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The Epidemiology of Human Gastrointestinal Infections in the Health Service Executive West (Clare, Limerick, Tipperary North), 2001 to 2007

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Introduction:

Every year there are thousands of cases of food-poisoning and gastroenteritis reported in Ireland[1] although reported cases constitute only a small proportion of actual cases. These infections encompass pathogens from viral, bacterial and protozoan aetiologies. However, most reported cases are likely to be viral in origin. Very young children are especially prone to rotavirus infection. In the last two years, hundreds (if not thousands) of cases of viral gastroenteritis were caused by Norovirus infection (also known as winter vomiting bug, Norwalk-like virus and SRSV-short round structured viruses). Outbreaks were reported in all genres of healthcare institutions – both nationally and regionally in the Health Service Executive (HSE) West (Clare, Limerick, Tipperary North). The main bacterial causes of food-poisoning are Campylobacter and Salmonella. Enterohaemorrhagic *Escherichia coli* (EHEC) infections are less common but can be associated with significant morbidity and mortality. Cryptosporidium is the most frequently detected protozoan cause of gastroenteritis although occasional reports of *Giardia lamblia* have been recorded recently. All pathogens have the potential to cause substantial outbreaks of disease.

Salmonella has been associated with many outbreaks of food-poisoning in Ireland and in the HSE West (Clare, Limerick, Tipperary North) in the past. Cryptosporidium was identified as the causative organism in a large waterborne outbreak in the midlands in recent times.[2] In Galway, in 2007, the largest waterborne outbreak of cryptosporidial gastroenteritis in humans in Ireland was investigated.

Data is presented, for the third consecutive year, on *Clostridium difficile* in the Mid-West. We report a large outbreak of *C. difficile* ribotype 027 in the Mid-West – the first report of this serious and emerging strain in the hospitals of the Mid-West.

This report details the descriptive epidemiology of laboratory confirmed cases of campylobacteriosis, cryptosporidiosis, salmonellosis, shigellosis, *C. difficile* and EHEC in the HSE West (Clare, Limerick, Tipperary North), formerly the Mid-Western Health Board), from 2001 to 2007.

Sampling Protocols:

All faeces specimens submitted for investigations are routinely checked for Salmonella, Shigella, EHEC and Campylobacter. Vibrio testing is performed when relevant clinical details are provided. EPEC testing is carried out on coliforms from patients under 5 years of age. Specific investigation of specimens for EHEC, as occurs in outbreak investigations, requires transport of specimens to a laboratory with a biosafety level 3 facility. There are, as yet, no such facilities available in the HSE Network 7 (which includes Mid-Western Regional Hospitals Limerick, Ennis and Nenagh, Mid-Western Regional Maternity and Regional Orthopaedic Hospitals and St. John's Hospital, Limerick).

Specimens submitted from those immunocompromised, those aged under 15 years or those tested for ova, cysts and parasites (OCP's)are also tested for Cryptosporidium routinely. OCP's are only tested for if relevant clinical details are supplied. Prior to 2002, only specimens from those immunocompromised or those requesting ova, cysts and parasites were tested for Cryptosporidium routinely. Specimens for *C. difficile* are tested for Toxins A and B (combined) . Specimens for Norovirus are tested by an ELISA antigen detection method by the Serology Department, MWRH, Limerick.

Hospital incidence rates are calculated using in-patient bed days used, as supplied by the HIPE Office. Population Crude Incidence Rates (CIRs) in this report, where calculated, are per 100,000 population and are based on the data published by Central Statistics Office (www.cso.ie) for Census 2002 and 2006.

Census

	2002	**2006**
Ireland	3,917,203	4,239,848
HSE West* (Clare, Limerick, Tipperary North)	339,591	361,028
Clare	103,277	110,950
Limerick	175,304	184,055
Tipperary North	61,010	66,023

For years 2002-2003, Census 2002 was used and for 2004-2007, Census 2006 was used.

Notifications of infectious disease are collated having regard to national case definitions. CDI and Norovirus infection in Mid-West residents confirmed during stays in non-Network 7 healthcare facilities are not included and are not attributed to Network 7 (Mid-West) healthcare facilities. While case definitions for CDI became available in May 2008, the data for 2007 has been compiled with that definition in mind. Previously a one-month rule for "subsequent episodes" was applied (as in mandatory surveillance in other jurisdictions) – with a "two month" rule the incidence compared to previous years appears adjusted lower.

Acknowledgements:

The work of Ms Elaine Kenneally and the medical scientists and staff in the Mid-Western Regional Hospital Microbiology Department and Mr Colm McDonnell, Mr Eddie Beggan and medical scientists, Serology Department, MWRH in the diagnosis and reporting of these cases is acknowledged and appreciated. We thank the staff of the Irish National Salmonella Reference Laboratory, Leiden University Medical Centre and the Public Health Laboratory, Cherry Orchard Hospital, Dublin for molecular typing information.

The Department of Public Health is very grateful for the efforts and time given by Senior Medical Officers, Specialists in Public Health Medicine in the Department of Public Health for assistance in the surveillance of food-poisoning and gastroenteritis and the follow-up by Environmental Health Officers of Clare, Limerick and Tipperary North.

The efforts of hospital infection control nurses and many other health care staff in the reporting, control and prevention of Norovirus and *C. difficile* in hospitals and long term care facilities are acknowledged.

The diligence of Ms Breda Tuohy, Surveillance Assistant in data entry, Ms Orla Hanrahan, Surveillance Officer and Ms Trina Dooley, HIPE Office, is gratefully acknowledged

Results:

In the HSE West (Clare, Limerick, Tipperary North) from January 2007 to December 2007, there were 175 reports of Campylobacter, 58 reports of cryptosporidiosis and 31 reports of salmonellosis (Table 1).

Table 1: Number of reports of Campylobacter, Cryptosporidium and Salmonella in HSE West (Clare, Limerick, Tipperary North) 2001-2007.

		Organism		Total
Year	**Campylobacter**	**Cryptosporidium**	**Salmonella**	
2001	62	4	28	94
2002	71	49	33	153
2003	103	48	22	173
2004	111	43	23	177
2005	149	62	20	231
2006	131	57	31	219
2007	175	58	31	264
Total	**802**	**321**	**188**	**1311**

The incidence rate of Campylobacter (Table 2) in HSE West (Clare, Limerick, Tipperary North) was similar to the average incidence in Ireland in 2005 and is the highest incidence recorded to date. The Health Protection Surveillance Centre[3] reported a national crude incidence rate (per 100,000 population) of 34.1 in 2002, 40.0 in 2003, 40.3 in 2004, 42.5 in 2005 and 42.8 in 2006 for Campylobacter. Annual crude incidence varies between regions, the highest rates being detected in the neighbouring midlands. Some national data are now available on cryptosporidiosis in Ireland. In the 2006 Annual Report from the HPSC, the national crude incidence rate was 8.7, half the rate in the Mid-West. Area incidence is influenced by occurrence of outbreaks and laboratory testing policies. The rate in the former Western Health Board was twice the national rate and a research project was initiated in UCG to examine the relationship between Cryptosporidium infection and drinking water supply there. There is a clear link between cryptosporidiosis and rural living. The crude incidence of salmonellosis showed no increase in the HSE West (Clare, Limerick, Tipperary North) in 2007 and compares well with the crude rate reported nationally of 10.0 in 2006.

Table 2: Annual crude incidence rate per 100,000 (CIR) of each pathogen in HSE West (Clare, Limerick, Tipperary North) 2001-2007.

		Organism	
Year	**Campylobacter**	**Cryptosporidium**	**Salmonella**
2001	18.3	1.2	8.2
2002	20.9	14.4	9.7
2003	30.3	14.1	7.1
2004	30.7	11.9	6.8
2005	41.3	17.1	5.5
2006	36.3	15.8	8.6
2007	48.5	16.1	8.6

Includes non-HSE West (Clare, Limerick, Tipperary North) residents.

In 2007, in Northern Ireland, an annual crude incidence rate (CIR) of 52.3 was reported provisionally for Campylobacter, compared to 55.2 in 2006 and 52.8 in 2005. In Wales, in 2007 the CIR was 108. Provisional CIRs for 'England & Wales' and Scotland for **2007** were 96.4 and 102, respectively, compared to 89.5 and 96.1 in 2006, 89.5 and 90.0 in 2005 and 85.1 and 86.2 in 2004.

In 2007, in Northern Ireland, a CIR of 5.0 was reported provisionally for Cryptosporidium compared to 7.8 in 2006, 9.8 in 2005 and 8.1 in 2004. In Wales, in 2006 the CIR was 7.2. Provisional CIRs for 'England & Wales' and Scotland for **2007** were 5.7 and 10.4, respectively, compared to 7.1 and 12.1 in 2006, 8.7 and 14.0 in 2005 and 6.9 and 9.2 in 2004.

The CIR of salmonellosis in the Mid-West is much lower than the CIR seen in UK regions. In 2007, in Northern Ireland, a provisional rate of 9.4 was reported for salmonellosis, lower than the rate of 12.0 in 2006, but slightly higher than in 2005 (10.7). Current levels are much lower than in 2004 (26.8). In Wales, in 2006 the CIR was 18.7. The provisional rate for 'England & Wales' for **2007** was 22.7, compared to 24.0 in 2006, 22.0 in 2005 and 25.2 in 2004. In Scotland, in 2006 and 2007, the provisional CIR was 20.1.

The population estimates for HSE West (Clare, Limerick, Tipperary North) Community Care Areas (CCAs) are not as reliable as county estimates so rates are based on county population.

Seven cases of campylobacteriosis in 2007 were diagnosed in non-HSE West (Clare, Limerick, Tipperary North) residents. The rate of campylobacteriosis in Tipperary North appears to have declined substantially in 2007 (Table 3a). With the exception of 2006 there is a constant rise in incidence of campylobacteriosis in the HSE West (Clare, Limerick, Tipperary North), particularly in counties Clare and Limerick. The incidence rate in Ireland was falling between 1999 and 2002 but stabilised around 41 from 2003-6. In very rare instances there can be sequelae to Campylobacter infection, most notably an association with Guillain-Barré syndrome.

Table 3a: Annual incidence rate for campylobacteriosis by county, 2001 – 2007.

	County							
	Clare		**Limerick**		**Tipperary N**		**HSE West***	
	Cases	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**
2001	14	13.6	23	13.1	20	32.8	57	16.8
2002	18	17.4	41	23.4	11	18	70	20.6
2003	25	24.2	51	29.1	21	34.4	97	28.5
2004	32	28.8	49	26.6	26	39.4	107	29.6
2005	43	38.8	77	41.8	20	30.3	140	38.8
2006	35	31.5	67	36.4	23	34.8	125	34.6
2007	54	48.7	97	52.7	17	25.7	168	46.5
Total	**221**		**405**		**138**		**764**	

Rate expressed per 100,000 population. Excludes cases in non-HSE West (Clare, Limerick, Tipperary North) residents.*

In 2007, three cases of cryptosporidiosis were in non-HSE West (Clare, Limerick, Tipperary North) residents. There is considerable variation in the rates reported from counties over the

years. The rate of cryptosporidiosis in Clare increased in 2005 mainly due to a suspected waterborne outbreak in the Ennis area (Table 3b). The rate in county Limerick in 2005 was three times the rate seen in 2004. In 2006 and 2007, there was little change in the rate of cryptosporidiosis in the counties.

Table 3b: Annual incidence rate for cryptosporidiosis by county, 2001 – 2007.

	County							
	Clare		**Limerick**		**Tipperary N**		**HSE West***	
	Cases	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**
2001	2	2.0	1	1.1	0	-	3	0.9
2002	15	14.5	31	17.7	3	4.9	49	14.4
2003	15	14.5	25	14.3	7	11.5	47	13.8
2004	15	13.5	9	4.9	18	27.3	42	11.6
2005	20	18.0	28	15.2	12	18.2	60	16.6
2006	15	13.5	28	15.2	13	19.7	56	15.5
2007	17	15.3	27	14.7	11	16.7	55	15.2
Total	**99**		**149**		**64**		**312**	

Rate expressed per 100,000 population. Excludes cases in non-HSE West (Clare, Limerick, Tipperary North) residents.*

In 2007, one case of salmonellosis was confirmed in a non-HSE West (Clare, Limerick, Tipperary North) residents. In 2002, the rate of salmonellosis in Tipperary North was particularly high compared to the low rate in Clare (Table 3c). The rate of salmonellosis has fallen in Clare in 2007 compared to 2006.

Table 3c: Annual incidence rate for salmonellosis by county, 2001 – 2007.

	County							
	Clare		**Limerick**		**Tipperary N**		**HSE West***	
	Cases	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**
2001	7	7.4	17	10.3	3	5.2	27	8.5
2002[#]	4	4.3	19	11.5	9	15.5	32	10.1
2003	3	2.9	12	6.9	7	11.5	22	6.5
2004	5	4.5	10	5.4	2	3.0	17	4.7
2005	1	0.9	14	7.6	4	6.1	19	5.2
2006	12	10.8	15	8.1	4	6.1	31	8.6
2007	5	4.5	19	10.3	6	9.1	30	8.3
Total	**37**		**106**		**35**		**178**	

Rate expressed per 100,000 population. [#]Excludes one case, no address assigned. Excludes cases in non-HSE West (Clare, Limerick, Tipperary North) residents.*

Seasonality (based on date of isolation when known, or reporting):

Prior to 1998, a peak in campylobacteriosis was seen in May-June but in recent years peaks have occurred throughout the year (Figure 1).

