# ANNUAL SUMMARY OF OUTBREAKS IN NEW ZEALAND 2002

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by

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# ANNUAL SUMMARY OF OUTBREAKS IN NEW ZEALAND 2002

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# 1. SUMMARY

## A. INCIDENCE & OUTCOMES:

- There was a decrease in the total number of outbreaks in 2002 (337 vs. 389 in 2001),
- However the average number of people involved per outbreak s increased significantly from 6.0 to 8.8.
- The number of outbreak associated cases increased slightly from 2323 in 2001 to 2890 cases in 2002.
- Common source outbreaks remain the most common outbreak types, especially those resulting from a common event.
- The number of household, common event, and community wide outbreaks decreased in 2002. Comparatively, institutional outbreaks and those of 'unknown type' have increased since 2001.
- All outbreaks resulted in 77 hospitalisations and 2 deaths

## B. GEOGRAPHY

- Auckland had the most outbreaks in 2002 (51.6%).
- Auckland, Rotorua and the West Coast had higher outbreak rates than the national average.
- Hawkes Bay, Hutt Valley, Nelson-Marlborough, Northland, South Canterbury, Tauranga, Waikato and Wanganui had lower rates than the national average.

## C. PATHOGENS

- Enteric pathogens caused fewer outbreaks in 2002 than in 2001, although more norovirus (ex. NLV) outbreaks were reported in 2002 than in 2001.
- The number of outbreak associated cases of Hepatitis A and C increased since 2001.
- Fewer protozoan (*Cryptosporidia* and *Giardia*) outbreaks cases were seen in 2002 than in 2001, similarly *Shigella* outbreaks.
- Norovirus caused most outbreaks in institutional settings in 2002 (27 outbreaks, 871 cases).
- Enteropathogens (*Salmonella*, *Campylobacter* and norovirus) caused more than 64% of outbreaks and 73% of outbreak related cases.

## D. SETTINGS

- Commercial food operations (mostly restaurants or cafes) were the most common setting for outbreaks in 2002, followed by households (34% and 28.1% respectively).
- Outbreaks occurring in institutions were larger and involved the largest proportion of cases. 19.8% of outbreak-associated cases occurred in rest-homes, 17% involved commercial food operations and 8.4% occurred in the home.

## E. TRANSMISSION ROUTES

- Person to person spread was responsible for the greatest proportion of outbreak-related cases (37.2%), although there were more foodborne outbreaks than person to person outbreaks (39.2% vs. 20.2%).
- Multiple modes of transmission were identified for 16.3% of outbreaks (27.2% of cases); 81.8% of those outbreaks had two modes of transmission (87.3% cases).
- Fewer foodborne outbreak cases, d and those with environmental transmission were seen in 2002 than in 2001. Zoonotic transmission outbreak numbers and cases remained similar.

## F. SOURCES

- In 2002, nearly half of all foodborne outbreaks had no identified source.
- *Campylobacter* and *Salmonella* outbreaks were primarily foodborne.

## G. RECOGNITION, REPORTING AND CONTROL OF OUTBREAKS

- Common event outbreaks are notified and reported sooner (3 days) than community wide (12.5 days), household (13 days), specific site (19.7 days), or dispersed outbreaks (34.9 days).
- Control measures were applied to 74% of outbreaks in 2002, a significant increase from 58% in 2001.

## 2. INTRODUCTION

### A. POPULATION DEMOGRAPHICS

There are 3,792,654* people in New Zealand[1], 75% residing in the North Island, and the remaining 25% in the South Island. Forty six percent of the population (1,760,076) live in three major cities, Auckland, Wellington and Christchurch. 1,823,007 (49%) are male, while 1,914,273 (51%) are female. 75% of people are of NZ European nationality, 5% from other European Nations. 15% Maori, 7% Asian, 6% Pacific Islanders and 1% Others. People responded to the census question regarding ethnicity more than once, and the first three choices were accepted.

### B. DATA AND SURVEILLANCE SYSTEMS

Outbreak surveillance provides a method for systematically recording outbreak characteristics and investigation. Outbreak summaries are recorded on EpiSurv, and can be linked to individual cases via an outbreak reference number.

The outbreak surveillance system in EpiSurv has been operational since 1997, though outbreak surveillance began in 1996. It should however be noted that outbreaks involving unusual pathogens or large numbers of cases are more likely to be reported, which will bias the information towards large outbreaks of unusual diseases. Notifiable diseases are more easily recognised by Public Health Services, and will be reported more readily than outbreaks caused by non-notifiable diseases.

EpiSurv relies upon self-reporting of outbreaks in institutions, therefore the increase in rest home outbreaks seen in 2002 may be artifact or real.

Data recording differences between outbreaks are difficult to resolve some fields of the outbreak report form are never filled in. The utility of the current systems for national surveillance purposes will be progressively re-examined in 2003 and 2004.

* This is based on Estimated Data from www.statistics.govt.org

## 3. METHODS

Data for this report was extracted from the outbreak surveillance system national database, held at the Institute of Environmental Science and Research Limited (ESR) Kenepuru Science Centre. The principal flows of surveillance information about notifiable diseases and disease outbreaks in New Zealand can be summarised as:

> "Outbreaks identified in the community, by ESR or district public health services (PHSs) are assessed at the PHS level. Once confirmed as an outbreak, the PHSs record data about the outbreak on a standardised Outbreak Report Form within their district electronic surveillance databases (EpiSurv). PHSs are encouraged to enter preliminary data as an interim report as soon as the outbreak is confirmed, then complete the remainder of the Outbreak Report Form when final data is available.
>
> On a weekly basis, this data (also data on individual cases) is downloaded from the district database and sent to ESR. It is collected within the national database on behalf of the Ministry of Health. The national database is supplemented by data on outbreaks recorded in the foodborne disease database, and by the ESR enteric reference and virology laboratories. PHS staff are asked to complete an Outbreak Report Form or outbreaks reported from these laboratory sources if appropriate." [2]

## A. CASE DEFINITION

"Outbreaks should be reported if the any of following conditions apply:"

1. Two or more cases of illness (not necessarily notifiable) are thought to be linked to a common source.

    - ► In particular when the common source is exposure at a common event, a common site, from food or water dispersed into the community, or in an institutional setting.
    - ► Cases of disease appear to be occurring as a community-wide outbreak where transmission is from person-to-person.
    - ► Except when this common source is well established as a national epidemic and reporting it as a discrete event is no longer useful.
    - ► Any other situation where outbreak investigation or control measures are being used or considered.

Outbreak reporting is encouraged when:

1. Secondary cases have occurred in an institutional setting.

2. The outbreak has occurred within a household and there is a reasonable possibility that it resulted from an external common source exposure for that household group.

    - ► Note: if the cases were more likely to have resulted from secondary transmission within a household over a period, this is not an outbreak.

Outbreak reporting is not usually required when:

1. A single secondary case, or a small number of cases, has acquired the illness by person-to-person transmission from a primary case.

    - ► These are distinguished on the individual case report forms as secondary cases.

## B. DATA USED FOR THIS REPORT

Analysis was based on data from outbreaks reported between 1st January and 31st December 2002, and received by the national database before 31 March 2003. The report includes some outbreaks that commenced in late 2001 and excludes some that began in late 2002 but were not reported until 2003.

The "Other Comments" field was used to enter data missing from fields, and PHS staff were contacted to verify the accuracy of this data.

# 4. RESULTS

## A. CHARACTERISTICS OF OUTBREAKS

### A4.1 Incidence of outbreaks in New Zealand

Three hundred and thirty seven outbreaks were reported to ESR in 2002, a crude national rate of 8.8 outbreaks per 100,000 population (Table 1). Outbreaks reported during 2002 involved 2890 confirmed and probable cases, a rate of 76.2 cases per 100,000 population at an average of 8.6 cases per outbreak.

The number of outbreaks in 2002 was less than the number of outbreaks in 2001 (389 in 2001), but more individuals were involved (2323 in 2001) ($\chi^2$=13.970, p<0.01). There was a significant increase in outbreak rate per 100,000 population from 6.0 to 8.8 ($\chi^2$=6.080, p<0.05) since 2001.

Of the 337 outbreaks reported in 2002, 319 (94.6%) were recorded as 'final reports'. Analysis was carried out on all 337 reported outbreaks, despite the 'interim' status of 18 (5.3%) outbreaks.

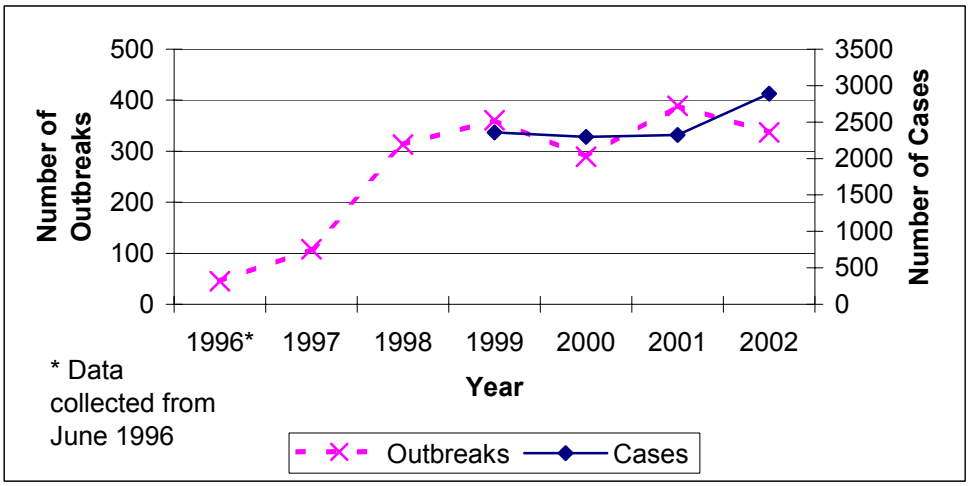
**Table 1. Characteristics of Outbreaks in New Zealand in 2002**

| Characteristics | Total | Rate* |
|---|---|---|
| Number of Outbreaks | 337 | 8.8 |
| Number of Cases | | |
| Confirmed | 990 | 26.1 |
| Probable | 1900 | 50.1 |
| Total | 2890 | 76.2 |
| Number of Exposed Persons† | 5275 | 139.1 |
| Number of Hospitalized Persons‡ | 77 | 2.0 |
| Number of Deaths§ | 2 | 0.1 |

* Crude Rate per 100,000 population, based on 2001 census
† This was recorded for 261 of 337 outbreaks (77.4%)
‡ This was recorded for 299 of 337 outbreaks (88.7%)
§ This was recorded for 300 of 337 outbreaks (89.0%)

Since 1997, the number of outbreaks and the number of cases involved in outbreaks have risen (Figure 1). While 2002 had fewer outbreaks than 2001, significantly more cases were involved (2890 c.f. 2323) ($\chi 2=61.050$, $p<0.01$).

