A 2011 risk profile on nontyphoidal Salmonella enterica in or on eggs has been updated in 2015 [29]. The risk profile concluded "the public health risk from *Salmonella* in or on eggs consumed in New Zealand has not changed since the 2011 risk profile, i.e these is little evidence that transmission of *Salmonella* via eggs is a significant transmission route in New Zealand. However, there is evidence to show that whole fresh eggs sold in New Zealand can be contaminated with *Salmonella* and this may be contributing to a small but undefined proportion of human illness". Part of the risk profile collated information on shelf life and storage conditions for eggs in relationship to risk from *Salmonella*.

### 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 bivalve molluscan 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 2015 by data source

In 2015, no individual notifications of sapovirus infection 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 2015, 9 sapovirus outbreaks were reported in EpiSurv with 164 associated cases and no deaths. One of the outbreaks was reported to be foodborne (Table 53) with 3 associated cases. 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. For the viral analyses performed by ESR's Enteric Virus Laboratory in 2015, sapovirus was identified in 5 (4.9%) of the reported 102 gastroenteritis outbreaks for which a pathogen had not been identified at the time of analysis.

The number of outbreaks in 2015 (9 outbreaks) was lower than the number of sapovirus outbreaks reported in 2014 (16 outbreaks), but similar to 2013 (8 outbreaks).

**Table 53. Sapovirus outbreaks reported, 2015**

| Measure | Foodborne sapovirus outbreaks | All sapovirus outbreaks |
|---|---|---|
| Outbreaks | 1 | 9 |
| Cases | 3 | 164 |
| Hospitalised cases | 0 | 0 |

There were no foodborne sapovirus outbreaks in 2014 and 2012, one foodborne sapovirus outbreak in 2013 with two associated cases, one foodborne sapovirus outbreak in 2011 with 14 cases and two foodborne sapovirus outbreaks reported in 2010 with 24 associated cases.

Table 54 contains details of the foodborne sapovirus outbreak reported in 2015, the evidence linking the outbreak to suspected foods was weak.

**Table 54. Details of foodborne Sapovirus outbreak, 2015**

| PHU | Month | Suspected vehicle | Exposure setting | Preparation setting | No. ill |
|---|---|---|---|---|---|
| Auckland | Mar | Unknown | Restaurant/café/bakery | Restaurant/café/bakery | 3C |

PHU: Public Health Unit, C: confirmed,

During the investigation of the outbreak in 2015, sapovirus was found in a faecal sample submitted to ESR's Enteric Virology Laboratory.

### Recent surveys

Nil.

### Relevant New Zealand studies and publications

Thirty-one fecal samples from 26 gastroenteritis outbreaks of unknown etiology occurring in New Zealand between 2011 and 2012 were selected for *de novo* metagenomic analysis [30]. Eight viruses and one parasite were detected, each already known to be associated with gastroenteritis, including adenovirus, rotavirus, sapovirus, and *Dientamoeba fragilis*.

### Relevant regulatory developments

Nil.

# Shigellosis

Summary data for shigellosis in 2015 are given in Table 55.

**Table 55. Summary of surveillance data for shigellosis, 2015**

| Parameter | Value in 2015 | Source |
|---|---|---|
| Number of notified cases | 111 | EpiSurv |
| Notification rate (per 100,000) | 2.4 | EpiSurv |
| Hospitalisations (% of notifications)[a] | 20 (18.0%) | MoH NMDS, EpiSurv |
| Deaths (% of notifications)[a] | 0 (0%) | EpiSurv |
| Estimated travel-related cases (%)[a] | 63 (56.8%) | 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 2015 by data source

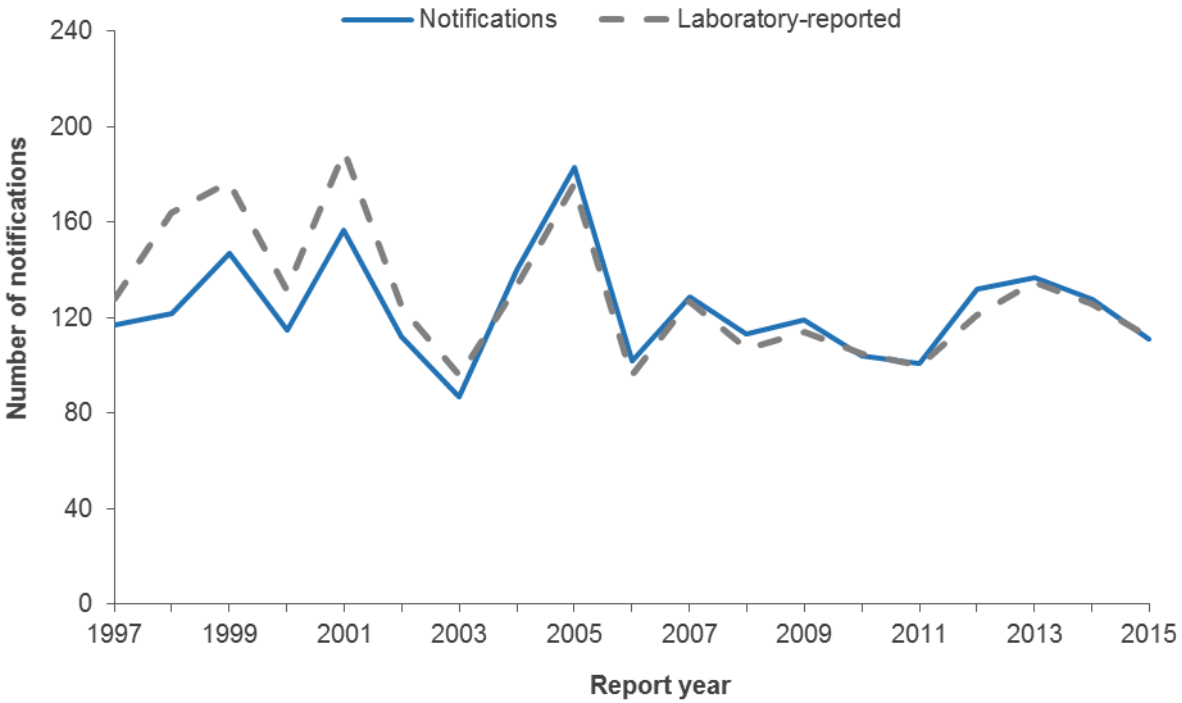
During 2015, 111 notifications (2.4 cases per 100,000 population) of shigellosis and no resulting deaths were reported in EpiSurv. The Enteric Reference Laboratory at ESR reported 112 cases (2.4 per 100,000 population) infected with *Shigella* in 2015.

The ICD-10 code A03 was used to extract shigellosis hospitalisation data from the MoH NMDS database. Of the 20 hospital admissions (0.4 admissions per 100,000 population) recorded in 2015, 10 were reported with shigellosis as the principal diagnosis and 10 with shigellosis as another relevant diagnosis.

### Notifiable disease data

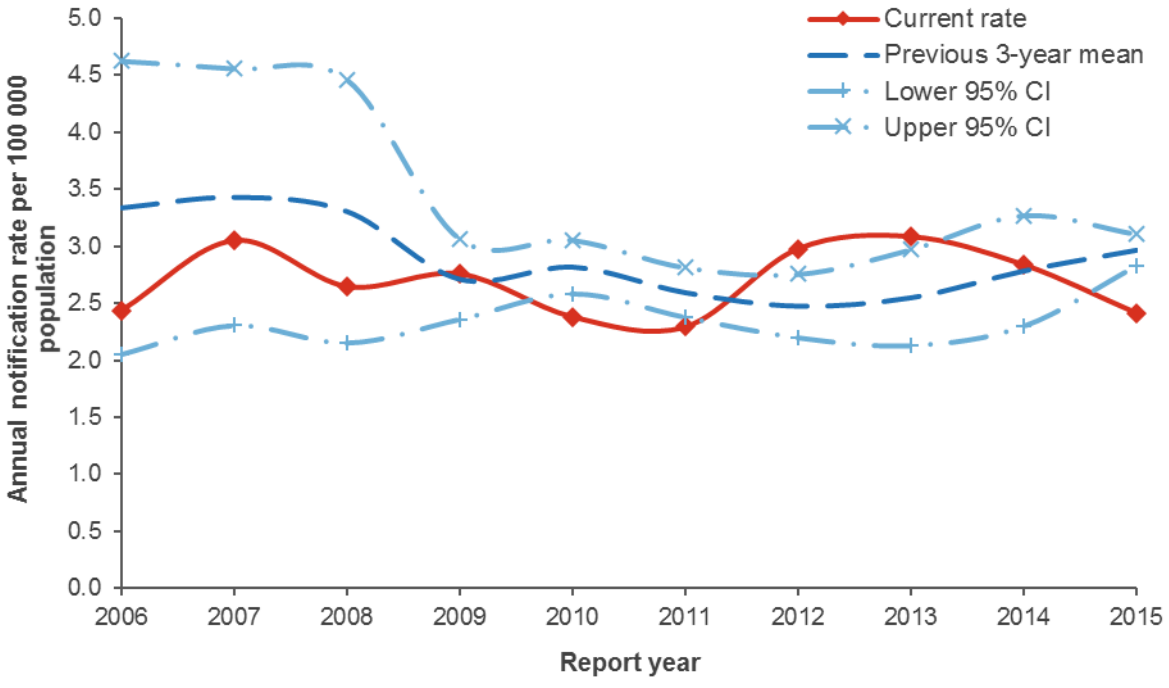
The number of notifications and laboratory reported cases of shigellosis was variable from year to year with the highest peak in notifications in 2005 (183 cases). Between 2006 and 2015 the number of notifications has been in the range of 101 to 137 cases (Figure 39).

**Figure 39. Shigellosis notifications and laboratory-reported cases by year, 1997–2015**



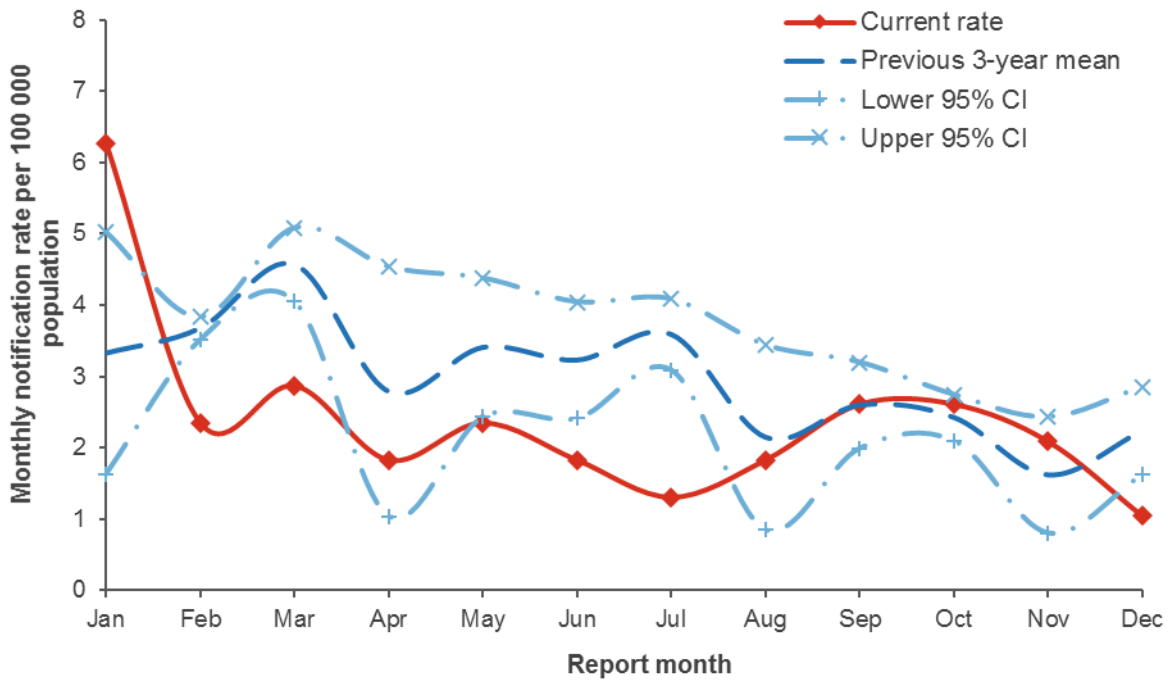

Between 2006 and 2015, the shigellosis notification rate has consistently been in the range of 2.3 to 3.1 notifications per 100,000 population (Figure 40).

**Figure 40. Shigellosis notification rate by year, 2006–2015**



The number of notified cases of shigellosis per 100,000 population by month for 2015 is shown in Figure 41. In 2015, the shigellosis notification rate was lower in Feburary through to July than the previous three year mean for the months, with a higher rate in January. The number of notifications per month was small, ranging from 24 in January to 4 in December.

**Figure 41. Shigellosis monthly rate (annualised), 2015**




In 2015, the rates of notification for shigellosis were slightly higher for males compared to females, with hospitalisation rates similar for males and females (Table 56). This is similar to the pattern seen in 2014.

**Table 56. Shigellosis cases by sex, 2015**

| Sex | EpiSurv notifications | | Hospitalisations[a] | |
|---|---|---|---|---|
| | No. | Rate[b] | No. | Rate[b] |
| Male | 62 | 2.7 | 8 | 0.4 |
| Female | 49 | 2.1 | 12 | 0.5 |
| **Total** | **111** | **2.4** | **20** | **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 15 to 69 years. The hospitalisation rates were not defined for any age group due to the small number of cases in each group (Table 57).

**Table 57. Shigellosis cases by age group, 2015**

| Age group | EpiSurv notifications | | Hospitalisations[a] | |
|---|---|---|---|---|
| | No. | Rate[b] | No. | Rate[b] |
| <1 | 1 | - | 0 | - |
| 1 to 4 | 11 | 4.5 | 3 | - |
| 5 to 9 | 7 | 2.2 | 2 | - |
| 10 to 14 | 0 | - | 1 | - |
| 15 to 19 | 8 | 2.5 | 0 | - |
| 20 to 29 | 17 | 2.6 | 2 | - |
| 30 to 39 | 15 | 2.7 | 1 | - |
| 40 to 49 | 18 | 2.9 | 0 | - |
| 50 to 59 | 14 | 2.3 | 4 | - |
| 60 to 69 | 12 | 2.5 | 2 | - |
| 70+ | 8 | 1.8 | 5 | - |
| **Total** | **111** | **2.4** | **20** | **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 2015 was overseas travel during the incubation period (56.8%), followed by consuming food from retail premises (45.0%) (Table 58).

