Health Protection Surveillance Centre

Annual Report 2005

HPSC Annual Report 2005

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Introduction

This is our seventh annual report. Normally this publication marks the culmination of a busy year and draws a line under a body of work undertaken in the fight against communicable disease. However this year it also marks the sad loss of our friend and colleague Dr Max Di Renzi, who was tragically killed in a car accident in Turkey last June. Max worked at HPSC throughout 2004 and 2005 and is sadly missed and fondly remembered by all who were lucky enough to know him.

2005 was a busy year on the disease front. Cryptosporidiosis, which has only recently become notifiable in Ireland, rose by 32.5%. As the highest rate occurred in the HSE Western Area, a research project at University College Galway to examine the relationship between drinking water supply and cryptosporidium infection in the region is a very welcome. Our understanding of this pathogen will remain limited without adequate information and as with many other pathogens there is a need for improved reference laboratories in Ireland. A HSE working group has been set up to examine these issues.

The importance of good surveillance was highlighted in 2005 when increasing failures of the Hib vaccine in children were detected. A catch-up campaign was initiated and already in 2006 we have seen a marked reduction in cases of Hib disease in young children.

The World Health Organisation has set 2010 as the deadline for the eradication of measles in Europe. Ireland continues to have one of the highest incidence in Europe - despite reporting our lowest ever number of cases in 2005. To eradicate measles we need to fully investigate every sporadic case. Of the 93 notifications in 2005 only11 were confirmed. The rest either had no laboratory investigations reported or were unclassified. Previous HPSC research has shown that a considerable number of children are susceptible to measles highlighting the need for a catch up vaccination programme in our schools. Immunisation uptake rates continue to improve in Ireland. However we don't have the full picture. We have no national data on the second dose of MMR or any other school delivered vaccine. This data is essential for the control of vaccine preventable diseases and highlights the need for a properly funded and implemented vaccine registry.

A 10% decrease in the numbers of newly diagnosed HIV cases, is likely to reflect a fall in the number of immigrants presenting for screening in 2005. Ongoing transmission of HIV in injecting drug users (IDU) and men who sex with men (MSM) as well as heterosexual transmission in Ireland demonstrate the need for continuing education and awareness programmes.

A report on the Surveillance of STIs was published by HPSC's Scientific Advisory Committee in 2005. The number of sexually transmitted infections continues to rise unabated and HPSC is working with the Health Research Board to commission a feasibility project to screen for chlamydia. This should help to inform future practice and should decrease the incidence of this pathogen. Anogenital warts were the most commonly notified STI in 2004. The arrival of the new human papilloma virus (HPV) vaccine will hopefully reduce the rates of warts but more importantly should reduce the incidence of cervical cancer caused by HPV. A national sexual health strategy is needed to provide a framework to prevent, diagnose and treat STIs.

In other jurisdictions pneumococcal conjugate vaccines, hexavalent vaccines which facilitate the introduction of vaccines against hepatitis B, and the use of vaccines to protect against chickenpox and rotavirus caused by gastroenteritis, are being developed. The National Immunisation Advisory Committee is considering the evidence

for these vaccines and it is essential that surveillance is improved so that we are well informed on the decisions that we make.

High numbers of verocytotoxigenic E.coli (VTEC) were reported in 2005. VTEC can cause serious health problems such as haemolytic uraemic syndrome (HUS). 17 HUS cases were reported in 2005 compared with 4-6 cases annually for each of the previous four years. The link between VTEC and many HUS cases may not have been made using the usual methods and this highlights the importance of thorough microbiological investigation of all HUS cases.

The HPSC Scientific Advisory Committee set up a multidisciplinary sub-committee in mid 2005 to produce guidelines on the detection, surveillance and management of invasive Group A streptococcal disease (iGAS) in Ireland. These have now been published and are available at www.hpsc.ie. iGAS infections cover a wide range of illnesses including necrotizing fasciitis.

Antimicrobial resistance remains a challenge for the HSE. Two new pathogens were added to the list for surveillance in 2005. The continuing high prevalence of resistance including increasing resistance levels of *E.coli* and enterococci underline the importance of fully implementing the Strategy for the control of Anti microbial Resistance in Ireland (SARI).

Antibiotic consumption continues to rise both in the community and in our hospitals. Some hospitals have managed to reduce antibiotic use but we need to build on and extend this progress.

Information on travel related disease continues to improve and is reflected in an increase in malaria cases notified in 2005. It is essential that holidaymakers and business travellers take appropriate treatment before visiting regions affected by malaria. This also applies to recent immigrants to Ireland who may not realize that any immunity they may have will fall after living for some time in a non-malarious area.

The HPSC and the HSE continue to strengthen preparedness against the on-going threat of avian influenza mutating to start a new influenza pandemic Sentinel GPs now monitor influenza like illness on a year round basis and all influenza outbreaks are now notifiable.

Tuberculosis in 2004 increased to a crude incidence rate of 11/100,000 population - up from a rate of 10.4. The rate in the indigenous population was 8.4/100,000. The fact that TB rates have not been falling in recent years coupled with the increasing risk of complication from drug resistant forms of tuberculosis continues to be a cause of concern. The public health infrastructure to control tuberculosis needs strengthening.

Finally, I would like to thank the scientific advisory committees and the HPSC sub-committees for all their hard work. They are a great example of what can be achieved through hard work in a multi-disciplinary environment.
I would also like to extend my thanks to all the staff at HPSC whose endevour and professionalism is reflected throughout this report.

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The Epidemiology of Verocytotoxigenic *E. coli* in Ireland, 2005

Key points:

- **In 2005, there were 125 cases of VTEC reported, 32% higher than the number reported in 2003 (the highest year prior to this) and over twice the number reported in 2004**
- **Increasing numbers of cases of non-O157 are reported (17 this year), possibly reflecting increased awareness of non-O157 VTEC and improved diagnosis and reporting**
- **High numbers of VTEC-confirmed HUS cases were reported in 2005 -17 HUS cases versus 4-6 per annum in the years 2001-2004, demonstrating the benefits of thorough microbiological investigation of HUS cases**
- **Private water supplies again raise concern as the MW report a large outbreak (18 confirmed cases) that was linked with a private group water scheme**

Introduction

Verotoxigenic *E. coli* (VTEC) are so-called because of their ability to produce one or both of two verotoxins (VT1 and VT2). They are an important cause of gastroenteric illness because of the severity of illness they can cause and in the requirement for prompt public health action to prevent further transmission. About 9% of cases develop haemolytic uraemic syndrome (HUS), a life-threatening complication. *E. coli* O157 was the first *E. coli* serogroup to be associated with this distinctive illness. Additional VT-producing serogroups frequently reported include O26, O111, O103 and O145. Infection can be transmitted through food, contaminated water, the environment and by direct contact with animal carriers. Person-to-person spread is an important mode of transmission in households, child-care facilities and institutions.

Data sources and methods

Enhanced information on notified VTEC cases was supplied as in previous years by HSE personnel, and typing data were provided by the Public Health Laboratory HSE Dublin Mid Leinster at Cherry Orchard Hospital which offers specialist diagnostic and typing services for VTEC. Although not notifiable, clinicians were also requested to report suspected cases of VTEC, i.e. cases of HUS or TTP of possible infective aetiology, for which there was no laboratory or epidemiological evidence of VTEC infection.

Results

In 2005, 125 confirmed cases of VTEC were notified to HPSC, a crude incidence rate (CIR) of 3.2 per 100,000 (table 1). There were 108 cases of VTEC O157 (2.8/100,000), 12 VTEC O26,

Table 1. Number and crude incidence rates confirmed VTEC and VTEC O157 infection, Ireland 2001-2005

Year	Nos. of VTEC O157 cases	CIR VTEC O157* (95% CI)	Number VTEC ‡ cases	CIR VTEC* (95% CI)
2001	52	1.3 (0.9-1.6)	N/A	N/A
2002	70	1.7 (1.3-2.2)	N/A	N/A
2003	88	2.2 (1.8-2.7)	95	2.4 (1.9-2.9)
2004	52	1.3 (1.0-1.7)	61	1.6 (1.2-2.0)
2005	108	2.8 (2.3-3.3)	125	3.2 (2.6-3.8)

* Data from the 2002 census were used to calculate rates
‡ Includes serogroup O157

Table 2. Number of confirmed VTEC cases by quarter and HSE area, CIR and age-standardised incidence rate (ASIR) by HSE area, Ireland 2005

Quarter	E	M	MW	NE	NW	SE	S	W	Total
Q1	2	1	0	0	0	1	1	1	6
Q2	5	1	1	1	3	3	2	3	19
Q3	15	7	4	2	2	10	6	4	50
Q4	13	3	21	4	0	2	1	6	50
Total	**35**	**12**	**26**	**7**	**5**	**16**	**10**	**14**	**125**
CIR (95% CI)	2.5 (1.7-3.3)	5.3 (2.3-8.3)	7.7 (4.8-10.6)	2.0 (0.5-3.5)	2.3 (0.3-4.3)	3.8 (1.9-5.7)	1.7 (0.6-2.8)	3.7 (1.8-5.6)	**3.2 (2.6-3.8)**
ASIR (95% CI)	2.5 (1.7-3.4)	5.0 (2.2-7.8)	7.7 (4.7-10.6)	2.0 (0.5-3.6)	2.2 (0.3-4.1)	3.7 (1.9-5.5)	1.7 (0.7-2.8)	3.7 (1.7-5.6)	- -

Table 3. Confirmed VTEC cases by method of laboratory confirmation, Ireland 2005.

	HUS	Non-HUS	Total
Isolation of NSF VTEC O157	9	94	103
Isolation of SF VTEC O157	2	1	3
Serodiagnosed as *E. coli* O157	2	0	2
Isolation of non-O157 VTEC	4	13	17
Total	17	108	125

two VTEC O ungroupable, and one each of VTEC O152, O21 and O123. In addition, five HUS cases were reported as suspected VTEC cases which are not included in the following analyses.

Regional and seasonal distribution

Regional variation was noted in the numbers of cases reported (table 2), with the highest incidence rates in the HSE-MW and HSE-M. A single outbreak was largely responsible for the atypically high incidence in the HSE-MW, while three small family outbreaks accounted for 8 of the 12 cases in the HSE-M[1]. In the HSE-ER in 2005, the number of VTEC cases was almost 3-fold higher than reported in previous years (35 cases in 2005 versus 12 cases in each year 2002-2004)[2]. Seven of these cases were non-O157 VTEC. Non-O157 VTEC were widely distributed throughout the country with cases reported from 7 of the 8 HSE areas. Large numbers of VTEC cases were notified in quarter 3, and atypically also in quarter 4, in particular in November (table 2).

Age-sex distribution

The highest incidence was recorded in young children, which is consistent with previous years (Figure 1). There were similar numbers of male (n=65) and female (n=59) cases. As in 2004, a higher proportion of VTEC infections notified in persons less than 5 years were due to non-O157 VTEC (10/50) than for other older groups (7/75), possibly reflecting the likelihood that children less than 5 years are tested for non-O157 VTEC more often than older patients.

Clinical features

Information on symptoms was available for 117 cases, of whom 87 (74%) were reported as symptomatic. Reported symptoms included bloody diarrhoea in 53 cases, and HUS in 17 cases. HUS cases ranged from 8 months to 68 years, and as in previous years, a higher proportion of paediatric (13/70) than adult (4/55) cases developed HUS. Notably, four HUS cases were caused by non-O157 VTEC -three by VTEC O26 and one by VTEC O21.

Travel-association

Nine infections were travel-associated. The countries visited within the potential incubation period were Spain (2), Greece (2), UK (1), Croatia (1), Hungary (1), Belgium (1) and Turkey (1), reflecting to some extent the frequency of travel by Irish residents to these destinations.

Microbiology

Among the 108 VTEC O157 infections reported, typical non-sorbitol fermenting (NSF) VTEC O157 were isolated from 103 cases, sorbitol-fermenting (SF) VTEC O157 from three cases, and two confirmed *E. coli* O157 cases were diagnosed by serodiagnosis alone. All 17 non-O157 VTEC cases were culture confirmed. Table 3 showed the number of HUS and non-HUS cases by method of laboratory confirmation.

Table 4 shows the phage types of the VTEC O157 strains isolated in 2005. As in previous years, PT32 was the commonest phage type reported, accounting for 56% of the VTEC O157 reported.

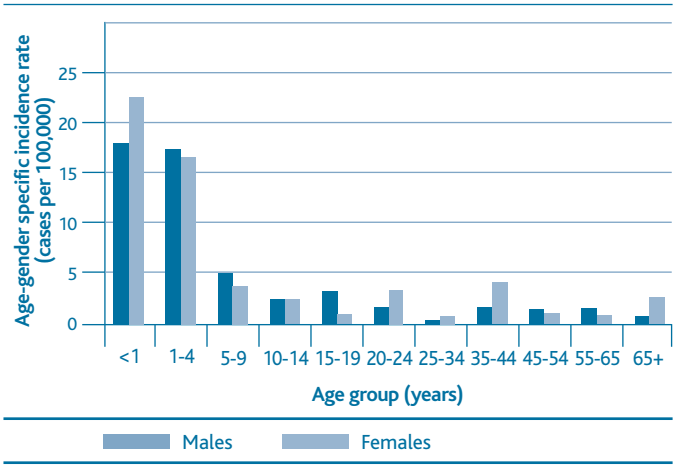

Figure 1. Age-specific incidence rate (per 100,000 population) of confirmed cases of VTEC, Ireland 2005

Table 4 Phage Types of VTEC O157 isolates referred to the PHL HSE Dublin Mid Leinster, Cherry Orchard Hospital in 2005

Phage type	Number (%)
PT32	59 (56%)
PT21/28	13 (12%)
PT8	12 (11%)
PT31	6 (6%)
PT4	4 (4%)
PT14	4 (4%)
PT88	3 (3%)
PT1	1 (1%)
RDNC	1 (1%)
PT51	1 (1%)
PT49	1 (1%)
PT54	1 (1%)
Total	106 (100%)

Note that 2 E. coli O157 infections were diagnosed by serodiagnosis and thus isolates were not available for typing.

In 2005, 89% of VTEC O157 strains carried the genes for VT2 only while 11% carried the genes for both VT1 and VT2 (table 5). In contrast, 41% of non-O157 VTEC isolates carried the genes for VT1 only, 12% for VT2 only, and 47% VT1 and VT2.

Outbreak investigations

In 2005, 19 outbreaks were reported, comprising 65 of the 125 confirmed cases reported. Four outbreaks were described as general outbreaks and 15 as family outbreaks. Seventeen were due to VTEC O157 and two to VTEC O26. The suspected modes of transmission reported are listed in table 6.

The most significant VTEC O157 outbreak in Ireland in 2005 occurred in the MW in October/November 2005.[1] Nine people were reported ill, including 2 children who developed HUS. A further nine asymptomatic contacts were confirmed as being infected with the outbreak strain and two persons with non-O157 VTEC strains. All cases recovered. This was the largest VTEC outbreak reported in Ireland to date. No food or water samples tested positive for VTEC, but results from a case-control study indicated that potential exposure to drinking water from a vulnerable local private group water scheme was a risk. The implicated GWS drew water from areas of agricultural land with close proximity to cattle and slurry spreading. VTEC O157 indistinguishable from the outbreak strain was isolated from an animal/farm sample.

Discussion

In 2005, 125 confirmed cases of VTEC were notified to HPSC (CIR 3.2 per 100,000). This is 32% higher than the number reported in 2003 (the highest year prior to this) and is over twice the number notified in 2004. Non-O157 VTEC have been recognised for many years in continental Europe as causing a significant proportion of VTEC infections, notably in Germany and Denmark.[3] The rise in the reported incidence of non-O157 infection in Ireland may be due to increased awareness nationally of non-O157 VTEC and improved diagnosis and reporting.

The seasonal distribution of cases was unusual in 2005, with an atypically high number of cases in quarter 4. This was due in part to a single large outbreak that occurred in the MW at this time, and also to the large number of VTEC O157 cases that were notified in the HSE-ER in November.[1] Three family outbreaks accounted for ten of the 13 ER cases. The existence of one large undetected outbreak in the ER at this time is unlikely as, in all, 5 different phage types were represented among the 13 cases reported.

For the first time in Ireland, cases of VTEC O157 due to sorbitol-fermenting VTEC O157 were reported. There were three cases, two of which were epidemiologically linked and were foreign travel-associated. Typically, most VTEC O157 are unable to ferment sorbitol, and it is this feature that facilitates their identification. Human infections due to sorbitol-fermenting VTEC O157 strains have been reported from Germany and the Czech Republic and most recently in the UK.[4]

In 2005, high numbers of VTEC-confirmed HUS cases were reported –17 HUS cases versus 4-6 per annum in the years 2001-2004. Eight of the 17 HUS cases notified in 2005 were diagnosed as VTEC either by serodiagnosis alone (n=2), by investigation for non-O157 VTEC (n=4) or by investigation for

Table 5. Verotoxin typing results for VTEC isolates referred to the PHL HSE Dublin Mid Leinster, Cherry Orchard Hospital in 2005

	VT1 only	VT2 only	VT1 and VT2	Total
O157	0	94	12	106
O26	4	0	8	12
O21	0	1	0	1
O123	1	0	0	1
O152	1	0	0	1
O ungroupable	1	1	0	2

Note that two E. coli O157 infections were diagnosed by serodiagnosis and thus isolates were not available for typing.

Table 6. VTEC outbreaks in Ireland 2005 by suspected mode of transmission.

Suspected modes of transmission*	Number of outbreaks	Confirmed cases	Number ill
P-P	4	12	7
P-P and animal contact	2	4	6
P-P and foodborne	2	4	4
Foodborne	2	6	3
P-P and waterborne	1	3	2
P-P, waterborne and animal contact	1	18	9
Foodborne and animal contact	1	2	2
Unknown/Not specified	6	16	17
Total	**19**	**65**	**50**

*P-P denotes person-to-person transmission

SF VTEC O157 (n=2), and would not have been recognised as VTEC had they been examined solely for the typical NSF VTEC O157. This demonstrates the benefits of thorough microbiological investigation of HUS cases.

A variety of sources and transmission routes have been demonstrated worldwide for VTEC, including food, water, environmental and direct animal contact as well as person-to-person transmission. For the VTEC outbreaks reported in Ireland 2005, multiple possible transmission routes were reported for many of the outbreaks, with person-to-person transmission suspected to have played a role in ten, food in five, water in two and animal contact in three outbreaks. For most of the outbreaks, the evidence for these transmission routes was circumstantial, but for the large outbreak in the HSE MW, there was epidemiological evidence both for person-to-person transmission and for waterborne spread. This re-enforces the concerns raised in the 2004 HPSC VTEC annual report in relation to the proper management of private water supplies (both private wells and private group schemes), especially those that have the potential to serve large numbers of people.[2]

Internationally, there were several foodborne outbreaks of VTEC in 2005. Notable VTEC outbreaks include a large outbreak of VTEC O157 in Wales in which sliced cooked meats were implicated.[5] Another VTEC O157 outbreak was associated with beef burgers in France in October 2005.[6] In Sweden, an outbreak VTEC O157 was epidemiologically linked to lettuce that had been irrigated with water from a small stream.[7] And more recently an outbreak of VTEC O103 was reported in Norway associated with a cured meat sausage.[8] These outbreaks serve as reminders of the potential role of a variety of foods in both VTEC O157 and non-O157 outbreaks.

In February 2006, the HPSC sub-committee on VTEC published a document for health professionals on VTEC.[9] It provides guidance for clinicians, public health professionals, environmental health professional and infection control personnel in relation to VTEC. Further guidance for laboratory personnel is in preparation.

Acknowledgements
We wish to acknowledge the co-operation of microbiologists, medical scientists, SMOs, SPHMs, surveillance scientists, infection control nurses, PEHOs, and EHOs in providing the information on which this report is based.

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Epidemiology of Cryptosporidiosis in Ireland, 2005

Key Points

- **In 2005, there was a 32% increase in the number of cryptosporidiosis cases notified in Ireland relative to 2004, with the crude incidence rate rising from 11.0 to 14.6 per 100,000 population**
- **Much of the excess in cases was concentrated in the months of April and May, a time when the incidence would be expected to be at its' highest**
- **Infection was reported most frequently in children under 5 years of age**
- **The lowest incidence was in the Eastern Region and the highest in the Western Area**

Introduction

Cryptosporidium is a protozoal parasite that causes a diarrhoeal illness in humans known as cryptosporidiosis. In immunocompetent patients it causes watery non-bloody diarrhoea, sometimes accompanied by abdominal pain, nausea, anorexia, fever and weight loss. In immuno-compromised individuals, especially those with AIDS, diarrhoea can be chronic and persistent, causing clinically significant fluid and electrolyte depletion. Weight loss, wasting and abdominal pain may be severe.

C. parvum (formerly known as *C. parvum* type II) and *C. hominis* (formerly known as *C. parvum* type I) are the main species associated with human infection, although a minority of human infections have been linked with other species such as *C. felis* and *C. meleagridis*. The primary reservoir for *C. hominis* is humans while both livestock (calves and lambs in particular) and humans serve as reservoirs for *C. parvum*. Thus, speciation can be used to indicate a likely source of infection for individual cases.

With both humans and animals serving as potential reservoirs, multiple routes of transmission are possible. The consumption of contaminated water is regarded as being an important transmission route, but infection has also been associated with swimming pools, farm animal contact, food and person-to-person spread.[1-6] A primary public health concern regarding *Cryptosporidium* is its relative resistance to chlorination.

Methods

Cases of cryptosporidiosis are notified, by both clinicians and laboratory directors, to the Medical Officer of Health in each

Table 1. Number of notified cases, crude incidence rate and age-standardised incidence rate of cryptosporidiosis by HSE area, 2005.

HSE area	No. notifications	CIR (95% CI)	ASIR (95% CI)
ER	38	2.7 (1.8-3.6)	2.6 (1.8-3.4)
M	36	16.0 (10.8-21.2)	14.7 (9.9-19.4)
MW	56	16.5 (12.2-20.8)	16.6 (12.3-21.0)
NE	62	18.0 (13.5-22.5)	16.8 (12.6-21.0)
NW	43	19.4 (13.6-25.2)	18.4 (12.8-23.9)
SE	99	23.4 (18.8-28.0)	23.1 (18.6-27.7)
S	105	18.1 (14.6-21.6)	18.6 (15.1-22.2)
W	131	34.4 (28.5-40.3)	35.7 (29.6-41.9)
Total	**570**	**14.6 (13.4-15.8)**	-

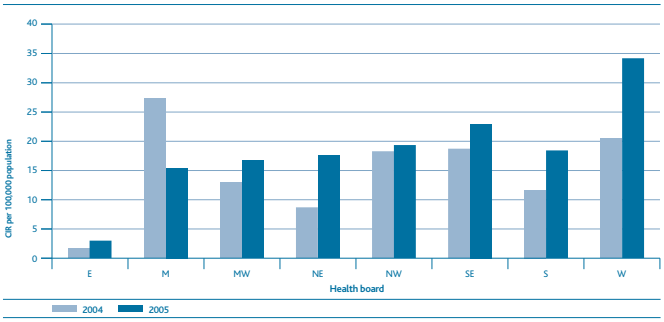

Figure 1. Crude incidence rates cryptosporidiosis by HSE area and year, 2004-2005

Table 2. Age-specific incidence rate of cryptosporidiosis by HSE area 2005.

Age group	HSE-ER	HSE-M	HSE-MW	HSE-NE	HSE-NW	HSE-SE	HSE-S	HSE-W
<1	0.0	87.49	175.28	91.59	66.14	99.73	91.31	267.88
1-4	7.76	192.46	160.26	136.49	162.45	212.62	159.38	427.60
5-9	2.25	24.17	34.44	32.04	56.19	30.15	51.33	54.38
10-14	0.0	5.60	16.11	7.41	22.47	18.20	14.31	20.69
>=15	2.67	0.58	1.87	6.40	3.49	7.57	4.56	3.59
Total	**2.71**	**15.97**	**16.49**	**17.97**	**19.41**	**23.37**	**18.09**	**34.45**

HSE area. These weekly notifications form the basis of the analyses presented here. The case definition used is that outlined in the HPSC booklet 'Case definitions for notifiable diseases' (http://www.ndsc.ie/hpsc/NotifiableDiseases/CaseDefinitions/). Census data from 2002 (CSO) were used to calculate incidence rates.

Results

Incidence

In 2005, 570 cases of cryptosporidiosis were notified in Ireland, a crude incidence rate of 14.6 per 100,000 population. This was a 32% increase on the number of cases notified in 2004.

Geographical distribution

The crude incidence (CIR) and age standardised incidence (ASIR) rates by HSE area for 2005 are reported in table 1. As per 2004, the HSE-ER reported the lowest crude incidence rate, while a 42% decrease in notifications occurred in the Midlands where a large outbreak in 2004 undoubtedly contributed to the higher incidence in that year. The main increases were reported in the HSE-NE, where the rate rose from 8.7 in 2004 to 18.0 per 100,000 in 2005 (a rate now similar to most other HSE areas), and in the HSE-W where the rate rose from 20.2 in 2004 to 34.4 per 100,000 in 2005, substantially higher that all other HSE areas (figure 1). In addition to a true difference in incidence, regional variation in incidence may also reflect regional variation in laboratory screening and case-finding policies.

Age distribution

The highest reported incidence was in children between the ages of 1 and 5 years (figure 2). This was found to be the case in almost all HSE areas although the age-specific incidence varied between 7.76 per 100,000 in this age group in the HSE -ER to 427.60 per 100,000 in the HSE-W (table 2). The incidence among males was slightly higher than for females in younger age groups (figure 2).

Seasonality

As in 2004, the disease displayed a pronounced seasonal distribution with 61% of cases notified during the 3 months April to June (figure 3). It was in this quarter in 2005 that the excess in cases were clustered.

Outbreaks of cryptosporidiosis

Six outbreaks of cryptosporidiosis were reported in 2005: four general outbreaks and two family outbreaks. Forty-nine people were reported ill as a result of these outbreaks, and 13 were hospitalised (an admission rate of 26%). The suspected mode of transmission for four outbreaks was unknown, however, for two general outbreaks, water was suspected to have played a role in transmission. The water supplies in both instances were public supplies and boil water notices were issued. Speciation of human isolates was undertaken for the SE outbreak, which was reported to be due to *C. hominis*.[7,8]

Discussion

Overall, there was a 32% increase in the number of cryptosporidiosis cases notified in Ireland in 2005 relative to 2004, with the crude incidence rate rising from 11.0 to 14.6 per 100,000. Much of the excess in cases was concentrated in the months of April and May, a time when the incidence would be expected to be at its' highest. At first, it was unclear

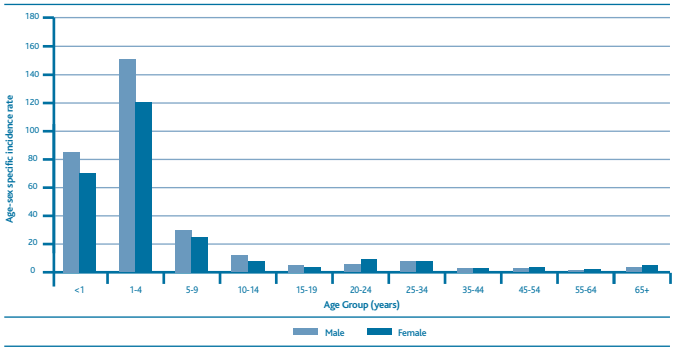

Figure 2. Age-sex specific incidence rates for cryptosporidiosis in Ireland, 2005

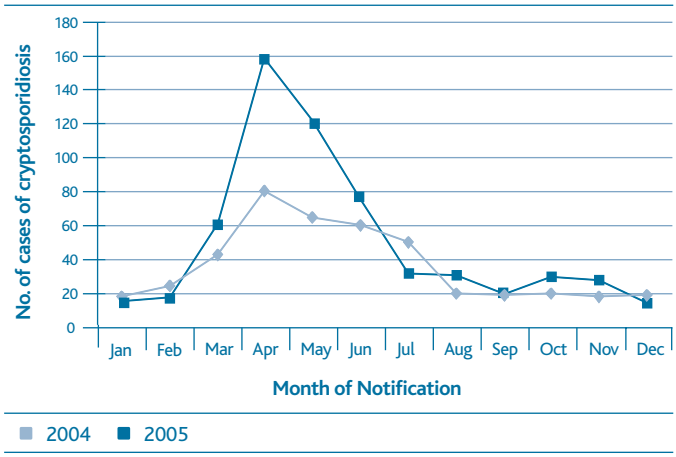

Figure 3. Seasonal distribution of cryptosporidiosis cases 2004-2005

if this just reflected improved reporting as notifiers became more familiar with the revised list of notifiable diseases and the new requirements of SI 707. However, provisional data show that the number of cryptosporidiosis cases notified in the second quarter 2006 mirrors more closely the number of cases reported in 2004 rather than in 2005, indicating that there was probably a real excess of cases in 2005.[9]

In 2005, the HSE-W reported the highest crude incidence rate -more than twice the national rate. There were 2 small general outbreaks reported from the region but the majority of cases appear to have been sporadic. Given the high rate of cryptosporidiosis reported in the HSE-W in 2005, a major new research project entitled 'Enhancing Human Health through Improved Water Quality' funded by the EPA at the Environmental Change Institute in National University of Ireland Galway (NUIG) is an interesting initiative. Led by Prof. Martin Cormican, researchers will examine the relationship between drinking water supply and the occurrence of cryptosporidium infection in the West of Ireland, and the effect of seasonal and environmental factors on ground water quality (http://www.nuigalway.ie/research/ehh/ehhtiwq _home.php). Another interesting study is being undertaken in Northern Ireland, where the CDSC (NI) has commenced a case control study to identify the risk factors for cryptosporidiosis infection.[10]

Drinking water is an important transmission route in outbreaks of cryptosporidiosis. Two outbreaks in Ireland in 2005 reported drinking water as being suspected of having played a role in transmission, and drinking water was also the suspected mode of transmission for four outbreaks in 2004.

The importance of water as a potential transmission route is reflected in a recommendation by the EPA that risk assessment should be carried out by each sanitary authority to determine the vulnerability of public water supplies to *Cryptosporidium*.[11] In 2005, the EPA reported that risk assessments had already been carried on 331 individual public water supplies in Ireland.[12]

Other potential transmission routes for cryptosporidiosis include direct animal contact, food, recreational water contact, and person-to-person spread. Significant outbreaks reported internationally in 2005 include a national outbreak in Scotland with 129 laboratory-confirmed cases. Infection was believed to be transmitted by infected lambs at a wildlife park where there were inadequate handwashing facilities.[5] A foodborne outbreak of *C. hominis* in Denmark was associated with whole carrots served in water at a salad bar in a company canteen.[6] And a recent review of waterborne outbreaks in England and Wales has reported that swimming pools were associated with 32 of 62 waterborne cryptosporidiosis outbreaks in England and Wales between 1992 and 2003.[4] These reports serve as reminders of the variety of transmission routes for *Cryptosporidium* infection.

A particularly interesting aspect of the HSE SE outbreak was the fact that it was due to *C. hominis*. In the absence of reference facilities for *Cryptosporidium* in Ireland, isolates from human cases are rarely typed except in the event of outbreaks. Given the very strong seasonal peak here in spring, it has seemed reasonable to suspect that *C. parvum* would be the predominant species in Ireland. Data from Northern Ireland and Scotland has shown *C. parvum* to predominate in

Table 2. Age-specific incidence rate of cryptosporidiosis by HSE area 2005.

Month	HSE area	Transmission route*	Location	Type	Number ill	Number hospitalised
Mar	SE	P-P and WB	Community	General	31	8
April	W	WB	Other	General	7	2
July	S	Unknown	Private house	Family	2	2
July	MW	Unknown	Private house	Family	2	-
Oct	W	Unknown	Travel related	General	4	-
Dec	S	Unknown	Community	General	3	1

** P-P denotes person-to-person transmission; WB denotes waterborne transmission*

these areas, however, in England, *C. hominis* is also important and accounts for over 40% of cases.[13-15] There is still much to learn about the epidemiology of *Cryptosporidium* in Ireland, and our understanding will remain limited in the absence of adequate typing information. A *Cryptosporidium* reference service would also be invaluable to sanitary authorities in assessing the risk to water supplies from *Cryptosporidium*.

Acknowledgements

We wish to acknowledge the co-operation of microbiologists, medical scientists, SMOs, SPHMs, surveillance scientists, infection control nurses, PEHOs, and EHOs in providing the information on which this report is based.

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Malaria in Ireland 2005

Key Points

- **In 2005, 44 cases of malaria were notified, an increase of 62% on the number reported in 2004**
- **The most common species reported was *P. falciparum*, accounting for 75% of cases notified**
- **The majority of cases became ill after exposure in sub-Saharan Africa**
- **Visiting family in country of origin was the most common reason reported for travel**
- **Only one malaria case in Ireland in 2005 reported full compliance with their prescribed course of malaria prophylaxis. The remaining cases either failed to take any malaria prophylaxis prior to exposure or failed to continue prophylaxis for the required time period.**
- **It is important that travellers to endemic areas are made aware of the need to be properly compliant with their antimalarial medication and anti-mosquito measures, and the potential health consequences of non- or partial compliance.**

Introduction

Malaria is the most important vectorborne disease in the world, with 400 million infections and around 1 million deaths annually. It is endemic in over 100 countries in sub-tropical and tropical areas of Africa, Central and South America, Asia, the Middle East and Oceania, with 90% of deaths occurring in Sub-Saharan Africa, mostly among young children.

Infection is caused by transmission of one of 4 species of *Plasmodium* (*P. falciparum*, *P.ovale*, *P.vivax* or *P. malariae*) through the bite of infected female anopheline mosquitoes. The species vary in their clinical effects, *P. falciparum* causing the most severe form of malaria, and the most deaths. TropNetEurop reported a case fatality of 1.4% for *P. falciparum* infections imported into Europe.[1] Malaria caused by other *Plasmodium* species is less severe. *P.ovale* and *P.vivax* also differ in that they have persistent liver stages, which can resist conventional treatment and can produce relapses up to a year after the initial infection.

Worldwide each year, up to 30,000 travellers fall ill with malaria on their return from visiting countries where the disease is endemic.[2] Pregnant woman, young children and the elderly are particularly at risk. Malaria in pregnancy increases the risk of maternal death, miscarriage, stillbirth and neonatal death. As malaria is a relatively rare disease in Ireland, a high level of suspicion is necessary when travel to endemic areas has occurred in either the recent or distant past.

Increasing numbers of Irish residents are travelling to malarious regions for holiday and business travel. An

Table 1. Malaria notifications, Ireland 2005 by country of exposure

Country of exposure	Number of notifications	% of all cases
Sub-saharan Africa	30	68%
Nigeria	22	50%
Other than Nigeria	8	18%
Asia	3	7%
Not reported	11	25%
Total	**44**	**100%**

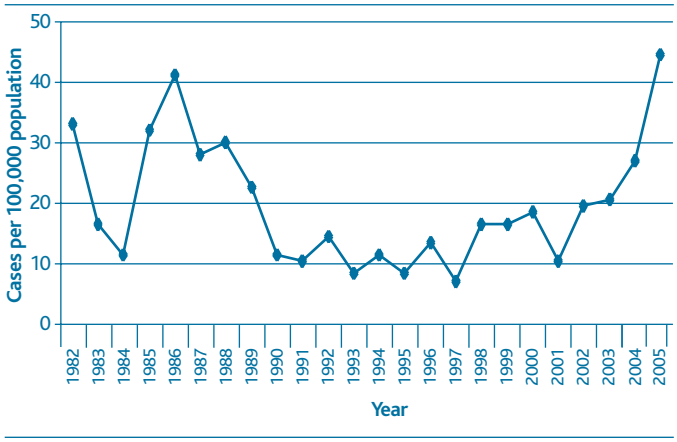

Figure 1. Number of malaria notifications, Ireland 1982-2005

increasing proportion of the population in Ireland originates from malaria endemic regions and regularly travels home.

Malaria surveillance aims to document the burden of illness in Ireland, to define the characteristics of those most at risk, and to identify those who could benefit most from preventive messages. In addition, the data collected permit monitoring for prophylaxis failures that might indicate emergence of drug resistance. There is potential also to identify cryptic cases; these are cases where the route of transmission is unclear or unusual.

Materials and Methods

Malaria has been notifiable in Ireland since 1948. The case definition adopted since 2004 is based on the EU case definition.[3] Since 2001, public health physicians have provided enhanced surveillance data, e.g. country of infection, reason for travel and use of chemoprophylaxis, where available to HPSC. Notification and enhanced surveillance data are maintained in the CIDR (Computerised Infectious Disease Reporting) database. The data used in this report are based on information retrieved from the CIDR database on malaria cases in 2005.

Results

Malaria incidence

In 2005, 44 cases of malaria were notified (figure 1). This is an increase of 62% on the number reported in 2004, and equates to a crude annual incidence rate of 1.1 per 100,000 (95% CI 0.79-1.45).

Areas reporting the highest number of cases were the HSE-E (n=12), HSE-NE (n=10) and HSE-S (n=10). There were also 5 cases in the HSE-M, 1 in the HSE-MW, 2 in the HSE-NW, 2 in the HSE-SE and 2 in the HSE-W.

Species of Plasmodium

As in previous years, the most common species reported was *P. falciparum*, accounting for 75% of all cases notified (n=33). There were also three *P. vivax*, one *P. ovale*, one *P. malariae* and one mixed *P. vivax*/*P. ovale* infection. This is similar to the species distribution reported by the UK and in Europe for cases of imported malaria.[4, 5]

Age and sex distribution

Twenty-one cases were male and 21 were female (unknown/unspecified=2). Cases ranged in age from 1 to 64 years. Females in the 25-34 age group were the most common age-sex group reported, and there were ten notifications (23%) in children under the age of 15 (figure 2).

Clinical features

Twenty-one cases were hospitalised, one case was described as a GP patient, and for 22 cases this information was not specified. In 2005 one death in an adult was reported as being due *P. falciparum*.

Country of infection

In 2005, there were no cases of airport, congenital, induced or introduced malaria reported. One relapsed case of *P. vivax* was reported. The remaining 43 cases were either reported as being, or were assumed to be, imported. Country of infection was recorded for 33 cases, the majority of whom were exposed in sub-Saharan Africa, with the remainder exposed in Asia (table 1).

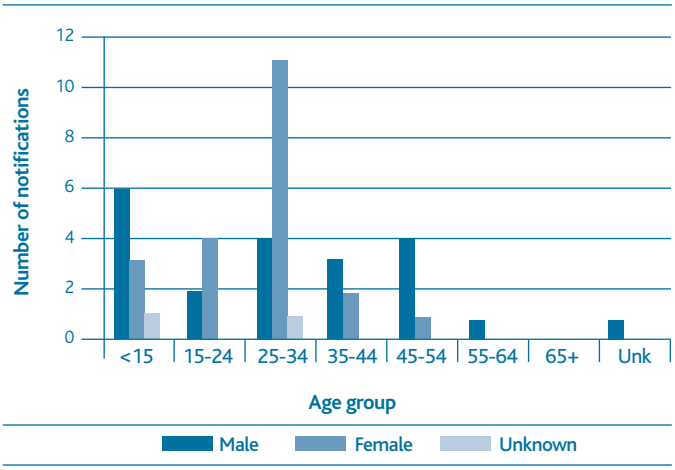

Figure 2. Age-sex distribution malaria cases, Ireland 2005.

