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**ANNUAL SUMMARY OF OUTBREAKS
IN NEW ZEALAND 2005**

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by

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IN NEW ZEALAND 2005**

Population and Environmental Health Group

April 2006

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EXECUTIVE SUMMARY

Characteristics

- There were 346 outbreaks reported in 2005 involving 2436 cases.
- The national outbreak rate was 9.3 outbreaks per 100 000 population.
- There were 69 hospitalisations and 4 deaths associated with outbreaks in 2005.

Distribution by PHU

- The highest number of outbreaks was reported by the Auckland PHU, which represented 70.5% (244/346) of all outbreaks in 2005.
- Auckland and West Coast had outbreak rates higher than the national rate.
- The highest outbreak rate (20.8 per 100 000 population) was observed in Auckland.

Type of outbreak

- Almost half (168/346) of all outbreaks were reported as a common source outbreak, the majority of which resulted from a common event.
- Institutional outbreaks represented 11.6% (40/346) of all outbreaks and 42.1% (1026/2436) of all associated cases.

Causal agents

- The causal agent (pathogen, toxin or chemical) was identified in 67.3% (233/346) of outbreaks involving 83.5% (2033/2436) of outbreak related cases.
- The remaining outbreaks where no organism was isolated were all recorded as gastroenteritis.
- Enteric agents were implicated in 97.7% (338/346) of outbreaks and 96.2% (2343/2436) of outbreak related cases.
- The most common implicated pathogen was norovirus (17.6% of outbreaks), followed by *Campylobacter* (13.6%) and *Salmonella* (7.5%).

Outbreak setting

- The most common settings where exposure or transmission occurred were the home environment (33.5% of outbreaks) and restaurants or cafés (30.9%).
- Rest homes were involved in only 4.9% (17/346) of outbreaks but 19.4% (472/2436) of all outbreak related cases.

Mode of transmission

- Foodborne outbreaks were the commonest mode of transmission, accounting for 52.9% (183/346) of outbreaks and 30.9% (753/2436) of cases.
- Person-to-person transmission was recorded in 49.1% (170/246) of outbreaks involving 70.6% (1721/2436) of cases.
- Multiple modes of transmission were identified in 33.8% (117/346) of outbreaks associated with 42.2% (1028/2436) of cases.

Recognition, investigation and control

- The majority of outbreaks (61.5%) were reported within 7 days of the onset of illness in the first case.
- The overall median reporting delay for outbreaks was 5.0 days.
- Outbreaks were most frequently identified when cases attended a common event (44.8% of outbreaks), when cases had person-to-person contact with other cases (37.0%) and when cases were linked to a common source (33.8%).
- Outbreak control measures were undertaken in 93.4% (323/346) of outbreaks reported in 2005. The most common measures were health education and advice (295 outbreaks) and modification of procedures (135).

1. INTRODUCTION

Outbreak surveillance in New Zealand has been conducted by ESR since 1996. The outbreak surveillance system was incorporated as a module within EpiSurv, the national notifiable disease surveillance system, in 1997.

Outbreak surveillance is undertaken for the following reasons¹:

- To identify and control widely dispersed outbreaks
- To improve outbreak prevention
- To assess impact of outbreaks and set priorities
- To evaluate prevention strategies
- To improve investigation methods
- To improve public health training
- To improve understanding of emerging diseases
- To meet international reporting requirements

2. METHODS

2.1. Outbreak definition

The Manual for Public Health Surveillance in New Zealand² states that the following types of outbreaks should be reported:

- Two or more cases linked to a common source, in particular where the common source is exposure at a common event, food or water dispersed in the community, an environmental source, or a source in an institutional setting.
- A community-wide or person-to-person outbreak (except when the source has become well established as a national epidemic and reporting it as a discrete event no longer serves a useful purpose)
- Any other situation where outbreak investigation or control measures are being used or considered

Outbreak reporting is encouraged for:

- A secondary case in an institution
- Household outbreaks – if there is a reasonable possibility that the outbreak resulted from a common source exposure for that household group.

Outbreak reporting is not usually required for:

- Most secondary cases.
- Single cases where a specific contaminated source is identified.

¹ Lopez L, Baker M, Kieft C. *Annual Summary of Outbreaks in New Zealand 2000*. 2001, Institute of Environmental Science & Research Ltd (ESR).

² *Manual for Public Health Surveillance*, 2005, Institute of Environmental Science & Research Ltd (ESR).

2.2. Data source

Outbreaks are reported to or identified by the local Public Health Unit (PHU). Data on each outbreak is recorded by the PHU on a standardised Outbreak Report Form within EpiSurv. Outbreak data can either be submitted as a final report that is complete or an interim report that can be finalised after further data is available. This data is downloaded weekly from each district EpiSurv database to be collated within the national EpiSurv database by ESR on behalf of the Ministry of Health. The national database is supplemented by data from the ESR enteric reference, virology and public health laboratories. If an outbreak is first identified by these laboratory sources, the responsible PHU is requested to complete an Outbreak Report Form.

The Outbreak Report Form consists of the following sections:

- Reporting authority (outbreak report date, interim/final report)
- Disease and implicated pathogen, toxin or chemical (name of implicated agent, case definitions)
- Outbreak demographics (number of cases, outbreak dates, age/sex of cases, incubation period, duration of illness)
- Circumstances of exposure/transmission (means of outbreak recognition, type of outbreak, setting, geographic location, mode of transmission, vehicle/source, evidence)
- Factors contributing to outbreak (specific factors relating to foodborne, waterborne, person-to-person and environmental outbreaks)
- Management of the outbreak (control measures undertaken)

The terms used in the Outbreak Report Form that relate to this report are defined in the glossary at the end of this report.

2.3. Data analysis

This report contains an analysis of data on outbreaks reported between 1 January 2005 and 31 December 2005 and recorded on EpiSurv as at 8 February 2006. Amendments made to outbreak data on EpiSurv after 8 February 2006 will not be reflected in this report.

The number and percentage of outbreaks and/or associated cases were ascertained. Rates were calculated using national and PHU population figures based on the 2001 Census data. Data on trends was based on previously published data in the Annual Summary of Outbreaks in New Zealand from 2001 to 2004.

The categories and subcategories analysed in this report were directly based on fields in the Outbreak Report Form, with two exceptions: implicated food sources were grouped in one or more food categories; and reporting delay was calculated using the outbreak report date and the date of onset of illness in the first case.

