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ANNUAL REPORT

Foodborne disease in New Zealand

2010

Prepared for Ministry of Agriculture and Forestry under project MRP/10/02 as part of overall contract for scientific services by the Institute of Environmental Science and Research Limited

Client Report FW 11031

May 2011

ANNUAL REPORT
CONCERNING FOODBORNE DISEASE
IN NEW ZEALAND
2010

Prepared for Ministry of Agriculture and Forestry under
project MRP/10/02 – Systematic reporting of epidemiology of potentially
foodborne disease in New Zealand for year 2010,
as part of overall contract for scientific services

by

Esther Lim
Liza Lopez
Peter Cressey
Ruth Pirie

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Institute of Environmental Science & Research Limited
Christchurch Science Centre
Location address: 27 Creyke Road, Ilam, Christchurch
Postal address: P O Box 29 181, Christchurch, New Zealand
Website: www.esr.cri.nz

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ANNUAL REPORT CONCERNING FOODBORNE DISEASE IN NEW ZEALAND 2010

Dr Stephen On
Food Safety Programme Leader

Peter Cressey
Project Leader

Dr Andrew Hudson
Peer Reviewer

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1 INTRODUCTION

The Ministry of Agriculture and Forestry (MAF) has an aim to reduce food-related risks to human health. Human health surveillance is an essential element of the monitoring and review component of its risk management framework. In addition, evidence from notifications, case enquiries, outbreak investigations and other epidemiological studies of human enteric diseases are being increasingly used as sources of data for risk assessments. There is increasing interest in foodborne disease statistics within MAF and its stakeholders.

This report for the calendar year 2010 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.

1.1 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 section 2.1.1 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 cases do not visit a GP or otherwise come to the attention of the medical system. By using these data as indicators, we are assuming that they are representative of all the cases and outbreaks that occur (see section 3 for a further discussion of this issue).
2. Foodborne transmission is only one of the routes by which humans are exposed to pathogens; other routes include water, animal contact and person to person. There are a number of indicators from which we can get information on the proportion of cases caused by foodborne transmission:

    - Reported risk factors: for a proportion of the notified cases, supplemental information is obtained by public health units (PHUs) on risk factors. This information should be interpreted with some caution as it is self reported by cases, no external validation of this information is undertaken, and often the cases will report several potentially important risk factors. The quality of information from notifiable disease surveillance as an indication for foodborne disease transmission has been reviewed in more detail (Lake *et al.*, 2005).
    - 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 a 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 (Cressey and Lake, 2005), as presented in relevant report sections. These are not

fixed values; 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. Four sets of published estimates are given in
- Table 1, for the USA (Scallan *et al.*, 2011), Australia (Hall and Kirk, 2005), England and Wales (Adak *et al.*, 2002) and the Netherlands (Havelaar *et al.*, 2008). The estimates for Australia and the Netherlands are based on expert opinion, the estimates for England and Wales are based on outbreak analysis, while the US estimates are based on data from surveillance, risk factor studies and a literature review. It is worth noting that, although for most of the diseases included in this report foodborne transmission is considered significant, there are several illnesses (shigellosis, giardiasis, cryptosporidiosis, hepatitis A) where it is considered to be only a small proportion of the total.

Table 1: Overseas estimates of the food attributable proportion of selected illness due to microbial hazards

Hazard	% Foodborne			
	USA (2011)	**Australia (2005)**	**England and Wales (2002)**	**Netherlands* (2008)**
Bacteria				
Bacillus cereus	100	100	100	90
Campylobacter spp.	80	75	80	42
Clostridium perfringens	100	100	94	91
Shiga toxin-producing *Escherichia coli* (STEC) O157:H7	68	65	63	40
STEC non-O157	82	NE	63	42
Listeria monocytogenes	99	98	99	69
Salmonella non-typhoidal	94	87	92	55
Shigella spp.	31	10	8	NE
Staphylococcus aureus	100	100	96	87
Yersinia enterocolitica	90	75	90	NE
Parasitic				
Cryptosporidium parvum	8	10	6	12
Giardia lamblia	7	5	10	13
Viral				
Hepatitis A virus	7	10	11	11
Norovirus	26	25	NE	17

* the Dutch study also collected opinions on the proportion of disease due to travel. A proportion of this will also be foodborne
NE = not estimated

This report considers information for the 2010 calendar year. Information from the scientific literature and other sources concerning food safety for that year has been summarised. However,

the time taken to publish scientific information is often lengthy, and it may be that additional information becomes available in the future.

1.2 Conditions Included in 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 that were selected for inclusion in this report are listed in Table 2. Data have been drawn from a number of sources including disease notification, hospitalisation, outbreak report and laboratory surveillance databases.

Table 2: Potentially foodborne conditions included in the report

Disease	Type	Source(s)	ICD*-10 code
Bacillus cereus intoxication	Bacterium	N, O, H	A05.4 Foodborne *Bacillus cereus* intoxication
Campylobacteriosis	Bacterium	N, O, H	A04.5 *Campylobacter* enteritis
Ciguatera 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]
Hepatitis A	Virus	N, O, H	B15 Acute hepatitis A
Listeriosis (total and perinatal)	Bacterium	N, O, H	A32 Listeriosis
Norovirus infection	Virus	O, H	A08.1 Acute gastroenteropathy due to Norwalk agent
Salmonellosis	Bacterium	N, O, H, L	A02.0 *Salmonella* enteritis
Scombrotoxicosis	Toxin	N, O	T61.1 Toxic effect: Scombroid fish poisoning
Shigellosis	Bacterium	N, O, H, L	A03 Shigellosis
Staphylococcus aureus intoxication	Bacterium	N, O	A05.0 Foodborne staphylococcal intoxication
Toxic shellfish poisoning	Toxin	N, O	T61.2 Other fish and shellfish poisoning
VTEC/STEC infection	Bacterium	N, O, L	A04.3 Enterohaemorrhagic *Escherichia coli* infection
Yersiniosis	Bacterium	N, O, H	A04.6 Enteritis due to *Yersinia enterocolitica*

Data Sources: EpiSurv notifications (N), EpiSurv outbreaks (O), MOH hospitalisations (H), ESR laboratory data (L)
VTEC = Verotoxin-producing *Escherichia coli* STEC = Shiga Toxin-producing *Escherichia coli*
* International Classification of Diseases

The 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 diseases (intoxications from the bacteria *Bacillus*, *Clostridium* and *Staphylococcus*, and norovirus infection) not every case is notifiable; only those that are part of a common source outbreak.

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 24 May 2005 (Cressey and Lake, 2005). In the current report the proportions of food-associated cases, derived from expert consultation, have been used to estimate the number of food-associated cases of relevant diseases. Travel-associated cases were subtracted from the total cases before application of the food-associated proportion.

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* [1]
Haemolytic uraemic syndrome (HUS)	H (D59.3 Haemolytic-uraemic syndrome)	Sequela to infection with VTEC / STEC

Data Sources: MoH hospitalisations (H)

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

The data sources above have been selected on the basis of availability of data for the specified reporting period and their availability 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 cannot be included in a report published soon after the end of the calendar year.

2 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 2010) for the reporting period.

2.1 Data Sources

The key sources of data used in this report are detailed in the following sections.

2.1.1 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 notifiable disease that they suspect or diagnose. The current reporting year was the third year in which laboratories were also required to report notifiable disease cases to Medical Officers of Health. It is uncertain whether this change would have impacted on the numbers of notified cases, although data on salmonellosis (section 4.13.3.1) and shigellosis (section 4.14.3.1) suggest an increasingly good alignment between notified and laboratory confirmed cases in recent years.

Notification data are recorded using a web based application (EpiSurv) available to staff at each of the 20 public health units (PHUs) in New Zealand. These data are transferred to the Institute of Environmental Science and Research (ESR) Ltd., where they are collated, analysed and reported on behalf of the Ministry of Health. Further information about notifiable diseases can be found in the Notifiable and Other Diseases in New Zealand: Annual Report 2010 (ESR, 2011a).

2.1.2 Laboratory-Based Surveillance

The reference laboratories at ESR maintain databases of laboratory results for notifiable diseases.

The number of laboratory-reported salmonellosis cases has, until recently, always exceeded the number of notifications. The implementation of integration processes in 2004 for notifications and laboratory results at ESR has addressed this problem.

2.1.3 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. 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 include repeated admissions for patients with chronic notifiable diseases (e.g. tuberculosis) or diseases which have long-term health impacts (e.g. meningococcal disease). 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 hospitalisations, including readmissions, have been reported for all primary disease. For the disease sequelae (GBS and HUS) there is potential

for multiple readmissions. Readmissions within the calendar year were removed and reported case numbers represent unique cases, rather than total admissions.

2.1.4 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. In particular, it should be noted that 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 found in epidemiological or environmental investigations. A new outbreak report form was introduced in October 2010. As a result, some variables previously reported are no longer available for analysis. For example, coding indicating the strength of evidence for concluding that an outbreak is foodborne was changed. Strength of evidence information for outbreak assignment will not be included in the current report for the 2010 year, but will be reported from 2011 onwards. More information about outbreak reporting system can be found in the Annual Summary of Outbreaks in New Zealand 2010 (ESR, 2011b).

2.1.5 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). 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 the current report, laboratory investigations are only reported for outbreaks classified as foodborne in EpiSurv.

2.1.6 Statistics New Zealand

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

2.1.7 MAF project reports and publications

MAF 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.

2.1.8 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 (Cressey and Lake, 2005). 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.

2.2 Analytical Methods

Key analytical methods used include:

2.2.1 Dates

Notification and outbreak data contained in this report are based on information recorded in EpiSurv as at 17 February 2011. Changes made to EpiSurv data by PHU staff after this date 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.

2.2.2 Data used for calculating rates of disease

All population rates use Statistics New Zealand mid-year population estimates as at 30 June 2010 and are crude rates unless otherwise stated. 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.

2.2.3 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.

2.2.4 Map classification scheme

The map classification for the disease rates is a combination of quantiles and equal intervals i.e. break points 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 colour shows where there are insufficient data to calculate a rate (fewer than 5 cases).

2.2.5 Risk factors and source of infection

For many diseases an analysis of exposure to risk factors for the cases is reported. The risk factor questions on the EpiSurv case report forms are those that are currently known for that disease. Often more than one risk factor is reported for each case. The high number of unknown outcomes associated with the risk factors should be noted.

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

2.2.6 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 (2007-2009).

2.3 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 (e.g. date reported or date of onset of illness)
- filters used to extract the data

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

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

3 THE ACUTE GASTROINTESTINAL ILLNESS (AGI) STUDY

The Acute Gastrointestinal Illness (AGI) Study is a set of three linked surveys, with the following objectives:

- To determine the magnitude and distribution of self reported AGI in the New Zealand population;
- To estimate the burden of disease associated with AGI;
- To describe and estimate the magnitude of under-ascertainment of AGI at each stage in the national communicable disease surveillance process; and,
- To identify modifiable factors affecting under-ascertainment that, if altered, could reduce case loss throughout the AGI component of the surveillance system.

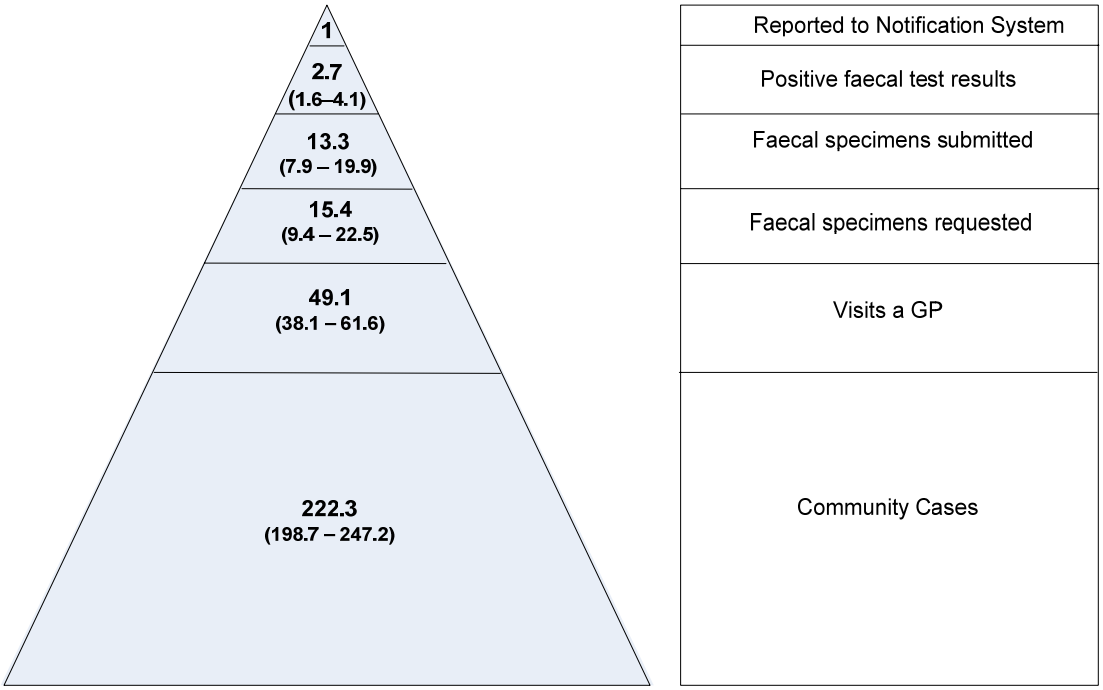
The three study elements were completed during 2005-2007 and each has been reported separately:

- Community study: a twelve month telephone survey conducted from February 2006 – January 2007 and reported as "Acute Gastrointestinal Illness (AGI) Study: Community Survey" (Adlam *et al.*, 2007),
- General practice study: a nationwide incidence study conducted over seven weeks from May – July 2006, using selected practices via a computer network practice management system, supplemented by a postal survey conducted in July 2006. This study has been reported as "Acute Gastrointestinal Illness (AGI) Study: General Practice Study" (Perera and Adlam, 2007), and
- Laboratory study: a postal survey of 45 community and hospital laboratories conducted in June 2006, and reported as "Acute Gastrointestinal Illness (AGI) Study: Laboratory Survey" (King *et al.*, 2007).

The results from the Community survey indicated that the incidence of AGI was 1.1 per person year, representing 4.66 million cases in New Zealand in one year. These illnesses are caused by microbial hazards that may be transmitted by a number of routes, including foods. However, at this stage it is not possible to identify the total fraction of AGI caused by foodborne transmission.

A final report amalgamating results from the three studies was produced to construct a reporting pyramid for AGI in New Zealand, as shown in Figure 1 (Lake *et al.*, 2010). It is important to recognise that this pyramid applies to AGI in its entirety, and cannot be applied to AGI caused by individual pathogens, which may have quite different ratios.

Figure 1: Reporting pyramid (areas to scale) for New Zealand showing ratios of cases in the community, general practice, and clinical laboratory levels relative to notifiable diseases, 2006 (mean, 5th and 95th percentiles)



The reporting pyramid is constructed from data reported from the community survey (Adlam *et al.*, 2007); GP survey (Perera and Adlam, 2007); and laboratory survey (King *et al.*, 2007).

Note that not all positive faecal test results will be for diseases that are notifiable.

4 REPORTING

4.1 Reporting Against Targets

In 2007, the New Zealand Food Safety Authority (now incorporated into MAF) established three performance goals for potentially foodborne illnesses.

4.1.1 Performance goals

- Campylobacteriosis: 50% reduction in foodborne component after a period of 5 years
- Salmonellosis: 30% reduction in foodborne component after a period of 5 years
- Listeriosis: No increase in the foodborne component with increasing range of foods available (including raw milk cheeses).

4.1.2 Rationale

The above diseases include the two most commonly notified, potentially foodborne illnesses in New Zealand plus listeriosis, one of the most severe. This selection is based, in part, on the ESR foodborne illness attribution work which identified campylobacteriosis and listeriosis as creating the highest human health burden within New Zealand (Cressey and Lake, 2007). The inclusion of salmonellosis will also allow for New Zealand comparability with US and UK monitoring programmes. For the period 2004-2007 there were approximately 13 600 notified cases of campylobacteriosis, 1 150 of salmonellosis and 23 of listeriosis annually in New Zealand. Foodborne illness due to VTEC/STEC infections is not included as there are only about 10 cases per year that could be attributable to foodborne sources. Norovirus is not incorporated at this stage because of the large fluctuations that occur in annual statistics (norovirus infection is not a notifiable disease but may be notified as acute gastroenteritis during investigation of a common source outbreak) and, for most cases, the causality (e.g. person-to-person) is likely to be outside of the influence of MAF.

The performance goals for the foodborne diseases have been determined by the MAF Board and aligned with expectations arising from current regulatory priorities and programmes (e.g. the MAF *Campylobacter* Risk Management Strategy 2010-2013). Notwithstanding yearly variations, a robust performance monitoring system should be able to measure trends in risk reduction over time e.g. for *Campylobacter*.

4.1.3 Methodology, tools and reporting

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

The measurement will be adjusted for the proportion of cases reported as having travelled overseas during the likely incubation period. It will be adjusted also for the proportion of disease estimated to be due to foodborne transmission.

The annual incidence of campylobacteriosis and salmonellosis will be reported in terms of calendar year totals of cases per 100 000-people (*Notifiable and Other Diseases in New Zealand Annual Report,* ESR). This allows for demographic changes within the New Zealand population to be appropriately captured. The proportion of cases acquired abroad will be estimated through the EpiSurv programme administered by ESR and MoH[1]. Estimates of the foodborne proportion of selected communicable diseases have been determined by expert elicitation and are approximately 0.6, 0.6 and 0.9 respectively for campylobacteriosis, salmonellosis and listeriosis.

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

4.1.4 Campylobacteriosis

4.1.4.1 Performance goal

- 50% reduction in reported annual incidence of foodborne campylobacteriosis after five years (2008-2012)

4.1.4.2 Measurement

The measurement used is the annual (calendar year) number (per 100 000 mid-year population estimate) of notified cases of human campylobacteriosis, with the baseline year being average of 2004-2007. The measurement will be adjusted for the proportion of cases reported as having travelled overseas during likely incubation period; and for the proportion of disease estimated to be due to foodborne transmission (Table 4).

Table 4: Estimated proportion of foodborne campylobacteriosis for 2010

	Cases	Proportion (%)	Rate (per 100 000, mid year estimated population)
Total notified	7 346		168.2
Estimated not travelled overseas	6 882	93.7	157.5
Estimated foodborne transmission proportion	3 957	57.5 (37.1 – 69.6)*	90.6 (58.5 – 109.7)#

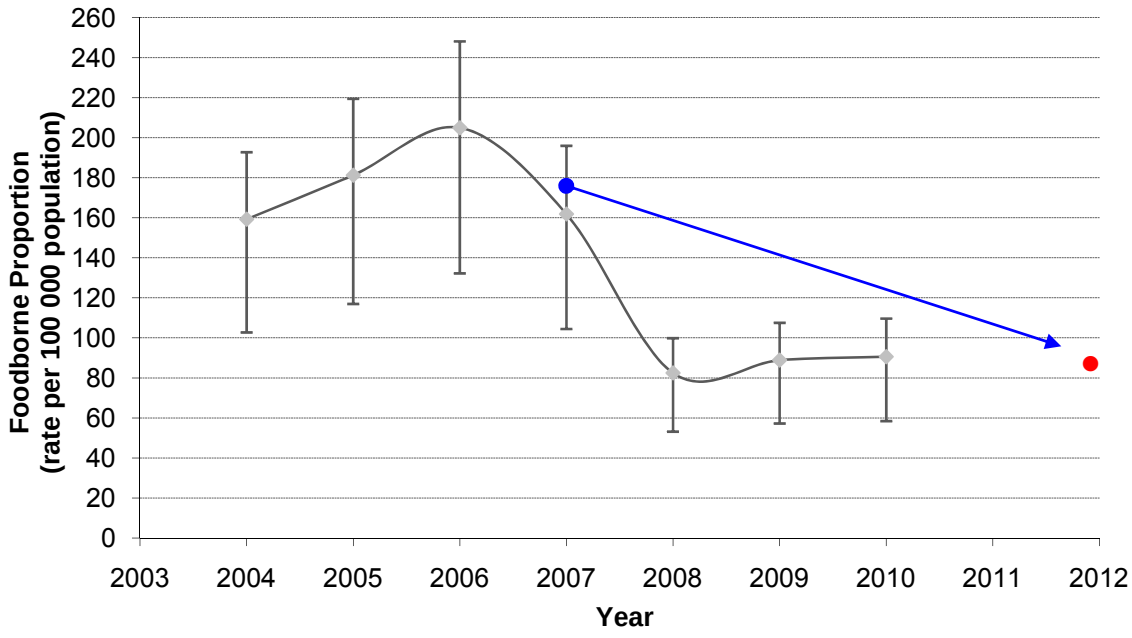
* Most likely (Minimum – Maximum) estimates of proportion foodborne, from expert consultation
# Most likely (Minimum – Maximum) estimates of foodborne rate

4.1.4.3 Presentation

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

[1] 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 2: Foodborne proportion of campylobacteriosis



The blue arrowed line represents the trend line from the baseline year (average of 2004-2007) to the five year target (red dot)

4.1.5 Salmonellosis

4.1.5.1 Performance target

- 30% reduction in reported annual incidence of foodborne salmonellosis after five years (2008-2012)

4.1.5.2 Measurement

The measurement used is the annual (calendar year) number (per 100 000 mid year population estimate) of notified cases of human salmonellosis, with the baseline being 2004-2007. The measurement will be adjusted for the proportion of cases reported as having travelled overseas during likely incubation period; and for the proportion of disease estimated to be due to foodborne transmission (Table 5).

Table 5: Estimated proportion of foodborne salmonellosis for 2010

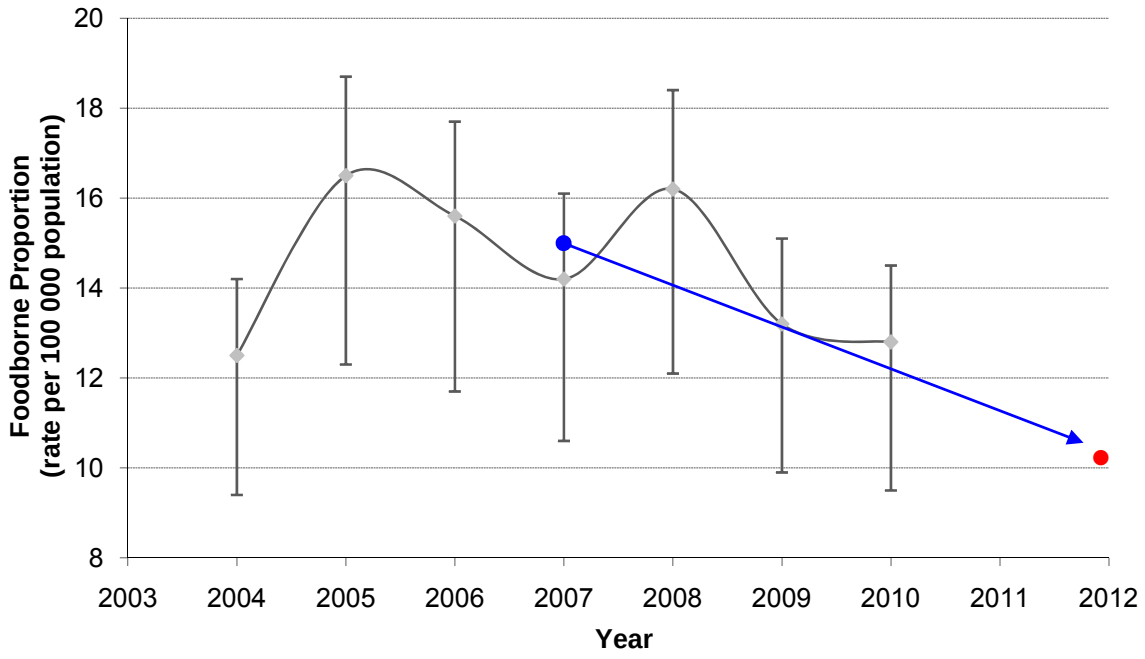
	Cases	Proportion (%)	Rate (per 100 000, mid year estimated population)
Total notified cases	1 146		26.2
Estimated not travelled overseas	917	80.0	21.0
Estimated foodborne transmission proportion	557	60.7 (45.4 -68.9)*	12.8 (9.5 – 14.5)#

* Most likely (Minimum – Maximum) estimates of proportion foodborne, from expert consultation
\# Most likely (Minimum – Maximum) estimates of foodborne rate

4.1.5.3 Presentation

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

Figure 3: Foodborne proportion of salmonellosis



The blue arrowed line represents the trend line from the baseline year (average of 2004-2007) to the five year target (red dot)

4.1.6 Listeriosis

4.1.6.1 Performance target

- No increase in reported annual incidence of foodborne listeriosis after five years (2008-2012)

4.1.6.2 Measurement

The measurement used is the annual (calendar year) number (per 100 000 population) of notified cases of human listeriosis, with the baseline being 2004-2007. The measurement will be adjusted for the proportion of cases reported as having travelled overseas during likely incubation period; and for the proportion of disease estimated to be due to foodborne transmission (Table 6).

Table 6: Estimated proportion of foodborne listeriosis for 2010

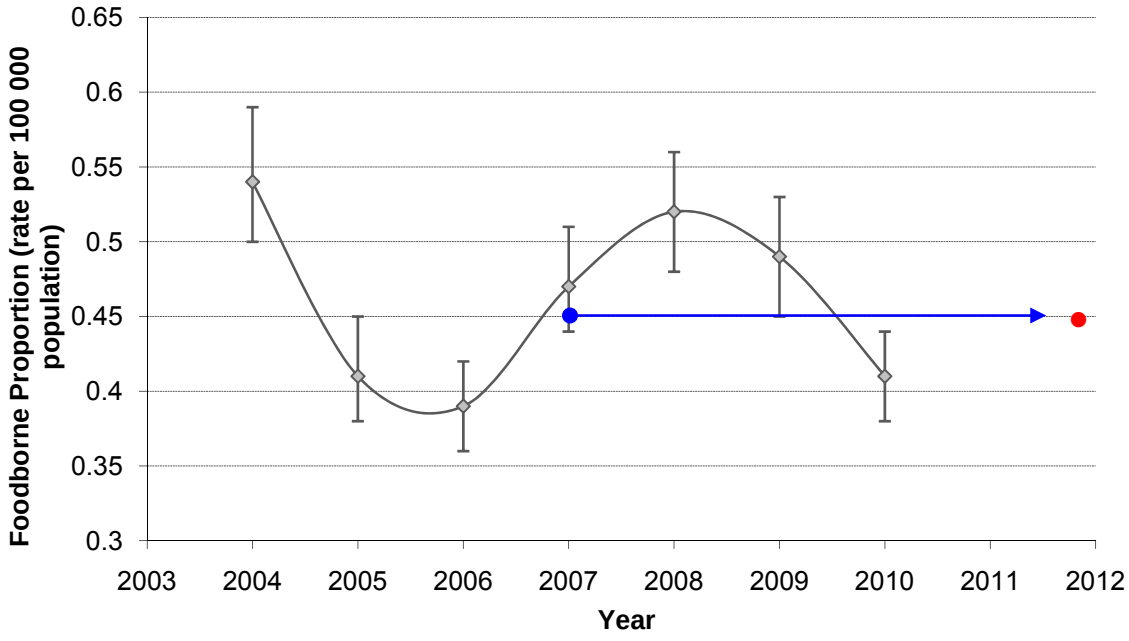
	Cases	Proportion (%)	Rate (per 100 000, mid year estimated population)
Total notified cases	23		0.53
Estimated not travelled overseas	21	93.3	0.48
Estimated foodborne transmission proportion	18	84.9 (78.4 – 92.1)*	0.41 (0.38 – 0.44)#

* Most likely (Minimum – Maximum) estimates of proportion foodborne, from expert consultation
# Most likely (Minimum – Maximum) estimates of foodborne rate

4.1.6.3 Presentation

The trend in relative rates (and ranges) compared with the baseline and five year goal is shown in Figure 4.

Figure 4: Foodborne proportion of listeriosis



The blue arrowed line represents the trend line from the baseline year (average of 2004-2007) to the five year target (red dot)

4.2 Incidence and Severity of Selected Foodborne Diseases

This section includes a summary 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 diseases with a small number of cases a more limited analysis has been carried out.

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 2004-2005. Note that these estimates are only available for some of the illnesses 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 disease that were reported to the notification system during the calendar year;
- Studies on foodborne attribution for the specific disease conducted or published during the calendar year;
- Information on the prevalence of the chemical 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.

4.3 *Bacillus cereus* Intoxication

4.3.1 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 that is either a contact of a confirmed case of the same disease, or has had contact with the same common source i.e., is part of an identified common source outbreak
Confirmed	A clinically compatible illness that is laboratory confirmed

4.3.2 *Bacillus cereus* intoxication cases reported in 2010 by data source

During 2010, no notifications of *B. cereus* intoxication were reported in EpiSurv.

The ICD-10 code A05.4 was used to extract *B. cereus* intoxication hospitalisation data from the MoH NMDS database. There were no hospital admissions recorded in 2010 with *B. cereus* intoxication as a primary or other relevant diagnosis.

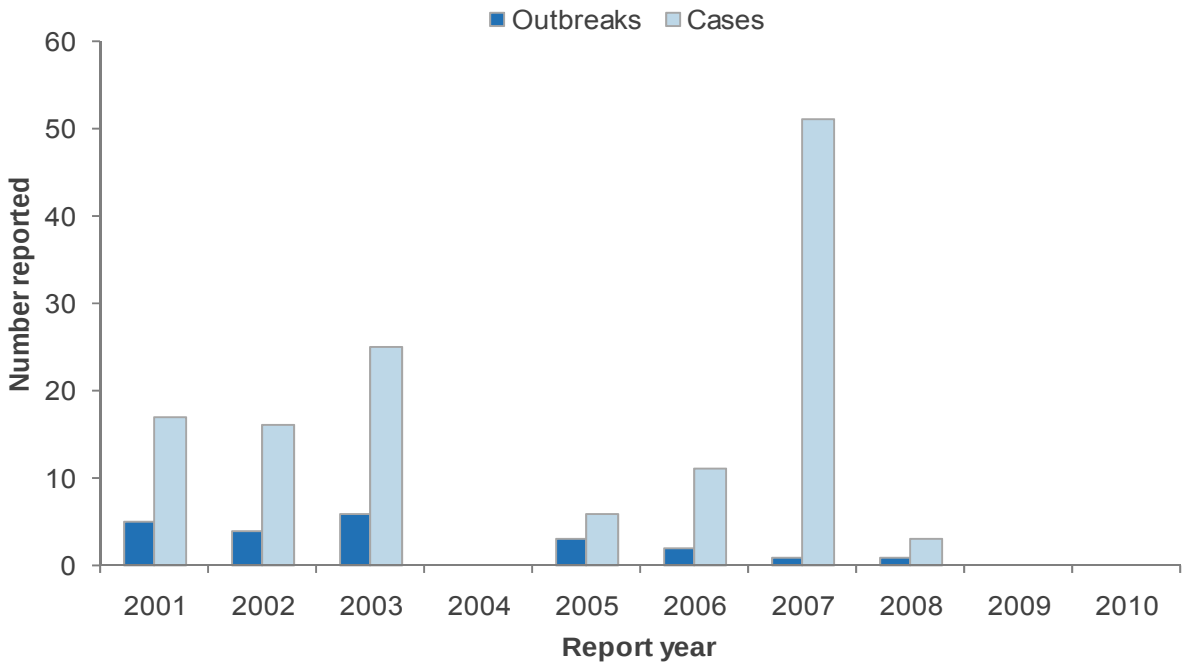
Expert consultation estimated that 97% (minimum = 90%, maximum = 99%) of *B. cereus* intoxication will be due to foodborne transmission. The expert consultation also estimated that approximately 60% of the foodborne transmission would be due to consumption of rice.

4.3.3 Outbreaks reported as caused by *Bacillus cereus*

No *B. cereus* outbreaks were reported in EpiSurv during 2010.

From 2004 to 2010, fewer outbreaks were reported each year in EpiSurv than in any of the four years prior to 2004 (Figure 5).

Figure 5: Foodborne *B. cereus* outbreaks and associated cases reported by year, 2001–2010



4.3.3.1 Laboratory investigation of samples from suspected foodborne outbreaks

No *B. cereus* outbreaks were reported in EpiSurv during 2010.

4.3.4 Recent surveys

Nil.

4.3.5 Relevant New Zealand studies and publications

Nil.

4.3.6 Relevant regulatory developments

Nil.

4.4 Campylobacteriosis

Summary data for campylobacteriosis in 2010 are given in Table 7.

Table 7: Summary surveillance data for campylobacteriosis, 2010

Parameter	Value in 2010	Section reference
Number of cases	7 346	4.4.2
Rate (per 100 000)	168.2	4.4.2
Hospitalisations (%)	624 (8.5%)	4.4.2
Deaths (%)	0 (0%)	4.4.2
Estimated travel-related cases (%)	464 (6.3%)	4.4.3.6
Estimated food-related cases (%)*	3 957 (57.5%)	4.4.2

* For estimation of food-related cases it was assumed that the proportions derived from expert consultation would exclude travel-related cases

4.4.1 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 i.e., is part of an identified common source outbreak

Confirmed A clinically compatible illness that is laboratory confirmed

4.4.2 Campylobacteriosis cases reported in 2010 by data source

During 2010, 7 346 notifications (168.2 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 624 hospital admissions (14.3 admissions per 100 000 population) recorded in 2010, 518 were reported with campylobacteriosis as the primary diagnosis and 106 with campylobacteriosis as another relevant diagnosis.

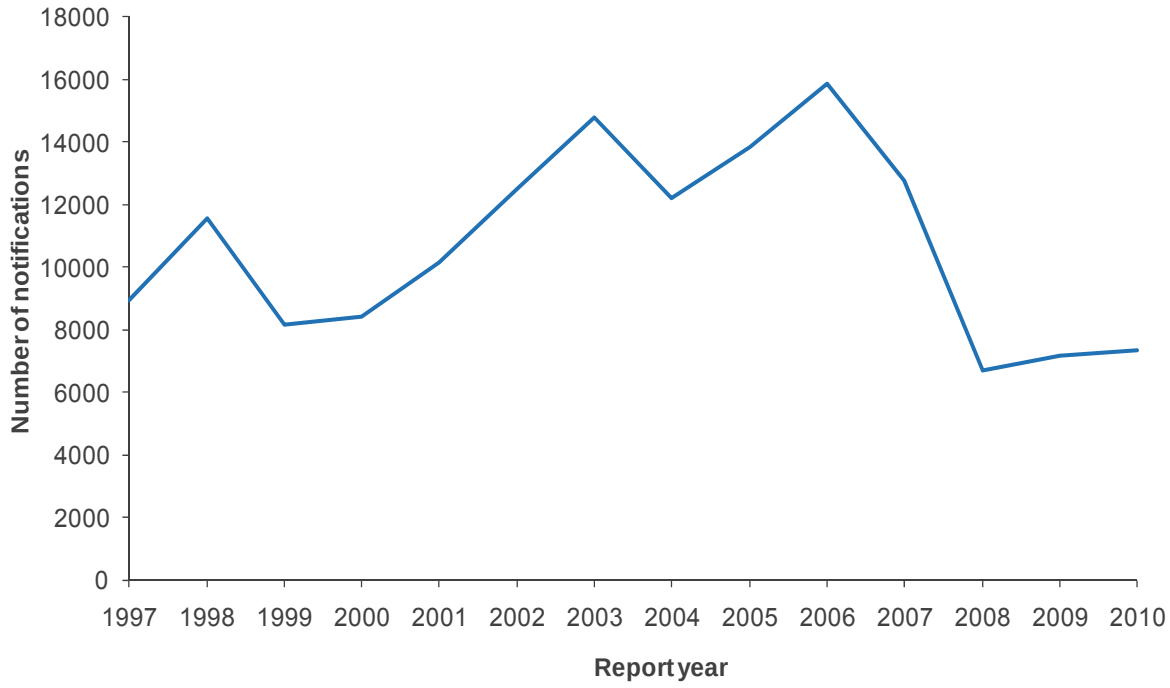
It has been estimated by expert consultation that 57.5% (minimum = 37%, maximum = 70%) of campylobacteriosis incidence is due to foodborne transmission. It was further estimated that 53% of foodborne transmission would be due to transmission via poultry.

4.4.3 Notifiable disease data

4.4.3.1 Annual notification trend

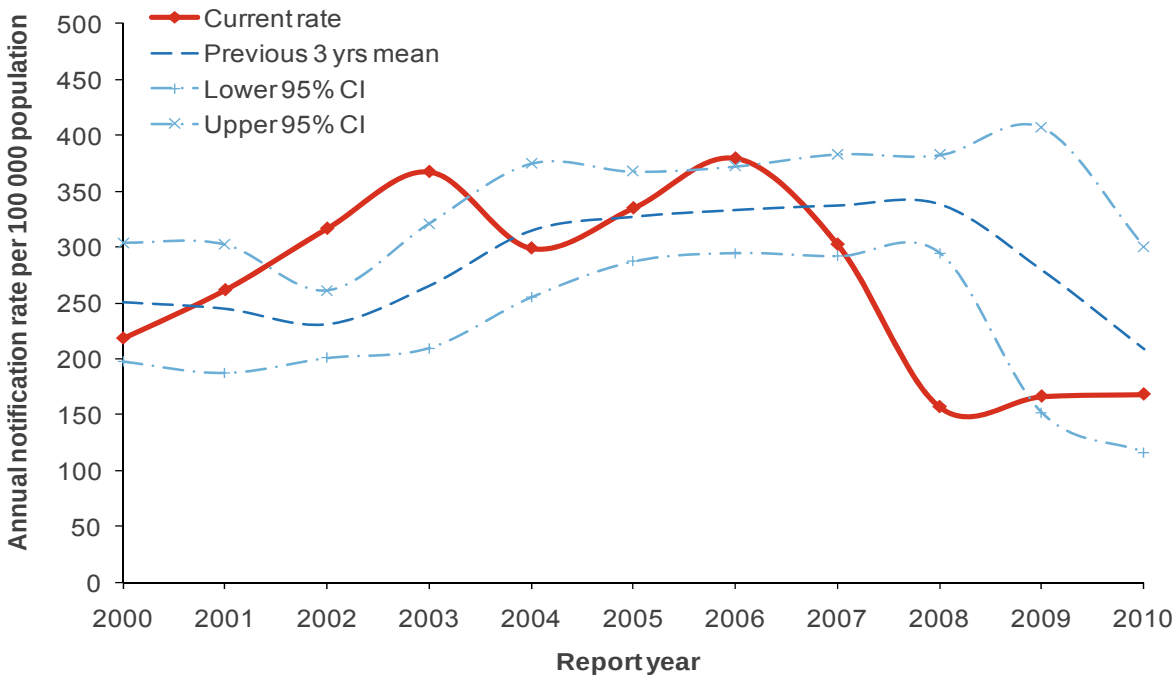
The number of campylobacteriosis notifications reported each year generally increased from 1996, with the highest number recorded in 2006 (15 873 cases). Since 2006, there has been a significant decrease in the number of cases reported (Figure 6). Notifications have been fairly stable in the period 2008-2010.