Reason for travel

Reason for travel was recorded for 28 cases. The largest subgroup identified in 2005 was people who had travelled to visit family in their country of origin –over half of those for whom the information was available (n=15). New entrants made up a further quarter of cases (n=7), with the remainder reported as holidaymakers (n=1), business travellers (n=1), armed services (n=1), Irish citizen living abroad (n=1), other (n=2) and not specified (n=16).

Use of chemoprophylaxis

Excluding new entrants (those who had spent their lives to date living in an endemic region would not be expected to be taking chemoprophylaxis), information on malaria prophylaxis was available for 21 of the remaining 37 cases. Of these, 17 (81%) took no prophylaxis, 3 (14%) took prophylaxis but failed to continue for the required period. Only one case reported full compliance with prescribed course of prophylaxis.

Interval between arrival in Ireland and onset of symptoms

Malarial infections can occur up to several months following exposure. For 19 cases, data were available both for the date of arrival from malarious region and date of onset of illness. The interval between these dates varied between 0 and 181 days (median 7). Eighty-eight per cent of *P. falciparum* infections had an interval of less than 2 weeks although intervals of 6 months and longer can occur [6]. The longest interval recorded here was for a *P. vivax* case. *P. vivax* (and *P. ovale and P. malariae*) tend to have longer incubation periods than *P. falciparum*.[6]

Discussion

In 2005, there were 44 cases of malaria notified in Ireland. Although malaria has been notifiable for many years, it is likely that there has been under-notification and some of the current increase undoubtedly reflects improved reporting consequent to the Infectious Diseases (Amendment) (No 3) Regulations (S.I. 707 of 2003). [7]

The majority of cases in 2005 were associated with travel in Africa (91% of those for whom country of infection information was available), parts of West Africa having some of the most intense malaria transmission in the world. Although in 2005, holidaymakers and business travellers formed only a small proportion of the cases reported, between 2001 and 2004 as many as 36% of malaria cases in Ireland specified holiday or business as their reason for travel.[8] The Health Protection Agency (HPA) in the UK has issued a number of advisories over the last couple of years, after several deaths and cases of severe malaria were reported in holidaymakers returning from The Gambia. Many cases had either failed to take any prophylaxis or had taken inadequate or inappropriate prophylaxis.

Increasing numbers of Irish residents were born or raised in countries endemic for malaria. In 2005, visiting family in country of origin was the most common reason given by cases for travel to an endemic region. In the UK, half of malaria cases occur in minority ethnic groups who have settled in the UK, that were visiting family and relations overseas when they acquired malaria.[6] Individuals in endemic regions build up immunity to malaria that fades rapidly while living in a malaria-free region like Ireland, and may wrongly

assume that they are still immune to the disease.
Failure to take appropriate prophylaxis and failure to take sensible protection measure against biting mospuitos are key factors in acquiring malaria. Only one malaria case in Ireland in 2005 reported full compliance with their prescribed course of prophylaxis. The remaining cases either failed to take any malaria prophylaxis prior to exposure or failed to continue prophylaxis for the required time period. It is important that travellers to endemic areas are made aware of the need to be properly compliant with their antimalarial medication and anti-mosquito measures, and the potential health consequences of non- or partial compliance.

The HPA Advisory Committee on Malaria Prevention (ACMP) has published guidelines (and updates) on prevention of malaria.[9] Four steps remain essential to prevent malaria in travellers:

Awareness: know about the risk of malaria
Bites by mosquitoes: prevent or avoid
Compliance with appropriate chemoprophylaxis.
Diagnose breakthrough malaria swiftly and obtain treatment promptly.

It is important that travellers to endemic areas are aware that preventive measures are not 100% effective, and that they should seek treatment promptly if they suffer symptoms suggestive of malaria within a year following their return, informing their physician of their travel history.

The guidelines of the HPA Advisory Committee on Malaria Prevention in travellers have also stated the need for balancing the risk of malaria and the risk of adverse reactions to anti-malarials. This depends upon place to be visited, duration of the visit, degree of exposure, level of drug resistance and the type of traveller.[9]

Acknowledgements
We wish to acknowledge the co-operation of microbiologists, medical scientists, public health physicians, SPHMs, surveillance scientists, infection control nurses, PEHOs, and EHOs in providing the information on which this report is based.

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Surveillance of Infectious Disease Outbreaks in Ireland, 2005

Key points

- **175 infectious disease outbreaks, of which 161 were gastroenteric/ infectious intestinal disease (IID) outbreaks were notified in 2005, which was a decrease on 2004**
- **The IID outbreaks were responsible for at least 2591 cases of illness**
- **Viral gastroenteritis caused by norovirus (NV) continues to the most common cause of IID outbreaks (60% of IID outbreaks confirmed/suspected NV)**
- **The majority of IID outbreaks (61%) were reported to have occurred in healthcare settings**

Introduction

The principal objective of the national outbreak surveillance system is to gain information on the epidemiology of all outbreaks of infectious disease in Ireland.

More specific objectives include measuring the burden of illness caused by outbreaks, identifying high-risk groups in the population and estimating the workload involved in the management of outbreaks. The information gathered can be used to inform public health professionals on the causes and factors contributing to outbreaks, to target prevention strategies and to monitor the effectiveness of prevention programmes.

Outbreak definition

An outbreak of infection or foodborne illness may be defined as two or more linked cases of the same illness or the situation where the observed number of cases exceeds the expected number, or a single case of disease caused by a significant pathogen. Outbreaks may be confined to some of the members of one family or may be more widespread and involve cases either locally, nationally or internationally.

Methods

Since 1st January 2004, outbreaks or "unusual clusters of changing patterns of illness" became notifiable under the Amendment to the Infectious Diseases Regulations.[1] (see outbreak definition in box above). Since that date, medical practitioners and clinical directors of diagnostic laboratories are required to notify to the medical officer of health any unusual clusters or changing patterns of illness, and individual cases thereof, that may be of public health concern.

Table 1. All outbreaks of ID, number of IID outbreaks and total numbers ill in IID outbreaks reported by health board (2005).

HSE Area	No. Outbreaks	Outbreak rate per 100,000 pop	No. ill in all outbreaks	No. of IID outbreaks
HSE-E	65	4.6	1534	61
HSE-M	10	4.4	117	9
HSE-MW	7	2.1	35	7
HSE-NE	13	3.8	125	12
HSE-NW	11	5	148	10
HSE-SE	31	7.3	477	31
HSE-S	31	5.3	255	25
HSE-W	7	1.8	57	6
Total	**175**	**2.8**	**2748**	**161**

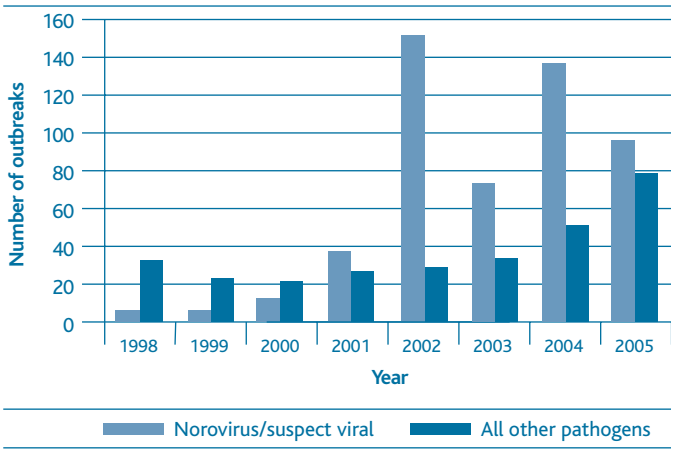

Figure 1. Number of outbreaks by year and by pathogen, 1998-2005 (Data prior to July 2001 provided by FSAI)

In addition since 1st January 2004, all outbreak data are being entered into the CIDR system database (either directly by the HSE-region, if that region has gone live onto CIDR) or indirectly by staff in HPSC.

Results

During 2005, 175 outbreaks of infectious disease were reported to HPSC, of which 161 were gastrointestinal/ infectious intestinal disease (IID) outbreaks. The IID outbreaks were responsible for at least 2591 people becoming ill, and there were 205 reported hospitalisations. The regional distribution of all outbreaks of infectious disease, and those specifically IID are detailed in table 1. The highest number of outbreaks was reported from the HSE-ER region (n=65), although the highest outbreak rate was in the HSE-S (7.3/100,000). The lowest rate was reported from the HSE-W (1.8/100,000).

Causative Pathogen

The breakdown of IID and non-IID outbreaks by pathogen are outlined in Tables 2 and 3 respectively. The overall numbers of IID outbreaks reported, decreased compared with 2004. Continuing the trend observed in previous years, the IID outbreaks in 2005 have been dominated by norovirus/ suspect viral outbreaks, accounting for 60% of all IID outbreaks reported in 2005 (Figure 1). The largest single outbreak reported in 2005 was a norovirus outbreak in a hospital involving 187 people.

After norovirus, the next most commonly reported outbreaks were EHEC, *Salmonella enterica, Campylobacter and Cryptosporidium*.

There were 20 outbreaks of EHEC (19 VTEC) reported in 2005, four general and 16 family outbreaks. The largest VTEC outbreak involved a significant investigation and occurred at a private house/crèche in the HSE-MW. Nine cases were ill and 18 cases in total were confirmed positive for *E. coli* (VTEC) O157 (VT 2 positive) infection. Two cases with Haemolytic Uraemic Syndrome were hospitalised. Cases ranged in age from ten months to sixty-two years. Results from a case-control study indicated that potential exposure to drinking water from a vulnerable local private group water scheme was a risk[1].

Seventeen outbreaks of *S. enterica* were reported in 2005, affecting a total of 52 people and resulting in 12 hospitalisations. There were three general and 14 family outbreaks. Three outbreaks were travel related with the Czech Republic, Tunisia and Spain cited as the countries of infection.

The number of outbreaks reported that were attributable to *Campylobacter* rose from one in 2004 to eight in 2005. All eight outbreaks were family outbreaks, and the suspected mode of transmission recorded was foodborne (5), person-to-person (2) and unknown (1).

There were six outbreaks of cryptosporidiosis in 2005: four general and two family outbreaks. The largest outbreak reported was a community outbreak affecting 31 people in the Carlow town area. The mode of transmission was suspected as waterborne although only low levels of cryptosporidium were found in the town water supplies. A boil water notice was issued and subsequently lifted when sampling confirmed that the town supply was free from cryptosporidium.[2]

Table 2. Pathogens associated with IID outbreaks notified in 2005

Disease	Number of outbreaks	Number ill
Noroviral Infection	61	1891
Suspected Norovirus	32	297
EHEC	20	53
Salmonella	17	52
Campylobacter	8	17
Unknown	8	119
Cryptosporidium	6	49
Norovirus & C. difficile	3	32
C. difficile	2	20
Shigellosis	2	44
Giardiasis	1	3
Rotavirus	1	14
Total	**161**	**2591**

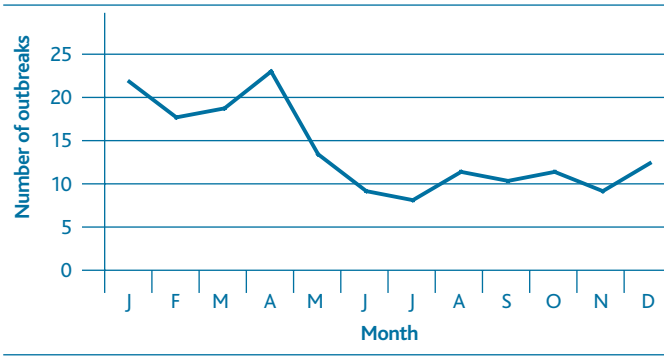

Figure 2. Seasonal distribution of IID outbreaks, 2005.

Fourteen outbreaks of non-IID/gastroenteric diseases were notified in 2005. Table 3 outlines the pathogens implicated and numbers ill. Further details on the non-IID outbreaks are available in the individual disease chapters. It is hoped that surveillance data on these outbreaks will improve in the coming years.

Mode of Transmission

Similar to previous years, person-to-person spread is the mode of transmission reported for the majority of outbreaks of IID in 2005 (table 4). Most of these outbreaks were due to norovirus/ suspect viral. Like 2004, the foodborne route was the second most frequently suspected mode of transmission and was identified in over 12 outbreaks in 2005. For many outbreaks more than one mode of transmission was suspected.

Location

As in previous years, the commonest location in which outbreaks occurred in 2005 was healthcare settings (table 5). 61% of all reported IID outbreaks occurred in these settings. Nine outbreaks were associated with foreign travel in 2005 compared to only one travel associated outbreak in 2004. Salmonella accounted for three of these outbreaks followed by Norovirus (2), EHEC (2), Cryptosporidium (1) and Shigella (1).

Seasonal distribution

When the IID outbreaks in 2005 are analysed by month of onset of illness of first case, it is seen that the majority of outbreaks occurred in the first 4 months of the year (Figure 2). This peak is attributable to the number of Norovirus outbreaks that occurred at this time. Norovirus was previously known as "Winter Vomiting" disease due to the increase in outbreaks that would occur during winter months.

Discussion

In 2005, all outbreaks of infectious diseases became notifiable for the first time, under the new Infectious Diseases Legislation.[3] There was an decrease in the overall number of outbreaks reported nationally in 2005, with 161 outbreaks of IID notified, compared to 169 in 2004.

As observed in recent years, viral gastroenteritis, principally caused by norovirus, accounted for the majority of outbreaks reported in 2005 (60% of IID outbreaks confirmed/suspected NV). Detailed molecular detection and typing of norovirus isolates was introduced by the National Virus Reference Laboratory (NVRL) in 2003, which has enabled us to study in much greater detail the molecular epidemiology of strains causing outbreaks. This data is routinely submitted to the European network 'Divine-net', which is an extension of the previous network entitled "Foodborne Viruses in Europe".[4] Divine-net aims to merge epidemiological and virological data on outbreaks of viral gastroenteritis, including norovirus, across Europe.

In 2005 travel associated outbreaks were a significant feature. In total nine outbreaks were travel associated, including a large norovirus outbreak on a cruise ship that affected 95 individuals.

An outbreak of shigellosis associated with travel to Egypt was identified in June 2005 involving over half the passengers on a flight from Luxor, in Egypt. The Egyptian authorities were

Table 3. Non–IID outbreaks notified in 2005

Disease	Number of outbreaks	Number ill
Mumps	6	39
HiB	1	2
Influenza A	1	42
Influenza B	1	33
Legionellosis	1	NK
Tuberculosis	1	8
Probable Varicella	1	9
Scabies	1	4
Suspected streptococcal infection	1	20
Total	**14**	**157**

Table 4. Principal mode of transmission reported in outbreaks of IID (2005).

Primary Mode of Transmission	Number of IID Outbreaks
Person-to-person	106
Unknown	20
Foodborne	12
Not Specified	8
P-P and Animal	3
P-P and FB	3
P-P and WB	3
FB and Animal	2
FB and Airborne	1
FB and WB	1
P-P and Airborne	1
Waterborne	1
Total	**161**

Table 5. IID Outbreaks by location, 2005.

Location	Number of IID Outbreaks
Hospital	59
Residential Institution	40
Private House	38
Travel Related	9
Community outbreak	4
Hotel	3
Not Specified	3
Other	3
Creche	1
Public House	1
Total	**161**

alerted and appropriate measures were put in place. Subsequent investigations could not conclusively identify the source of infection.[5]

In October 2005 Health Protection Scotland identified an international outbreak of *S*. Goldcoast infection in tourists returning from Majorca. An alert through Enter-Net and the European Commission's Early Warning and Response System (EWRS) led to an international response with active case finding. In total 148 cases were identified in 10 different countries – including six cases in Ireland. Despite extensive investigations the source of infection was not identified. The outbreak was declared over on the 1st December 2005.

Outbreak data has been entered into the CIDR system since the beginning of 2004, therefore real time data on outbreaks is available to all CIDR users nationally as they go-live on the system. With the continued national roll-out of CIDR, it is hoped enhanced surveillance data on all outbreaks of infectious disease will be even more timely and complete as users enter their own outbreak data.

This will enable epidemiological, microbiological and environmental data relating to the outbreak to be shared locally and nationally, and should greatly assist in the management and control of outbreaks, as well as allowing analysis of the national data to inform future public health policies.

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Acknowledgements

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Salmonella in Ireland, 2005

Key Points

- **In 2005, the incidence rate of human salmonellosis decreased (8.9/10^5) compared to 2004 (10.6/10^5) from analysis of the clinical notification data**
- **The highest incidence rate was observed in children under 5 years of age**
- **After *S.* Enteritidis (n=145) and *S.* Typhimurium (n=85), the next most common serotypes were *S.* Agona (n=10), and *S.* Virchow (n=9)**
- **21% of cases were reported to be associated with travel outside of Ireland in 2005**

Introduction

Salmonellosis is one of the most common zoonotic diseases in humans in Ireland and worldwide. At present, over 2,460 serotypes of *Salmonella* have been identified. Two serotypes, however, *S. enterica* serotype Enteritidis and *S. enterica* serotype Typhimurium have accounted for the majority of cases of human salmonellosis in recent years.

Salmonellosis presents clinically as an acute enterocolitis, with sudden onset of headache, abdominal pain, diarrhoea, nausea and occasionally vomiting. Fever is almost always present. Dehydration, especially amongst vulnerable populations such as infants, the immunocompromised and the elderly, may be severe. *S.* Typhi and *S.* Paratyphi can cause enteric fever, a severe systemic life threatening condition, but this is very rare in Ireland and mainly travel-associated.

Salmonella is a zoonoses and a wide range of domestic and wild animals, as well as humans can act as the reservoir for this pathogen. Prevention, surveillance and control of *Salmonella* infections is of major public health importance.

Methods

The National Salmonella Reference Laboratory (NSRL) was established in 2000 in the Department of Medical Microbiology, University College Hospital, Galway. This laboratory accepts *S. enterica* isolates from all clinical and food laboratories for serotyping, phage typing and antimicrobial sensitivity testing.

This report reviews data available from the National Salmonella Reference Laboratory (NSRL) and weekly events of

Table 1. Analysis of clinical isolates of S. enterica (n=357) referred to NSRL, (2005) by age-group and gender.

Age group (years)	No. of isolates (%)	Male	Female	Unknown
0-4	75 (21)	28	37	10
5-9	19 (5)	10	7	2
10-14	22 (6)	9	13	0
15-19	18 (5)	7	9	2
20-24	29 (8)	16	13	0
25-34	59 (17)	16	40	3
35-44	35 (10)	19	14	2
45-54	31 (9)	20	10	1
55-64	23 (6)	9	13	1
65+	37 (10)	20	17	0
Unknown	9 (3)	6	3	0
Total	357	160	176	21

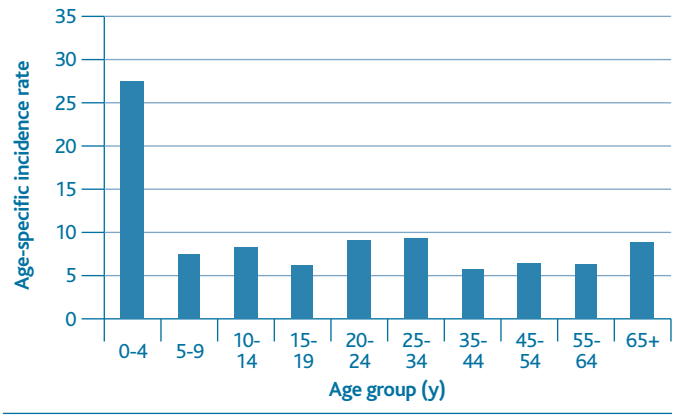

Figure 1. Age-specific incidence rate of human salmonellosis in Ireland, 2005.

salmonellosis extracted from the CIDR system for the year 2004. These data enable us to provide an overview of the epidemiology and burden of disease caused by *Salmonella* infections in Ireland today.

Results

Demographic information

There were 357 clinical isolates of *S. enterica* referred to NSRL in 2005. The male: female ratio was 0.9:1. The age groups and sex of those affected are shown in table 1. The highest number of cases was seen in children under five years of age. When age-specific incidence rates were calculated (Figure 1), the burden of illness in this age group was even more evident.

Seasonality

Analysis of the number of salmonellosis events notified to HPSC by week in 2005, revealed peaks in incidence from mid-August to early October. Seasonal peaks are typically seen each year at this time.

Serotyping, phage typing and antibiotic susceptibility results from NSRL

Serotyping

The breakdown of *Salmonella* serotypes by health board is shown in table 2. It should be noted however that for the NSRL data, health board location refers to the location of the clinical laboratory that the isolate was originally sent to, and may not always correspond with the geographic location of the case.

As has been the trend in recent years, the predominant serotype causing human illness in 2005 was *S.* Enteritidis (n=145), followed by *S.* Typhimurium (n=85). Table 3 shows the changing shift in the more common serotypes in the past number of years. In 2005, after *S.* Enteritidis and *S.* Typhimurium, the next most commonly isolated serotypes were *S.* Agona (n=10), *S.* Virchow (n=9), *S.* Hadar (n=8) and *S.* Dublin (n=5). There were 5 cases of S. Typhi detected in

Phage typing

The predominant phage types of *S.* Typhimurium and *S.* Enteritidis are summarised in Tables 4 and 5. The commonest phage type of *S.* Typhimurium reported in 2005 was DT104 (44%), followed by DT104b (15%). In previous years (1998-2003) PT4 was the predominant phage type of *S.* Enteritidis, but this trend changed in 2004 with PT1 replacing PT4 as the main phage type detected. This trend has continued in 2005 with PT1 accounting for 30% of the isolates. This is followed by PT14b (15%), PT8 (14%) and PT4 (13%).

Travel-association

75 out of 357 isolates (21%) reported to NSRL in 2005 were found to be associated with travel outside of Ireland. The most commonly reported countries were Spain (n=7), Nigeria (n=7), Thailand (n=6), Majorca (n=6) and Tunisia (n=5).

Antimicrobial resistance

The antimicrobial susceptibility patterns of the most commonly isolated serotypes in 2005 are presented in table 6. Analysis of the 2005 AMR data again demonstrated high levels of resistance among *S.* Typhimurium, particularly DT104 isolates.

Table 2. Serotypes of Salmonella enterica by health board, 2005.

Serotype	HSE-ER	HSE-M	HSE-MW	HSE-NE	HSE-NW	HSE-SE	HSE-S	HSE-W	Total
Agona	2	0	0	1	1	6	0	0	10
Anatum	3	0	1	0	0	0	0	0	4
Arechavaleta	2	0	0	0	0	0	0	0	2
Blockley	0	1	0	0	0	0	1	2	4
Braenderup	1	0	0	0	0	0	0	0	1
Bredeney	1	0	1	0	0	1	0	0	3
Bukavu	1	0	0	0	0	0	0	0	1
Concord	0	0	1	0	0	0	0	0	1
Corvallis	1	0	0	0	0	1	0	0	2
Cotham	0	0	0	0	0	0	0	1	1
Dublin	0	0	1	0	0	0	2	2	5
Enteritidis	55	8	8	11	11	15	27	10	145
Give	1	0	0	0	0	0	0	1	2
Goldcoast	1	0	1	2	1	0	0	2	7
Hadar	4	0	1	0	0	1	2	0	8
Indiana	1	0	0	1	0	0	0	0	2
Infantis	2	0	0	0	0	1	0	0	3
Isangi	0	0	0	0	0	1	0	0	1
Java	1	0	1	0	0	0	0	5	7
Javiana	1	0	0	0	1	0	0	0	2
Kedougou	0	0	0	0	0	1	0	0	1
Kentucky	1	1	0	1	0	0	0	1	4
Limete	1	0	0	0	0	0	0	0	1
Livingstone	1	0	0	0	0	0	0	0	1
Mikawasima	0	1	0	0	0	0	0	0	1
Minnesota	0	0	0	0	0	1	0	0	1
Newport	4	0	0	0	1	0	0	0	5
Oranienburg	1	0	0	0	1	0	0	0	2
Paratyphi A	1	0	0	0	0	0	0	0	1
Rissen	1	0	0	0	0	0	0	0	1
Saintpaul	1	0	0	0	0	0	0	1	2
Sandiego	1	0	0	0	0	0	0	1	2
Schwarzengrund	0	0	0	0	0	0	1	0	1
Senftenberg	1	0	0	0	0	0	0	0	1
Stanley	3	0	0	0	0	1	1	1	6
Stanleyville	2	0	0	0	0	0	1	0	3
Telelkebir	2	0	0	0	0	0	0	0	2
Tennessee	1	0	0	0	0	0	0	0	1
Thompson	0	0	0	0	0	0	1	0	1
Typhi	3	1	0	0	0	0	1	0	5
Typhimurium	26	9	3	7	5	19	11	5	85
Uganda	1	0	0	1	0	0	0	0	2
Unnamed	2	1	1	1	0	0	1	1	7
Virchow	5	1	0	0	0	0	2	1	9
Worthington	0	0	0	0	0	1	0	0	1
Total	**135**	**23**	**19**	**25**	**21**	**49**	**51**	**34**	**357**
CIR	**9.6**	**10.2**	**5.6**	**7.2**	**9.5**	**11.6**	**8.8**	**8.9**	**9.1**

CIR: Crude incidence rate per 100,000 population

** 1 case of S. Enteritidis was known to be resident in UK*

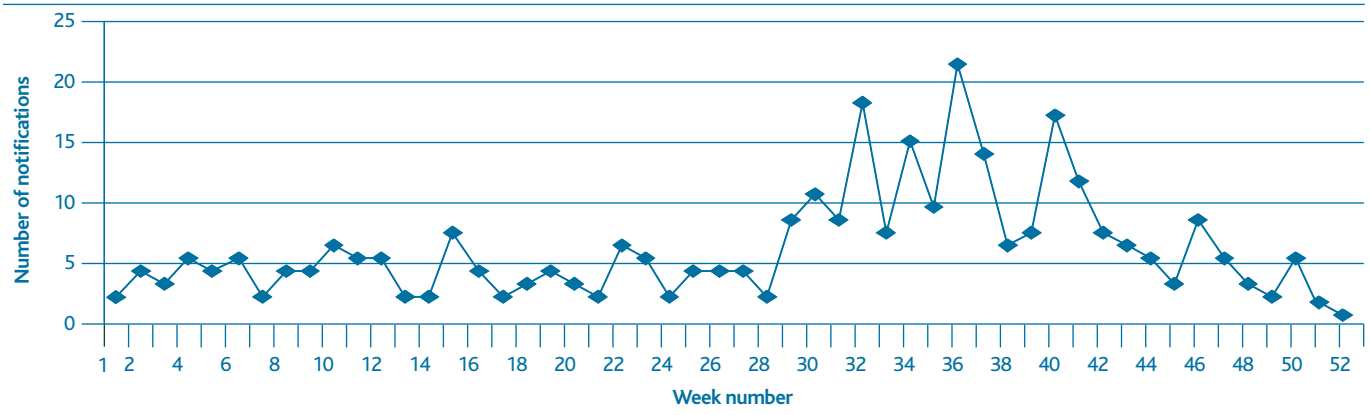

Figure 2. Number of salmonellosis notifications by week, 2005 (data from CIDR).

Table 3. Serotypes of S. enterica referred to NSRL (2000-2005) (%).

Serotype	2000	2001	2002	2003	2004	2005
S. Enteritidis	239 (36)	248 (46)	165 (40)	205 (42)	173 (41)	145 (41)
S. Typhimurium	284 (43)	165 (30)	140 (34)	135 (28)	125 (30)	85 (24)
S. Agona	6 (1)	2 (0.4)	5 (1)	5 (1)	2 (0.5)	10 (3)
S. Virchow	9 (1)	16 (3)	10 (2)	10 (2)	10 (2)	9 (3)
S. Hadar	11 (2)	4 (1)	6 (1)	21 (4)	4 (1)	8 (2)
S. Dublin	12 (2)	12 (2)	9 (2)	5 (1)	4 (1)	5 (1)
S. Kentucky	15 (2)	4 (1)	1 (0.2)	10 (2)	7 (2)	4 (1)
S. Bredeney	24 (4)	11 (2)	2 (0.5)	3 (1)	11 (3)	3 (1)
All others	65 (10)	81 (15)	78 (19)	92 (19)	83 (20)	88 (25)
Total	**665**	**543**	**416**	**486**	**419**	**357**

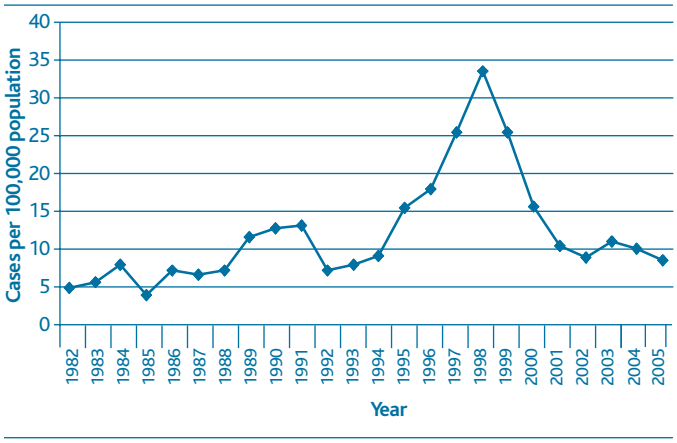

Figure 3. Crude rate of Salmonellosis in Ireland per 100,000 population, 1982-2005 (CIDR)

Clinical notification data

Salmonellosis is a notifiable disease. Medical practitioners have a statutory obligation to report all suspected cases. There were 349 cases notified to HPSC through the weekly notification system in 2005, giving a crude incidence rate of 8.9 per 100,000 population.

Outbreaks

In 2005, there were 17 outbreaks of *S. enterica* notified to HPSC; 3 general and 14 family outbreaks, affecting a total of 52 people. Three of the outbreaks were travel related with Spain, Tunisia and the Czech Republic cited as the countries of infection. The largest outbreak was a community outbreak caused by *S.* Agona that affected 6 people and resulted in 5 hospitalisations.

Discussion

Salmonella enterica continues to be an extremely significant cause of gastroenteritis in Ireland, despite a decrease in the rate of infections due to salmonellosis in 2005 ($8.9/10^5$) compared to 2004 ($10.6/10^5$). The highest incidence was reported in the South East health board region. A similar incidence rate was reported in Northern Ireland ($10.43/10^5$) [*CDSC-NI, 25/08/06 – personal communication*], while higher rates were seen in England and Wales[1,2] ($22.7/10^5$) [*calculated from provisional data 28/09/06*] and Scotland[3] ($22.3/10^5$).

Similar trends regarding the epidemiology of this pathogen were noted in 2005 as in previous years. Males and females were equally affected. All age-groups were affected but the highest incidence was noted in children less than five years of age. It is likely that more specimens are submitted for testing from this age-group, so this should be borne in mind when interpreting these data.

Analysis of serotyping revealed that there were 44 different serotypes identified in 2005. *S.* Enteritidis and *S.* Typhimurium were the causative serotypes identified in 65% of cases. The proportion of cases attributable to *S.* Typhimurium continues to decrease with *S.* Enteritidis and other serotypes increasing in their relative importance. The emergence of more unusual serotypes could be attributable to the increase in the number of cases that are associated with foreign travel (21% in 2005). In addition a significant number of travel-associated typhoid cases are reported each year. Five cases were reported in 2005, one associated with travel to India and two with travel to Pakistan. It is important that travellers are made aware of the measures that can be taken to reduce the risk of developing food-/ water-borne illness whilst abroad and especially that typhoid vaccination is given when travelling to endemic countries.

In previous years (1998-2003) PT4 was the predominant phage type of *S.* Enteritidis, but this trend has changed since 2004 with non-PT4 phage types being detected more and more. In particular the incidence of PT14b and PT8 has increased in recent years, accounting for 3% and 5% respectively of the total phage types detected in 2003 and increasing to 15% and 14% respectively in 2005. This shift in phage type has been observed in many countries in Europe in recent years and could be attributable to factors such as increased travel, global food trade and animal vaccinations.[4,5]

The typing of all human Salmonella cases by the NSRL

Table 4. Phage types of S. Typhimurium in human isolates (2005)

Phage type	No. of isolates (%)
DT104	37 (44)
DT104b	13 (15)
DT193	5 (6)
DT12	3 (4)
DT208	1 (1)
U310	1 (1)
Other	12 (14)
No type	13 (15)
Total	**85**

Table 5. Phage types of S. Enteritidis in human isolates (2005)

Phage type	No. of isolates (%)
PT1	44 (30)
PT14b	22 (15)
PT8	20 (14)
PT4	19 (13)
PT21	12 (8)
PT24var	4 (3)
PT6a	3 (2)
PT6	3 (2)
Other	13 (9)
No type	5 (3)
Total	**145**

Table 6. Antimicrobial susceptibilities of human Salmonella enterica serotypes isolated in Ireland in 2005.

	% Resistance						
Serotype (Number)	**Amp**	**Chl**	**Strep**	**Sulph**	**Tet**	**Trim**	**Nal**
Enteritidis (145)	5	0	0	2	3	2	30
Typhimurium (85)	73	64	72	75	79	8	9
Agona (10)	40	0	40	0	0	0	10
Virchow (9)	22	0	0	44	33	44	89
Hadar (8)	75	0	100	0	100	0	88
Stanley (6)	67	50	33	50	67	17	0
Typhi (5)	20	20	20	20	20	20	40
Kentucky (4)	25	0	25	50	50	0	50
Bredeney (3)	0	0	0	0	0	0	0

Amp = Ampicillin, Chl = Chloramphenicol, Strep = Streptomycin, Sulph = Sulphonamide, Tet = Tetracycline, Trim = Trimethoprim, Nal = Naladixic acid

continues to be an extremely powerful discriminatory tool particularly for cluster/ outbreak detection and especially for the two most common serovars S. Enteritidis and S. Typhimurium. In addition the submission of Irish data to international networks such as Enter-net allows the collation and analysis of serotyping, phage typing and AMR data across international borders and not only allows international outbreaks to be identified but also allows such emerging trends to be identified, monitored and explained.

In September 2005 the NSRL reported an unusual cluster of four human cases of *S.* Agona with a distinctive antibiogram (AS resistant). By November six cases had been identified, five from the HSE-S and one with an epidemiological link to the HSE-S. In addition the NSRL had identified a non-human (poultry) isolate from a poultry plant in the South-East. Despite extensive epidemiological, environmental and microbiological investigations no common source was found. As no further cases were reported, the outbreak was declared over.

In October 2005 an international outbreak of *S.* Goldcoast infection in tourists returning from Majorca was identified by Health Protection Scotland. An alert through Enter-Net and the European Commission's Early Warning and Response system (EWRS) led to an international response with active case finding. In total 148 cases were identified in 10 different countries – including six cases in Ireland. Despite extensive trawling, no testable hypothesis about foods, outlets, or other potential sources of infection could be generated. The outbreak was declared over on the 1st December 2005. Finally analysis of the 2005 AMR data (antimicrobial resistance) of the various *Salmonella* serovars demonstrated high levels of resistance among *S.* Typhimurium isolates, particularly DT104 isolates. The emergence of MDR (multi-drug resistant) S. Typhimurium and DT104 is well documented and constitutes an increasing global public health problem. [6]

Acknowledgements
We wish to sincerely thank Prof. Martin Cormican and the staff of the National Salmonella Reference Laboratory, UCHG for providing the laboratory data for this report and also the clinical, food and veterinary microbiology laboratories that send isolates to NSRL for analysis. In addition, we would like to thank the Departments of Public Health and Community Care areas for providing the clinical notification data.

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Campylobacteriosis in Ireland, 2005

Key Points

- **Campylobacter remains the commonest cause of gastroenteritis of bacterial aetiology in Ireland**
- **In 2005, there were 1803 cases of campylobacteriosis notified (CIR 46.0/10^5) which is the highest number of cases reported since 1999 (2085 cases)**
- **The highest burden of illness was in children under 5 years of age**
- **In 2005, the highest incidence rate was reported from the Midlands health board region (69.2/ 10^5)**

Background

Campylobacteriosis is the commonest reported bacterial cause of infectious intestinal disease in Ireland. Two species account for the majority of infections: *C. jejuni* and *C. coli*. Illness is characterised by severe diarrhoea and abdominal pain. Symptoms may subside after a number of days or may persist for weeks. Rarely, more severe sequelae may develop such as reactive arthritis, Reiter's syndrome, or HUS and approximately 1 in every 1000 cases leads to a severe neurological disorder called Guillain-Barré Syndrome (GBS). Undercooked meat especially poultry is often associated with illness as is unpasteurised milk and untreated water. The majority of infections, however, remain largely unexplained by recognised risk factors for disease.

Methods

Human campylobacter infection became a statutorily notifiable disease for the first time in January 2004 under the Amendment to the Infectious Diseases Regulations.[1]
Data for this report were extracted and analysed from the CIDR system.

Results

Incidence

In total, 1803 notifications of human campylobacteriosis were notified in 2005 in Ireland. This gives a crude incidence rate (CIR) of 46 cases per 100,000 population (table 1). This compared with a CIR of 43.7 cases per 100,000 in 2004. The annual number of cases by year since 1999 is shown in Figure 1.

Age standardised rates were calculated to allow comparisons

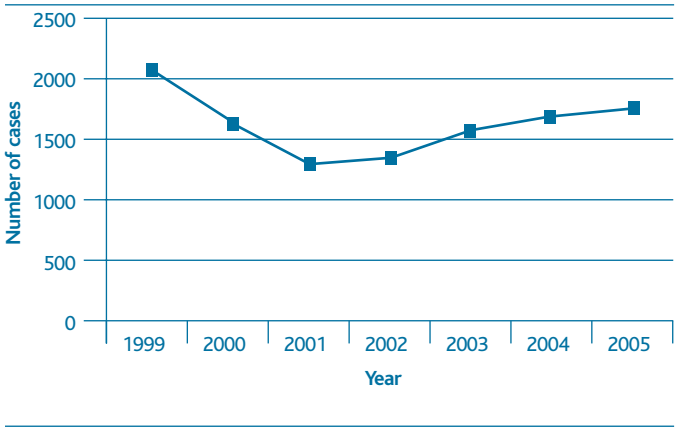

Figure 1. Annual number of cases of campylobacteriosis in Ireland, 1999-2005

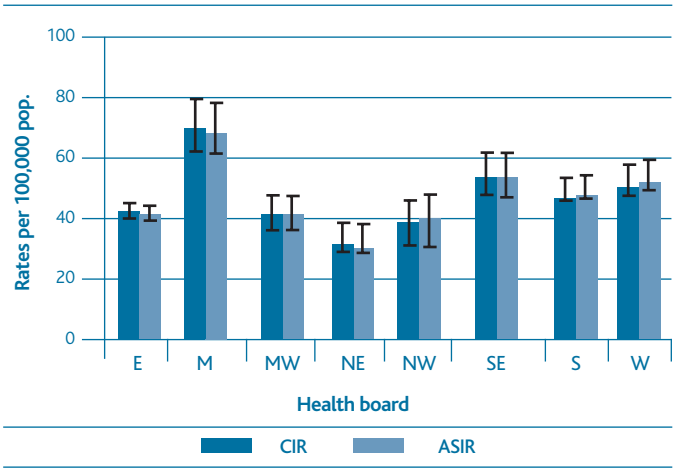

Figure 2: Age standardised incidence rates (ASIR) of human campylobacteriosis in Ireland, compared to crude incidence rates (CIR) in each health board, 2005.

