ANNUAL REPORT
CONCERNING FOODBORNE DISEASE
IN NEW ZEALAND
2008

Prepared as part of a New Zealand Food Safety Authority
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by

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1 INTRODUCTION

The New Zealand Food Safety Authority (NZFSA) has an aim to reduce food-related risks to human health. Its Science Strategy has identified human health surveillance as 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 NZFSA and its stakeholders.

This report for the calendar year 2008 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) means that investigation is more likely to identify a source of exposure to the pathogen. However, only a small proportion of outbreaks are reported, and experience shows that outbreaks associated with a foodservice premise are more likely to be reported and investigated.
    - 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. Three sets of published expert opinion estimates are given in Table 1, for the USA (Mead *et al.*, 1999), Australia (Hall *et al.*, 2005) and the Netherlands (Havelaar *et al.*, 2008). 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, infection with Hepatitis A) where it is considered only a small proportion of the total.

Table 1: Overseas estimates of the food attributable proportion of selected microbial diseases

Illness/hazard	% Foodborne		
	USA	**Australia**	**Netherlands***
Bacteria			
Bacillus cereus	100	100	90
Campylobacter spp.	80	75	42
Clostridium perfringens	100	100	91
Escherichia coli O157:H7	85	65	40
Listeria monocytogenes	99	NE	69
Salmonella non-typhoidal	95	87	55
Shigella spp.	20	10	NE
Staphylococcus food poisoning	100	100	87
Yersinia enterocolitica	90	75	NE
Parasitic			
Cryptosporidium parvum	10	10	12
Giardia lamblia	10	5	13
Viral			
Hepatitis A	5	NE	11

* 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 2008 calendar year. Information from the scientific literature and other sources concerning food safety for that year have 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 infection	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
STEC/VTEC infection	Bacterium	N, O, L	A04.3 Enterohaemorrhagic *Escherichia coli* infection
Toxic shellfish poisoning	Toxin	N, O	T61.2 Other fish and shellfish poisoning
Yersiniosis	Bacterium	N, O, H	A04.6 Enteritis due to *Yersinia enterocolitica*

Data Sources: EpiSurv notifications (N), EpiSurv outbreaks (O), NZHIS hospitalisations (H), ESR laboratory data (L)
* 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. *Salmonella* Typhi and *Salmonella* Paratyphi are not included as the majority of cases acquire their infection overseas.

For some diseases (intoxications from *Bacillus*, *Clostridium* and *Staphylococcus* bacteria, 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. In this process it has been assumed that travel-associated cases can be removed 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 often 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)	Sequelae following infection with *Campylobacter* [1]
Haemolytic uraemic syndrome (HUS)	H (D59.3 Haemolytic-uraemic syndrome)	Sequelae to infection with Shiga toxin producing *E. coli*

Data Sources: NZHIS 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 2008) 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 first 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 2008 Annual Surveillance Report (Population and Environmental Health Group (ESR), 2008b).

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 New Zealand Health Information Service (NZHIS)

NZHIS in the Ministry of Health 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 Guillain-Barré Syndrome (GBS) and Haemolytic-uraemic Syndrome (HUS), for which there is potential for multiple readmissions, hospitalised cases have been reported.

2.1.4 Outbreak Surveillance

ESR has operated an outbreak surveillance system 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. More information about outbreak reporting system can be found in the 2007 Disease Outbreak Report (Population and Environmental Health Group (ESR), 2008a).

2.1.5 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.

2.1.6 NZFSA project reports and publications

NZFSA 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.

2.1.7 Risk attribution

Information from a NZFSA 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 data contained in this report are based on information recorded in EpiSurv as at 11 February 2009 and outbreak data as at 7 March 2009. 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 2008 and are crude rates unless otherwise stated.

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 maps classification for the disease rates is quantiles i.e. the data have been divided into three groups containing equal numbers of 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 (less 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 (2005-2007).

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.

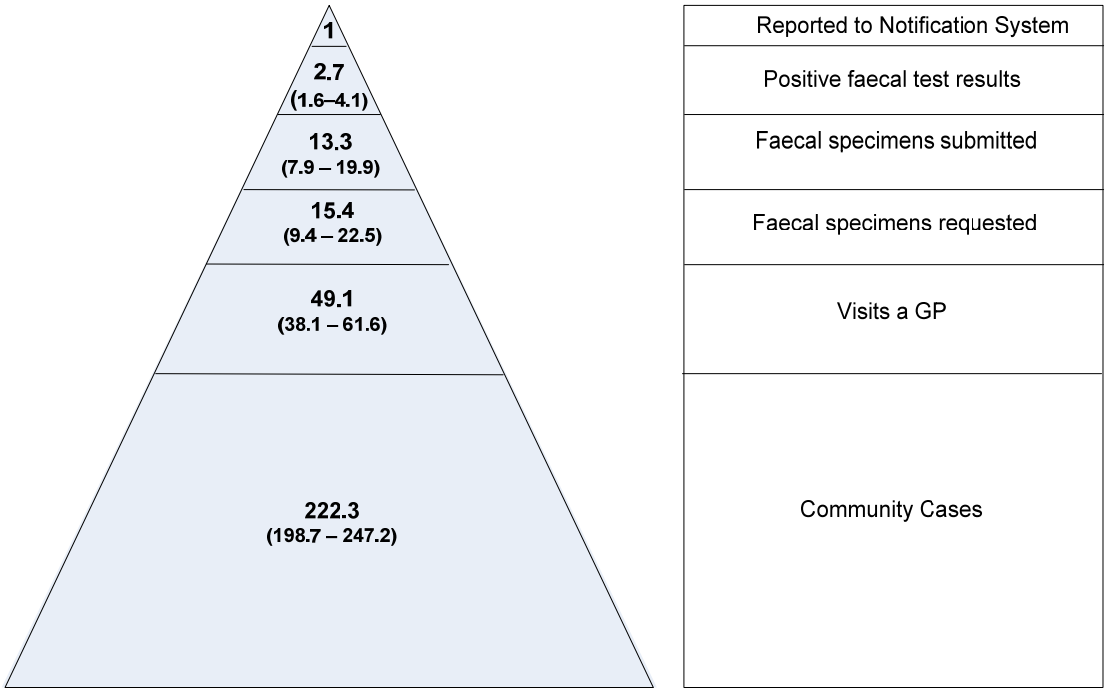
The three study elements were completed during 2005-2007 and each has been reported separately (available from the NZFSA website: http://www.nzfsa.govt.nz/science/research-projects/index.htm):

- 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 amalgamated 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.*, 2007). 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 NZFSA 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 verocytotoxigenic/shigatoxigenic *Escherichia coli* (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 only became a notifiable disease in December 2007) and the causality (e.g. person-to-person) is likely to be outside of the influence of NZFSA.

The performance goals for the foodborne diseases have been determined by the NZFSA Board and aligned with expectations arising from current regulatory priorities and programmes e.g. the NZFSA *Campylobacter* Risk Management Strategy 2008-2011. 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 NZFSA 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,* ESR. The NZFSA Science Group 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.

Year on 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

4.1.4.2 Measurement

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 2008

	Cases	Proportion (%)	Per 100 000 mid year estimated population
Total notified	6 693		156.8
Estimated not travelled overseas	6 124	91.5	143.5
Estimated foodborne transmission proportion	3 521	57.5 (37.1 – 69.6)*	82.5 (53.2 – 99.9)#

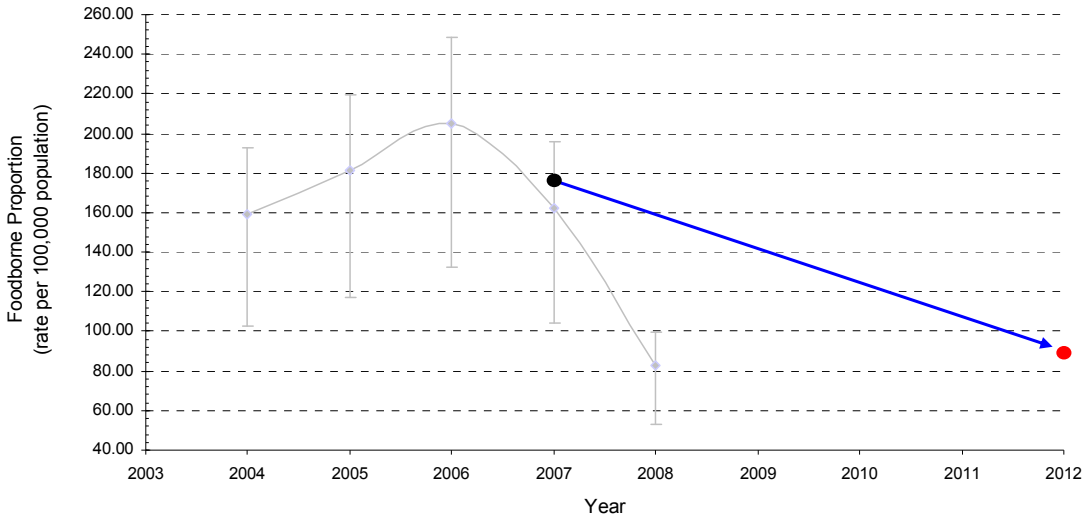
* Most likely (Minimum – Maximum) estimates of proportion foodborne, from expert consultation
# Most likely (Minimum – Maximum) estimates of foodborne rate

4.1.4.3 Presentation

The trend in cases numbers and relative rates (and ranges) compared with the baseline and five year goal (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



4.1.5 Salmonellosis

4.1.5.1 Performance target

- 30% reduction in reported annual incidence of foodborne salmonellosis after five years

4.1.5.2 Measurement

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 2008

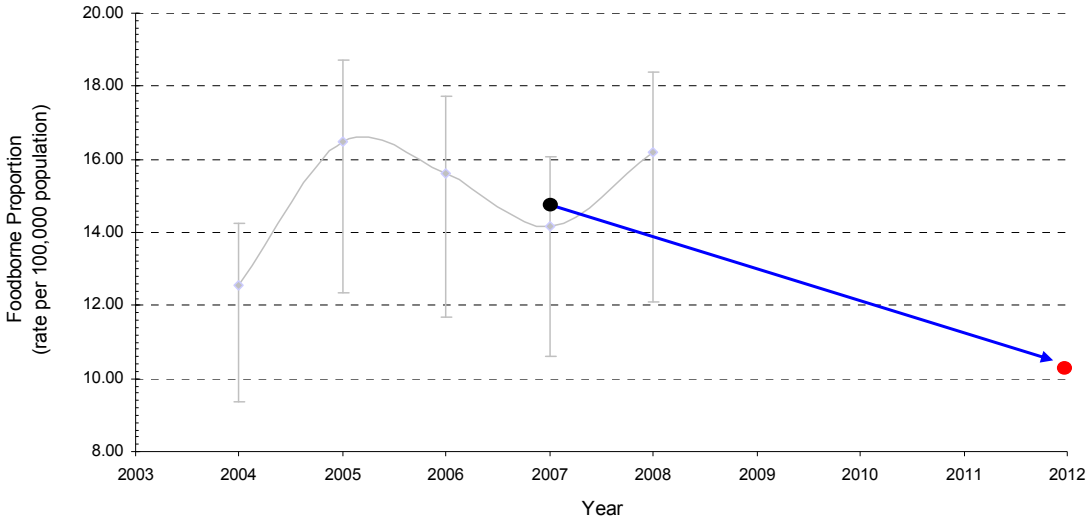
	Cases	Proportion (%)	Per 100 000 mid year estimated population
Total notified cases	1 346		31.5
Estimated not travelled overseas	1 139	85.1	26.7
Estimated foodborne transmission proportion	691	60.7 (45.4 -68.9)*	16.2 (12.1 – 18.4)#

* 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 cases numbers and relative rates (and ranges) compared with the baseline and five year goal (Figure 3).

Figure 3: Foodborne proportion of salmonellosis



4.1.6 Listeriosis

4.1.6.1 Performance target

- No increase in reported annual incidence of foodborne listeriosis after five years

4.1.6.2 Measurement

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 2008

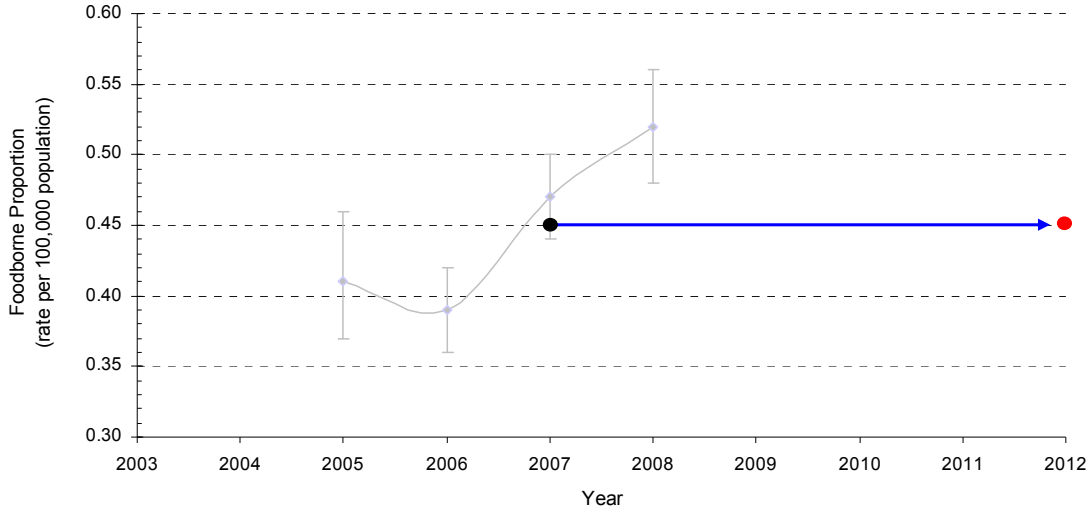
	Cases	Proportion (%)	Per 100 000 mid year estimated population
Total notified cases	27		0.63
Estimated not travelled overseas	26	96.3	0.61
Estimated foodborne transmission proportion	22	84.9 (78.4 – 92.1)*	0.52 (0.48 – 0.56)#

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

4.1.6.3 Presentation

Graphical of trend in cases numbers and relative rates (and ranges) compared with baseline period and five year goal (Figure 4).

Figure 4: Foodborne proportion of listeriosis



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 the 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 *B. 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 2008 by data source

During 2008, three notifications of *Bacillus cereus* intoxication and no resulting deaths were reported in EpiSurv.

The ICD-10 code A05.4 was used to extract *Bacillus cereus* intoxication hospitalisation data from the NZHIS NMDS database. There were two hospital admissions (0.05 admissions per 100 000 population) recorded in 2008 with *Bacillus cereus* intoxication as another relevant diagnosis.

Expert consultation estimated that 97% (minimum = 90%, maximum = 99%) of *Bacillus 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*

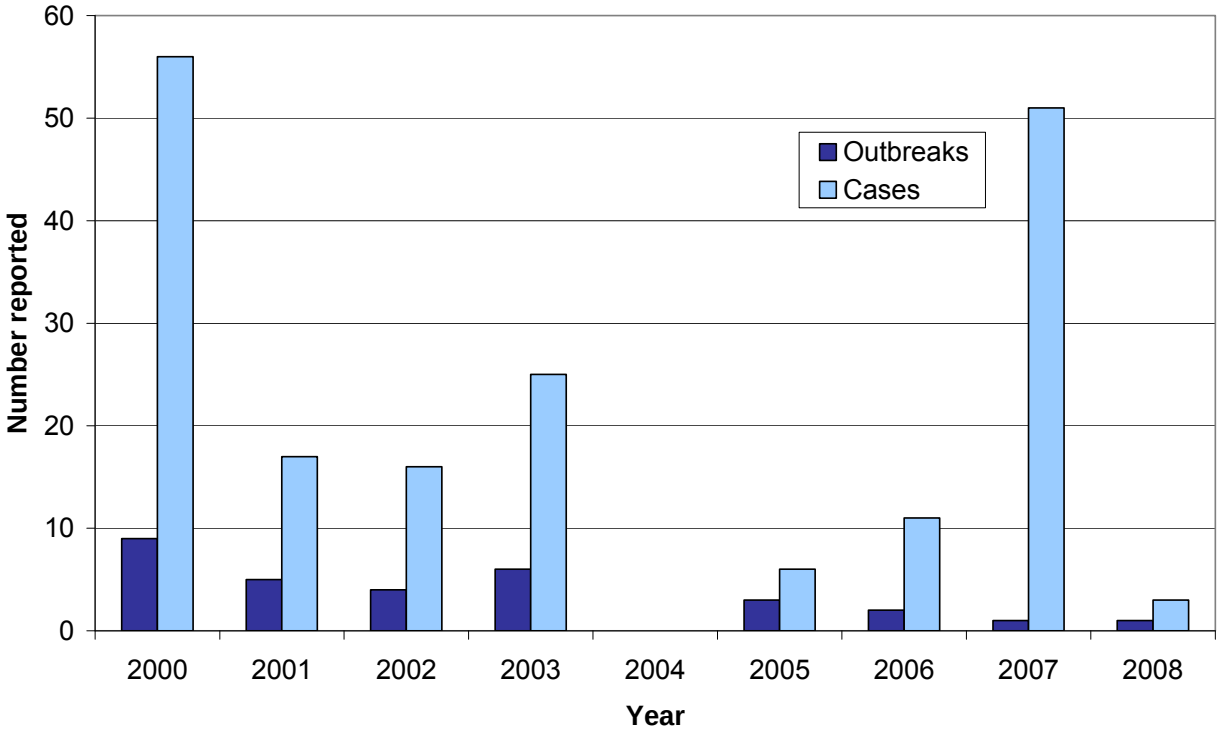
The one *Bacillus cereus* outbreak reported in 2008 was foodborne (Table 7)

Table 7: *Bacillus cereus* outbreaks reported, 2008

Measure (No.)	Foodborne *Bacillus cereus* outbreaks	All *Bacillus cereus* outbreaks
Outbreaks	1	1
Cases	3	3
Hospitalised cases	0	0

In 2008 there were fewer outbreak cases of foodborne *Bacillus cereus* intoxication than any of the previous eight years, other than 2004 when no outbreaks were reported. From 2004 to 2008, fewer outbreaks were reported each year in EpiSurv than in any of the four years prior to 2004 (Figure 5).

Figure 5: Foodborne *Bacillus cereus* outbreaks and associated cases reported by year, 2000–2008



4.3.3.1 Details of food-associated outbreaks

Table 8 contains details of the one food–associated *B. cereus* outbreak reported in 2008.

Table 8: Details of food-associated *Bacillus cereus* outbreak, 2008

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Auckland (April)	Chicken and lamb curry with rice	Café	1C, 2P	1, 2

C = confirmed, P = probable
Confirmation:
1 = Environmental investigation – identified critical control point failures linked to implicated source
2 = Epidemiological – case had history of exposure to implicated source
3 = Epidemiological – case control or cohort study showed elevated risk for cases to implicated source
4 = Laboratory – pathogen suspected to have caused illness identified in food handler
5 = Laboratory – pathogen suspected to have caused illness identified in implicated source (food)
6 = No evidence
7 = Other evidence

The suspected vehicle for the outbreak is consistent with expert opinion, that rice is the predominant cause of foodborne *Bacillus cereus* intoxication.

4.3.3.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratory, elevated levels of *Bacillus cereus* (>10^5 CFU/g) were isolated from food samples

associated with three investigations. The foods were fried rice, lamb curry and rice, and rice. For the outbreak in which lamb curry and rice was implicated high levels of *Bacillus cereus* were detected both in the food (10^6 CFU/g) and in faeces (>10^5 CFU/g) from cases.

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 2008 are given in Table 9.

Table 9: Summary surveillance data for campylobacteriosis, 2008

Parameter	Value in 2008	Section reference
Number of cases	6 693	4.4.2
Rate (per 100 000)	156.8	4.4.2
Hospitalisations (%)	485 (7.2%)	4.4.2
Deaths (%)	0 (0%)	4.4.2
Estimated travel-related cases (%)	569 (8.5%)	4.4.3.6
Estimated food-related cases (%)*	3 521 (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 2008 by data source

During 2008, 6 693 notifications (156.8 cases per 100 000 population) of campylobacteriosis were reported in EpiSurv.

The ICD-10 code A04.5 was used to extract campylobacteriosis hospitalisation data from the NZHIS NMDS database. Of the 485 hospital admissions (11.4 admissions per 100 000 population) recorded in 2008, 388 were reported with campylobacteriosis as the primary diagnosis and 97 with campylobacteriosis as another relevant diagnosis.

No deaths due to campylobacteriosis were recorded in EpiSurv in 2008.

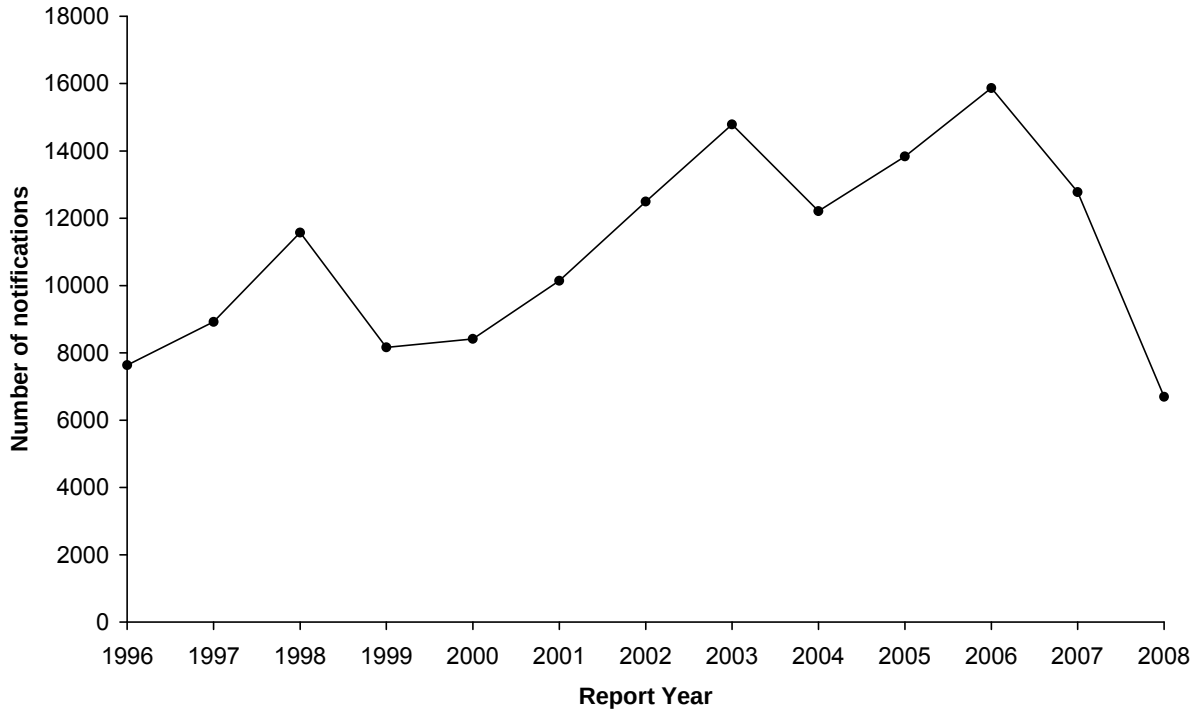
It has been estimated by expert consultation that 57.5% (minimum = 37%, maximum = 70%) of campylobacteriosis incidence is due to foodborne transmission. It was further estimated that 53% of foodborne transmission would be due to transmission via poultry.

4.4.3 Notifiable disease data

4.4.3.1 Annual notification trend

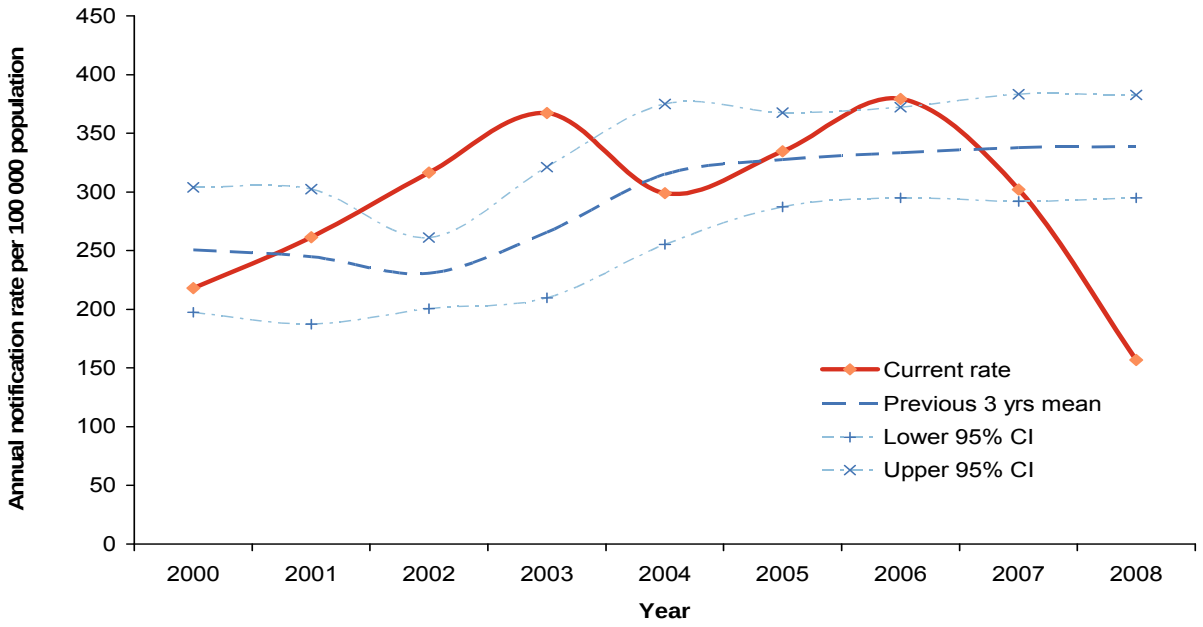
The number of campylobacteriosis notifications reported each year has generally increased since 1996, with the highest number recorded in 2006 (15 873 cases) (Figure 6). The number of cases began to drop in 2007 and the number of notifications reported in 2008 (6 693 cases) is the lowest in the 13 year period.

Figure 6: Campylobacteriosis notifications by year, 1996-2008



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 and 2008.

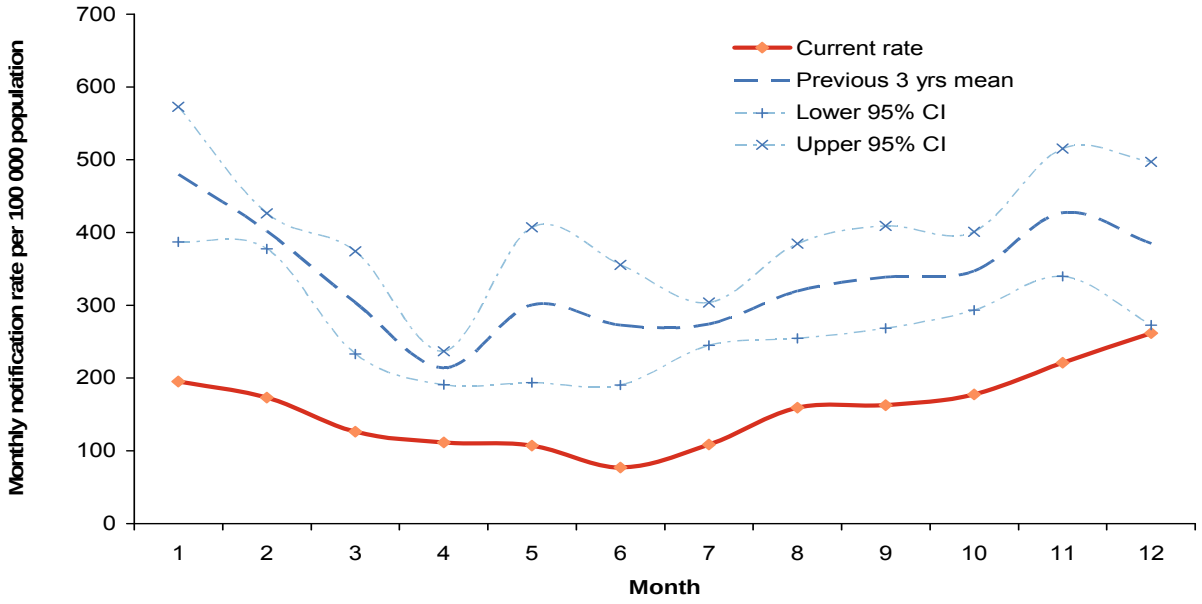
Figure 7: Campylobacteriosis notification rate by year, 2000-2008



4.4.3.2 Seasonality

The number of notified cases of campylobacteriosis per 100 000 population by month for 2008 is shown in Figure 8. The pattern in 2008 is similar to previous years, highly seasonal with a summer peak and winter trough. The lowest monthly campylobacteriosis notification total for 2008 was for the month of June with 274 notifications and the highest was for the month of December when 931 cases were notified.

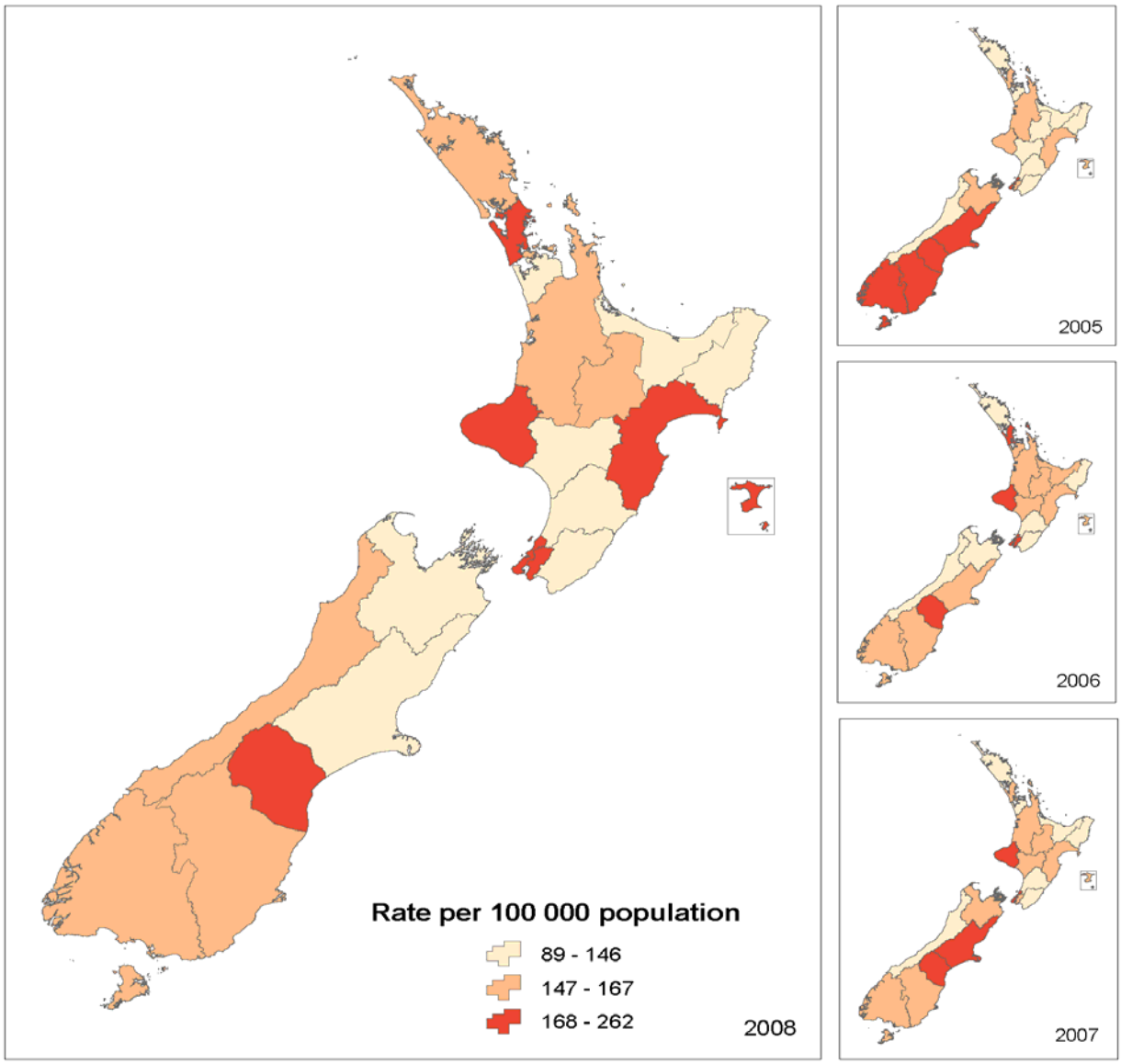
Figure 8: Campylobacteriosis monthly rate (annualised) for 2008



4.4.3.3 Geographic distribution of campylobacteriosis notifications

Campylobacteriosis rates varied throughout the country as demonstrated in Figure 9. The highest rates were reported for South Canterbury (262.2 per 100 000 population) and Hutt Valley (210.0 per 100 000) DHBs. The lowest rates were reported for Tairawhiti (89.3 per 100 000) and MidCentral (119.0 per 100 000) DHBs. South Canterbury DHB has been in the highest quantile of campylobacteriosis notification rates for each of the last four years.

Figure 9: Geographic distribution of campylobacteriosis notifications, 2005-2008



4.4.3.4 Age and sex distribution of campylobacteriosis cases

The number and rate of notifications and hospitalisations for campylobacteriosis were higher in males than in females (Table 10).

Table 10: Campylobacteriosis cases by sex, 2008

Sex	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
Male	3 711	177.4	257	12.3	
Female	2 888	132.7	228	10.5	
Unknown	94				
Total	6 693	156.8	485	11.4	

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

The highest age-specific notification rate for campylobacteriosis occurred for children aged 1 to 4 years (318.7 per 100 000 population) and children aged less than one year (271.6 per 100 000). The hospitalisation rate for the 70+ years age group was more than double that reported in any other age group (Table 11).