Figure 6: Campylobacteriosis notifications by year, 1997–2010



The campylobacteriosis annual rate trend (Figure 7) was very similar to the corresponding annual notification trend; with a general increase in the notification rate observed over the period 2000-2006 followed by a sudden reduction in 2007. The notification rate has been fairly stable in the period 2008-2010.

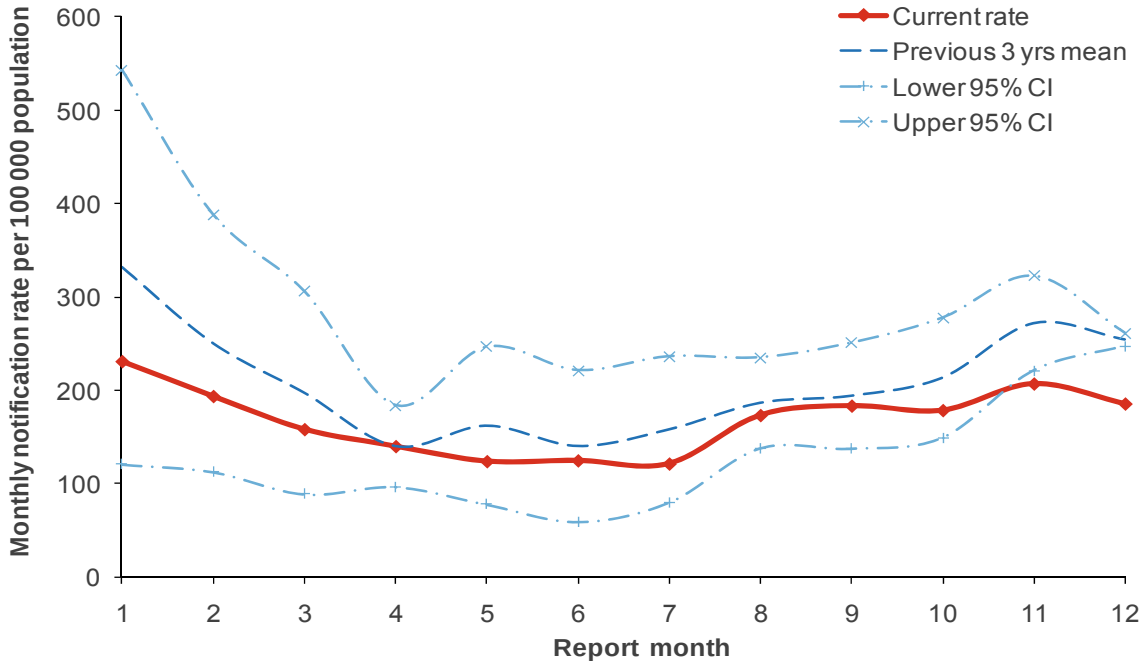
Figure 7: Campylobacteriosis notification rate by year, 2000–2010



4.4.3.2 Seasonality

The number of notified cases of campylobacteriosis per 100 000 population by month for 2010 is shown in Figure 8. The pattern in 2010 is similar to previous years, with a summer peak and winter trough. However, the summer peak in notified cases is less pronounced than in previous years. The monthly number of notifications in 2010 ranged from 441 notifications (July) to 840 notifications (January).

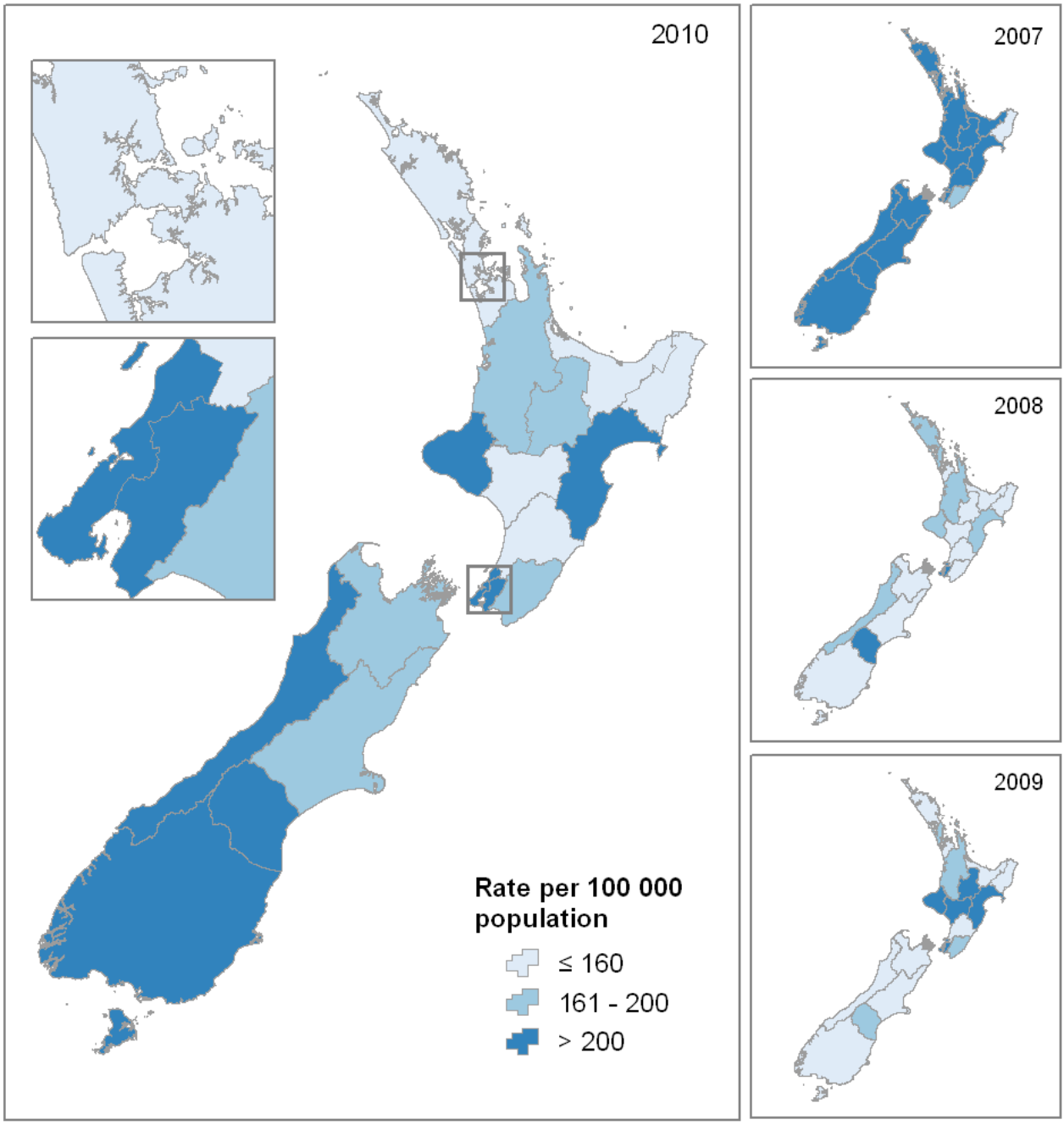
Figure 8: Campylobacteriosis monthly rate (annualised), 2010



4.4.3.3 Geographic distribution of campylobacteriosis notifications

Campylobacteriosis rates varied throughout the country as shown in Figure 9. The highest rates were reported in Taranaki (242.5 per 100 000 population, 265 cases) and Hutt Valley (238.5 per 100 000 population, 343 cases) DHBs. The lowest rates were reported in Tairawhiti (79.6 per 100 000, 37 cases) and Counties Manukau (108.8 per 100 000, 534 cases) DHBs. Hutt Valley and Capital and Coast DHBs have featured in the highest quantile of campylobacteriosis notification rates for each of the last four years.

Figure 9: Geographic distribution of campylobacteriosis notifications, 2007–2010



4.4.3.4 Age and sex distribution of campylobacteriosis cases

In 2010, the number and rate of notifications and hospitalisations for campylobacteriosis were significantly higher in males (190.9 per 100 000 population, 4 093 cases) compared to females (144.3 per 100 000, 3 027 cases) (Table 8).

Table 8: Campylobacteriosis cases by sex, 2010

Sex	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
Male	4 093	190.9	348	16.2	
Female	3 207	144.3	276	12.4	
Unknown	46				
Total	**7 346**	**168.2**	**624**	**14.3**	**0**

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

The highest age-specific notification rates for campylobacteriosis in 2010 were in the 1 to 4 years (314.4 per 100 000 population, 780 cases) and the less than 1 year (279.3 per 100 000, 178 cases) age groups. The highest hospitalisation rate was in the 70+ years age group and was more than 1.5-times than reported in any other age group (Table 9).

Table 9: Campylobacteriosis cases by age group, 2010

Age group	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	178	279.3	17	26.7	
1 to 4	780	314.4	25	10.1	
5 to 9	367	128.0	10	3.5	
10 to 14	278	94.0	15	5.1	
15 to 19	498	154.5	41	12.7	
20 to 29	1 228	203.4	85	14.1	
30 to 39	842	147.6	49	8.6	
40 to 49	919	144.9	56	8.8	
50 to 59	850	156.6	70	12.9	
60 to 69	713	175.4	89	21.9	
70+	682	173.6	167	42.5	
Unknown	11				
Total	**7 346**	**168.2**	**624**	**14.3**	**0**

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

4.4.3.5 Risk factors reported

The risk factors recorded for campylobacteriosis in 2010 are shown in Table 10. The most common risk factors reported were contact with farm animals (39.1%) and consumption of food from retail premises (36.8%).

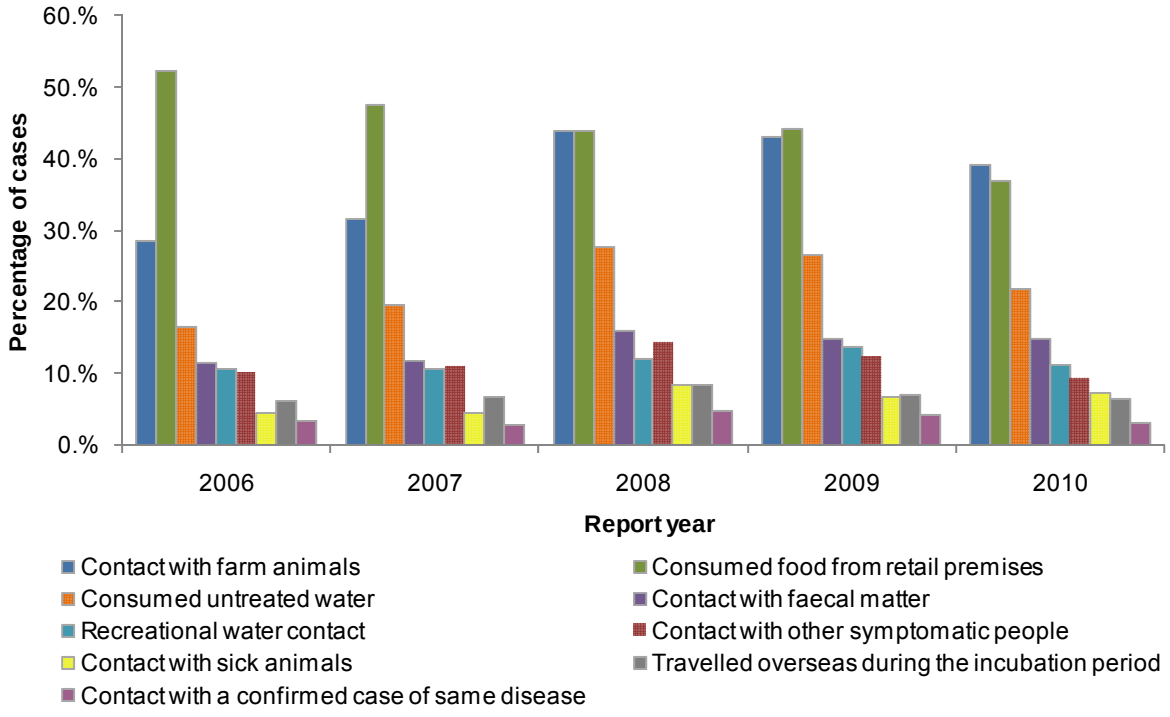
Table 10: Exposure to risk factors associated with campylobacteriosis, 2010

Risk Factor	Notifications			
	Yes	No	Unknown	%[a]
Contact with farm animals	1 055	1 643	4 648	39.1
Consumed food from retail premises	926	1 591	4 829	36.8
Consumed untreated water	498	1 795	5 053	21.7
Contact with faecal matter	365	2 092	4 889	14.9
Recreational water contact	281	2 249	4 816	11.1
Contact with other symptomatic people	236	2 292	4 818	9.3
Contact with sick animals	163	2 109	5 074	7.2
Travelled overseas during the incubation period	185	2 745	4 416	6.3
Contact with a confirmed case of same disease	79	2 436	4 831	3.1

[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 2006 and 2010, contact with farm animals, consumption of food from retail premises, and consumption of untreated water were consistently the most commonly reported risk factors for campylobacteriosis. There has been a decrease in the percentage of cases that reported consuming food from retail premises and this risk factor is now reported by a lower percentage than those who report contact with farm animals (Figure 10).

Figure 10: Campylobacteriosis risk factors by percentage of cases and year, 2006-2010



4.4.3.6 Estimate of travel-related cases

For cases where information on travel was provided in 2010, 6.3% (95%CI 5.5-7.3%) 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 2010. The resultant distribution has a mean of 464 cases (95% CI 388-546).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 7.0% (95% CI 6.6-7.5%). The proportion of travel-associated cases in 2010 was lower than in 2009.

4.4.4 Outbreaks reported as caused by *Campylobacter* spp.

In this section only *Campylobacter* spp. outbreaks with a suspected or known foodborne source are included unless otherwise stated.

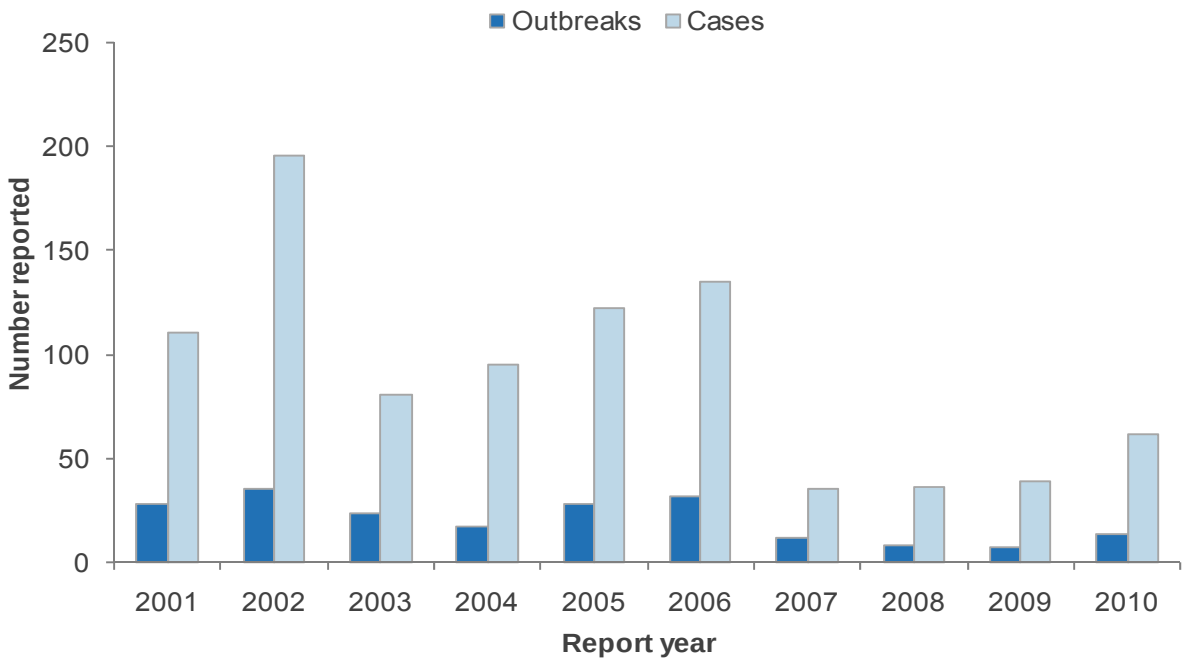
In 2010, 14 (48.3%) of the *Campylobacter* outbreaks and 62 (54.9%) of the associated cases were reported as foodborne (Table 11). *Campylobacter* outbreaks accounted for 4.8% (29/606) of all outbreaks and 1.8% (113/6321) of all associated cases.

Table 11: *Campylobacter* spp. outbreaks reported, 2010

Measure	Foodborne *Campylobacter* spp. outbreaks	All *Campylobacter* spp. outbreaks
Outbreaks	14	29
Cases	62	113
Hospitalised cases	4	6

The number of foodborne *Campylobacter* spp. outbreaks and associated cases increased from 17 outbreaks (95 cases) in 2004 to 32 outbreaks (135 cases) in 2006. In 2007 the number of foodborne *Campylobacter* spp. outbreaks decreased markedly to 12 outbreaks and in 2009 the lowest number of outbreaks (7) was reported of any of the 10 years, 2001-2010 (Figure 11). In 2010, 14 outbreaks (62 cases) were reported, representing an increase compared to recent years.

Figure 11: Foodborne *Campylobacter* spp. outbreaks and associated cases reported by year, 2001–2010



4.4.4.1 Details of food-associated outbreaks

Table 12 contains details of the 14 food–associated *Campylobacter* spp. outbreaks reported in 2010.

Table 12: Details of food-associated *Campylobacter* spp. outbreaks, 2010

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill
Wellington (February)	BBQ chicken, lamb kebabs	Hospital (acute care)	16C
Auckland (April)	Unknown	Home	2C
Auckland (May)	Unknown	Marae	3C, 4P
Wellington (June)	Chicken liver paté	Restaurant/café	3C
Canterbury (September)	Chicken liver paté	Restaurant/café	2C, 1P
Auckland (September)	Unknown	Home, takeaways	1C, 1P
Rotorua (October)	Unpasteurised milk	Farm, home	2C, 2P
Wellington (October)	Unknown	Restaurant/café	2C
Waikato (November)	Unpasteurised milk	Home	2C
Auckland (November)	Chicken kebab rice meal	Restaurant/café, takeaways	1C, 1P
Otago (November)	Untreated drinking water	Caterers, other setting	4C, 5P
Canterbury (November)	Chicken souvlaki, pita breads	Takeaways	5C
Wellington (December)	Chicken red curry, prawns	Restaurant/café	2C
Manawatu (December)	Unpasteurised milk	Caterers, other setting	2C, 1P

C = confirmed, P = probable

4.4.4.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratory in 2010, *Campylobacter* was isolated from faecal samples from one foodborne outbreak (Canterbury – November in Table 12). *Campylobacter* was not isolated from any food samples associated with foodborne outbreaks.

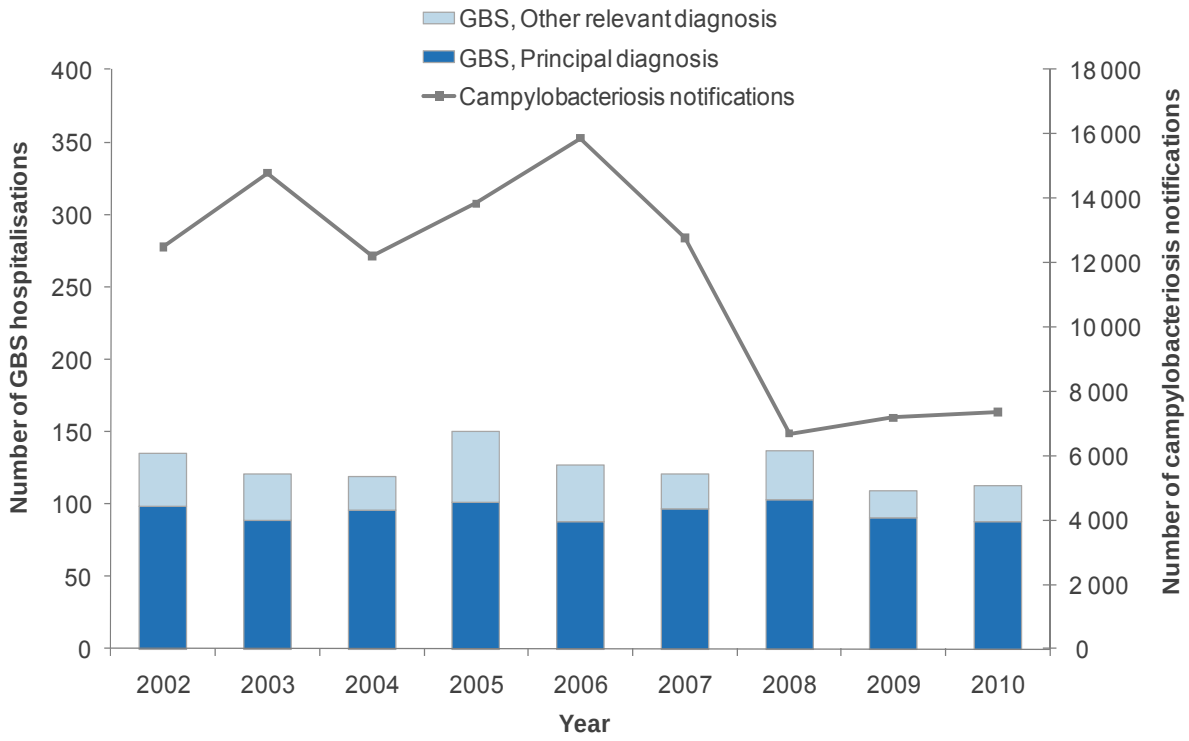
4.4.5 Disease sequelae - Guillain-Barré syndrome

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. Of the 113 hospitalised cases (2.6 admissions per 100 000 population) recorded in 2010, 88 were reported with GBS as the primary diagnosis and 25 with this condition as another relevant diagnosis.

Over the period 2002 to 2010, the number of hospitalised cases (any diagnosis code) for GBS ranged from 109 to 150 (Figure 12). The numbers of campylobacteriosis notifications during the same period are also included in Figure 12 for comparison. There is little evidence for a correlation between campylobacteriosis notifications and hospitalised GBS cases, although the numbers of GBS hospitalised cases in 2009 and 2010 were the lowest reported during the period 2002–2010.

Figure 12: Guillain-Barré syndrome hospitalised cases, 2002–2010



In 2010, the number of GBS hospital admissions was greater for males than females (Table 13).

Table 13: Guillain-Barré syndrome hospitalised cases by sex, 2010

Sex	Cases hospitalised[a]	
	No.	Rate[b]
Male	62	2.9
Female	51	2.3
Total	**113**	**2.6**

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

In 2010, the highest hospitalised case rate for GBS occurred in those aged 70+ years (Table 14).

Table 14: Guillain-Barré syndrome hospitalised cases by age group, 2010

Age group	Cases hospitalised[a]	
	No.	Rate[b]
<5	9	2.9
5 to 9	2	-
10 to 14	1	-
15 to 19	4	-
20 to 29	9	1.5
30 to 39	12	2.1
40 to 49	16	2.5
50 to 59	19	3.5
60 to 69	17	4.2
70+	24	6.1
Total	**113**	**2.6**

[a] MoH morbidity data for hospital admissions
[b] per 100 000 of population. Where fewer than five cases have been reported a rate has not been calculated.

4.4.6 Recent surveys

4.4.6.1 Campylobacter in turkeys and ducks

Campylobacter spp. were enumerated in rinsates of turkey and duck carcasses procured under the NMD protocol from participating turkey and duck processors (Wong, 2010). A presence/absence determination of *Campylobacter* spp., from the combined caecal contents of 10 birds from the same cut was also made.

Forty sets of pooled caecal samples from turkeys were received from the three major processors. Only one of these pooled samples was negative for *Campylobacter* spp. The remaining caecal sets were either positive for one species of *Campylobacter* (*C. jejuni* or *C. coli*) or a combination of both species identified from representative colonies on plate cultures using the polymerase chain reaction (PCR) method. Two hundred samples of turkey rinsates were enumerated for *Campylobacter* spp. Of these, 34% contained < 2.48 $\log_{10}$ CFU carcass^{-1} (this result, which is below the limit of detection of the method, would normally be reported as "not detected" under the broiler NMD reporting), and 50% of counts were between 2.48–4.0 $\log_{10}$ CFU carcass^{-1}. *Campylobacter* spp. were recorded at levels between 4.1–6.0 $\log_{10}$ CFU carcass^{-1} in 14.5% of rinsates. Only 1.5% or three of samples recorded *Campylobacter* spp. at > 6.0 $\log_{10}$ CFU carcass^{-}

[1]. Turkey rinsates provided by one of the processors yielded *C. jejuni* only by PCR identification of up to five representative colonies. The other two processors provided rinsates containing either *C. jejuni* or *C. coli* or a mixed infection of both species.

Twenty-eight sets of pooled caeca from ducks were received from three processors. All caecal samples were positive for *Campylobacter* spp. All representative isolates selected from plate cultures were identified by PCR as *C. jejuni*. A total of 140 samples of duck rinsates were received of which five were rejected because they were received frozen. Twenty per cent of the samples (27/135) had *Campylobacter* spp. counts of < 2.30 $\log_{10}$ CFU carcass^{-1} (normally reported as "not detected" in broiler NMD reporting). Of the 16% of samples that had *Campylobacter* spp. counts exceeding 4.0 $\log_{10}$ CFU carcass^{-1}, only one duck rinsate exceeded 5.0 $\log_{10}$ CFU carcass^{-1}. The duck rinsates (with the exception of one rinsate which yielded *C. jejuni* and *C. coli*) cultured mainly *C. jejuni*.

4.4.6.2 Campylobacter in spent breeder and end-of-lay (EOL) chicken

Campylobacter infection in independent flocks of spent breeder and EOL birds at slaughter was determined by examining the combined contents of 10 caeca samples obtained from each flock of slaughtered birds, using the NMD protocol (Wong and Chung, 2010). The *Campylobacter* spp. status of each flock was determined by performing a presence/absence determination of these pathogens in the combined caecal contents. In addition, pathogen levels were enumerated in each carcass rinsate in a set of five from each flock, in accordance with the NMD protocol.

Eighteen flocks of breeder birds were accepted for the project, but caecal samples were received from 16 flocks only. Thirteen flocks (81.3%) were positive for *Campylobacter* spp. and three flocks were negative for *Campylobacter* spp. *Campylobacter coli* was isolated from nine of the 13 positive flocks. *Campylobacter jejuni* was isolated from five flocks, including one containing a mixed infection with *C. coli*. Ninety-five carcass rinsates of breeder birds were received, five each from 17 flocks and 10 from one flock. Eighty-five rinsates (89.5%) had counts of <2.48 $\log_{10}$ CFU carcass^{-1} (under the NMD protocol, this would be regarded by industry as "not detected"). Ten carcass rinsates (10.5%), contained counts of *Campylobacter* spp. at ≥2.48 $\log_{10}$ CFU carcass^{-1}. One flock produced *Campylobacter* spp.-contaminated rinsates from all five carcasses sampled, with counts of between 4.21 $\log_{10}$ CFU carcass^{-1} and 5.85 $\log_{10}$ CFU carcass^{-1}. Five carcasses belonging to two other flocks had counts of *Campylobacter* spp. at ≤3.26 $\log_{10}$ CFU carcass^{-1}.

Campylobacter spp. were isolated from the caecal contents of EOL birds in 11 out of 13 (84.6%) flocks screened. *C. jejuni* was isolated from 10/11 of the positive flocks, and *C. coli* was isolated from two flocks, one of which had a mixed infection with *C. jejuni*. Seventy carcass rinsates from the 13 flocks of EOL birds were received of which 10 were sampled twice from one flock (from two cuts of birds). Sixty-two rinsates (88.6%) produced non-detectable counts of *Campylobacter* spp. recorded as <2.30 $\log_{10}$ CFU carcass^{-1}. Eight rinsates (11.4%) from four flocks produced colonies of *Campylobacter* spp. on modified Charcoal Cefoperazone Desoxycholate agar (mCCDA) plates. In one of these flocks, all five carcass rinsates contained *C. jejuni* counts of between 3.60 $\log_{10}$ CFU carcass^{-1}and 4.17 $\log_{10}$ CFU carcass^{-1}. In the remaining three flocks, one rinsate from each of these flocks produced a low count of *Campylobacter* spp. ranging from 2.30 $\log_{10}$ CFU carcass^{-1} to 3.20 $\log_{10}$ CFU carcass^{-1}.

4.4.6.3 Campylobacter in uncooked retail chicken meat

One hundred and seventy-five samples of diced or minced retail chicken meat were tested for the prevalence and concentration of *Campylobacter* spp. to measure the impact of introducing the mandatory *Campylobacter* performance target to primary broiler chicken processing on *Campylobacter* spp. levels in retail uncooked chicken meats (Wong and Hudson, 2010). Samples were obtained from retail outlets in Auckland, Hamilton, Wellington, Christchurch and Dunedin using the protocol of the 2003–2004 survey (Wong *et al.*, 2007). Data generated on the prevalence and concentration of *Campylobacter* spp. in the chicken meat samples were compared with those from the 2003–2004 survey.

The results of the 2009 survey showed a range of *Campylobacter* prevalence values for each city, from 51.4% in Christchurch to 88.6% in Hamilton. However, the confidence intervals (CI) were wide because of the small number of samples taken at each centre. Only one instance of non-overlapping CIs occurred as the 95% maximum for Christchurch (68.6%) was less than the minimum for Hamilton (73.3%). An overall prevalence for *Campylobacter* spp. of 69.7% (95% CI: 62.3–76.4) was found in the current survey, while the equivalent data for the 2003–2004 survey showed an overall prevalence of 89.6% (95% CI: 84.9–93.2). Assuming that all other factors with respect to the measurement of prevalence were the same for both surveys, it can be concluded that a significant reduction of almost 20% (from 89.6% to 69.7%, $P < 0.001$) in the prevalence *of Campylobacter* occurred in chicken products in the five-to-six year period between surveys.

Most of the positive samples (86.9%) contained *Campylobacter* spp. at concentrations of <1.0 $\log_{10}$ CFU g^{-1}, compared with 90.8% of samples in the 2003–2004 survey.

4.4.7 Relevant New Zealand studies and publications

4.4.7.1 Reports

A further study was reported on source attribution of human campylobacteriosis cases in the Manawatu, based on multi-locus sequence typing (MLST) (French and Marshall, 2010). Samples were catalogued from July 2009 to June 2010. The study showed a marked decline in the proportion of human cases attributable to poultry sources (<50%) compared to the period prior to the introduction of the *Campylobacter* in Poultry Risk Management Strategy in 2006 (>70%).

To further analyse temporal trends in source attribution of campylobacteriosis in the Manawatu, a time-dependent element was added to various attribution models (French and Marshall, 2009). This study confirmed the decreased contribution of poultry as a source of human campylobacteriosis form 2007 onwards.

Other studies reported during 2010 providing information on *Campylobacter* were:

- An investigation of the survival of New Zealand *Campylobacter* strains, contributing significantly to human disease, under varying conditions of temperature, time and processing conditions (e.g. marination) (Al Sakkaf *et al.*, 2010).

4.4.7.2 Journal papers

Two papers were published during 2010 examining aspects of the spatial epidemiology of campylobacteriosis in New Zealand (Müllner *et al.*, 2010b; Rind and Pearce, 2010). With respect to transmission of *Campylobacter* spp. by food sources, Rind and Pearce found a near-significant

association between the campylobacteriosis rate in a Territorial Local Authority (TLA) area and the density of fresh food outlets, but not the density of restaurants, fast food outlets or supermarkets. Müllner *et al.* reported that poultry-associated cases of campylobacteriosis in the Manawatu are more likely to be found in urban than rural areas, while young children in rural areas have a higher risk of infection with ruminant strains than their urban counterparts.

A further paper was published on the three year (2005-2008) study of the molecular epidemiology of *Campylobacter* spp. in the Manawatu (Müllner *et al.*, 2010a). Between 60.1 and 81.4% of poultry carcasses from major suppliers were contaminated with *C. jejuni*. Both internationally rare and common genotypes (as determined by multi-locus sequence typing) were identified. There was evidence of ubiquitous and supplier-associated types. The dominant human type (ST474) is internationally rare and was found almost exclusively in poultry isolates from one supplier.

4.4.8 Relevant regulatory developments

MAF updated their *Campylobacter* Risk Management Strategy to cover the period 2010-2013[2]. The objectives remain unchanged from the previous edition of the Risk Management Strategy covering the period 2008-2011.

4.5 Ciguatera Fish Poisoning (CFP)

4.5.1 Case definition

Clinical description: Gastroenteritis, possibly followed by neurologic symptoms

Laboratory test for diagnosis: Demonstration of ciguatoxin in implicated fish

Case classification: Not applicable

4.5.2 Ciguatera fish poisoning cases reported in 2010 by data source

During 2010, no notifications of ciguatera fish poisoning were reported in EpiSurv.

The ICD-10 code T61.0 was used to extract ciguatera fish poisoning hospitalisation data from the MoH NMDS database. Two hospital admissions were recorded in 2010, one with ciguatera fish poisoning as the primary diagnosis and other with ciguatera fish poisoning 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.

4.5.3 Outbreaks reported as caused by ciguatera fish poisoning

One foodborne ciguatera fish poisoning outbreak with two associated cases was reported in 2010 (Table 15).

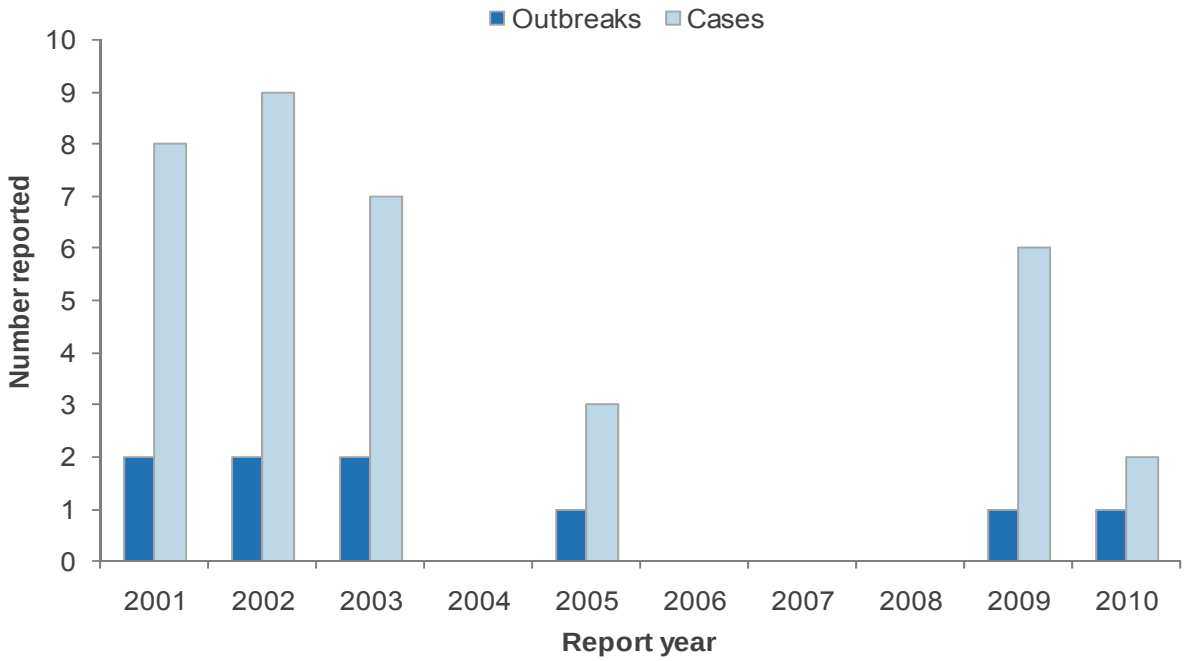
[2] http://www.foodsafety.govt.nz/elibrary/industry/Campylobacter_Risk-Comprehensive_Aimed.pdf

Table 15: Details of food-associated ciguatera fish poisoning outbreak, 2010

Measure	Foodborne ciguatera fish poisoning outbreaks	All ciguatera fish poisoning outbreaks
Outbreaks	1	1
Cases	2	2
Hospitalised cases	0	0

Over the 10 year period from 2001 to 2010, very few outbreaks of ciguatera fish poisoning have been reported, with no more than two outbreaks of ciguatera fish poisoning reported in any year (Figure 13).

Figure 13: Outbreaks and associated cases due to ciguatera fish poisoning reported by year, 2001–2010



4.5.3.1 Details of food-associated outbreaks

Table 16 contains details of the one food-associated ciguatera fish poisoning outbreak reported in 2010.

Table 16: Details of food-associated ciguatera fish poisoning outbreak

Public Health Unit (Month)	Suspected Vehicle	Setting	Number ill
Taranaki (June)	Red snapper	Home[1]	2C

C = confirmed, P = probable
[1] While the fish was consumed in New Zealand, it was imported from Fiji

4.5.3.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR in 2010, ciguatoxins were detected in a sample of cooked red snapper from Fiji, related to the outbreak reported in Table 16.

4.5.4 Relevant New Zealand studies and publications

4.5.4.1 Journal papers

A paper was published by staff from New Zealand's National Poisons Centre (NPC), highlighting an increasing number of enquiries regarding patients presenting with ciguatera fish poisoning following vacations, particularly to the Pacific Islands and the north of Australia (Schep *et al.*, 2010).

4.5.5 Relevant regulatory developments

Nil.

4.6 *Clostridium perfringens* Intoxication

4.6.1 Case definition

Clinical description:	Gastroenteritis with profuse watery diarrhoea
Laboratory test for diagnosis:	Detection of enterotoxin in faecal specimen or faecal spore count of $\geq 10^6$/g or isolation of $\geq 10^5$/g *Clostridium perfringens* in leftover food
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 i.e., is part of an identified common source outbreak
Confirmed	A clinically compatible illness that is laboratory confirmed

4.6.2 *Clostridium perfringens* intoxication cases reported in 2010 by data source

During 2010, one notification of *C. perfringens* intoxication and no resulting 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 2010 with *C. perfringens* intoxication as a primary or other relevant diagnosis.