2.4. Data limitations

The available outbreak data is restricted to the outbreaks recorded in EpiSurv by PHUs. Outbreaks are more likely to be reported if they involve unusual pathogens, notifiable

diseases, a large number of cases or a well defined setting. The differing availability of resources between PHUs may also impact outbreak reporting at a regional level.

Data recording differences occur when fields in an Outbreak Report Form are incomplete or incorrectly entered, resulting in measurement bias. For example, the date of onset of illness in the first case was not reported for 17 outbreaks and incorrectly entered for 9 outbreaks (the date of onset occurring after the report date) in 2005.

Over the previous five years, different methods of data analysis have been used in the Annual Summary of Outbreaks in New Zealand. In 2003 and 2004, interim outbreak reports were excluded from analysis. In 2002, causal agents were categorised as laboratory confirmed versus suspected. As a result of these different analytical methods, only general comments were possible regarding outbreak trends.

3. RESULTS

3.1. Characteristics of outbreaks

During 2005, there were 346 outbreaks reported, with a national rate of 9.3 outbreaks per 100 000 population. Of these outbreaks reported in 2005, 343 (99.1%) were classified as final, while the remaining three were classified as interim. A total of 2436 cases were associated with outbreaks, at a national rate of 65.2 cases per 100 000 population. Of the total cases, 667 (27.4%) were confirmed, 1767 (72.5%) were probable, while the status of the remaining two cases was unknown. The average number of cases per outbreak was 7.0 in 2005.

3.2. Distribution of outbreaks by PHU

The highest number of outbreaks (244) was reported by the Auckland PHU, which represented 70.5% (244/346) of all outbreaks in 2005 (see Table 1). Wellington had the second highest number of outbreaks (27), followed by Canterbury (25). The highest outbreak rate (20.8 per 100 000 population) was also observed in Auckland (see Figure 1). The second highest outbreak rate (19.9 per 100 000 population) was calculated for the West Coast, though only 1.7% (6/346) of all outbreaks in 2005 were reported from this region. No outbreaks were reported in Eastern Bay of Plenty.

Figure 1: Outbreak rates by PHU region, 2005

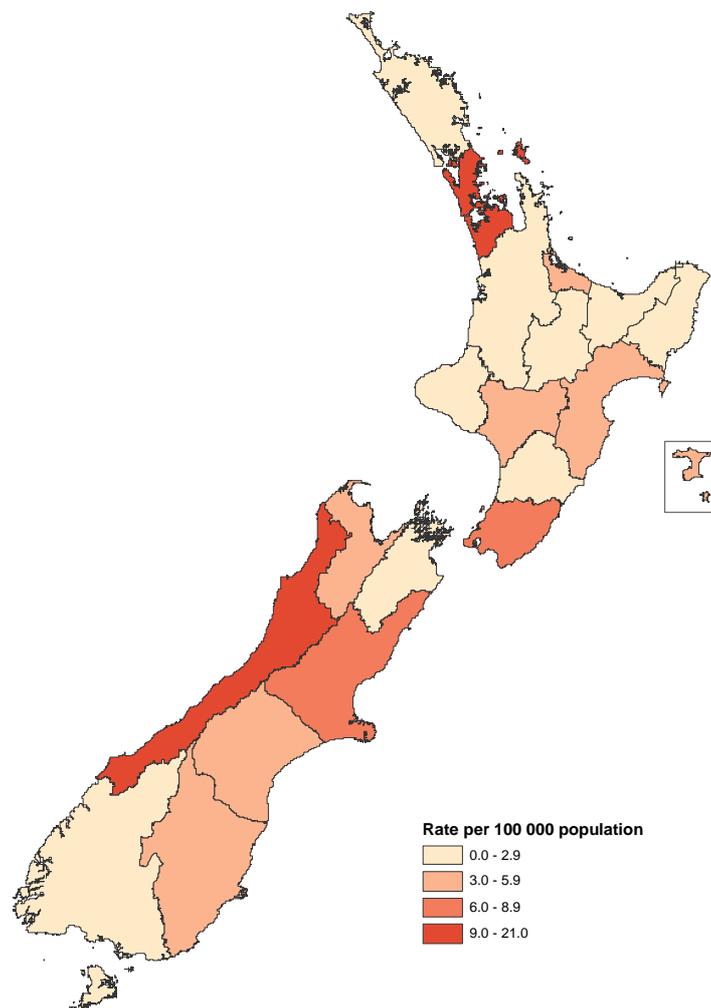


Table 1: Outbreaks and associated cases by PHU, 2005

PHU	No. of outbreaks	% of outbreaks (n=346)	No. of cases	% of cases (n=2436)	Outbreak rate¹
Northland	2	0.6%	50	2.1%	1.4
Auckland ²	244	70.5%	1081	44.4%	20.8
Waikato	2	0.6%	33	1.4%	0.6
East. Bay of Plenty	0	0.0%	0	0.0%	0.0
Rotorua	1	0.3%	2	0.1%	1.0
Tauranga	4	1.2%	27	1.1%	3.1
Gisborne	1	0.3%	8	0.3%	2.3
Hawkes Bay	8	2.3%	112	4.6%	5.6
Taranaki	2	0.6%	31	1.3%	1.9
Manawatu	3	0.9%	37	1.5%	2.0
Wanganui	2	0.6%	33	1.4%	3.1
Wellington ³	27	7.8%	353	14.5%	6.4
Marlborough	1	0.3%	13	0.5%	2.5
Nelson	3	0.9%	56	2.3%	3.6
Canterbury	25	7.2%	458	18.8%	6.2
South Canterbury	4	1.2%	39	1.6%	5.1
West Coast	6	1.7%	28	1.1%	19.9
Otago	9	2.6%	67	2.8%	5.4
Southland	2	0.6%	8	0.3%	1.9
Total	346	100.0%	2436	100.0%	-

1 Rate per 100 000 population calculated using 2001 Census data

2 Includes Northwest Auckland, Central Auckland and South Auckland Health Districts

3 Includes Wellington, Hutt and Wairarapa Health Districts

3.3. Type of outbreak

Almost half (168/346) of all outbreaks in 2005 were reported as a common source outbreak. Of these outbreaks, 124 reportedly resulted from a common event, 25 from a common source in a specific site and 19 from a common source dispersed in the community (see Table 2). Household outbreaks accounted for 23.1% (80/346) of outbreaks but just 9.4% (229/2436) of outbreak cases. Institutional outbreaks had the highest number of cases per outbreak (25.7), accounting for 11.6% (40/346) of all outbreaks and 42.1% (1026/2436) of outbreak associated cases. Community wide outbreaks, where transmission occurred through person-to-person contact, represented 2.6% (9/346) of reported outbreaks.