Table 11: Campylobacteriosis cases by age group, 2008

Age groups	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	174	271.6	4	6.2	
1 to 4	752	318.7	19	8.1	
5 to 9	327	113.7	16	5.6	
10 to 14	271	89.8	15	5.0	
15 to 19	467	144.8	29	9.0	
20 to 29	1 060	186.1	75	13.2	
30 to 39	814	139.5	37	6.3	
40 to 49	814	128.4	52	8.2	
50 to 59	734	141.1	51	9.8	
60 to 69	643	170.3	54	14.3	
70+	611	164.3	133	35.8	
Unknown	26				
Total	6 693	156.8	485	11.4	

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

4.4.3.5 Risk factors reported

The risk factors recorded for campylobacteriosis are shown in Table 12. The most common risk factors are contact with farm animals (44.1%) and consumption of food from food retail premises (44.0%).

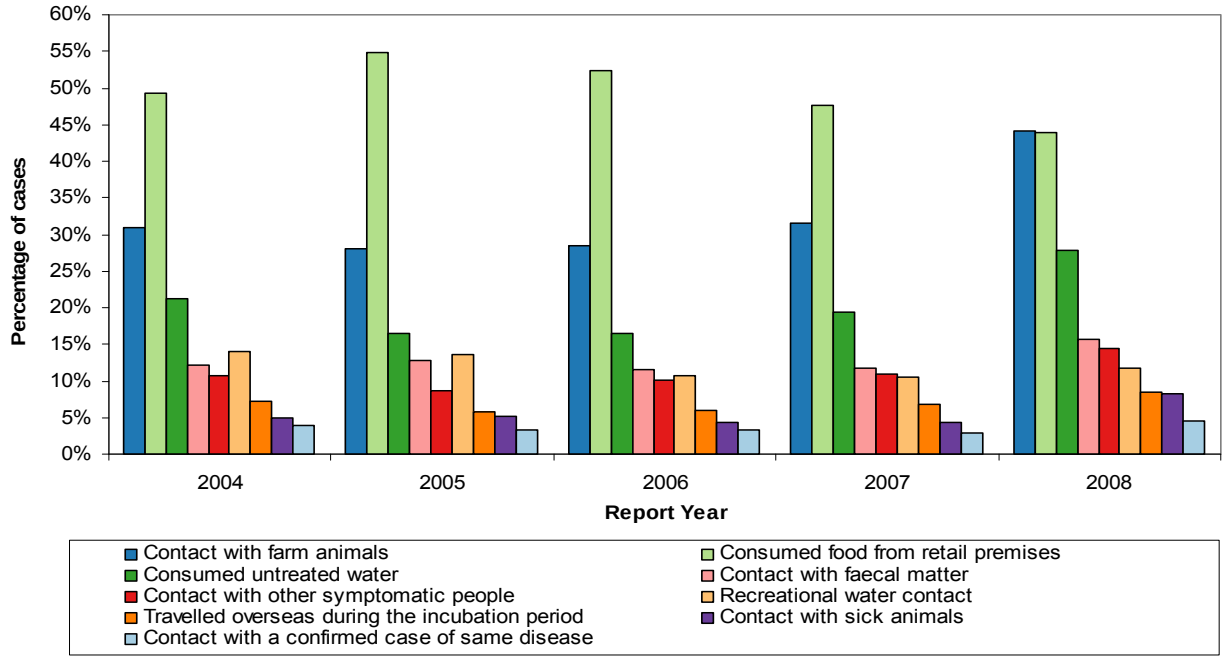
Table 12: Exposure to risk factors associated with campylobacteriosis, 2008

	Notifications			
Risk Factor	**Yes**	**No**	**Unknown**	**%[a]**
Contact with farm animals	793	1007	4893	44.1%
Consumed food from retail premises	684	871	5138	44.0%
Consumed untreated water	392	1017	5284	27.8%
Contact with faecal matter	235	1268	5190	15.6%
Contact with other symptomatic people	230	1372	5091	14.4%
Recreational water contact	179	1334	5180	11.8%
Travelled overseas during the incubation period	173	1863	4657	8.5%
Contact with sick animals	123	1377	5193	8.2%
Contact with a confirmed case of same disease	79	1693	4921	4.5%

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

Over the five years 2004 to 2008, the consumption of food from retail premises, contact with farm animals, and consumption of untreated water were consistently the most commonly reported risk factors for campylobacteriosis. However, 2008 was the only year where a greater proportion of cases reported contact with farm animals than consumption of food at a retail premises (Figure 10).

Figure 10: Campylobacteriosis risk factors by percentage of cases and year, 2004 – 2008



4.4.3.6 Estimate of travel-related cases

For cases where information on travel was provided, 8.5% (95%CI 7.3-9.8%) 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 2008. The resultant distribution has a mean of 569 cases (95% CI 475-669).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 6.5% (95% CI 6.1-6.8%). The proportion of travel-associated cases in 2008 was higher than for any of the previous three years. However, the estimated number of travel-associated cases was lower than in recent years.

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.

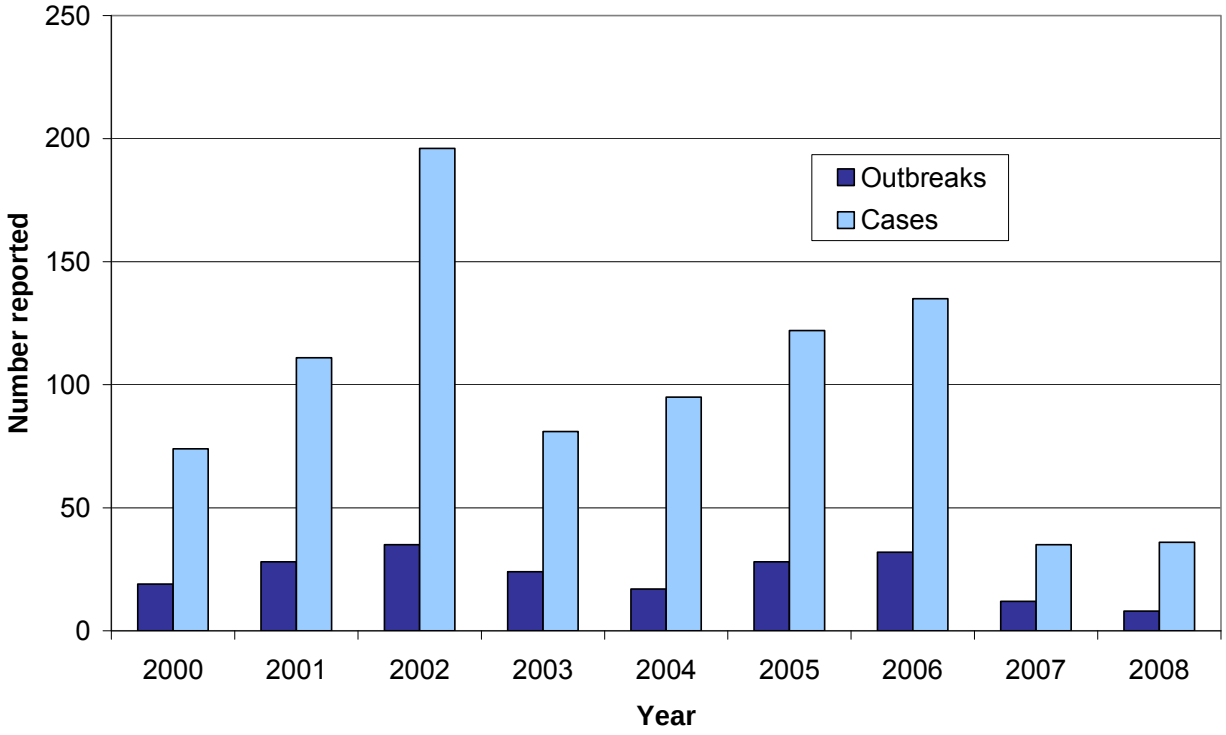
In 2008, eight (50%) of the *Campylobacter* outbreaks and 36 (33%) of the associated cases were reported as foodborne (Table 13). Two of the three *Campylobacter* cases reported as hospitalised were associated with foodborne outbreaks. *Campylobacter* outbreaks accounted for 6.3% (16/449) of all outbreaks and 1.7% (109/6503) of all associated cases. Both norovirus (152 outbreaks, 3917 cases) and *Giardia* (50 outbreaks, 184 cases) were implicated in more outbreaks than *Campylobacter* (16 outbreaks), and rotavirus (16 outbreaks, 128 cases), *Salmonella* (15 outbreaks, 163 cases) and *Clostridium* (7 outbreaks, 215 cases) also had more associated cases than *Campylobacter* (109 cases).

Table 13: *Campylobacter* spp. outbreaks reported, 2008

Measure (No.)	Foodborne *Campylobacter* spp. outbreaks	All *Campylobacter* spp. outbreaks
Outbreaks	8	16
Cases	36	109
Hospitalised cases	2	3

The number of foodborne campylobacteriosis 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 campylobacteriosis outbreaks decreased markedly to 12 outbreaks and in 2008 there was the lowest number of outbreaks (8) reported of any of the nine years, 2000-2008 (Figure 11).

Figure 11: Foodborne *Campylobacter* spp. outbreaks and associated cases reported by year, 2000 – 2008



4.4.4.1 Details of food-associated outbreaks

Table 14 contains details of the eight food–associated *Campylobacter* spp. outbreaks reported in 2008.

Table 14: Details of food-associated *Campylobacter* spp. outbreaks, 2008

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Auckland (September)	Eggs	Overseas	2C	6
Auckland (November)	Water	Home, farm	1C, 3P	6
Canterbury (June)	Unknown	Rest home	2C	2
Otago (April)	Lamb's fry and bacon	Café	5C	1, 2
Otago (July)	Liver, mashed potato and gravy	Rest home, continuing care hospital, caterers	4C	1, 2
Waikato (July)	Milk	Prison, farm	2C	7
Wellington (November)	Chicken	Rest home, continuing care hospital	6C	2
Wellington (December)	Chicken liver paté	Café	8C, 3P	1, 2, 5

C = confirmed, P = probable
Confirmation:
1 = Environmental investigation – identified critical control point failures linked to implicated source
2 = Epidemiological – case had history of exposure to implicated source
3 = Epidemiological – case control or cohort study showed elevated risk for cases to implicated source
4 = Laboratory – pathogen suspected to have caused illness identified in food handler
5 = Laboratory – pathogen suspected to have caused illness identified in implicated source (food)
6 = No evidence
7 = Other evidence

While a range of products were implicated as the suspected source of infection in the outbreaks, the level of confirmation for most outbreaks was low. In only one outbreak, linked to consumption of inadequately prepared chicken liver paté, was *Campylobacter* identified in the implicated source.

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, *Campylobacter* was not isolated from any clinical or food samples during 2008.

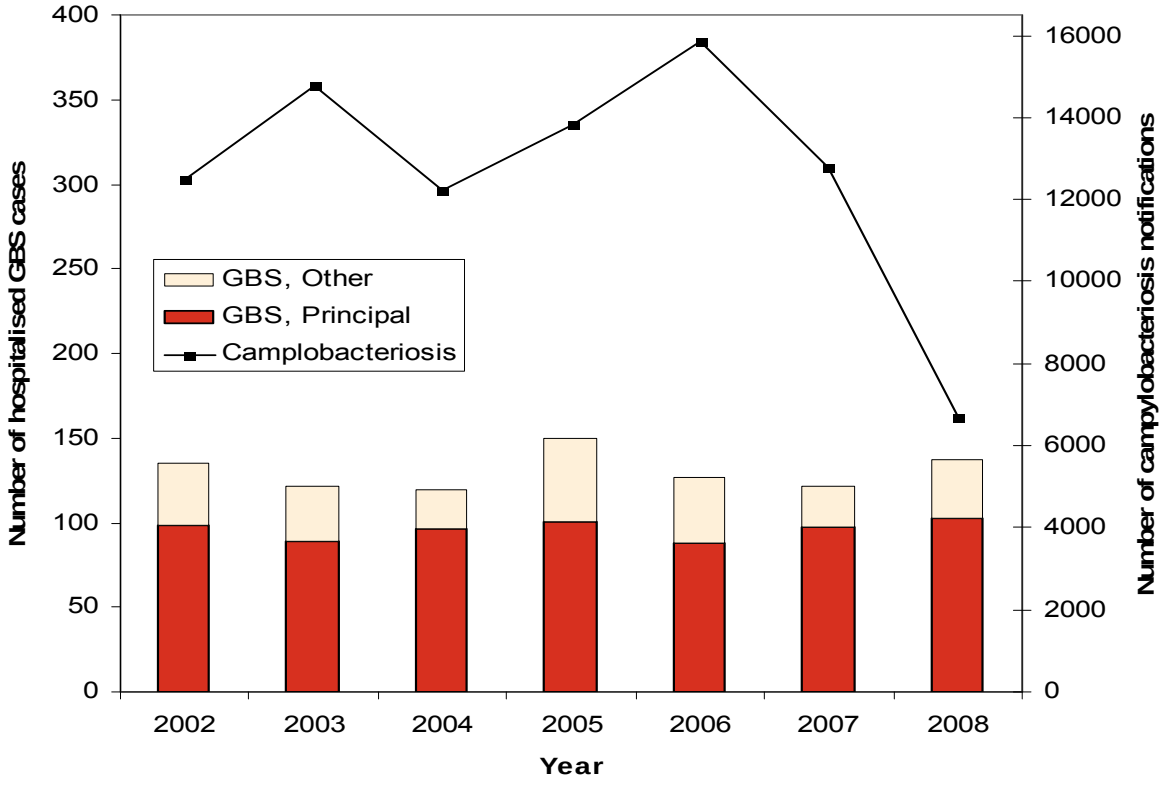
4.4.5 Disease sequelae - Guillain-Barré Syndrome (GBS)

Guillain-Barré Syndrome is most commonly 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 NZHIS NMDS database. Of the 137 hospitalised cases (3.2 admissions per 100,000 population) recorded in 2008, 103 were reported with GBS as the primary diagnosis and 34 with this condition as another relevant diagnosis.

Over the period 2002 to 2008 the number of hospitalised cases (any diagnosis code) for GBS have varied in the range 102 to 150 (Figure 12). The number 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.

Figure 12: GBS hospitalised cases, 2002 - 2008



In 2008 the number of GBS hospital admissions was greater for males than females (Table 15).

Table 15: GBS hospitalised cases by sex, 2008

Sex	Cases hospitalised[a]	
	No.	Rate[b]
Male	75	3.6
Female	62	2.8
Total	137	3.2

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

In 2008 the highest hospitalised case rate for GBS occurred in 70+ year olds (Table 16).

Table 16: GBS hospitalised cases by age group, 2008

Age groups	Cases hospitalised[a]	
	No.	Rate[b]
<1 to 4	3	1.0
5 to 9	1	0.3
10 to 14	5	1.7
15 to 19	8	2.5
20 to 29	6	1.1
30 to 39	19	3.3
40 to 49	13	2.1
50 to 59	30	5.8
60 to 69	20	5.3
70+	32	8.6
Total	137	3.2

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

4.4.6 Relevant New Zealand studies and publications

4.4.6.1 Reports

A three-year (2005-2008) project in the Manawatu aimed at source attribution of human campylobacteriosis cases using multi-locus sequence typing (MLST) identified poultry as the most important source of infection (French, 2008). Based on three different approaches, the contribution of poultry to human campylobacteriosis cases was estimated to be 52-75%. Cattle were the next most important source, contributing 17-23% to human cases. Smaller contributions were estimated from sheep, wild birds and environmental water. Poultry strain types were more common amongst human cases in urban areas, while ruminant types were predominantly found amongst human cases in rural areas. Demographic analysis suggests that environmental and occupational exposures may be relatively more important for exposure to ruminant strain types.

A smaller study was carried out in Christchurch during February to April 2008 to validate the results of the Manawatu study (Wong *et al.*, 2008).

Other studies reported during 2008 providing information on *Campylobacter* were:

- An investigation of the amount of drip liquid in leak-proof packaged retail poultry and enumeration of *Campylobacter* in the drip liquid, when present (Wong, 2008);
- A consumer telephone survey to assess knowledge, attitudes and beliefs with respect to *Campylobacter*, campylobacteriosis and poultry (Gilbert and Cressey, 2008);
- An investigation of the reduction in *Campylobacter* on chicken breasts during commercial freezing, followed by domestic frozen storage (McIntyre, 2008);
- A survey of on-farm risk factors for *Campylobacter* infection of poultry flocks in New Zealand (Lake *et al.*, 2008) and an associated literature review of risk factors identified internationally (Hudson *et al.*, 2008); and
- An investigation of the distribution of *Campylobacter* on chicken carcasses (Paulin and Wong, 2008).

4.4.6.2 Journal papers

A study of 163 chicken carcasses, taken from retail outlets in Auckland, Wellington and Christchurch, isolated *Campylobacter* from 73 (44.8%) carcass rinse samples and from weep water (free liquid in retail packages) from 20 samples (12.3%) (Chrystal *et al.*, 2008). The mean count from positive carcasses was 3.6 log CFU (range <400-6 x 10^5 CFU/carcass).

Faecal samples were collected from 410 dairy cattle from 36 farms in the Matamata-Piako district in New Zealand (Gilpin *et al.*, 2008b). *Campylobacter jejuni* was isolated from 51% of dairy cattle and 65% of calves. Penner serotyping and pulsed field gel electrophoresis were used to examine similarities between bovine *Campylobacter* types and human isolates from the same district. Twenty-one percent of bovine types and 43% of human isolates formed indistinguishable clusters of at least one bovine and one human isolate.

Investigations were carried out at seven dairy farms on which a campylobacteriosis case had been notified (Gilpin *et al.*, 2008a). Based on genotyping and epidemiological questionnaires, contact with dairy cow faeces was the most likely source of infection in four of the seven cases investigated. The relative risk of a dairy farm worker being notified with campylobacteriosis was estimated to be 1.88 (95% confidence interval 1.6-2.2).

A one year survey conducted from mid-2005 to 2006 measured the counts and/or prevalence in fresh bovine faeces of bacterial and protozoan pathogens on New Zealand dairy farms (Moriarty *et al.*, 2008). A total of 155 faecal samples were collected from four farms. The prevalence of *Campylobacter* was 64% (99/155).

4.4.7 Relevant regulatory developments

NZFSA and the New Zealand Poultry Industry Association have developed a new code of practice (COP) specifically for poultry processing:
http://www.nzfsa.govt.nz/animalproducts/publications/code-of-practice/poultry/

The code includes:

- Improvements for control of *Campylobacter* identified by NZFSA's *Campylobacter* Strategy Working Group;
- Expected standards for Good Manufacturing Practice; and
- Procedures to promote compliance with legal requirements set under the Animal Products Act 1999

In December 2008, NZFSA launched their *Campylobacter Risk Management Strategy 2008-2011*: http://www.nzfsa.govt.nz/foodborne-illness/campylobacter/strategy/Campylobacter_risk_management_strategy_2008-2011.pdf

The objectives of the strategy are to:

1. To reduce the incidence of foodborne human campylobacteriosis in accordance with the NZFSA performance target
2. To estimate the proportion of foodborne cases attributable to poultry and other sources
3. To determine the relative contributions of different interventions throughout the food chain in reducing risks to human health
4. To continue to make well-informed risk management decisions on appropriate control measures and their implementation
5. To assess the effectiveness of risk management decisions by utilising a monitoring and review programme
6. To coordinate and prioritise research activities

This represents a widening of the scope of the 2006 *Campylobacter in Poultry Risk Management Strategy 2006-2009,* to include investigation and management of other potential exposure pathways for humans.

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 2008 by data source

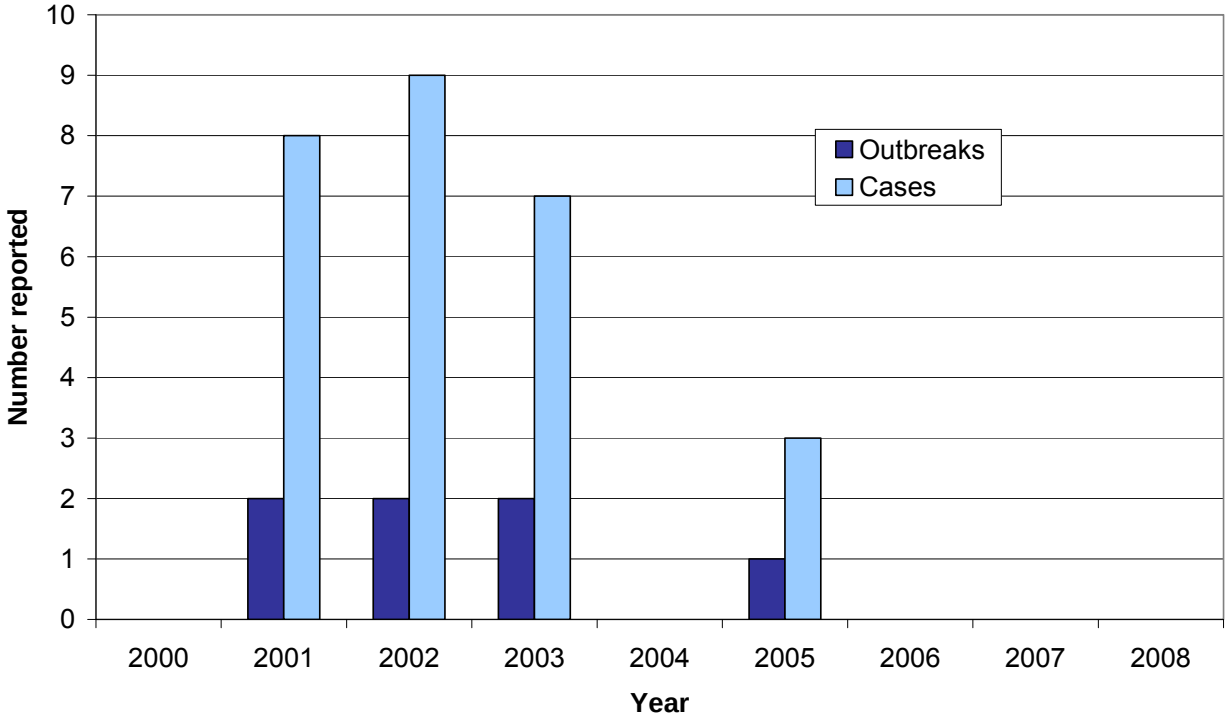
Two ciguatera fish poisoning cases were reported in EpiSurv in 2008.

The ICD-10 code T61.0 was used to extract ciguatera fish poisoning hospitalisation data from the NZHIS NMDS database. Of the 8 hospital admissions (0.2 admissions per 100 000 population) recorded in 2008, all were reported with ciguatera fish poisoning as the primary diagnosis.

4.5.3 Outbreaks reported as caused by ciguatera fish poisoning

No outbreaks due to ciguatera fish poisoning were reported in 2008 (Figure 13). Very few outbreaks of ciguatera fish poisoning have been reported in recent years, the last outbreak involving three cases was reported in 2005.

Figure 13: Outbreaks and associated cases due to ciguatera fish poisoning reported by year, 2000 – 2008



4.5.3.1 Laboratory investigation of samples from suspected foodborne outbreaks

Nil.

4.5.4 Relevant New Zealand studies and publications

Nil.

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 ≥10^6/g or isolation of ≥10^5/g *C. 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 2008 by data source

During 2008, two cases of *Clostridium perfringens* intoxication were reported in EpiSurv with no resulting deaths recorded.

4.6.3 Outbreaks reported as caused by *Clostridium perfringens*

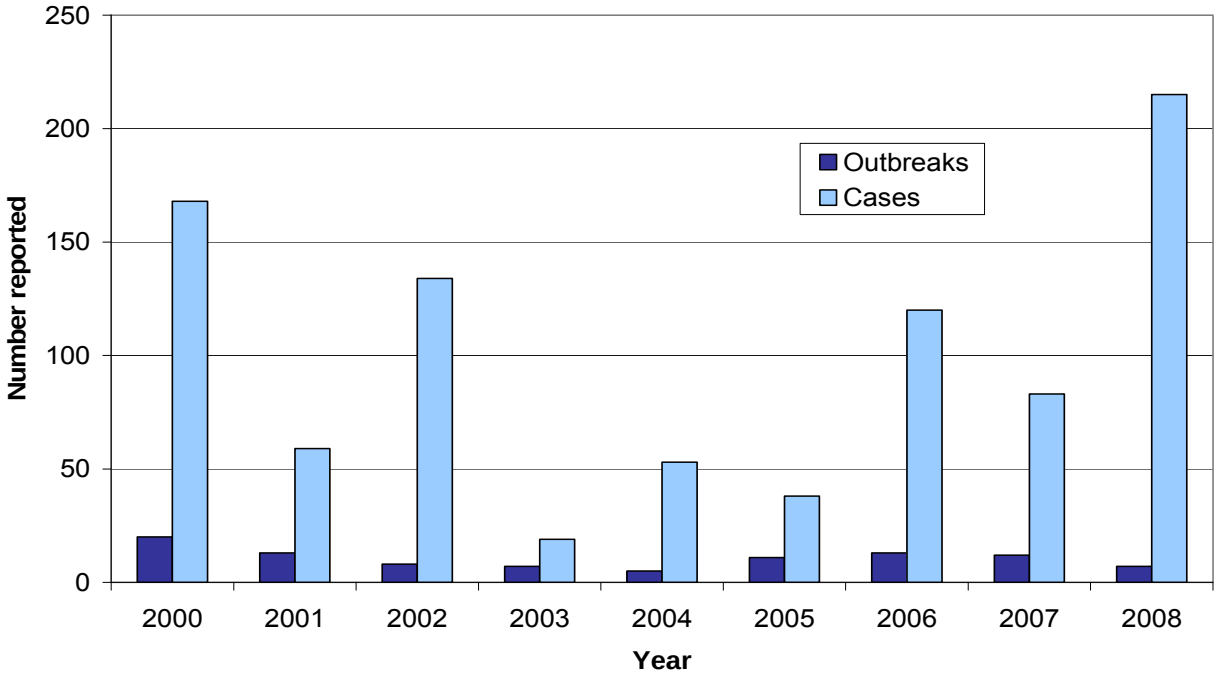
All seven *Clostridium perfringens* outbreaks for 2008 were associated with a suspected or known foodborne source (Table 17).

Table 17: *Clostridium perfringens* outbreaks reported, 2008

Measure (No.)	Foodborne *Clostridium perfringens* outbreaks	All *Clostridium perfringens* outbreaks
Outbreaks	7	7
Cases	215	215
Hospitalised cases	0	0

Since 2000, the number of foodborne outbreaks associated with *Clostridium perfringens* has fluctuated, from five outbreaks in 2004 to 20 outbreaks in 2000 and 2006 (Figure 14). The number of cases associated with *Clostridium perfringens* outbreaks has also varied over time. In 2008 the number of cases associated with foodborne outbreaks due to *Clostridium perfringens* was the highest of any year in the period monitored (2000-2008).

Figure 14: Foodborne *Clostridium perfringens* outbreaks and associated cases reported by year, 2000–2008



4.6.3.1 Details of food-associated outbreaks

Table 18 contains details of the seven food–associated *Clostridium perfringens* outbreaks reported in 2008.

Table 18: Details of food-associated *Clostridium perfringens* outbreaks, 2008

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Auckland (May)	Lamb curry and rice	Café	2C	1
Auckland (July)	Chicken biryani and mutton curry	Community gathering	2C, 56P	1, 2
Auckland (October)	Seafood mornay	Hostel	1C, 120P	2, 5
Auckland (November)	Roast meats (lamb, beef and pork)	Café	2C, 2P	7
Auckland (December)	Roast meats	Café	1C, 5P	6
Canterbury (August)	Rice, beans and salad	Café	5C, 11P	1, 2
Canterbury (August)	Rice, beans and salad	Café	1C, 7P	2

C = confirmed, P = probable
Confirmation:
1 = Environmental investigation – identified critical control point failures linked to implicated source
2 = Epidemiological – case had history of exposure to implicated source
3 = Epidemiological – case control or cohort study showed elevated risk for cases to implicated source
4 = Laboratory – pathogen suspected to have caused illness identified in food handler
5 = Laboratory – pathogen suspected to have caused illness identified in implicated source (food)
6 = No evidence
7 = Other evidence

Of the seven food-associated *Clostridium perfringens* outbreaks, two were associated with roast meats, two with meat curries, two with rice, beans and salad and one with seafood.

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, *Clostridium perfringens* and/or its toxin was detected in clinical samples from 10 investigations. *Clostridium perfringens* was detected at high levels in leftovers of a seafood meal associated with one outbreak. Implicated foods included roast meals (2), buffet meal, Mexican food, Asian meal, seafood meal, prawn satay and peanut butter.

4.6.4 Relevant New Zealand studies and publications

NZFSA published an article on the risks of high levels of *Clostridium perfringens* developing in improperly handled bulk cooked foods (NZFSA, 2008a). This article was accompanied by another describing a 2006 outbreak caused by *Clostridium perfringens* in turkey and the lessons to be learnt from the outbreak (NZFSA, 2008b).

4.6.5 Relevant regulatory developments

Nil.

4.7 Cryptosporidiosis

Summary data for cryptosporidiosis in 2008 are given in Table 19.

Table 19: Summary surveillance data for cryptosporidiosis, 2008

Parameter	Value in 2008	Section reference
Number of cases	764	4.7.2
Rate (per 100 000)	17.9	4.7.2
Hospitalisations (%)	32 (4.2%)	4.7.2
Deaths (%)	0 (0%)	4.7.2
Estimated travel-related cases (%)	56 (7.4%)	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 2008 by data source

During 2008, 764 notifications (17.9 cases per 100 000 population) of cryptosporidiosis were reported in EpiSurv.

The ICD-10 code A07.2 was used to extract cryptosporidiosis hospitalisation data from the NZHIS NMDS database. Of the 32 hospital admissions (0.7 admissions per 100 000 population) recorded in 2008, 19 were reported with cryptosporidiosis as the primary diagnosis and 13 with cryptosporidiosis as another relevant diagnosis.

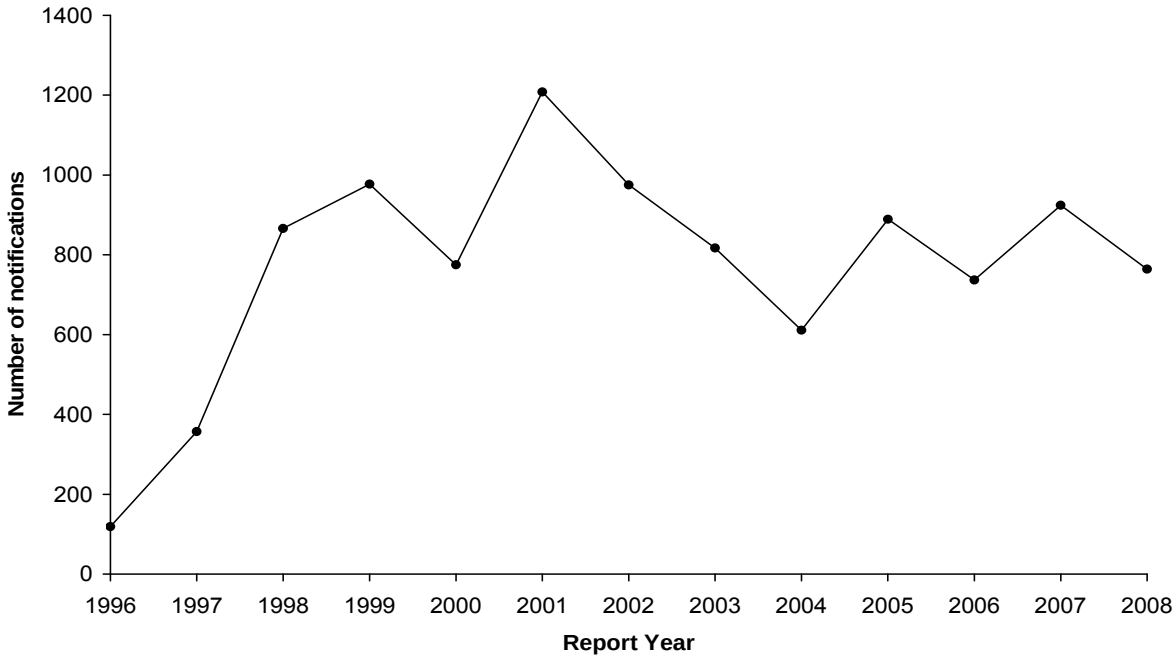
No deaths were recorded in EpiSurv in 2008.

4.7.3 Notifiable disease data

4.7.3.1 Annual notification trend

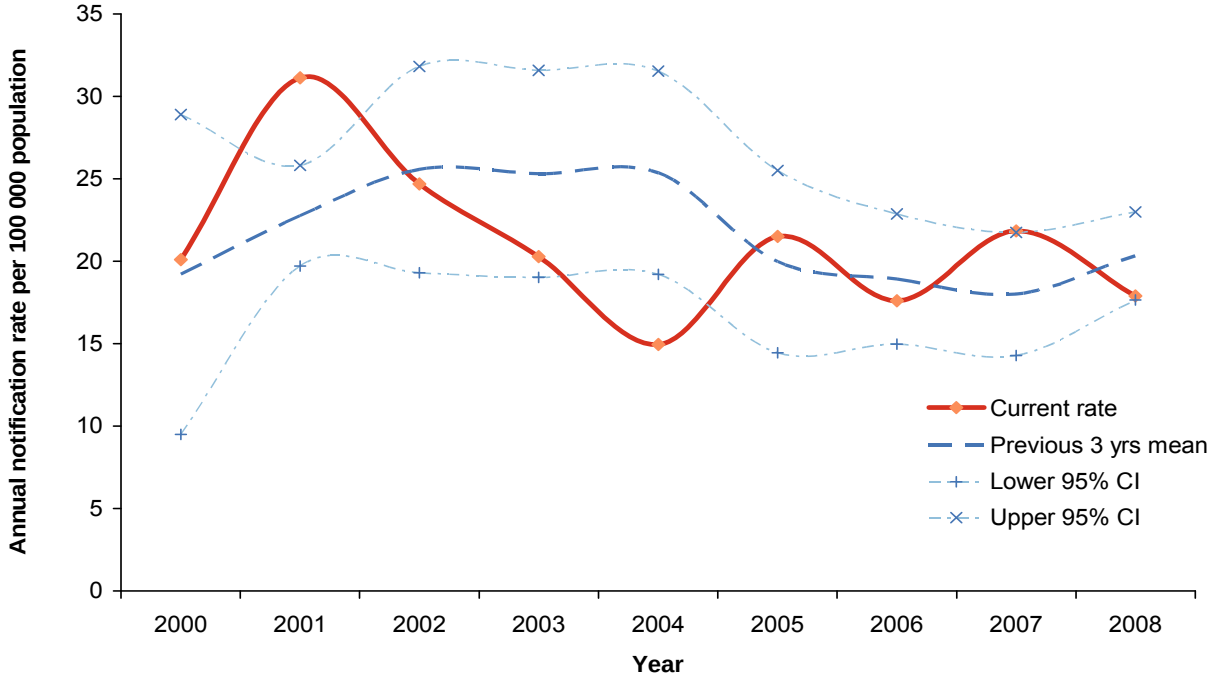
Cryptosporidiosis became a notifiable disease in 1996. The number of notifications peaked at 1 208 cases in 2001 and then decreased to 611 in 2004. Since 2004 the number of notifications has fluctuated between 737 (2006) and 924 (2007) (Figure 15).