4.6.3 Outbreaks reported as caused by *Clostridium perfringens*

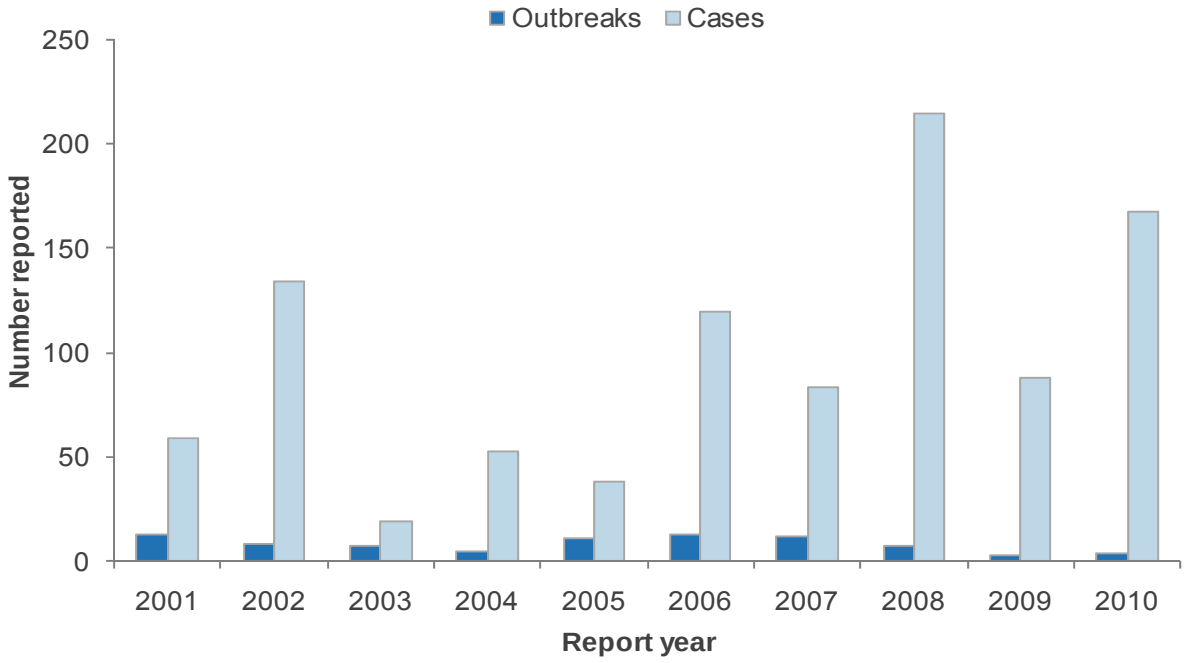
All four *C. perfringens* outbreaks for 2010 were associated with a suspected or known foodborne source (Table 17).

Table 17: *C. perfringens* outbreaks reported, 2010

Measure	Foodborne *C. perfringens* outbreaks	All *C. perfringens* outbreaks
Outbreaks	4	4
Cases	168	168
Hospitalised cases	0	0

Between 2001 and 2010, the number of foodborne outbreaks associated with *C. perfringens* has fluctuated, from three in 2009 to 13 outbreaks in 2001 and 2006 (Figure 14). The number of cases associated with *C. perfringens* outbreaks has also varied 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 (168 cases) was reported in 2010.

Figure 14: Foodborne *C. perfringens* outbreaks and associated cases reported by year, 2001–2010



4.6.3.1 Details of food-associated outbreaks

Table 18 contains details of the four food–associated *C. perfringens* outbreaks reported in 2010.

Table 18: Details of food-associated *C. perfringens* outbreaks, 2010

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill
Auckland (January)	Unknown	Restaurant/café	6C, 60P
Auckland (March)	Mince with Mexican bean sauce	Hostel	84C, 3P
Auckland (March)	Roast beef meal	Home, takeaways	1C, 1P
Auckland (December)	Skewered beef, chicken, pork	Restaurant/café	2C, 11P

C = confirmed, P = probable

4.6.3.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratory in 2010, *C. perfringens* and/or its toxin was detected in clinical samples from all four outbreaks identified in Table 18. *C. perfringens* and/or its toxin was not detected in any associated food samples. Food samples were submitted in relation to two of these outbreaks.

4.6.4 Relevant New Zealand studies and publications

Nil.

4.6.5 Relevant regulatory developments

Nil.

4.7 Cryptosporidiosis

Summary data for cryptosporidiosis in 2010 are given in Table 19.

Table 19: Summary surveillance data for cryptosporidiosis, 2010

Parameter	Value in 2010	Section reference
Number of cases	954	4.7.2
Rate (per 100 000)	21.8	4.7.2
Hospitalisations (%)	30 (3.1%)	4.7.2
Deaths (%)	0 (0%)	4.7.2
Estimated travel-related cases (%)	83 (8.7%)	4.7.3.6
Estimated food-related cases (%)	NA	

NA = not applicable, no information is available on the food attributable proportion of cryptosporidiosis in New Zealand

4.7.1 Case definition

Clinical description: An illness with diarrhoea 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 i.e., is part of an identified common source outbreak

Confirmed A clinically compatible illness that is laboratory confirmed

4.7.2 Cryptosporidiosis cases reported in 2010 by data source

During 2010, 954 notifications (21.8 cases per 100 000 population) of cryptosporidiosis and no resulting deaths were reported in EpiSurv.

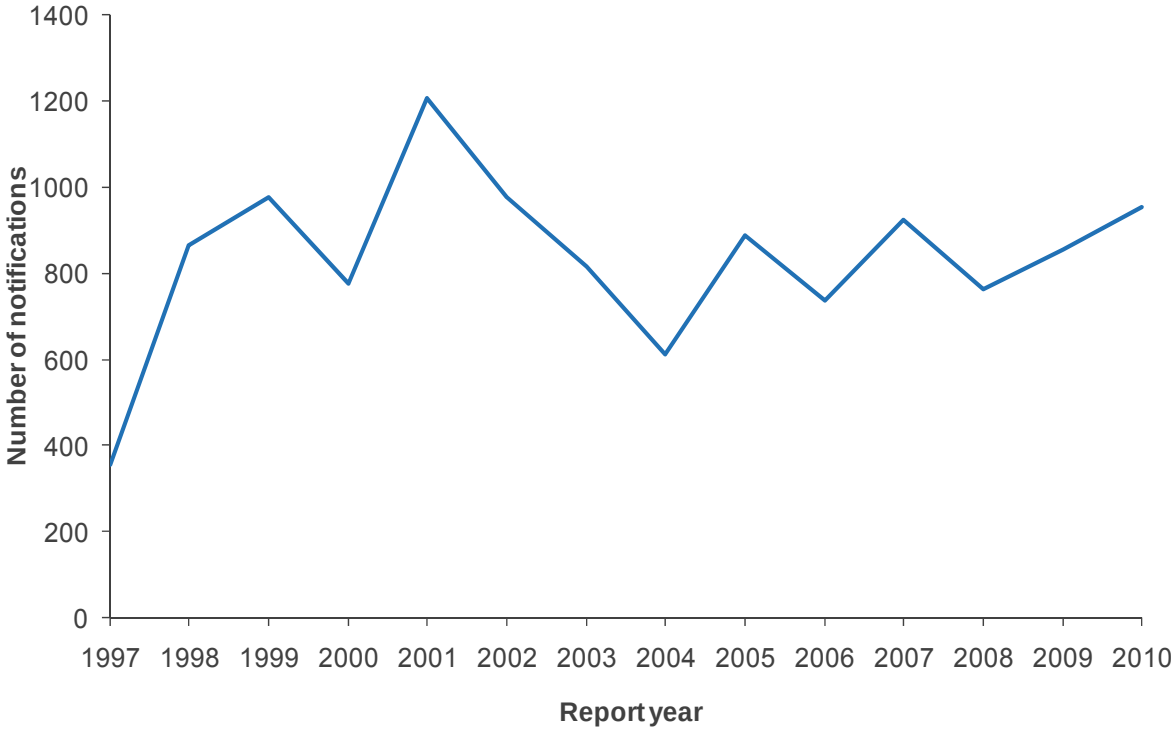
The ICD-10 code A07.2 was used to extract cryptosporidiosis hospitalisation data from the MoH NMDS database. Of the 30 hospital admissions (0.7 admissions per 100 000 population) recorded in 2010, 16 were reported with cryptosporidiosis as the primary diagnosis and 14 with cryptosporidiosis as another relevant diagnosis.

4.7.3 Notifiable disease data

4.7.3.1 Annual notification trend

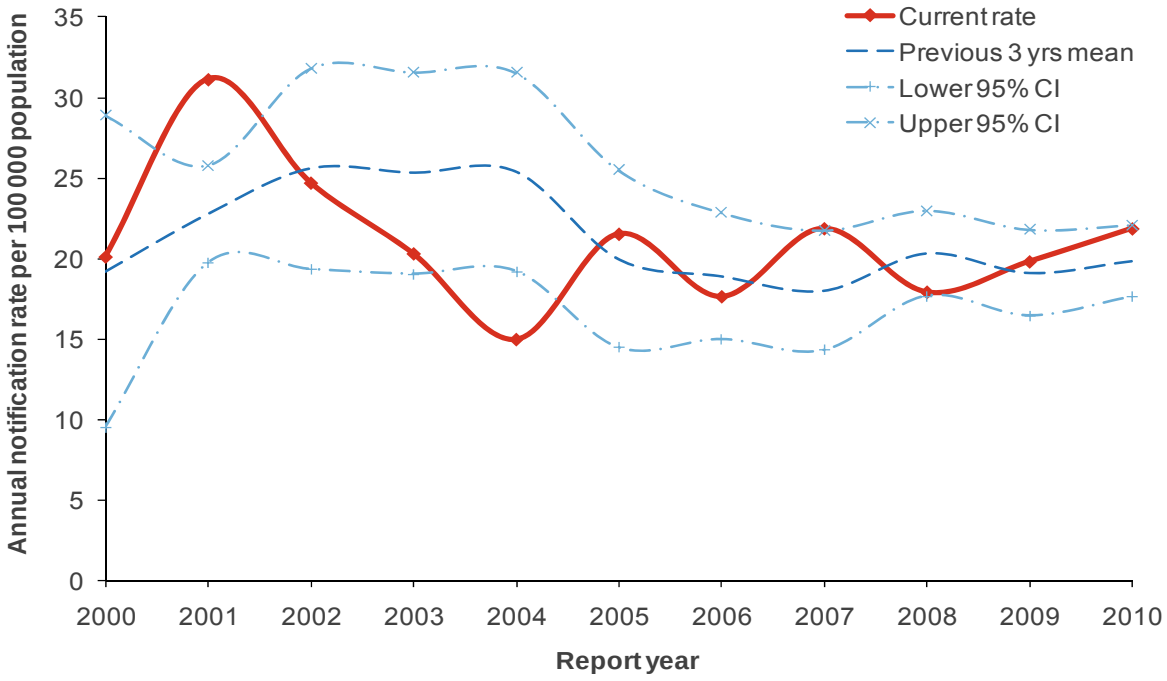
Cryptosporidiosis became a notifiable disease in 1996. The number of notifications peaked at 1 208 cases in 2001 and then decreased to 611 in 2004. Since 2004 the number of notifications has fluctuated, with the highest number of notifications reported in 2010 (954 cases) (Figure 15).

Figure 15: Cryptosporidiosis notifications by year, 1997–2010



The cryptosporidiosis annual population rate trend is very similar to the corresponding annual notification trend. The highest cryptosporidiosis annual notification rate was reported in 2001 and generally decreased until 2004. Notification rates have fluctuated since 2004, but generally higher rates have been observed than in 2004 (Figure 16).

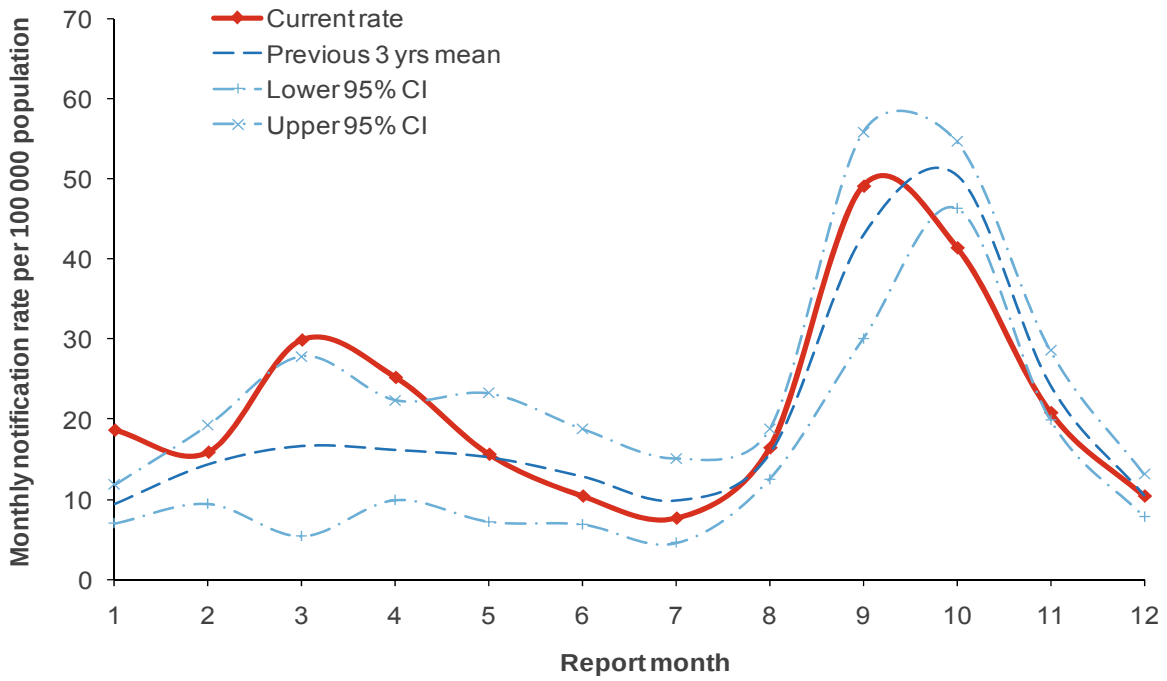
Figure 16: Cryptosporidiosis notification rate by year, 2000–2010



4.7.3.2 Seasonality

The number of notified cases of cryptosporidiosis reported per 100 000 population by month for 2010 was similar to previous years. Cryptosporidiosis has a consistent spring peak that occurs each year in September or October (Figure 17).

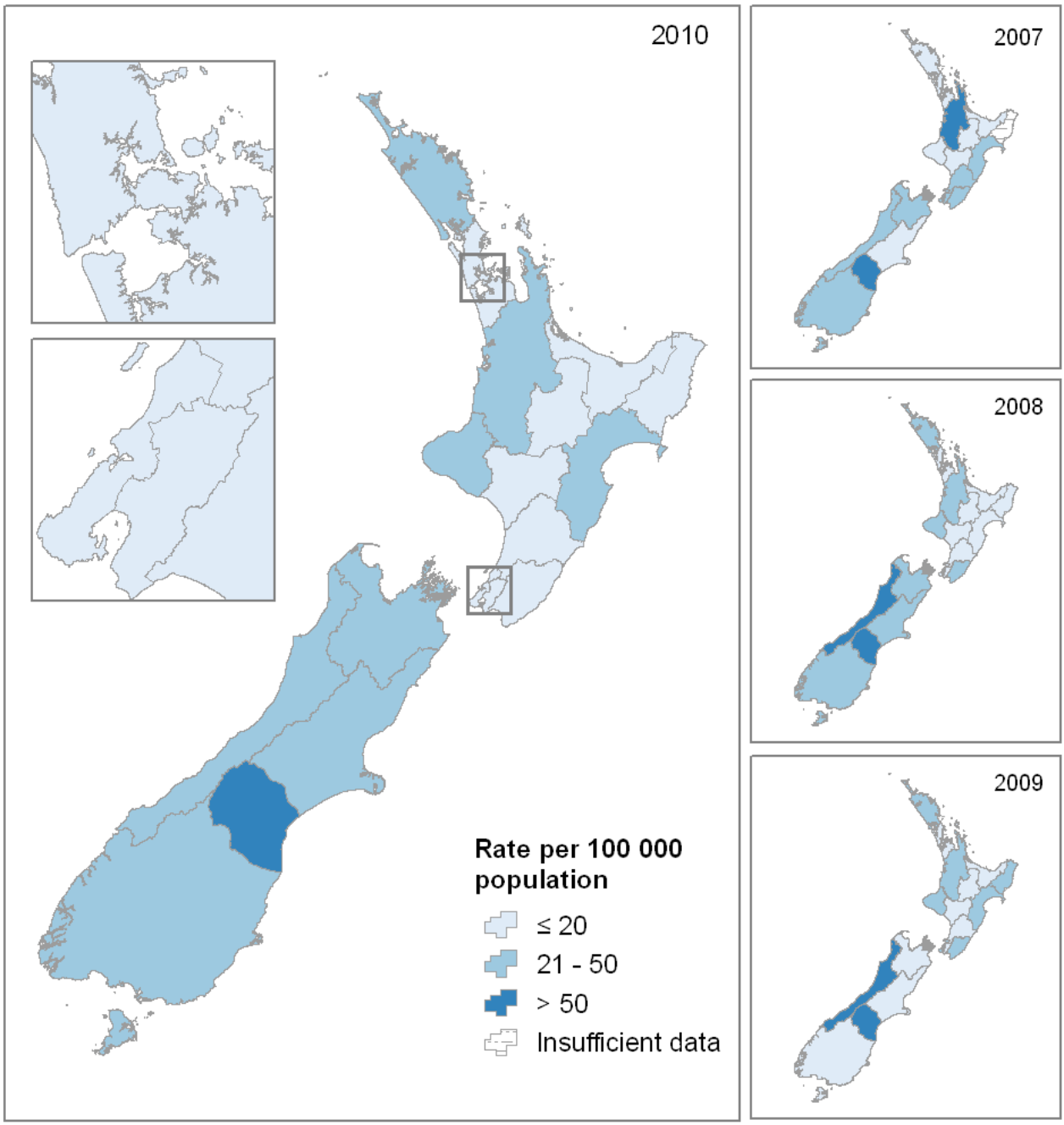
Figure 17: Cryptosporidiosis monthly rate (annualised), 2010



4.7.3.3 Geographic distribution of cryptosporidiosis notifications

There have been consistently higher population rates of cryptosporidiosis notifications in the predominantly rural DHBs compared to the more urban DHBs (Figure 18). In 2010, the highest rates were reported in South Canterbury (84.1 per 100 000 population, 47 cases) and Canterbury (45.3 per 100 000, 230 cases) DHBs. The lowest rates were reported in Hutt Valley (6.3 per 100 000, 9 cases) and Bay of Plenty (6.7 per 100 000, 14 cases) DHBs. South Canterbury DHB has been in the highest quantile of cryptosporidiosis notification rates for each of the last four years.

Figure 18: Geographic distribution of cryptosporidiosis notifications, 2007-2010



4.7.3.4 Age and sex distribution of cryptosporidiosis cases

In 2010, the number and notification rates for cryptosporidiosis were slightly higher for males (22.5 per 100 000 population, 482 cases) compared to females (21.0 per 100 000, 466 cases). However the number and rate of hospitalisations were lower for males compared to females (Table 20).

Table 20: Cryptosporidiosis cases by sex, 2010

Sex	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
Male	482	22.5	13	0.6	
Female	466	21.0	17	0.8	
Unknown	6		0		
Total	**954**	**21.8**	**30**	**0.7**	**0**

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

During 2010, the highest cryptosporidiosis age specific notification rates were in the 1 to 4 years age group (115.3 per 100 000 population, 286 cases), followed by the less than 1 year age group (53.4 per 100 000, 34 cases) and the 5 to 9 years age group (42.2 per 100 000, 121 cases) (Table 21). The hospitalisation rate was not defined for most age groups due to the small number of cases.

Table 21: Cryptosporidiosis cases by age group, 2010

Age group	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	34	53.4	2	-	
1 to 4	286	115.3	13	5.2	
5 to 9	121	42.2	1	-	
10 to 14	81	27.4	2	-	
15 to 19	54	16.7	2	-	
20 to 29	110	18.2	3	-	
30 to 39	113	19.8	2	-	
40 to 49	77	12.1	3	-	
50 to 59	41	7.6	0	-	
60 to 69	18	4.4	0	-	
70+	16	4.1	2	-	
Unknown	3		0		
Total	**954**	**21.8**	**30**	**0.7**	**0**

[a] MoH morbidity data for hospital admissions
[b] per 100 000 of population. Where fewer than five cases have been reported a rate has not been calculated.

4.7.3.5 Risk Factors Reported

During 2010, the most commonly reported risk factors reported for cryptosporidiosis were contact with farm animals (55.2%), contact with faecal matter (39.5%), and consumption of untreated water (37.8%) (Table 22).

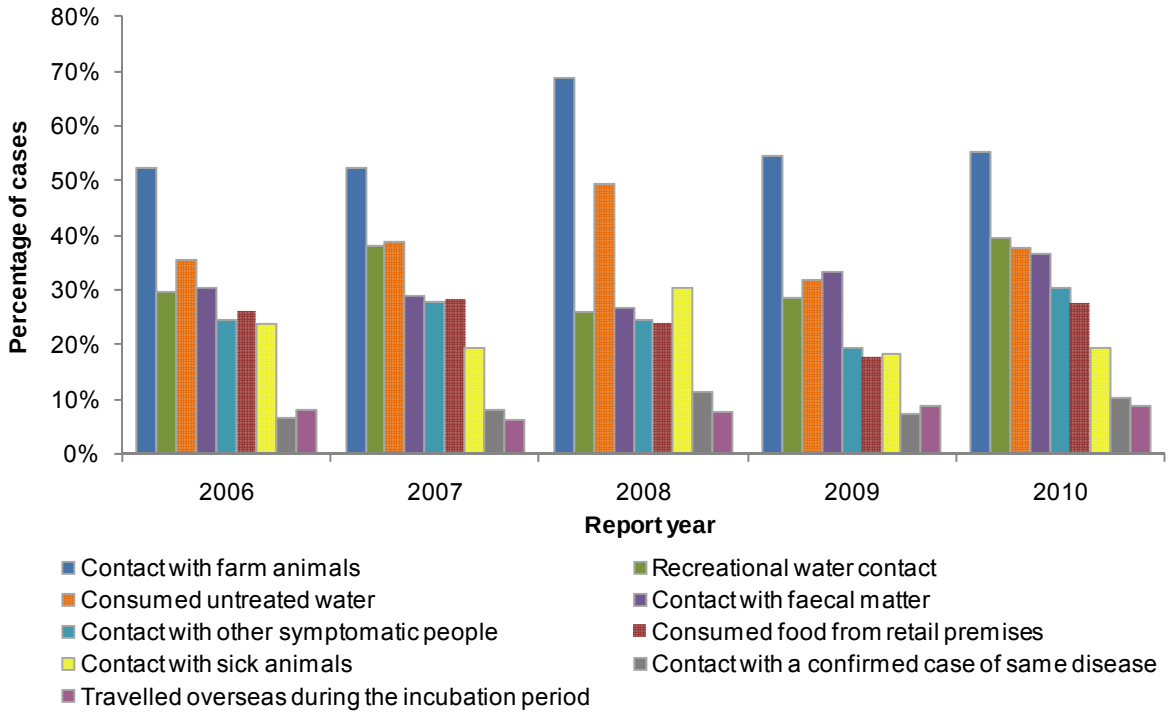
Table 22: Exposure to risk factors associated with cryptosporidiosis, 2010

Risk Factor	Notifications			
	Yes	No	Unknown	%[a]
Contact with farm animals	320	260	374	55.2
Recreational water contact	203	311	440	39.5
Consumed untreated water	168	276	510	37.8
Contact with faecal matter	167	290	497	36.5
Contact with other symptomatic people	153	350	451	30.4
Consumed food from retail premises	135	357	462	27.4
Contact with sick animals	89	370	495	19.4
Contact with a confirmed case of same disease	48	423	483	10.2
Travelled overseas during the incubation period	53	554	347	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 2006 and 2010, the most consistently reported risk factors for cryptosporidiosis were contact with farm animals, recreational water contact, and consumption of untreated water (Figure 19).

Figure 19: Cryptosporidiosis risk factors by percentage of cases and year, 2006-2010



4.7.3.6 Estimate of travel-related cases

For cases where information on travel was provided, 8.7% (95%CI 6.6-11.3%) 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 2010. The resultant distribution has a mean of 83 cases (95% CI 57-114).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 7.7% (95% CI 6.6-8.9%). The proportion of travel-associated cases in 2010 was very similar to 2009.

4.7.4 Outbreaks reported as caused by *Cryptosporidium* spp.

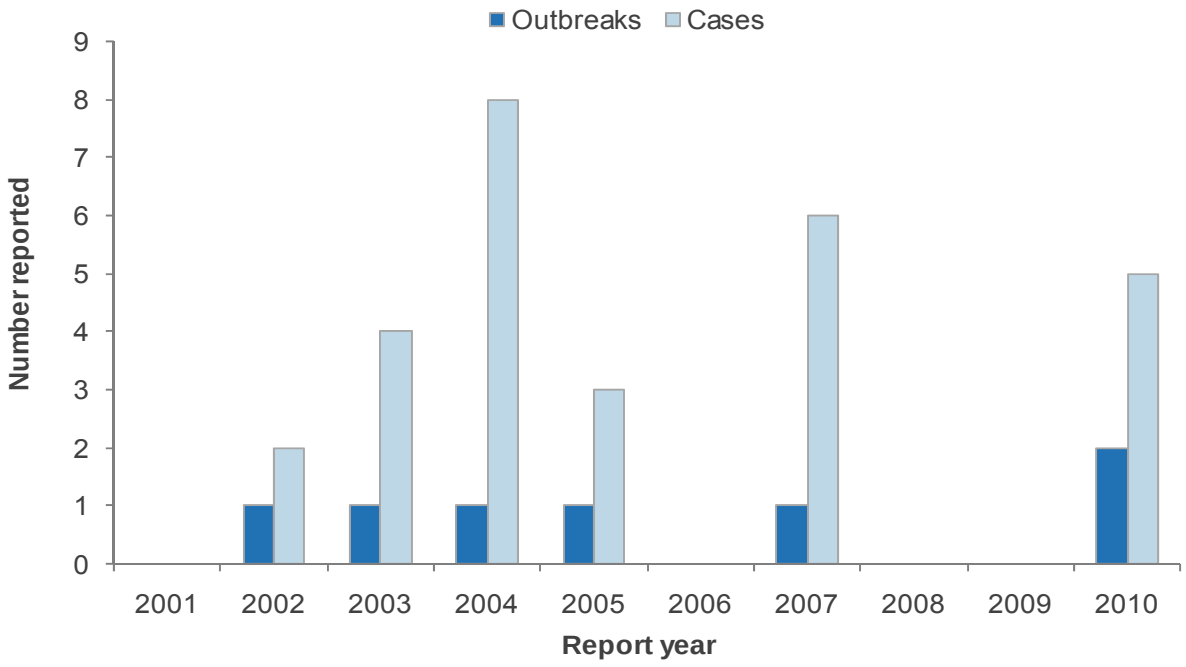
In 2010, two (4.7%) of the *Cryptosporidium* spp. outbreaks and five (1.7%) of the associated cases were reported as foodborne (Table 23). *Cryptosporidium* spp. outbreaks accounted for 7.1% (43/606) of all outbreaks and 4.7% (294/6321) of all associated cases.

Table 23: *Cryptosporidium* spp. outbreaks reported, 2010

Measure	Foodborne *Cryptosporidium* spp. outbreaks	All *Cryptosporidium* spp. outbreaks
Outbreaks	2	43
Cases	5	294
Hospitalised cases	0	1

Foodborne *Cryptosporidium* spp. outbreaks are rare, with not more than one outbreak reported each year in the nine year period, (2001-2009), and two outbreaks reported in 2010 (Figure 20). The largest outbreak, with eight associated cases, was reported in 2004.

Figure 20: Foodborne *Cryptosporidium* spp. outbreaks and associated cases reported by year, 2001–2010



4.7.4.1 Details of food-associated outbreaks

Table 24 contains details of the two food–associated *Cryptosporidium* spp. outbreaks reported in 2010.

Table 24: Details of food-associated *Cryptosporidium* spp. outbreaks, 2010

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill
Waikato (September)	Unpasteurised milk	Home	2C, 1P
Waikato (September)	Unpasteurised milk	Home	2C

C = confirmed, P = probable

4.7.4.2 Laboratory investigation of samples from suspected foodborne outbreaks

In 2010, no food or clinical samples were submitted to ESR's Public Health Laboratory relating to food-associated *Cryptosporidium* spp. outbreaks.

4.7.5 Relevant New Zealand studies and publications

4.7.5.1 Journal papers

An outbreak of gastrointestinal illness in a class of 96 veterinary students in New Zealand was investigated (Grinberg *et al.*, 2010). While the source of infection could not be identified microbiologically, responses to a questionnaire suggested that the exposure may have been due to contact with calves during a practical class.

4.7.6 Relevant regulatory developments

Nil.

4.8 Giardiasis

Summary data for giardiasis in 2010 are given in Table 25.

Table 25: Summary surveillance data for giardiasis, 2010

Parameter	Value in 2010	Section reference
Number of cases	1 985	4.8.2
Rate (per 100 000)	45.4	4.8.2
Hospitalisations (%)	33 (1.7%)	4.8.2
Deaths (%)	0 (0%)	4.8.2
Estimated travel-related cases (%)	424 (21.4%)	4.8.3.6
Estimated food-related cases (%)	NA	

NA = not applicable, no information is available on the food attributable proportion of giardiasis in New Zealand

4.8.1 Case definition

Clinical description:	An illness characterised by diarrhoea, abdominal cramps, bloating, 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 i.e., is part of an identified common source outbreak
Confirmed	A clinically compatible illness that is laboratory confirmed

4.8.2 Giardiasis cases reported in 2010 by data source

During 2010, 1 985 notifications (45.4 cases per 100 000 population) of giardiasis and no resulting deaths were reported in EpiSurv.

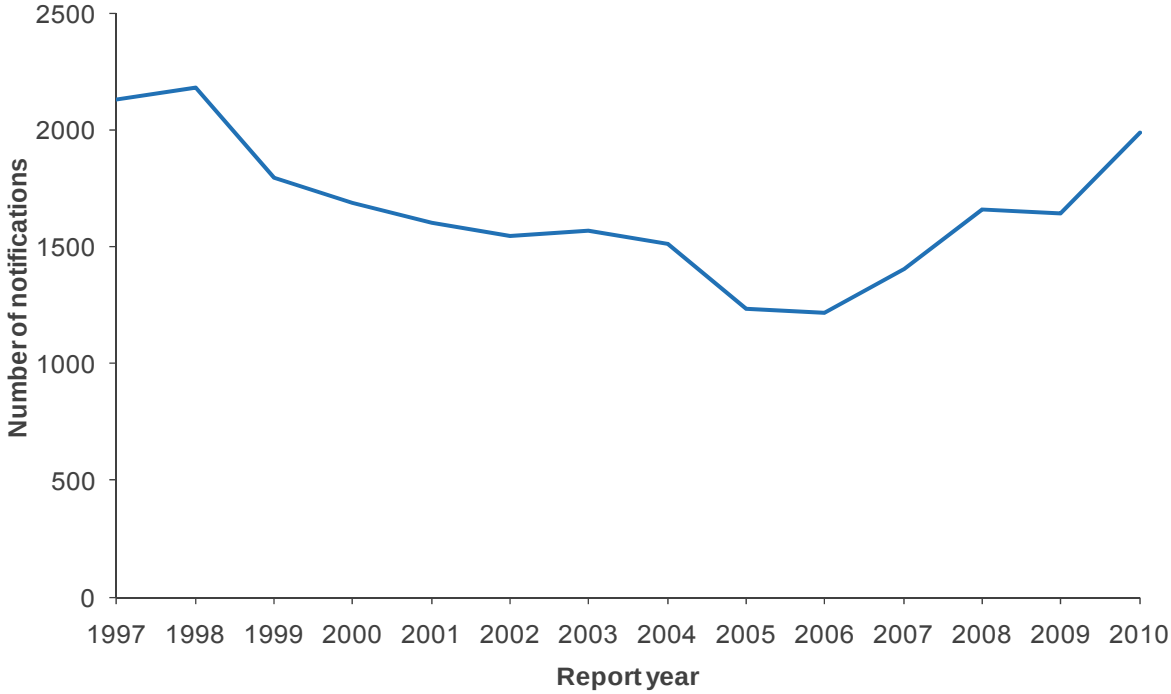
The ICD-10 code A07.1 was used to extract giardiasis hospitalisation data from the MoH NMDS database. Of the 33 hospital admissions (0.8 admissions per 100 000 population) recorded in 2010, 18 were reported with giardiasis as the primary diagnosis and 15 with giardiasis as another relevant diagnosis.

4.8.3 Notifiable disease data

4.8.3.1 Annual notification trend

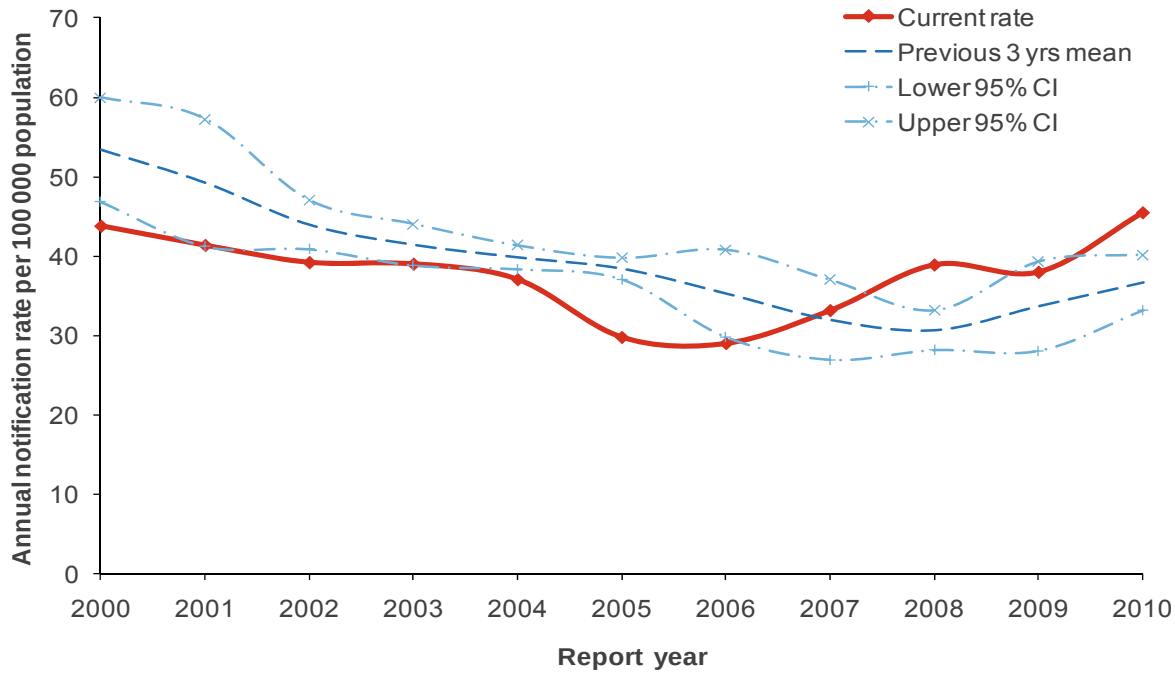
There was a steady decrease in the number of giardiasis cases reported each year from 1998 to 2006. Since 2006, there has been an increasing trend in the number of notifications, with the highest number of notifications since 1999 reported in 2010 (Figure 21).

Figure 21: Giardiasis notifications by year, 1997–2010



The giardiasis annual population rate trend is very similar to the corresponding annual notification trend. The giardiasis notification rate had steadily declined from 43.8 per 100 000 population in 2000 to 29.0 per 100 000 in 2006, but has been increasing steadily since 2006 (Figure 22). The 2010 notification rate was significantly higher than the 2009 rate, and is the highest rate reported between 2001 and 2010.

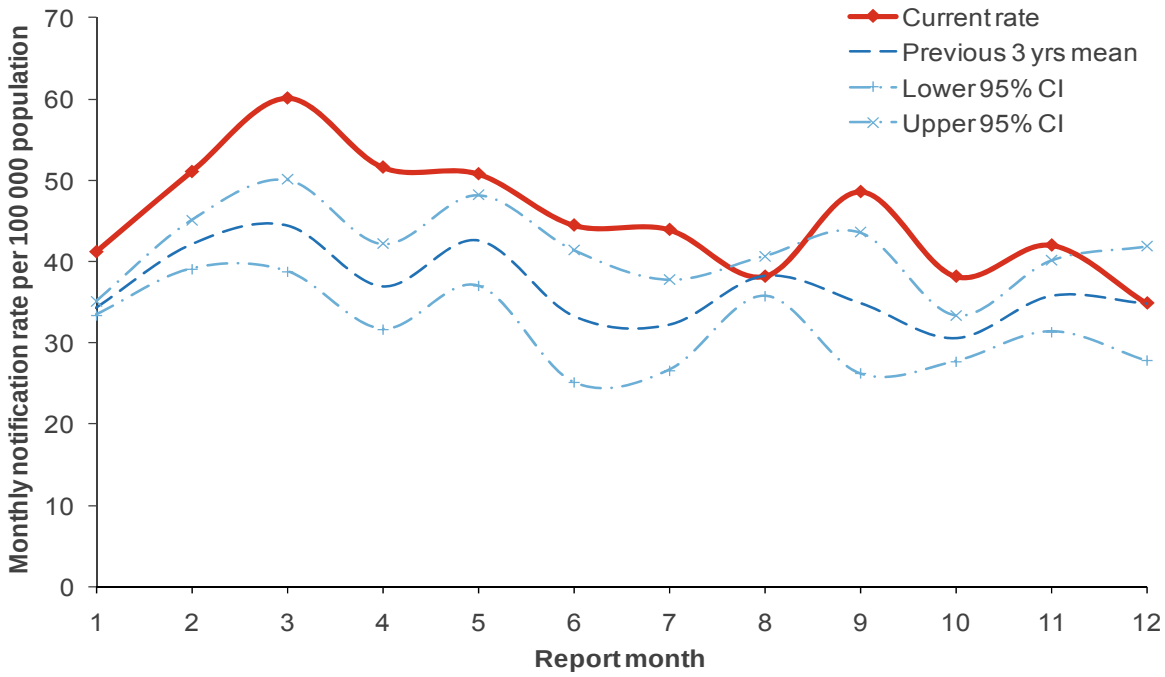
Figure 22: Giardiasis notification rate by year, 2000–2010



4.8.3.2 Seasonality

There was no strong seasonal pattern in the population rate of giardiasis notifications reported by month either historically or in 2010. There were more notifications reported in March and September 2010 compared to previous years (Figure 23).