**Table 58. Exposure to risk factors reported for shigellosis notifications, 2015**

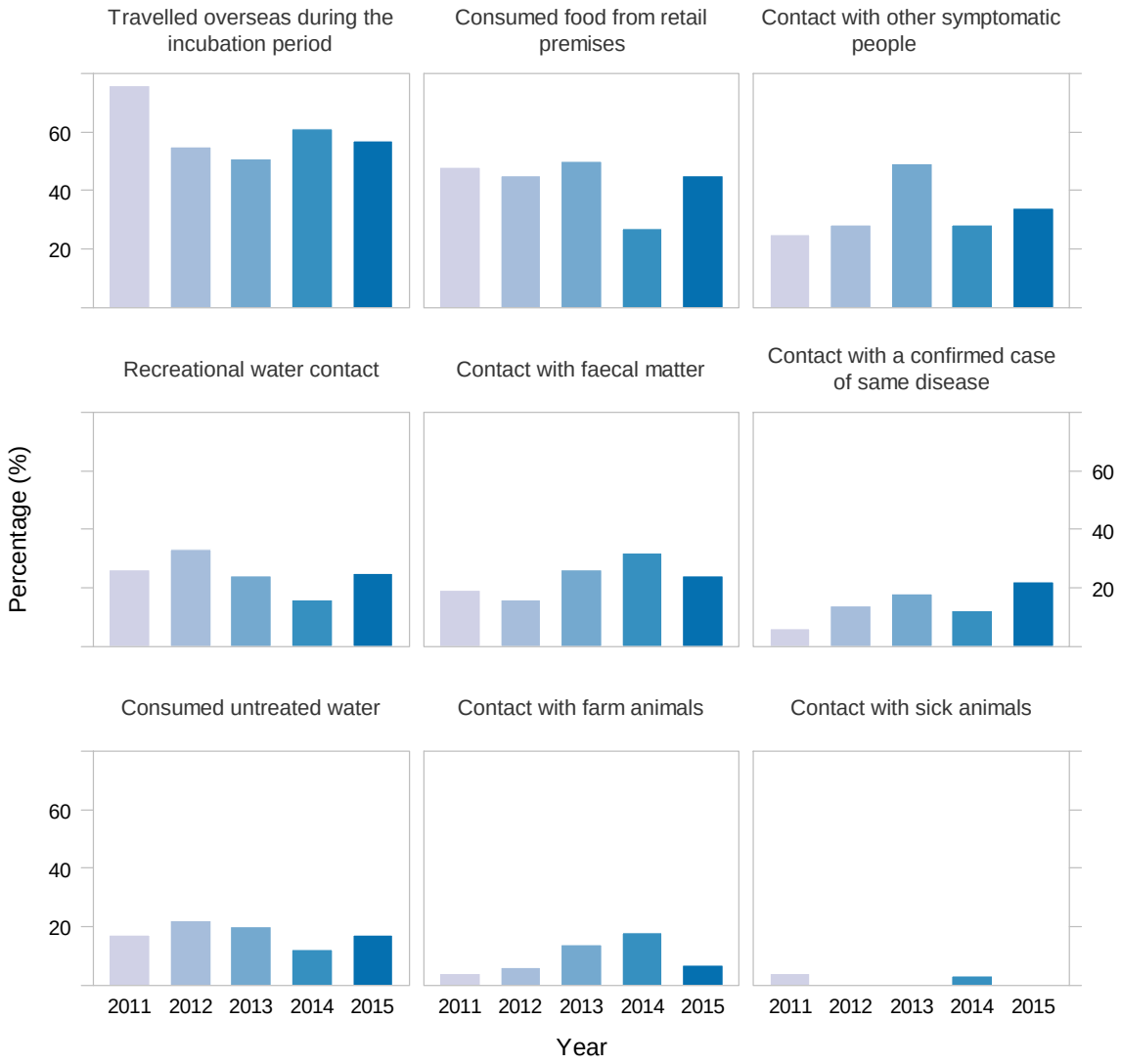
| Risk factor | Notifications | | | |
|---|---|---|---|---|
| | Yes | No | Unknown | %[a] |
| Travelled overseas during the incubation period | 63 | 48 | 0 | 56.8 |
| Consumed food from retail premises | 18 | 22 | 71 | 45.0 |
| Contact with other symptomatic people | 17 | 33 | 61 | 34.0 |
| Recreational water contact | 11 | 33 | 67 | 25.0 |
| Contact with faecal matter | 10 | 32 | 69 | 23.8 |
| Contact with a confirmed case of same disease | 10 | 36 | 65 | 21.7 |
| Consumed untreated water | 6 | 29 | 76 | 17.1 |
| Contact with farm animals | 3 | 43 | 65 | 6.5 |
| Contact with sick animals | 0 | 43 | 68 | 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.

During the period 2011–2015, overseas travel during the incubation period has been the leading reported risk factor for shigellosis, followed by consuming food from a retail premises and contact with other symptomatic people (Figure 42). The risk factors show no clear trends over the period 2011 to 2015.

**Figure 42. Percentage of cases by exposure to risk factors associated with shigellosis and year, 2011–2015**




For cases where information on travel was provided in 2015, 56.8% (95% CI 47.0-66.0%) 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 2015. The resultant distribution has a mean of 63 cases (95% CI 42-86).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 55.8% (95% CI 51.3-60.3%).

### Outbreaks reported as caused by *Shigella* spp.

In 2015, there were 12 *Shigella* spp. outbreaks reported and five of these were reported to be foodborne (Table 59). 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. One of the hospitalisations due to *Shigella* spp. was associated with a foodborne outbreak.

**Table 59. *Shigella* spp. outbreaks reported, 2015**

| Measure | Foodborne *Shigella* spp. outbreaks | All *Shigella* spp. outbreaks |
|---|---|---|
| Outbreaks | 5 | 12 |
| Cases | 39 | 56 |
| Hospitalised cases | 1 | 5 |

The number of foodborne shigellosis outbreaks has been steady over the five year period 2011–2015, with four or five foodborne outbreaks being reported each year. The highest number of cases associated with outbreaks in a year was 39 cases in 2015. From 2006 to 2010 there were no more than two outbreaks reported each year (Figure 43).

**Figure 43. Foodborne *Shigella* spp. outbreaks and associated cases reported by year, 2006–2015**

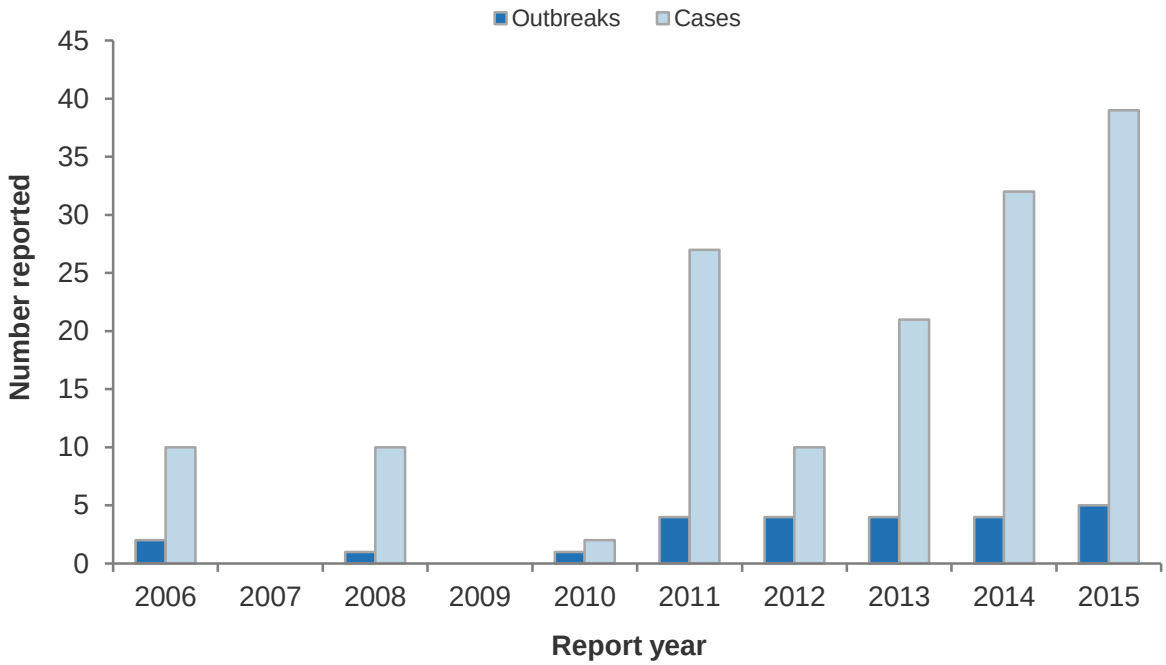


Table 60 contains details of the foodborne *Shigella* spp. outbreaks reported in 2015. The evidence linking any of these outbreaks to specific foods or food in general was weak.

**Table 60. Details of foodborne *Shigella* spp. outbreaks, 2015**

| PHU | Month | Suspected vehicle | Exposure setting | Preparation setting | No. ill |
|---|---|---|---|---|---|
| PH South | Jan | Unknown | Home | Home | 3C, 1P |
| Auckland | Jan | Unknown | Other setting | Other setting | 2C |
| C and PH | Mar | Unknown | Other setting | Unknown | 8C, 18P |
| MidCentral | Oct | Unknown | Restaurant/café/bakery | Unknown | 1C, 4P |
| Auckland | Nov | Unknown | Unknown | Unknown | 2C |

PHU: Public Health Unit, PH South: Public Health South, C and PH: Community and Public Health,

C: confirmed, P: probable.

Twenty one clinical samples were submitted to ESR's Public Health Laboratory relating to the March *Shigella* spp. outbreak listed in Table 60. *Shigella* spp. was detected in three of the faecal specimens. *Giardia* and *Campylobacter* were also detected in the outbreak faecal specimens.

### *Shigella* types commonly reported

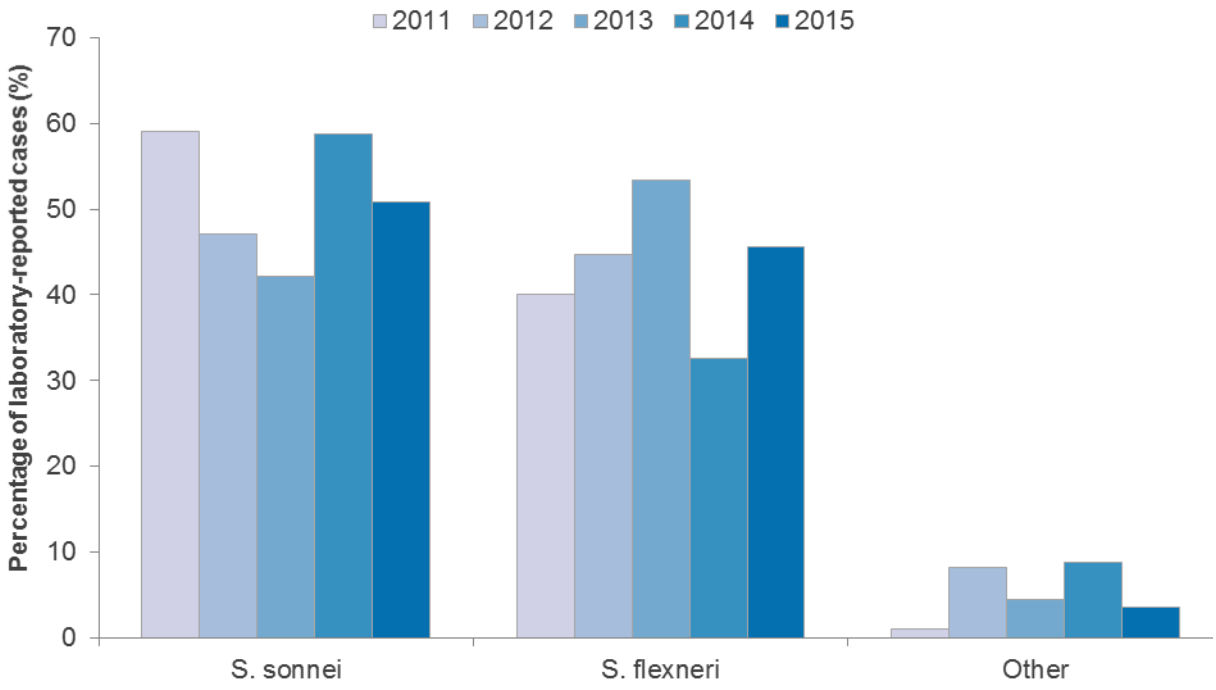
In 2014, the Enteric Reference Laboratory at ESR reported 112 cases infected with *Shigella* spp. *Shigella sonnei* biotype a and biotype g were the predominant subtypes confirmed in 2015 (Table 61).

**Table 61. *Shigella* species and subtypes identified by the Enteric Reference Laboratory, 2011–2015**

| Species | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| ***S. sonnei*** | **59** | **57** | **57** | **74** | **57** |
| biotype a | 38 | 27 | 35 | 32 | 20 |
| biotype f | 1 | 3 | 1 | 6 | 0 |
| biotype g | 20 | 27 | 21 | 36 | 37 |
| ***S. flexneri*** | **40** | **54** | **72** | **41** | **51** |
| 1 | 4 | 1 | 6 | 7 | 8 |
| 2a | 15 | 10 | 12 | 11 | 14 |
| 2b | 1 | 3 | 2 | 6 | 6 |
| 3a | 5 | 3 | 10 | 4 | 7 |
| Other | 15 | 37 | 42 | 13 | 16 |
| **Other** | **1** | **10** | **6** | **11** | **4** |
| *S. boydii* | 0 | 7 | 5 | 9 | 4 |
| *S. dysenteriae* | 1 | 3 | 1 | 1 | 0 |
| *Shigella* species not identified | 0 | 0 | 0 | 1 | 0 |
| **Total** | **100** | **121** | **135** | **126** | **112** |

The percentage of shigellosis cases infected with *S. sonnei* in 2015 (51%) was within the range of values observed between 2011 and 2014 (between 42% and 59%). The percentage of shilgellosis cases with *S. flexneri* in 2015 (46%) was also within the range of values observed between 2011 and 2015 (between 33% and 53%) (Figure 44).

**Figure 44. Percentage of laboratory-reported cases by *Shigella* species and year, 2011–2015**




### 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 2015 by data source

During 2015, there were two notifications 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 2015 with *S. aureus* intoxication recorded as the principal diagnosis.

### Outbreaks reported as caused by *Staphylococcus aureus*

In 2015, two foodborne *S. aureus* outbreaks were reported with seven associated cases (Table 62). 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 62. *S. aureus* outbreaks reported, 2015**

| Measure | Foodborne *S. aureus* outbreaks | All *S. aureus* outbreaks |
|---|---|---|
| Outbreaks | 2 | 2 |
| Cases | 7 | 7 |
| Hospitalised cases | 0 | 0 |

The number of foodborne outbreaks associated with *S. aureus* reported each year between 2006 and 2015 ranged from zero to two (Figure 45). No *S. aureus* outbreaks were reported in EpiSurv in four of the last ten years.

**Figure 45. Foodborne *S. aureus* outbreaks and associated cases reported by year, 2006–2015**

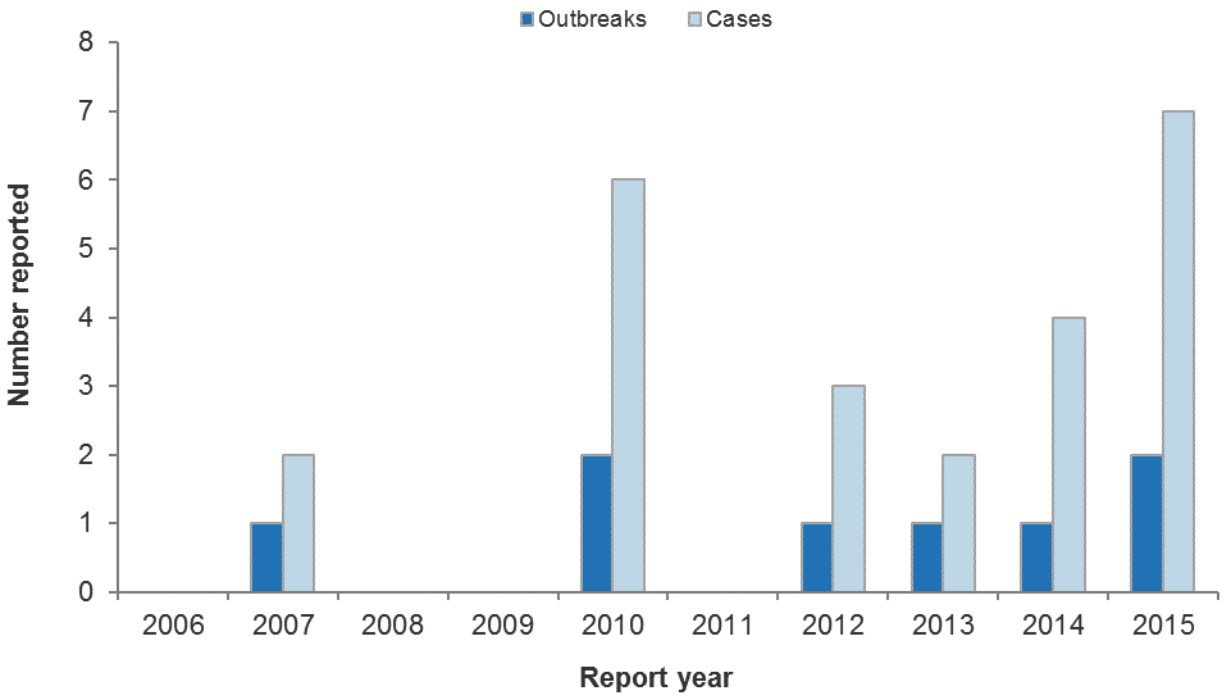



Table 63 contains details of the two foodborne *S. aureus* outbreaks reported in 2015. The level of evidence for suspected foods was weak in both the outbreaks.

**Table 63. Details of foodborne *S. aureus* outbreak, 2015**

| PHU | Month | Suspected vehicle | Exposure setting | Preparation setting | No. ill |
|---|---|---|---|---|---|
| Auckland | Apr | Teriyaki chicken on rice | Community/church/sports gathering | Other food outlet | 3C, 2P |
| MidCentral | Sep | Unknown | Restaurant/cafe/bakery | Restaurant/cafe/bakery | 2C |

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

In 2015, faecal and food specimens were submitted to ESR's Public Health Laboratory relating to the Auckland food-associated *S. aureus* outbreak listed in Table 63. Staphylococcal enterotoxin was detected in one faecal sample and in the food samples. High counts of *S.aureus* were detected in the food sample. In addition to *S. aureus, B. cereus* was detected in food samples and norovirus was detected in one of the faecal samples.