Figure 15: Cryptosporidiosis notifications by year, 1996-2008



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 slightly higher rates have been observed than in 2004 (Figure 16).

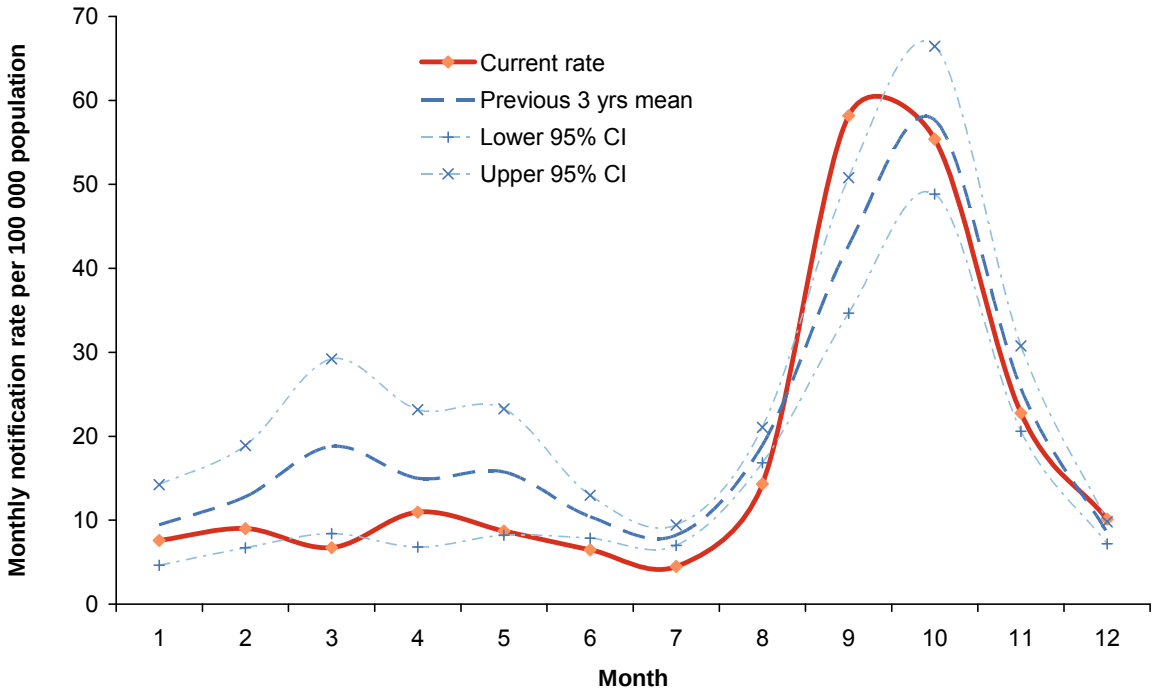
Figure 16: Cryptosporidiosis notification rate by year, 2000-2008



4.7.3.2 Seasonality

The number of notified cases of cryptosporidiosis reported per 100 000 population by month for 2008 was similar to previous years. Cryptosporidiosis has a consistent spring peak (September/October) (Figure 17).

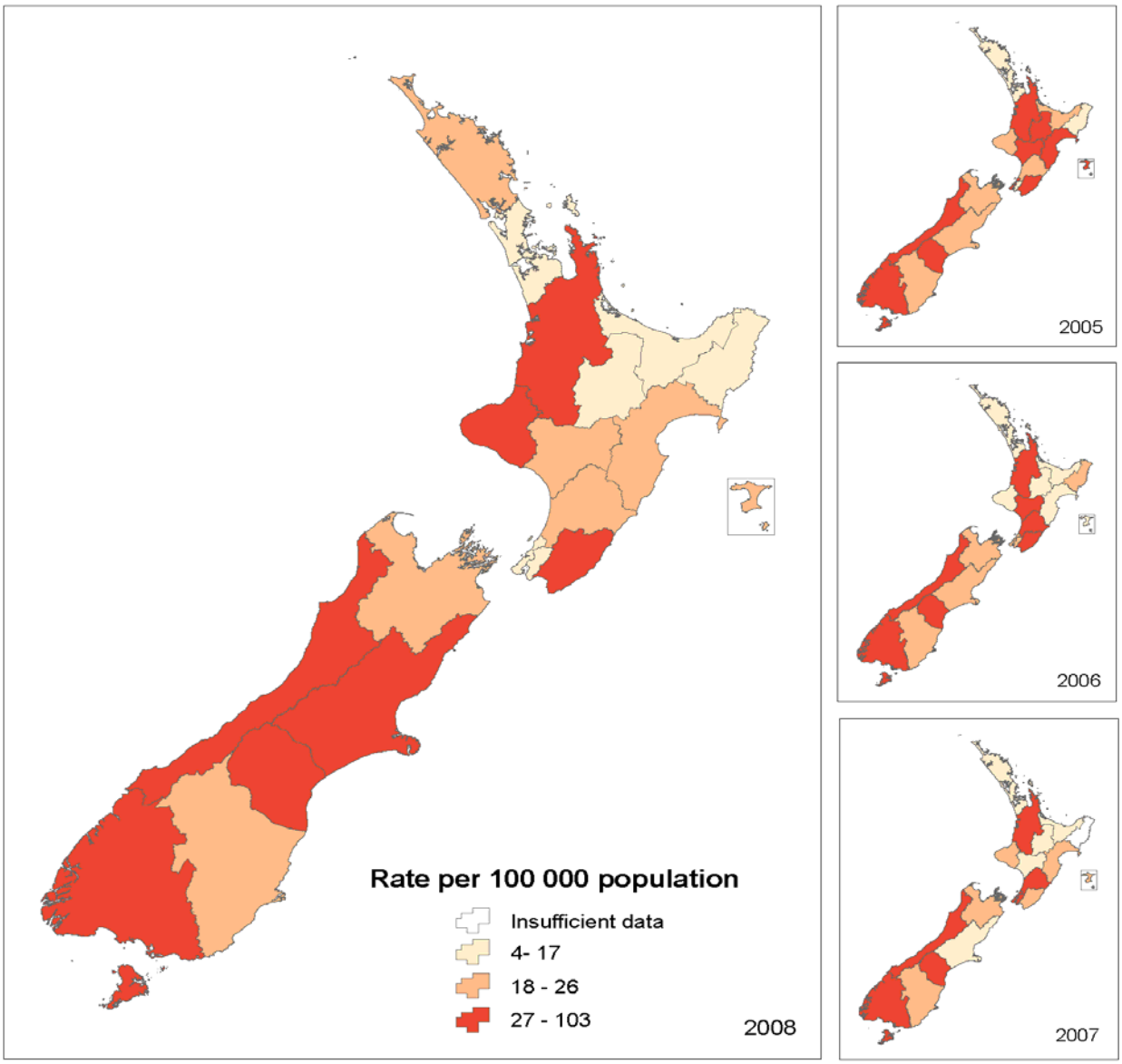
Figure 17: Cryptosporidiosis monthly rate (annualised) for 2008



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 2008, the highest rates were reported in South Canterbury (103.1 per 100 000 population), West Coast (58.7 per 100 000) and Southland (51.4 per 100 000) DHBs. South Canterbury DHB has reported the highest cryptosporidiosis rates for the past four years.

Figure 18: Geographic distribution of cryptosporidiosis notifications, 2005-2008



4.7.3.4 Age and sex distribution of cryptosporidiosis cases

The number and notification rates for cryptosporidiosis were similar for males and females, however twice the number of females were hospitalised than males (Table 20).

Table 20: Cryptosporidiosis cases by sex, 2008

Sex	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
Male	377	18.0	10	0.5	
Female	377	17.3	22	1.0	
Unknown	10				
Total	764	17.9	32	0.7	

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

In 2008 the highest cryptosporidiosis age specific notification rates were in the 1 to 4 years age group (264 cases, 111.9 per 100 000 population), followed by the less than one year age group (23 cases, 35.9 per 100 000) and the 5 to 9 years age group (95 cases, 33.0 per 100 000) (Table 21). Similarly, the hospitalisation rate was highest in the 1 to 4 years age group.

Table 21: Cryptosporidiosis cases by age group, 2008

Age groups	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	23	35.9	0	0.0	
1 to 4	264	111.9	10	4.2	
5 to 9	95	33.0	6	2.1	
10 to 14	47	15.6	4	1.3	
15 to 19	57	17.7	0	0.0	
20 to 29	98	17.2	5	0.9	
30 to 39	86	14.7	4	0.7	
40 to 49	37	5.8	0	0.0	
50 to 59	31	6.0	3	0.6	
60 to 69	18	4.8	0	0.0	
70+	7	1.9	0	0.0	
Unknown	1				
Total	764	17.9	32	0.7	

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

4.7.3.5 Risk Factors Reported

In 2008 the most commonly reported risk factor for cryptosporidiosis notification cases was contact with farm animals (69.0%), followed by consumption of untreated water (50.0%), contact with sick animals (31.0%), and contact with faecal matter (26.8%) (Table 22).

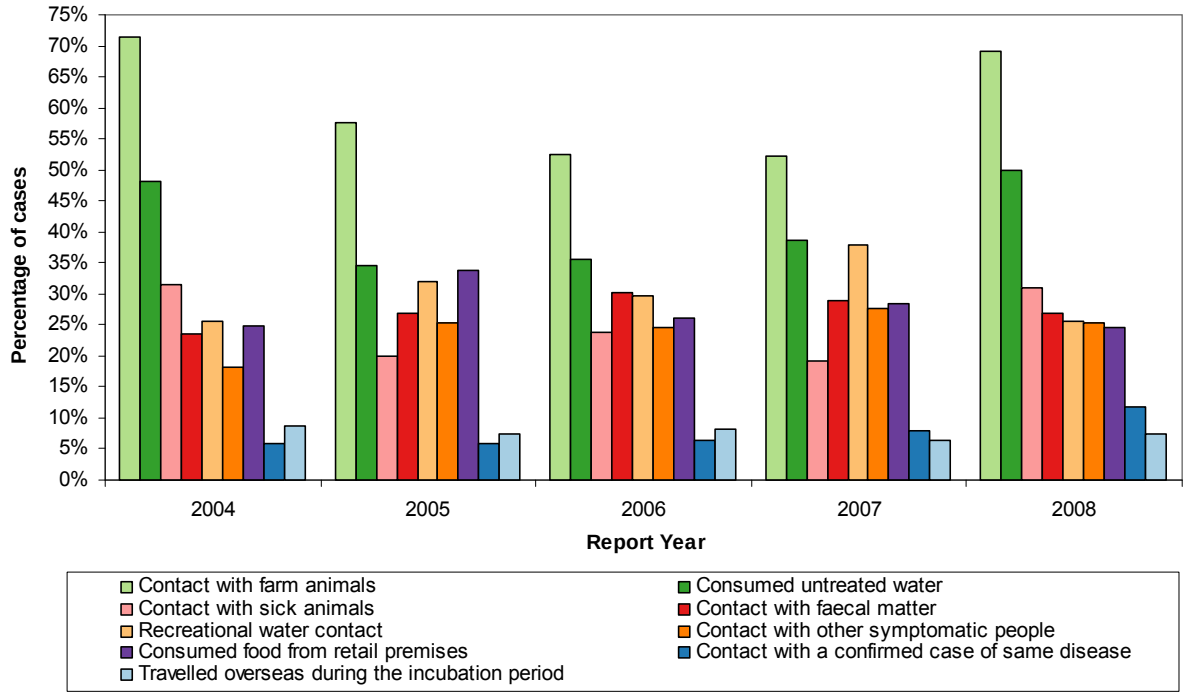
Table 22: Exposure to risk factors associated with cryptosporidiosis, 2008

	Notifications			
Risk Factor	**Yes**	**No**	**Unknown**	**%[a]**
Contact with farm animals	341	153	270	69.0%
Consumed untreated water	186	186	392	50.0%
Contact with sick animals	113	252	399	31.0%
Contact with faecal matter	103	281	380	26.8%
Recreational water contact	107	312	345	25.5%
Contact with other symptomatic people	106	311	347	25.4%
Consumed food from retail premises	86	263	415	24.6%
Contact with a confirmed case of same disease	46	346	372	11.7%
Travelled overseas during the incubation period	35	441	288	7.4%

[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.

Over the five year period 2004 to 2008 the most consistently reported risk factors for cryptosporidiosis were contact with farm animals and consumption of untreated water (Figure 19).

Figure 19: Cryptosporidiosis risk factors by percentage of cases and year, 2004 – 2008



4.7.3.6 Estimate of travel-related cases

For cases where information on travel was provided, 7.4% (95%CI 5.1-10.0%) 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 2008. The resultant distribution has a mean of 56 cases (95% CI 35-82).

4.7.4 Outbreaks reported as caused by *Cryptosporidium* spp.

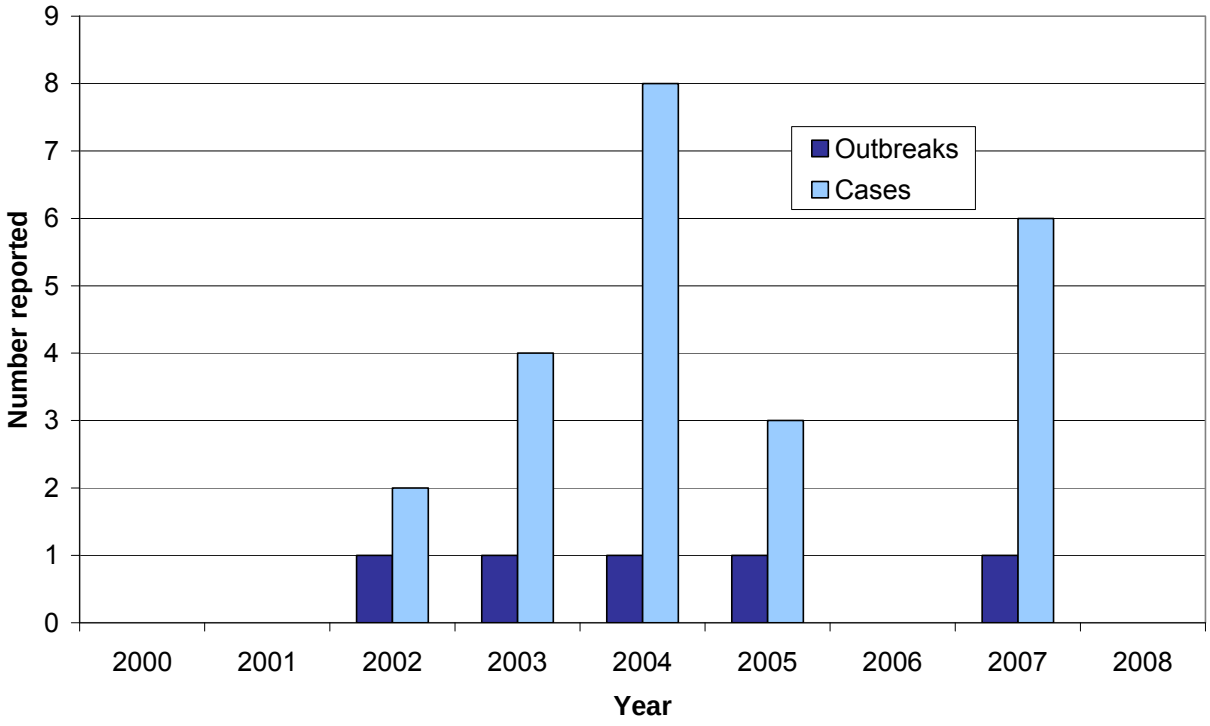
No foodborne *Cryptosporidium* outbreaks were reported in 2008 (Table 23).

Table 23: *Cryptosporidium* spp. outbreaks reported, 2008

Measure (No.)	Foodborne *Cryptosporidium* spp. outbreaks	All *Cryptosporidium* spp. outbreaks
Outbreaks	0	7
Cases	0	29
Hospitalised cases	0	1

Foodborne *Cryptosporidium* outbreaks are rare with not more than one outbreak reported each year in the nine year period, 2000-2008 (Figure 20). The largest outbreak with 8 associated cases was reported in 2004.

Figure 20: Foodborne *Cryptosporidium* spp. outbreaks and associated cases reported by year, 2000 – 2008



4.7.4.1 Details of food-associated outbreaks

No foodborne *Cryptosporidium* outbreaks were reported in 2008.

4.7.4.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratory, *Cryptosporidium* spp. was detected in two samples, one of human faeces and one of animal (calf) faeces. However, neither investigation implicated food as the source of the infection.

4.7.5 Relevant New Zealand studies and publications

4.7.5.1 Journal papers

During 2005 and 2006, 1 190 faecal samples were collected from 1-7 week old dairy calves from 10 farms in the Otago region (Winkworth *et al.*, 2008b). Using direct immunofluorescent microscopy, *Cryptosporidum* spp. was detected in 2.6% of samples.

A one year survey conducted from mid-2005 to 2006 measured the counts and/or prevalence in fresh bovine faeces of bacterial and protozoan pathogens on New Zealand dairy farms (Moriarty *et*

al., 2008). A total of 155 faecal samples were collected from four farms. The prevalence of *Cryptosporidium* was 5% (8/155).

4.7.6 Relevant regulatory developments

Nil.

4.8 Giardiasis

Summary data for giardiasis in 2008 are given in Table 24.

Table 24: Summary surveillance data for giardiasis, 2008

Parameter	Value in 2008	Section reference
Number of cases	1 662	4.8.2
Rate (per 100 000)	38.9	4.8.2
Hospitalisations (%)	39 (2.3%)	4.8.2
Deaths (%)	0 (0%)	4.8.2
Estimated travel-related cases (%)	427 (25.7%)	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 2008 by data source

During 2008, 1 662 notifications (38.9 cases per 100 000 population) of giardiasis were reported in EpiSurv.

The ICD-10 code A07.1 was used to extract giardiasis hospitalisation data from the NZHIS NMDS database. Of the 39 hospital admissions (0.9 admissions per 100 000 population) recorded in 2008, 18 were reported with giardiasis as the primary diagnosis and 21 with giardiasis as another relevant diagnosis.

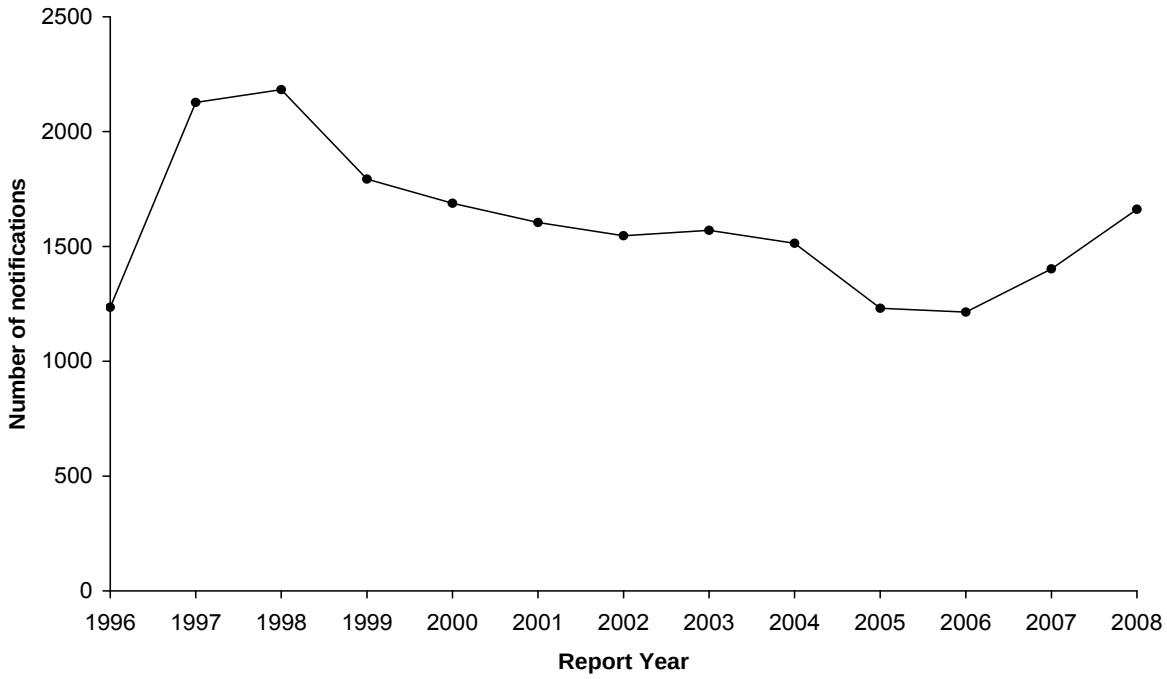
No deaths were recorded in EpiSurv in 2008.

4.8.3 Notifiable Disease Data

4.8.3.1 Annual notification trend

Giardiasis became a notifiable disease in 1996. From 1998 there was a steady decrease in the number of cases reported each year up until 2006. Recent years have seen an increase in notifications (Figure 21).

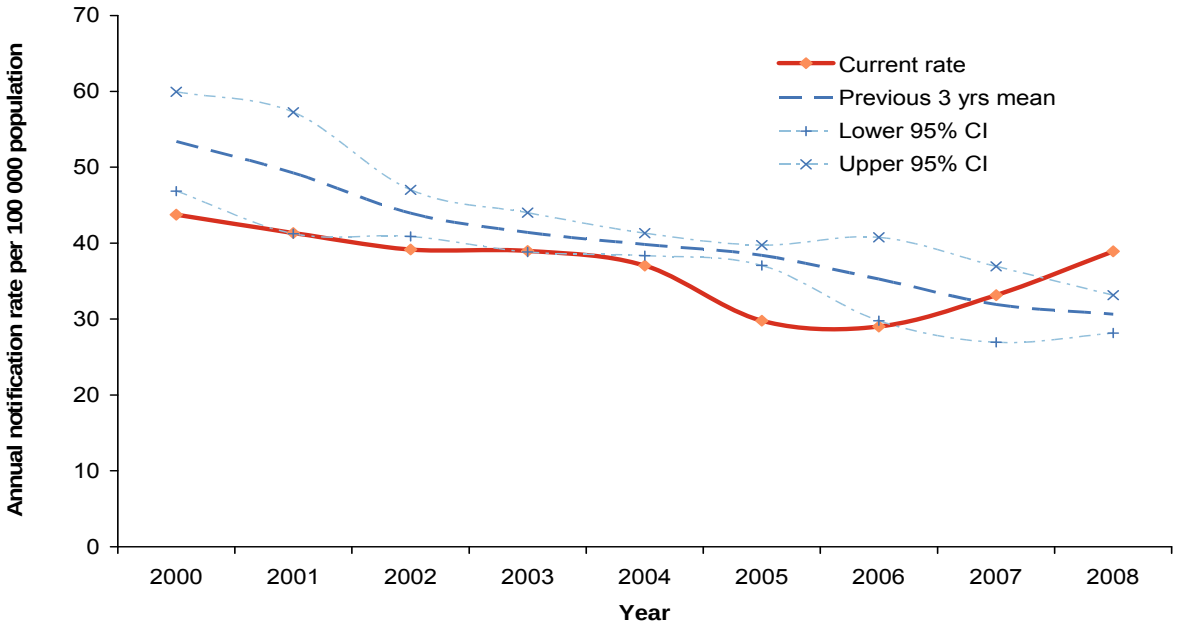
Figure 21: Giardiasis notifications by year, 1996-2008



* Notification of giardiasis began midway through 1996.

Between 2000 and 2006 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 risen significantly in 2008 to 39.0 per 100 000 (Figure 22).

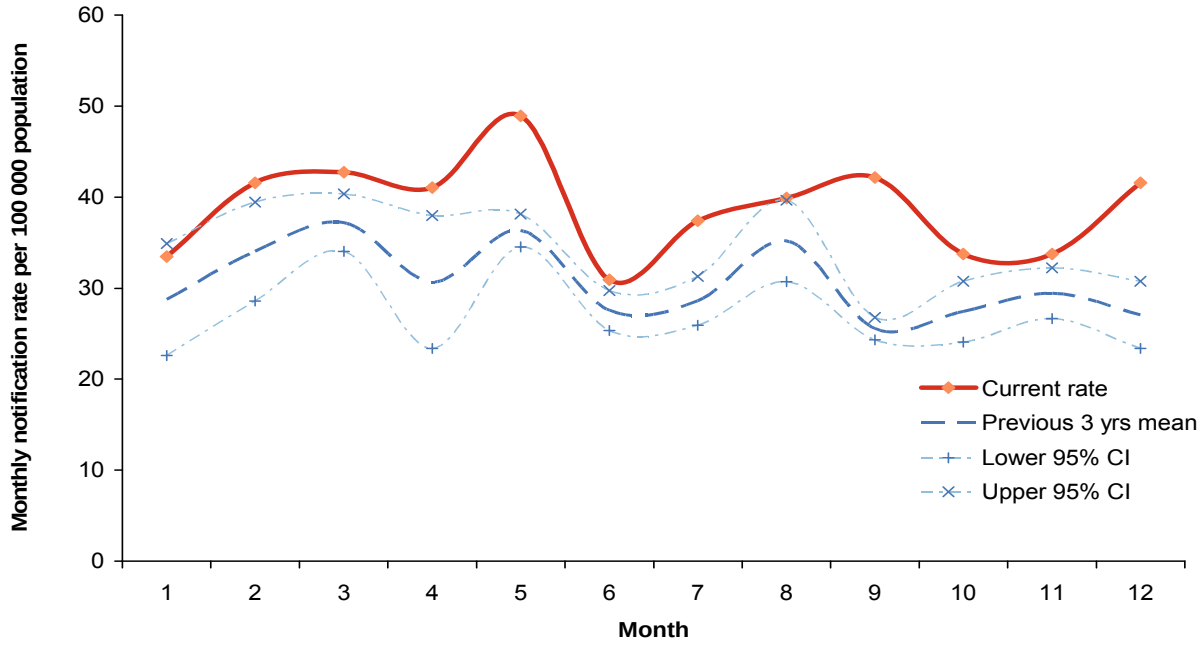
Figure 22: Giardiasis notification rate by year, 2000-2008



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 2008 (Figure 23).

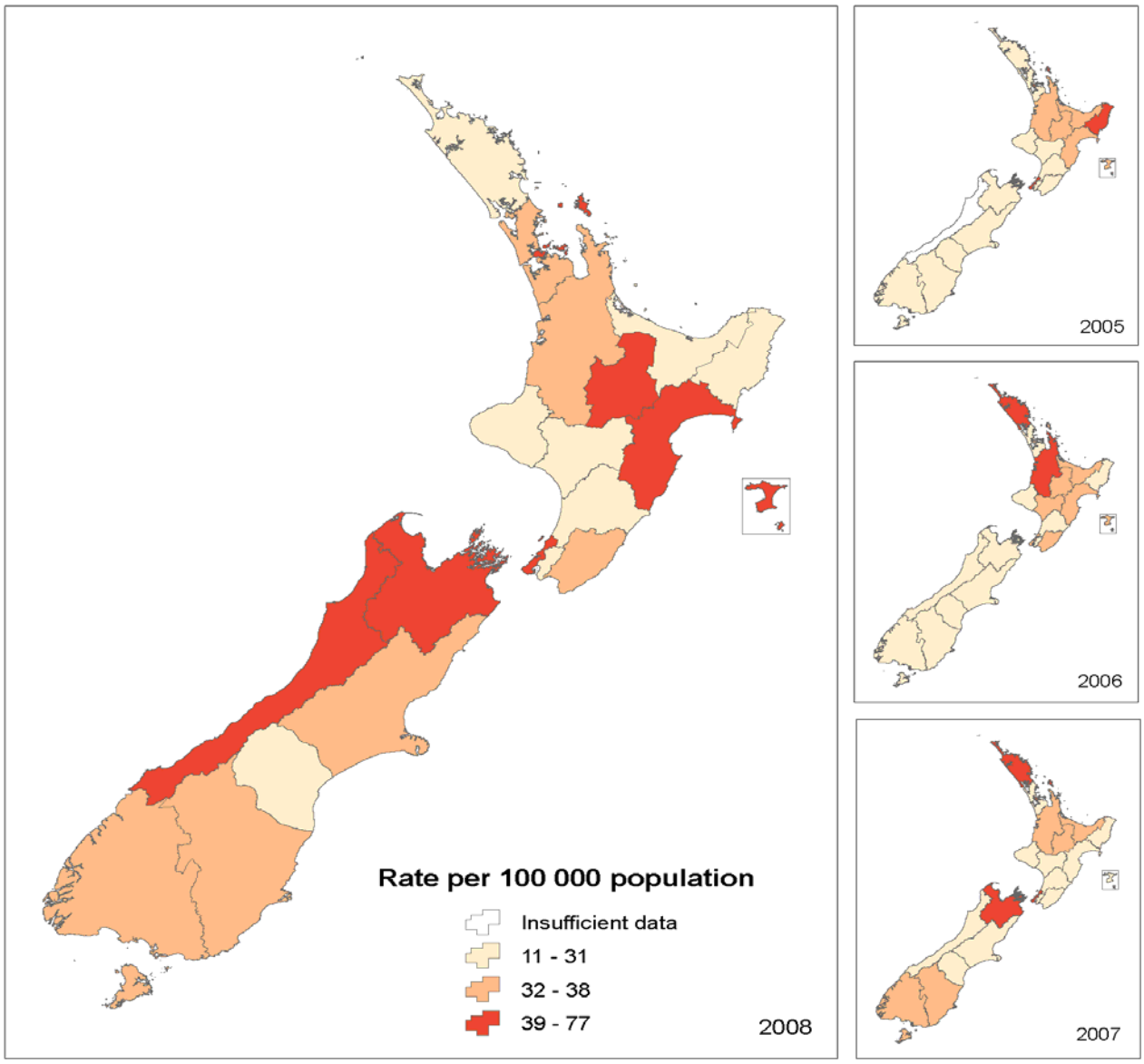
Figure 23: Giardiasis monthly rate (annualised) for 2008



4.8.3.3 Geographic distribution of giardiasis notifications

Notification rates of giardiasis varied throughout the country during 2008 (Figure 24). The highest rates were recorded in Capital and Coast (76.7 per 100 000 population, 218 cases), followed by West Coast (64.9 per 100 000, 21 cases) and Auckland (59.8 per 100 000, 262 cases) DHBs. The lowest rate was recorded in Taranaki DHB (11.1 per 100 000, 12 cases). No DHB has been consistently in the highest quantile of giardiasis rates during the last four years.

Figure 24: Geographic distribution of giardiasis notifications, 2005-2008



4.8.3.4 Age and sex distribution of giardiasis cases

The giardiasis notification and hospitalisation rates were similar for males and females (Table 25).

Table 25: Giardiasis cases by sex, 2008

Sex	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
Male	827	39.5	17	0.8	
Female	805	37.0	22	1.0	
Unknown	30				
Total	1662	38.9	39	0.9	

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

In 2008 the highest age-specific giardiasis notification rates were in those aged one to four years (134.8 per 100 000 population) followed by the 30 to 39 years age group (67.4 per 100 000) and cases aged less than one year (67.1 per 100 000) (Table 26). The highest hospitalisation rates were in those aged less than one year and those age 70 years or more.

Table 26: Giardiasis cases by age group, 2008

Age groups	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	43	67.1	1	1.6	
1 to 4	318	134.8	3	1.3	
5 to 9	151	52.5	3	1.0	
10 to 14	33	10.9	1	0.3	
15 to 19	43	13.3	2	0.6	
20 to 29	154	27.0	5	0.9	
30 to 39	393	67.4	9	1.5	
40 to 49	218	34.4	2	0.3	
50 to 59	130	25.0	2	0.4	
60 to 69	120	31.8	5	1.3	
70+	56	15.1	6	1.6	
Unknown	3				
Total	1662	38.9	39	0.9	

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

4.8.3.5 Risk Factors Reported

The most commonly reported risk factors for giardiasis notification cases were contact with other symptomatic people and consumption of untreated water (40.9% for both). Other frequently reported risk factors include recreational water contact (34.8%) and contact with faecal matter (34.2%) (Table 27).

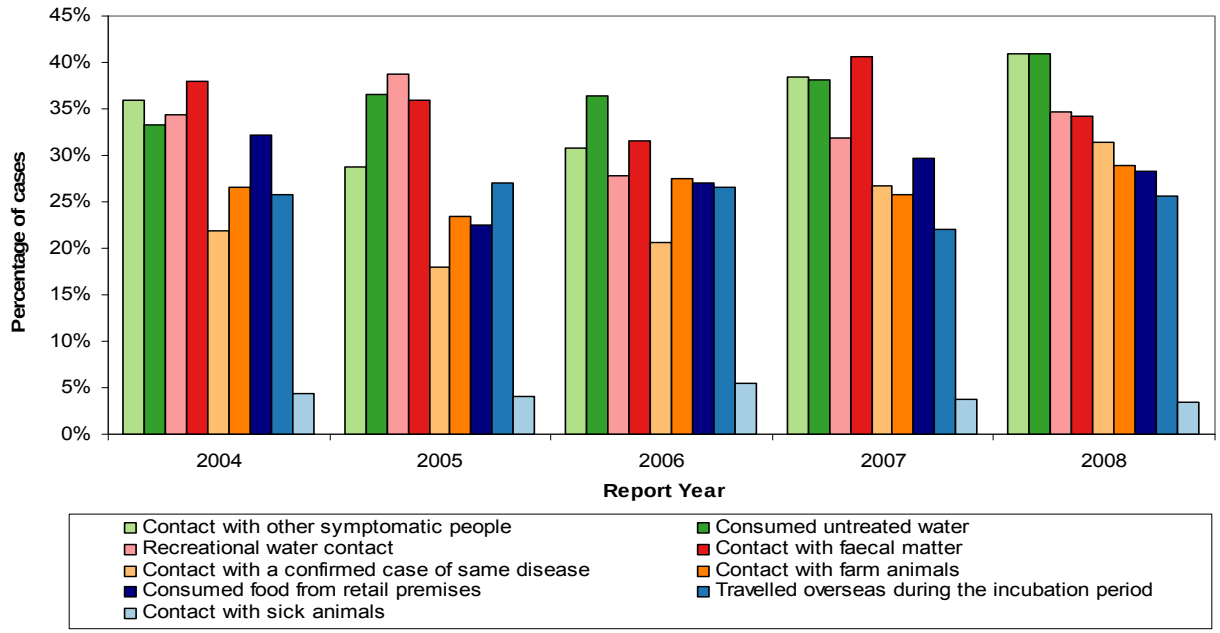
Table 27: Exposure to risk factors associated with giardiasis, 2008

	Notifications			
Risk Factor	**Yes**	**No**	**Unknown**	**%[a]**
Contact with other symptomatic people	198	286	1178	40.9%
Consumed untreated water	164	237	1261	40.9%
Recreational water contact	162	304	1196	34.8%
Contact with faecal matter	147	283	1232	34.2%
Contact with a confirmed case of same disease	162	355	1145	31.3%
Contact with farm animals	148	365	1149	28.8%
Consumed food from retail premises	113	287	1262	28.3%
Travelled overseas during the incubation period	164	475	1023	25.7%
Contact with sick animals	15	423	1224	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.