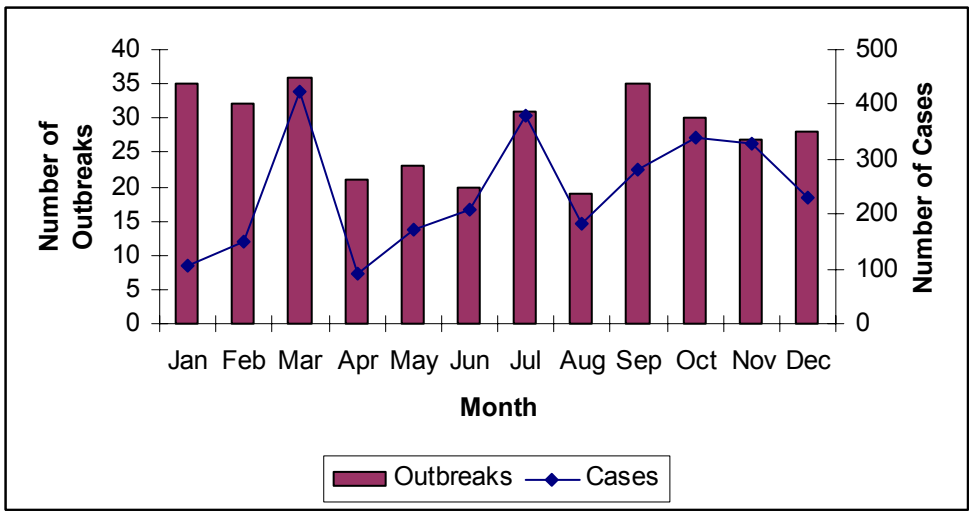
**Figure 1. Outbreaks per Year**




Reporting of outbreaks was seasonal (Figure 2) with a decrease in the reporting of outbreaks over the winter months. This is the same pattern as seen in other years[2]. The fewest cases were reported during April, although this is not reflected in the number of outbreaks reported.

There were a large number of outbreaks in January, February and April involving few cases. The average number of cases per outbreak in these months was 3.0, 4.7 and 4.5 respectively. Alternatively, in March, July, October and November, there were few outbreaks, involving many cases, an average of 12.0, 12.1, 12.0 and 13.0 cases per outbreak.

**Figure 2. Outbreaks per Month in 2002**



## B. TYPES OF OUTBREAKS

**Table 2. Outbreak Types seen in 2002**

| Type of Outbreak | Number of Outbreaks | Percent of Outbreaks | Rate* | Number of Cases | Percent of Cases | Rate |
|---|---|---|---|---|---|---|
| **Common Source** | **201** | **59.6** | **5.3** | **1333** | **46.1** | **35.1** |
| Attended Common Event | 157 | 78.1 | 4.1 | 918 | 68.9 | 24.2 |
| Common Source dispersed in community | 8 | 4.0 | 0.2 | 100 | 7.5 | 2.6 |
| Common Source in specific place | 36 | 17.9 | 0.9 | 315 | 23.6 | 8.3 |
| **Community-wide person to person transmission** | **3** | **0.9** | **0.1** | **28** | **1.0** | **0.7** |
| **Transmission within defined setting** | **106** | **31.5** | **2.8** | **1382** | **47.8** | **36.4** |
| Institutional | 49 | 46.2 | 1.3 | 1206 | 87.3 | 31.8 |
| Household | 57 | 53.8 | 1.5 | 176 | 12.7 | 4.6 |
| **Other** | **5** | **1.5** | **0.1** | **28** | **1.0** | **0.7** |
| **Unknown** | **22** | **6.5** | **0.6** | **119** | **4.1** | **3.1** |
| **TOTAL** | **337** | | | **2890** | | |

### B4.2 Common Source Outbreaks

Two hundred and one outbreaks (59.6%) were reported as from a common source. Of these, 157 (78.1%) were identified with a common event (e.g. conference etc.), eight (4.0%) a common source in the community (e.g. dissemination of a contaminated food product during manufacturing) and 36 (17.9%) with transmission over a protracted period, but from a specific place (e.g. contamination of recreational water). Combined, these outbreaks comprised 1333 cases (46.1% of total).

### B4.3 Community Wide Outbreaks

Community wide outbreaks, where transmission occurred through person-to-person contact accounted for three outbreaks (0.9%). There were 28 cases involved with community-wide outbreaks, an average of 9.3 cases per outbreak.

* Crude Rate per 100,000 population, based on 2001 census

### B4.4 Outbreaks in Defined Settings

One hundred and six outbreaks (31.5%) were reported as being due to transmission within a defined setting. Of these, 49 (46%) were institutional outbreaks (e.g. rest homes) containing 1206 cases [41.7% of all outbreak cases in 2002] an average of 24.6 cases per outbreak.

Fifty-seven defined setting outbreaks (54%) occurred in households. There were 176 associated cases, an average of 3.1 cases per outbreak.

### B4.5 2002 and 2001 Comparisons

Two significant differences were observed between 2002 and 2001. Namely, there were almost twice as many institutional outbreaks in 2002 than in 2001 ($\chi 2=6.021$, $p<0.05$) but fewer household outbreaks ($\chi 2=9.531$, $p<0.01$).

The proportion of cases due to common event, community wide or household outbreaks decreased in 2002, but there was an increase in the proportion of cases due to institutional outbreaks. Also, the number of cases due to 'unknown' outbreak types increased in 2002. These are summarised in Table 3 below.

**Table 3. Distribution of cases 2001 v 2002**

| | Proportion of Total Cases | | | |
|---|---|---|---|---|
| | **2001** | **2002** | $\chi^2$ | **P-value** |
| Common Event | 0.37 | 0.32 | 14.359 | <0.01 |
| Community Wide | 0.02 | 0.01 | 7.429 | <0.01 |
| Household | 0.13 | 0.06 | 67.643 | <0.01 |
| **Institutional** | **0.32** | **0.42** | **55.183** | **<0.01** |
| **Unknown** | **0.01** | **0.04** | **30.917** | **<0.01** |

### B4.6 Outbreaks and Cases by Health District

During 2002, outbreaks were reported from all health districts except Ruapehu. The Auckland region (incorporating North West, Central and South Auckland districts) had the most outbreaks, 175 (51.9% of total), 173 of which were due to enteric pathogens. Canterbury had the second highest number of outbreaks (35 outbreaks, all enteric) closely followed by Wellington (20, 18 enteric).

The crude national outbreak rate was 8.8 per 100,000 people, several health districts had significantly higher rates (Table 4), including Auckland, Rotorua and the West Coast. By comparison Hawkes Bay, Hutt Valley, Nelson-Marlborough, Northland, South Canterbury, Tauranga, Waikato and Wanganui had significantly lower rates than the national average.

**Table 4. Outbreaks and Associated Cases by Health District**

| Health District* | Number of Outbreaks | Rate† | $\chi^2$ | p-value | Number of Cases | Rate | $\chi^2$ | p-value |
|---|---|---|---|---|---|---|---|---|
| **Auckland‡** | **175** | **15.0** | **1671.8** | **<0.01** | 1028 | 87.8 | 15.2 | <0.01 |
| Canterbury | 35 | 8.6 | | | 660 | 163 | 31.0 | <0.01 |
| Eastern Bay of Plenty | 1 | 2.1 | | | 2 | 4.1 | 32.3 | <0.01 |
| Gisborne | 2 | 4.5 | | | 12 | 27.3 | 13.1 | <0.01 |
| **Hawkes Bay** | **4** | **2.8** | **86.2** | **<0.01** | 24 | 16.7 | 65.6 | <0.01 |
| **Hutt** | **8** | **6.0** | **32.1** | **<0.01** | 107 | 80.3 | | |
| **Manawatu** | **17** | **11.5** | **17.2** | **<0.01** | 69 | 46.7 | 16.0 | <0.01 |
| **Nelson-Marlborough** | **6** | **4.9** | **17.1** | **<0.01** | 136 | 111 | 18.2 | <0.01 |
| **Northland** | **6** | **4.4** | **14.2** | **<0.01** | 53 | 38.4 | 24.9 | <0.01 |
| Otago | 11 | 6.6 | | | 46 | 27.6 | 50.2 | <0.01 |
| **Rotorua** | **6** | **9.3** | **40.9** | **<0.01** | 18 | 28 | 18.9 | <0.01 |
| **South Canterbury** | **5** | **6.4** | **20.1** | **<0.01** | 86 | 110 | 11.0 | <0.01 |
| Southland | 1 | 0.6 | | | 5 | 2.82 | 124.0 | <0.01 |
| Taranaki | 9 | 8.6 | | | 130 | 125 | 30.2 | <0.01 |
| Taupo | 1 | 3.2 | | | 3 | 9.53 | 17.5 | <0.01 |
| **Tauranga** | **5** | **3.9** | **9.4** | **<0.01** | 32 | 24.8 | 43.5 | <0.01 |
| **Waikato** | **10** | **3.3** | **24.6** | **<0.01** | 43 | 14 | 153.2 | <0.01 |
| Wairarapa | 1 | 2.6 | | | 8 | 20.8 | 14.7 | <0.01 |
| **Wanganui** | **4** | **6.9** | **16.6** | **<0.01** | 27 | 46.4 | 6.4 | <0.05 |
| Wellington | 20 | 7.9 | | | 369 | 145 | 140.5 | <0.01 |
| **West Coast** | **10** | **33.0** | **134.6** | **<0.01** | 32 | 106 | 3.0 | 0.08 |
| **NEW ZEALAND** | **337** | **8.9** | | | **2890** | **76.2** | | |