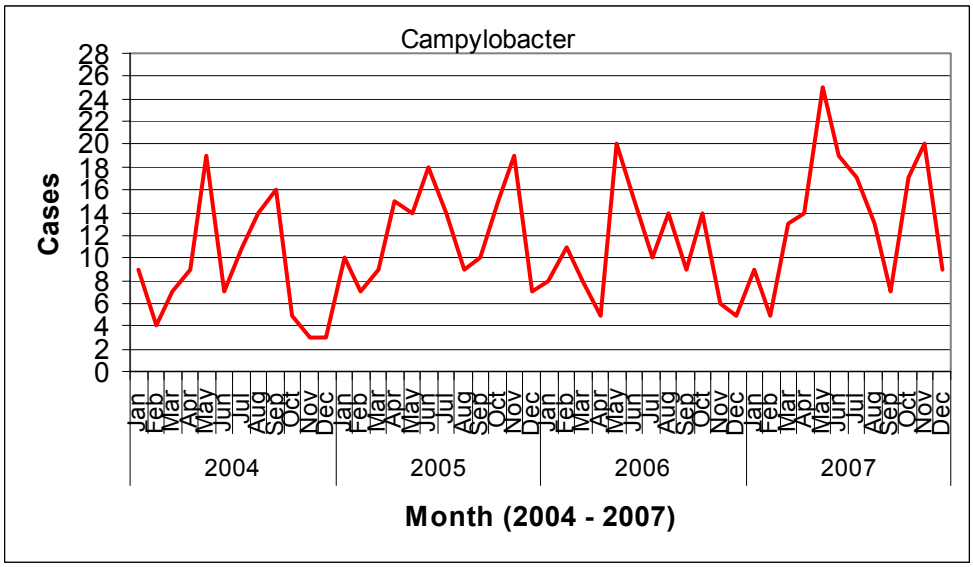


Figure 1: Cases of Campylobacter reported in the HSE West (Clare, Limerick, Tipperary North), 2004-2007 (n=547).

Reports of cryptosporidiosis show a characteristic seasonal peak in spring but a smaller peak is also evident in autumn in recent years. In 2004, 2005 and 2007 there is a large spring peak (Figure 2). In 2003 there were a number of Cryptosporidium infections associated with travel abroad – at least two of these cases appear to be associated with the use of recreational swimming pools. There was a suspected waterborne outbreak of Cryptosporidium in the Mid-West in 2005.

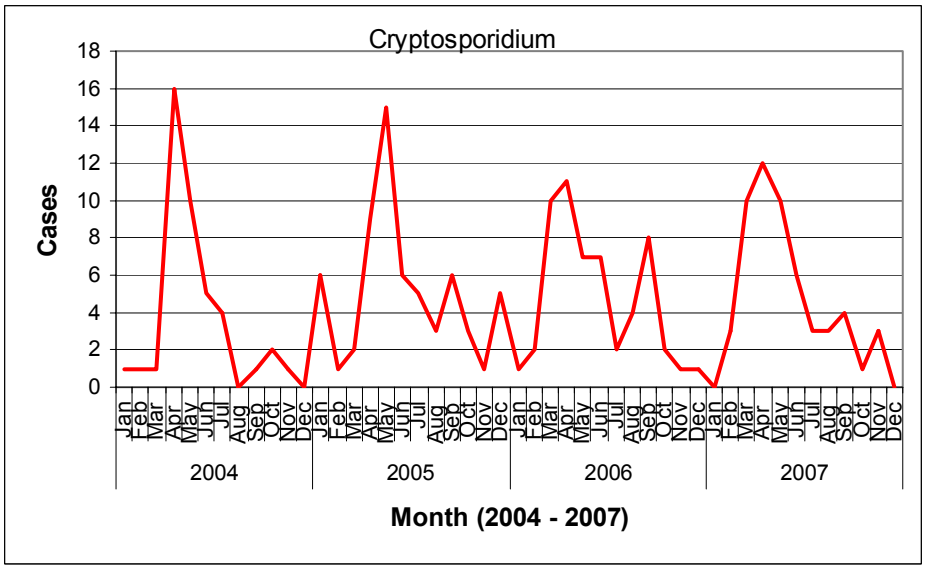


Figure 2: Cases of cryptosporidiosis reported in the HSE West (Clare, Limerick, Tipperary North), 2004-2007 (n=215).

Reports of salmonellosis tend to peak in the summer period but the incidence has fallen in recent years and now even small increases can cause a peak at any time over the year (Figure 3).

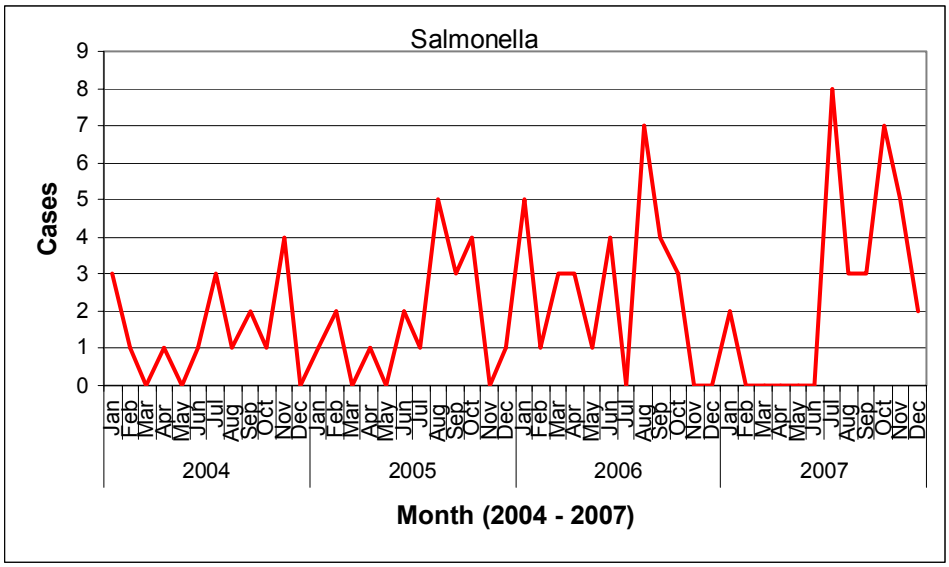


Figure 3: Cases of salmonellosis reported in the HSE West (Clare, Limerick, Tipperary North), 2004-2007 (n=98).

Sex Distribution:

From 2001 to 2007, 413 cases of Campylobacter were detected in males and 350 in females (Table 4). The male to female ratio was 1.2:1. Apart from some occasional deviations, there appears to be more males than females affected in most years.

Table 4: Sex distribution of Campylobacter by county in HSE West (Clare, Limerick, Tipperary North), 2001-2007.

County	**Clare** (n=221)		**Limerick** (n=404)		**Tipperary N** (n=138)		**HSE West***	
Sex	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**
Year								
2001	5	9	7	16	13	7	25	32
2002	13	5	20	21	7	4	40	30
2003	13	12	26	25	14	7	53	44
2004	19	13	28	21	16	10	63	44
2005	24	19	43	34	10	10	77	63
2006	18	17	37	30	11	12	66	59
2007[$]	31	23	50	46	8	9	89	78
Total	**123**	**98**	**211**	**193**	**79**	**59**	**413**	**350**

[$] *Sex not known one case*

From 2002 to 2007, 170 cases of Cryptosporidium were detected in males and 139 in females (Table 5). The male to female ratio was 1.2:1. A preponderance of disease in males is seen but rates can vary geographically over the years.

Table 5: Sex distribution of cryptosporidiosis by county in HSE West (Clare, Limerick, Tipperary North), 2002-2007.

County	**Clare** (n=97)		**Limerick** (n=148)		**Tipperary N** (n=64)		**HSE West***	
Sex	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**
Year								
2002	10	5	18	13	1	2	29	20
2003	12	3	13	12	5	2	30	17
2004	3	12	3	6	9	9	15	27
2005	12	8	15	13	7	5	34	26
2006	11	4	14	14	7	6	32	24
2007	6	11	18	9	6	5	30	25
Total	**54**	**43**	**81**	**67**	**35**	**29**	**170**	**139**

From 2001 to 2007, 99 cases of salmonellosis were detected in males and 79 in females (Table 6). The male to female ratio was 1.3:1. Unusually, in 2005, there were more cases in females compared to males. Between 2002 and 2005, a large proportion of cases appear to be associated with recent travel, particularly the Iberian peninsula, and cases of *S.* Enteritidis non-phage type 4. In 2007, non-PT4 *S.* Enteritidis appears to be as predominant, *even without history of foreign travel*.

Table 6: Sex distribution of salmonellosis by county in HSE West (Clare, Limerick, Tipperary North), 2001-2007.

County	**Clare** (n=37)		**Limerick** (n=106)		**Tipperary N** (n=35)		**HSE West***	
Sex	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**
Year								
2001	6	1	9	8	1	2	16	11
2002[#]	2	2	10	9	9	0	21	11
2003	3	0	6	6	5	2	14	8
2004	5	0	5	5	0	2	10	7
2005	0	1	4	10	2	2	6	13
2006	6	6	7	8	2	2	15	16
2007	3	2	10	9	4	2	17	13
Total	**25**	**12**	**51**	**55**	**23**	**12**	**99**	**79**

[#]*Excludes one case not assigned to a county.*

Age Distribution:

The age distribution of Campylobacter cases was very similar for all years examined (Table 7). Age specific incidence rates are shown for 2003-2006 (Figure 4).

For Campylobacter, the trend mirrors the pattern reported in national statistics, most cases occurred in the very young and further peaks in the 25-34 year old age group and in the oldest age group. In 2005 this pattern changed again with a noticeable peak in those aged 15-19 years also but it was not reproduced in 2006-2007. Figure 7 show the distribution for 2007 alone.

Table 7: Age distribution of all cases of campylobacteriosis 2001-2007.

	Age Group (Years)										
Year	**0-4**	**5–9**	**10–14**	**15-19**	**20-24**	**25-34**	**35-44**	**45–54**	**55–64**	**65+**	**Total**
2001	22	3	2	3	4	9	4	1	1	8	57
2002	23	2	0	5	6	13	7	3	6	5	70
2003	27	4	5	4	7	15	12	3	6	13	96
2004	38	10	4	2	9	12	7	5	9	11	107
2005	36	9	2	13	7	17	21	9	10	16	140
2006	33	14	5	1	9	21	13	7	10	12	125
2007	50	15	3	6	15	21	20	13	12	13	168
Total	**229**	**57**	**21**	**34**	**57**	**108**	**84**	**41**	**54**	**78**	**763**

The age distribution of cryptosporidiosis cases must be interpreted with consideration to the age threshold in laboratory investigation practice stated in the introduction (Table 8 and Figure 5). Figure 8 show the distribution for 2007 alone.

Table 8: Age distribution of all cases of cryptosporidiosis, 2002-2007.

	Age Group (Years)										
Year	**0-4**	**5-9**	**10-14**	**15-19**	**20-24**	**25-34**	**35-44**	**45-54**	**55-64**	**65+**	**Total**
2002	25	15	2	2	0	4	0	0	0	1	49
2003	31	13	1	0	0	1	0	0	0	1	47
2004	28	10	2	0	0	1	1	0	0	0	42
2005	41	9	5	0	1	3	1	0	0	0	60
2006	34	10	7	1	2	2	0	0	0	0	56
2007	36	9	3	0	2	2	3	0	0	0	55
Total	**195**	**66**	**20**	**3**	**5**	**13**	**5**	**0**	**0**	**2**	**309**

Salmonellae affect a wider age range compared to Campylobacter and Cryptosporidium but a large proportion of cases still occur in the younger age groups (Table 9 and Figure 6). The number of infections in older people was high in 2005. Figure 9 show the distribution for 2007 alone.

Table 9: Age distribution of all cases of salmonellosis, 2001-2007.

	Age Group (Years)										
Year	**0-4**	**5-9**	**10-14**	**15-19**	**20-24**	**25-34**	**35-44**	**45-54**	**55-64**	**65+**	**Total**
2001	7	5	1	2	4	2	2	1	1	2	27
2002	8	1	1	4	4	3	4	5	1	1	32
2003	3	1	2	0	2	3	2	4	3	2	22
2004	4	2	0	0	1	4	1	1	1	3	17
2005	3	1	0	0	5	2	0	0	4	4	19
2006	7	3	1	1	2	5	5	2	1	4	31
2007	6	3	0	0	2	7	3	2	5	2	30
Total	**38**	**16**	**5**	**7**	**20**	**26**	**17**	**15**	**16**	**18**	**178**

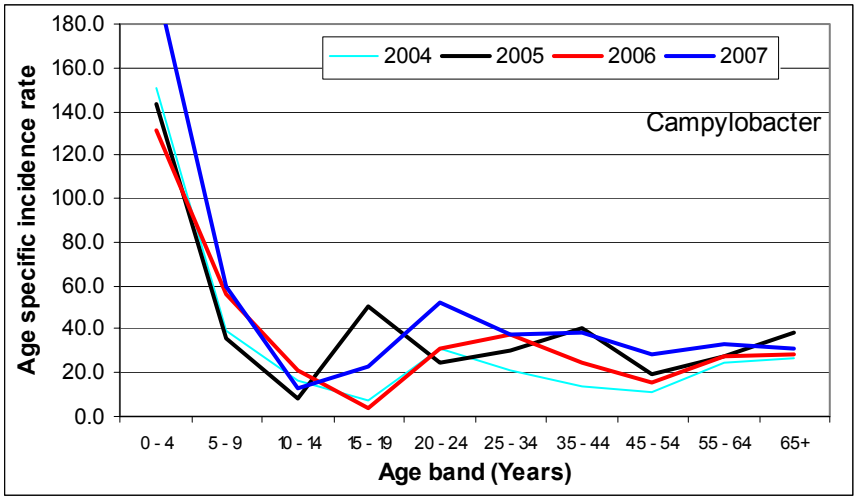


Figure 4: Age-specific incidence rates of campylobacteriosis, 2004-2007.