Table 1: Number of cases and CIR per 100,000 population of human campylobacteriosis in Ireland by health board, 2005.

Health Board	No. of cases	CIR - (incl. 95% C.I.)
HSE-ER	612	43.7 [40.2 - 47.2]
HSE-M	156	69.2 [58.3 - 80.1]
HSE-MW	140	41.2 [34.4 - 48.0]
HSE-NE	113	32.8 [26.8 - 38.8]
HSE-NW	87	39.3 [31.3 - 47.5]
HSE-SE	230	54.3 [47.3 - 61.3]
HSE-S	271	46.7 [41.1 - 52.3]
HSE-W	194	51.0 [43.8 - 58.2]
Total	**1803**	**46.0 [43.9 - 48.1]**

Table 2. Gender distribution of campylobacter cases by health board region, 2005.

	Female	Male	Unknown	Total
HSE-ER	332	276	4	612
HSE-M	87	68	1	156
HSE-MW	78	62	0	140
HSE-NE	68	45	0	113
HSE-NW	48	38	1	87
HSE-SE	118	111	1	230
HSE-S	132	138	1	271
HSE-W	105	87	2	194
Total	**968**	**825**	**10**	**1803**

to be made between health board regions without the confounding effects of age (Figure 2). In 2005, the highest incidence was reported from the Midlands region followed by the South Eastern region. The lowest rate was reported from the North Eastern region.

Seasonal distribution

Analysis of the data by week of notification is shown in Figure 3. A peak in cases is evident in week 25 and 26.

Age

When the distribution of cases for each age group is examined, it is evident that by far the highest burden of illness is seen in children less than five years (Figure 4). This was also noted in previous years and is a well-reported feature of campylobacteriosis.

Gender distribution

Females accounted for 53.7 percent of all cases notified (males 45.8%; unknown 0.6%) (table 2). However the variance in gender distribution that has been noted since 1999 was again evident when the data was adjusted for age and sex. In almost all age - groups there is a predominance of male cases (figure 5).

Outbreak data

There were eight family outbreaks of campylobacteriosis notified in 2005, affecting a total of 17 people. The suspected mode of transmission recorded was foodborne (5), person-to-person (2) and unknown (1).

Discussion

In 2004, human campylobacter infections became statutorily notifiable for the first time under the Amendment to the Infectious Diseases Regulations.[1]

Therefore since 2004, the data on campylobacteriosis has been collated directly from the notifiable disease data on CIDR and not as part of the Zoonoses Directive data collection (as had been the case since 1999).

Analysis of the 2005 data reveals that campylobacteriosis still remains the most common cause of bacterial gastroenteric infection in Ireland - with over five times the number of salmonellosis cases reported in 2005.

The crude incidence rate (CIR) of campylobacteriosis increased in Ireland in 2005 (46.0 cases/100,000 persons) compared to 2004 (43.7/100,000). This was in fact the highest rate reported in Ireland since the year 1999. In most regions, an increase was seen in 2005, especially in the HSE-M and HSE-MW regions, however the CIR for the Western region decreased from 63.1/10^5 in 2004 to 51/10^5 in 2005.

For the same period, higher rates were noted for Northern Ireland (51.6/100,000) [*CDSC-NI, 25/08/06 – personal communication*], England and Wales[2,3] (91.8/100,000) [*calculated from provisional data, 28/09/06*] and Scotland[4] (90.2/100,000).

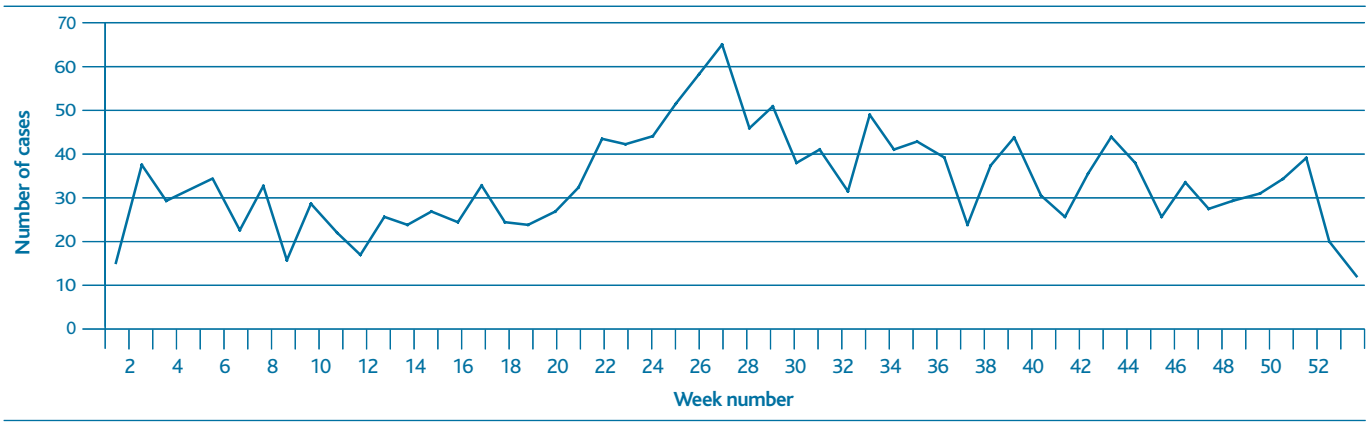

Figure 3: Total cases of campylobacteriosis events by week, 2005 (data from CIDR)

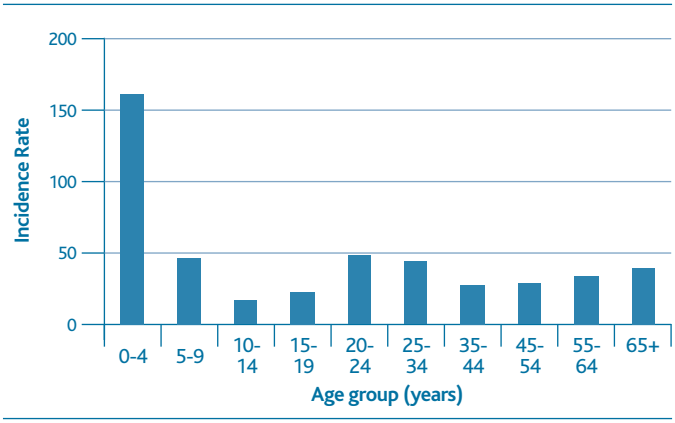

Figure 4: Age specific incidence rates for campylobacteriosis in Ireland, 2005 (data from CIDR)

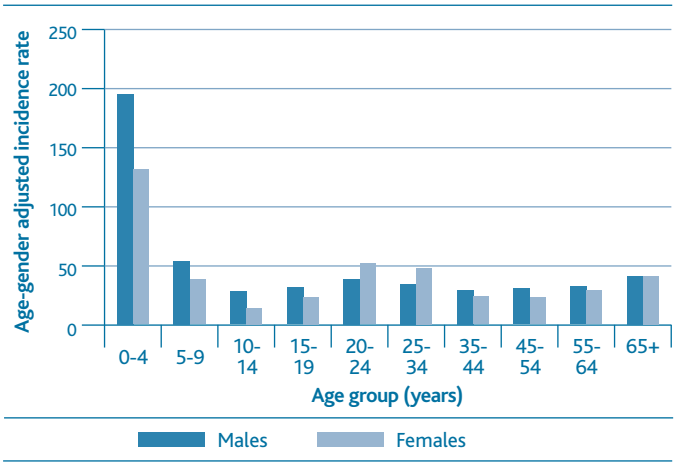

Figure 5: Age-gender adjusted incidence of campylobacteriosis according to age group in 2005.

As has been noted consistently since 1999, some interesting epidemiologic features of this pathogen have emerged in recent years. In particular, the higher incidence rate in young children and the bias towards male cases in almost all age groups.

The risk factors associated with Campylobacteriosis remain poorly understood and this area has been identified as a key research need in Ireland by an expert group at the conference *Campylobacter* Surveillance and Research in Ireland – The Way Ahead?" which was held in UCD in June 2005.

Already significant strides have been made to expand our understanding of the complex epidemiology of this infection. An all-Ireland case-control study carried out by the HSE-ER region in the ROI and in all four Health and Social Services Boards (HSSB) in NI was completed in 2005. Findings from the study reveal that eating chicken, and lettuce, and eating out in restaurants/ takeaways are major risk factors for campylobacteriosis in Ireland, North and South.[5]

A three-year study, "The Sentinel surveillance of Campylobacter in Ireland", funded by ***safefood***, commenced in 2005. This project will involve the collection of detailed clinical and microbiological information on cases of Campylobacter infection in order to generate hypotheses as to potential risk factors for infection. Food, animal and human sources of Campylobacter will be targeted. This project will bring together the Public Health Medical Practitioners, Clinical/Food Laboratory Personnel, Veterinary Health Specialists and Food Safety research expertise to address the growing issue of campylobacteriosis in Ireland.[6]

As the most common cause of bacterial gastroenteritis in Ireland, Campylobacter continues to be significant public health issue, both in terms of personal suffering and economic costs. Through continued surveillance and targeted research our understanding of this disease will improve and more effective prevention and control strategies may be developed.

Acknowledgements

We wish to thank all who have provided data for this report, including specialists in public health medicine, senior/area medical officers, surveillance scientists, clinical microbiologists, medical scientists, infection control nurses, principal/ environmental health officers.

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Rotavirus in Ireland, 2005

Key Points

- **Rotavirus remains one of the most common causes of acute infectious gastroenteritis in Ireland**
- **In 2005, there were 2251 cases of rotavirus notified (CIR 57.5/10^5)**
- **The highest burden of illness was in children under 2 years of age**
- **In 2005, the highest incidence rate was reported from the Western health board region (99.4/ 10^5)**

Background

Rotavirus is the most common cause of acute gastroenteritis in children worldwide and a frequent cause of diarrhoea associated deaths in developing countries. In developed countries, mortality due to rotavirus is low, however the morbidity and economic costs associated with infection are significant.[1]

Illness is characterised by sudden onset diarrhoea and vomiting, often with mild fever. Occasionally there is blood in stools. Symptoms usually last for only a few days but in severe cases hospitalisation may be required due to dehydration. Transmission is usually person-to-person, mainly via the faecal-oral route. Children less than two years of age are most susceptible to infection, although cases are often seen in elderly and immunocompromised adults - particularly in institutional settings. Transmission can be rapid, through person-to-person contact, airborne droplets, or contact with contaminated objects such as toys.

Methods

Acute infectious gastroenteritis became a statutorily notifiable disease for the first time in January 2004 under the Amendment to the Infectious Diseases Regulations.[1]
Only cases of rotavirus and gastroenteritis unspecified are notifiable under this disease category. Prior to 2004 gastroenteritis was only notifiable when contracted by children less than two years of age. Data for this report were extracted and analysed from the CIDR system.

Table 1: Number of cases and CIR per 100,000 population of rotavirus in Ireland by health board, 2005.

Health Board	No. of cases	CIR
HSE-E	658	47.0
HSE-M	176	78.1
HSE-MW	92	27.1
HSE-NE	162	47.0
HSE-NW	167	75.4
HSE-SE	283	66.8
HSE-S	335	57.7
HSE-W	378	99.4
Total	**2251**	**57.5**

Table 2: Age specific incidence rates for rotavirus in Ireland, 2005 .

Age Group (Years)	Number of cases	ASIR
0-4	2172	782.3
5-9	25	9.5
10-14	5	1.8
15-19	2	0.6
20-24	1	0.3
25-34	2	0.3
35-44	0	0.0
45-54	1	0.2
55-64	2	0.6
65+	22	5.0
Unknown	19	-
Total	**2251**	**57.5**

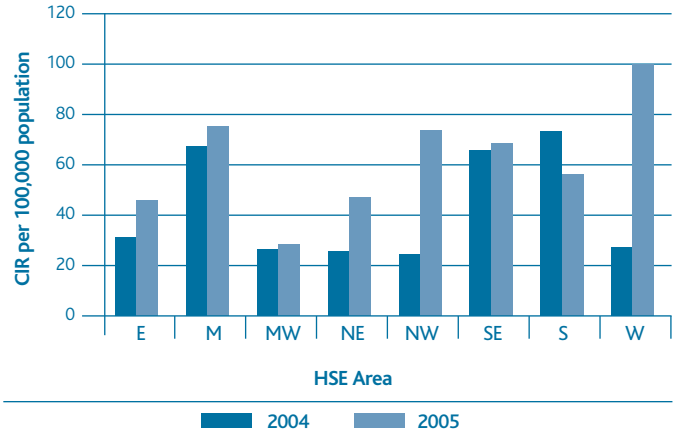

Figure 1: Crude incidence rate per 100,000 population for rotavirus by health board in Ireland, 2004 to 2005.

Results

Incidence

There were 2404 notifications of Acute Infectious Gastroenteritis (AIG) in 2005. Rotavirus was the causative organism identified in 2251 (93%) of these giving a crude incidence rate (CIR) of 57.5 cases per 100,000 population (table 1). This represents an increase compared to 2004, when 1600 cases of rotavirus were notified (CIR 40.8 cases per 100,000). The incidence rates increased across all health boards relative to 2004 values, except in the Southern Region where a decrease was observed (Figure 1). The highest incidence rate was in the Western Region with a CIR of 99.4 per 100,000 population.

Seasonal distribution

Analysis of the data by week of notification is shown in Figure 2. Most cases were notified in the first half of the year with a peak incidence during week 17. A later peak was also observed during week 33, however this was attributable to the bulk uploading of notifications for April, May, June and August for the WHB region.

Age

When the distribution of cases for each age group is examined, it is evident that the highest burden of illness is seen in children less than five years (table 2). A further breakdown of these figures revealed that the majority (n = 2026) of infections occurred in children less the two years of age. There has been a continuous increase in the number of cases affecting this age group over recent years (Figure 3). As rotavirus became notifiable in 2004 it is possible that figures for previous years underestimate the true burden of infection and this should be borne in mind when analyzing these data

Gender distribution

No significant gender bias was noted in 2005 with a male: female ratio of 1.11: 1. This is similar to the ratio observed in 2004 (1.18: 1)

Outbreak data

There was only one outbreak of rotavirus notified in 2005. This general outbreak occurred in the Eastern region in a residential institution. A total of 14 people became ill and the suspected mode of transmission was person-to-person spread.

Discussion

In 2004, rotavirus infections became statutorily notifiable for the first time under the disease category Acute Infectious Gastroenteritis (Amendment to the Infectious Diseases Regulations).[1] Prior to 2004 only gastroenteritis cases in children under two years of age were notifiable.

The crude incidence rate (CIR) of rotavirus increased in Ireland

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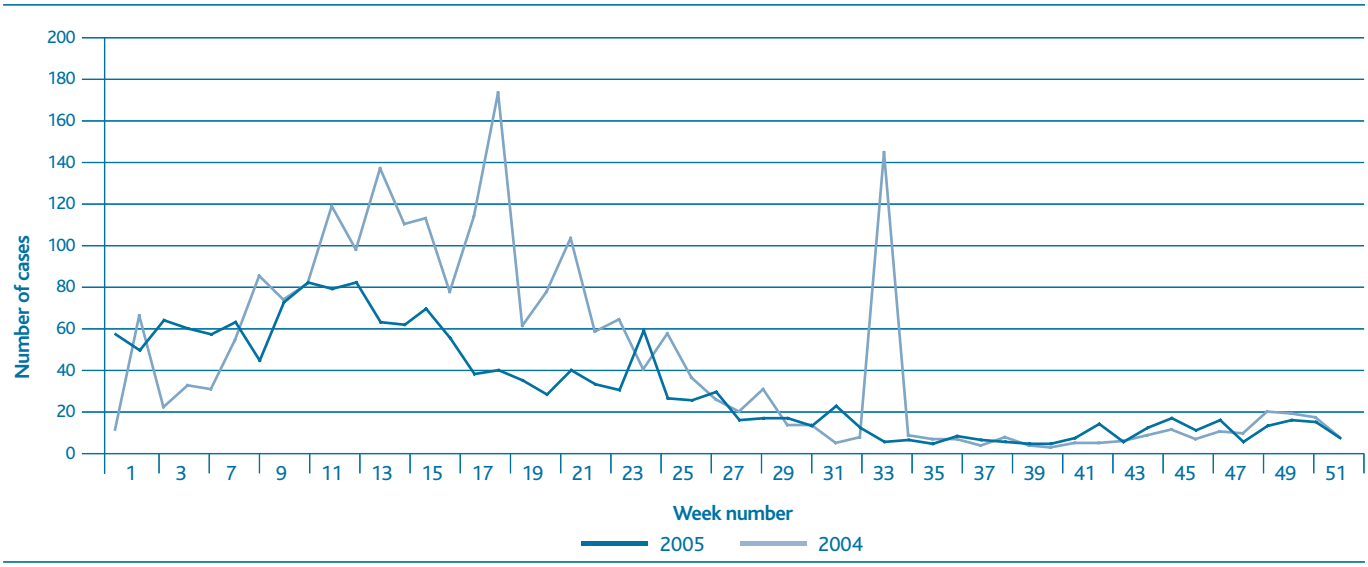

Figure 2: Total number of rotavirus events by week, 2005 (data from CIDR)

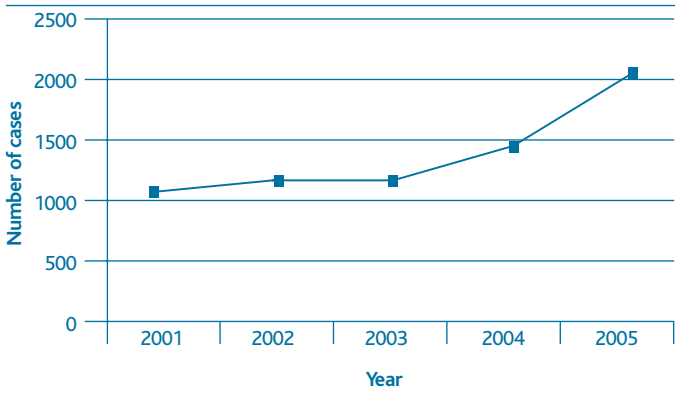

Figure 3: Number of cases of rotavirus in children less than two by year, 2001 to 2005

in 2005 (57.5 cases/100,000 persons) compared to 2004 (40.8/100,000). In most regions, an increase was seen in 2005, especially in the WHB region. For the same period, lower rates were noted for England and Wales[2,3] (26.8/100,000) [*calculated from provisional data 28/09/06*] and Scotland[4] (31.5/100,000). However rotavirus is not statutorily notifiable in the UK and so meaningful comparisons cannot be made.

Analysis of the data presented here shows that children less than two years of age are most at risk. This was also noted in 2004 and is a well-reported feature of the illness worldwide. Seasonal peaks in winter/spring, as observed here, are also a common feature of rotavirus infections in temperate climates.

The morbidity and associated medical costs associated with rotavirus infections is considerable, the extent of which was highlighted in an Irish study published in 2003.[5] The study monitored hospital admissions, treatments and costs of rotavirus infections in two paediatric hospitals, over a 2-year period. Results revealed that one percent of all hospital admissions were for community-acquired rotavirus. Of these cases, 87% required intravenous rehydration and 13% were rehydrated orally. The minimum cost per case was 728.40. This represents a significant burden on healthcare resources in Ireland.

It is a widely accepted theory that every child will have a rotavirus infection within the first five years of life.[2] These early rotavirus infections induce long-lasting immunity and are the reason infections are uncommon in adulthood. This acquired immunity has prompted much research into the development of an effective vaccine in recent decades and is a high priority for international agencies such as WHO and the Global Alliance for Vaccine and Immunisations.

Acknowledgements

We wish to thank all who have provided data for this report, including specialists in public health medicine, senior/area medical officers, surveillance scientists, clinical microbiologists, medical scientists, infection control nurses, principal/environmental health officers.

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Sexually Transmitted Infections in Ireland, 2004

Key Points

- **There were 10,695* sexually transmitted diseases (STIs) notified in Ireland in 2004. This represents an increase of 12.1% when compared to 2003 (n=9,538);**
- **The three most commonly notified STIs in 2004 were ano-genital warts (n=4,174), *Chlamydia trachomatis* (n=2,803) and non-specific urethritis (n=2,746);**
- **Notifications of ano-genital warts increased by 4.8%; *Chlamydia trachomatis* increased by 24.1% and non-specific urethritis by 17.8%;**
- **Notifications of infectious hepatitis B and syphilis decreased by 24.1% and 38.7% respectively;**
- **Notifications of gonorrhoea increased by 45.2%.**

**On 1st January 2004, Infectious Diseases Amendment S.I. No. 707 of 2003 established a revised list of STIs in which candidiasis, molluscum contagiosum and pediculosis pubis are no longer classed as notifiable diseases.*

Introduction

Sexually transmitted infections (STIs) give rise to illness, infertility and death. Estimates from the World Health Organisation (WHO) indicate that there are some 340 million new cases of syphilis, gonorrhoea, chlamydia and trichomoniasis in men and women aged 15–49 years around the world, each year.[1] STIs increase the risk of sexual transmission of HIV.

Early detection and treatment of STIs is important in order to protect the health of the population. The Health Protection Surveillance Centre (HPSC) is responsible for the ongoing, systematic collection, collation and analysis of data relating to trends in the notification of STIs in Ireland. This analysis is intended to inform public health action as well as informing the development of clinical and laboratory services around the country.

Following amendments to the Infectious Diseases Regulations (Infectious Diseases (Amendment) (No. 3) Regulations 2003, S.I. No. 707 of 2003), the list of notifiable STIs was revised in January 2004 to include the following 11 infections:

- Ano-genital warts;
- Chancroid;
- *Chlamydia trachomatis*;
- Genital herpes simplex;
- Gonorrhoea;
- Granuloma inguinale;
- Infectious hepatitis B;
- Lymphogranuloma venereum;
- Non-specific urethritis;
- Syphilis, and;
- Trichomoniasis.

Candidiasis, *molluscum contagiosum* and *pediculosis pubis* are no longer classified as notifiable STIs.

This report is a summary of the key findings noted from the 2004 data returns, a detailed comprehensive report relating to STI notifications in 2004 is available on the HPSC website.[2]

The incidence of STIs in Ireland continues to rise. Notifications increased by 12.1% in 2004 compared to 2003, this is despite the exclusion of notifications for candidiasis, *molluscum contagiosum* and *pediculosis pubis*.

Notifications for syphilis decreased by 38.7%. This is attributable to control measures introduced in response to an outbreak of syphilis that took place in Dublin between 2000 and 2002. This enhanced syphilis data is briefly summarized in this chapter, but has been reported more comprehensively elsewhere.[3]

STI surveillance in Ireland is largely based on notifications received from STI clinics. However, in response to changes in the Infectious Diseases Regulations, there was a notable increase in the number of notifications received from diagnostic laboratories in 2004. This is a welcome development as it helps to strengthen disease surveillance. Notifications are also received from primary care.

Despite changes to the legislation, STI surveillance in Ireland has a number of limitations. This was the subject of an extensive study undertaken by the HPSC in the course of 2004 and 2005. The report and its recommendations can be found on the HPSC website.[4]

Methods

Clinicians and laboratories notify their respective Department of Public Health of probable and confirmed cases of an STI. It is important to note that the current Infectious Diseases Regulations oblige both medical practitioners and clinical directors of diagnostic laboratories to notify the relevant Medical Officer of Health. Therefore, all clinicians regardless of setting have a statutory obligation to report probable and confirmed cases of a sexually transmitted infection.

Notifications are anonymised prior to reporting to the Medical Officer of Health. Data are then collated, aggregated and analysed at a local and regional level by individual Departments of Public Health, as well as nationally by the HPSC. Analyses are reported quarterly and annually.

This report predates recent organizational changes in the Health Service. Therefore, this document relates to eight HSE regions

- HSE-ER
- HSE-M
- HSE-MW
- HSE-NE
- HSE-NW
- HSE-SE
- HSE-S
- HSE-W

STI surveillance statistics relate to annual data from 1989 and quarterly data from 1995. The data are analysed and presented by disease, quarter year, HSE region, age group and gender. Rates per 100,000 population for the years 1989 to

Table 1: Numbers of current notifiable sexually transmitted infections, 2004 and 2003.

Sexually Transmitted Infection	2004	2003	Increase	% Increase
Ano-Genital Warts	4174	3981	193	4.8
Chancroid	1	0	1	0
Chlamydia Trachomatis	2803	2258	545	24.1
Genital Herpes Simplex	411	375	36	9.6
Gonorrhoea	270	186	84	45.2
Granuloma Inguinale	1	0	1	0
Infectious Hepatitis B	85	112	-27	-24.1
Lymphogranuloma Venereum	0	0	0	0
Non-Specific Urethritis	2746	2332	414	17.8
Syphilis	144	235	-91	-38.7
Trichomoniasis	60	59	1	1.7
Total	**10695**	**9538**	**1157**	**12.1**

Table 2: Numbers of current notifiable sexually transmitted infections, 1989 to 2004.

Sexually Transmitted Infection	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Ano-Genital Warts	505	917	1089	1066	1432	1532	1972	2286	2514	2886	3049	3735	3993	3932	3981	4174
Chancroid	2	0	0	2	0	2	3	1	1	0	1	16	1	1	0	1
Chlamydia Trachomatis	174	215	164	192	315	133	245	364	462	646	869	1343	1649	1922	2258	2803
Genital Herpes Simplex	78	123	109	125	124	173	198	181	211	243	275	269	331	358	375	411
Gonorrhoea	27	90	73	51	24	98	91	83	98	125	175	290	349	214	186	270
Granuloma Inguinale	0	0	0	0	6	0	0	1	1	0	1	0	0	0	0	1
Infectious Hepatitis B	0	0	0	0	0	0	4	2	0	0	2	15	39	57	112	85
Lymphogranuloma venereum	0	0	0	0	0	0	0	0	5	1	2	0	0	1	0	0
Non-Specific Urethritis	600	738	549	585	756	610	781	823	1034	1083	1265	1726	1634	2025	2332	2746
Syphilis	12	19	20	20	8	11	11	17	16	15	6	46	279	303	235	144
Trichomoniasis	51	86	163	41	57	29	60	71	94	38	47	78	64	73	59	60
Total	**1449**	**2188**	**2167**	**2082**	**2722**	**2588**	**3365**	**3829**	**4436**	**5037**	**5692**	**7518**	**8339**	**8886**	**9538**	**10695**

1993 are based on the 1991 population census; rates for the years 1994 to 1999 are based on the 1996 population census and rates for the years 2000 to 2004 are based on the 2002 population census. It should be noted that cases of infectious hepatitis B may also be reported through the weekly infectious disease report published by HPSC and although they are identified in STI clinics, they may not have been acquired through sexual contact.

Results

Notified STIs between 1989 and 2004

During 2004, 10,695 STI notifications were recorded compared to 9,538 in 2003 (12.1% increase (table 1)). STI notifications have risen consistently each year since 1994. The incidence of sexually transmitted infections has risen by 313.3% between 1994 and 2004 (figure 1).

Since the last annual report, gonorrhoea notifications have increased by 45.2%. Notifications of *C. trachomatis*, non-specific urethritis, genital herpes simplex and ano-genital warts have also increased (table 1).

Notifications of syphilis and infectious hepatitis B decreased, syphilis by 38.7% and infectious hepatitis B by 24.1%. The cumulative rate per 100,000 population for all STIs notifications increased from 243.5 per 100,000 in 2003 to 273 per 100,000 population in 2004. Table 2 outlines annual notification by infection and year. The general upward trends in the most common STI notifications are illustrated in figures 2-8.

Notified STIs by HSE region, 2004

The majority of STI notifications during 2004 were from the HSE-ER (47.2%). Four HSE regions (ER, MW, S and W) accounted for 87.4% of all notifications (table 3).

Notified STIs by age group and gender, 2004

STIs in males accounted for 51% of all notifications, 36.4% were females. Data relating to gender was not reported in 12.5% of cases (table 4). The majority of cases of gonorrhoea (86.7%), infectious hepatitis B (81.2%), non-specific urethritis (79.9%), syphilis (72.9%) and ano-genital warts (34.8%) were seen in males. The majority of notifications of trichomoniasis (91.7%), genital herpes simplex (66.4%) and *C. trachomatis* (53.2%) were seen in females (table 4).

In 2004, 11% (n=1,174) of notified cases of STIs were aged 0 to 19 years, 55.9% (n=5,983) were 20 to 29 years, 15.3% (n=1,632) were 30 to 39 years, and 5.5% (n=591) were aged 40 years of age or older. The age of cases was not reported in 12.3% of notifications (n=1,315). Those aged 20-29 years accounted for the largest number of notifications (table 5).

Disease-specific trends

Ano-genital warts

Ano-genital warts, the clinically visible manifestations of infection with human papilloma virus (HPV), were the most commonly notified STI in Ireland in 2004, accounting for 39% of all notifications. In 2004 ano-gential wart notifications (n=4,174, rate=106.6 per 100,000 population) increased by 4.8%, compared to 2003 (figure 2). The number of cases averaged over 1,000 cases per quarter. In 2004, males accounted for 34.8% of cases and females for 34.6% of cases

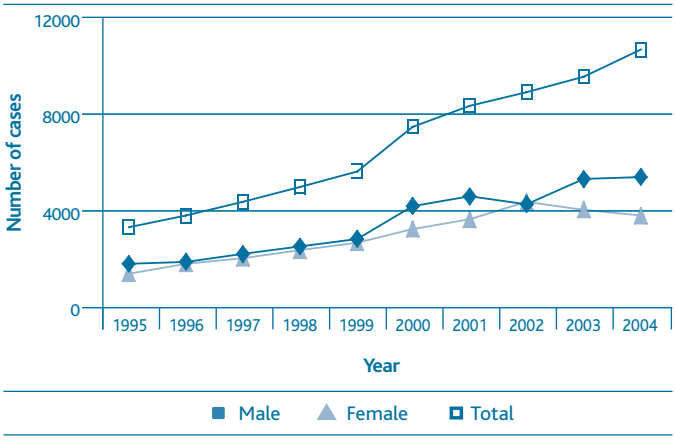

Figure 1. All currently notifiable STIs combined by year and by gender, between 1995 and 2004.

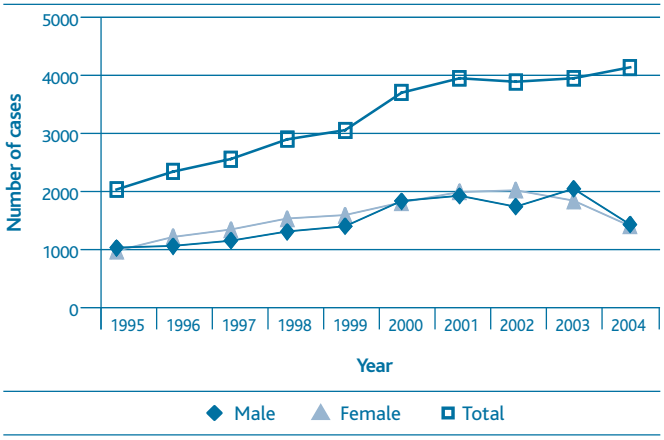

Figure 2. Ano-genital warts by year and by gender, between 1995 and 2004.

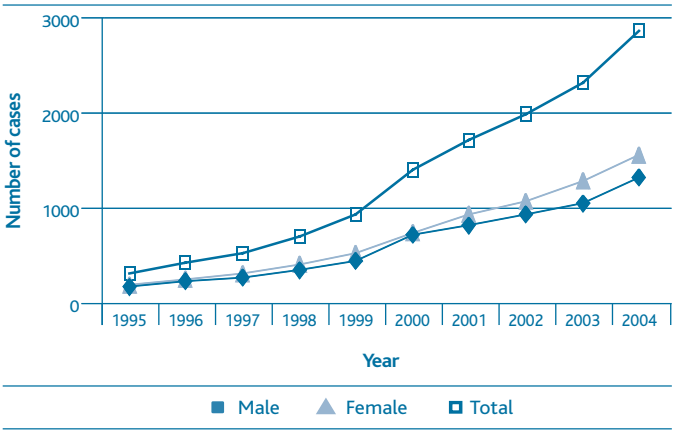

Figure 3. Trachomatis by year and by gender, between 1995 and 2004.

(gender was not reported for 30.6% cases). Those aged 0-19 years accounted for 8.8% of the total, 44.9% of cases were aged 20-29 years, 11.8% were aged 30-39 years and 3.8% were aged 40 years or older. Information relating to age group was reported in 30.7% of cases.

It is estimated that many more people without warts have subclinical disease or latent infection with HPV. Most visible ano-genital warts are benign and caused by HPV types 6 and 11. Infection with some other HPV types, especially 16, 18, 31 and 45 may lead to the development of invasive cervical cancer and other cancers of the ano-genital tract.[5]

Chancroid

Chancroid is an uncommon infecton. Since 1989, and with the exception of 2000 (when 16 cases were notified), the number of notification has ranged between 0 and 3.

Chlamydia trachomatis

The number of *C. trachomatis* notifications has increased steadily since 1995 (figure 3). There were 2,803 cases (71.6 per 100,000 population) notified in 2004. Notifications in the fourth quarter of 2004 were the highest recorded in any one quarter. *C. trachomatis* accounted for 26.2% of all STI notifications in 2004. In addition to a true underlying increase in the number of people infected, this increase reflects increased testing and the use of highly sensitive and specific DNA amplification techniques (NAATS). The numbers reported are likely to represent a substantial underestimate of the true burden of disease as *C. trachomatis* infection is asymptomatic in at least 70% of women and 50% of men.[6]

Males accounted for 45.1% of cases, females 53.2% (gender was not reported in 1.7% cases). Those aged 0-19 years accounted for 14.1%, those aged 20-29 years, 69.8%, 12.5% were aged 30-39 years and 2.9% were aged 40 years or older. Age data were not reported for 0.8% of cases.

The STI subcommittee of Scientific Advisory Committee (SAC) of the HPSC has recently highlighted the need for chlamydia screening in Ireland and strongly recommended that the feasibility, acceptability, likely uptake and effectiveness of screening in various settings in Ireland be examined as a matter of priority.[7]

Genital herpes simplex

Genital herpes simplex notifications increased by 9.6% since 2003 (figure 4). A total of 411 cases were reported (10.5 per 100,000 population). There was a decrease in notifications in Q2 (n=86) and a rise during Q4 (n=117). Males accounted for 32.8% of the total and females 64.4%. Gender was not reported in 0.7% cases. Those aged 0-19 years accounted for 10.7% of cases, while 55% of cases were aged 20-29 years, 22.9% were aged 30-39 years and 10.2% were aged 40 years or older. Age was not reported in 1.2% of cases.

Gonorrhoea

The peak in gonorrhoea notifications observed in 2001 coincided with an outbreak of syphilis amongst Men who have Sex with Men (MSM). Gonococcal infections tend to be concentrated in core risk groups, such as MSM. This may be reflected in the 2004 data, in that 86.7% of notifications were male, and 11.1% were female.

Table 3: Notified sexually transmitted infections by HSE region, 2004 and percentage change compared to 2003.

Sexually Transmitted Infection	HSE-ER	HSE-M	HSE-MW	HSE-NE	HSE-NW	HSE-SE	HSE-S	HSE-W	Total
Ano-Genital Warts	1813	0	526	1	217	393	698	526	4174
Chancroid	0	0	0	0	0	0	0	1	1
Chlamydia Trachomatis	1563	39	208	36	78	159	380	340	2803
Genital Herpes Simplex	248	0	27	0	2	14	51	69	411
Gonorrhoea	189	1	8	1	6	12	29	24	270
Granuloma Inguinale	0	0	1	0	0	0	0	0	1
Infectious Hepatitis B	57	0	10	1	8	0	3	6	85
Lymphogranuloma Venereum	0	0	0	0	0	0	0	0	0
Non-Specific Urethritis	1058	0	908	0	163	183	331	103	2746
Syphilis	97	1	8	2	1	4	20	11	144
Trichomoniasis	25	9	1	5	1	4	12	3	60
	5050	**50**	**1697**	**46**	**476**	**769**	**1524**	**1083**	**10695**
Total	**47.2%**	**0.5%**	**15.9%**	**0.4%**	**4.6%**	**7.2%**	**14.2%**	**10.1%**	**100%**

There were 270 cases of gonorrhoea notifications in 2004 (figure 5) (6.9 per 100,000 population). This reflects a rise of 45.2% in the number of reported cases compared to 2003. Those aged 0-19 years accounted for 6.3% of cases, 58.9% of cases were aged 20-29 years, 23.7% were aged 30-39 years and 11.1% were aged 40 years or older.

It should be noted that the reported numbers of gonorrhoea, like chlamydia, are likely to represent an underestimate of the true incidence of infection, as gonorrhoea can be asymptomatic in up to 86% of women and 55% of men.[8]

Granuloma inguinale

Granuloma inguinale is a rarely reported infection in Ireland. The number of cases of granuloma inguinale has ranged from 0 to 6 cases per year, between 1989 and 2004.

Infectious Hepatitis B

Between 1989 and 1999, infectious hepatitis B cases reported through the STI quarterly notification system ranged from 0 to 4 cases per year. Notifications increased from two cases in 1999 to 112 in 2003, the highest yearly total on record (figure 6). A large proportion of this rise is attributable to increased screening and testing. In 2004, 85 notifications were received (2.2 per 100,000 population), a decrease of 24.1% compared to 2003. Males accounted for 81.2% of notifications, and females 15.3% (gender was not reported in 3.5% cases). The number of male cases increased by 4.5%, female cases decreased by 71.7% in 2004, compared to 2003. Those aged 0-19 years accounted for 11.8% of notifications, 40% of cases were 20-29, 32.9% were 30-39 and 15.3% were aged 40 years or older.

Lymphogranuloma venereum

No cases of lymphogranuloma venereum (LGV) were notified during 2004. Notifications of LGV have ranged between 0 and 5 cases per year, between 1989 and 2004.

Non-specific urethritis

In 2004, 2,746 cases of non-specific urethritis were notified (figure 7) (70.1 per 100,000 population). Males accounted for 79.9% of cases, and females 20% (gender was not reported 0.1% cases). This represents a 20.4% rise in male notifications and an 8.1% rise in female notifications compared to 2003. Those aged 0-19 years accounted for 12.1% of notifications, 60.4% of cases were aged 20-29 years, 19.3% were aged 30-39 years and 8.0% were aged 40 years or older. Non-specific urethritis accounted for 25.7% of all STI notifications in 2004.

Syphilis

Between 1989 and 1999 the mean number of annual notifications was 14.1 (figure 8). Notifications peaked in 2002 with 303 cases reported. Syphilis has remained endemic since.