The risk factors associated with giardiasis cases have remained consistent from 2004 until 2008 (Figure 25). From 2005 onwards the trend suggests a growing importance of contact with other symptomatic people and consumption of untreated water.

Figure 25: Giardiasis risk factors by percentage of cases and year, 2004 – 2008



4.8.3.6 Estimate of travel-related cases

For cases where information on travel was provided, 25.7% (95%CI 21.9-29.7%) 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 2008. The resultant distribution has a mean of 427 cases (95% CI 353-506).

4.8.4 Outbreaks reported as caused by *Giardia* spp.

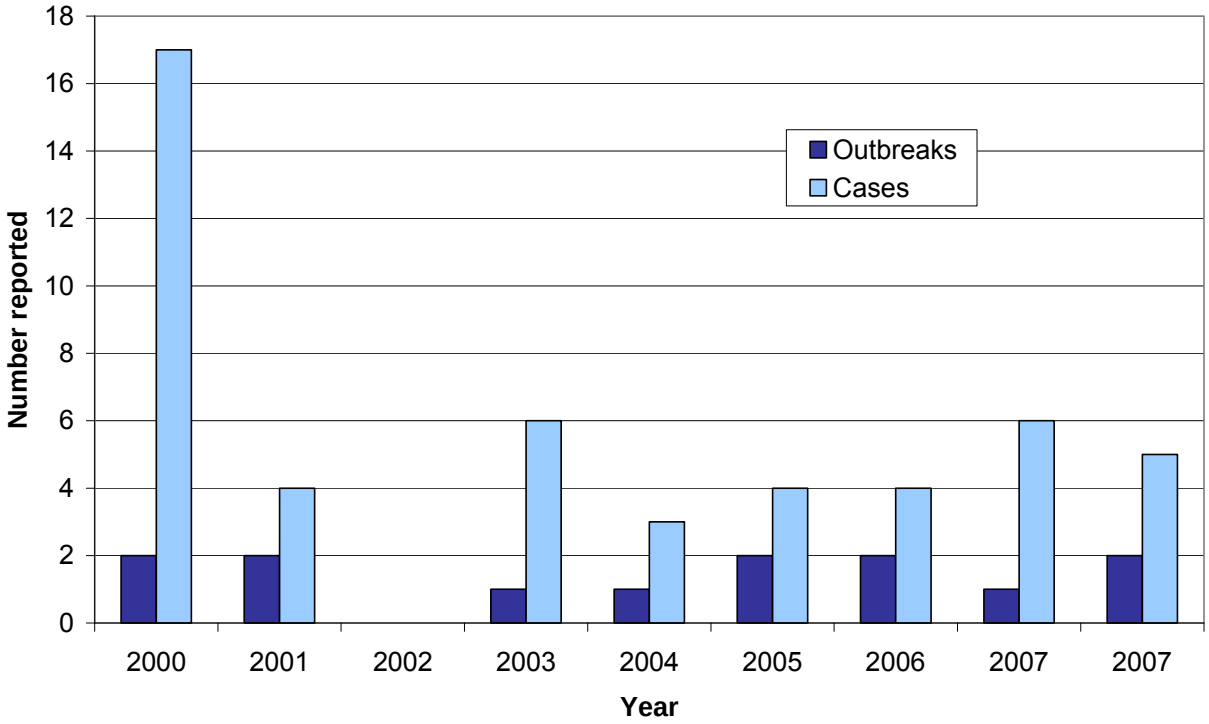
In 2008 there were 50 *Giardia* spp. outbreaks reported with two of these associated with a suspected or known foodborne source (Table 28).

Table 28: *Giardia* spp. outbreaks reported, 2008

Measure (No.)	Foodborne *Giardia* spp. outbreaks	All *Giardia* spp. outbreaks
Outbreaks	2	50
Cases	5	184
Hospitalised cases	0	0

Since 2003 one or two foodborne *Giardia* spp. outbreaks have been reported in EpiSurv each year (Figure 26). These outbreaks involved small numbers of cases.

Figure 26: Foodborne *Giardia* outbreaks and associated cases of reported by year, 2000 – 2008



4.8.4.1 Details of food-associated outbreaks

Table 29 contains details of the two food–associated *Giardia* spp. outbreaks reported in 2008.

Table 29: Details of food-associated *Giardia* spp. outbreaks, 2008

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Auckland (March)	Unknown	Overseas	2C	6
Rotorua (June)	Unknown	Home, Overseas	2C, 1P	2

C = confirmed, P = probable
Confirmation:
1 = Environmental investigation – identified critical control point failures linked to implicated source
2 = Epidemiological – case had history of exposure to implicated source
3 = Epidemiological – case control or cohort study showed elevated risk for cases to implicated source
4 = Laboratory – pathogen suspected to have caused illness identified in food handler
5 = Laboratory – pathogen suspected to have caused illness identified in implicated source (food)
6 = No evidence
7 = Other evidence

While these outbreaks were reported as food-associated in EpiSurv, no specific foods were identified and the evidence linking the outbreak to an implicated source was generally weak.

4.8.4.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratory, *Giardia* spp. was detected in faecal samples from a 17 case outbreak associated with a tour group to Nepal. No food was implicated.

4.8.5 Relevant New Zealand studies and publications

4.8.5.1 Journal papers

During 2005 and 2006, 1 190 faecal samples were collected from 1-7 week old dairy calves from 10 farms in the Otago region (Winkworth *et al.*, 2008b). Using direct immunofluorescent microscopy, *Giardia* spp. were detected in 31% of samples. The prevalence of *Giardia* spp. cysts in faeces was higher in older animals.

Giardia spp. isolates from dairy calves (40) and human cases (30), living in the same area and collected over a similar period, were genotyped using the beta-giardin gene (Winkworth *et al.*, 2008a). There was significant overlap of genotypes from calves and humans for both genetic assemblages A and B.

A one year survey conducted from mid-2005 to 2006 measured the counts and/or prevalence in fresh bovine faeces of bacterial and protozoan pathogens on New Zealand dairy farms (Moriarty *et al.*, 2008). A total of 155 faecal samples were collected from four farms. The prevalence of *Giardia* was 4.5% (7/155).

4.8.6 Relevant regulatory developments

Nil.

4.9 Hepatitis A

Summary data for hepatitis A in 2008 are given in Table 30.

Table 30: Summary surveillance data for hepatitis A, 2008

Parameter	Value in 2008	Section reference
Number of cases	91	4.9.2
Rate (per 100,000)	2.1	4.9.2
Hospitalisations (%)	37 (40.7%)	4.9.2
Deaths (%)	0 (0%)	4.9.2
Estimated travel-related cases (%)	42 (45.8%)	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 2008 by data source

During 2008, 91 notifications (2.1 cases per 100 000 population) of hepatitis A were reported in EpiSurv.

The ICD-10 code B15 was used to extract hepatitis A hospitalisation data from the NZHIS NMDS database. Of the 37 hospital admissions (0.9 admissions per 100 000 population) recorded in 2008, 19 were reported with hepatitis A as the primary diagnosis and 18 with hepatitis A as another relevant diagnosis.

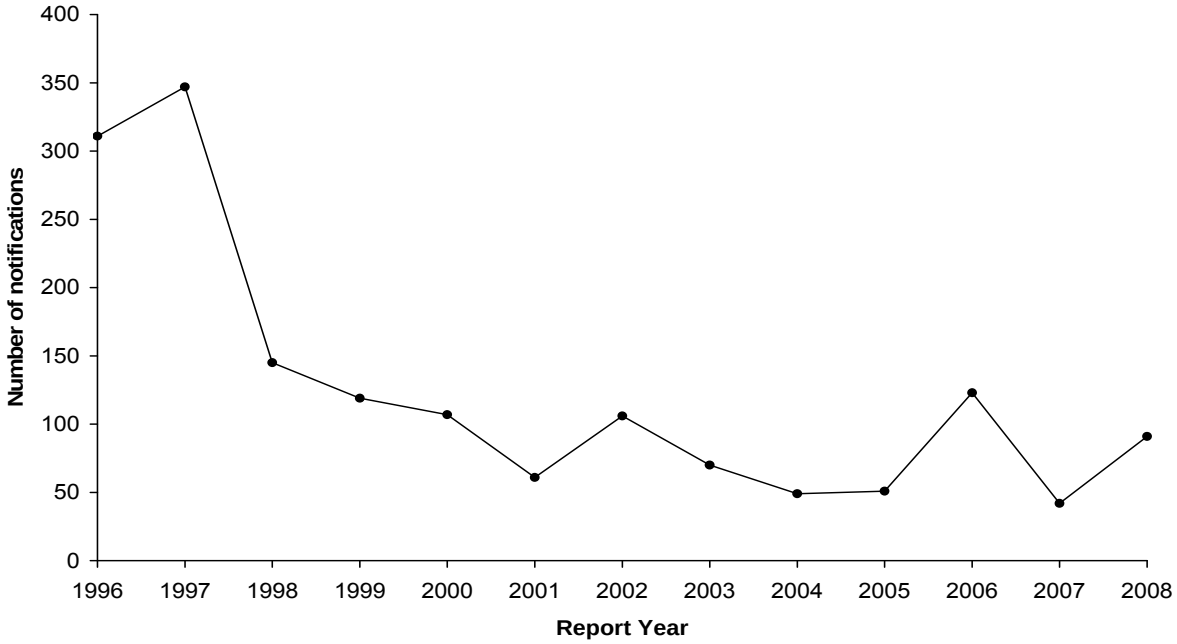
No deaths resulting from hepatitis A were recorded in EpiSurv in 2008.

4.9.3 Notifiable disease data

4.9.3.1 Annual notification trend

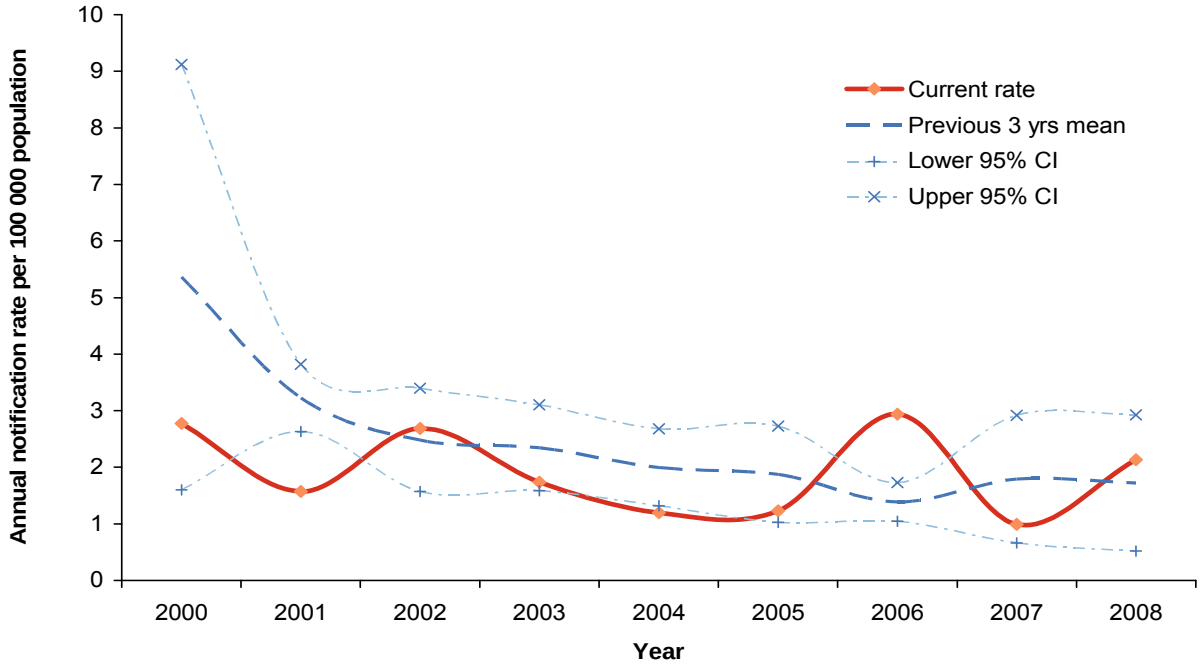
Over the last thirteen years there has been an overall downward trend in the number of notifications of hepatitis A, although an increase in notifications was observed in 2002, 2006 and again in 2008 (Figure 27). The 2008 increase was largely attributable to two outbreaks, involving 29 people altogether.

Figure 27: Hepatitis A notifications by year, 1996-2008



Hepatitis A notification rates varied throughout the nine year period, 2000-2008 (Figure 28). The notification rate trend showed peaks in 2002, 2006 and 2008, with the highest hepatitis A notification rate in 2006 (2.9 per 100 000).

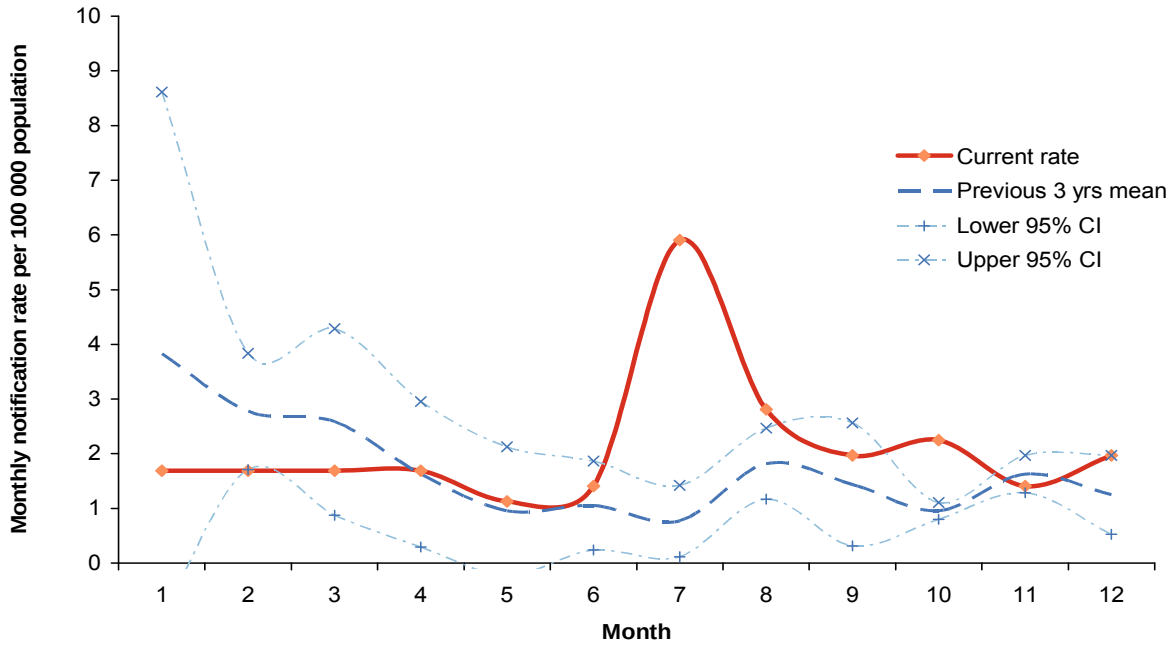
Figure 28: Hepatitis A notification rate by year, 2000-2008



4.9.3.2 Seasonality

In 2008 there was an unusually large number of hepatitis A notifications reported during July (Figure 29). Many of these cases were linked to a hepatitis A outbreak in a childcare centre in the MidCentral DHB that involved 20 people.

Figure 29: Hepatitis A monthly rate (annualised) for 2008



4.9.3.3 Age and sex distribution of hepatitis A cases

In 2008 the hepatitis A notification rate was higher for males than females, whereas the hospitalisation rate was similar for both genders (Table 31).

Table 31: Hepatitis A cases by sex, 2008

Sex	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
Male	58	2.8	20	1.0	
Female	31	1.4	17	0.8	
Unknown	2				
Total	91	2.1	37	0.9	

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

The age-specific hepatitis A notification rate in 2008 was highest for those aged 1 to 4 years (5.5 per 100 000 population), followed by 5 to 9 year olds (3.5 per 100 000) (Table 32). The hospitalisation rate was highest in those age 70 years and over.

Table 32: Hepatitis A cases by age group, 2008

Age groups	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	1	1.6	0	0.0	
1 to 4	13	5.5	2	0.8	
5 to 9	10	3.5	1	0.3	
10 to 14	8	2.7	2	0.7	
15 to 19	9	2.8	1	0.3	
20 to 29	16	2.8	7	1.2	
30 to 39	15	2.6	5	0.9	
40 to 49	7	1.1	5	0.8	
50 to 59	6	1.2	2	0.4	
60 to 69	3	0.8	2	0.5	
70+	3	0.8	10	2.7	
Unknown	0				
Total	91	2.1	37	0.9	

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

4.9.3.4 Risk Factors Reported

The most commonly reported risk factor for hepatitis A in 2008 was overseas travel during the incubation period (Table 33). Other frequently reported risk factors included contact with a confirmed case in previous 3 months (39.1%) and household contact with a confirmed case (34.3%).

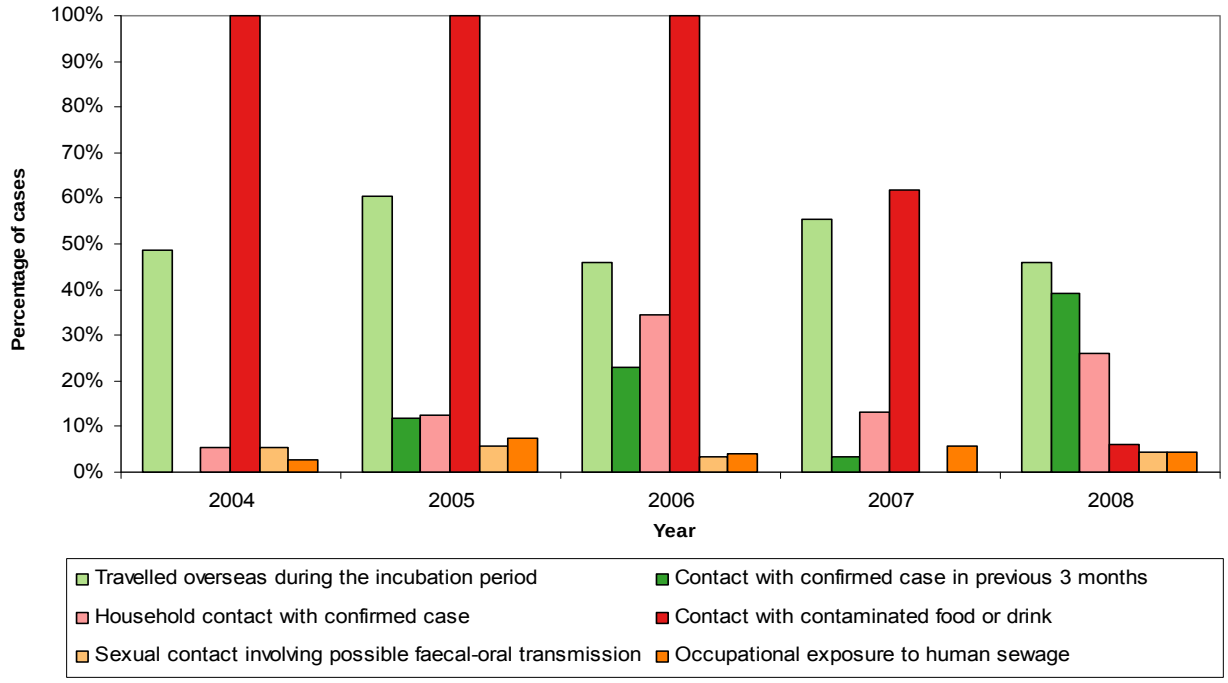
Table 33: Exposure to risk factors associated with hepatitis A, 2008

	Notifications			
Risk Factor	**Yes**	**No**	**Unknown**	**%[a]**
Travelled overseas during the incubation period	38	45	8	45.8%
Contact with confirmed case in previous 3 months	25	39	27	39.1%
Household contact with confirmed case	18	51	22	26.1%
Contact with contaminated food or drink	3	46	42	6.1%
Occupational exposure to human sewage	3	65	23	4.4%
Sexual contact involving possible faecal-oral transmission	3	65	23	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 2004 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). In 2008 contact with contaminated food or drink was identified as a risk factor by only 6.1% of cases, instead contact with a confirmed case (household or otherwise) was more frequently identified. Since 2004, approximately half (45% to 60%) of all 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, 2004 – 2008



4.9.3.5 Estimate of travel-related cases

For cases where information on travel was provided, 45.8% (95%CI 32.4-61.5%) 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 2008. The resultant distribution has a mean of 42 cases (95% CI 25-61).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 49.8% (95% CI 41.8-58.5%).

4.9.4 Outbreaks reported as caused by hepatitis A virus

During 2008 one of the three hepatitis A virus outbreaks reported in EpiSurv was associated with a suspected or known foodborne source (Table 34).

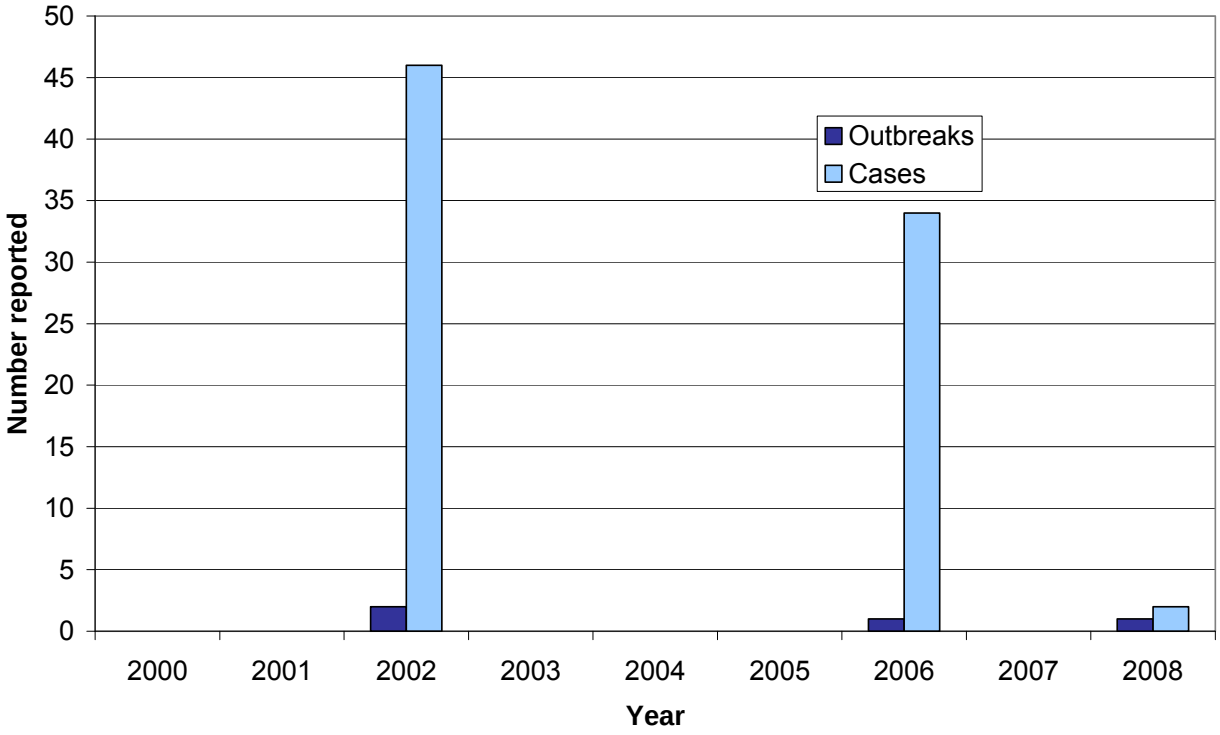
Table 34: Hepatitis A virus outbreaks reported, 2008

Measure (No.)	Foodborne Hepatitis A outbreaks	All Hepatitis A outbreaks
Outbreaks	1	3
Cases	2	31
Hospitalised cases	0	5

Foodborne hepatitis A virus outbreaks are rare with only three reported in the period 2000 to 2008 (in 2002, 2007 and 2008) (Figure 31). Although occurring infrequently, foodborne outbreaks of

hepatitis A virus can be associated with many cases, although this was not the case with the food-associated outbreak in 2008.

Figure 31: Foodborne hepatitis A virus foodborne outbreaks and associated cases reported by year, 2000–2008



4.9.4.1 Details of food-associated outbreaks

Table 35 contains details of the food–associated hepatitis A virus outbreak reported in 2008.

Table 35: Details of food-associated hepatitis A virus outbreak, 2008

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Wellington (April)	Unknown	Home	2C	7

C = confirmed, P = probable
Confirmation:
1 = Environmental investigation – identified critical control point failures linked to implicated source
2 = Epidemiological – case had history of exposure to implicated source
3 = Epidemiological – case control or cohort study showed elevated risk for cases to implicated source
4 = Laboratory – pathogen suspected to have caused illness identified in food handler
5 = Laboratory – pathogen suspected to have caused illness identified in implicated source (food)
6 = No evidence
7 = Other evidence

While foodborne transmission was identified in relation to this outbreak, no specific foods were identified and the evidence implicating food was not strong.

4.9.5 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratory, no samples were found to contain hepatitis A virus.

4.9.6 Relevant New Zealand studies and publications

Nil.

4.9.7 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 2008 by data source

Four cases of histamine (scombroid) fish poisoning were reported in EpiSurv during 2008.

The ICD-10 code T61.1 was used to extract scombroid fish poisoning hospitalisation data from the NZHIS NMDS database. Of the 4 hospital admissions (0.1 admissions per 100 000 population) recorded in 2008, all were reported with scombroid fish poisoning as the primary diagnosis.

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

Two histamine (scombroid) fish poisoning outbreaks were reported in 2008 involving a total of six associated cases, with no cases hospitalised (Table 36). Both outbreaks reported foodborne transmission.

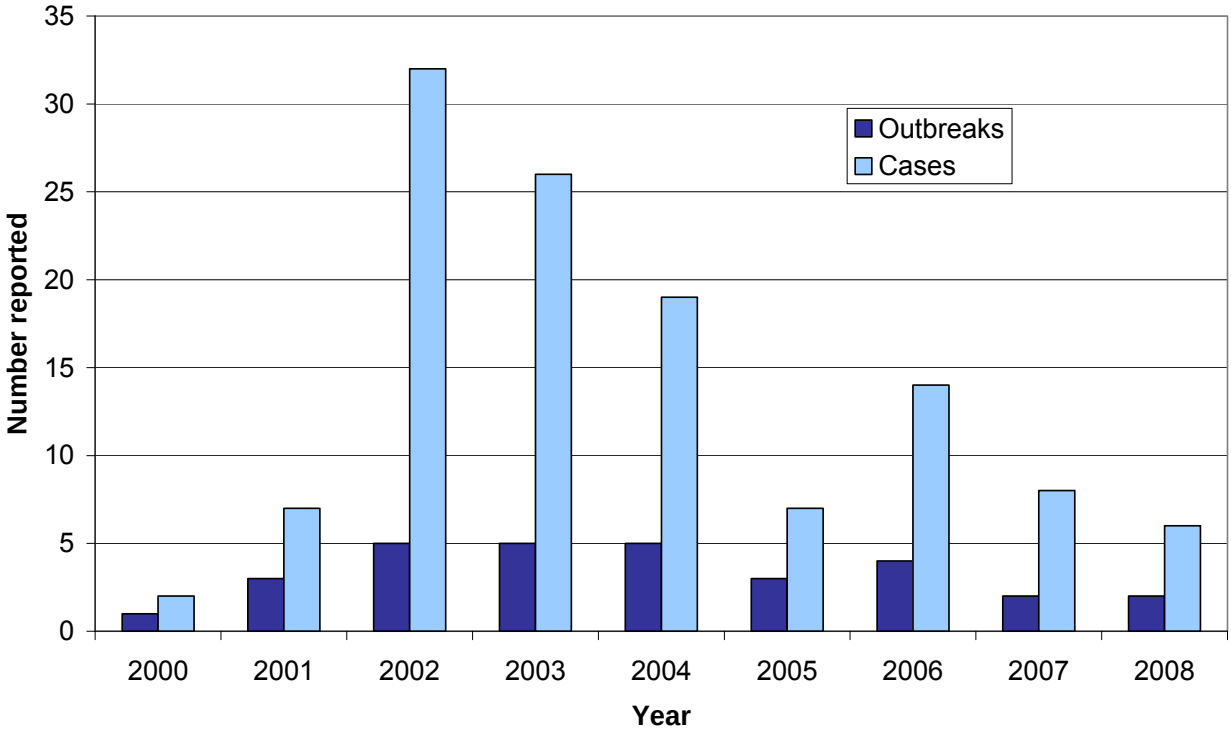
Table 36: Histamine (scombroid) fish poisoning outbreaks reported, 2008

Measure (No.)	Foodborne histamine fish poisoning outbreaks	All histamine fish poisoning outbreaks
Outbreaks	2	2
Cases	6	6
Hospitalised cases	0	0

Between 2000 and 2008 the number of foodborne histamine (scombroid) fish poisoning outbreaks reported each year has ranged from one to six (Figure 32). The highest number of outbreaks was reported in 2004 (6 outbreaks, 21 cases) but the highest total number of associated cases was

reported in 2002 (5 outbreaks, 32 cases). Since 2002, the total number of cases associated with the outbreaks has generally decreased.

Figure 32: Histamine (scombroid) fish poisoning outbreaks and associated cases reported by year, 2000 – 2008



4.10.3.1 Details of food-associated outbreaks

Table 37 contains details of the two food–associated histamine poisoning outbreaks reported in 2008.

Table 37: Details of food-associated histamine poisoning outbreaks, 2008

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Auckland (January)	Smoked kahawai	Home, open air market	2P	2
Auckland (November)	Smoked kahawai	Home	4C	5

C = confirmed, P = probable
Confirmation:
1 = Environmental investigation – identified critical control point failures linked to implicated source
2 = Epidemiological – case had history of exposure to implicated source
3 = Epidemiological – case control or cohort study showed elevated risk for cases to implicated source
4 = Laboratory – pathogen suspected to have caused illness identified in food handler
5 = Laboratory – pathogen suspected to have caused illness identified in implicated source (food)
6 = No evidence
7 = Other evidence

Histamine poisoning is virtually always associated with consumption of scombroid fish species. This significantly assists identification of causal foods and evidence linking outbreaks to foods is consequently strong in most outbreaks.

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, analyses were carried out on fish samples from two investigations. The histamine concentrations in fish samples analysed in relation to outbreaks were in the range 2770-3040 mg/kg (277-304 mg/100 g). These levels are high enough 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 2008 are given in Table 38.

Table 38: Summary surveillance data for listeriosis, 2008

Parameter	Value in 2008	Section reference
Number of cases	27	4.11.2
Rate (per 100,000)	0.6	4.11.2
Hospitalisations (%)	26 (96.3%)	4.11.2
Deaths (%)	5 (18.5%)	4.11.2
Estimated travel-related cases (%)	1 (3.7%)	4.11.3.4
Estimated food-related cases (%)*	22 (85%)	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 2008 by data source

During 2008, 27 notifications (0.6 cases per 100 000 population) of listeriosis were reported in EpiSurv, of which six were perinatal. Twenty-three cultures were received by the ESR Special Bacteriology Laboratory.

The ICD-10 code A32 was used to extract listeriosis hospitalisation data from the NZHIS NMDS database. Of the 26 hospital admissions (0.6 admissions per 100 000 population) recorded in 2008, 13 were reported with listeriosis as the primary diagnosis and 13 with listeriosis as another relevant diagnosis.

Three deaths due to non-perinatal listeriosis and two perinatal deaths were recorded in EpiSurv in 2008.