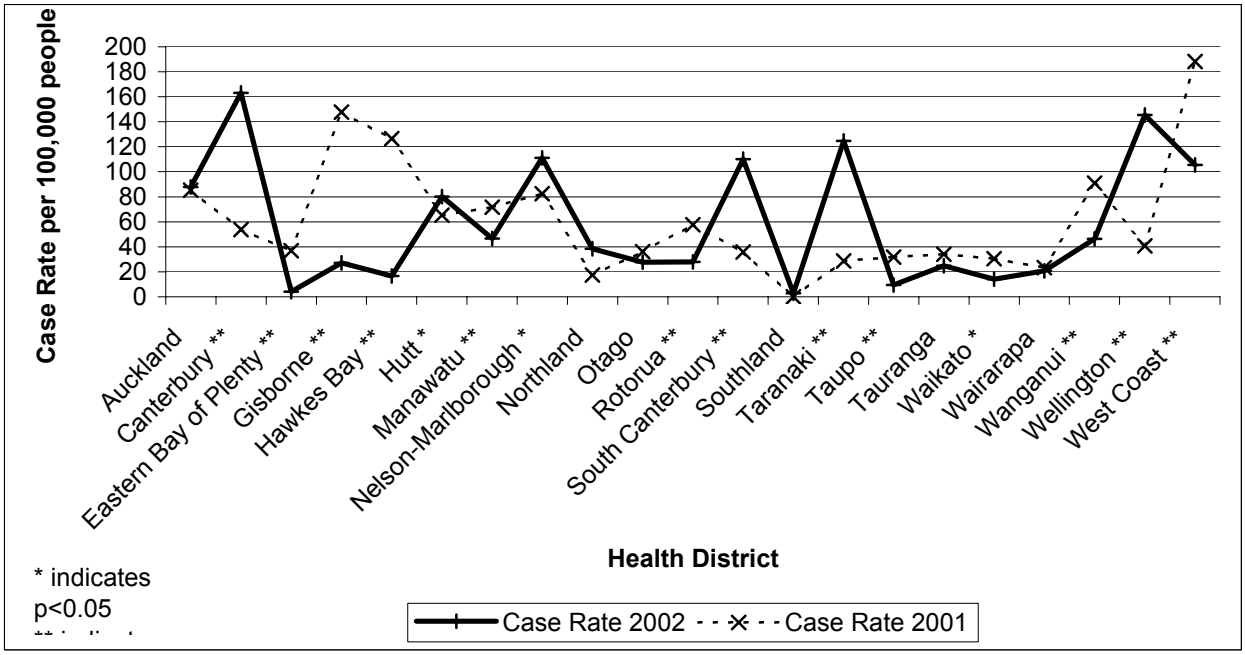
* Where no health district was indicated on the reporting form, health district was assigned according to the PHU where the outbreak was entered into the surveillance system

† Per 100,000 population, based on 2001 census

‡ Includes North West Auckland, Central Auckland and South Auckland Health Districts

Figure 3 shows areas of New Zealand where the case rate differed significantly between 2001 and 2002. Case rates in Eastern Bay of Plenty, Gisborne, Hawkes Bay, Manawatu, Rotorua, Taupo, Waikato, Wanganui and West Coast were significantly lower than in 2001, whereas case rates in Canterbury, Hutt, Nelson-Marlborough, South Canterbury, Taranaki and Wellington were higher.

**Figure 3. Difference between Case Rates[*] in 2001 and 2002**




[*] Case rates refers to cases associated with outbreaks

## B4.7 Causal Pathogens and Toxins

The causal agent(s) of outbreaks were identified in 240 outbreaks (71.2%) comprising 2395 cases (82.9%), Table 5 shows outbreaks by causal organism.

Both the number of outbreaks and the number of associated cases caused by enteric pathogens or agents was lower in 2002 than in 2001 ($\chi^2$=12.318, p<0.01; $\chi^2$=28.356, p<0.01 respectively).

Multiple agents were implicated in three outbreaks, involving 55 cases. Most of these were "norovirus + another agent". The agents that caused the largest outbreaks in 2002 were norovirus, *Campylobacter* sp. and *Salmonella* sp. More outbreaks were caused by norovirus in 2002 than in 2001 ($\chi^2$=7.732, p<0.01). The proportion of outbreaks caused by *Campylobacter* or *Salmonella* has not changed significantly from 2001.

'Poisoning' was the cause of six outbreaks (including outbreaks where poisoning was 'suspected') and 35 associated cases. Eighteen outbreaks were caused by bacterial enterotoxins (*S. aureus*, *B. cereus* and 'suspected') with 52 associated cases. None of these were significantly different to the previous year.

*Cryptosporidium* and *Giardia* related outbreaks remained constant 2002 and 2001, but the number of cases associated with these outbreaks has decreased significantly ($\chi^2$=14.552, p<0.01).

There was no increase in number of outbreaks of *M. tuberculosis* in 2002 compared to 2001, but there were more cases seen ($\chi^2$=6.404, p<0.05). One outbreak involved 20 people in Auckland, another involved 13 people in the Hawkes Bay.

The number of cases of Hepatitis associated with outbreaks in 2002 increased ($\chi^2$=5.424, p<0.05). One outbreak of Hepatitis A in Northland in April related to the consumption of raw blueberries and affecting 27 people caused this increase. A decrease in the number of *Shigella* cases associated with outbreaks was seen in 2002 ($\chi^2$=21.199, p<0.01). However the number of outbreaks did not decrease significantly.

There were neither, more outbreaks nor cases, of *Bordetella pertussis, Neisseria meningitidis* or Rotavirus in 2002 than in 2001.

There were no outbreaks of *Legionella*, lead absorption, measles, MSG poisoning, Dengue or Cannabis oil abuse akin to 2001.

The only agent causing an outbreak in 2002, not observed in 2001 was Leptospira.

## Table 5. Outbreaks and Associated Cases by Agent of Disease

| Pathogen | Number of Outbreaks | Percent of Outbreaks | Number of Cases | Percent of Cases | Average Number of Cases per Outbreak |
|---|---|---|---|---|---|
| Unidentified | 97 | 28.8% | 495 | 17.1% | 5.1 |
| B. cereus | 4 | 1.2% | 16 | 0.6% | 4.0 |
| B. pertussis | 8 | 2.4% | 34 | 1.2% | 4.3 |
| Campylobacter | 50 | 14.8% | 237 | 8.2% | 4.7 |
| Ciguatera | 2 | 0.6% | 9 | 0.3% | 4.5 |
| C. perfringens | 8 | 2.4% | 133 | 4.6% | 16.6 |
| C. parvum | 15 | 4.5% | 122 | 4.2% | 8.1 |
| E coli O157 | 1 | 0.3% | 3 | 0.1% | 3.0 |
| Giardia | 12 | 3.6% | 70 | 2.4% | 5.8 |
| Hepatitis A virus | 4 | 1.2% | 34 | 1.2% | 8.5 |
| Hepatitis C virus | 1 | 0.3% | 3 | 0.1% | 3.0 |
| Leptospira | 2 | 0.6% | 5 | 0.2% | 2.5 |
| Multiple | 1 | 0.3% | 29 | 1.0% | 29.0 |
| M. tuberculosis | 4 | 1.2% | 39 | 1.3% | 9.8 |
| N. meningitidis | 2 | 0.6% | 8 | 0.3% | 4.0 |
| norovirus | 70 | 20.8% | 1263 | 43.7% | 18.0 |
| norovirus & B. cereus | 1 | 0.3% | 3 | 0.1% | 3.0 |
| norovirus & A. caviae | 1 | 0.3% | 23 | 0.8% | 23.0 |
| Rotavirus | 2 | 0.6% | 43 | 1.5% | 21.5 |
| Salmonella | 28 | 8.3% | 126 | 4.4% | 4.5 |
| S. Typhimurium | 8 | 2.4% | 127 | 4.4% | 15.9 |
| Scrombotoxin | 1 | 0.3% | 20 | 0.7% | 20.0 |
| Shigella | 7 | 2.1% | 27 | 0.9% | 3.9 |
| Solanine | 1 | 0.3% | 2 | 0.1% | 2.0 |
| S. aureus | 4 | 1.2% | 9 | 0.3% | 2.3 |
| Y. enterocolitica | 3 | 0.9% | 10 | 0.3% | 3.3 |
| **TOTAL** | **337** | | **2890** | | **8.6** |

Causative agents were not laboratory confirmed in 97 outbreaks (28.8%) consisting of 495 cases (17.1%).

Of these non-laboratory confirmed pathogens (Table 6) the most common suspected agent was norovirus (18.6%) outbreaks and associated cases (41.4%).

Of the outbreaks caused by unknown organisms/toxins, 55 (comprising 232 cases) were outbreaks of gastroenteritis. The two remaining outbreaks involved two people each. Two exhibited signs of typical histamine poisoning, and were seemingly infected by consuming fish that contained high levels of histamine. The other two people exhibited signs of leptospirosis, however, *Leptospira* were not isolated and confirmed as the cause, thus the unknown status.