In the course of 2004, 144 cases were notified (3.7 per 100,000 population). This represents a decrease of 38.7% compared to 2003. Males accounted for 72.9% of notifications and females 26.4% (gender was not reported 0.7% cases). This represents a 23.4% decline among men and a decline of 60.8% among women, compared to 2003. Of those cases notified, 2.8% were aged 0-19 years, 34.7% of

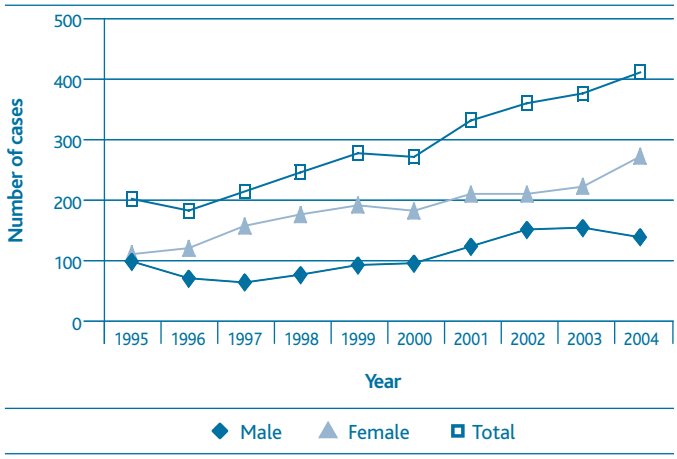

Figure 4. Genital herpes simplex by year and by gender, between 1995 and 2004.

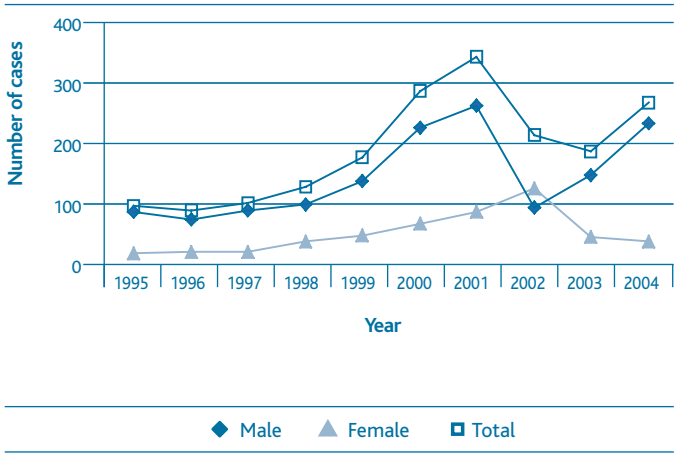

Figure 5. Gonorrhoea by year and by gender, between 1995 and 2004.

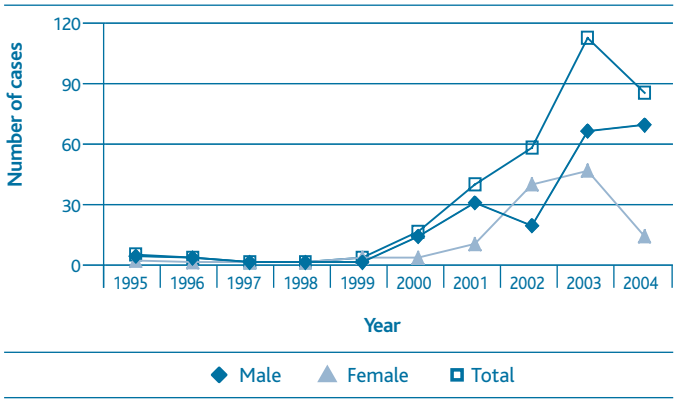

Figure 6. Infectious hepatitis B by year and by gender, between 1995 and 2004.

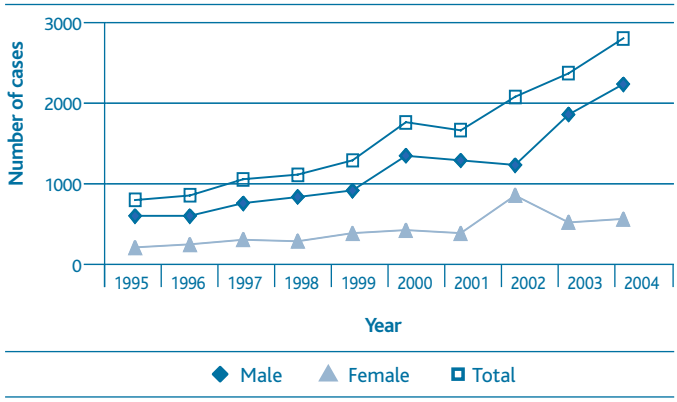

Figure 7. Non-specific urethritis by year and by gender, between 1995 and 2004.

cases were aged 20-29 years, 37.5% were aged 30-39 years and 23.6% were aged 40 years or older. Age was not reported in 1.4% of cases. Routine syphilis surveillance was enhanced in 2000 in response to the rise in notifications (see section on enhanced syphilis surveillance below for further details).

Enhanced surveillance of syphilis, 2004

Due to the complex nature of syphilis surveillance, this section relates only to enhanced surveillance reporting. Enhanced Surveillance was established in the year 2000 and modified somewhat in 2004. A total of 104 cases of syphilis were reported during 2004. Amendments to the Infectious Diseases Regulations resulted in a large number of notifications from laboratory sources during 2004 (n=199), due to the lack of enhanced surveillance data on these notifications; few are included in this analysis.

Reflecting the distribution of the population and provision of clinical services, 99% of cases (n=103) were reported by the HSE-ER. With regard to stage of illness at the time of diagnosis, of the 104 cases reported, 72.1% (n=75) cases were early* syphilis and 13.5% (n=14) were late† syphilis cases. Men accounted for 79.8% (n=83/104) of diagnoses and women 20.2% (n=21/104). MSM accounted for 57.7% (n=60/104) of cases: 93.3% (n=56) were homosexual and 6.7% (n=4) were bisexual. Of particular concern is the proportion of cases attributed to heterosexual contacts - 38.5% (n=40), of whom 55% were male and 45% female. Sexual orientation was unaccounted for in 3.8% (n=4) of cases. HIV positivity was reported in 16.3% (n=17/104) of cases, 11 of whom were early syphilis cases, two were late syphilis cases and staging was unknown in four cases. A concurrent STI was reported in 15.4% of cases; 68.8% were early syphilis cases and 12.5% were late syphilis. HIV was not diagnosed as a concurrent infection. Of those women (n=8) who were diagnosed through antenatal screening, most were diagnosed with early syphilis.

*Early (infectious) syphilis cases refer to primary, secondary and early latent syphilis cases.

†Late syphilis cases refer to late latent and tertiary syphilis cases.

Trichomoniasis

Trichomoniasis notifications fluctuated significantly between 1989 and 2004. The highest number of cases on record occurred in 1991 when 163 notifications were made (4.6 per 100,000 population). The average number of notifications for all years between 1989 and 2004, excluding 1991, was 60.5. During 2004, 60 cases (1.5 per 100,000 population) were notified. This represents an increase of 1.7% compared to 2003. Five percent of cases notified were male and 91.7% were female. The number of male cases decreased by 70% and the number of female cases increased by 12.2%, compared to 2003. Notifications among those aged 0-19 years account for 6.7% of the total number of cases, 38.3% of cases were aged 20-29 years, 31.7% were aged 30-39 years and 23.3% were aged 40 years or older.

Discussion

The incidence of sexually transmitted infections in Ireland continues to rise. The upward trend reflects changing social values and lifestyles choices. The figures suggest that more

Table 4: Notified sexually transmitted infections by gender, 2004.

Sexually Transmitted Infection	Male	Female	Gender UK[1]	Total
Ano-Genital Warts	1454	1445	1275	4174
Chancroid	0	1	0	1
Chlamydia Trachomatis	1264	1492	47	2803
Genital Herpes Simplex	135	273	3	411
Gonorrhoea	234	30	6	270
Granuloma Inguinale	1	0	0	1
Infectious Hepatitis B	69	13	3	85
Lymphogranuloma Venereum	0	0	0	0
Non-Specific Urethritis	2193	550	3	2746
Syphilis	105	38	1	144
Trichomoniasis	3	55	2	60
Total	**5458**	**3897**	**1340**	**10695**
%	**51%**	**36.4%**	**12.5%**	**100%**

[1]UK=Unknown.

Table 5: Notified sexually transmitted infections by age group (years), 2004.

Sexually Transmitted Infection	0-19	20-29	30-39	40+	Age UK[1]	Total
Ano-Genital Warts	367	1875	492	159	1281	4174
Chancroid	0	1	0	0	0	1
Chlamydia Trachomatis	395	1955	350	80	23	2803
Genital Herpes Simplex	44	226	94	42	5	411
Gonorrhoea	17	159	64	30	0	270
Granuloma Inguinale	0	1	0	0	0	1
Infectious Hepatitis B	10	34	28	13	0	85
Lymphogranuloma Venereum	0	0	0	0	0	0
Non-Specific Urethritis	333	1659	531	219	4	2746
Syphilis	4	50	54	34	2	144
Trichomoniasis	4	23	19	14	0	60
Total	**1174**	**5983**	**1632**	**591**	**1315**	**10695**
%	**11.0**	**55.9**	**15.3**	**5.5**	**12.3**	**100**

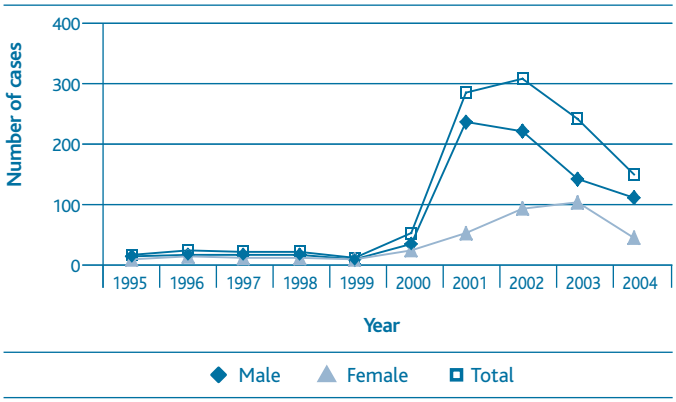

Figure 8. Syphilis, by year and by gender, between 1995 and 2004.

people are being tested and treated for sexually transmitted infections than ever before. Yet clearly more needs to be done to prevent infection and limit the harm that results. This requires relevant, timely and accurate information. The methods currently used to generate this information have a number of limitations. Chief among those is the absence of disaggregated and detailed demographic data. Due to the lack of demographic, clinical and risk factor data, it is not possible to characterize those individuals most at risk, nor it is possible to plan, structure or target sexual health services to meet the needs of the population.

The Sexually Transmitted Infections subcommittee for the Scientific Advisory Committee of the HPSC recently reviewed the adequacy of STI surveillance in this country.[4] Their report makes a number of important recommendations, not least is the call for a national Sexual Health Strategy. Such a strategy is necessary to provide a framework for the future development of prevention, diagnostic and treatment services such that they are fair, equitable and that they meet the needs of the population in an effective and acceptable manner.

There is an established body of evidence from the United Kingdom to suggest that sexual ill health is not equally distributed among the population. In the UK, the highest burden of illness is borne by women, gay men, teenagers, young adults and those from minority ethnic backgrounds. There is a strong link between social deprivation and the incidence of STIs.[9] STI surveillance in Ireland suggests that similar trends are evolving in this country. However, weaknesses in current systems hamper our ability to quantify the inequity and evaluate the effectiveness of control measures, including prevention and treatment. More work in this area is required.

Acknowledgements

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HIV and AIDS in Ireland, 2005

Key Points

- **During 2005, there were 318 newly diagnosed cases of HIV infection, a 10% decrease on the number of cases diagnosed in 2004 (356 cases)**
- **The cumulative total of HIV infections reported in Ireland to the end of December 2005 is 4,082**
- **Of the 318 cases, 159 were among heterosexuals, 66 among IDUs and 57 among MSM. Incomplete data were received for 28 (8.8%) of the newly diagnosed cases**
- **Of the 318 cases, 128 were born in Ireland, 116 were born in sub-Saharan Africa and 15 were born in other countries in western Europe. Information on geographic origin is unavailable for 42 of the newly diagnosed cases**
- **Twenty seven of the 318 cases newly diagnosed with HIV in 2005 were late diagnoses, i.e. they were diagnosed with AIDS at the time of HIV diagnosis**
- **A total of 876 AIDS cases and 431 deaths among HIV/AIDS cases have been reported to the HPSC up to the end of December 2005**

Introduction

During 2005, an estimated 4.1 million people worldwide became newly infected with HIV and an estimated 2.8 million lost their lives to AIDS.[1] HIV infection remains a disease of major public health importance in the WHO European region, with increasing numbers of people living with HIV.[2]

Timely and complete HIV surveillance data are essential to accurately monitor trends in the epidemic. Data on HIV and AIDS in Ireland are obtained from the national HIV case based reporting system, a voluntary anonymised surveillance system. Neither HIV nor AIDS are statutorily notifiable at present in Ireland.

Materials and Methods

HIV and AIDS surveillance in Ireland is voluntary and anonymous and operates in cooperation with laboratories, clinicians and departments of public health. For every newly diagnosed HIV infection, a HIV/AIDS surveillance report form is sent by the laboratory which confirms the diagnosis, to the treating clinician. Forms are completed by the clinician and forwarded to the appropriate department of public health which in turn forwards them to the HPSC where national figures are collated. Analysis of HIV data is carried out by the HPSC every six months and a report is published on the HPSC website. Clinicians are also asked to report all cases of AIDS and deaths among HIV/AIDS patients to the HPSC using the HIV/AIDS surveillance report form. A summary of the HIV and AIDS data are forwarded twice yearly to the European Centre for the Epidemiological Monitoring of AIDS (EuroHIV).

Table 1: HIV infected patients in Ireland by probable route of transmission (up to end December 2005)

Probable route of transmission	2005	Cumulative Total (to end Dec. 2005)
IDU	66	1270
Heterosexual	159	1487
MSM	57	885
Haemophiliac	-	106
Children (including MCT)	3	85
Transfusion Recipient	4	11
Other	1	93
Unknown	28	145
Total	**318**	**4082**

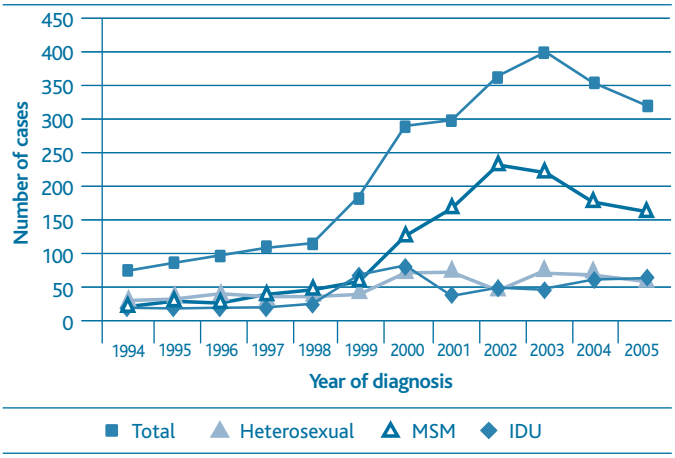

Figure 1: Newly diagnosed HIV infections in Ireland among heterosexuals, MSM and IDUs (1994 to 2005)

Results

Newly diagnosed HIV infections

During 2005, a total of 318 HIV infections were newly diagnosed, compared to 356 cases in 2004 and 399 cases in 2003. The rate of HIV infection in 2005 was 81 per million population. The cumulative total number of HIV infections reported up to the end of December 2004 was 4,082.

Probable route of transmission

Table 1 shows newly diagnosed HIV infections in 2004 and 2005 by probable route of transmission. The cumulative total of cases by probable route of transmission is also provided. Figure 1 shows trends in newly diagnosed cases from 1994 to 2005 by probable route of transmission for the three most frequent routes, namely, heterosexual contact (HC), men who have sex with men (MSM) and injecting drug users (IDUs). Information on risk group was unavailable for 28 (8.8%) of the cases newly diagnosed in 2005.

Heterosexual contact

There were 159 heterosexually acquired cases diagnosed during 2005. This compares to 178 cases in 2004 and 223 cases in 2003. Of the 159 heterosexual cases, there were 91 females and 68 males and the mean age was 33.4 years. Of the 159 cases acquired through heterosexual contact, 101 were born in sub-Saharan Africa (SSA) and 32 were born in Ireland. Seventeen (10.7%) of the 159 heterosexual cases diagnosed in 2005 were diagnosed late, i.e. diagnosed with AIDS at the time of HIV diagnosis.

Men who have sex with men

There were 57 new diagnoses among MSM during 2005, a decrease from the number diagnosed in 2004 (64 cases) and 2003 (75 cases). The mean age at HIV diagnosis in MSM in 2005 was 37.1 years. Of the 57 cases diagnosed in 2005, 37 (64.9%) were born in Ireland and seven (12.3%) in western Europe. Five (8.8%) of the 57 cases in MSM were diagnosed late.

Injecting drug use

There were 66 new diagnoses among IDUs during 2005, compared to 71 in 2004 and 49 in 2003. Of the 66 cases, 37 were male, 29 were female and the mean age at HIV diagnosis was 30.5 years. Fifty five (83.3%) were born in Ireland. Four (6.2%) of the 66 cases in IDUs were diagnosed late.

Mother to child transmission

There were three cases of mother to child transmission (MCT) diagnosed in children in 2005. Two children were born in SSA and one was born in Ireland. In this case, the mother was presumed to have been infected in SSA. In all three cases, the mother was diagnosed after the birth of the child. In addition, there were 105 babies born to a HIV infected mother during 2005, 90 are not infected and 15 remain of indeterminate status (i.e. do not meet the criteria for HIV infection and are <18 months at time of test).

Sex and Age distribution

Of the 318 cases newly diagnosed in 2005, 181 (56.9%) were

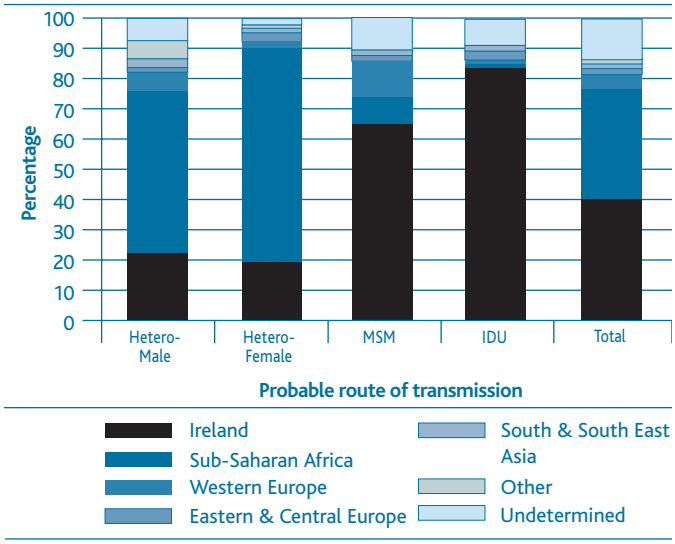

Figure 2: Newly diagnosed HIV infections in Ireland by probable route of transmission and geographic origin (2005)

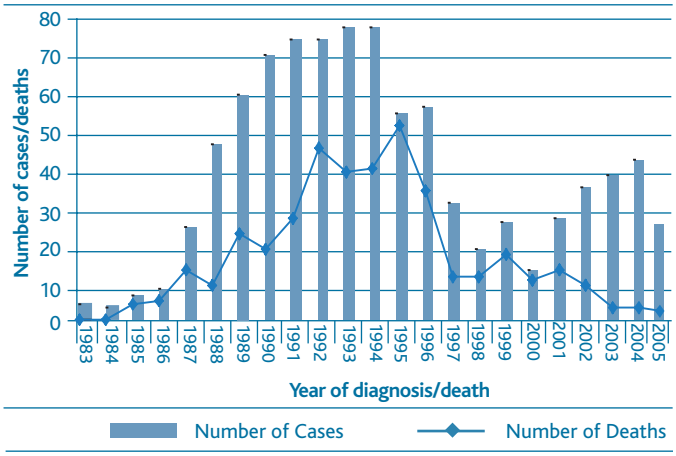

Figure 3: AIDS cases and HIV/AIDS related deaths, 1983 to 2005 (reported up to June 2006)

male and 136 (42.8%) were female, giving a male to female ratio of 1.3:1. Gender was unknown for one case. Among females, the most frequent route of transmission was heterosexual contact, which accounted for 67% of newly diagnosed infections. Among males, the most frequent routes of transmission were heterosexual contact (38%) and sex between men (31%). Of the 136 females who were diagnosed with HIV infection in 2005, 33 were reported to be pregnant at HIV diagnosis. Information relating to pregnancy status was not provided for 17 of the female cases.

Most of the newly diagnosed cases (74.5%) were aged between 20 and 40 years. The mean age at HIV diagnosis was 33.4 years. The mean age at HIV diagnosis was 29.7 years in females and 36.2 years in males, a difference of 6.5 years.

Geographic origin

Analysis of 2005 cases by geographic origin is presented in figure 2. Classification by geographic origin is as used by EuroHIV and is based on country of birth. Of the 318 cases diagnosed in 2005, 128 were born in Ireland, 116 in SSA, 15 in western Europe, seven in central and eastern Europe and five in south and south east Asia. Information on geographic origin is unavailable for 42 of the newly diagnosed cases.

Area of residence

Of the 318 cases newly diagnosed in 2005, 209 were resident in the Eastern Region (i.e. Dublin, Kildare and Wicklow) and 63 were resident elsewhere in the country at the time of HIV diagnosis. Information on area of residence is unavailable for 46 of the 318 cases. By risk group, 83.3% of IDUs, 73.7% of MSM and 67.7% of heterosexuals were resident in the Eastern region at HIV diagnosis.

Stage of infection

Information on stage of infection at time of HIV diagnosis was available for 267 of the newly diagnosed cases. Of the 267 cases, 179 were asymptomatic at HIV diagnosis and 27 were diagnosed with AIDS at the time of HIV diagnosis. Of the 27 late diagnoses, 17 were among heterosexuals, five among MSM and four among IDUs. The probable route of transmission was unknown for one case.

AIDS cases and deaths among HIV/AIDS cases

A total of 876 AIDS cases, including 190 cases (21.7%) in females, were reported to the end of 2005. Of the 876 AIDS cases, 390 (44.5%) were reported to have died. The total number of deaths in HIV infected individuals (with or without an AIDS diagnosis) reported to the end of 2005 was 431.

Figure 3 shows the number of AIDS cases and deaths reported among AIDS cases by year of diagnosis and year of death (includes all cases reported up to the end of December 2005). AIDS cases are analysed by year of diagnosis as recommended by NASC.[3] It is important to note that there is significant underreporting and late reporting of AIDS cases and deaths among HIV and AIDS cases. It is likely that further reports particularly relating to recent years, will be received and the number of cases of AIDS and deaths will be revised upwards for some years, in particular for the later years.

Discussion

Between 1998 and 2003, there was a dramatic increase in the number of newly diagnosed HIV infections in Ireland, from 120 cases in 1998 to 399 cases in 2003 (a 3.3 fold increase). This decreased to 356 cases in 2004 and 318 cases in 2005. While these data indicate a downward trend, it is important to note that these data do not represent HIV incidence. The data include individuals who were infected in previous years and depend on uptake of HIV testing. Available data on HIV infection in the EU show that the number of new HIV diagnoses increased from 14,028 in 2001 to 17,281 in 2004 (in 20 countries where complete data was available).[4] In addition, the ongoing increase in annual notifications of STIs in Ireland (from 2,588 in 1994 to 10,695 in 2004) is of concern as the presence of an STI is known to facilitate the transmission and acquisition of HIV.[5,6]

The drop in the number of newly diagnosed HIV cases is due predominantly to a decrease in the number of heterosexually acquired cases, from a peak of 232 in 2002 to 159 in 2005. This is largely due to a drop in heterosexually acquired cases in persons born in SSA, from 177 cases in 2002 to 101 in 2005. This may reflect the recent decrease in the number of asylum seeker applications (from 11,634 in 2002 to 4,323 in 2005), with possibly fewer cases being detected through the asylum seeker screening program. However, it is important to remember that people coming to Ireland from SSA do not form a homogeneous group and include students, immigrant workers, refugees, economic migrants, asylum seekers and others. The number of heterosexually acquired cases in persons born in Ireland remained steady between 2002 and 2005 with an average of 30 cases per year. Currently, heterosexual contact is the most frequently reported mode of transmission in most countries in western Europe with the number of cases in this transmission group almost doubling between 2001 and 2004 (from 5,968 to 11,126).[2] In many countries, as in Ireland, the majority of these cases were in persons born in countries with generalised epidemics. This is not unexpected given the prevalence of HIV in those regions of the world and reinforces the need to ensure that prevention and care services are adapted to reach migrant populations.

There were 57 new diagnoses among MSM during 2005, a decrease from the number diagnosed in 2004 (64 cases) and 2003 (75 cases). However, MSM continue to be a population at high risk for HIV infection and worryingly the number of HIV cases reported among MSM in most western European countries increased between 2000 and 2004.[2]

The number of new diagnoses among IDUs decreased in 2005 compared to 2004. There was a considerable jump in the number of cases in IDUs between 1998 and 1999 (from 26 to 69 cases) with an average number of 60 cases per year since then. Ongoing transmission of HIV among IDUs highlights the need for maintaining harm reduction measures in order to prevent transmission of blood borne viruses among this group.

The detection of HIV infection before or during pregnancy allows for the provision of appropriate care and treatment for

the mother and allows for the reduction or even prevention of mother to child transmission of HIV infection.[7] A policy to recommend and offer routine antenatal HIV testing to all women was introduced in Ireland in 1999. Since 2002, the HPSC has collected data on the uptake of the antenatal HIV test from all maternity hospitals/units in Ireland. Further information on the antenatal HIV screening programme can be found on the HPSC website (www.hpsc.ie).

The analysis of AIDS surveillance data and interpretation of trends is difficult. The usefulness of these data depends on the extent to which case reporting is complete and it is felt that there is considerable under-reporting and late reporting of AIDS cases and deaths among HIV/AIDS cases. The efficacy of highly active antiretroviral therapy (HAART), which was introduced in Ireland in 1996, has led to a fall in the number of patients who develop AIDS-defining conditions and has improved outcomes for those who do develop such conditions. Therefore, clinicians may no longer consider it meaningful to define patients in terms of their disease stage and consequently may be less likely to report an AIDS diagnosis. However, it appears that reporting of AIDS cases, particularly where HIV and AIDS are diagnosed simultaneously, has improved since the introduction of HIV case based reporting in 2001.

It is of concern that 27 of the 318 cases newly diagnosed with HIV in 2005 were late diagnoses, i.e. they were diagnosed with AIDS at the time of HIV diagnosis. There are significant benefits associated with diagnosing HIV as early in the course of infection as possible, both to the individual and to the community. These individuals who were diagnosed late do not have the opportunity to avail of treatment and intervention prior to their AIDS diagnosis.

More detailed HIV and AIDS reports are available on the HPSC website (http://www.ndsc.ie/A-Z/HepatitisHIVAIDSandSTIs/HIVandAIDS/Publications/).

Acknowledgements

The HPSC wish to thank all who have contributed to HIV and AIDS surveillance - the National Virus Reference Laboratory, microbiology laboratories, the Department of Health and Children, the departments of public health, consultants in infectious disease/GUM and all other clinicians involved.

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Viral Hepatitis in Ireland, 2005

Key Points

- **Hepatitis A incidence remained low, with 56 cases notified in 2005**
- **The number of hepatitis B notifications continued to increase with 905 cases reported in 2005, compared to 724 cases in 2004**
- **Where acute/chronic hepatitis B status was known, 90.5% (n=705) of cases were reported as chronic and 9.5% (n=74) were reported as acute**
- **Increases were also seen in hepatitis C notifications, with 1,439 cases reported, compared to 1,136 in 2004. The majority of cases occurred in young adults**
- **Baseline data collection for the national database for people infected with hepatitis C though administration of blood and blood products has been completed. The first annual report will be produced in early 2007**

Viral Hepatitis - Type A

Introduction

Hepatitis A is an acute, usually self-limiting disease of the liver caused by the hepatitis A virus (HAV). It is transmitted by person-to-person contact, primarily via the faecal-oral route and is associated with poor hygiene and sanitation and water that is contaminated with human faecal matter.[1]

In developed countries, hepatitis A is most commonly seen among travellers to endemic countries, injecting drug users (IDU), men who have sex with men (MSM) and household or sexual contacts of known cases. Sporadic food and waterborne outbreaks and outbreaks in crèches also occur. The median incubation period for hepatitis A is 30 days and infection can usually be transmitted from one to three weeks prior to onset of illness to approximately one week after the appearance of jaundice. Prolonged viral excretion, for up to six months, can occasionally occur. Clinical severity tends to increase with age and adults can experience severe illness lasting several months. Symptoms include sudden onset of fever, fatigue, loss of appetite, nausea and abdominal pain. Jaundice usually occurs within a few days of onset of symptoms.[1,2]

A safe and effective vaccine is available for hepatitis A. In Ireland, vaccination is recommended for individuals in high-risk groups such as travellers to high endemicity countries, patients with chronic liver disease, individuals at occupational risk, close contacts of infected persons, individuals with haemophilia and recipients of plasma-derived clotting factors.[3]

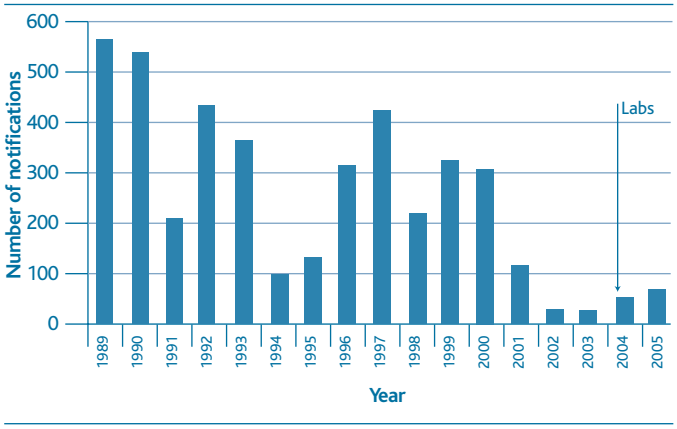

Figure 1. Number of cases of hepatitis A notified, 1989-2005

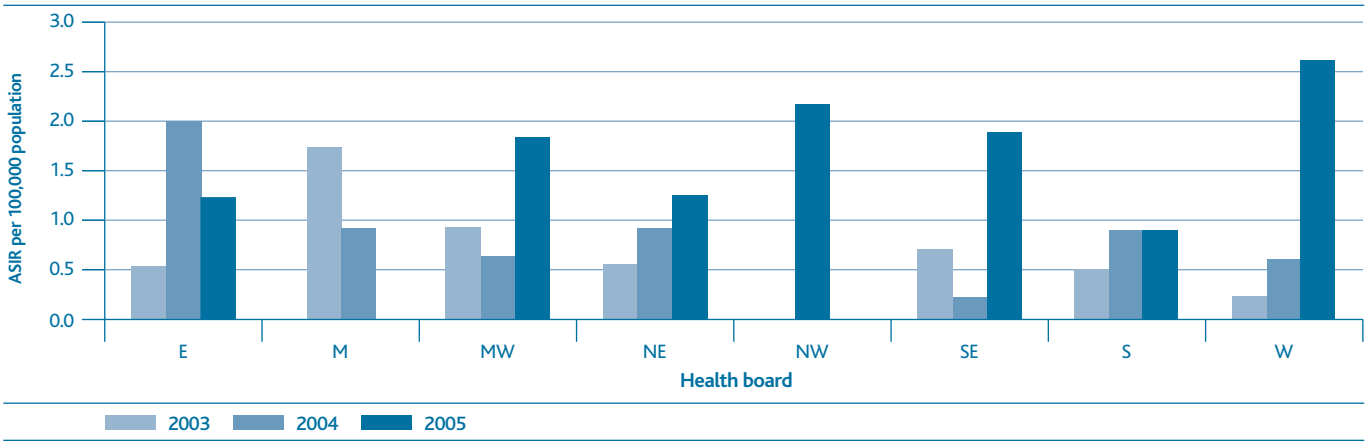

Figure 2. Age-standardised incidence rates of hepatitis A per 100,000 population by HSE area, 2003-2005

Materials and Methods

Hepatitis A is a notifiable disease under the Infectious Diseases Regulations 1981. Aggregate data on notifications are available from 1982 and disaggregate data are available since mid-2000. An amendment to the regulations implemented on 1st January 2004 (S.I. 707 of 2003) introduced case definitions and mandatory laboratory reporting.[4]

Results

Hepatitis A incidence remained relatively low in 2005, with 56 cases notified to HPSC. This corresponds to an age-standardised incidence rate (ASIR) of 1.4/100,000 population and represents an increase of 19% compared to the number of notifications received in 2004 (n=47) (figure 1). Forty-eight cases were reported as confirmed, six were reported as possible and the case classification was not reported for two cases. The highest ASIRs were in the HSE-W (2.6/100,000 population, n=10) and HSE-NW (2.2/100,000 population, n=5) (figure 2). However, a large proportion (70%) of the HSE-W cases represented late notifications and had onset dates in 2004. Fifty-seven percent of cases notified in 2005 were female (n=32). Young adults aged between 25 and 44 years (n=25) and adults over the age of 65 years (n=12) were most affected. (figure 3). Four cases had travelled outside Ireland within the incubation period of the disease. No hepatitis A outbreaks were reported to the HPSC in 2005.

Discussion

There is currently no enhanced surveillance system for hepatitis A in Ireland, but risk factor information is collected in the context of outbreaks. In 2005, four cases were thought to be travel-associated. Little or no information on the source of infection was available for the remainder of the cases.

The age distribution of cases notified in 2005 is different to that in 2004, when the highest rates were in young children, followed by young adults. In 2005, high rates were seen in people aged over 65 years in addition to young adults. High rates in young adults are expected in countries with low endemicity as many people are not exposed to hepatitis A in childhood and hence are not immune. Young adults are more likely to travel outside of Ireland and eat in restaurants both on holidays and at home. The cases in the over 65s were not clustered in time or place and none of them were reported as being part of an outbreak.

Outside of Ireland, an outbreak among MSM was reported in Dorset, England and a foodborne outbreak was reported among Danish travellers returning from a holiday at a Turkish resort.[5,6]

Viral Hepatitis – Type B

Introduction

Hepatitis B virus is transmitted by contact with blood or body fluids of an infected person. The main routes of transmission worldwide are perinatal, child-child transmission, unsafe injections and sexual contact. Although only a small proportion of those infected experience symptoms in the acute phase, there is a high probability of developing chronic infection if the infection is acquired in infancy or early childhood. Approximately 90% of infants infected at birth, 20-50% of children infected between one and five years of age

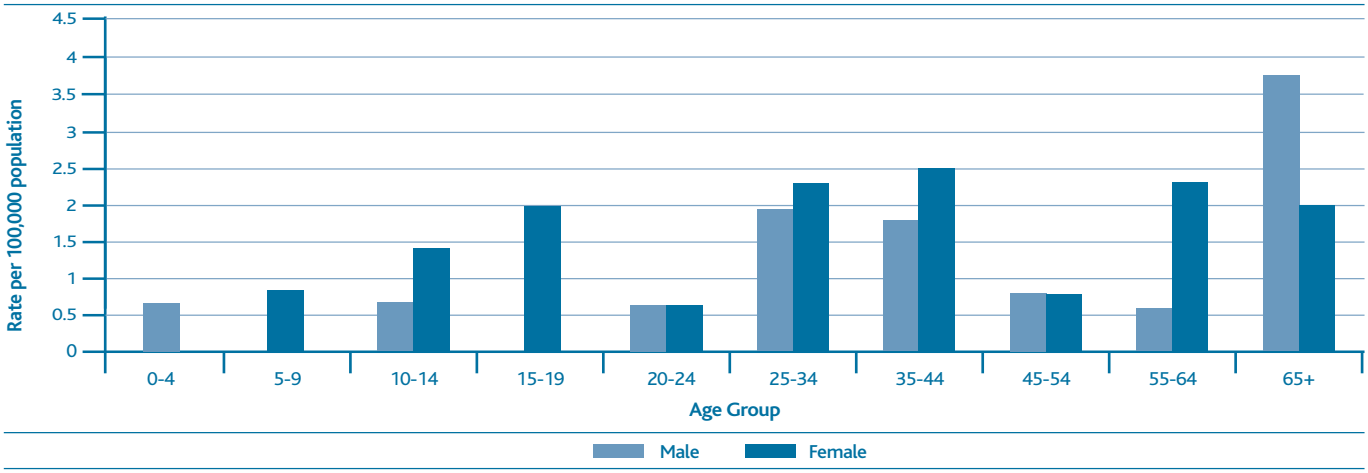

Figure 3: Age- and sex-specific incidence rates of hepatitis A per 100,000 population, 2005

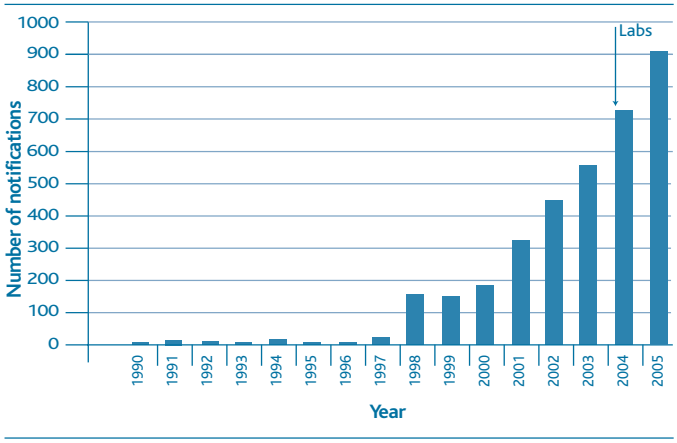

Figure 4. Number of cases of hepatitis B notified, 1990-2005

and 1-10% of those infected as older children or adults develop chronic hepatitis B infections.[1, 7]

It is estimated that more than 350 million people worldwide are chronically infected. In Sub-Saharan Africa, South-East Asia and parts of China over 8% of the population have chronic hepatitis B infections, most of which were contracted at birth or through child-to-child contact in household settings. Chronic infection is associated with an increased risk of developing liver cirrhosis and/or hepatocellular carcinoma and an estimated 15-25% of chronically infected people will die prematurely from these conditions.[1,7] The prevalence of hepatitis B virus infection in Ireland is low (<1%)[8], however infection is more prevalent in certain high-risk populations such as MSM, IDU[9,10], prisoners[11] and immigrants from intermediate- or high-endemicity countries.