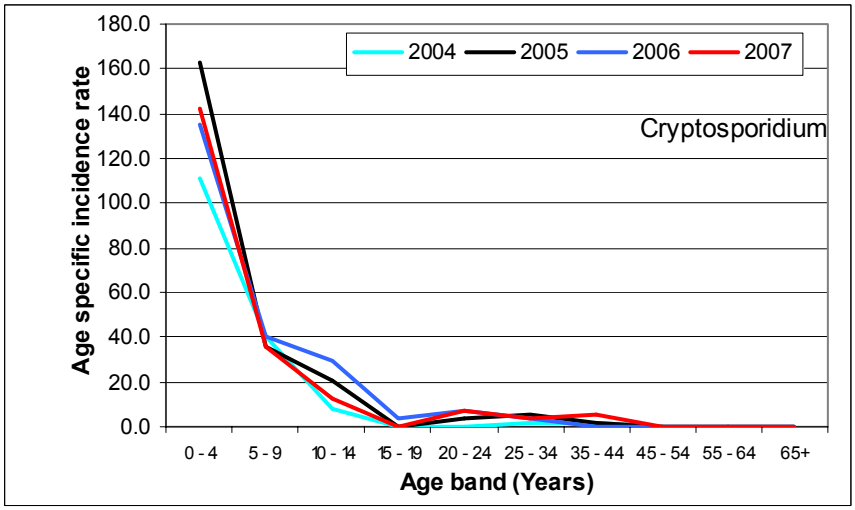


Figure 5: Age-specific incidence rates of cryptosporidiosis, 2004-2007.

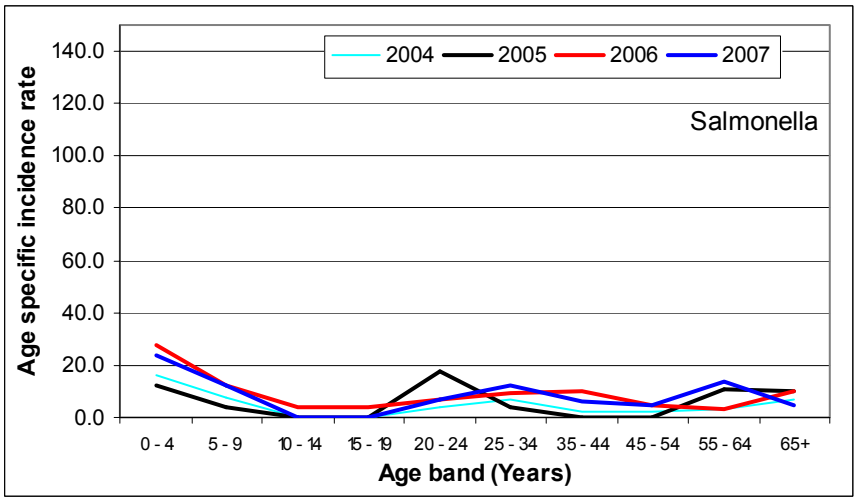


Figure 6: Age-specific incidence rates of salmonellosis, 2004-2007.

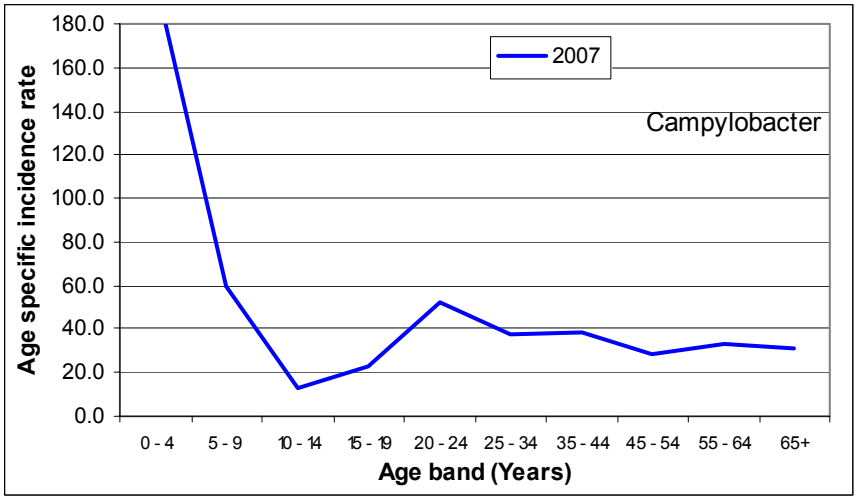


Figure 7: Age-specific incidence rates of campylobacteriosis, 2007.

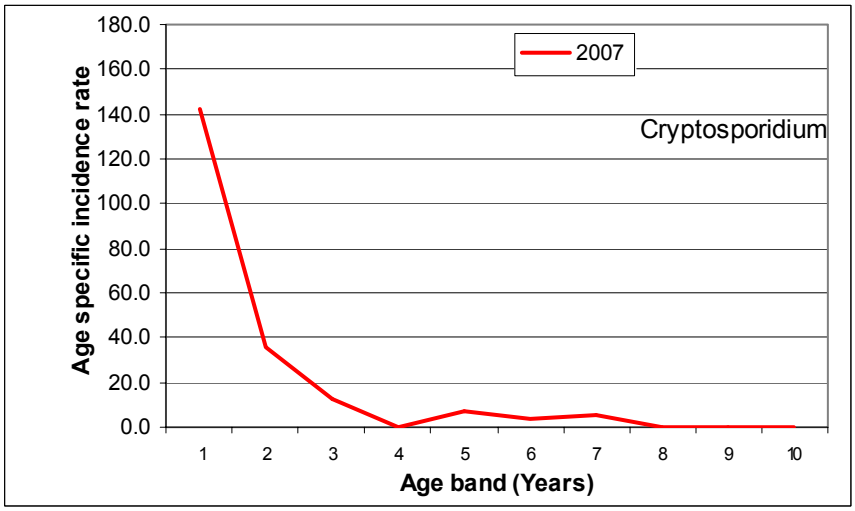


Figure 8: Age-specific incidence rates of cryptosporidiosis, 2007.

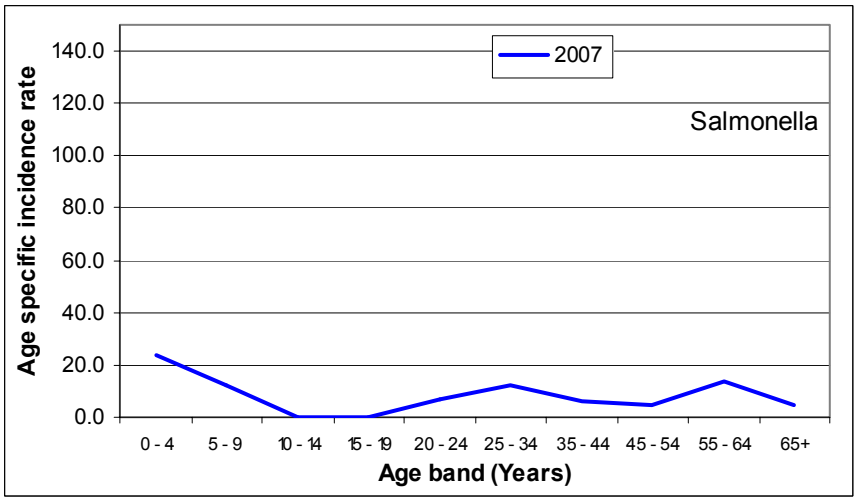


Figure 9: Age-specific incidence rates of salmonellosis, 2007.

Species Listing:

Campylobacter: Several species of Campylobacter cause campylobacteriosis. The most common species is *C. jejuni* followed by *C. coli* (Table 10). In 2001, nalidixic acid resistance was reported in 21% of Campylobacter isolates (n=62) whereas in 2005, resistance to nalidixic acid was reported in 18% of Campylobacter species.

Table 10: Isolates of Campylobacter species in HSE West (Clare, Limerick, Tipperary North), 2001-2007.

Year	*C. jejuni*	*C. coli*	*C. species*	*C. upsaliensis*	*C. fetus*
2001	48	5	3	1	0
2002	59	6	5	0	0
2003	84	6	7	0	0
2004	99	6	2	0	0
2005	126	9	5	0	0
2006	104	15	5	0	1
2007	143	22	9	0	1

Salmonella: Several different serovars of *S. enterica* were isolated (Table 11). *S*. Enteritidis represented 41- 42% of isolates from 2001 to 2007 (except for 2003, 30%). *S.* Typhimurium varied from 15-44% from 2001-2007.

Data from the investigation of isolates at the National Salmonella Reference Laboratory, Galway are also available. In 2001, *S.* Enteritidis PT4 (4) was the most common phage type followed by PT21 (3). In more recent years 2002-4, a change in the epidemiology of phage types of *S*. Enteritidis is evident with a greater proportion of non-PT4 isolates being identified. *S*. Typhimurium DT104 (7) and DT193 (7) were the most common phage types detected, followed by U302 (2). None of the *S*. Typhimurium DT193 isolates were kanamycin resistant, where data was available. There is growing concern about the level of antibiotic resistant *S*. Typhimurium DT104 reported.

Table 11: Serovars of S. enterica *in HSE West (Clare, Limerick, Tipperary North), 2001-2007.*

Year	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*
S. Typhimurium	12	10	5	5	3	6	10
S. Enteritidis	11	14	9	7	9	13	13
S. Dublin	0	3	2	1	1	1	0
S. Hadar	0	1	3	0	1	1	0
S. Infantis	0	1	0	0	0	0	0
S. Mbandaka	0	1	0	0	0	0	0
S. Singapore	0	1	0	0	0	0	0
S. Stanley	0	1	0	1	0	2	1
S. Typhi	0	1	2	0	0	0	0
S. Agama	0	0	0	0	0	0	1
S. Agona	1	0	0	0	0	1	0
S. Alachua	0	0	0	0	0	0	1
S. Brandenberg	1	0	0	0	0	0	0
S. Bredeney	1	0	1	0	1	2	1
S. Java	1	0	0	0	0	0	1
S. Manhattan	0	0	1	0	1	0	0
S. Kentucky	0	0	1	0	0	0	0
S. Virchow	0	0	1	1	0	0	0
S. Newport	0	0	0	1	0	0	0
S. Rubislaw	0	0	0	1	0	0	0
S. Give	0	0	0	0	1	0	0
S. Anatum	0	0	0	0	1	0	0
S. Blockley	0	0	0	0	1	0	0
S. Goldcoast	0	0	0	0	1	0	0
S. Oranienburg	0	0	0	0	0	1	1
S. Poona	0	0	0	0	0	1	1
S. SaintPaul	0	0	0	0	0	1	0
S. Schwarzengrund	0	0	0	0	0	1	0
S. Wien	0	0	0	0	0	1	0
S. Haifa	0	0	0	0	0	0	1
Salmonella sp	0	0	0	0	1	0	0
Total	**27**	**33**	**25**	**17**	**20**	**31**	**31**

Salmonella species have been isolated from urine and blood, and occasionally from respiratory specimens. In 2002, the *S*. Typhi isolated was in a resident of another area in Ireland. In 2003, both *S*. Typhi isolates were recorded in visitors to Ireland from the Indian subcontinent. One unusual serovar, *S*. Havana was isolated in the Mid-West but was from a non-HSE West (Clare, Limerick, Tipperary North) resident. One isolate was recovered from a wound swab. In 2005, a serotype, *S.* Goldcoast was isolated in a case linked to travel to Majorca. This was one case from an outbreak affecting residents from several EU countries. *S.* Oranienburg is rare but in 2001 the serovar was linked to an outbreak involving chocolate. In 2006-7, England Wales and Scotland reported an increase in the number of *S*. Schwarzengrund cases detected.

Between 2002 and 2006, 52 isolates of *S*. Enteritidis were confirmed, 49 were phage typed (PT), 36 were non-PT4 (73%) and 13 were PT4 (27%). Recent travel history was ascertained in 28 non-PT4 cases and all but four (three in 2006) gave a history of recent foreign travel, Spain in the majority of cases (18/28). Any association between non-PT4 *S.* Enteritidis and travel to the Iberian peninsula is not as evident in 2006-2007.

S. Enteritidis Phage Types (PT):

	2002	2003	2004	2005	2006	2007	All
PT4	3	2	4	0	4	2	15
PT1	6	1	2	3	2		14
PT6	2		1			4	7
PT6c				2			2
PT8		2			1	2	5
PT12	1						1
PT14	1						1
PT14b	1			3	2		6
PT21		1		1	2	2	6
PT24		1					1
PT 5					1		1
PT2						1	1
PT 34						1	1
PTn/a		*2*			*1*		*3*
Total	**14**	**9**	**7**	**9**	**13**	**12**	**64**

Outbreaks:

Most cases of campylobacteriosis are sporadic. No outbreaks of campylobacteriosis were confirmed and reported. Contact with pets and consumption of undercooked poultry are regarded as an important risk factors for campylobacteriosis. Poultry preparation must always be followed by hand disinfection in the kitchen. Several cases reported travel abroad as a possible risk factor in their illness associated with Campylobacter.

In 2005 there were eight cases of cryptosporidiosis in pre-school children in the Ennis area of Co. Clare in May without other risk factors. A resultant “boil water” notice was issued by Clare County Council and this was lifted in June although a limited boil water notice for vulnerable groups (immunocompromised people, children under five years old and visitors to Ennis) remains in place pending introduction of full drinking water treatment. Some cases appeared to be linked through family outbreaks. In 2007, there were three family clusters involving siblings with cryptosporidiosis.