### Recent surveys

*A microbiological survey of ready-to-eat fruit salads available in New Zealand*

A microbiological survey of fresh-cut retail fruit salads (non-retorted, ready-to-eat) available in supermarkets and online retail stores in New Zealand was conducted during 2013-2014 [25]. Seventy five batches were sampled, covering a range of types of fruit salad. At the end of the products shelf-life, composite samples from five salads from the same batch were enumerated for coagulase-producing *Staphylococcus* spp. Coagulase-producing *Staphylococcus* spp. were not detected in any of the samples with a detection limit of 10 CFU/g.

### Relevant New Zealand studies and publications

Nil.

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

### Toxic shellfish poisoning cases reported in 2015

During 2015, 3 notifications (0.1 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 14 hospital admissions (0.3 admissions per 100,000 population) reported in 2015, 12 were reported with 'other fish and shellfish poisoning' as the primary diagnosis and two were reported as another relevant 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 2015, no toxic shellfish poisoning outbreaks were reported in which cases had symptoms consistent with PSP. It should be noted that all toxic shellfish poisoning outbreaks are categorised as foodborne, as consumption of contaminated shellfish is the only currently recognised transmission route for this disease.

In the period 2011 to 2015 there were 2 outbreaks due to toxic shellfish poisoning. One outbreak in 2012 with 29 cases and one outbreak in 2014 with 13 cases.

### Recent surveys

Nil.

### Relevant New Zealand studies and publications

Nil.

### Relevant regulatory developments

Nil.

# VTEC/STEC infection

Summary data for VTEC/STEC infection in 2015 are given in Table 64.

**Table 64. Summary of surveillance data for VTEC/STEC infection, 2015**

| Parameter | Value in 2015 | Source |
|---|---|---|
| Number of notified cases | 330 | EpiSurv |
| Notification rate (per 100,000) | 7.2 | EpiSurv |
| Hospitalisations (% of notifications)[a] | 99 (30%) | MoH NMDS, EpiSurv |
| Deaths (% of notifications)[a] | 0 (0%) | EpiSurv |
| Estimated travel-related cases (%)[a] | 26 (7.8%) | EpiSurv |
| Estimated food-related cases (%)[b] | 91 (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.

## Changes to laboratory methods

In July some Auckland laboratories changed the methodology in testing faecal specimens. These changes include using polymerase chain reaction (PCR) for molecular detection of VTEC/STEC and all faecal samples being tested for VTEC/STEC instead of only faecal samples with blood, or those from under 5 year olds. These changes have resulted in an increased notification rate for VTEC/STEC in the second half of the year for the Auckland and Northland areas.

### VTEC/STEC infection cases reported in 2015 by data source

During 2015, 330 notifications (7.2 cases per 100,000 population) of VTEC/STEC infection and no resulting deaths were reported in EpiSurv. The Enteric Reference Laboratory at ESR reported 343 cases (7.5 cases per 100,000) infected with VTEC/STEC in 2015.

The ICD-10 code A04.3 was used to extract enterohaemorrhagic *E. coli* infection hospitalisation data from the MoH NMDS database. Of the 20 hospital admissions (0.4 admissions per 100,000 population) recorded in 2015, 14 were reported with enterohaemorrhagic *E. coli* infection as the principal diagnosis and 6 with enterohaemorrhagic *E. coli* infection as another relevant diagnosis.

It has been estimated by expert consultation that 29.9% (95$^{th}$ percentile credible interval; 3.5% to 60.7%) of O157 VTEC/STEC incidence and 34.0% (95$^{th}$ 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 2015, there was a large increase in VTEC/STEC notifications compared to previous years (Figure 46 and Figure 47).

Introduction of all faecal specimen screening using PCR in an Auckland laboratory in July 2015 contributed to increased VTEC/STEC detection.

**Figure 46. VTEC/STEC infection notifications by year, 1997–2015**

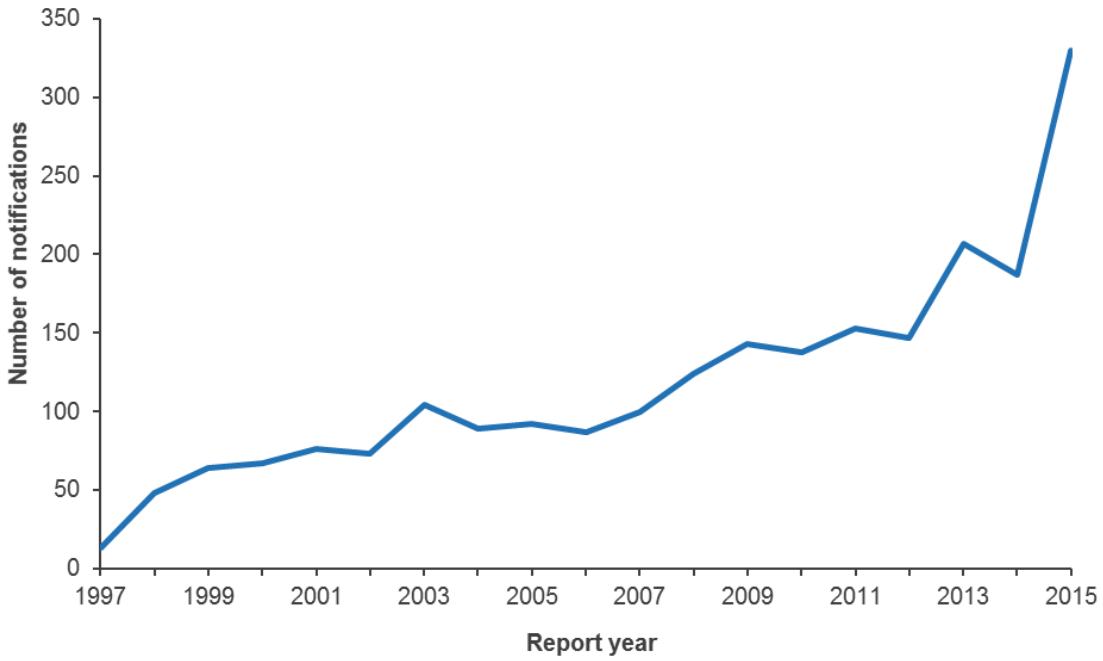
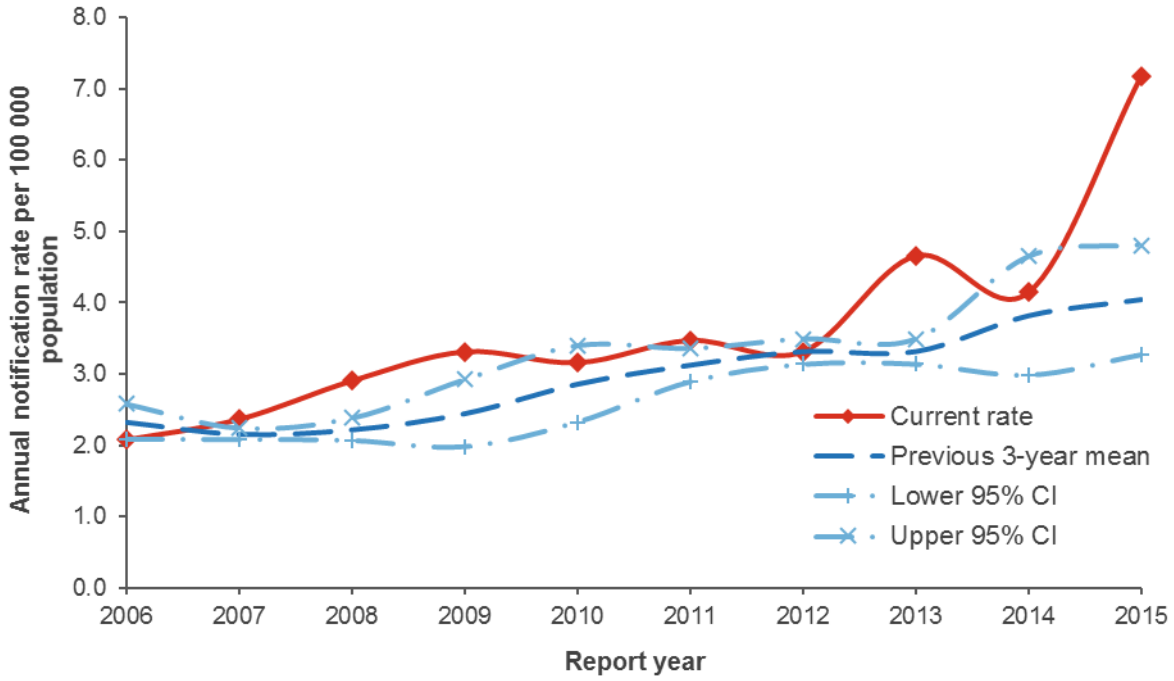
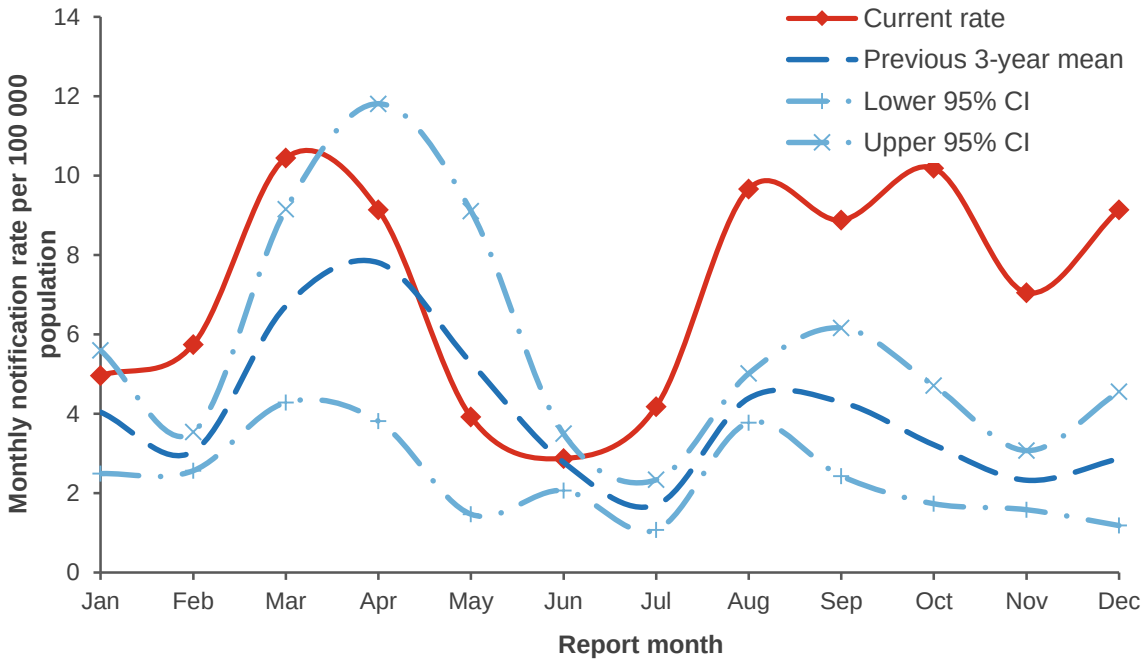


Figure 47. VTEC/STEC infection notification rate by year, 2006–2015




The number of notified cases of VTEC/STEC infection per 100,000 population by month for 2015 are shown in Figure 48. The 2015 monthly notification rate trend was similar to the trend in recent years for the first 6 months with a defined peak in autumn. A sustained increase in notification rate compared to recent years was observed from August onwards which corresponds to the time when the methodology was changed in some Auckland laboratories.

Figure 48. VTEC/STEC infection monthly rate (annualised), 2015



In 2015 notification rates were similar for females and males, however, hospitalisation rates were slightly higher for females than for males (Table 65).

**Table 65. VTEC/STEC infection cases by sex, 2015**

| Sex | EpiSurv notifications | | Hospitalisations[a] | |
|---|---|---|---|---|
| | No. | Rate[b] | No. | Rate[b] |
| Male | 162 | 7.2 | 7 | 0.3 |
| Female | 168 | 7.2 | 13 | 0.6 |
| **Total** | **330** | **7.2** | **20** | **0.4** |

[a] MoH NMDS data for hospital admissions

[b] per 100,000 of population

In 2015, the VTEC/STEC infection notification rate was highest for the 1 to 4 years age group (40.5 per 100,000 population, 100 cases), followed by the less than 1 year age group (32.1 per 100,000, 19 cases). The number of hospitalisations ranged between zero and six for each of the age groups (Table 66).

**Table 66. VTEC/STEC infection cases by age group, 2015**

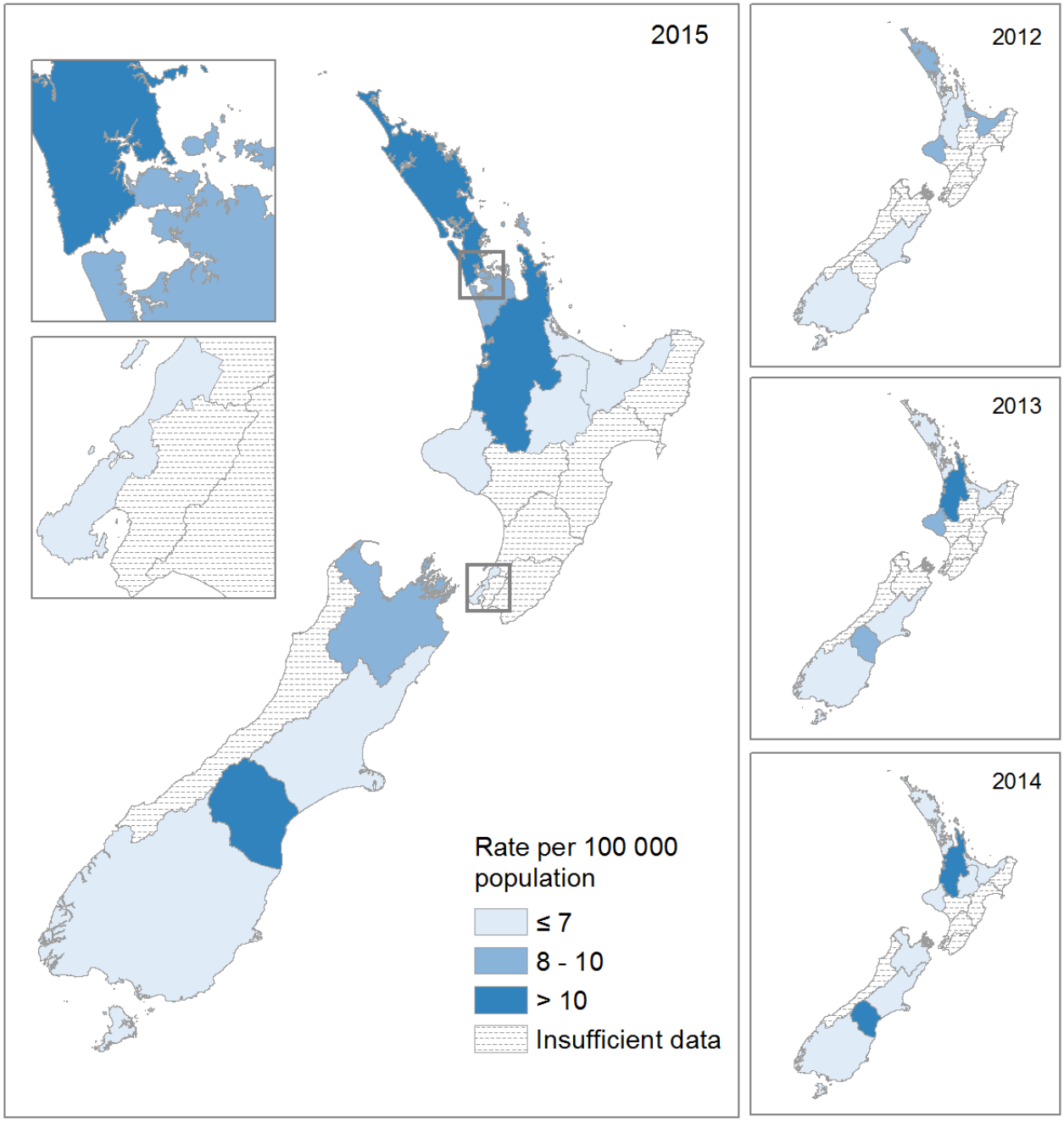
| Age group (years) | EpiSurv notifications | | Hospitalisations[a] | |
|---|---|---|---|---|
| | No. | Rate[b] | No. | Rate[b] |
| <1 | 19 | 32.1 | 0 | - |
| 1 to 4 | 100 | 40.5 | 6 | 2.4 |
| 5 to 9 | 31 | 9.8 | 3 | - |
| 10 to 14 | 18 | 6.1 | 1 | - |
| 15 to 19 | 15 | 4.7 | 1 | - |
| 20 to 29 | 27 | 4.1 | 1 | - |
| 30 to 39 | 17 | 3.0 | 0 | - |
| 40 to 49 | 16 | 2.6 | 3 | - |
| 50 to 59 | 23 | 3.8 | 1 | - |
| 60 to 69 | 27 | 5.7 | 2 | - |
| 70+ | 37 | 8.2 | 2 | - |
| **Total** | **330** | **7.2** | **20** | **0.4** |

[a] MoH NMDS data for hospital admissions (IDC-10 Code: A04.3)

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

Rates of VTEC/STEC infection varied throughout the country as illustrated in Figure 49. In 2015, the highest rates of VTEC/STEC infection were for Northland (14.3 per 100,000, 24 cases), Waikato (13.6 per 100,000, 53 cases), Waitemata (10.8 per 100,000, 62 cases) and South Canterbury (10.2 per 100,000, six cases) DHBs. Note that rates were not calculated for 7 DHBs where there were insufficient (less than 5) cases notified in 2015. The increase in notifications in Northland, Waitemata, Auckland and Counties Manukau are likely to be due to the change in laboratory methods.