**Table 6. Unconfirmed (suspected) agents causing outbreaks in 2002**

| Suspected Agent | Number of Outbreaks | Percent of Outbreaks | Number of Cases | Percent of Cases |
|---|---|---|---|---|
| B. cereus | 1 | 1.0% | 2 | 0.4% |
| C. perfringens | 3 | 3.1% | 6 | 1.2% |
| Cucurbitacins | 1 | 1.0% | 2 | 0.4% |
| E. coli | 1 | 1.0% | 5 | 1.0% |
| norovirus | 18 | 18.6% | 205 | 41.4% |
| S.aureus/B.cereus susp. | 8 | 8.2% | 23 | 4.6% |
| Salmonella/Campylobacter/ norovirus susp. | 6 | 6.2% | 12 | 2.4% |
| Shellfish poisoning | 1 | 1.0% | 2 | 0.4% |
| S. aureus | 1 | 1.0% | 2 | 0.4% |
| Unknown | 57 | 58.8% | 236 | 47.7% |
| **TOTAL** | **97** | | **495** | |

### B4.8 Pathogens Causing Types of Outbreaks

The frequency of toxins or pathogenic agents implicated in specific outbreak types is shown in Table 7.

Of the outbreaks where pathogenic agents were identified, norovirus and *Campylobacter* sp. were most often isolated from 'common event' outbreaks, though more cases were involved in the norovirus outbreaks.

*Campylobacter* sp. and *Salmonella* sp. caused the same number (2) of outbreaks that were caused by a common source dispersed in the community, with *Campylobacter* sp. causing the most individual cases.

*Cryptosporidium parvum* was the pathogen responsible for most outbreaks of a common source from a specific place. Two large outbreaks occurred in Wellington, responsible for 72 of the 104 cases (69.2%), both were waterborne: the source of infection determined to be two different swimming pools.

*Campylobacter* sp. (11 outbreaks, 31 cases) dominated community outbreaks, seemingly by person to person transmission.

## Table 7. Number of outbreaks and cases by outbreak type

| Pathogen | Common Event | | Common Source Dispersed in Community | | Common source in specific place | | Community-wide, person to person | | Household | | Institutional | | Other Outbreak Type | | Unknown | | Grand Total Outbreaks | Grand Total Cases |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B. cereus | **3*** | 12 | | | | | | | **1** | 4 | | | | | | | **4** | 16 |
| B. pertussis | | | | | | | **2** | 17 | **5** | 15 | | | **1** | 2 | | | **8** | 34 |
| Campylobacter | **27** | 119 | **2** | 13 | **7** | 66 | | | **11** | 31 | **1** | 2 | **1** | 2 | **1** | 4 | **50** | 237 |
| Ciguatera | **1** | 2 | | | **1** | 7 | | | | | | | | | | | **2** | 9 |
| C. perfringens | **8** | 133 | | | | | | | | | | | | | | | **8** | 133 |
| C. parvum | | | | | **8** | 104 | | | **5** | 14 | **1** | 2 | **1** | 2 | | | **15** | 122 |
| E. coli O157 | **1** | 3 | | | | | | | | | | | | | | | **1** | 3 |
| Giardia | **1** | 3 | | | **2** | 7 | **1** | 11 | **6** | 25 | **1** | 15 | **1** | 9 | | | **12** | 70 |
| Hepatitis A | **1** | 3 | **1** | 27 | | | | | **1** | 2 | | | | | **1** | 2 | **4** | 34 |
| Hepatitis C | | | | | **1** | 3 | | | | | | | | | | | **1** | 3 |
| Leptospira | | | | | **2** | 5 | | | | | | | | | | | **2** | 5 |
| Multiple | | | | | | | | | | | **1** | 29 | | | | | **1** | 29 |
| M. tuberculosis | **2** | 24 | | | | | | | **1** | 2 | | | **1** | 13 | | | **4** | 39 |
| N. meningitidis | | | | | | | | | | | **2** | 8 | | | | | **2** | 8 |
| norovirus | **27** | 292 | | | **3** | 75 | | | **5** | 14 | **27** | 871 | | | **8** | 11 | **73** | 1263 |
| norovirus & B.cereus | **1** | 3 | | | | | | | | | | | | | | | **1** | 3 |
| norovirus & A.caviae | | | | | | | | | | | **1** | 23 | | | | | **1** | 23 |
| Rotavirus | | | | | | | | | | | **2** | 43 | | | | | **2** | 43 |
| Salmonella | **9** | 45 | **2** | 38 | **3** | 12 | | | **9** | 21 | **3** | 6 | | | **2** | 4 | **28** | 126 |
| S. Typhimurium | **3** | 44 | **1** | 0 | **1** | 2 | | | **1** | 2 | **1** | 2 | | | **1** | 77 | **8** | 127 |
| Scrombotoxin | | | **1** | 20 | | | | | | | | | | | | | **1** | 20 |
| Shigella | **1** | 4 | | | **1** | 3 | | | **5** | 20 | | | | | | | **7** | 27 |
| Solanine toxin | **1** | 2 | | | | | | | | | | | | | | | **1** | 2 |
| S. aureus | **3** | 7 | | | | | | | **1** | 2 | | | | | | | **4** | 9 |
| Unspecified | **67** | 219 | **1** | 2 | **7** | 31 | | | **4** | 17 | **9** | 205 | | | **9** | 21 | **98** | 498 |
| Y. enterocolitica | **1** | 3 | | | | | | | **2** | 7 | | | | | | | **3** | 10 |
| **TOTAL OUTBREAKS** | **157** | | **8** | | **36** | | **3** | | **57** | | **49** | | **5** | | **18** | | **337** | |
| **TOTAL CASES** | | **918** | | **100** | | **315** | | **28** | | **176** | | **1206** | | **28** | | **116** | | **2890** |

* **Bold** numbers indicate the number of outbreaks, while the normal number beside refers to the number of cases associated with the outbreaks.

### B4.9 Outcome of Outbreaks

Twenty-eight outbreaks in 2002 involved the hospitalisation of 77 cases. This is a significant increase in outbreaks from 2001 (16 outbreaks involving hospitalisation of 78 cases, $\chi^2=4.870$, $p<0.05$). However, there were no significant differences in the number of cases that were hospitalised.

Deaths occurred in two outbreaks (one case in each outbreak), one in Auckland and the other in Wellington. Both outbreaks were of norovirus and occurred in September and August respectively.

Information provided from the Auckland indicated cause of death was "a myocardial infarction brought about by uncontrollable protracted vomiting".

In 2002, outbreaks caused by norovirus were responsible for the bulk of outbreak related hospitalisations (41.6%), with *Salmonella* sp. outbreaks accounting for 22.1% of hospitalisations (Table 8). All cases of meningitis involved in *Neisseria meningitidis* outbreaks were hospitalised.

**Table 8. Number and Proportion of Hospitalised Cases per Pathogen**

| Pathogen | Number of Cases (n=2089) | Cases hospitalised (n=77) | Percent of cases Hospitalised | Percent of Hospitalisations |
|---|---|---|---|---|
| Unspecified | 495 | 4 | 0.8% | 5.2% |
| B. cereus | 16 | 0 | | |
| B. pertussis | 34 | 2 | 5.9% | 2.6% |
| Campylobacter | 237 | 2 | 0.8% | 2.6% |
| Ciguatera poisoning | 9 | 0 | | |
| C. perfringens | 133 | 0 | | |
| C. parvum | 122 | 1 | 0.8% | 1.3% |
| E coli O157 | 3 | 0 | | |
| Giardia | 70 | 0 | | |
| Hepatitis A virus | 34 | 5 | 14.7% | 6.5% |
| Hepatitis C virus | 3 | 0 | | |
| Leptospira | 5 | 1 | 20.0% | 1.3% |
| Multiple | 29 | 0 | | |
| M. tuberculosis | 39 | 4 | 10.3% | 5.2% |
| N. meningitidis | 8 | 8 | 100.0% | 10.4% |
| Norovirus | 1263 | 32 | 2.5% | 41.6% |
| Norovirus & B. cereus | 3 | 0 | | |
| Norovirus & A. caviae | 23 | 0 | | |
| Rotavirus | 43 | 0 | | |
| Salmonella | 126 | 8 | 6.3% | 10.4% |
| S. Typhimurium | 127 | 9 | 7.1% | 11.7% |
| Scrombotoxin | 20 | 1 | 5.0% | 1.3% |
| Shigella | 27 | 0 | | |
| Solanine | 2 | 0 | | |
| S. aureus | 9 | 0 | | |
| Y. enterocolitica | 10 | 0 | | |

### B4.10 Outbreak Setting

In 2002, the proportion of outbreaks occurring in the home (28%) and commercial food operations (34%) was approximately the same ($\chi^2$=0.5844, p=0.44). This is similar to 2001, where 36% outbreaks related to home, and 43% to visiting commercial food outlets.

**Table 9. The Setting of Outbreaks in 2002**

| Outbreak Setting | Number of Outbreaks | Percent of Outbreaks | Number of Cases | Percent of Cases |
|---|---|---|---|---|
| **Commercial Food Operators** | **133** | **34.0%** | **798** | **17.0%** |
| Restaurant or café | 66 | 16.9% | 363 | 7.7% |
| Takeaway | 29 | 7.4% | 84 | 1.8% |
| Special event/catered function | 9 | 2.3% | 120 | 2.6% |
| Bakery | 1 | 0.3% | 25 | 0.5% |
| Hotel | 8 | 2.0% | 130 | 2.8% |
| Supermarket/deli | 10 | 2.6% | 29 | 0.6% |
| Other food outlet* | 10 | 2.6% | 47 | 1.0% |
| **Institutions** | **59** | **15.1%** | **1392** | **29.7%** |
| School/University | 14 | 3.6% | 157 | 3.3% |
| Rest/Retirement Home | 28 | 7.2% | 926 | 19.8% |
| Camp | 8 | 2.0% | 215 | 4.6% |
| Childcare centre/Pre-school | 9 | 2.3% | 94 | 2.0% |
| **Community Groups** | **3** | **0.8%** | **31** | **0.7%** |
| Other | 2 | 0.5% | 20 | 0.5% |
| Clubs | 1 | 0.3% | 11 | 0.2% |
| **Workplace** | **23** | **5.9%** | **102** | **2.2%** |
| Workplace | 3 | 0.8% | 22 | 0.5% |
| Farm | 13 | 3.3% | 43 | 0.9% |
| Abattoir | 7 | 1.8% | 37 | 0.8% |
| **Household (home)** | **110** | **28.1%** | **392** | **8.4%** |
| **Other** | **1** | **0.3%** | **4** | **0.1%** |
| Overseas Acquired | 1 | 0.3% | 4 | 0.1% |
| **Information not provided** | **24** | **6.1%** | **270** | **5.8%** |
| **Setting unknown** | **37** | **9.5%** | **190** | **4.1%** |
| **TOTAL** | **391**† | | **4688** | |

* Other food outlets included foodcourts, service stations and a birthday party.
† More than one setting was reported for some outbreaks

### B4.11 Transmission

Table 10 shows that most outbreaks in 2002 were foodborne. Person to person outbreaks were responsible for more cases.