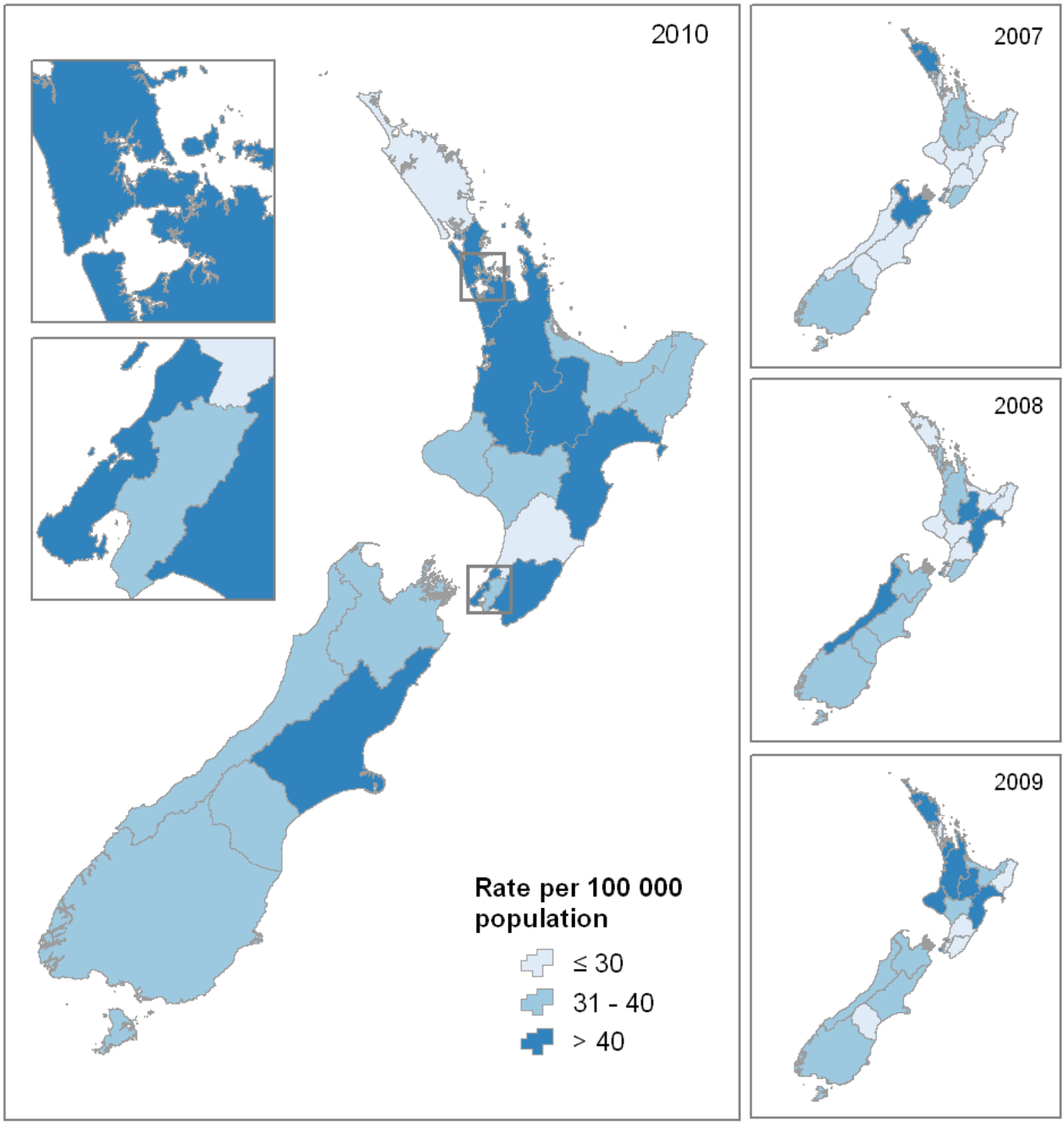
Figure 23: Giardiasis monthly rate (annualised), 2010



4.8.3.3 Geographic distribution of giardiasis notifications

Giardiasis rates varied throughout the country during 2010 (Figure 24). The highest rate was reported in Hawke's Bay DHB (67.6 per 100 000 population, 105 cases), followed by Auckland (67.5 per 100 000, 304 cases) and Canterbury (55.5 per 100 000, 282 cases) DHBs. The lowest rate was reported in MidCentral DHB (17.3 per 100 000, 29 cases). Lakes and Hawke's Bay DHBs have been consistently in the highest quantile of giardiasis notification rates between 2008 and 2010.

Figure 24: Geographic distribution of giardiasis notifications, 2007–2010



4.8.3.4 Age and sex distribution of giardiasis cases

The 2010 giardiasis notification cases and rates were higher for males (46.4 per 100 000 population, 995 cases) compared to females (44.0 per 100 000, 979 cases) (Table 26). Hospitalisation rates were lower for males compared to females.

Table 26: Giardiasis cases by sex, 2010

Sex	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
Male	995	46.4	12	0.6	
Female	979	44.0	21	0.9	
Unknown	11		0		
Total	**1 985**	**45.4**	**33**	**0.8**	**0**

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

In 2010, the highest age-specific giardiasis notification rates were in those aged 1 to 4 years (159.2 per 100 000 population, 395 cases) followed by the 30 to 39 years (79.0 per 100 000, 451 cases) and 5 to 9 years (64.5 per 100 000, 185 cases) age groups (Table 27). The hospitalisation rate was not defined for most age groups due to the small number of cases.

Table 27: Giardiasis cases by age group, 2010

Age group	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	27	42.4	3	-	
1 to 4	395	159.2	4	-	
5 to 9	185	64.5	1	-	
10 to 14	46	15.6	0	-	
15 to 19	35	10.9	1	-	
20 to 29	197	32.6	2	-	
30 to 39	451	79.0	4	-	
40 to 49	284	44.8	6	0.9	
50 to 59	172	31.7	6	1.1	
60 to 69	145	35.7	2	-	
70+	46	11.7	4	-	
Unknown	2		0		
Total	**1 985**	**45.4**	**33**	**0.8**	**0**

[a] MoH morbidity data for hospital admissions
[b] per 100 000 of population. Where fewer than five cases have been reported a rate has not been calculated.

4.8.3.5 Risk Factors reported

In 2010, the most commonly reported risk factors for notified giardiasis cases were contact with faecal matter (41.2%), contact with other symptomatic people (36.9%), and consumption of untreated water (35.0%) (Table 28).

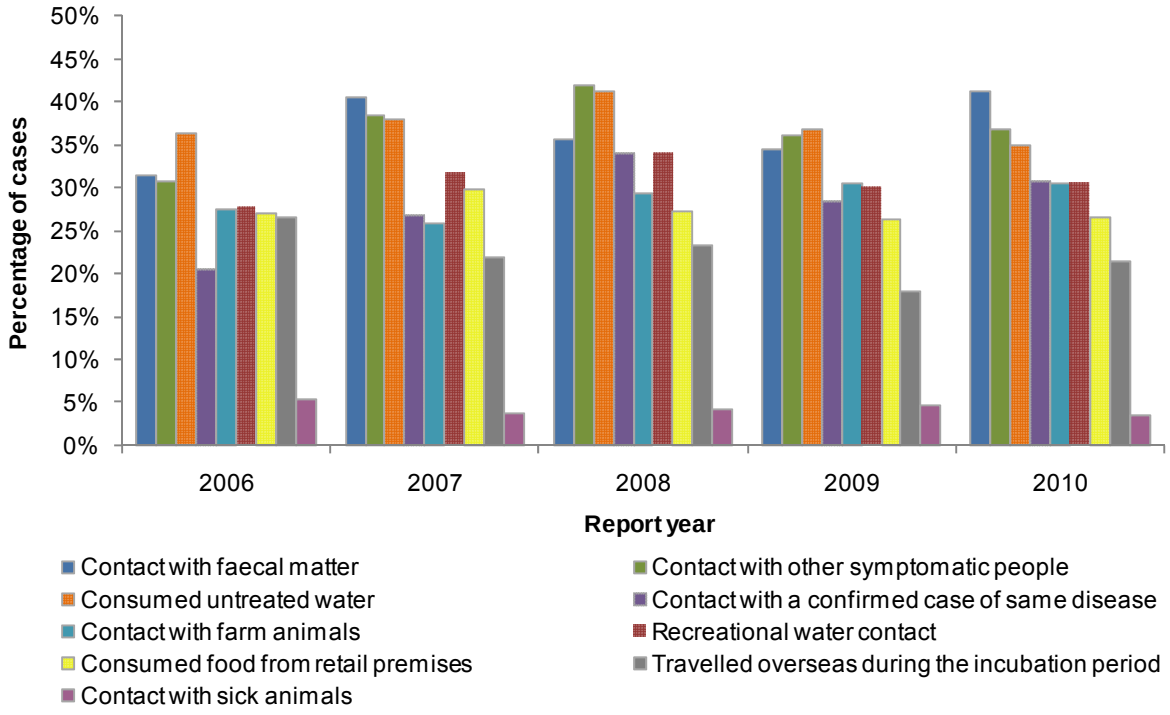
Table 28: Exposure to risk factors associated with giardiasis, 2010

Risk Factor	Notifications			
	Yes	No	Unknown	%[a]
Contact with faecal matter	248	354	1 383	41.2
Contact with other symptomatic people	244	418	1 323	36.9
Consumed untreated water	190	353	1 442	35.0
Contact with a confirmed case of same disease	207	467	1 311	30.7
Contact with farm animals	198	449	1 338	30.6
Recreational water contact	195	444	1 346	30.5
Consumed food from retail premises	151	416	1 418	26.6
Travelled overseas during the incubation period	163	600	1 222	21.4
Contact with sick animals	20	563	1 402	3.4

[1]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 2007 and 2010, the most commonly reported risk factors for giardiasis were consumption of untreated water, contact with faecal matter and contact with other symptomatic people (Figure 25).

Figure 25: Giardiasis risk factors by percentage of cases and year, 2007-2010



4.8.3.6 Estimate of travel-related cases

For cases where information on travel was provided, 21.4% (95%CI 18.5-24.4%) 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 2010. The resultant distribution has a mean of 424 cases (95% CI 350-504).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 21.7% (95% CI 20.2-23.4%). The proportion of travel-associated cases in 2010 was slightly greater than in 2009, but less than in 2008.

4.8.4 Outbreaks reported as caused by *Giardia* spp.

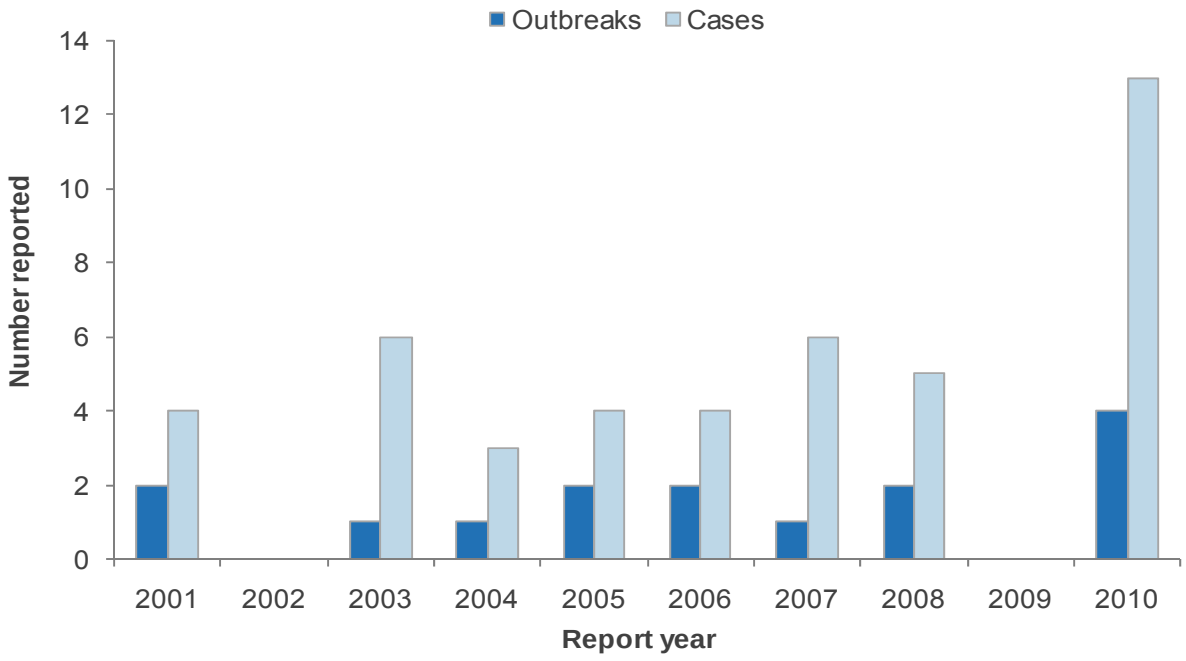
In 2010, there were 97 *Giardia* spp. outbreaks reported. Four of these were associated with a suspected or known foodborne source (Table 29).

Table 29: *Giardia* spp. outbreaks reported, 2010

Measure	Foodborne *Giardia* spp. outbreaks	All *Giardia* spp. outbreaks
Outbreaks	4	97
Cases	13	378
Hospitalised cases	0	3

Since 2001, one or two foodborne *Giardia* spp. outbreaks have been reported in EpiSurv each year, with the exception of 2002 and 2009 where no outbreaks were reported (Figure 26). These outbreaks involved small numbers of cases. In 2010, four outbreaks were reported involving 13 cases, which represented the greatest number of foodborne *Giardia* spp. outbreaks and associated cases in the period 2001-2010.

Figure 26: Foodborne *Giardia* spp. outbreaks and associated cases of reported by year, 2001–2010



4.8.4.1 Details of food-associated outbreaks

Table 18 contains details of the four food–associated *Giardia* spp. outbreaks reported in 2010.

Table 30: Details of food-associated *Giardia* spp. outbreaks, 2010

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill
South Canterbury (July)	Unknown	Restaurant/café, hotel/motel (overseas, South America)	5C, 1P
Auckland (September)	Unknown	Home, takeaways	1C, 1P
Waikato (November)	Unpasteurised milk	Farm, home	3C
Waikato (November)	Undercooked chicken wings	Other setting (overseas, Samoa)	2C

C = confirmed, P = probable

4.8.4.2 Laboratory investigation of samples from suspected foodborne outbreaks

In 2010, no food or clinical samples were submitted to ESR's Public Health Laboratory relating to food-associated *Giardia* spp. outbreaks.

4.8.5 Relevant New Zealand studies and publications

4.8.5.1 Journal papers

A description of the epidemiology of giardiasis in New Zealand concluded that the distribution of cases was consistent with largely human reservoirs, with a relatively small contribution from zoonotic sources in rural environments and a modest contribution from overseas travel (Snel *et al.*, 2009a; Snel *et al.*, 2009b).

4.8.6 Relevant regulatory developments

Nil.

4.9 Hepatitis A

Summary data for hepatitis A in 2010 are given in Table 31.

Table 31: Summary surveillance data for hepatitis A, 2010

Parameter	Value in 2010	Section reference
Number of cases	46	4.9.2
Rate (per 100,000)	1.1	4.9.2
Hospitalisations (%)	30 (65.2%)	4.9.2
Deaths (%)	0 (0%)	4.9.2
Estimated travel-related cases (%)	33 (71.4%)	4.9.3.6
Estimated food-related cases (%)	NA	

NA = not applicable, no information is available on the food attributable proportion of hepatitis A in New Zealand

4.9.1 Case definition

Clinical description: An illness with a discrete onset of symptoms (fever, malaise, anorexia, nausea, or abdominal discomfort) with jaundice and/or elevated serum aminotransferase levels

Laboratory test for diagnosis: Positive anti HAV IgM in serum

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 i.e., is part of an identified common source outbreak

Confirmed: A clinically compatible illness that is laboratory confirmed

4.9.2 Hepatitis A cases reported in 2010 by data source

During 2010, 46 notifications (1.1 cases per 100 000 population) of hepatitis A and no resulting deaths were reported in EpiSurv.

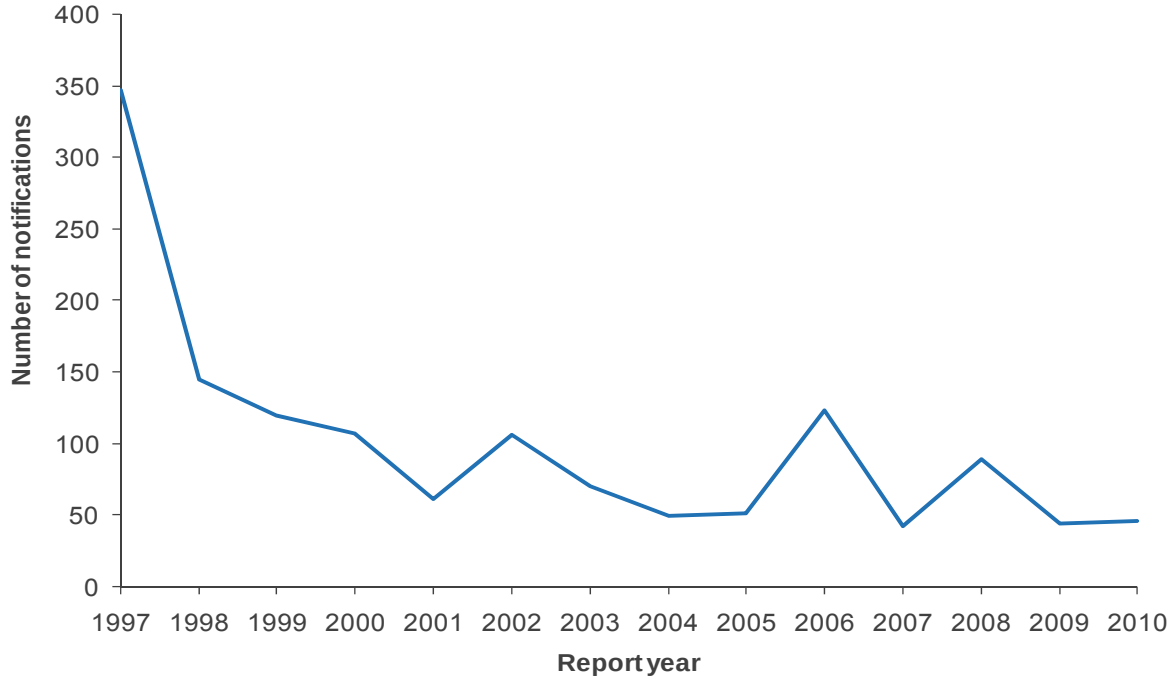
The ICD-10 code B15 was used to extract hepatitis A hospitalisation data from the MoH NMDS database. Of the 30 hospital admissions (0.7 admissions per 100 000 population) recorded in 2010, 20 were reported with hepatitis A as the primary diagnosis and 10 with hepatitis A as another relevant diagnosis.

4.9.3 Notifiable disease data

4.9.3.1 Annual notification trend

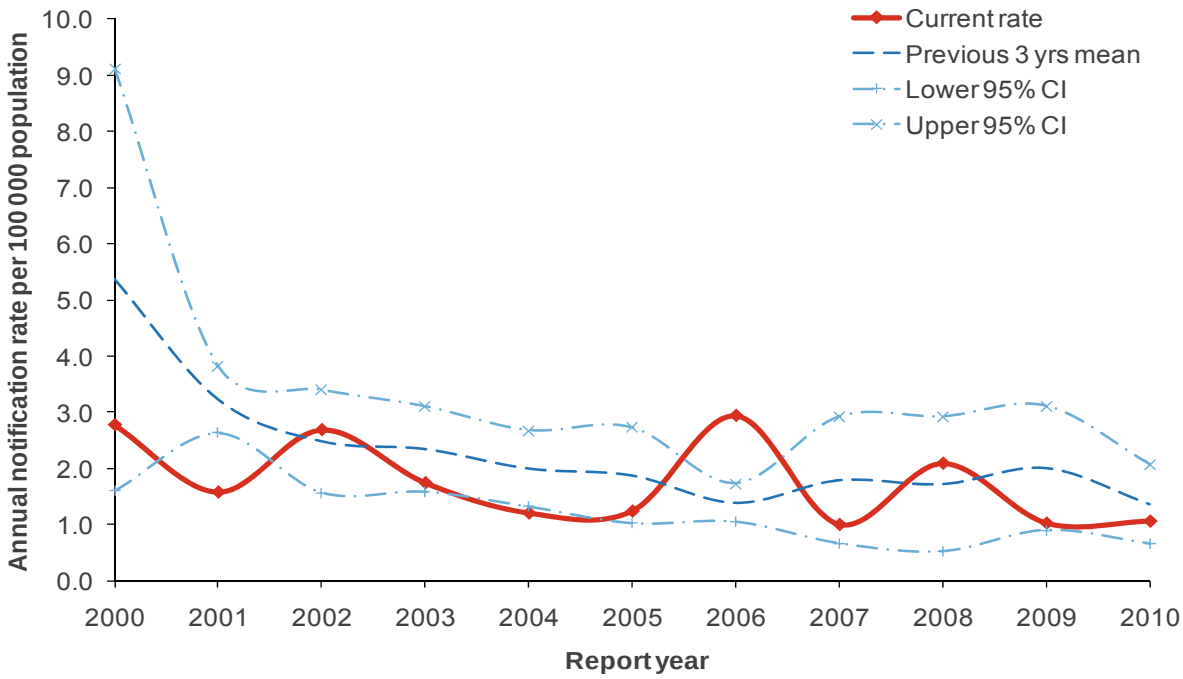
Between 1997 and 2010, there has been an overall downward trend in the number of notifications of hepatitis A, although an increase in notifications was observed in 2002, 2006 and 2008, corresponding to large numbers of hepatitis A cases associated with an outbreak in each of those years (Figure 27).

Figure 27: Hepatitis A notifications by year, 1997–2010



Hepatitis A notification rates varied throughout the ten-year period, 2000–2010 (Figure 28). The notification rate trend is very similar to the corresponding annual notification trend, showing peaks in 2002, 2006 and 2008. The highest hepatitis A notification rate was recorded in 2006 (2.9 per 100 000 population).

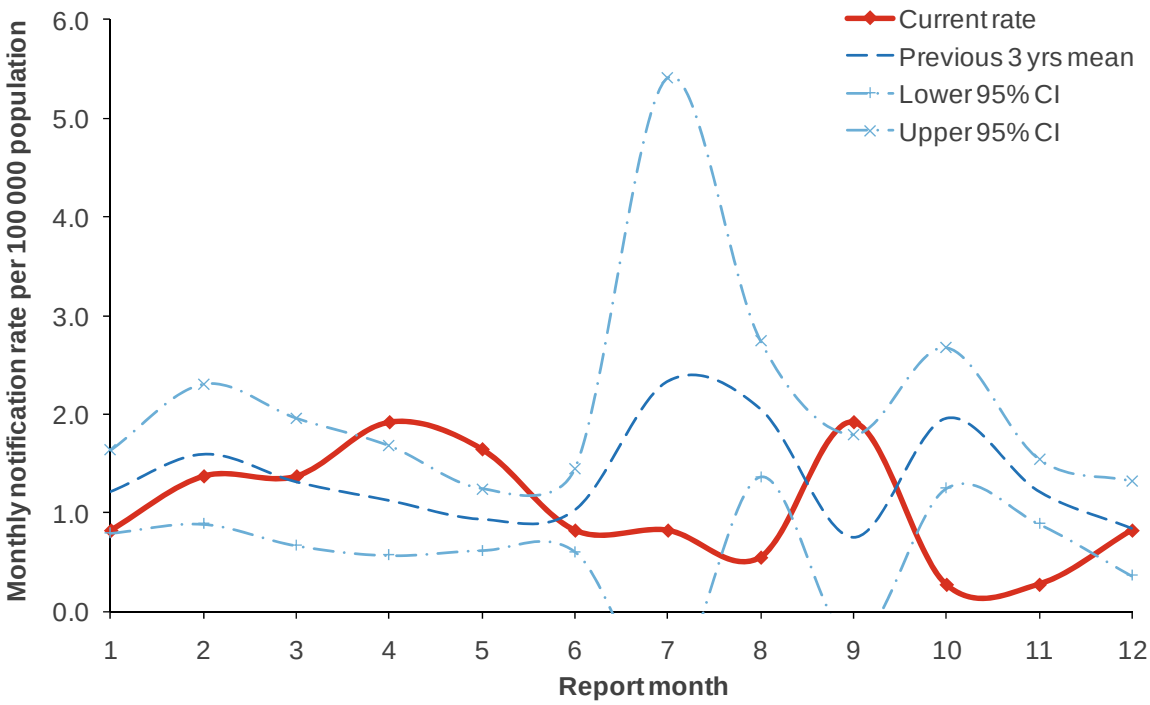
Figure 28: Hepatitis A notification rate by year, 2000–2010



4.9.3.2 Seasonality

There was no strong seasonal pattern in the population rate of hepatitis A notifications reported by month either historically or in 2010.

Figure 29: Hepatitis A monthly rate (annualised), 2010



4.9.3.3 Age and sex distribution of hepatitis A cases

In 2010, the hepatitis A notification and hospitalisation rates were similar for males and females (Table 32).

Table 32: Hepatitis A cases by sex, 2010

Sex	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
Male	23	1.1	16	0.7	
Female	23	1.0	14	0.6	
Unknown	0		0		
Total	**46**	**1.1**	**30**	**0.7**	**0**

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

The age-specific hepatitis A notification rate in 2010 was highest for the 15 to 19 years (2.2 per 100 000 population, 7 cases). The notification and hospitalisation rates were not defined for most age groups due to the small number of cases.

Table 33: Hepatitis A cases by age group, 2010

Age group	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	0	-	0	-	
1 to 4	0	-	0	-	
5 to 9	6	2.1	2	-	
10 to 14	4	-	0	-	
15 to 19	7	2.2	3	-	
20 to 29	12	2.0	5	0.8	
30 to 39	6	1.1	3	-	
40 to 49	6	0.9	4	-	
50 to 59	4	-	3	-	
60 to 69	1	-	1	-	
70+	0	-	9	2.3	
Unknown	0		0		
Total	**46**	**1.1**	**30**	**0.7**	**0**

[a] MoH morbidity data for hospital admissions
[b] per 100 000 of population. Where fewer than five cases have been reported a rate has not been calculated.

4.9.3.4 Risk Factors Reported

The most commonly reported risk factor for hepatitis A in 2010 was overseas travel during the incubation period (71.4%) (Table 34).

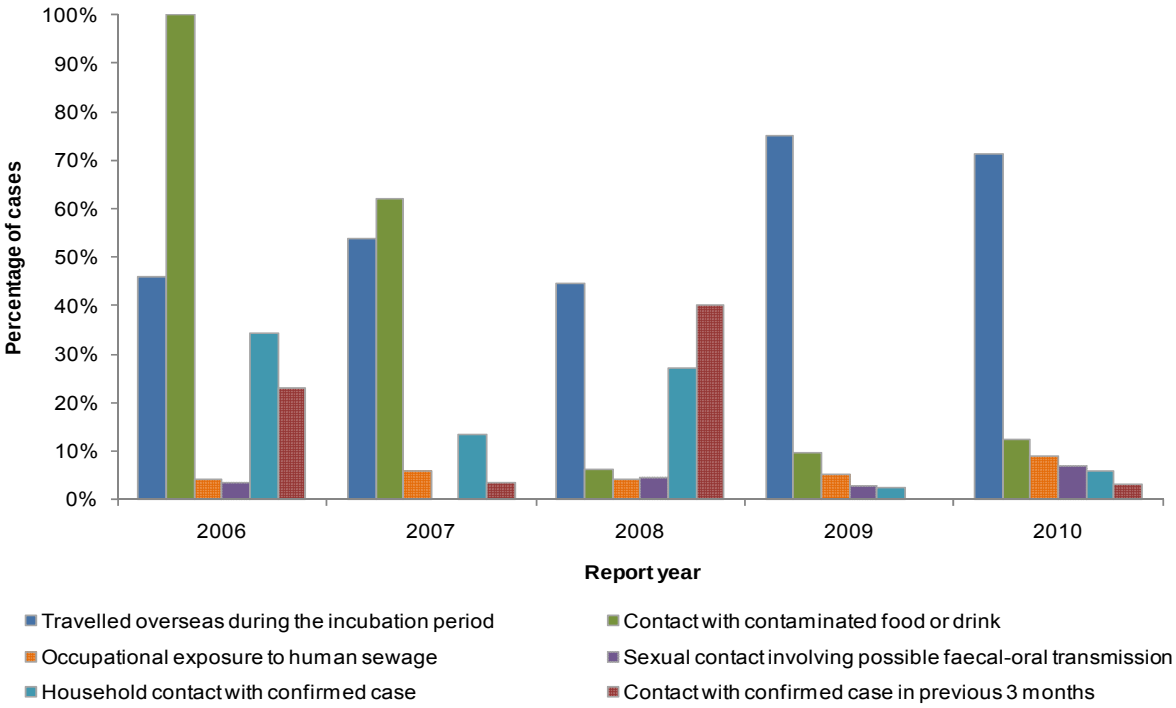
Table 34: Exposure to risk factors associated with hepatitis A, 2010

Risk Factor	Notifications			
	Yes	No	Unknown	%[a]
Travelled overseas during the incubation period	30	12	4	71.4
Contact with contaminated food or drink	2	14	30	12.5
Occupational exposure to human sewage	3	31	12	8.8
Sexual contact involving possible faecal-oral transmission	2	27	17	6.9
Household contact with confirmed case	2	33	11	5.7
Contact with confirmed case in previous 3 months	1	32	13	3.0

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

Between 2006 and 2007 the risk factors associated with hepatitis A cases generally occurred in the same order of importance with a high proportion of cases reporting contact with contaminated food or drink (Figure 30). Between 2008 and 2010, contact with contaminated food or drink was identified as a risk factor by only a small proportion of cases, instead overseas travel during the incubation period was the most frequently identified risk factor. Since 2006, 44.6% to 71.4% of cases each year have reported overseas travel during the incubation period of the disease.

Figure 30: Hepatitis A risk factors by percentage of cases and year, 2006–2010



4.9.3.5 Estimate of travel-related cases

For cases where information on travel was provided, 71.4% (95%CI 55.4-84.3%) had travelled overseas during the incubation period. Assuming that the cases for which travel information was provided were representative of all hepatitis A cases, a Poisson distribution can be used to estimate the total number of potentially travel related cases of hepatitis A in 2010. The resultant distribution has a mean of 33 cases (95% CI 18-51).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 59.2% (95% CI 52.2-66.0%).

4.9.4 Outbreaks reported as caused by hepatitis A virus

One foodborne hepatitis A virus outbreak was reported in 2010 (Table 35).

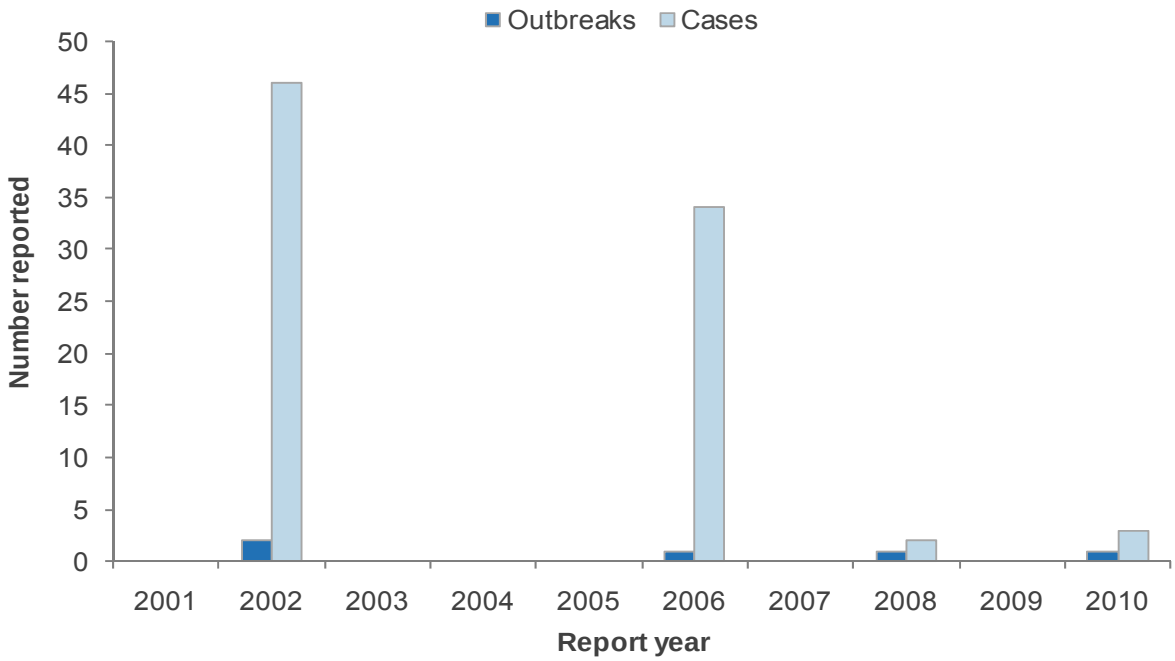
Table 35: Hepatitis A virus outbreaks reported, 2010

Measure	Foodborne hepatitis A virus outbreaks	All hepatitis A virus outbreaks
Outbreaks	1	1
Cases	3	3
Hospitalised cases	1	1

Foodborne hepatitis A virus outbreaks are rare with only four reported in the period 2001 to 2010 (2002, 2006, 2008 and 2010) (Figure 31). Although occurring infrequently, foodborne outbreaks of hepatitis A virus can be associated with many cases (46 cases and 34 cases respectively for

outbreaks reported in 2002 and 2006), although this was not so for the food-associated outbreak in 2008 and 2010 (2 cases and 3 cases respectively).

Figure 31: Foodborne hepatitis A virus outbreaks and associated cases reported by year, 2001–2010



4.9.4.1 Details of food-associated outbreaks

Table 36 contains details of the food-associated hepatitis A virus outbreak reported in 2010.

Table 36: Details of food-associated hepatitis A virus outbreak, 2010

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill
Otago (May)	Raw shellfish	Swim/spa, other setting (overseas, Vanuatu)	3C

C = confirmed, P = probable

4.9.4.2 Laboratory investigation of samples from suspected foodborne outbreaks

In 2010, no food or clinical samples were submitted to ESR's Public Health Laboratory relating to food-associated hepatitis A virus outbreaks.

4.9.5 Relevant New Zealand studies and publications

Nil.

4.9.6 Relevant regulatory developments

Nil.

4.10 Histamine (Scombroid) Fish Poisoning

4.10.1 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

4.10.2 Histamine (scombroid) fish poisoning cases reported in 2010 by data source

Two cases of histamine (scombroid) fish poisoning and no resulting deaths were reported in EpiSurv during 2010.

The ICD-10 code T61.1 was used to extract scombroid fish poisoning hospitalisation data from the MoH NMDS database. All three hospital admissions recorded in 2010 were reported with scombroid fish poisoning as the primary diagnosis. It should be noted that EpiSurv and the MoH NMDS database are separate systems and hospital admission can occur without cases being notified.

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

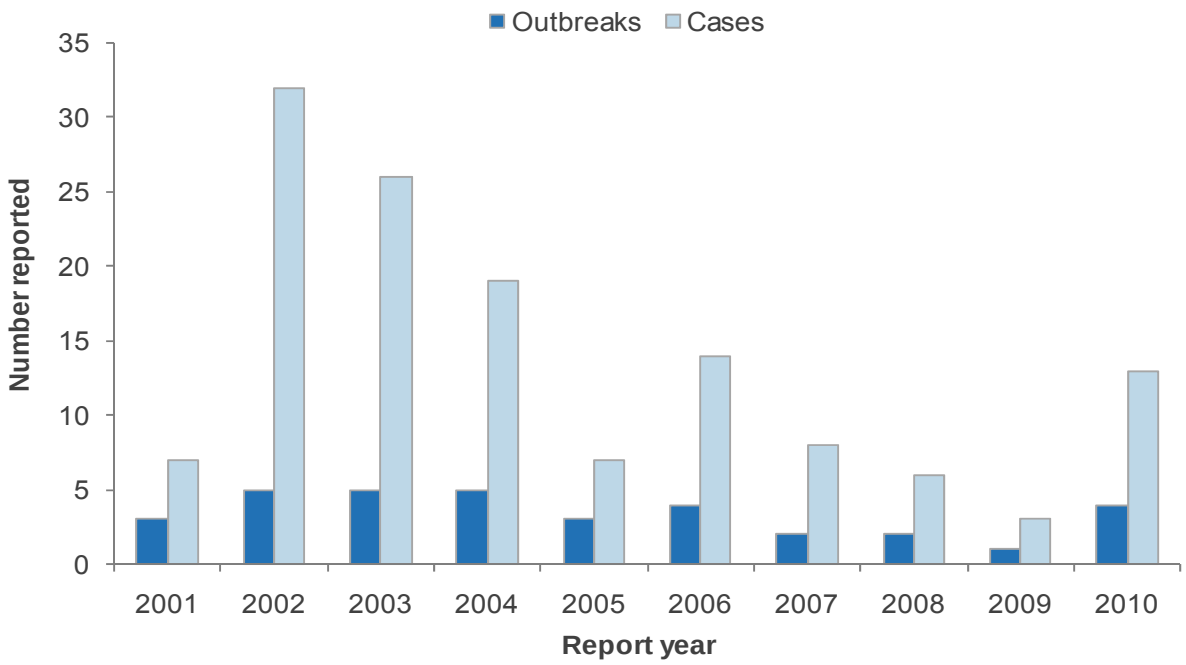
Four histamine (scombroid) fish poisoning outbreaks were reported in 2010 involving 13 associated cases, with no cases hospitalised (Table 34). All outbreaks reported foodborne transmission.

Table 37: Histamine (scombroid) fish poisoning outbreaks reported, 2010

Measure	Foodborne histamine fish poisoning outbreaks	All histamine fish poisoning outbreaks
Outbreaks	4	4
Cases	13	13
Hospitalised cases	0	0

Between 2001 and 2010 the number of foodborne histamine (scombroid) fish poisoning outbreaks reported each year has ranged from one to five (Figure 32). The highest number of outbreaks was reported between 2002 and 2004 (5 outbreaks reported each year) and the highest total number of associated cases was reported in 2002 (32 cases).

Figure 32: Histamine (scombroid) fish poisoning outbreaks and associated cases reported by year, 2001–2010



4.10.3.1 Details of food-associated outbreaks

Table 38 contains details of the four histamine fish poisoning outbreaks reported in 2010.