**Figure 49. Geographic distribution of VTEC/STEC infection notifications, 2012–2015**



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 2015, the most commonly reported risk factors for VTEC/STEC infection cases were consumption of dairy products (87.4%), consumption of raw fruit/vegetables (85.6%), and contact with household pets (83.7%) (Table 67).

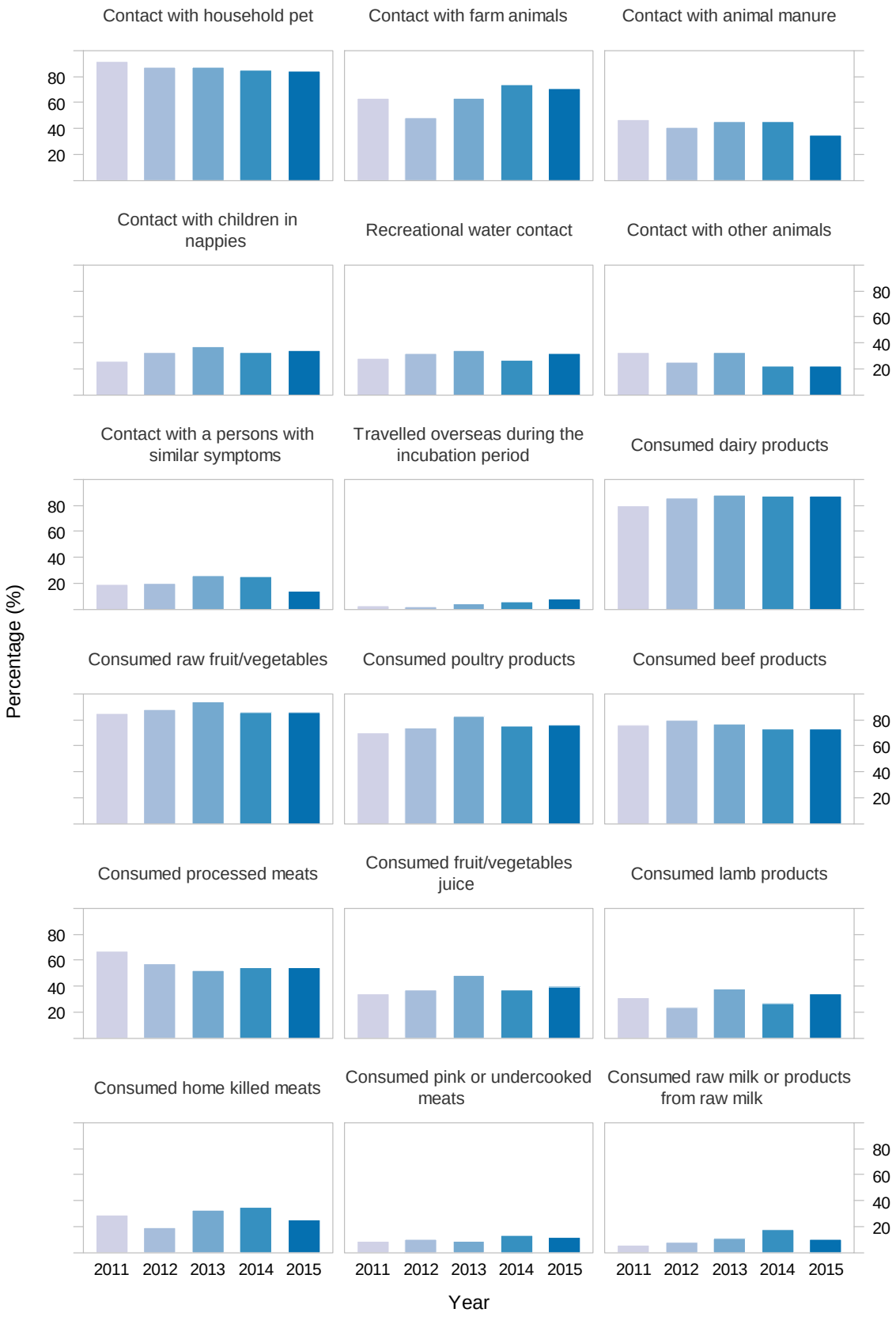
**Table 67. Exposure to risk factors reported for notifications of VTEC/STEC infection, 2015**

| Risk factor | Notifications | | | |
|---|---|---|---|---|
| | Yes | No | Unknown | %[a] |
| Consumed dairy products | 139 | 20 | 171 | 87.4 |
| Consumed raw fruit/vegetables | 137 | 23 | 170 | 85.6 |
| Contact with household pets | 103 | 20 | 207 | 83.7 |
| Consumed poultry products | 120 | 37 | 173 | 76.4 |
| Consumed beef products | 116 | 42 | 172 | 73.4 |
| Contact with farm animals | 79 | 32 | 219 | 71.2 |
| Consumed processed meats | 81 | 69 | 180 | 54.0 |
| Consumed fruit/vegetables juice | 56 | 88 | 186 | 38.9 |
| Contact with animal manure | 28 | 52 | 250 | 35.0 |
| Consumed lamb products | 48 | 93 | 189 | 34.0 |
| Contact with children in nappies | 53 | 105 | 172 | 33.5 |
| Recreational water contact | 54 | 115 | 161 | 32.0 |
| Consumed home killed meats | 39 | 120 | 171 | 24.5 |
| Contact with other animals | 19 | 69 | 242 | 21.6 |
| Contact with persons with similar symptoms | 29 | 174 | 127 | 14.3 |
| Consumed pink or undercooked meats | 19 | 134 | 177 | 12.4 |
| Consumed raw milk or products from raw milk | 16 | 147 | 167 | 9.8 |
| Travelled overseas during the incubation period | 20 | 236 | 74 | 7.8 |

[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 2011 and 2015, the risk factors reported by VTEC/STEC infection cases generally occurred in the same order of importance and to a similar magnitude (Figure 50). 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 50. Percentage of cases with exposure to risk factors reported for VTEC/STEC infection and year, 2011–2015**



For cases where information on travel was provided in 2015, 7.8% (95% CI 5.0-12.0%) 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 2015. The resultant distribution has a mean of 26 cases (95% CI 13-42).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 5.6% (95% CI 4.1-7.7%).

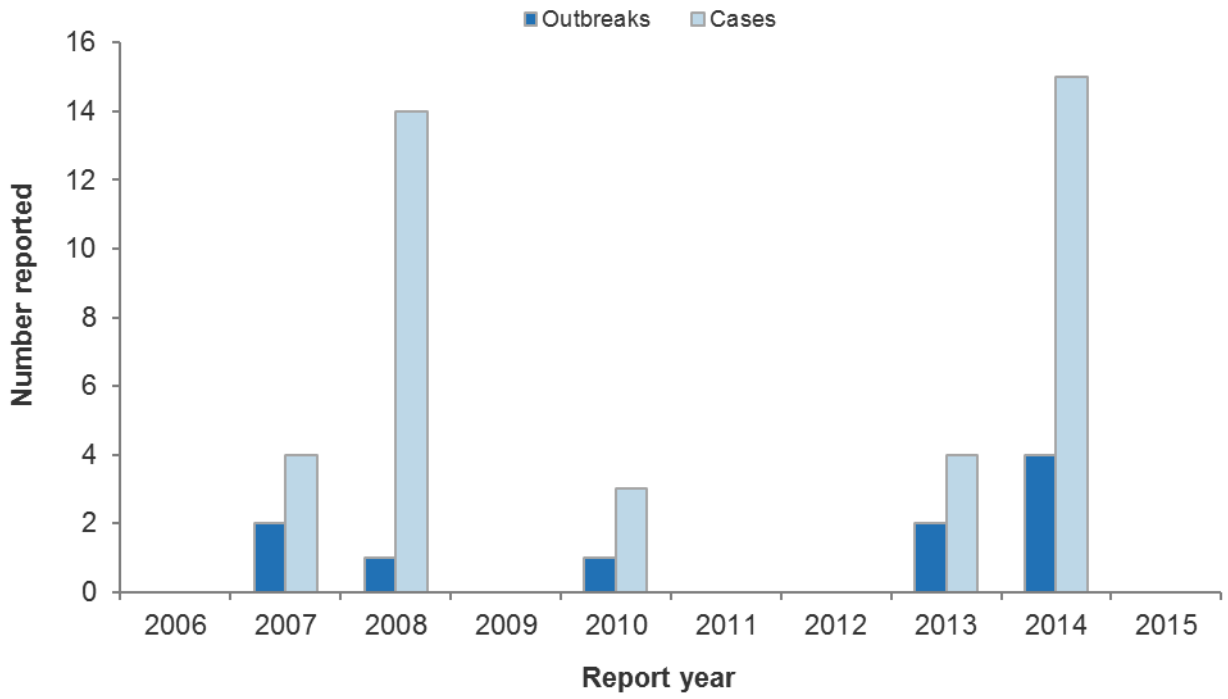
### Outbreaks reported as caused by VTEC/STEC

Of the 17 outbreaks (94 cases) of VTEC/STEC infection during 2015, none were classed as foodborne.

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.

Over the period from 2006 to 2015 no more than four foodborne outbreaks of VTEC/STEC were reported each year with no outbreaks reported for five of the ten years (Figure 51). With the exception of an outbreak in 2008 with 14 associated cases, no single outbreak in this period had more than five associated cases.

**Figure 51. Foodborne VTEC/STEC outbreaks and associated cases reported by year, 2006–2015**



### VTEC/STEC types commonly reported

A total of 343 cases infected with VTEC/STEC were reported by the ESR Enteric Reference Laboratory in 2015. Of these, 183 (53.4%) isolates were identified as *E. coli* O157:H7, 101 (29.4%) as non-O157:H7 and for 59 (17.2%) isolates VTEC could not be isolated although verocytotoxin producing genes were detected by PCR.

Of the 101 non-O157:H7 isolates, 14 were typed as O26:H11 and 10 each as O176:HNM, and ONT:HNM (Table 68). The number of non-O157 VTEC/STEC cases in 2015 was higher than 2013 and 2014 due to the changes in laboratory methods and the screening of all faecal samples submitted to an Auckland laboratory, (Figure 52).

**Table 68. VTEC/STEC subtypes identified by the Enteric Reference Laboratory, 2011–2015**

| Serotype | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| **O157** | **139** | **119** | **192** | **170** | **183** |
| O157:H7 | 139 | 119 | 192 | 170 | 183 |
| **Non-O157** | **14** | **23** | **22** | **21** | **101** |
| O26:H11 | 1 | 1 | 1 | 1 | 14 |
| O176:HNM | 1 | 1 | - | 3 | 10 |
| ONT:HNM | | 9 | 1 | 2 | 10 |
| ONT:H2 | 1 | - | 1 | 1 | 9 |
| O38:H26 | - | 1 | 1 | 2 | 5 |
| O91:HNM | - | - | - | - | 5 |
| O128:H2 | 2 | - | 1 | - | 4 |
| O153:H2 | - | - | - | - | 4 |
| ORough:HNM | - | - | 1 | - | 3 |
| O103:H2 | 1 | - | - | - | 2 |
| O103:H25 | - | - | 1 | - | 2 |
| O117:H7 | - | - | - | - | 2 |
| O146:H21 | 1 | 1 | - | 1 | 2 |
| ONT:H11 | - | 2 | 1 | - | 2 |
| ONT:H8 | - | - | - | - | 2 |
| Other types[a] | 7 | 8 | 14 | 11 | 25[b] |
| **Unable to be typed** | | | **1** | **2** | **59** |
| **Total** | **153** | **142** | **215** | **193** | **343** |

[a] Cases not listed in table, single cases unless indicated otherwise. NM: Non-Motile, NT: Non-Typable

2011: O123:HNM, O131:HRough, O178:H23, O84:H2 (two cases), O84:HNM, ORough:H2

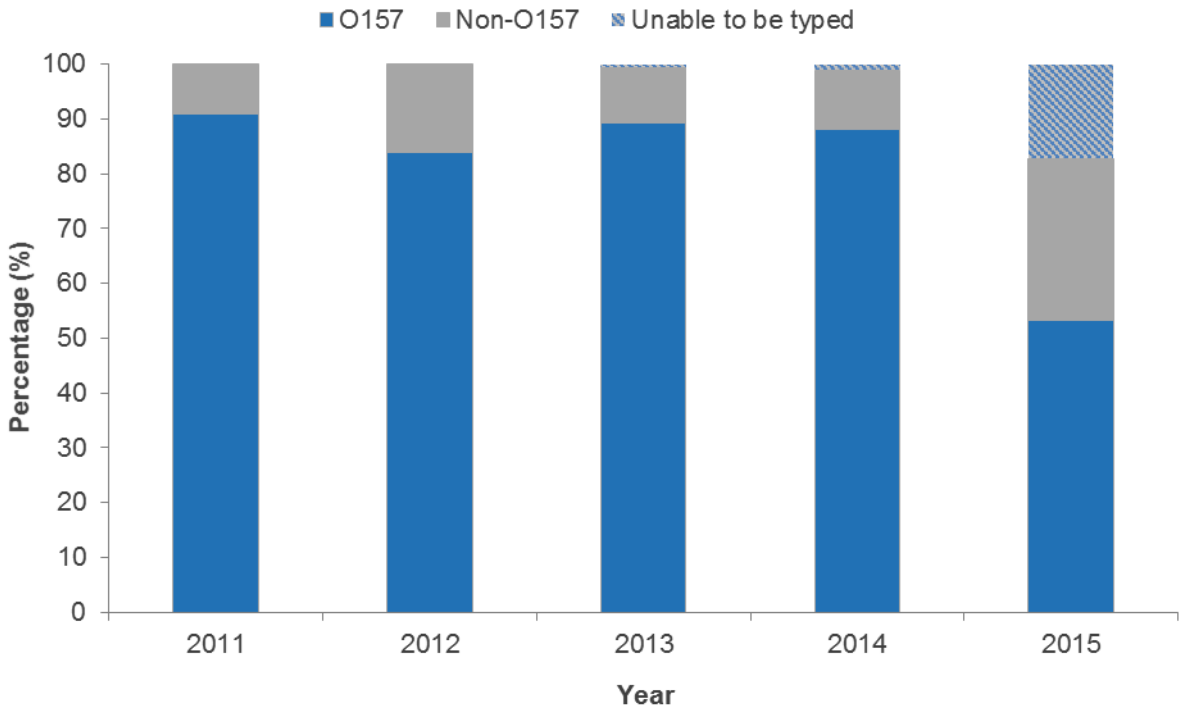
2012: O26:H7, O68:HNM, O84:HNM, O128:HNM, O146:HRough, O176:HRough, O180:HNM, ONT:H7

2013: O84:HNM, O84:HNT, O116:H11, O121:H19 (two cases), O121:HNT, O123:HMN, O145:H34, O156:H25, O163:H19, O177:HNM, O179:H8, O182:HNM, ORough:H2

2014: O6:H7, O26:HNM (two cases), O68:HNM (two cases), O84:H2, O108:H25, O182:HNM (two cases), ONT:H6, ONT:H21

2015: O38:HNM, O55:HNT, O8:H28, O80:HNM, O84:H2, O91:H21, O112:H8, O128:HNM, O130:H11, O145:HNM, O149:H18, O163:H19, O174:H8, O174:HNM, O177:HNM, O178:H7, O179:H8, O183:H18, O186:H10, ONT:H26, ONT:H49, ONT:HNT, ORough:H16, ORough:H2, ORough:H7

**Figure 52. Percentage of *E. coli* O157 and non-O157 laboratory-reported cases by year, 2011–2015**



Most human isolates of O157:H7 are further genotyped by pulsed-field gel electrophoresis (PFGE). Table 69 summarises PFGE typing of human O157:H7 isolates each year from 2011 to 2015.

