ANNUAL REPORT CONCERNING FOODBORNE DISEASE IN NEW ZEALAND 2007

Prepared as part of a New Zealand Food Safety Authority contract for scientific services

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 2007 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 general practitioner (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 for New Zealand was not developed. Two sets of published expert opinion estimates are given in Table 1, for the USA (Mead *et al.*, 1999) and Australia (Hall and Kirk, 2005). 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) for which foodborne transmission is considered to be only a small proportion of the total.

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

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

NE = not estimated

This report considers information for the 2007 calendar year. Information from the scientific literature and other sources concerning food safety for that year have been collated and 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:

a) The potential to be caused by foodborne transmission; and,
b) 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, and outbreak reports 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*
Haemolytic-uraemic Syndrome (HUS)	H (D59.3 Haemolytic-uraemic syndrome)	Sequelae to infection with Shiga toxin producing *E. coli*

Data Sources: NZHIS hospitalisations (H)

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 2007) 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. From 21 December 2007, laboratories are now also required to report cases of notifiable diseases to Medical Officers of Health. 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 2007 Annual Surveillance Report (Population and Environmental Health Group (ESR), 2008a).

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), 2008b).

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 31 December 2007. 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 2007 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 map classification scheme for the disease rates is based on 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 (2004-2006).

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.

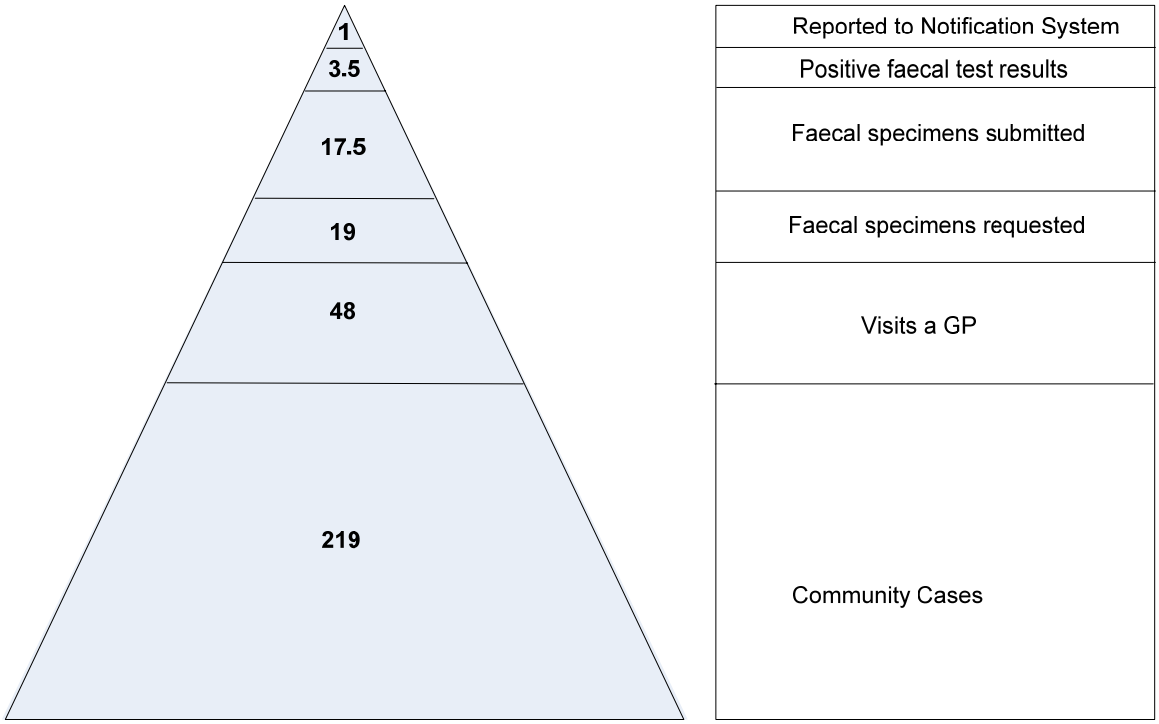
The three study elements were completed during 2005-2007 and each has been reported separately (available from the NZFSA website: http://www.nzfsa.govt.nz/science/research-projects/index.htm):

- 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 1.12 per person year, representing 4.6 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.*, 2007b). 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 using data from the AGI study*



* 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

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 in New Zealand per annum, 1 150 of salmonellosis and 23 of listeriosis annually. Food-borne illness due to verocytotoxigenic/shigatoxigenic *Escherichia coli* 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 occurs 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* in Poultry Strategy. 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 2007

	Cases	Proportion (%)	Per 100 000 mid year estimated population
Total notified	12 776		302.2
Estimated not travelled overseas	11 907	93.2	281.6
Estimated foodborne transmission proportion	6 847	57.5 (37.1 – 69.6)*	161.9 (104.5 – 196.0)#

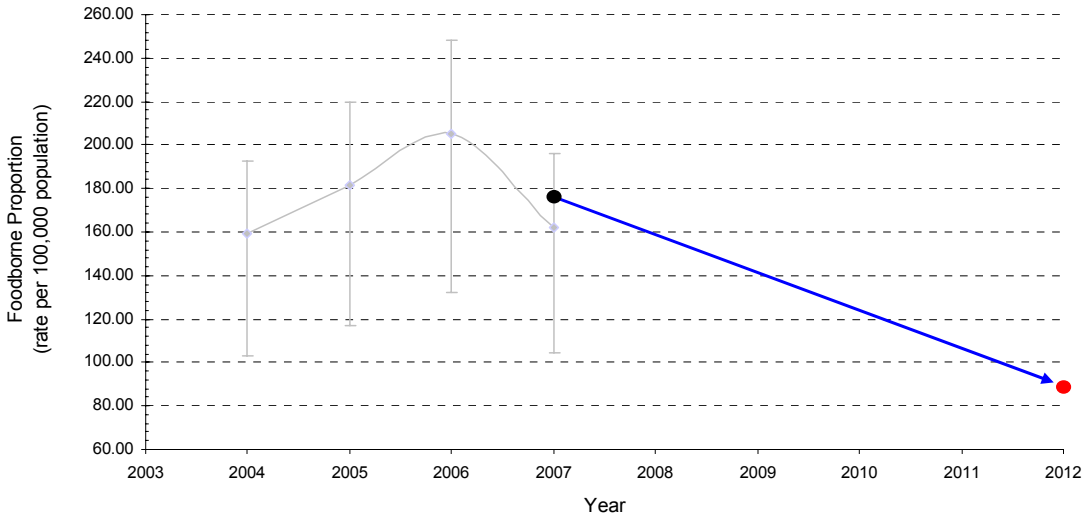
* Most likely (Minimum – Maximum) estimates of proportion foodborne, from expert consultation
# Most likely (Minimum – Maximum) estimates of foodborne rate

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 2007

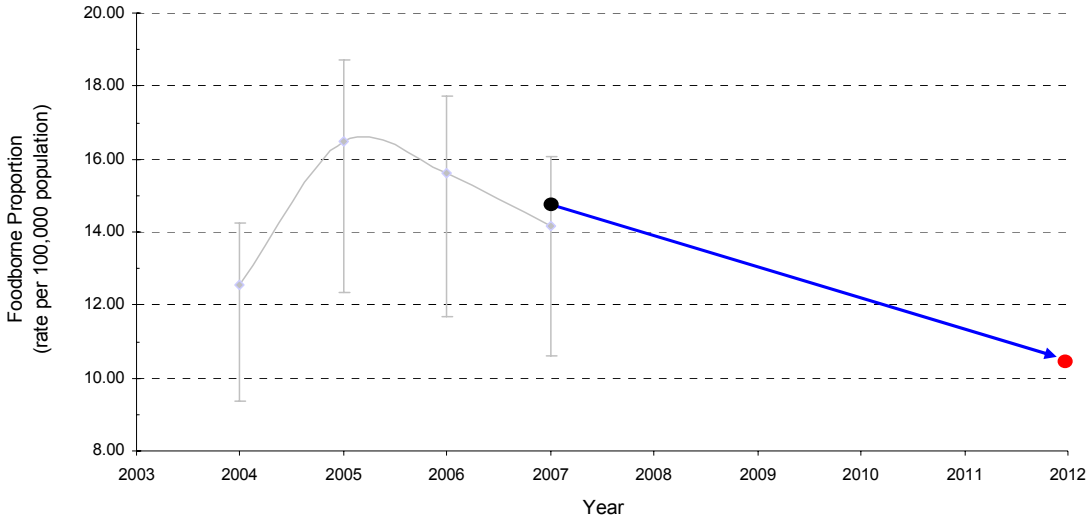
	Cases	Proportion (%)	Per 100 000 mid year estimated population
Total notified cases	1 274		30.1
Estimated not travelled overseas	987	77.5	23.3
Estimated foodborne transmission proportion	599	60.7 (45.4 -68.9)*	14.2 (10.6 – 16.1)#

* 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 2007

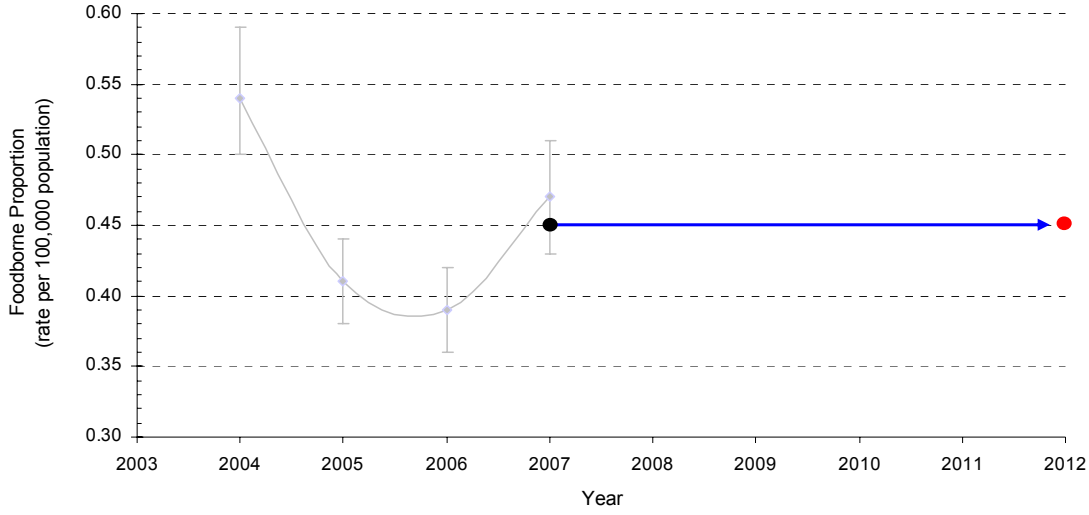
	Cases	Proportion (%)	Per 100 000 mid year estimated population
Total notified cases	26		0.61
Estimated not travelled overseas	24	90.9	0.56
Estimated foodborne transmission proportion	20	84.9 (78.4 – 92.1)*	4.7 (4.4 – 5.1)#

* 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) 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 2007 by data source

There were no cases of *Bacillus cereus* intoxication reported in EpiSurv in 2007.

The ICD-10 code A05.4 was used to extract *Bacillus cereus* intoxication hospitalisation data from the NZHIS NMDS database. There were 3 hospital admissions (0.1 admissions per 100 000 population) recorded in 2007 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*

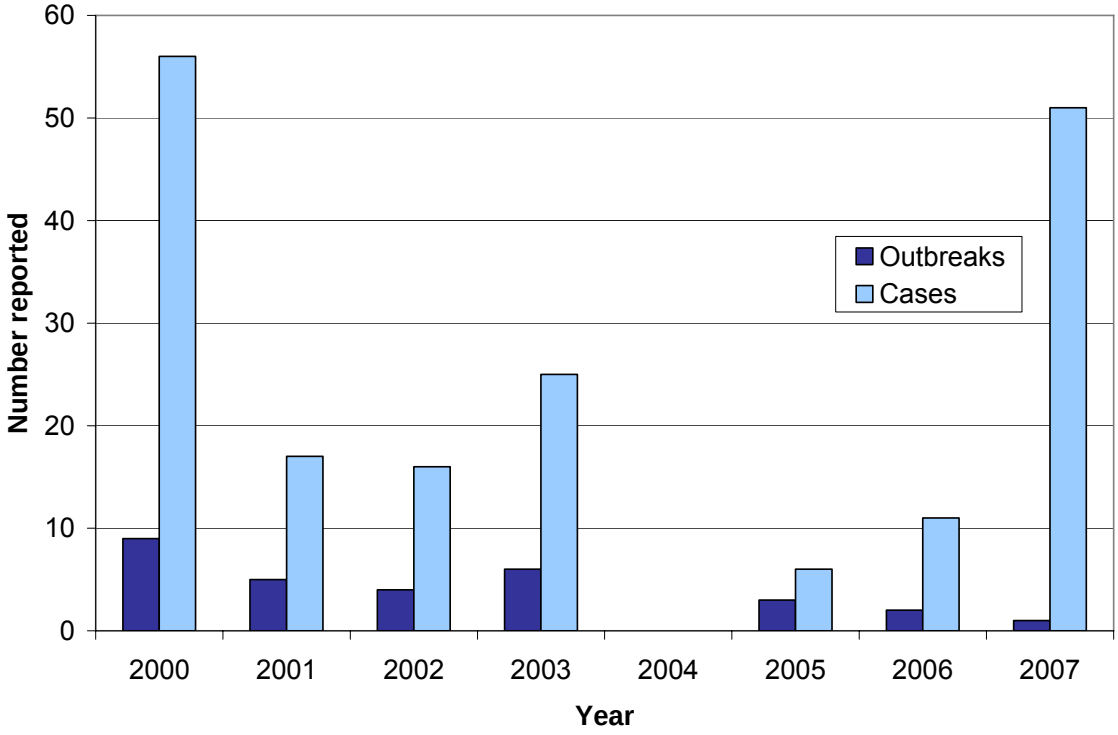
The one *Bacillus cereus* outbreak reported in 2007 was foodborne (Table 7).

Table 7: *Bacillus cereus* outbreak reported, 2007

Measure (No.)	Foodborne *Bacillus cereus* outbreaks	All *Bacillus cereus* outbreaks
Outbreaks	1	1
Cases	51	51
Hospitalised cases	0	0

In 2007, fewer outbreaks but more associated cases of foodborne *Bacillus cereus* intoxication were reported than in previous years (Figure 5).

Figure 5: Foodborne *Bacillus cereus* outbreaks and associated cases reported by year, 2000–2007



4.3.3.1 Details of food-associated outbreaks

Table 8 contains details of the one food–associated *B. cereus* intoxication outbreak reported in 2007.

Table 8: Details of food-associated *Bacillus cereus* outbreak, 2007

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Auckland (October)	Daal (lentil soup)	Caterers	51C	3, 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

4.3.3.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratories, elevated levels of *Bacillus cereus* were isolated from food samples associated with one investigation. The foods were from an Asian meal, including cooked rice, chicken, prawns, coconut cream and cashew nuts. This was a different incident to the outbreak identified in Table 8.

4.3.4 Recent surveys

Bakery Products - Microbiological Quality (Cornelius, 2007a; b)

Bakery products (300) were collected from January to July 2007, including 126 cream-filled, 120 custard-filled and 4 contained both cream and custard. Fifty samples were collected from Auckland, 52 from each of Wellington and Christchurch and 48 samples were collected from each of Hamilton and Dunedin. All samples were analysed for faecal coliforms, *Escherichia coli*, *Bacillus cereus*, coagulase-positive staphylococci and *Salmonella*. Most (245 and 249) samples were also tested for pH and water activity respectively.

When compared with limits listed in 'Guidelines for the Microbiological Examination of Ready-to-eat Foods', 217 of the 250 samples (87%) were considered to be of good microbiological quality with acceptable levels of *E. coli, B. cereus*, coagulase-positive staphylococci and *Salmonella* spp. Of the remaining 33 samples, 24 were of marginal quality, 6 were unsatisfactory and three were potentially infectious. All samples had water activities of at least 0.98. There was no significant difference between the summer and winter results for most analytes, but there were significant differences, at the 95% level, for faecal coliforms in cream-filled products and *B. cereus* in custard-filled products. Most samples (88%) had pH values ≥6.0.

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 2007 are given in Table 9.

Table 9: Summary surveillance data for campylobacteriosis, 2007

Parameter	Value in 2007	Section reference
Number of cases	12 776	4.4.2
Rate (per 100 000)	302.2	4.4.2
Hospitalisations (%)	937 (7.3%)	4.4.2
Deaths (%)	1 (0.008%)	4.4.2
Estimated travel-related cases (%)	869 (6.8%)	4.4.3.6
Estimated food-related cases (%)*	6 847 (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 2007 by data source

During 2007, 12 776 notifications (302.2 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 937 hospital admissions (22.2 admissions per 100 000 population) recorded in 2007, 752 were reported with campylobacteriosis as the primary diagnosis and 185 with campylobacteriosis as another relevant diagnosis.

One death due to campylobacteriosis was recorded in EpiSurv in 2007.

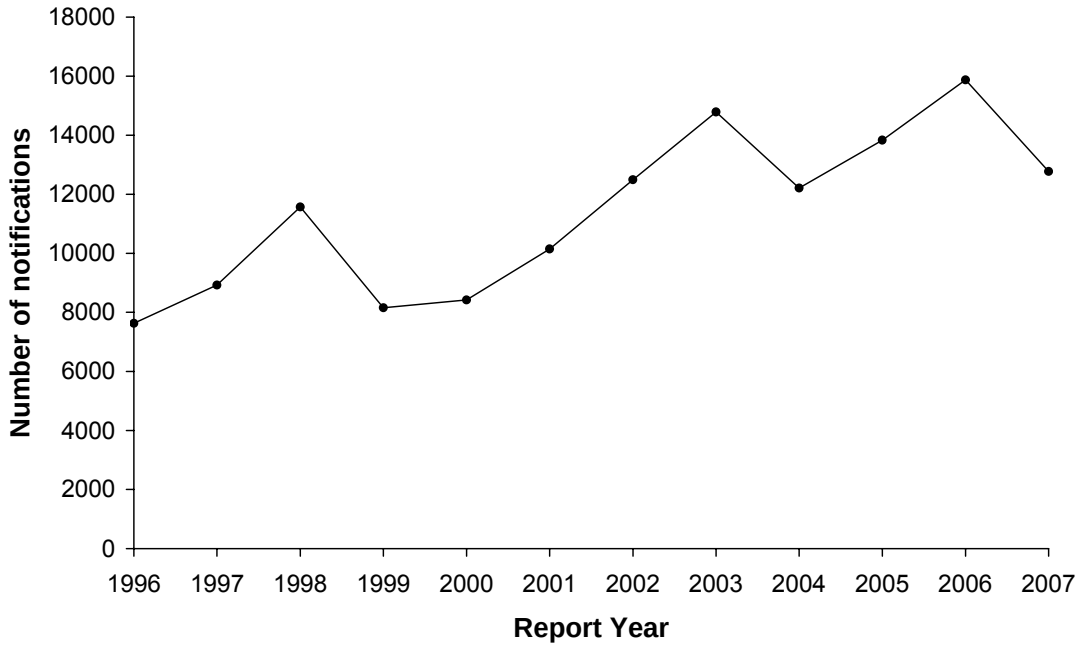
It has been estimated by expert consultation that 58% (minimum = 37%, maximum = 70%) of campylobacteriosis incidence is due to foodborne transmission. It was further estimated that 53% of foodborne transmission would be due to transmission via poultry.

4.4.3 Notifiable disease data

4.4.3.1 Annual notification trend

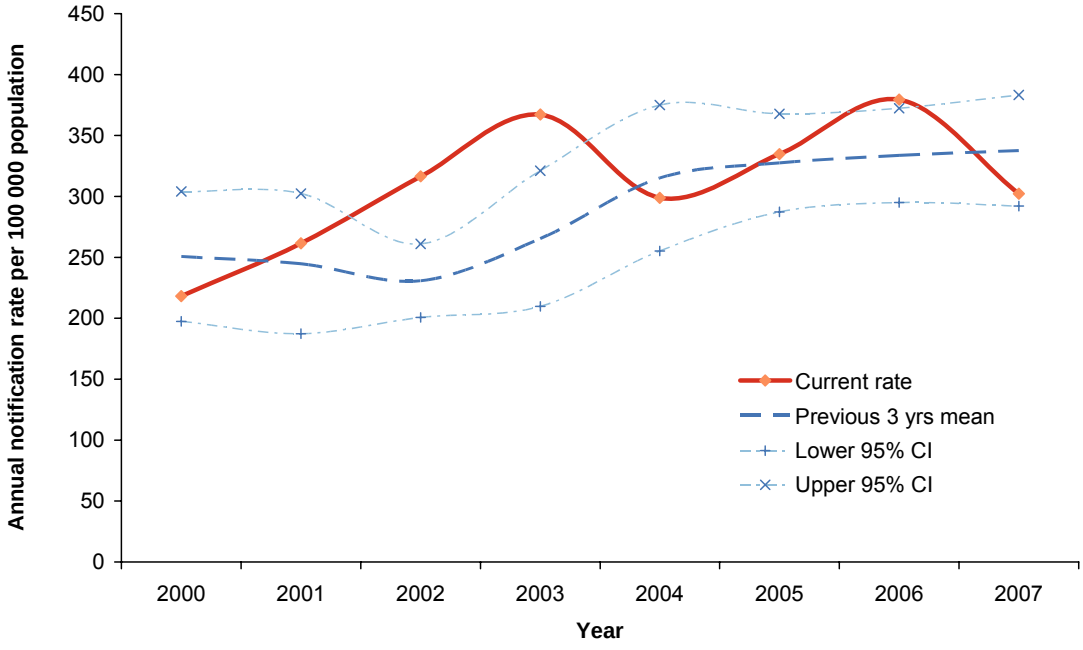
The number of campylobacteriosis notifications reported each year has generally increased since 1996, with the highest number recorded in 2006 (Figure 6). In 2007, the number of campylobacteriosis notifications reported was lower than the two previous years.

Figure 6: Campylobacteriosis notifications by year, 1996-2007



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 to 2006. The rate reported in 2007 was the lowest since 2004.

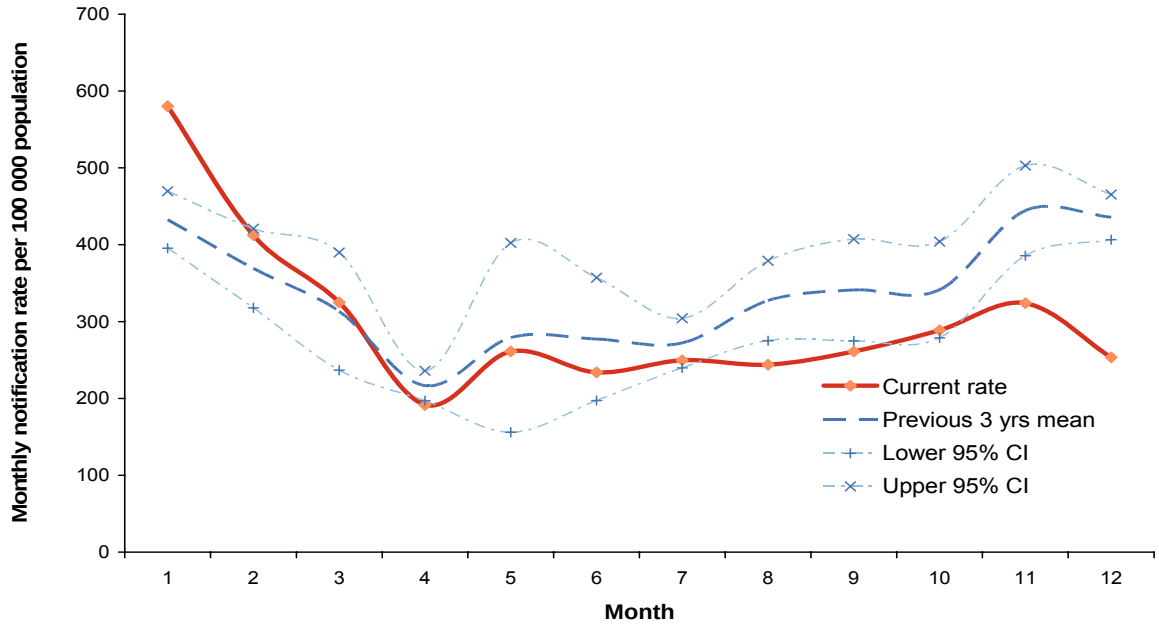
Figure 7: Campylobacteriosis notification rate by year, 2000-2007



4.4.3.2 Seasonality

The number of notified cases of campylobacteriosis per 100 000 population by month for 2007 is shown in Figure 8. Campylobacteriosis is highly seasonal with a summer peak and winter trough. The pattern in 2007 is similar to 2006 where there was a second peak in early winter. The highest monthly campylobacteriosis total for 2007 was for the month of January when 2 045 cases were notified.

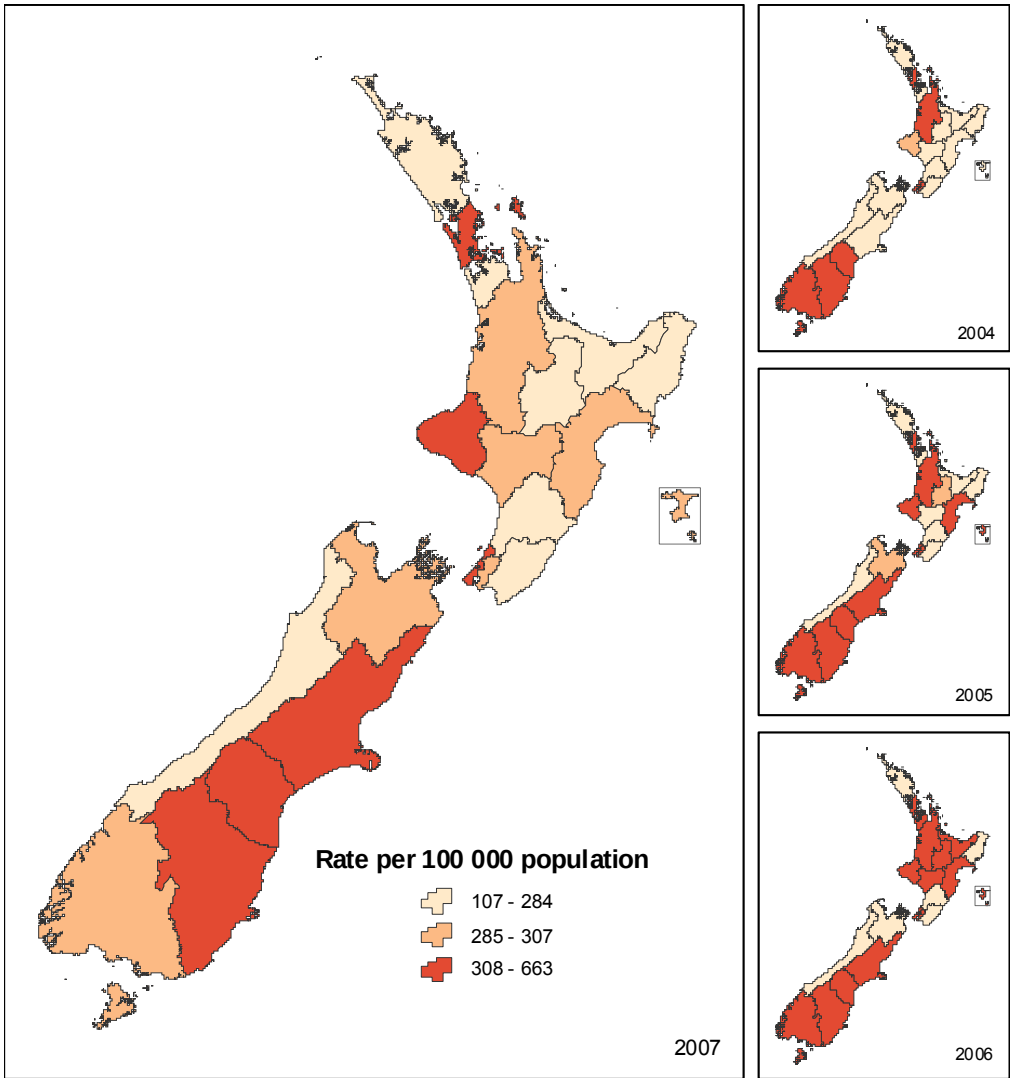
Figure 8: Campylobacteriosis monthly rate (annualised) for 2007



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 and Taranaki DHBs (398.3 per 100 000 population, 220 cases; 382.1 per 100 000 population, 410 cases respectively) and the lowest rates were reported for Tairawhiti and Wairarapa DHBs (106.8 per 100 000 population, 49 cases; 172.0 per 100 000 population, 68 cases respectively).

Figure 9: Geographic distribution of campylobacteriosis notifications, 2004-2007



4.4.3.4 Age and sex distribution of campylobacteriosis cases

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

Table 10: Campylobacteriosis cases by sex, 2007

Sex	EpiSurv notifications		Hospitalisations[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
Male	6 790	327.9	503	24.3	1
Female	5 719	265.1	438	20.3	
Unknown	267				
Total	12 776	302.2	941	22.3	1

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

The highest age-specific notification rate was reported for children aged 1-4 years (449.3 per 100 000 population, 1 036 cases), followed by the 20-29 year age group (389.6 per 100 000 population, 2 178 cases). 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, 2007

Age groups	EpiSurv notifications		Hospitalisations[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	201	325.3	12	19.4	
1 to 4	1 036	449.3	37	16.0	
5 to 9	604	208.3	24	8.3	
10 to 14	577	188.5	31	10.1	
15 to 19	940	294.2	72	22.5	
20 to 29	2 178	389.6	145	25.9	
30 to 39	1 589	268.3	81	13.7	
40 to 49	1 678	265.7	69	10.9	
50 to 59	1 536	299.3	111	21.6	
60 to 69	1 202	333.2	101	28.0	
70+	1 107	304.5	258	71.0	1
Unknown	128				
Total	12 776	302.2	941	22.3	1

[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. As in previous years, the risk factor associated with most of the cases was food consumed from retail premises (47.7%).

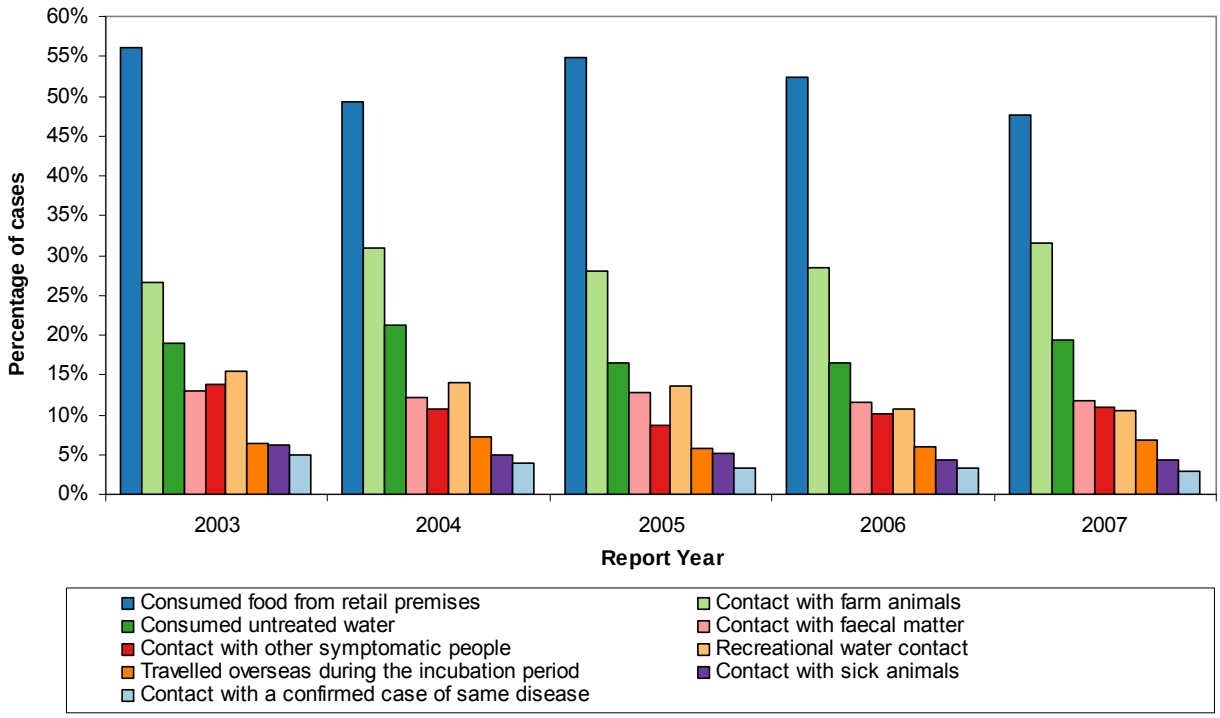
Table 12: Exposure to risk factors associated with campylobacteriosis, 2007

	Notifications			
Risk Factor	**Yes**	**No**	**Unknown**	**%[a]**
Consumed food from retail premises	1 488	1 632	9 656	47.7%
Contact with farm animals	1 117	2 414	9 245	31.6%
Consumed untreated water	558	2 329	9 889	19.3%
Contact with faecal matter	384	2 878	9 514	11.8%
Contact with other symptomatic people	367	2 985	9 424	10.9%
Recreational water contact	337	2 839	9 600	10.6%
Travelled overseas during the incubation period	283	3 891	8 602	6.8%
Contact with sick animals	135	2 942	9 699	4.4%
Contact with a confirmed case of same disease	121	4 147	8 508	2.8%

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

Over the five years 2003 to 2007, 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 and their relative importance has remained reasonably consistent (Figure 10).