**Table 10. Principle Modes of Transmission for Outbreaks in 2002**

| Principle Mode of Transmission | Number of Outbreaks | Percent of Outbreaks | Number of Cases | Percent of Cases |
|---|---|---|---|---|
| Foodborne | 132 | 39.2% | 677 | 23.4% |
| Waterborne | 6 | 1.8% | 18 | 0.6% |
| Person to Person | 68 | 20.2% | 1075 | 37.2% |
| Environmental | 1 | 0.3% | 9 | 0.3% |
| Zoonotic | 7 | 2.1% | 22 | 0.8% |
| Other | 0 | 0.0% | 0 | 0.0% |
| Unknown | 60 | 17.8% | 287 | 9.9% |
| Not Specified | 8 | 2.4% | 15 | 0.5% |
| Multiple Modes | 55 | 16.3% | 787 | 27.2% |
| **TOTAL** | **337** | | **2890** | |

16.3% of outbreaks were reported to have had more than one mode of transmission. This commonly happens, as the faecal-oral route often allows pathogens to spread first to food, then from person to person.

Table 11 shows the further separation of outbreaks and cases caused by multiple modes of transmission, depending on how many modes of transmission were reported.

**Table 11. Multiple Modes of Transmission of Outbreaks and Cases in 2002**

| Multiple Modes of Transmission | Number of Outbreaks | Percent of Outbreaks | Number of Cases | Percent of Cases |
|---|---|---|---|---|
| Four Modes | 1 | 1.8% | 49 | 6.2% |
| Three Modes | 9 | 16.4% | 51 | 6.5% |
| Two Modes | 45 | 81.8% | 687 | 87.3% |
| **TOTAL** | **55** | | **787** | |

In total, 137 outbreaks, comprising 769 cases were attributed to foodborne spread. These figures include outbreaks where multiple modes of transmission were suspected (Table 12). This is similar to the number of foodborne outbreaks seen in 2001, though significantly fewer cases were involved in 2002 ($\chi^2$=232.34, p<0.01).

Waterborne outbreaks made up 7.7% of all outbreaks in 2002, and 7.0% of outbreak cases. There were no more outbreaks seen in 2002 than in 2001 but there were more cases involved with waterborne outbreaks ($\chi^2$=75.152, p<0.01).

Person to person spread was involved in 114 outbreaks and 1706 cases in 2002. This is an increase in the number of cases from 2001 ($\chi^2$=184.44, p<0.01). There was no increase in the number of outbreaks from 2001.

The number of cases (224 in 2002) involved with environmental transmission of disease has also increased from 2001 ($\chi^2$=23.146, p<0.01). There was no increase in the number of outbreaks from 2001.

The number of outbreaks (17) and cases (98) in 2002 that were caused by zoonotic transmission remain similar to values reported in 2001.

The number of cases involved with 'other' forms of spread have increased significantly from 2001 ($\chi^2$=117.93, p<0.01). There was no increase in the number of outbreaks from 2001.

**Table 12. Modes of Transmission including multiple modes**

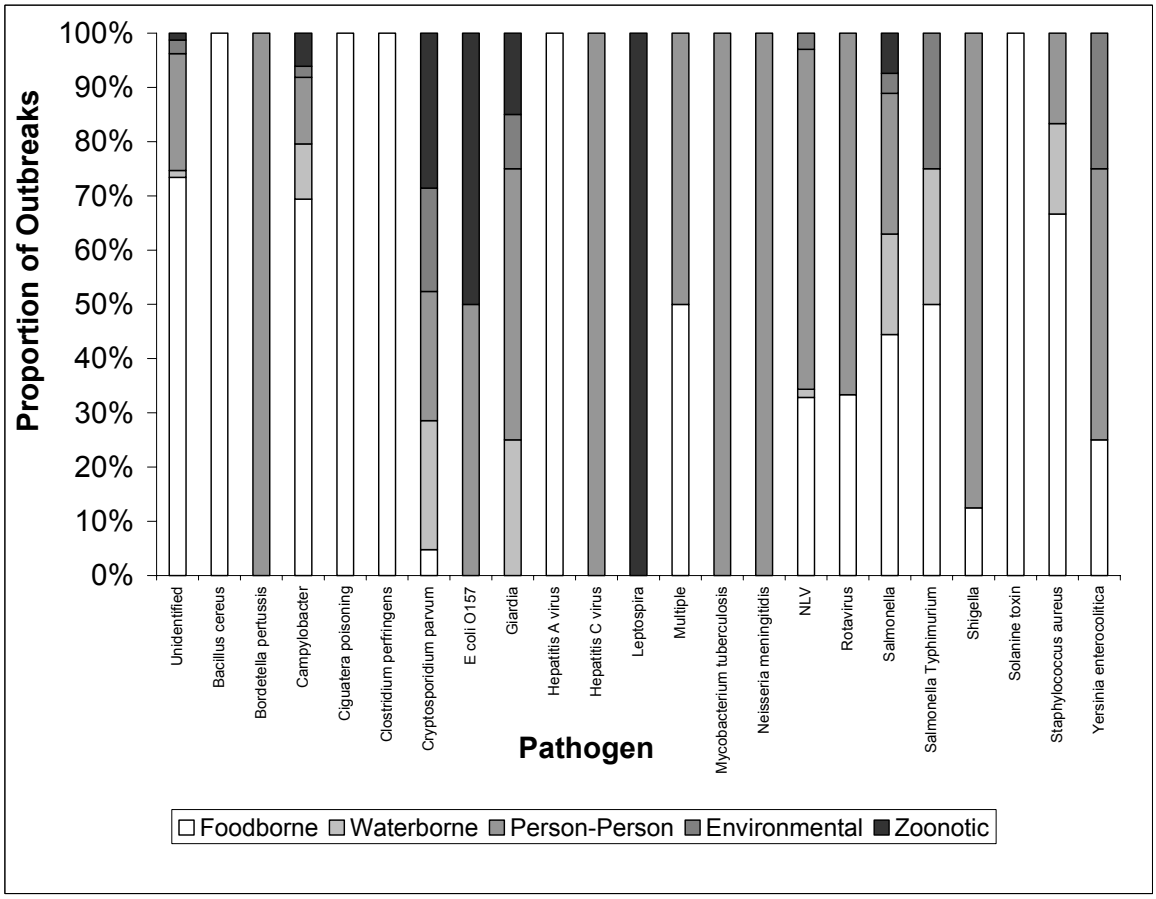
| Modes of Transmission (all inclusive) | Number of Outbreaks | Percent of Outbreaks | Number of Cases | Percent of Cases |
|---|---|---|---|---|
| Foodborne spread | 137 | 43.9% | 769 | 23.4% |
| Waterborne spread | 24 | 7.7% | 230 | 7.0% |
| Peron-person spread | 114 | 36.5% | 1706 | 51.9% |
| Environmental spread | 13 | 4.2% | 224 | 6.8% |
| Zoonotic spread | 17 | 5.4% | 98 | 3.0% |
| Other forms of spread | 7 | 2.2% | 257 | 7.8% |
| **TOTAL** | **312** | | **3284** | |

## B4.12 Specific Pathogens Related to Transmission of Outbreaks

Most outbreaks caused by *Campylobacter* sp., *Salmonella* sp. (inc. Typhyimurium) *and S. aureus* were foodborne. Person to person spread was responsible for most outbreaks of norovirus, Rotavirus, *Shigella* and *Y. enterocolitica*.

*Cryptosporidium* caused equal proportions of zoonotic, environmental, person to person and waterborne outbreaks, but was responsible for fewer foodborne outbreaks. *Giardia* showed a similar pattern although not implicated in any foodborne outbreaks. *E. coli* was spread equally within foodborne and person to person outbreaks.

**Figure 4. Pathogens and Outbreaks they Caused**



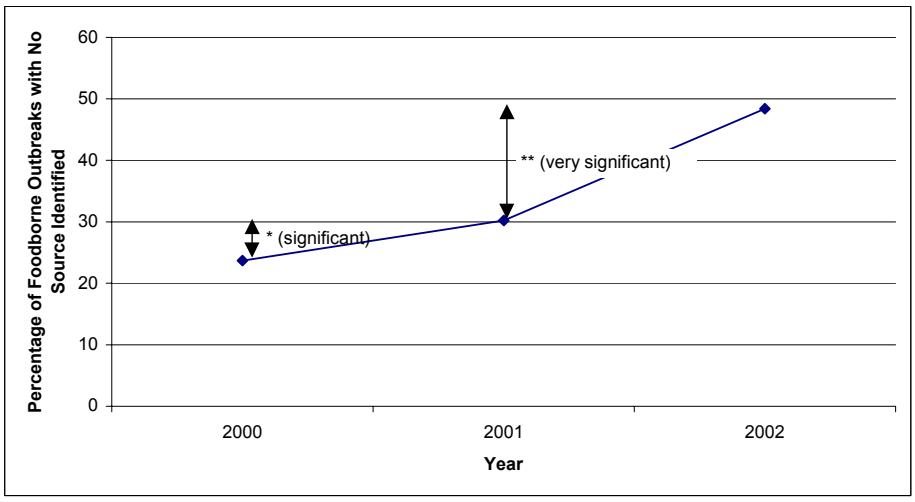
## B4.13 Pathogens, Foods and Factors Contributing to Foodborne Outbreaks

### *a) Specific Foods Implicated in Foodborne Outbreaks*

Nearly half of all foodborne infections did not have an identified source. This proportion is a further increase from 2001, and is the continuation of an apparent trend. The difference between the number of foodborne outbreaks with an identified source in 2000 and 2001 is significant, as is the difference between 2001 and 2002.