Table 2: Outbreaks and associated cases by type of outbreak, 2005

Outbreak type	No. of outbreaks	% of outbreaks (n=346)	No. of cases	% of cases (n=2436)	Cases per outbreak
Common event	124	35.8%	603	24.8%	4.9
Dispersed common source	19	5.5%	122	5.0%	6.4
Common site	25	7.2%	212	8.7%	8.5
Community wide	9	2.6%	41	1.7%	4.6
Institutional	40	11.6%	1026	42.1%	25.7
Household	80	23.1%	229	9.4%	2.9
Other outbreak type	14	4.0%	109	4.5%	7.8
Unknown outbreak type	35	10.1%	94	3.9%	2.7
Total	346	100.0%	2436	100.0%	7.0

3.4. Causal agents

The causal agent was identified in 233 (67.3%) outbreaks that were associated with 2033 (83.5%) cases. For each of these outbreaks only one causal agent was recorded. No specific pathogen was isolated in the remaining 113 (32.7%) outbreaks, all of which were recorded as gastroenteritis outbreaks.

Enteric agents were implicated in the vast majority of outbreaks (97.7%) and cases (96.2%) (see Table 3). The most common causal agent implicated in outbreaks in 2005 was norovirus, which resulted in 61 (17.6%) outbreaks and 1159 (47.6%) of cases. Norovirus outbreaks had an average of 19 cases per outbreak, the highest of any causal agent in 2005. The next most common agent associated with outbreaks was *Campylobacter* (13.6%), followed by *Salmonella* (7.5%), *Cryptosporidium parvum* (7.2%) and *Giardia* (6.6%).

Non-enteric agents accounted for only 8 (2.3%) outbreaks associated with 93 (3.8%) cases in 2005. These outbreaks involved *Mycobacterium tuberculosis* (3 outbreaks), influenza viruses (2), *Legionella pneumophila* (2) and lead (1).

Table 3: Outbreaks and associated cases by agent type, 2005

Agent type	No. of outbreaks	% of outbreaks	No. of cases	% of cases
<i>Enteric</i>				
Norovirus	61	17.6%	1159	47.6%
<i>Campylobacter</i> spp.	47	13.6%	252	10.3%
<i>Salmonella</i> spp.	26	7.5%	120	4.9%
<i>Cryptosporidium parvum</i>	25	7.2%	108	4.4%
<i>Giardia</i> spp.	23	6.6%	91	3.7%
<i>Clostridium perfringens</i>	11	3.2%	38	1.6%
Rotavirus	6	1.7%	53	2.2%
<i>Shigella</i> spp.	5	1.4%	58	2.4%
<i>Staphylococcus aureus</i>	5	1.4%	21	0.9%
<i>Bacillus</i> spp.	5	1.4%	10	0.4%
VTEC/STEC	3	0.9%	8	0.3%
Histamine poisoning	3	0.9%	7	0.3%
<i>Yersinia enterocolitica</i>	2	0.6%	8	0.3%
Hepatitis A virus	2	0.6%	4	0.2%
Ciguatera poisoning	1	0.3%	3	0.1%
Unidentified pathogen ¹	113	32.7%	403	16.5%
Total enteric	338	97.7%	2343	96.2%
<i>Non-enteric</i>				
<i>M. tuberculosis</i>	3	0.9%	39	1.6%
Influenza viruses	2	0.6%	30	1.2%
<i>Legionella pneumophila</i>	2	0.6%	21	0.9%
Lead	1	0.3%	3	0.1%
Total non-enteric	8	2.3%	93	3.8%

¹ All outbreaks with no pathogen identified in 2005 were classified as gastroenteritis

The specific causal agents implicated in the various outbreak types are shown in Table 4. Common event outbreaks were mostly associated with norovirus (15 outbreaks), *Campylobacter* (15) and *Clostridium perfringens* (11). Outbreaks due to a common source dispersed in the community were most frequently linked to *Salmonella* (4 outbreaks), while outbreaks due to a common source in a specific site were mostly commonly due to *Campylobacter* (7). Norovirus was commonly identified in both community-wide outbreaks (3 outbreaks) and institutional outbreaks (27). Household outbreaks were frequently associated with *Cryptosporidium parvum* (18 outbreaks), *Giardia* (16) and *Campylobacter* (14).

Table 4: Outbreak type by agent type, 2005

Agent type	Outbreak Type								Total
	CEvt ¹	CDsp ²	CSite ³	Com ⁴	Inst ⁵	Hse ⁶	Oth ⁷	Unk ⁸	
<i>Enteric</i>									
Norovirus	15	0	3	3	27	7	1	5	61
<i>Campylobacter</i> spp.	15	2	7	1	1	14	2	5	47
<i>Salmonella</i> spp.	6	4	3	0	0	8	4	1	26
<i>C. parvum</i>	0	0	3	0	1	18	2	1	25
<i>Giardia</i> spp.	0	0	1	1	0	16	2	3	23
<i>Clostridium perfringens</i>	11	0	0	0	0	0	0	0	11
Rotavirus	0	0	0	1	4	1	0	0	6
<i>Shigella</i> spp.	1	1	0	0	1	2	0	0	5
<i>Staphylococcus aureus</i>	3	1	0	0	0	0	0	1	5
<i>Bacillus</i> spp.	5	0	0	0	0	0	0	0	5
VTEC/STEC	0	0	1	0	0	1	0	1	3
Histamine poisoning	0	3	0	0	0	0	0	0	3
<i>Yersinia enterocolitica</i>	0	0	1	0	0	0	0	1	2
Hepatitis A virus	0	0	0	0	0	1	0	1	2
Ciguatera poisoning	1	0	0	0	0	0	0	0	1
Unidentified pathogen	67	8	4	1	3	12	2	16	113
<i>Non-enteric</i>									
<i>M. tuberculosis</i>	0	0	0	2	1	0	0	0	3
Influenza viruses	0	0	0	0	2	0	0	0	2
<i>Legionella pneumophila</i>	0	0	1	0	0	0	1	0	2
Lead	0	0	1	0	0	0	0	0	1
Total	124	19	25	9	40	80	14	35	346

- 1 Common event
- 2 Common source dispersed in community
- 3 Common site
- 4 Community wide
- 5 Institutional
- 6 Household
- 7 Other
- 8 Unknown

3.5. Morbidity and mortality

There were 25 (7.2%) outbreaks reported in 2005 that involved the hospitalisation of cases. A total of 69 outbreak associated cases were hospitalised. There were a similar number of hospitalised cases for outbreaks due to non-enteric agents (33 cases) and enteric agents (36). However, a higher percentage of cases associated with non-enteric outbreaks were hospitalised, compared to enteric outbreaks (36.7% versus 1.7%) (see Table 5). A high proportion of hospitalised cases were linked with *Legionella pneumophila* (85.7%), *Yersinia enterocolitica* (75.0%), VTEC/STEC (50.0%), and influenza viruses (36.7%).