Figure 10: Campylobacteriosis risk factors by percentage of cases and year, 2003 – 2007



4.4.3.6 Estimate of travel-related cases

For cases where information on travel was provided, 6.8% (283/4174; 95%CI 6.0-7.6%) 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 2007. The resultant distribution has a mean of 866 cases (95% CI 753-985).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 6.4% (95% CI 6.0-6.8%).

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.

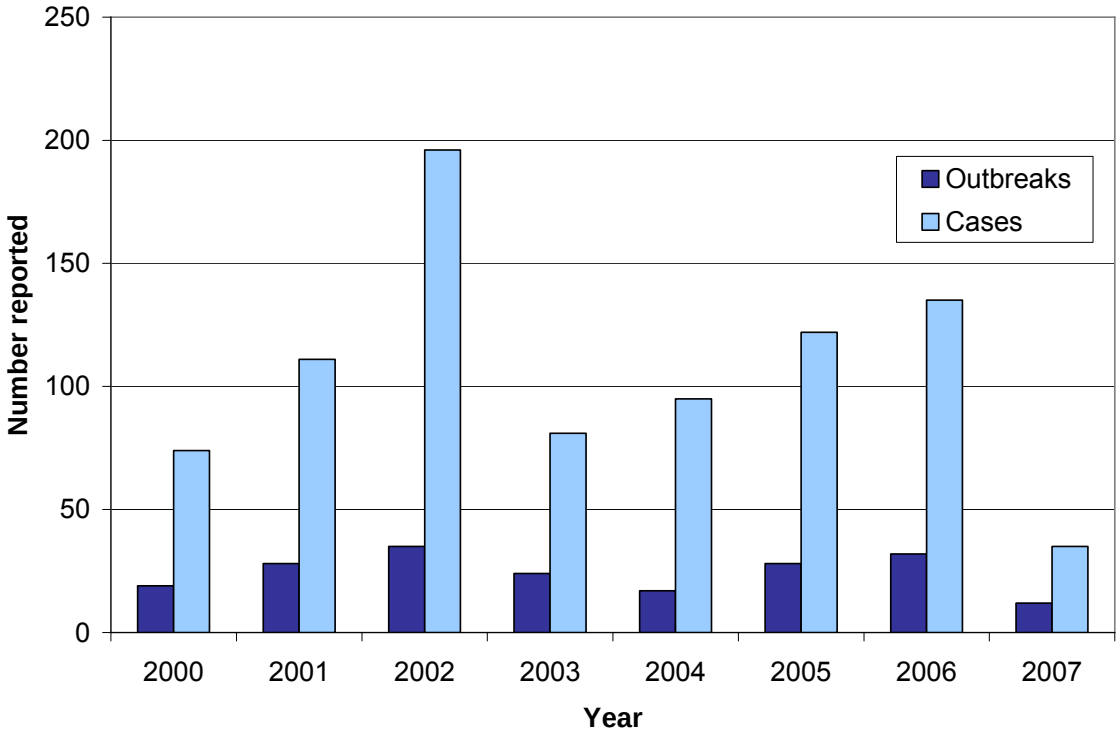
In 2007, 12 (60%) of the *Campylobacter* outbreaks and 35 (65%) of associated cases were reported as foodborne related (Table 13). The *Campylobacter* case reported as hospitalised was associated with a foodborne outbreak. *Campylobacter* outbreaks accounted for 4.0% (20/492) of all outbreaks and 0.7% (54/7988) of all associated cases. In 2007, *Campylobacter* was the fourth most commonly reported causal agent in outbreaks, but the most commonly reported foodborne causal agent for outbreaks.

Table 13: *Campylobacter* spp. outbreaks reported, 2007

Measure (No.)	Foodborne *Campylobacter* spp. outbreaks	All *Campylobacter* spp. outbreaks
Outbreaks	12	20
Cases	35	54
Hospitalised cases	1	1

Over the eight year period from 2000 to 2007 the highest number of foodborne campylobacteriosis outbreaks and cases were reported in 2002 (35 outbreaks, 196 cases) with the second highest reported for 2006 (32 outbreaks, 135 cases). The lowest number of outbreaks and cases were reported in 2007 (Figure 11).

Figure 11: Foodborne *Campylobacter* spp. outbreaks and associated cases reported by year, 2000 – 2007



4.4.4.1 Details of food-associated outbreaks

Table 14 contains details of the 12 food–associated *Campylobacter* spp. outbreaks reported in 2007. The most commonly reported suspected vehicle was chicken, although evidence implicating particular foods was generally weak (history of exposure).

Table 14: Details of food-associated *Campylobacter* spp. outbreaks, 2007

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Auckland (April)	Chicken kebab	Takeaway	1C, 1P	1, 2
Auckland (April)	Salad	Café	2C, P	2
Auckland (June)	Unknown	Home, supermarket	1C, 3P	2
Auckland (June)	Unknown	Home	1C, 2P	6
Auckland (July)	Chicken pizza	Café	1C, 1P	2
Auckland (August)	Pork	Café	2C, 1P	2
Auckland (October)	Unknown	Café	3C, 4P	2
Marlborough (May)	Chicken	Home	3C, P	2
Otago (January)	Barbecued chicken	Home	2C, P	2
Otago (January)	Chicken	Home	1C, 1P	2
Otago (April)	Unknown	Café	1C, 2P	1, 2
West Coast (February)	Unknown	Café, Home	2C, P	2, 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

4.4.4.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratories, *Campylobacter* spp. were isolated from faecal samples in five investigations. The foods implicated in these investigations included chicken, lamb kebabs, lamb shanks and an Asian meal. Only two of these investigations were reported as outbreaks in Episurv.

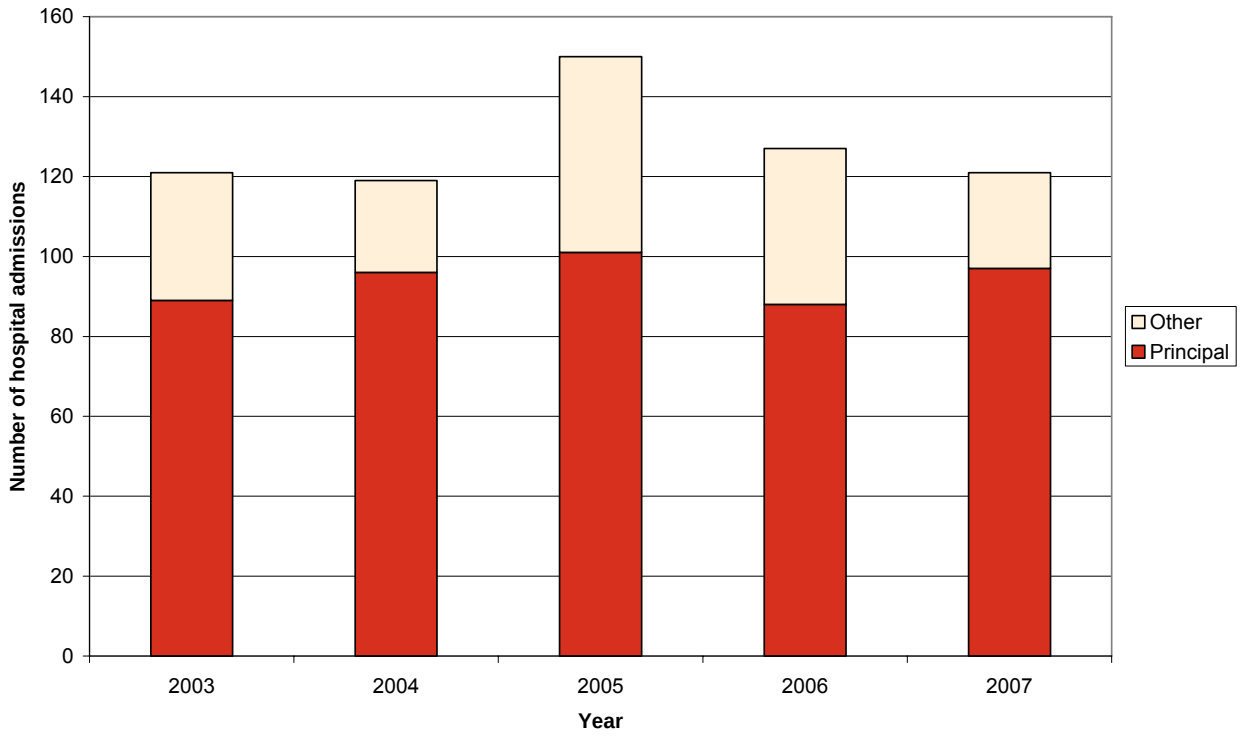
4.4.5 Disease sequelae - Guillain-Barré Syndrome (GBS)

Guillain-Barré Syndrome (GBS) 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 121 cases admitted to hospital (2.9 cases per 100 000 population) recorded in 2007, 97 were reported with GBS as the primary diagnosis and 24 with this condition as another relevant diagnosis.

Over the period 2002 to 2007 the number of hospitalised cases (any diagnosis code) for GBS has varied from 119 to 150 (Figure 12).

Figure 12: GBS hospitalised cases, 2003 - 2007



In 2007 the number of GBS hospitalised cases was greater for males than females (Table 15).

Table 15: GBS hospitalised cases by sex, 2007

Sex	Cases hospitalised[a]	
	No.	Rate[b]
Female	49	2.3
Male	72	3.5
Total	121	2.9

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

In 2007 the highest case rate for GBS was reported for 60-69 year olds (Table 16).

Table 16: GBS hospitalised cases by age group, 2007

Age groups	Cases hospitalised[a]	
	No.	Rate[b]
<1	0	0.0
1 to 4	3	1.3
5 to 9	3	1.0
10 to 14	1	0.3
15 to 19	7	2.2
20 to 29	8	1.4
30 to 39	13	2.2
40 to 49	13	2.1
50 to 59	30	5.8
60 to 69	23	6.4
70+	20	5.5
Total	121	2.9

[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 Journal papers

A letter to the New Zealand Medical Journal updated surveillance data on New Zealand's rates of campylobacteriosis (Baker *et al.*, 2007). The letter ascribed a large proportion of these cases to poultry consumption and described the current situation as a 'common source outbreak'. The letter reiterated an earlier call to apply technologies such as freezing to New Zealand's poultry supply.

A significant increase in the number of cases of *Campylobacter* infection was experienced in New Zealand during the winter of 2006. Isolates (112) from cases occurring during this period were submitted for PFGE, MLST and Penner serotyping (McTavish *et al.*, 2007). Distinct clusters of *Campylobacter* isolates were identified, including one sequence type (ST-474), representing 32/112 isolates, that may represent an endemic sequence type present in New Zealand. The spatial pattern of genotypes, combined with the general increase in notifications, is consistent with a common source epidemic. It was considered likely that the source of this epidemic was a source contaminated with the dominant sequence types ST-474 and ST-190. ST-474 is not a commonly identified sequence type internationally, but is present in about 10% of human and poultry isolates in New Zealand and has also been isolated from sheep and cows.

Three modelling approaches were used to apportion human cases of campylobacteriosis in New Zealand to various sources of *Campylobacter*, using genotyping information (French *et al.*, 2007). The three approaches gave broadly similar results, with the main source being poultry (55-71%), followed by sheep (15-16%), cattle (8-14%), environmental sources (3-12%) and birds (3-4%). The ST-474 strain accounted for approximately 25% of human cases and was commonly isolated from poultry. This strain is rare in other countries.

4.4.7 Relevant regulatory developments

From February 2007, an addition was made to the existing National Microbiological Database (NMD) programme, requiring enumeration of *Campylobacter* on poultry carcasses. The *Campylobacter* results will be evaluated after an initial 18 month programme, including a lead in period of 3 months, by NZFSA and industry technical experts, and the programme modified if deemed necessary or appropriate.
http://www.nzfsa.govt.nz/animalproducts/publications/consultation/drafts/nmd/page-02.htm

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 2007 by data source

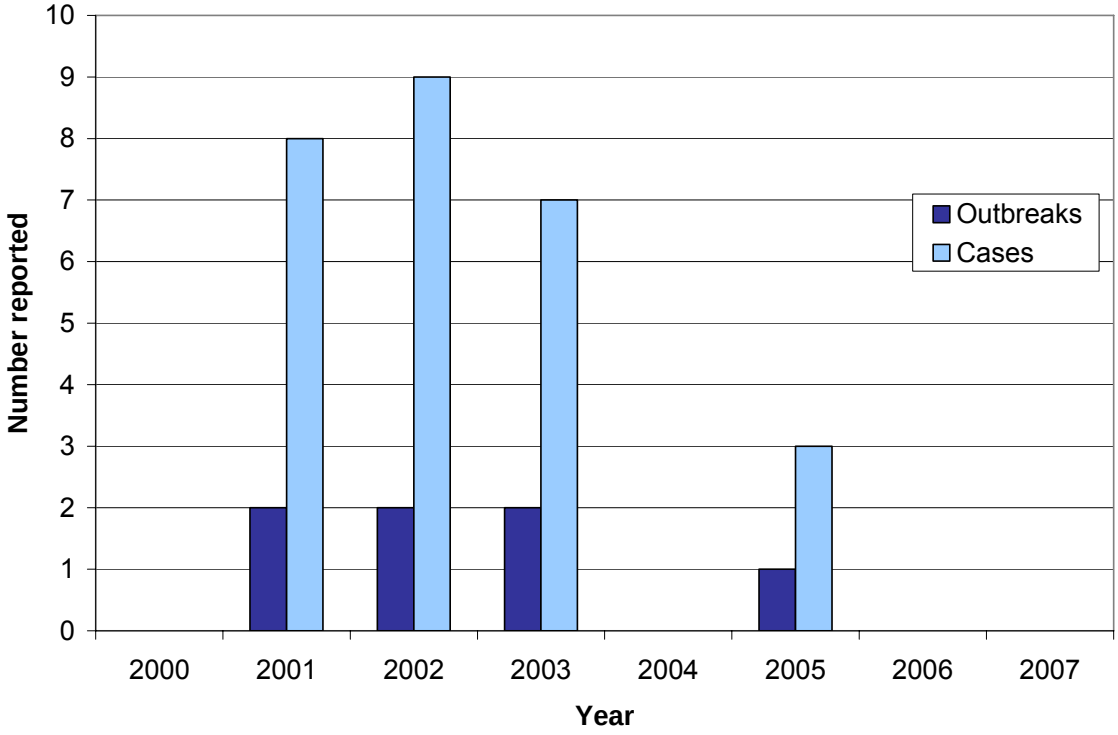
No ciguatera fish poisoning cases were reported in EpiSurv in 2007.

The ICD-10 code T61.0 was used to extract ciguatera fish poisoning hospitalisation data from the NZHIS NMDS database. Of the 3 hospital admissions (0.1 admissions per 100 000 population) recorded in 2007, all were reported with ciguatera fish poisoning as the primary diagnosis.

4.5.3 Outbreaks reported as caused by ciguatera fish poisoning

No cases or outbreaks due to ciguatera fish poisoning were reported in 2007 (Figure 13). Very few outbreaks of ciguatera fish poisoning have been reported in recent years. In the four years 2004 to 2007 one outbreak due to ciguatera fish poisoning was reported.

Figure 13: Outbreaks and associated cases due to ciguatera fish poisoning reported by year, 2000 – 2007



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 $\geq 10^6$/g or isolation of $\geq 10^5$/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 2007 by data source

Three cases of *Clostridium perfringens* intoxication were reported in EpiSurv during 2007 with no resulting deaths recorded.

4.6.3 Outbreaks reported as caused by *Clostridium perfringens*

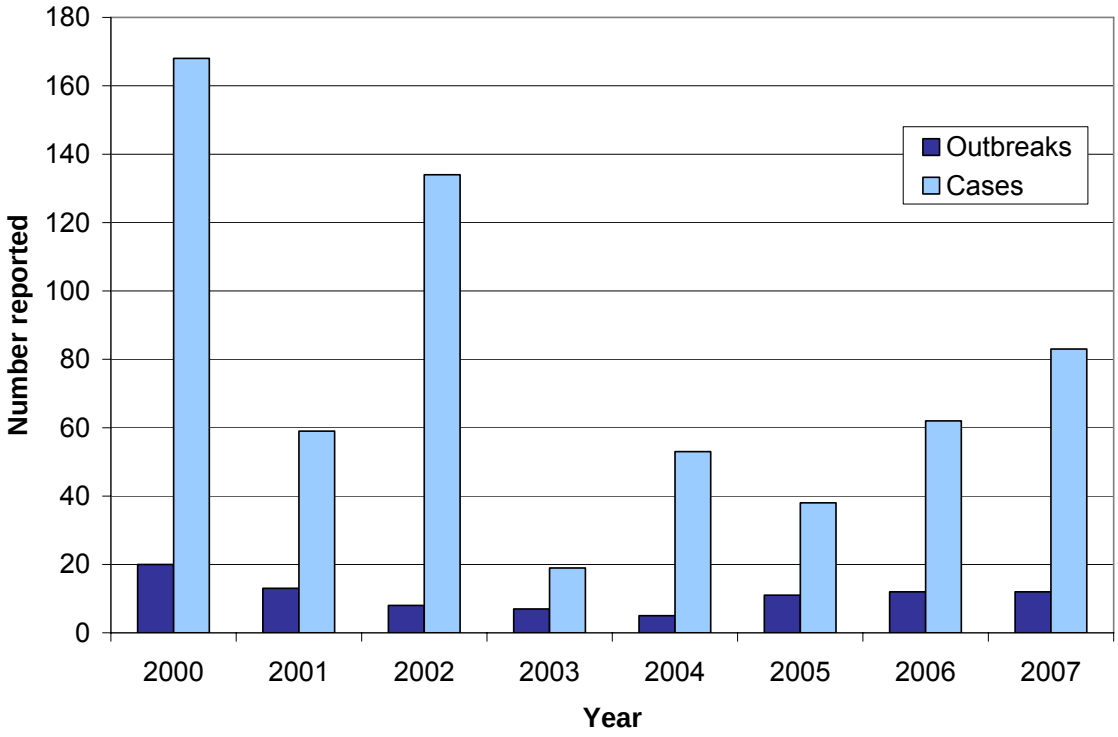
All but one of the *Clostridium perfringens* outbreaks for 2007 were associated with a suspected or known foodborne source (Table 17).

Table 17: *Clostridium perfringens* outbreaks reported, 2007

Measure (No.)	Foodborne *Clostridium perfringens* outbreaks	All *Clostridium perfringens* outbreaks
Outbreaks	12	13
Cases	83	87
Hospitalised cases	0	0

There was a steady decrease in the number of foodborne outbreaks associated with *Clostridium perfringens* between 2000 and 2004, but an increase in the number of outbreaks reported between 2005 and 2007 (Figure 14). The number of cases associated with *Clostridium perfringens* outbreaks has varied over time with a trend towards more cases associated with an outbreak in the last three years (2005 to 2007).

Figure 14: Foodborne *Clostridium perfringens* outbreaks and associated cases reported by year, 2000–2007



4.6.3.1 Details of food-associated outbreaks

Table 18 contains details of the 12 food–associated *Clostridium perfringens* intoxication outbreaks reported in 2007.

Table 18: Details of food-associated *Clostridium perfringens* outbreaks, 2007

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Auckland (January)	Roast meats	Takeaway	2P	2
Auckland (February)	Roast meats	Café	4P	1, 2
Auckland (March)	Kebab	Takeaway	3P	1, 2
Auckland (March)	Kebab	Takeaway	2P	1, 2
Auckland (March)	Roast meats	Café	1C, 3P	1, 2
Auckland (April)	Chicken	Café	1C, 2P	2
Auckland (April)	Lamb kebab	Café	2C, 4P	1, 2
Auckland (August)	Roast meats	Café	2C, 4P	1, 2
Auckland (October)	Chicken burrito	Takeaway	1C, 1P	1, 2
Auckland (October)	Unknown	Home, Takeaway	2C	2
Wellington (January)	Roast meats	Café	2C, 15P	1, 2
Wellington (December)	Roast meats	Café	16C, 16P	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

Of the 12 food-associated *Clostridium perfringens* intoxication outbreaks, six were associated with roast meats, although the evidence linking the food to the outbreak cases was generally weak.

4.6.3.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratories, *C. perfringens* and/or its toxin was detected in clinical samples from 14 investigations. *C. perfringens* was not detected in any associated food samples, although food was rarely presented for analysis. Implicated foods included roast meals (4), buffet meals (2), Indian food (2), chicken (3), kebabs, scallops, and spring rolls and dip. Eight of the investigations related to outbreaks listed in Table 18.

4.6.4 Relevant New Zealand studies and publications

Nil.

4.6.5 Relevant regulatory developments

Nil.

4.7 Cryptosporidiosis

Summary data for cryptosporidiosis in 2007 are given in Table 19.

Table 19: Summary surveillance data for cryptosporidiosis, 2007

Parameter	Value in 2007	Section reference
Number of cases	924	4.7.2
Rate (per 100 000)	21.9	4.7.2
Hospitalisations (%)	40 (4.3%)	4.7.2
Deaths (%)	0 (0%)	4.7.2
Estimated travel-related cases (%)	59 (6.4%)	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 2007 by data source

During 2007, 924 notifications (21.9 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 40 hospital admissions (1.0 admissions per 100 000 population) recorded in 2007, 26 were reported with cryptosporidiosis as the primary diagnosis and 14 with cryptosporidiosis as another relevant diagnosis.

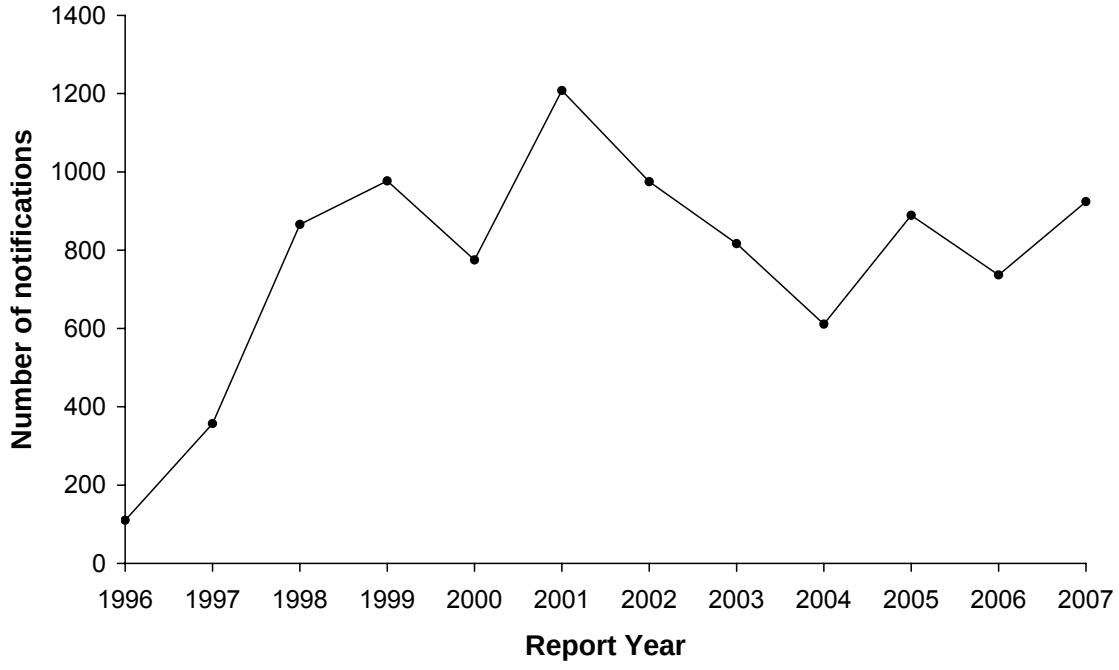
No deaths due to cryptosporidiosis were recorded in EpiSurv in 2007.

4.7.3 Notifiable disease data

4.7.3.1 Annual notification trend

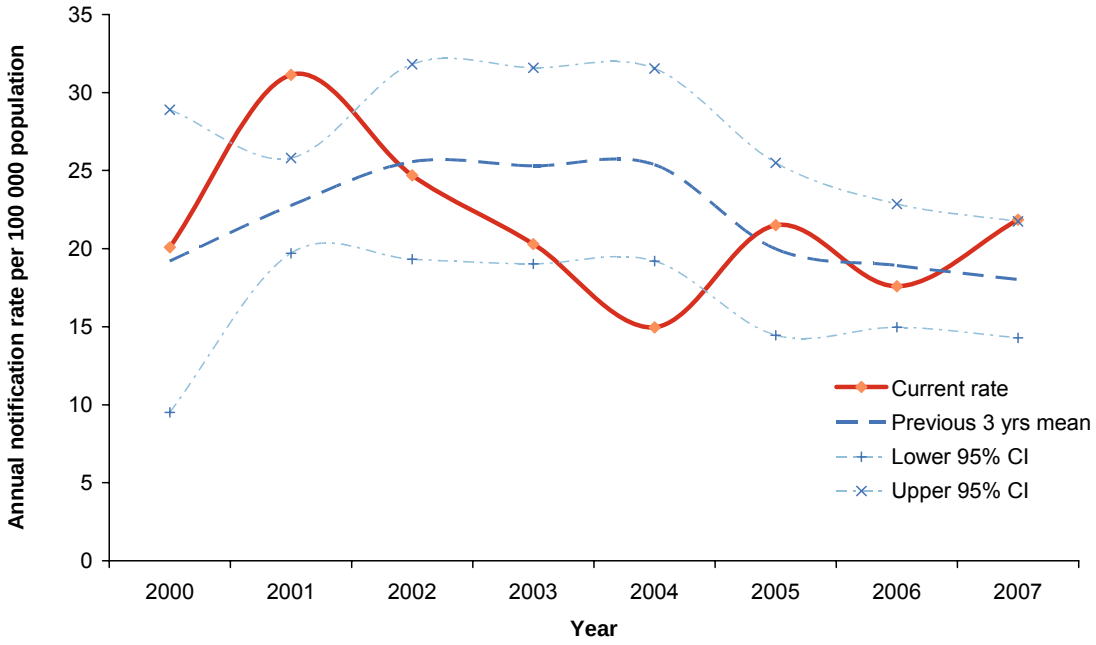
Cryptosporidiosis became a notifiable disease in June 1996. The highest number of cases was reported in 2001 (1 208 cases). Between 2001 and 2004 there was a decrease in the number of notifications, followed by an increasing number of notifications since 2005 (Figure 15).

Figure 15: Cryptosporidiosis notifications by year, 1996-2007



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 has generally decreased since, although 2005 to 2007 reported slightly higher rates than observed in 2004 (Figure 16).

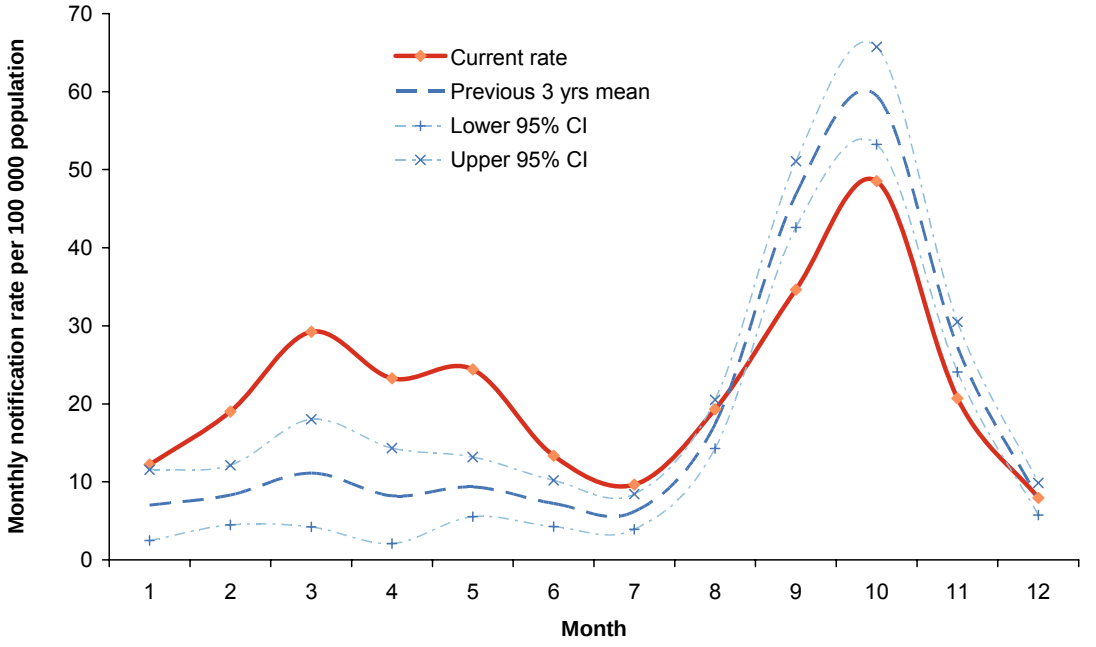
Figure 16: Cryptosporidiosis notification rate by year, 2000-2007



4.7.3.2 Seasonality

The number of notified cases of cryptosporidiosis reported per 100 000 population by month for 2007 was similar to previous years. Cryptosporidiosis has a consistent spring peak (September/October) (Figure 17).

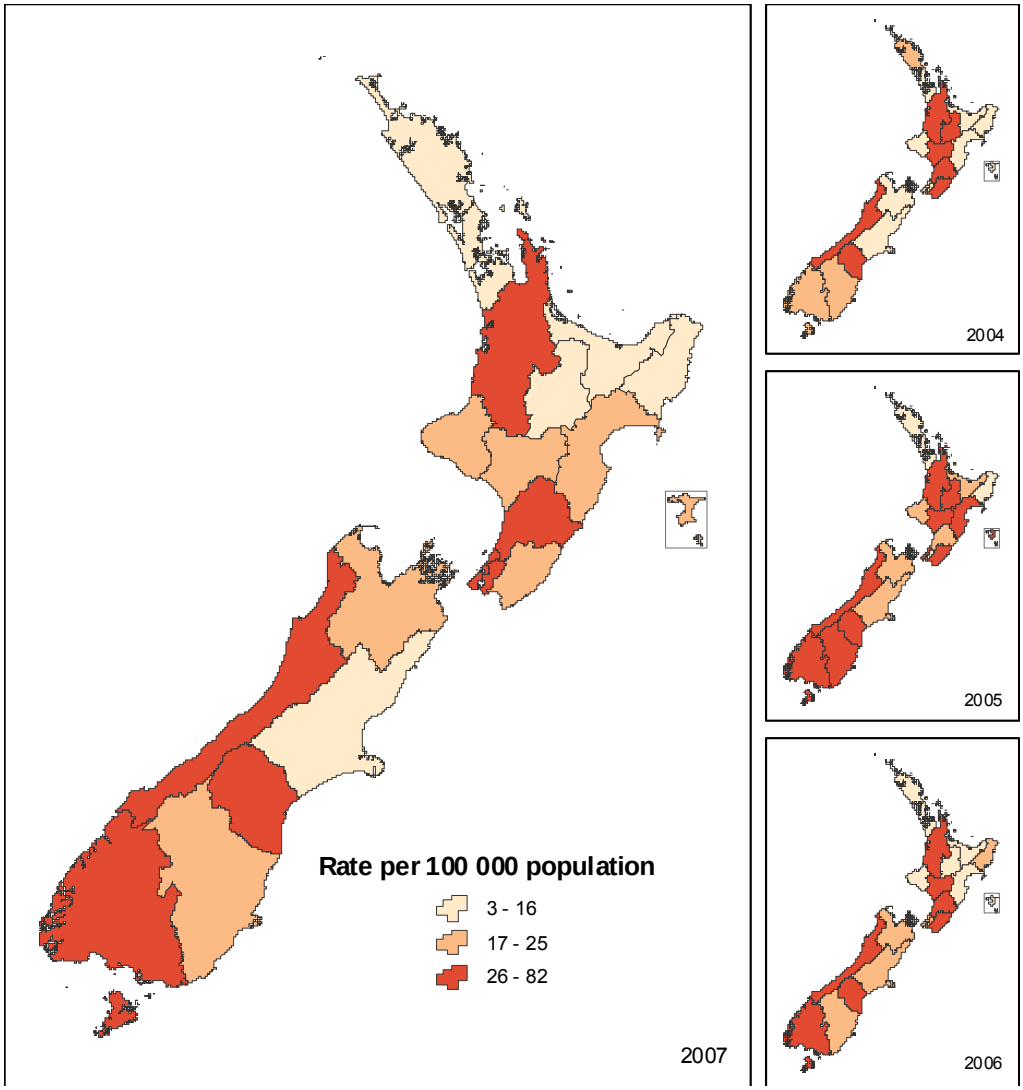
Figure 17: Cryptosporidiosis monthly rate (annualised) for 2007



4.7.3.3 Geographic distribution of cryptosporidiosis notifications

There were consistently higher population rates of cryptosporidiosis notifications reported in the predominantly rural DHBs compared to the more urban DHBs (Figure 18). In 2007, the highest rates were reported in South Canterbury (74.2 per 100 000 population), Southland (52.5 per 100 000) and Waikato (51.5 per 100 000) DHBs. South Canterbury has reported the highest cryptosporidiosis rates for the past four years.