The number of foodborne infections without an identified source has more than doubled since 2000. This indicates that finding the source of foodborne disease outbreaks is difficult. It may also show that finding the source was deemed more important in 2000 than in 2002.

**Figure 5. Percentage of Foodborne Outbreaks with Unidentified Sources**




Chicken was involved in 26 outbreaks in 2002 (210 cases), in comparison, only 17 were identified in 2001 (Table 13). However, these numbers are not significantly different when the population of all foodborne diseases are compared.

Fish was involved in 13 outbreaks (involving 78 cases), not significantly more than in 2001 (5 outbreaks involving 'fish and chips').

There was a decrease in outbreaks caused by mixed foods in 2002 ($\chi^2$=22.717, p<0.01).

## Table 13. Food Implicated in Foodborne Outbreaks

| Source of Infection | Number of Outbreaks | Percent of Outbreaks | Number of Cases | Percent of Cases |
|---|---|---|---|---|
| No Source Identified | 80 | 51.6% | 439 | 45.4% |
| Chicken | 8 | 5.2% | 74 | 7.7% |
| Chicken, Bread, Salad, Mixed | 1 | 0.6% | 3 | 0.3% |
| Chicken, Dairy | 1 | 0.6% | 62 | 6.4% |
| Chicken, Kebab | 3 | 1.9% | 12 | 1.2% |
| Chicken, Meat | 1 | 0.6% | 2 | 0.2% |
| Chicken, Pate | 1 | 0.6% | 2 | 0.2% |
| Chicken, Rice | 1 | 0.6% | 6 | 0.6% |
| Chicken, Salad | 2 | 1.3% | 28 | 2.9% |
| Chicken, Sandwich | 2 | 1.3% | 7 | 0.7% |
| Chicken, Turkey, Salad | 1 | 0.6% | 5 | 0.5% |
| Chicken, Vegetables, Pie | 1 | 0.6% | 9 | 0.9% |
| Dairy* | 1 | 0.6% | 4 | 0.4% |
| Dry Goods | 1 | 0.6% | 3 | 0.3% |
| Eggs | 1 | 0.6% | 4 | 0.4% |
| Fish† | 12 | 7.7% | 75 | 7.8% |
| Fish, Chicken | 1 | 0.6% | 3 | 0.3% |
| Fish, Sandwich | 1 | 0.6% | 2 | 0.2% |
| Fruit | 1 | 0.6% | 2 | 0.2% |
| Meat | 7 | 4.5% | 23 | 2.4% |
| Meat, Cheese, Sandwich | 1 | 0.6% | 3 | 0.3% |
| Meat, Chicken, Rice | 1 | 0.6% | 6 | 0.6% |
| Meat, Chicken, Vegetables | 1 | 0.6% | 2 | 0.2% |
| Meat, Egg, Vegetables | 1 | 0.6% | 5 | 0.5% |
| Meat, Pie | 1 | 0.6% | 2 | 0.2% |
| Meat, Pizza | 1 | 0.6% | 2 | 0.2% |
| Meat, Rice | 1 | 0.6% | 3 | 0.3% |
| Meat, Rice, Mixed | 1 | 0.6% | 2 | 0.2% |
| Meat, Sandwich | 1 | 0.6% | 28 | 2.9% |
| Meat, Vegetables | 1 | 0.6% | 3 | 0.3% |
| Mixed‡ | 3 | 1.9% | 7 | 0.7% |
| Mixed, Eggs | 1 | 0.6% | 2 | 0.2% |
| Mixed, Rice | 1 | 0.6% | 25 | 2.6% |
| Pizza | 1 | 0.6% | 13 | 1.3% |
| Salad, Turkey, Meat | 1 | 0.6% | 2 | 0.2% |
| Vegetables | 1 | 0.6% | 2 | 0.2% |
| Water§ | 9 | 5.8% | 90 | 9.3% |
| Water, Dairy | 1 | 0.6% | 5 | 0.5% |
| **TOTAL** | **155**** | | **967** | |

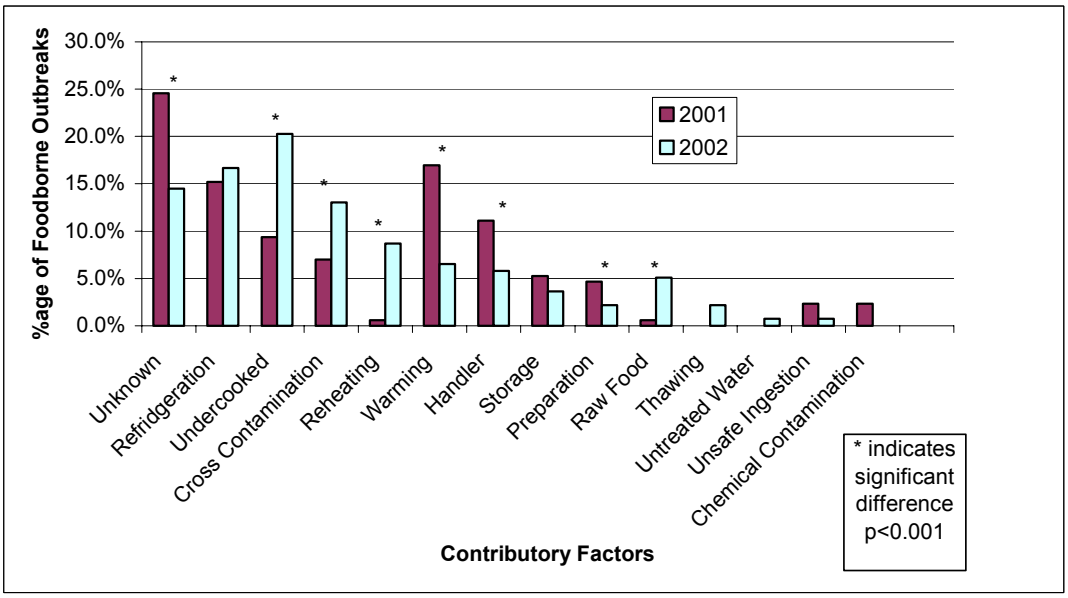
* Includes cream/milk/cheese
† Includes fish, seafood and shellfish.
‡ Where 'buffet meals' or 'appetizers' were suggested to be the source of infection.
§ Included where the household source of water was from 'tanks' or 'roof supply'.
** Not all foodborne outbreaks were associated with a source of infection.

### *b) Contributing Factors to Foodborne Outbreaks*

In 2001, there were more 'unknown' factors contributing to foodborne outbreaks than there were in 2002 (Figure 6). This trend is also seen with 'warming', 'storage' and 'preparation' factors where the food was held at inappropriate temperatures, stored incorrectly prior to preparation or prepared too far in advance.

In 2002 there was a significant increase in the contribution of undercooked food and cross-contamination of already cooked food to foodborne outbreaks.

**Figure 6. Proportion of Foodborne Outbreaks with Contributory Factors**




In 2001 there were several outbreaks that indicated undercooking of chicken livers as a potential source for *Campylobacter* sp. outbreaks. However, this was not seen in 2002.

Many outbreaks did not have contributory factors identified, and many pathogens were not linked with particular food types. Six norovirus outbreaks had no foodtype associated with them, but were thought to have arisen as a result of poor food handling practices. Undercooking and cross-contamination contributed to the most outbreaks of foodborne disease.

### B4.14 Pathogens and Factors Affecting Waterborne Outbreaks

Waterborne outbreaks were caused by *Campylobacter, Cryptosporidium parvum*, *Giardia* and *Salmonella* in similar amounts (5 outbreaks per pathogen) but the pathogen involving the most cases was *Cryptosporidium parvum*. These figures are not significantly different from 2001. Salmonella was not the causative pathogen in any 2001 waterborne outbreaks, neither was norovirus.

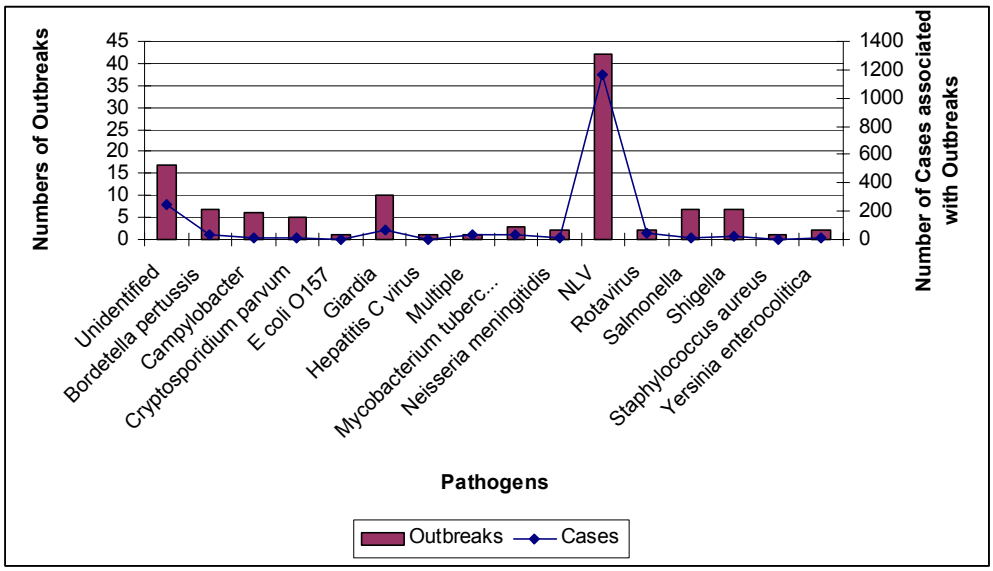
Most *Campylobacter* sp. related waterborne outbreaks were a result of water supplies, in which the water was untreated. Of the five *Cryptosporidium* waterborne outbreaks, three were determined to have no identified factors relating to the outbreaks. The two that did were also caused by untreated water supplies. Giardia showed a similar pattern, whereas the one norovirus waterborne outbreak appeared to be caused by a contaminated reservoir, which was also an inadequate supply and untreated water. The remaining outbreaks implicated the same factors.