Contact with farm animals and pets are believed to be important risk factors for this disease. It may be partly an explanation of the extremely low rates seen in urban areas (Dublin City and County) and higher rates in children who reside in rural areas.

No large outbreaks of salmonellosis were reported between 2001 and 2007. Family outbreaks of salmonellosis did occur but whether transmission is within the family or due to a common source was not ascertained. Travel is a very common risk factor reported in cases of salmonellosis. *S.* Virchow and *S.* Manhattan were possibly associated with travel to Spain. Alerts from Enter-Net about salmonellosis in Europe were received throughout the period, the largest relating to *S.* Enteritidis PT14b in 2002, but no linkage to any cases in the Mid-West was confirmed. Both PT14b cases in 2006 reported travel to Spain. Reptiles, especially terrapins, can be reservoirs for salmonella and parents should be aware of the risk to children such contacts involve.

In 2007, travel was a risk factor reported in 22 cases, eleven Campylobacter, one Cryptosporidium and ten Salmonella (32%). Eight cases were associated with travel to the Iberian peninsula, three to Thailand, three to Turkey, two to Tunisia and one each to Bulgaria, Nigeria, New Zealand, Venezuela and the UK; one not known.

Since January 1st 2004 there is a requirement on clinicians and laboratory clinical directors to notify outbreaks and any changing patterns/ unusual clusters of disease to the Medical Officer of Health (MoH) at the Department of Public Health who must in turn notify the HSE-Health Protection Surveillance Centre.

Outcome:

No deaths due to campylobacteriosis, cryptosporidiosis or salmonellosis were reported.

Shigellosis

2003: There were five reports of shigellosis. Two were *Shigella sonnei* and these were linked cases with travel abroad (Tunisia) reported as a probable cause. There were three reports of *S. flexneri* in 2003 – all appeared to be sporadic.

2004: There were two reports of shigellosis, one case was *S. sonnei,* this case reported recent travel to Sri Lanka and the other was *S. boydii* – the latter was believed to be travel related (South Africa).

2005: There was one laboratory confirmed *S. flexneri* related to travel to Ghana; two cases were confirmed *S. sonnei*, of which one was related to travel to Peru and the other linked to travel to the US (the latter was linked to two clinical notifications of illness – a family cluster).

2006: There were six *S. flexneri* and two *S. sonnei* reported (five males and three females). Six were in children under 18 years. Three were in Clare, four in Limerick and one in Tipperary. Two cases reported recent travel – one to France and one to Portugal. One case did have concurrent giardiasis.

Travel is a very common risk factor in shigellosis in this area. The organism is very infectious and immediate public health follow-up is needed as soon as a notification is made. It is vital to notify such cases as soon as possible.

2007: There were two cases of *Shigella sonnei* confirmed in December 2007. These two cases appeared to have no links but a cluster of eight cases of *S. sonnei* were reported though a common link was not detected.

EHEC Infections (also called Verotoxigenic *E. coli* – VTEC)

Enterohaemorrhagic *E. coli* infection can be caused by a number of different serotypes of *E. coli*. The most notable serotype is *E. coli* O157 although other types can be verotoxin producers. In a small proportion of cases this infection can lead to very serious illness such as haemorrhagic colitis and haemolytic uraemic syndrome. **For this reason immediate telephone notification to the MoH at the Department of Public Health, by laboratory or clinician, of suspect EHEC is critical.** A classic symptom of the illness is "bloody diarrhoea", however this can be a symptom of shigellosis and there are cases of EHEC infection without bloody diarrhoea. Many cases are asymptomatic.

Enhanced surveillance of EHEC has been in place since 1998 (Table 12).

Table 12: Number of reports of suspected EHEC infections in HSE West (Clare, Limerick, Tipperary North) 1999-2007.

Year	HSE West*
1999	12
2000	3
2001	3
2002	5
2003	10
2004	8
2005	27
2006	22
2007	18
Total	**107**

Includes non-HSE West (Clare, Limerick, Tipperary North) residents. Non-O157 EHEC may be underreported.*

In some years there are a number of cases which are not laboratory-confirmed and some cases were detected in non-HSE West (Clare, Limerick, Tipperary North) residents. Up to 2004, the HSE West (Clare, Limerick, Tipperary North) had one of the lowest incidences of EHEC infection in Ireland (Table 13) but this altered in 2005 because of a large outbreak. Neighbouring jurisdictions may report VTEC O157 only. Rates for 2003 in Scotland and England & Wales were 2.9 and 1.3 per 100,000 population respectively. Scotland has traditionally had a high level of VTEC O157 infection and large outbreaks in the past. A relatively low rate of 2.9 per 100,000 population seen in 2003 was followed in 2004 with a rate of 4.1 (209 cases) and 3.4 in 2005. In 2006 and 2007 (provisionally) the rate in Scotland was 4.8. In England & Wales the rate of VTEC O157 in 2004 was 1.3, in 2005 it rose to 1.8, in 2006 it was 1.9 but provisional data for 2007 suggest a decrease to 1.4. The VTEC O157 rate in Northern Ireland increased in 2007, provisionally the rate was 3.2, higher than 2006 (2.7), 2005 (2.9) and much higher than 2004 (1.1). Rates of EHEC in Mid-West include occasional non-O157 isolates and should not be directly compared to UK rates that only include O157. Some cases are also acquired abroad.

Table 13: Number of reports of confirmed EHEC infections in HSE West (Clare, Limerick, Tipperary North) and Ireland and crude incidence rate (CIR) 2000-2007.

Year	HSE West*	CIR	Ireland	CIR
2000	2	0.6	N/A	-
2001	2	0.6	N/A	-
2002	0	0	N/A	-
2003	7[†]	2.1	95	2.4
2004	6[‡]	1.7	61	1.4
2005	26[$]	7.2	125	3.0
2006	21[$]	5.8	158	3.7
2007	17[$]	4.4		
Total	**81**			

Excludes non-residents. [†]Three confirmed cases detected but excluded (non-HSE West (Clare, Limerick, Tipperary North) residents). [‡] Two confirmed cases detected but excluded (non-HSE West (Clare, Limerick, Tipperary North) residents). [$]One non-HSE West (Clare, Limerick, Tipperary North) resident excluded.

Males (23) and females (20) were equally affected up to 2006. In 2006, there was a 2:1 ratio of females (15) to males (6). In 2007, there were eight males and nine females affected. Most cases occur in the young (Table 14) though this data is greatly influenced by cases ascertained in outbreak investigations.

From 2000 to 2004, two EHEC were detected from residents in Clare and ten in Limerick. Five cases in Tipperary North were all detected in 2004 and three cases (O157) were epidemiologically linked.
In 2003, three cases of EHEC infection were detected in non-HSE West (Clare, Limerick, Tipperary North) residents – these cases were linked to outbreaks of EHEC infection in the eastern area. One family outbreak (3 cases) of EHEC infection in 2003 reported travel abroad as a risk factor. Another risk factor reported in one case in 2003 was contact with farm animals.
In 2004, 4/6 EHEC cases were serotype O157 phage type 32 and 2/6 cases were serotype O26. One case of EHEC O157 is likely to have been acquired abroad.
National data published by the Health Protection Surveillance Centre point to a late summer/early autumn peak. In the HSE West (Clare, Limerick, Tipperary North), cases occurred sporadically during the year.

In 2005, three cases were reported from Clare and two were from Tipperary North. Twenty-one cases were reported from Limerick, of which 18 were linked by an outbreak of *E. coli* O157, verotoxin 2 positive (VT2+), phage type 32[4]. Two cases were detected incidental to the outbreak investigation, one was non-groupable VT2+ and the other was *E. coli* O123 VT1+. One further *E. coli* O157 was detected which was non-toxigenic and is not included in the EHEC data.

In 2006, there were no cases in Clare, four cases were reported in Tipperary North and seventeen in Limerick. While 4-5 family clusters were identified from the index cases through

active case-finding, the crude rate in Limerick would appear to be significantly higher than the national crude rate. Ten cases were symptomatic and eleven were asymptomatic. Eighteen cases were serotype O157 and three were serotype O26.

In 2007, there were four cases in Clare, six in Limerick and seven in Tipperary North. Two family clusters of E. coli O157 were identified – one cluster accounting for six cases (phage type 14) and the other for five cases (phage type 32). Of the 17 cases, only three were asymptomatic in 2007. Fifteen cases were serotype O157, one was O111 and one case had both O26 and O113.

Table 14: Age distribution of all cases of confirmed EHEC in HSE West (Clare, Limerick, Tipperary North) 2000-2007 (n=81).

	Age Group (Years)										
	0-4	**5–9**	**10–14**	**15-19**	**20-24**	**25-34**	**35-44**	**45–54**	**55–64**	**65+**	**Total**
Cases	40	8	2	1	2	4	11	4	5	4	**81**

Phage typing and verotoxin detection is carried out through the Public Health Laboratory in Cherry Orchard Hospital, Dublin. All isolates detected in the Mid-West are referred to this laboratory. Phage type 32 was the most common phage type reported (46), three PT8, one PT2, one PT34, three PT51 and six PT21/28 were reported. Phage type 14 emerged in the Mid-West in one cluster of six cases in 2007. Verotoxin was confirmed in all cases (VT1 or VT2) from 2005 to 2007.

In 2003, one case of verotoxin *E. coli* O26 was detected in the Mid-West; in 2004 three were detected (one non-HSE West* resident), in 2006, three were detected and in 2007 one was detected. From data made available by Public Health Laboratory, Cherry Orchard Hospital – other cases of verotoxin positive *E. coli* O26 have been reported in the West and North West.

In 2008, following an increase in the number of EHEC reported in Ireland, the HPSC advised householders who use water from private wells to ensure they are properly maintained. Water supplies should be well protected from potential contamination by farm animals such as cattle, which can carry the EHEC in their faeces without signs and symptoms.

***Clostridium difficile*:**

Clostridium difficile (*C. difficile*), a Gram-positive obligate anaerobic bacterium, was first discovered in 1935. However, its role as the major causative pathogen in antibiotic associated diarrhoea (AAD) and pseudomembranous colitis (PMC) was detailed much later. The bacterium can exist as either vegetative cells or spores – the latter conferring resistance to many adverse conditions. Toxigenic *C. difficile* is regarded as the cause of PMC. The incidence of PMC became quite pronounced after the introduction of antibiotics in the 1950's. The spectrum of clinical manifestations caused by *C. difficile* ranges from asymptomatic colonisation, mild AAD to a fulminant, often relapsing and occasionally fatal colitis. Managing *C. difficile* infection involves removal of the offending antibiotic (where possible), isolation of the patient and treatment with targeted antibiotic against the bacterium (metronidazole or vancomycin orally). Alternative therapies are available for recalcitrant infections.

A quarter of all AAD is thought to be caused by this organism, *C. difficile,* and it is typically associated with greater morbidity than other causes of AAD. Toxin assays are positive in more than half of those with antibiotic associated colitis and almost all with antibiotic associated PMC.
During the first month of life about 50% of infants become colonised with *C. difficile*, possibly acquiring it from the hospital environment. Neonates remain asymptomatic carriers even where toxin is produced, possibly due to the absence of enterocytic membrane toxin receptors.
C. difficile can be detected in the faeces of 3% of healthy adults. Colonisation and infection increase markedly beyond 65 years of age. Asymptomatic presence has been reported in about 7% of residents of long-term care facilities.

Antibiotic administration (in particular 3rd generation cephalosporins) and underlying morbidity are risk factors. Generally CDI is more commonly a nosocomial infection and therefore this poses a significant financial burden on health care services due to prolonged hospital stay, infection control resources, laboratory and therapeutic costs. Excretion of *C. difficile* by symptomatic patients, in the hospital setting, can result in direct transmission or cross-transmission, via hands of health care workers (HCWs), to other patients. Physical proximity to a symptomatic case is important in transmission. The role of the environment (cause or effect) is controversial. Isolation of hospitalised symptomatic patients is important.

Community acquired CDI does occur but *C. difficile* diagnostic testing is not readily available to general practice as a point of care test. A study by *Kyne et al.* in Ireland showed 11% of toxin positive CDI had no hospitalisation in the previous 60 days.

The problem of CDI is escalating. More widespread empirical use of broad-spectrum antibiotics is occurring. The introduction of waterless, alcohol-based hand hygiene rubs and gels in healthcare settings may also be a factor as this hand disinfection method is not very effective against spores of *C. difficile*. The pathogenesis of disease and resultant morbidity and mortality also appears to be undergoing some shift. The emergence of a more virulent strain (ribotype O27 / toxinotype III) in the US and Canada, and more recently in Europe is a cause for concern.

Surveillance of CDI is required and is necessary. Mandatory surveillance at national level in Northern Ireland began in January 2005, followed by England, Wales and, more recently, Scotland.

Pathogenesis:

The indigenous microflora (normal healthy bug population) of the bowel is disrupted by exposure to antimicrobials and *C. difficile* can overcome the normal suppressive effects of this microflora "colonisation resistance". CDI is a toxigenic condition and the organism elaborates 2 toxins; Toxin A (*tcd*A) and toxin B (*tcd*B) which cause mucosal injury and damage. CDI results when a pathogenic strain colonises and then causes disease in patients rendered susceptible (exposure to antibiotics or anti-neoplastic agents etc.). *Tcd*A is cytotoxic and enterotoxic. *Tcd*B is cytotoxic only. Outbreak strains indicate bacterial virulence factors are important as well as host factors for transmission and disease. Molecular typing can be carried out to ascertain the different types of strains circulating in the population This facility is currently only available to Ireland at facilities in the UK and Europe. Their typing system analyses part of the DNA chromosome in a test called ribotyping, over 100 ribotypes of *C. difficile* have been identified. Ribotype 027 is the strain, known as Toxinotype III (or NAP1/BI) in US & Canada that has focused media interest of late as it has been found to be associated with significant morbidity and mortality. This strain produces more of the toxins than most other types because a mutation has knocked out the gene that controls toxin production. This strain, and other emerging ribotypes also seems to have a greater capability of spread between patients.