Figure 18: Geographic distribution of cryptosporidiosis notifications, 2004-2007



4.7.3.4 Age and sex distribution of cryptosporidiosis cases

The number, notification rates and hospitalisations for cryptosporidiosis were similar for males and females (Table 20).

Table 20: Cryptosporidiosis cases by sex, 2007

Sex	EpiSurv notifications		Hospitalisations[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
Male	444	21.4	19	0.9	
Female	470	21.8	21	1.0	
Unknown	10				
Total	924	21.9	40	0.9	

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

In 2007 the highest cryptosporidiosis age specific notification rates were in the 1 to 4 years age group (329 cases, 142.7 per 100 000 population), followed by the less than one years (30 cases, 48.6 per 100 000) and the 5 to 9 years (120 cases, 41.4 per 100 000) (Table 21).

Table 21: Cryptosporidiosis cases by age group, 2007

Age groups	EpiSurv notifications		Hospitalisations[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	30	48.6	3	4.9	
1 to 4	329	142.7	10	4.3	
5 to 9	120	41.4	2	0.7	
10 to 14	65	21.2	1	0.3	
15 to 19	39	12.2	1	0.3	
20 to 29	104	18.6	15	2.7	
30 to 39	121	20.4	5	0.8	
40 to 49	42	6.7	0	0.0	
50 to 59	34	6.6	1	0.2	
60 to 60	25	6.9	0	0.0	
70+	13	3.6	2	0.6	
Unknown	2				
Total	924	21.9	40	0.9	

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

4.7.3.5 Risk Factors Reported

In 2007, the most commonly reported risk factor for cryptosporidiosis notification cases was contact with farm animals (52.9%), followed by consumption of untreated water (38.9%) and recreational water contact (38.0%) (Table 22).

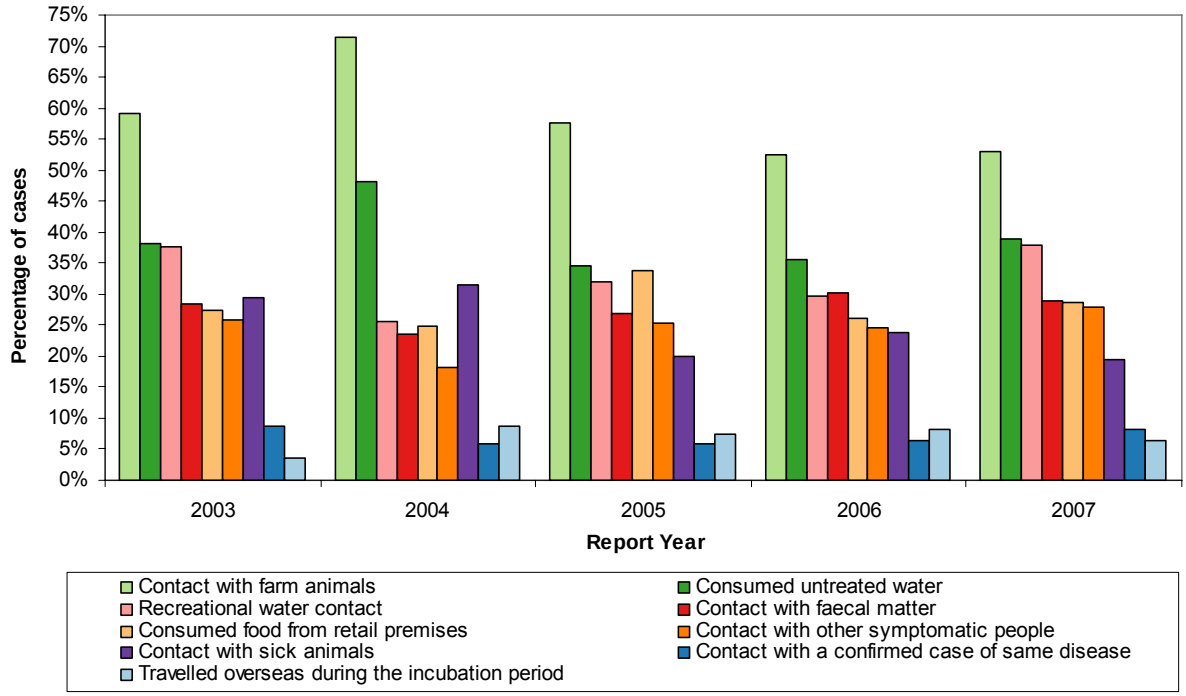
Table 22: Exposure to risk factors associated with cryptosporidiosis, 2007

	Notifications			
Risk Factor	**Yes**	**No**	**Unknown**	**%[a]**
Contact with farm animals	319	284	321	52.9%
Consumed untreated water	163	256	505	38.9%
Recreational water contact	191	312	421	38.0%
Contact with faecal matter	153	378	393	28.8%
Consumed food from retail premises	102	254	568	28.7%
Contact with other symptomatic people	147	380	397	27.9%
Contact with sick animals	92	383	449	19.4%
Contact with a confirmed case of same disease	44	489	391	8.3%
Travelled overseas during the incubation period	42	613	269	6.4%

[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 2003 to 2007 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, 2003 – 2007



4.7.3.6 Estimate of travel-related cases

For cases where information on travel was provided, 6.4% (42/655; 95%CI 4.6-8.5%) 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 2007. The resultant distribution has a mean of 59 cases (95% CI 38-85).

4.7.4 Outbreaks reported as caused by *Cryptosporidium* spp.

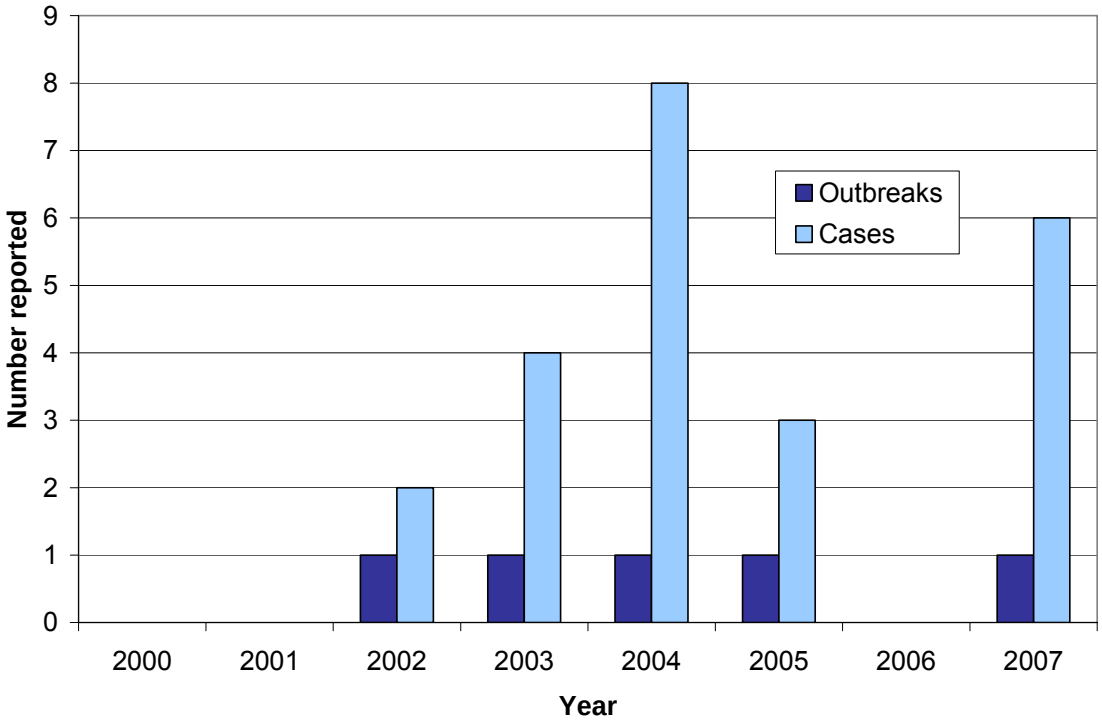
One foodborne *Cryptosporidium* outbreak was reported in 2007 (Table 23).

Table 23: *Cryptosporidium* spp. outbreaks reported, 2007

Measure (No.)	Foodborne *Cryptosporidium* spp. outbreaks	All *Cryptosporidium* spp. outbreaks
Outbreaks	1	29
Cases	6	102
Hospitalised cases	0	0

Foodborne *Cryptosporidium* outbreaks are rare with not more than one outbreak reported each year in the eight year period, 2000 to 2007 (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 – 2007



4.7.4.1 Details of food-associated outbreaks

Table 24 contains details of the one food–associated *Cryptosporidium* spp. outbreak reported in 2007. It should be noted that the organism was not isolated from the implicated food.

Table 24: Details of food-associated *Cryptosporidium* spp. outbreak, 2007

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Otago (November)	Raw milk	Farm, Home	6C	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

4.7.4.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratories, *Cryptosporidium* spp. were not detected in any samples.

4.7.5 Relevant New Zealand studies and publications

An analysis of the seasonality of cryptosporidiosis in New Zealand was carried out, to assess the potential importance of recreational activities (Lake *et al.*, 2007a). In New Zealand human cryptosporidiosis demonstrates spring and autumn peaks of incidence with the spring peak being three times greater in magnitude than the autumn peak. The imbalance between the two peaks is notable, and may be associated with the high livestock density in New Zealand. In the summer and autumn the cryptosporidiosis rate was positively associated with temperatures in the current and previous month, highlighting the importance of outdoor recreation to transmission. No associations between spring incidence and weather were found providing little support for the importance of drinking-water pathways. Imported travel cases do not appear to be an important factor in the aetiology of cryptosporidiosis in New Zealand.

4.7.6 Relevant regulatory developments

Nil.

4.8 Giardiasis

Summary data for giardiasis in 2007 are given in Table 25.

Table 25: Summary surveillance data for giardiasis, 2007

Parameter	Value in 2007	Section reference
Number of cases	1 401	4.8.2
Rate (per 100 000)	33.1	4.8.2
Hospitalisations (%)	34 (2.4%)	4.8.2
Deaths (%)	0 (0%)	4.8.2
Estimated travel-related cases (%)	307 (21.9%)	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 2007 by data source

During 2007, 1 401 notifications (33.1 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 34 hospital admissions (0.8 admissions per 100 000 population) recorded in 2007, 20 were reported with giardiasis as the primary diagnosis and 14 with giardiasis as another relevant diagnosis.

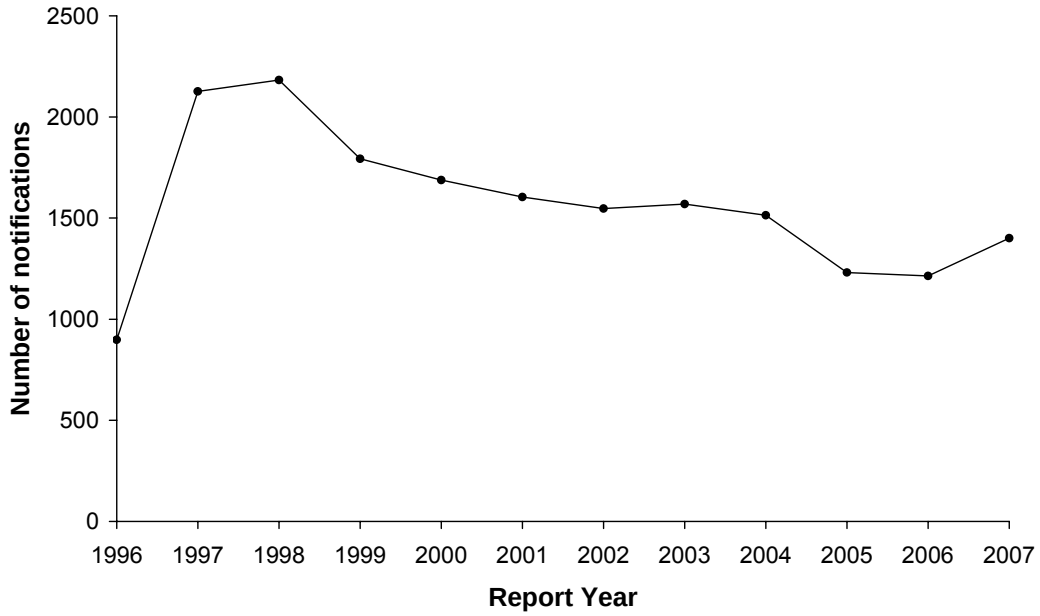
No deaths were recorded in EpiSurv in 2007.

4.8.3 Notifiable disease data

4.8.3.1 Annual notification trend

Giardiasis became a notifiable disease in 1996. Since 1998 there has been a steady decrease in the number of cases reported each year (Figure 21). The first increase in notifications since 1998 was seen in 2007.

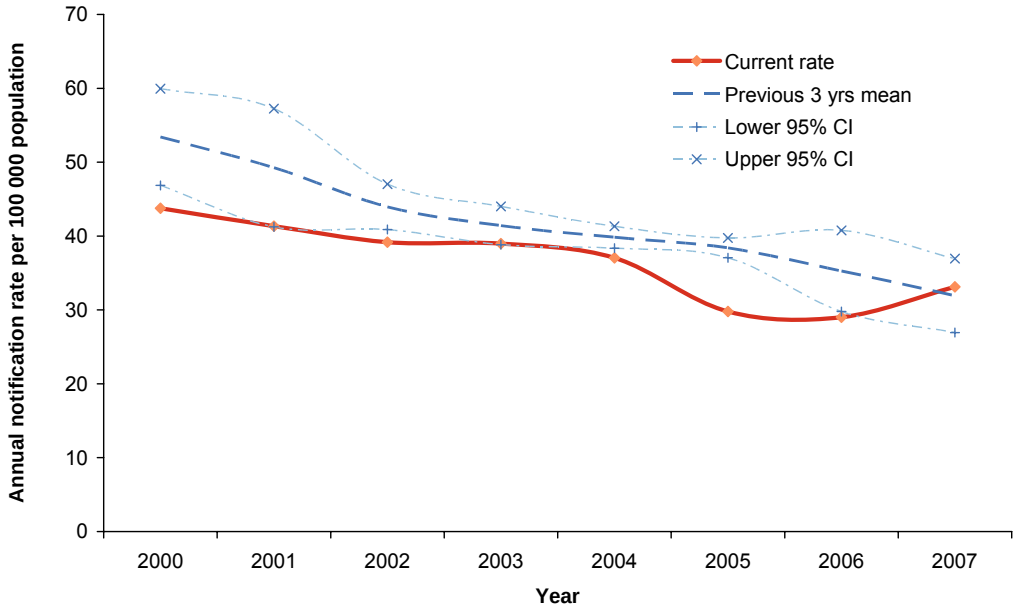
Figure 21: Giardiasis notifications by year, 1996-2007



* Notification of giardiasis began midway through 1996.

Between 2000 and 2007 the giardiasis notification rate has declined from 43.8 per 100 000 population in 2000 to 33.1 per 100 000 in 2007 (Figure 22).

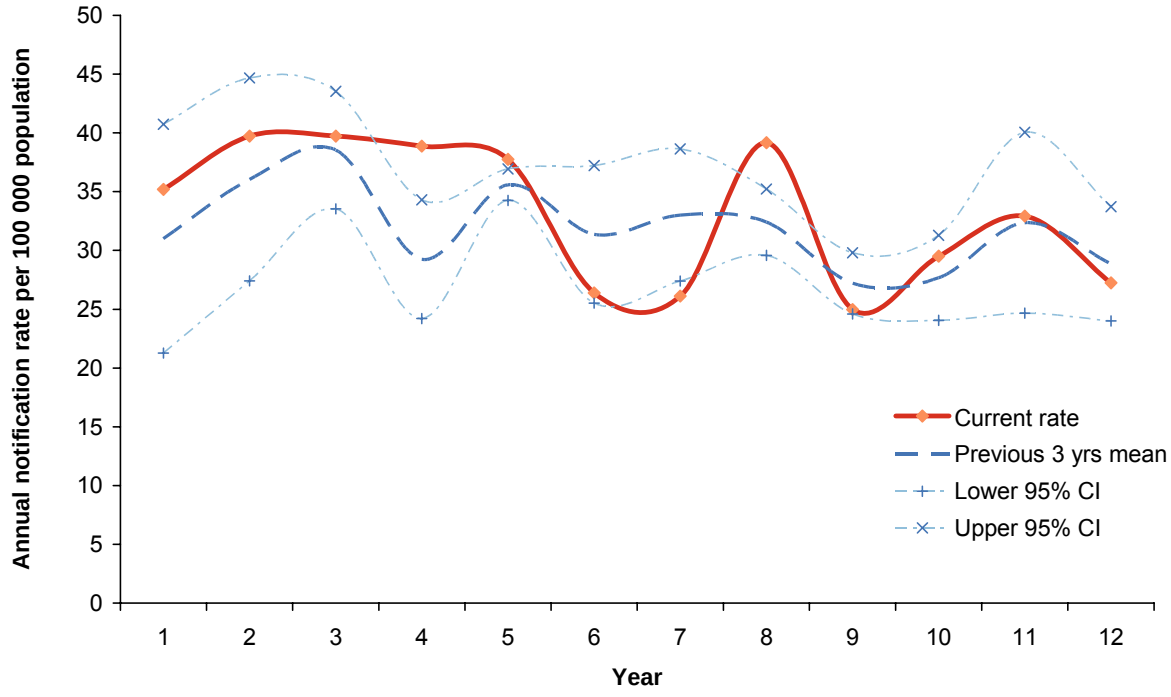
Figure 22: Giardiasis notification rate by year, 2000-2007



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 2007 (Figure 23).

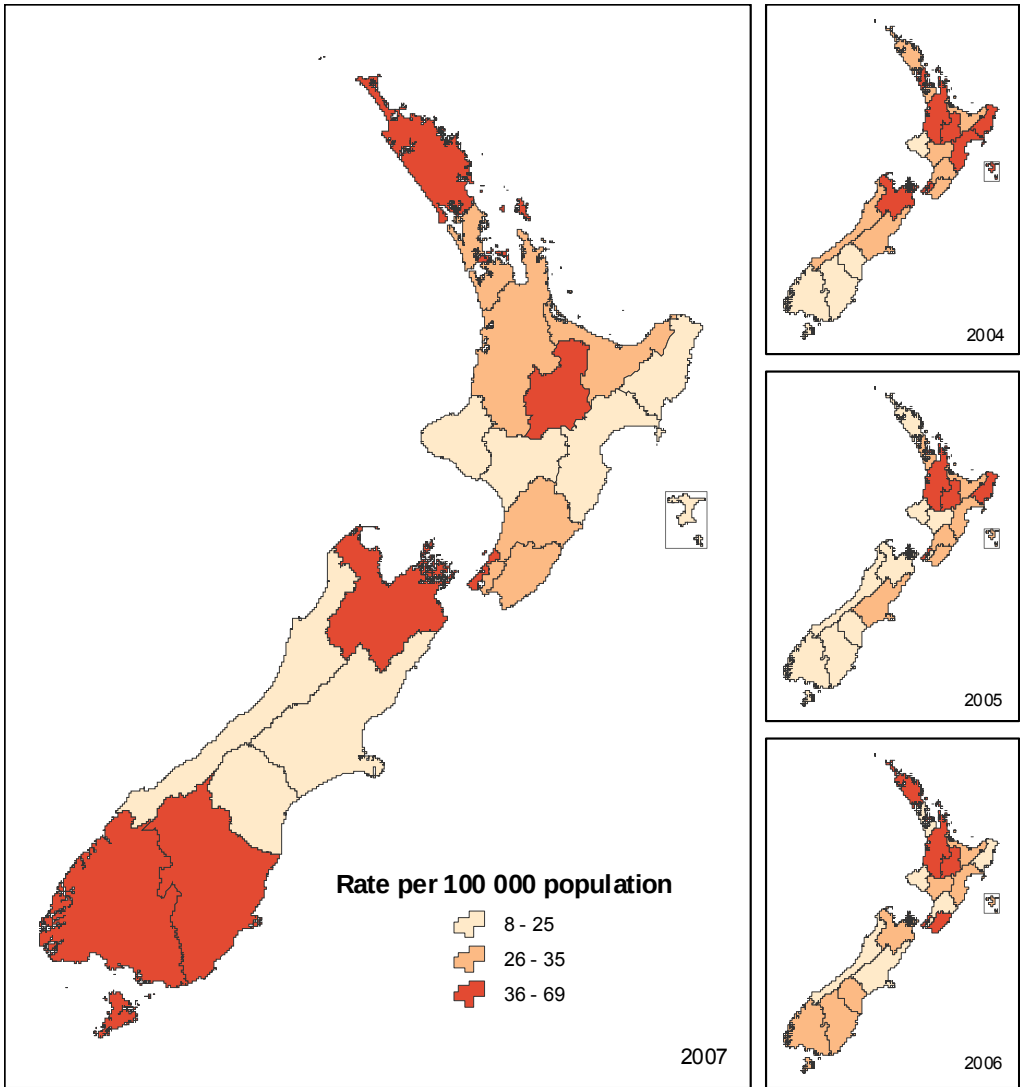
Figure 23: Giardiasis monthly rate (annualised) for 2007



4.8.3.3 Geographic distribution of giardiasis notifications

Notification rates of giardiasis varied throughout the country (Figure 24). Since 2003 there has been a decrease in the rate of giardiasis in most district health boards (DHB). In 2007 the highest giardiasis notification rates were reported in Nelson Marlborough, Capital and Coast, and Northland DHBs.

Figure 24: Geographic distribution of giardiasis notifications, 2004-2007



4.8.3.4 Age and sex distribution of giardiasis cases

The giardiasis notification rates were similar for males and females but the hospitalisation rates were slightly higher for females than males (Table 26).

Table 26: Giardiasis cases by sex, 2007

Sex	EpiSurv notifications		Hospitalisations[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No
Male	663	32.0	9	0.4	
Female	716	33.2	25	1.2	
Unknown	22				
Total	1 401	33.1	34	0.8	

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

In 2007, the highest age-specific giardiasis notification rates were in those aged one to four years (108.4 per 100 000) followed by the 30-39 year age group (57.4 per 100 000) and cases aged less than one year (48.6 per 100 000) (Table 27). The highest hospitalisation rates were in those aged less than four years.

Table 27: Giardiasis cases by age group, 2007

Age groups	EpiSurv notifications		Hospitalisations[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	30	48.6	2	3.2	
1 to 4	250	108.4	10	4.3	
5 to 9	97	33.5	2	0.7	
10 to 14	22	7.2	0	0.0	
15 to 19	23	7.2	0	0.0	
20 to 29	137	24.5	2	0.4	
30 to 39	340	57.4	3	0.5	
40 to 49	210	33.3	3	0.5	
50 to 59	135	26.3	4	0.8	
60 to 60	105	29.1	1	0.3	
70+	40	11.0	7	1.9	
Unknown	12				
Total	1 401	33.1	34	0.8	

[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 factor for giardiasis notification cases was contact with faecal matter (41.3%). Other frequently reported risk factors included contact with other symptomatic people (39.1%) and consumption of untreated water (38.6%) (Table 28).

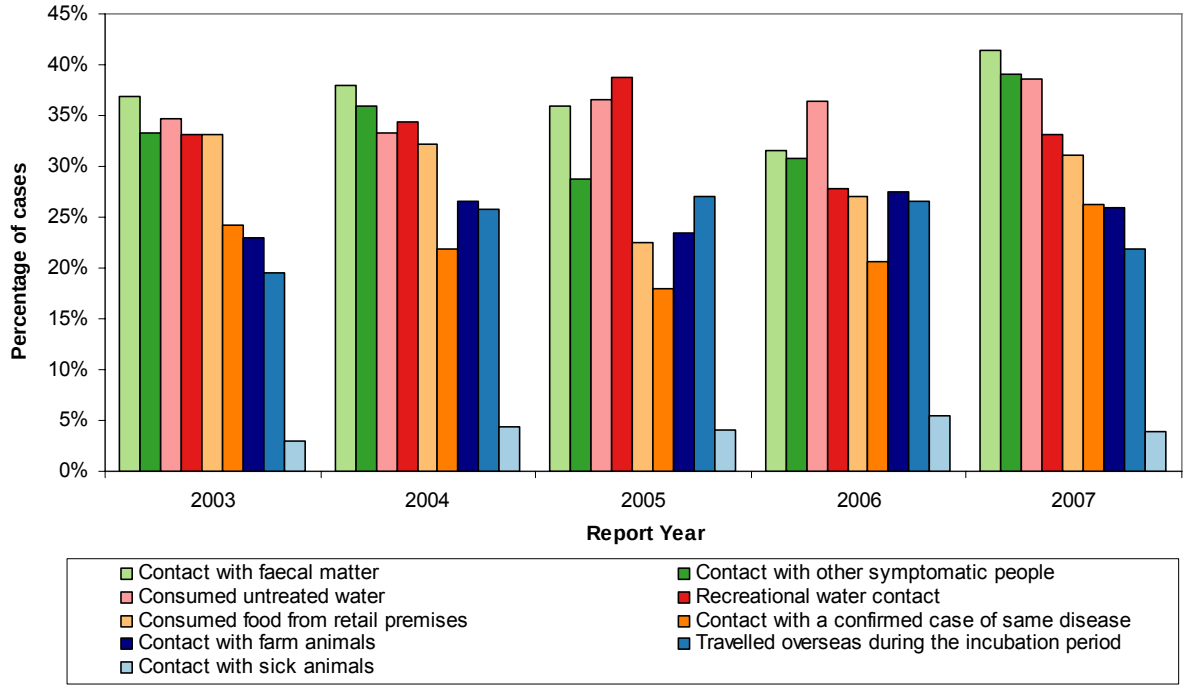
Table 28: Exposure to risk factors associated with giardiasis, 2007

	Notifications			
Risk Factor	**Yes**	**No**	**Unknown**	**%[a]**
Contact with faecal matter	186	264	951	41.3%
Contact with other symptomatic people	182	284	935	39.1%
Consumed untreated water	152	242	1007	38.6%
Recreational water contact	149	301	951	33.1%
Consumed food from retail premises	114	253	1034	31.1%
Contact with a confirmed case of same disease	131	368	902	26.3%
Contact with farm animals	126	359	916	26.0%
Travelled overseas during the incubation period	137	488	776	21.9%
Contact with sick animals	17	415	969	3.9%

[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 2003 until 2007 (Figure 25).

Figure 25: Giardiasis risk factors by percentage of cases and year, 2003 – 2007



4.8.3.6 Estimate of travel-related cases

For cases where information on travel was provided, 21.9% (137/625; 95%CI 18.4-25.7%) 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 2007. The resultant distribution has a mean of 307 cases (95% CI 248-372).

4.8.4 Outbreaks reported as caused by *Giardia* spp

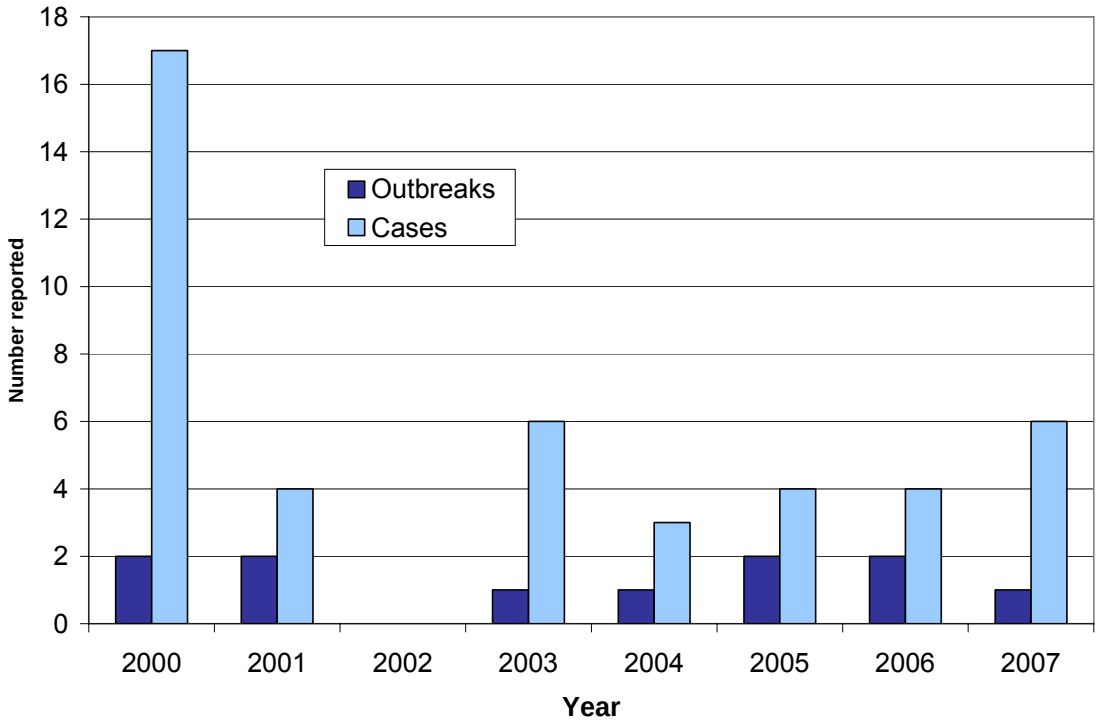
In 2007 there were 21 giardiasis outbreaks reported with one of these associated with a suspected or known foodborne source (Table 29).

Table 29: *Giardia* spp. outbreaks reported, 2007

Measure (No.)	Foodborne *Giardia* spp. outbreaks	All *Giardia* spp. outbreaks
Outbreaks	1	21
Cases	6	111
Hospitalised cases	0	0

Since 2000 two or less foodborne giardiasis outbreaks have been reported in EpiSurv each year (Figure 26). These outbreaks generally involved a small number of cases.

Figure 26: Foodborne *Giardia* spp. outbreaks and associated cases reported by year, 2000 – 2007



4.8.4.1 Details of food-associated outbreaks

Table 30 contains details of the one food–associated *Giardia* spp. outbreak reported in 2007.

Table 30: Details of food-associated *Giardia* spp. outbreak, 2007

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Otago (January)	Unknown	Home	5C, 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

4.8.4.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratories, *Giardia* spp. were detected in a faecal sample from a nine case day care centre outbreak. No food was implicated.

4.8.5 Relevant New Zealand studies and publications

Nil.

4.8.6 Relevant regulatory developments

Nil.

4.9 Hepatitis A

Summary data for hepatitis A in 2007 are given in Table 31.

Table 31: Summary surveillance data for hepatitis A, 2007

Parameter	Value in 2007	Section reference
Number of cases	42	4.9.2
Rate (per 100 000)	1.0	4.9.2
Hospitalisations (%)	35 (83.3%)	4.9.2
Deaths (%)	0 (0%)	4.9.2
Estimated travel-related cases (%)	24 (56.8%)	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 2007 by data source

During 2007, 42 notifications (1.0 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 35 hospital admissions (0.8 admissions per 100 000 population) recorded in 2007, 17 were reported with hepatitis A as the primary diagnosis and 18 with hepatitis A as another relevant diagnosis.