Table 38: Details of food-associated histamine (scombroid) fish poisoning outbreaks, 2010

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill
Auckland (March)	King fish	Restaurant/café	6P
Auckland (July)	Smoked king fish	Home, other food outlet, supermarket	3C
Auckland (October)	Tuna fish	Restaurant/café	2C
Auckland (December)	Smoked fish pie	Home, supermarket	2C

C = confirmed, P = probable

4.10.3.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Food Chemistry Laboratory in 2010, analyses were carried out on fish samples (smoked king fish, smoked orange roughy) from one foodborne outbreak (Auckland – July in Table 38). The histamine concentration in the smoked hapuka sample analysed was 2 195 mg/kg (220 mg/100 g). This is sufficiently high to cause histamine poisoning.

4.10.4 Relevant New Zealand studies and publications

Nil.

4.10.5 Relevant regulatory developments

Nil.

4.11 Listeriosis

Summary data for listeriosis in 2010 are given in Table 39.

Table 39: Summary surveillance data for listeriosis, 2010

Parameter	Value in 2010	Section reference
Number of cases	23	4.11.2
Rate (per 100 000)	0.5	4.11.2
Hospitalisations (%)	31 (134.8%)	4.11.2
Deaths (%)	7 (30.4%)	4.11.2
Estimated travel-related cases (%)	2 (6.7%)	4.11.3.4
Estimated food-related cases (%)*	18 (84.9%)	4.11.2

* For estimation of food-related cases it was assumed that the proportions derived from expert consultation would exclude travel-related cases

4.11.1 Case definition

Clinical description: An infection which produces several clinical syndromes including stillbirths, listeriosis of the newborn, meningitis, bacteraemia, or localised infections. Pregnant women, the immunosuppressed and the frail elderly are at greatest risk

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

Case classification:
Probable Not applicable
Confirmed A clinically compatible illness that is laboratory confirmed

4.11.2 Listeriosis cases reported in 2010 by data source

During 2010, 23 notifications (0.5 cases per 100 000 population) of listeriosis were reported in EpiSurv, of which six were perinatal. Twenty-two cultures of *L. monocytogenes* were received 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 31 hospital admissions (0.7 admissions per 100 000 population) recorded in 2010, 13 were reported with listeriosis as the primary diagnosis and 18 with listeriosis as another relevant diagnosis.

Three deaths resulting from non-perinatal listeriosis and four from perinatal listeriosis were recorded in EpiSurv in 2010.

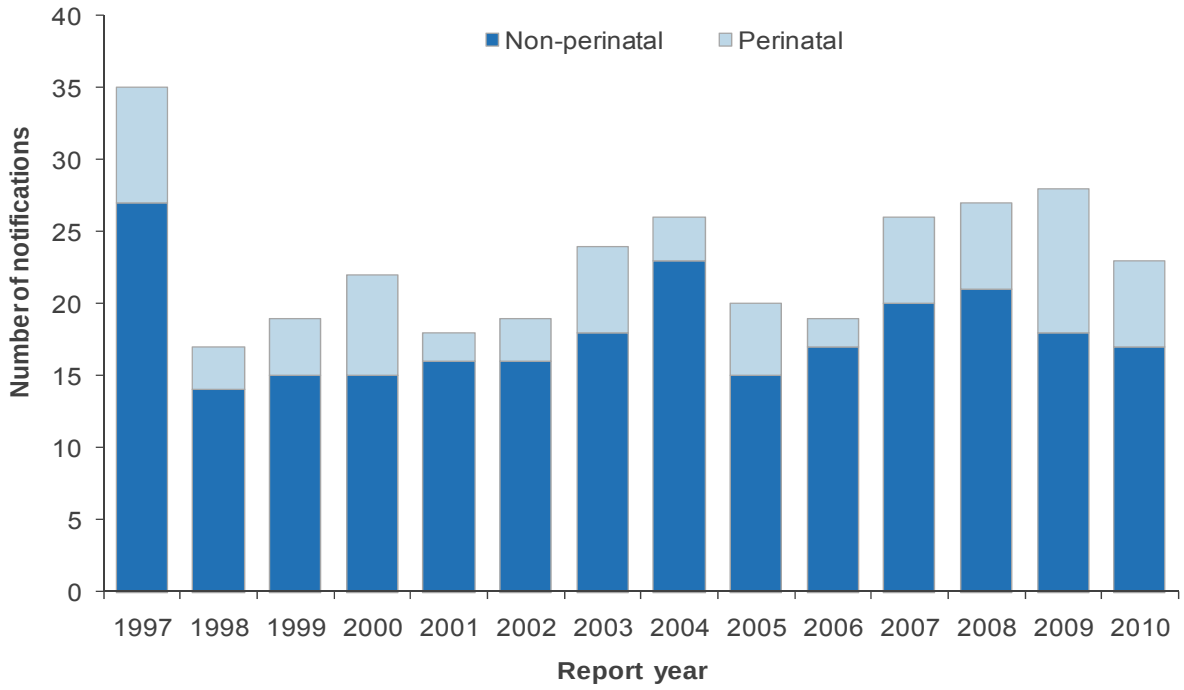
It has been estimated by expert consultation that 85% (minimum = 78%, maximum = 92%) of listeriosis incidence is due to foodborne transmission. It was further estimated that approximately 50% of foodborne transmission was due to consumption of ready-to-eat meats, while approximately 7% was due to ice cream consumption.

4.11.3 Notifiable disease data

4.11.3.1 Annual notification trend

Between 1997 and 2010, the total number of listeriosis notifications has generally fluctuated between 17 notifications (1998) and 28 notifications (2009), with the exception of 35 notifications reported in 1997 (Figure 33). Six of the 2010 notifications were reported as perinatal, similar to recent years.

Figure 33: Listeriosis non-perinatal and perinatal notifications by year, 1997–2010



4.11.3.2 Age and sex distribution of listeriosis cases

In 2010, the number and rate of notifications for listeriosis were higher for females (0.7 per 100 000 population, 15 cases) compared to males (0.4 per 100 000, 8 cases). The number and rate of hospitalisations were also higher for females than for males (Table 40).

Table 40: Listeriosis cases by sex, 2010

Sex	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv[b]
	No.	Rate[c]	No.	Rate[c]	No.
Male	8	0.4	13	0.6	1
Female	15	0.7	18	0.8	2
Total	23	0.5	31	0.7	3

[a] MoH morbidity data for hospital admissions
[b] Perinatal cases are recorded in terms of the mother's demography and perinatal deaths are not recorded in this table
[c] per 100 000 of population

In 2010, the age specific listeriosis notification and hospitalisation rates were highest in the 70+ years age group (Table 41). The notification and hospitalisation rates were not defined for all other age groups due to the small number of cases.

Table 41: Listeriosis cases by age group, 2010

Age group	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv[b]
	No.	Rate[c]	No.	Rate[c]	No.
<1	1	-	4	-	
1 to 4	1	-	3	-	
5 to 9	0	-	0	-	
10 to 14	0	-	0	-	
15 to 19	0	-	0	-	
20 to 29	3	-	2	-	
30 to 39	2	-	2	-	
40 to 49	1	-	1	-	
50 to 59	2	-	3	-	
60 to 69	5	1.2	4	-	
70+	8	2.0	12	3.1	3
Total	**23**	**0.5**	**31**	**0.7**	**3**

[a] MoH morbidity data for hospital admissions
[b] Perinatal cases are recorded in terms of the mother's demography and perinatal deaths are not recorded in this table
[c] per 100 000 of population. Where fewer than five cases have been reported a rate has not been calculated.

4.11.3.3 Risk Factors Reported

During 2010, the most common risk factors reported for non-perinatal listeriosis cases were an underlying illness (68.8%) and receiving immunosuppressive drugs (52.9%) (Table 42).

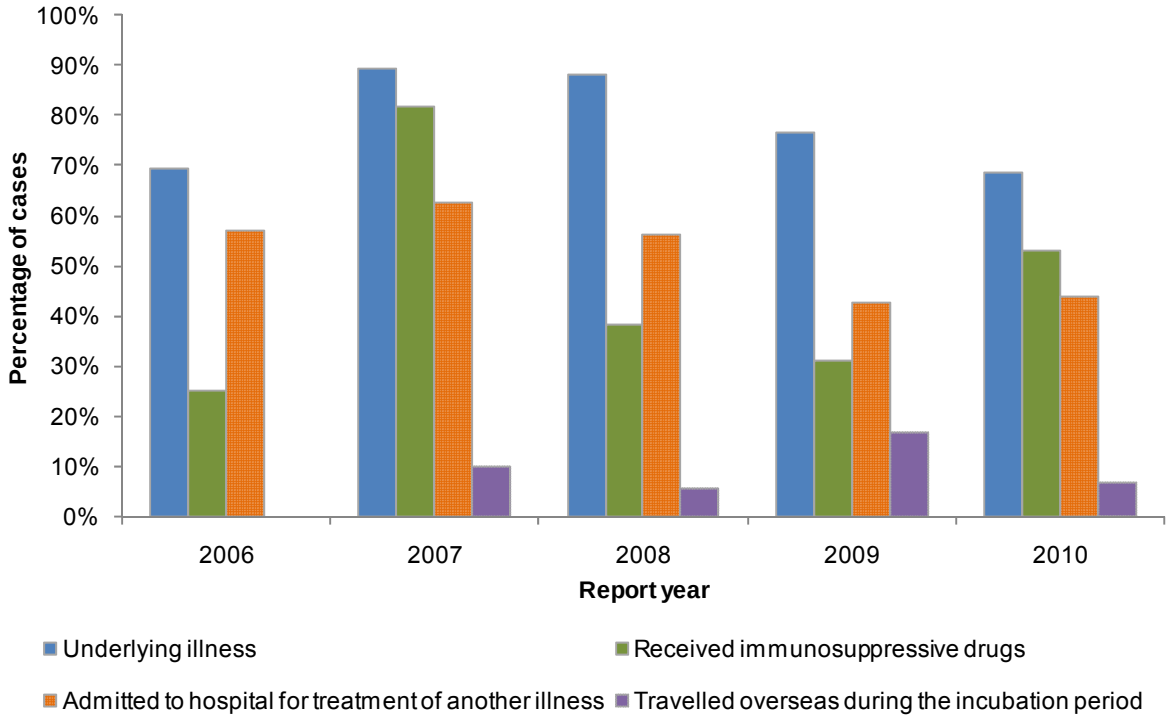
Table 42: Exposure to risk factors associated with listeriosis-non perinatal, 2010

Risk Factor	Notifications			
	Yes	No	Unknown	%[a]
Underlying illness	11	5	1	68.8
Received immunosuppressive drugs	9	8	0	52.9
Admitted to hospital for treatment of another illness	7	9	1	43.8
Travelled overseas during the incubation period	1	14	2	6.7

[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. Perinatal cases are excluded from this analysis.

Between 2006 and 2010 the risk factor most commonly associated with listeriosis cases has been an underlying illness (Figure 34).

Figure 34: Listeriosis risk factors by percentage of cases and year, 2006–2010



4.11.3.4 Estimate of travel-related cases

For cases where information on travel was provided, 6.7% (95%CI 0.2-32.0%) had travelled overseas during the incubation period. Assuming that the cases for which travel information was provided were representative of all listeriosis cases, a Poisson distribution can be used to estimate the total number of potentially travel related cases of listeriosis in 2010. The resultant distribution has a mean of 2 cases (95% CI 0-7).

4.11.4 Outbreaks reported as caused by *Listeria* spp.

No *Listeria* spp. outbreaks were reported in 2010.

The outbreak reported in 2009 is the only *Listeria* spp. outbreak to be reported for the period 2001 to 2010.

4.11.4.1 Laboratory investigation of samples from suspected foodborne outbreaks

No *Listeria* spp. outbreaks were reported in 2010.

4.11.5 *Listeria monocytogenes* types commonly reported

A total of 22 human *L. monocytogenes* isolates were confirmed and reported by ESR's Special Bacteriology Laboratory during 2010.

Table 43 shows the number of isolates of *L. monocytogenes* types reported by the Special Bacteriology Laboratory at ESR in the period 2007-2010.

Table 43: *L. monocytogenes* subtypes of laboratory-reported listeriosis, 2007–2010

Serotype	Number of isolates (%)			
	2007	2008	2009	2010
4	16 (61.5)	16 (69.6)	25 (86.2)	16 (72.7%)
1/2	10 (38.5)	7 (30.4)	4 (13.8)	6 (27.3%)
Total	**26**	**23**	**29**	**22**

4.11.6 Recent Surveys

Nil.

4.11.7 Relevant New Zealand studies and publications

Nil.

4.11.8 Relevant regulatory developments

In May 2010, a new and updated standard to monitor *L. monocytogenes* in ready-to-eat seafood replaced *Listeria* Circular 1995 (IAIS003.9). The standard was further amended in August 2010[3]. The *Listeria* Monitoring Programme for Ready-to-Eat Seafood contains separate sampling protocols for long shelf-life and short shelf-life products.

4.12 Norovirus Infection

4.12.1 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

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 i.e., is part of an identified common source outbreak

Confirmed: A clinically compatible illness that is laboratory confirmed

4.12.2 Norovirus infection cases reported in 2010 by data source

During 2010, 78 notifications (1.8 cases per 100 000 population) of norovirus and no resulting 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.

[3] http://www.foodsafety.govt.nz/elibrary/industry/iais-003-operations-3/listeria-monitoring-programme-for-ready-to-eat-seafood.pdf

The ICD-10 code A08.1 was used to extract norovirus infection hospitalisation data from the MoH NMDS database. Of the 159 hospital admissions (3.6 admissions per 100 000 population) recorded in 2010, 36 were reported with norovirus infection as the primary diagnosis and 123 with norovirus infection as another relevant diagnosis.

An expert consultation estimated that 40% of norovirus infections were due to foodborne transmission and of these 40% were due to consumption of molluscan shellfish.

4.12.3 Outbreaks reported as caused by norovirus

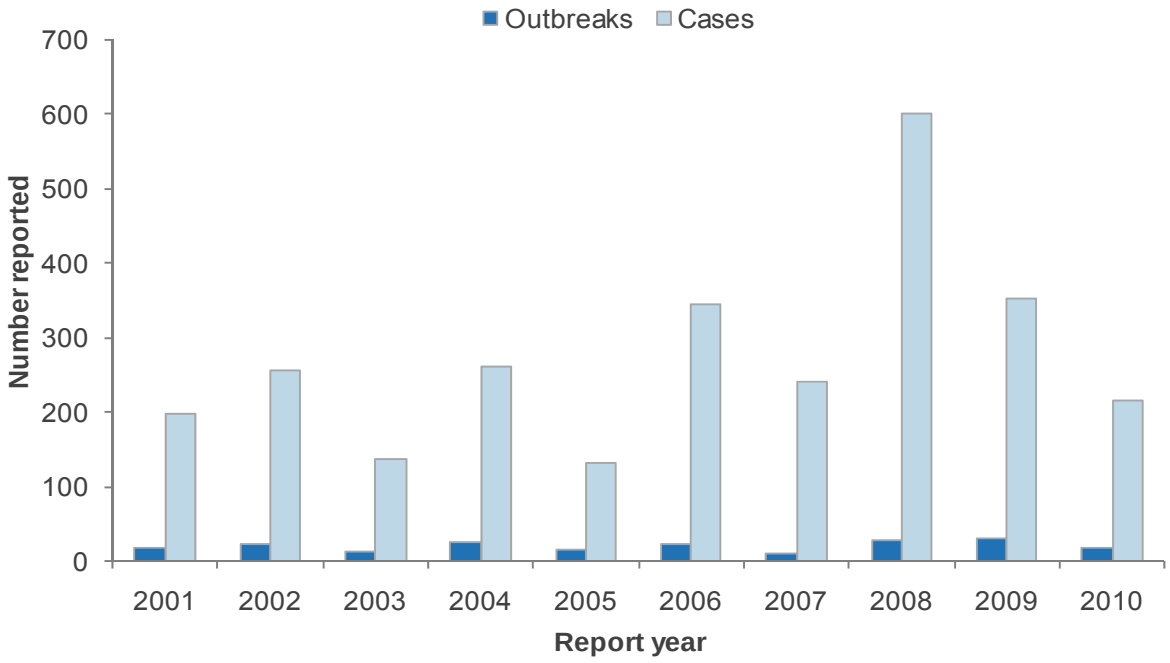
During 2010, there were 152 norovirus outbreaks reported in EpiSurv and of these 19 were associated with a suspected or known foodborne source (Table 44). In total, 215 cases were associated with these foodborne outbreaks.

Table 44: Norovirus outbreaks reported, 2010

Measure	Foodborne norovirus outbreaks	All norovirus outbreaks
Outbreaks	19	152
Cases	215	3 223
Hospitalised cases	0	30

The number of foodborne outbreaks in 2009 was greater than in any of the prior eight years and the number of associated cases was the second highest reported (Figure 35). This decreased to 19 outbreaks (215 cases) in 2010. Between 2001 and 2010 the number of foodborne norovirus outbreaks reported each year ranged from 10 (2007) to 30 (2009). The total number of cases associated with these outbreaks each year ranged from 131 (in 2005) to 602 cases (in 2008).

Figure 35: Foodborne norovirus outbreaks and associated cases reported by year, 2001–2010



4.12.3.1 Details of food-associated outbreaks

Table 45 contains details of the 19 food–associated norovirus outbreaks reported in 2010.

Table 45: Details of food-associated norovirus outbreaks, 2010

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill
Wellington (February)	Prawn cutlets	Marae, tangi	28C
Auckland (March)	Unknown	Home, takeaways	2C, 3P
Auckland (May)	Ham sandwiches	Community, home	7C, 28P
Auckland (June)	Unknown	Home, restaurant/café	2C
Wanganui (July)	Oysters	Restaurant/café	1C, 14P
Auckland (July)	Unknown	Restaurant/café	2C
Manawatu (August)	Unknown	Caterers, workplace	2C, 4P
Auckland (August)	Unknown	Takeaways	1C, 1P
Auckland (September)	Unknown	Restaurant/café	11C, 4P
Auckland (September)	Unknown	Caterers, workplace	6C, 12P
Auckland (September)	Unknown	Caterers	1C, 6P
Auckland (September)	Unknown	Caterers	4C, 21P
Auckland (September)	Unknown	Takeaways	1C, 1P
Auckland (October)	Unknown	Restaurant/café	1C, 6P
Auckland (October)	Unknown	Restaurant/café	3C, 1P
Auckland (November)	Unknown	Restaurant/café	2C
Northland (December)	Unknown	Hotel/motel	28P
Wellington (December)	Unknown	Restaurant/café	2C, 1P
Wellington (December)	Crab surimi, shrimp	Restaurant/café	9C

C = confirmed, P = probable

4.12.3.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratory in 2010, samples were received relating to 17/19 food-associated norovirus outbreaks identified in Table 45. Norovirus was detected in faecal samples from 16/17 foodborne outbreaks. Food samples were submitted for eight of these outbreaks. Norovirus (GI and GII) was detected in oysters samples associated with one outbreak (Wanganui – July in Table 45). Sapovirus was also detected in these oysters. Both norovirus and sapovirus were detected in associated faecal samples.

4.12.4 Relevant New Zealand studies and publications

4.12.4.1 Journal papers

A paper was published reviewing current testing methodology for norovirus in New Zealand, characteristics of shellfish-related norovirus outbreaks and current risk management measures (Greening and McCoubrey, 2010).

4.12.5 Relevant regulatory developments

Nil.

4.13 Salmonellosis

Summary data for salmonellosis in 2010 are given in Table 46.

Table 46: Summary surveillance data for salmonellosis, 2010

Parameter	Value in 2010	Section reference
Number of cases	1 146	4.13.2
Rate (per 100,000)	26.2	4.13.2
Hospitalisations (%)	169	4.13.2
Deaths (%)	0 (0%)	4.13.2
Estimated travel-related cases (%)	229 (20.0%)	4.13.3.6
Estimated food-related cases (%)*	557 (60.7%)	4.13.2

* For estimation of food-related cases it was assumed that the proportions derived from expert consultation would exclude travel-related cases

4.13.1 Case definition

Clinical description: Salmonellosis presents as gastroenteritis. Asymptomatic infections may occur

Laboratory test for diagnosis: Isolation of *Salmonella* species (excluding *S.* Typhi) 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 i.e., is part of an identified common source outbreak

Confirmed: A clinically compatible illness that is laboratory confirmed

4.13.2 Salmonellosis cases reported in 2010 by data source

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

During 2010, 1 146 notifications (26.2 cases per 100 000 population) of salmonellosis and no resulting deaths were reported in EpiSurv. The Enteric Reference Laboratory at ESR reported 1 144 cases infected with non-typhoidal *Salmonella* (26.2 cases per 100 000).

The ICD-10 code A02.0 was used to extract salmonellosis hospitalisation data from the MoH NMDS database. Of the 169 hospital admissions (3.9 admissions per 100 000 population) recorded in 2010, 120 were reported with salmonellosis as the primary diagnosis and 49 with salmonellosis as another relevant diagnosis.

It has been estimated by expert consultation that 61% (minimum = 45%, maximum = 69%) of salmonellosis incidence is due to foodborne transmission. It was further estimated that 36% of foodborne transmission was due to transmission via poultry.

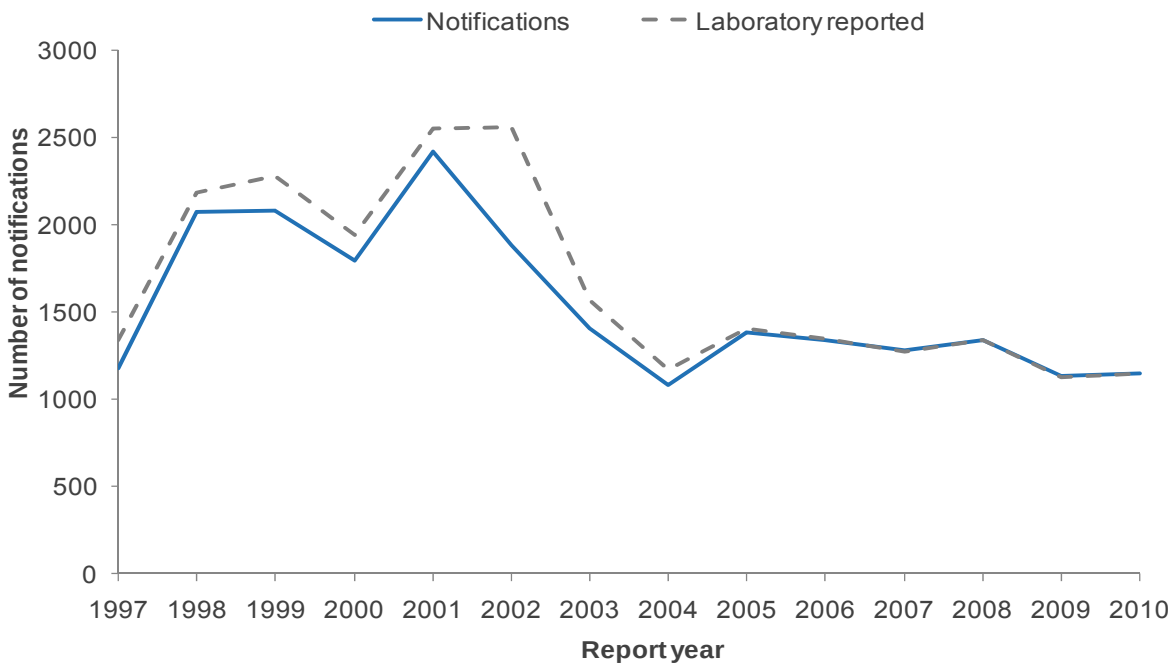
4.13.3 Notifiable disease data

4.13.3.1 Annual notification trend

From 1997 to 2001 there was a general annual increase in the number of salmonellosis notifications with the highest number reported in 2001 (2 417 cases) (Figure 36). After 2001 the number of notifications decreased to a low in 2004 (1 081 cases), and has remained stable at 1 128 to 1 382 notifications per year since.

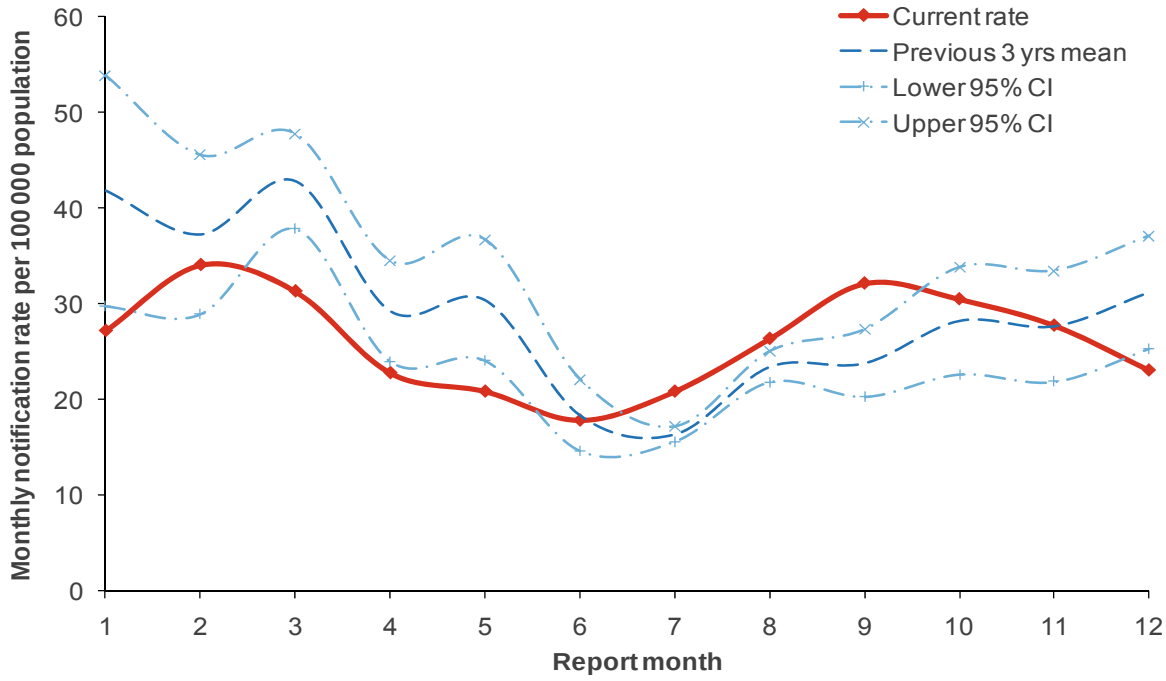
Integration of notification and laboratory data at ESR has reduced the differences between the number of notifications and laboratory reported cases seen prior to 2005.

Figure 36: Salmonellosis notifications and laboratory reported cases by year, 1997–2010



Between 2000 and 2010, the salmonellosis annual notification rate was highest in 2001 before decreasing from 2002 to 2004 and stabilising after that (Figure 37).

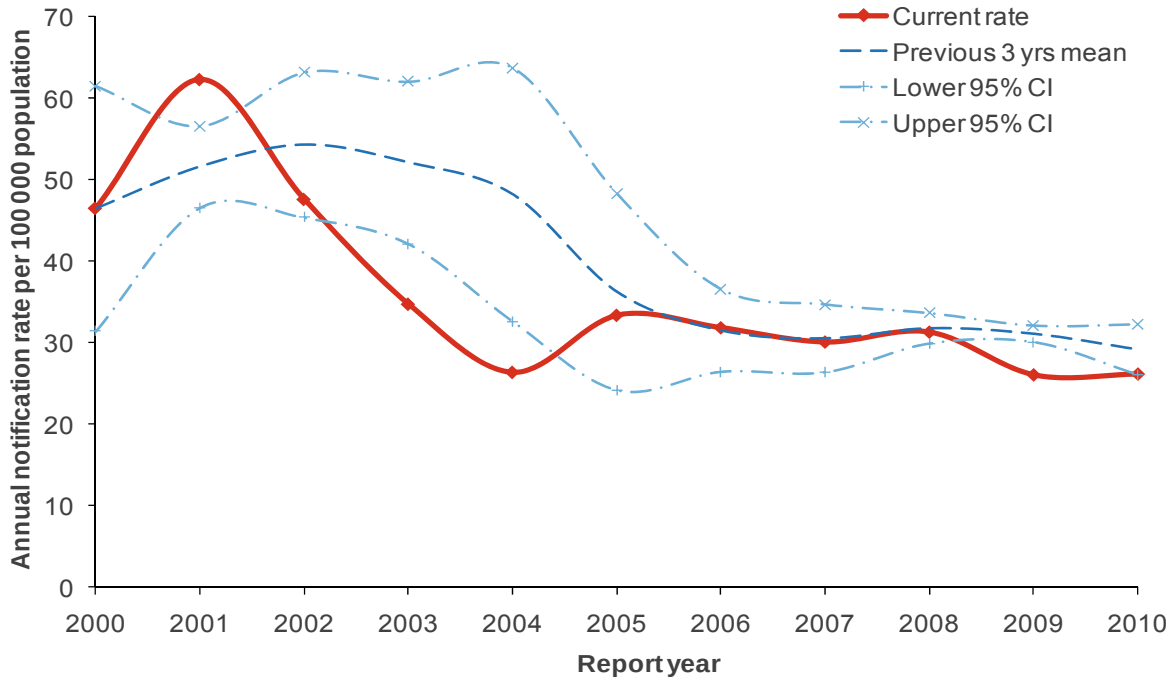
Figure 37: Salmonellosis notification rate by year, 2000–2010



4.13.3.2 Seasonality

In 2010, salmonellosis notifications per 100 000 population reported by month showed peaks in February and September and low rates in early winter and early summer, differing from the usual seasonal trend of a summer peak and winter trough (Figure 38).

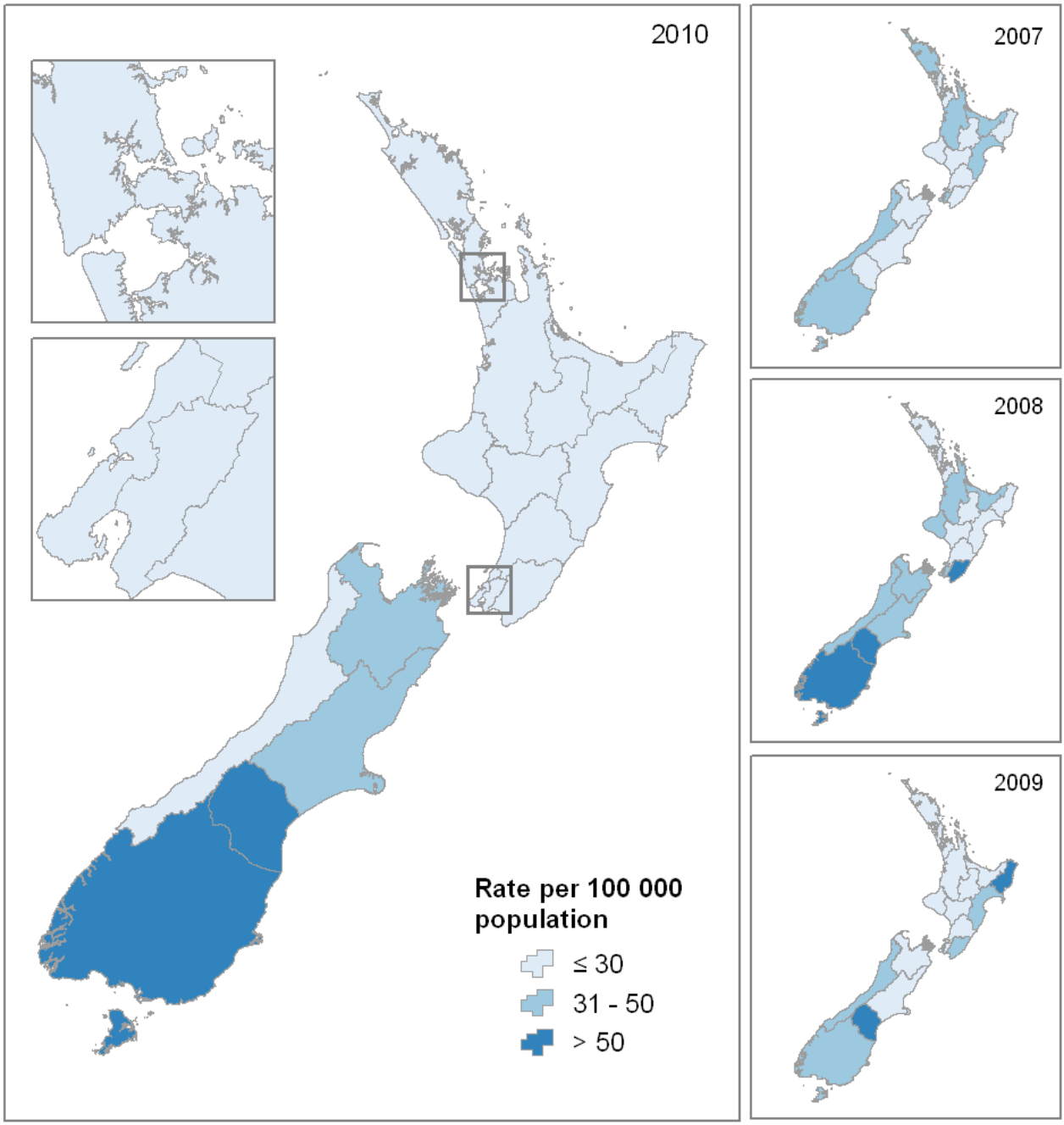
Figure 38: Salmonellosis notification monthly rate (annualised), 2010



4.13.3.3 Geographic distribution of salmonellosis notifications

Rates of salmonellosis varied throughout the country as illustrated in Figure 39. The highest salmonellosis notification rate in 2010 was reported in South Canterbury DHB (66.2 per 100 000 population, 37 cases), followed by Southern DHB (64.0 per 100 000, 194 cases). South Canterbury DHB featured in the highest quantile of salmonellosis notification rates between 2008 and 2010.

Figure 39: Geographic distribution of salmonellosis notifications, 2007–2010



4.13.3.4 Age and sex distribution of salmonellosis cases

In 2010, the numbers and rates of notifications for salmonellosis were similar for males and females. Number and rates of hospitalisations for females were higher compared to males (Table 47).

Table 47: Salmonellosis cases by sex, 2010

Sex	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
Male	561	26.2	70	3.3	
Female	577	26.0	99	4.5	
Unknown	8		0		
Total	**1 146**	**26.2**	**169**	**3.9**	**0**

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

In 2010, age-specific salmonellosis rates were highest for those aged less than 1 year for both the notifications (87.9 per 100 000 population, 56 cases) and hospitalisations (14.1 per 100 000 population, 9 admissions) (Table 48). Those in the 1 to 4 years age group also reported high salmonellosis notification rates compared to other age groups.

Table 48: Salmonellosis cases by age group, 2010

Age group	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	56	87.9	9	14.1	
1 to 4	216	87.1	19	7.7	
5 to 9	76	26.5	13	4.5	
10 to 14	48	16.2	2	0.7	
15 to 19	62	19.2	7	2.2	
20 to 29	155	25.7	12	2.0	
30 to 39	133	23.3	13	2.3	
40 to 49	127	20.0	16	2.5	
50 to 59	111	20.4	17	3.1	
60 to 69	79	19.4	16	3.9	
70+	81	20.6	45	11.5	
Unknown	2		0		
Total	**1 146**	**26.2**	**169**	**3.9**	**0**

[a] MoH morbidity data for hospital admissions
[b] per 100 000 of population. Where fewer than five cases have been reported a rate has not been calculated.

4.13.3.5 Risk factors reported

The most commonly reported risk factors for salmonellosis cases notified during 2010 were contact with farm animals (38.4%), consumption of food from retail premises (37.6%), and consumption of untreated water (23.3%) (Table 49).

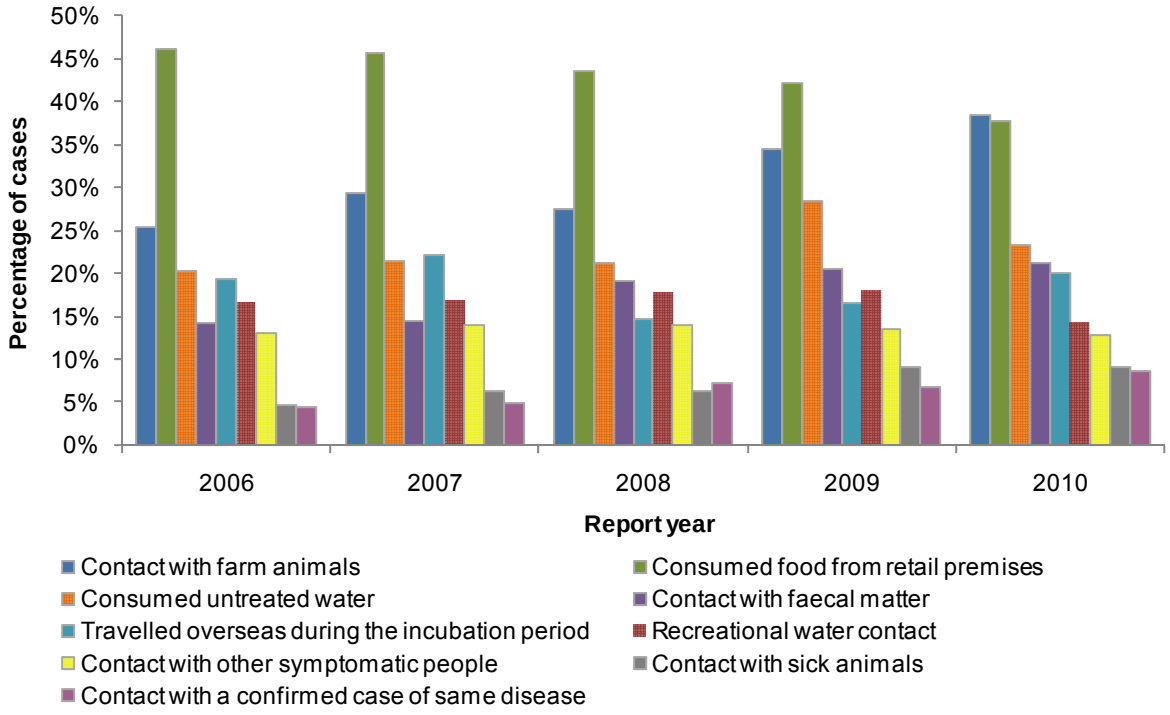
Table 49: Exposure to risk factors associated with salmonellosis, 2010

Risk Factor	Notifications			
	Yes	No	Unknown	%[a]
Contact with farm animals	223	358	565	38.4
Consumed food from retail premises	213	353	580	37.6
Consumed untreated water	113	373	660	23.3
Contact with faecal matter	108	403	635	21.1
Travelled overseas during the incubation period	131	524	491	20.0
Recreational water contact	79	475	592	14.3
Contact with other symptomatic people	71	479	596	12.9
Contact with sick animals	48	477	621	9.1

[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 2006 and 2010 the risk factors associated with salmonellosis, except contact with farm animals, have generally occurred in the same order of importance and to the same magnitude on a yearly basis (Figure 40). The most commonly reported risk factors for salmonellosis cases every year were contact with farm animals and consumption of food from retail premises.