Laboratory Diagnosis:

In the hospitals of the HSE West (Clare, Limerick, Tipperary North), Network 7 of the National Hospitals Office (NHO), culture and enzyme immunoassays (EIA) for toxin production were used to report positive cases from 2003 to 2007.

Clinical assessment and endoscopy for PMC can be used but sensitivity, specificity and timely results are issues. Products of *C. difficile* (glutamate dehydrogenase, volatile fatty acids

and cell cytotoxicity assays) which have been used in the past lacked specificity and sensitivity. EIAs have become the most frequently used test but a new generation of rapid molecular tests may herald the future of diagnostics for this bacterium. Molecular typing and antimicrobial susceptibility testing is largely confined to Reference Laboratories in the UK and Europe.

Specimen selection:

- Formed stool should **not** be tested. Out-patient and in-patient specimens should be tested. In fact, where possible, all diarrhoeal specimens submitted should be tested for toxin. Adopting this approach minimises bias.
- In the UK, the recommendation is that national routine surveillance of CDI should be confined to those aged over the age of 65 years.
- Specimens should be examined for toxin production – in the HSE West (Clare, Limerick, Tipperary North) this is performed via an EIA for both toxin A and B.
- It is recommended that public health authorities be notified of all cases. (Since May 4th 2008, *Clostridium difficile* associated disease (CDAD) has become a notifiable disease under the Acute Infectious Disease (AIG) category),
- Unnecessary repeat tests can be avoided if further samples are tested in accordance with advice from the Microbiology Laboratory.
- Specimens should be fresh and processed immediately (or kept below 2^{o}C if testing within 72 hours or below –20^{o}C if testing after 72 hours)

Methods and Materials:

Data were extracted from the Laboratory Information Management System (LIMS) at the Mid-Western Regional Hospital. Positive results for *C. difficile* from January 2003 to December 2007 were obtained.

Culture of *C. difficile* and toxin A and B EIA results were available for 2003. There were 330 cultures positive in 2003 but only 243 were toxin positive. These included many duplicates. From mid-2004, EIA for toxin detection is the diagnostic investigation used. Culture **may** still be requested and performed if further typing is deemed appropriate.

A small number of toxigenic *C. difficile* may be missed by not performing culture (<1% of those tested). This analysis was based on toxin positives. Quality control samples were excluded.

Data 2003-2006: Of 1021 toxin positive tests over the period there were 4 positives from infants in 2003, one in 2005 and one in 2006 that were excluded; 305 results (50 in 2003, 88 in 2004,167 in 2005 and 93 in 2006) were **excluded** because they were positive within 4 weeks of the first positive result. In 897 results, from 792 patients, 48 results suggest re-acquisition of the bacterium and 65 were considered "borderline" in that they were positive between 4 – 8 weeks after the first positive test. These were **not excluded** from the analysis of episodes but were excluded where the cases were analysed. Data presented in this report are based on positive tests performed on stool samples which may or may not have been "diarrhoeal". The history of antibiotic therapy in cases is unknown. Diagnostic testing in St. John's Hospital may not have been performed in MWRH prior to 2004.

Data 2007: With the publication of "*National Guidelines on Management and Surveillance of Clostridium difficile in Ireland*" in May 2008, cases positive within eight weeks of the last positive specimen were excluded. These criteria were applied retrospectively to the 2007 dataset.

Results:

The increase in *C. difficile* in the United Kingdom is illustrated by data from **voluntary** reporting over several years in Figure 10. Rates of 60-80 per 100,000 population were reported in Northern Ireland, Scotland and England & Wales in 2003. Rates increased in all these areas from 2004 to 2006. **A direct comparison of reports and rates is not possible** because different methodologies (toxin or culture) and different rates (both numerator and denominator) are used in surveillance.

In England and Wales **mandatory** surveillance of CDI was introduced in most regions by NHS Trust in January 2005. However, unlike voluntary reporting, mandatory surveillance was confined to those over 65 years – though changes in England have occurred from 2008. Rates between regions like Wales and England are not comparable as different denominators are used for calculating rates.

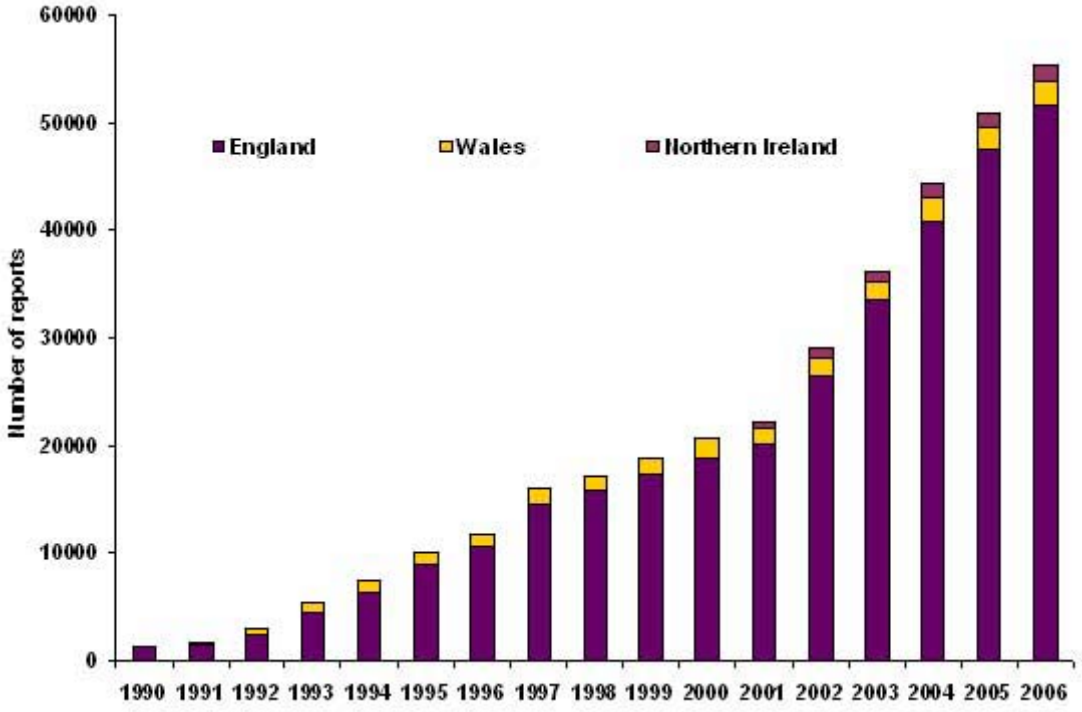


Figure 7: Reports (voluntary surveillance) of C.difficile *isolated from faecal specimens in England, Wales and Northern Ireland 1990-2006.*

Comprehensive mandatory surveillance of *C. difficile* is now underway in Northern Ireland and Scotland. In the UK, guidance has been issued in relation to typing isolates, outbreak investigation and associated mortality as well as infection control. In Ireland, infections caused by *C. difficile* are to be made specifically notifiable in 2008.

Table 15: Toxin positive episodes of C. difficile *in HSE West (Clare, Limerick, Tipperary North), 2003-7.*

Year	Toxin +
2003	189
2004	268
2005	254
2006	186
2007	184
Total	**1081**

Data must be interpreted cautiously where there are fluctuations in the incidence. The underlying trend in number of requests made and patients referred for testing needs to be considered – unlike MRSA bacteraemia surveillance.

There does not appear to be a strong seasonal pattern to the distribution of cases in 2003-2007 although more episodes seem to occur in the late winter and spring, not unlike Norovirus (see Figure 11).

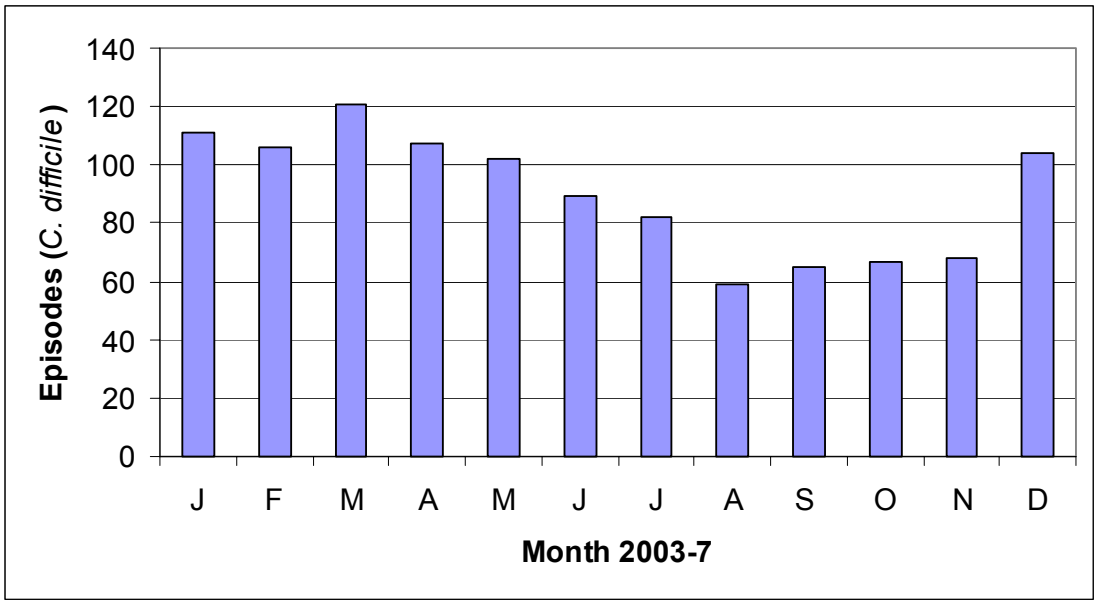


Figure 11: Seasonal monthly distribution of episodes of toxigenic C. difficile *2003-7.*

While the vast majority of cases were recorded as requests from patients hospitalised in the acute centres in the Mid-West, a proportion of these cases arise in A/E patients or OPD. Community hospitals, rehabilitation centres and general practitioners also recorded patients with positive results. It is not possible with this data to determine the proportion of cases that may be "community acquired". Patients diagnosed in an acute hospital may have been admitted from the community or a long term care facility within 48 hours of diagnosis. Patients

diagnosed in the community or long term care facilities may have acquired the infection in an acute hospital before transfer. It must be borne in mind that sampling and selection bias over the period has an impact on interpretation of this data.

Significantly more women than men are diagnosed. Over the period 60% of episodes were diagnosed in women (see Table 16). One reason for this is that women have a longer life expectancy.

Table 16: Episodes of toxigenic C. difficile *in HSE West (Clare, Limerick, Tipperary North) 2003-7 by sex.*

Year	F	M	Total
2003	107	82	189
2004	166	102	268
2005	148	106	254
2006	121	65	186
2007	141	43	184
Total	683	398	1081

The monthly distribution of episodes of *C. difficile* January 2003 to December 2007 is shown in Figure 12 by sex.

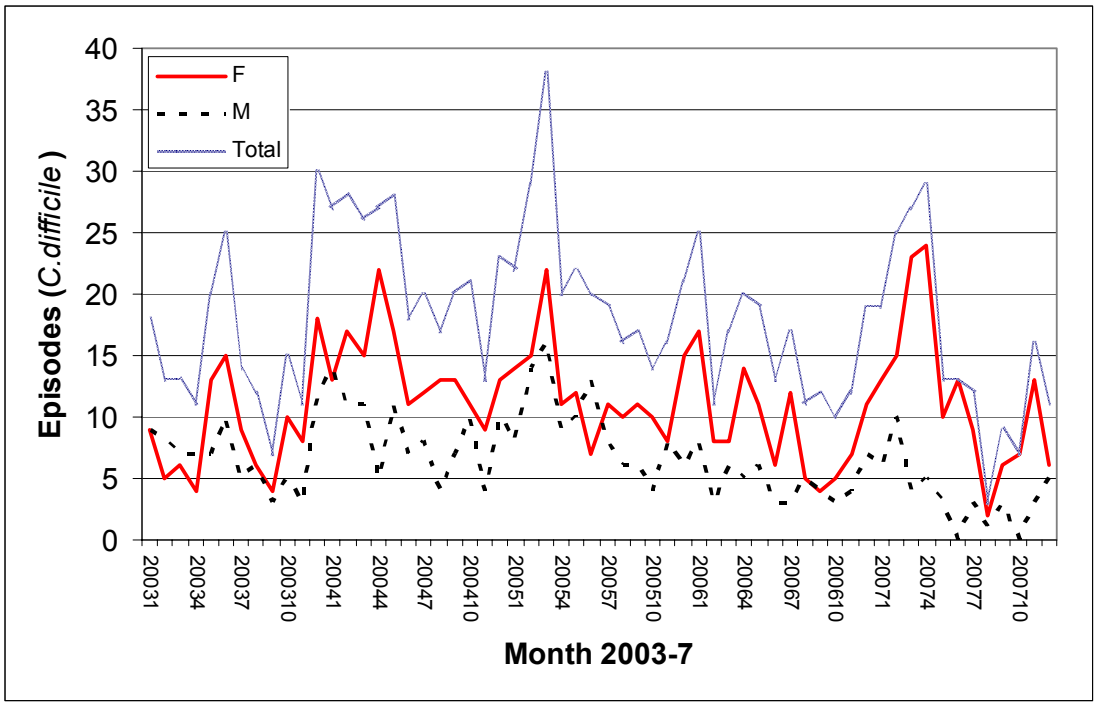


Figure 12: Monthly distribution of episodes of C. difficile *2003-7 HSE West (Clare, Limerick, Tipperary North).*

The vast majority of affected patients are those aged over 65 years (see Figure 13). Note the relative proportion of females over 85 years of age. In England and Wales and Northern Ireland it is reported that 82% of reports involve persons over 65 years. In the HSE West (Clare, Limerick, Tipperary North) the equivalent figure is 85%.