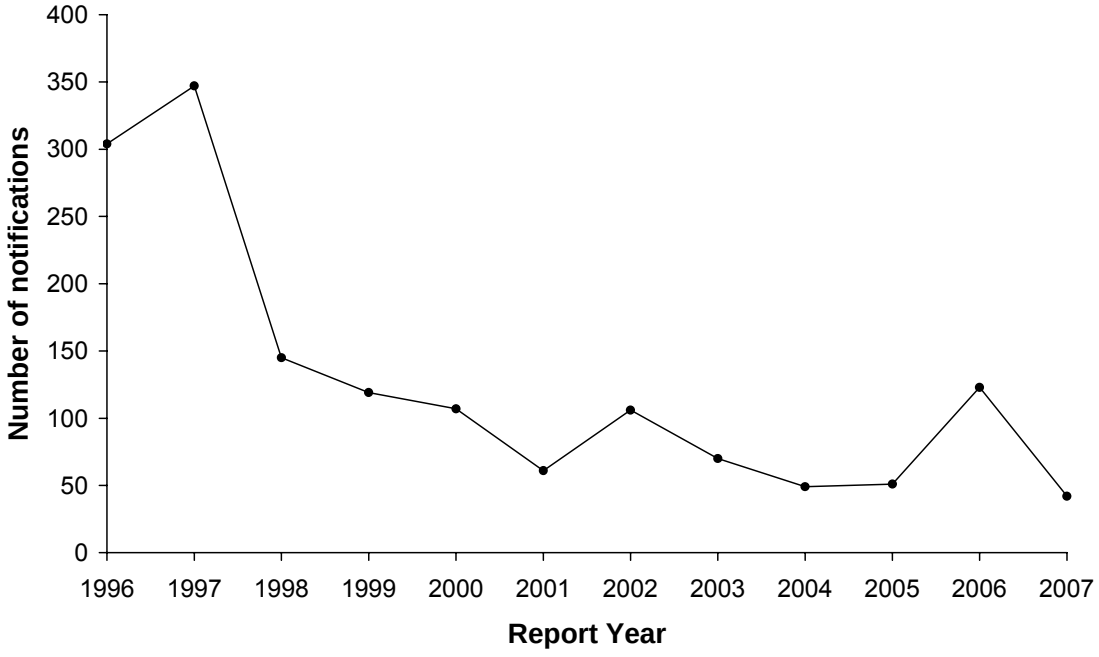
No deaths resulting from hepatitis A were recorded in EpiSurv.

4.9.3 Notifiable disease data

4.9.3.1 Annual notification trend

There has been a general decrease in the number of hepatitis A notifications since 1997 (347 cases) with the exception of an increase in 2002 and 2006 (Figure 27).

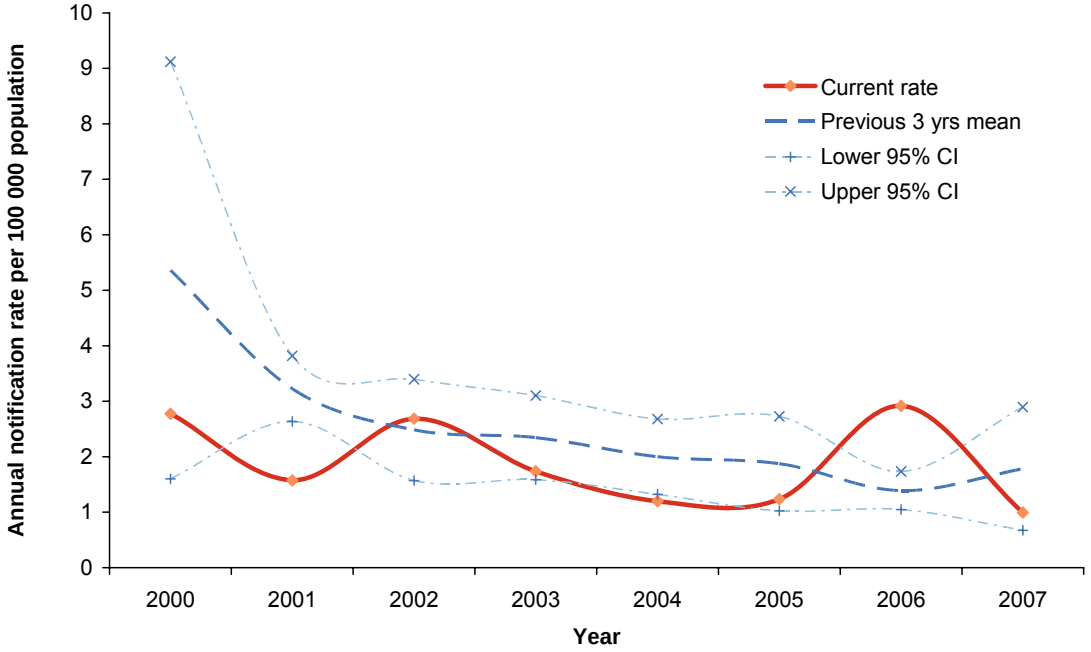
Figure 27: Hepatitis A notifications by year, 1996-2007



The hepatitis A notification rate has generally decreased since 1997 (Figure 28). The highest hepatitis A notification rate since 1997 was in 2006 with the previous two years experiencing the

lowest notification rate (1.2 per 100 000 population). The 2007 rate was similar to that reported in recent years, excluding 2006.

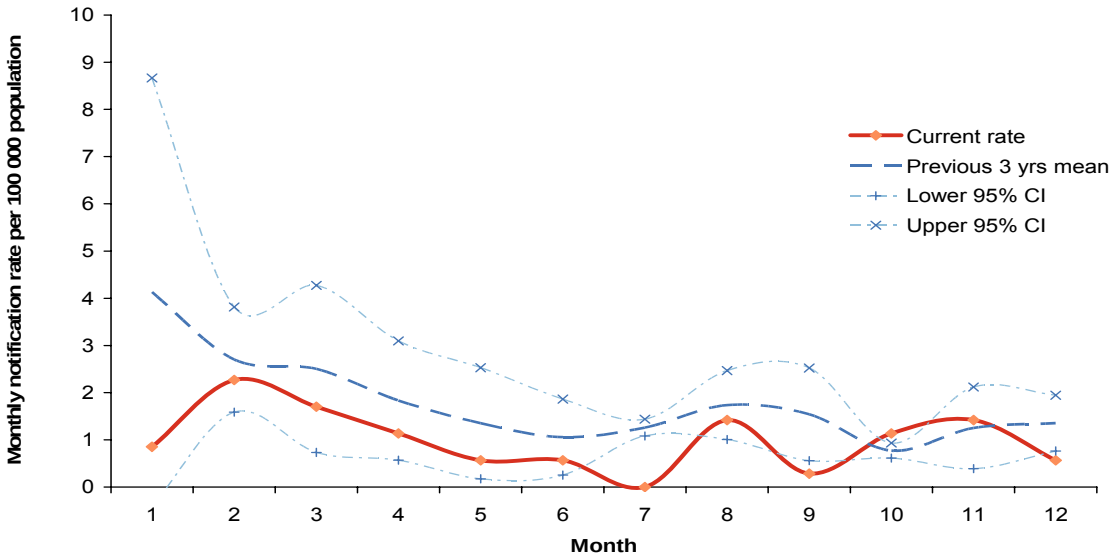
Figure 28: Hepatitis A notification rate by year, 2000-2007



4.9.3.2 Seasonality

In 2007 there was no strong seasonal pattern for hepatitis A notifications (Figure 29).

Figure 29: Hepatitis A monthly rate (annualised) for 2007



4.9.3.3 Age and sex distribution of Hepatitis A cases

In 2007 the hepatitis A notification rate was slightly higher for males than females (Table 32) but the hospitalisation rate for females was higher than males.

Table 32: Hepatitis A cases by sex, 2007

Sex	EpiSurv notifications		Hospitalisations[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No
Male	26	1.3	15	0.7	
Female	16	0.7	20	0.9	
Unknown	0				
Total	42	1.0	35	0.8	

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

The age-specific hepatitis A notification rate in 2007 was highest for those aged 15 to 19 years (2.5 per 100 000), followed by five to nine year olds (2.1) and 20 to 29 year olds (1.3) (Table 33).

Table 33: Hepatitis A cases by age group, 2007

Age groups	EpiSurv notifications		Hospitalisations[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	0	0.0	0	0.0	
1 to 4	0	0.0	1	0.4	
5 to 9	6	2.1	5	1.7	
10 to 14	2	0.7	0	0.0	
15 to 19	8	2.5	4	1.3	
20 to 29	7	1.3	8	1.4	
30 to 39	3	0.5	0	0.0	
40 to 49	5	0.8	5	0.8	
50 to 59	6	1.2	1	0.2	
60 to 60	2	0.6	3	0.8	
70+	3	0.8	8	2.2	
Unknown	0				
Total	42	1.0	35	0.8	

[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 2007 was contact with contaminated food or drink (61.9%) (Table 34). Other frequently reported risk factors included overseas travel during the incubation period (56.8%) and household contact with a confirmed case (13.3%).

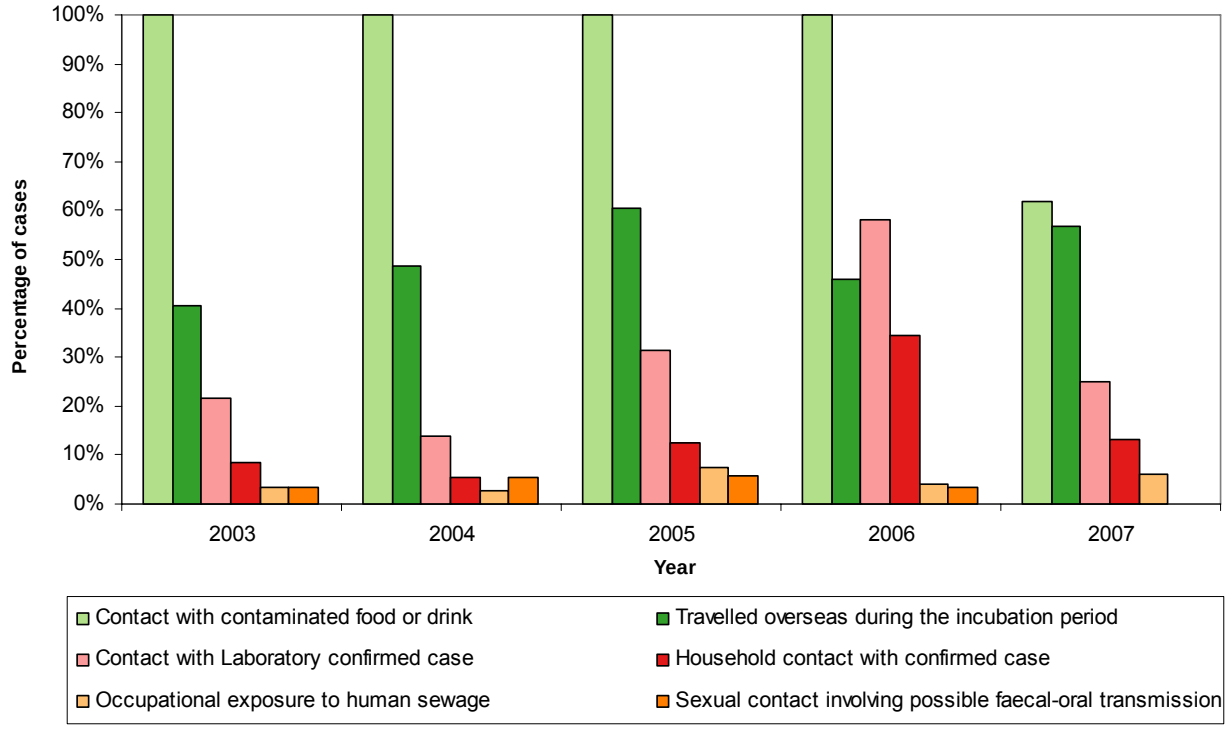
Table 34: Exposure to risk factors associated with hepatitis A, 2007

	Notifications			
Risk Factor	**Yes**	**No**	**Unknown**	**%[a]**
Contact with contaminated food or drink	13	8	21	61.9%
Travelled overseas during the incubation period	21	16	5	56.8%
Household contact with confirmed case	4	26	12	13.3%
Occupational exposure to human sewage	2	31	9	6.1%
Contact with confirmed case in previous 3 months	1	27	14	3.6%
Sexual contact involving possible faecal-oral transmission	0	28	14	0.0%

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

Between 2003 and 2007 the risk factors associated with hepatitis A cases have generally occurred in the same order of importance and with the same magnitude each year (Figure 30). Each year contact with contaminated food or drink has been reported by a very high percentage of all hepatitis A cases. A large number of cases reported overseas travel during the incubation period as a risk factor.

Figure 30: Hepatitis A risk factors by percentage of cases and year, 2003 – 2007



4.9.3.5 Estimate of travel-related cases

For cases where information on travel was provided, 56.8% (21/37; 95%CI 35.1-83.5%) 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 2007. The resultant distribution has a mean of 24 cases (95% CI 11-39).

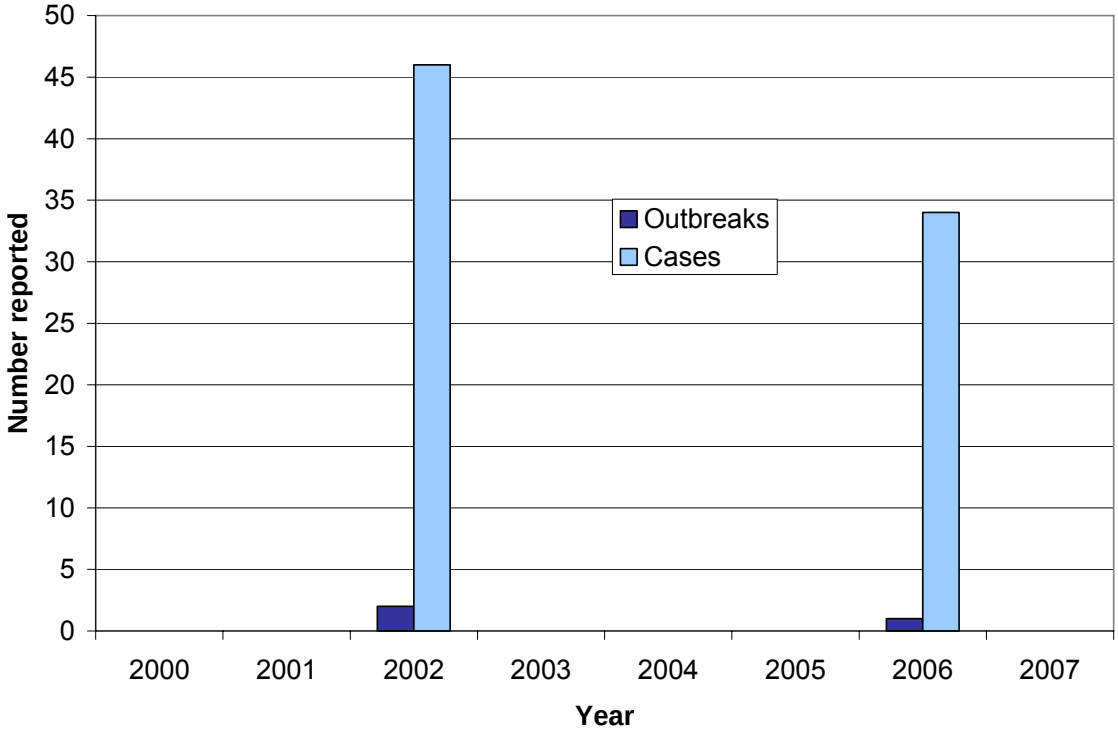
If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 49.0% (95% CI 40.5-58.2%).

4.9.4 Outbreaks reported as caused by hepatitis A virus

No outbreaks due to hepatitis A virus were reported in 2007.

Foodborne hepatitis A outbreaks are rare with only two reported in the period 2000 to 2007 (in 2002 and 2006) (Figure 31). Although occurring infrequently, each foodborne outbreak has been associated with many cases.

Figure 31: Foodborne hepatitis A virus outbreaks and associated cases reported by year, 2000–2007



4.9.5 Relevant New Zealand studies and publications

Nil.

4.9.6 Relevant regulatory developments

Nil.

4.10 Histamine (Scombroid) Fish Poisoning

4.10.1 Case definition

Clinical description: Tingling and burning sensation around mouth, facial flushing, sweating, nausea and vomiting, headache, palpitations, dizziness and rash

Laboratory test for diagnosis: Detection of histamine levels ≥ 50mg/100g fish muscle

Case classification: Not applicable

4.10.2 Histamine (scombroid) fish poisoning cases reported in 2007 by data source

In 2007, one notification of histamine (scombroid) fish poisoning and no resulting deaths were reported in EpiSurv.

The ICD-10 code T61.1 was used to extract scombroid fish poisoning hospitalisation data from the NZHIS NMDS database. The one hospital admission (0.02 admissions per 100 000 population) recorded in 2007 was reported with scombroid fish poisoning as the primary diagnosis.

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

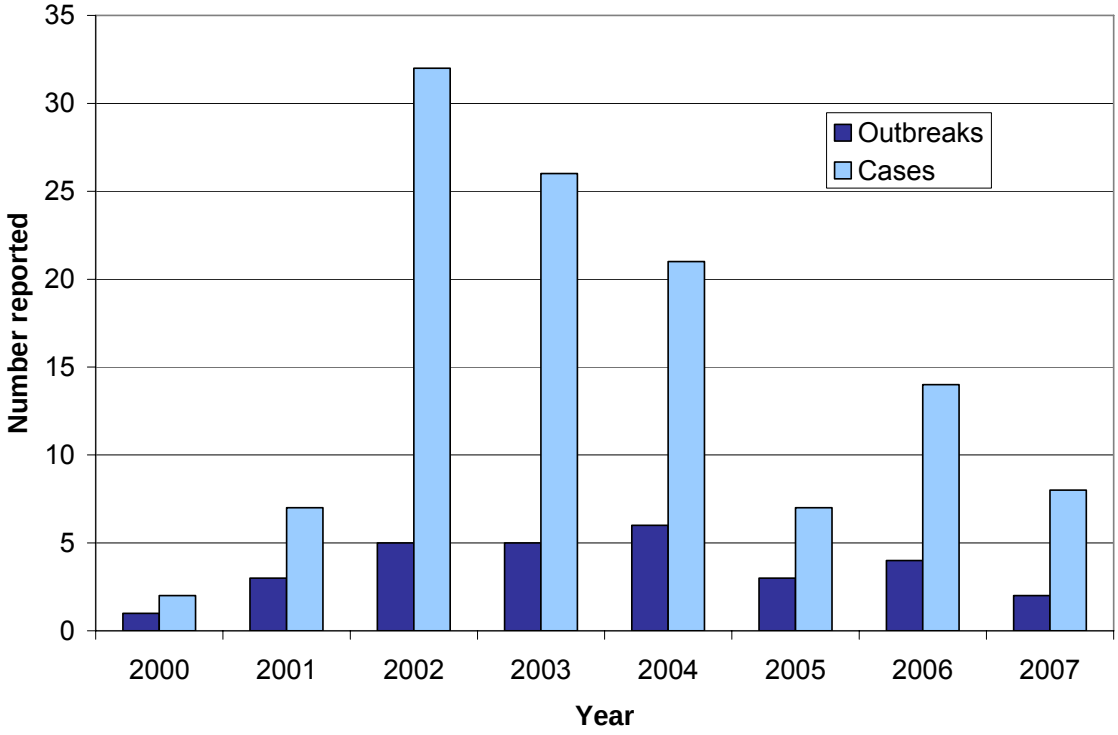
Two histamine (scombroid) fish poisoning outbreaks were reported in 2007 involving a total of 8 associated cases, with no cases hospitalised (Table 35). All outbreaks reported foodborne transmission.

Table 35: Histamine (scombroid) fish poisoning outbreaks reported, 2007

Measure (No.)	Foodborne histamine fish poisoning outbreaks	All histamine fish poisoning outbreaks
Outbreaks	2	2
Cases	8	8
Hospitalised cases	0	0

Between 2000 and 2007 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 – 2007



4.10.3.1 Details of food-associated outbreaks

Table 36 contains details of the two foodborne histamine poisoning outbreaks reported in 2007.

Table 36: Details of food-associated histamine poisoning outbreaks, 2007

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Northland (January)	Fish cakes	Takeaway	5C	1, 5
Auckland (September)	'Tuna and marlin	Fish processing premise	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

4.10.3.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratories, analyses were carried out on fish samples from three investigations and a cheese sample associated with a fourth investigation. The histamine concentrations in fish samples analysed in relation to outbreaks were in the range 165-2380 mg/kg, while the histamine concentration in the cheese sample analysed was 175 mg/kg. The histamine level measured in cheese is below levels that are usually associated with adverse reactions.

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 2007 are given in Table 37.

Table 37: Summary surveillance data for listeriosis, 2007

Parameter	Value in 2007	Section reference
Number of cases	26	4.11.2
Rate (per 100 000)	0.6	4.11.2
Hospitalisations (%)	29 (111.9%)	4.11.2
Deaths (%)	4 (15.4%)	4.11.2
Estimated travel-related cases (%)	2 (9.1%)	4.11.3.4
Estimated food-related cases (%)*	20 (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 2007 by data source

During 2007, 26 notifications (0.6 cases per 100 000 population) of listeriosis were reported in EpiSurv, of which five were perinatal. Twenty-six 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 29 hospital admissions (0.7 admissions per 100 000 population) recorded in 2007, 12 were reported with listeriosis as the primary diagnosis and 17 with listeriosis as another relevant diagnosis.

Two perinatal and two non-perinatal deaths were recorded in EpiSurv in 2007.

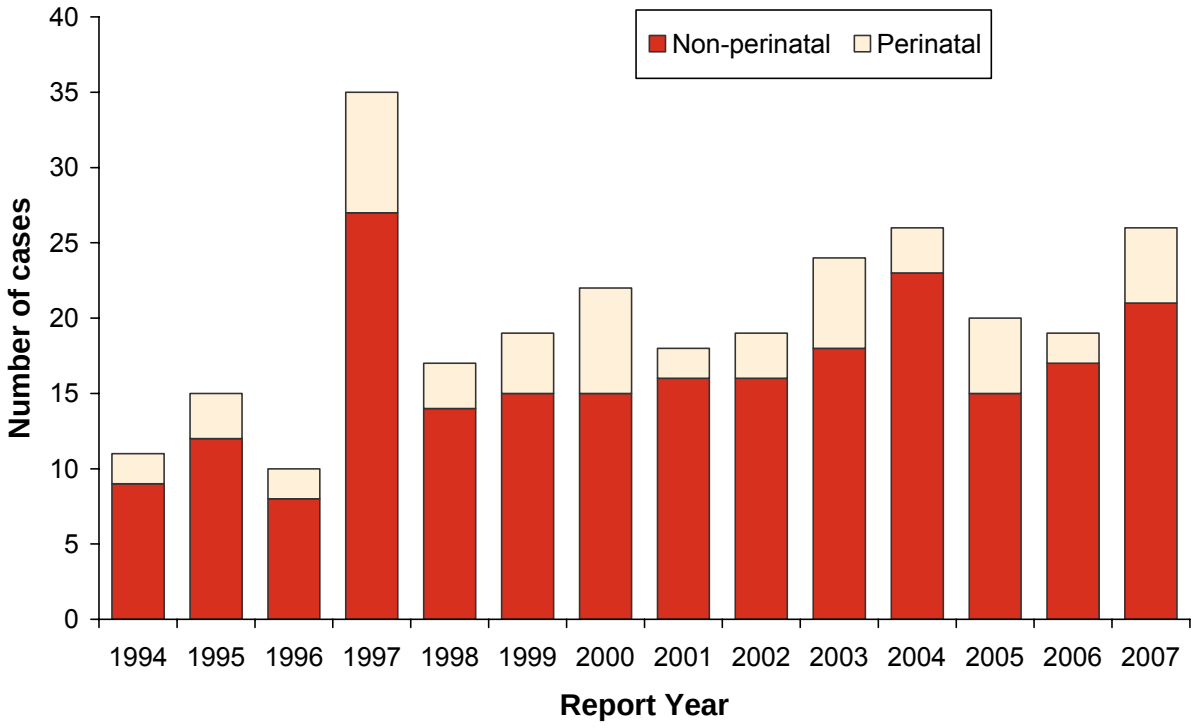
It has been estimated by expert consultation that 85% (minimum = 78%, maximum = 92%) of listeriosis incidence is due to foodborne transmission. It was further estimated that approximately 50% of foodborne transmission was due to consumption of ready-to-eat meats, while approximately 7% was due to ice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

4.11.3 Notifiable disease data

4.11.3.1 Annual notification trend

The number of listeriosis notifications reported in 2007 was the same as reported in 2004 and the second highest in the period 1994 to 2007 (Figure 33). The highest number of notifications was reported in 1997 (35 cases). Five (19.2%) of the 2007 cases were recorded as perinatal, similar to recent years.

Figure 33: Listeriosis non-perinatal and perinatal notifications by year, 1994-2007



4.11.3.2 Age and sex distribution of listeriosis cases

In 2007 the number and rate of notifications and hospitalisations for listeriosis was higher for females than males (Table 38).

Table 38: Listeriosis cases by sex, 2007

Sex	EpiSurv notifications		Hospitalisations[a]		Deaths recorded in EpiSurv[b]
	No.	Rate[c]	No.	Rate[c]	No.
Male	7	0.3	8	0.4	1
Female	18	0.8	21	1.0	1
Unknown	1				
Total	26	0.6	29	0.7	2

[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 2007 the age specific listeriosis notification rates were highest in the 70+ years age group (12 cases, 3.3 per 100 000 population), followed by the 60 to 69 years age group (6 cases, 1.7 per 100 000) (Table 39). The highest hospitalisation rates were in the 70 years and over age group.

Table 39: Listeriosis cases by age group, 2007

Age groups	EpiSurv notifications		Hospitalisations[a]		Deaths recorded in EpiSurv[b]
	No.	Rate[c]	No.	Rate[c]	No.
<1	0	0.0	1	1.6	
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	0	0.0	0	0.0	
20 to 29	2	0.4	1	0.2	
30 to 39	3	0.5	3	0.5	
40 to 49	1	0.2	1	0.2	
50 to 59	2	0.4	2	0.4	1
60 to 69	6	1.7	4	1.1	
70+	12	3.3	17	4.7	1
Total	26	0.6	29	0.7	2

[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 2007 the most common risk factor reported for listeriosis was an underlying illness (89.5%), receiving immunosuppressive drugs (81.8%) and hospital admission for another illness (62.5%) (Table 40).

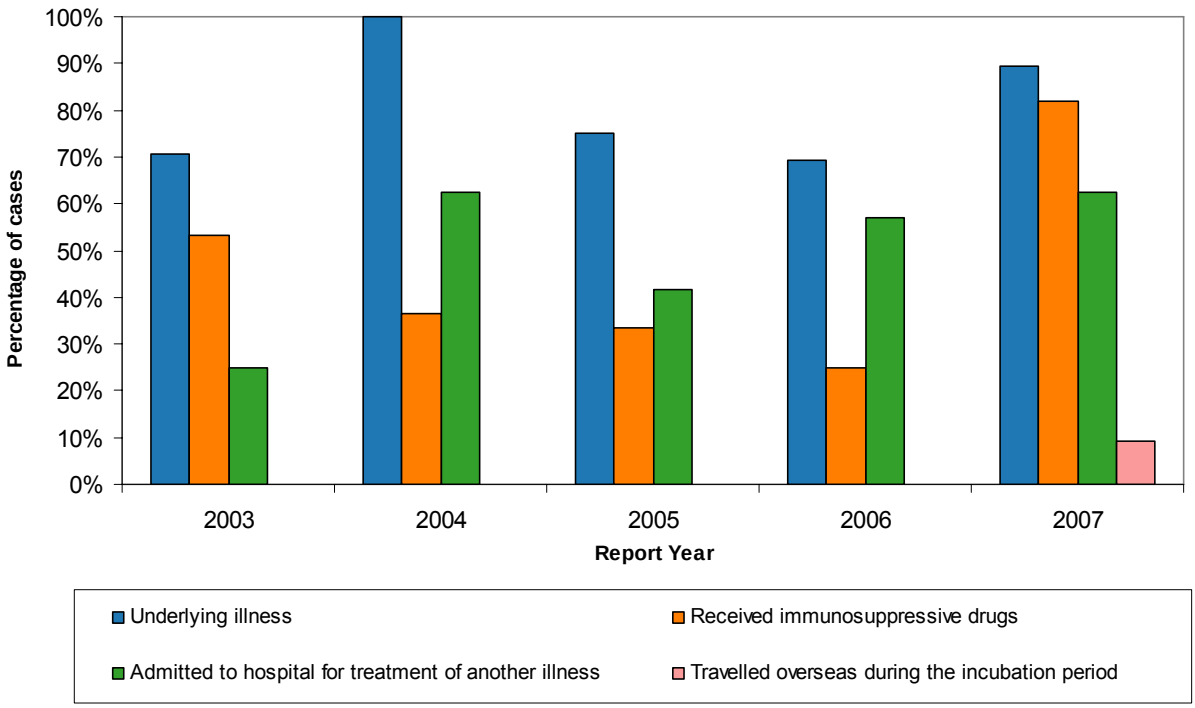
Table 40: Exposure to risk factors associated with listeriosis, 2007

	Notifications			
Risk Factor	**Yes**	**No**	**Unknown**	**%[a]**
Underlying illness	17	2	2	89.5%
Received immunosuppressive drugs	9	2	10	81.8%
Admitted to hospital for treatment of another illness	10	6	5	62.5%
Travelled overseas during the incubation period	1	10	10	9.1%

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

Between 2003 and 2007 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 cases. Overseas travel is not reported to be an important risk factor for listeriosis.

Figure 34: Listeriosis risk factors by percentage of cases and year, 2003 – 2007



4.11.3.4 Estimate of travel-related cases

For cases where information on travel was provided, 9.1% (1/11; 95%CI 0.2-33.5%) had travelled overseas during the incubation period. Assuming that the cases for which travel information was provided were representative of all listeriosis cases, a Poisson distribution can be used to estimate the total number of potentially travel related cases of listeriosis in 2007. The resultant distribution has a mean of 2 cases (95% CI 0-10).

4.11.4 Outbreaks reported as caused by *Listeria* spp.

No listeriosis outbreaks were reported in EpiSurv in 2007.

4.11.4.1 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratories, *Listeria monocytogenes* was isolated from a smoked fish sample implicated in an investigation of a single case.

4.11.5 Recent Surveys

Nil.

4.11.6 Relevant New Zealand studies and publications

Nil.

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 norovirus in faecal or vomit specimen or leftover food
Case classification:	
Probable	A clinically compatible illness that is either a contact of a confirmed case of the same disease, or has had contact with the same common source i.e., is part of an identified common source outbreak
Confirmed	A clinically compatible illness that is laboratory confirmed

4.12.2 Norovirus infection cases reported in 2007 by data source

The ICD-10 code A08.1 was used to extract norovirus hospitalisation data from the NZHIS NMDS database. Of the 154 hospital admissions (3.6 admissions per 100 000 population) recorded in 2007, 31 were reported with norovirus as the primary diagnosis and 123 with norovirus as another relevant diagnosis.

An expert consultation estimated that 40% (minimum = 28%, maximum = 49%) 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

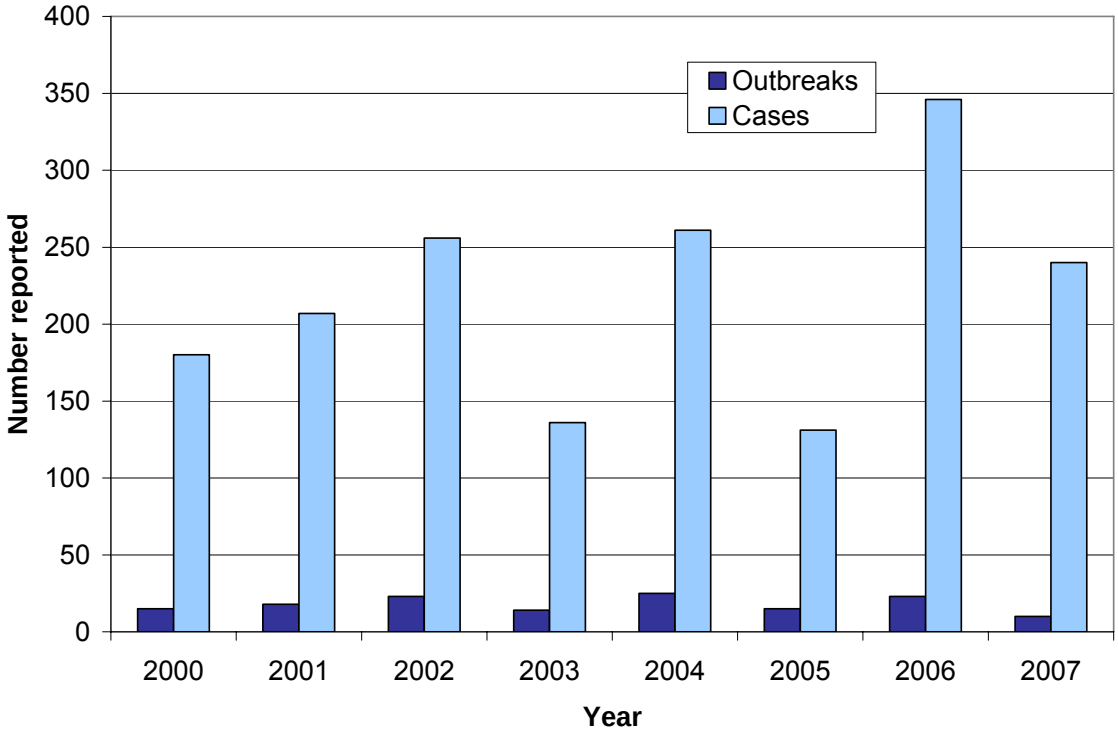
During 2007 there were 206 norovirus outbreaks reported in EpiSurv and of these 10 were associated with a suspected or known foodborne source (Table 41). A total of 240 cases were associated with these foodborne outbreaks.