**Table 69. PFGE genotypes of human *E. coli* O157:H7 isolates, 2011–2015**

| Genotype | Number of isolates | | | | |
|---|---|---|---|---|---|
| | 2011 | 2012 | 2013 | 2014 | 2015 |
| Xb0097 | 19 | 12 | 30 | 22 | 21 |
| Xb0079 | 24 | 24 | 29 | 12 | 20 |
| Xb0168 | 12 | 14 | 7 | 13 | 11 |
| Xb0233 | - | 1 | 10 | 4 | 9 |
| Xb0352 | - | - | - | 3 | 9 |
| Xb0207 | - | 1 | 1 | - | 4 |
| Xb0483 | - | - | - | - | 4 |
| Xb0536 | - | - | - | - | 4 |
| Xb0110 | 1 | 2 | 5 | 4 | 3 |
| Xb0117 | 6 | 2 | 12 | 4 | 3 |
| Xb0370 | 3 | 8 | 2 | 4 | 3 |
| Xb0014 | 4 | 5 | 2 | 4 | 1 |
| Xb0049 | 8 | 4 | 8 | 7 | 1 |
| Xb0343 | 1 | - | 1 | 4 | 1 |
| Xb0456 | - | - | - | 5 | - |
| Other types | 60 | 45 | 82 | 86 | 89 |
| **Total** | **138** | **118** | **189** | **172** | **183** |

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

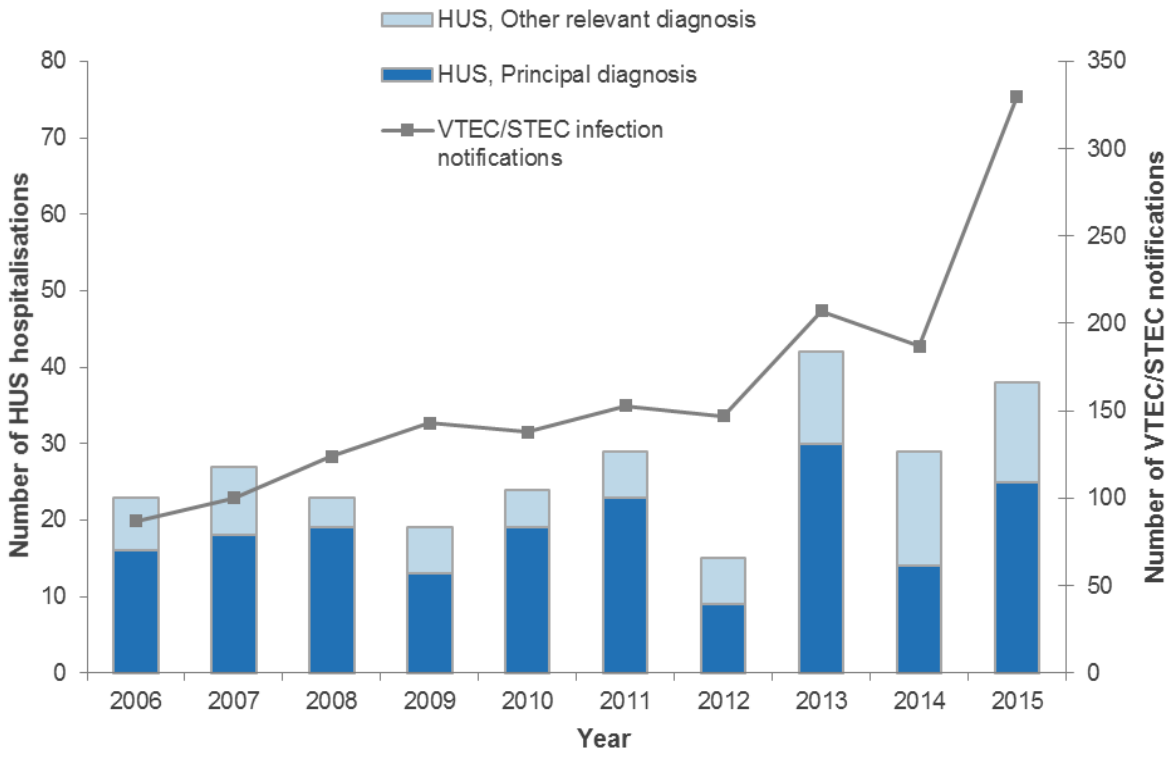
### Disease sequelae – haemolytic uraemic syndrome (HUS)

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. In a change from previous years, only HUS cases that were incident in 2015 were considered, rather than all cases that were hospitalised in 2015. That is, if a HUS cases hospitalised in 2015 had been hospitalised with HUS in a previous year, the 2015 admission was considered to be a readmission, rather than an incident case. Data for previous years have been recalculated to reflect this change. Of the 38 incident hospital admissions recorded in 2015 (0.8 per 100,000 population), 25 were reported with HUS as the primary diagnosis and 13 with HUS as another relevant diagnosis.

Between 2006 and 2015, the number of incident hospitalised cases (any diagnosis code) of HUS each year ranged from 15 to 42 (Figure 53). In 2015, the number of incident hospitalised cases increased to 38 from 29 in 2014. This increase corresponded with an increase in the number of VTEC/STEC notifications.

Figure 53. Haemolytic-uraemic syndrome (HUS) hospitalised cases, 2006–2015




In 2015, the number of female incident hospitalised cases due to HUS was greater than the number of male cases (Table 70). The relative proportion of female and male cases was similar between 2014 and 2015.

Table 70. Haemolytic uraemic syndrome hospitalised cases by sex, 2015

| 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 2015, the highest age-specific rates of incident hospitalised cases due to HUS were in the less than 5 years age group (Table 71).

**Table 71. Haemolytic uraemic syndrome hospitalised cases by age group, 2015**

| Age group (years) | Hospitalised cases [a] | |
|---|---|---|
| | No. | Rate[b] |
| <5 | 14 | 4.6 |
| 5 to 9 | 5 | 1.6 |
| 10 to 14 | 1 | - |
| 15 to 19 | 1 | - |
| 20 to 29 | 4 | - |
| 30 to 39 | 0 | - |
| 40 to 49 | 2 | - |
| 50 to 59 | 1 | - |
| 60 to 69 | 5 | 1.1 |
| 70+ | 5 | 1.1 |
| **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 2015, 14 cases of HUS were reported to the NZPSU, of which 12 had a diarrhoeal prodrome. The median age at presentation of diarrhoeal cases was 1.9 years (range 0.7 to 7.4 years). Ten of the 12 had bloody diarrhoea and 11 of 12 cases had *E. coli* O157:H7 isolated from their stools. Seven of the 12 (58%) diarrhoeal cases lived on a farm/lifestyle block or had visited a farm in the previous two weeks. One child had been to a public animal petting enclosure.

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

*A microbiological survey of seed sprouts (and shoots) available in New Zealand*

A quantitative microbiological survey of ready-to-eat packaged seed sprouts and shoots, available from supermarkets, independent sellers and farmer's markets in New Zealand, was carried out between April and August 2014 [24]. Fifty different lots/batches of various types of seed sprouts and shoots were purchased. Fifty composite samples (each from the same batch of seed sprouts and shoots) were tested for the presence or absence of Shiga toxin-producing *Escherichia coli* (STEC). STEC was not detected in any of the composite samples.

*A microbiological survey of ready-to-eat fruit salads available in New Zealand*

A microbiological survey of fresh-cut retail fruit salads (non-retorted, ready-to-eat) available in supermarkets and online retail stores in New Zealand was conducted during 2013-2014 [25]. Seventy five batches were sampled, covering a range of types of fruit salad. At the end of the products shelf-life, composite samples from five salads from the same batch were enumerated for *Escherichia coli*. *Escherichia coli* were not detected in any of the samples with a detection limit of 3 MPN/g.

*A microbiological survey of processed animal feeds – a pilot study*

New Zealand feed mills (*n* = 15) supplied a total of 58 samples of their finished animal feeds, and these were composited for each mill at the laboratory [16]. Although ruminant feeds were targeted in this survey, a proportion of feeds received were intended for other species, particularly poultry. STEC (Top 7) was not detected in any feed sample.

*PFGE analysis of meat isolates of E. coli O157:H7 in New Zealand (2014)*

This report describes the results of PFGE analysis of 47 *E. coli* O157:H7 isolates from meat received by ESR during the period 1 January 2014 to 31 December 2014 [31]. All of the isolates were analysed by PFGE using both XbaI and BlnI. When the two PFGE types were combined, 37 XbaI:BlnI types were observed.

### Relevant New Zealand studies and publications

Nil.

### Relevant regulatory developments

Nil.

# Yersiniosis

Summary data for yersiniosis in 2015 are given in Table 72.

**Table 72. Summary of surveillance data for yersiniosis, 2015**

| Parameter | Value in 2015 | Source |
|---|---|---|
| Number of notified cases | 634 | EpiSurv |
| Notification rate (per 100,000) | 13.8 | EpiSurv |
| Hospitalisations (% of notifications)[a] | 62 (9.8%) | MoH NMDS |
| Deaths | 0 | EpiSurv |
| Estimated travel-related cases (%)[a] | 63 (9.9%) | EpiSurv |
| Estimated food-related cases (%)[b] | 361 (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 2015 by data source

During 2015, 634 notifications (13.8 cases per 100,000 population) of yersiniosis and no resulting deaths were reported in EpiSurv.

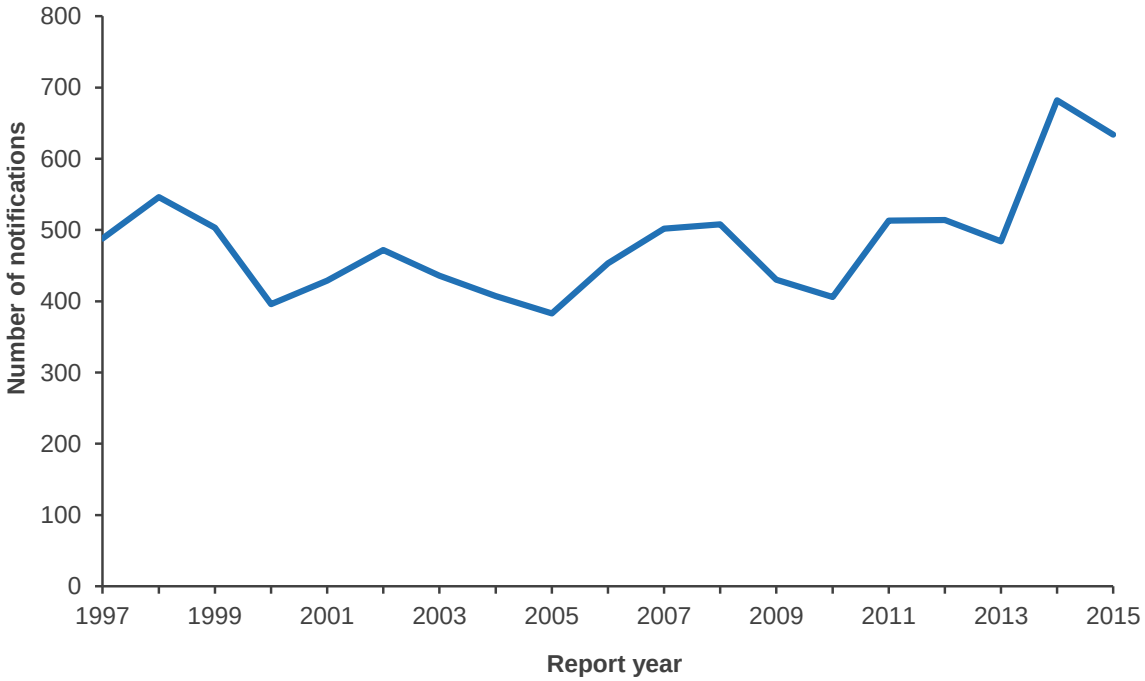
The ICD-10 code A04.6 was used to extract yersiniosis (*Yersinia enterocolitica)* hospitalisation data from the MoH NMDS database. Of the 62 hospital admissions (1.3 admissions per 100,000 population) recorded in 2015, 38 were reported with yersiniosis as the principal diagnosis and 24 with yersiniosis as another relevant diagnosis.

It has been estimated by expert consultation that 63.2% (95$^{th}$ 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

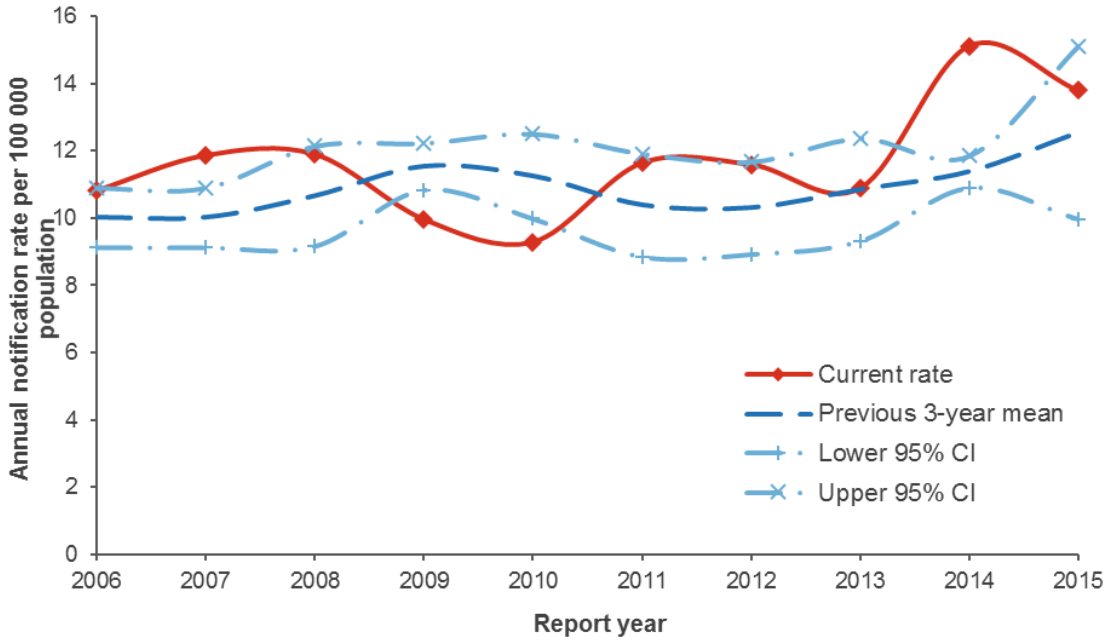
Yersiniosis became notifiable in 1996, with the highest number of notifications reported in 2014 (682). Since 1998, the annual number of notifications reported has been between 383 notifications (2005) and 682 notifications (2014) (Figure 54).