Table 5: Hospitalised outbreak cases and total outbreak cases by agent type, 2005

Agent type	No. of hospitalised cases ¹	No. of total cases	% of cases hospitalised
<i>Enteric</i>			
<i>Campylobacter</i> spp.	11	252	4.4%
<i>Yersinia enterocolitica</i>	6	8	75.0%
VTEC/STEC	4	8	50.0%
Norovirus	2	1159	0.2%
<i>Cryptosporidium parvum</i>	2	108	1.9%
Rotavirus	2	53	3.8%
<i>Salmonella</i> spp	1	120	0.8%
Unidentified pathogen ²	8	403	2.0%
Total enteric	36	2111	1.7%
<i>Non-enteric</i>			
<i>Legionella pneumophila</i>	18	21	85.7%
Influenza viruses	11	30	36.7%
<i>M. tuberculosis</i>	4	39	10.3%
Total non-enteric	33	90	36.7%

1 This information was recorded for 97.7% (338/346) of outbreaks

2 All outbreaks with no pathogen identified in 2005 were classified as gastroenteritis

There were four deaths associated with outbreaks in 2005, all of which were linked to respiratory diseases. An outbreak of *Legionella pneumophila* in Christchurch resulted in three deaths, while the remaining fatality was linked to an outbreak of influenza type A virus in a continuing care hospital.

3.6. Outbreak setting

The most common outbreak setting was the home, which was recorded in 116 (33.5%) outbreaks with 465 (19.1%) associated cases (see Table 6). Commercial food operators were also a common outbreak setting, which included restaurants/cafés (107 outbreaks), takeaway outlets (27) and supermarkets/delicatessens (11). The most common institutional settings were rest homes (17 outbreaks), followed by childcare/pre-schools (11). The setting was unknown in 30 (8.7%) outbreaks.

Table 6: Outbreaks and associated cases by setting of exposure/transmission, 2005

Outbreak setting	No. of outbreaks¹	% of total outbreaks (n=346)	No. of cases¹	% of total cases (n=2436)
<i>Commercial food operators</i>				
Restaurant/caf�e	107	30.9%	483	19.8%
Takeaway	27	7.8%	71	2.9%
Supermarket/delicatessen	11	3.2%	44	1.8%
Other food outlet	2	0.6%	6	0.2%
Caterers	1	0.3%	7	0.3%
<i>Institutions</i>				
Rest home	17	4.9%	472	19.4%
Childcare/pre-school	11	3.2%	80	3.3%
Camp	6	1.7%	112	4.6%
Hotel/motel	5	1.4%	48	2.0%
Hospital (acute care)	3	0.9%	115	4.7%
Hospital (continuing care)	3	0.9%	107	4.4%
School	2	0.6%	39	1.6%
Hostel/boarding house	2	0.6%	36	1.5%
Prison	1	0.3%	18	0.7%
<i>Community</i>				
Tangi/hui	4	1.2%	29	1.2%
Community/church gathering	3	0.9%	26	1.1%
Swimming/spa pool	1	0.3%	26	1.1%
<i>Workplace</i>				
Workplace	10	2.9%	104	4.3%
Farm	8	2.3%	47	1.9%
<i>Home</i>	116	33.5%	465	19.1%
<i>Other setting</i>	29	8.4%	381	15.6%
<i>Unknown setting</i>	30	8.7%	75	3.1%

¹ More than one setting was recorded for some outbreaks

3.7. Mode of transmission

In 2005, the most common mode of transmission was foodborne (183 outbreaks), followed by person-to-person (170) (see Table 7). Although foodborne outbreaks represented 52.9% (183/346) of all outbreaks, only 30.9% (753/2436) of cases were associated with these outbreaks. The opposite was evident for person-to-person outbreaks, which represented 49.1% (170/346) of outbreaks and 70.6% (1721/2436) of outbreak cases. The mode of transmission was unknown in 37 (10.7%) outbreaks.

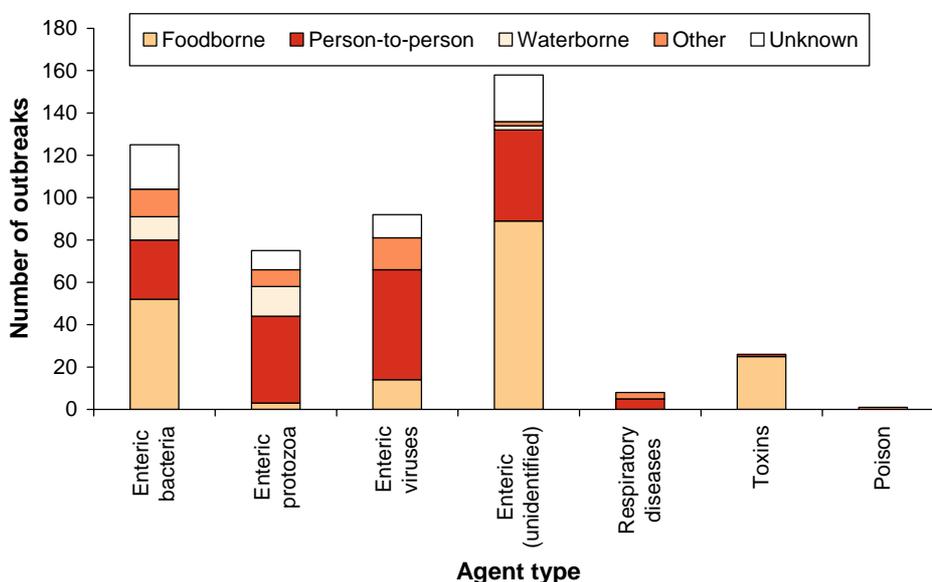
Table 7: Outbreaks and associated cases by mode of transmission, 2005

Transmission mode	No. of outbreaks ¹	% of total outbreaks (n=346)	No. of cases ¹	% of total cases (n=2436)
Foodborne	183	52.9%	753	30.9%
Person-to-person	170	49.1%	1721	70.6%
Waterborne	27	7.8%	184	7.6%
Environmental	22	6.4%	412	16.9%
Zoonotic	11	3.2%	43	1.8%
Other	9	2.6%	240	9.9%
Unknown	37	10.7%	127	5.2%

¹ More than one mode of transmission was recorded for 117 outbreaks with 1028 associated cases.