Table 41: Norovirus outbreaks reported, 2007

Measure (No.)	Foodborne norovirus outbreaks	All norovirus outbreaks
Outbreaks	10	206
Cases	240	5 902
Hospitalised cases	1	129

Since 2000 the number of foodborne associated norovirus outbreaks reported each year has ranged from 10 (in 2007) to 25 (in 2004). The total number of cases associated with these outbreaks has ranged from 131 (in 2005) to 346 (in 2006).

Figure 35: Foodborne norovirus outbreaks and associated cases reported by year, 2000 – 2007



4.12.3.1 Details of food-associated outbreaks

Table 42 contains details of the 10 food–associated norovirus outbreaks reported in 2007.

Table 42: Details of food-associated norovirus outbreaks, 2007

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Auckland (September)	Unknown	Takeaway	5C, 9P	2, 4
Auckland (September)	Unknown	Takeaway	1C, 1P	2, 4
Auckland (October)	Unknown	Café	2C, 2P	1, 4
Auckland (November)	Butter chicken	Event centre	5C	6
Auckland (November)	Salad	Camp	3C, 43P	2
Canterbury (April)	Rice/couscous salad	Caterers	4C, 84P	2, 3
Canterbury (September)	Unknown	Café	1C, 14P	2
Northland (July)	Unknown	Café	27C	1, 3
Rotorua (June)	Chicken rolls	Home, Takeaway	2C, 1P	2
Wellington (May)	Shrimps	Café, Caterers	36C	2, 3

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

4.12.3.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratories, norovirus was detected in faecal samples from 93 investigations. Norovirus was not detected in any associated food samples, although food samples were rarely submitted in relation to these investigations. A diverse range of foods were implicated in these investigations, although in many cases no particular food was implicated.

4.12.4 Relevant New Zealand studies and publications

4.12.4.1 Reports

Norovirus Detection in Shellfish (Greening and Hewitt, 2007)

From 1 July 2006 to 30 June 2007, 36 shellfish samples were submitted to ESR and tested for norovirus using the IANZ accredited ESR method. The samples were from New Zealand (13), Korea (13) and Australia (10). Of these, 8 samples were associated directly with outbreaks, and 7/8 of these were imported from Korea. The other outbreak-related sample was mussels from New Zealand, which tested negative for norovirus. A further 6 samples from Korea were submitted in association with norovirus outbreak investigations. Other non-outbreak related samples were submitted for environmental surveillance.

A total of 19/36 (53%) were positive for either GI and/or GII norovirus. No samples were positive for NV GI only, 8 samples (22%) were positive for NV GII only and 11 samples (11/36, 31%) were positive for both norovirus GI and GII.

Quantitation calculations were carried out, with samples from Korea having levels of NV GII ranging between 91-219 RTPCRU copies/gram, whilst the New Zealand shellfish having levels

between 154-3652 RTPCRU/gram, which equates to approx 10^2 and 10^2-10^3 NV copies per g of gut from oyster and tuatua respectively (approx 1 g gut per sample). Other samples with 2 or less replicates testing positive for norovirus were considered to have norovirus levels too low to provide meaningful quantification.

4.12.4.2 Journal papers and articles

A series of papers and articles were published, reporting outbreaks of norovirus infection due to consumption of raw Korean oysters. These included:

- An outbreak associated with an international rugby test at Eden Park, Auckland affecting an estimated 352 patrons at an attack rate of 65% (Simmons *et al.*, 2007). Norovirus GI and GII were found in the stools of cases and in shucked, raw imported Korean oysters from batches consumed by cases. A retrospective cohort study found the strongest statistical association between cases with consumption of oysters (Relative risk 11.9 for one of four hospitality areas).
- An outbreak reported in New Plymouth affecting six people (Rohleder and de Jager, 2007),
- A further article mentioned an outbreak associated with a sports tournament in Christchurch and offered practical information on norovirus and what food businesses could do to reduce risks (Anonymous, 2007).

4.12.5 Relevant regulatory developments

Following responses from a discussion document, NZFSA announced changes to the Prescribed Food Standard and import requirements for bivalve molluscan shellfish (BMS) due to increased frequency of norovirus infections associated with imported shellfish.

NZFSA has introduced amendments that will better manage food safety hazards associated with BMS, such as growing beds exposed to sewage and biotoxin and metal contaminants. International best practice for managing these risks is for a programme to be introduced that assesses and manages the food safety hazards associated with growing, harvesting, transporting, processing and labelling BMS.

Imports will be required to comply with or be equivalent to the New Zealand BMS standard. Consignments of BMS arriving in New Zealand will only be cleared if the exporting country has a recognised BMS programme that manages hazards in a way that meets New Zealand's requirements.

Countries that have been exporting BMS to New Zealand and do not have a recognised programme have 12 months from the implementation date to apply to NZFSA for assessment of their country's BMS programme. During this transition period, countries may export BMS to New Zealand under current import requirements until their assessment is completed. After this period only countries which have applied for assessment will be able to export BMS to New Zealand, either under current import requirements where they are yet to be assessed or under agreed pre-clearance arrangement where assessment has been completed.

http://www.nzfsa.govt.nz/publications/food-connect/2007/Food_Connect_Spring_2007.pdf

4.13 Salmonellosis

Summary data for salmonellosis in 2007 are given in Table 43.

Table 43: Summary surveillance data for salmonellosis, 2007

Parameter	Value in 2007	Section reference
Number of cases	1 274	4.13.2
Rate (per 100 000)	30.1	4.13.2
Hospitalisations (%)	150 (11.8%)	4.13.2
Deaths (%)	1 (0.08%)	4.13.2
Estimated travel-related cases (%)	287 (22.5%)	4.13.3.6
Estimated food-related cases (%)*	599 (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 2007 by data source

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

During 2007, 1 274 notifications (30.1 cases per 100 000 population) of salmonellosis were reported in EpiSurv. The Enteric Reference Laboratory at ESR confirmed 1 267 *Salmonella* isolates (30.0 cases per 100 000).

The ICD-10 code A02 was used to extract salmonellosis hospitalisation data from the NZHIS NMDS database. Of the 150 hospital admissions (3.5 admissions per 100 000 population) recorded in 2007, 123 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 2007.

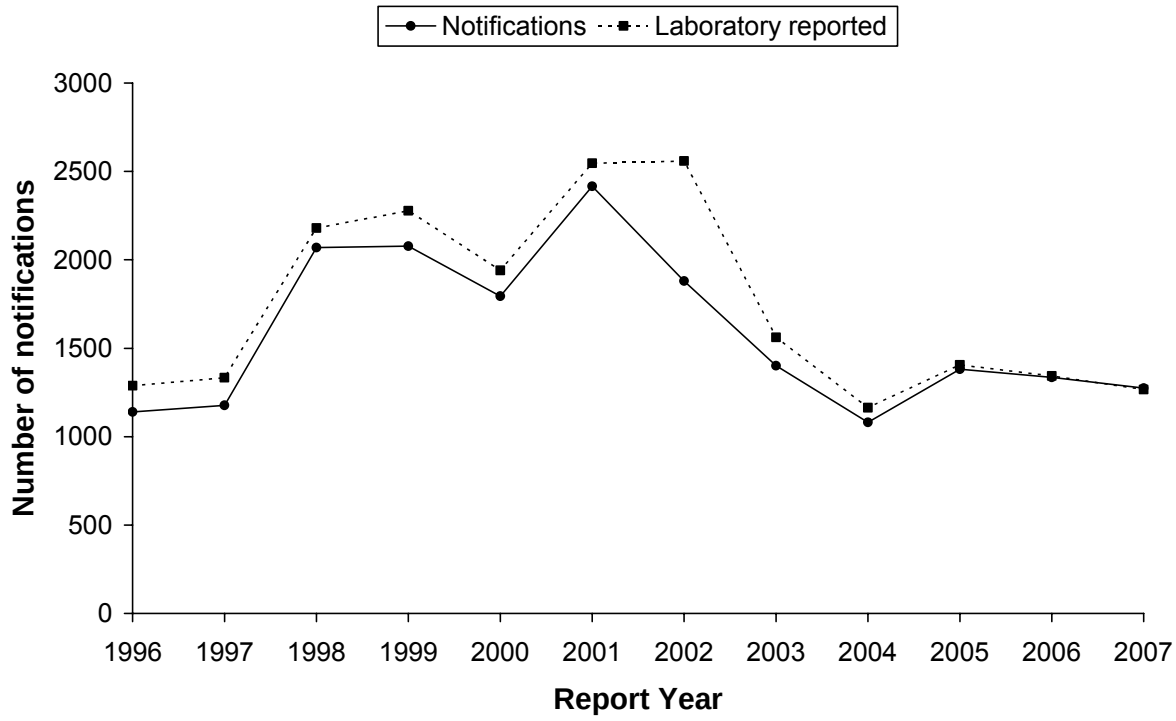
It has been estimated by expert consultation that 61% (minimum = 45%, maximum = 69%) of salmonellosis incidence is due to foodborne transmission. It was further estimated that 36% of foodborne transmission was due to transmission via poultry.

4.13.3 Notifiable disease data

4.13.3.1 Annual notification trend

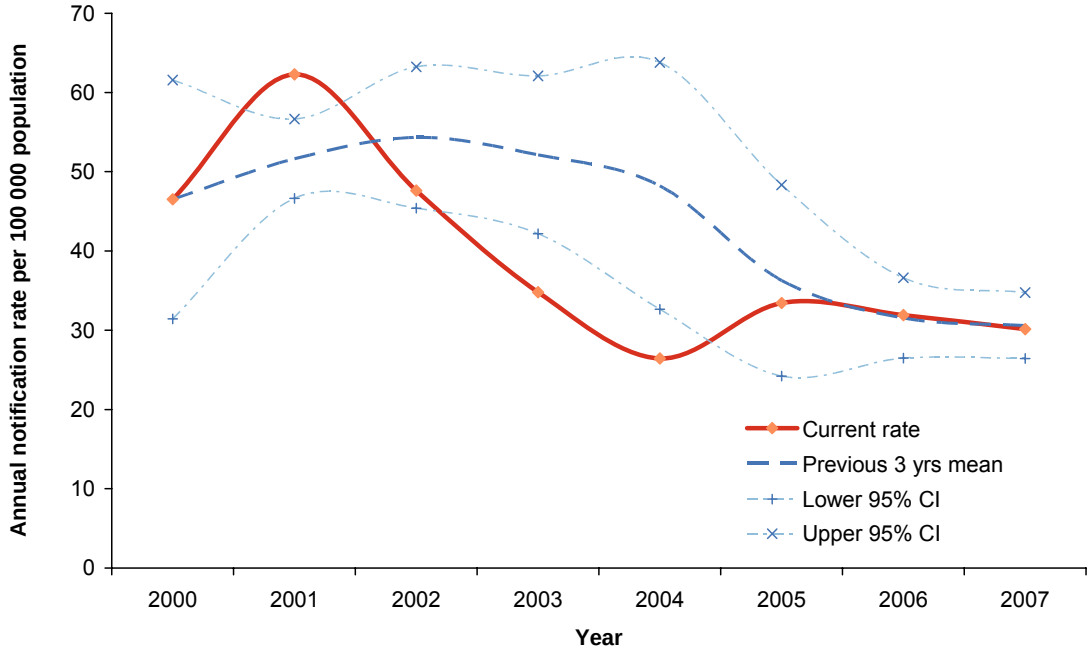
After 1996 there was a general annual increase in the number of salmonellosis notifications with the highest number reported in 2001 (2 417 cases) (Figure 36). After 2001 the number of notifications decreased to a low in 2004 (1 081 cases) before increasing slightly in more recent years.

Figure 36: Salmonellosis notifications and laboratory reported cases by year, 1996-2007



The 2007 salmonellosis notification rate was 30.1 cases per 100 000 population. Over the eight year period from 2000 to 2007 the salmonellosis annual notification rate was highest in 2001 before decreasing steadily to a low in 2004 and levelling off after that (Figure 37).

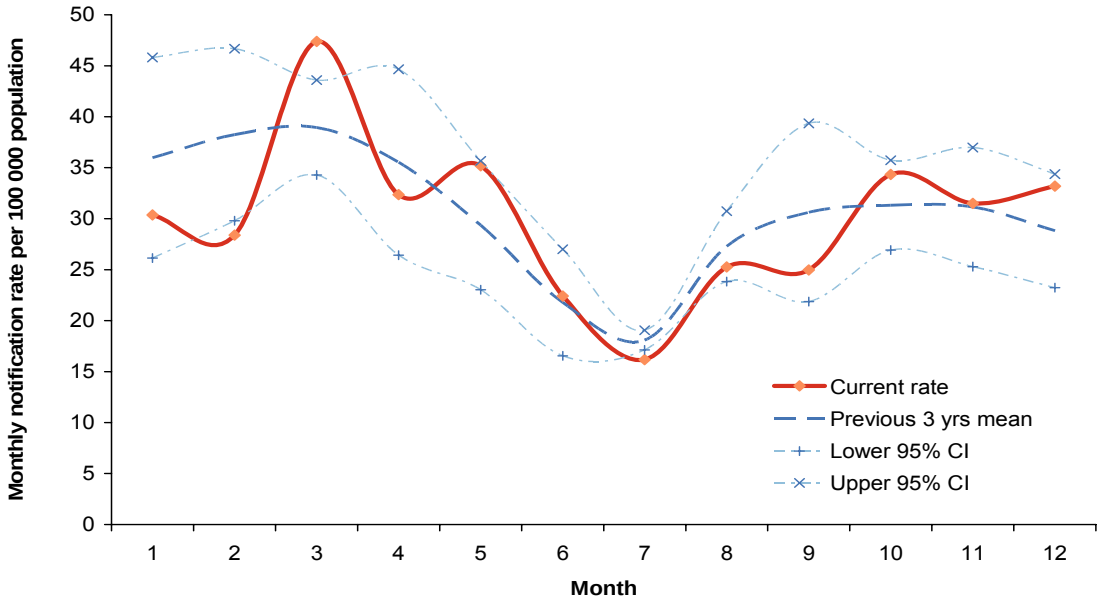
Figure 37: Salmonellosis notification rate by year, 2000-2007



4.13.3.2 Seasonality

Salmonellosis notifications reported per 100 000 population by month for 2007 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.

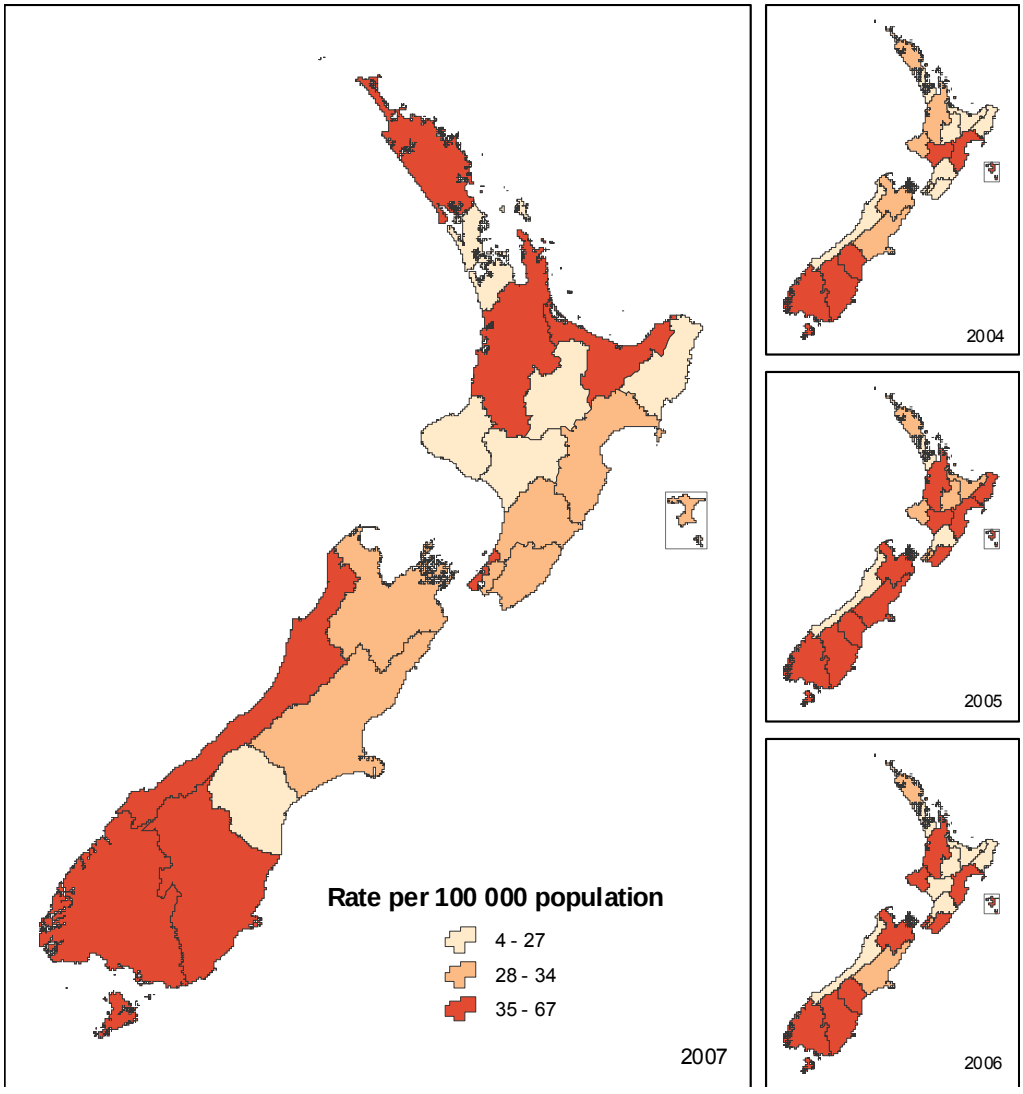
Figure 38: Salmonellosis notification monthly rate (annualised) for 2007



4.13.3.3 Geographic distribution of salmonellosis notifications

Rates vary throughout the country as illustrated in Figure 39. The highest rates were recorded in Southland (48.9 per 100 000 population) and Bay of Plenty (45.3 per 100 000). From 2004 to 2007 Otago and Southland DHBs consistently feature in the quantile with the highest notification rates and West Coast and MidCentral DHBs in the quantile with the lowest notification rates. However, some changes in geographical distribution were apparent in 2007 with West Coast and Bay of Plenty DHBs, historical in the quantile with the lowest notification rates, being in the quantile with the high notification rates.

Figure 39: Geographic distribution of salmonellosis notifications, 2004-2007



4.13.3.4 Age and sex distribution of salmonellosis cases

In 2007, 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 being hospitalised (Table 44).

Table 44: Salmonellosis cases by sex, 2007

Sex	EpiSurv notifications		Hospitalisations[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No
Male	652	31.5	85	4.1	1
Female	600	27.8	65	3.0	
Unknown	22				
Total	1 274	30.1	150	3.5	1

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

In 2007, age-specific salmonellosis rates were highest for those aged less than one for both the EpiSurv notifications (111.7 per 100 000) and NZHIS hospitalisations (14.6 per 100 000 population) (Table 45). One to four year olds also had a high salmonellosis rate compared to other age groups (108.4 per 100 000).

Table 45: Salmonellosis cases by age group, 2007

Age groups	EpiSurv notifications		Hospitalisations[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	69	111.7	9	14.6	
1 to 4	250	108.4	21	9.1	
5 to 9	70	24.1	7	2.4	
10 to 14	58	18.9	8	2.6	
15 to 19	69	21.6	5	1.6	
20 to 29	172	30.8	19	3.4	
30 to 39	145	24.5	6	1.0	
40 to 49	150	23.8	23	3.6	1
50 to 59	112	21.8	12	2.3	
60 to 60	102	28.3	17	4.7	
70+	69	19.0	23	6.3	
Unknown	8				
Total	1 274	30.1	150	3.5	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 factor for salmonellosis notification cases during 2007 was consumption of food from retail premises (44.7%) followed by contact with farm animals (30.2%) and travel overseas during the incubation period (22.5%) (Table 46).

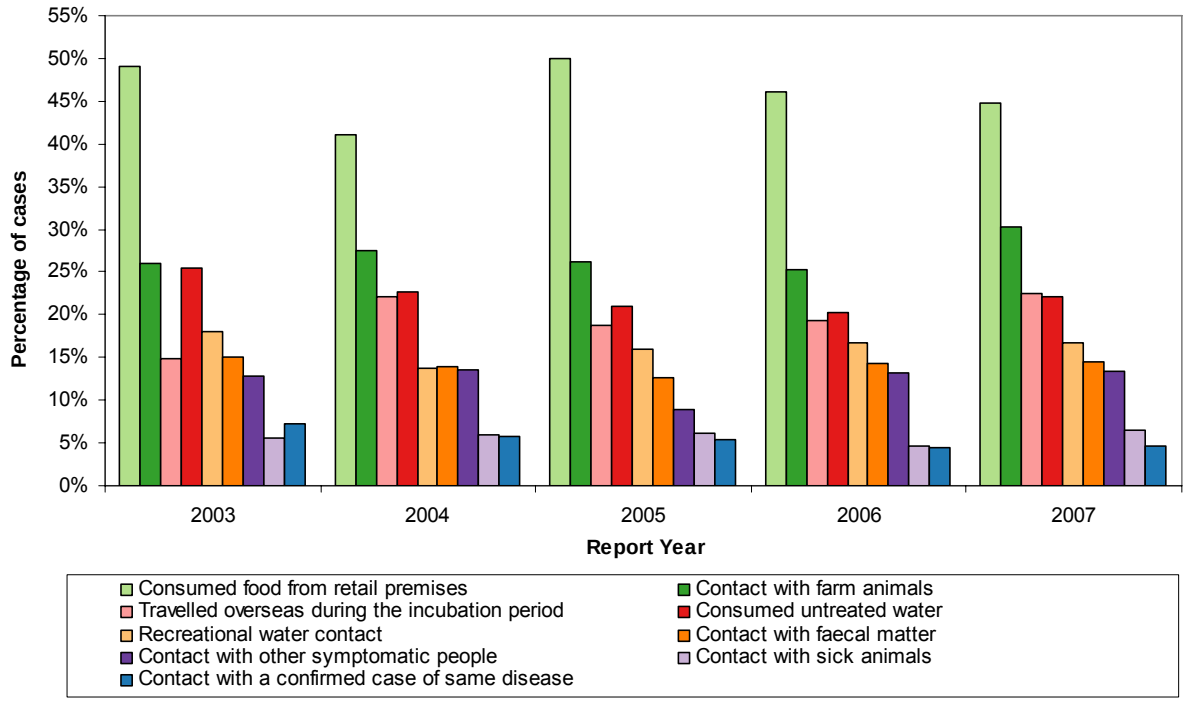
Table 46: Exposure to risk factors associated with salmonellosis, 2007

	Notifications			
Risk Factor	**Yes**	**No**	**Unknown**	**%[a]**
Consumed food from retail premises	212	262	800	44.7%
Contact with farm animals	180	416	678	30.2%
Travelled overseas during the incubation period	159	547	568	22.5%
Consumed untreated water	96	338	840	22.1%
Recreational water contact	86	426	762	16.8%
Contact with faecal matter	77	455	742	14.5%
Contact with other symptomatic people	73	470	731	13.4%
Contact with sick animals	34	483	757	6.6%
Contact with a confirmed case of same disease	25	513	736	4.6%

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

Between 2003 and 2007 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, 2003 – 2007



4.13.3.6 Estimate of travel-related cases

For cases where information on travel was provided, 22.5% (159/706; 95%CI 19.2-26.2%) 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 2007. The resultant distribution has a mean of 287 cases (95% CI 233-345).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 20.4% (95% CI 18.9-21.9%).

4.13.4 Outbreaks reported as caused by *Salmonella* spp

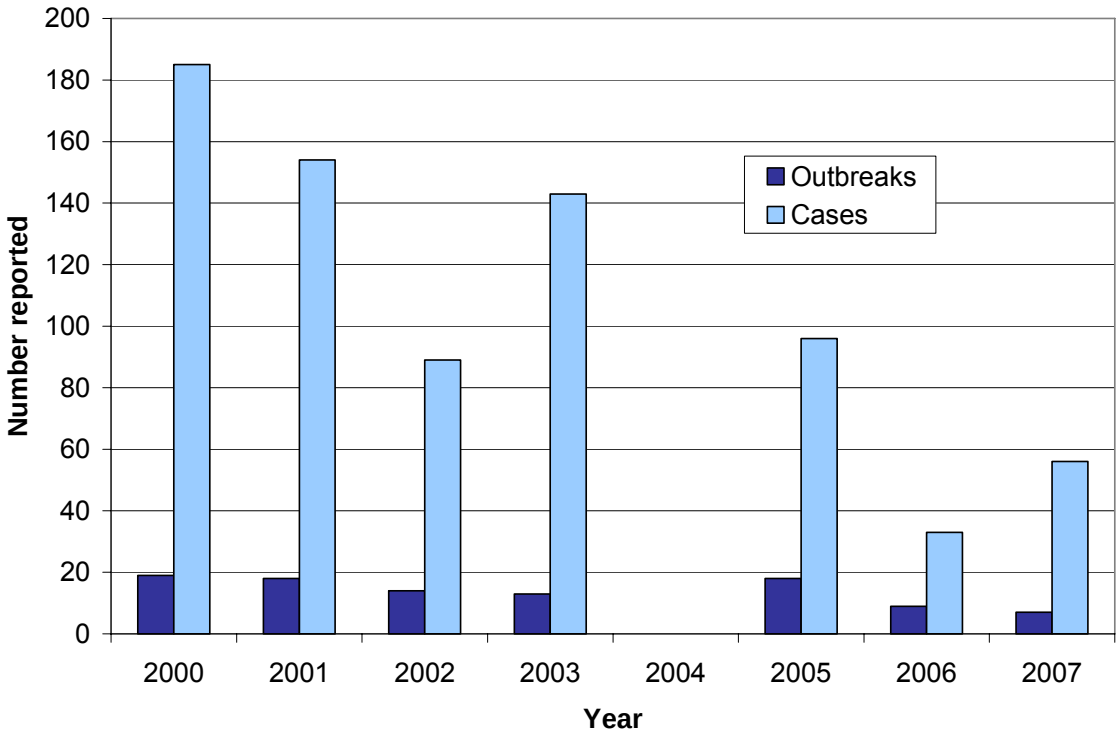
In 2007, there were eight salmonellosis outbreaks reported with seven of these with a suspected or known foodborne related source (Table 47).

Table 47: *Salmonella* spp. outbreaks reported, 2007

Measure (No.)	Foodborne *Salmonella* spp. outbreaks	All *Salmonella* spp. outbreaks
Outbreaks	7	8
Cases	56	141
Hospitalised cases	2	9

The number of foodborne outbreaks reported between 2000 and 2007 ranged from seven to twenty, generally decreasing in number over time (Figure 41). The total numbers of cases associated with the outbreaks have also generally decreased over this period.

Figure 41: Foodborne *Salmonella* spp. outbreaks and associated cases reported by year, 2000–2007



4.13.4.1 Details of food-associated outbreaks

Table 48 contains details of the seven food–associated *Salmonella* spp. outbreaks reported in 2007.

Table 48: Details of food-associated *Salmonella* spp. outbreaks, 2007

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Auckland (April)	Chicken pizza	Takeaway	1C, 1P	2
Hawke's Bay (December)	Unknown	Home	11C	2
Otago (April)	Unknown	Home	1C, 3P	2
Tauranga (March)	Unknown	Unknown	5C	6
Waikato (October)	Unknown	Café	5C	2
Wellington (March)	Chicken	Community	11C, 8P	2
Wellington (October)	Chicken, lamb or vegetarian kebabs	Takeaway	10C	2, 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.

4.13.4.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratories, no samples were found to be positive for *Salmonella* spp.

4.13.5 *Salmonella* types commonly reported

4.13.5.1 Human isolates

A total of 1 267 non-Typhi human isolates were typed by ESR's Enteric Reference Laboratory during 2007. Of these isolates, 596 (47.0%) were *Salmonella* Typhimurium.

Table 49 shows the number of cases of selected *Salmonella* types reported by the Enteric Reference Laboratory at ESR. The incidence of all *S.* Typhimurium definitive types (DT) was generally lower than 2006 numbers but greater than 2004. DT160 remained the most common single type.

Table 49: Selected *Salmonella* serotypes and subtypes of laboratory-confirmed salmonellosis, 2004 – 2007

Subtype	2004	2005	2006	2007
S. Typhimurium	580	757	733	596
DT160	221	248	260	152
DT1	65	114	72	91
DT156	56	75	87	73
DT101	31	67	71	43
DT74	46	28	42	29
Other or unknown	161	225	201	208
S. Enteritidis	142	151	107	151
PT9a	44	73	53	60
PT1b	9	9	9	18
PT26	8	9	7	17
Other or unknown	81	60	38	56
S. Infantis	63	67	58	86
S. Brandenburg	86	68	55	47
S. Chester	0	0	1	37
S. Virchow	26	16	13	34
S. Saintpaul	33	65	35	25
S. Corvallis	11	14	20	17
Other or unknown serotypes	223	268	321	274
Total	**1 164**	**1 406**	**1 343**	**1 267**

4.13.5.2 Non-human isolates

A total of 1 001 non-human *Salmonella* isolates were typed by ESR's Enteric Reference Laboratory during 2007 (Table 50).

Table 50: Selected *Salmonella* serotypes and subtypes from non-human sources, 2006-2007

Subtype	2006	2007	Major Sources
S. Typhimurium	543	333	
DT101	189	73	Bovine (33), miscellaneous poultry (18), poultry environmental (9)
RDNC	33	52	Bovine (14), feline (12)
DT1	40	36	Bovine (28)
DT160	75	30	Equine (7), bovine (6), avian (5), environmental (5)
DT135	22	27	Bovine (15)
Other or unknown	184	115	
S. Brandenburg	319	191	Ovine (111), bovine (39), environmental (14), food (11)
S. Hindmarsh	162	110	Ovine (91), bovine (16)
S. Infantis	68	70	Food (23), poultry environmental (19)
S. Give 15+	1	31	Poultry feed (30)
S. Anatum	13	25	Meat and bone meal (16)
S. Agona	34	22	Poultry environmental (12)
Other or unknown serotypes	277	219	
Total	**1 417**	**1 001**	

S. Brandenburg remains the most commonly found non-human *Salmonella* serotype.

4.13.5.3 Outbreak types

Table 51 shows the number of hospitalised cases and total cases by subtype for foodborne *Salmonella* outbreaks reported during 2007. Each of the seven outbreaks was associated with a different subtype. The *Salmonella* Typhimurium phage type 156 outbreak was associated with the most cases (19). There were two foodborne *Salmonella* outbreaks where a case was hospitalised (*Salmonella* Montevideo and *Salmonella* Typhimurium phage type 160).

Table 51: *Salmonella* serotypes and subtypes reported in foodborne outbreaks, 2007

Pathogen and Subtype	Outbreaks	Hospitalised cases	Total cases
Salmonella Typhimurium phage type 160	1	1	2
Salmonella Enteritidis phage type 26	1	0	11
Salmonella spp.	1	0	4
Salmonella Infantis	1	0	5
Salmonella Typhimurium phage type 8	1	0	5
Salmonella Typhimurium phage type 156	1	0	19
Salmonella Montevideo	1	1	10

Note: The order of the outbreak serotypes and subtypes in this table corresponds to the order of the associated outbreaks in Table 48.

4.13.6 Recent surveys

Nil.

4.13.7 Relevant New Zealand studies and publications

4.13.7.1 Reports

Modelling of exposure of New Zealand consumers to *Salmonella* (NZFSA, 2007)

The New Zealand Food Safety Authority (NZFSA) is committed to the development of risk-based food safety standards for the domestic, import and export sectors using robust risk analysis methods. To this end a major evaluation has been conducted of:

- The relative likelihood of New Zealanders becoming ill from *Salmonella* transmitted via food compared with *Salmonella* being transmitted via other pathways such as direct contact with animals and overseas travel
- Changes in relative likelihood of foodborne salmonellosis that may eventuate from importation of poultry products from overseas according to specific import scenarios.

This Science Group report provides the scientific basis for identification and selection of risk management options in relation to different scenarios for imported poultry products.

Potential Re-growth of *Salmonella* from Contaminated Pet Chews (Wong, 2007)

The aim of this project was to investigate the potential for *Salmonella* transfer from contaminated pet chews to a handler's hand and re-growth of *Salmonella* on pet chews moistened with artificial dog saliva.