**Figure 54. Yersiniosis notifications by year, 1997–2015**



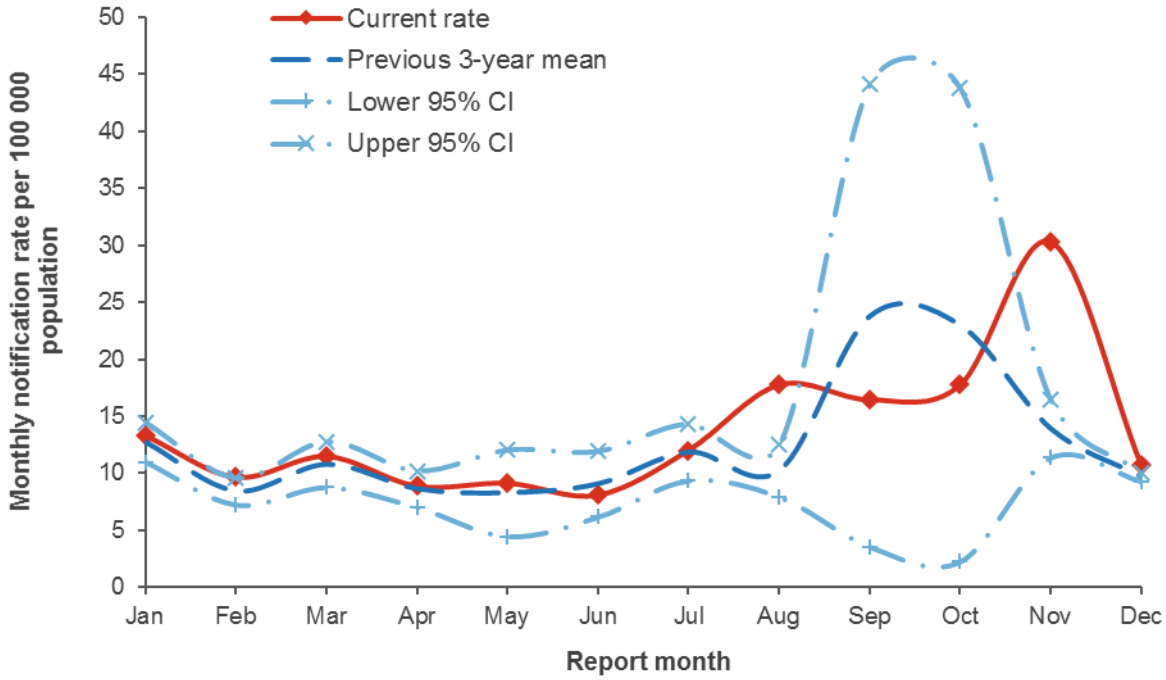

The yersiniosis annual notification rate has remained stable (ranging from 9.3 to 11.9 per 100,000) between 2006 and 2013, but increased markedly in 2014. In 2015 the notification rate decreased below that observed in 2014, but was still higher than observed during 2006 to 2013 (Figure 55).

**Figure 55. Yersiniosis notification rate by year, 2006–2015**



The number of notified cases of yersiniosis per 100,000 population by month for 2015 is shown in Figure 56. The 2015 monthly notification rate trend was similar to the mean monthly rate in previous years for December to July, with a peak in cases observed in November. In 2014 there was a large peak in notifications during September and October, associated with a single large outbreak (220 cases).

**Figure 56. Yersiniosis monthly rate (annualised), 2015**




In 2015 the yersiniosis notification and hospitalisation rates were slightly higher for females than for males (Table 73). In 2014 the notification and hospitalisation rates were similar for males and females.

**Table 73. Yersiniosis cases by sex, 2015**

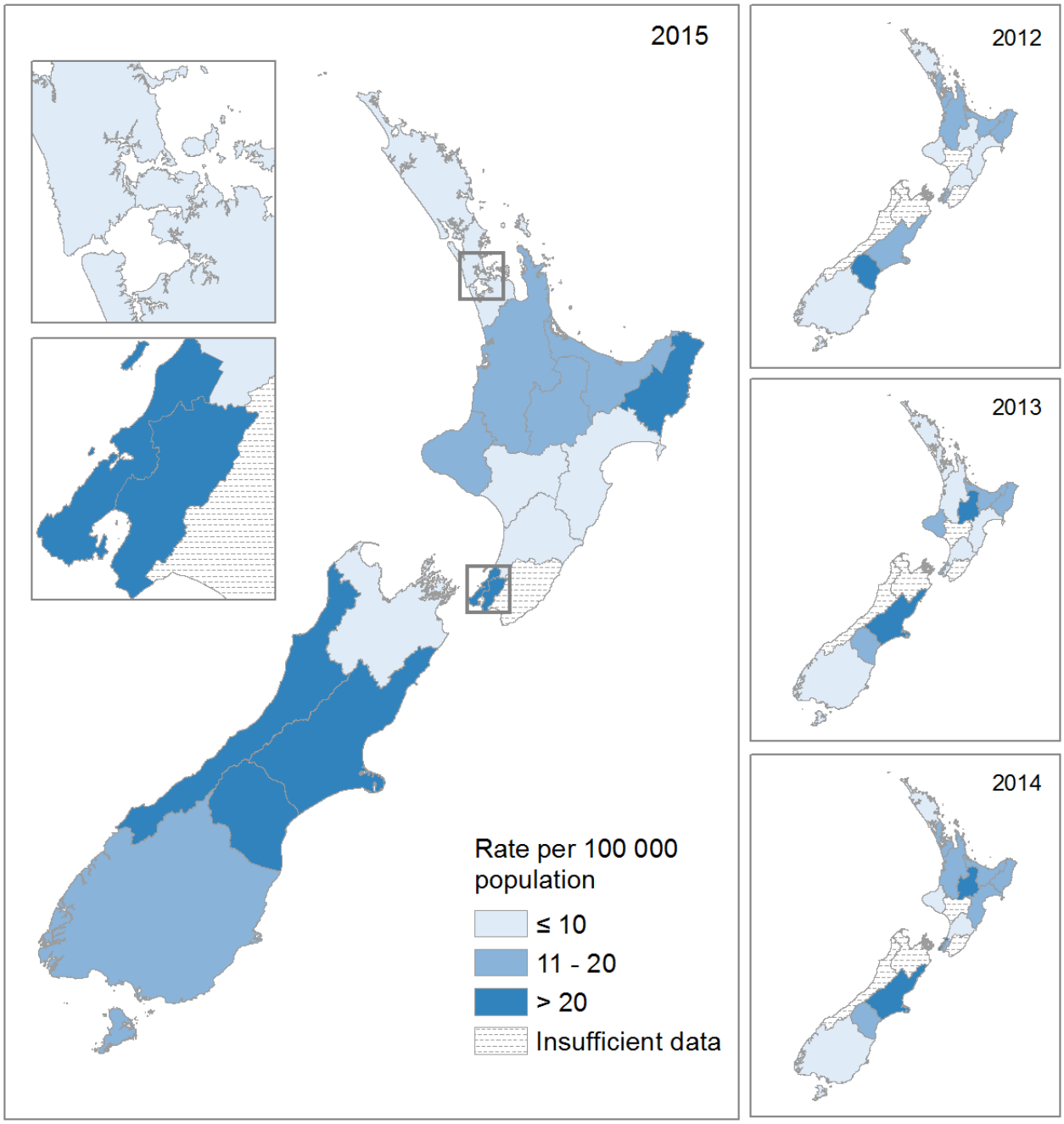
| Sex | EpiSurv notifications | | Hospitalisations[a] | |
|---|---|---|---|---|
| | No. | Rate[b] | No. | Rate[b] |
| Male | 295 | 13.1 | 27 | 1.2 |
| Female | 339 | 14.5 | 35 | 1.5 |
| **Total** | **634** | **13.8** | **62** | **1.3** |

[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 57. In 2015, the highest rates were for the Canterbury (30.8 per 100,000 population, 162 cases) and South Canterbury (27.3 per 100,000, 16 cases) DHBs.

**Figure 57. Geographic distribution of yersiniosis notifications, 2012–2015**




In 2015, the highest yersiniosis notification rates were for the less than 1 year (49.4 per 100,000 population, 41 cases) and 1 to 4 years (41.4 per 100,000, 102 cases) age groups. Notification rates for the under five year olds were more than twice the rates for any other age group (Table 74). Over half of the hospitalised cases were aged over 50 years.

### Table 74. Yersiniosis cases by age group, 2015

| Age group (years) | EpiSurv notifications | | Hospitalisations[a] | |
|---|---|---|---|---|
| | No. | Rate[b] | No. | Rate[b] |
| <1 | 41 | 69.4 | 2 | - |
| 1 to 4 | 102 | 41.4 | 7 | 2.8 |
| 5 to 9 | 24 | 7.6 | 1 | - |
| 10 to 14 | 21 | 7.2 | 1 | - |
| 15 to 19 | 30 | 9.5 | 4 | - |
| 20 to 29 | 66 | 10.1 | 5 | 0.8 |
| 30 to 39 | 60 | 10.7 | 3 | - |
| 40 to 49 | 64 | 10.3 | 2 | - |
| 50 to 59 | 101 | 16.7 | 10 | 1.7 |
| 60 to 69 | 55 | 11.6 | 6 | 1.3 |
| 70+ | 70 | 15.6 | 21 | 4.7 |
| **Total** | **634** | **13.8** | **62** | **1.3** |

[a] MoH NMDS data for hospital admissions

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

In 2015, the most commonly reported risk factors for yersiniosis notifications were consumption of food from retail premises (47.7%), followed by contact with farm animals (28.1%), contact with faecal matter (22.2%), recreational water contact (19.9%) and consuming untreated water (18.2%) (Table 75).

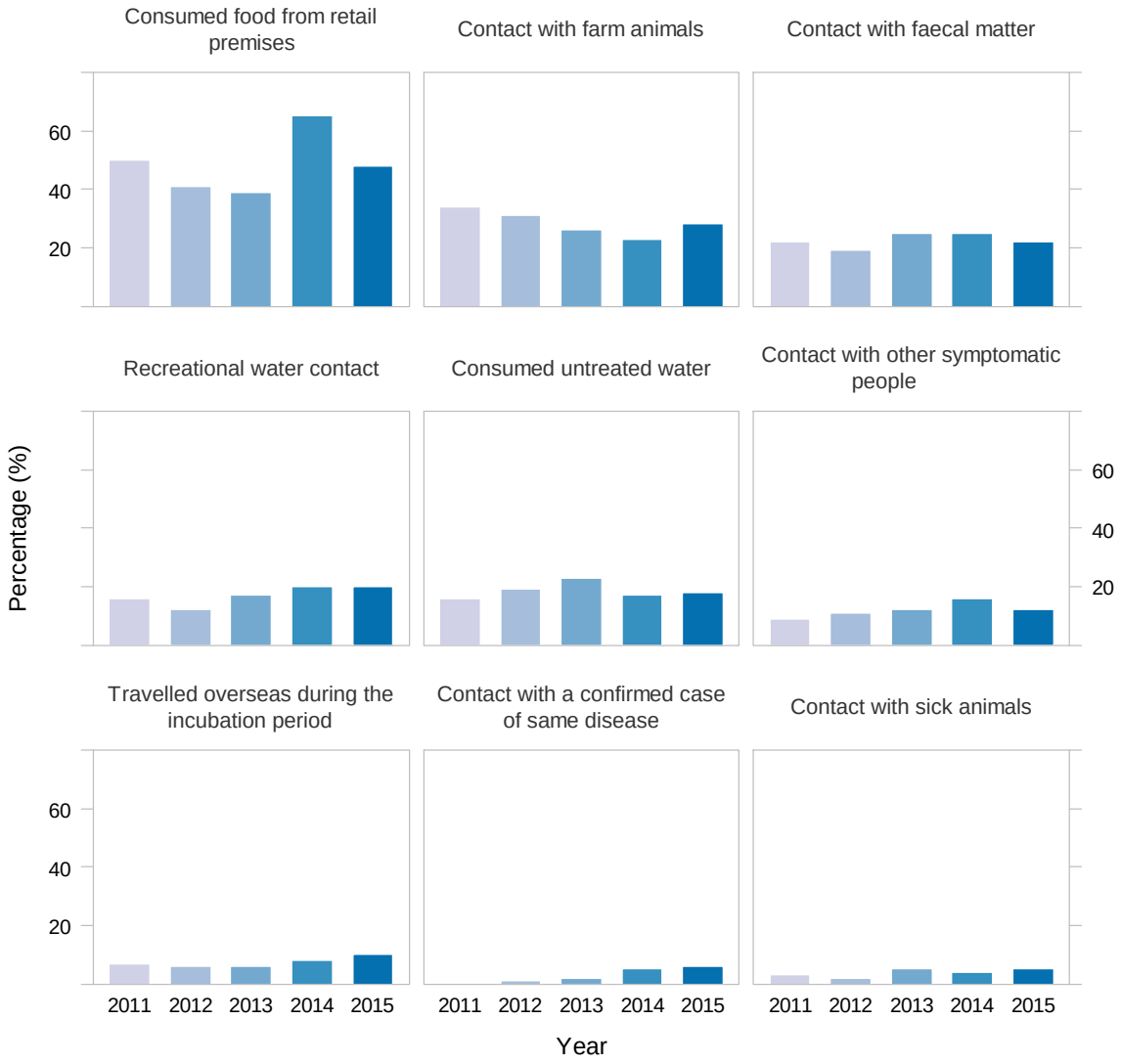
### Table 75. Exposure to risk factors reported for yersiniosis notifications, 2015

| Risk factor | Notifications | | | |
|---|---|---|---|---|
| | Yes | No | Unknown | %[a] |
| Consumed food from retail premises | 147 | 161 | 326 | 47.7 |
| Contact with farm animals | 99 | 253 | 282 | 28.1 |
| Contact with faecal matter | 74 | 259 | 301 | 22.2 |
| Recreational water contact | 67 | 270 | 297 | 19.9 |
| Consumed untreated water | 57 | 257 | 320 | 18.2 |
| Contact with other symptomatic people | 40 | 289 | 305 | 12.2 |
| Travelled overseas during the incubation period | 36 | 326 | 272 | 9.9 |
| Contact with a confirmed case of same disease | 13 | 220 | 401 | 5.6 |
| Contact with sick animals | 16 | 314 | 304 | 4.8 |

[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 2011 and 2015, the most commonly reported risk factor for yersiniosis cases was consumption of food from retail premises, followed by contact with farm animals (Figure 58). There has been a decrease in the proportion of cases reporting contact with farm animals between 2011 and 2014, however this trend reversed in 2015. There are no clear trends in the other risk factors.

**Figure 58. Percentage of cases with exposure to risk factors reported for yersiniosis and year, 2011–2015**




For cases where information on travel was provided in 2015, 9.9% (95% CI 7.2-13.6%) 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 2015. The resultant distribution has a mean of 63 cases (95% CI 39-91).

If data from the last four years are considered, the estimated proportion of cases travelling overseas within the incubation period of the organism was 8.0% (95% CI 6.6-9.8%).

### Outbreaks reported as caused by *Yersinia* spp.

During 2015, there were two *Yersinia* spp. outbreaks, with a total of 5 cases, reported in EpiSurv. Both *Yersinia* spp. outbreaks were associated with a suspected foodborne source. (Table 76). No hospitalised outbreak cases were associated with the outbreaks. 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 76. *Yersinia* spp. outbreaks reported, 2015**

| Measure | Foodborne *Yersinia* spp. outbreaks | All *Yersinia* spp. outbreaks |
|---|---|---|
| Outbreaks | 2 | 2 |
| Cases | 5 | 5 |
| Hospitalised cases | 0 | 0 |

Between 2006 and 2015 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 59).

**Figure 59. Foodborne *Yersinia* spp. outbreaks and associated cases reported by year, 2006–2015**

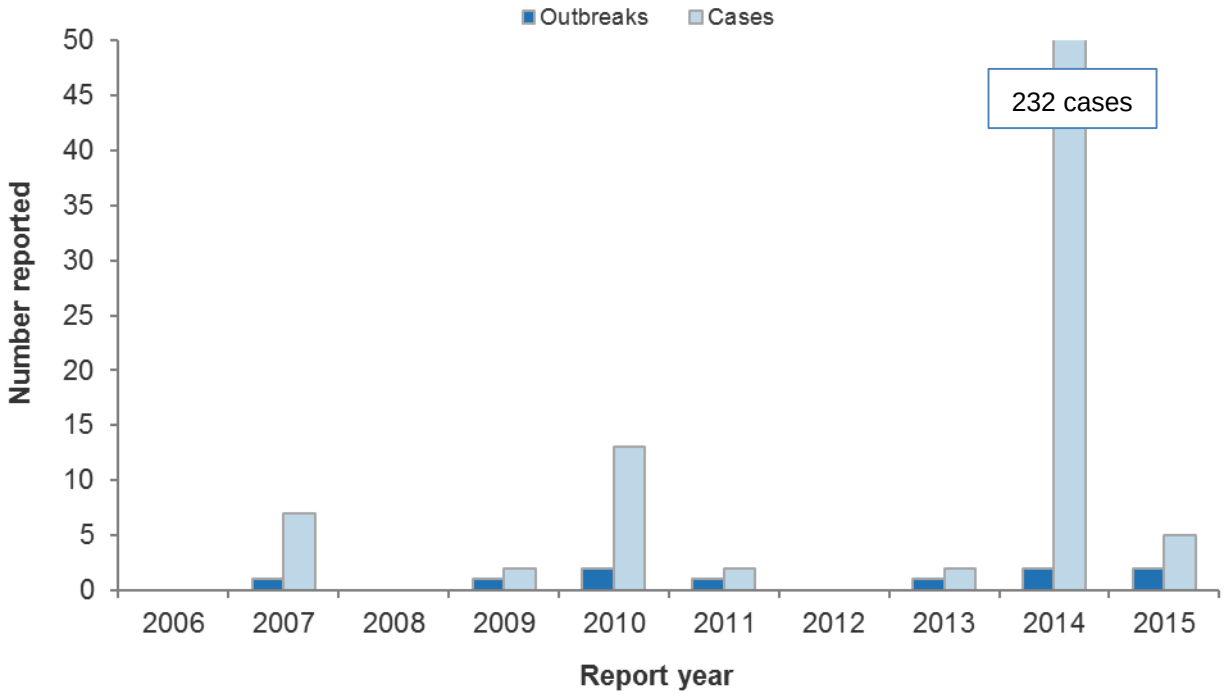


Table 77 contains details of the foodborne *Yersinia* spp. outbreaks reported in 2015. The evidence linking either of these outbreaks to specific foods or food in general was weak.