Hepatitis B is a vaccine-preventable disease and in 1992 the WHO recommended that hepatitis B vaccine be included in routine immunisation programmes in all countries by 1997.[7] The current vaccination policy in Ireland is based on targeting identifiable risk groups for vaccination. These include babies born to mothers with acute or chronic hepatitis B infections, patients with chronic renal failure or haemophilia, individuals at occupational risk, close contacts of infected persons, IDU, prisoners, homeless people, heterosexuals with multiple partners and MSM.[3]

Materials and Methods

Hepatitis B is a notifiable disease under the Infectious Diseases Regulations 1981. An amendment to the regulations implemented on 1st January 2004 (S.I. 707 of 2003) introduced case definitions and mandatory laboratory reporting, and differentiated between notifications of acute hepatitis B and chronic hepatitis B for the first time.[4] Departments of Public Health, in conjunction with HPSC, introduced enhanced surveillance of acute cases of hepatitis B from January 2005. Some enhanced forms are also received for chronic cases.

Results

The increase in hepatitis B notifications seen in recent years continued in 2005, with 905 cases notified. This represents a 25% increase compared to 2004 (figure 4). The national age-standardised notification rate was 23/100,000 population, with the highest rates reported by the HSE-E (32.6/100,000 population, n=491) and the HSE-W (25.7/100,000 population, n=91) (figure 5). Case classification was reported for 821 cases, with 95% (n=777) of cases reported as confirmed and 5% (n=44) reported as probable.
Eighty-six percent of notifications (n=779) contained information on acute/chronic status. Where status was known, 90.5% of cases were reported as chronic (n=705) and 9.5% were reported as acute (n=74).

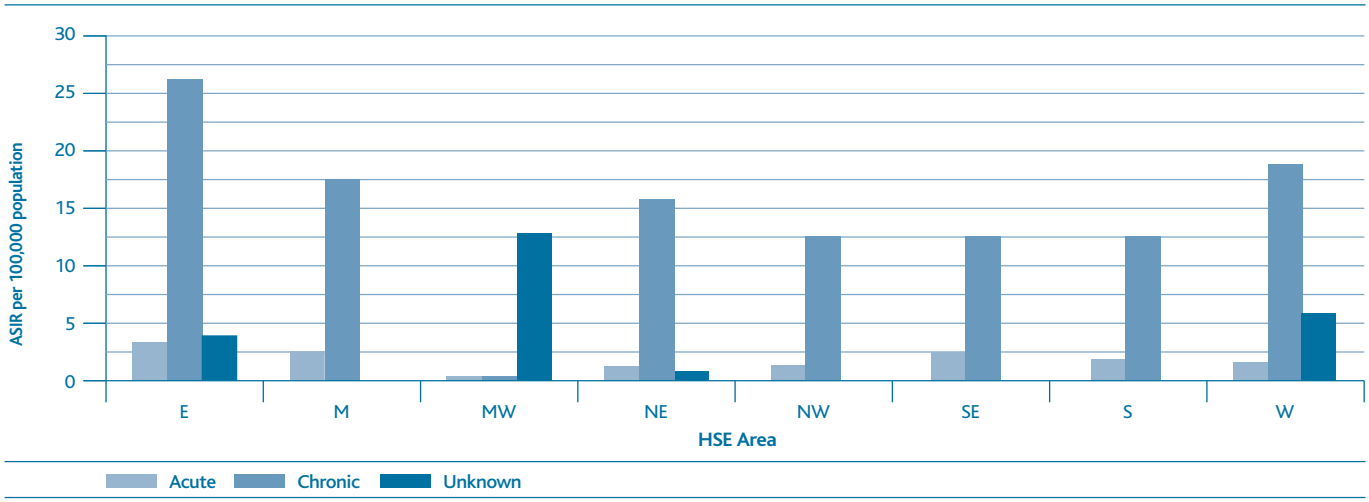

Figure 5. Age-standardised incidence rates of hepatitis B per 100,000 population by HSE area, 2005

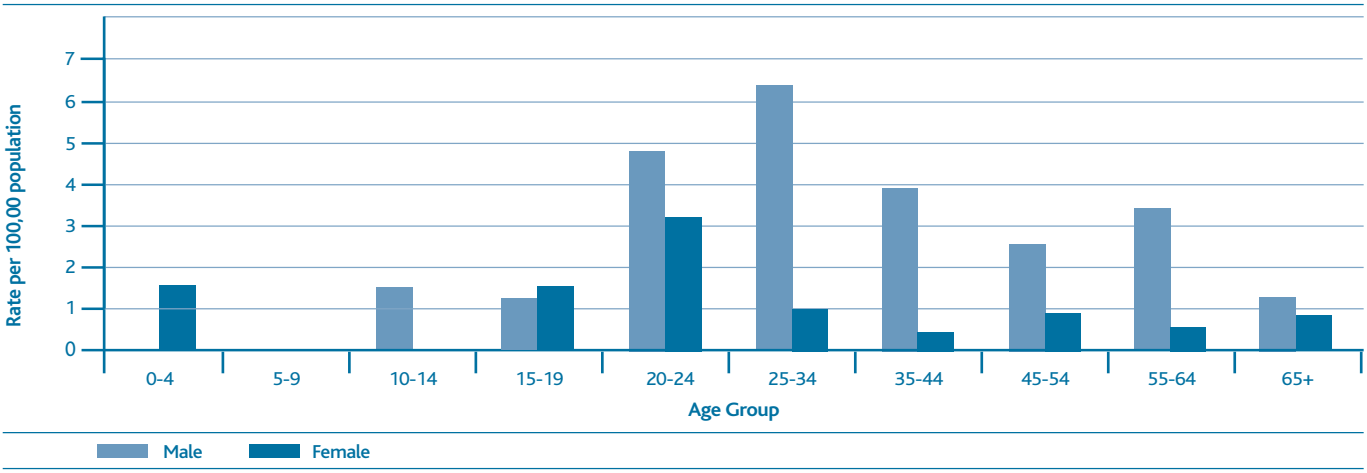

Figure 6a. Age-and sex-specific incidence rates of acute hepatitis B per 100,000 population, 2005

The age and sex breakdown for acute and chronic cases differed substantially and is presented separately in figures 6a and 6b. Seventy-six percent of acute cases notified in 2005 were male (n=56) and 24% (n=18) were female. Over 60% (63.5%, n=47) were aged between 20 and 44 years. However, adults of all ages were affected and 26% (n=19) of acute hepatitis B cases were aged 45 years or older. There was also a higher proportion of male (53%, n=372) chronic cases than female (41%, n=292), but the difference was not as marked (sex was unknown for 6%). Young adults were predominantly affected, with 82% (n=578) of chronic cases aged between 20 and 44 years. The age distribution for male chronic cases was slightly older than that for females.

Risk factor information and region of birth also differed between acute and chronic cases. Enhanced surveillance forms were received for 49 of the 74 acute cases and no risk factor was identified for 13 (26.5%) of these. The main risk factors identified for acute hepatitis B related to sexual exposure. Where enhanced data were received, 6.1% (n=3) of cases were associated with sexual contact with a known case of hepatitis B, 24.5% (n=12) of cases were MSM and a further 20% (n=10) were associated with possible sexual exposure (sexual orientation not identified). The cases with known or suspected sexual exposure ranged in age from 19 to 70 years and were mostly males (80%). Where reason for testing was identified (n=41), 73% (n=30) of acute cases were tested because they were symptomatic and 15% (n=6) were tested because they were MSM or went for STI screening. Where country of birth was known (59%, n=44), 75% (n=33) were born in Ireland.

Limited enhanced data and risk factor information were available for chronic cases, but where information was available, 139 out of 183 cases (76%) were identified as either asylum seekers or as having been born in a country where hepatitis B is endemic (hepatitis B surface antigen prevalence of 2% or higher). Where region of birth was identified (n=144), 52.1% (n=75) of chronic cases were born in Sub-Saharan Africa, 13.2% (n=19) were born in East Asia/The Pacific, 9.7% (n=14) were born in Central Europe and 7.6% (n=11) were born in Western Europe (10 in Ireland). The most common countries of birth were Nigeria (20.8%), China (11.8%) and Somalia (10.4%). Where the reason for testing was reported (n=116), 66% (n=76) of chronic cases were identified through asylum seeker screening and 9% (n=10) were identified through antenatal screening.

Discussion

Statutory notifications of hepatitis B have increased every year since 1999 and the epidemiology of hepatitis B in Ireland is changing. This is due in part to the changes in immigration patterns to Ireland associated with economic development. The number of asylum seeker applications increased from 1,179 in 1996 to a peak of 11,634 in 2002, and decreased to

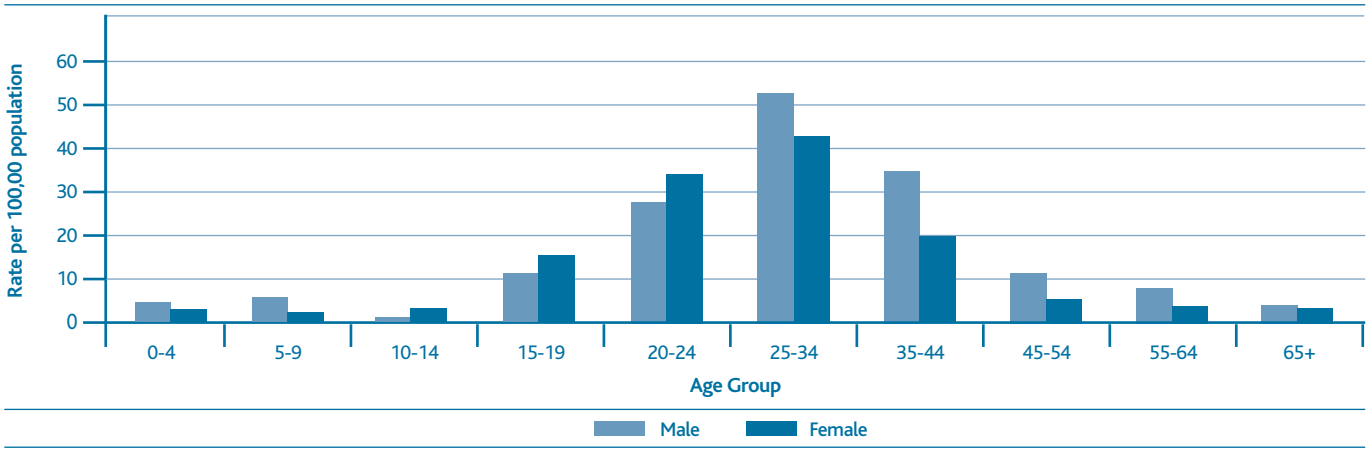

Figure 6b. Age- and sex-specific incidence rates of chronic hepatitis B per 100,000 population, 2005

4,323 in 2005.[12] The most common nationalities of asylum seekers in 2005 were Nigerian (34%), Somalian (9%) and Romanian (9%). All of these countries have either intermediate or high hepatitis B surface antigen prevalence. The number of work permits issued by the Department of Enterprise, Trade and Employment has also increased substantially in recent years, with 4,328 new permits issued in 1999 and 29,594 in 2002.[13] The number has decreased since then and 7,354 new permits were issued in 2005. The most common countries of origin in 2005 were the Philippines, India and South Africa, all of which have either intermediate or high hepatitis B endemicity. Limited information is available on the actual risk factors for cases with chronic infections but it is likely that a large proportion of infections were acquired at birth or in early childhood where individuals were born in countries with endemic hepatitis B.

The number of acute hepatitis B notifications also increased in 2005, with most cases occurring in Irish nationals. Sexual acquisition remained the dominant likely source of infection. The current immunisation policy in Ireland is based on targeting identifiable risk groups for vaccination. MSM and individuals who change sexual partner frequently are included as risk groups in the immunisation guidelines. However, there may be problems identifying people at risk. Most sexually acquired acute cases were tested for hepatitis B because they were symptomatic. Many people at risk may not attend STI clinics or discuss their sexual behaviour with their GPs and may never have been offered hepatitis B vaccination. The number of sexually-acquired acute cases in people aged over 35 years increased by 70% in 2005 compared to 2004 and people who fall outside of the expected demographic for sexually transmitted infections may be less likely to be offered vaccination.

A proportion of the increases seen in recent years are likely to be attributable to improvements in case identification and notification with the introduction of mandatory laboratory reporting and screening programmes such as voluntary health screening for asylum seekers and antenatal screening in many maternity hospitals.

Hepatitis B data have improved significantly with the introduction of case definitions, differentiation between acute and chronic hepatitis B and enhanced surveillance for hepatitis B. Further improvements are anticipated with the planned addition of the enhanced surveillance questions to CIDR by the end of 2006.

Viral Hepatitis-Type C

Introduction

Hepatitis C virus (HCV) was first identified in 1989. It was previously known as non-A non-B hepatitis and was known to be the cause of most transfusion-associated hepatitis. The WHO estimates that about 170 million people worldwide are currently infected with HCV. [1,14]

HCV is transmitted primarily via exposure to contaminated blood or blood products and the main causes of infection are sharing infected needles or other drug paraphernalia and the receipt of unscreened blood or blood products. Occupational

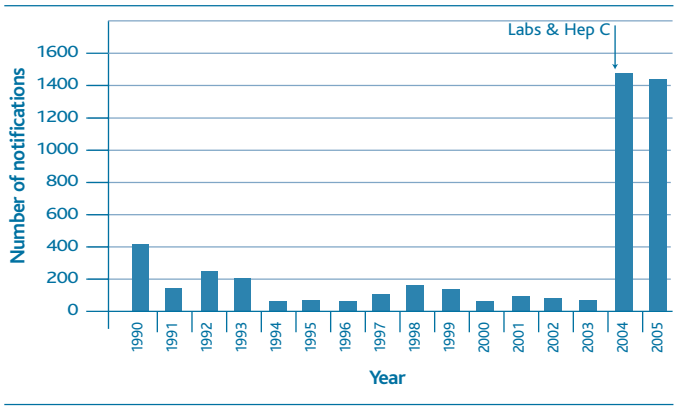

Figure 7. Number of notifications of hepatitis (type unspecified) 1990-2003, and number of notifications of hepatitis C in 2004 & 2005

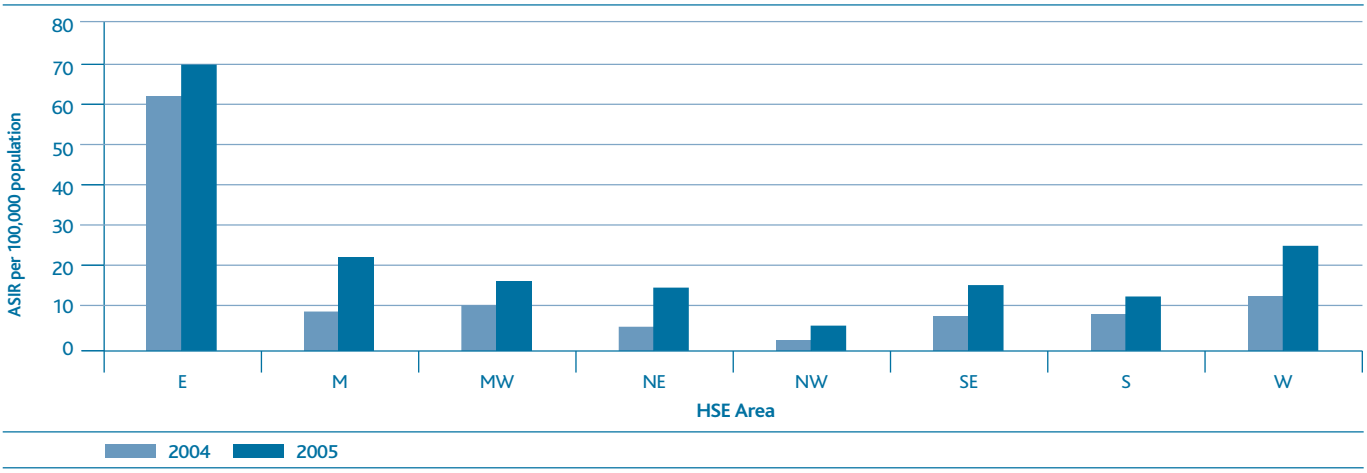

Figure 8. Age-standardised incidence rates of hepatitis C per 100,000 population by HSE area, 2004 & 2005

exposure to infected blood, mother-to-baby and sexual transmission also occur but are less common. In developed countries, it is estimated that 90% of people with chronic hepatitis C are current or former injecting drug users or have received unscreened blood or blood products.[1,14]

Over 90% of cases are asymptomatic in the acute phase of the disease but between 50 and 80% progress to chronic infection. Of those chronically infected about 10-20% develop cirrhosis and between 1 and 5% develop hepatocellular carcinoma over a period of 20-30 years. There is currently no vaccine available for hepatitis C. [1,14]

Materials and Methods

Hepatitis C became a notifiable disease under the Infectious Diseases Amendment Regulations introduced on the 1st January 2004 (S.I. 707 of 2003).[4] Previously hepatitis C could be notified under the category "viral hepatitis, type unspecified", but was not a notifiable disease in its own right. Since the HPSC started collecting disaggregate data in mid-2000, many of the notifications of viral hepatitis type unspecified have included information on the causative agent and most of these were hepatitis C.

Results

The number of cases of hepatitis C remained high in 2005 with 1,439 cases notified to the HPSC, compared to 1,136 in 2004 (figure 7). This corresponds to an ASIR of 36/100,000 population. Over 70% of all cases were reported by the HSE-E, giving an ASIR of 69/100,000 population (n=1063) (figure 8). Sixty-four percent (n=918) of cases were male and 35% (n=503) were female (sex was unknown for 1% (n=18)). Young adults of both sexes were most affected, with 80% (n=1,154) of cases aged between 20 and 44 years. The age breakdown of males and females was very similar (figure 9).

Discussion

Prior to 2004, there was very little routine information available to describe the epidemiology of hepatitis C in Ireland. The 2004 and 2005 data indicate that the incidence of hepatitis C is high and that the geographic distribution is skewed towards the HSE-E.

There is currently no enhanced surveillance system for hepatitis C. However, studies in Irish settings and anecdotal evidence indicate that new cases of hepatitis C are mainly occurring in injecting drug users and are strongly associated with sharing syringes or other drug paraphernalia.[9,10,11] A cross-sectional study of blood-borne infections in clients attending addiction treatment centres in the HSE-E found that 66% had antibodies to hepatitis C virus, and a national study of individuals entering prisons found that 72% of IDU had hepatitis C antibodies.[10,11] The skewed geographic distribution and the predominance of males and young adults of both sexes, in the notification data, are likely to be a reflection of this.

Additional information, particularly risk factor data, is essential for identifying populations at risk and for planning public health strategies for hepatitis C prevention and future

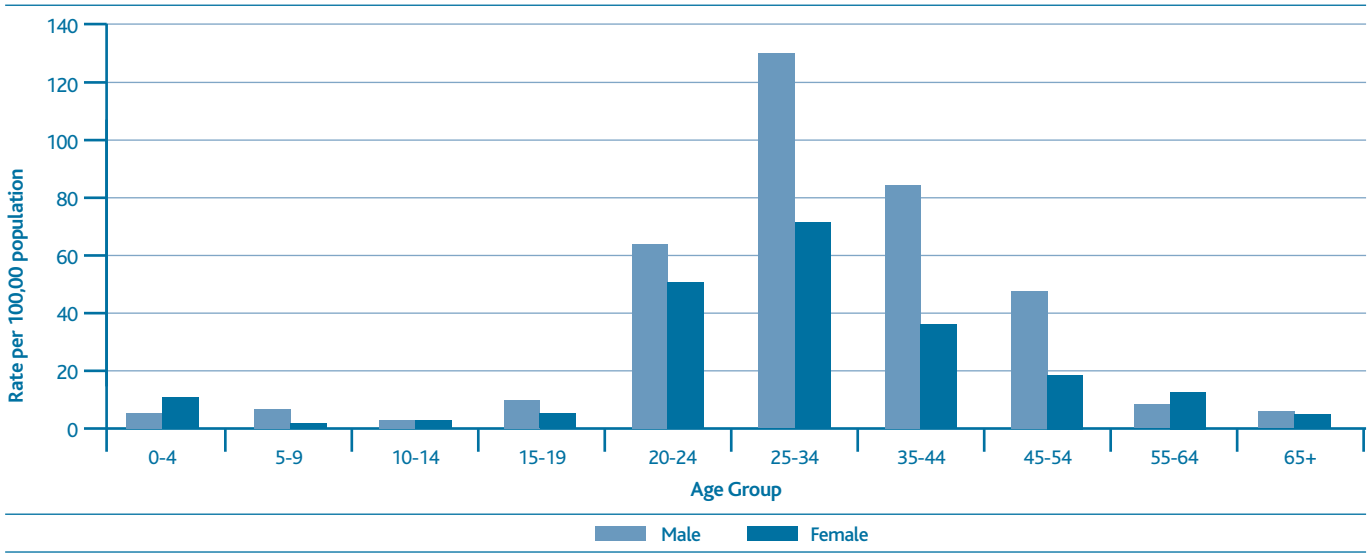

Figure 9. Age- and sex-specific incidence rates of hepatitis C per 100,000 population, 2005

health service provision. It is hoped that the proposed introduction of enhanced surveillance for hepatitis C, and the availability of this on CIDR, will result in improvements in the hepatitis C data.

National Hepatitis C Database

A national database of people infected with hepatitis C through the administration of blood or blood products has been set up by HPSC in association with the eight designated hepatology units. This project was recommended by the Consultative Council on Hepatitis C [15] and is supported financially by the Department of Health and Children. The objectives of the database are:

- To follow the natural history of infection in this group of people
- To evaluate the impact of various host factors on the progression of the disease
- To evaluate the outcomes of treatment
- To monitor the uptake of services
- To provide information for the planning and evaluation of health services
- To serve as a resource for future research into hepatitis C

Any person who has contracted hepatitis C infection through the administration of blood or blood products within the State is eligible to be included in the database. It is estimated that over 1,700 persons have been infected with hepatitis C in this way. These include women infected through anti-D immune globulin, persons with haemophilia, recipients of blood transfusion and persons who received treatment for renal disease.

Data collection commenced at the end of 2004 and is based on data contained in the medical records of patients who have attended any of the eight designated hepatology units. Baseline data collection has been completed and the first annual report will be published in early 2007. Follow-up information will be collected annually thereafter. Only patients who have given written consent are included in the database and the database does not contain names or addresses. Ethical approval for the database has been received from the ethics committees of the eight hospitals. Patient support groups are represented on the Steering Committee, which oversees the project. There will be an annual call for research based on the data contained in the database and this process will also be overseen by the Steering Committee.

Acknowledgments
HPSC would like to thank staff in the Departments of Public Health and all the laboratories and clinicians who provided data. Special thanks are also due to the staff in the hepatology units for all their work for the hepatitis C database. In particular, we would like to thank the NVRL, with whom we are working closely in order to more fully describe the epidemiology of hepatitis C in Ireland.

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Infectious Disease Notifications in Ireland, 2005

Key Points

- **There were 11,228 notifications reported through the weekly infectious disease notification system in 2005**
- **Infectious disease notifications in 2005 increased by 20% compared to 2004, i.e. 1,892 additional notifications in 2005**
- **Acute infectious gastroenteritis and mumps notifications predominantly accounted for this increase**
- **A rise in notifications due to cryptosporidiosis, hepatitis B, hepatitis C and influenza also contributed to the increase**

Introduction

Infectious diseases that are at the present time statutorily notifiable in Ireland are specified in the Infectious Diseases (Amendment) (No.3) Regulations 2003 (S.I. No. 707 of 2003) which came into effect on the 1st January 2004. As before clinicians and now laboratory directors are legally obliged to notify. The amendment legislation also introduced the use of case definitions for infectious diseases for the first time in Ireland and specified that unusual clusters or changing patterns of illness that may be of public health concern must be reported.

Under the legislation, as soon as a medical practitioner becomes aware of, or suspects that, a person is suffering from, or is a carrier of, an infectious disease specified in the regulations, or as soon as a clinical director of a diagnostic laboratory identifies an infectious disease specified in the regulations, he/she is required to provide a written or electronic notification to a Medical Officer of Health in the relevant HSE Area. For a subset of diseases that have serious public health implications, medical practitioners/laboratory directors are required to give immediate preliminary notification (e.g. by phone) to the Medical Officer.[1] These notifications provide the basis for disease control and surveillance in Ireland.

The medical officers in the HSE Areas investigate the notified cases as appropriate. Case investigation, depending on the disease, may include: 1) collecting more detailed data on the case including possible risk factors for the disease 2) obtaining a specimen for laboratory testing if not already obtained by

the medical practitioner 3) contact tracing i.e. identifying persons who may have been in contact with the patient during the time the patient was infected or during the time the patient was infectious or had the same exposure as the patient (e.g. ingested the same infected food or water). Contact tracing identifies exposed individuals who may be susceptible to the disease; prophylaxis or vaccination may be administered to these individuals (if appropriate and depending on the disease in question). The purpose of case investigation is to stop further spread of disease after a case is identified and to prevent the disease from occurring again.

The HSE Areas either enter the notifications directly into the Computerised Infectious Disease Reporting (CIDR) system to which HPSC has real-time access or they forward the notification data to HPSC on a weekly basis where these data are inputted to CIDR. At HPSC a weekly infectious disease report on national data is produced from CIDR. This report is distributed to those involved in the control and surveillance of infectious disease in Ireland. An abbreviated version of this report is also available on the HPSC website.

Surveillance at a national level allows infectious disease trends to be monitored, provides information about the need for, and impact of, infectious disease prevention and control programmes, guides infectious disease policy development and allows Ireland to meet international reporting requirements such as providing infectious disease data to EU disease specific networks and to the World Health Organisation (WHO).

A summary of the 2005 infectious disease data reported through the weekly infectious disease notification system is presented in this report.

Materials and Methods

HPSC and four of the HSE Areas namely HSE-M, HSE-NE, HSE-SE and HSE-S commenced using the CIDR system during 2005. (CIDR is described in a separate chapter in this document). The HSE Areas using CIDR enter infectious disease notifications directly onto CIDR. HPSC can view these data using the Business Objects reporting tool on CIDR (except for patient name and address). For HSE Areas not using CIDR during 2005, Medical Officers in the HSE Areas provided case based data to the Director of HPSC by the Wednesday of each week, on infectious diseases notified to them during the previous week, using an agreed dataset.[2] At HPSC, this data was inputted to a Microsoft Access database and then migrated to the CIDR system on the Thursday evening of each week. Following year-end, extensive data cleaning and validation was undertaken by HPSC in conjunction with the HSE Areas. Duplicate notifications were identified and removed, case classifications were reviewed, inconsistencies in the data identified and inaccuracies corrected and notifications were updated with more complete information if available.

Data for this report were extracted from CIDR on the 5th September 2006. These figures may differ from those published previously, due to ongoing updating of notification data on CIDR. Data analysis was performed using Business Objects and Microsoft Excel. Case classifications were assigned to notifications as per the Case Definitions for

Table 1. Number of notifiable infectious diseases by HSE Area in 2005, total numbers notified in 2005 and 2004 and the comparison between total numbers in 2004 and 2005

Infectious disease	HSE-E	HSE-M	HSE-MW	HSE-NE	HSE-NW	HSE-SE	HSE-S	HSE-W	Total 2005	Total 2004	Increase/ Decrease
Acute anterior poliomyelitis	0	0	0	0	0	0	0	0	0	0	0
Acute infectious gastroenteritis	717	212	94	167	167	295	364	388	2404	1899	505
Anthrax	0	0	0	0	0	0	0	0	0	0	0
Bacillus cereus food-borne infection/intoxication	0	0	0	0	0	0	0	0	0	1	-1
Bacterial meningitis (not otherwise specified)	11	1	2	2	2	6	4	2	30	36	-6
Botulism	0	0	0	0	0	0	0	0	0	0	0
Brucellosis	1	3	46	1	0	1	0	1	53	60	-7
Campylobacter infection	612	156	140	113	87	230	271	194	1803	1711	92
Cholera	0	0	0	0	0	0	0	0	0	0	0
Clostridium perfringens (type A) food-borne disease	*	*	*	*	*	*	*	*	1	5	-4
Creutzfeldt Jakob disease	*	*	*	*	*	*	*	*	4	4	0
Creutzfeldt Jakob disease (new variant)	*	*	*	*	*	*	*	*	2	0	2
Cryptosporidiosis	38	36	56	62	43	99	105	131	570	431	139
Diphtheria	0	0	0	0	0	0	0	0	0	0	0
Echinococcosis	0	0	0	0	0	0	0	0	0	0	0
Enterohaemorrhagic *Escherichia coli*	35	16	27	7	7	17	10	15	134	67	67
Giardiasis	27	1	1	2	7	6	5	8	57	53	4
Haemophilus influenzae disease (invasive)	15	3	1	5	0	2	2	6	34	38	-4
Hepatitis A (acute)	18	0	6	4	5	8	5	10	56	47	9
Hepatitis B (acute and chronic)	491	43	45	58	30	62	85	91	905	723	182
Hepatitis C	1062	46	53	48	13	62	63	91	1438	1136	302
Influenza	82	39	117	2	11	15	31	21	318	79	239
Legionellosis	5	0	1	1	0	1	1	0	9	4	5
Leptospirosis	2	1	2	0	4	2	2	2	15	15	0
Listeriosis	2	3	1	2	0	0	1	3	12	11	1
Malaria	12	5	1	10	2	2	10	2	44	27	17
Measles	52	8	6	9	4	7	1	6	93	330	-237
Meningococcal disease	64	21	16	18	11	19	36	18	203	198	5
Mumps	225	55	104	82	174	29	125	289	1083	423	660
Noroviral infection	474	46	107	146	47	52	104	81	1057	1126	-69
Paratyphoid	0	0	0	0	0	0	0	0	0	4	-4
Pertussis	28	2	13	15	3	2	6	14	83	92	-9
Plague	0	0	0	0	0	0	0	0	0	0	0
Q fever	0	0	4	1	0	0	1	4	10	7	3
Rabies	0	0	0	0	0	0	0	0	0	0	0
Rubella	11	0	2	1	1	1	1	0	17	49	-32
Salmonellosis	118	22	19	31	22	51	48	38	349	417	-68
Severe Acute Respiratory Syndrome (SARS)	0	0	0	0	0	0	0	0	0	0	0
Shigellosis	13	5	5	0	0	4	8	1	36	57	-21
Smallpox	0	0	0	0	0	0	0	0	0	0	0
Staphylococcal food poisoning	6	0	0	0	0	0	0	0	6	3	3
Streptococcus group A infection (invasive)	19	1	3	3	3	1	1	18	49	35	14
Streptococcus pneumoniae infection (invasive)	106	7	34	28	4	32	9	37	257	175	82
Tetanus	0	0	0	0	0	0	0	0	0	1	-1
Toxoplasmosis	18	5	2	1	3	9	1	8	47	33	14
Trichinosis	0	0	0	0	0	0	0	0	0	0	0
Tularemia	0	0	0	0	0	0	0	0	0	0	0
Typhoid	3	1	0	0	0	0	0	1	5	5	0
Typhus	0	0	0	0	0	0	0	0	0	0	0
Viral encephalitis	0	0	0	0	2	1	0	3	6	5	1
Viral haemorrhagic fevers	0	0	0	0	0	0	0	0	0	0	0
Viral meningitis	13	3	3	1	1	6	1	7	35	23	12
Yellow fever	0	0	0	0	0	0	0	0	0	0	0
Yersiniosis	*	*	*	*	*	*	*	*	3	6	-3

**Data not reported to HSE Area level when total figures for Ireland less than five cases*
The EARSS, STI and TB data are not included in this report. Data on these diseases can be found in separate chapters in this document
The 2004 figures shown here may differ from those published previously, due to ongoing updating of notification data on CIDR

Table 2. Number of notifiable infectious diseases by age group (years) in 2005

Infectious disease	0-4	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55-64	65+	Unknown	Total
Acute infectious gastroenteritis	2238	32	8	5	8	14	12	6	10	50	21	2404
Bacterial meningitis (not otherwise specified)	13	1	2	3	2	2	2	2	1	2	0	30
Brucellosis	0	0	0	0	0	2	8	16	15	12	0	53
Campylobacter infection	455	124	64	92	154	271	178	151	124	183	7	1803
Clostridium perfringens (type A) food-borne disease	0	0	0	0	0	0	0	0	0	1	0	1
Creutzfeldt Jakob disease	0	0	0	0	0	0	0	0	1	3	0	4
nv Creutzfeldt Jakob disease	0	0	0	0	1	0	0	0	1	0	0	2
Cryptosporidiosis	351	74	29	14	21	34	14	13	4	14	2	570
Enterohaemorrhagic *Escherichia coli*	55	14	8	7	8	4	16	7	5	10	0	134
Giardiasis	12	2	1	4	4	14	8	8	2	2	0	57
Haemophilus influenzae disease (invasive)	16	2	1	2	0	0	3	2	1	7	0	34
Hepatitis A (acute)	1	1	3	3	2	13	12	4	5	12	0	56
Hepatitis B (acute and chronic)	9	6	5	54	142	391	196	55	27	16	4	905
Hepatitis C	22	8	4	22	190	626	337	155	36	23	15	1438
Influenza	56	42	24	11	12	42	42	23	20	44	2	318
Legionellosis	0	0	0	0	0	0	4	2	1	2	0	9
Leptospirosis	0	0	2	1	2	0	1	3	4	2	0	15
Listeriosis	0	0	0	0	0	0	0	2	2	8	0	12
Malaria	5	3	2	1	5	16	5	5	1	0	1	44
Measles	76	10	3	1	0	0	0	0	0	0	3	93
Meningococcal disease	128	15	12	19	8	3	3	2	8	4	1	203
Mumps	49	87	108	323	302	135	32	22	8	5	12	1083
Noroviral infection	49	5	3	10	16	32	34	54	97	738	19	1057
Pertussis	61	9	5	2	0	0	2	3	0	0	1	83
Q fever	0	1	0	0	0	3	4	1	1	0	0	10
Rubella	16	0	0	0	1	0	0	0	0	0	0	17
Salmonellosis	83	17	19	19	32	53	33	33	24	36	0	349
Shigellosis	3	0	0	1	3	15	9	0	4	1	0	36
Staphylococcal food poisoning	0	0	0	0	0	1	1	1	0	3	0	6
Streptococcus group A infection (invasive)	4	2	2	3	2	5	5	3	7	15	1	49
Streptococcus pneumoniae infection (invasive)	50	8	1	1	6	15	23	22	30	99	2	257
Toxoplasmosis	3	2	1	3	6	16	8	5	2	1	0	47
Typhoid	0	0	1	0	0	2	1	0	1	0	0	5
Viral encephalitis	2	0	0	0	0	2	0	0	0	2	0	6
Viral meningitis	11	5	4	3	3	3	4	1	0	0	1	35
Yersiniosis	2	0	0	0	0	0	1	0	0	0	0	3
Total	**3770**	**470**	**312**	**604**	**930**	**1714**	**998**	**601**	**442**	**1295**	**92**	**11228**

The EARSS, STI and TB data are not included in this report. Data on these diseases can be found in separate chapters in this document

Notifiable Diseases booklet.[3] Incidence rates were calculated using population data taken from the 2002 census.

Notifiable infectious diseases that were reported through the weekly infectious disease notification system in 2005 are presented in this chapter. Therefore, three of the European Antimicrobial Resistance Surveillance System (EARSS) diseases (enterococcal bacteraemia, *Escherichia coli* infection (invasive) and *Staphylococcus aureus* bacteraemia), all sexually transmitted infections (STIs) and tuberculosis (TB) are excluded. Reports on the EARSS, STI and TB data are included as separate chapters within this document. A report on infectious disease outbreaks is also included elsewhere in this document.

Results

Notifiable infectious diseases

The breakdown of infectious diseases notified in 2005 by HSE Area, age group, sex and case classification are presented in tables 1 – 4, respectively. Please note that notifiable diseases with no cases in 2005 are not presented in tables 2 - 4.

There were 11,228 infectious disease notifications reported to HPSC during 2005, representing a 20% increase in notifications compared to 2004 (n=9,336). Acute infectious gastroenteritis, cryptosporidiosis, hepatitis B, hepatitis C, influenza and mumps mainly accounted for this increase (table 1).

Of the 11,228 infectious disease notifications gastrointestinal diseases accounted for 57.8% of notifications, bloodborne diseases for 20.9%, vaccine preventable diseases for 11.7%, respiratory and direct contact diseases for 7.7%, vector borne and zoonotic diseases for 1.5%, other viral diseases (includes viral encephalitis, viral haemorrhagic fevers and viral meningitis) for 0.4% and transmissible spongiform encephalopathies (Creutzfeldt Jakob disease and new variant Creutzfeldt Jakob disease) for less than 0.1% of the notifications (figure 1).

Case classification was assigned for 98% of the notifications in 2005 compared to 81% in 2004. During 2005, 88% were classified as confirmed, three percent as probable, six percent as possible, while two percent had no case classification assigned (table 4).

No cases of acute anterior poliomyelitis, anthrax, *Bacillus cereus* food-borne infection/intoxication, botulism, cholera,

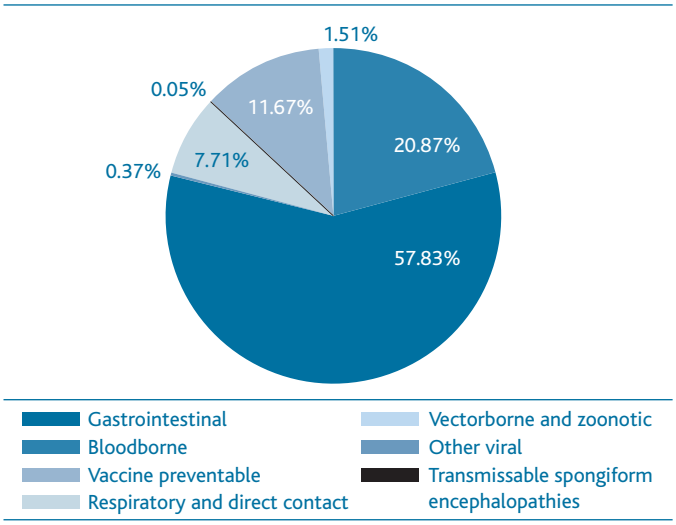

Figure 1. Infectious disease notifications in 2005 by disease category (Please note the EARSS, STI and TB data are not included in these figures).