Sixteen packs of *Salmonella* contaminated pet chews from a previous study were used to conduct the hand transfer and re-growth experiments. Transfer of <10 CFU of *Salmonella* by hand was demonstrated in one sample. Re-growth of *Salmonella* on pet chews was not observed after re-hydration for up to 72 hours with artificial dog saliva electrolyte. The pH of the electrolyte (9.78) is sufficiently high that it could be inhibiting the re-growth of *Salmonella*. Counts of <2 to 300 CFU of *Salmonella* were enumerated from the moistened pet chews. *Salmonella* survived for at least 279 days on some pet chews.

It was concluded that contaminated pet chews can transfer *Salmonella* cells to a person's hand but salmonellae are unlikely to grow over time on pet chews moistened with dog saliva electrolyte. While dog saliva may inhibits growth of *Salmonella* on partially eaten pet chews, *Salmonella* could survive and be ingested by pets as well as transferred to a person's hand when feeding pets.

Review of Notified Salmonellosis Outbreak Data as a Source of Information for Attribution (King and Lake, 2007)

Accumulated information on outbreaks of a particular illness provides one means of assigning attribution i.e. identifying sources and vehicles of infection, and their relative importance. In New Zealand, outbreaks of many infectious illnesses are reported by public health units via the notifiable diseases reporting system, and collated by a dedicated module of the EpiSurv database administered by ESR.

The proportion of New Zealand outbreaks of salmonellosis for which there is strong evidence to identify a source or vehicle was 28/251 (11.1%). The information provided in outbreak records appears reasonably complete, although in many instances the vehicle and mode of transmission information is suspected rather than confirmed. For nearly half the outbreaks a serovar or phage type is not currently recorded, and more complete information of this type would enhance the data considerably.

For risk attribution and management, the most useful signal from this analysis appears to be the importance of infected food handlers. These were identified in 12 of the 28 outbreaks in which there was reasonable evidence to indicate a source. All but one of these 12 outbreaks occurred in a food vendor or event setting. Overall, the picture that emerges for salmonellosis outbreaks is that the etiology is hugely varied, although foodborne transmission is suggested for 40% of outbreaks, amongst which infected food handlers account for perhaps half of these.

4.13.8 Relevant regulatory developments

Nil.

4.14 Shigellosis

Summary data for shigellosis in 2007 are given in Table 52.

Table 52: Summary surveillance data for shigellosis, 2007

Parameter	Value in 2007	Section reference
Number of cases	126	4.14.2
Rate (per 100 000)	3.0	4.14.2
Hospitalisations (%)	58 (46.0%)	4.14.2
Deaths (%)	0 (0%)	4.14.2
Estimated travel-related cases (%)	71 (56.3%)	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 2007 by data source

During 2007, 126 notifications (3.0 cases per 100 000 population) of shigellosis were reported in EpiSurv. The Enteric Reference Laboratory at ESR confirmed 127 *Shigella* isolates (3.0 per 100 000 population).

The ICD-10 code A03 was used to extract shigellosis hospitalisation data from the NZHIS NMDS database. Of the 58 hospital admissions (1.4 admissions per 100 000 population) recorded in 2007, 27 were reported with shigellosis as the primary diagnosis and 31 with shigellosis as another relevant diagnosis.

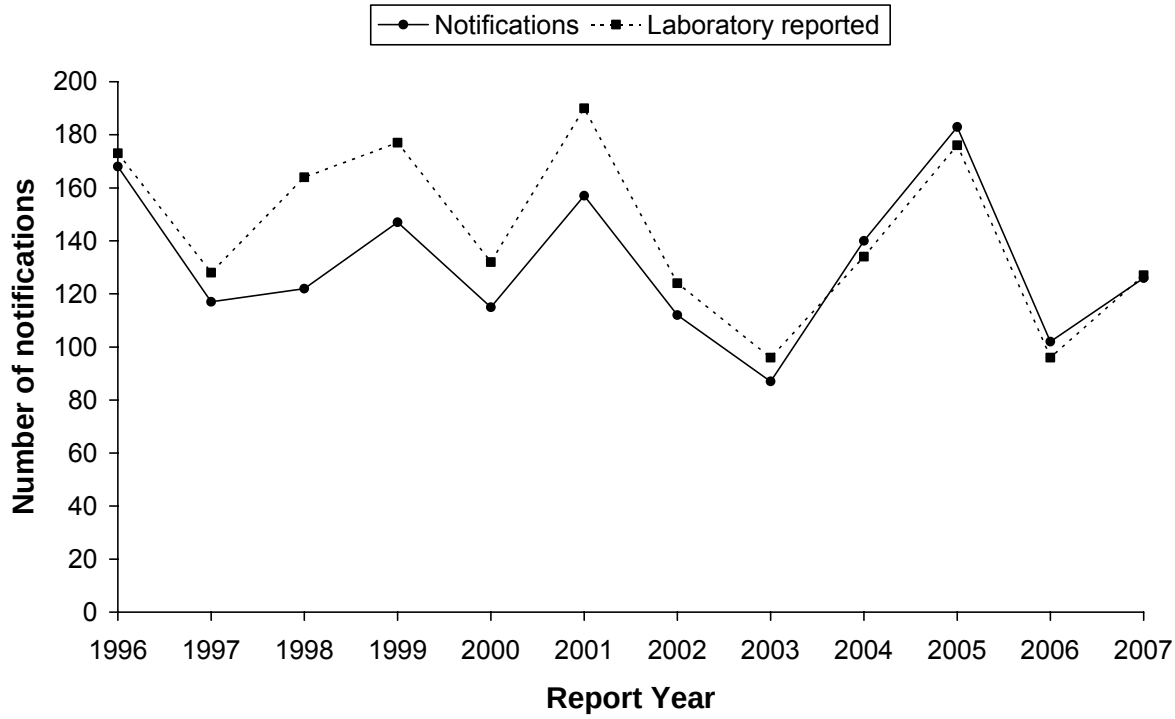
No deaths resulting from shigellosis were recorded in EpiSurv in 2007

4.14.3 Notifiable disease data

4.14.3.1 Annual notification trend

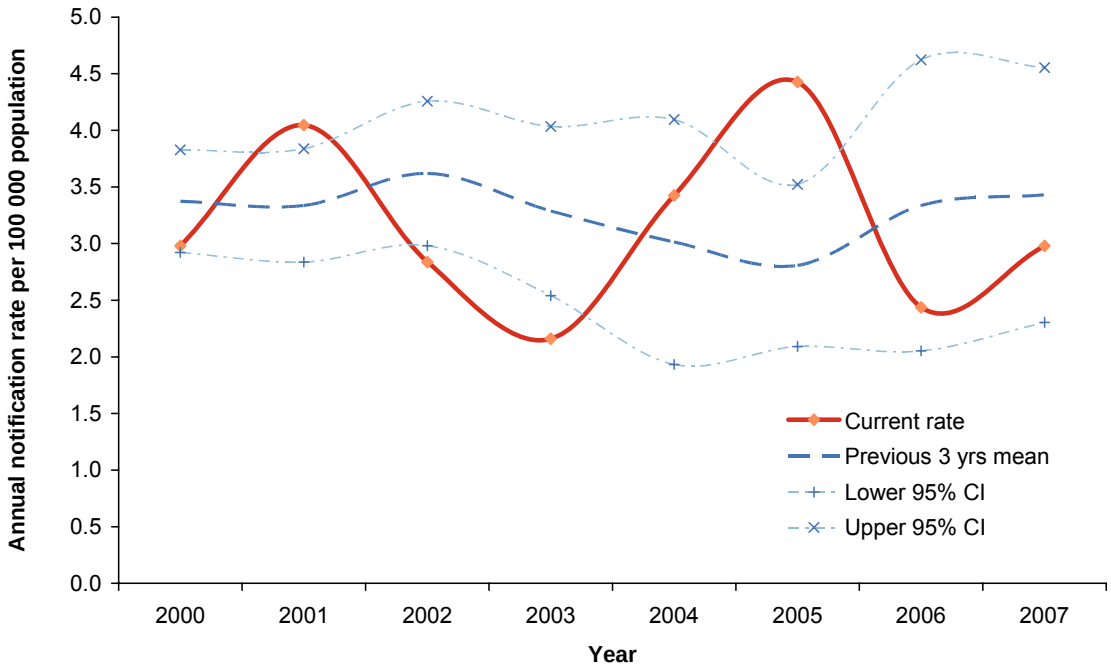
The number of notifications and laboratory reported cases of shigellosis fluctuates each year (Figure 42).

Figure 42: Shigellosis notifications and laboratory reported cases by year, 1996-2007



The 2007 notification rate (3.0 per 100 000 population) was higher than the 2006 rate (2.4 per 100 000, 102 cases), but below the annualised rate for the 10 year period 1997-2006 (3.2 per 100 000) (Figure 43).

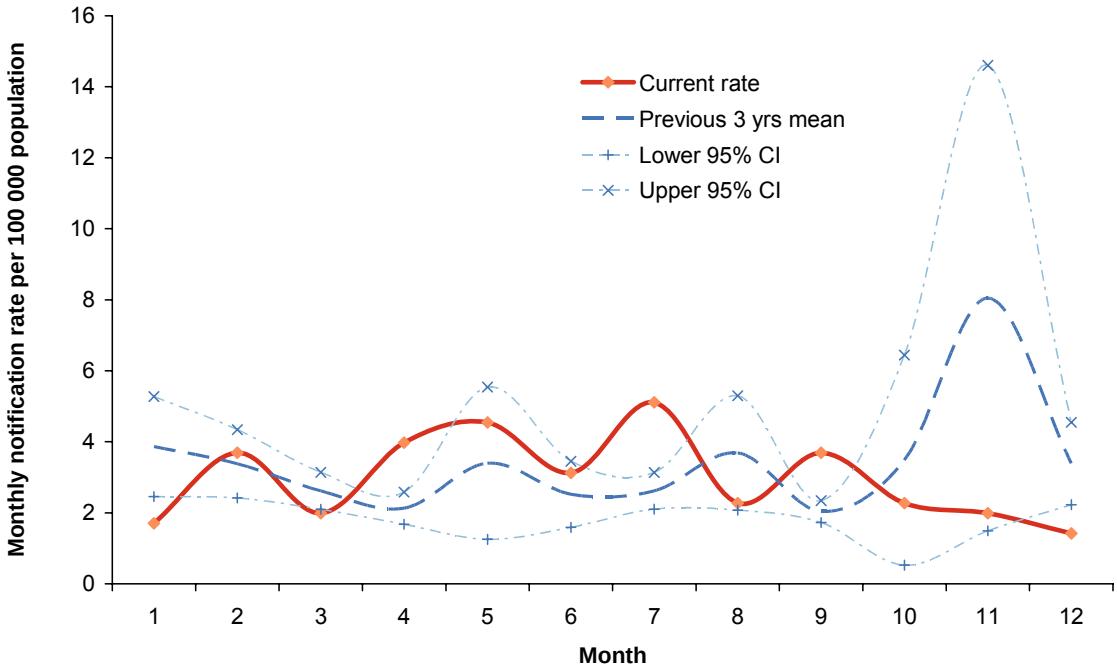
Figure 43: Shigellosis notification rate by year, 2000-2007



4.14.3.2 Seasonality

The number of notified cases of shigellosis per 100 000 population by month for 2007 is shown in Figure 44. In 2007, shigellosis notifications were highest in May and July. 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 2007



4.14.3.3 Age and sex distribution of shigellosis cases

The number and rates of notifications for shigellosis were similar for males and females (Table 53), although the number and rate of hospitalisations was slightly higher for females.

Table 53: Shigellosis cases by sex, 2007

Sex	EpiSurv notifications		Hospitalisations[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No
Male	60	2.9	10	0.5	
Female	65	3.0	18	0.8	
Unknown	1				
Total	126	3.0	28	0.7	

[a] NZHIS Morbidity data for hospital admissions

[b] per 100 000 of population

Age-specific shigellosis notification rates were highest for those aged between 1 and 4 years. This was consistent for the EpiSurv notifications (10.4 per 100 000) and NZHIS hospitalisations (2.2 per 100 000 population) (Table 54). One to four year olds also had a high shigellosis rate

compared to all other age groups. Notification and hospitalisation rates were lowest for those aged 15 to 19 years and 60 years and over.

Table 54: Shigellosis cases by age group, 2007

Age groups	EpiSurv notifications		Hospitalisations[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	1	1.6	1	1.6	
1 to 4	24	10.4	5	2.2	
5 to 9	6	2.1	3	1.0	
10 to 14	7	2.3	1	0.3	
15 to 19	6	1.9	0	0.0	
20 to 29	13	2.3	2	0.4	
30 to 39	18	3.0	6	1.0	
40 to 49	18	2.9	3	0.5	
50 to 59	22	4.3	6	1.2	
60 to 69	6	1.7	1	0.3	
70+	5	1.4	0	0.0	
Unknown	0				
Total	126	3.0	28	0.7	

[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 2007 was overseas travel during the incubation period (reported by 56.3% of cases) followed by contact with other symptomatic people (36.2%) and consumed food from retail premises (30.9%) (Table 55).

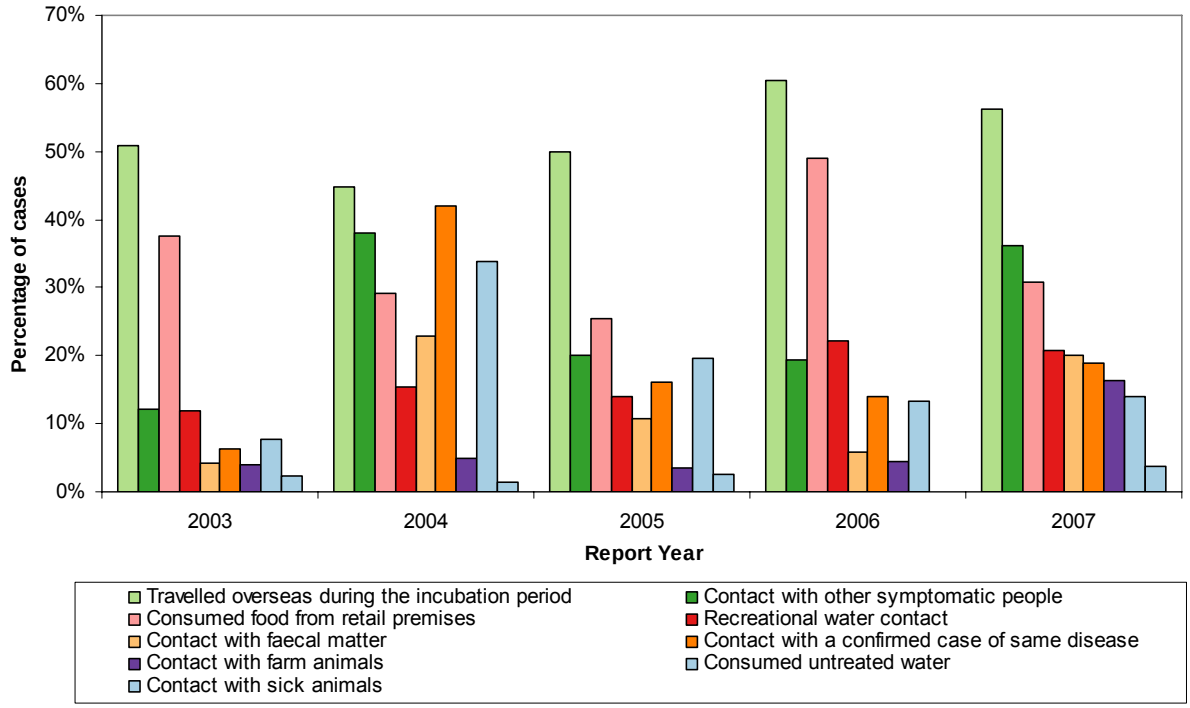
Table 55: Exposure to risk factors associated with shigellosis, 2007

	Notifications			
Risk Factor	**Yes**	**No**	**Unknown**	**%[a]**
Travelled overseas during the incubation period	54	42	30	56.3%
Contact with other symptomatic people	25	44	57	36.2%
Consumed food from retail premises	17	38	71	30.9%
Recreational water contact	12	46	68	20.7%
Contact with faecal matter	11	44	71	20.0%
Contact with a confirmed case of same disease	11	47	68	19.0%
Contact with farm animals	10	51	65	16.4%
Consumed untreated water	6	37	83	14.0%
Contact with sick animals	2	53	71	3.6%

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

During the five year period 2003 to 2007 the most commonly reported risk factors for shigellosis has consistently been overseas travel during the incubation period (Figure 45). Other reported risk factors have varied from year to year with no clear trends.

Figure 45: Shigellosis risk factors by percentage of cases and year, 2003 – 2007



4.14.3.5 Estimate of travel-related cases

For cases where information on travel was provided, 56.3% (54/96; 95% CI 44.8-78.6%) 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 2007. The resultant distribution has a mean of 71 cases (95% CI 48-97).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 52.2% (95% CI 45.4-59.5%).

4.14.4 Outbreaks reported as caused by *Shigella* spp

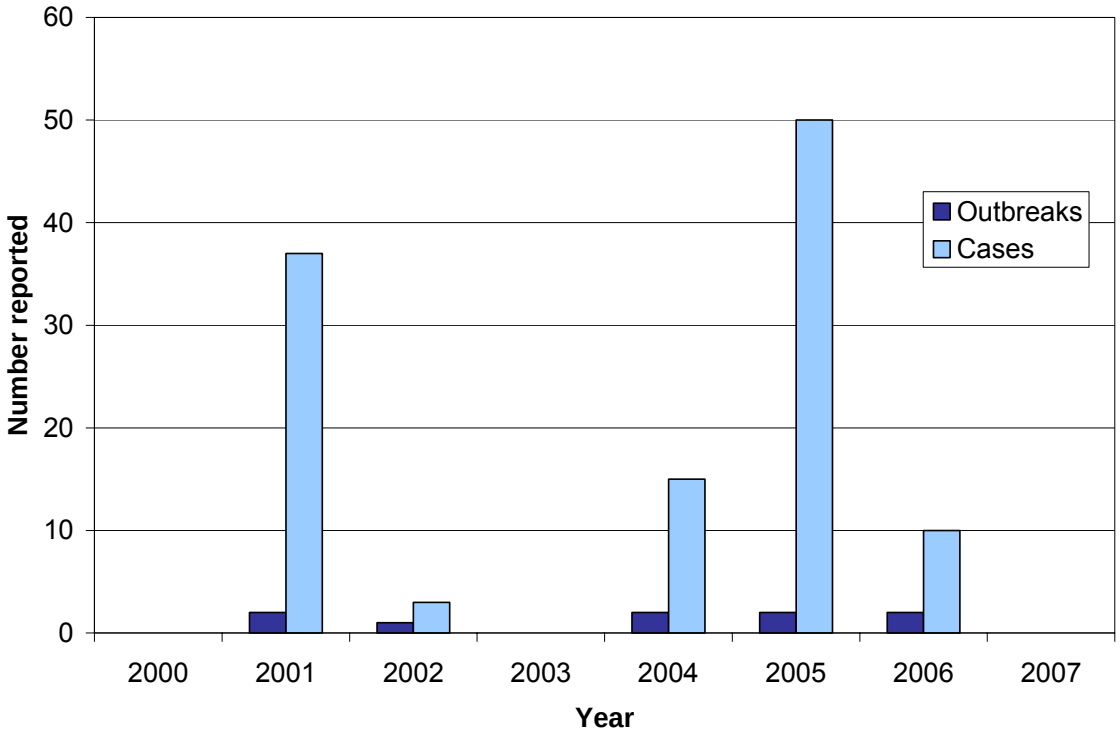
None of the six *Shigella* spp. outbreaks reported in EpiSurv in 2007 were foodborne (Table 56).

Table 56: *Shigella* spp. outbreaks reported, 2007

Measure (No.)	Foodborne *Shigella* spp. outbreaks	All *Shigella* spp. outbreaks
Outbreaks	0	6
Cases	0	24
Hospitalised cases	0	5

Foodborne shigellosis outbreaks are rare with not more than two outbreaks being reported each year from 2000 to 2007, however each outbreak may be associated with a large number of cases (on average 13 cases per outbreak from 2000 to 2007) (Figure 46).

Figure 46: Foodborne *Shigella* spp. outbreaks and associated cases reported by year, 2000 – 2007



4.14.4.1 Laboratory investigation of samples from suspected foodborne outbreaks

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

4.14.5 *Shigella* types commonly reported

There were 127 isolates of *Shigella* confirmed in 2007, compared with 96 in 2006. The predominant biotypes were *S. sonnei* (86 isolates) and *S. flexneri* (21 isolates).

4.14.6 Relevant New Zealand studies and publications

Nil.

4.14.7 Relevant regulatory developments

Nil.

4.15 *Staphylococcus aureus* Intoxication

4.15.1 Case definition

Clinical description: Gastroenteritis with sudden severe nausea and vomiting

Laboratory test for diagnosis: Detection of enterotoxin in faecal or vomit specimen or in leftover food or isolation of ≥10^3/gram coagulase-positive *S. aureus* from faecal or vomit specimen or ≥10^5 from leftover food

Case classification:

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

Confirmed: A clinically compatible illness that is laboratory confirmed

4.15.2 *Staphylococcus aureus* intoxication cases reported in 2007 by data source

In 2007, one notification of *Staphylococcus aureus* intoxication was reported in EpiSurv with no resulting deaths.

The ICD-10 code A05.0 was used to extract foodborne staphylococcal intoxication hospitalisation data from the NZHIS NMDS database. There were no hospital admissions with foodborne staphylococcal intoxication as a primary or other relevant diagnosis reported in 2007.

4.15.3 Outbreaks reported as caused by *Staphylococcus aureus*

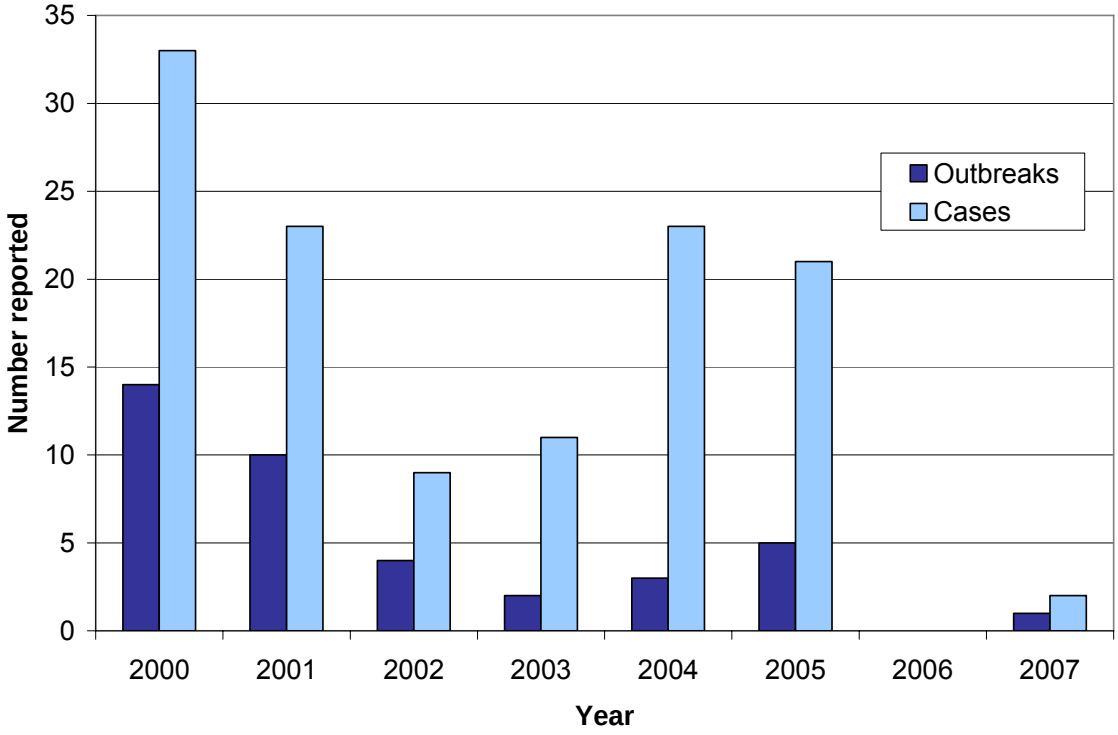
In 2007, one of two *Staphylococcus aureus* outbreaks reported in EpiSurv in 2007 was identified as foodborne (Table 57).

Table 57: *Staphylococcus aureus* outbreaks reported, 2007

Measure (No.)	Foodborne *Staphylococcus aureus* outbreaks	All *Staphylococcus aureus* outbreaks
Outbreaks	1	2
Cases	2	6
Hospitalised cases	0	0

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 2007 one *Staphylococcus aureus* outbreak involving two cases was 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

Table 58 contains details of the one food–associated *Staphylococcus aureus* outbreak reported in 2007. Evidence linking the cases to consumption of the implicated foods was generally weak.

Table 58: Details of food-associated *Staphylococcus aureus* outbreak, 2007

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Auckland (October)	Pork, chicken or beef stirfry	Takeaway	1C, 1P	2, 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

4.15.3.2 Laboratory investigation of samples from suspected foodborne outbreaks

During investigations of suspected foodborne illness outbreaks by ESR's Public Health Laboratories, two investigations revealed evidence of *S. aureus* intoxication. Findings included high levels of *S. aureus* in a fried chicken sample implicated in one investigation and high levels of *S. aureus* in the faecal sample from another investigation, in which an Asian meal was the implicated food. Enterotoxin was not detected in either case. The latter investigation related to the outbreak reported in Table 58.

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 result 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 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 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.

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 occurring within 24 hours of consuming shellfish OR one or more of the neurological signs/symptoms from group C 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 2007 by data source

There were three cases of toxic shellfish poisoning reported in EpiSurv in 2007. This continues the low number of toxic shellfish poisoning notifications in recent years. The poisoning occurred after the consumption of steamed mussels. Diarrhoeic shellfish poisoning toxins were detected.

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 seven hospital admissions recorded in 2007, six were reported with 'other fish and shellfish poisoning' as the primary diagnosis and one with this condition as another relevant diagnosis. Note that this ICD-10 code includes shellfish and other fish.

4.16.3 Outbreaks reported as caused by TSP

In 2007 there was one outbreak due to toxic shellfish poisoning reported in EpiSurv (Table 59).

Table 59: TSP outbreak reported, 2007

Measure (No.)	Foodborne TSP outbreaks	All TSP outbreaks
Outbreaks	1	1
Cases	2	2
Hospitalised cases	0	0

4.16.3.1 Details of food-associated outbreaks

Table 60 contains details of the one food–associated TSP outbreak reported in 2007.

Table 60: Details of food-associated TSP outbreak, 2007

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Taranaki (August)	Shellfish	Camp	2P	None

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

4.17 VTEC/STEC Infection

Summary data for VTEC/STEC infection in 2007 are given in Table 61.

Table 61: Summary surveillance data for VTEC/STEC infection, 2007

Parameter	Value in 2007	Section reference
Number of cases	100	4.17.2
Rate (per 100 000)	2.4	4.17.2
Hospitalisations (%)	47 (47.0%)	4.17.2
Deaths (%)	0 (0%)	4.17.2
Estimated travel-related cases (%)	6 (5.6%)	4.17.3.5
Estimated food-related cases (%)*	38 (40%)	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 2007 by data source

During 2007, 100 notifications (2.4 cases per 100 000 population) of VTEC/STEC infection were reported in EpiSurv. The Enteric Reference Laboratory received 97 isolates (2.3 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 47 hospital admissions recorded in 2007, 22 were reported with enterohaemorrhagic *Escherichia coli* infection as the primary diagnosis and 25 with this condition as another relevant diagnosis.

No deaths due to VTEC/STEC infection were recorded in EpiSurv in 2007.

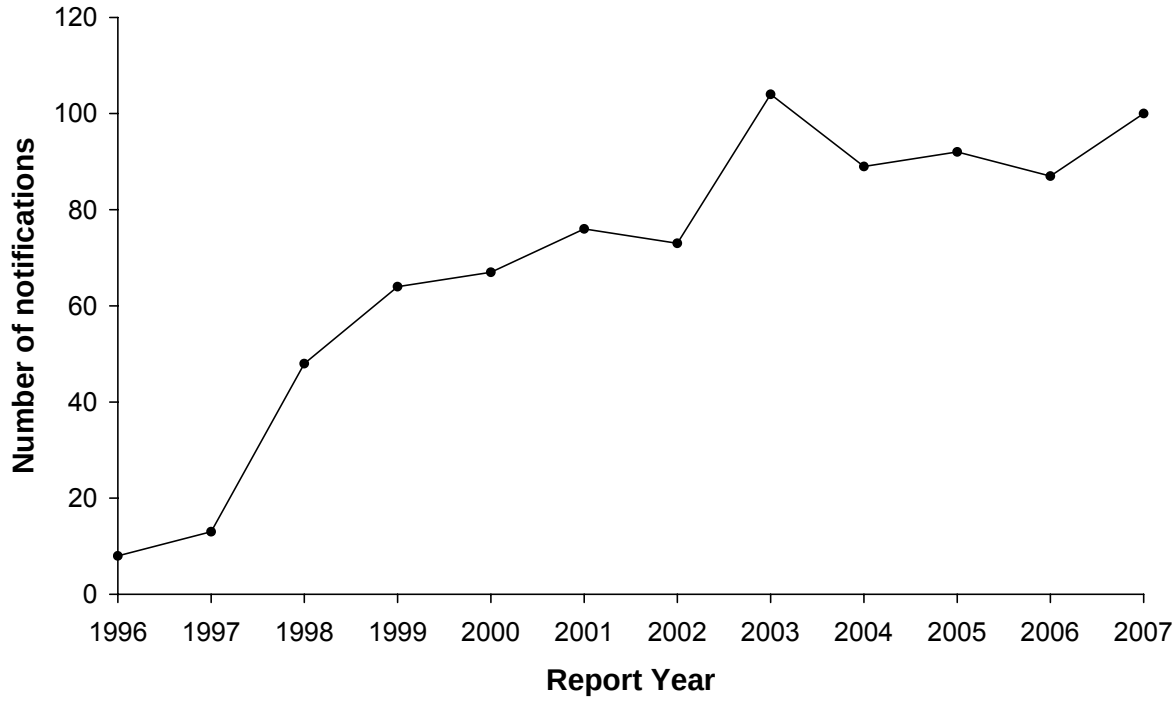
It has been estimated by expert consultation that 40% (minimum = 27%, maximum = 51%) of VTEC/STEC incidence is due to foodborne transmission. The expert consultation also estimated that approximately 30% of foodborne VTEC/STEC transmission was due to red meat of which two-thirds was considered to be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

4.17.3 Notifiable disease data

4.17.3.1 Annual notification trend

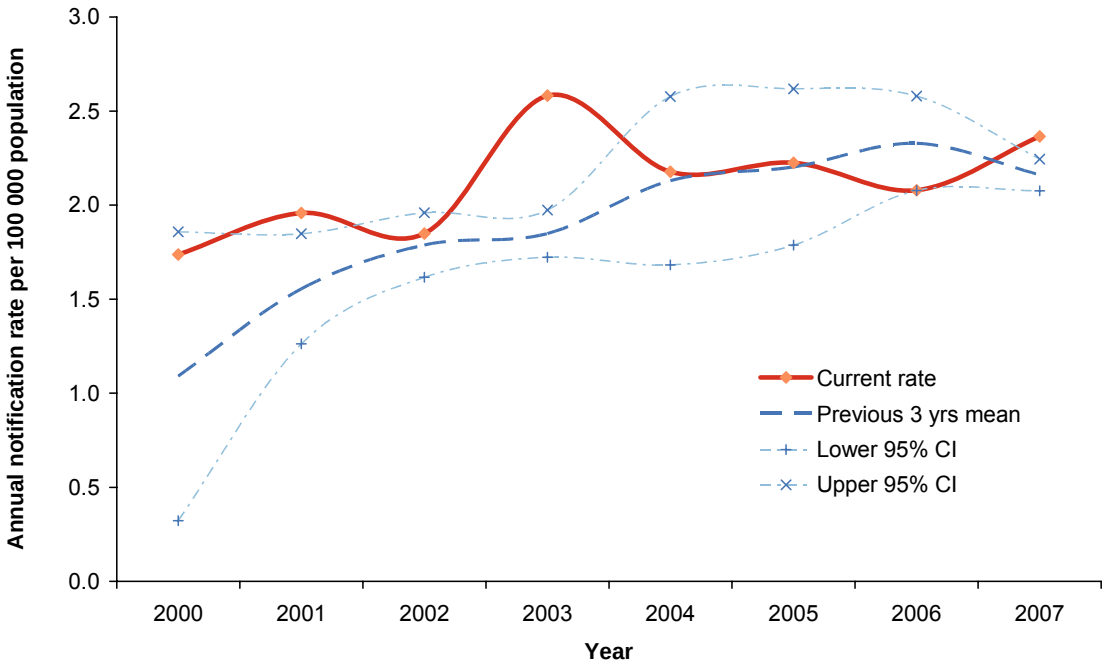
In 2007, 100 VTEC/STEC notifications were reported in EpiSurv, this is the second highest number of notifications since VTEC/STEC became notifiable in 1996. As shown in Figure 48, there has been a general increase in the notifications with the highest number of notifications reported in 2003 (104 cases).