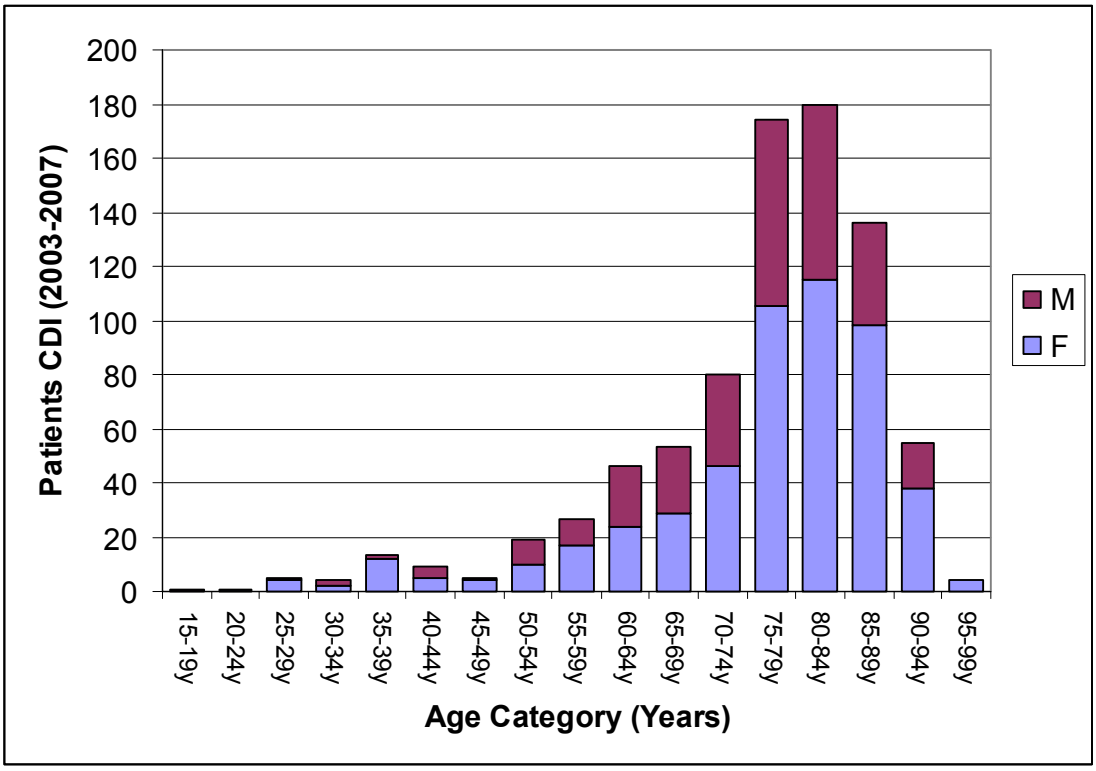


Figure 13: Age distribution of patients affected by toxigenic C. difficile *2003-7, HSE West (Clare, Limerick, Tipperary North).*

Patterns within Hospitals of the HSE West (Clare, Limerick, Tipperary North)

For the four main acute hospitals the incidence rate (per 1000 in patient bed days used) is used to examine the trends in each hospital (Table 17).

Table 17: Incidence rate (per 1000 in-patient bed days used) of toxigenic C. difficile *episodes 2003-7, in four acute hospitals HSE West (Clare, Limerick, Tipperary North).*

Incidence rate	MWRHL	MWRHN	MWRHE	SJHL
2003	0.658	1.845	0.770	0.186
2004	1.047	1.763	0.802	0.261
2005	1.081	0.673	1.040	0.495
2006	0.682	0.364	0.651	0.142
2007	0.519	0.261	1.786	0.387

The rate of *C. difficile* infection appears to be steadily decreasing in Mid-Western Regional Hospital Nenagh. In 2006, all acute hospitals recorded a substantial fall in incidence of patient episodes of *C. difficile* but in 2007 the incidence increased in St. John's Hospital, Limerick and dramatically so in MWRH, Ennis (Figure 14).

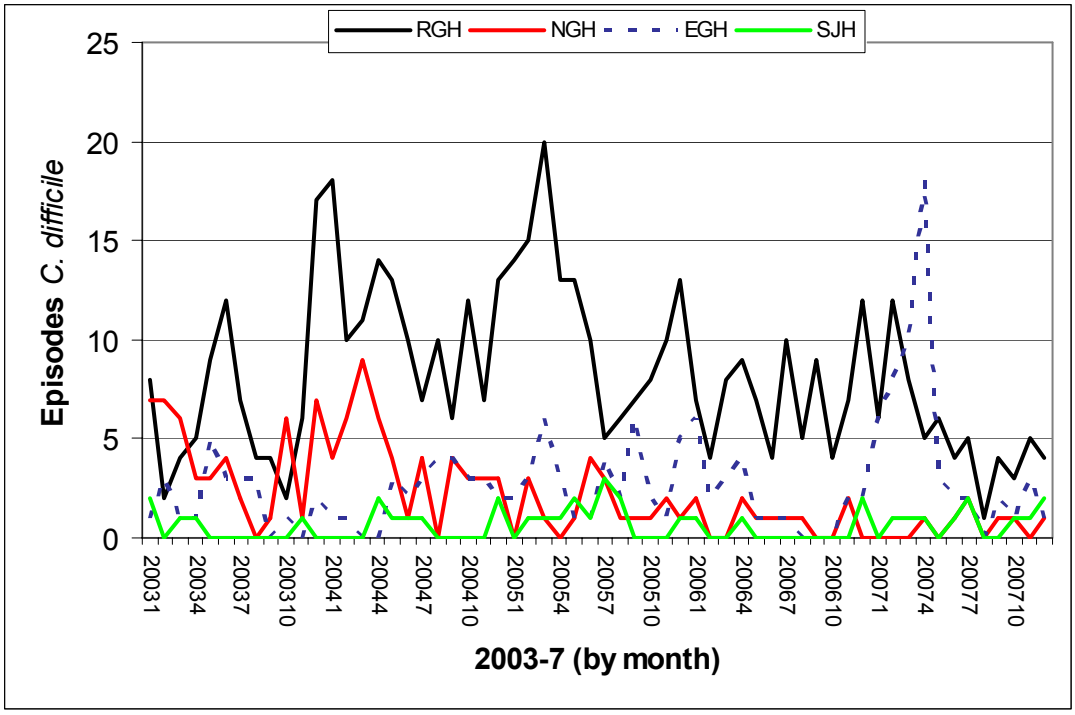


Figure 14: Episodes of toxigenic C. difficile *reported in 2003-7, MWRH Limerick, MWRH Nenagh, MWRH Ennis and St John's Hospital, Limerick.*

Cases of *C. difficile* in long term or rehabilitation care facilities should not be overlooked. These facilities may act as reservoirs of patients (and staff) with asymptomatic (and symptomatic) carriage of *C. difficile*. Transfer between facilities may result in the re-

introduction of toxigenic *C. difficile* to clean environments. Figures 15 and 16 show cases of CDI in some long-term care facilities in the Mid-West.

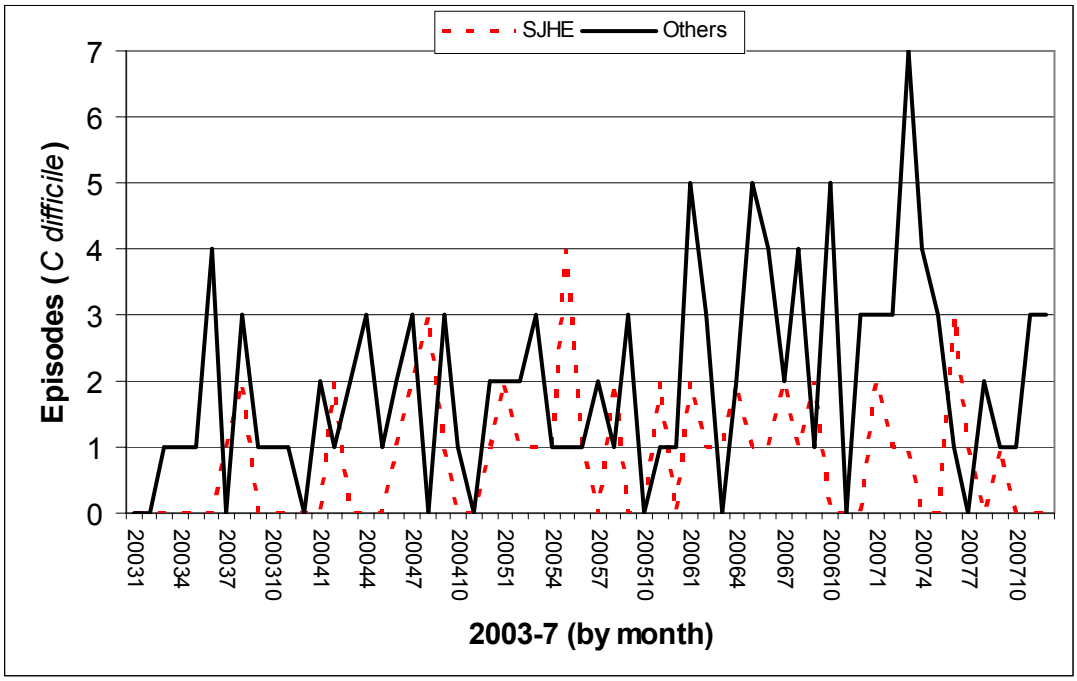


Figure 15: Episodes of toxigenic C. difficile *reported in 2003-7, St Josephs Hospital Ennis and others in Mid-West (general practice, community hospitals, nursing homes).*

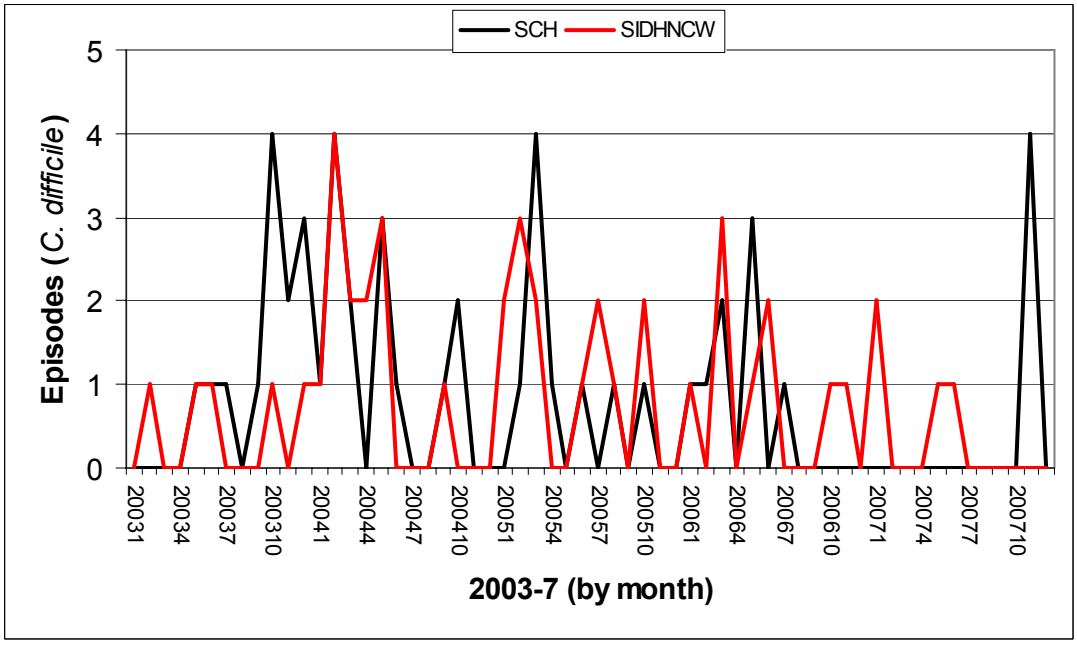
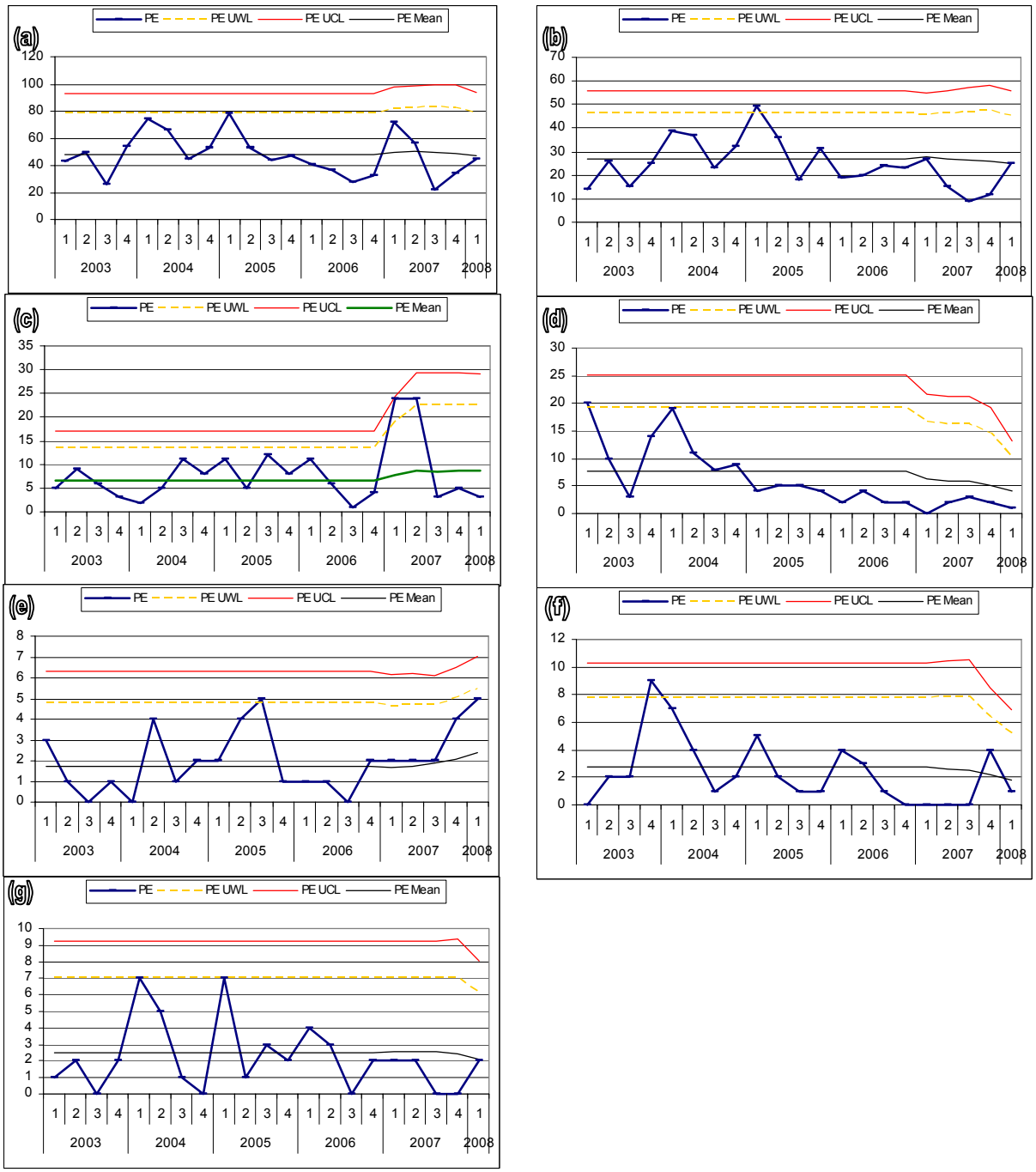