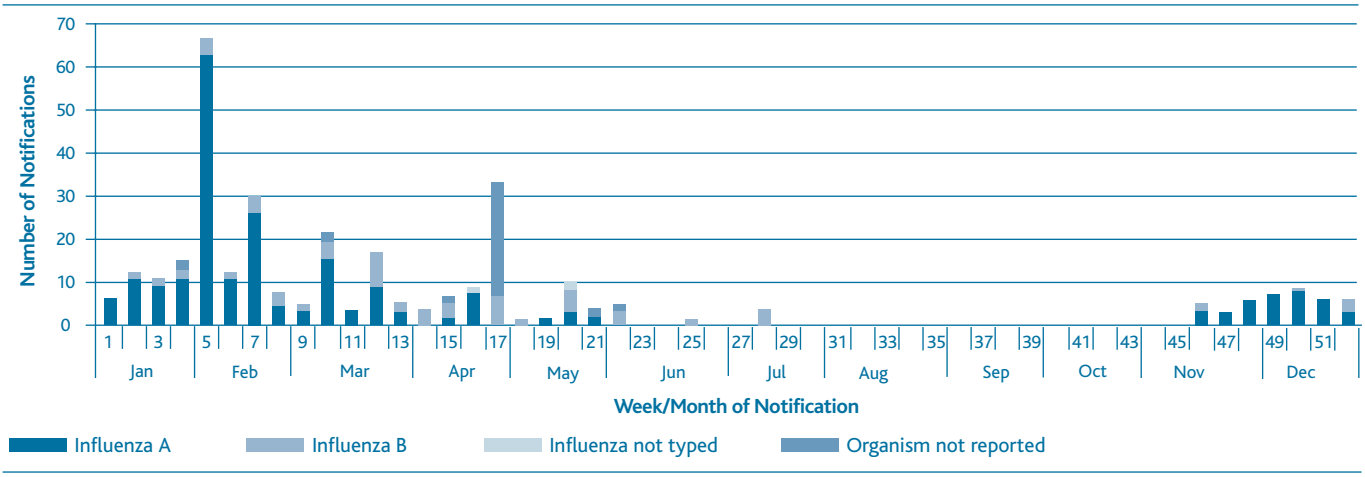

Figure 2. Influenza notifications by week and month of notification in 2005

diphtheria, echinococcosis, paratyphoid, plague, rabies, SARS, smallpox, tetanus, trichinosis, tularemia, typhus, viral haemorrhagic fevers or yellow fever were notified during 2005.

As comprehensive reports on campylobacter infection, cryptosporidiosis, Enterohaemorrhagic *Escherichia coli*, *Haemophilus influenzae* disease (invasive), hepatitis A (acute), hepatitis B (acute and chronic), hepatitis C, malaria, measles, meningococcal disease and bacterial meningitis (not otherwise specified), mumps, salmonellosis, Streptococcus group A infection (invasive), *Streptococcus pneumoniae* infection (invasive) are presented in separate chapters elsewhere in this document, these diseases are not discussed in any further detail here.

Acute infectious gastroenteritis

During 2005, 2,404 cases (61.4/100,000) of acute infectious gastroenteritis were notified. This is an increase of approximately 27% compared to 2004 when 1,899 cases (48.5/100,000) were notified. In 2005, of the 2,404 notifications 94% (n=2,251) were due to rotavirus while in 2004 of the 1,899 notifications, 84% (n=1,600) were due to rotavirus. This represents a 41% increase in the number of rotavirus specified under acute infectious gastroenteritis in 2005 compared to 2004. Rotavirus is discussed further in a separate chapter in this document.

Brucellosis

During 2005, 53 cases of brucellosis were notified compared to 60 notifications in 2004. Case classification was provided for 52 of the notifications; seven were classified as confirmed while 45 were classified as probable. The number of notifications in 2005 and 2004 appears to be a significant increase on the previous ten years when on average there were 11 notifications each year. However, it is important to bear in mind that cases are now being notified by laboratories that would previously have gone unreported and the notifications classified as probable may be a reflection of past infection rather than acute infection as many of the laboratory reports were based on an isolated high titre result.

Forty-nine of the cases (92%) in 2005 were male while four (8%) were female. The cases ranged in aged from 30 years to 83 years (mean age, 55 years; median age, 55 years).

Table 3. Number of notifiable infectious diseases by sex in 2005

Infectious disease	Male	Female	Unknown	Total
Acute infectious gastroenteritis	1227	1125	52	2404
Bacterial meningitis (not otherwise specified)	18	12	0	30
Brucellosis	49	4	0	53
Campylobacter infection	968	825	10	1803
Clostridium perfringens (type A) food-borne disease	0	1	0	1
Creutzfeldt Jakob disease	1	3	0	4
nv Creutzfeldt Jakob disease	1	1	0	2
Cryptosporidiosis	309	259	2	570
Enterohaemorrhagic *Escherichia coli*	62	71	1	134
Giardiasis	32	24	1	57
Haemophilus influenzae disease (invasive)	15	19	0	34
Hepatitis A (acute)	24	32	0	56
Hepatitis B (acute and chronic)	480	373	52	905
Hepatitis C	918	502	18	1438
Influenza	154	163	1	318
Legionellosis	8	1	0	9
Leptospirosis	14	1	0	15
Listeriosis	6	6	0	12
Malaria	21	21	2	44
Measles	52	40	1	93
Meningococcal disease	113	90	0	203
Mumps	620	457	6	1083
Noroviral infection	445	609	3	1057
Pertussis	43	40	0	83
Q fever	9	1	0	10
Rubella	8	9	0	17
Salmonellosis	168	179	2	349
Shigellosis	14	21	1	36
Staphylococcal food poisoning	4	2	0	6
Streptococcus group A infection (invasive)	25	24	0	49
Streptococcus pneumoniae infection (invasive)	149	108	0	257
Toxoplasmosis	18	28	1	47
Typhoid	3	2	0	5
Viral encephalitis	3	3	0	6
Viral meningitis	25	10	0	35
Yersiniosis	1	2	0	3
Total	6007	5068	153	11228

The EARSS, STI and TB data are not included in this report. Data on these diseases can be found in separate chapters in this document

Clostridium perfringens (type A) food-borne disease

One case of *Clostridium perfringens* (type A) food-borne disease was notified during 2005 compared to five cases in 2004. The case in 2005 was aged greater than 65 years.

Creutzfeldt Jakob disease

In 2005, four cases of classical Creutzfeldt Jakob disease (CJD) were notified. This is identical to 2004 when four cases were also notified. All four cases in 2005 were aged greater than 55 years and three cases occurred in females.

nv Creutzfeldt Jakob disease

Two cases of new variant Creutzfeldt Jakob disease (nvCJD) were notified during 2005. One case was in the age group 20-24 years while the second case was in the age group 55-64 years. Only one other case of nvCJD was notified since nvCJD became notifiable in 1997; this case was notified in 1999.

Giardiasis

Fifty-seven cases of giardiasis were notified in 2005, giving a notification rate of 1.5 per 100,000 total population. This is similar to 2004 when 53 cases were notified. In 2005, the cases ranged in age from 7 months to 74 years (mean age, 28 years; median age, 29 years). Twenty-four of the cases were female, 32 were male while gender was unreported for one case. Case classification was reported for 53 notifications; all 53 were classified as confirmed.

Influenza

Three hundred and eighteen cases of influenza were notified in 2005, giving a notification rate of 8.1 per 100,000 population. This is a four-fold increase compared to 2004 when 79 cases of influenza were notified. Over a third (n=116) of influenza notifications were in February (Weeks 5-8) of 2005 with 21% (n=66) in Week 5 of 2005 (figure 2). Twenty-one of the 116 influenza notifications in February had onset dates reported, of these 15 had onset dates in late 2004. The peak in notifications during Week 17 was due to a school outbreak of influenza that occurred in the HSE-M during Week 16.

Of the 318 influenza notifications during 2005, 216 were reported as influenza A virus, 65 as influenza B virus while organism details were not reported for the remaining 37 notifications. Thirty-four cases were classified as possible while the remaining 284 were classified as confirmed.

Table 4. Number of notifiable infectious diseases by case classification in 2005

Infectious disease	Confirmed	Probable	Possible	Not Specified	Total
Acute infectious gastroenteritis	2251	151	0	2	2404
Bacterial meningitis (not otherwise specified)	8	5	17	0	30
Brucellosis	7	45	0	1	53
Campylobacter infection	1794	1	0	8	1803
Clostridium perfringens (type A) food-borne disease	1	0	0	0	1
Creutzfeldt Jakob disease	4	0	0	0	4
nv Creutzfeldt Jakob disease	2	0	0	0	2
Cryptosporidiosis	565	0	0	5	570
Enterohaemorrhagic *Escherichia coli*	134	0	0	0	134
Giardiasis	53	0	0	4	57
Haemophilus influenzae disease (invasive)	34	0	0	0	34
Hepatitis A (acute)	48	0	6	2	56
Hepatitis B (acute and chronic)	777	44	0	84	905
Hepatitis C	1432	0	0	6	1438
Influenza	284	0	34	0	318
Legionellosis	7	2	0	0	9
Leptospirosis	14	0	0	1	15
Listeriosis	11	0	0	1	12
Malaria	43	0	0	1	44
Measles	11	0	76	6	93
Meningococcal disease*	180	7	16	0	203
Mumps	436	85	488	74	1083
Noroviral infection	1037	16	0	4	1057
Pertussis	33	6	30	14	83
Q fever	2	4	0	4	10
Rubella	0	0	15	2	17
Salmonellosis	344	1	0	4	349
Shigellosis	36	0	0	0	36
Staphylococcal food poisoning	6	0	0	0	6
Streptococcus group A infection (invasive)	47	0	0	2	49
Streptococcus pneumoniae infection (invasive)	251	1	4	1	257
Toxoplasmosis	47	0	0	0	47
Typhoid	5	0	0	0	5
Viral encephalitis	6	0	0	0	6
Viral meningitis	8	23	0	4	35
Yersiniosis	3	0	0	0	3
Total	**9921**	**391**	**686**	**230**	**11228**

**As per the case definitions, meningococcal disease notifications are classified as definite, presumed and possible. For convenience they are reported in this table as confirmed, probable and possible, respectively.*

The EARSS, STI and TB data are not included in this report. Data on these diseases can be found in separate chapters in this document

Based on data obtained through the influenza sentinel surveillance system, a report on influenza activity during the 2005/2006 season is included elsewhere in this document while a report on influenza activity during the 2004/2005 season in available on the HPSC website.[4]

Legionellosis

Nine cases of legionnaires' disease were notified in 2005. All nine cases were aged greater than 35 years. Eight of the cases were male and one was female. Seven of the cases were classified as confirmed while two were classified as probable. There was one death. Of the nine cases, two were community-acquired, two were hospital-acquired, and five were travel-associated. Countries of travel included France, Spain and Turkey. A case of legionnaires' disease is defined as travel-associated if the patient spent one or more nights away from their home in accommodation used for commercial or leisure purposes e.g. hotels, holiday apartments etc. in the 10 days before the onset of illness. Travel-associated cases may involve travel within Ireland or travel abroad. All travel-associated cases in 2005 were notified to the European Working Group for Legionella Infections (EWGLI) surveillance scheme. The aim of this surveillance scheme is to detect cases of travel-associated legionnaires' disease and thereby rapidly identify outbreaks and implement control measures.[5]

Leptospirosis

Fifteen cases of leptospirosis were notified in 2005 identical to 2004 when 15 cases were also notified. All except one of the cases in 2005 were male (93%) and all cases were aged between 14 and 76 years (mean age, 43 years; median age, 51 years). Risk exposures reported included occupational exposure through farming activities (n=4), outdoor recreational contact with water (n=2) and exposure in or around the home/garden (n=2). There was also one case that reported accidental exposure to pond water. The species implicated was reported as *Leptospira interrogans hardjo* for two cases; species was not reported for the remaining 13 cases.

Listeriosis

Twelve cases of listeriosis were notified in 2005 compared to

11 in 2004. The cases in 2005 ranged in age from 48 years to 83 years (mean age, 68 years; median, 71 years) and 50% were male. Ten cases were reported either as elderly (>64 years) or as suffering from an underlying illness that predisposed them to listeriosis. No information on risk factors was available for the remaining two cases but one was aged over 55 years. No pregnancy-associated or neonatal cases were reported. Clinical presentations included septicaemia (n=5), meningitis (n=1) and peritonitis (n=1); no clinical information was provided for the remaining five cases.

Noroviral infection

There were 1,057 noroviral infection notifications during 2005, giving a notification rate of 27.0 per 100,000 population. In 2004, there were 1,126 noroviral notifications. In 2005, the majority (n=738, 70%) of notifications and the highest age specific rates (169.3/100,000) were in those aged greater than 64 years. Gender was reported for 1,054 cases, of these 609 cases (58%) were female and 445 (42%) were male.

Pertussis

There were 83 (2.1/100,000) pertussis notifications in 2005 compared to 92 in 2004. The majority (90%) of cases in 2005 were aged less than 15 years with 73% of cases in the age group 0-4 years. Forty-three cases were male while 40 were female. Thirty-three cases (40%) were classified as confirmed, six (7%) as probable, 30 (36%) classified as possible and 14 (17%) had no case classification assigned. There is no enhanced surveillance system in place for pertussis so additional information, such as detailed vaccination history of the cases is not available.

Q Fever

Ten cases of Q fever were notified during 2005 compared to seven in 2004. In 2005, nine cases occurred in males and one in a female. The cases ranged in age from six years to 55 years (mean age, 36 years; median age, 36 years). Case classification was provided for six notifications; two were classified as confirmed and four as probable.

Rubella

During 2005, 17 rubella cases were notified compared to 49 in 2004 and 59 in 2003. Case classification was provided for 15 of the rubella notifications; all 15 were classified as possible. Sixteen of the cases (94%) notified in 2005 were aged less than four years. Eight cases were male and nine were female.

Shigellosis

Thirty-six cases (0.9/100,000) of shigellosis were notified in 2005 compared to 57 in 2004 and 36 in 2003. The majority of cases (89%) in 2005 occurred in those aged 20 years or older. Of the 36 cases notified, 22 were due to *Shigella sonnei*, 12 due to *Shigella flexneri* while species was not reported for the remainder. All 36 cases were classified as confirmed. Twenty-one cases were female, 14 were male while gender was not reported for one case.

Staphylococcal food poisoning

Six cases of staphylococcal food poisoning were notified during 2005 compared to three in 2004. The cases in 2005 ranged in age from 28 to 93 years. All six cases were classified as confirmed.

Toxoplasmosis

During 2005, 47 cases of toxoplasmosis were notified compared to 33 in 2004. Three of the cases in 2005 were reported as congenital cases, the first congenital cases reported since the condition became notifiable in 2004. Congenital cases are identified through a pilot toxoplasmosis screening program which commenced in July 2005, and is co-ordinated at the Rotunda Hospital in conjunction with the National Newborn Screening Laboratory.

The remaining 44 cases ranged in age from 5 years to 93 years (mean age, 33 years; median, 29 years). Of the 44 cases twenty-five were female, 18 male while gender was not reported for one case.

Typhoid

Five cases of typhoid were notified during 2005 identical to 2004 when five cases were also notified. The cases in 2005 ranged in age from 10 to 55 years (mean age, 33 years; median age, 33 years). Three of the cases were male and two were female. The countries of infection were India (n=1), Nigeria (n=1), Pakistan (n=1) and not reported (n=2). All five cases were classified as confirmed.

Viral encephalitis

Six cases of viral encephalitis were notified in 2005, similar to five cases in 2004. All six cases in 2005 were classified as confirmed. Herpes simplex virus was reported as the causative organism for two cases; the causative organism was not reported for the remainder.

Viral meningitis

In 2005, 35 (0.9/100,000) cases of viral meningitis were notified compared to 23 in 2004 and 39 cases in 2003. Sixty-six percent (n=23) of cases in 2005 occurred in those aged less than 20 years with over 30% (n=11) in the age group 0-4 years. The majority of viral meningitis notifications in 2005 were male (n=25). Of the 35 notifications, eight were classified as confirmed, twenty-three as probable while case classification was not specified for the remainder. The causative organisms were reported as Coxsackievirus A (n=1), Coxsackievirus B (n=1) while the causative organisms were not reported for the remainder.

Yersiniosis

Three cases of yersiniosis were notified during 2005 compared to six in 2004. All three cases in 2005 were classified as confirmed. Two of the cases were less than one year of age.

Discussion

Overall, the number of notifications in 2005 reported to HPSC through the weekly infectious disease notification system (n=11,228) increased by 20% compared to 2004 (n=9,336). These figures exclude the EARSS organisms (*S. pneumoniae* is an exception and should be reported through both systems), STI and TB data that are presented as separate chapters in this document. A small subset of notifiable diseases contributed to most of this increase in 2005 compared to 2004. Cryptosporidiosis notifications increased by 32%, acute

infectious gastroenteritis and hepatitis C notifications by 27% and hepatitis B notifications by 25% compared to 2004. There was a 2.6-fold increase in mumps notifications during 2005 (n=1,083) compared to 2004 (n=423). This was due to an outbreak that started towards the end of 2004 and continued in 2005. The mumps outbreak is discussed further in a separate chapter in this document.

Influenza notifications increased four-fold in 2005 (n=318) compared to 2004 (n=79). Notifications peaked in February 2005 when a third of all the cases were notified. However, this peak was probably due to a delay in notifying rather than any true peak in influenza activity at that time in 2005. This observation is supported by the fact that of the 21 notifications in February 2005 with onset dates reported (out of a total of 116) 15 had onset dates in late 2004 and furthermore the influenza sentinel surveillance system observed an increase in influenza-like illness towards the end of 2004 with a peak in the first week of 2005 and not in February 2005, which coincides with the onset/occurrence date of the late notifications.

Gastrointestinal illnesses account for over half of the notifications reported through the weekly infectious disease reporting system in 2005, with blood-borne, vaccine preventable and respiratory and direct contact diseases accounting for most of the remainder. However, in addition to the 11,228 infectious disease notifications presented in this chapter for 2005, there were also 3,784 reports of EARSS organisms and 461 TB notifications (provisional figure). A final figure for STI notifications in 2005 is not yet available, however, more than likely it will be of similar magnitude to 2004, when 10,695 cases were notified. These figures indicate the burden of disease due to the notifiable infectious diseases in Ireland, with STIs contributing to a substantial proportion of that burden.

The amendment, S.I. No. 707 of 2003 that came into effect in January 2004 introduced the use of case definitions for infectious diseases for the first time in Ireland. Case definitions allow more effective analysis and interpretation of notification data. Case classification was assigned for 98% of the notifications in 2005. This is a considerable improvement compared to 2004 when case classifications were assigned for 81% of notifications. Standard operating procedures for the HSE Areas using CIDR during 2005 may have played an important role in the improvement in assigning case classifications to notification data during 2005. For those using CIDR, data entry, data cleaning and data validation checks are approached by all users in a relatively standardised way, thereby, helping to improve the quality of the notification data and the efficiency with which data are managed.

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The authors would like to sincerely thank everyone who contributed to the surveillance of notifiable infectious diseases in Ireland including laboratory staff, notifying physicians, administrative, ˝ medical and scientific staff in the Community Care Areas and in the Departments of Public Health. Special thanks to everyone involved in cleaning and validating the data.

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Computerised Infectious Disease Reporting System (CIDR)

Key Points

- **CIDR is the new national shared information system used to manage the surveillance and control of infectious diseases in Ireland.**
- **CIDR national roll-out commenced in early 2005 and is now being used in six of the eight HSE areas (covering 80% of the population).**
- **All information in CIDR is held in a single shared national information repository. As a web-based system (built using modern internet technologies) CIDR allows the rapid reporting and appropriate sharing of clinical and laboratory information among CIDR users.**
- **CIDR has been found to be a robust and secure system that can be adapted to meet the changing surveillance needs in Ireland**
- **CIDR has been awarded the IS17799 accreditation for information security management. HPSC, including CIDR, is the first public sector body in Ireland to be awarded this accreditation.**
- **HPSC uses CIDR for the routine collation and analysis of infectious disease notifications.**

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Background

Computerised Infectious Disease Reporting (CIDR) system was developed by the HPSC in collaboration with its partners; the DoHC, the HSE areas, the FSAI and the FSPB. CIDR utilises modern internet-based technologies. CIDR is now providing an integrated and standardised electronic surveillance system to collect, collate, analyse and disseminate good quality

Table 1. CIDR implementation in Public Health Departments and Hospital laboratories

HSE area	Public Health implementation	Hospital Laboratory implementation(by date and laboratory site)
Reference laboratories		May 2004 NVRL, NMRL, NSRL, MRSA†
HSE North East	May 2004	May 2004 Our Lady of Lourdes, Drogheda; Navan; Cavan-Monaghan; Dundalk
HSE-Midlands	April 2005	April 2005 Mullingar/Tullamore/Port Laois
HSE South	July 2005	January 2006 Mercy Hospital
HSE South East	October 2005	October 2005 Waterford Regional Hospital
HSE North West	February 2006	Not yet implemented
HSE East	June 2006	June 2006 St. James' Hospital
HSE Mid-west	Not yet implemented	Not yet implemented
HSE West	Not yet implemented	Not yet implemented

** Pilot implementation in May 2004, CIDR "go-live" from February 2005*
† National Virus Reference laboratory (NVRL); National Meningococcal Reference laboratory (NMRL); National MRSA reference laboratory (NMRSAL); National Salmonella Reference Laboratory (NSRL).

laboratory-based and clinical notification data on communicable disease in a timely manner in Ireland.

CIDR allows:

- The provision of timely and comprehensive information to facilitate public health action in individual cases of infectious disease
- The generation of standard reports on the incidence and burden of infectious diseases nationally, regionally, and locally
- Evaluation of the effectiveness of prevention and control programmes nationally, regionally and locally

CIDR System
CIDR was designed in 2002, and development and testing of the system took place between 2003-2004. CIDR was successfully piloted in 2004 in HSE North East and reference laboratories, following which national implementation was recommended by CIDR Board.

The CIDR system uses the latest .NET development environment with SQL Server 2000 as the backend database and makes extensive use of XML technology, in line with the inter-operability requirements of e-government initiatives.

Ensuring that information within CIDR is stored and accessed appropriately is key to CIDR. A number of data security protection systems are in place; access to the system is provided via the Government Virtual Private Network (G-VPN); the core system is firewall-protected; information is encrypted before being transferred from local PCs to the core system; and access to the system is limited to authorised users (username, password and user authentication required by unique RSA key fobs). CIDR was accredited with the IS17799 in February 2005.

CIDR users in public health departments and clinical microbiology laboratories enter and retrieve infectious disease information from CIDR via standard browser software on their personal computers. No additional software is required.

CIDR reporting
The information collected and stored by CIDR is available for analysis utilising a report writing / business intelligence application called 'Business Objects'. This software enables information to be retrieved from complex relational databases in a user-friendly fashion yet leaves the underlying data safe.

In Business Objects there is a set of reports that are available to all users (Corporate Documents). All users can run these reports, however the data and the level of detail returned will depend on the user's access rights. Business Objects can also be used to create reports.

CIDR implementation in 2005
CIDR Project Board recommended national CIDR roll-out in November 2004. In early 2005, CIDR roll-out implementation began in a phased manner.

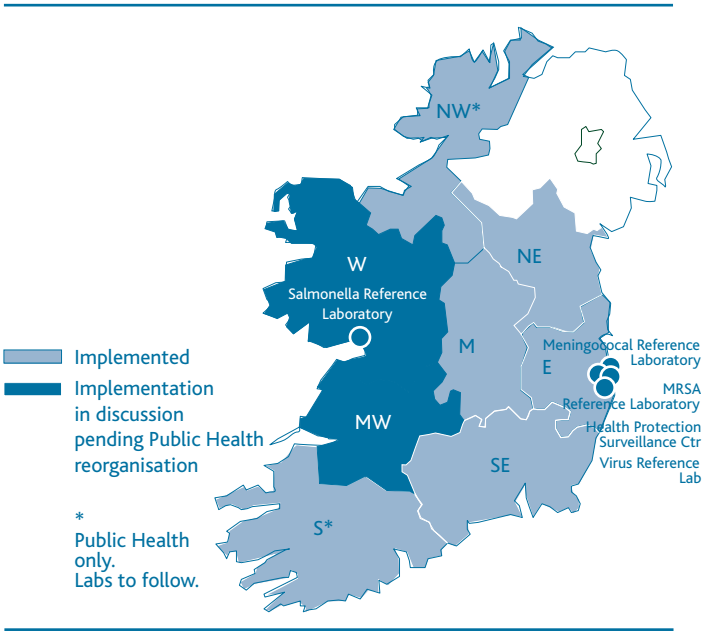

Figure 1. CIDR national implementation progress by HSE area (July 2006)

Rolling CIDR out nationally has required an on-going and close collaboration between the different HSE directorates (Population Health, National Hospitals Office and National Information and Communication Technology Office Directorate), HSE areas (Departments of Public Health, regional hospital microbiology laboratories, and IT staff) and the national CIDR team.

CIDR implementation in Departments of Public Health and laboratories

By the end of 2005 CIDR was implemented in four HSE areas, another two HSE areas implemented CIDR in the first six months of 2006. Laboratories have implemented CIDR in tandem with, or closely following, regional public health department implementation where possible. However, in some areas laboratories have not been able to implement CIDR simultaneously (table 1). However, with time, additional laboratories are implementing CIDR, thus facilitating the notification process of notifiable infectious diseases.

CIDR implementation in laboratories has required close liaison between CIDR team, and the relevant laboratory personnel. Prior to implementation all laboratories review and document their current business processes in relation to infectious disease notification, and also document the expected practice when each laboratory participates in CIDR.

Laboratory notifications are entered in to CIDR via manual entry or via a data extract from the relevant Laboratory Information Management System (LIMS). The CIDR design is open and flexible enough to accept data from systems other than LIMS e.g. MS Access databases.

CIDR Disaster Recovery / Business Continuity

The core CIDR system is physically located within the premises of HPSC. Data is backed up daily and stored securely off-site. As part of a business continuity plan, in the event of unanticipated loss of equipment or access to that equipment, a disaster recovery / business continuity solution was developed, in conjunction with Fujitsu. This Business Continuity solution replicates data via the Government VPN to a Disaster Recovery CIDR environment hosted off-site. The Disaster Recovery system has been tried and tested on a number of occasions and has demonstrated that this solution can support business continuity in the event of the main system being down.

CIDR training

There are now more than 200 CIDR users across the six HSE CIDR using sites, HPSC and reference laboratories. All CIDR users must complete data protection training prior to CIDR application training. There is separate training for public health and laboratory CIDR users, relevant to their needs. Additional advanced CIDR training is provided to high-level public health CIDR users. CIDR training is provided in HPSC and is delivered by HPSC staff who are trained for this purpose.

Supporting CIDR users

CIDR helpdesk

CIDR helpdesk is manned by designated HPSC/CIDR helpdesk staff. The helpdesk is available during normal working hours and can be accessed via email or telephone. All calls are logged and are dealt with by CIDR operations or technical staff.

CIDR user group

As part of good information governance a national CIDR user group was convened in December 2005. This group meets quarterly. The CIDR user group members represent the nominated public health and laboratory CIDR users from each of the HSE CIDR using areas. These meetings provide CIDR users with a forum to compare and discuss various aspects of CIDR.

CIDR user group members review updates and upgrades to the CIDR system and feed in questions and suggestions on CIDR operation. Suggestions come from CIDR users locally, through the CIDR helpdesk, or from CIDR team. At these meetings CIDR team highlights any issues that have arisen in the last quarter and presents solutions and recommendations for standardisation of data and business processes to the CIDR user group. The views of the user group will be taken into account in any updates or upgrades of the CIDR system.

CIDR user group members feedback to their regional CIDR users via their local CIDR user groups.

CIDR communications

CIDR newsletter is distributed bi-or tri-monthly to all CIDR users and is available on the HPSC website. Additional information on CIDR (Frequently asked Questions, News, Training, Presentations and Committees) is available on the HPSC website at http://www.ndsc.ie/hpsc/CIDR/.

Measles in Ireland, 2005

Key Points

- **There were 93 measles notifications in 2005**
- **The crude incidence rate of measles per 100,000 population in 2005 was 2.4 compared to 8.4 in 2004 and 14.6 in 2003**
- **Of the 93 measles notifications 12% were classified as confirmed, 82% were classified as possible and six percent had no case classification assigned**

Introduction

Measles is an acute viral infectious disease characterised by high fever, cough, conjunctivitis, runny nose and rash. Complications of measles include otitis media, pneumonia, croup, diarrhoea and encephalitis. Measles results in death in approximately one to two cases per 1,000 population. In Ireland, three measles deaths were reported during 2000. Two of these deaths were as a result of pneumonia complicating measles and one was due to post-measles encephalitis.

Measles is highly contagious but can be prevented by vaccination. Measles vaccine in Ireland is currently available as part of the combined measles-mumps-rubella (MMR) vaccine. More than 99% of individuals who receive two MMR doses (provided the first dose is given after their first birthday) develop immunity to measles. Two doses of MMR are required to ensure protection, as two to five percent of children fail to respond to one dose of MMR. In Ireland, vaccination with the first dose of MMR (MMR_1) is recommended at twelve to fifteen months of age and the second dose (MMR_2) at four to five years of age.

The number of measles notifications, in Ireland, by year since 1948 is shown in figure 1. The highest number of notifications was in 1959, with 15,134 cases reported. In the 1970s an average of 2,327 cases of measles were notified each year with an average of seven deaths every year from measles. In 1985 there were nearly 10,000 measles notifications, this was the same year a measles vaccine was

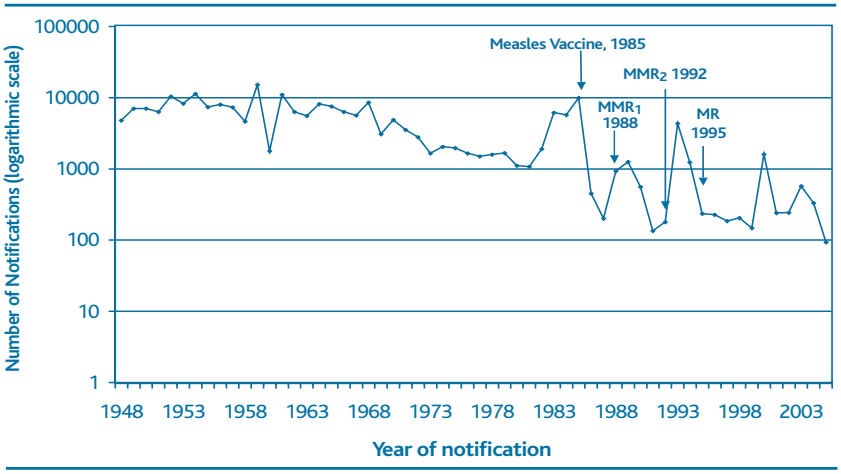

Figure 1. Annual number (log scale) of measles notifications in Ireland 1948-2005 and year of introduction of measles and MMR vaccine. (A measles and rubella campaign for primary school-age children was conducted in 1995).

first introduced into Ireland. By 1991 the number of measles notifications had dropped to 135.

Since 2000 measles is notified weekly to HPSC. HPSC routinely publishes a national measles report that is distributed to those involved in measles control and surveillance in Ireland. HPSC also forwards the measles notification data to the EU measles surveillance network EUVAC.NET and to the World Health Organisation (WHO) on a monthly basis.

This review summarises the 2005 measles notification data.

Materials and Methods

During 2005, for HSE Areas using the CIDR system, measles notifications were inputted directly on CIDR at regional level. HPSC can view this data using the Business Objects reporting tool on CIDR (except for patient name and address). For HSE Areas not using CIDR, anonymous notifications were sent to HPSC and these data were inputted on CIDR by HPSC. Measles data presented in this report were taken from the CIDR system on the 19th September 2006. These figures may differ from those published previously, due to ongoing updating of notification data in CIDR.

Case classifications are assigned to measles notifications as per the Case Definitions for Notifiable Diseases.[1] Analysis of measles data was carried out using Business Objects and Microsoft Excel. Incidence rates were calculated based on population data taken from the 2002 census.

Results

Incidence

A total of 93 measles cases were notified during 2005, giving a crude incidence rate of 2.4 per 100,000 population. In contrast, the crude incidence rate was 8.4 per 100,000 in 2004 and 14.6 per 100,000 in 2003. The annual number of notifications in 2005 is the lowest since 1948 when measles was specified as a notifiable disease under the Health Act, 1947 (figure 1).

The breakdown of measles cases by HSE Area and the crude incidence rates by HSE Area during 2005 are presented in table 1. The highest number of notifications was in the HSE-E (n=52, 56%) followed by the HSE-NE (n=9, 10%). The highest crude incidence rate in 2005 was in the HSE-E (3.7/100,000) followed by the HSE-M (3.5/100,000).

There were on average two notifications each week during 2005. No outbreaks of measles were notified during 2005.

Case classification

Case classification was provided for 94% (n=87) of measles notifications in 2005. Of the 93 notifications in 2005, 11 (12%) were classified as confirmed, 76 (82%) as possible while case classification was not provided for six (6%) notifications. All 11 notifications classified as confirmed were laboratory confirmed.

Age and sex distribution

A breakdown of measles notifications by age group and the

Table 1. Number of measles notifications and crude incidence rates (CIR) per 100,000 population by HSE Area in 2005

HSE Area	Number	CIR
HSE-E	52	3.7
HSE-M	8	3.5
HSE-MW	6	1.8
HSE-NE	9	2.6
HSE-NW	4	1.8
HSE-SE	7	1.7
HSE-S	1	0.2
HSE-W	6	1.6
Total	**93**	**2.4**

Table 2. Number of measles notifications by age group and age specific incidence rate per 100,000 population (ASIR) in 2005

Age group (years)	Number	ASIR
<1	27	49.5
1-2	41	36.7
3-4	8	7.2
5-9	10	3.8
10-14	3	1.1
15-19	1	0.3
20-24	0	0.0
25+	0	0.0
Unknown	3	-
Total	**93**	**2.4**

age specific incidence rates per 100,000 population in 2005 are presented in table 2. All measles notifications, where age was reported, were aged less than 20 years. The highest number of notifications (n=41, 44%) in 2005 was in those aged 1-2 years followed by those aged less than one year (n=27, 29%) and those aged 5-9 years (n=10, 11%). The highest incidence rates in 2005 were in those aged less than one year (49.5/100,000) and 1-2 years (36.7 /100,000). Of the 93 measles notifications, 52 were male, 40 were female, while sex was not reported for one notification.

Laboratory data

Laboratory results were provided to HPSC for 24 (24/93, 26%) measles notifications. Eleven of these were laboratory positive for measles while 13 were negative for measles (table 3).

Oral fluid specimens should be obtained between one and five weeks following the appearance of the rash. Samples obtained less than one week after rash onset may lead to a false negative result. Of the 13 laboratory negative measles cases, 12 had oral fluid specimens sent for laboratory testing. Four of these negative oral fluid specimens were taken less than seven days after onset while five had no specimen date reported. The remaining negative oral fluid specimens were taken greater than one week following onset.

As measles vaccine induces a positive measles IgM response a positive IgM test cannot be used to confirm the diagnosis of measles in individuals who received measles vaccine six to 45 days before rash onset. Of the 11 laboratory positive measles notifications two had received at least one dose of vaccine. The date of vaccination in relation to onset of disease was not provided for one of these while the second case was vaccinated two years prior to onset.

Vaccination data

Vaccination status was reported for 59 (63%) of the 93 notifications. Thirty-six cases (36/59, 61%) were unvaccinated. Seventeen percent (6/36) of those unvaccinated were aged greater than 15 months and therefore, were potentially eligible for vaccination with MMR_1 (assuming there were no contraindications to vaccination).

Five cases (5/59, 8%) were vaccinated with MMR_1 only. All five cases were aged less than six years. Of the five cases vaccinated with MMR_1; one received the vaccine less than 18 days prior to onset suggesting the possibility they may have been incubating measles at the time of vaccination; three were vaccinated greater than six months prior to onset; the date of vaccination in relation to disease onset was not reported for one case. An additional 12 cases received at least one dose of MMR. The MMR_1 vaccination dates were reported for six of these notifications; all six were vaccinated greater than three months prior to onset.

Six cases received MMR_2. The dates of vaccination were only reported for three of the six cases. None of these cases were reported as laboratory confirmed; therefore, none of these six

Table 3. Measles laboratory test results (n=24).

	Laboratory Result		
Specimen type	Positive	Negative	Total
Oral fluid sample	4	12 *	16
Serum sample	6	1 †	7
Oral fluid and serum samples	1	0	1
Total	11	13	24 ‡

** specimen date in relation to onset date not reported for 5 cases, and for 4 cases the specimen was taken <7 days after onset*
†specimen taken <7 days after onset
‡laboratory results were only provided for 24 of the 93 notifications

Table 4. Number of measles notifications in Ireland by age group and hospitalisation status during 2005

Age group (years)	Hospitalised	Not hospitalised	Not reported/unknown	Total
<1	3	10	14	27
1-2	2	17	22	41
3-4	0	1	7	8
5-9	0	5	5	10
10-14	0	0	3	3
15-19	0	0	1	1
20-24	0	0	0	0
25+	0	0	0	0
Unknown	0	0	3	3
Total	**5**	**33**	**55**	**93**

cases are known to be, or can be, classified as vaccine failures based on the data provided.

Hospitalisation data & complications of measles

Information on hospitalisation status was available for 38 cases (38/93, 41%). Five cases were hospitalised representing 13% (n=5/38) of all cases with known hospitalisation status (table 4). The length of hospital stay was only reported for two notifications, with the length of stay ranging from seven to nine days. The hospitalised cases ranged in age from 8 to 18 months.

Three of the hospitalised cases were unvaccinated; all three were aged less than 15 months. One hospitalised case, aged 18 months, had received one dose of MMR (date of vaccination was not provided). Vaccination status was not provided for the remaining hospitalised case.

Information on measles associated complications was reported for 10 (10/93, 11%) notifications. One case was reported to have a lower respiratory tract infection. The nine remaining cases were reported to have no complications. No measles deaths were reported among the 93 measles notifications. However, the Central Statistics Office reported one measles death in 2005 in a case in the age group 25-34 years.

Discussion

During 2005, there were only 93 measles notifications in Ireland. This is a 3.5-fold decrease compared to 2004 (n=330) and a six-fold decrease compared to 2003 (n=572) and is the lowest number of measles notifications recorded since 1948 when measles was specified as a notifiable disease under the Health Act, 1947 (figure 1). The WHO has targeted 2010 for eliminating measles and reducing the incidence of congenital rubella infection to less than one case of congenital rubella syndrome per 100,000 live births in the WHO European Region. In order to achieve measles elimination in Ireland it is essential that all suspected measles cases are notified. Strengthening of measles surveillance will be a critical component in the control and elimination of this disease. Measles surveillance is required to detect cases and to understand the reasons for the occurrence of this disease so that appropriate and timely control measures can be implemented.

Measles can be difficult to diagnose clinically. It is important that follow-up laboratory information is provided for accurate surveillance. For elimination it is also essential that all suspected cases have specimens sent for laboratory testing. Of the 93 measles notifications in 2005, 74% (n=69/93) either had no specimen sent for laboratory testing or had no laboratory results reported. Laboratory testing is a very important part of measles surveillance. Good surveillance and laboratory data provide evidence, where there is low incidence, that the absence of notifications is attributable to the absence of disease rather than to inadequate detection and reporting.

For Ireland to achieve the WHO target, of measles elimination and preventing congenital rubella infection, it is also essential that all rubella and congenital rubella cases are notified. It is again important to have follow-up laboratory information as rubella can also be difficult to diagnose clinically and often measles and rubella are clinically indistinguishable. During 2005 only 17 rubella cases were notified; 15 of these were classified as possible while two had no case classification assigned. This low number suggests rubella is underreported in Ireland. (Rubella data are described in the infectious disease chapter in this document.)

The incompleteness of measles surveillance data provided to HPSC continues to be a major limitation. For example, vaccination status was not provided for over a third of notifications. Also, for a number of cases, where vaccination status was provided, the date of vaccination in relation to disease onset was not reported, making interpretation of the vaccination data difficult. Good vaccination data allow informed decisions to be made about where vaccination coverage should be improved. To prevent outbreaks occurring it is important to monitor what populations are unvaccinated.