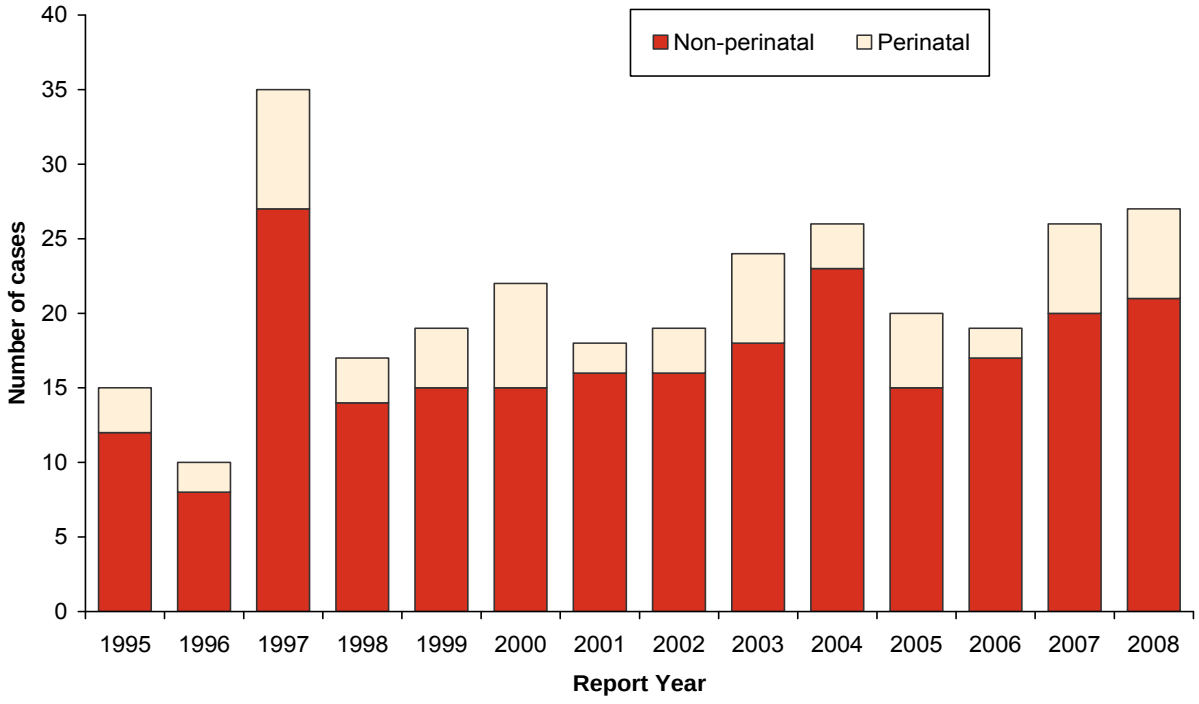
It has been estimated by expert consultation that 85% (minimum = 78%, maximum = 92%) of listeriosis incidence is due to foodborne transmission. It was further estimated that approximately 50% of foodborne transmission was due to consumption of ready-to-eat meats, while approximately 7% was due to ice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

4.11.3 Notifiable disease data

4.11.3.1 Annual notification trend

The number of listeriosis notifications reported in 2008 was similar to the number reported in 2007 (Figure 33). The highest number of notifications was reported in 1997 (35 cases). Six (22.2 %) of the 2008 cases were recorded as perinatal, similar to recent years.

Figure 33: Listeriosis non-perinatal and perinatal notifications by year, 1995-2008



4.11.3.2 Age and sex distribution of listeriosis cases

In 2008 the number and rate of notifications for listeriosis were similar for males and females but more females than males were reported as hospitalised (Table 39).

Table 39: Listeriosis cases by sex, 2008

Sex	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv[b]
	No.	Rate[c]	No.	Rate[c]	No.
Male	11	0.5	7	0.3	1
Female	16	0.7	19	0.9	2
Unknown	0				
Total	27	0.6	26	0.6	3

[a] NZHIS 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 2008 the age specific listeriosis notification rates were highest in the 70 years and over age group (11 cases, 3.0 per 100 000 population), followed by the less than 1 year age group (1 case, 1.6 per 100 000) (Table 40). The highest hospitalisation rates were in the 70 years and over age group.

Table 40: Listeriosis cases by age group, 2008

Age groups	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv[b]
	No.	Rate[c]	No.	Rate[c]	No.
<1	1	1.6	2	3.1	
1 to 4	0	0.0	0	0.0	
5 to 9	0	0.0	0	0.0	
10 to 14	0	0.0	0	0.0	
15 to 19	1	0.3	1	0.3	
20 to 29	4	0.7	1	0.2	
30 to 39	2	0.3	1	0.2	
40 to 49	3	0.5	3	0.5	
50 to 59	2	0.4	2	0.4	
60 to 69	3	0.8	1	0.3	
70+	11	3.0	15	4.0	3
Unknown	0				
Total	27	0.6	26	0.6	5

[a] NZHIS 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

4.11.3.3 Risk Factors Reported

In 2008 the most common risk factors reported for listeriosis were an underlying illness (88.2%), hospital admission for another illness (56.3%), and receiving immunosuppressive drugs (38.5%) (Table 41).

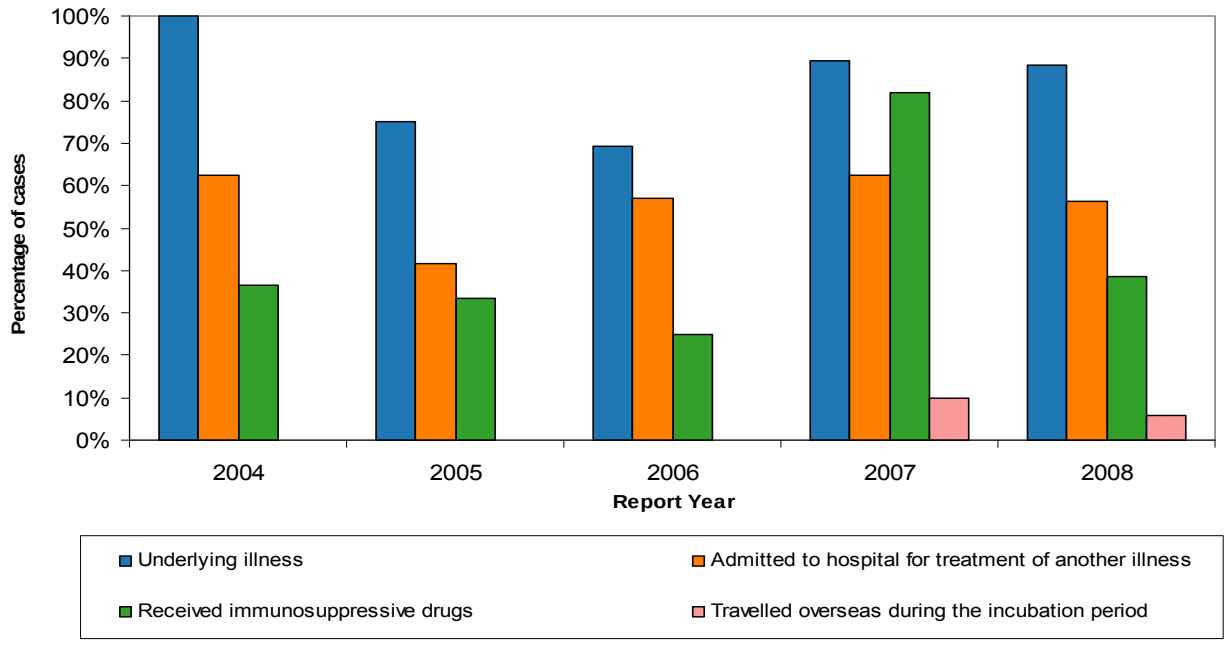
Table 41: Exposure to risk factors associated with listeriosis, 2008

	Notifications			
Risk Factor	**Yes**	**No**	**Unknown**	**%[a]**
Underlying illness	15	2	4	88.2%
Admitted to hospital for treatment of another illness	9	7	5	56.3%
Received immunosuppressive drugs	5	8	8	38.5%
Travelled overseas during the incubation period	1	16	4	5.9%

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

Between 2004 and 2008 the risk factors associated with listeriosis cases have generally occurred in a similar order of importance each year (Figure 34). Every year an underlying illness was the risk factor most commonly reported for listeriosis. Overseas travel is not reported to be an important risk factor for listeriosis.

Figure 34: Listeriosis risk factors by percentage of cases and year, 2004 – 2008



4.11.3.4 Estimate of travel-related cases

One case reported overseas travel within the incubation period for the disease during 2008.

4.11.4 Outbreaks reported as caused by *Listeria* spp.

No listeriosis outbreaks were reported in EpiSurv in 2008.

4.11.4.1 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratory, *Listeria monocytogenes* was not isolated from any samples.

4.11.5 Recent Surveys

Nil.

4.11.6 Relevant New Zealand studies and publications

4.11.6.1 *Reports*

Newspaper articles during February 2008 reported detection of *Listeria monocytogenes* in packaged cold beef from Waikato Hospital cafeteria. No associated cases of listeriosis were reported.
http://www.scoop.co.nz/stories/GE0802/S00087.htm

Following further detections in product from the same plant Auckland Regional Public Health Service recommended that further production at the plant be stopped until suitable sanitisation could be carried out.
http://www.arphs.govt.nz/Media_Releases/Archive/2008/20080229_listeria_investigation.asp

4.11.7 Relevant regulatory developments

Nil.

4.12 Norovirus Infection

4.12.1 Case definition

Clinical description:	Gastroenteritis usually lasting 12-60 hours
Laboratory test for diagnosis:	Detection of NLV 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 2008 by data source

During 2008, 117 individual notifications (2.7 cases per 100 000 population) of norovirus were reported in EpiSurv with no associated deaths.

The ICD-10 code A08.1 was used to extract norovirus infection hospitalisation data from the NZHIS NMDS database. Of the 200 hospital admissions (4.7 admissions per 100 000 population) recorded in 2008, 59 were reported with norovirus infection as the primary diagnosis and 141 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

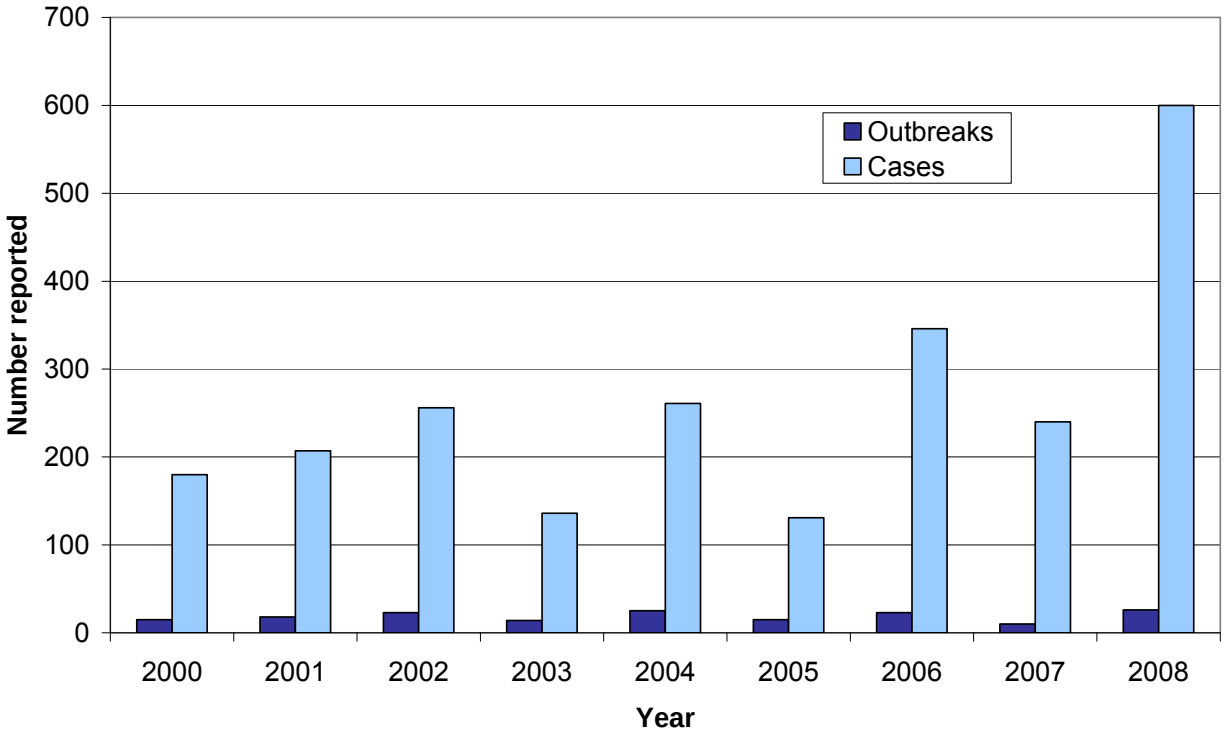
During 2008 there were 152 norovirus outbreaks reported in EpiSurv and of these 26 were associated with a suspected or known foodborne source (Table 42). A total of 600 cases were associated with these foodborne outbreaks.

Table 42: Norovirus outbreaks reported, 2008

Measure (No.)	Foodborne norovirus outbreaks	All norovirus outbreaks
Outbreaks	26	152
Cases	600	3917
Hospitalised cases	0	88

The number of foodborne outbreaks (26) and associated cases (600) reported in 2008 was greater than in any of the prior eight years (Figure 35). From 2000 to 2007 the number of foodborne norovirus outbreaks reported each year had ranged from 10 (in 2007) to 25 (in 2004). The total number of cases associated with these outbreaks had ranged from 131 (in 2005) to 346 (in 2006).

Figure 35: Foodborne norovirus outbreaks and associated cases reported by year, 2000 – 2008



4.12.3.1 Details of food-associated outbreaks

Table 43 contains details of the 26 food–associated norovirus outbreaks reported in 2008.

Table 43: Details of food-associated norovirus outbreaks, 2008

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Auckland (January)	Unknown	Cafe	3C, 1P	6
Auckland (January)	Sweet and sour fish, egg and noodles	Home, takeaway	2C, 1P	6
Auckland (March)	Unknown	Hostel	29P	4
Auckland (March)	Chicken sushi	School, caterers	2C, 5P	6
Auckland (April)	Unknown	Home, café	2C, 1P	6
Auckland (April)	Infected food handler	Caterers	6C, 23P	4
Auckland (April)	Unknown	Home	3C, 13P	6
Auckland (May)	Unknown	Home, supermarket	2C	6
Auckland (May)	Unknown	Café	2C	6
Auckland (June)	Unknown	Café	1C, 3P	6
Auckland (June)	Unknown	Home, café	2C	6
Auckland (June)	Unknown	Hotel/motel, café	1C, 1P	6
Auckland (July)	Oysters	Café	1C, 1P	2, 3, 5
Auckland (July)	Oysters	Home, other food outlet	2C, 1P	2
Auckland (July)	Oysters and fish	Home, café	1C, 1P	6
Auckland (July)	Oysters	Home, other food outlet	2C, 9P	2, 7

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Auckland (July)	Oysters	Boat	5C, 25P	3
Auckland (July)	Oysters	Function centre	2C, 28P	3
Auckland (July)	Oysters	Café	1C, 2P	7
Auckland (August)	Unknown	Takeaway	2C	6
Manawatu (September)	Unknown	Acute care hospital	2C, 18P	7
Manawatu (October)	Food and or fomites	University commercial food hall and hall of residence	6C, 282P	1, 2, 7
Northland (September)	Oysters	Home, Supermarket, other food outlet	2C, 8P	2, 5
Tauranga (July)	Unknown	Workplace	4C, 29P	2
Wellington (January)	Unknown	Childcare centre	31C	6
Wellington (November)	Infected food handler, roast beef and ham meal, pasta salad	Workplace, Cafe	16C, 16P	6

C = confirmed, P = probable
Confirmation:
1 = Environmental investigation – identified critical control point failures linked to implicated source
2 = Epidemiological – case had history of exposure to implicated source
3 = Epidemiological – case control or cohort study showed elevated risk for cases to implicated source
4 = Laboratory – pathogen suspected to have caused illness identified in food handler
5 = Laboratory – pathogen suspected to have caused illness identified in implicated source (food)
6 = No evidence
7 = Other evidence

Oysters were implicated in approximately one-third of norovirus-associated outbreaks (8/26; 31%), with seven of these outbreaks linked to a single brand of oysters. There was occasionally stronger evidence implicating oysters (e.g. organism detected in suspect food) than for other food vehicles, due to the availability of methods to detect norovirus in oysters. Such methods are not generally available for other foods.

4.12.3.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of illness outbreaks caused by potentially foodborne organisms by ESR's Public Health Laboratory, norovirus was detected in faecal samples from 90 investigations. Norovirus was detected in oyster samples from three investigations. A diverse range of foods were implicated in these investigations, although in many investigations no food was implicated and some outbreaks, including several large outbreaks in institutional settings (rest homes, childcare centres), are likely to have been due to person-to-person transmission.

4.12.4 Relevant New Zealand studies and publications

4.12.4.1 Reports

Newspaper articles reported outbreaks of norovirus infection associated with consumption of oysters in Northland.
http://www.northernadvocate.co.nz/localnews/storydisplay.cfm?storyid=3787642&thesection=localnews&thesubsection=&thesecondsubsection
http://tvnz.co.nz/content/1942852
http://www.scoop.co.nz/stories/GE0807/S00131.htm

4.12.4.2 Journal papers

Multiplex real-time RT-PCR was used to detected norovirus in faecal specimens from pigs and sheep in New Zealand (Wolf *et al.*, 2009). Norovirus was detected in 2/23 (9%) of pig faecal samples (all genogroup II) and in 8/33 (24%) of sheep faecal samples (all genogroup III). This paper was published electronically during 2008.

4.12.5 Relevant regulatory developments

Nil.

4.13 Salmonellosis

Summary data for salmonellosis in 2008 are given in Table 44.

Table 44: Summary surveillance data for salmonellosis, 2008

Parameter	Value in 2008	Section reference
Number of cases	1 346	4.13.2
Rate (per 100,000)	31.5	4.13.2
Hospitalisations (%)	127 (9.4%)	4.13.2
Deaths (%)	1 (0.07%)	4.13.2
Estimated travel-related cases (%)	207 (14.9%)	4.13.3.6
Estimated food-related cases (%)*	691 (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 2008 by data source

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

During 2008, 1 346 notifications (31.5 cases per 100 000 population) of salmonellosis were reported in EpiSurv. The Enteric Reference Laboratory at ESR confirmed 1 339 *Salmonella* isolates (31.4 cases per 100 000).

The ICD-10 code A02.0 was used to extract salmonellosis hospitalisation data from the NZHIS NMDS database. Of the 127 hospital admissions (3.0 admissions per 100 000 population) recorded in 2008, 100 were reported with salmonellosis as the primary diagnosis and 27 with salmonellosis as another relevant diagnosis.

One death resulting from salmonellosis was recorded in EpiSurv in 2008.

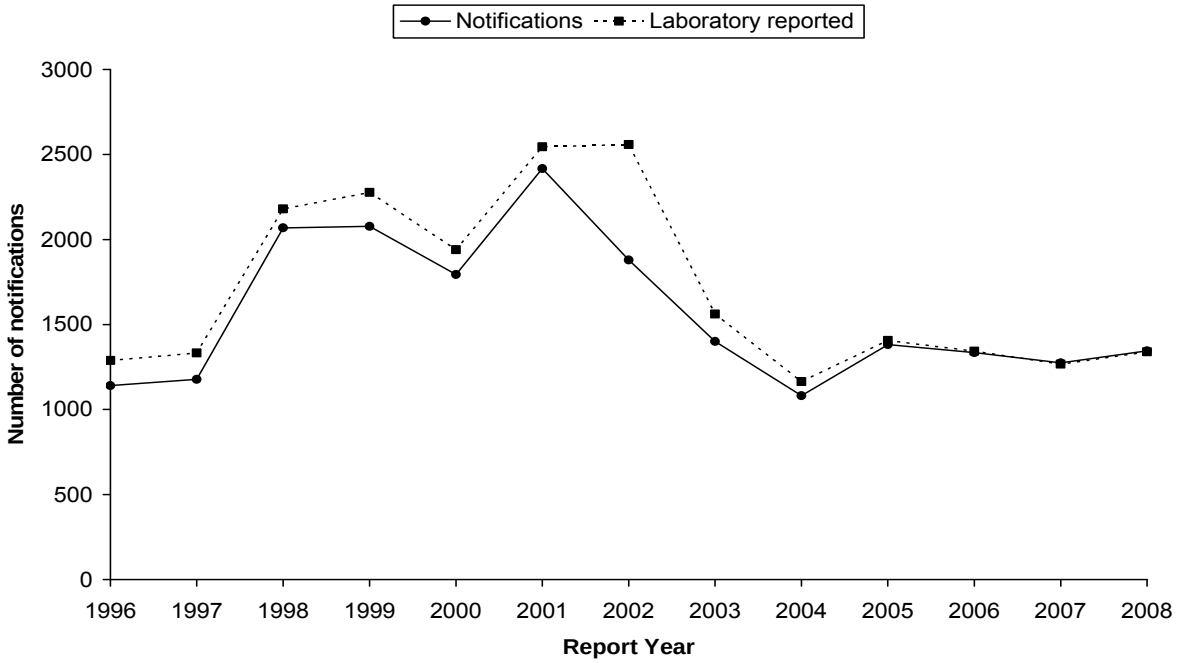
It has been estimated by expert consultation that 61% (minimum = 45%, maximum = 69%) of salmonellosis incidence is due to foodborne transmission. It was further estimated that 36% of foodborne transmission was due to transmission via poultry.

4.13.3 Notifiable disease data

4.13.3.1 Annual notification trend

From 1996 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), increasing slightly in 2005 and then levelling off in more recent years.

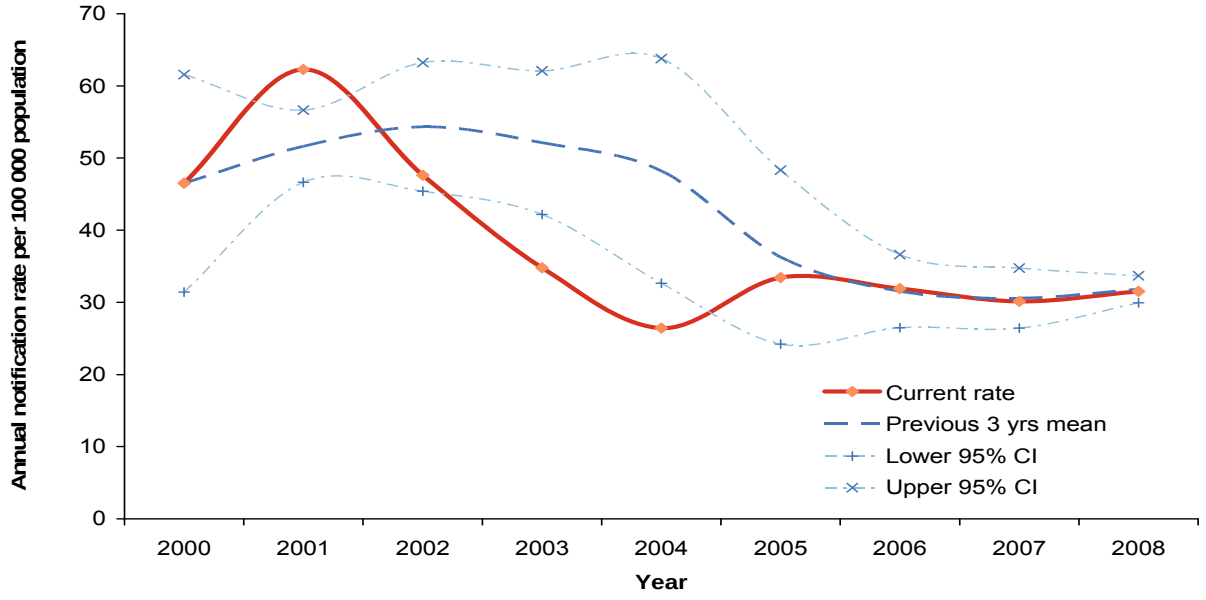
Figure 36: Salmonellosis notifications and laboratory reported cases by year, 1996-2008



The change to direct laboratory notifications suggests that any differences between the number of notified cases and the number of laboratory reported cases should disappear in the future. Data for 2008 supports this conclusion.

The 2008 salmonellosis notification rate was 31.5 per 100 000 population. Over the nine year period from 2000 to 2008 the salmonellosis annual notification rate was highest in 2001 before decreasing from 2002 to 2004 and levelling off after that (Figure 37).

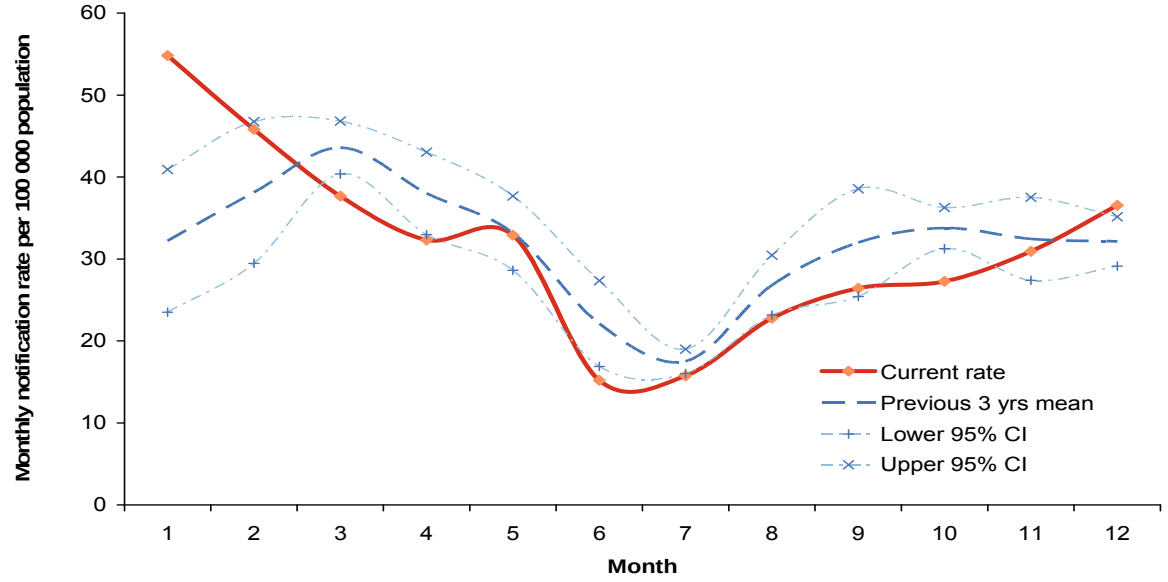
Figure 37: Salmonellosis notification rate by year, 2000-2008



4.13.3.2 Seasonality

Salmonellosis notifications reported per 100 000 population by month for 2008 show a clear seasonal pattern with notifications being highest during summer and autumn and lowest in mid-winter (Figure 38). A similar trend is seen in the historic mean rate.

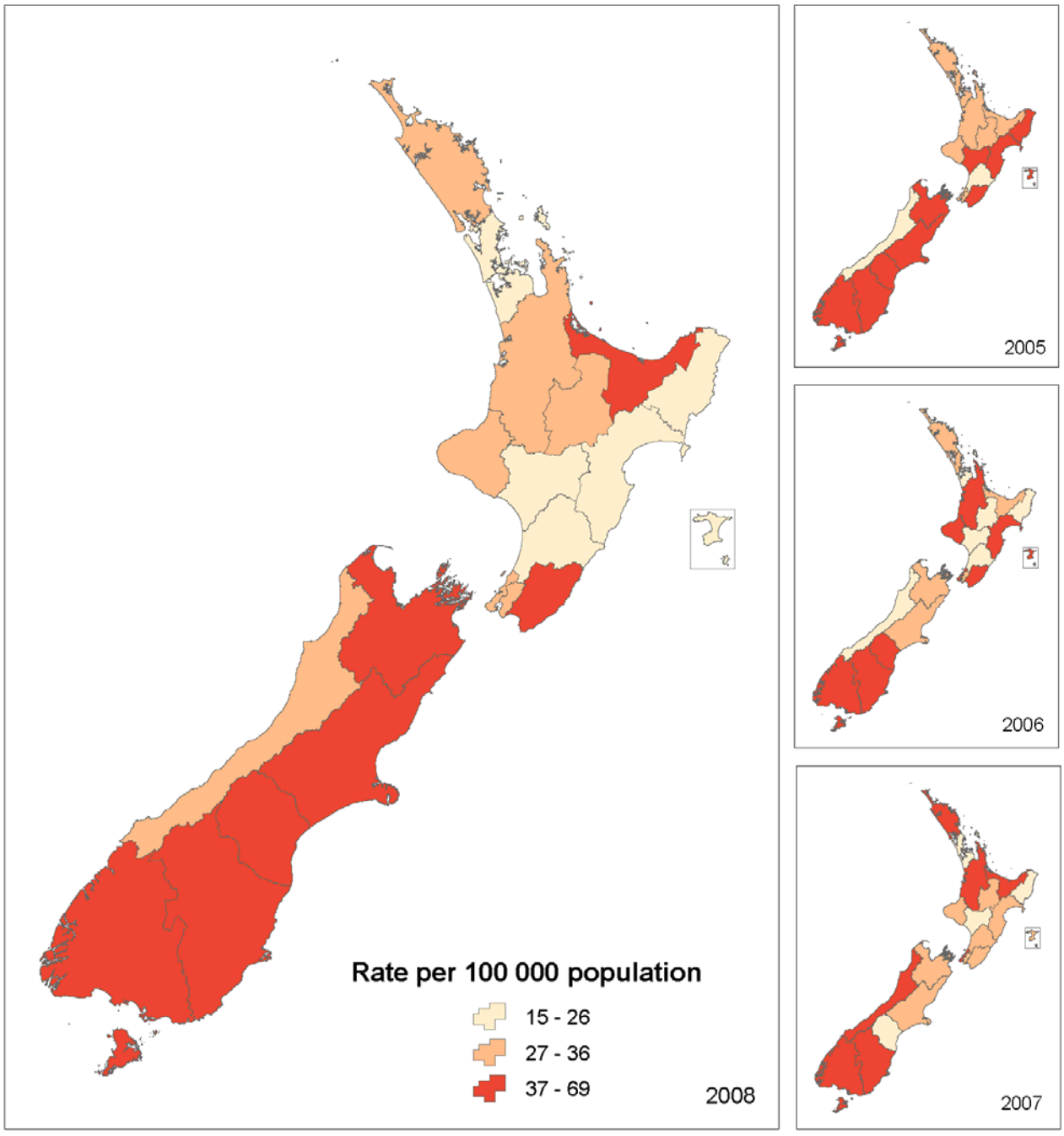
Figure 38: Salmonellosis notification monthly rate (annualised) for 2008



4.13.3.3 Geographic distribution of salmonellosis notifications

Rates of salmonellosis vary throughout the country as illustrated in Figure 39. The highest salmonellosis notification rate in 2008 was reported in Otago DHB (68.9 per 100 000 population, 129 cases), followed by South Canterbury DHB (66.9 per 100 000, 37 cases). Otago and Southland DHBs have consistently featured in the quantile of DHBs with the highest notification rates for the past four years.

Figure 39: Geographic distribution of salmonellosis notifications, 2005-2008



4.13.3.4 Age and sex distribution of salmonellosis cases

In 2008 the numbers and rates of notification and hospitalisation for salmonellosis were generally similar for males and females with slightly more males than females being reported in EpiSurv, and more females than males being hospitalised (Table 45).

Table 45: Salmonellosis cases by sex, 2008

Sex	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
Male	704	33.6	55	2.6	
Female	622	28.6	72	3.3	1
Unknown	20				
Total	1 346	31.5	127	3.0	1

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

In 2008 age-specific salmonellosis rates were highest for those aged less than 1 year for both the notifications (135.8 per 100 000) and hospitalisations (18.7 per 100 000 population) (Table 46). One to four year olds also have a high salmonellosis notification and hospitalisation rates compared to other age groups (108.9 per 100 000).

Table 46: Salmonellosis cases by age group, 2008

Age groups	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	87	135.8	12	18.7	
1 to 4	257	108.9	19	8.1	
5 to 9	80	27.8	5	1.7	
10 to 14	55	18.2	2	0.7	
15 to 19	75	23.3	5	1.6	
20 to 29	185	32.5	14	2.5	
30 to 39	164	28.1	13	2.2	
40 to 49	145	22.9	9	1.4	
50 to 59	120	23.1	11	2.1	
60 to 69	86	22.8	13	3.4	
70+	90	24.2	24	6.5	1
Unknown	2				
Total	1 346	31.5	127	3.0	1

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

4.13.3.5 Risk factors reported

The most commonly reported risk factors for salmonellosis notified cases during 2008 were consumption of food from retail premises (44.7%) followed by contact with farm animals (28.0%) and consumption of untreated water (22.2%) (Table 47).

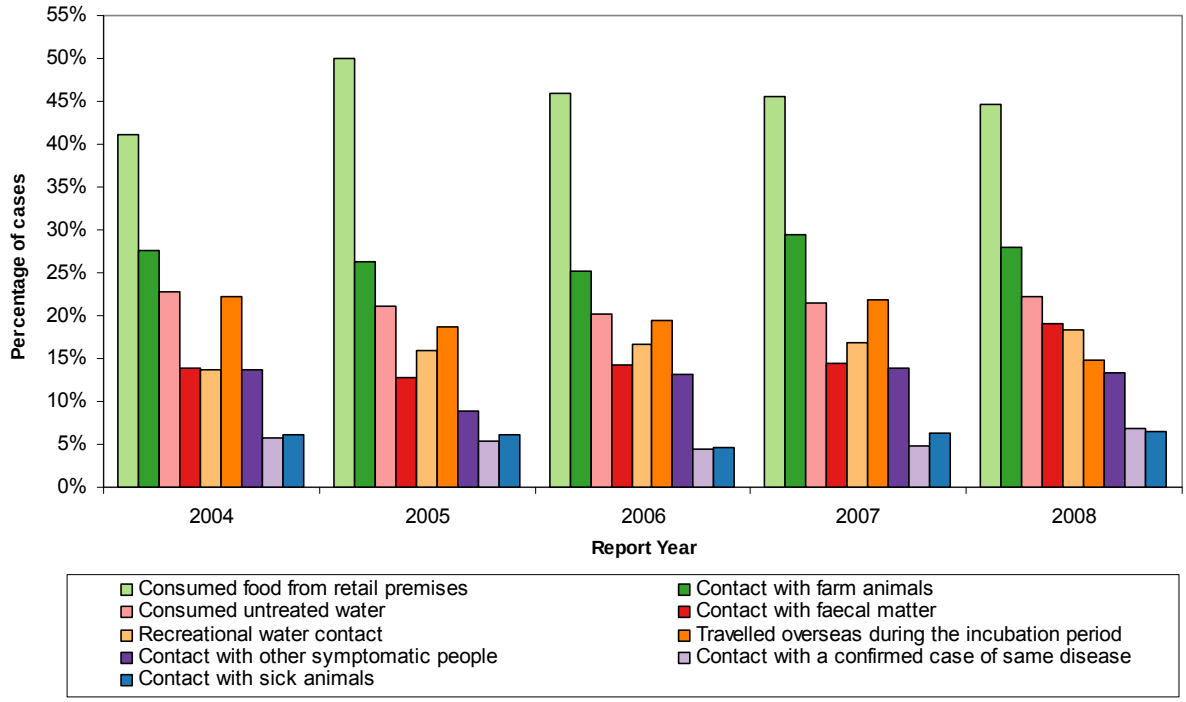
Table 47: Exposure to risk factors associated with salmonellosis, 2008

	Notifications			
Risk Factor	**Yes**	**No**	**Unknown**	**%[a]**
Consumed food from retail premises	266	329	751	44.7%
Contact with farm animals	203	521	622	28.0%
Consumed untreated water	120	421	805	22.2%
Contact with faecal matter	119	507	720	19.0%
Recreational water contact	116	517	713	18.3%
Travelled overseas during the incubation period	117	668	561	14.9%
Contact with other symptomatic people	88	571	687	13.4%
Contact with sick animals	41	591	714	6.5%

[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 2004 and 2008 the risk factors associated with salmonellosis cases have generally occurred in the same order of importance and to the same magnitude on a yearly basis (Figure 40). The consumption of food from retail premises has been the most commonly reported risk factor for salmonellosis cases every year and was considerably higher than contact with farm animals, the next most common risk factor.