Figure 16: Episodes of toxigenic C. difficile *reported in 2003-7, St Camillus' Hospital Limerick and St. Ita's Hospital Newcastlewest.*

Statistical Process Control (SPC) Charts have proved useful indicators of trends in the occurrence of episodes of disease. SPC charts assume rates in a region or institution will be largely similar over time. They can allow distinction between natural variation and "special

cause" variation (where something unusual occurs). A rate that falls outside the upper control limit, UCL, (or a trend towards the control limit) should lead to a search for an explanation for the pattern. (Quarter 1, 2008 included due to late publication of this report)

The SPC charts in the four acute hospitals and two long term care facilities in Limerick show *C. difficile* episodes falling below average for the period studied, particularly in Mid-Western Hospital Nenagh (Figure 17d).



Figures 17 (a) to (g): Statistical Process Control Charts for quarterly episodes of C. difficile *2003-7; (a) HSE West (Clare, Limerick, Tipperary North); (b) MWRH Limerick; (c) MWRH Ennis; (d) MWRH Nenagh; (e) St. John's Hospital, Limerick; (f) St. Camillus' Hospital, Limerick; (g) St. Ita's Hospital, Newcastlewest, Limerick.*

Feedback to HCWs in such teams through the Infection Prevention & Control Teams in hospitals may assist in heightened awareness of CDI and its prevention and control.
Key control measures include hand hygiene, single use equipment, environmental hygiene, isolation and barrier precautions, outbreak control and prudent antibiotic stewardship.

In 2004, a retrospective analysis of CDI in elderly patients in the southern region of Ireland illustrated the value of targeted antibiotic policy, specifically intravenous cephalosporin use, leading to a reduction in CDI in elderly[5]. In 2007, the Mid-Western Regional Hospital Adult Antibiotic Policy and Preferred Drugs List were launched. These were readily accessed electronically via the intranet.

Perhaps one of the bigger barriers to infection control and *C. difficile* is the lack of good isolation facilities in many Irish hospitals. In July 2006, a comprehensive Healthcare Commission investigation report into 'outbreaks of *Clostridium difficile* at Stoke Mandeville Hospital, Buckinghamshire Hospitals NHS Trust' was published[6]. Hospital management and infection control practitioners must take key lessons from the recommendations.

In December 2007, the Department of Health were advised by local HSE authorities of an increased incidence of CDI in the Mid-Western Regional Hospital, Ennis. The full report of a HSE review into the increased incidence is available online at:
http://www.hse.ie/eng/Publications/Hospitals/Review_of_Increased_Identification_of_Clostridium_Difficile,_Ennis.pdf
Forty-five elderly hospitalised patients (mainly women) were confirmed with CDI (Figure 17c) from January to June 2007. The outbreak was due to the emergence of the new ribotype 027 in the hospital. This type has been associated with large outbreaks in other hospitals around the world. Since July 2007, the baseline level of CDI has returned to low levels at the hospital. This was the largest outbreak of CDI 027 in Ireland to date.

Discussion:

C. difficile is the most important infectious cause of healthcare associated diarrhoea in industrialised countries. Early diagnosis is associated with better prognosis. Diagnosis of CDI is usually based on clinical features and detection of *C. difficile* toxin. A new toxin detection EIA (ICTAB, Meridian) for toxin A and B has been developed with greater sensitivity and specificity than assays used to date. Standardised criteria for specimen selection and rapid testing should be agreed in all healthcare facilities in the Mid-West (i.e. a standardised protocol). There appears to be a high level of repetition in sample toxin testing. This may reflect a lack of appreciation that it is unnecessary to check for microbiological clearance before transfer of *C. difficile* affected patients out of isolation facilities. Instead, transfer should be based on clearance of symptoms for 48 hours. Unnecessary expensive diagnostic testing

could be minimised. Some individuals appear susceptible to recurrent bouts of CDI, which is consistent with other reports.

In the US and Canada there is speculation that CDI is evolving into a more serious disease with higher case fatality – potentially linked to a new virulent strain. The ribotype O27 (toxinotype III) has been reported in the UK, the Netherlands, Belgium and more recently on this Isle. It is a hypertoxin producer and is associated with increased morbidity and mortality in patients. In 2006, an outbreak of ribotype O27 in Ireland was confirmed and reported for the first time.[7] Results from the Mid-West are corroborated by the 2006 Hospital Infection Society Healthcare Associated Infection Prevalence Survey, which reported *C. difficile* levels in Ireland statistically significantly lower than rates in England, Wales and Northern Ireland. The rate in England was four times the rate in Ireland.

The decreasing use of culture for diagnosis of *C. difficile* infection and the lack of typing/reference facilities in Ireland do not facilitate optimal local outbreak control. In the event of suspected outbreaks of CDI, archived specimens (such as stool or ELISA supernatant) may be useful for retrospective testing (culture, ribotyping).

Infection control should prevent and control outbreaks of CDI in hospitals. Hand disinfection with alcohol rubs may not kill spores and they have no proven benefit in preventing recurrent *C. difficile* episodes – enteric precautions (isolation, gloves, aprons), hand washing with soap and water, single use rectal thermometers and antibiotic restrictions are the necessary interventions.

CDI may be under-recognised as a community acquired diarrhoea. Consistent and sustained surveillance for *C. difficile* should be encouraged to monitor carefully the trends in the hospitals in the Area – this data should be supplemented with data on outcome

Many countries in Europe have surveillance schemes (mandatory or voluntary) in place for recording incidence and outbreaks of this infection without resort to legislation. Recommendations and resources for surveillance need to be clarified at national level. There have been recent reports of outbreaks of *C. difficile* infection by ribotype 027 in Ireland and this would suggest that a national *C. difficile* reference facility should be in place. It would be important to ascertain the molecular epidemiology of the current strains of *C. difficile* circulating nationally and to monitor for new and emerging strains. *C. difficile* is probably the most significant health-care associated infection of our times.

Other causes of Gastroenteric Illness:

Norovirus: Norovirus (winter vomiting illness also known as SRSV and Norwalk-like virus) was reported as laboratory confirmed in over 230 cases in 2004 alone in the West (Clare, Limerick, Tipperary North). In 2005 there were only 107 cases of Norovirus reported. There was no major increase in 2006, with 110 cases of Norovirus laboratory confirmed. Testing is mainly confined to hospital outbreaks or outbreak investigations. Anecdotal reports suggest the virus is prevalent in the community though few people either seek medical advice or get tested. In this Area there were outbreaks of Norovirus in all the acute hospitals from 2004 to 2006. In many circumstances visiting to hospitals can be restricted and in severe circumstances more extreme measures need to be adopted to resolve the outbreak. Results from the 2006 *Hospital Infection Society* Healthcare Associated Infection Prevalence Survey reported Norovirus levels in Ireland, statistically significantly lower than rates in England and Wales. In 2007 there appeared to be a clear peak in winter months (Figure 18) with 135 cases, affecting men and women equally but more commonly in the older age groups.

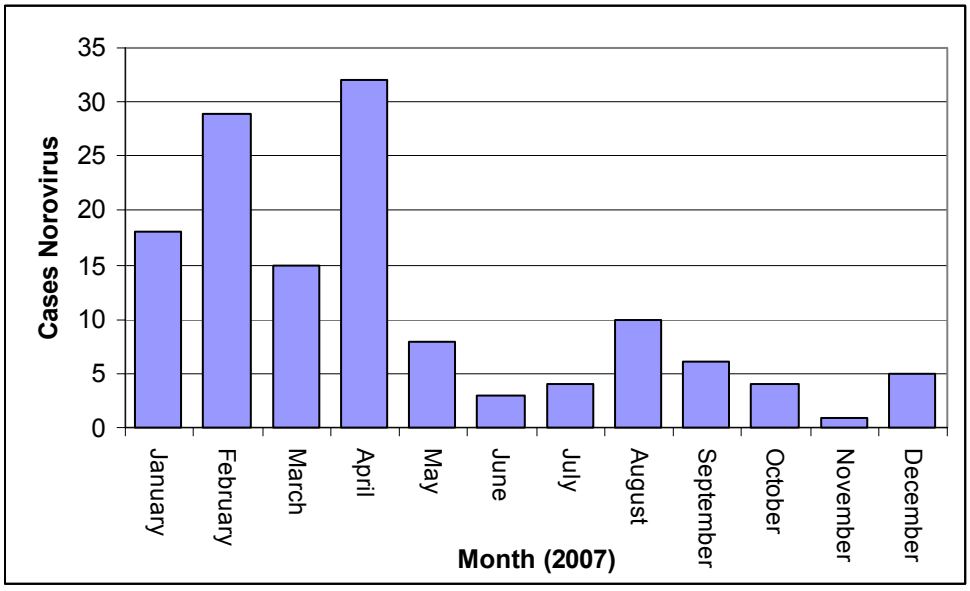


Figure 18: Monthly distribution of episodes of Norovirus in 2007, HSE Mid-West.

Table 18: Age and sex distribution of Norovirus infections in the HSE West (Clare, Limerick, Tipperary North) in 2007.

Age Group	F	M	**Total**
0-4y	5	6	**11**
15-19y		1	**1**
20-24y		1	**1**
25-34y	1	1	**2**
35-44y		2	**2**
45-54y	2	3	**5**
55-64y	5	9	**14**
65-74y	10	11	**21**
75-84y	18	25	**43**
85-94y	19	16	**35**
All	**60**	**75**	**135**

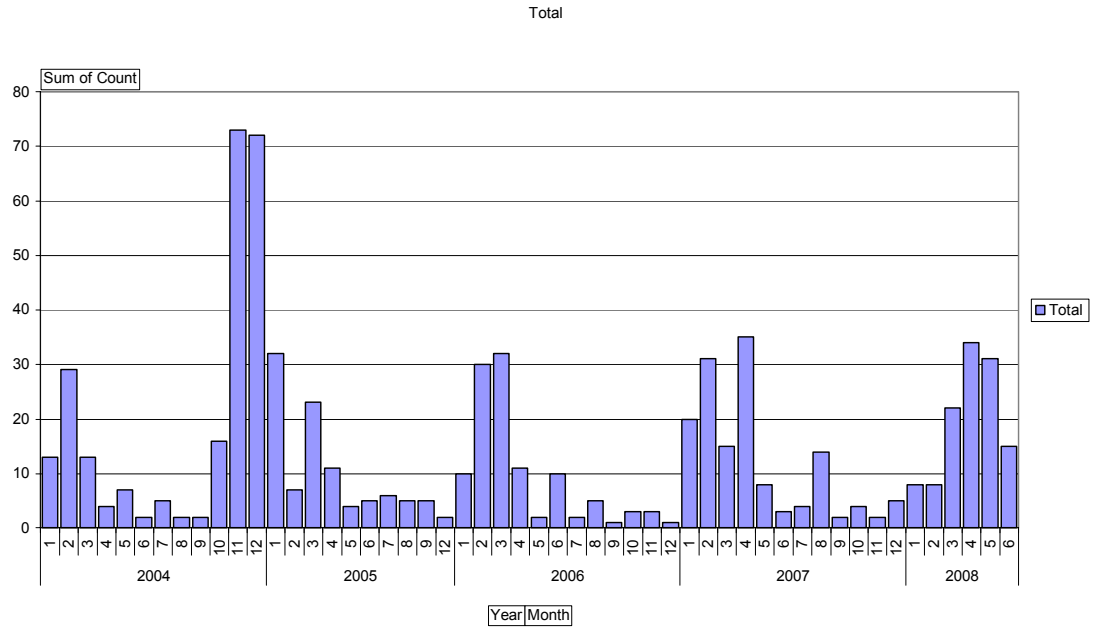


Figure 19: Monthly distribution of episodes of Norovirus in the HSE Mid-West, 2004-8.