As measles surveillance and data quality are improved so to will the ability to control and prevent measles cases thereby aiding elimination of measles in Ireland.

Acknowledgements

HPSC wish to sincerely thank everyone who contributed to measles surveillance in Ireland. Special thanks to those who provided enhanced measles data.

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Mumps in Ireland, 2004-2005

Key Points

- **A national mumps outbreak that commenced in November 2004 continued during 2005**
- **The outbreak was predominantly in those born before 1988, particularly those born between 1983 and 1986, who were not scheduled to receive two MMR doses during childhood as MMR was first introduced in 1988**
- **An outbreak control team was convened in November 2004 and control measures implemented**
- **As outbreaks were reported in a number of third level colleges all new entrants, in autumn 2005, were recommended MMR vaccine (if not previously vaccinated with two doses)**

Introduction

Mumps is an acute viral infectious disease characterised by fever and swelling of one or more salivary glands, most commonly the parotid gland. Mumps infection can present with other symptoms such as meningitis or pancreatitis. Mumps infection may also cause inflammation of the ovaries, testicles or breast tissue. More serious problems include encephalitis and deafness, but these are rare.

Mumps virus is spread from person to person through airborne transmission, by droplet spread, such as from coughs and sneezes, and through kissing or other direct contact with saliva of an infected person.

In Ireland, mumps became a notifiable disease in 1988. Between 1988 and 2003, only clinicians were required to notify mumps cases. Since January 2004, laboratories are also required to notify cases identified.[1] Between 1988 and 2003 two mumps outbreaks occurred, the first in 1989 with 709 notifications, and the second during 1996/1997 with 707 notifications (figure 1). The number of mumps cases notified during the inter-epidemic period was low, with approximately 40 cases notified annually.

Mumps infection can be prevented by vaccination. Mumps vaccine in Ireland is available as part of the combined measles-mumps-rubella (MMR) vaccine. Vaccination with the first dose of MMR is recommended at twelve to fifteen months and the second dose at four to five years.[2] Mumps vaccine was first offered in Ireland in 1988, with the introduction of the MMR vaccine. In 1992, a second dose of MMR was recommended for children aged 10 to 14 years. As

Table 1. Number of mumps notifications and crude incidence rates (CIR) per 100,000 population by HSE Area, 2003-2005

HSE Area	2003		2004		2005	
	Number	CIR	Number	CIR	Number	CIR
HSE-E	20	1.4	96	6.9	225	16.1
HSE-M	4	1.8	109	48.4	55	24.4
HSE-MW	1	0.3	14	4.1	104	30.6
HSE-NE	4	1.2	13	3.8	82	23.8
HSE-NW	0	0.0	111	50.1	174	78.5
HSE-SE	4	0.9	9	2.1	29	6.8
HSE-S	5	0.9	16	2.8	125	21.5
HSE-W	2	0.5	55	14.5	289	76.0
Total	**40**	**1.0**	**423**	**10.8**	**1083**	**27.6**

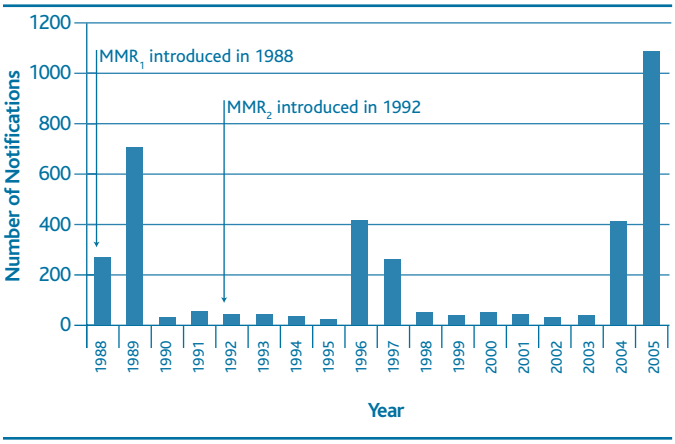

Figure 1. Number of mumps notifications by year and year of introduction of MMR vaccine in Ireland

a result of mumps outbreaks in 1996/1997, that predominantly affected primary school children, the age of the second dose was lowered to four to five years in 1999.

Materials and Methods

Mumps data, obtained through the weekly infectious disease notification system, for 2004-2005 are presented here. During 2004, Medical Officers in the HSE Areas provided case based data to the Director of HPSC by the Wednesday of each week, on infectious diseases notified to them during the previous week, using an agreed dataset.[3] These notifications were inputted on a Microsoft Access database in HPSC. In 2005, HPSC commenced using the CIDR system. Historical notifiable infectious disease data since 1988 were migrated from the Microsoft Access system to CIDR. Four of the HSE Areas also commenced using CIDR during 2005 namely the HSE-M, HSE-NE, HSE-SE and HSE-S. For HSE Areas live on CIDR the infectious disease notifications are entered directly on CIDR at regional level. HPSC can view this data using the Business Objects reporting tool on CIDR (except for patient name and address). For HSE Areas not live on CIDR during 2005, Medical Officers in the HSE Areas continued to provide case based data to the Director of HPSC by the Wednesday of each week, on infectious diseases notified to them during the previous week. At HPSC, these data were migrated to the CIDR system on the Thursday of each week. The figures presented in this report are based on data on the CIDR system as of the 5th September 2006. These figures may differ from those published previously, due to ongoing updating of notification data in CIDR.

An enhanced surveillance system for mumps was established during 2004 to capture information on the mumps outbreak. Enhanced mumps data received at HPSC were entered on a Microsoft Access database. Please note the final cleaning and validation of the 2004 and 2005 data on the mumps enhanced database, with all the Departments of Public Health in the HSE Areas, was not completed at the time of writing of this report.

Case classifications were assigned to mumps notifications as per the Case Definitions for Notifiable Diseases.[4]

Analysis of mumps data was carried out using Business Objects, Microsoft Access and Excel. Incidence rates were calculated based on population data taken from the 2002 census.

Results

Epidemiology

A national mumps outbreak began in Ireland in 2004 and continued into 2005. In total, there were 423 (10.8/100,000) mumps notifications during 2004 and 1,083 (27.6/100,000) in 2005. In comparison, 40 (1.0/100,000) cases were notified during 2003. The increase in mumps notifications commenced at the beginning of November 2004 (Week 44 2004) peaking in the second week of November (Week 45 2004) with 81 notifications and again in mid-April (Week 16 2005) with 54 notifications (figure 2). Between Week 44 2004 (early November) and Week 52 2005 there were 1,433 notifications with on average 23 mumps notifications each week. In comparison, there was, on average, less than one mumps

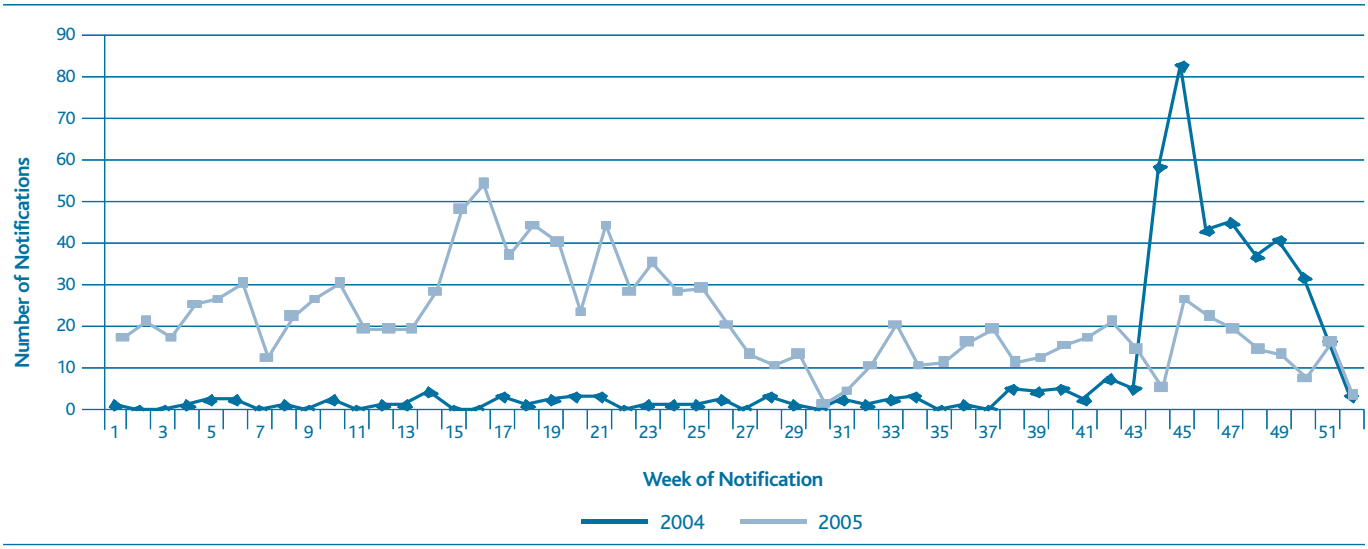

Figure 2. Number of mumps notifications by week and year, 2004-2005

notification each week in 2003. All HSE Areas reported more cases in 2004/2005 compared to 2003 (table 1). The highest crude incidence rates were in the HSE-NW and HSE-W during 2005. The outbreak was predominantly among those born before 1988 and, in particular, in those born between 1983 and 1986 (figure 3); many of this group were in third level education and were associated with outbreaks in colleges and universities. Of the 1,433 mumps notifications from Weeks 44 2004 to Week 52 2005; 505 (35%) were classified as confirmed; 94 (7%) as probable; 554 (39%) as possible. Case classification was not supplied for 280. Of the 1,433 notifications 809 were male, 616 were female while sex was not reported for eight notifications.

Mumps notifications declined during 2006. From June 2006 (Week 23) to late August 2006 (Week 35) there were on average six notifications (provisional data) each week.

Enhanced surveillance system

At the start of the outbreak in 2004 an enhanced surveillance system was established to collect information on risk factors for infection and reported vaccination status. This information helped identify appropriate control strategies to prevent ongoing transmission and to identify public health strategies needed. Mumps enhanced data were also used to determine the morbidity associated with mumps illness.

Enhanced data received at HPSC for 2004/2005 notifications are reported here. Please note the final cleaning and validation of these data on the mumps enhanced database, with all the Departments of Public Health in the HSE Areas, was not completed at the time of writing of this report.

The most likely place where the case acquired mumps was reported for 349 notifications; for 67% (n=234/349) of these mumps notifications university/college was reported as the place the infection was most likely acquired.

Of the 389 notifications where vaccination status was reported 28% (n=109/389) were unvaccinated, 43% (n=166/389) were reported to have received one dose of MMR (MMR_1) and 29% (n=114/389) were reported to have received two doses of MMR (MMR_2). Self reported vaccination status might be inaccurate. Of the cases reported to have received MMR_1 61% (n=102/166) had no vaccination dates reported and 89% (n=148/166) had no MMR batch number reported. Both vaccination dates were only reported for 39% (n=45/114) of cases reported to have received MMR_2 and nine percent (n=4/45) of these were vaccinated with MMR_2 less than 18 days prior to onset of symptoms, this means they were probably exposed already. Only four percent (n=5/114) of cases that were reported to have received two doses of MMR had both MMR batch numbers reported.

Information on hospitalisation status was available for 467 notifications. Thirty-seven cases were hospitalised, representing eight percent of all cases with known hospitalisation status. Reported complications of mumps included orchitis (18%, n=44/243), pancreatitis (1.16%, n=4/345), meningitis (1%, n=4/400), deafness (0.76%, n=3/395), mastitis (0.29%, n=1/349) and encephalitis (0.25%, n=1/397).

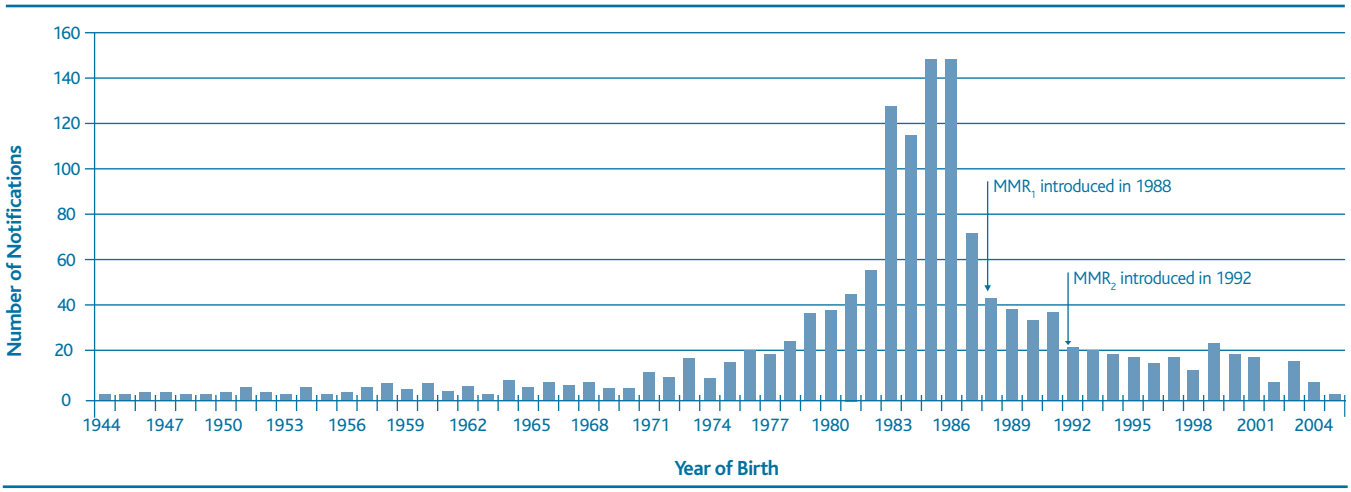

Figure 3. Mumps notifications (n=1,341) from Week 44 2004 to Week 52 2005 by year of birth and year of introduction of MMR in Ireland (year of birth not shown for 6 cases born before 1944)

Public Health Strategies/Control Measures

At the beginning of the outbreak a national outbreak control team was convened, bringing together health professionals from all HSE Areas, DoHC, NVRL and HPSC. This group agreed on public health strategies (vaccination and management of cases and close contacts) to control the outbreak at national and local level. Communication messages were standardised and control measures were implemented locally.

Because the outbreak predominantly affected third level colleges this population was targeted for a MMR vaccination programme. All students and staff under 25 years of age who had not received two does of MMR were recommended vaccination. The vaccine was provided either by public health services, student health services, or by the student's own GP. MMR vaccine was also provided for those at risk in the wider community through GP practices. Public health messages during the outbreak urged parents to make sure that their children were vaccinated with two doses of MMR by six years of age (i.e. routine vaccination schedule). Vaccine was provided free of charge by the HSE Areas.

To prevent ongoing transmission of mumps virus and ensure high levels of immunity among the college students the mumps outbreak control group also recommended that all new entrants to third level colleges for the academic year 2005/2006 (less than 25 years of age) should be fully vaccinated with two doses of MMR prior to commencing the academic year.

To increase awareness of the outbreak leaflets and information materials were developed and disseminated locally and made available on the HPSC Internet site and other HSE Internet sites. These materials included information about mumps, MMR vaccination and the control measures recommended.

Discussion

The number of mumps notifications increased dramatically during 2004 (n=423) and 2005 (n=1,083) compared to 2003 (n=40). The majority of notifications were in those born before 1988 and in particular in older teenagers and young adults born between 1983 and 1986, who were too old to have been routinely scheduled for two doses of MMR during childhood. Protection against mumps was first offered in Ireland in 1988, with the introduction of the MMR vaccine. In 1992, a second dose of MMR was recommended for children aged 10-14 years. In 1999 the age of the second dose was lowered to four to five years.

Other countries have also recently reported resurgence in mumps. During 2004 and 2005, the United Kingdom had an outbreak of mumps. During 2005, 56,390 (provisional figure) mumps cases were notified; the majority were in those aged 19-23 years and attending colleges or universities.[5] These cases were too old to be offered two doses of MMR routinely when it was introduced in the United Kingdom in 1988. These individuals would have missed the opportunity for mumps exposure during childhood because high MMR vaccination coverage in younger children had reduced circulation of mumps in the United Kingdom.[6]

In the United States an outbreak of mumps began in a college in Iowa in December 2005 and by May 2006 involved at least ten additional states.[7] The age group most affected was young adults aged 18-24 years, many of whom were college students.[7] In Iowa, preliminary vaccination data among 1,192 mumps cases indicated six percent were unvaccinated, 12% had received one dose of MMR vaccine, 51% had received two doses while vaccination status was unknown for 31% of cases (the majority of whom were adults).[7]

In studies in the United States mumps vaccination was shown to be between 78% and 91% effective.[8] However, a recent report by Harling *et al*. suggests that the effectiveness of one dose could be as low as 64%.[9] The same study documented vaccine effectiveness of 88% with two doses.[9] As mentioned above, preliminary data in the mumps outbreak in Iowa indicated a large proportion of cases had received one or two doses of MMR. A number of the mumps notifications in Ireland were also reported to have received one or two doses of MMR vaccine, however, for the majority of these cases the vaccination status was not confirmed, as most did not have complete vaccination dates or vaccination batch numbers reported. The HSE Area staff experienced great difficulty in determining the true vaccination status of cases, due to lack of immunisation records or difficulty accessing immunisation records. Accurate vaccination status is vital to determine the efficacy of the vaccine and to inform vaccination policy. This emphasises the importance, and need, for a national vaccination registry in Ireland.

Mumps notifications declined during 2006. It is anticipated that the mumps notifications will continue to decline in 2006. With MMR_1 uptake in those 24 months of age in 2005 approximately 11% below the target uptake of 95% it is vital that immunisation uptake rates improve if future mumps outbreaks are to be prevented.

Acknowledgements

We wish to thank everyone involved in mumps surveillance including laboratory staff, notifying physicians, administrative, medical and scientific staff in the Community Care Areas and in the Departments of Public Health. Thanks to everyone in the mumps outbreak control team.

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Immunisation Uptake in Ireland, 2005

Key Points

- **Immunisation uptake rates at both 12 and 24 months improved in 2005**
- **Uptake of D_3, T_3, P_3, Hib_3, $Polio_3$ and $MenC_3$ at 12 months was 85%**
- **Uptake of D_3, T_3, P_3, Hib_3 and $Polio_3$ at 24 months was 90%**
- **Uptake of $MenC_3$ at 24 months was 89%**
- **Where data were available uptake of MMR_1 at 24 months was 84%**

Introduction

Vaccination is a simple, safe and effective way of protecting people against harmful infectious diseases that can cause serious complications and sometimes death. In addition, vaccination helps reduce the possibility of passing on vaccine-preventable infections to others in the community. To effectively control vaccine-preventable diseases and prevent outbreaks it is recommended that at least 95% of children complete the childhood immunisation schedule.

The current Irish childhood immunisation schedule recommends that babies receive one dose of vaccine against tuberculosis (BCG vaccine) at birth or by one month of age and three doses of vaccines against diphtheria, pertussis, tetanus, *Haemophilus influenzae* type b, poliomyelitis and meningococcal group C at two, four and six months of age. Between 12 and 15 months of age children should receive the first dose of MMR. A booster dose of diphtheria, pertussis, poliomyelitis and tetanus and the second dose of MMR should be given at four to five years of age.

Immunisation uptake statistics for 2005 are presented in this report. These statistics relate to children registered in the immunisation databases in the HSE Areas. The proportion of these children who completed the recommended immunisation schedule by 12 or 24 months of age in 2005 is reported.

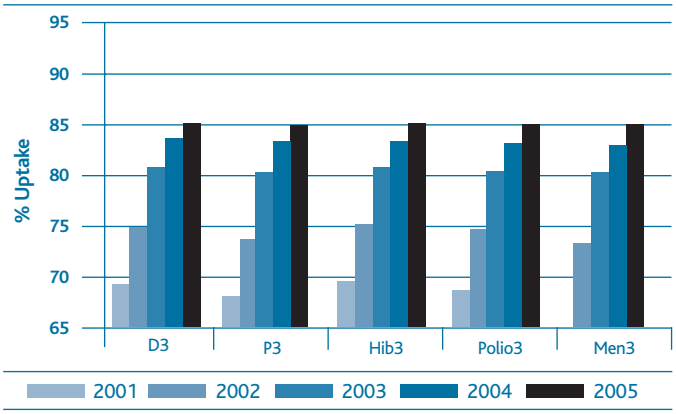

Figure 1. Annual immunisation uptake rates at 12 months in Ireland, 2001-2005
Note scale ranges from 65-95%
T_3 uptake identical to D_3 uptake, therefore T_3 uptake not presented in this chart

Table 1. Immunisation uptake rates in children 12 months of age in 2005

% Uptake at 12 months

Cohort born between 01/01/2004 – 31/12/2004

HSE Area	No. in cohort	D_3	P_3	T_3	Hib_3	$Polio_3$	$MenC_3$	BCG
HSE-E	22,728	81	81	81	81	81	80	na*
HSE-M	3,963	91	91	91	91	91	91	89
HSE-MW	5,098	87	87	87	87	87	87	93
HSE-NE	6,315	90	90	90	90	90	89	na*
HSE-NW	3,167	90	90	90	90	90	89	90
HSE-SE	6,790	87	87	87	87	87	87	97
HSE-S†	8,631	85	85	85	85	85	85	90‡
HSE-W	5,700	87	87	87	87	87	85	na*
Ireland	**62,392§**	**85**	**85**	**85**	**85**	**85**	**85**	**93**

** Data not available at this time*
† As the denominator/number in cohort varied according to vaccine, most commonly used number is presented here. The number in cohort eligible for BCG vaccine was 1,810
‡ HSE-S: part coverage of neonatal BCG, Kerry only
§ Number in cohort eligible for BCG vaccine was 20,592

Materials and Methods

Each HSE Area maintains a childhood immunisation register. In 2005, each HSE Area provided HPSC with immunisation uptake data on a quarterly basis. These uptake data related to all children on the HSE Area databases who reached their first or second birthday (uptake at 12 and 24 months, respectively) in that quarter and who had received three doses of vaccine against diphtheria (D_3), pertussis (P_3), tetanus (T_3), *H. influenzae* type b (Hib3), poliomyelitis (Polio3) and meningococcal group C ($MenC_3$) and one dose of BCG vaccine (uptake at 12 months only) and one dose of vaccine against measles, mumps and rubella (MMR_1; uptake at 24 months only). Data on the number of children eligible for immunisation in each cohort, the number immunised and the percentage immunised were provided.

HPSC collated and analysed these data in Microsoft Excel and quarterly reports were produced which are available on the HPSC website.[1] Annual immunisation uptake rates presented in this report were calculated by collating the quarterly data provided by the HSE Areas. These statistics, therefore, relate to children who were 12 and 24 months of age in 2005 i.e. birth cohorts born between 01/01/2004 & 31/12/2004 and 01/01/2003 & 31/12/2003 and who completed the immunisation schedule outlined above.

Results

Immunisation uptake rates at 12 months

In 2005, national immunisation uptake rates at 12 months were 85% for D_3, P_3, T_3, Hib_3, $Polio_3$ and $MenC_3$. This was an improvement of two percent when compared to 2004 (figure 1). Immunisation uptake rates in Ireland have been steadily rising each year since 2001, when uptake of vaccines was between 68 and 70% (figure 1). In 2005, uptake of the above vaccines ranged from 80-81% in the HSE-E to 91% in the HSE-M (table 1). In 2005, BCG uptake rates were available for the second time for an entire year. Five of the eight HSE Areas were in a position to provide figures (representing a third of the national birth cohort), and uptake was 93%. BCG uptake ranged from 89% in the HSE-M to 97% in the HSE-SE (table 1).

Quarterly immunisation uptake rates for D_3, P_3, T_3, Hib_3, $Polio_3$ and $MenC_3$ rose in 2005 from 83-84% in Q1-2005 to 87% by Q4-2005 (figure 2). The highest uptake rate at 12 months since the collation of these data commenced in Q3-2000 was reported in Q4-2005 (87%). This is in contrast to the low that was seen in Q2-2001 when uptake rates were 65 to 67% (figure 2).

Immunisation uptake rates at 24 months

In 2005, a slight improvement in immunisation uptake rates at 24 months was seen. National uptake for D_3, P_3, T_3, Hib_3 and $Polio_3$ was 90% and 89% for $MenC_3$ (figure 3). Compared

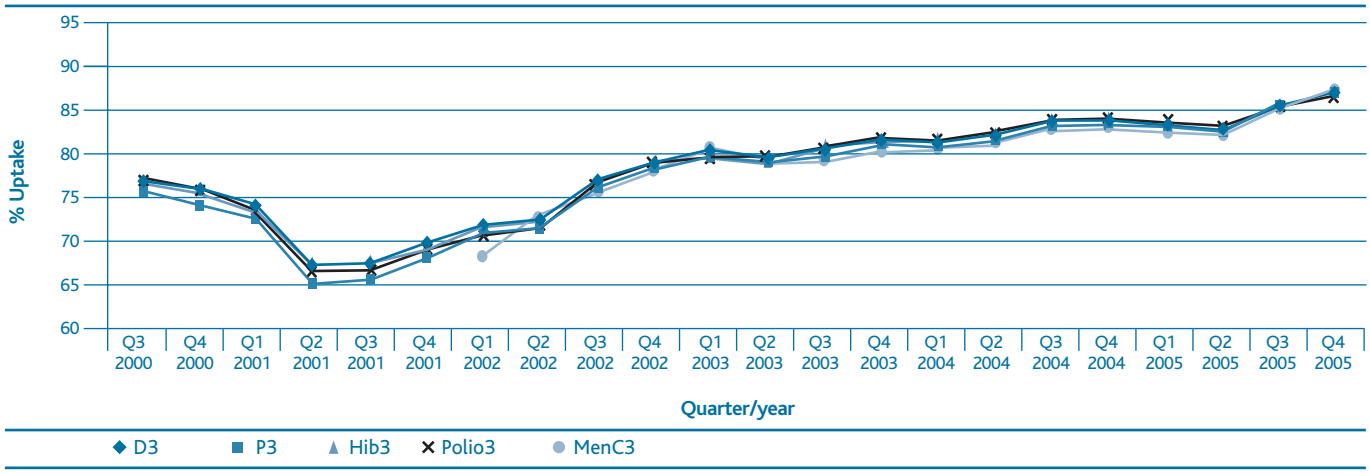

Figure 2. Quarterly immunisation uptake rates at 12 months in Ireland, Q3 2000-Q4 2005
Note scale ranges from 60-95%
T_3 uptake identical to D_3 uptake, therefore T_3 uptake not presented in this chart

with 2004, uptake of these vaccines improved by one percent (figure 3). Uptake of D_3, P_3, T_3, Hib_3, $Polio_3$ and $MenC_3$ ranged from 86-88% in the HSE-E to 96% in the HSE-M (table 2). Six of the eight HSE Areas had 90% or greater uptake for all these vaccines. The target uptake of 95% was reached for D_3, P_3, T_3, Hib_3, $Polio_3$ and $MenC_3$ in the HSE-M during Q1-2005 to Q4-2005 and for D_3, P_3, T_3, Hib_3 and $Polio_3$ in the HSE-NW during Q3-2005.

During 2005 MMR_1 uptake was 84% nationally, however, this figure is incomplete as MMR_1 data in Q4-2005 was only available for seven of the eight HSE Areas. In Q4-2005 MMR_1 uptake was 95% in the HSE-M.

Discussion

Childhood vaccinations have made a major contribution to reducing the incidence of infectious disease in Ireland and in eliminating diseases such as polio and smallpox. Monitoring immunisation uptake is necessary to identify under vaccinated populations and to evaluate the effectiveness of efforts to increase uptake. Uptake of 95% is recommended to control and prevent outbreaks of disease such as measles.

National immunisation uptake rates for D_3, P_3, T_3, Hib_3, $Polio_3$ and $MenC_3$ at 12 and 24 months increased by two and one percent, respectively, in 2005 compared to 2004. The 2005 uptake figures for D_3, P_3, T_3, Hib_3, $Polio_3$ and $MenC_3$ at both 12 months (85%) and 24 months (89-90%) are the highest reported since collation of these data commenced in 2000 and 1999, respectively. For all vaccines, with the exception of MMR_1, uptake rates at 24 months were 90% or greater in six of the eight HSE Areas. In the HSE-M the target uptake rate of 95% was reached for MMR_1 during Q4-2005. This is the first time any HSE Area reached the target uptake of 95% for MMR_1 since the collation of these statistics commenced in 1999. The target uptake of 95% was also reached at 24 months for D_3, P_3, T_3, Hib_3, $Polio_3$ and $MenC_3$ in the HSE-M during Q1-2005 to Q4-2005, for D_3, P_3, T_3, Hib_3 and $Polio_3$ in the HSE-NW during Q3-2005 and at 12 months for BCG in the HSE-SE during Q1-2005 to Q4-2005. These continued improvements in uptake rates are encouraging. However, further improvements are necessary so that the 95% target rate is achieved nationally for all vaccines. In 2005, national uptake rates at 24 months for D_3, P_3, T_3, Hib_3, $Polio_3$ and $MenC_3$ were five to six percent below the target rate while MMR_1 was 11% below the target rate.

Table 2. Immunisation uptake rates in children 24 months of age in 2005

% Uptake at 24 months

Cohort born between 01/01/2003 – 31/12/2003

HSE Area	No. in cohort	D_3	P_3	T_3	Hib_3	$Polio_3$	$MenC_3$	MMR_1
HSE-E	22,224*	88	87	88	87	87	86	78*
HSE-M†	3,837	96	96	96	96	96	96	93
HSE-MW	5,105	90	90	90	90	90	90	86
HSE-NE	6,003	93	92	93	93	93	92	89
HSE-NW	3,233	94	93	94	93	94	92	89
HSE-SE	6,862	91	91	91	91	91	90	86
HSE-S†	8,383	91	91	91	91	91	90	85
HSE-W	5,504	92	91	92	92	92	89	83
Ireland	**61,151**	**90**	**90**	**90**	**90**	**90**	**89**	**84***

**The national MMR_1 figure is incomplete, as Q-4 2005 MMR_1 data was not available for the HSE-E. HSE-E MMR_1 figure is based on data from Q1-2005 to Q3-2005. The numbers in the HSE-E and Ireland cohorts eligible for MMR_1 vaccine were 16,766 and 55,778, respectively.*
† As the denominator/number in cohort varied according to vaccine, most commonly used number is presented here.

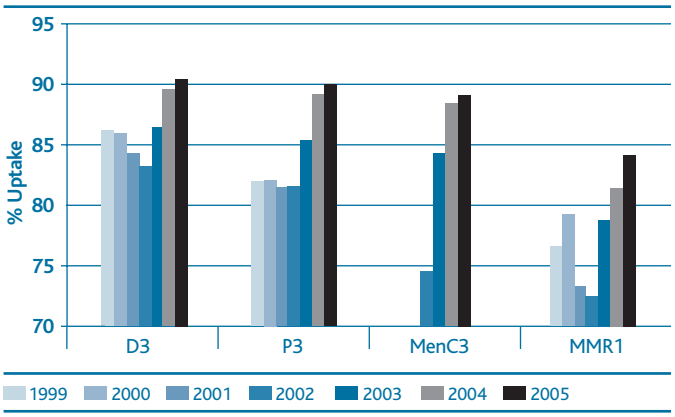

Figure 3. Annual immunisation uptake rates at 24 months in Ireland, 1999-2005
Note scale ranges from 70-95%
Since T_3, Hib_3 and $Polio_3$ uptake identical/almost identical to D_3 uptake, only D_3 uptake figures presented
Footnote: MMR, 2005 uptake figure is not complete as one HSE area was unable to provide MMR data for quarter 4 2005

Acknowledgements

HPSC would like to thank the HSE Areas for providing these data. Particular thanks to the Immunisation Co-ordinators, Specialists in Public Health, Surveillance Scientists and System Analysts for their help.

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Meningococcal Disease in Ireland, 2005

Key Points

- **In 2005, 203 cases of meningococcal disease were notified in Ireland**
- ***Neisseria meningitidis* serogroup B accounted for 83% of these notifications**
- **There were six meningococcal disease related deaths in 2005**
- **Five of the deaths occurred in children <5years of age**

Introduction

Meningococcal disease occurs worldwide. There are significant variations in the geographical distribution of the *Neisseria meningitidis* serogroups that cause disease. Serogroups B and C are responsible for the majority of meningococcal disease in developed countries. Serogroup Y accounts for up to a third of the cases in the United States, yet it occurs relatively infrequently in most other developed countries. Meningococcal disease in Africa and Asia can largely be attributed to serogroup A and in more recent times serogroup W135.

Since 2001 the incidence of meningococcal disease has been on the decline in Ireland with rates of 5-6 cases per 100,000 total population occurring of late. This is in contrast with the epidemic-like rates that occurred towards the end of the last century when >14 cases per 100,000 total population were occurring annually.

A major contributory factor in this reduction has been the introduction of the MenC conjugate vaccine in 2000 to the routine childhood immunisation schedule at 2, 4 and 6 months and the implementation at the same time of a catch-up programme for under 23 year olds. Following the introduction of this vaccine, the incidence of serogroup C has plummeted from approximately 130 cases (>3/100,000) to just five cases (0.1/100,000) annually.

In this report the epidemiology of meningococcal disease in 2005 is described. A brief update on other forms of bacterial meningitis is also presented.

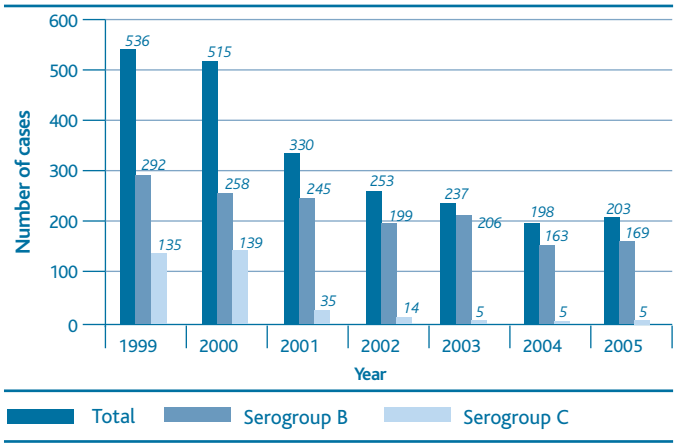

Figure 1. Number of invasive meningococcal disease cases notified annually in Ireland, 1999-2005 (includes imported cases)

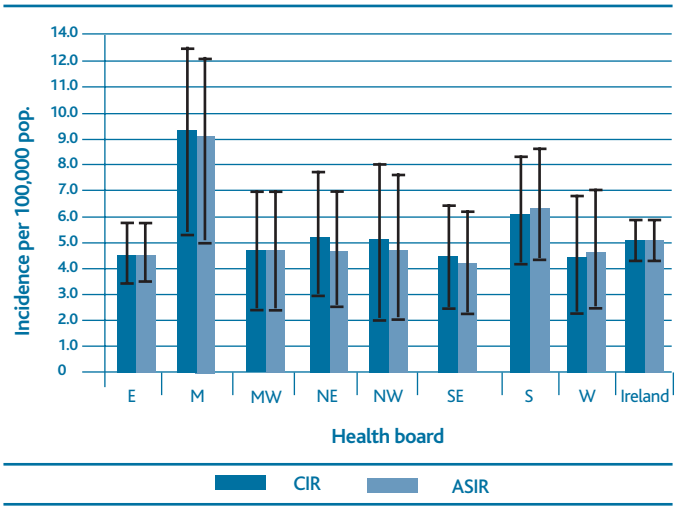

Figure 2. Age standardised (ASIR) and crude incidence rates (CIR) with 95% confidence intervals by HSE area for meningococcal disease, in 2005

Materials and Methods

Meningococcal disease is a notifiable disease in Ireland. From 1982-2003 it was notifiable under bacterial meningitis (including meningococcal septicaemia). More recently it has become a notifiable disease in its own right with the implementation of the Infectious Disease (Amendment) (No. 3) Regulations 2003 (SI No. 707 of 2003) on January 1st 2004.[1]

Most forms of bacterial meningitis are now notifiable under their specific disease pathogen name as listed in the legislation. For bacterial meningitis pathogens not listed, these forms of meningitis are notifiable under the disease termed "bacterial meningitis (not otherwise specified)". The case definitions used are described in the HPSC Case Definitions for Notifiable Diseases booklet.[2]

Detailed enhanced surveillance of meningococcal disease and bacterial meningitis has been in place in Ireland since 1997 under the heading of, bacterial meningitis (including meningococcal septicaemia). All historical case based data on meningococcal disease and bacterial meningitis notifications since 1999 are now in the Computerised Infectious Disease Reporting (CIDR) system. During 2005, for areas using CIDR, meningococcal disease and bacterial meningitis notifications were inputted directly at regional level, events created and enhanced information updated on the system. For areas not on the system, notifications including the enhanced data continued to be sent to HPSC and these data were inputted on CIDR by HPSC.

In 2005 the meningococcal disease notifications on CIDR were reconciled monthly by HPSC with the Irish Meningococcal and Meningitis Reference Laboratory (IMMRL) national database on laboratory confirmed cases. Approximately once per quarter Departments of Public Health were requested by HPSC to review the meningococcal disease and bacterial meningitis events for 2005 to ensure the data was accurate and complete. Following year-end, final data cleaning and validation checks on the 2005 notifications/events was undertaken by HPSC in conjunction with the Departments of Public Health and the IMMRL. Any updates to these events were made in the CIDR system.

For this report, data analysis was performed using Business Objects Reporting in CIDR and MS Excel. Incidence rates were calculated using population data taken from the 2002 Census of Population as the denominator. The Irish population was used as the standard population when applying the direct method of age standardisation. This was undertaken in order to control for the confounding effect of age so that incidence rates between HSE areas could be compared.

Data for this report were extracted from CIDR on 6th September 2006. These figures may differ from those published previously, due to ongoing updating of notification data in CIDR.

Results

Total notifications

In 2005, 203 cases of meningococcal disease were notified. As no imported cases were reported, all cases have been

Table 1. Number of meningococcal disease notification by serogroup and case classification, in 2005

Classification	Serogroup B	Serogroup C	Serogroup W135	Serogroup Y	Non Groupable	No organism	Total
Definite	168	4	3	3	2	0	180
Presumed	1	1	0	0	0	5	7
Possible	0	0	0	0	0	16	16
Total	**169**	**5**	**3**	**3**	**2**	**21**	**203**

included in the analysis for this report. The incidence of meningococcal disease increased very slightly in 2005 (5.2/100,000 total population) compared with 2004 (5.1/100,000; n=198) but was lower than that reported in 2003 (6.1/100,0000; n=237) and 2002 (6.5/100,0000; n=253) (figure 1). Ninety-two percent (187/203) of the meningococcal disease notifications in 2005 were laboratory confirmed. One hundred and eighty cases were classified as "definite" of which 100 were confirmed by PCR alone, 71 by both culture and PCR and nine by culture alone. The remaining seven laboratory confirmed cases were classified as "presumed" and were confirmed by serology (n=1), microscopy (n=5) and culture from a non-sterile site (n=1). In addition there were 16 cases for which there was no positive laboratory confirmation, these are classified as "possible". The number of meningococcal disease cases by serogroup and case classification are presented in table 1.