Figure 40: Salmonellosis risk factors by percentage of cases and year, 2006–2010



4.13.3.6 Estimate of travel-related cases

For cases where information on travel was provided, 20.0% (95%CI 17.0-23.3%) 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 2010. The resultant distribution has a mean of 229 cases (95% CI 189-272).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 18.4% (95% CI 17.0-19.9%).

4.13.4 Outbreaks reported as caused by *Salmonella* spp.

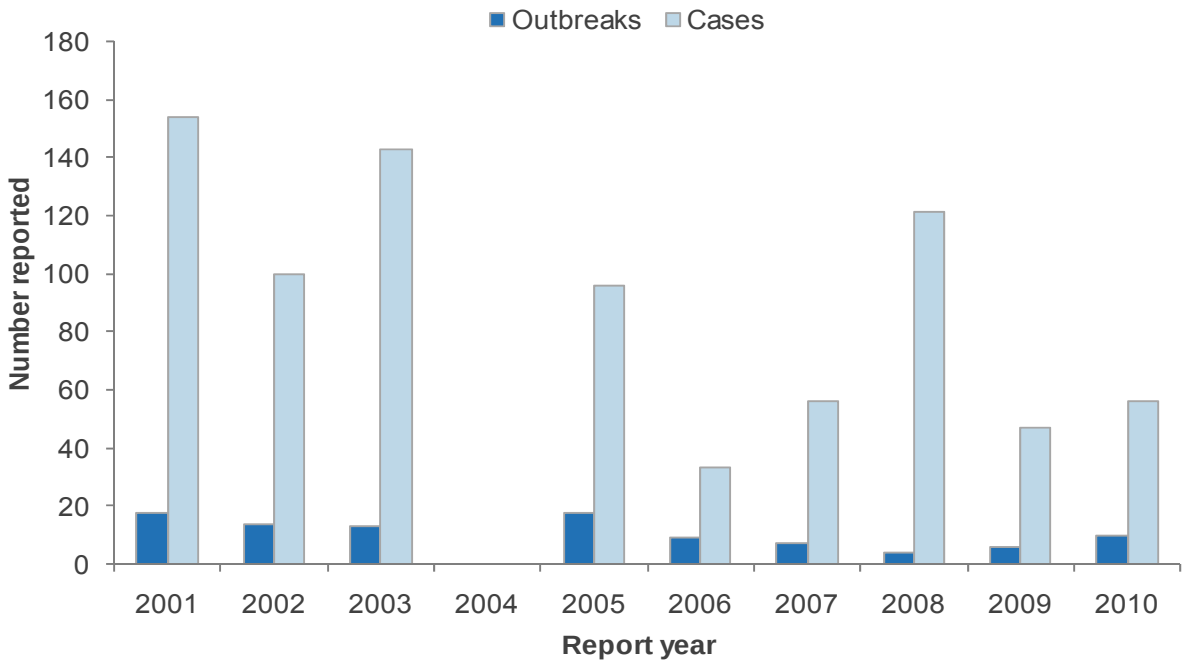
In 2010, there were 23 *Salmonella* spp. outbreaks reported and 10 of these were reported to be foodborne (Table 50). Six of the nine hospitalisations due to *Salmonella* spp. were associated with foodborne outbreaks.

Table 50: *Salmonella* spp. foodborne outbreaks reported, 2010

Measure	Foodborne *Salmonella* spp. outbreaks	All *Salmonella* spp. outbreaks
Outbreaks	10	23
Cases	56	100
Hospitalised cases	6	9

The number of foodborne outbreaks associated with *Salmonella* spp. reported between 2001 and 2010 ranged from zero (2004) to 18 (2001), generally decreasing in number over time (Figure 41). The total number of cases associated with the outbreaks has also generally decreased over the period, although 2008 had the highest number of cases since 2003.

Figure 41: Foodborne *Salmonella* spp. outbreaks and associated cases reported by year, 2001–2010



4.13.4.1 Details of food-associated outbreaks

Table 51 contains details of the 10 food–associated *Salmonella* spp. outbreaks reported in 2010.

Table 51: Details of food-associated *Salmonella* spp. outbreaks, 2010

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill
Gisborne (January)	Unknown	Home, hotel/motel	5C
Auckland (February)	Pizza	Restaurant/café, home	1C, 6P
Auckland (February)	Unknown	Bakery	4C
Taranaki (May)	Untreated water	Farm, home	2C, 1P
Auckland (June)	Unknown	Home	1C, 2P
Auckland (July)	Milk shake	Home, other setting	1C, 3P
South Canterbury (September)	Chocolate mousse cake - uncooked egg whites	Restaurant/café	10C, 11P
Wanganui (October)	Unpasteurised milk	Farm	2C
Otago (November)	Spanish cream - uncooked eggs	Home	4C
Waikato (December)	Chicken curry	Restaurant/café (overseas, Tonga)	3C

C = confirmed, P = probable

4.13.4.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratory in 2010, samples were submitted relating to two of the foodborne *Salmonella* spp. outbreaks identified in Table 51. For one outbreak, faecal samples were submitted, while food samples (cheese, water) were submitted for the other outbreak. *Salmonella* spp. were not detected in any of the submitted samples.

4.13.5 *Salmonella* types commonly reported

4.13.5.1 Human isolates

A total of 1 144 cases infected with non-typhoidal *Salmonella* were reported by the ESR Enteric Reference Laboratory during 2010. Of these cases, 594 (51.9%) were *Salmonella* Typhimurium.

Table 52 shows the number of isolates of selected *Salmonella* types reported by the Enteric Reference Laboratory at ESR. The incidence of all *S.* Typhimurium definitive types (DT) varied between 2007 and 2010. DT160 remained the most common single type. However, the number of isolates of this type continues to decrease. The number of cases due to *S.* Typhimurium DT1 decreased markedly between 2009 and 2010, while cases of *S.* Typhimurium RDNC-May06 increased markedly during the same period.

Table 52: Selected *Salmonella* serotypes and subtypes of laboratory-reported salmonellosis, 2007-2010

Subtype	2007	2008	2009	2010
S. Typhimurium	596	729	661	594
DT160	152	135	106	107
DT101	43	72	56	70
DT1	91	72	94	36
DT156	73	67	54	35
DT42	15	93	40	26
RDNC-May06	51	55	43	85
Other or unknown	171	235	268	235
S. Enteritidis	151	124	95	113
DT9a	60	45	39	49
DT1b	18	19	4	5
DT26	17	10	2	1
Other or unknown	56	50	50	58
S. Infantis	86	86	71	54
S. Brandenburg	47	33	36	47
S. Saintpaul	25	35	26	34
S. Virchow	34	14	12	16
S. Agona	13	10	10	12
S. Mississippi	11	10	14	9
Other or unknown serotypes	304	298	197	265
Total	**1 267**	**1 339**	**1 122**	**1 144**

4.13.5.2 Non-human isolates

A total of 1 220 non-human *Salmonella* isolates were typed by the Enteric Reference Laboratory during 2010 (Table 53).

Table 53: Selected *Salmonella* serotypes and subtypes from non-human sources, 2007-2010

Subtype	2007	2008	2009	2010	Major Sources, 2010
S. Typhimurium	333	727	388	574	
DT101	73	146	48	88	Bovine (74)
DT12a	8	39	32	84	Bovine (66)
RDNC	52	104	67	80	Bovine (40), Poultry environmental (10), Feline (10)
DT1	36	63	42	57	Bovine (46)
DT9	11	34	32	45	Bovine (27), Ovine (13)
DT156	24	55	31	33	Bovine (30)
DT160	30	47	26	23	Bovine (10)
Other or unknown	99	239	110	164	
S. Brandenburg	191	92	137	238	Ovine (94), Avian (71), Bovine (36), Food (15)
S. Hindmarsh	110	34	46	56	Ovine (45), Bovine (10)

Subtype	2007	2008	2009	2010	Major Sources, 2010
S. Infantis	70	51	30	34	Meat and bone meal (7), Poultry environmental (7), Bovine (7)
S. Agona	22	26	36	25	Meat and bone meal (12), Poultry feed (6)
Other or unknown serotypes	275	419	251	293	
Total	**1 001**	**1 349**	**888**	**1 220**	

S. Brandenburg was the most commonly isolated serotype in non-human samples during 2010, with numbers increasing for the second year in a row. 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.

4.13.5.3 Outbreak types

Table 54 shows the number of hospitalised cases and total cases by subtype for nine of the 10 foodborne *Salmonella* outbreaks reported during 2010. The subtype was unknown for the remaining foodborne *Salmonella* outbreak. Two outbreaks were associated with *S.* Infantis, two with *S.* Typhimurium phage type 135 and the remaining five outbreaks were associated with unique subtypes. The largest outbreak, due to *S.* Typhimurium phage type 155 was associated with 21 cases and four hospitalisations from the South Canterbury region.

Table 54: *Salmonella* subtypes reported in foodborne outbreaks, 2010

Pathogen and Subtype	Outbreaks	Hospitalised cases	Total cases
S. Infantis	2	0	11
S. Typhimurium phage type 135	2	0	8
S. Typhimurium phage type 101	1	0	2
S. Typhimurium phage type 126	1	0	3
S. Typhimurium phage type 155	1	4	21
*S.*Typhimurium phage type 156	1	0	3
S. Typhimurium phage 160	1	1	4

4.13.6 Recent surveys

Salmonella infection in independent flocks of spent breeder and EOL birds at slaughter was determined by examining the combined contents of 10 caecal samples obtained from each flock of slaughtered birds, using the NMD protocol (Wong and Chung, 2010). The *Salmonella* spp. status of each flock was determined by performing a presence/absence determination of these pathogens in the combined caecal contents. In addition, pathogen levels were enumerated in each carcass rinsate in a set of five from each flock, in accordance with the NMD protocol.

Eighteen flocks of breeder birds were accepted for the project, but caecal samples were received from 16 flocks only. *Salmonella* spp. were not isolated from the caecal samples of the 16 breeder bird flocks received. Ninety-five carcass rinsates of breeder birds were received, five each from 17 flocks and 10 from one flock. *Salmonella* spp. were not isolated from any of the breeder carcass rinsates when a 30 mL volume of rinsate from each carcass was tested.

Salmonella spp. (*S.* Oranienburg, *S.* Thompson, *S.* Infantis and *Salmonella enterica* sub-species I 6,7,14:k) were isolated from the caeca of 4/13 flocks (30.8%) of EOL birds.

Seventy carcass rinsates from the 13 flocks of EOL birds were received of which 10 were sampled twice from one flock (from two cuts of birds). *S.* Infantis and *S.* Oranienburg were isolated from the enrichments of two carcass rinsates, one from each of two positive flocks. The estimated counts for these two positive rinsates were between 1.12 $\log_{10}$ CFU carcass^{-1} and 2.30 $\log_{10}$ CFU carcass^{-1}. All others rinsates contained counts of *Salmonella* spp. of <1.12 $\log_{10}$ CFU carcass^{-1}.

4.13.7 Relevant New Zealand studies and publications

4.13.7.1 Reports

An analysis of human salmonellosis surveillance data was carried, with the aim of attributing non-typhoidal salmonellosis to specific pathways (Adlam *et al.*, 2010). All non-typhoidal salmonellosis cases notified in the period 2000-2009 were analysed using case-case analysis. A similar analysis was carried out of specific serotypes. Analysis of outbreaks of salmonellosis was also carried out. It was concluded that quantitative attribution of proportions of non-typhoidal salmonellosis to specific pathways was not possible.

4.13.7.2 Journal papers

Antibiotic susceptibility of *Salmonella* serotypes from human (n = 1 560) and non-human (n = 1 505) sources during the period 2002-2007 was summarised (Broughton *et al.*, 2010). The most common serotypes in humans were *S.* Typhimurium, *S.* Enteritidis, *S.* Brandenburg and *S.* Infantis. Over the 6-year period human cases due to *S.* Agona and *S.* Enteritidis increased and cases due to *S.* Typhimurium decreased. The most common serotypes from non-human sources were *S.* Typhimurium, *S.* Brandenberg, *S.* Hindmarsh and *S.* Infantis, and there were no significant changes over time. More isolates were non-susceptible to streptomycin than to any other antibiotic. Almost all isolates were susceptible to ciprofloxacin and gentamicin. There were significant trends of increasing non-susceptibility to streptomycin and sulfonamides in isolates from human and non-human sources, while ampicillin, tetracycline and multidrug non-susceptibility also increased in human isolates. Despite these increases, rates of antibiotic non-susceptibility in *Salmonella* in NZ are still lower than in many international settings.

A case-control study was conducted following identification of an outbreak of *S.* Typhimurium DT1 (STM1) in the Gisborne region (McCallum *et al.*, 2010). The case control study included 15 cases and 40 controls. Cases were found to be seven times more likely to have eaten watermelon than controls and one and a half times more likely to have eaten ham. Isolates from cases were found to be indistinguishable by PFGE typing. *Salmonella* was not recovered from any food sample.

4.13.8 Relevant regulatory developments

A discussion paper was released in August 2010, recommending a continuance of the porcine carcass *Salmonella* testing programme as a component of the National Microbiological Database[4]. Submissions were sought and have been analysed[5].

[4] http://www.foodsafety.govt.nz/elibrary/industry/sampling-nmd-porcine-salmonella/porcine-s-discussion-paper-edit-cf.pdf

[5] http://www.foodsafety.govt.nz/elibrary/industry/sampling-nmd-porcine-salmonella/analysis-of-submissions.pdf

MAF updated their *Salmonella* Risk Management Strategy to cover the period 2010-2013[6]. The objectives remain unchanged from the previous edition of the Risk Management Strategy covering the period 2009-2012.

4.14 Shigellosis

Summary data for shigellosis in 2010 are given in Table 55.

Table 55: Summary surveillance data for shigellosis, 2010

Parameter	Value in 2010	Section reference
Number of cases	105	4.14.2
Rate (per 100,000)	2.4	4.14.2
Hospitalisations (%)	25 (23.8%)	4.14.2
Deaths (%)	0 (0%)	4.14.2
Estimated travel-related cases (%)	69 (65.6%)	4.14.3.6
Estimated food-related cases (%)	NA	

NA = not applicable, no information is available on the food attributable proportion of shigellosis in New Zealand

4.14.1 Case definition

Clinical description: Shigellosis presents as gastroenteritis

Laboratory test for diagnosis: Isolation of *Shigella* spp. 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 i.e., is part of an identified common source outbreak

Confirmed: A clinically compatible illness that is laboratory confirmed

4.14.2 Shigellosis cases reported in 2010 by data source

During 2010, 105 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 105 cases (2.4 per 100 000 population) infected with *Shigella* in 2010.

The ICD-10 code A03 was used to extract shigellosis hospitalisation data from the MoH NMDS database. Of the 25 hospital admissions (0.6 admissions per 100 000 population) recorded in 2010, 21 were reported with shigellosis as the primary diagnosis and four with shigellosis as another relevant diagnosis.

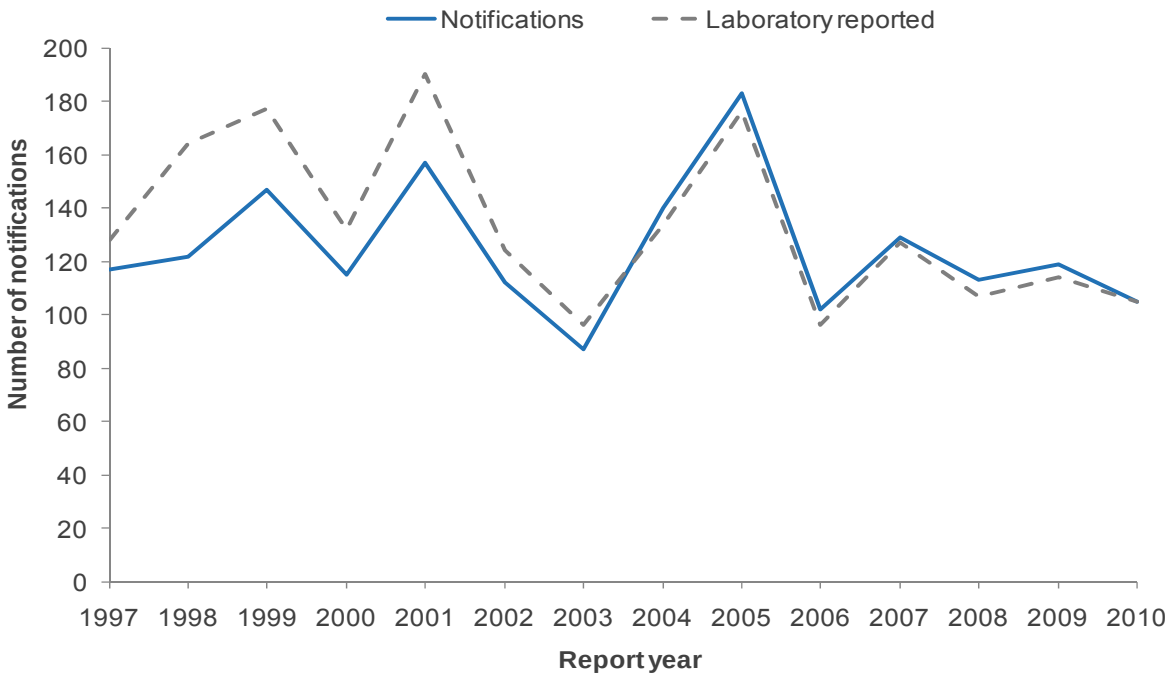
[6] http://www.foodsafety.govt.nz/elibrary/industry/salmonella-strategy_2010-13.pdf

4.14.3 Notifiable disease data

4.14.3.1 Annual notification trend

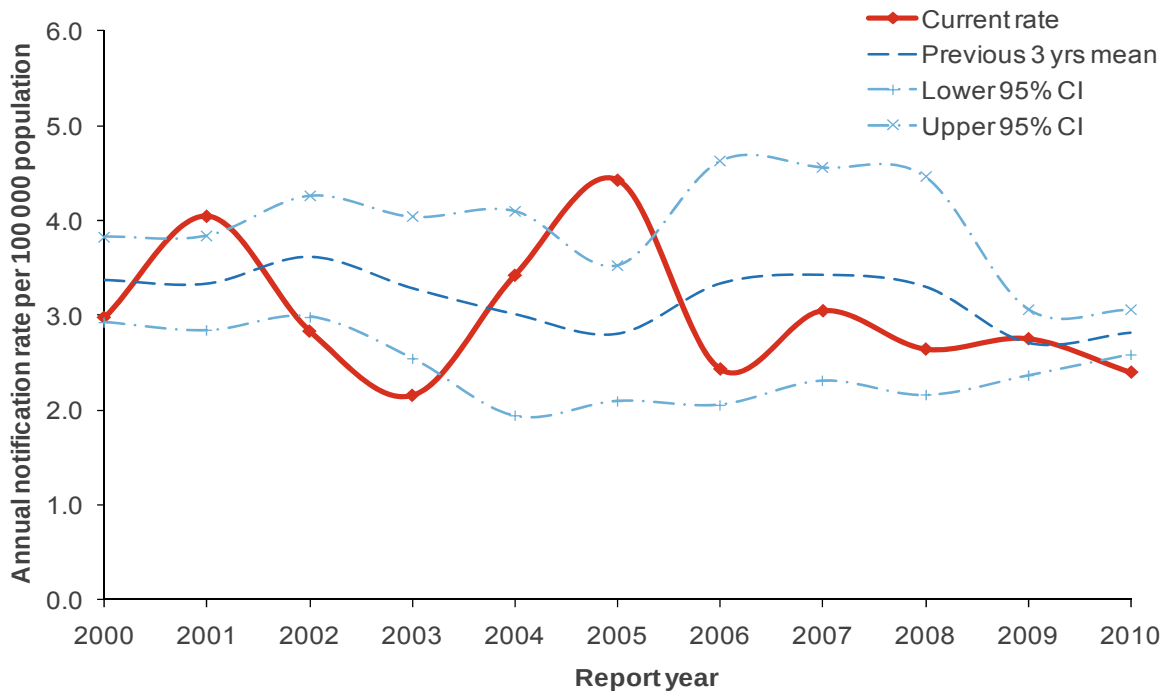
The number of notifications and laboratory reported cases of shigellosis fluctuates from year to year, but without any clear pattern (Figure 42). Numbers of notifications have been very stable between 2006 and 2010.

Figure 42: Shigellosis notifications and laboratory reported cases by year, 1997–2010



Between 2000 and 2006, the shigellosis annual notification rate fluctuated and was lowest in 2003 (2.2 per 100 000 population) and highest in 2005 (4.4 per 100 000). Since 2007 the annual notification rates have been static (Figure 43).

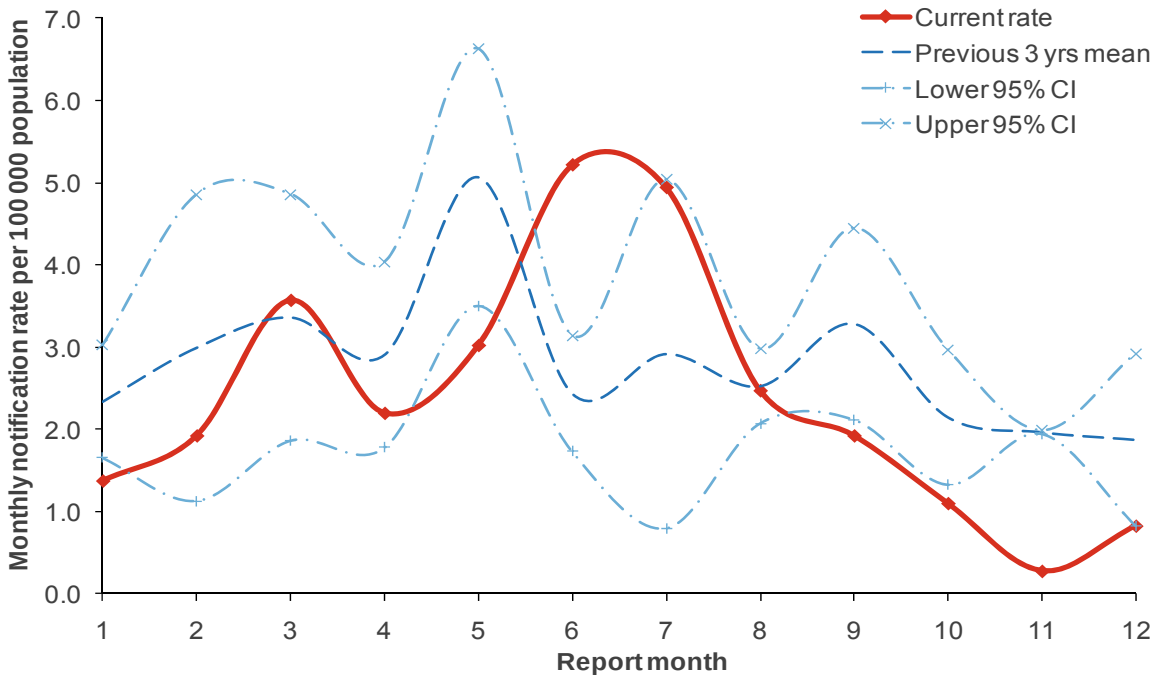
Figure 43: Shigellosis notification rate by year, 2000–2010



4.14.3.2 Seasonality

The number of notified cases of shigellosis per 100 000 population by month for 2010 is shown in Figure 44. In 2010, the shigellosis notification rate was highest in June and lowest in November.

Figure 44: Shigellosis monthly rate (annualised), 2010



4.14.3.3 Age and sex distribution of shigellosis cases

In 2010, the numbers and rates of notifications and hospitalisations for shigellosis were similar for males and females (Table 56).

Table 56: Shigellosis cases by sex, 2010

Sex	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
Male	50	2.3	13	0.6	
Female	55	2.5	12	0.5	
Unknown	0		0		
Total	**105**	**2.4**	**25**	**0.6**	**0**

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

Age-specific shigellosis notification rates were highest for those in the 1 to 4 years (4.8 per 100 000 population, 12 cases) and the 60 to 69 years (3.4 per 100 000, 14 cases) age groups. The hospitalisation rates were not defined for any age groups due to the small number of cases (Table 57).

Table 57: Shigellosis cases by age group, 2010

Age group	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	1	-	1	-	
1 to 4	12	4.8	4	-	
5 to 9	9	3.1	4	-	
10 to 14	5	1.7	1	-	
15 to 19	3	-	1	-	
20 to 29	20	3.3	3	-	
30 to 39	7	1.2	1	-	
40 to 49	14	2.2	1	-	
50 to 59	17	3.1	4	-	
60 to 69	14	3.4	4	-	
70+	3	-	1	-	
Unknown	0		0		
Total	**105**	**2.4**	**25**	**0.6**	**0**

[a] MoH morbidity data for hospital admissions
[b] per 100 000 of population. Where fewer than five cases have been reported a rate has not been calculated.

4.14.3.4 Risk factors reported

The most commonly reported risk factor for shigellosis in 2010 was overseas travel during the incubation period (65.6%), followed by consumption of food from retail premises (57.1%) (Table 58).

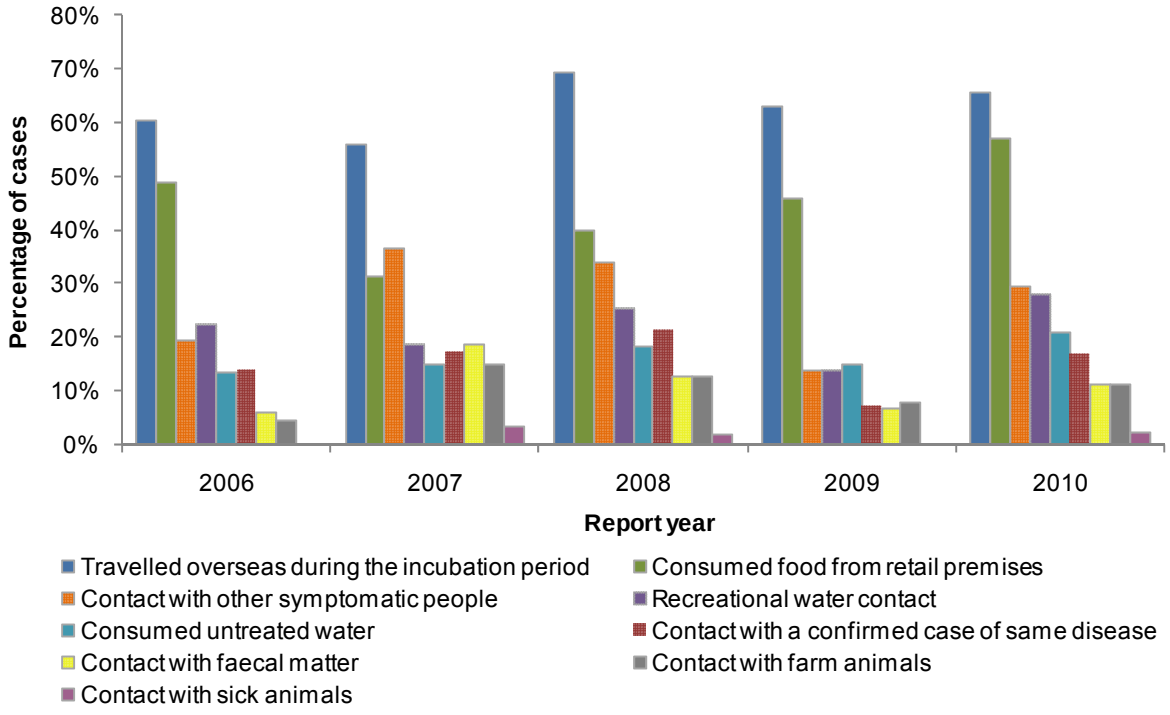
Table 58: Exposure to risk factors associated with shigellosis, 2010

Risk Factor	Notifications			
	Yes	No	Unknown	%[a]
Travelled overseas during the incubation period	40	21	44	65.6
Consumed food from retail premises	24	18	63	57.1
Contact with other symptomatic people	13	31	61	29.5
Recreational water contact	10	26	69	27.8
Consumed untreated water	5	19	81	20.8
Contact with a confirmed case of same disease	7	34	64	17.1
Contact with faecal matter	5	40	60	11.1
Contact with farm animals	5	40	60	11.1
Contact with sick animals	1	41	63	2.4

[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.

Between 2006 and 2010, overseas travel during the incubation period and consumption of food from retail premises were usually the two most commonly reported risk factors for shigellosis each year (Figure 45).

Figure 45: Shigellosis risk factors by percentage of cases and year, 2006–2010



4.14.3.5 Estimate of travel-related cases

For cases where information on travel was provided, 65.6% (95%CI 52.3-77.3%) 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 2010. The resultant distribution has a mean of 69 cases (95% CI 48-93).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 64.7% (95% CI 59.2-70.0%).

4.14.4 Outbreaks reported as caused by *Shigella* spp.

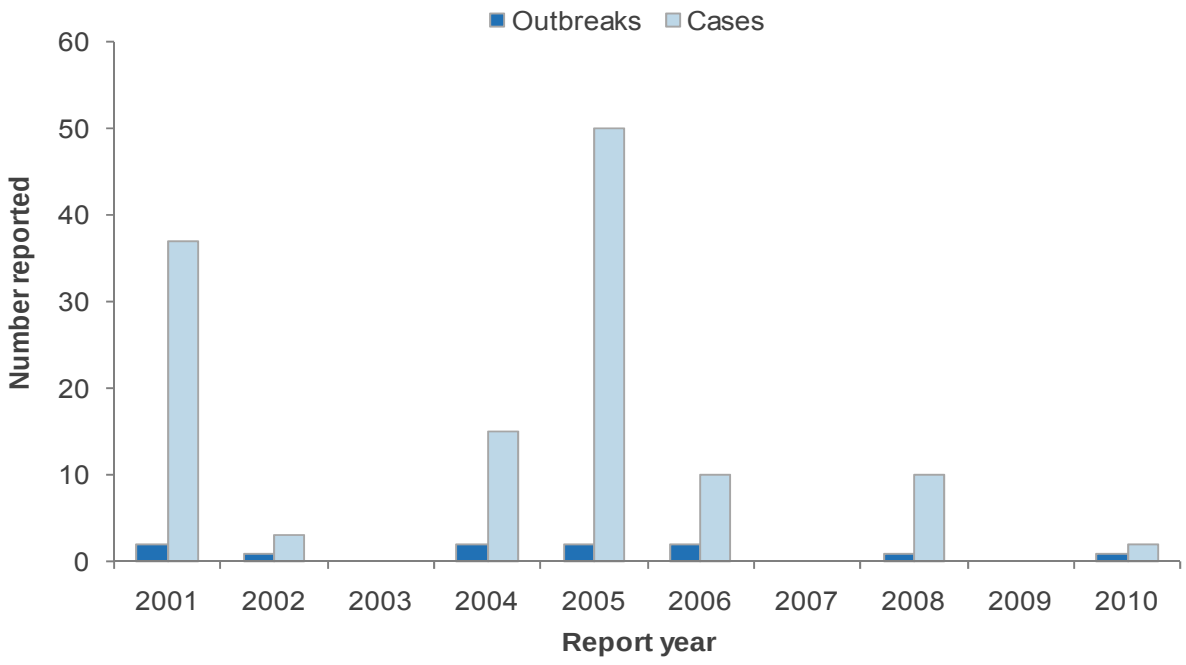
One foodborne *Shigella* spp. outbreak was reported in 2010 (Table 59).

Table 59: *Shigella* spp. outbreaks reported, 2010

Measure	Foodborne *Shigella* spp. outbreaks	All *Shigella* spp. outbreaks
Outbreaks	1	5
Cases	2	16
Hospitalised cases	0	4

Foodborne shigellosis outbreaks are rare with not more than two outbreaks being reported each year from 2001 to 2010 (Figure 46).

Figure 46: Foodborne *Shigella* spp. outbreaks and associated cases reported by year, 2001–2010



4.14.4.1 Details of food-associated outbreaks

Table 60 contains details of the *Shigella* spp. outbreak reported in 2010.

Table 60: Details of food-associated *Shigella* spp. outbreaks, 2010

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill
Canterbury (March)	Unknown	Bakery	2C

C = confirmed, P = probable

4.14.4.2 Laboratory investigation of samples from suspected foodborne outbreaks

In 2010, no food or clinical samples were submitted to ESR's Public Health Laboratory relating to food-associated *Shigella* spp. outbreaks.

4.14.5 *Shigella* types commonly reported

There were 105 cases infected with *Shigella* spp. reported by the Enteric Reference Laboratory at ESR in 2010. The species and major serogroups identified in 2010 were distributed as follows: *S. sonnei* biotypes (48.5%, 51 isolates, including 27 Biotype a and 23 Biotype g), *S. flexneri* (46.7%, 49 isolates, including 21 type 2a and 10 type 2b), *S. boydii* (3.8%, 4 isolates, including 2 type 13), and one isolate of *S. dysenteriae* (1.0%). Table 61 summarises *Shigella* typing data for 2007-1010.

Table 61: Selected *Shigella* species and subtypes of laboratory-reported shigellosis, 2007-2010

Biotype	Number of isolates (%)			
	2007	2008	2009	2010
S. sonnei	87 (68.5)	70 (65.4)	73 (64.0)	51 (48.5)
Biotype a	43	28	33	27
Biotype f	1	1	4	1
Biotype g	43	41	36	23
S. flexneri	32 (25.2)	33 (30.8)	31 (27.2)	49 (46.7)
2a	15	12	13	21
2b	0	0	2	10
3a	1	4	6	6
6	5	6	3	4
Other	11	11	7	8
S. boydii	5 (4.0)	3 (2.8)	8 (7.0)	4 (3.8)
Other	2 (1.6)	1 (0.9)	2 (1.8)	1 (1.0)
Total	**127**	**107**	**114**	**105**

4.14.6 Relevant New Zealand studies and publications

Nil.

4.14.7 Relevant regulatory developments

Nil.

4.15 *Staphylococcus aureus* Intoxication

4.15.1 Case definition

Clinical description: Gastroenteritis with sudden severe nausea and vomiting

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 that is either a contact of a confirmed case of the same disease, or has had contact with the same common source i.e., is part of an identified common source outbreak

Confirmed: A clinically compatible illness that is laboratory confirmed

4.15.2 *Staphylococcus aureus* intoxication cases reported in 2010 by data source

During 2010, there was one notification of *S. aureus* intoxication and no resulting deaths reported in EpiSurv.

The ICD-10 code A05.0 was used to extract foodborne staphylococcal intoxication hospitalisation data from the MoH NMDS database. Of the two hospital admissions recorded in 2010, both were reported with foodborne staphylococcal intoxication as the primary diagnosis. It should be noted that EpiSurv and the MoH NMDS database are separate systems and hospital admission can occur without cases being notified.

4.15.3 Outbreaks reported as caused by *Staphylococcus aureus*

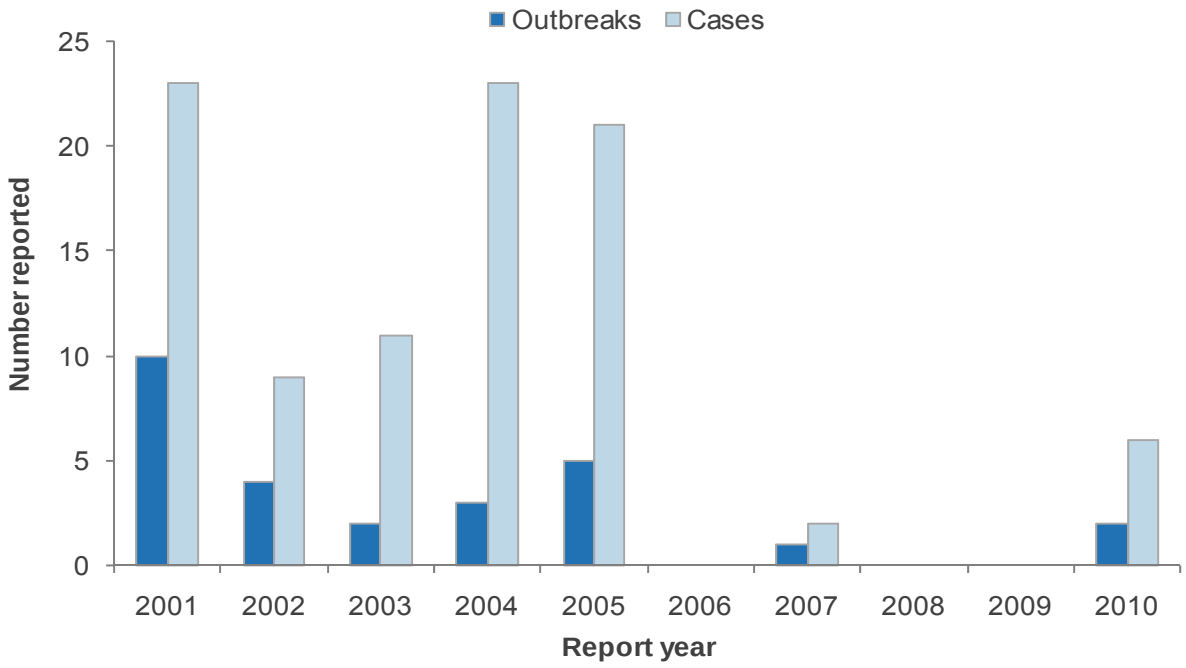
Two foodborne *S. aureus* outbreaks were reported in 2010 (Table 62).

Table 62: *S. aureus* outbreaks reported, 2010

Measure	Foodborne *S. aureus* outbreaks	All *S. aureus* outbreaks
Outbreaks	2	2
Cases	6	6
Hospitalised cases	1	1

Between 2001 and 2003 there was a steady decrease in the number of *S. aureus* outbreaks reported (Figure 47) followed by a small increase in 2004 and 2005. In 2006, 2008 and 2009, no *S. aureus* outbreaks were reported in EpiSurv, with two outbreaks in 2010.

Figure 47: Foodborne *S. aureus* outbreaks and associated cases reported by year, 2001–2010



4.15.3.1 Details of food-associated outbreaks

Table 63 contains details of the two food–associated *S. aureus* outbreaks reported in 2010.

Table 63: Details of food-associated *S. aureus* outbreaks, 2010

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill
Auckland (February)	Indian meal	Restaurant/café	1C, 3P
Auckland (May)	Grilled mussel with spinach, cheese and bacon topping	Restaurant/café	2C

C = confirmed, P = probable

4.15.3.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratory in 2010, faecal samples were submitted in relation to both foodborne outbreaks identified in Table 63. Staphylococcal enterotoxin was detected in faecal samples from on foodborne outbreak. No associated food samples were submitted for analysis.

4.15.4 Relevant New Zealand studies and publications

Nil.

4.15.5 Relevant regulatory developments

Nil.