Figure 48: VTEC/STEC infection notifications by year, 1996-2007



Over the period 2000 to 2007 the VTEC/STEC infection notification rate has varied little with the highest population rate being reported in 2003 (2.6 cases per 100 000 population) (Figure 49).

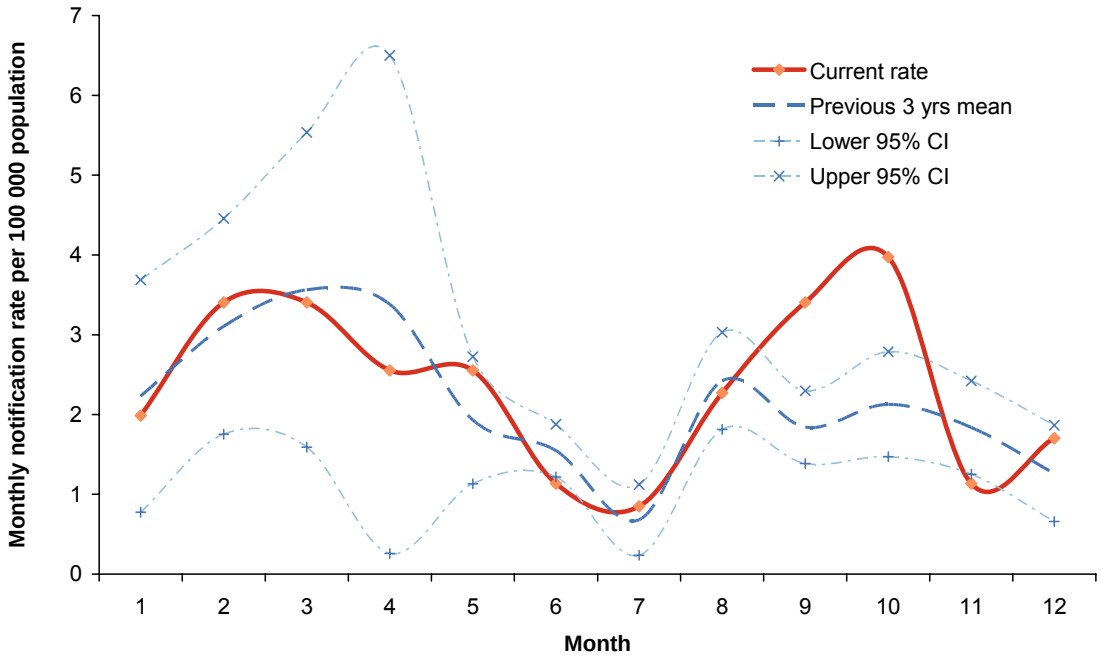
Figure 49: VTEC/STEC infection notification rate by year, 2000-2007



4.17.3.2 Seasonality

The number of notified cases of VTEC/STEC infection per 100 000 population by month for 2007 is shown in Figure 50. The historic mean rate shows a peak in March/April and a trough in July. The 2007 notification follows a similar pattern but peaks in late February and again in October.

Figure 50: VTEC/STEC infection monthly rate (annualised) for 2007



4.17.3.3 Age and sex distribution of VTEC/STEC infection

In 2007, the number and notification rate for VTEC/STEC infection was similar between males and females but the hospitalisation rate was higher in females than males (Table 62).

Table 62: VTEC/STEC infection cases by sex, 2007

Sex	EpiSurv notifications		Hospitalisations[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No
Male	45	2.2	18	0.9	
Female	55	2.5	29	1.3	
Unknown	0				
Total	100	2.4	47	1.1	

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

In 2007 the age specific notification VTEC/STEC infection rates were highest in the less than one year age group (12 cases, 19.4 per 100 000 population), followed by the 1 to 4 years age (42 cases, 18.2 per 100 000). These two age groups also had the highest hospitalisation rates (Table 63).

Table 63: VTEC/STEC infection cases by age group, 2007

Age groups	EpiSurv notifications		Hospitalisations[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	12	19.4	2	3.2	
1 to 4	42	18.2	7	3.0	
5 to 9	12	4.1	4	1.4	
10 to 14	2	0.7	1	0.3	
15 to 19	2	0.6	2	0.6	
20 to 29	2	0.4	1	0.2	
30 to 39	4	0.7	3	0.5	
40 to 49	7	1.1	5	0.8	
50 to 59	4	0.8	6	1.2	
60 to 60	7	1.9	8	2.2	
70+	6	1.7	8	2.2	
Unknown	0				
Total	100	2.4	47	1.1	

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

4.17.3.4 Risk factors reported

It should be noted that each disease has its own investigation module, and the identification of a large number of risk factors for VTEC/STEC infection is a reflection of the content of the investigation module, rather than a characteristic of the disease in New Zealand.

In 2007 the most commonly reported risk factor for VTEC/STEC infection was contact with household pets (87.0%), followed by consumption of raw fruit/vegetables (83.9%), consumption of dairy products (76.8%), and consumption of beef products (69.4%) (Table 64).

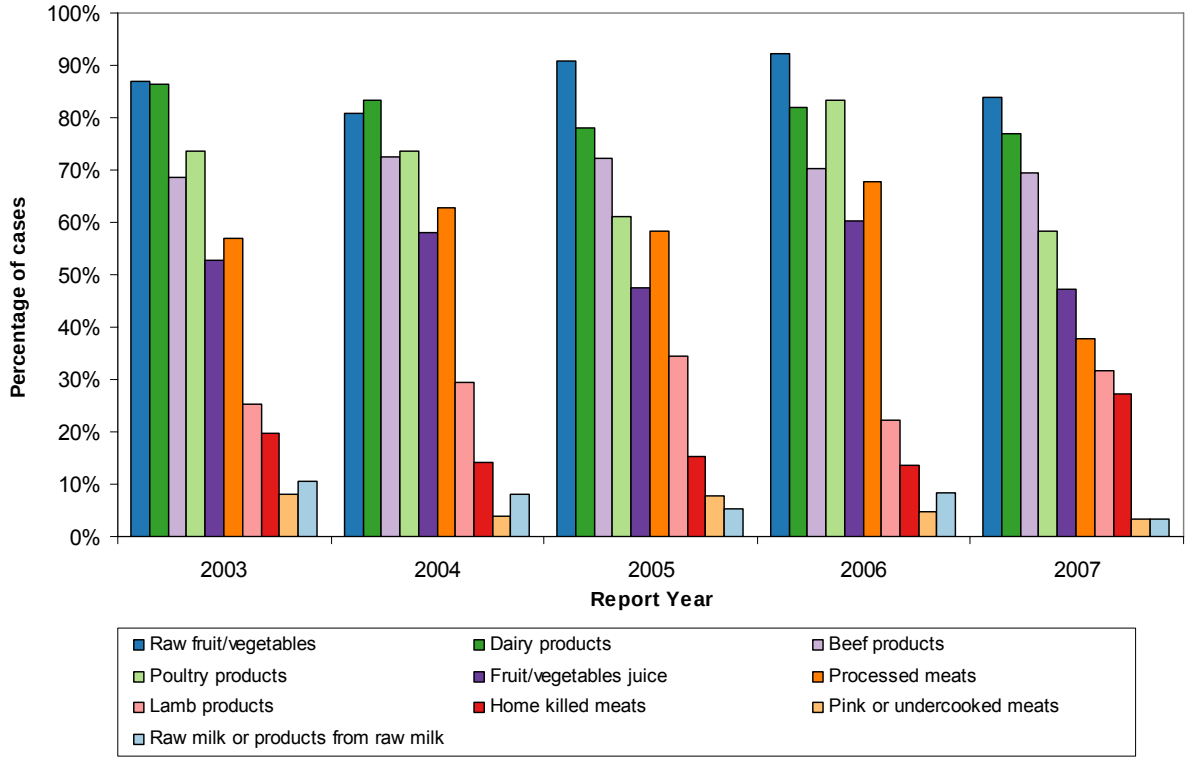
Table 64: Exposure to risk factors associated with VTEC/STEC infection, 2007

Risk Factor	Notifications			
	Yes	No	Unknown	%[a]
Contact with household pets	47	7	46	87.0%
Consumed raw fruit/vegetables	52	10	38	83.9%
Consumed dairy products	53	16	31	76.8%
Consumed beef products	43	19	38	69.4%
Contact with farm animals	32	20	48	61.5%
Consumed poultry products	38	27	35	58.5%
Consumed fruit/vegetables juice	26	29	45	47.3%
Contact with animal manure	15	24	61	38.5%
Consumed processed meats	23	38	39	37.7%
Contact with Children in nappies	25	45	30	35.7%
Consumed lamb products	19	41	40	31.7%
Recreational water contact	21	49	30	30.0%
Contact with other animals	13	31	56	29.5%
Consumed home killed meats	18	48	34	27.3%

Risk Factor	Notifications			
	Yes	No	Unknown	%[a]
Contact with persons with similar symptoms	19	54	27	26.0%
Travelled overseas during the incubation period	5	84	11	5.6%
Consumed pink or undercooked meats	2	57	41	3.4%
Consumed raw milk or products from raw milk	2	60	38	3.2%

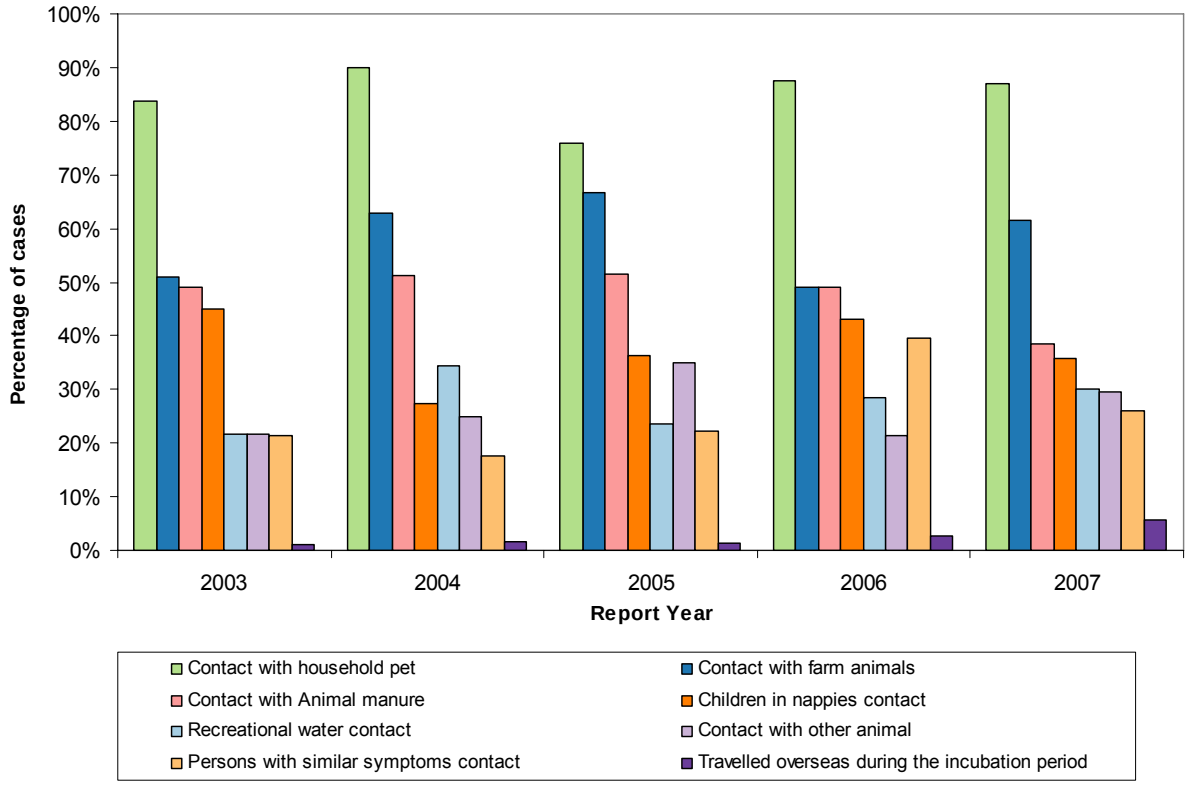
[a]Percentage refers to the cases that answered "yes" out of the total number of cases for which this information was supplied. Cases may have more than one risk factor recorded.

Figure 51: VTEC/STEC foodborne risk factors by percentage of cases and year, 2003 – 2007



The two most consistently reported risk factors for VTEC/STEC infection over the five year period 2003 to 2007 were the consumption of raw fruit/vegetables (Figure 51) and contact with household pets (Figure 52). The reporting of the various risk factors varies from year to year, although there are no observable trends.

Figure 52: VTEC/STEC risk factors excluding food consumption by percentage of cases and year, 2003 - 2007



4.17.3.5 Estimate of travel-related cases

For cases where information on travel was provided, 5.6% (5/89; 95%CI 1.8-11.5%) 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 2007. The resultant distribution has a mean of 6 cases (95% CI 1-14).

4.17.4 Outbreaks reported as caused by VTEC/STEC

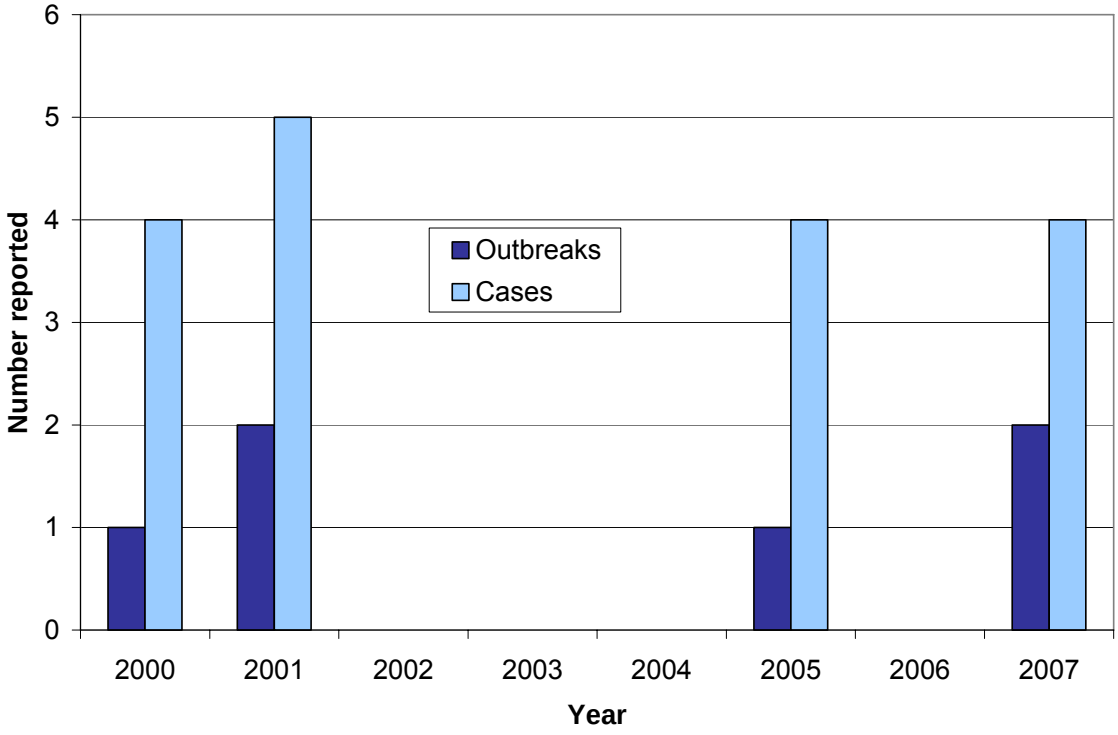
Two foodborne VTEC/STEC outbreaks were reported in 2007 (Table 65).

Table 65: VTEC/STEC outbreaks reported, 2007

Measure (No.)	Foodborne VTEC/STEC outbreaks	All VTEC/STEC outbreaks
Outbreaks	2	6
Cases	4	13
Hospitalised cases	3	4

Over the eight year period 2000 to 2007 there has been a total of six foodborne outbreaks of VTEC/STEC with no more than two outbreaks reported in any one year (Figure 53). There were two foodborne outbreaks reported in 2007, each involving two cases.

Figure 53: Foodborne VTEC/STEC outbreaks and associated cases reported by year, 2000 – 2007



4.17.4.1 Details of food-associated outbreaks

Table 66 contains details of the two food–associated VTEC/STEC outbreaks reported in 2007. Although the outbreaks were identified as foodborne, no specific foods were implicated.

Table 66: Details of food-associated VTEC/STEC outbreaks, 2007

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Auckland (March)	Unknown	Unknown	2C	6
Auckland (September)	Unknown	Tangi	2C	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

4.17.4.2 Laboratory investigation of samples from suspected foodborne outbreaks

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

4.17.5 VTEC/STEC types commonly reported

A total of 97 VTEC/STEC isolates were typed in 2007, of which 96 were *E. coli* O157:H7 and one was of non-O157:H7 type.

4.17.6 Recent surveys

Nil.

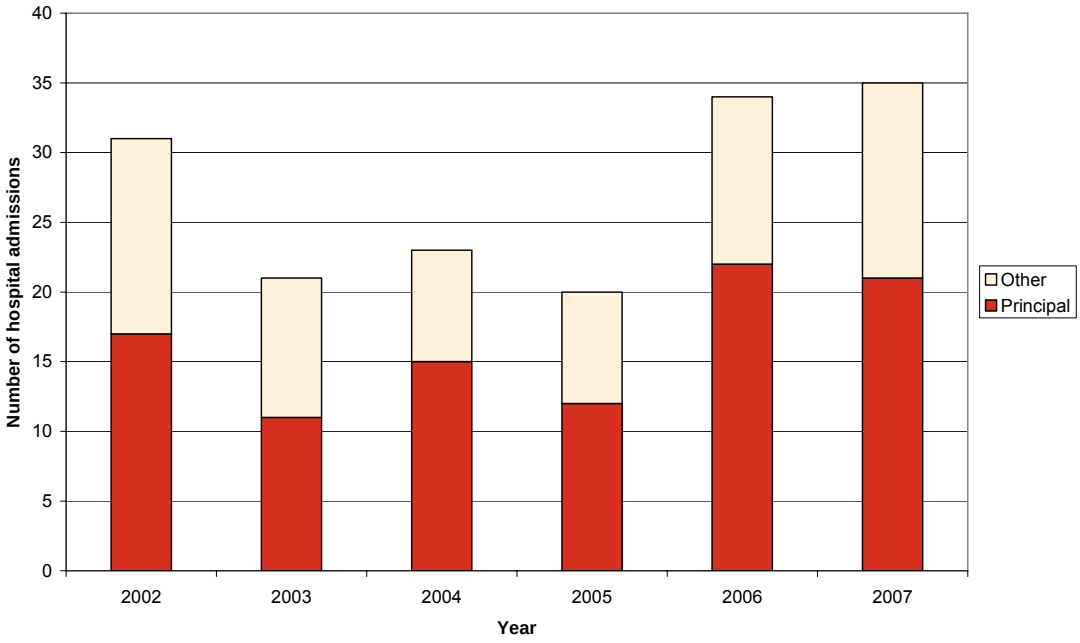
4.17.7 Disease sequelae - haemolytic-uraemic syndrome (HUS)

Haemolytic-uraemic 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 35 hospitalised cases (0.8 admissions per 100 000 population) recorded in 2007, 21 were reported with HUS as the primary diagnosis and 14 with this condition as another relevant diagnosis.

Over the period 2002 to 2007 between 20 and 35 hospitalised cases for HUS have been reported each year (Figure 54).

Figure 54: HUS hospitalised cases, 2002 - 2007



In 2007 the number of HUS hospitalised cases for females was higher than for males (Table 67).

Table 67: HUS hospitalised cases by sex, 2007

Sex	Hospitalised cases[a]	
	No.	Rate[b]
Male	16	0.9
Female	19	0.8
Total	35	0.8

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

In 2007 the highest hospitalised case rate for HUS occurred in 1 to 4 year olds (Table 68).

Table 68: HUS hospitalised cases by age group, 2007

Age groups	Hospitalised cases[a]	
	No.	Rate[b]
<1	3	4.9
1 to 4	13	5.6
5 to 9	4	1.4
10 to 14	1	0.3
15 to 19	2	0.6
20 to 29	1	0.2
30 to 39	4	0.7
40 to 49	0	0.0
50 to 59	3	0.6
60 to 60	2	0.6
70+	2	0.6
Total	35	0.8

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

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

During 2007, 4 cases of HUS were reported to the NZPSU.

4.17.8 Relevant New Zealand studies and publications

4.17.8.1 Reports

PFGE Typing of Human Case and Food Isolates of *E. coli* O157:H7 in New Zealand (Cornelius *et al.*, 2006)

From March to September 2006, 25 isolates were uploaded to the PulseNet USA *E. coli* O157:H7 pulsed field gel electrophoresis (PFGE) database with the *Xba*I:*Bln*I pattern EXHX01.0074:EXHA26.0569. Although this pattern is relatively common in the US database, this number of isolates suggests a potential common source outbreak. USDA-FSIS found *E. coli* O157:H7 isolates from two US meat-processing plants with two similar *Xba*I:*Bln*I patterns

(EXHX01.0074:EXHA26.0569 and EXHX01.1401:EXHA26.0569). One common link between these meat-processing plants is that both sourced some of their meat from New Zealand.

As a consequence of the isolations in the US, in April 2006 the NZFSA and, independently, ESR (PulseNet Aotearoa) received an urgent request from the USDA-FSIS and US-CDC, requesting information on the prevalence of this pattern amongst New Zealand *E. coli* O157:H7 isolates.

As the New Zealand database contained only limited data, responding to this request required the analysis by PFGE of over 200 additional isolates. Comparisons were made with the *Xba*I profiles of 203 human isolates and 229 meat isolates.

All of the New Zealand isolates were distinguishable from the USA patterns EXHX01.0074:EXHA26.0569, and EXHX01.1401:EXHA26.0569. Thus there is no evidence to indicate that the *E. coli* O157:H7 isolates recovered from the US meat-processing plant came from New Zealand meat.

This report is available in full from the NZFSA website:
http://www.nzfsa.govt.nz/science/research-projects/e-coli/ecoli-final.pdf

4.17.9 Relevant regulatory developments

NZFSA announced a proposal to develop a New Zealand standard for the manufacture of uncooked comminuted, fermented meat (UCFM), such as salami, in response to concerns centred on the pathogen shiga-like toxin-producing *Escherichia coli* (STEC).

NZFSA has produced a discussion document and is seeking comments on the proposed standard from UCFM producers, as well as industry associations and other relevant government agencies. The proposed standard is based on the Food Standards Code standard, the PQIP Code of Practice and other elements that NZFSA has identified as essential inclusions.

http://www.nzfsa.govt.nz/publications.food-focus/2007-02/page-13.htm

4.18 Yersiniosis

Summary data for yersiniosis in 2007 are given in Table 69.

Table 69: Summary surveillance data for yersiniosis, 2007

Parameter	Value in 2007	Section reference
Number of cases	527	4.18.2
Rate (per 100 000)	12.5	4.18.2
Hospitalisations (%)	50 (9.5%)	4.18.2
Deaths (%)	0 (0%)	4.18.2
Estimated travel-related cases (%)	32 (6.1%)	4.18.3.6
Estimated food-related cases (%)*	277 (56%)	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 2007 by data source

During 2007, 527 notifications (12.5 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 50 hospital admissions (1.2 admissions per 100 000 population) recorded in 2007, 19 were reported with yersiniosis as the primary diagnosis and 31 with yersiniosis as another relevant diagnosis.

No deaths resulting from yersiniosis were recorded in EpiSurv in 2007.

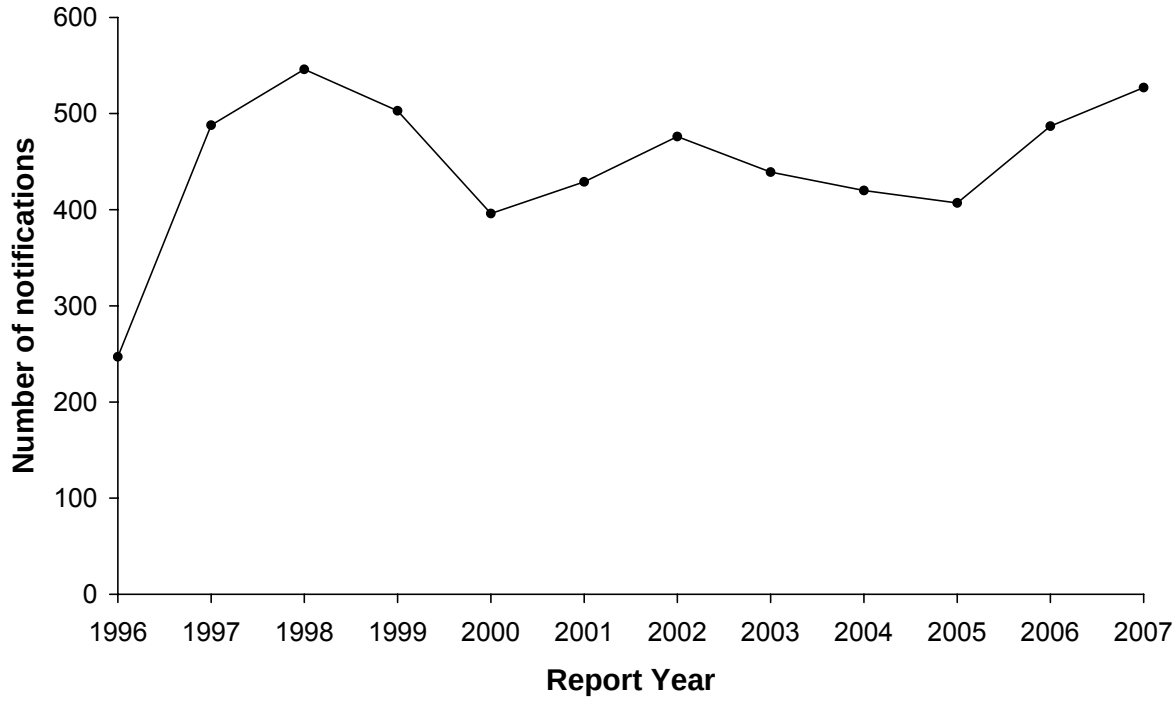
It has been estimated by expert consultation that 56% (minimum = 42%, maximum = 71%) of yersiniosis incidence is due to foodborne transmission. Approximately 50% of foodborne transmission was estimated to be due to consumption of pork.

4.18.3 Notifiable disease data

4.18.3.1 Annual notification trend

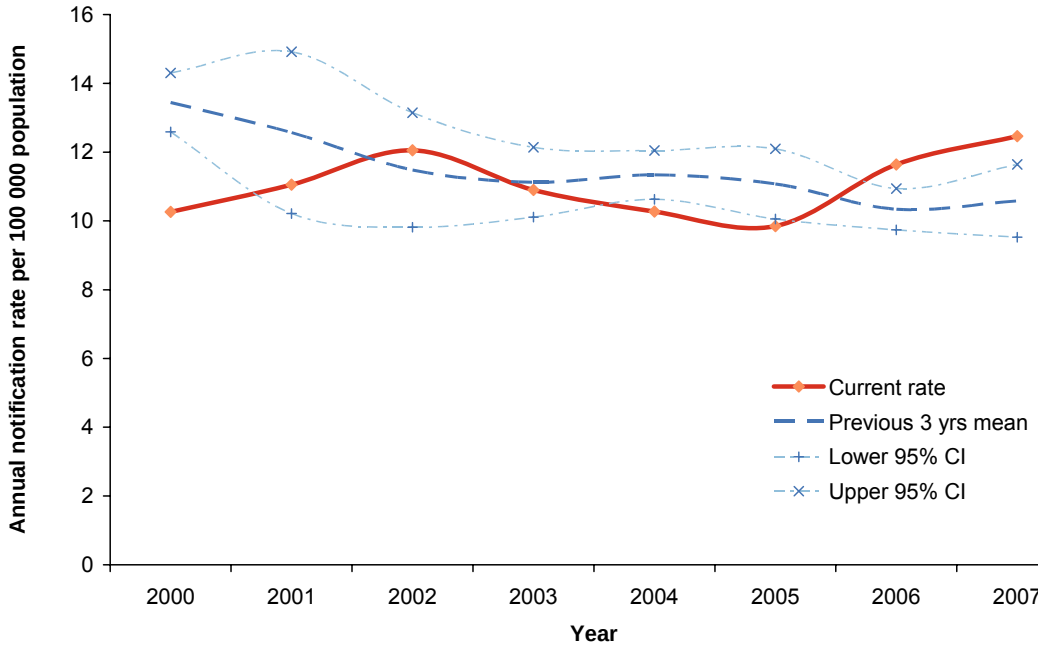
In 2007, 527 yersiniosis notifications were reported in EpiSurv, the second highest number of notifications since yersiniosis became notifiable in 1996. The highest number of notifications was reported in 1998 (546 notifications) (Figure 55). Over the five years period 2002 to 2007 the number of cases reported decreased from 476 cases in 2002 to 407 in 2005 before increasing steeply to 527 in 2007.

Figure 55: Yersiniosis notifications by year, 1996-2007



In 2007 the yersiniosis notification rate was 12.5 cases per 100 000 population. The yersiniosis notification rate has varied little (ranging from 9.9 to 12.5 per 100 000) between 2000 and 2007 (Figure 56).

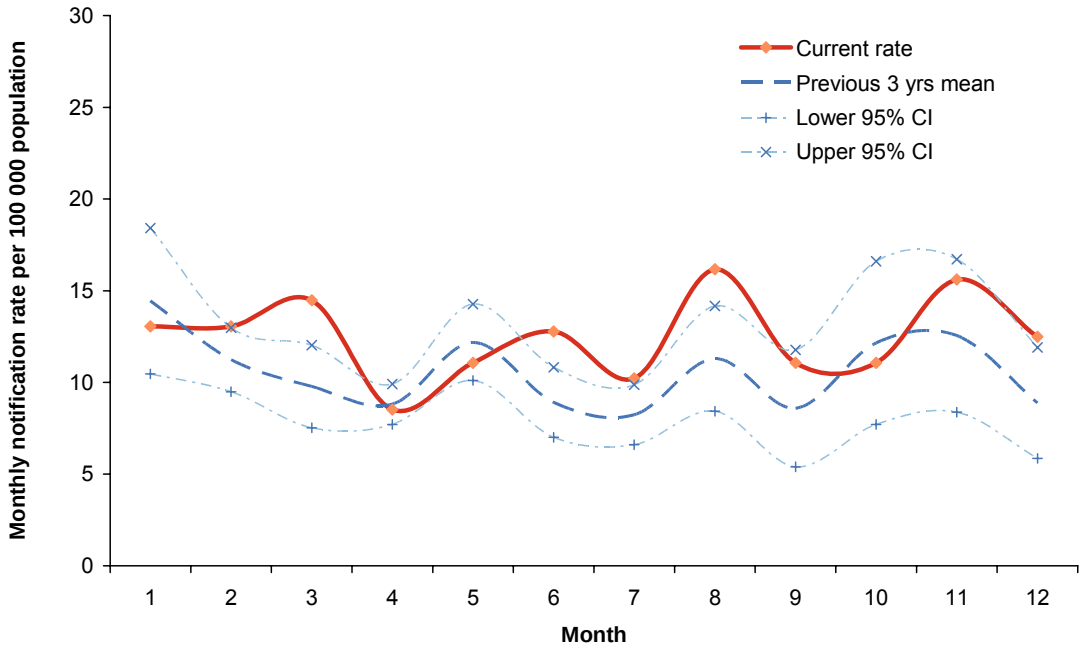
Figure 56: Yersiniosis notification rate by year, 2000-2007



4.18.3.2 Seasonality

The number of notified cases of yersiniosis per 100 000 population by month for 2007 is shown in Figure 57. The historic mean yersiniosis rate varies throughout the year with a possible peak in January (highest notification rate) and a trough in June/July. In 2007, the highest notification rates were observed in March, August and November and the lowest in April.