**Table 77. Details of foodborne *Yersinia* spp outbreaks reported, 2015**

| PHU | Month | Suspected vehicle | Exposure setting | Preparation setting | No. ill |
|---|---|---|---|---|---|
| Waikato | Jan | Unknown | Home | Home | 2C |
| Community and Public Health | May | Miso marinated fish meal or seasoned vegtables | Restaurant/café/bakery | Restaurant/café/bakery | 1C, 2P |

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

In 2015 no clinical or food samples were submitted to ESR's Public Health Laboratory relating to the *Yersinia* spp. outbreaks.

### *Yersinia* types commonly reported

In 2015, clinical laboratories submitted 588 isolates for *Yersinia* spp. confirmation and typing to the Enteric Reference Laboratory (ERL) at ESR. Notifiable *Yersinia* spp. (ie *Yersinia enterocolitica* (YE) and *Y. pseudotuberculosis* (YTB)) were identified in 91% 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 78. Between 2011 and 2015, the largest proportion of cases was due to *Y. enterocolitica*. A single spike in 2014 of *Y. pseudotuberculosis* cases were predominantly associated with a single large outbreak of yersiniosis. An increase in the number of cases being reported with *Y. enterocolitica* biotype 1A and biotype 2 was observed compared to the previous four years (Figure 60).

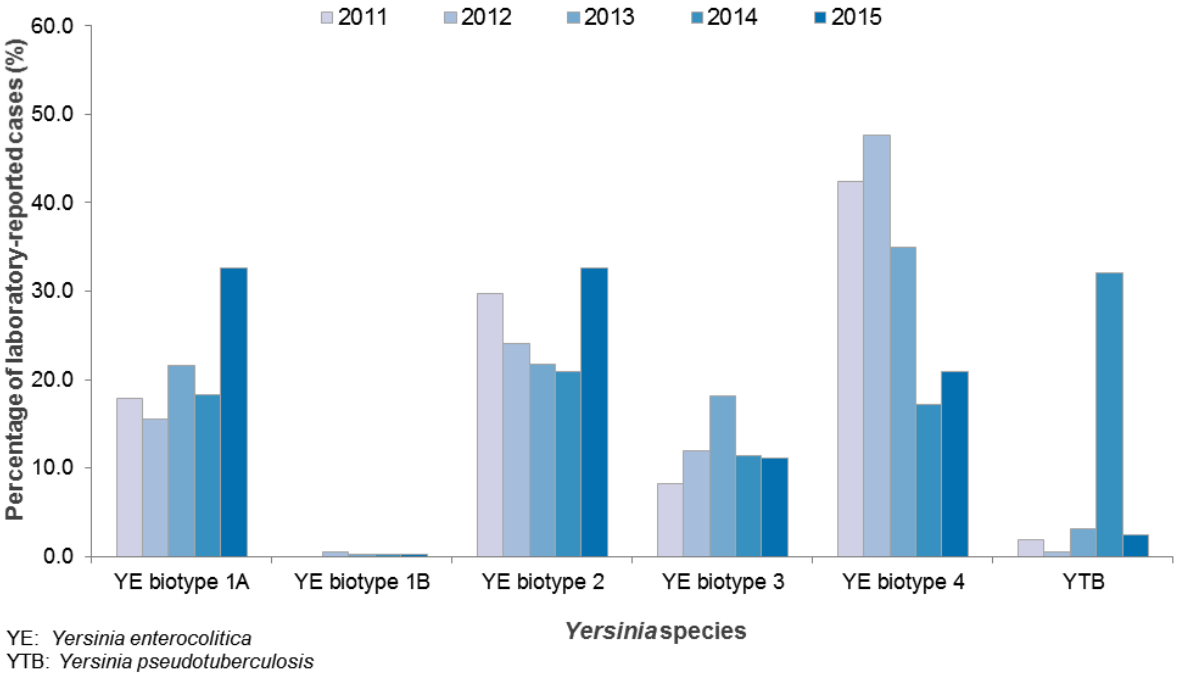
These numbers need to be interpreted with some caution as

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 78. Notifiable *Yersinia* spp. identified by the Enteric Reference Laboratory, 2011–2015**

| Species | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| ***Yersinia enterocolitica*** | **433** | **443** | **405** | **384** | **521** |
| biotype 1A | 79 | 69 | 90 | 103 | 173 |
| biotype 1B | 0 | 2 | 1 | 1 | 1 |
| biotype 2 | 131 | 107 | 91 | 118 | 173 |
| biotype 3 | 36 | 53 | 76 | 64 | 59 |
| biotype 4 | 187 | 212 | 146 | 97 | 111 |
| biotype not identified | - | - | 1 | 1 | 4 |
| ***Yersinia pseudotuberculosis*** | **8** | **2** | **13** | **181** | **13** |
| **Total** | **441** | **445** | **418** | **565** | **534** |

**Figure 60. Percentage of laboratory-reported cases of notifiable *Yersinia* spp. by species and year, 2011–2015**




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

### Recent surveys

Nil.

### Relevant New Zealand studies and publications

### Journal papers

The laboratory response to a large potentially food transmitted outbreak of *Yersinia pseudotuberculosis* was reported [32]. Biochemical and molecular characterisation techniques were used to identify outbreak strains.

### Relevant regulatory developments

Nil

# 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 2015, 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 12 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 2015* [13].

### 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 [12]. 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 2015 [33].

### 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.

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 [3]. 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 [14].

# 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 18 February 2016. 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 2015 mid-year population estimates and are crude rates unless otherwise stated. At 30 June 2015, the New Zealand population was estimated to be

4,595,750. The mid-year population estimate for 2013 used in the analysis of trends was updated in 2014 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 (2012−2014).

# SUMMARY TABLES

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# SUMMARY TABLES

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

**Table 79. Number of cases and rate per 100,000 population of selected notifiable diseases in New Zealand, 2014–2015**

| Disease | 2014 | | 2015 | | Change [b,c] |
|---|---|---|---|---|---|
| | Cases | Rates | Cases | Rates | |
| Campylobacteriosis | 6782 | 150.4 | 6218 | 135.3 | ↞ |
| Cryptosporidiosis | 584 | 12.9 | 696 | 15.1 | ↠ |
| Gastroenteritis[a] | 756 | 16.8 | 500 | 10.9 | ↞ |
| Giardiasis | 1709 | 37.9 | 1510 | 32.9 | ↞ |
| Hepatitis A | 74 | 1.6 | 47 | 1.0 | ↞ |
| Listeriosis | 25 | 0.6 | 26 | 0.6 | → |
| Salmonellosis | 956 | 21.2 | 1051 | 22.9 | → |
| Shigellosis | 128 | 2.8 | 111 | 2.4 | ← |
| VTEC/STEC infection | 187 | 4.1 | 330 | 7.2 | ↠ |
| Yersiniosis | 681 | 15.1 | 634 | 13.8 | ← |

[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,

[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 80. Deaths due to selected notifiable diseases recorded in EpiSurv, 1997–2015

| Disease | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Campylobacteriosis | 2 | 2 | 1 | 3 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Gastroenteritis | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| Giardiasis | 1 | 0 | 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 | 1 |
| Listeriosis - perinatal | 6 | 0 | 2 | 4 | 1 | 3 | 2 | 2 | 4 | 1 | 2 | 2 | 2 | 4 | 0 | 2 | 4 | 2 | 3 |
| Salmonellosis | 2 | 2 | 1 | 7 | 2 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Shigellosis | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| VTEC/STEC infection | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| Yersiniosis | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 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 81. MoH mortality data for selected notifiable diseases, 2011–2013

| Disease | ICD 10 Codes | 2011 | | 2012 | | 2013[a] | |
|---|---|---|---|---|---|---|---|
| | | Und[b] | Cont[c] | Und[b] | Cont[c] | Und[b] | Cont[c] |
| Campylobacteriosis | A04.5 | 0 | 2 | 0 | 0 | 2 | 0 |
| Hepatitis A | B15 | 0 | 0 | 0 | 0 | 0 | 0 |
| Listeriosis | A32 | 0 | 1 | 4 | 1 | 1 | 1 |
| Salmonellosis | A02 | 0 | 0 | 1 | 0 | 0 | 1 |
| Shigellosis | A03 | 0 | 0 | 0 | 0 | 1 | 0 |
| Yersiniosis | A04.6 | 0 | 0 | 2 | 0 | 0 | 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 82. MoH Hospitalisations data for selected notifiable diseases, 2013–2015

| Disease | ICD 10 Codes | 2013 | | 2014 | | 2015 | |
|---|---|---|---|---|---|---|---|
| | | Principal diagnosis | Other relevant diagnosis | Principal diagnosis | Other relevant diagnosis | Principal diagnosis | Other relevant diagnosis |
| Campylobacteriosis | A04.5 | 591 | 128 | 612 | 117 | 564 | 117 |
| Cryptosporidiosis | A07.2 | 38 | 21 | 22 | 4 | 21 | 9 |
| Giardiasis | A07.1 | 24 | 23 | 43 | 25 | 33 | 20 |
| Hepatitis A | B15 | 29 | 10 | 33 | 16 | 27 | 37 |
| Listeriosis | A32 | 13 | 11 | 15 | 13 | 19 | 13 |
| Salmonellosis | A02 | 128 | 40 | 109 | 37 | 141 | 31 |
| Shigellosis | A03 | 26 | 3 | 12 | 6 | 10 | 10 |
| Toxic shellfish poisoning | T61.2 | 9 | 2 | 29 | 0 | 12 | 2 |
| VTEC/STEC infection | A04.3 | 19 | 8 | 7 | 5 | 14 | 6 |
| Yersiniosis | A04.6 | 29 | 18 | 26 | 25 | 38 | 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 83. Number of cases and rate per 100,000 population of selected notifiable diseases by ethnic group, 2015

| 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 | 486 | 70.9 | 127 | 44.9 | 354 | 68.0 | 42 | 82.8 | 4834 | 158.2 | 6218 | 135.3 |
| Cryptosporidiosis | 56 | 8.2 | 17 | 6.0 | 26 | 5.0 | 8 | 15.8 | 565 | 18.5 | 696 | 15.1 |
| Gastroenteritis[c] | 46 | 6.7 | 15 | 5.3 | 41 | 7.9 | 8 | 15.8 | 327 | 10.7 | 500 | 10.9 |
| Giardiasis | 112 | 16.3 | 17 | 6.0 | 91 | 17.5 | 24 | 47.3 | 1153 | 37.7 | 1510 | 32.9 |
| Hepatitis A | 6 | 0.9 | 7 | 2.5 | 9 | 1.7 | 3 | - | 19 | 0.6 | 47 | 1.0 |
| Listeriosis | 5 | 0.7 | 1 | - | 8 | 1.5 | 0 | - | 12 | 0.4 | 26 | 0.6 |
| Salmonellosis | 104 | 15.2 | 49 | 17.3 | 89 | 17.1 | 12 | 23.7 | 747 | 24.4 | 1051 | 22.9 |
| Shigellosis | 5 | 0.7 | 21 | 7.4 | 13 | 2.5 | 5 | 9.9 | 58 | 1.9 | 111 | 2.4 |
| VTEC/STEC infection | 30 | 4.4 | 10 | 3.5 | 14 | 2.7 | 8 | 15.8 | 256 | 8.4 | 330 | 7.2 |
| Yersiniosis | 51 | 7.4 | 18 | 6.4 | 100 | 19.2 | 7 | 13.8 | 428 | 14.0 | 634 | 13.8 |

[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 84. Number of cases and rates of selected notifiable diseases per 100,000 population by sex, 2015

| Disease | Sex | | | | | |
|---|---|---|---|---|---|---|
| | Male | | Female | | Total[a] | |
| | Cases | Rate | Cases | Rate | Cases | Rate |
| Campylobacteriosis | 3466 | 153.6 | 2749 | 117.6 | 6218 | 135.3 |
| Cryptosporidiosis | 315 | 14.0 | 381 | 16.3 | 696 | 15.1 |
| Gastroenteritis[b] | 224 | 9.9 | 276 | 11.8 | 500 | 10.9 |
| Giardiasis | 793 | 35.1 | 717 | 30.7 | 1510 | 32.9 |
| Hepatitis A | 19 | 0.8 | 28 | 1.2 | 47 | 1.0 |
| Listeriosis – non perinatal | 11 | 0.5 | 15 | 0.6 | 26 | 0.6 |
| Salmonellosis | 516 | 22.9 | 535 | 22.9 | 1051 | 22.9 |
| Shigellosis | 62 | 2.7 | 49 | 2.1 | 111 | 2.4 |
| VTEC/STEC infection | 162 | 7.2 | 168 | 7.2 | 330 | 7.2 |
| Yersiniosis | 295 | 13.1 | 339 | 14.5 | 634 | 13.8 |

[a] Total includes cases where sex was unknown.

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

## Table 85. Number of cases and rates of selected notifiable diseases per 100,000 population by age group, 2015

| | <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 | 127 | 214.9 | 638 | 258.7 | 288 | 91.4 | 231 | 78.7 | 320 | 101.0 | 972 | 149.3 | 630 | 112.3 | 702 | 112.8 | 804 | 132.7 | 736 | 154.7 | 766 | 170.7 | 6,218 | 135.3 |
| Cryptosporidiosis | 11 | 18.6 | 199 | 80.7 | 89 | 28.2 | 41 | 14.0 | 44 | 13.9 | 124 | 19.0 | 80 | 14.3 | 55 | 8.8 | 24 | 4.0 | 16 | 3.4 | 12 | 2.7 | 696 | 15.1 |
| Gastroenteritis | 34 | 57.5 | 50 | 20.3 | 13 | 4.1 | 13 | 4.4 | 8 | 2.5 | 47 | 7.2 | 61 | 10.9 | 71 | 11.4 | 62 | 10.2 | 50 | 10.5 | 75 | 16.7 | 500 | 10.9 |
| Giardiasis | 27 | 45.7 | 282 | 114.3 | 114 | 36.2 | 43 | 14.7 | 25 | 7.9 | 144 | 22.1 | 298 | 53.1 | 230 | 36.9 | 153 | 25.3 | 146 | 30.7 | 47 | 10.5 | 1510 | 32.9 |
| Hepatitis A | | | 3 | | 3 | | 1 | | 5 | 1.6 | 12 | 1.8 | 7 | 1.2 | 11 | 1.8 | 1 | | 3 | | 1 | | 47 | 1.0 |
| Listeriosis | 1 | | 2 | | | | | | | | 5 | 0.8 | 3 | | 2 | | 1 | | 3 | | 9 | 2.0 | 26 | 0.6 |
| Salmonellosis | 61 | 103.2 | 191 | 77.4 | 67 | 21.3 | 32 | 10.9 | 30 | 9.5 | 157 | 24.1 | 113 | 20.2 | 113 | 18.2 | 132 | 21.8 | 98 | 20.6 | 56 | 12.5 | 1051 | 22.9 |
| Shigellosis | 1 | | 11 | 4.5 | 7 | 2.2 | | | 8 | 2.5 | 17 | 2.6 | 15 | 2.7 | 18 | 2.9 | 14 | 2.3 | 12 | 2.5 | 8 | 1.8 | 111 | 2.4 |
| VTEC/STEC infection | 19 | 32.1 | 100 | 40.5 | 31 | 9.8 | 18 | 6.1 | 15 | 4.7 | 27 | 4.1 | 17 | 3.0 | 16 | 2.6 | 23 | 3.8 | 27 | 5.7 | 37 | 8.2 | 330 | 7.2 |
| Yersiniosis | 41 | 69.4 | 102 | 41.4 | 24 | 7.6 | 21 | 7.2 | 30 | 9.5 | 66 | 10.1 | 60 | 10.7 | 64 | 10.3 | 101 | 16.7 | 55 | 11.6 | 70 | 15.6 | 634 | 13.8 |