4.16 Toxic Shellfish Poisoning

4.16.1 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 results in various combinations of gastrointestinal, neurosensory, neurocerebellar/neuromotor, general neurological and other symptoms. Case definitions for suspected cases of toxic shellfish poisoning are:

Amnesic Shellfish Poisoning (ASP): Vomiting or diarrhoea or abdominal cramps 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 (TSP) type unspecified: 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.

Case definitions for probable cases of toxic shellfish poisoning are:

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 level:
ASP: 20 ppm domoic acid/100 g shellfish
DSP: 20 μg/100 g or 5 MU/100 g shellfish (MU = mouse units)
NSP: 20 MU/100 g shellfish
PSP: 80 μg/100 g shellfish

Case definitions for confirmed cases of toxic shellfish poisoning are:

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 level:

ASP: 0.05 mg/kg body weight
DSP: ingestion of 48 μg or 12 MU
NSP: 0.3 MU/kg body weight

PSP: 10 MU/kg body weight (≅ 2μg/kg body weight)

Clinical symptoms for assigning status:
Group A:
• paraesthesia - i.e. 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

4.16.2 Toxic shellfish poisoning cases reported in 2010

During 2010, nine notifications (0.2 cases per 100 000 population) of toxic shellfish poisoning (TSP) and no resulting deaths were reported in EpiSurv.

This is by far the highest number of annual notifications of toxic shellfish poisoning in recent years. Seven of the nine notifications reported consumption of shellfish (tuatuas in six cases, pipis in one case) from recreational harvesting at Papamoa Beach in the Bay of Plenty. While three of the cases appear in EpiSurv as 'toxic shellfish poisoning-unspecified', the remainder are recorded as suspected cases of paralytic shellfish poisoning (PSP). The cases were collectively investigated as an outbreak (see 4.16.3.1). A health warning was in effect in the region at the time the shellfish were collected.

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 26 hospital admissions reported in 2010, 22 were reported with 'other fish and shellfish poisoning' as the primary diagnosis and four with this condition 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.

4.16.3 Outbreaks reported as caused by toxic shellfish poisoning

One outbreak due to TSP was reported in 2010 (Table 64).

4.16.3.1 Details of food-associated outbreaks

Table 64 contains details of the TSP outbreak reported in 2010.

Table 64: Details of food-associated TSP outbreak, 2010

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill
Bay of Plenty (January)	Shellfish	Other setting (beach)	8P

C = confirmed, P = probable

4.16.3.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratory in 2010, PSP toxin was detected in a sample of tuatua implicated in the outbreak detailed in Table 64.

4.17 VTEC/STEC Infection

Summary data for VTEC/STEC infection in 2010 are given in Table 65.

Table 65: Summary surveillance data for VTEC/STEC infection, 2010

Parameter	Value in 2010	Section reference
Number of cases	138	4.17.2
Rate (per 100,000)	3.2	4.17.2
Hospitalisations (%)	13 (9.4%)	4.17.2
Deaths (%)	0 (0%)	4.17.2
Estimated travel-related cases (%)	4 (3.2%)	4.17.3.5
Estimated food-related cases (%)*	53 (39.6%)	4.17.2

* For estimation of food-related cases it was assumed that the proportions derived from expert consultation would exclude travel-related cases

4.17.1 Case definition

Clinical description: An illness of variable severity characterised by diarrhoea (often bloody) and abdominal cramps. Illness may be complicated by haemolytic uraemic syndrome (HUS), or thrombotic thrombocytopaenic purpura (TTP)

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 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 i.e., is part of an identified common source outbreak

Confirmed A clinically compatible illness that is laboratory confirmed

4.17.2 VTEC/STEC infection cases reported in 2010 by data source

During 2010, 138 notifications (3.2 cases per 100 000 population) of VTEC/STEC infection and no resulting deaths were reported in EpiSurv. The Enteric Reference Laboratory at ESR reported 128 cases (2.9 per 100 000) infected with VTEC/STEC in 2010.

The ICD-10 code A043 was used to extract enterohaemorrhagic *E. coli* infection hospitalisation data from the MoH NMDS database. Of the 13 hospital admissions recorded in 2010, 10 were reported with enterohaemorrhagic *E. coli* infection as the primary diagnosis and three with this condition as another relevant diagnosis.

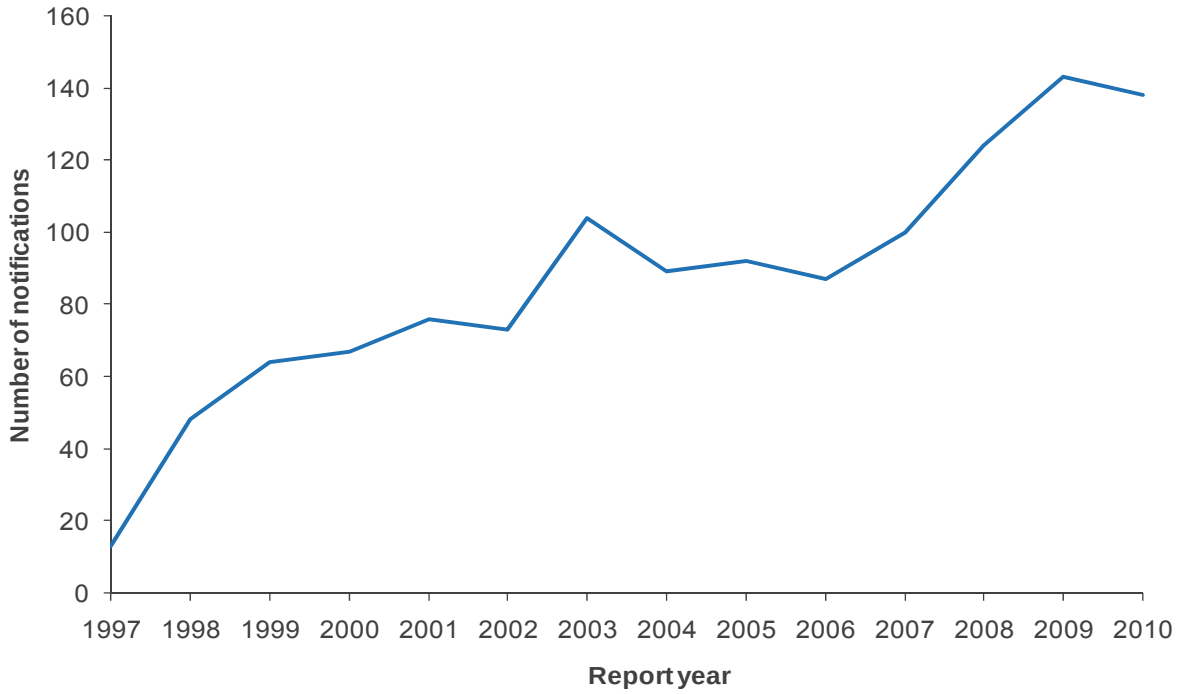
It has been estimated by expert consultation that 40% (minimum = 27%, maximum = 51%) of VTEC/STEC incidence is due to foodborne transmission. The expert consultation also estimated that approximately 30% of foodborne VTEC/STEC transmission was due to red meat of which two-thirds was considered to be due to consumption of uncooked, fermented, comminuted meat.

4.17.3 Notifiable disease data

4.17.3.1 Annual notification trend

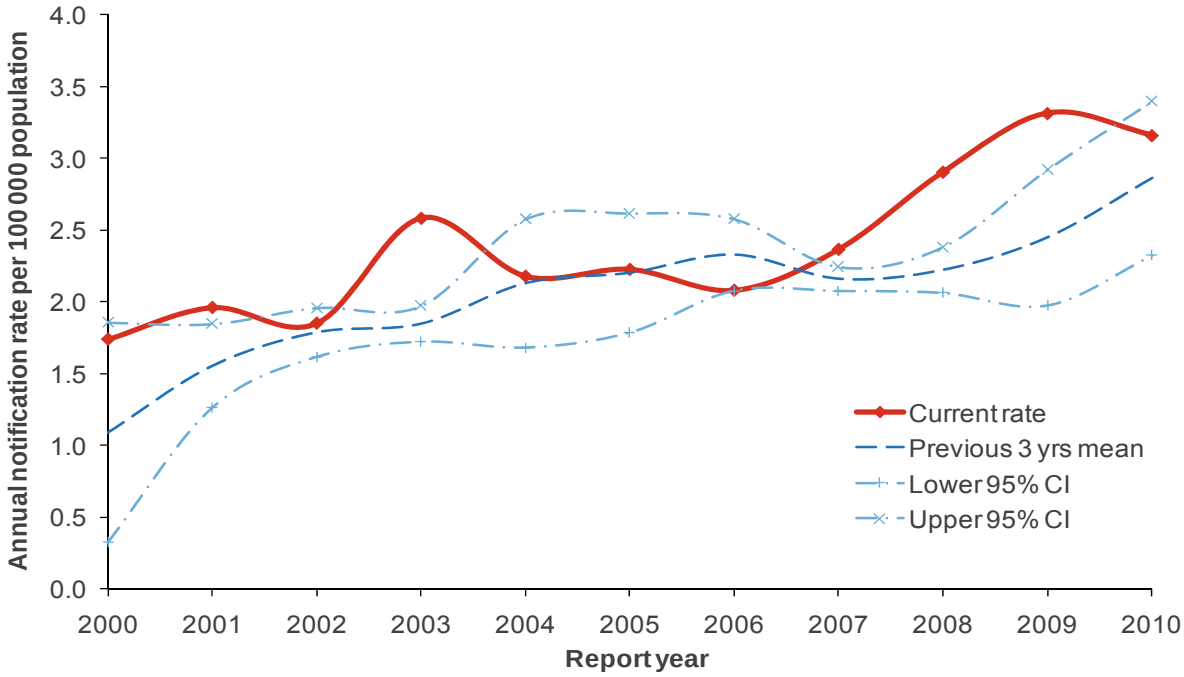
In 2010, 138 VTEC/STEC infection notifications were reported in EpiSurv. There has been a general increase in the notifications of VTEC/STEC infection since 1997, with the highest number of notifications in 2009 (143 cases), followed by 2010 (138 cases) (Figure 48).

Figure 48: VTEC/STEC infection notifications by year, 1997–2010



The VTEC/STEC infection annual rate trend (Figure 49) was very similar to the corresponding annual notification trend, showing a gradual increasing trend with a peak in 2003 and a slight decrease from 2009 to 2010.

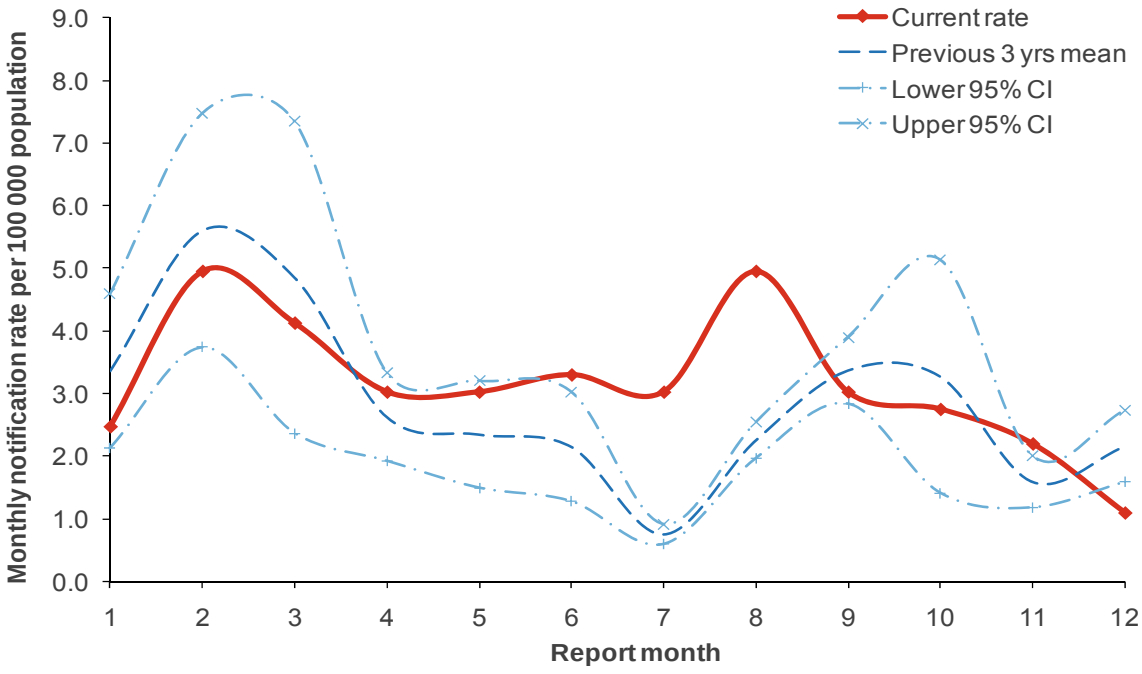
Figure 49: VTEC/STEC infection notification rate by year, 2000–2010



4.17.3.2 Seasonality

The number of notified cases of VTEC/STEC infection per 100 000 population by month for 2010 are shown in Figure 50. The 2010 monthly notification rate is similar to the historic mean rate trend with a peak in February, but with a second peak in August 2010 instead of the historic trough in July.

Figure 50: VTEC/STEC infection notification monthly rate (annualised), 2010



4.17.3.3 Age and sex distribution of VTEC/STEC infection

In 2010, the sex-specific notifications and hospitalisation rates were the same for males and females (Table 66).

Table 66: VTEC/STEC infection by sex, 2010

Sex	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
Male	67	3.1	6	0.3	
Female	70	3.1	7	0.3	
Unknown	1				
Total	**138**	**3.2**	**13**	**0.3**	**0**

[a] MoH morbidity data for hospital admissions
[b] per 100 000 of population. Where fewer than five cases have been reported a rate has not been calculated.

In 2010, the age specific VTEC/STEC infection notification rates were highest in the 1 to 4 years age group (25.8 per 100 000 population, 64 cases), followed by the less than 1 year age group (14.1 per 100 000, 9 cases). The 1 to 4 years age group also had the highest number of hospitalisations (Table 67). The hospitalisation rates were not defined for all other age groups due to the small number of cases.

Table 67: VTEC/STEC infection by age group, 2010

Age group	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	9	14.1	0	-	
1 to 4	64	25.8	5	2.0	
5 to 9	13	4.5	0	-	
10 to 14	4	-	1	-	
15 to 19	2	-	0	-	
20 to 29	8	1.3	2	-	
30 to 39	7	1.2	0	-	
40 to 49	6	0.9	0	-	
50 to 59	8	1.5	0	-	
60 to 69	9	2.2	2	-	
70+	8	2.0	3	-	
Unknown	0		0		
Total	**138**	**3.2**	**13**	**0.3**	**0**

[a] MoH morbidity data for hospital admissions
[b] per 100 000 of population. Where fewer than five cases have been reported a rate has not been calculated.

4.17.3.4 Risk factors reported

In 2010, the most commonly reported risk factors for VTEC/STEC infection were contact with household pets (85.9%), consumption of dairy products (83.3%), consumption of raw fruit or vegetables (82.6%), and consumption of beef products (77.0%) (Table 68).

Table 68: Exposure to risk factors associated with VTEC/STEC infection, 2010

Risk Factor	Notifications			
	Yes	No	Unknown	%[a]
Contact with household pets	61	10	67	85.9
Consumed dairy products	75	15	48	83.3
Consumed raw fruit/vegetables	71	15	52	82.6
Consumed beef products	67	20	51	77.0
Consumed poultry products	63	26	49	70.8
Consumed processed meats	51	35	52	59.3
Contact with farm animals	39	27	72	59.1
Contact with animal manure	30	28	80	51.7
Contact with children in nappies	42	46	50	47.7
Consumed fruit/vegetables juice	29	47	62	38.2
Contact with persons with similar symptoms	30	60	48	33.3
Recreational water contact	27	64	47	29.7
Contact with other animals	16	41	81	28.1
Consumed home killed meats	21	64	53	24.7
Consumed lamb products	19	62	57	23.5
Consumed raw milk or products from raw milk	13	75	50	14.8
Consumed pink or undercooked meats	4	83	51	4.6
Travelled overseas during the incubation period	3	92	43	3.2

[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 2006 and 2010, the most consistently reported risk factors for VTEC/STEC infection were consumption of dairy products, consumption of raw fruit or vegetables (Figure 51), contact with household pets, and contact with farm animals (Figure 52).

Figure 51: VTEC/STEC infection foodborne risk factors by percentage of cases and year, 2006–2010

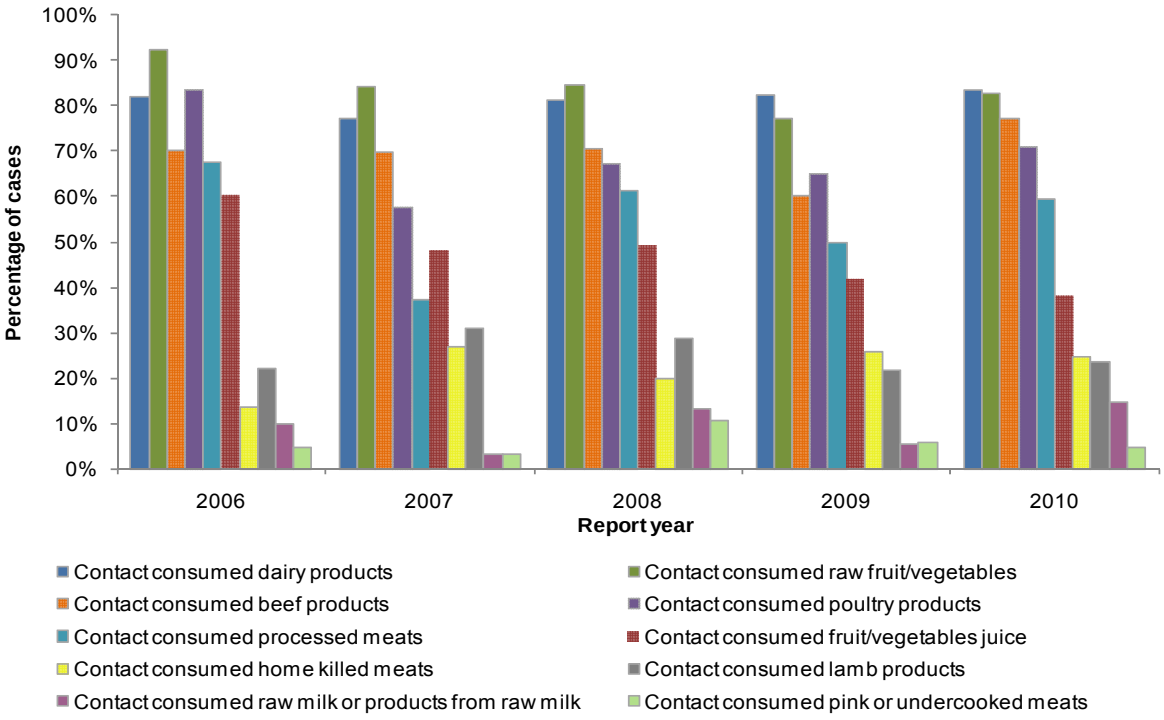
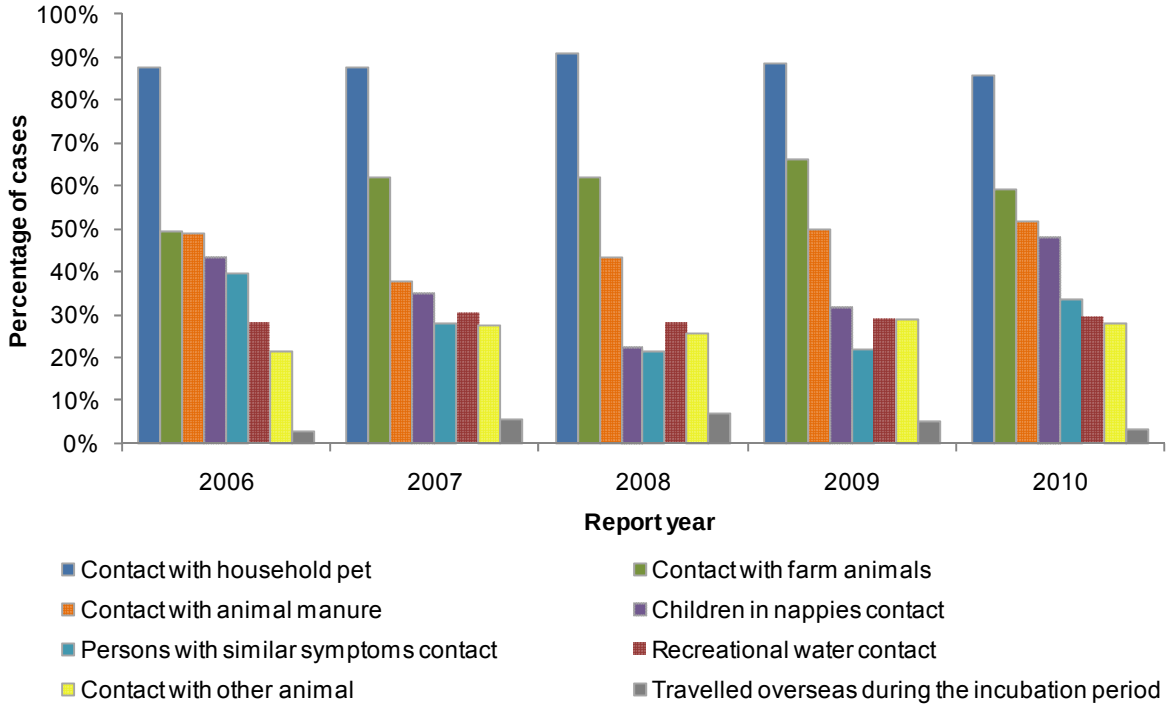


Figure 52: VTEC/STEC infection risk factors excluding food consumption by percentage of cases and year, 2006–2010



4.17.3.5 Estimate of travel-related cases

For cases where information on travel was provided, 3.2% (95%CI 0.7-9.0%) 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 2010. The resultant distribution has a mean of 4 cases (95% CI 0-11).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 5.0% (95% CI 3.0-7.8%).

4.17.4 Outbreaks reported as caused by VTEC/STEC

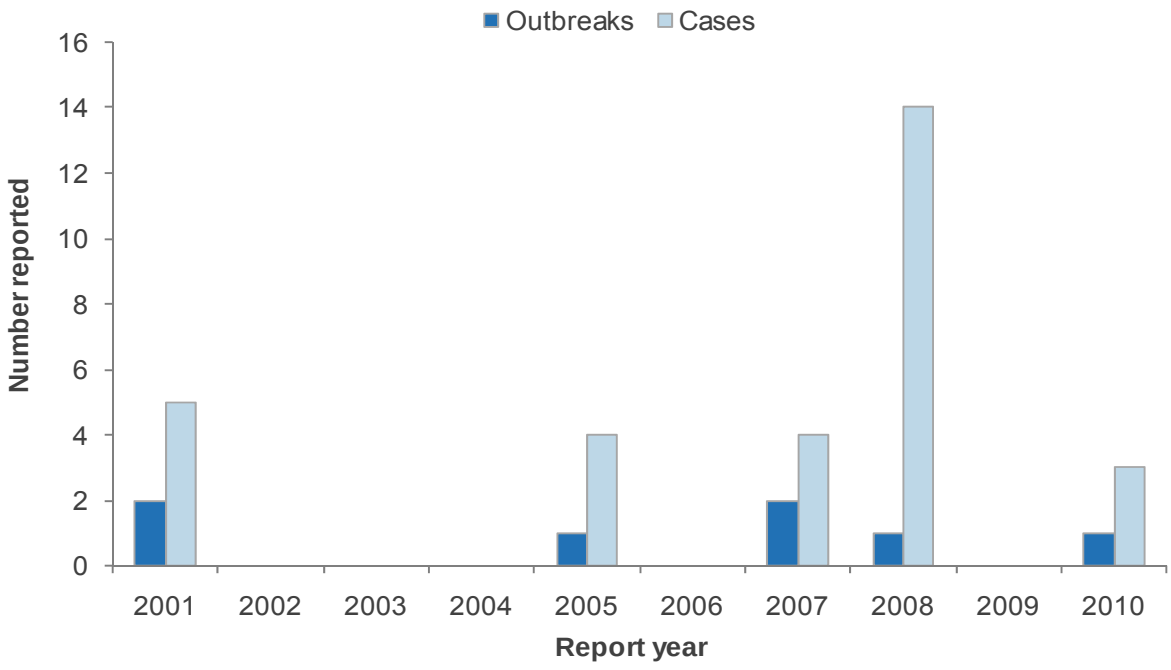
One foodborne VTEC/STEC outbreak was reported in 2010 (Table 69).

Table 69: VTEC/STEC outbreaks reported, 2010

Measure	Foodborne VTEC/STEC outbreaks	All VTEC/STEC outbreaks
Outbreaks	1	5
Cases	3	12
Hospitalised cases	0	1

Over the 10 year period from 2001 to 2010 there have been no more than two foodborne outbreaks of VTEC/STEC reported each year (Figure 53). With the exception of an outbreak in 2008 with 14 associated cases, no outbreak in this period had more than five associated cases.

Figure 53: Foodborne VTEC/STEC outbreaks and associated cases reported by year, 2001–2010



4.17.4.1 Details of food-associated outbreaks

Table 70 contains details of the VTEC/STEC outbreak reported in 2010.

Table 70: Details of food-associated VTEC/STEC outbreak, 2010

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill
Auckland (May)	Undercooked chicken	Home	2C, 1P

C = confirmed, P = probable

4.17.4.2 Laboratory investigation of samples from suspected foodborne outbreaks

In 2010, no food or clinical samples were submitted to ESR's Public Health Laboratory relating to food-associated VTEC/STEC outbreaks.

4.17.5 VTEC/STEC types commonly reported

A total of 128 cases infected with VTEC/STEC were reported by the ESR Enteric Reference Laboratory in 2010. Of these, 115 (89.8%) were identified as *E. coli* O157:H7, and 13 as non-O157:H7. Of the 13 non-O157:H7, two were typed as O176:HNM, while the remaining 11 serotypes were all unique. Table 71 summarises VTEC/STEC typing data for the period 2007-2010.

Table 71: Subtypes of laboratory-reported VTEC/STEC infection, 2007-2010

Serotype	Number of isolates (%)			
	2007	2008	2009	2010
O157:H7	96 (98.9)	120 (98.3)	137 (94.5)	115 (89.8)
ONT:HNM			3 (2.1)	
O176:HNM				2 (1.6)
Other types[1]	O77:HNM	O176:HNM O130:H11	O22:H16 O103:H25 O174:H21 O26:H11 O103:H2	ONT:H21 ONT:H23 O128:H2 ORough:HNT ORough:H7 O77:HNM O84:H2 O123:H8 ONT:HRough O68:HNM ONT:H2
Total	**97**	**122**	**145**	**128**

[1] Types are representative of a single isolate

Most human isolates of O157:H7 are further genotyped by Pulsed-Field Gel Electrophoresis (PFGE). Table 72 summarises PFGE typing of human O157:H7 isolates for 2007-2010.

Table 72: PFGE genotypes of human *E. coli* O157:H7 isolates, 2007-2010

Genotype	Number of isolates			
	2007	2008	2009	2010
Xb0040	13	9	33	29
Xb0049	18	6	10	25
Xb0168	10	12	8	8
Xb0040a	2	0	6	7
Xb0019	2	1	3	3
Xb0090	0	0	0	3
Xb0040g	2	1	2	2
Other types	44	47	75	38
Total	**91**	**76**	**137**	**115**

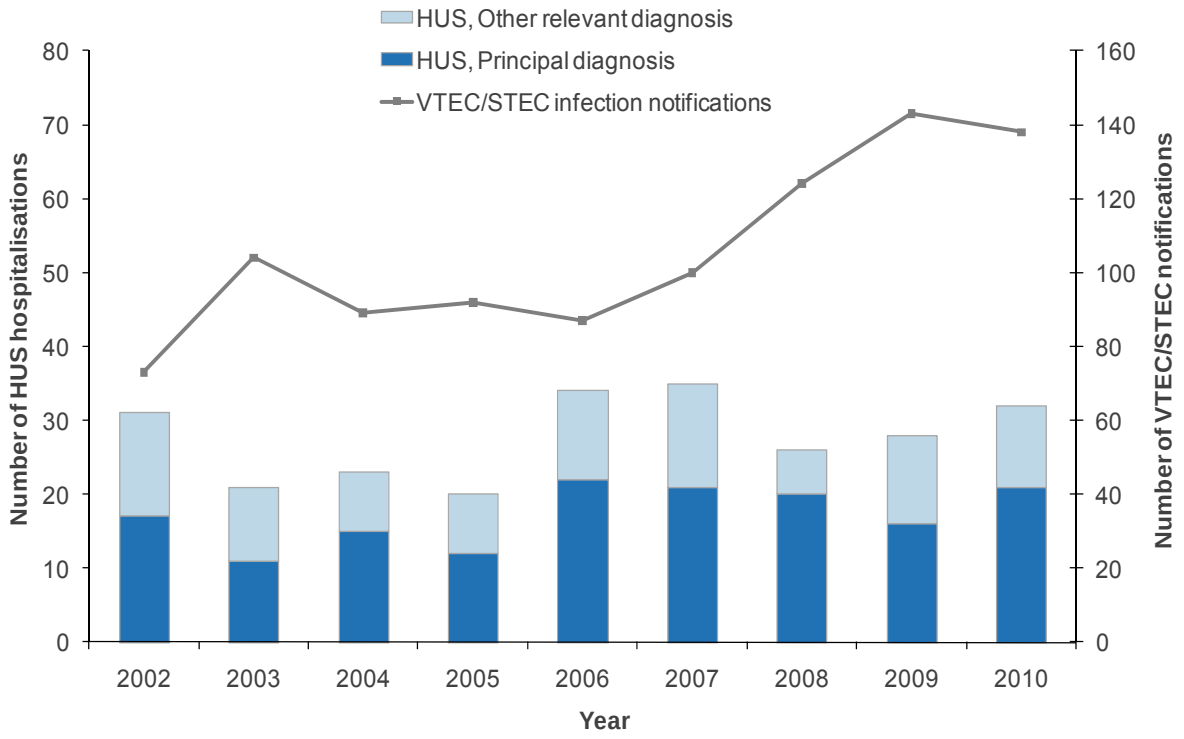
4.17.6 Disease sequelae - haemolytic-uraemic syndrome (HUS)

HUS is a serious sequela of a VTEC/STEC enteric infection.

The ICD-10 code D59.3 was used to extract HUS hospitalisation data from the MoH NMDS database. Of the 32 hospitalised cases (0.7 admissions per 100 000 population) recorded in 2010, 21 were reported with HUS as the primary diagnosis and 11 with HUS as another relevant diagnosis.

Over the nine-year period from 2002 to 2010, between 20 (in 2005) and 35 (in 2007) hospitalised cases for HUS have been reported each year. There is little evidence for a correlation between VTEC/STEC notifications and hospitalised HUS cases (Figure 54).

Figure 54: HUS hospitalised cases, 2002–2010



In 2010, the number of HUS hospitalised cases was greater for females than males (Table 73).

Table 73: HUS hospitalised cases by sex, 2010

Sex	Hospitalised cases[a]	
	No.	Rate[b]
Male	12	0.6
Female	20	0.9
Total	**32**	**0.7**

[a] M0H morbidity data for hospital admissions
[b] per 100 000 of population

In 2010 the highest age-specific hospitalised rate for HUS occurred for those aged less than five years (Table 74).

Table 74: HUS hospitalised cases by age group, 2010

Age groups	Hospitalised cases[a]	
	No.	Rate[b]
<5	9	2.9
5 to 9	3	-
10 to 14	0	-
15 to 19	1	-
20 to 29	4	-
30 to 39	3	-
40 to 49	5	0.8
50 to 59	2	-
60 to 69	3	-
70+	2	-
Total	**32**	**0.7**

[a] MoH morbidity data for hospital admissions
[b] per 100 000 of population. Where fewer than five cases have been reported a rate has not been calculated.

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

During 2010, 10 cases of HUS were reported to the NZPSU, of which nine had a diarrhoeal prodome. The median age at presentation of the nine cases was 2.9 years (range 1.1 to 6.1 years). Five cases had *E. coli* O157:H7 isolated from their stools.

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 to the website where NZPSU Annual Reports are published: http://dnmeds.otago.ac.nz/departments/womens/paediatrics/research/nzpsu/annual_rpts.html

4.17.7 Recent surveys

In responses to US initiatives to further control *E. coli* O157:H7 in the US beef supply, MAF and the New Zealand industry agreed in January 2008 to molecular genotype (PFGE) all *E. coli* O157:H7 isolates detected under the New Zealand monitoring programme and provide a summary to US agencies on a regular basis. A total of 55 isolates collected during 2009 were genotyped (Cornelius, 2009), with 92.3% of PFGE patterns from New Zealand meat isolates found to be distinguishable from US genotypes.

4.17.8 Relevant New Zealand studies and publications

Nil.

4.17.9 Relevant regulatory developments

Nil.

4.18 Yersiniosis

Summary data for yersiniosis in 2010 are given in Table 75.

Table 75: Summary surveillance data for yersiniosis, 2010

Parameter	Value in 2010	Section reference
Number of cases	406	4.18.2
Rate (per 100,000)	9.3	4.18.2
Hospitalisations (%)	27 (6.7%)	4.18.2
Deaths (%)	0 (0%)	4.18.2
Estimated travel-related cases (%)	16 (4.0%)	4.18.3.6
Estimated food-related cases (%)*	219 (56.2%)	4.18.2

* For estimation of food-related cases it was assumed that the proportions derived from expert consultation would exclude travel-related cases

4.18.1 Case definition

Clinical description: An acute illness with diarrhoea, fever and abdominal pain. Mesenteric adenitis may occur and complications include arthritis and systemic infection

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 either a contact of a confirmed case of the same disease, or has had contact with the same common source i.e., is part of an identified common source outbreak

Confirmed: A clinically compatible illness that is laboratory confirmed

4.18.2 Yersiniosis cases reported in 2010 by data source

During 2010, 406 notifications (9.3 cases per 100 000 population) of yersiniosis and no resulting deaths were reported in EpiSurv.

The ICD-10 code A04.6 was used to extract yersiniosis hospitalisation data from the MoH NMDS database. Of the 27 hospital admissions (0.6 admissions per 100 000 population) recorded in 2010, 13 were reported with yersiniosis as the primary diagnosis and 14 with yersiniosis as another relevant diagnosis.

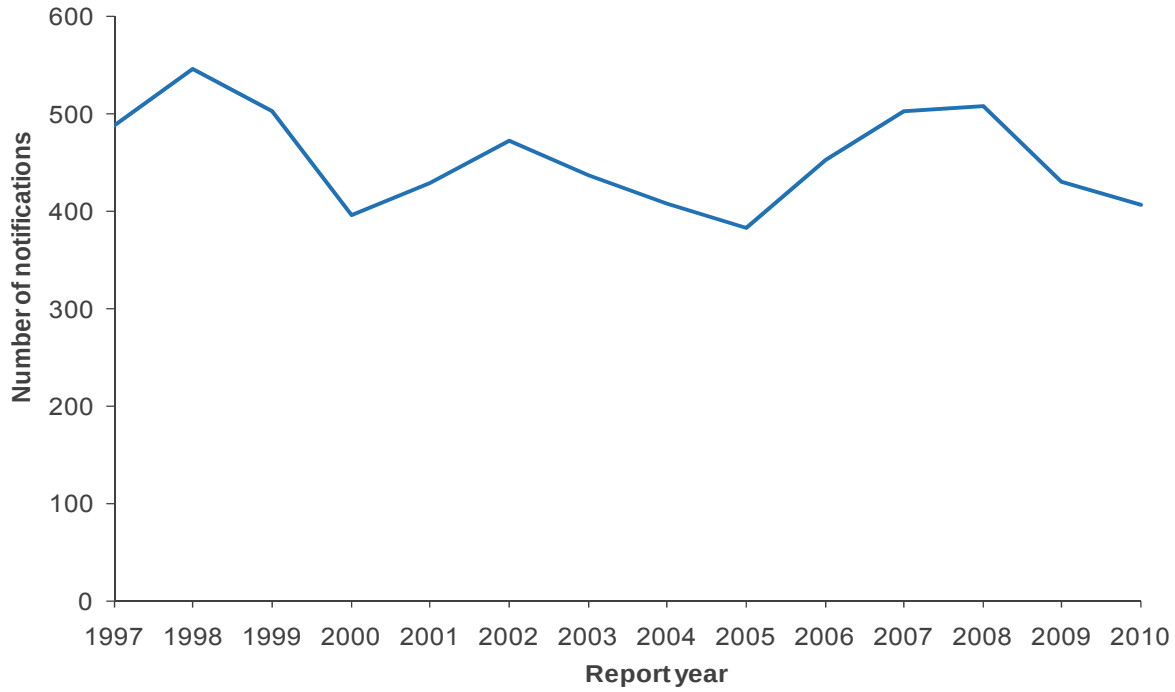
It has been estimated by expert consultation that 56% (minimum = 42%, maximum = 71%) of yersiniosis incidence is due to foodborne transmission. Approximately 50% of foodborne transmission was estimated to be due to consumption of pork.

4.18.3 Notifiable disease data

4.18.3.1 Annual notification trend

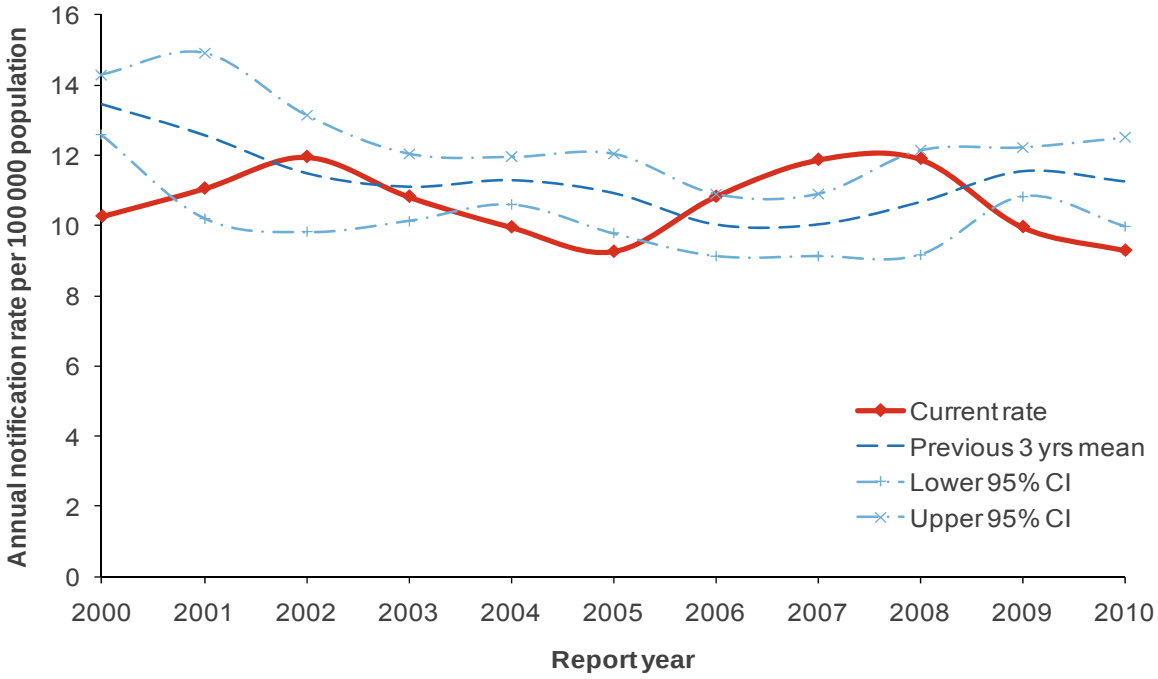
During 2010, 406 yersiniosis notifications were reported in EpiSurv. Yersiniosis became notifiable in 1996, with the highest number of notifications reported in 1998 (546 cases). Since 1998, the annual number of notifications has fluctuated slightly across the years, but has remained between 383 (2005) and 508 cases (2008) (Figure 55).