Figure 19 demonstrates the variation in cases over the years 2004 to 2008 in the Network 7 hospitals and health care facilities, some years with higher incidence than others.

Hepatitis A:

Hepatitis A is a viral infection that may give rise to jaundice, however it is very different from Hepatitis B and C. HAV is primarily transmitted by contaminated food, water or human to human contact. Most people recover quickly after infection, some may have sub-clinical infection (without signs and symptoms) and are usually immune thereafter. HAV is a vaccine preventable disease. In recent years the incidence of HAV has been very low due to good sanitation, hygiene and food preparation practices. Occasionally, travel-related infections are reported. The disease typically has a cyclical nature – with peaks recurring in waves, 3-5 years apart. The intervals of low incidence are marked by a growing proportion of the population becoming susceptible to HAV. It is likely that there will be a resurgence or outbreak of HAV in the future in Ireland. Public health, general practitioners and hospital clinicians should be aware of the potential for HAV to cause massive outbreaks of disease when introduced to susceptible communities. Early control measures may reduce and prevent more cases. Suspected and laboratory confirmed cases of HAV should be promptly notified to the Medical Officer of Health to allow early intervention. Travellers to areas where HAV incidence is high should seek advice on vaccination before they travel.

There were three cases of laboratory confirmed hepatitis A reported in 2004. There were four cases confirmed in 2005, two in Clare (one believed to be related to travel to India), one in Tipperary and one in Limerick (also thought related to travel to India). In 2006, there were two cases of hepatitis A confirmed, both male (20 and 94 years old). In 2007, there was one clinical notification of acute HAV.

Acute Infectious Gastroenteritis: There were 109 laboratory reports of acute infectious gastroenteritis (rotavirus, adenovirus, enteropathogenic *E. coli* etc…) in 2004, the majority being rotavirus infections. In 2005 there were 84 reports of rotavirus infection.
In 2007, there were 69 reports of acute infectious gastroenteritis due to rotavirus compared to 2006 when there were 93 reports of rotavirus infection. Six cases of enteropathogenic *E. coli* were reported in 2007 in children under two years, five in males and one in a female. Serotypes included O55, O86 O119 and O127 (non-verotoxin producing).

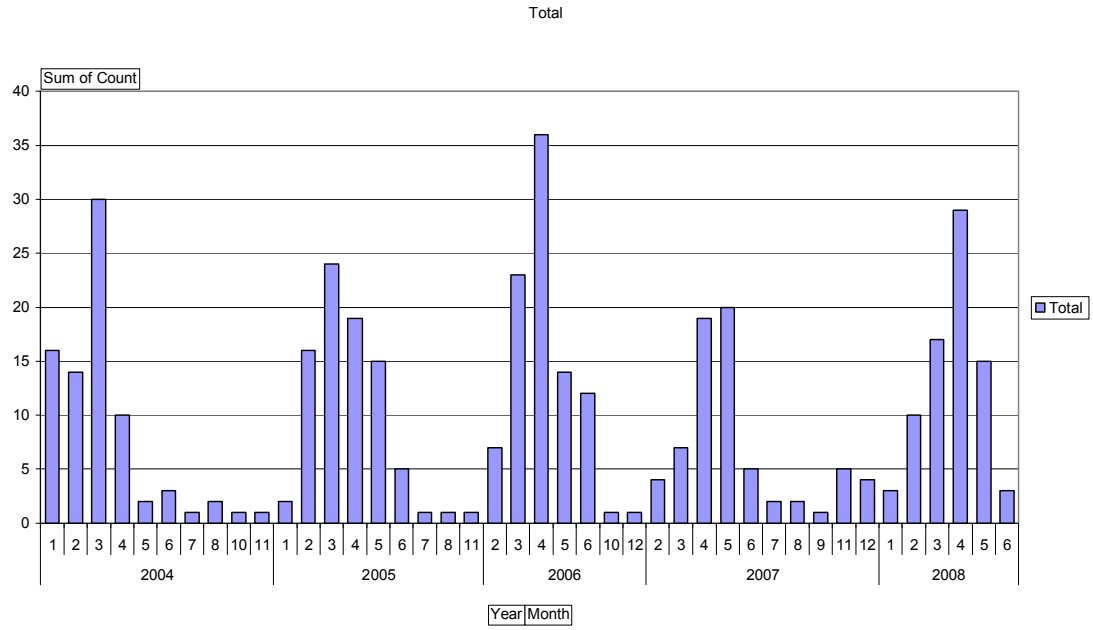


Figure 20: Monthly distribution of episodes of Rotavirus in the HSE Mid-West, 2004-8.

Figure 20 demonstrates the variation in rotavirus cases over the years 2004 to 2008 in the Network 7 hospitals.

Listeriosis: In 2004 there were two cases of listeriosis reported in two females in HSE West (Clare, Limerick, Tipperary North). In 2007 there was one case of listeriosis in an elderly female in Limerick.

Giardia: Four cases of giardiasis were reported by the laboratory in 2004 – two adults, one male and one female, in Co. Limerick and two adults, one male and one female, in Co. Clare. In 2005, one case was reported from a male in Clare.
In 2006, seven cases of *Giardia lamblia* were detected – all but one case was resident in Clare. Travel to Nepal was indicated in one family cluster and to Turkey in another case. One case had a concurrent shigellosis and another had concurrent *Blastocystis sp*.
In 2007, there were three cases of Giardiasis, two adults and one child – one from Clare, Limerick and Tipperary North.

Two cases of *Blastocystis hominis* and seven *Entamoeba coli* were detected in 2004. In 2005 two reports of *Entamoeba coli* and one of *Entamoeba histolytica* were reported. In 2007, there were two adults found with *Entamoeba histolytica* in– one in Clare and one in Limerick.
In 2005 there were two reports of *Vibrio mimicus* isolated in faecal cultures in young children.

Yersiniosis – no cases were reported in 2006. One isolate of *Y. frederiksenii* was reported in 2007.

Mid-Western Regional Zoonosis Committee

A multi-disciplinary Regional Zoonosis Committee meets regularly throughout the year to discuss aspects of zoonoses (infectious diseases that humans contract through contact with animals; e.g. Salmonella, Campylobacter, Cryptosporidium, rabies, bovine TB, yersiniosis, toxoplasmosis, EHEC). Public health professionals, microbiologists, medical scientists, food safety analysts, environmental health officers, veterinarians and veterinary officers examine data on zoonoses in the region. For several years, with *safe*food and the HSE, the Committee has successfully organised seminars to highlight aspects of food safety and zoonoses. The active participation of such disciplines has highlighted the need for inter-sectoral collaboration in effective and timely surveillance and for immediate interventions to investigate clusters of Salmonella, Norovirus, EHEC and Cryptosporidium.

European Food Safety Authority

The European Food Safety Authority (EFSA) was established in 2002. EFSA has published reports on studies examining the incidence of Salmonella, Campylobacter, yersiniosis and listeriosis) in animals, humans and food products from EU member states. Data is collected under an EU directive and published reports are available via the EFSA website. (www.efsa.europa.eu)

Weekly Infectious Disease Notifications:

It is estimated that the true burden of illness may be ten times the number of cases reported nationally. It is very important that clinicians notify **all** suspect and confirmed cases to the Department of Public Health.

New legislation was enacted with effect from January 2004 that makes clinician and laboratory notification of all cases of campylobacteriosis, cryptosporidiosis, listeriosis, trichinosis, shigellosis, Norovirus, EHEC, giardiasis, hepatitis A, salmonellosis and yersiniosis a requirement under law. A category of "acute infectious gastroenteritis" remains and covers illness due to rotavirus, enteropathogenic *E. coli* and other pathogens.

Statutory notification of botulism, *Bacillus cereus* and Staphylococcal food-borne infection or intoxication, cholera, echinococcosis, typhoid and paratyphoid, toxoplasmosis remains an obligation.

There is also a requirement to report outbreaks and any changing patterns/ unusual clusters of disease. While this is done for Norovirus, Salmonella, Cryptosporidium and EHEC, the issue of *C. difficile* associated diarrhoea remains vague.

The lack of attendant resources to cope with the burden of reporting and follow-up under the new legislation has severely constrained the timeliness and completeness of response in the Department of Public Health. Currently the process leads to significant duplication of notifications. In previous years, approximately 200 cases of infectious diseases were notified. This has escalated to over 2000 reports on 1600 notifications.

In December 2006, the responsibility for the management of infectious disease follow-up and contact tracing moved from the Community Care Areas to the Department of Public Health. All infectious disease notifications should be sent to the Medical Officer of Health in the Department of Public Health and where there are significant public health aspects to the case identified the report should be **telephoned** immediately to the Department. From January 2007, the Communicable Disease Surveillance and Control Unit in the Department of Public Health commenced enhanced surveillance of Campylobacter, Cryptosporidium through postal questionnaires. Enhanced surveillance of salmonellosis is carried out by Senior Medical Officers in the Department of Public Health.

Under legislation in force in 2003, only cases of cryptosporidiosis under 2 years of age were notifiable. These reports and campylobacteriosis reports may not be distinguishable from other gastroenteritis and bacterial food-poisoning reports. Thus direct comparisons are not useful and it is difficult to determine the true burden of disease in the population without laboratory data.

Prevention and Treatment:

Hand-washing – before preparing food, after handling meat and after contact with pets – can help minimise risk of infection in the home. Proper cooking of all meats (especially poultry) and maintenance of fridges at temperatures less than 4^{o}C will help minimise risk. Campylobacteriosis, cryptosporidiosis and salmonellosis are usually self-limiting gastrointestinal infections. A decision to treat infection with antibiotics should be made in consultation with the local consultant microbiologist.

Specific national guidelines on the management of outbreaks of Norovirus in the healthcare setting were published by the Health Protection Surveillance Centre (www.hpsc.ie).
http://www.ndsc.ie/hpsc/A-Z/Gastroenteric/ViralGastroenteritis/Publications/File,1194,en.pdf

The HPSC have also published a report from a subcommittee on VTEC as well as a report on Waterborne cryptosporidiosis.
http://www.ndsc.ie/hpsc/A-Z/Gastroenteric/VTEC/Guidance/File,1458,en.pdf
http://www.ndsc.ie/hpsc/A-Z/Gastroenteric/Cryptosporidiosis/Publications/WaterborneCryptosporidiosisSub-CommitteeReport/File,898,en.pdf

For those interested in further information about the *Quality of Drinking Water in Ireland*, annual reports are made available on the website of the Environmental Protection Authority (www.epa.ie); http://www.epa.ie/NewsCentre/ReportsPublications/Water/

Conclusions:

- With the exception of Campylobacter which increased, the crude annual incidence rates of human Salmonella, Cryptosporidium, EHEC infection and cryptosporidiosis in the HSE West (Clare, Limerick, Tipperary North) remained the same in 2007 by comparison with 2006.
- Campylobacter remains the most common bacterial cause of food-poisoning or gastroenteritis in 2007 (175 cases).
- The underlying incidence of EHEC remains high in the Mid-West, despite falling from 26 cases in 2005 to 17 in 2007.
- Norovirus was laboratory confirmed in 135 cases in 2007 – but this significantly underestimates the number of cases in the community.
- Rotavirus was the cause of 69 cases of gastroenteritis in young children under two years, in 2007.
- Isolates of Salmonella and Campylobacter were isolated from blood occasionally, demonstrating the potential pathogenicity of these bacteria.
- *S*. Typhimurium and *S*. Enteritidis remain in the top position as the most dominant serovars of salmonella in the Mid-West.
- Clinicians must be ever vigilant for uncharacteristic clinical presentations that can be associated with an underlying gastrointestinal infection. This is particularly pertinent with the increasing numbers of immigrants, foreign travel history and immunocompromised individuals.
- Young children appear to be the most vulnerable to infection with Campylobacter, EHEC and Cryptosporidium. Pets, especially reptiles, are often a reservoir for enteric pathogens and children should be advised on the need for hand disinfection after handling pets at home or at pet farms / zoos.
- The HPSC advise householders who use water from private wells to ensure they are properly maintained to reduce the potential of contracting EHEC.
- Water supplies should be well protected from potential contamination by farm animals such as cattle, which can carry the EHEC in their faeces without signs and symptoms.
- Outbreaks of salmonellosis continue to occur across Ireland and Europe and timely and vigilant surveillance is required to enable an appropriate response to disease.
- Important legislative changes were introduced in 2004 which impact on the reporting of pathogens responsible for food borne disease and gastrointestinal illness.
- Case definitions and the schedule of notifiable infectious diseases in Ireland are to be amended in 2008 to include surveillance of *C. difficile* infection (or CDI).
- Surveillance reports, regional data and ID-Link are no longer be accessible via the website of the former MWHB.

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