Figure 40: Salmonellosis risk factors by percentage of cases and year, 2004 – 2008



4.13.3.6 Estimate of travel-related cases

For cases where information on travel was provided, 14.9% (95%CI 12.3-17.7%) 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 2008. The resultant distribution has a mean of 207 cases (95% CI 157-249).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 18.9% (95% CI 17.4-20.3%).

4.13.4 Outbreaks reported as caused by *Salmonella* spp

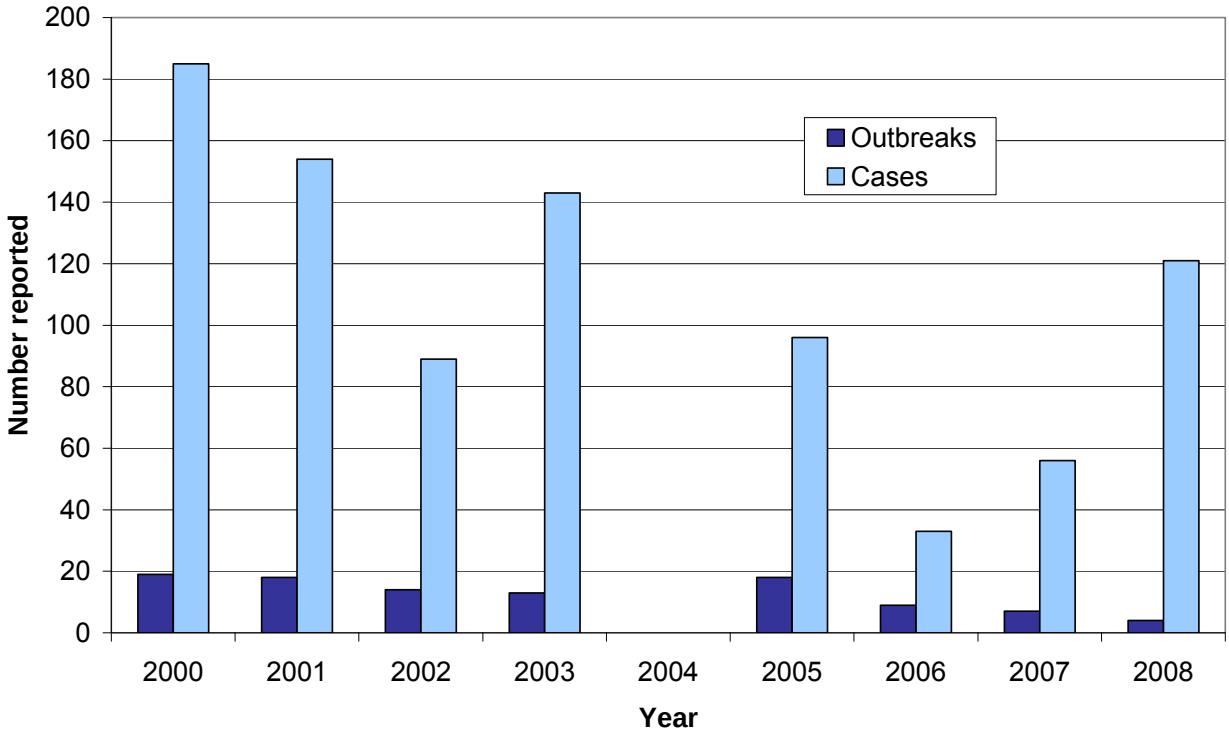
In 2008 there were 15 *Salmonella* spp. outbreaks reported and four of these were reported to be foodborne (Table 48). All but one of the hospitalisations due to *Salmonella* spp. were associated with foodborne outbreaks.

Table 48: *Salmonella* spp. foodborne outbreaks reported, 2008

Measure (No.)	Foodborne *Salmonella* spp. outbreaks	All *Salmonella* spp. outbreaks
Outbreaks	4	15
Cases	121	163
Hospitalised cases	17	18

The number of foodborne outbreaks reported between 2000 and 2008 ranged from zero (2004) to 19 (2000), generally decreasing in number over time (Figure 41). The total numbers of cases associated with the outbreaks have also generally decreased over the period 2000-2008, although in 2008 there was the highest number of cases since 2003.

Figure 41: Foodborne *Salmonella* spp. outbreaks and associated cases reported by year, 2000–2008



4.13.4.1 Details of food-associated outbreaks

Table 49 contains details of the four food–associated *Salmonella* spp. outbreaks reported in 2008.

Table 49: Details of food-associated *Salmonella* spp. outbreaks, 2008

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Canterbury (November)	Flour	Home	67C	2, 3, 5
Nelson (March)	Poultry, eggs	Home, Supermarket, Takeaway, Café	30C	3
Otago (January)	Smoked trout, infected food handler	Home	5C, 1P	2
Wellington (March)	Unknown	Prison	6C, 12P	7

C = confirmed, P = probable
Confirmation:
1 = Environmental investigation – identified critical control point failures linked to implicated source
2 = Epidemiological – case had history of exposure to implicated source
3 = Epidemiological – case control or cohort study showed elevated risk for cases to implicated source
4 = Laboratory – pathogen suspected to have caused illness identified in food handler
5 = Laboratory – pathogen suspected to have caused illness identified in implicated source (food)
6 = No evidence
7 = Other evidence

Evidence linking salmonellosis outbreaks to particular food vehicles was generally weak. However, the largest outbreak occurring in late 2008 and early 2009 included very strong evidence for uncooked flour as the source of the outbreak.

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, *Salmonella* spp. were detected in faecal samples associated with four investigations, with chicken and barbecue food implicated in two of the investigations. *Salmonella* Typhimurium DT42 was detected in unopened packets of flour associated with the outbreak mentioned previously.

4.13.5 *Salmonella* types commonly reported

4.13.5.1 Human isolates

A total of 1 339 non-Typhi human isolates were typed by ESR's Enteric Reference Laboratory during 2008. Of these isolates, 729 (54.4%) were *Salmonella* Typhimurium.

Table 50 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) was greater than the 2007 numbers and similar to 2005 and 2006. DT160 remained the most common single type. However, the number of isolates of this type continues to decrease. The large increases in typed isolates of *S.* Typhimurium DT42, *S.* Mbandaka and *S.* Saintpaul are probably largely due to their involvement in significant outbreaks. The number of *S.* Chester isolates continues to increase, while those of *S.* Brandenburg continue to decrease.

Table 50: Selected *Salmonella* serotypes and subtypes of laboratory-confirmed salmonellosis, 2005 – 2008

Subtype	2005	2006	2007	2008
S. Typhimurium	757	733	596	729
DT160	248	260	152	135
DT42	27	28	15	93
DT101	67	71	43	72
DT1	114	72	91	72
DT156	75	87	73	67
DT74	28	42	29	21
Other or unknown	198	173	193	269
S. Enteritidis	151	107	151	124
PT9a	73	53	60	45
PT1b	9	9	18	19
PT26	9	7	17	10
Other or unknown	60	38	56	50
S. Infantis	67	58	86	86
S. Chester	0	1	37	64
S. Mbandaka	8	22	14	39
S. Saintpaul	65	35	25	35
S. Brandenburg	68	55	47	33
S. Virchow	16	13	34	14
Other or unknown serotypes	274	319	277	215
Total	**1 406**	**1 343**	**1 267**	**1 339**

4.13.5.2 Non-human isolates

A total of 1 349 non-human *Salmonella* isolates were typed by the Enteric Reference Laboratory during 2008 (Table 51).

Table 51: Selected *Salmonella* serotypes and subtypes from non-human sources, 2006-2008

Subtype	2006	2007	2008	Major Sources, 2008
S. Typhimurium	543	333	727	
DT101	189	73	146	Bovine (59), Poultry miscellaneous (50), Poultry environmental (30)
RDNC	33	52	104	Bovine (38)
DT8	12	4	64	Bovine (57)
DT1	40	36	63	Bovine (53)
DT156	27	24	55	Bovine (42)
DT160	75	30	47	Avian (9), Poultry feed (9), Bovine (7)
Other or unknown	167	114	248	
S. Brandenburg	319	191	92	Ovine (31), Bovine (23), Environmental (16), Food (14)
S. Infantis	68	70	51	Poultry feed (16), Poultry environmental (8), Reptile (6), Poultry miscellaneous (6)
S. Mbandaka	6	18	51	Environmental (20), Poultry feed (13), Poultry environmental (12)
S. Senftenberg	15	18	42	Environmental (17), Poultry feed (12), Meat and bone meal (7)
S. Hindmarsh	162	110	34	Ovine (24), Bovine (6)
S. Tennessee	12	7	31	Meat and bone meal (17), Poultry feed (7)
S. Agona	34	22	26	Poultry environmental (7), Meat and bone meal (7), Poultry feed (4)
Other or unknown serotypes	258	232	295	
Total	**1 417**	**1 001**	**1 349**	

S. Typhimurium DT 101 was the most commonly isolated serotype in non-human samples during 2008, while the number of samples typed as *S.* Brandenburg continued to decrease, in line with the decrease in human cases.

4.13.5.3 Outbreak types

Table 52 shows the number of hospitalised cases and total cases by subtype for foodborne *Salmonella* outbreaks reported during 2008. Each of the four outbreaks was associated with a different subtype. The largest outbreak, due to *Salmonella* Typhimurium phage type 42 was associated with 13 hospitalisations and 67 cases from a variety of regions throughout the country.

Table 52: *Salmonella* subtypes reported in foodborne outbreaks, 2008

Pathogen and Subtype	Outbreaks	Hospitalised cases	Total cases
Salmonella Typhimurium phage type 42	1	13	67
Salmonella Mbandaka	1	4	30
Salmonella Saintpaul	1	0	6
Salmonella Infantis	1	0	18

4.13.6 Recent surveys

Nil.

4.13.7 Relevant New Zealand studies and publications

4.13.7.1 Journal papers

A study of 163 chicken carcasses, taken from retail outlets in Auckland, Wellington and Christchurch did not detect *Salmonella* spp. from any carcass rinse samples or associated external packaging (Chrystal *et al.*, 2008).

A one year survey conducted from mid-2005 to 2006 measured the counts and/or prevalence in fresh bovine faeces of bacterial and protozoan pathogens on New Zealand dairy farms (Moriarty *et al.*, 2008). A total of 155 faecal samples were collected from four farms. *Salmonella* was not detected in any of the 155 samples.

4.13.8 Relevant regulatory developments

Nil.

4.14 Shigellosis

Summary data for shigellosis in 2008 are given in Table 53.

Table 53: Summary surveillance data for shigellosis, 2008

Parameter	Value in 2008	Section reference
Number of cases	113	4.14.2
Rate (per 100,000)	2.6	4.14.2
Hospitalisations (%)	19 (16.8%)	4.14.2
Deaths (%)	0 (0%)	4.14.2
Estimated travel-related cases (%)	84 (74.4%)	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 2008 by data source

During 2008 113 notifications (2.6 cases per 100 000 population) of shigellosis were reported in EpiSurv. The Enteric Reference Laboratory at ESR confirmed 107 *Shigella* isolates (2.5 per 100 000 population).

The ICD-10 code A03 was used to extract shigellosis hospitalisation data from the NZHIS NMDS database. Of the 19 hospital admissions (0.4 admissions per 100 000 population) recorded in 2008, 15 were reported with shigellosis as the primary diagnosis and four with shigellosis as another relevant diagnosis.

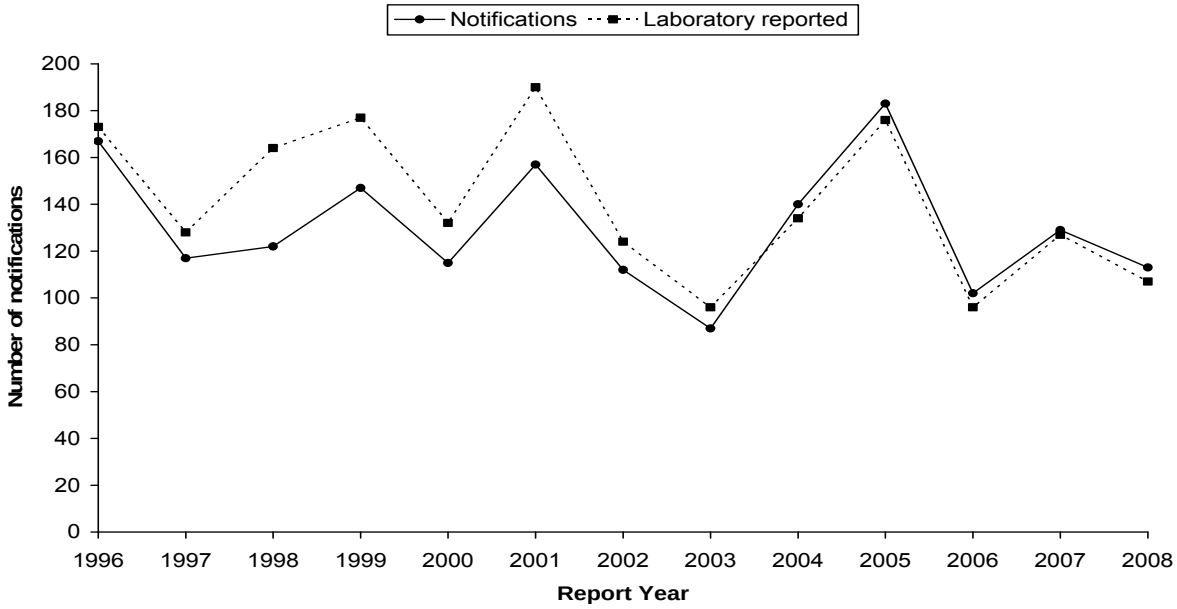
No deaths resulting from shigellosis were recorded in EpiSurv in 2008

4.14.3 Notifiable disease data

4.14.3.1 Annual notification trend

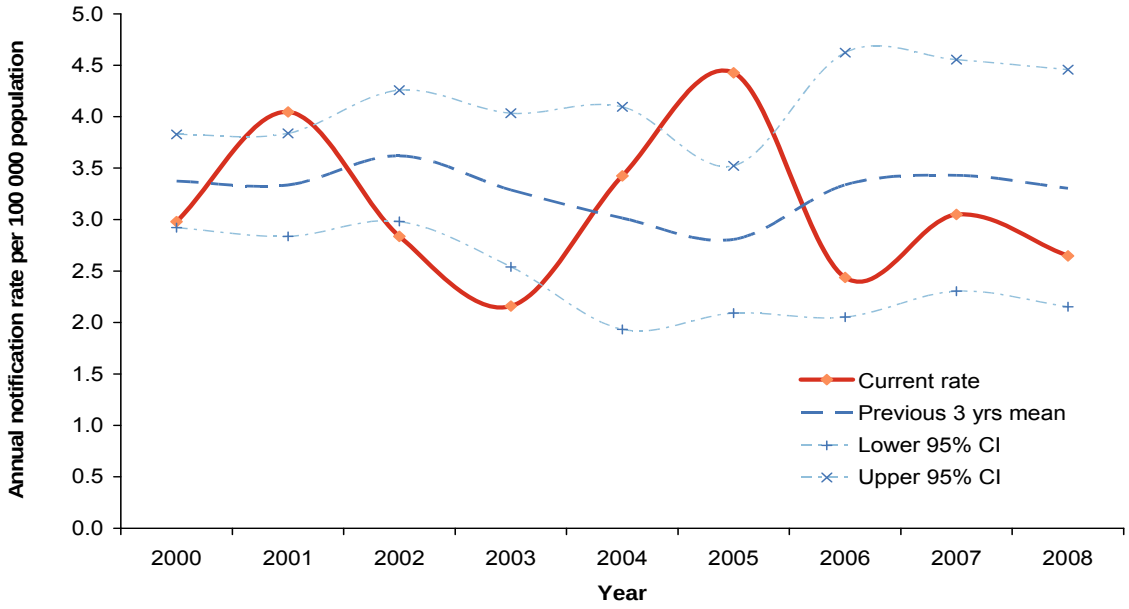
The number of notifications and laboratory reported cases of shigellosis fluctuates from year to year, but without any clear pattern (Figure 42).

Figure 42: Shigellosis notifications and laboratory reported cases by year, 1996-2008



The 2008 shigellosis notification rate was 2.6 per 100 000 population. This is a decrease from the previous year and was one of the lowest rates since 2000 (Figure 43).

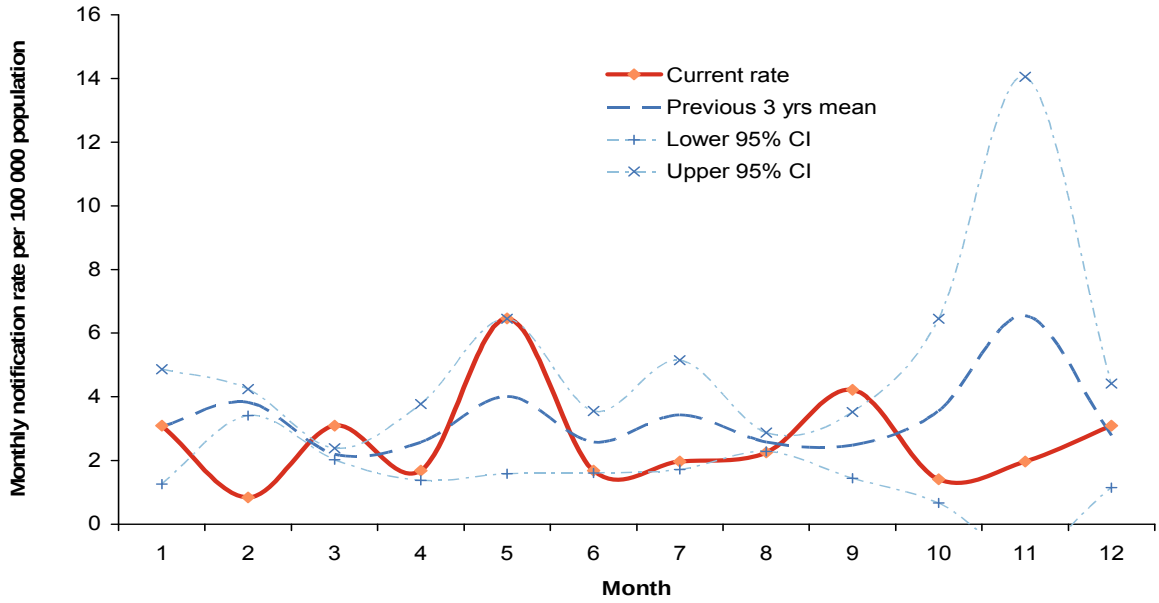
Figure 43: Shigellosis notification rate by year, 2000-2008



4.14.3.2 Seasonality

The number of notified cases of shigellosis per 100 000 population by month for 2008 is shown in Figure 44. In 2008 shigellosis notifications were highest in May and September. The May peak is consistent with historical trends. There is a peak in the historical mean in November due to a large shigellosis outbreak in Northland and Auckland in 2005.

Figure 44: Shigellosis monthly rate (annualised) for 2008



4.14.3.3 Age and sex distribution of shigellosis cases

The number and rates of notifications and hospitalisations for shigellosis were higher for males than females (Table 54).

Table 54: Shigellosis cases by sex, 2008

Sex	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
Male	62	3.0	13	0.6	
Female	46	2.1	6	0.3	
Unknown	5				
Total	113	2.6	19	0.4	

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

Age-specific shigellosis notification and hospitalisation rates were highest for those aged between 1 and 4 years. (Table 55). Notification rates were lowest for those aged <1 year, 15 to 19 years, and 5 to 9 years.

Table 55: Shigellosis cases by age group, 2008

Age groups	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	0	0.0	0	0.0	
1 to 4	13	5.5	3	1.3	
5 to 9	4	1.4	1	0.3	
10 to 14	7	2.3	3	1.0	
15 to 19	4	1.2	1	0.3	
20 to 29	15	2.6	3	0.5	
30 to 39	18	3.1	1	0.2	
40 to 49	21	3.3	2	0.3	
50 to 59	19	3.7	4	0.8	
60 to 69	6	1.6	1	0.3	
70+	6	1.6	0	0.0	
Unknown	0				
Total	113	2.6	19	0.4	

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

4.14.3.4 Risk factors reported

The most commonly reported risk factor for shigellosis in 2008 was overseas travel during the incubation period (reported by 74.4% of cases) followed by consumption of food from retail premises (44.7%) and recreational water contact (31.8%) (Table 56).

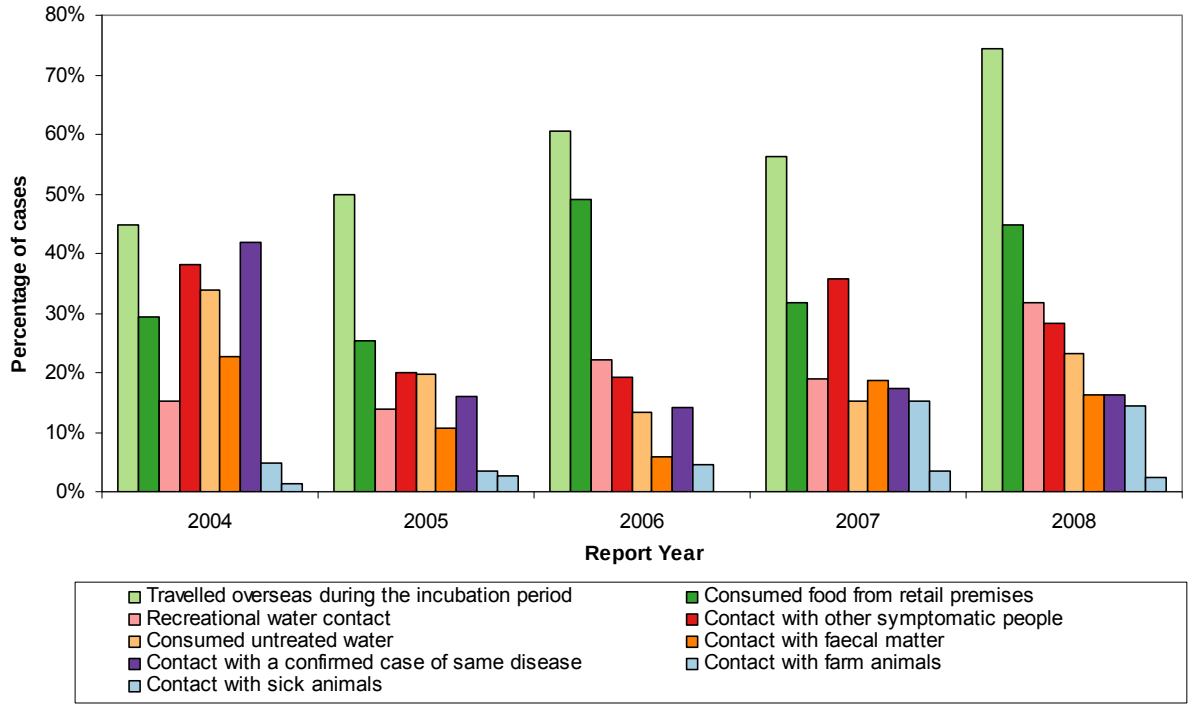
Table 56: Exposure to risk factors associated with shigellosis, 2008

	Notifications			
Risk Factor	**Yes**	**No**	**Unknown**	**%[a]**
Travelled overseas during the incubation period	58	20	35	74.4%
Consumed food from retail premises	17	21	75	44.7%
Recreational water contact	14	30	69	31.8/%
Contact with other symptomatic people	13	33	67	28.3%
Consumed untreated water	6	20	87	23.1%
Contact with faecal matter	7	36	70	16.3%
Contact with farm animals	7	42	64	14.3%
Contact with sick animals	1	43	69	2.3%
Travelled overseas during the incubation period	58	20	35	74.4%

[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.

With the exception of 2004, overseas travel during the incubation period and consumption of food from retail premises were the two most commonly reported risk factors for shigellosis each year during the five year period 2004 to 2008 (Figure 45).

Figure 45: Shigellosis risk factors by percentage of cases and year, 2004 – 2008



4.14.3.5 Estimate of travel-related cases

For cases where information on travel was provided, 74.4% (95%CI 56.5-94.7%) had travelled overseas during the incubation period. Assuming that the cases for which travel information was provided were representative of all shigellosis cases, a Poisson distribution can be used to estimate the total number of potentially travel related cases of shigellosis in 2008. The resultant distribution has a mean of 84 cases (95% CI 58-114).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 59.0% (95% CI 51.4-67.0%). The percentage of cases reporting overseas travel during the incubation period of the disease was higher in 2008 than for any of the previous three years.

4.14.4 Outbreaks reported as caused by *Shigella* spp

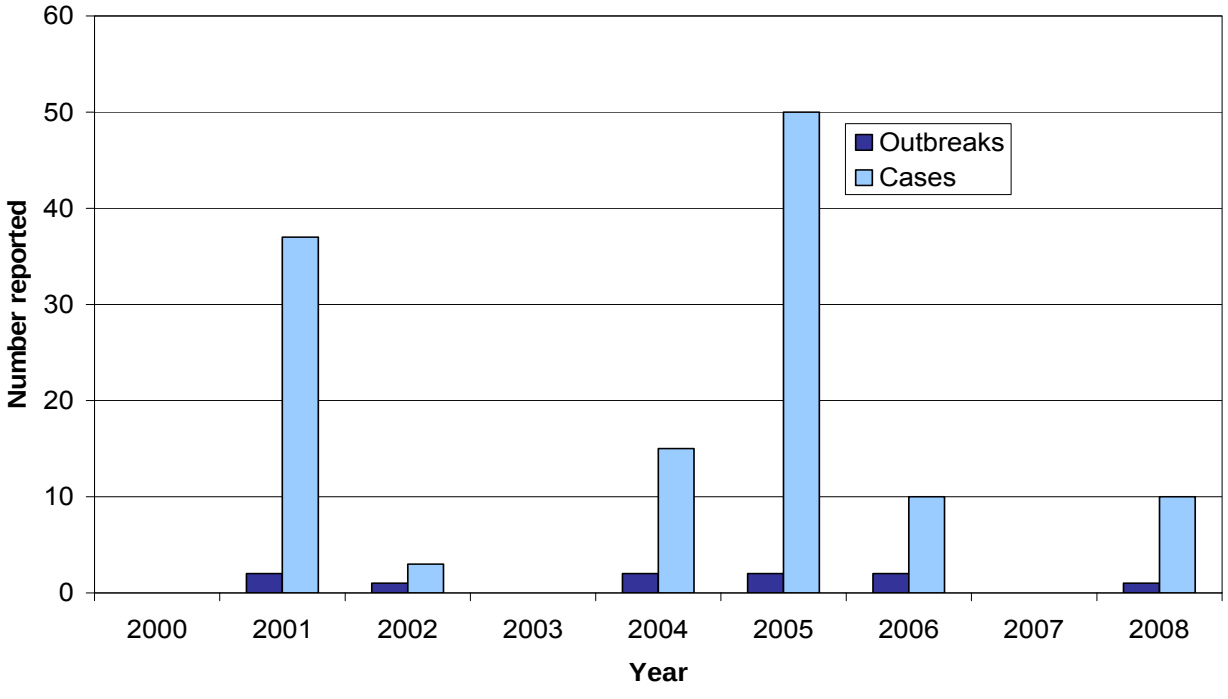
One of the six *Shigella* outbreaks reported in EpiSurv in 2008 was foodborne (Table 57).

Table 57: *Shigella* spp. outbreaks reported, 2008

Measure (No.)	Foodborne *Shigella* spp. outbreaks	All *Shigella* spp. outbreaks
Outbreaks	1	6
Cases	10	27
Hospitalised cases	1	4

Foodborne shigellosis outbreaks are rare with not more than two outbreaks being reported each year from 2000 to 2008 (Figure 46).

Figure 46: *Shigella* outbreaks and associated cases reported by year, 2000 – 2008



4.14.4.1 Details of food-associated outbreaks

Table 58 contains details of the food–associated *Shigella* spp. outbreak reported in 2008

Table 58: Details of food-associated *Shigella* spp. outbreak, 2008

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Wellington (January)	Unknown	Home	10C	6

C = confirmed, P = probable
Confirmation:
1 = Environmental investigation – identified critical control point failures linked to implicated source
2 = Epidemiological – case had history of exposure to implicated source
3 = Epidemiological – case control or cohort study showed elevated risk for cases to implicated source
4 = Laboratory – pathogen suspected to have caused illness identified in food handler
5 = Laboratory – pathogen suspected to have caused illness identified in implicated source (food)
6 = No evidence
7 = Other evidence

While the outbreak listed in Table 58 was reported to be foodborne, no evidence was provided to support this assertion.

4.14.4.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratory, no samples were found to contain *Shigella* spp.

4.14.5 *Shigella* types commonly reported

There were 107 isolates of *Shigella* spp. confirmed in 2008, compared with 127 in 2007. *S. sonnei* biotypes accounted for 70 of the isolates, while *S. flexneri* accounted for a further 33 isolates.

Table 59 summarises typing information for the food-associated outbreak that occurred during 2008.

Table 59: Pathogen subtypes reported in foodborne *Shigella* spp. outbreaks, 2008

Pathogen and Subtype	Outbreaks	Hospitalised cases	Total cases
Shigella sonnei Biotype *g*	1	1	10

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 $\geq 10^3$/gram coagulase-positive *S. aureus* from faecal or vomit specimen or $\geq 10^5$ 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 2008 by data source

In 2008 there were no notifications of *Staphylococcus aureus* intoxication reported in EpiSurv.

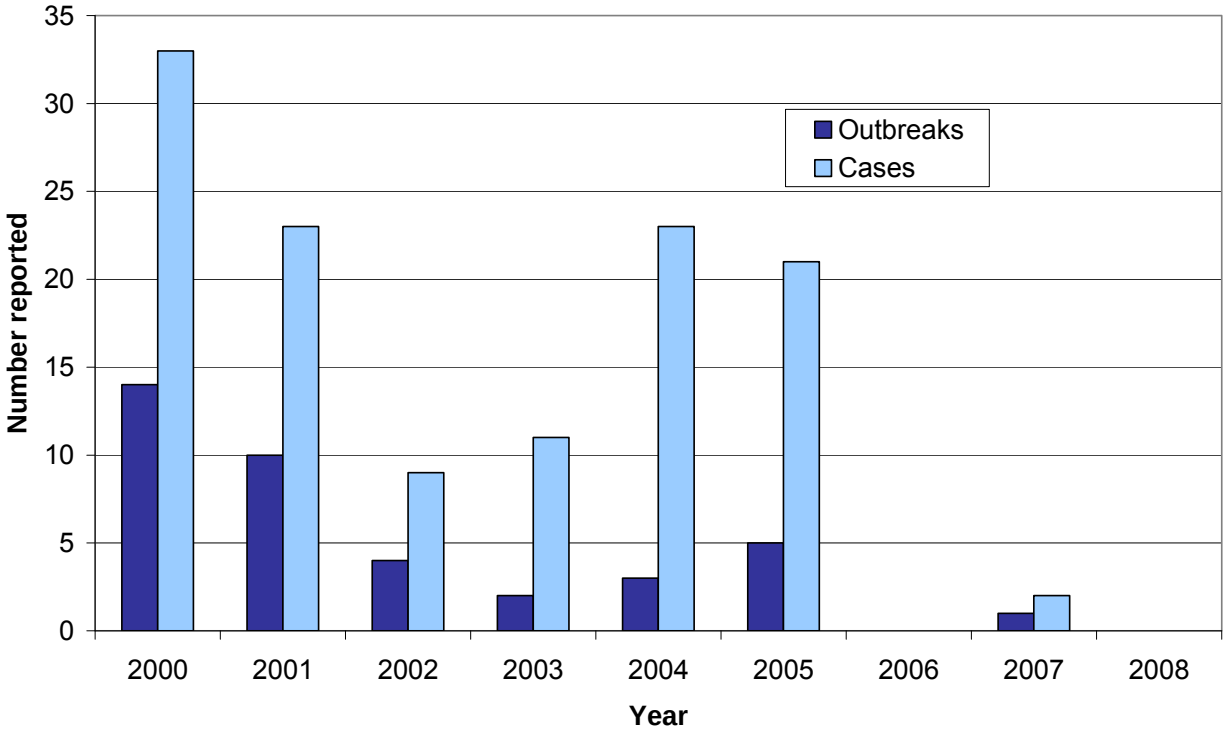
The ICD-10 code A05.0 was used to extract foodborne staphylococcal intoxication hospitalisation data from the NZHIS NMDS database. Of the three hospital admissions recorded in 2008, two were reported with foodborne staphylococcal intoxication as the primary diagnosis and one with this condition as another relevant diagnosis.

4.15.3 Outbreaks reported as caused by *Staphylococcus aureus*

In 2008, no *Staphylococcus aureus* outbreaks were reported in EpiSurv.

Between 2000 and 2003 there was a steady decrease in the number of *Staphylococcus aureus* outbreaks reported (Figure 47) followed by a small increase in 2004 and 2005. In 2006 and 2008 no *Staphylococcus aureus* outbreaks were reported in EpiSurv.

Figure 47: Foodborne *Staphylococcus aureus* outbreaks and associated cases reported by year, 2000 – 2007



4.15.3.1 Details of food-associated outbreaks

In 2008, no *Staphylococcus aureus* outbreaks were reported in EpiSurv.

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, two investigations revealed evidence of *S. aureus* intoxication. Findings included high levels of *S. aureus* in a faecal sample from an investigation with no specific food implicated and high levels of *S. aureus* and presence of the associated enterotoxin in a faecal sample from another investigation, in which a chicken biryani meal was the implicated food.