## B4.15 Pathogens and Factors Affecting Person to Person Outbreaks

Figure 7 shows the distribution of pathogens involved in person-to-person outbreaks. Norovirus caused most outbreaks and associated cases (42 outbreaks, 1166 cases). Norovirus person to person outbreaks increased from 2001 ($\chi^2$=5.225, p<0.05), while *Cryptosporidium* outbreaks decreased ($\chi^2$=5.869, p<0.05). These are the two principle differences seen between years.

In an institutional setting, if the outbreak was linked to a specific event occurring within that setting, then it is classified as a 'common event' outbreak. If the outbreak was linked to contact with a specific contaminated environment within that setting, then it is reclassified as 'common sources in specific place'.

**Figure 7. Pathogens involved in Person to Person Outbreaks in 2002**




The most common factor contributing to person to person outbreaks in 2002 was contact with infected people (57 outbreaks, 50%). Unidentified factors contributed to 19 outbreaks, and contact with infected people and 'environment' were believed to have contributed to 13 outbreaks (11.4%).

### B4.16 Pathogens and Factors Affecting Environmental Outbreaks

As in 2001, *Cryptosporidium parvum* was implicated most frequently in environmental outbreaks (4 outbreaks, 28.6%) involved the most number of people (86). The number of outbreaks was not significantly different from 2001. Norovirus caused two environmental outbreaks involving 67 people.

Half of all environmental outbreaks (7) were caused by contact with contaminated environments and untreated recreational water. The remaining were divided into: exposure to contaminated recreational water (4), exposure to infected animals, environment and untreated recreational water (2) and unidentified factors (1).

### B4.17 Pathogens Implicated in Zoonotic Outbreaks

*Cryptosporidium* caused the majority of zoonotic outbreaks (6 outbreaks involving 17 people). However, the zoonotic pathogen that involved the most people was *Campylobacter* sp., with three outbreaks involving 55 people.

## C. OUTBREAK RECOGNITION, INVESTIGATION AND CONTROL

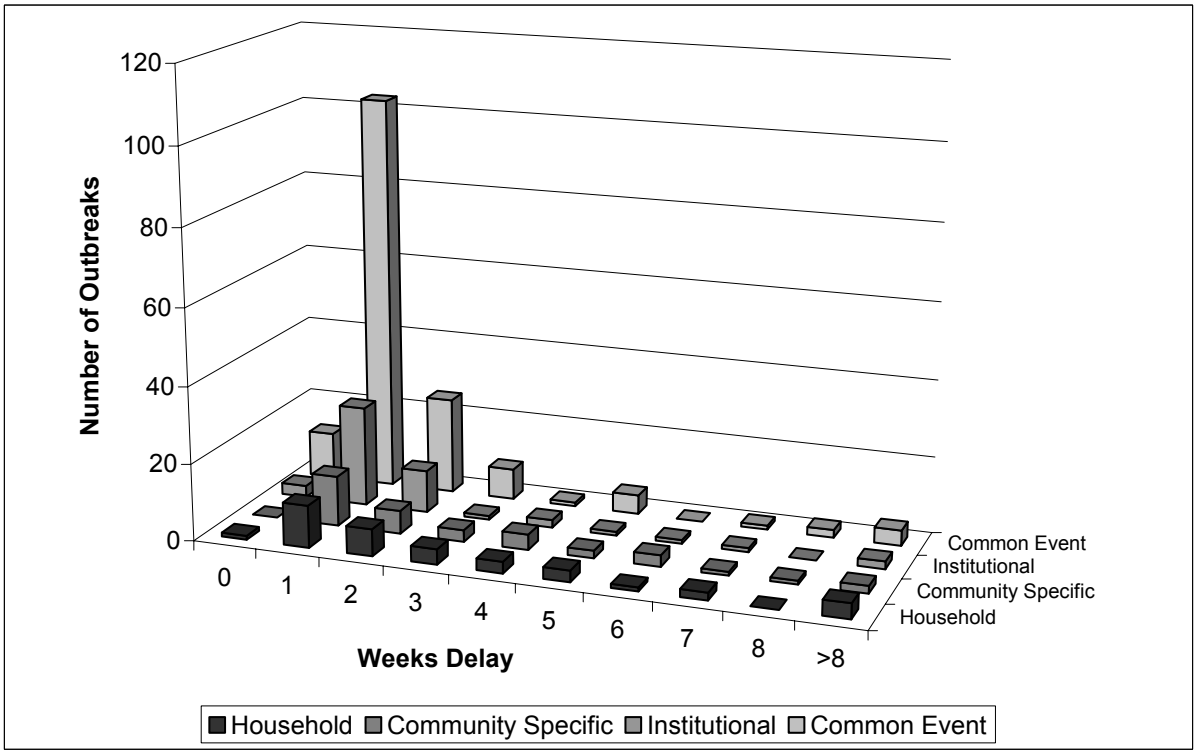
### C4.18 Reporting Delays

The date that outbreaks were reported on EpiSurv is defined as the report date upon which the Public Health Service (PHS) was aware of the outbreak. Some variability in time taken to report can arise from the time for PHS staff to report to EpiSurv, rather than the time from general practitioners report to the PHS.

Of the 323 outbreaks (95.8%) for which a date of onset of illness was recorded, 85.4% (276) were reported within one calendar month (30 days). A further 11.5% (37) were recorded on EpiSurv between one and three months of the date of onset. 4 more outbreaks (1.2%) were reported between three months and a year after the date of onset, while two outbreaks have been reported in 2002 that occurred in 2001. These proportions are almost identical to reporting delays seen in 2001.

Different types of outbreaks caused different delays in reporting. Figure 8 shows that the majority of common event outbreaks were reported in the first three weeks following the onset of illness. Institutional outbreaks mimic this trend, however, household outbreaks are reported up to 6 weeks after onset of illness.

**Figure 8. Reporting Delays for Outbreak Types**



When comparing the average delay period (in days) of different outbreak types, the median is the most useful measurement of central tendency for skewed distributions. Consequently, Table 14 displays the mean and the median number of days delay for reporting. Most outbreaks were reported within 1 or 2 days of onset of illness, apart from those related to a common source dispersed throughout the community, which often took up to five weeks to be reported. The reporting delay for community wide person to person transmission outbreaks had a reporting delay of 36.5 days in 2001, and 12.5 days in 2002, similarly Institutional outbreaks took an average of 20 days to be reported in 2001, but 5.5 days in 2002 (medians compared only).

**Table 14. Average Reporting Delay for Different Types of Outbreaks**

| Type of Outbreak | Number | Mean | Median | Skewed* |
|---|---|---|---|---|
| **Common Source** | **203** | **11.2** | **4** | **YES** |
| Attended Common Event | 161 | 8.3 | 3 | YES |
| Common Source dispersed in Community | 7 | 34.9 | 9 | NO |
| Common Source in Specific Place | 35 | 19.7 | 13 | NO |
| **Community-wide person to person transmission** | **2** | **12.5** | **12.5** | **N/A** |
| **Transmission within defined setting** | **84** | **24** | **8** | **YES** |
| Institutional | 48 | 12.1 | 5.5 | YES |
| Household | 36 | 40.6 | 13 | YES |
| **Other** | **4** | **46.8** | **39.5** | **NO** |
| **Unknown** | **18** | **5.1** | **3.5** | **NO** |
| **TOTAL** | **311†** | **14.9** | **5** | **YES** |

* Where the distribution is skewed the answer is 'yes' and the median should be used as the central tendency measurement.

† Not all Outbreaks had a 'type' attributed to them.

### C4.19 Means of recognition and linkage between cases

Two hundred and fifteen outbreaks (1907 cases) were recognised via multiple means, and had more than one linkage method between cases. A further 111 outbreaks (involving 812 cases) were recognised by a single set of circumstances. Outbreaks were most often identified by cases being linked to a common source (food, water or an environmental site), cases having attended a common event or those that have had contact with other cases.

Most outbreaks were recognised through several sets of circumstances, though cases being linked to common sources (true of both outbreaks and their associated cases) were the most common, though fewer outbreaks were recognised this way than in 2001 ($\chi 2 = 18.631$, $p<0.01$).

**Table 15. Recognition of Outbreaks**

| Means of Recognition | Number of Outbreaks | Percent of Outbreaks | Number of Cases | Percent of Cases |
|---|---|---|---|---|
| Increase in Incidence | 60 | 10.2% | 1193 | 21.7% |
| Attended Common Event | 167 | 28.4% | 1414 | 25.7% |
| Cases linked to Common Source | 248 | 42.1% | 2064 | 37.5% |
| Person to Person Contact | 70 | 11.9% | 442 | 8.0% |
| Common Organism | 37 | 6.3% | 365 | 6.6% |
| Other Means | | | | |
| Family Group | 6 | 1.0% | 18 | 0.3% |
| None Specified | 1 | 0.2% | 4 | 0.1% |

### C4.20 Control Measures

Specific action was taken to control 250 outbreaks (74.2%) during 2002, while 17.2% of outbreaks (58) had no control measures applied. This is a significant increase from the 58% controlled in 2001 ($\chi 2=19.989$, $p<0.01$). Two hundred and five outbreaks were controlled by more than one control measure. The control measures that were applied are described in Table 16.