Foodborne transmission was the principal mode of transmission in outbreaks involving unidentified enteric organisms (classified as “gastroenteritis”), enteric bacteria and toxins (see Figure 2). Person-to-person transmission was the commonest mode of transmission for enteric protozoa, enteric viruses and respiratory diseases.

Figure 2: Number of outbreaks by agent type and mode of transmission, 2005



3.8. Foodborne outbreaks

Causal agents

There were 183 foodborne outbreaks reported in 2005, 89 (48.6%) of which were not linked to a specific pathogen (see Table 8). Specific pathogens most commonly associated with foodborne outbreaks included *Campylobacter* (28 outbreaks), *Salmonella* (20), norovirus (14) and *Clostridium perfringens* (11). Enteric bacteria (*Campylobacter*, *Salmonella*, *Shigella*, VTEC/STEC and *Yersinia enterocolitica*) were implicated in 28.4% (52/183) of foodborne outbreaks, enteric toxins (*Clostridium perfringens*, *Staphylococcus aureus*, *Bacillus*, histamine and ciguatera) in 13.7% (25/183), enteric viruses (norovirus) in 7.7% (14/183), and enteric protozoa (*Giardia* and *Cryptosporidium parvum*) in 1.6% (3/183).

Table 8: Foodborne outbreaks and associated cases by agent type, 2005

Agent type	No. of outbreaks	% of outbreaks	No. of cases	% of cases
<i>Campylobacter</i> spp.	28	15.3%	122	16.2%
<i>Salmonella</i> spp.	20	10.9%	103	13.7%
Norovirus	14	7.7%	125	16.6%
<i>Clostridium perfringens</i>	11	6.0%	38	5.0%
<i>Staphylococcus aureus</i>	5	2.7%	21	2.8%
<i>Bacillus</i> spp	5	2.7%	10	1.3%
Histamine	3	1.6%	7	0.9%
<i>Shigella</i> spp	2	1.1%	50	6.6%
<i>Giardia</i> spp.	2	1.1%	4	0.5%
VTEC/STEC	1	0.5%	4	0.5%
<i>Cryptosporidium parvum</i>	1	0.5%	3	0.4%
Ciguatera	1	0.5%	3	0.4%
<i>Yersinia enterocolitica</i>	1	0.5%	2	0.3%
Unidentified pathogen ¹	89	48.6%	261	34.7%
Total	183	100.0%	753	100.0%

¹ All outbreaks with no pathogen identified in 2005 were classified as gastroenteritis

Food sources implicated

Of the 183 foodborne outbreaks in 2005, 7 (3.8%) outbreaks had a definite source identified and 90 (49.2%) had a suspected source identified. The actual definite or suspected sources were listed in 95 of these outbreaks. The main foods implicated in these outbreaks were chicken (38 outbreaks), meat (19) and seafood (12) (see Table 9).

Table 9: Foodborne outbreaks and associated cases by implicated food source, 2005

Implicated food source	No. of outbreaks¹	% of outbreaks (n=183)	No. of cases	% of cases (n=753)
Chicken	38	20.8%	182	24.2%
Meat (lamb, beef, pork)	19	10.4%	81	10.8%
Seafood	12	6.6%	49	6.5%
Rice	8	4.4%	24	3.2%
Sandwich/burger	8	4.4%	29	3.9%
Bakery	7	3.8%	52	6.9%
Salad	6	3.3%	57	7.6%
Mayonnaise/dressing	4	2.2%	18	2.4%
Dairy	2	1.1%	22	2.9%
Vegetable	2	1.1%	26	3.5%
Water	2	1.1%	14	1.9%
Eggs	1	0.5%	3	0.4%

1 More than one food source was implicated in some outbreaks

Contributing factors

The factors contributing to foodborne outbreaks commonly involved time and temperature abuses such as inadequate cooling or refrigeration in 38.8% (71/183) of foodborne outbreaks, improper storage prior to preparation in 23.5% (43/183) and improper hot holding in 13.7% (25/183) (see Table 10). Cross contamination of food was also a common contributing factor, which was reported in 36.1% (66/183) of foodborne outbreaks.

Table 10: Foodborne outbreaks by contributing factor, 2005

Contributing factor	No. of outbreaks¹	% of total outbreaks (n=183)
<i>Time/temperature abuse</i>		
Inadequate cooling or refrigeration	71	38.8%
Improper storage prior to preparation	43	23.5%
Improper hot holding	25	13.7%
Inadequate heating of previously cooked food	13	7.1%
Undercooking	13	7.1%
Inadequate thawing	11	6.0%
Preparation too far in advance	10	5.5%
<i>Contamination of food</i>		
Cross contamination	66	36.1%
Contamination from an infected food handler	9	4.9%
<i>Unsafe sources</i>		
Consumption of raw food	9	4.9%
Use of untreated water in food prep.	3	1.6%
Use of ingredients from unsafe sources	1	0.5%
<i>Other factors</i>		
	10	5.5%
<i>Unknown factors</i>		
	10	5.5%

¹ More than one contributing factor was recorded for some outbreaks

3.9. Person-to-person outbreaks

Causal agents

There were 170 person-to-person outbreaks with 1721 associated cases in 2005. The most common causal agent was norovirus, which was recorded in 27.1% (46/170) of person-to-person outbreaks involving 62.8% (1080/1721) of cases (see Table 11). Other common pathogens include *Cryptosporidium parvum* (12.9%) and *Giardia* (11.2%). Enteric viruses (norovirus and rotavirus) were implicated in 30.6% (52/170) of person-to-person outbreaks, enteric protozoa (*Cryptosporidium parvum* and *Giardia*) in 24.1% (41/170), enteric bacteria (*Salmonella*, *Campylobacter* and *Shigella*) in 16.5% (28/170), respiratory pathogens (*Mycobacterium tuberculosis* and influenza viruses) in 3.0% (5/170) and toxins (*Staphylococcus aureus*) in 0.6%. A quarter of all person-to-person outbreaks were not linked to an identifiable pathogen, but were classified as gastroenteritis.