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 2008

There was one case of toxic shellfish poisoning reported in EpiSurv in 2008. This continues the low number of toxic shellfish poisoning notifications in recent years. The poisoning occurred after the consumption of mussels collected from Wainui Bay in the Tasman district. The type of toxic shellfish poisoning was unspecified.

The ICD-10 code T61.2 was used to extract hospitalisation data for 'other fish and shellfish poisoning' from the NZHIS NMDS database. Of the six hospital admissions recorded in 2008, all were reported with 'other fish and shellfish poisoning' as the primary diagnosis. Note that this ICD-10 code includes shellfish and other fish.

4.16.3 Outbreaks reported as caused by TSP

In 2008 there were no outbreaks due to toxic shellfish poisoning reported in EpiSurv.

4.17 VTEC/STEC Infection

Summary data for VTEC/STEC infection in 2008 are given in Table 60.

Table 60: Summary surveillance data for VTEC/STEC infection, 2008

Parameter	Value in 2008	Section reference
Number of cases	128	4.17.2
Rate (per 100,000)	3.0	4.17.2
Hospitalisations (%)	9 (7.0%)	4.17.2
Deaths (%)	0 (0%)	4.17.2
Estimated travel-related cases (%)	8 (6.3%)	4.17.3.5
Estimated food-related cases (%)*	48 (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 2008 by data source

During 2008, 128 notifications (3.0 cases per 100 000 population) of VTEC/STEC infection were reported in EpiSurv. The Enteric Reference Laboratory received 120 isolates (2.8 per 100 000).

The ICD-10 code A043 was used to extract enterohaemorrhagic *Escherichia coli* infection hospitalisation data from the NZHIS NMDS database. Of the nine hospital admissions recorded in 2008, seven were reported with enterohaemorrhagic *Escherichia coli* infection as the primary diagnosis and two with this condition as another relevant diagnosis.

No deaths due to VTEC/STEC infection were recorded in EpiSurv in 2008.

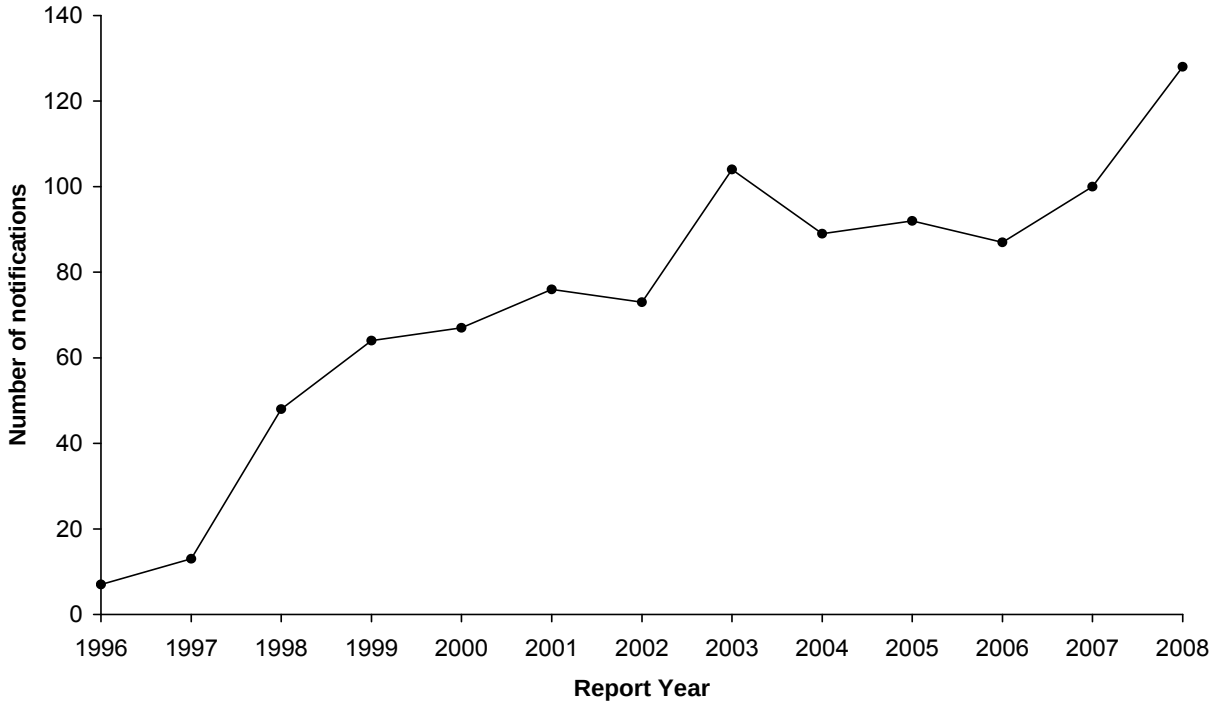
It has been estimated by expert consultation that 40% (minimum = 27%, maximum = 51%) of VTEC/STEC incidence is due to foodborne transmission. The expert consultation also estimated that approximately 30% of foodborne VTEC/STEC transmission was due to red meat of which two-thirds was considered to be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

4.17.3 Notifiable disease data

4.17.3.1 Annual notification trend

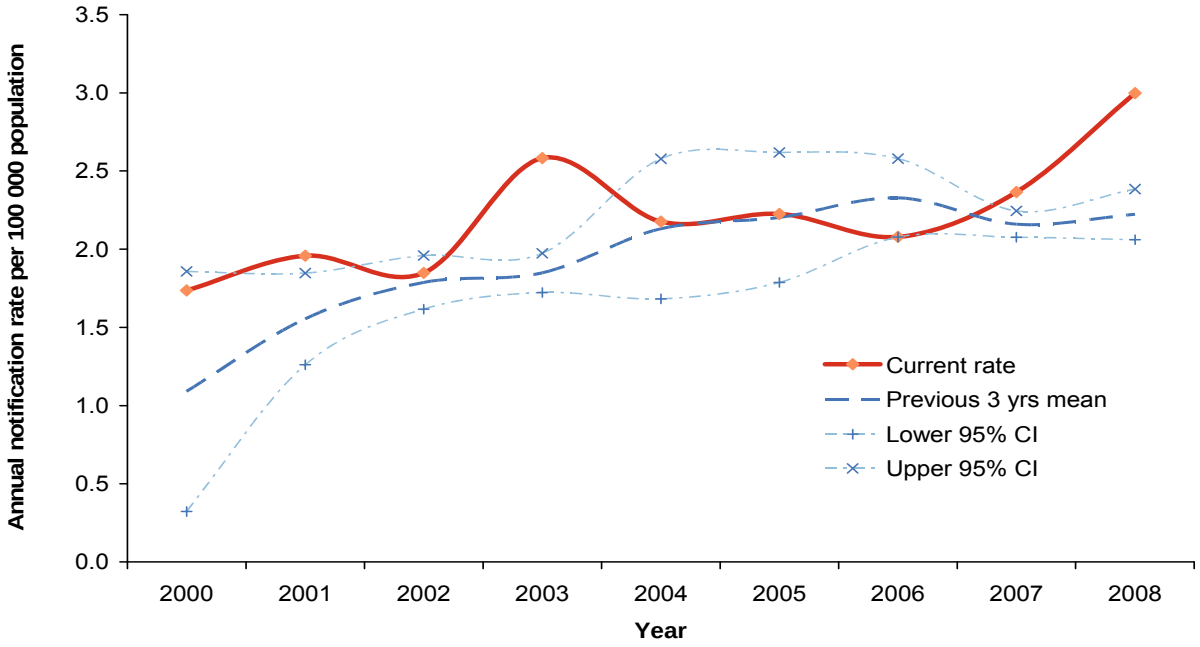
In 2008, 128 VTEC/STEC notifications were reported in EpiSurv. This is the highest number of notifications since VTEC/STEC became notifiable in 1996. As shown in Figure 48, there has been a general increase in the notifications of VTEC/STEC infection since 1996.

Figure 48: VTEC/STEC infection notifications by year, 1996-2008



The 2008 VTEC/STEC infection notification rate was 3.0 per 100 000 population. Over the period 2000 to 2008 the VTEC/STEC infection notification rates have varied little with slight increases seen in 2007 and 2008 (Figure 49).

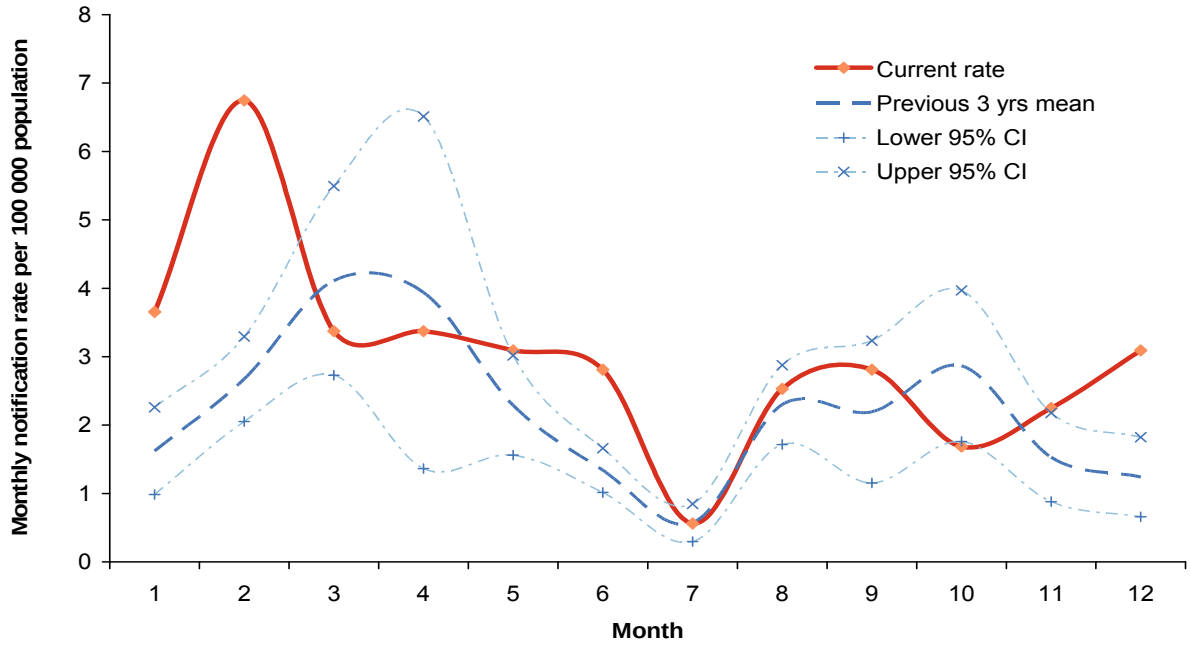
Figure 49: VTEC/STEC infection notification rate by year, 2000-2008



4.17.3.2 Seasonality

The number of notified cases of VTEC/STEC infection per 100 000 population by month for 2008 are shown in Figure 50. The 2008 notification rate follows the similar historic mean rate trend, but with a peak in February instead of March/April and a trough in October, where a peak has historically occurred.

Figure 50: VTEC/STEC infection notification monthly rate (annualised) for 2008



4.17.3.3 Age and sex distribution of VTEC/STEC infection

In 2008 the number and notification rates for VTEC/STEC infection were similar between males and females but hospitalisations were higher in females than males (Table 61).

Table 61: VTEC/STEC infection by sex, 2008

Sex	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
Male	67	3.2	3	0.1	
Female	60	2.8	6	0.3	
Unknown	1				
Total	128	3.0	9	0.2	

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

In 2008 the age specific VTEC/STEC infection notification rates were highest in the 1 to 4 years age group (39 cases, 16.5 per 100 000 population), followed by the less than one year age group (5 cases, 7.8 per 100 000). The 5 to 9 years age group had the highest hospitalisation rates (Table 62).

Table 62: VTEC/STEC infection by age group, 2008

Age groups	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	5	7.8	0	0.0	
1 to 4	39	16.5	0	0.0	
5 to 9	10	3.5	2	0.7	
10 to 14	5	1.7	0	0.0	
15 to 19	11	3.4	1	0.3	
20 to 29	17	3.0	1	0.2	
30 to 39	10	1.7	0	0.0	
40 to 49	10	1.6	2	0.3	
50 to 59	4	0.8	1	0.2	
60 to 69	12	3.2	2	0.5	
70+	5	1.3	0	0.0	
Unknown	0				
Total	128	3.0	9	0.2	

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

4.17.3.4 Risk factors reported

In 2008 the most commonly reported risk factors for VTEC/STEC infection were contact with household pets (91.5%), followed by consumption of raw fruit/vegetables (84.4%), consumption of dairy products (80.9%), and consumption of beef products (71.6%) (Table 63).

Table 63: Exposure to risk factors associated with VTEC/STEC infection, 2008

Risk Factor	Notifications			
	Yes	No	Unknown	%[a]
Contact with household pets	54	5	69	91.5%
Consumed raw fruit/vegetables	54	10	64	84.4%
Consumed dairy products	55	13	60	80.9%
Consumed beef products	48	19	61	71.6%
Consumed poultry products	41	19	68	68.3%
Contact with farm animals	37	20	71	64.9%
Consumed processed meats	41	25	62	62.1%
Consumed fruit/vegetables juice	26	28	74	48.1%
Contact with animal manure	22	26	80	45.8%
Recreational water contact	23	49	56	31.9%
Consumed lamb products	17	41	70	29.3%
Contact with children in nappies	20	54	54	27.%
Contact with other animals	13	36	79	26.5%
Contact with persons with similar symptoms	19	55	54	25.7%
Consumed home killed meats	13	51	64	20.3%
Consumed raw milk or products from raw milk	9	57	62	13.6%
Consumed pink or undercooked meats	6	50	72	10.7%
Travelled overseas during the incubation period	5	75	48	6.3%

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

The two most consistently reported risk factors for VTEC/STEC infection over the five year period 2004 to 2008 were the consumption of raw fruit/vegetables (Figure 51) and contact with household pets (Figure 52).

Figure 51: VTEC/STEC foodborne risk factors by percentage of cases and year, 2004 – 2008

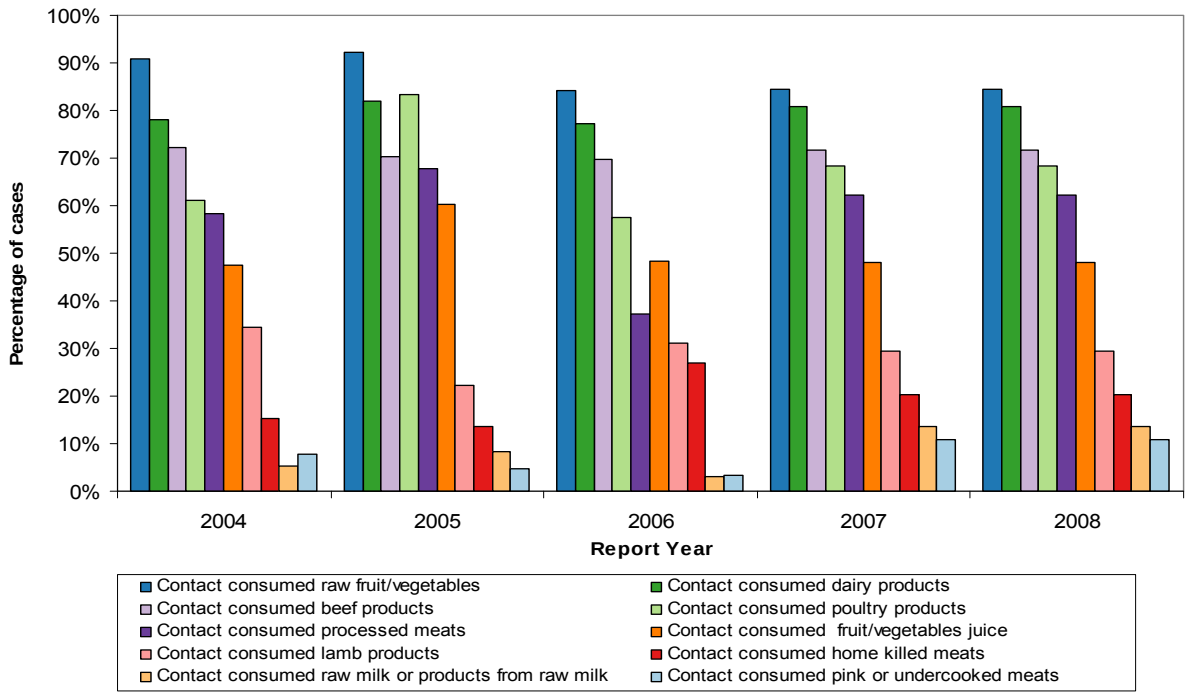
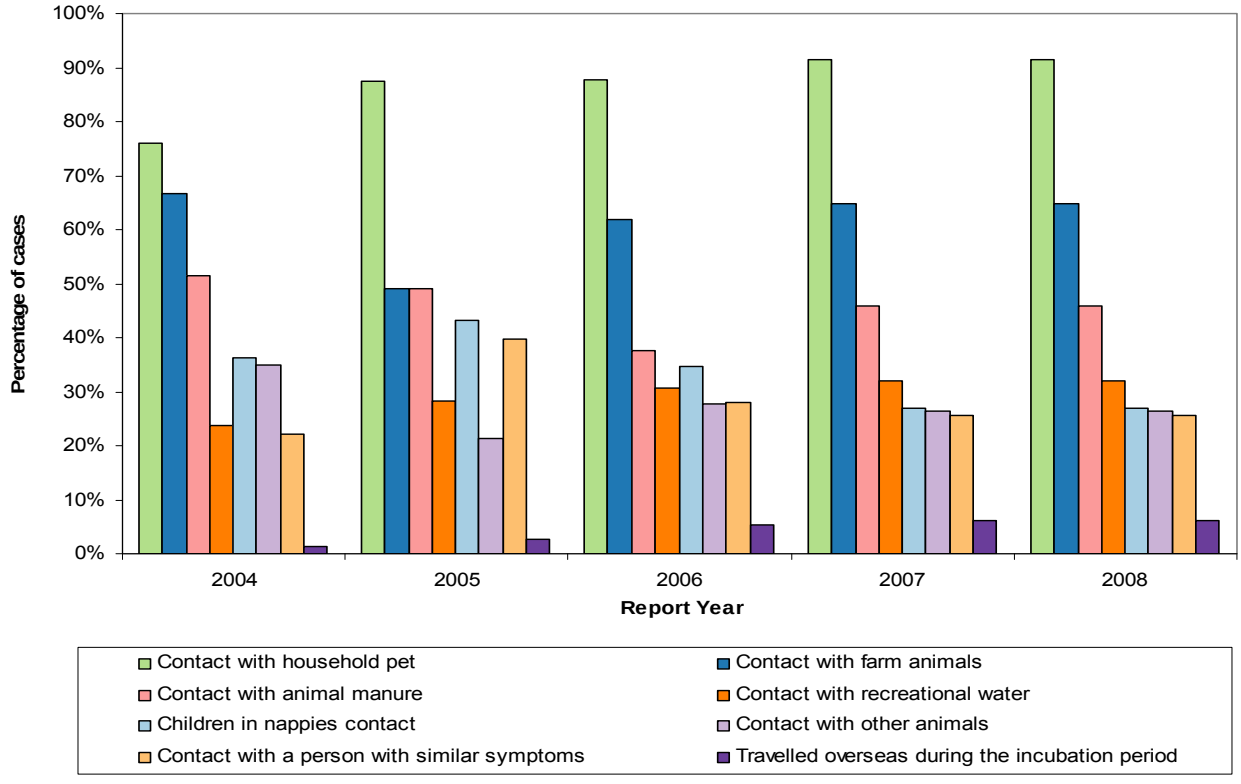


Figure 52: VTEC/STEC risk factors excluding food consumption by percentage of cases and year, 2004 - 2008



4.17.3.5 Estimate of travel-related cases

For cases where information on travel was provided, 6.3% (95%CI 2.0-12.8%) 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 2008. The resultant distribution has a mean of 8 cases (95% CI 1-19).

4.17.4 Outbreaks reported as caused by VTEC/STEC

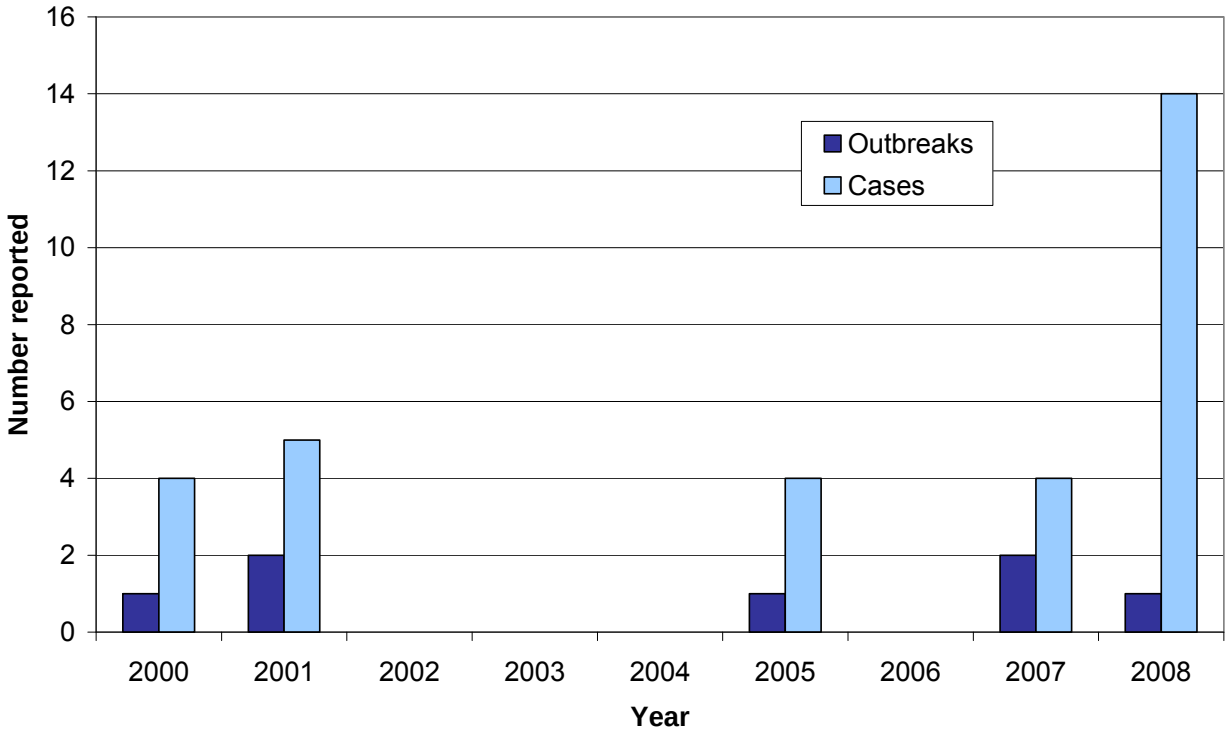
One foodborne VTEC/STEC outbreak with 14 associated cases was reported in 2008 (Table 64).

Table 64: VTEC/STEC outbreaks reported, 2008

Measure (No.)	Foodborne VTEC/STEC outbreaks	All VTEC/STEC outbreaks
Outbreaks	1	4
Cases	14	25
Hospitalised cases	4	4

Over the nine year period from 2000 to 2008 there have been no more than two foodborne outbreaks of VTEC/STEC reported each year (Figure 53). Prior to 2008 there were no outbreaks reported that had more than four associated cases.

Figure 53: Foodborne VTEC/STEC outbreaks and associated cases reported by year, 2000 – 2008



4.17.4.1 Details of food-associated outbreaks

Table 58 contains details of the food–associated VTEC/STEC outbreak reported in 2008.

Table 65: Details of food-associated VTEC/STEC outbreak, 2008

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Auckland (March)	Unknown	Unknown	14C	6

C = confirmed, P = probable
Confirmation:
1 = Environmental investigation – identified critical control point failures linked to implicated source
2 = Epidemiological – case had history of exposure to implicated source
3 = Epidemiological – case control or cohort study showed elevated risk for cases to implicated source
4 = Laboratory – pathogen suspected to have caused illness identified in food handler
5 = Laboratory – pathogen suspected to have caused illness identified in implicated source (food)
6 = No evidence
7 = Other evidence

While a single VTEC/STEC outbreak in 2008 was classified as foodborne, the evidence to support this was weak.

4.17.4.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratory, VTEC/STEC was not detected in any sample analysed.

4.17.5 VTEC/STEC types commonly reported

A total of 120 VTEC/STEC isolates were typed in 2008, of which 118 were *E. coli* O157:H7. The remaining two isolates were of types O176:HNM and O130:H11. This compares with 96 isolates (95 O157:H7 and one O177:HNM) received in 2007.

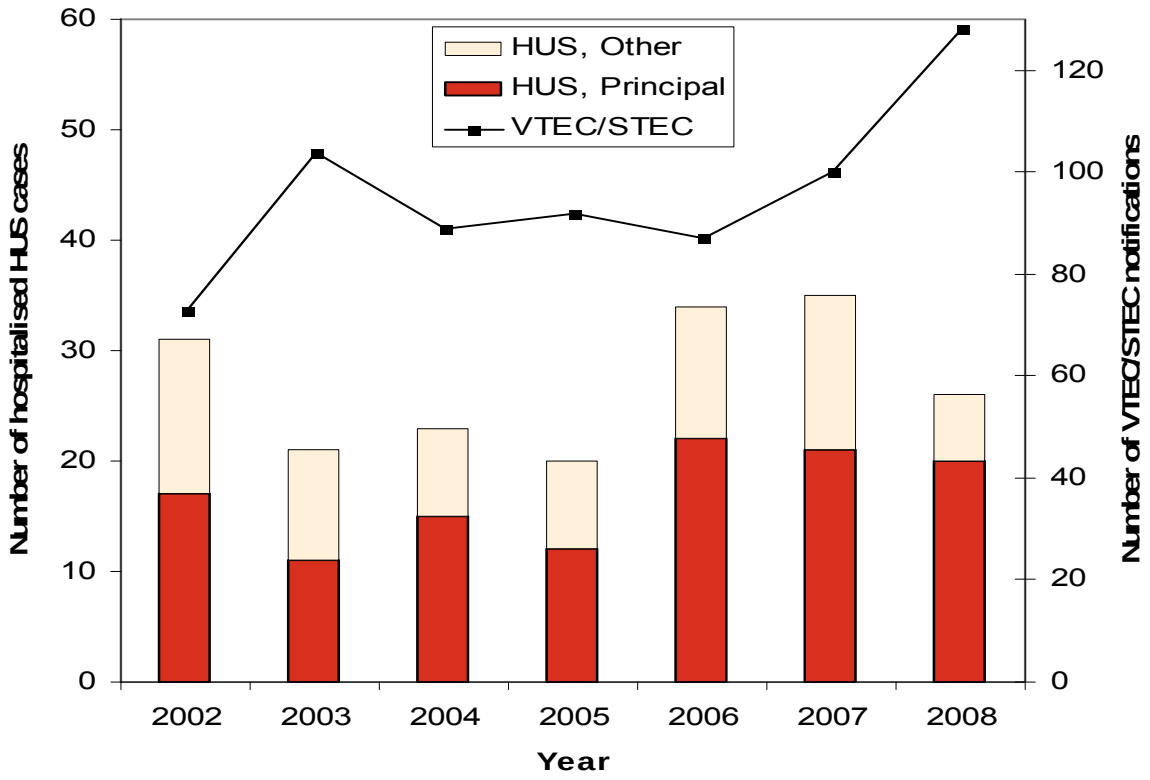
4.17.6 Disease Sequelae - haemolytic-uraemic syndrome (HUS)

Haemolytic-uremic syndrome 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 NZHIS NMDS database. Of the 26 hospitalised cases (0.6 admissions per 100 000 population) recorded in 2008, 20 were reported with HUS as the primary diagnosis and 6 with this condition as another relevant diagnosis.

Over the seven year period from 2002 to 2008, between 21 (in 2003) and 35 (in 2007) hospitalised cases for HUS have been reported each year (Figure 54). VTEC/STEC notifications have also been plotted on Figure 54 for comparison. There is little evidence for a correlation between VETC/STEC notifications and hospitalised HUS cases.

Figure 54: HUS hospitalised cases, 2002 - 2008



In 2008 the number of HUS hospitalised cases was greater for females was than males (Table 66).

Table 66: HUS hospitalised cases by sex, 2008

Sex	Hospitalised cases[a]	
	No.	Rate[b]
Male	10	0.5
Female	16	0.7
Total	26	0.6

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

In 2008 the highest hospitalised case rate for HUS occurred in <1 to 4 year olds (Table 67).

Table 67: HUS hospitalised cases by age group, 2008

Age groups	Hospitalised cases[a]	
	No.	Rate[b]
<1 to 4	8	2.7
5 to 9	5	1.7
10 to 14	1	0.3
15 to 19	0	0.0
20 to 29	2	0.4
30 to 39	5	0.9
40 to 49	1	0.2
50 to 59	1	0.2
60 to 69	1	0.3
70+	2	0.5
Total	26	0.6

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

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

During 2008, eight cases of HUS were reported to the NZPSU. Seven of these cases had a diarrhoeal prodrome, with a mean age of 4.6 years (range 1.5 – 12.0 years). Three cases had *E. coli* O157:H7 isolated from their stools.
Source:
http://dnmeds.otago.ac.nz/departments/womens/paediatrics/research/nzpsu/pdf/2008_report.pdf

4.17.7 Recent surveys

Nil.

4.17.8 Relevant New Zealand studies and publications

4.17.8.1 Journal papers

A one year survey conducted from mid-2005 to 2006 measured the counts and/or prevalence in fresh bovine faeces of bacterial and protozoan pathogens on New Zealand dairy farms (Moriarty *et al.*, 2008). A total of 155 faecal samples were collected from four farms. The prevalence of VTEC/STEC was 1.3% (2/155). One of the isolates was typed by polymerase chain reaction (PCR) as *E. coli* O130:H11. The second isolate was provisionally typed as H38, although the O serogroup could not be typed.

4.17.9 Relevant regulatory developments

Nil.

4.18 Yersiniosis

Summary data for yersiniosis in 2008 are given in Table 68.

Table 68: Summary surveillance data for yersiniosis, 2008

Parameter	Value in 2008	Section reference
Number of cases	509	4.18.2
Rate (per 100,000)	11.9	4.18.2
Hospitalisations (%)	53 (10.4%)	4.18.2
Deaths (%)	0 (0%)	4.18.2
Estimated travel-related cases (%)	31 (6.1%)	4.18.3.6
Estimated food-related cases (%)*	269 (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 2008 by data source

During 2008, 509 notifications (11.9 cases per 100 000) of yersiniosis were reported in EpiSurv.

The ICD-10 code A04.6 was used to extract yersiniosis hospitalisation data from the NZHIS NMDS database. Of the 53 hospital admissions (1.2 admissions per 100 000 population) recorded in 2008, 23 were reported with yersiniosis as the primary diagnosis and 30 with yersiniosis as another relevant diagnosis.

No deaths resulting from yersiniosis were recorded in EpiSurv in 2008.

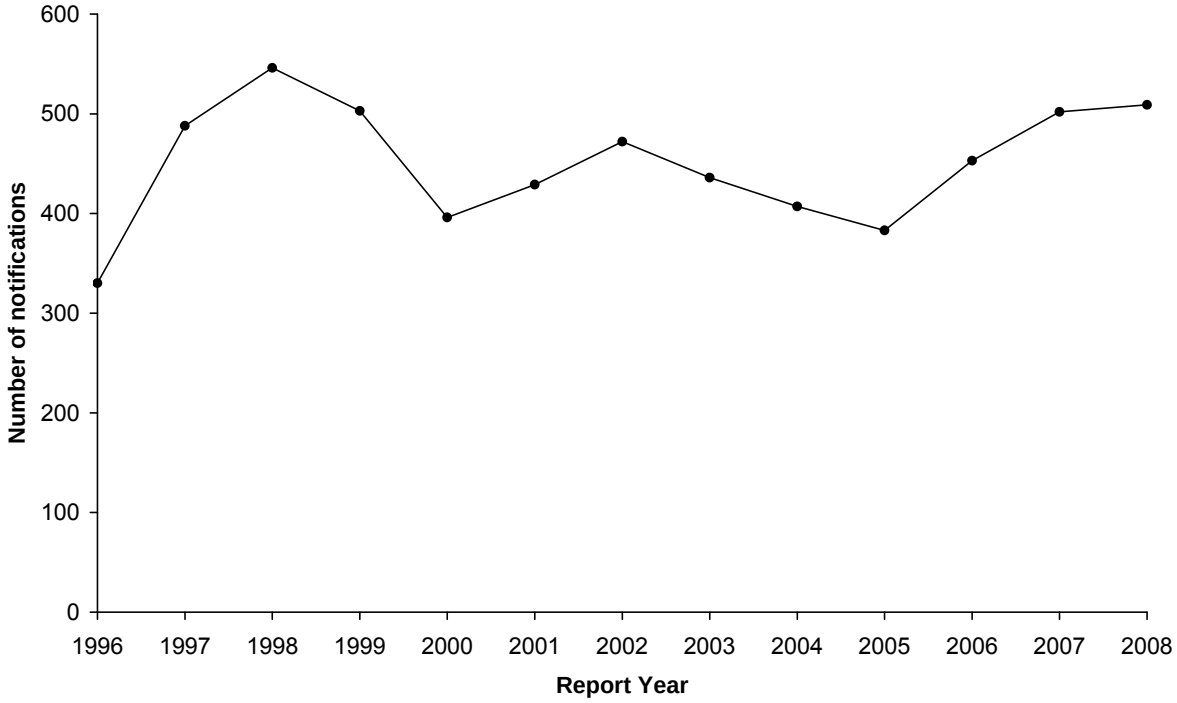
It has been estimated by expert consultation that 56% (minimum = 42%, maximum = 71%) of yersiniosis incidence is due to foodborne transmission. Approximately 50% of foodborne transmission was estimated to be due to consumption of pork.