Figure 55: Yersiniosis notifications by year, 1997–2010



The yersiniosis notification rate was 9.3 per 100 000 population in 2010. Between 2000 and 2010, the yersiniosis annual notification rate has remained fairly stable (ranging from 9.3 to 12.0 per 100 000) (Figure 56).

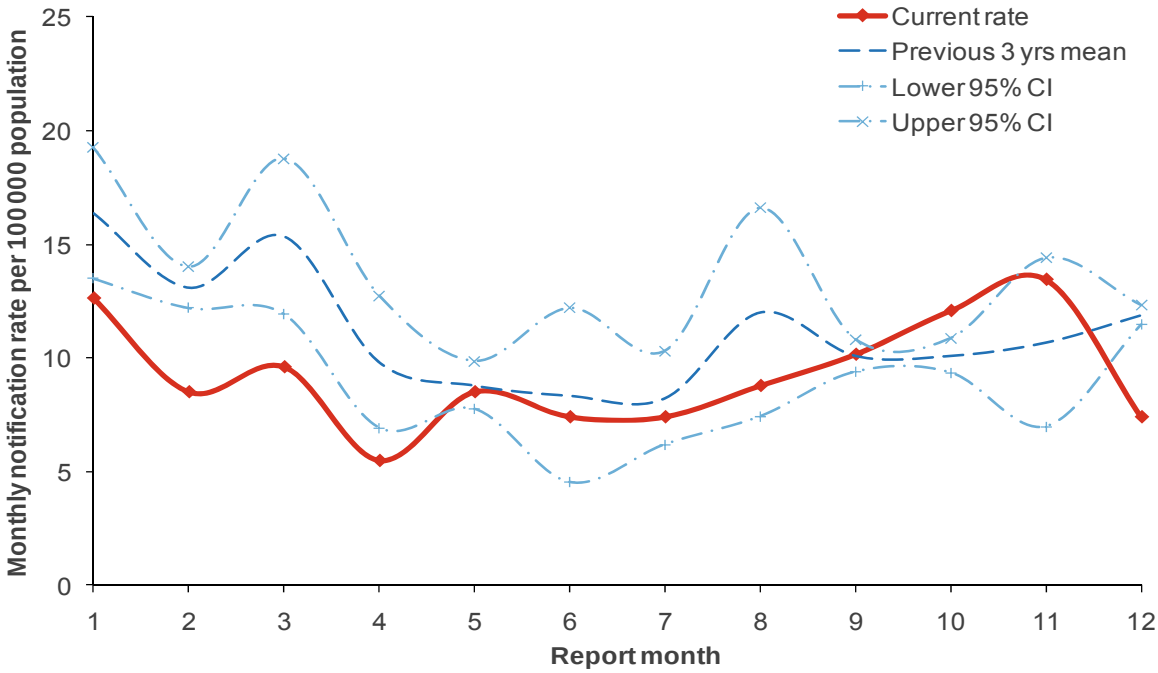
Figure 56: Yersiniosis notification rate by year, 2000–2010



4.18.3.2 Seasonality

The number of notified cases of yersiniosis per 100 000 population by month for 2010 is shown in Figure 57. The 2010 notification rate trend differed from the seasonal historic mean rate trend of a summer peak and winter trough.

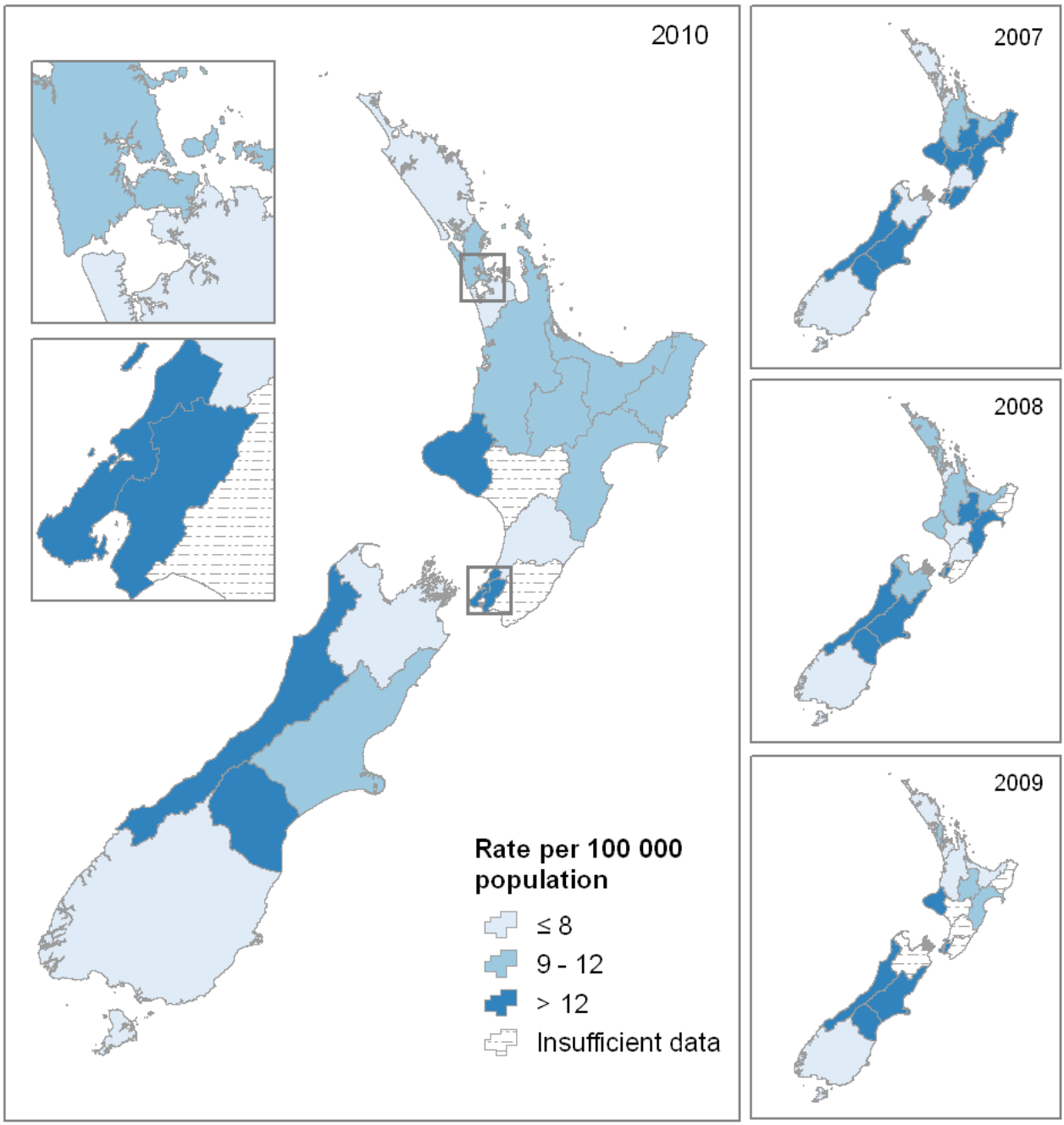
Figure 57: Yersiniosis monthly rate (annualised), 2010



4.18.3.3 Geographic distribution of yersiniosis notifications

Yersiniosis notification rates vary throughout New Zealand as illustrated in Figure 58. The highest rates were reported in Capital and Coast (19.2 per 100 000 population, 56 cases) and Taranaki (18.3 per 100 000, 20 cases) DHBs. Hutt Valley, Capital and Coast, West Coast and South Canterbury DHBs have been in the highest quantile of yersiniosis notification rates for each of the last four years.

Figure 58: Geographic distribution of yersiniosis notifications, 2007–2010



4.18.3.4 Age and sex distribution of yersiniosis cases

The yersiniosis notification rate was significantly higher for males (10.5 per 100 000 population, 225 cases) than for females (8.1 per 100 000, 181 cases) in 2010. However, the hospitalisation rate was slightly higher for females compared to males (Table 76).

Table 76: Yersiniosis cases by sex, 2010

Sex	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
Male	225	10.5	11	0.5	
Female	181	8.1	16	0.7	
Unknown	0		0		
Total	**406**	**9.3**	**27**	**0.6**	**0**

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

In 2010, the highest age-specific yersiniosis notification rates occurred in the less than 1 year (69.0 per 100 000 population, 44 cases) and the 1 to 4 years (43.5 per 100 000, 108 cases) age groups. Age-specific notifications rates were more than four times higher for those groups than for any other age group (Table 77). The highest hospitalisation rates were reported for those in the 1 to 4 years age group, although hospitalisation rates were not calculated for most age groups, due to the small numbers of cases.

Table 77: Yersiniosis cases by age group, 2010

Age group	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	44	69.0	4	-	
1 to 4	108	43.5	6	2.4	
5 to 9	12	4.2	1	-	
10 to 14	20	6.8	0	-	
15 to 19	14	4.3	3	-	
20 to 29	39	6.5	1	-	
30 to 39	31	5.4	3	-	
40 to 49	35	5.5	3	-	
50 to 59	53	9.8	1	-	
60 to 69	29	7.1	2	-	
70+	21	5.3	3	-	
Unknown	0		0		
Total	**406**	**9.3**	**27**	**0.6**	**0**

[a] MoH morbidity data for hospital admissions
[b] per 100 000 of population. Where fewer than five cases have been reported a rate has not been calculated.

4.18.3.5 Risk factors reported

In 2010, the most commonly reported risk factors for yersiniosis notifications were consumption of food from retail premises (46.2%) and contact with farm animals (34.9%) (Table 78).

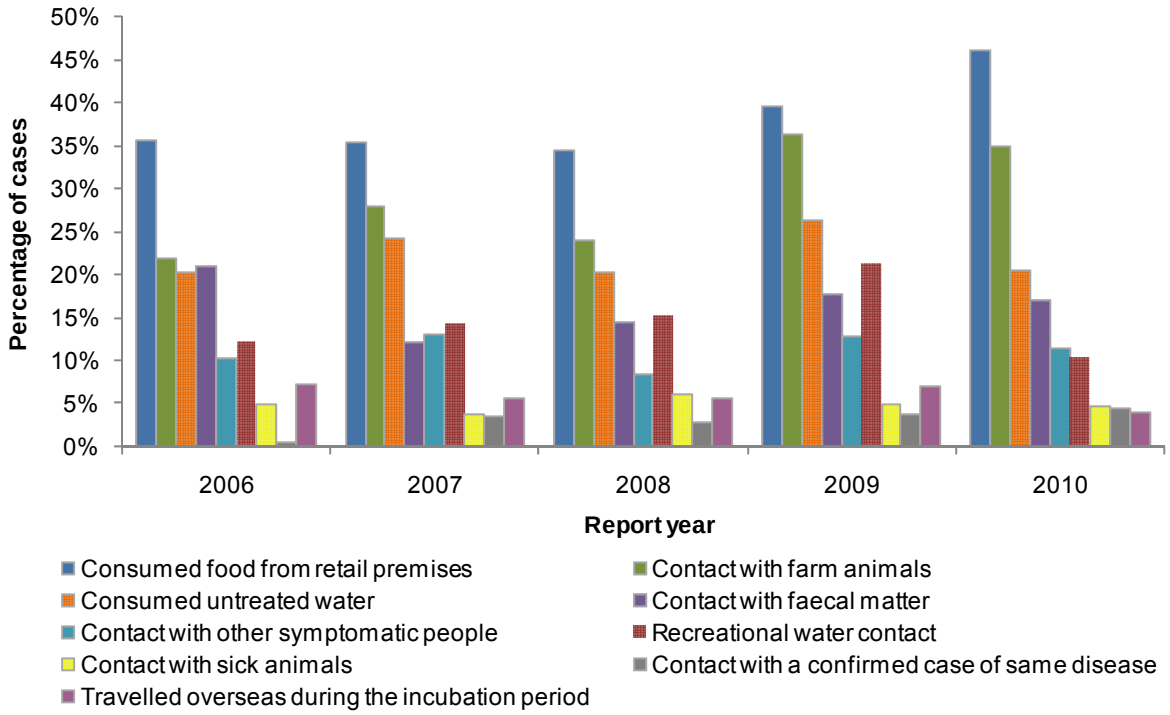
Table 78: Exposure to risk factors associated with yersiniosis, 2010

Risk Factor	Notifications			
	Yes	No	Unknown	%[a]
Consumed food from retail premises	72	84	250	46.2
Contact with farm animals	59	110	237	34.9
Consumed untreated water	30	116	260	20.5
Contact with faecal matter	26	126	254	17.1
Contact with other symptomatic people	18	140	248	11.4
Recreational water contact	16	140	250	10.3
Contact with sick animals	7	147	252	4.5
Contact with a confirmed case of same disease	6	131	269	4.4

[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.

Between 2006 and 2010, the risk factors associated with yersiniosis cases have generally occurred in the same order of importance each year (Figure 59). Over the past five years, consumption of food from retail premises and contact with farm animals have been the most commonly reported risk factors.

Figure 59: Yersiniosis risk factors by percentage of cases and year, 2006–2010



4.18.3.6 Estimate of travel-related cases

For cases where information on travel was provided, 4.0% (95%CI 1.6-8.1%) 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 2010. The resultant distribution has a mean of 16 cases (95% CI 6-30).

If data from the last four years are considered, the estimated proportion of cases travelling overseas within the incubation period of the organism is 5.8% (95% CI 4.4-7.6%).

4.18.4 Outbreaks reported as caused by *Yersinia* spp.

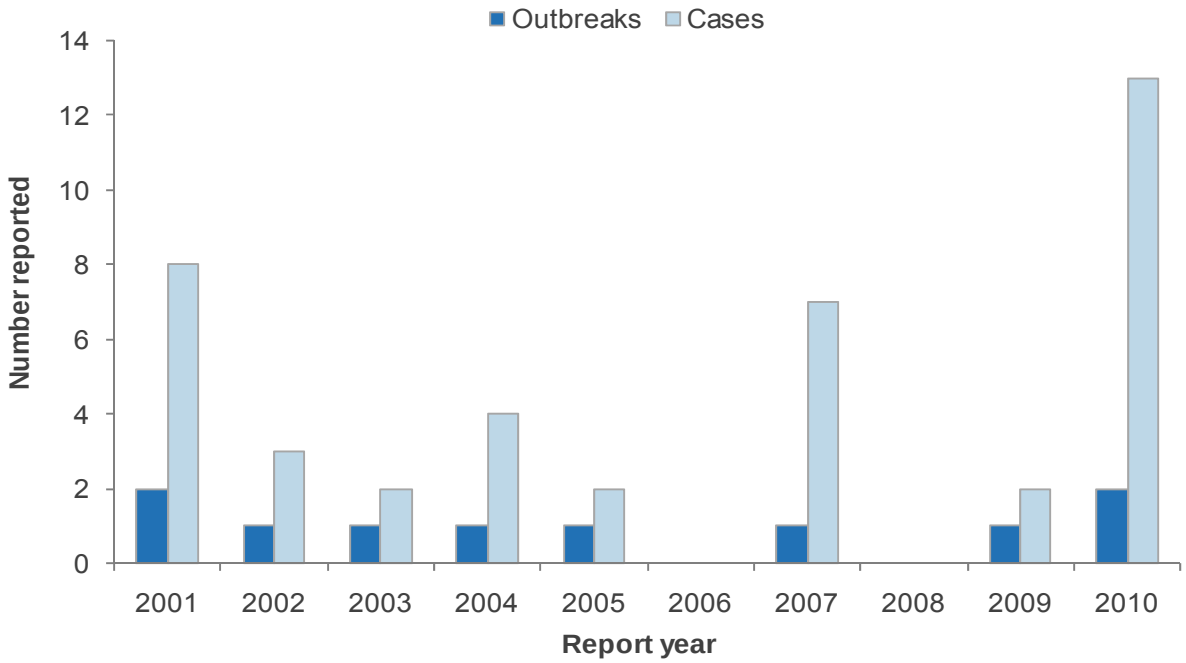
During 2010, there were two *Yersinia* spp. outbreaks, with a total of 13 cases, reported in EpiSurv, both associated with a suspected foodborne source (Table 79).

Table 79: *Yersinia* spp. outbreaks reported, 2010

Measure	Foodborne *Yersinia* spp. outbreaks	All *Yersinia* spp. outbreaks
Outbreaks	2	2
Cases	13	13
Hospitalised cases	0	0

Between 2001 and 2010 very few foodborne *Yersinia* spp. outbreaks were reported in EpiSurv (two or less each year), with a small total number of associated cases (ranging from two to 13) (Figure 60).

Figure 60: Foodborne *Yersinia* spp. outbreaks and associated cases reported by year, 2001–2010



4.18.4.1 Details of food-associated outbreaks

Table 80 contains details of the food–associated *Yersinia* spp. outbreaks reported in 2010.

Table 80: Details of the food-associated *Yersinia* spp. outbreaks, 2010

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill
Wellington (May)	Undercooked pork, pork sausages	Childcare centre	5C
Taranaki (October)	Water	Unknown	8C

C = confirmed, P = probable

4.18.4.2 Laboratory investigation of samples from suspected foodborne outbreaks

In 2010, no food or clinical samples were submitted to ESR's Public Health Laboratory relating to food-associated *Yersinia* spp. outbreaks.

4.18.5 Relevant New Zealand studies and publications

Nil.

4.18.6 Relevant regulatory developments

Nil.

5 SUMMARY TABLES

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

Table 81: Number of cases and rates per 100 000 population of selected notifiable diseases in New Zealand, 2009–2010

Disease	2009		2010		Change [b,c]
	Cases	Rates	Cases	Rates	
Campylobacteriosis	7 177	166.3	7 346	168.2	→
Cryptosporidiosis	854	19.8	954	21.8	➔
Gastroenteritis [a]	712	16.5	492	11.3	←
Giardiasis	1 639	38.0	1 985	45.4	➔
Hepatitis A	44	1.0	46	1.1	→
Listeriosis	28	0.6	23	0.5	←
Salmonellosis	1 128	26.1	1 146	26.2	→
Shigellosis	119	2.8	105	2.4	←
VTEC/STEC infection	143	3.3	138	3.2	←
Yersiniosis	430	10.0	406	9.3	←

[a] Cases of gastroenteritis from a common source or foodborne intoxication e.g. staphylococcal intoxication
[b] ←= Significant decrease, ➔ = Significant increase, ▫ = No change, ← = Not significant decrease, → = not significant increase, NA = not applicable
[c] The Pearson chi-square test or where necessary Fisher's exact test were used to determine statistical significance. P-values less than 0.05 are considered to be significant at the 95% level of confidence.

Table 82: Deaths due to selected notifiable diseases recorded in EpiSurv, 1997-2010

Disease	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Campylobacteriosis	2	2	1	3	1	1	0	0	1	1	1	0	0	0
Gastroenteritis	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Giardiasis	1	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
Listeriosis - perinatal	6	0	2	4	1	3	2	2	0	1	2	2	2	4
Salmonellosis	2	2	1	7	2	1	0	0	1	1	1	1	1	0
Shigellosis	0	0	1	0	0	0	0	0	0	0	0	0	0	0
VTEC/STEC infection	1	1	0	0	0	0	0	0	0	0	0	0	1	0
Yersiniosis	0	2	0	0	0	0	0	1	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 83: MoH mortality data for selected notifiable diseases, 2006-2008

Disease	ICD 10 Codes	2006		2007		2008 [a]	
		Und[b]	Cont[c]	Und[b]	Cont[c]	Und[b]	Cont[c]
Campylobacteriosis	A04.5	3	0	1	0	0	4
Cryptosporidiosis	A072	0	0	0	0	0	0
Giardiasis	A07.1	0	0	0	0	0	0
Hepatitis A	B15	0	0	0	2	0	1
Listeriosis	A32	0	1	2	0	1	1
Salmonellosis	A02	1	0	0	0	1	2
Shigellosis	A03	0	0	0	0	1	0
Yersiniosis	A04.6	0	0	0	0	1	1

[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 84: MoH morbidity data for selected notifiable diseases, 2008-2010

Disease	ICD 10 Codes	2008		2009		2010	
		Principal diagnosis	Other relevant diagnosis	Principal diagnosis	Other relevant diagnosis	Principal diagnosis	Other relevant diagnosis
Campylobacteriosis	A04.5	388	97	473	101	518	106
Cryptosporidiosis	A07.2	19	13	19	4	16	14
Giardiasis	A07.1	18	21	21	13	18	15
Hepatitis A	B15	19	18	17	7	20	10
Listeriosis	A32	13	13	11	17	13	18
Salmonellosis	A02	118	40	130	28	120	49
Shigellosis	A03	15	4	14	5	21	4
Toxic shellfish poisoning	T61.2	6	0	19	4	22	4
VTEC/STEC infection	A04.3	7	2	6	1	10	3
Yersiniosis	A04.6	23	30	24	22	13	14

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 85: Number of cases and rates of selected notifiable diseases per 100 000 population by ethnic group, 2010

Disease	Ethnicity											
	European		Māori		Pacific Peoples		Asian		Other Ethnicity		Unknown	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Campylobacteriosis	5 556	206.2	451	79.8	132	58.3	345	101.2	49	144.6	813	
Cryptosporidiosis	790	29.3	69	12.2	12	5.3	22	6.5	8	23.6	53	
Gastroenteritis	384	14.3	30	5.3	4		19	5.6	6	17.7	49	
Giardiasis	1 519	56.4	113	20.0	9	4.0	58	17.0	42	124.0	244	
Hepatitis A	12	0.4	3		10	4.4	18	5.3	0		3	
Listeriosis	16	0.6	1		5		1		0		0	
Salmonellosis	839	31.1	110	19.5	34	15.0	55	16.1	7	20.7	101	
Shigellosis	46	1.7	17	3.0	15	6.6	15	4.4	4		8	
VTEC/STEC infection	118	4.4	10	1.8	4		1		3		2	
Yersiniosis	228	8.5	27	4.8	17	7.5	86	25.2	6	17.7	42	

Note: Disease rates for ethnic groups are based on 2006 census data from Statistics New Zealand and should not be compared to disease rates used elsewhere in the report, which have been calculated using 2010 mid-year population estimates from Statistics New Zealand. Where fewer than five cases have been notified, a rate has not been calculated and the cell has been left blank.

Table 86: Number of cases and rates of selected notifiable diseases per 100 000 population by sex, 2010

Disease	Sex							
	Male		Female		Unknown		Total	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Campylobacteriosis	4 093	190.9	3207	144.3	46		7 346	168.2
Cryptosporidiosis	482	22.5	466	21.0	6		954	21.8
Gastroenteritis	217	10.1	261	11.7	14		492	11.3
Giardiasis	995	46.4	979	44.0	11		1 985	45.4
Hepatitis A	23	1.1	23	1.0	0		46	1.1
Listeriosis – non perinatal	8	0.4	9	0.4	0		17	0.4
Salmonellosis	561	26.2	577	26.0	8		1 146	26.2
Shigellosis	50	2.3	55	2.5	0		105	2.4
VTEC/STEC infection	67	3.1	70	3.1	1		138	3.2
Yersiniosis	225	10.5	181	8.1	0		406	9.3

Table 87: Number of cases and rates of selected notifiable diseases per 100 000 population by age group, 2010

Disease	Age group																							
	<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+		Unknown		Total	
	Cases	Rate	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	178	279.3	780	314.4	367	128.0	278	94.0	498	154.5	1 228	203.4	842	147.6	919	144.9	850	156.6	713	175.4	682	173.6	11		7 346	168.2
Cryptosporidiosis	34	53.4	286	115.3	121	42.2	81	27.4	54	16.7	110	18.2	113	19.8	77	12.1	41	7.6	18	4.4	16	4.1	3		954	21.8
Gastroenteritis	31	48.6	88	35.5	6	2.1	11	3.7	15	4.7	51	8.4	69	12.1	64	10.1	53	9.8	45	11.1	43	10.9	16		492	11.3
Giardiasis	27	42.4	395	159.2	185	64.5	46	15.6	35	10.9	197	32.6	451	79.0	284	44.8	172	31.7	145	35.7	46	11.7	2		1985	45.4
Hepatitis A	0		0		6	2.1	4		7	2.2	12	2.0	6	1.1	6	0.9	4		1		0		0		46	1.1
Listeriosis	1		1		0		0		0		3		2		1		2		5	1.2	8	2.0	0		23	0.5
Salmonellosis	56	87.9	216	87.1	76	26.5	48	16.2	62	19.2	155	25.7	133	23.3	127	20.0	111	20.4	79	19.4	81	20.6	2		1146	26.2
Shigellosis	1		12	4.8	9	3.1	5	1.7	3		20	3.3	7	1.2	14	2.2	17	3.1	14	3.4	3		0		105	2.4
VTEC/STEC infection	9	14.1	64	25.8	13	4.5	4		2		8	1.3	7	1.2	6	0.9	8	1.5	9	2.2	8	2.0	0		138	3.2
Yersiniosis	44	69.0	108	43.5	12	4.2	20	6.8	14	4.3	39	6.5	31	5.4	35	5.5	53	9.8	29	7.1	21	5.3	0		406	9.3

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
- First (lowest) band
- Second (middle) band
- Third (highest) band

Table 88: Number of cases of selected notifiable diseases by district health board, 2010

District health board	Northland	Waitemata	Auckland	Counties Manukau	Waikato	Lakes	Bay of Plenty	Tairawhiti	Taranaki	Hawke's Bay	Whanganui	MidCentral	Hutt Valley	Capital and Coast	Wairarapa	Nelson Marlborough	West Coast	Canterbury	South Canterbury	Southern	Total
Campylobacteriosis	183	843	655	534	680	183	322	37	265	317	98	248	343	592	73	235	66	931	122	619	7 346
Cryptosporidiosis	41	81	64	39	141	14	14	5	30	45	6	19	9	35	7	36	10	230	47	81	954
Gastroenteritis	4	60	63	26	30	4	10		13	4	16	44	54	90	3	8	7	44	0	12	492
Giardiasis	41	253	304	205	181	44	72	16	36	105	23	29	51	146	17	48	10	282	20	102	1 985
Hepatitis A	1	2	7	9	4	1	1	2	0	2	1	3	1	2	0	0	0	7	0	3	46
Listeriosis	1	1	3	4	1	0	2	1	1	0	1	3	1	1	0	0	1	0	0	2	23
Salmonellosis	37	111	99	73	90	19	49	13	28	42	9	31	31	52	9	51	9	162	37	194	1 146
Shigellosis	7	19	14	16	11	0	6	0	0	5	0	0	2	3	0	2	0	14	2	4	105
VTEC/STEC infection	4	14	8	7	24	8	13	8	4	8	2	1	0	2	2	1	1	24	0	7	138
Yersiniosis	5	53	41	29	33	10	17	5	20	18	4	11	23	56	3	9	5	46	9	9	406

Table 89: Rates per 100 000 population of selected notifiable diseases by district health board, 2010

District health board	Northland	Waitemata	Auckland	Counties Manukau	Waikato	Lakes	Bay of Plenty	Tairawhiti	Taranaki	Hawke's Bay	Whanganui	MidCentral	Hutt Valley	Capital and Coast	Wairarapa	Nelson Marlborough	West Coast	Canterbury	South Canterbury	Southern	Total
Campylobacteriosis	116.3	157.0	145.5	108.8	186.6	178.4	153.3	79.6	242.5	204.1	155.1	148.3	238.5	203.2	181.2	170.2	201.6	183.2	218.4	204.1	168.2
Cryptosporidiosis	26.1	15.1	14.2	7.9	38.7	13.6	6.7	10.8	27.5	29.0	9.5	11.4	6.3	12.0	17.4	26.1	30.6	45.3	84.1	26.7	21.8
Gastroenteritis		11.2	14.0	5.3	8.2		4.8		11.9		25.3	26.3	37.6	30.9		5.8	21.4	8.7		4.0	11.3
Giardiasis	26.1	47.1	67.5	41.8	49.7	42.9	34.3	34.4	32.9	67.6	36.4	17.3	35.5	50.1	42.2	34.8	30.6	55.5	35.8	33.6	45.4
Hepatitis A			1.6	1.8														1.4			1.1
Listeriosis																					0.5
Salmonellosis	23.5	20.7	22.0	14.9	24.7	18.5	23.3	28.0	25.6	27.0	14.2	18.5	21.6	17.8	22.3	36.9	27.5	31.9	66.2	64.0	26.2
Shigellosis	4.4	3.5	3.1	3.3	3.0		2.9			3.2								2.8			2.4
VTEC/STEC infection		2.6	1.8	1.4	6.6	7.8	6.2	17.2		5.2								4.7		2.3	3.2
Yersiniosis	3.2	9.9	9.1	5.9	9.1	9.7	8.1	10.8	18.3	11.6		6.6	16.0	19.2		6.5	15.3	9.1	16.1	3.0	9.3

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
- First (lowest) band
- Second (middle) band
- Third (highest) band

Table 90: Notifiable disease cases by year, 1987-2010

Disease	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Campylobacteriosis	2 921	2 796	4 187	3 850	4 148	5 144	8 101	7 714	7 442	7 635	8 924	11 572	8 161	8 418	10 146	12 494	14 788	12 215	13 836	15 873	12 778	6 694	7 177	7 346
Cryptosporidiosis										119	357	866	977	775	1 208	975	817	611	889	737	924	764	854	954
Gastroenteritis										555	310	492	601	727	940	1 087	1 026	1 363	557	937	622	687	712	492
Giardiasis										1 235	2 127	2 183	1 793	1 688	1 604	1 547	1 570	1 514	1 231	1 214	1 402	1 660	1 639	1 985
Hepatitis A	158	176	134	150	224	288	257	179	338	311	347	145	119	107	61	106	70	49	51	123	42	89	44	46
Listeriosis	12	7	10	16	26	16	11	8	13	10	35	17	19	22	18	19	24	26	20	19	26	27	28	23
Salmonellosis	1 140	1 128	1 860	1 619	1 244	1 239	1 340	1 522	1 334	1 141	1 177	2 069	2 077	1 795	2 417	1 880	1 401	1 081	1 382	1 335	1 275	1 339	1 128	1 146
Shigellosis	143	145	137	197	152	124	128	185	191	167	117	122	147	115	157	112	87	140	183	102	129	113	119	105
VTEC/STEC infection							3	3	6	7	13	48	64	67	76	73	104	89	92	87	100	124	143	138
Yersiniosis										330	488	546	503	396	429	472	436	407	383	453	502	508	430	406

Note: cell is blank where data are unavailable

Table 91: Rates per 100 000 population of selected notifiable diseases in New Zealand and other selected countries

Disease	New Zealand	Australia[1]	USA[2]	Canada[4]	UK[5]	EU Total[5]	Other High
Year	**2010**	**2010**	**2009**	**2006**	**2009**	**2009**	
Campylobacteriosis	168.2	76.2	13.0	29.7 (2005)	106.3	45.6	193 (Czech Republic)[5] 111 (Luxembourg)[5]
Cryptosporidiosis	21.8	6.6	2.9	2.2	8.1[6]	2.4[6]	9.4 (Ireland)[6]
Giardiasis	45.4	NN	7.4[3]	12.2	5.9[6]	60.6[6]	691 (Romania)[6] 64 (Russian Federation)[7]
Hepatitis A	1.1	1.2	0.9[3]	NN	1.3[6]	3.4[6]	228 (Kyrgyzstan)[7] 123 (Latvia)[6]
Listeriosis	0.5	0.3	0.3	NN	0.4	0.4	3.5 (San Marino)[7] 1.8 (Denmark)[5]
Salmonellosis	26.2	53.5	15.2	18.0	17.0	23.7	100 (Czech Republic)[5] 77 (Slovakia)[5]
Shigellosis	2.4	2.5	4.0	2.0	2.6[6]	1.8[6]	53 (Kyrgyzstan)[7] 27 (Armenia)[7] 14 (Bulgaria)[6]
VTEC/STEC Infection	3.2	0.4	1.6[8]	3.1	2.2	0.8	10 (Azerbaijan)[7] 5.4 (Israel)[7] 5.3 (Ireland)[5]
Yersiniosis	9.3	NN	0.3	1.8	0.1	1.7	14 (Lithuania)[5] 12 (Finland)[5]

NN Not notifiable

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

2 FoodNet – Foodborne Diseases Active Surveillance Network http://www.cdc.gov/foodnet/

3 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 2008 year)

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

5 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 2009 http://www.efsa.europa.eu/en/efsajournal/doc/2090.pdf

6 European Centre for Disease Prevention and Control (ECDC). Annual epidemiological report on communicable diseases in Europe http://ecdc.europa.eu/en/Pages/home.aspx (ECDC data presented here relate to the 2008 year)

7 World Health Organization Regional Office for Europe Centralized Information System for Infectious Diseases (CISID) http://data.euro.who.int/cisid/?TabID=67 (CISID data presented here relates to the 2008 year)

8 Sum of O157 and non-O157

Table 92: Foodborne outbreaks and associated cases by agent type, 2010

Agent type	No. of outbreaks	% of outbreaks (N = 141)[2]	No. of cases	% of cases (N = 936)[2]
Norovirus	19	13.5	215	23.0
Campylobacter spp.	14	9.9	62	6.6
Salmonella spp.	10	7.1	56	6.0
Clostridium perfringens	4	2.8	168	17.9
Giardia spp.	4	2.8	13	1.4
Histamine (scombroid) fish poisoning	4	2.8	13	1.4
Cryptosporidium spp.	2	1.4	5	0.5
Sapovirus	2	1.4	24	2.6
Staphylococcus aureus	2	1.4	6	0.6
Yersinia spp.	2	1.4	13	1.4
Ciguatera fish poisoning	1	0.7	2	0.2
Escherichia coli O157:H7	1	0.7	3	0.3
Hepatitis A virus	1	0.7	3	0.3
Probable MSG poisoning	1	0.7	2	0.2
Salmonella Typhi	1	0.7	3	0.3
Shigella spp.	1	0.7	2	0.2
Toxic shellfish poisoning	1	0.7	8	0.9
Unidentified pathogen[1]	72	51.1	340	36.3

[1] All outbreaks with no pathogen identified in 2010 were classified as gastroenteritis

[2] Two agents were reported in one foodborne outbreak with two cases, therefore totals add to more than 100%

Table 93: Outbreaks associated with commercial food operators, 2010

Outbreak setting	No. of outbreaks[1]	% of total outbreaks (N = 138)	No. of cases[1]	% of total cases (N = 678)
Restaurant/cafe	81	58.7	414	61.1
Takeaway	40	29.0	120	17.7
Caterers	8	5.8	105	15.5
Supermarket/deli	4	3.6	11	4.1
Other food outlet	5	2.9	28	1.6

[1] More than one setting was recorded for seven outbreaks with 22 associated cases

Table 94: Foodborne outbreaks and associated cases by implicated food source, 2010

Implicated vehicle/source	No. of outbreaks[1]	% of outbreaks (N = 107)	No. of cases	% of cases (N = 801)
Poultry	17	15.9	73	9.1
Shellfish	16	15.0	96	12.0
Dairy	13	12.1	84	10.5
Fish	8	7.5	24	3.0
Rice	8	7.5	23	2.9
Grains/beans	6	5.6	135	16.9
Oils/sugars	6	5.6	33	4.1
Meat (pork)	5	4.7	57	7.1
Meat (beef)	5	4.7	108	13.5
Meat (lamb)	4	3.7	34	4.2
Vegetables (root)	3	2.8	8	1.0
Vegetables (leafy)	3	2.8	7	0.9
Eggs	3	2.8	59	7.4
Water	3	2.8	20	2.5
Fruit/nut	2	1.9	36	4.5
Vegetables (vine/stalk)	2	1.9	6	0.7
Unspecified food source[2]	46	43.0	377	47.1

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

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

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

Table 95: Foodborne outbreaks by causal agent and implicated vehicle / source, 2010

Implicated vehicle/source[1]	Norovirus	*Campylobacter* spp.	*Salmonella* spp.	*Clostridium* spp.	*Staphylococcus aureus*	Histamine (scombroid) fish poisoning	*Giardia* spp.	Other[2]	Unidenified pathogen[3]	Total number of outbreaks
Poultry	0	6	1	1	0	0	1	1	7	**17**
Shellfish	3	1	0	0	1	0	0	3	8	**16**
Dairy	0	3	3	0	1	0	1	2	3	**13**
Fish	0	0	0	0	0	4	0	1	3	**8**
Rice	0	1	0	0	1	0	0	0	6	**8**
Grains/beans	1	1	0	1	0	0	0	0	3	**6**
Oils/sugars	0	1	2	0	0	0	0	0	3	**6**
Meat (pork)	1	0	0	1	1	0	0	1	1	**5**
Meat (beef)	0	0	0	3	0	0	0	0	2	**5**
Meat (lamb)	0	1	0	1	0	0	0	1	1	**4**
Vegetables (root)	0	0	0	0	0	0	0	0	3	**3**
Vegetables (leafy)	0	0	0	0	1	0	0	0	2	**3**
Eggs	0	0	2	0	0	0	0	0	1	**3**
Water	0	1	1	0	0	0	0	1	0	**3**
Fruit/nut	0	0	0	0	0	0	0	0	2	**2**
Vegetables (vine/stalk)	0	0	0	0	0	0	0	0	2	**2**
Unspecified food source[2]	9	1	3	1	0	0	0	2	30	**46**
Total	**13**	**11**	**8**	**4**	**2**	**4**	**2**	**12**	**51**	**107**

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

[2] Other includes all causal agents listed in Table 92 that were implicated in fewer than three foodborne outbreaks

[3] All outbreaks with no pathogen identified in 2010 were classified as gastroenteritis

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

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