Table 11: Person-to-person outbreaks and associated cases by agent type, 2005

Agent type	No. of outbreaks	% of outbreaks	No. of cases	% of cases
Norovirus	46	27.1%	1080	62.8%
<i>Cryptosporidium parvum</i>	22	12.9%	97	5.6%
<i>Giardia</i> spp.	19	11.2%	83	4.8%
<i>Salmonella</i> spp.	13	7.6%	50	2.9%
<i>Campylobacter</i> spp.	10	5.9%	27	1.6%
Rotavirus	6	3.5%	53	3.1%
<i>Shigella</i> spp.	5	2.9%	58	3.4%
<i>M. tuberculosis</i>	3	1.8%	39	2.3%
Influenza viruses	2	1.2%	30	1.7%
<i>Staphylococcus aureus</i>	1	0.6%	2	0.1%
Unidentified pathogen ¹	43	25.3%	202	11.7%
Total	170	100.0%	1721	100.0%

¹ All outbreaks with no pathogen identified in 2005 were classified as gastroenteritis

Contributing factors

Exposure to infected people was the primary contributing factor for all person-to-person outbreaks reported in 2005. Other contributing factors reported were poor hygiene of cases (3.5%, 6/170) and excessively crowded living conditions (0.6%, 1/170).

3.10. Waterborne outbreaks

Causal agents

Of the 27 waterborne outbreaks reported in 2005, the most commonly identified pathogens were *Campylobacter* and *Giardia* (9 outbreaks each) (see Table 12). Enteric protozoa (*Giardia* and *Cryptosporidium parvum*) were implicated in 51.9% (14/27) of waterborne outbreaks and enteric bacteria (*Campylobacter* and *Salmonella*) in 40.7% (11/27). The pathogen was not identified in two (7.4%) waterborne outbreaks, which were recorded as gastroenteritis.

Table 12: Waterborne outbreaks and associated cases by agent type, 2005

Agent type	No. of outbreaks	% of outbreaks	No. of cases	% of cases
<i>Campylobacter</i> spp.	9	33.3%	115	62.5%
<i>Giardia</i> spp.	9	33.3%	34	18.5%
<i>Cryptosporidium parvum</i>	5	18.5%	17	9.2%
<i>Salmonella</i> spp.	2	7.4%	5	2.7%
Unidentified pathogen ¹	2	7.4%	13	7.1%
Total	27	100.0%	184	100.0%

¹ All outbreaks with no pathogen identified in 2005 were classified as gastroenteritis

Contributing factors

The contributing factors linked to waterborne outbreaks include an untreated water supply (17 outbreaks), contamination of water source (6) and contamination of reservoirs or holding tanks (2) (see Table 13).

Table 13: Waterborne outbreaks by contributing factor, 2005

Contributing factor	No. of outbreaks¹	% of total outbreaks (n=27)
Untreated water supply	17	63.0%
Contamination of water source	6	22.2%
Contamination of reservoir(s)/holding tank(s)	2	7.4%
Other factors	1	3.7%
Unknown factors	10	37.0%

¹ More than one contributing factor was recorded for some outbreaks

3.11. Environmental outbreaks

Causal agents

The most common causal agent identified in environmental outbreaks was norovirus, which was recorded in 31.8% (7/22) of environmental outbreaks and associated with 60.2% (248/412) cases (see Table 14). Enteric viruses (norovirus and rotavirus) were implicated in 40.9% (9/22) of environmental outbreaks, enteric bacteria (*Campylobacter*) in 18.2% (4/22), enteric protozoa (*Cryptosporidium parvum* and *Giardia*) in 18.2% (4/22), respiratory pathogens (*Legionella pneumophila*) in 9.1% (2/22) and poison (lead) in 4.5% (1/22). Outbreaks of gastroenteritis, where no pathogen was identified, accounted for 9.1% (2/22) of all environmental outbreaks.

Table 14: Environmental outbreaks and associated cases by agent type, 2005

Agent type	No. of outbreaks	% of outbreaks	No. of cases	% of cases
Norovirus	7	31.8%	248	60.2%
<i>Campylobacter</i> spp.	4	18.2%	49	11.9%
<i>Cryptosporidium parvum</i>	3	13.6%	33	8.0%
Rotavirus	2	9.1%	27	6.6%
<i>Legionella pneumophila</i>	2	9.1%	21	5.1%
<i>Giardia</i> spp.	1	4.5%	6	1.5%
Lead	1	4.5%	3	0.7%
Unidentified pathogen ¹	2	9.1%	25	6.1%
Total	22	100.0%	412	100.0%

1 All outbreaks with no pathogen identified in 2005 were classified as gastroenteritis

Contributing factors

The major contributing factor associated with environmental outbreaks was exposure to a contaminated environment, which was recorded in 86.4% (19/22) of environmental outbreaks. The other contributing factors were exposure to infected animals or animal products (4 outbreaks) and exposure to contaminated swimming pool (4).

3.12. Zoonotic outbreaks

Causal agents

Over half (6/11) of the zoonotic outbreaks reported in 2005 were linked to *Campylobacter* (see Table 15). Enteric bacteria (*Campylobacter*, *Salmonella* and VTEC/STEC) were implicated in 72.7% (8/11) of zoonotic outbreaks and enteric protozoa (*Cryptosporidium parvum* and *Giardia*) in 27.3% (3/11).

Table 15: Zoonotic outbreaks and associated cases by agent type, 2005

Agent type	No. of outbreaks	% of outbreaks	No. of cases	% of cases
<i>Campylobacter</i> spp.	6	54.5%	16	37.2%
<i>Cryptosporidium parvum</i>	2	18.2%	8	18.6%
<i>Giardia</i> spp.	1	9.1%	15	34.9%
<i>Salmonella</i> spp.	1	9.1%	2	4.7%
VTEC/STEC	1	9.1%	2	4.7%
Total	11	100.0%	43	100.0%

Contributing factors

The contributing factors associated with zoonotic outbreaks in 2005 were exposure to infected animals or animal products (72.7%, 8/11) and exposure to contaminated environment (36.4%, 4/11).

3.13. Outbreak recognition, investigation and control

Timeliness of reporting

The majority of outbreaks were reported by the PHU within 7 days of the first onset of illness (61.5%, 197/320), while 30.3% (97/320) of outbreaks were reported between 8 and 30 days after the onset and 6.6% (21/320) of outbreaks were reported between 31 and 60 days after the onset. Five (1.6%) outbreaks were reported more than 60 days after the first onset of illness. The longest reporting delay was 295 days related to an outbreak of *Giardia* involving 15 cases.