4.18.3 Notifiable disease data

4.18.3.1 Annual notification trend

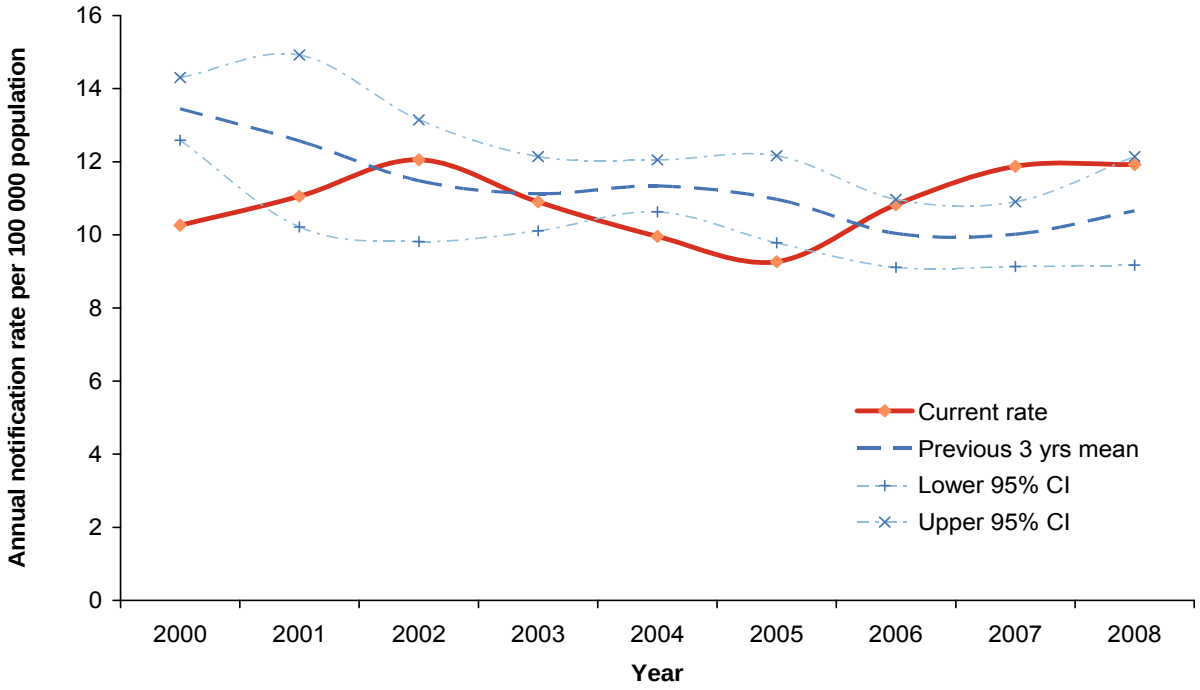
In 2008, 509 yersiniosis notifications were reported in EpiSurv (Figure 55). Yersiniosis became notifiable in 1996, with the highest number of notifications reported in 1998 (546 notifications). Since 1998 the number of notifications gradually declined to 407 cases in 2005 before increasing again to 509 cases in 2008.

Figure 55: Yersiniosis notifications by year, 1996-2008



In 2008 the yersiniosis notification rate was 11.9 cases per 100 000 population. The yersiniosis notification rate has varied little (ranging from 9.9 to 12.1 per 100 000) between 2000 and 2008 (Figure 56).

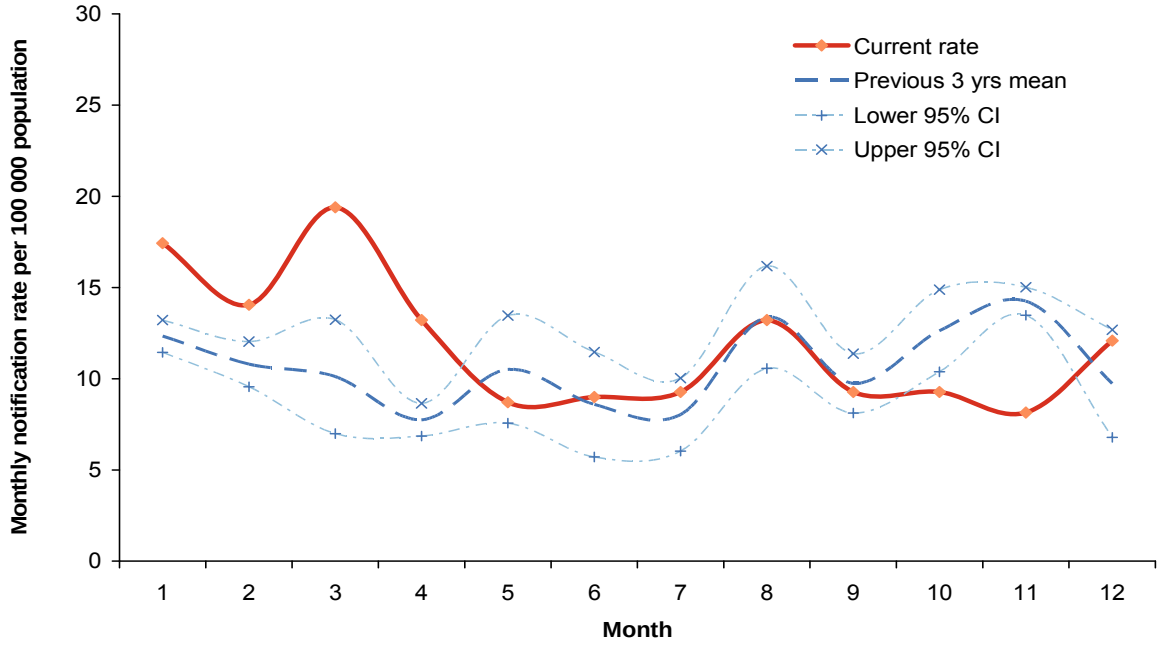
Figure 56: Yersiniosis notification rate by year, 2000-2008



4.18.3.2 Seasonality

The number of notified cases of yersiniosis per 100 000 population by month for 2008 is shown in Figure 57. The historic mean rate shows seasonal peaks in March, May, August and November. The 2008 notification rate follows a similar pattern with peaks observed in March, August and an additional peak in December.

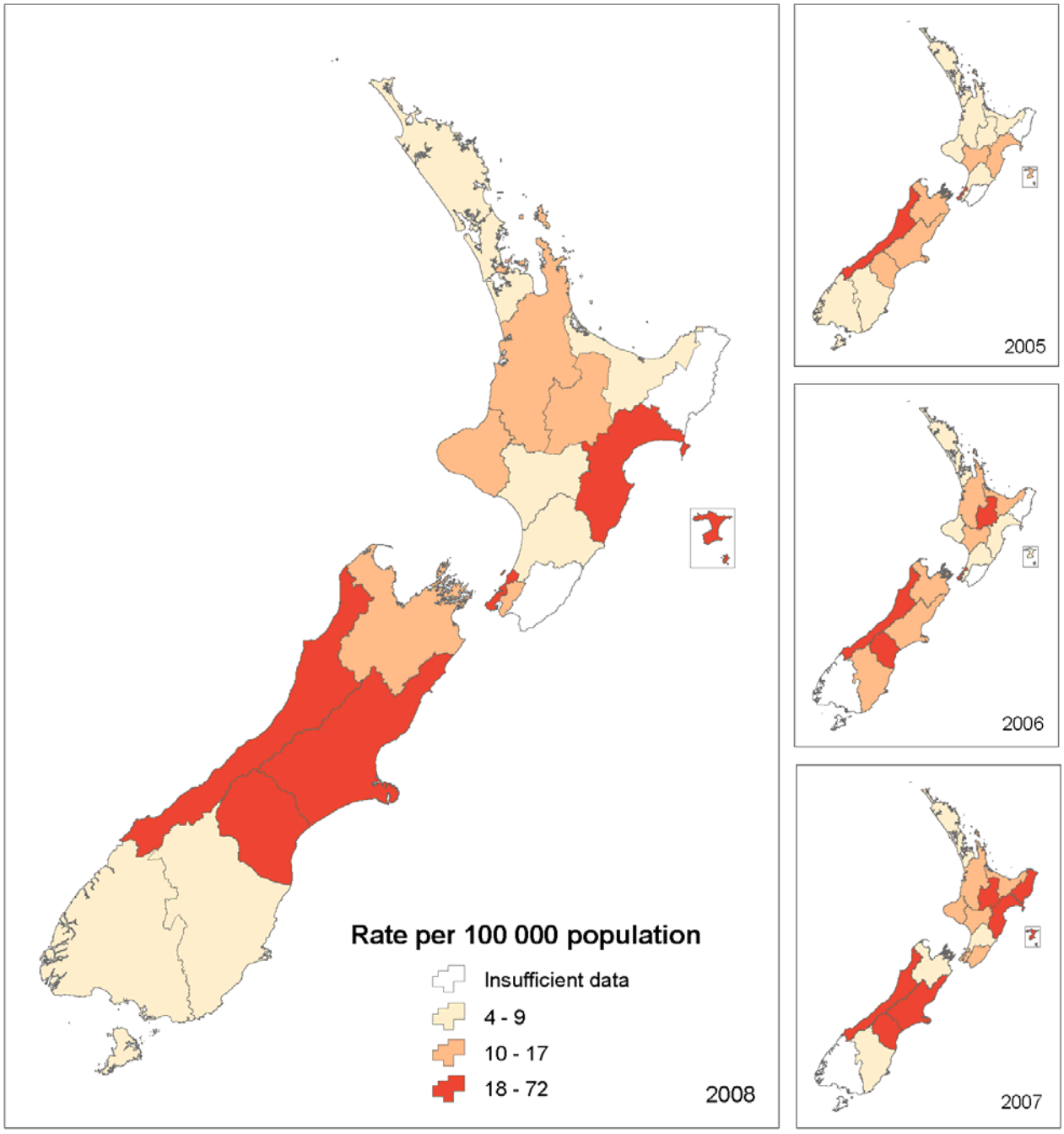
Figure 57: Yersiniosis monthly rate (annualised) for 2008



4.18.3.3 Geographic distribution of yersiniosis notifications

Yersiniosis notification rates vary throughout New Zealand as illustrated in Figure 58. The past two years have seen high notification rates for the majority of the South Island, with the exception of Otago and Southland DHB. Consistent with previous years, West Coast, South Canterbury and Capital and Coast DHBs recorded the highest rates for 2008. Similarly, MidCentral and Otago consistently have low yersiniosis notification rates.

Figure 58: Geographic distribution of yersiniosis notifications, 2005-2008



4.18.3.4 Age and sex distribution of yersiniosis cases

The yersiniosis notification rate was slightly higher for males than females; conversely, the hospitalisation rate was slightly higher for females (Table 69).

Table 69: Yersiniosis cases by sex, 2008

Sex	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
Male	262	12.5	21	1.0	
Female	234	10.8	32	1.5	
Unknown	13				
Total	509	11.9	53	1.2	

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

In 2008 the highest age-specific yersiniosis notification rate was for those aged less than one year for notifications (73.4 per 100 000 population) (Table 70). The next highest notification rate was for those aged 1 to 4 years (46.2 per 100 000 population) and this rate was more than three times higher than for any other age group. The highest hospitalisation rates were reported for those aged 70 years and over (6.7 per 100 000 population) and 60 to 69 years (2.1 per 100 000), although 70% of these cases (23/33) were reported with yersiniosis as another relevant diagnosis

Table 70: Yersiniosis cases by age group, 2008

Age groups	EpiSurv notifications		Morbidity[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	47	73.4	1	1.6	
1 to 4	109	46.2	1	0.4	
5 to 9	15	5.2	4	1.4	
10 to 14	18	6.0	0	0.0	
15 to 19	20	6.2	1	0.3	
20 to 29	52	9.1	2	0.4	
30 to 39	47	8.1	5	0.9	
40 to 49	49	7.7	4	0.6	
50 to 59	56	10.8	2	0.4	
60 to 69	40	10.6	8	2.1	
70+	55	14.8	25	6.7	
Unknown	1				
Total	509	11.9	53	1.2	

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

4.18.3.5 Risk factors reported

The most commonly reported risk factors for yersiniosis notification cases during 2008 were consumption of food from retail premises (35.5%), followed by contact with farm animals (24.7%) (Table 71).

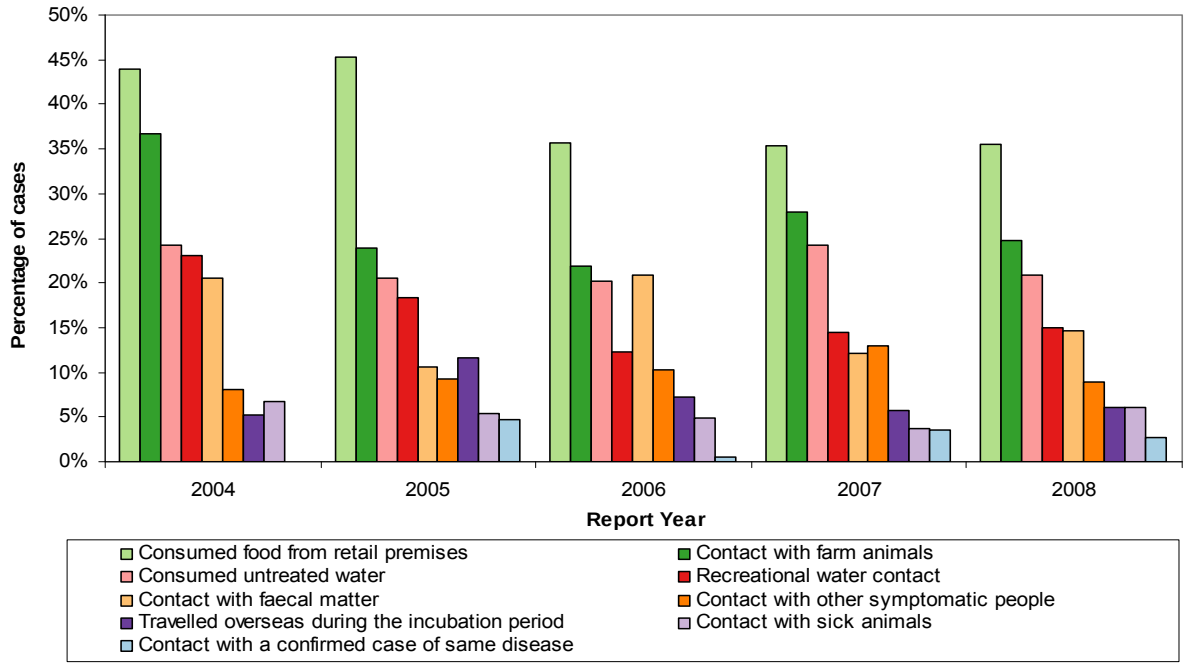
Table 71: Exposure to risk factors associated with yersiniosis, 2008

	Notifications			
Risk Factor	**Yes**	**No**	**Unknown**	**%[a]**
Consumed food from retail premises	66	120	323	35.5 %
Contact with farm animals	56	171	282	24.7 %
Consumed untreated water	38	144	327	20.9 %
Recreational water contact	30	170	309	15.0 %
Contact with faecal matter	29	170	310	14.6 %
Contact with other symptomatic people	18	184	307	8.9 %
Travelled overseas during the incubation period	14	216	279	6.1 %
Contact with sick animals	12	186	311	6.1 %

[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 2004 and 2008 the risk factors associated with yersiniosis cases have generally occurred in the same order of importance and to the same magnitude each year (Figure 59). Over the past five years the consumption of food from retail premises has been the most commonly reported risk factor associated with yersiniosis cases followed by contact with farm animals. The percentage of cases with the risk factors recreational water contact and contact with faecal matter varies from year to year.

Figure 59: Yersiniosis risk factors by percentage of cases and year, 2002 – 2008



4.18.3.6 Estimate of travel-related cases

For cases where information on travel was provided, 6.1% (95%CI 3.3-9.7%) 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 2008. The resultant distribution has a mean of 31 cases (95% CI 14-53).

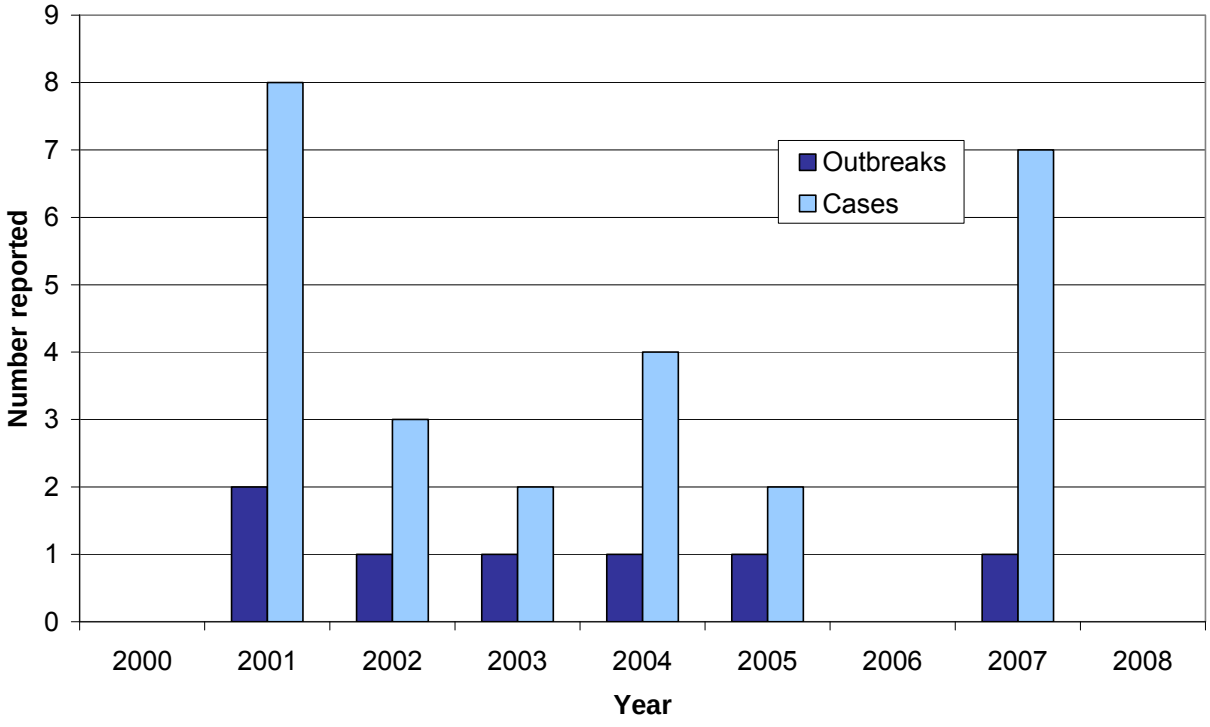
If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 7.2% (95% CI 5.7-9.0%).

4.18.4 Outbreaks reported as caused by *Yersinia* spp.

No *Yersinia* spp. outbreaks were reported in EpiSurv in 2008.

Between 2000 and 2008 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 eight) (Figure 60).

Figure 60: Foodborne *Yersinia* outbreaks and associated cases reported by year, 2000 – 2008



4.18.4.1 Details of food-associated outbreaks

No *Yersinia* spp. outbreaks were reported in EpiSurv in 2008.

4.18.4.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratory, no samples were found to contain *Yersinia* spp.

4.18.5 Relevant New Zealand studies and publications

4.18.5.1 Reports

In the five year period (2002 to 2006) reviewed, the annual notification rate for yersiniosis in New Zealand increased over the four years 2003 to 2006, but remained lower than it was in 2002 (Pirie *et al.*, 2008). A number of District Health Boards (DHBs) (West Coast, South Canterbury, Capital and Coast) had consistently higher notification rates than the overall New Zealand notification rate. Children aged less than 5 years experienced the highest reported rates of yersiniosis and there was a small increase in the notification rate for the 60 years and over age group.

Not all *Yersinia* spp. are pathogenic and biotyping data is a very useful tool to investigate notification practices. There was a large variation in the practices of laboratories between DHBs in referring isolates to ESR's Enteric Reference Laboratory (ERL) for characterisation e.g. laboratories in some DHBs sent in more than 50% of their isolates while in other DHBs no isolates were submitted in the five year period. A feature of the biotyping data in more recent years was the increasing percentage of non-pathogenic isolates being typed. Public Health Services (PHSs) requested guidance in the interpretation and use of *Yersinia* biotyping results.

An increasing number of hospitalisations for yersiniosis were reported over the five years reviewed with approximately half of these being admissions for yersiniosis as a primary diagnosis. The numbers were very small but the combining of the yersiniosis hospitalisations data with the *Yersinia* strain and biotyping information showed that an increasing number of the hospitalisations were for non-pathogenic strains of *Yersinia*.

PHSs reported varying practices in the investigation of yersiniosis cases with most PHSs investigating yersiniosis cases to some extent. Biotyping results did not appear to be readily available to PHSs and often did not make their way into EpiSurv.

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 72: Cases and rates per 100 000 population of notifiable diseases in New Zealand during 2007 and 2008

Disease	2007		2008		Change [b,c]
	Cases	Rates	Cases	Rates	
Campylobacteriosis	12 778	302.2	6 693	156.8	←
Cryptosporidiosis	924	21.9	764	17.9	←
Gastroenteritis [a]	622	14.7	690	16.2	→
Giardiasis	1 402	33.2	1 662	38.9	→
Hepatitis A	42	1.0	91	2.1	→
Listeriosis	26	0.6	27	0.6	→
Salmonellosis	1 274	30.1	1 346	31.5	→
Shigellosis	129	3.1	113	2.6	←
VTEC/STEC Infection	100	2.4	128	3.0	→
Yersiniosis	502	11.9	509	11.9	→

[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 Mantel-Haenszel 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 73: Deaths due to notifiable diseases recorded in EpiSurv from 1997 to 2008

Disease	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Campylobacteriosis	2	2	1	3	1	1	0	0	1	1	1	0
Gastroenteritis	0	0	0	0	0	1	0	0	0	0	0	0
Giardiasis	1	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
Listeriosis - perinatal	6	0	2	4	1	3	2	2	0	1	2	2
Salmonellosis	2	2	1	7	2	1	0	0	1	1	1	1
Shigellosis	0	0	1	0	0	0	0	0	0	0	0	0
VTEC/STEC Infection	1	1	0	0	0	0	0	0	0	0	0	0
Yersiniosis	0	2	0	0	0	0	0	1	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 74: NZHIS mortality data for selected potential foodborne diseases, 2004-2006

Disease	ICD 10 Codes	2004		2005		2006 [a]	
		Underlying[b]	Contributory[c]	Underlying[b]	Contributory[c]	Underlying[b]	Contributory[c]
Campylobacteriosis	A04.5	1	1	0	3	3	0
Cryptosporidiosis	A072	0	0	0	0	0	0
Giardiasis	A07.1	0	0	0	0	0	0
Hepatitis A	B15	0	0	0	0	0	0
Listeriosis	A32	1	0	0	0	0	1
Salmonellosis	A02	0	1	0	1	1	0
Shigellosis	A03	0	0	0	0	0	0
Yersiniosis	A04.6	0	0	0	0	0	0

[a] Latest year that data are available

[b] Underlying – main cause of death

[c] Contributory – selected contributory cause of death (not main cause of death)

Table 75: Hospital admissions for selected notifiable diseases, 2006 - 2008

Disease	ICD 10 Codes	2006		2007		2008	
		Principal diagnosis	Other relevant diagnosis	Principal diagnosis	Other relevant diagnosis	Principal diagnosis	Other relevant diagnosis
Campylobacteriosis	A04.5	969	212	752	185	388	97
Cryptosporidiosis	A07.2	20	10	26	14	19	13
Giardiasis	A07.1	43	28	20	14	18	21
Hepatitis A	B15	33	14	17	18	19	18
Listeriosis	A32	13	10	12	17	13	13
Salmonellosis	A02	123	39	123	27	118	40
Shigellosis	A03	13	2	27	1	15	4
Toxic shellfish poisoning	T61.2	17	4	6	1	6	0
VTEC/STEC infection	A04.3	16	23	22	24	26	20
Yersiniosis	A04.6	29	26	19	31	23	30

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 76: Cases reported in 2008 by ethnic group

	Ethnicity											
	European		Maori		Pacific Peoples		Other Ethnicity		Unknown		Total	
Disease	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Campylobacteriosis	3 570	132.5	348	61.6	67	29.6	139	37.1	2 569		6 693	166.2
Cryptosporidiosis	589	21.9	56	9.9	5	2.2	19	5.1	95		764	19.0
Gastroenteritis	441	16.4	32	5.7	14	6.2	35	9.3	168		690	17.1
Giardiasis	861	32.0	62	11.0	8	3.5	46	12.3	685		1 662	41.3
Hepatitis A	33	1.2	14	2.5	13	5.7	24	6.4	7		91	2.3
Listeriosis	16	0.6	2	0.4	2	0.9	1	0.3			21	0.5
Salmonellosis	820	30.4	108	19.1	19	8.4	51	13.6	348		1 346	33.4
Shigellosis	53	2.0	4	0.7	13	5.7	12	3.2	31		113	2.8
VTEC/STEC Infection	88	3.3	12	2.1	1	0.4	5	1.3	22		128	3.2
Yersiniosis	273	10.1	26	4.6	14	6.2	41	10.9	155		509	12.6

Note: Disease rates for ethnic groups and total cases are based on 2006 census data from Statistics New Zealand and should not be compared to disease rates used else-where in the report, which have been calculated using 2008 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 77: Cases and rates per 100 000 population in 2008 by sex

	Sex							
	Male		Female		Unknown		Total	
Disease	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Campylobacteriosis	3 711	177.4	2 888	132.7	94		6 693	156.8
Cryptosporidiosis	377	18.0	377	17.3	10		764	17.9
Gastroenteritis	305	14.6	359	16.5	26		690	16.2
Giardiasis	827	39.5	805	37.0	30		1 662	38.9
Hepatitis A	58	2.8	31	1.4	2		91	2.1
Listeriosis	11	0.5	10	0.5			21	0.5
Salmonellosis	704	33.6	622	28.6	20		1 346	31.5
Shigellosis	62	3.0	46	2.1	5		113	2.6
VTEC/STEC infection	67	3.2	60	2.8	1		128	3.0
Yersiniosis	262	12.5	234	10.8	13		509	11.9

Table 78: Cases and rates per 100 000 population in 2008 by age group

	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	
Disease	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**
Campylobacteriosis	174	271.6	752	318.7	327	113.7	271	89.8	467	144.8	1060	186.1	814	139.5	814	128.4	734	141.1	643	170.3	611	164.3	26		6693	156.8
Cryptosporidiosis	23	35.9	264	111.9	95	33.0	47	15.6	57	17.7	98	17.2	86	14.7	37	5.8	31	6.0	18	4.8	7	1.9	1		764	17.9
Gastroenteritis	29	45.3	101	42.8	13	4.5	15	5.0	30	9.3	67	11.8	85	14.6	108	17.0	79	15.2	45	11.9	71	19.1	47		690	16.2
Giardiasis	43	67.1	318	134.8	151	52.5	33	10.9	43	13.3	154	27.0	393	67.4	218	34.4	130	25	120	31.8	56	15.1	3		1662	38.9
Hepatitis A	1		13	5.5	10	3.5	8	2.7	9	2.8	16	2.8	15	2.6	7	1.1	6	1.2	3		3				91	2.1
Listeriosis	1								1		4		2		3		2		3		11	3.0			27	0.6
Salmonellosis	87	135.8	257	108.9	80	27.8	55	18.2	75	23.3	185	32.5	164	28.1	145	22.9	120	23.1	86	22.8	90	24.2	2		1346	31.5
Shigellosis			13	5.5	4		7	2.3	4		15	2.6	18	3.1	21	3.3	19	3.7	6	1.6	6	1.6			113	2.6
VTEC/STEC Infection	5	7.8	39	16.5	10	3.5	5	1.7	11	3.4	17	3.0	10	1.7	10	1.6	4		12	3.2	5	1.3			128	3.0
Yersiniosis	47	73.4	109	46.2	15	5.2	18	6.0	20	6.2	52	9.1	47	8.1	49	7.7	56	10.8	40	10.6	55	14.8	1		509	11.9

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 quantiles (tertiles) and shaded to indicate the age groups with highest, medium and lowest rates of disease. Shadings used are:

- Fewer than 5 cases
- First (lowest) tertile
- Second (middle) tertile
- Third (highest) tertile

Table 79: Disease notifications and incidence rates per 100 000 population by District Health Board, 2008

Notifications

District Health Board	Northland	Waitemata	Auckland	Counties Manukau	Waikato	Lakes	Bay of Plenty	Tairawhiti	Taranaki	Hawke's Bay	Whanganui	MidCentral	Hutt	Capital and Coast	Wairarapa	Nelson-Marlborough	West Coast	Canterbury	South Canterbury	Otago	Southland	Total
Campylobacteriosis	249	881	699	624	574	154	257	41	204	305	89	196	298	578	50	198	54	661	145	274	162	6693
Cryptosporidiosis	40	18	16	17	113	17	31	5	29	28	12	33	18	26	18	31	19	136	57	43	57	764
Gastroenteritis	7	129	107	59	31	4	23	2	3	7	21	41	31	64	3	7	10	123	6	12		690
Giardiasis	42	189	262	174	113	44	59	11	12	64	15	27	41	218	13	53	21	190	17	61	36	1662
Hepatitis A	5	7	12	15	4	1	1		2	1	9	20	1	4	2	1		4		1	1	91
Listeriosis	1	2	3	6	4						1	1		1	1			3		2		27
Salmonellosis	43	110	98	94	127	26	75	7	39	36	14	42	49	91	23	67	10	186	37	129	43	1346
Shigellosis	2	18	24	21	5	1	5		1	2			4	10		7	1	6	1	3	2	113
VTEC/STEC Infection	10	14	14	12	18	4	3	2	6	1	1	1	1	6	1	3	1	22	3	4	1	128
Yersiniosis	14	43	47	35	33	14	17	3	12	31	5	8	24	66	1	14	14	97	12	9	10	509

Rates

District Health Board	Northland	Waitemata	Auckland	Counties Manukau	Waikato	Lakes	Bay of Plenty	Tairawhiti	Taranaki	Hawke's Bay	Whanganui	MidCentral	Hutt	Capital and Coast	Wairarapa	Nelson-Marlborough	West Coast	Canterbury	South Canterbury	Otago	Southland	Total
Campylobacteriosis	161.0	169.2	159.6	131.8	161.1	151.7	125.1	89.3	189.4	198.9	140.6	119.0	210.0	203.2	125.8	145.9	166.8	133.3	262.2	146.3	146.2	156.8
Cryptosporidiosis	25.9	3.5	3.7	3.6	31.7	16.7	15.1	10.9	26.9	18.3	19.0	20.0	12.7	9.1	45.3	22.8	58.7	27.4	103.1	23.0	51.4	17.9
Gastroenteritis	4.5	24.8	24.4	12.5	8.7		11.2			4.6	33.2	24.9	21.8	22.5		5.2	30.9	24.8	10.8	6.4		16.2
Giardiasis	27.1	36.3	59.8	36.8	31.7	43.3	28.7	24.0	11.1	41.7	23.7	16.4	28.9	76.7	32.7	39.1	64.9	38.3	30.7	32.6	32.5	38.9
Hepatitis A	3.2	1.3	2.7	3.2							14.2	12.1										2.1
Listeriosis				1.3																		0.6
Salmonellosis	27.8	21.1	22.4	19.9	35.7	25.6	36.5	15.3	36.2	23.5	22.1	25.5	34.5	32.0	57.9	49.4	30.9	37.5	66.9	68.9	38.8	31.5
Shigellosis		3.5	5.5	4.4	1.4		2.4							3.5		5.2		1.2				2.6
VTEC/STEC Infection	6.5	2.7	3.2	2.5	5.1				5.6					2.1				4.4				3.0
Yersiniosis	9.0	8.3	10.7	7.4	9.3	13.8	8.3		11.1	20.2	7.9	4.9	16.9	23.2		10.3	43.2	19.6	21.7	4.8	9.0	11.9

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

- Fewer than 5 cases
- First (lowest) tertile
- Second (middle) tertile
- Third (highest) tertile

Table 80: Notifiable disease cases by year and source, 1987-2008

Note: cell is blank where data are unavailable

Disease	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Campylobacteriosis	2921	2796	4187	3850	4148	5144	8101	7714	7442	7635	8924	11572	8161	8418	10146	12494	14788	12215	13836	15873	12778	6693
Cryptosporidiosis										119	357	866	977	775	1208	975	817	611	889	737	924	764
Gastroenteritis										555	310	492	601	727	940	1087	1026	1363	557	937	622	690
Giardiasis										1235	2127	2183	1793	1688	1604	1547	1570	1514	1231	1214	1402	1662
Hepatitis A	158	176	134	150	224	288	257	179	338	311	347	145	119	107	61	106	70	49	51	123	42	91
Listeriosis	12	7	10	16	26	16	11	8	13	10	35	17	19	22	18	19	24	26	20	19	26	27
Salmonellosis	1140	1128	1860	1619	1244	1239	1340	1522	1334	1141	1177	2069	2077	1795	2417	1880	1401	1081	1382	1335	1274	1346
Shigellosis	143	145	137	197	152	124	128	185	191	167	117	122	147	115	157	112	87	140	183	102	129	113
VTEC/STEC infection							3	3	6	7	13	48	64	67	76	73	104	89	92	87	100	128
Yersiniosis										330	488	546	503	396	429	472	436	407	383	453	502	509

Table 81: Foodborne outbreaks and associated cases by agent type, 2008

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

[a] All outbreaks with no pathogen identified were classified as gastroenteritis

Table 82: Outbreaks associated with commercial food operators, 2008

Outbreak setting	No. of outbreaks [a]	% of total outbreaks (n=449)	No. of cases [a]	% of total cases (n=6503)
Restaurant/Café	55	12.2	547	8.4
Takeaway	17	3.8	373	5.7
Other food outlet	12	2.7	73	1.1
Supermarket/deli	6	1.3	49	0.8
Caterer	4	0.9	78	1.2

[a] More than one setting was recorded for some outbreaks

Table 83: Foodborne outbreaks and associated cases by implicated food source, 2008

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

[a] More than one food source was implicated in some outbreaks

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

Table 84: Foodborne outbreaks by casual agent and implicated vehicle / source, 2008

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

1 More than one vehicle / source was implicated in some outbreaks
2 Includes all causal agents listed in Table 81 that were implicated in less than three foodborne outbreaks
3 All outbreaks with no pathogen identified in 2008 were classified as gastroenteritis
4 A common meal, premises or setting may have been implicated but no specific food items were recorded

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