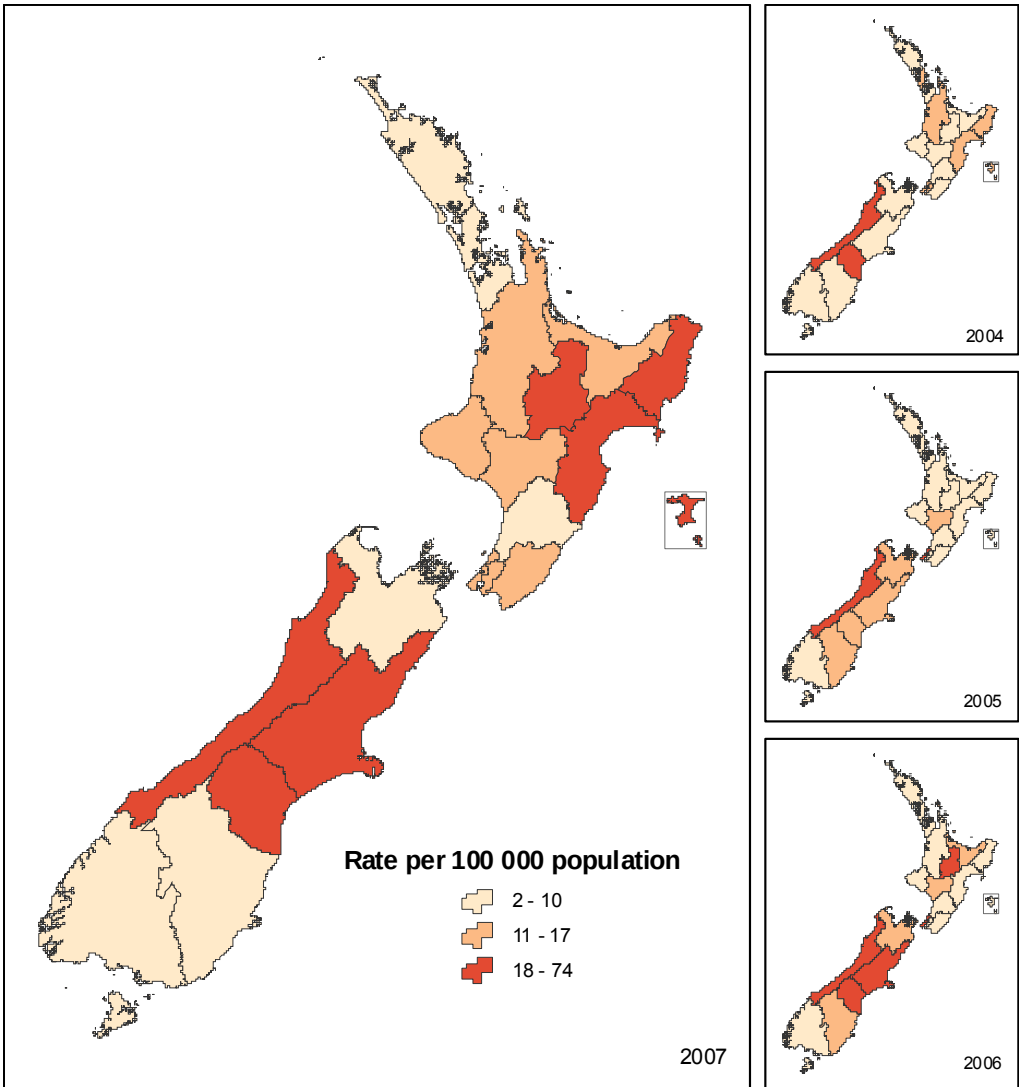
Figure 57: Yersiniosis monthly rate (annualised) for 2007



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 central South Island and Lakes DHBs. Consistent with previous years, in 2007, high rates were recorded for West Coast, South Canterbury and Canterbury. Similarly, Northland, MidCentral, and Southland consistently had low yersiniosis notification rates.

Figure 58: Geographic distribution of yersiniosis notifications, 2004-2007



4.18.3.4 Age and sex distribution of yersiniosis cases

The yersiniosis notification rate was similar for males and females, with notification and hospitalisation rates being slightly higher for males (Table 70).

Table 70: Yersiniosis cases by sex, 2007

Sex	EpiSurv notifications		Hospitalisations[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No
Male	271	13.1	26	1.3	
Female	245	11.4	24	1.1	
Unknown	11	-	0	-	
Total	527	12.5	50	1.2	-

[a] NZHIS morbidity data for hospital admissions

[b] per 100 000 of population

In 2007 the highest age-specific yersiniosis notification rate was for those aged less than one year for notifications (51.8 per 100 000 population) and hospitalisations (6.5 per 100 000 population) (Table 71). The notification rate for those aged one to four years (43.8 per 100 000 population) was more than three times higher than for any other age group.

Table 71: Yersiniosis cases by age group, 2007

Age groups	EpiSurv notifications		Hospitalisations[a]		Deaths recorded in EpiSurv
	No.	Rate[b]	No.	Rate[b]	No.
<1	32	51.8	4	6.5	
1 to 4	101	43.8	5	2.2	
5 to 9	24	8.3	3	1.0	
10 to 14	22	7.2	0	0.0	
15 to 19	20	6.3	1	0.3	
20 to 29	54	9.7	3	0.5	
30 to 39	69	11.6	4	0.7	
40 to 49	58	9.2	3	0.5	
50 to 59	55	10.7	2	0.4	
60 to 60	35	9.7	5	1.4	
70+	53	14.6	20	5.5	
Unknown	4	-	0	-	
Total	527	12.5	50	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 factor for yersiniosis notification cases during 2007 was consumption of food from retail premises (34.8%) followed by contact with farm animals (26.6%) (Table 72).

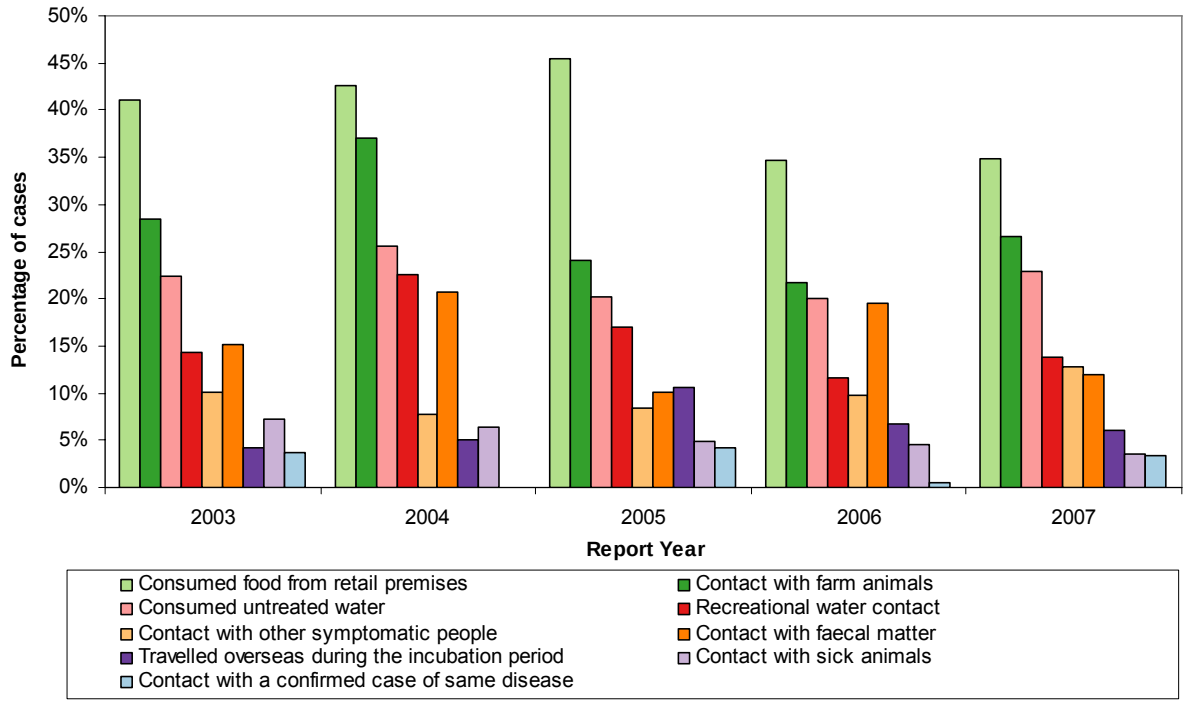
Table 72: Exposure to risk factors associated with yersiniosis, 2007

	Notifications			
Risk Factor	**Yes**	**No**	**Unknown**	**%[a]**
Consumed food from retail premises	77	144	306	34.8%
Contact with farm animals	73	201	253	26.6%
Consumed untreated water	50	168	309	22.9%
Recreational water contact	33	206	288	13.8%
Contact with other symptomatic people	32	219	276	12.7%
Contact with faecal matter	29	215	283	11.9%
Travelled overseas during the incubation period	18	277	232	6.1%
Contact with sick animals	8	220	299	3.5%
Contact with a confirmed case of same disease	7	206	314	3.3%

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

Between 2003 and 2007 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, 2003 – 2007



4.18.3.6 Estimate of travel-related cases

For cases where information on travel was provided, 6.1% (18/295; 95% CI 3.6-9.2%) 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 2007. The resultant distribution has a mean of 32 cases (95% CI 16-53).

If data from the last four years are considered the estimated proportion of cases travelling overseas within the incubation period of the organism is 7.0% (95% CI 5.5-8.7%).

4.18.4 Outbreaks reported as caused by *Yersinia* spp.

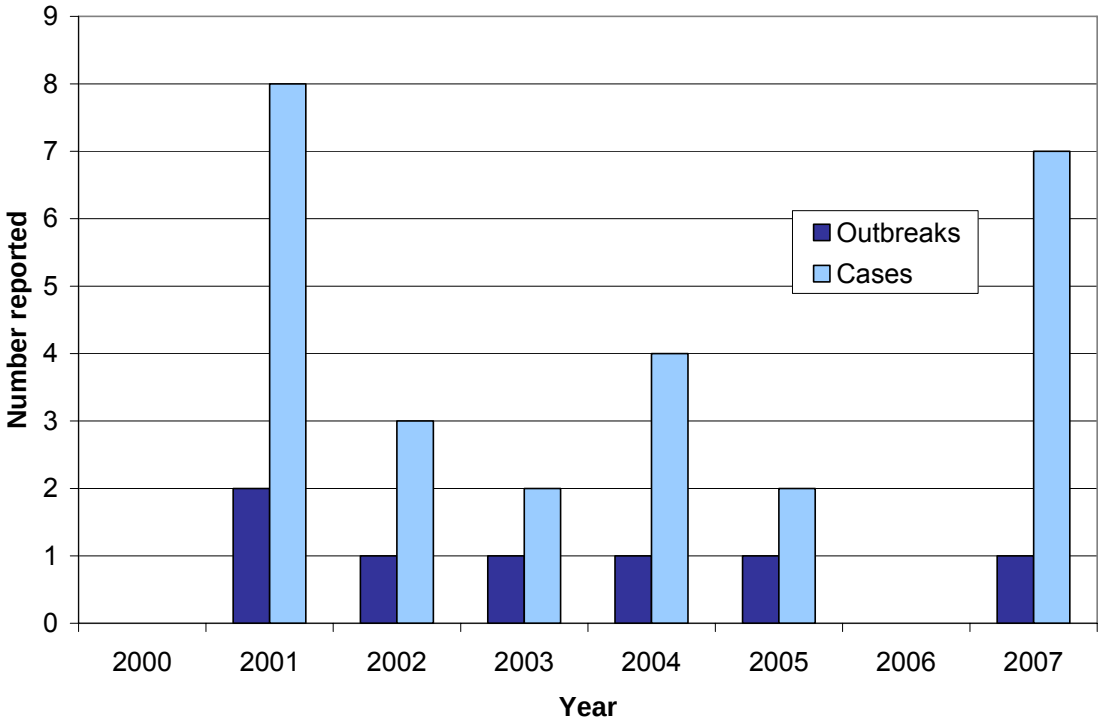
One of three *Yersinia* spp. outbreaks for 2007 was associated with a suspected or known foodborne source (Table 73).

Table 73: *Yersinia* spp. outbreaks reported, 2007

Measure (No.)	Foodborne *Yersinia* spp. outbreaks	All *Yersinia* spp. outbreaks
Outbreaks	1	3
Cases	7	15
Hospitalised cases	0	0

Between 2000 and 2007 very few foodborne *Yersinia* spp. outbreaks were reported in EpiSurv (on average one a year), with a small total number of associated cases (ranging from two to eight) (Figure 60).

Figure 60: Foodborne *Yersinia* spp. outbreaks and associated cases reported by year, 2000 – 2007



4.18.4.1 Details of food-associated outbreaks

Table 74 contains details of the one food–associated *Yersinia* spp. outbreak reported in 2007.

Table 74: Details of food-associated *Yersinia* spp. outbreak, 2007

Public Health Unit (Month)	Suspected vehicle	Setting	Number ill	Confirmation
Canterbury (November)	Cheerios	Butcher shop	7C	2, 3

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

4.18.4.2 Laboratory investigation of samples from suspected foodborne outbreaks

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

4.18.5 Recent surveys

Nil.

4.18.6 Relevant New Zealand studies and publications

Nil.

4.18.7 Relevant regulatory developments

Nil.

5 SUMMARY TABLES

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

Table 75: Cases and rates per 100 000 population of notifiable diseases in New Zealand during 2006 and 2007

Disease	2006		2007		Change[b,c]
	Cases	Rates	Cases	Rates	
Campylobacteriosis	15 873	379.3	12 776	302.2	←
Cryptosporidiosis	737	17.6	924	21.9	→
Gastroenteritis[a]	937	22.4	621	14.7	←
Giardiasis	1 214	29.0	1 401	33.1	→
Hepatitis A	123	2.9	42	1.0	←
Listeriosis	19	0.5	26	0.6	→
Salmonellosis	1 335	31.9	1 274	30.1	←
Shigellosis	102	2.4	126	3.0	→
Toxic Shellfish Poisoning	1	0.0	3	0.1	→
VTEC/STEC Infection	87	2.1	100	2.4	→
Yersiniosis	487	11.6	527	12.5	→

[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
[c] The Mantel-Haenszel chi-square test was used to determine statistical significance. P-values less than or equal to 0.05 are considered to be significant at the 95% level of confidence.

Table 76: Deaths due to notifiable diseases recorded in EpiSurv from 1997 to 2007

Disease	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Campylobacteriosis	2	2	1	3	1	1	0	0	1	1	1
Gastroenteritis	0	0	0	0	0	1	0	0	0	0	0
Giardiasis	1	0	0	0	0	0	0	0	0	0	0
Listeriosis - non perinatal	2	0	1	2	1	0	2	3	1	0	2
Listeriosis - perinatal	6	0	2	4	1	3	2	2	0	1	2
Salmonellosis	2	2	1	7	2	1	0	0	1	1	1
Shigellosis	0	0	1	0	0	0	0	0	0	0	0
VTEC/STEC Infection	1	1	0	0	0	0	0	0	0	0	0
Yersiniosis	0	2	0	0	0	0	0	1	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 77: NZHIS death data for selected potential foodborne diseases, 2003-2005

Disease	ICD 10 Codes	2003		2004		2005[a]	
		Underlying[b]	Contributory[c]	Underlying[b]	Contributory[c]	Underlying[b]	Contributory[c]
Campylobacteriosis	A04.5	1	0	1	1	0	3
Cryptosporidiosis	A072	1	0	0	0	0	0
Listeriosis	A32	2	0	1	0	0	0
Salmonellosis	A02	1	0	0	1	0	1
VTEC/STEC Infection	A44	0	0	0	1	0	0

[a]Underlying – main cause of death

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

Note : Mortality data has not yet been published by NZHIS for years after 2005

Table 78: Hospital admissions for selected notifiable diseases, 2005 – 2007

Disease	ICD 10 Codes	2005		2006		2007	
		Principal diagnosis	Other relevant diagnosis	Principal diagnosis	Other relevant diagnosis	Principal diagnosis	Other relevant diagnosis
Campylobacteriosis	A04.5	871	198	967	212	752	185
Cryptosporidiosis	A07.2	34	8	20	10	26	14
Giardiasis	A07.1	27	25	43	28	20	14
Hepatitis A	B15	21	15	33	14	17	18
Listeriosis	A32	8	11	13	10	12	17
Salmonellosis	A02	130	36	122	39	123	27
Shigellosis	A03	20	2	13	2	27	31
VTEC/STEC Infection	A40-A44	15	18	16	23	22	25
Yersiniosis	A04.6	12	15	29	26	19	31

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 79: Cases reported in 2007 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	8 522	316.4	652	115.3	135	59.7	405	108.1	3 062		12 776	317.2
Cryptosporidiosis	676	25.1	89	15.7	14	6.2	19	5.1	126		924	22.9
Gastroenteritis	465	17.3	26	4.6	9	4.0	23	6.1	98		621	15.4
Giardiasis	945	35.1	77	13.6	7	3.1	43	11.5	329		1401	34.8
Hepatitis A	17	0.6	3		6	2.7	14	3.7	2		42	1.0
Listeriosis	18	0.7	2				4		2		26	0.6
Salmonellosis	830	30.8	93	16.5	48	21.2	58	15.5	245		1 274	31.6
Shigellosis	64	2.4	13	2.3	20	8.8	10	2.7	19		126	3.1
VTEC/STEC Infection	78	2.9	7	1.2			7	1.9	8		100	2.5
Yersiniosis	364	13.5	33	5.8	11	4.9	43	11.5	76		527	13.1

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 2007 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 80: Cases and rates per 100 000 population in 2007 by sex

	Sex							
	Male		Female		Unknown		Total	
Disease	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Campylobacteriosis	6 790	327.9	5 719	265.1	267		12 776	302.2
Cryptosporidiosis	444	21.4	470	21.8	10		924	21.9
Gastroenteritis	255	12.3	348	16.1	18		621	14.7
Giardiasis	663	32.0	716	33.2	22		1401	33.1
Hepatitis A	26	1.3	16	0.7			42	1.0
Listeriosis - non perinatal	7	0.3	13	0.6	1		21	0.5
Salmonellosis	652	31.5	600	27.8	22		1 274	30.1
Shigellosis	60	2.9	65	3.0	1		126	3.0
VTEC/STEC Infection	45	2.2	55	2.5			100	2.4
Yersiniosis	271	13.1	245	11.4	11		527	12.5

Table 81: Cases and rates per 100 000 population in 2007 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	201	325.3	1036	449.3	604	208.3	577	188.5	940	294.2	2178	389.6	1589	268.3	1678	265.7	1536	299.3	1202	333.2	1107	304.5	128		12776	302.2
Cryptosporidiosis	30	48.6	329	142.7	120	41.4	65	21.2	39	12.2	104	18.6	121	20.4	42	6.7	34	6.6	25	6.9	13	3.6	2		924	21.9
Gastroenteritis	11	17.8	28	12.1	10	3.4	11	3.6	28	8.8	77	13.8	100	16.9	103	16.3	84	16.4	62	17.2	70	19.3	37		621	14.7
Giardiasis	30	48.6	250	108.4	97	33.5	22	7.2	23	7.2	137	24.5	340	57.4	210	33.3	135	26.3	105	29.1	40	11.0	12		1401	33.1
Hepatitis A					6	2.1	2		8	2.5	7	1.3	3		5	0.8	6	1.2	2		3				42	1.0
Listeriosis											2		3		1		2		6	1.7	12	3.3			26	0.6
Salmonellosis	69	111.7	250	108.4	70	24.1	58	18.9	69	21.6	172	30.8	145	24.5	150	23.8	112	21.8	102	28.3	69	19.0	8		1274	30.1
Shigellosis	1		24	10.4	6	2.1	7	2.3	6	1.9	13	2.3	18	3.0	18	2.9	22	4.3	6	1.7	5	1.4			126	3.0
VTEC/STEC Infection	12	19.4	42	18.2	12	4.1	2		2		2		4		7	1.1	4		7	1.9	6	1.7			100	2.4
Yersiniosis	32	51.8	101	43.8	24	8.3	22	7.2	20	6.3	54	9.7	69	11.6	58	9.2	55	10.7	35	9.7	53	14.6	4		527	12.5

Table 82: Disease notifications and incidence rates per 100 000 population by District Health Board, 2007

Disease	Campylobacteriosis		Cryptosporidiosis		Gastroenteritis		Giardiasis		Hepatitis A		Listeriosis		Salmonellosis		Shigellosis		VTEC/STEC Infection		Yersiniosis	
District Health Board	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**
Northland	369	239.8	24	15.6	4		73	47.4	1		4		60	39.0	2		3		11	7.1
Waitemata	1699	331.0	58	11.3	82	16.0	143	27.9	7	1.4	1		113	22.0	8	1.6	11	2.1	37	7.2
Auckland	1382	319.0	45	10.4	93	21.5	187	43.2	5	1.2	3		110	25.4	24	5.5	4		41	9.5
Counties Manukau	1118	240.6	57	12.3	55	11.8	129	27.8	9	1.9	5	1.1	84	18.1	18	3.9	3		20	4.3
Waikato	1080	305.9	182	51.5	34	9.6	118	33.4	1		1		137	38.8	13	3.7	22	6.2	37	10.5
Lakes	288	283.7	15	14.8	12	11.8	38	37.4					27	26.6	7	6.9	4		22	21.7
Bay of Plenty	498	244.9	30	14.8	13	6.4	71	34.9	3		2		92	45.3	8	3.9	8	3.9	20	9.8
Tairawhiti	49	106.8	3				11	24.0					11	24.0					9	19.6
Taranaki	410	382.1	21	19.6	6	5.6	16	14.9	2		1		28	26.1	2		2		18	16.8
Hawke's Bay	461	301.4	37	24.2	21	13.7	36	23.5	4				49	32.0	2		2		28	18.3
Whanganui	190	298.8	10	15.7	5	7.9	9	14.2	1				14	22.0					8	12.6
MidCentral	332	202.2	50	30.5	32	19.5	42	25.6			1		44	26.8	2		2		7	4.3
Hutt	435	307.4	61	43.1	25	17.7	36	25.4	2		2		48	33.9	5	3.5			22	15.5
Capital and Coast	988	351.2	74	26.3	61	21.7	138	49.0	1		2		112	39.8	5	1.8	3		47	16.7
Wairarapa	68	172.0	10	25.3	6	15.2	12	30.3					11	27.8					6	15.2
Nelson-Marlborough	409	304.1	30	22.3	5	3.7	93	69.1	1				36	26.8	4		5	3.7	7	5.2
West Coast	81	251.2	12	37.2	8	24.8	6	18.6					12	37.2			3		24	74.4
Canterbury	1754	357.8	70	14.3	144	29.4	124	25.3	3		1		147	30.0	17	3.5	19	3.9	131	26.7
South Canterbury	220	398.3	41	74.2	4		12	21.7			1		10	18.1	1		3		14	25.3
Otago	621	334.1	36	19.4	7	3.8	66	35.5	1		2		75	40.3	5	2.7	3		13	7.0
Southland	324	293.6	58	52.5	4		41	37.1	1				54	48.9	3		3		5	4.5
Total	12776	302.2	924	21.9	621	14.7	1401	33.1	42	1.0	26	0.6	1274	30.1	126	3.0	100	2.4	527	12.5

Note : Where less than 5 cases have been notified a rate has not been calculated and the cell has been left blank.

Table 83: Notifiable disease cases by year, 1987-2007

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
Campylobacteriosis	2921	2796	4187	3850	4148	5144	8101	7714	7442	7635	8924	11572	8161	8418	10146	12495	14788	12215	13836	15873	12776
Cryptosporidiosis										119	357	866	977	775	1208	975	817	611	889	737	924
Gastroenteritis										555	310	492	601	727	940	1087	1026	1363	557	937	621
Giardiasis										1235	2127	2183	1793	1688	1604	1547	1570	1514	1231	1214	1401
Hepatitis A	158	176	134	150	224	288	257	179	338	311	347	145	119	107	61	106	70	49	51	123	42
Listeriosis	12	7	10	16	26	16	11	8	13	10	35	17	19	22	18	19	24	26	20	19	26
Salmonellosis	1140	1128	1860	1619	1244	1239	1340	1522	1334	1141	1177	2069	2077	1795	2417	1880	1401	1081	1382	1335	1274
Shigellosis	143	145	137	197	152	124	128	185	191	167	117	122	147	115	157	112	87	140	183	102	126
VTEC/STEC Infection							3	3	6	7	13	48	64	67	76	73	104	89	92	87	100
Yersiniosis										330	488	546	503	396	429	476	439	420	407	487	527

Table 84: Foodborne outbreaks and associated cases by agent type, 2007

Agent type	No. of outbreaks	% of outbreaks (n=74)	No. of cases	% of cases (n=611)
Campylobacter spp.	12	16.2	35	5.7
Clostridium perfringens	12	16.2	83	13.6
Norovirus	10	13.5	240	39.3
Salmonella spp.	7	9.5	56	9.2
VTEC/STEC	2	2.7	4	0.7
Histamine (scombroid)	2	2.7	8	1.3
Cryptosporidium spp.	1	1.4	6	1.0
Giardia	1	1.4	6	1.0
Salmonella typhi	1	1.4	3	0.5
Staphylococcus aureus	1	1.4	2	0.3
Bacillus cereus	1	1.4	51	8.3
Toxic shellfish poisoning	1	1.4	2	0.3
Vibrio parahaemolyticus	1	1.4	11	1.8
Yersinia spp.	1	1.4	7	1.1
Unidentified pathogen[1]	21	28.4	97	15.9
Total	**74**	**100.0**	**611**	**100.0**

1 All outbreaks with no pathogen identified were classified as gastroenteritis

Table 85: Outbreaks associated with commercial food operators, 2007

Outbreak setting[1]	No. of outbreaks	% of total outbreaks (n=492)	No. of cases	% of total cases (n=7988)
Restaurant/Café	41	8.3	406	5.1
Takeaway	26	5.3	164	2.1
Caterer	6	1.2	217	2.7
Other food outlet	2	0.4	12	0.2
Supermarket/Deli	1	0.2	4	0.1

1 More than one setting was recorded for some outbreaks

Table 86: Foodborne outbreaks and associated cases by implicated food source, 2007

Implicated vehicle / source	No. of outbreaks[1]	% of outbreaks (n=74)	No. of cases	% of cases (n=611)
Poultry	19	25.7	97	15.9
Meat (lamb, beef, pork)	16	21.6	111	18.2
Fresh produce	12	16.2	241	39.4
Rice/noodles/pasta	6	8.1	132	21.6
Roast meal	6	8.1	65	10.6
Kebab	6	8.1	25	4.1
Shellfish	4	5.4	51	8.3
Processed meat[2]	4	5.4	14	2.3
Fish	3	4.1	19	3.1
Eggs	2	2.7	22	3.6
Pies	2	2.7	6	1.0
Pulses/Lentils	1	1.4	51	8.3
Dairy	1	1.4	6	1.0
Sandwich/burger	1	1.4	2	0.3
Infected food handler	9	12.2	144	23.6
Unspecified food source[3]	6	8.1	50	8.2
No vehicle / source identified	15	20.3	74	12.1

1 More than one vehicle / source was implicated in some outbreaks
2 Processed meats included savaloys, cheerios, hot dogs and bacon
3 A common meal, premises or setting may have been implicated but no specific food items were recorded.

Table 87: Foodborne outbreaks by causal agent and implicated vehicle / source, 2007

Implicated vehicle / source[1]	*Campylobacter* spp.	*Clostridium perfringens*	Norovirus	*Salmonella* spp.	Other causal agent[2]	Unidentified pathogen[3]	Total number of outbreaks
Poultry	5	3	2	3	1	5	19
Meat (lamb, beef, pork)	1	7	0	1	1	6	16
Fresh produce	1	2	2	2	2	3	12
Rice/noodles/pasta	0	1	1	1	1	2	6
Kebab	1	3	0	1	0	1	6
Shellfish	0	0	1	0	2	1	4
Processed meat[4]	0	0	0	1	1	2	4
Fish	0	0	0	0	3	0	3
Eggs	0	0	0	1	0	1	2
Pies	0	0	0	0	0	2	2
Pulses/Lentils	0	0	0	0	1	0	1
Dairy	0	0	0	0	1	0	1
Sandwich/burger	0	0	0	0	0	1	1
Infected food handler	1	0	4	1	1	1	9
Unspecified food source[5]	1	0	2	0	1	2	6
No vehicle / source identified	3	1	0	4	1	6	15
Total	**12**	**12**	**10**	**7**	**12**	**21**	**74**

1 More than one vehicle / source was implicated in some outbreaks
2 Includes all causal agents listed in table 8 that were implicated in less than three foodborne outbreaks
3 All outbreaks with no pathogen identified in 2007 were classified as gastroenteritis
4 Processed meats included savaloys, cheerios, hot dogs and bacon
5 A common meal, premises or setting may have been implicated but no specific food items were recorded.

6 REFERENCES

Adlam B, Perera S, Lake R, Gallagher L, Bhattacharya A. (2007) Acute gastrointestinal illness (AGI) study: Community survey. ESR CLient Report FW0711. Wellington: ESR.

Anonymous. (2007) Norovirus outbreaks hits sports tournament. 4degreesC; Spring 2007:

Baker M, Wilson N, Edwards R. (2007) *Campylobacter* infection and chicken: an update on New Zealand's largest 'common source outbreak'. New Zealand Medical Journal; 120: http://www.nzma.org.nz/journal/120-1261/2717/.

Cornelius A, Gilpin B, Nicol C. (2006) PFGE typing of human case and food isolates of E. coli O157:H7 in New Zealand. ESR Client Report FW06101. Christchurch: ESR.

Cornelius A. (2007a) Bakery products: Microbiological quality (Summer). ESR Client Report FW0736. Christchurch: ESR.

Cornelius A. (2007b) Bakery products: Microbiological quality. ESR Client Report FW0786. Christchurch: ESR.

Cressey P, Lake R. (2005) Ranking food safety risks. Development of NZFSA policy 2004-2005. ESR Client Report FW0563. Christchurch: ESR.

Cressey P, Lake R. (2007) Risk ranking: Estimates of the burden of foodborne disease fo New Zealand. ESR Client Report FW0724. Christchurch: ESR.

French N, Carter P, Collins-Emerson J, Midwinter A, Mullner P, Wilson D. (2007) Comparing 'source attribution' models for human campylobacteriosis. Proceedings of 14th International Workshop on Campylobacter, Helicobacter and Related Organisms (CHRO), Rotterdam, The Netherlands, 5-7 September 2007.

Greening GE, Hewitt J. (2007) Improved methods for recovery and detection of norovirus in shellfish and foods. NZFSA analytical development: Validation Report. ESR Client Report FW0653. Keneperu: ESR.

Hall G, Kirk M. (2005) Foodborne illness in Australia. Annual incidence circa 2000. Canberra: Australian Government Department of Health and Aging.

King N, Lake R. (2007) Review of notified salmonellosis outbreak data as a source of information for attribution. ESR Client Report FW06114. Christchurch: ESR.

King N, Lake R, Sexton K, Bridgewater P. (2007) Acute gastrointestinal illness (AGI) study: Laboratory survey. ESR Client Report FW0685. Wellington: ESR.

Lake IR, Pearce J, Savill M. (2007a) The seasonality of human cryptosporidiosis in New Zealand. Epidemiology and Infection; doi:10.1017/S0950268807009922.

Lake R, Whyte R, Kliem C. (2005) Evlautaion of foodborne disease outbreaks/human health surveillance interface. ESR Client Report FW0522. Christchurch: ESR.

Lake R, Adlam B, Perera S. (2007b) Acute gastrointestinal illness (AGI) study: Final study report. ESR Client Report FW0753. Wellington: ESR.

McTavish S, Pope C, Nicol C, Sexton K, French N, Carter P. (2007) Wide Geographical Distribution of Internationally Rare Campylobacter Clones within New Zealand. Epidemiology and Infection; doi: 10.1017/S0950268807009892.

Mead PS, Slutsker L, Dietz V, McCaig LF, Bresee JS, Shapiro C, Griffin PM, Tauxe RV. (1999) Food-related illness and death in the United States. Emerging Infectious Diseases; 5: 607-625.

NZFSA. (2007) Modelling of exposure of New Zealand consumers to *Salmonella*. NZFSA Science Group Report 6. Wellington: NZFSA.

Perera S, Adlam B. (2007) Acute gastrointestinal illness (AGI) study: General Practice survey. ESR Client Report FW0716. Wellington: ESR.

Population and Environmental Health Group (ESR). (2008a) Notifiable and other diseases in New Zealand. ESR Client Report FW08034. Keneperu: ESR.

Population and Environmental Health Group (ESR). (2008b) Annual summary of outbreaks in New Zealand 2007. ESR Client Report FW08035. Keneperu: ESR.

Rohleder M, de Jager D. (2007) Norovirus outbreak in New Plymouth from Korean oysters. New Zealand Public Health Surveillance Review; March 2007: 7.

Simmons G, Garbutt C, Hewitt J, Greening GE. (2007) A New Zealand outbreak of norovirus gastroneteritis linked to the consumption of imported raw Korean oysters. New Zealand Medical Journal; 120: http://www.nzma.org.nz/journal/120-1264/2773/.

Wong TL. (2007) Salmonella from pet chews: Transmission by hand and potential re-growth following rehydration with artificial dog saliva. ESR Client Report FW0781. Christchurch: ESR.