Reporting delay (time between date of onset of illness in the first case and the report date) varied between different outbreak types (see Table 16). The shortest median reporting delay (1.0 days) was associated with community wide outbreaks, though calculations were based on data from only 5 outbreaks. Outbreaks linked to a common event or a common source dispersed in the community both had a median reporting delay of 2.0 days. The longest median reporting delay (12.0 days) occurred specifically with household outbreaks.

Table 16: Median reporting delay by outbreak type, 2005

Outbreak type	No. of outbreaks¹	Median reporting delay (days)
Common event	120	2.0
Common source dispersed in community	18	2.0
Common source in specific place	22	10.0
Community wide person-to-person transmission	5	1.0
Institutional (transmission within a defined setting)	34	6.0
Household (transmission within a single household)	74	12.0
Other outbreak type	14	20.5
Unknown outbreak type	33	2.0
Total	320	5.0

1 Outbreaks with the date of onset of illness in the first case either missing or incorrectly entered were excluded

Recognition of outbreaks

Outbreaks were most frequently identified when cases attended a common event (44.8%), when cases had person-to-person contact with other cases (37.0%) and when cases were linked to a common source (33.8%) (see Table 17). There was more than one means of recognition for 40.5% (140/346) of outbreaks involving 60.0% (1462/2436) of cases.

Table 17: Outbreaks by means of recognition, 2005

Means of recognition	No. of outbreaks¹	% of total outbreaks (n=346)
Cases attended common event	155	44.8%
Cases had person-to-person contact with other cases	128	37.0%
Cases linked to common source	117	33.8%
Common organism type/strain characteristics in cases	80	23.1%
Increase in disease incidence	44	12.7%
Other means	6	1.7%
Unknown means	1	0.3%

1 More than one means of recognition was recorded for some outbreaks.

Control measures

Outbreak control measures were undertaken in 93.4% (323/346) of outbreaks reported in 2005. The most common measures undertaken were health education and advice for those working with the source (295 outbreaks), followed by modification of procedures (135) (see Table 18).

Table 18: Outbreaks by control measures undertaken, 2005

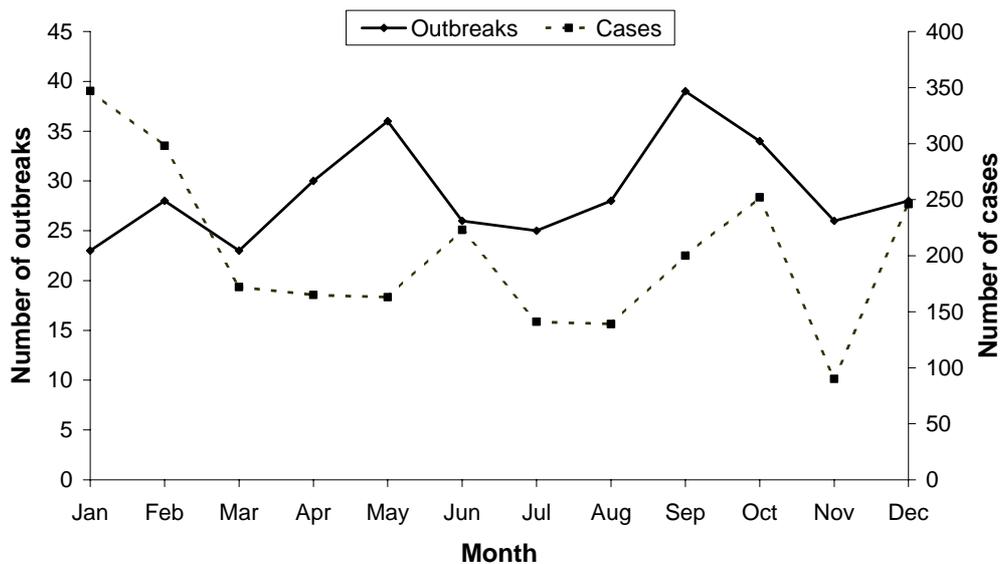
Outbreak control measure	No. of outbreaks¹	% of total outbreaks (n=346)
<i>Source</i>		
Health education and advice	295	85.3%
Modification of procedures	135	39.0%
Exclusion	47	13.6%
Cleaning, disinfection	41	11.8%
Isolation	22	6.4%
Health warning	12	3.5%
Treatment	12	3.5%
Closure	9	2.6%
Removal	4	1.2%
<i>Vehicle and vector</i>		
Treatment	4	1.2%
Removal	1	0.3%
<i>Contacts and potential contacts</i>		
Health education and advice	19	5.5%
Chemoprophylaxis	4	1.2%
Vaccination	2	0.6%
<i>No control measures</i>		
	12	3.5%
<i>Unknown control measures</i>		
	11	3.2%

¹ More than one control measure was recorded for some outbreaks

3.14. Summary of trends

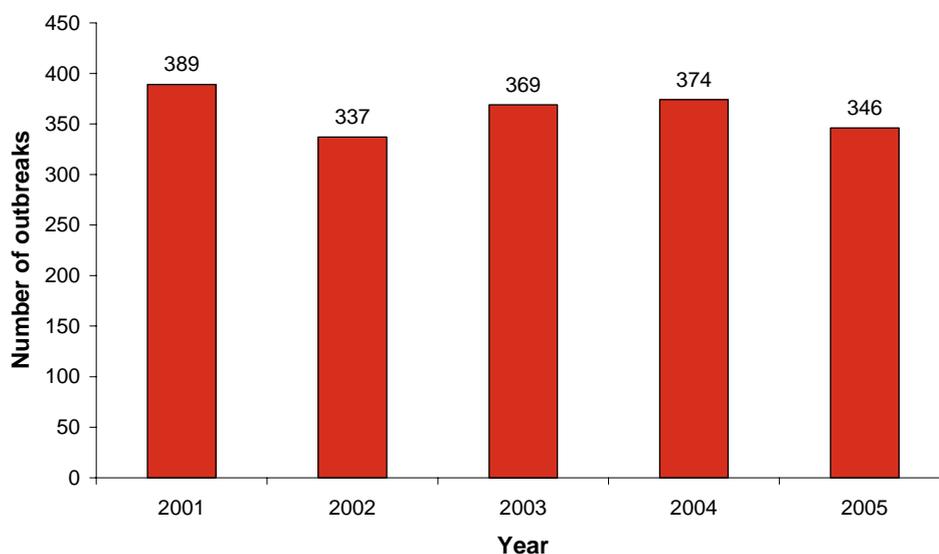
In 2005, the highest number of outbreaks was reported in September (39 outbreaks), May (36) and October (34), while the highest number of outbreak related cases occurred in January (347 cases) and February (298) (see Figure 3). Overall, the highest average number of cases per outbreak occurred in the summer months of January (15.1 cases per outbreak), February (10.6) and December (8.8).