Of the 250 outbreaks controlled, 168 (67.2%) were controlled at the source, with health education and advice (60.7%) and modifications of procedures (54.2%) the most common control measures applied.

**Table 16. Control Measures Taken for Outbreaks in 2002**

| Control Measures Taken* | Number of Outbreaks | | | Percent of Outbreaks | |
|---|---|---|---|---|---|
| Controlled Outbreaks | **250** | | | 74.2% | |
| Controlled at source | | 168 | | | 67.2% |
| Closed | | | 11 | | 6.5% |
| Modified Procedures | | | 91 | | 54.2% |
| Cleaned | | | 48 | | 28.6% |
| Removed | | | 4 | | 2.4% |
| Treatment | | | 13 | | 7.7% |
| Exclusion | | | 37 | | 22.0% |
| Isolation | | | 39 | | 23.2% |
| Health Education & Advice | | | 102 | | 60.7% |
| Vector Control | | 6 | | | 2.4% |
| Vector Treated | | | 3 | | 50.0% |
| Vector Removed | | | 3 | | 50.0% |
| Contacts & Potential Contacts | | 33 | | | 13.2% |
| Chemoprophylaxis | | | 5 | | 15.2% |
| Vaccination | | | 2 | | 6.1% |
| Health Education and Advice | | | 26 | | 78.8% |
| Other, unspecified | | 43 | 43 | | |
| Not Controlled | **58** | | | 17.2% | |
| Unknown | **29** | | | 8.6% | |
| **TOTAL** | **337** | **250** | **427** | | |

* More than one control measure was taken for at least 90 outbreaks

# 5. DISCUSSION

## A. OUTBREAK DESCRIPTIONS

A total of 337 outbreaks were reported to ESR in 2002.

Common source outbreaks are still the most common outbreak type, especially those resulting from a common event. This may reflect awareness and/or the relative ease of identification of common event outbreaks. Conversely outbreaks involving a common source, dispersed in the community, or those occurring in relation to a specific site may have low rates because they are harder to identify, or because they genuinely occur less frequently. The data gathered does not allow the determination of the situation.

It was reported in 2001 that the number of household outbreaks had increased. This trend has reversed in 2002, and is seen in common event outbreaks and community wide outbreaks as well. Comparatively, institutional outbreaks and those designated 'of unknown type' have significantly increased since 2001. Several outbreaks did occur in nursing homes in 2002, which increased the number of these types of outbreaks. The increase in numbers of reported institutional outbreaks may be a direct result of education in that area, to increase recognition of these outbreaks, or there may be more outbreaks occurring in institutional settings.

Auckland had the largest number of outbreaks in 2002 (51.6% of total), however comparing each district to the crude national rate (8.9 outbreaks per 100,000 people) allows inter-district comparisons. The West Coast had the most outbreaks per 100,000 people (33), while Auckland and Rotorua were also significantly higher than the national rate (15 and 9.3 respectively). Hawkes Bay, the Hutt Valley, Nelson-Marlborough, Northland, South Canterbury, Tauranga, Waikato and Wanganui all had lower outbreak rates than the national average, with Hawkes Bay recording the lowest (2.8). It is not known whether these regional differences are real or a result of differences in outbreak recognition, recording and reporting.

Enteric pathogens caused fewer outbreaks in 2002 than in 2001, although more norovirus outbreaks were reported in 2002. There was an increase in numbers of outbreak associated Tuberculosis and Hepatitis cases in 2002. . Fewer cases associated with protozoan (*Cryptosporidia* and *Giardia*) outbreaks were seen in 2002 than in 2001, and the same trend was shown for *Shigella* outbreaks. The number of outbreaks (and associated cases) due to bacterial enterotoxins, *Campylobacter*, *Salmonella*, *Bordetella pertussis*, *Neisseria meningitidis* and Rotavirus have not changed significantly from 2001.

*Cryptosporidium parvum* caused most outbreaks of a common source from a specific setting. Two outbreaks occurred in Wellington, involving 72 cases. Both outbreaks were waterborne, associated with two different recreational swimming pools. Norovirus caused most outbreaks in institutional settings in 2002 (27 outbreaks, 871 cases). Norovirus also caused the same number of common event outbreaks (27), but involved far fewer individuals (292).

As in previous years, few outbreaks had serious outcomes. Seventy-seven outbreak related cases were hospitalised and two died. These rates are almost identical to those seen in 2001. The two deaths occurred in cases involved in norovirus outbreaks (one in Auckland, the other Wellington), and were related to comorbid disease rather than the infection per se. Outbreaks caused by norovirus were responsible for 41.6% of all hospitalisations, and *Salmonella* 22.1%. All cases of meningitis associated with *Neisseria meningitidis* outbreaks were hospitalised.

Commercial food operations were the most common setting for outbreaks in 2002, closely followed by households (34% and 28.1% respectively). Most outbreaks related to commercial food operations occurred in restaurants or cafes. However, outbreaks occurring in institutions involved the largest proportion of cases, 19.8% of all outbreak-associated cases occurred in rest-homes, while 17% of all cases involved commercial food operations and 8.4% of all outbreak-related cases occurred in the home.

Person to person spread of disease was responsible for the greatest proportion of outbreak-related cases (37.2%), although there were more foodborne outbreaks than person to person outbreaks (39.2% compared to 20.2%). Multiple modes of transmission were identified for 16.3% of outbreaks (27.2% of cases), and 81.8% of those outbreaks had two modes of transmission (87.3% cases). Fewer cases of foodborne outbreaks, and outbreaks involved with environmental transmission were seen in 2002 than in 2001. Conversely, there were more cases involved with waterborne and person to person outbreaks in 2002 than the previous year. The number of cases and outbreaks caused by zoonotic transmission remained similar.

The number of foodborne outbreaks with indistinguishable sources continues to increase. In 2002, nearly half of all foodborne outbreaks had no identified source. There was a decrease in the number of foodborne outbreaks attributable to consumption of mixed foods between 2002 and 2001. This may have resulted from small changes in the manner in which the analysis of data has been carried out between the years, rather than a true representation of the types of food causing foodborne outbreaks.

Factors that contributed to foodborne outbreaks in 2002 are slightly different to 2001. There were fewer outbreaks brought about by warming, storage and 'preparation misconduct' than 2001. However, there was an increase in those resulting from undercooking, cross contamination and raw food. Whether or not these are true representations of what kitchen practice occur are a byproduct of more focussed educational directives is impossible to distinguish.

Particular pathogens are primarily responsible for particular types of outbreaks. All *Mycobacterium tuberculosis* outbreaks were caused by person to person spread. Similarly, all Hepatitis A outbreaks were foodborne. Half of *E. coli* O157 outbreaks in 2002 were environmental, while the other half were zoonotic. Large proportions of Shigella and Rotavirus outbreaks were spread through person to person transmission. *Campylobacter* and *Salmonella* outbreaks spread via all possible transmission routes, but were primarily foodborne. *Cryptosporidium* was also spread via all transmission routes, foodborne spread was responsible for fewer outbreaks than alternate methods.

## B. RECOGNITION, REPORTING AND CONTROL OF OUTBREAKS

The majority of all outbreaks were recognised and reported to the Public Health Service within a week of onset of illness. Analysis shows that common event outbreaks are notified and reported more expediently (3 days) than community wide (12.5 days), household (13 days), specific site (19.7 days), or dispersed outbreaks (34.9 days). This demonstrates the extreme difficulty in tracing and investigating of outbreaks when they have been dispersed throughout the community.

Most outbreaks were recognised through several sets of circumstances, though cases being linked to common sources (both outbreaks and their associated cases) were the most common. This was closely followed in importance by cases having attended a common event, or a simple increase in incidence of the disease.

Specific actions were taken to control a greater proportion of outbreaks in 2002 than in 2001, a continuing trend from previous years. The most popular method of control tends to involve health education and advice, while strong control measures (closure, vaccination) were only utilised in a small number of outbreaks. Modification of procedures was used moderately as a control method, probably in conjunction with other methods. Most outbreaks that were controlled used more than one method (82%).

## C. DATA LIMITATIONS AND BIASES

Outbreaks involving unusual pathogens or large numbers of cases are more likely to be reported, which will bias the information towards large outbreaks of unusual diseases. Some Public Health Services collect and report data with more 'enthusiasm' than others, resulting in artificial disparities between geographical areas that are not real. Notifiable diseases are more easily recognised by Public Health Services, and will be reported more readily than outbreaks caused by non-notifiable diseases.

EpiSurv relies upon self-reporting of outbreaks in institutions, whereas there may be many outbreaks of disease occurring in health institutions (such as hospitals) that are not being recorded. Indeed, the increase in rest home outbreaks seen in 2002 may be part of more vigilant surveillance by Public Health Services in rest homes, rather than a true increase of outbreaks.

Data recording differences between outbreaks are difficult to overcome. Some fields of the outbreak report form are never filled in. Some are over filled, with several methods of transmission (for instance) being recorded, when in actual fact, only two apply. Some outbreaks are not fully recorded on EpiSurv, and so analysis is carried out on 'interim' reports only. There remains a real need to refine the national data collection and analysis processes and information communication, and in so doing to differentiate clearly between local and national data needs and the processes that underpin these.

These problems notwithstanding, outbreaks continue to provide an opportunity to increase knowledge of infectious diseases. Risk factors and interventions that have been identified and have had a positive effect on spread of disease can be determined by studying individual outbreaks in more detail. Information gathered from individual outbreaks and in more combined reports such as this one can be useful in policy formulation for both local and national policy makers.

## 6. REFERENCES


1. Statistics New Zealand [WEBSITE] http://www.statistics.govt.nz

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