[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 86. Number of cases of selected notifiable diseases by District Health Board, 2015

| 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 | 255 | 818 | 532 | 488 | 599 | 163 | 244 | 49 | 225 | 246 | 86 | 196 | 195 | 387 | 72 | 217 | 80 | 728 | 126 | 512 | 6218 |
| Cryptosporidiosis | 27 | 83 | 51 | 74 | 116 | 12 | 19 | 4 | 24 | 26 | 9 | 42 | 9 | 27 | 11 | 12 | 5 | 70 | 14 | 61 | 696 |
| Gastroenteritis[a] | 1 | 65 | 113 | 32 | 7 | 14 | 18 | 3 | 7 | 1 | 17 | 71 | 22 | 75 | 5 | 1 | 6 | 29 | 1 | 12 | 500 |
| Giardiasis | 61 | 211 | 183 | 162 | 113 | 60 | 65 | 21 | 28 | 74 | 18 | 29 | 20 | 156 | 14 | 64 | 11 | 135 | 13 | 72 | 1510 |
| Hepatitis A | 2 | 8 | 9 | 10 | | | 4 | 1 | | | | 5 | 1 | | | | | 4 | | 3 | 47 |
| Listeriosis | | 2 | 3 | 3 | 1 | | 6 | | | | 1 | | 1 | 3 | 1 | 1 | | 3 | | 1 | 26 |
| Salmonellosis | 40 | 143 | 122 | 69 | 63 | 18 | 38 | 13 | 25 | 24 | 9 | 38 | 25 | 61 | 10 | 29 | 7 | 155 | 26 | 136 | 1051 |
| Shigellosis | | 13 | 26 | 23 | 6 | 1 | 5 | | 1 | | | 3 | 3 | 11 | | | | 12 | | 7 | 111 |
| VTEC/STEC infection | 24 | 62 | 44 | 45 | 53 | 5 | 13 | | 8 | 2 | 3 | 3 | 1 | 6 | 1 | 12 | 3 | 23 | 6 | 16 | 330 |
| Yersiniosis | 8 | 54 | 47 | 49 | 48 | 12 | 37 | 10 | 16 | 12 | 6 | 10 | 29 | 62 | 1 | 10 | 7 | 162 | 16 | 38 | 634 |

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

## Table 87. Rate per 100,000 population of selected notifiable diseases by District Health Board, 2015

| 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 | 151.5 | 142.1 | 108.6 | 93.5 | 153.4 | 155.5 | 110.2 | 103.4 | 194.1 | 153.3 | 137.4 | 113.9 | 135.4 | 128.5 | 166.7 | 149.9 | 244.6 | 138.4 | 215.0 | 163.1 | 135.3 |
| Cryptosporidiosis | 16.0 | 14.4 | 10.4 | 14.2 | 29.7 | 11.5 | 8.6 | | 20.7 | 16.2 | 14.4 | 24.4 | 6.3 | 9.0 | 25.5 | 8.3 | 15.3 | 13.3 | 23.9 | 19.4 | 15.1 |
| Gastroenteritis | | 11.3 | 23.1 | 6.1 | 1.8 | 13.4 | 8.1 | | 6.0 | | 27.2 | 41.3 | 15.3 | 24.9 | 11.6 | | 18.3 | 5.5 | | 3.8 | 10.9 |
| Giardiasis | 36.2 | 36.7 | 37.3 | 31.1 | 28.9 | 57.3 | 29.3 | 44.3 | 24.2 | 46.1 | 28.8 | 16.9 | 13.9 | 51.8 | 32.4 | 44.2 | 33.6 | 25.7 | 22.2 | 22.9 | 32.9 |
| Hepatitis A | | 1.4 | 1.8 | 1.9 | | | | | | | | 2.9 | | | | | | | | | 1.0 |
| Listeriosis | | | | | | | 2.7 | | | | | | | | | | | | | | 0.6 |
| Salmonellosis | 23.8 | 24.8 | 24.9 | 13.2 | 16.1 | 17.2 | 17.2 | 27.4 | 21.6 | 15.0 | 14.4 | 22.1 | 17.4 | 20.3 | 23.1 | 20.0 | 21.4 | 29.5 | 44.4 | 43.3 | 22.9 |
| Shigellosis | | 2.3 | 5.3 | 4.4 | 1.5 | | 2.3 | | | | | | | 3.7 | | | | 2.3 | | 2.2 | 2.4 |
| VTEC/STEC infection | 14.3 | 10.8 | 9.0 | 8.6 | 13.6 | 4.8 | 5.9 | | 6.9 | | | | | 2.0 | | 8.3 | | 4.4 | 10.2 | 5.1 | 7.2 |
| Yersiniosis | 4.8 | 9.4 | 9.6 | 9.4 | 12.3 | 11.5 | 16.7 | 21.1 | 13.8 | 7.5 | 9.6 | 5.8 | 20.1 | 20.6 | | 6.9 | 21.4 | 30.8 | 27.3 | 12.1 | 13.8 |

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 88. Number of cases of selected notifiable diseases by year, 1988–2001

| Disease | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Campylobacteriosis | 2796 | 4187 | 3850 | 4148 | 5144 | 8101 | 7714 | 7442 | 7635 | 8924 | 11 572 | 8161 | 8418 | 10 145 |
| Cryptosporidiosis[a] | | | | | | | | | 119 | 357 | 866 | 977 | 775 | 1208 |
| Gastroenteritis[a b] | | | | | | | | | 555 | 310 | 492 | 601 | 727 | 942 |
| Giardiasis[a] | | | | | | | | | 1235 | 2127 | 2183 | 1793 | 1688 | 1604 |
| Hepatitis A | 176 | 134 | 150 | 224 | 288 | 257 | 179 | 338 | 311 | 347 | 145 | 119 | 107 | 61 |
| Listeriosis | 7 | 10 | 16 | 26 | 16 | 11 | 8 | 13 | 10 | 35 | 17 | 19 | 22 | 18 |
| Salmonellosis | 1128 | 1860 | 1619 | 1244 | 1239 | 1340 | 1522 | 1334 | 1141 | 1177 | 2069 | 2077 | 1795 | 2417 |
| Shigellosis | 145 | 137 | 197 | 152 | 124 | 128 | 185 | 191 | 167 | 117 | 122 | 147 | 115 | 157 |
| VTEC/STEC infection[c] | | | | | | 3 | 3 | 6 | 7 | 13 | 48 | 64 | 67 | 76 |
| Yersiniosis[a] | | | | | | | | | 330 | 488 | 546 | 503 | 396 | 429 |

[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 [34]. Note: cell is blank where data are unavailable.

## Table 89. Number of cases of selected notifiable diseases by year, 2002–2015

| Disease | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Campylobacteriosis | 12 493 | 14 788 | 12 215 | 13 836 | 15 873 | 12 778 | 6694 | 7177 | 7346 | 6686 | 7016 | 6837 | 6776 | 6218 |
| Cryptosporidiosis | 975 | 817 | 611 | 888 | 737 | 924 | 764 | 854 | 954 | 610 | 877 | 1348 | 584 | 696 |
| Gastroenteritis[a] | 1088 | 1030 | 1363 | 560 | 938 | 625 | 687 | 713 | 493 | 570 | 765 | 559 | 756 | 500 |
| Giardiasis | 1547 | 1570 | 1514 | 1231 | 1214 | 1402 | 1660 | 1639 | 1985 | 1934 | 1714 | 1729 | 1709 | 1510 |
| Hepatitis A | 106 | 70 | 49 | 51 | 123 | 42 | 89 | 44 | 46 | 26 | 82 | 91 | 74 | 47 |
| Listeriosis | 19 | 24 | 26 | 20 | 19 | 26 | 27 | 28 | 23 | 26 | 25 | 19 | 25 | 26 |
| Salmonellosis | 1880 | 1401 | 1081 | 1382 | 1335 | 1275 | 1339 | 1128 | 1146 | 1055 | 1081 | 1143 | 954 | 1051 |
| Shigellosis | 112 | 87 | 140 | 183 | 102 | 129 | 113 | 119 | 104 | 101 | 132 | 137 | 128 | 111 |
| VTEC/STEC infection | 73 | 104 | 89 | 92 | 87 | 100 | 124 | 143 | 138 | 153 | 147 | 205 | 187 | 330 |
| Yersiniosis | 472 | 436 | 407 | 383 | 453 | 502 | 508 | 430 | 406 | 513 | 514 | 484 | 682 | 634 |

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

## Table 90. 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 (2015) | Australia[a] (2015) | USA[b] (2015) | Canada[d] (2014) | UK[e] (2014) | EU Total[e] (2014) | Other high |
| Campylobacteriosis | 135.3 | 96.2 | 13.0 | 28.4 | 103.9 | 71.0 | 197.4 (Czech Republic)[e]<br>158.8 (Luxembourg)[e] |
| Cryptosporidiosis | 15.1 | 17.3 | 3.3 | 2.5 | 10.4[f] | 3.2[f] | 12.1 (Ireland)[f] |
| Giardiasis | 32.9 | NN | 5.8[c] | 10.3 | 6.6[f] | 5.4[f] | 21.3 (Bulgaria)[f]<br>19.0 (Estonia)[f] |
| Hepatitis A | 1.0 | 0.8 | 0.6[c] | 0.6 | 0.5[f] | 2.6[f] | 66.8 (Bulgaria)[f]<br>17.9 (Romania)[f] |
| Listeriosis | 0.6 | 0.3 | 0.2 | 0.4 | 0.3 | 0.5 | 1.6 (Denmark)[e]<br>1.3 (Sweden)[e] |
| Salmonellosis | 22.9 | 72.8 | 15.9 | 21.5 | 12.6 | 23.4 | 126.1 (Czech Republic)[e]<br>75.3 (Slovakia)[e] |
| Shigellosis | 2.4 | 4.7 | 5.5 | 2.2 | 3.2[f] | 1.6[f] | 10.6 (Bulgaria)[f]<br>8.3 (Slovakia)[f] |
| VTEC/STEC infection | 7.2 | 0.6 | 2.6[g] | 1.8 | 2.1 | 1.6 | 12.4 (Ireland)[e]<br>5.5 (Netherlands)[e] |
| Yersiniosis | 13.8 | NN | 0.3 | 1.0 | 0.1[f] | 1.9[f] | 10.6 (Finland)[e]<br>7.7 (Denmark)[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] Canadian Notifiable Disease Surveillance System (CNDSS) http://dsol-smed.phac-aspc.gc.ca/dsol-smed/ndis/index-eng.php. Yersiniosis is not notifiable in Canada, but information on isolate submission is collected through the National Enteric Surveillance Program (NESP) http://www.publications.gc.ca/site/eng/9.507317/publication.html. Yersiniosis rates calculated in this way are expected to underestimate the rate.

[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/publications/surveillance_reports/annual_epidemiological_report/Pages/epi_index.aspx (ECDC data presented here relate to the 2012 year).

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

## Table 91. Foodborne outbreaks and associated cases by pathogen/condition, 2015

| Pathogen/Condition | Outbreaks (n = 78)[d] | | Cases (n = 509)[d] | |
|---|---|---|---|---|
| | No. | %[a] | No. | %[b] |
| Norovirus | 18 | 23.1 | 212 | 41.7 |
| *Campylobacter* spp. | 11 | 14.1 | 46 | 9.0 |
| *Clostridium perfringens* | 5 | 6.4 | 67 | 13.2 |
| *Shigella* spp. | 5 | 6.4 | 39 | 7.7 |
| *Aeromonas* spp. | 3 | 3.8 | 40 | 7.9 |
| *Salmonella* spp. | 3 | 3.8 | 30 | 5.9 |
| *Giardia* spp. | 2 | 2.6 | 30 | 5.9 |
| *Staphylococcus aureus* | 2 | 2.6 | 7 | 1.4 |
| *Yersinia* spp. | 2 | 2.6 | 5 | 1.0 |
| *Bacillus cereus* | 1 | 1.3 | 5 | 1.0 |
| *Cryptosporidium* spp. | 1 | 1.3 | 11 | 2.2 |
| Hepatitis A | 1 | 1.3 | 7 | 1.4 |
| *Salmonella* Typhi | 1 | 1.3 | 2 | 0.4 |
| Sapovirus | 1 | 1.3 | 3 | 0.6 |
| Pathogen not identified[c] | 25 | 32.1 | 69 | 13.6 |

[a] Percentage of outbreaks for each pathogen/condition, calculated using the total number of foodborne outbreaks (78). 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 (509).

[c] All enteric outbreaks with no pathogen identified in 2015 were recorded as gastroenteritis.

[d] Three agents were reported in three foodborne outbreaks with 64 associated cases, therefore percentage totals add to more than 100%.

## Table 92. Foodborne outbreaks and associated cases by exposure setting, 2015

| Exposure setting | Outbreaks (n = 78)[c] | | Cases (n = 509)[c] | |
|---|---|---|---|---|
| | No. | %[a] | No. | %[b] |
| **Commercial food operators** | **43** | **55.1** | **201** | **39.5** |
| Restaurant/café/bakery | 28 | 35.9 | 145 | 28.5 |
| Takeaway | 7 | 9.0 | 16 | 3.1 |
| Temporary or mobile food premise | 2 | 2.6 | 6 | 1.2 |
| Supermarket/delicatessen | 1 | 1.3 | 7 | 1.4 |
| Caterers | 1 | 1.3 | 8 | 1.6 |
| Other food outlet | 4 | 5.1 | 19 | 3.7 |
| **Institutions** | **11** | **14.1** | **193** | **37.9** |
| Long-term care facility | 5 | 6.4 | 97 | 19.1 |
| School | 4 | 5.1 | 68 | 13.4 |
| Childcare centre | 1 | 1.3 | 24 | 4.7 |
| Marae | 1 | 1.3 | 4 | 0.8 |
| **Other** | **27** | **34.6** | **140** | **27.5** |
| Private home | 17 | 21.8 | 56 | 11.0 |
| Community/church gathering | 3 | 3.8 | 26 | 5.1 |
| Farm | 2 | 2.6 | 15 | 2.9 |
| Workplace | 1 | 1.3 | 8 | 1.6 |
| Other setting[d] | 4 | 5.1 | 35 | 6.9 |
| **Unknown exposure setting** | **2** | **2.6** | **5** | **1.0** |

[a] Percentage of outbreaks for each exposure setting, calculated using the total number of foodborne outbreaks (78). 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 (509).

[c] Five outbreaks had two or more exposure settings (30 cases)

[d] Three outbreaks had an overseas exposure setting, one outbreak was shellfish gathering.

## Table 93. Foodborne outbreaks and associated cases by preparation setting, 2015

| Preparation setting | Outbreaks (n = 78)[c] | | Cases (n = 509) | |
|---|---|---|---|---|
| | No. | %[a] | No. | %[b] |
| **Commercial food operators** | **44** | **56.4** | **221** | **43.4** |
| Restaurant/café/bakery | 27 | 34.6 | 146 | 28.7 |
| Takeaway | 8 | 10.3 | 19 | 3.7 |
| Caterers | 2 | 2.6 | 26 | 5.1 |
| Temporary or mobile food service | 2 | 2.6 | 6 | 1.2 |
| Other food outlet | 5 | 6.4 | 24 | 4.7 |
| **Institutions** | **10** | **12.8** | **188** | **36.9** |
| Long-term care facility | 5 | 6.4 | 97 | 19.1 |
| School | 2 | 2.6 | 52 | 10.2 |
| Marae | 2 | 2.6 | 15 | 2.9 |
| Childcare centre | 1 | 1.3 | 24 | 4.7 |
| **Other** | **21** | **26.9** | **72** | **14.1** |
| Private home | 16 | 20.5 | 46 | 9.0 |
| Overseas manufacturer | 2 | 2.6 | 12 | 2.4 |
| Farm | 1 | 1.3 | 11 | 2.2 |
| Community/church gathering | 1 | 1.3 | 3 | 0.6 |
| Other setting | 2 | 2.6 | 7 | 1.4 |
| **Unknown exposure setting** | **5** | **6.4** | **35** | **6.9** |

[a] Percentage of outbreaks for each preparation setting, calculated using the total number of foodborne outbreaks (78). 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 (509).

[c] Two outbreaks had 2 or more preparation settings (7 cases)

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