Figure 3: Number of outbreaks and associated cases by month, 2005



The annual number of outbreaks in 2005 was less than the preceding two years, though there has been no consistent trend from 2001 to 2005 (see Figure 4).

Figure 4: Number of outbreaks by year, 2001-2005

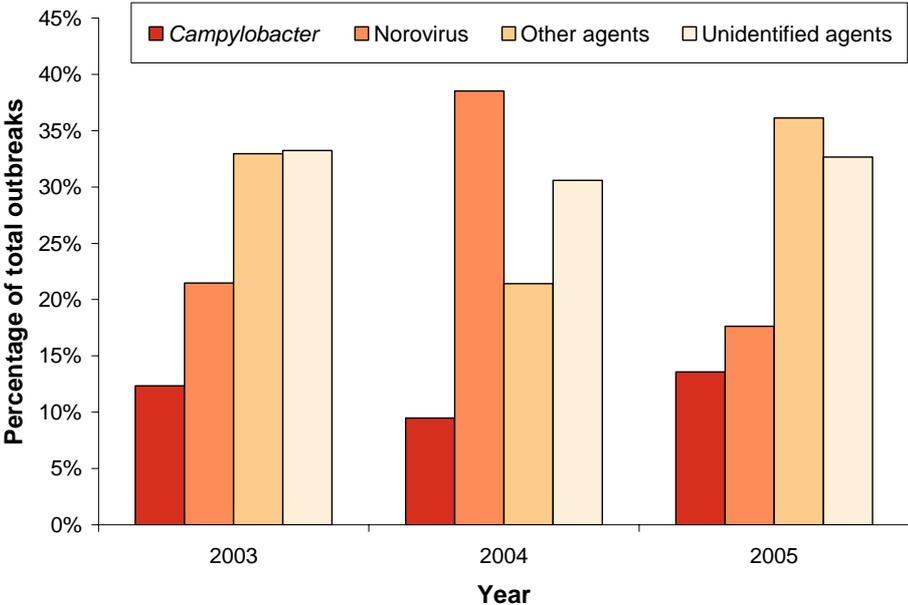


Over the last five years, the national annual outbreak rate ranged between 8.8 outbreaks per 100 000 population in 2002 and 10.4 in 2001. The national outbreak case rate was 65.2 cases per 100 000 population in 2005 compared to a rate of 109.3 in 2004. The national case rate in 2005 was similar to annual rates observed in 2001 to 2003.

Common event outbreaks have consistently been the most frequent outbreak type over the last 5 years. The second most common outbreak type has been household outbreaks, with the exception of 2004, when institutional outbreaks linked to norovirus were numerous.

In 2005, 67.3% (233/346) of outbreaks were linked with an identified agent, compared to 69.4% (227/327) in 2004, and 66.8% (227/340) in 2003. Norovirus and *Campylobacter* were the commonest single agent types linked to outbreaks from 2003 to 2005 (see Figure 5). The number of norovirus outbreaks (126) and associated cases (3022) was substantially higher in 2004, compared with 2005, where the number of norovirus outbreaks (61) and cases (1159) had decreased by over half.

Figure 5: Percentage of outbreaks by agent type and year, 2003-2005



The most common outbreak settings over the previous five years were restaurants/cafés and the home, except in 2004 when rest homes were the most common setting due to outbreaks of norovirus.

The principal modes of transmission from 2001 to 2005 were foodborne and person-to-person transmission. In most years the proportion of outbreaks linked with foodborne transmission exceeded that of person-to-person transmission, though this did not occur in 2004.

The median reporting delay calculated for 2005 was 5.0 days, the same delay being noted in 2002 to 2004.

Health education and advice related to the outbreak source was the most common control measure in the past 5 years, followed by modification of procedures pertaining to the source. The proportion of outbreaks where no control measures were reportedly undertaken has decreased from 27.8% of outbreaks in 2001 to 3.5% in 2005.

GLOSSARY³

Common event outbreak

An outbreak due to exposure of a group of persons to a noxious influence that is common to the individuals in the group, where the exposure is brief and essentially simultaneous and all resultant cases develop within one incubation period of the disease. Cases therefore have exposures that are grouped in place and time (synonymous with point source outbreak).

Common site outbreak

An outbreak due to exposure of a group of persons to a noxious influence that is common to the individuals in the group, where exposures have occurred at the same place (or site) but over a longer time-period than those of common event outbreaks (i.e. grouped in place but not in time). In the Outbreak Report Form, these outbreaks are called *common source in a specific place*.

Common source outbreak

Outbreak due to exposure of a group of persons in the community to a noxious influence that is common to the individuals in the group. These outbreaks are subcategorised into common event (where exposures are grouped in time and place), dispersed common source (grouped in time but not in place) and common site (grouped in place but not in time).

Community wide outbreak

Outbreak of individuals in the community, where transmission predominantly occurs by direct exposure of susceptible people to infectious people (synonymous with person-to-person outbreak).

Contamination

The presence of a disease agent on a body surface, in clothes, bedding, toys, or other inanimate articles or substances including water and food.

Dispersed common source outbreak

Outbreak due to exposure of a group of persons in the community to a noxious influence that is common to the individuals in the group, where the exposures are not grouped in place (and may or may not be grouped in time). These outbreaks are often due to a distributed vehicle of infection transmission, such as a commercially prepared food item or a water supply.

EpiSurv

The national notifiable disease surveillance system managed by ESR to record data on notifiable diseases and outbreaks reported by public health units.

ESR

Institute of Environmental Science & Research Limited.

Environment

All that which is external to the individual human host.

³ Adapted from *Disease Outbreak Manual*. 2002, Institute of Environmental Science & Research Ltd (ESR).

Exposure

Proximity and/or contact with a potential source of a disease agent in such a manner that effective transmission of the agent and harmful or protective effects of the agent may occur.

Household outbreak

Outbreak confined to members of a single household.

Institutional outbreak

Outbreak confined to the population of a specific residential or other institutional setting, such as a hospital, rest home, prison or boarding school.

Outbreak

An epidemic limited to a localised increase in the incidence of a disease, such as in a town or closed institution.

Source (of illness)

The person, animal, object or substance from which a disease agent passes to a host.

Transmission of illness

Any mechanism by which a disease agent is spread through the environment or to another person. Mechanisms are defined as either direct or indirect.