Age and gender distribution

There were 113 (56%) cases of meningococcal disease in males in 2005 and 90 (44%) in females, giving a male to female ratio of 1.25:1.0.

In 2005, the meningococcal disease notifications ranged in age from 1 month – 71 years, with a median age of 2 years. Age was not reported for one case. Twenty five percent of all the cases (n=52) occurred in infants <1 year of age, giving an age specific rate of 95.4 per 100,000. As in previous years the incidence rate was highest in this age group, followed by the 1-4 year olds, with an age specific rate of 34.1 per 100,000.

Serogroup distribution

Neisseria meningitidis serogroup B accounted for 83% of the meningococcal disease notifications in 2005, with 169 cases being notified. The remainder of the notifications were due to serogroup C (n=5), serogroup W135 (n=3), serogroup Y (n=3), non-groupable (n=2) and in 21 where no organism was detected (table 1).

The incidence of serogroup B disease increased very slightly in 2005 compared with 2004, from 4.2 per 100,000 total population to 4.3 per 100,000 total population. The incidence of serogroup C disease continues to remain at the same all time low incidence rate seen since 2003 of 0.1 per 100,000 total population.

Meningococcal disease by HSE area

To control for the confounding effect of age across HSE areas, direct age standardisation of the 2005 meningococcal disease data was undertaken. The highest incidence rate was in HSE-M with 8.6 cases occurring per 100,000 population (95% CI 4.9-12.3/100,000) while the lowest was in HSE-SE where 4.3 cases per 100,000 population arose (95% CI 2.4-6.3/100,000). Six of the eight HSE areas had incidence rates ranging between 4.3 and 4.9 per 100,000, while the remaining two HSE areas had higher rates – 6.4 per 100,000 in HSE-S and 8.6 per 100,000 in HSE-M. None of the rates in the HSE areas were considered statistically different from the national rate of 5.2 per 100,000 (95% CI 4.5-5.9/100,000) since the 95% confidence intervals overlapped. The age standardised and crude incidence rates by HSE area are presented in figure 2.

MenC vaccine failures
There was one MenC vaccine failure in 2005, which is a case of serogroup C meningococcal disease arising in an individual despite having been fully vaccinated against the disease. This vaccine failure arose in a two year old child who had received three doses of MenC as an infant. The child recovered.
No MenC vaccine failures occurred in either 2004 or 2003.

Meningococcal disease deaths
There were six meningococcal disease related deaths in 2005 (5 due to serogroup B and 1 due to serogroup Y). This is a case fatality ratio of 3% (6 deaths/203 cases). Five of the six deaths occurred in children <5 years of age, CFR of 3.9%. Four of these deaths were due to serogroup B disease and one due to serogroup Y. There was also a serogroup B related death in a young adult.

In comparison, there were 10 meningococcal disease deaths in 2004, giving a CFR of 5%. This included seven serogroup B deaths in young children, a serogroup C related death in an elderly adult and two meningococcal disease deaths where no organism was detected and were therefore classified as possible cases.

Other forms of bacterial meningitis
Although not as common as meningococcal disease other forms of bacterial meningitis can and do occur. In 2005 the breakdown of these was as follows: 30 cases of bacterial meningitis (not otherwise specified), *Streptococcus pneumoniae* meningitis (n=19), *Haemophilus influenzae* meningitis (n=9; 7 type b, 1 type f and 1 non-capsular), TB meningitis (n=8, provisional figure) and listeria meningitis (n=1). Separate chapters in this report examine in detail the epidemiology of *S. pneumoniae* invasive infections, invasive *H. influenzae* disease and tuberculosis.

With regard to bacterial meningitis (not otherwise specified) notifications in 2005, eight were classified as "confirmed" which consisted of group B streptococci (n=5), group C streptococci (n=1), *Pseudomonas aeruginosa* (n=1) and *Staphylococcus aureus* (n=1) meningitis. No organism was identified for the remaining 22 cases of which five were classified as "probable" and 17 as "possible". No deaths were reported relating to bacterial meningitis (not otherwise specified) in 2005.

The listeria meningitis case notified under listeriosis occurred in an elderly adult.

Discussion
In comparison with the late 1990s when Ireland was in the midst of a meningococcal disease epidemic and incidence rates in excess of 14 cases per 100,000 were arising annually, the burden of meningococcal disease in this country has declined to a third of these rates. In 2005, 5.2 cases per 100,000 total population occurred. As in previous years the highest morbidity and mortality was in young children in 2005. Sixty three percent of all the cases and 83% of all the deaths occurred in <5 year olds. Overall, the distribution of cases by gender shows a slight predominance of disease among male patients. PCR remains a very important tool in the laboratory diagnosis of meningococcal disease, with over

half the laboratory confirmed cases being diagnosed by this method alone and another 38% confirmed by PCR and culture methods. Therefore, PCR was involved in diagnosis of 92% of laboratory confirmed cases in 2005.

Significant advances have been made toward the control of meningococcal disease with the development of meningococcal conjugate vaccines. The success of the MenC conjugate vaccine immunisation campaign in Ireland in reducing the burden of serogroup C disease, has also been experienced by several European countries who have undertaken such programmes. This vaccine has proven to be highly safe and effective. A monovalent serogroup A conjugate vaccine is currently being developed at an affordable price, offers hope for the elimination of large epidemics in African countries. On 14th January 2005, a tetravalent conjugate vaccine incorporating serogroups A, C, Y, W135 was licensed in the United States for 11-55 year olds and is now recommended for the routine immunisation of adolescents and other high risk groups.

Despite its decline in recent years in Ireland, meningococcal disease and in particular serogroup B disease continues to be a serious public health concern. The incidence rate for serogroup B disease in 2005 was 4.3 cases per 100,000 total population and although almost half that reported in 1999 (8.1/100,000), a rate of 4 per 100,000 is still high in comparison to many other developed countries where rates of 1 per 100,000 or less are reported.

Worldwide serogroup B causes about 50% of meningococcal disease. To date, attempts to obtain an effective and broad-spectrum vaccine for this serogroup have failed. Since the development of a conjugate B polysaccharide vaccine has proven problematic, alternative approaches are now the focus of intensive research such as vaccines derived from outer membrane proteins and genome-based vaccine discovery using reverse vaccinology technology. Effective prevention of meningococcal disease will not be achievable without the development of a vaccine against serogroup B disease. Until then meningococcal disease will continue to contribute substantially to the burden of morbidity and mortality in children both in Ireland and globally.

Acknowledgements

HPSC wish to thank all who provided data for this report: Departments of Public Health, IMMRL, Microbiology Laboratories and Medical Officers in the Community Care Areas.

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Invasive *Haemophilus influenzae* in Ireland, 2005

Key Points

- **34 cases of invasive *Haemophilus influenzae* were notified in 2005**
- **41% of cases occurred in children <5 years of age**
- **18 cases of *H. influenzae* type b (Hib) were notified**
- **72% of Hib cases occurred in children <5 years**
- **14 true Hib vaccine failures occurred in 2005 compared to six in 2004**
- **92% of Hib cases occurring in children <5years in 2005 were associated with Hib vaccine failures**
- **A Hib catch-up booster campaign was launched in November 2005**

Introduction

Haemophilus influenzae and in particular *H. influenzae* type b (Hib) causes serious invasive diseases. These infections occur predominantly in children and the clinical manifestations include meningitis, septicaemia, epiglottitis and cellulitis. Invasive disease due to other *H. influenzae* serotypes or to non-capsular strains can also occur. Routine use of the Hib conjugate vaccine has led to a remarkable decline in Hib disease in both developed and developing countries. Ireland has been no exception. Following the introduction of the vaccine to the Irish childhood immunisation schedule in October 1992, the incidence of Hib disease declined from 2.9 per 100,000 total population in the late 1980s to 0.2 per 100,000 total population by 2000. However, towards the end of 2004 a rise in the number of Hib cases and vaccine failures was seen and this continued into 2005.[1]

Materials and Methods

Since January 1st 2004 with the implementation of the Infectious Diseases (Amendment) (No. 3) Regulations 2003, invasive *H. influenzae* is a notifiable disease, with clinicians and laboratories legally obliged to notify. Prior to this, data on invasive *H. influenzae* cases were obtained through regular laboratory surveys, bacterial meningitis notifications and reports from the Health Protection Agency reference laboratory in the UK. An enhanced surveillance system commenced in 1999. A case of invasive *H. influenzae* is defined as the isolation of the organism or its nucleic acid from a normally sterile site. Full details of the case definition are provided in the HPSC Case Definitions booklet.[2]

Table 1. Number of invasive H. influenzae cases by serotype and age group in 2005

	Type b	Type f	Non capsular	Not typed	Total	ASIR of Hib	ASIR of all H. influenzae
<1	1	0	1	0	2	1.8	3.7
1-4	12	0	2	0	14	5.4	6.3
5-9	1	0	1	0	2	0.4	0.8
10-14	1	0	0	0	1	0.4	0.4
15-19	0	0	0	2	2	0.0	0.6
20-44	0	2	1	0	3	0.0	0.2
45-64	1	0	1	1	3	0.1	0.4
65+	2	0	4	1	7	0.5	1.6
All ages	18	2	10	4	34	0.5	0.9

ASIR, age specific incidence rate per 100,000

Data pertaining to *H. influenzae* cases prior to 2004 (1996-2003) are on an MS Access database. *H. influenzae* notifications since 2004 are inputted to the Computerised Infectious Disease Reporting System (CIDR). At least once per quarter events on CIDR were reconciled by HPSC with reports from the HPA Haemophilus Reference Unit, relating to Irish isolates typed there. Departments of Public Health were requested by HPSC each quarter to review events to date for 2005 to ensure data were accurate and complete. Following year-end, final data cleaning and validation checks on the 2005 notifications/events were undertaken by HPSC in conjunction with the Departments of Public Health. Any updates to these events were made in the CIDR system. Analysis for this report was performed using Business Objects Reporting in CIDR and MS Excel. Incidence rates were calculated using the 2002 Census of Population as the denominator.

Data for this report were extracted from CIDR on 4th September 2006. These figures may differ from those published previously, due to ongoing updating of notification data in CIDR.

Results

H. influenzae – Cases

In 2005, 34 cases (0.9/100,000) of invasive *H. influenzae* disease were notified in Ireland, compared to 38 in 2004 (0.97/100,000). Sixteen of the thirty four cases notified in 2005 were in children <5 years of age, three were in 5-14 year old children and the remainder were in adults (n=15) (table 1). The highest age specific incidence rates were in the 1-4 year olds (6.3/100,000), followed by the <1 year olds (3.7/100,000) (table 1). The clinical diagnosis for the 19 cases that occurred in children were as follows: meningitis (n=8), septicaemia (n=5), epiglottitis (n=3), cellulitis (n=1), septic arthritis (n=1) and unknown (n=1).

Over half of the cases in 2005 (n=18) were due to *H. influenzae* type b (Hib) disease (table 1). Thirteen (72%) of the Hib infections occurred in children <5 years and two in 5-14 year old children. Over the same period in 2004, 18 cases of invasive Hib were also reported; nine were in children <5 years of age and nine were in adults. In addition to the 18 Hib cases in 2005, cases of invasive *H. influenza*e disease due to type f (n=2), non capsular (n=10) and strains that were not typed (n=4) also occurred (table 1).

H. influenzae – Deaths

Four deaths due to invasive *H. influenzae* were reported in 2005. Two were due to Hib disease, one occurring in a young child the other in an elderly adult. The two other deaths were also in a young child and an elderly adult and were due to non-capsular strains of *H. influenza*e.

Hib vaccine failures

A true Hib vaccine failure (TVF) is defined as Hib disease occurring in an individual despite being fully vaccinated against the disease. An apparent vaccine failure (AVF) is Hib disease arising in an individual who had received some but not all the recommended doses of Hib vaccine and therefore was incompletely immunised.

There were 14 Hib TVFs and one AVF in 2005. In 2004 and 2003, six and three TVFs occurred respectively (figure 1). The

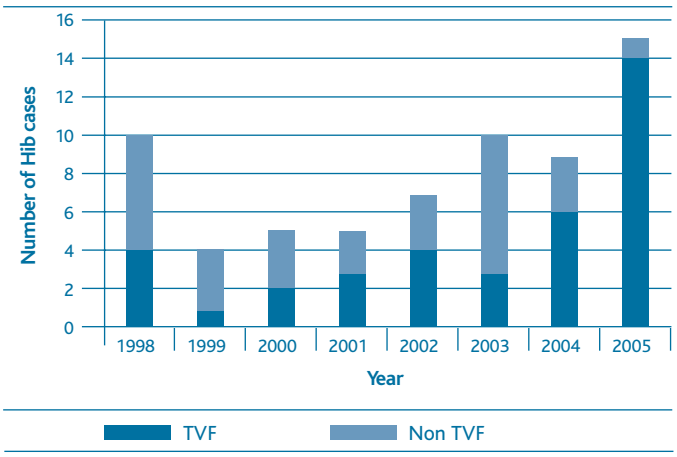

Figure 1. Number of Hib cases in <15 year olds that were associated with and not associated with a true vaccine failure (TVF), 1998-2005

14 TVFs in 2005 ranged in age from 13 months to 14 years. The majority (86%; 12/14) arose in children <5 years of age. Therefore, 92% (12/13) of the Hib cases in 2005 that occurred in children <5years of age were associated with TVFs.

Discussion

The number of invasive *H. influenzae* disease notifications declined very slightly in 2005 compared with 2004 i.e. down from 38 to 34 cases. The proportion of cases occurring in adults declined from 66% in 2004 (25/38) to 44% in 2005 (15/34). Therefore, an increase in the proportion of cases occurring in children was seen in 2005, accounting for 56% of the cases. This increase of invasive *H. influenzae* cases in children <15 years of can largely be attributed to an increase in type b cases in 2005, 15 cases occurred compared to 9 in 2004. Associated with this increase in Hib cases in 2005, was a very substantial rise in Hib vaccine failures, 14 occurring in total. Prior to 2004 the number of TVFs never exceeded four, ranging between one and four per year. In 2004, six TVFs occurred with four of these occurring in the last quarter of the year. This increase continued on into 2005, with five, and three TVFs reported in Quarter 1 and Quarter 2, respectively.

The increase in the number of Hib cases in fully vaccinated children led to concerns that a three-dose infant schedule was no longer sufficient to maintain long term protection. A similar situation had emerged in the UK a number of years previously.[3] Therefore, in response to this emerging trend in Ireland and coupled with the scientific evidence that Hib vaccine efficacy is higher in those immunised at an older age (>12 months), than in children vaccinated routinely as infants,[4] the National Immunisation Advisory Committee recommended that a catch up Hib dose be offered to children <4 years of age, in order to further protect this age group from Hib disease.

The catch up campaign was launched by HSE on 21st November 2005 and ran until May 2006. Defaulters were followed up over the summer months.

Furthermore, as recommended by the National Immunisation Advisory Committee, HSE Management Team have now approved the inclusion of a routine Hib booster in the childhood immunisation schedule at 12 months of age, commencing on 18th September 2006.

Acknowledgements

Many thanks to each and everyone who have provided data for this report – Departments of Pubic Health, Microbiology Laboratories, HPA Haemophilus Reference Unit and hospital clinicians.

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Invasive Pneumococcal Disease in Ireland, 2005

Key points

- **Statutory infectious disease notifications underestimate the burden of invasive pneumococcal disease (IPD) in Ireland when compared with European Antimicrobial Resistance Surveillance System (EARSS) reports**
- **In 2005, 257 cases IPD were notified through the notification system compared to 175 cases in 2004**
- **Through EARSS, 401 IPD isolates were reported in 2005, almost identical to 2004 (n=400)**
- **Both systems demonstrated the same age incidence trends, with rates highest in the very young and the very old**

Introduction

Streptococcus pneumoniae can cause invasive and non-invasive disease. Invasive pneumococcal disease (IPD) includes septicaemia, pneumonia, and meningitis. The most common non-invasive diseases are otitis media, sinusitis and bronchitis. IPD tends to be a disease of early childhood and of older adults. More than 90 serotypes of *S. pneumoniae* have been described based on capsular polysaccharide composition. Although most serotypes have been shown to cause serious disease, only a few serotypes produce the majority of infections.

Vaccination is the only available tool to prevent pneumococcal disease. A 23-valent polysaccharide vaccine (PPV23) has been available for many years. It has been used extensively in Ireland, targeted at older children (>2 years) and adults considered at risk of IPD.[1] However, its application has been limited since it is poorly immunogenic in young children and therefore, not suitable for inclusion in routine childhood immunisation schedules. In more recent years a 7-valent pneumococcal conjugate vaccine (PCV7) has been licensed for use in many countries, including Ireland. In Europe, it is estimated that 74.4% of the most commonly reported serotypes in young children are covered by the PCV7. This vaccine is recommended for use in Ireland in infants and young children considered at increased risk of IPD.

Materials and Methods

Invasive *S. pneumoniae* infection (IPD) was made a notifiable disease from 1st January 2004 with clinicians and laboratories legally obliged to notify. The case definition for IPD is

Table 1. Number of isolates of S. pneumoniae by serotype in 2005 (n=24)

Serotype	1	6B	7F	8	9N	9V	14	15C	19A	23F	33F	38	Total
All ages	4	1	3	1	1	3	5	1	1	2	1	1	24
<5 years	0	1	2	0	1	1	3	1	1	0	1	0	11
PCV7*	N	Y	N	N	N	Y	Y	N	N	Y	N	N	-
PPV23**	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N	-

** Indicates whether above serotypes covered by 7-valent pneumococcal conjugate vaccine; y=yes, n=no*
*** Indicates whether above serotypes covered by 23-valent pneumococcal polysaccharide vaccine; y=yes, n=no*

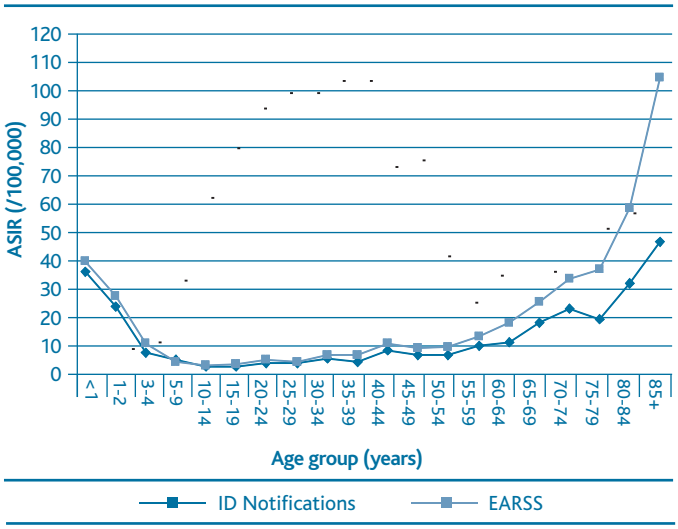

Figure 1. Number of cases of invasive pneumococcal disease reported through the infectious disease notification system and EARSS in 2005

outlined in the HPSC Case Definitions for Notifiable Diseases booklet.[2]

In 2005, the HSE areas using the Computerised Infectious Diseases Reporting (CIDR) system inputted the notifications directly. For areas not on the system, notifications were forwarded weekly to HPSC and from there, inputted to CIDR. Following year-end, a detailed data cleaning and validation process was undertaken by HPSC in collaboration with the Departments of Public Health in the HSE areas. Updates to notifications/events were made directly on CIDR.

Data relating to IPD are also collated through the European Antimicrobial Resistance Surveillance System (EARSS) in Ireland. Details of the EARSS system are described in a separate chapter within this document.

Incidence rates in this report were calculated using the 2002 Census of Population as the denominator. The Irish population was used as the standard population in the direct age standardisation method.

Data for this report was extracted from CIDR on 11th September 2006. These figures may differ from those published previously, due to ongoing updating of notification data on CIDR.

Results

Infectious Disease Notification System

In 2005, 257 cases (6.6/100,000 population) of IPD were notified through the weekly infectious disease notification system. This was a 47% increase compared to 2004 when 175 cases were notified (4.5/100,000 population). The majority of the IPD notifications in 2005 were classified as confirmed (98%, n=251). The remainder consisted of one probable, four possible and one case where case classification was not reported. The overall male to female ratio was 1.4:1.0 (149/108). The age distribution of IPD in 2005 ranged from 1 month to 96 years, for two cases age was not reported. The incidence rates were highest in the very old, i.e. 85 years of age and older (45.5/100,000) and the very young, i.e. <1 year (34.9/100,000) (figure 1). Incidence rates were also high in 1-2 year olds (22.4/100,000) and in the age groups 65 years and older, all had incidence rates >16 per 100,000 (figure 1). For those in the age groups between 3 and 64 years, incidence rates did not exceed 10 per 100,000 and ranged from 0.3 to 9.1 per 100,000 (figure 1).

When IPD incidence rates were examined by geographical distribution (HSE area), variation between HSE area was apparent despite controlling for the confounding effect of age using direct age standardisation. Incidence rates ranged from 1.5 per 100,000 population in HSE-S to 9.9 per 100,000 in HSE-MW (figure 2). The HSE-S (1.5/100,000; 95% CI 0.5-2.5), HSE-NW (1.6/100,000; 95% CI 0.03-3.1) and HSE-M (3.1/100,000; 95% CI 0.8-5.4) all had incidence rates of IPD significantly lower than the national rate (6.6/100,000; 95% CI 5.7-7.3). The remaining five HSE areas all had incidence rates within the range 7.3 to 9.9 per 100,000 population (figure 2).

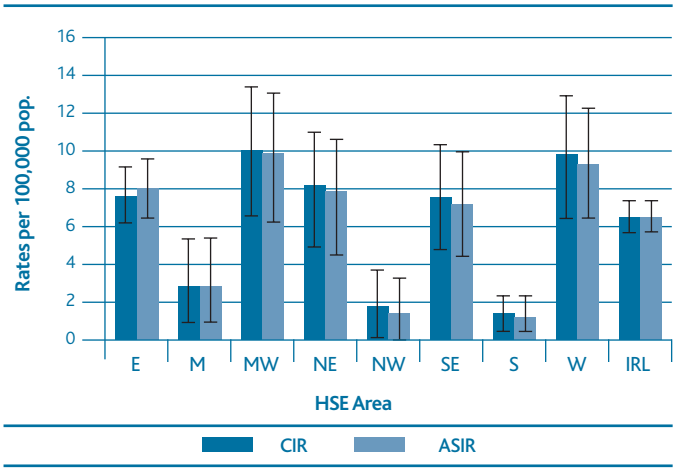

Figure 2. Age standardised and crude incidence rates with 95% confidence intervals by HSE area for invasive pneumococcal disease reported through the infectious disease notification system in 2005

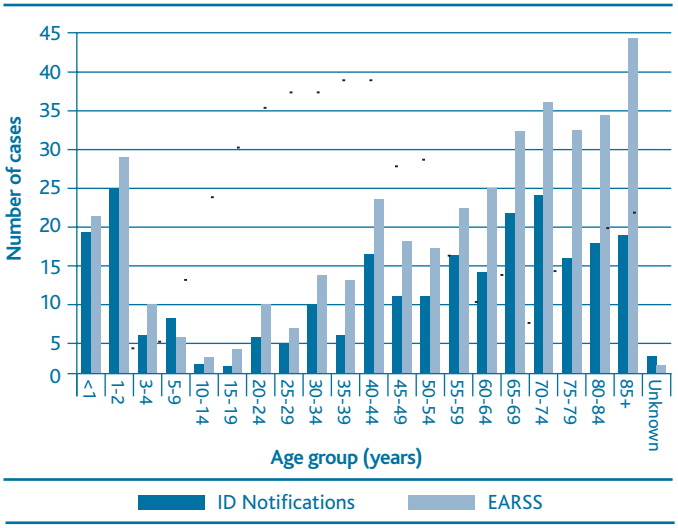

Figure 3. Number of cases of invasive pneumococcal disease reported through the infectious disease notification system and EARSS in 2005

European Antimicrobial Resistance Surveillance System (EARSS)

In 2005, 401 cases of IPD were reported through EARSS, which was almost identical to that reported in 2004 (n=400). In 2005, 56% (n=144) more IPD cases were reported through EARSS than through the infectious disease notification system. A greater number of cases were reported through EARSS for all age groups and in particular for the older age groups (figure 3). The age specific incidence rates for the EARSS IPD data followed a similar trend to that captured by the notification data, with rates highest in the very young (39/100,000 in <1 year olds) and the very old (105/100,000 in 85 year olds and older) (figure 1). Incidence rates in infants, children and young adults were alike in both systems. However, with increasing age the incidence rates of IPD cases as reported through EARSS were substantially higher, reflecting the higher number of cases being reported by this system in these age groups (figure 1).

The geographical distribution of IPD based on the EARSS data showed that the incidence ranged from 6.1 per 100,000 population in HSE-NE to 14.9 per 100,000 in HSE-NW, with a national incidence rate of 10.2 per 100,000 total population (figure 4). When the national rate is adjusted to take account of the fact that EARSS data represents 98% population coverage, the corrected rate was 10.4 per 100,000. For five of the eight HSE areas, the incidence of IPD was higher based on the EARSS data rather than on the notification data. The exceptions were HSE-SE where identical numbers were reported through both systems, the HSE-MW where three additional cases reported via the infectious disease notification system (2 possible cases which did not meet the EARSS case definition and one case notified at the very end of 2005, which is on the EARSS database for 2006) and the HSE-NE where seven more cases were reported on the notification system than through EARSS. Serotype data was available on 24 IPD isolates from two of the 42 laboratories participating in EARSS in 2005. Eleven of the isolates were from children <5 years of age. Five of the isolates (45%) in this age group had a serotype that would have been specifically covered by PCV7 (table 1). These data are discussed in more detail in the EARSS chapter within this document.

Discussion

Despite IPD being a notifiable disease, the statutory infectious disease notification system does not accurately reflect the true burden of this disease in Ireland. When compared with EARSS reports, the burden of IPD in most of the HSE areas is substantially underestimated by the notification data. Similarly the burden of disease in each of the age groups, in particular the older age groups, is also considerably underestimated.

Based on the notification data, incidence of IPD was considered to be significantly lower in HSE-M, HSE-NW and HSE-S. However, when the EARSS data were analysed by HSE area, it was found that incidence rates in these three areas were notably higher and HSE-NW had the highest rate of all the eight HSE areas at 14.9 per 100,000. Such discrepancies in IPD data are in all probability a reflection of local reporting practices, where laboratories are reporting directly to EARSS at HPSC but are not simultaneously reporting these cases to Departments of Public Health in the HSE areas through the notification process. Therefore, for HSE areas to more

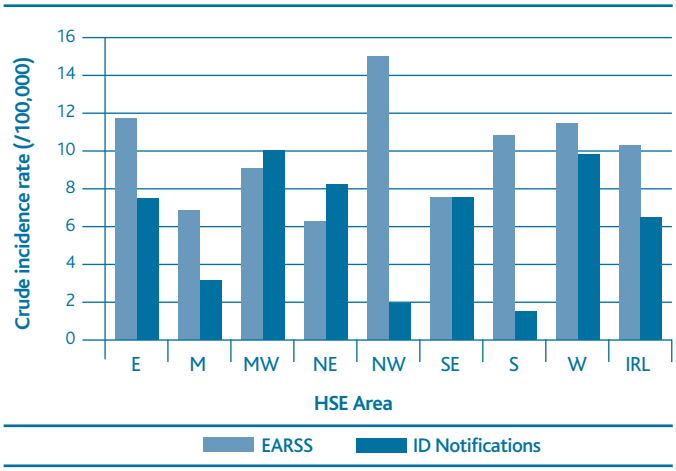

Figure 4. Crude incidence rates of invasive pneumococcal disease reported through the infectious disease notification system and EARSS in 2005

accurately ascertain the burden of IPD in their regions, it is vital for all laboratories to notify cases through the statutory notification process as well as through EARSS. However, as more laboratories commence using the CIDR system the discrepancy between the notification data and the EARSS data should hopefully diminish.

Surveillance of IPD in Ireland is also hampered by the fact that there is no comprehensive enhanced surveillance system in place in this country for the disease. With the result that detailed information is not available on cases as to whether or not they: (i) were in any of the recognised "at-risk" groups, (ii) had been vaccinated, and (iii) survived. Furthermore, at present isolates of *S. pneumoniae* are not routinely serotyped. In 2005, of the 401 isolates reported through EARSS, serotype results were reported for just 24. Eleven of those serotyped were isolates from children <5 years of age and the results indicated that 45% of the cases would have been covered by the PCV7. However, a far larger and more representative sample of isolates would need to be serotyped to obtain an accurate picture of the main IPD serotypes circulating in Ireland and to determine the proportion of those covered by the vaccines available. Reliable epidemiologic data is important for making rational choices for public health issues, such as vaccination strategies in the case of IPD.

In February 2006, the Chief Medical Officer in the UK announced that a pneumococcal conjugate vaccine (PCV7 - Prevenar, Wyeth) was to be added to the childhood immunisation schedule in the autumn at two and four months with a third dose given at 13 months. The current approach to pneumococcal vaccination in Ireland is based on selective vaccination of high-risk groups. The PPV23 vaccine is recommended for those 24 months and older, and PCV7 is recommended for infants and children. The National Immunisation Advisory Committee (NIAC) of Ireland is at present considering the necessity and feasibility of introducing pneumococcal vaccination to the routine infant immunisation schedule. Rigorous efforts should be made to strengthen the current surveillance of IPD through enhanced surveillance and routine serotyping of all isolates, in order to best inform decisions on vaccination policy in Ireland and to measure their impact thereafter.

Acknowledgements

HPSC is grateful to all medical and scientific staff working in public health and microbiology laboratories and to clinicians in hospitals and primary care who participated in the surveillance of IPD in Ireland and provided data for this report.

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Epidemiology of Influenza in Ireland, 2005/2006 Season

Key Points

- **Influenza activity was moderate during the 2005/2006 season, peaking in March 2006**
- **Influenza A (H3) and B co-circulated this season**
- **During the 2005/2006 season, avian influenza A (H5N1) outbreaks continued to pose a significant global threat to human health**

Introduction

The 2005/2006-influenza season was the sixth year of influenza surveillance using sentinel general practices in Ireland. The Health Protection Surveillance Centre (HPSC) is working in collaboration with the National Virus Reference Laboratory (NVRL) and the Irish College of General Practitioners (ICGP) on this project.

Influenza activity was moderate in Ireland for most of the 2005/2006 season, with the peak of activity occurring later than usually observed, during week 10 2006. Influenza A (H3) and B co-circulated this season. Influenza activity mainly affected 5 to 14 year olds.

The most significant global event during the 2005/2006-influenza season was the continuing global spread of poultry outbreaks of avian influenza A (H5N1) associated with sporadic cases/clusters of human infection and a significant proportion of human deaths. [1, 2]

Materials and Methods

Clinical data

Forty-six general practices (located in all HSE areas and representing 4.1% of the national population) were recruited to report electronically, on the number of patients who consulted with influenza-like illness (ILI) on a weekly basis. ILI is defined as the sudden onset of symptoms with a temperature of 38°C or higher, with two or more of the following: headache, sore throat, dry cough and myalgia. Cases were those attending for the first time with these symptoms.

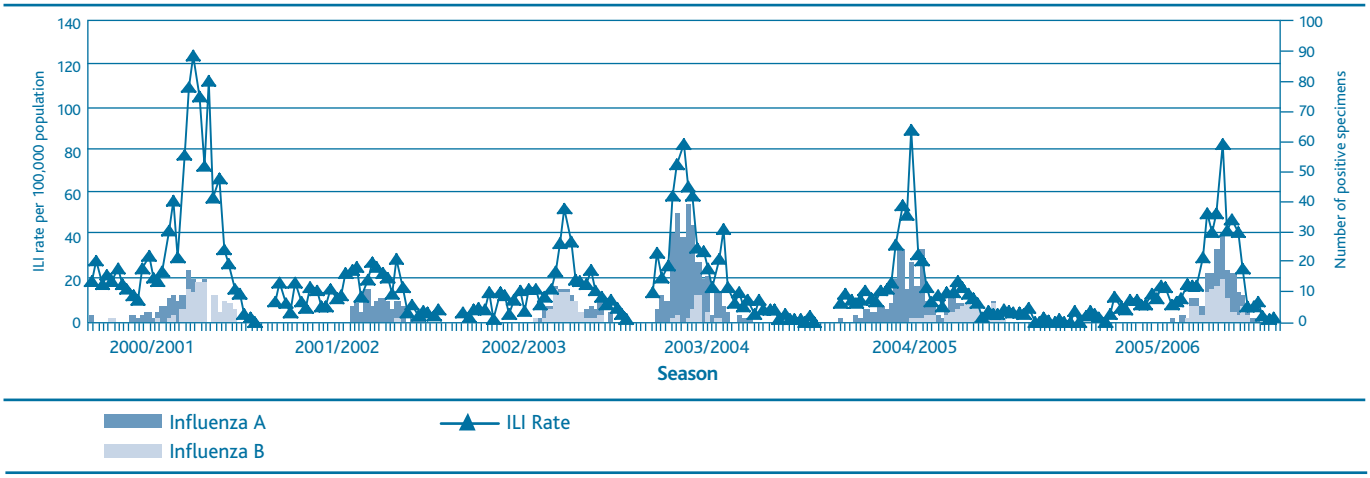

Figure 1. ILI rate per 100,000 population and the number of positive influenza specimens detected by the NVRL during the 2000/2001, 2001/2002, 2002/2003, 2003/2004, 2004/2005 seasons, summer 2005 and the 2005/2006 season.

Virological data
Sentinel GPs were requested to send a combined nasal and throat swab on at least one ILI patient per week to the NVRL. Swabs were tested for influenza using immunofluorescence and PCR techniques and results were reported to HPSC. The NVRL also tested respiratory specimens (predominantly paediatric), referred mainly from hospitals.

Other indicators of influenza activity
The Departments of Public Health reported an influenza activity index every week to HPSC. The activity index is analogous to that used by the WHO global influenza surveillance system and the European Influenza Surveillance Scheme (EISS).[3, 4] Each Department of Public Health also established one sentinel hospital in each HSE area, reporting total, accident and emergency and respiratory admissions data on a weekly basis. Sentinel primary and secondary schools were also located in each HSE area in close proximity to the sentinel GPs, reporting weekly absenteeism data.

The Departments of Public Health also reported all notified cases of influenza and all influenza/ILI outbreaks to HPSC every week. An enhanced dataset on all hospitalised influenza cases aged between 0 and 14 years of age was also reported to HPSC from the Departments of Public Health. From January 2005, HPSC was notified of all registered deaths on a weekly basis from the General Registrar's Office (GRO).

Weekly report and EISS
HPSC produced a weekly influenza report, which was posted on the HPSC website www.hpsc.ie each Thursday. Results of clinical and virological data were reported, along with a map of influenza activity and a summary of influenza activity worldwide. HPSC also reported the clinical and virological dataset to the European Influenza Surveillance Scheme (EISS) every Thursday.

Results
It should be noted that enhanced surveillance and mortality data for the 2005/2006 season are provisional.

Clinical data
Influenza activity in Ireland peaked later in the 2005/2006 season compared to the previous season. Activity was moderate for most of the 2005/2006 influenza season, with a peak during week 10 2006 at 82.5 per 100,000 population (figure 1). During the peak of activity, the majority of ILI cases reported were aged between 5 and 14 years.

Virological data
The NVRL tested 378 sentinel specimens for influenza virus during the 2005/2006 season. One hundred and thirty-two (34.9%) sentinel specimens were positive for influenza: 64 (48.5%) influenza A (61 A H3 and 3 A unsubtyped) and 68 (51.5%) influenza B. The predominant influenza virus subtype identified was influenza A (H3), accounting for 95.3% of positive influenza A specimens. The majority of positive influenza sentinel cases were aged between 15 and 64 years (78.5%).

The NVRL also tested 1,783 non-sentinel respiratory specimens, 24 (1.3%) of which were positive for influenza A, 12 (0.7%) for influenza B, and 376 (21.1%) were positive for

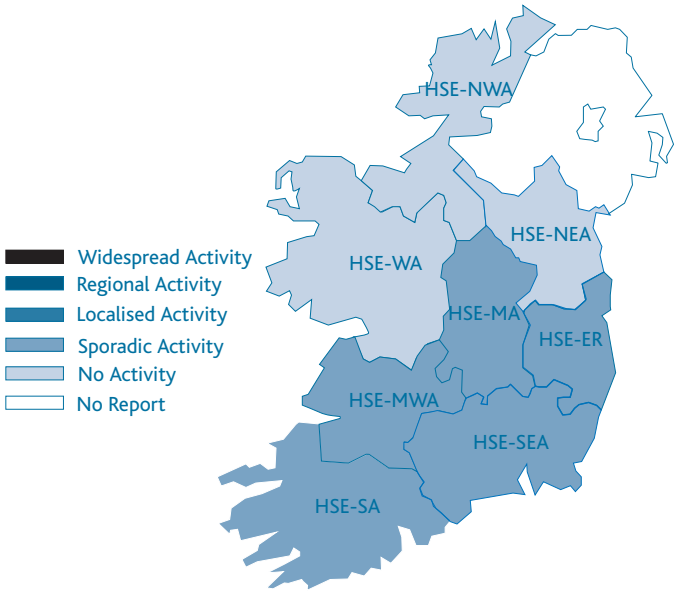

Figure 2. Map of influenza activity by HSE area during the 2005/2006 season peak of influenza activity, week 10 2006.

RSV. The majority (90.2%) of influenza and RSV positive specimens were between 0 and 4 years of age.

Vaccination status and antigenic characterisation
Of the 132 positive influenza virus detections from sentinel specimens, 109 (82.6%) were unvaccinated, 10 (7.6%) were vaccinated and vaccination status was unknown in 13 (9.8%) cases. Of the 10 cases that were vaccinated, influenza A (H3) was detected in five cases and influenza B in five cases.

Two influenza specimens were sequenced at the NVRL and antigenic characterisation was undertaken at the WHO laboratory (Mill Hill) in London. One influenza A (H3) isolate was antigenically characterised as A/Hong Kong/4443/05 and one influenza B isolate was characterised as being closely related to B/Hong Kong/45/05.

Regional influenza activity
Regional influenza activity peaked during week 10 2006, with HSE-Eastern Region (HSE-ER), -Midland Area (HSE-MA), -Mid Western Area (HSE-MWA), -South Eastern Area (HSE-SEA) and -Southern Area (HSE-SA) all reporting localised influenza activity (figure 2). Overall, influenza activity was most intense in HSE-ER, -NE, and -MWA during the 2005/2006 season. The highest ILI consultation rates were observed in HSE-MWA, peaking during week 10 2006.

Outbreaks
During the 2005/2006 season, four ILI/influenza outbreaks were reported to HPSC. One ILI outbreak occurred during week 4 2006 in a nursing home in HSE-NEA. The main symptoms experienced were headache, malaise, nasal symptoms and fever. All residents had received the 2005/2006 influenza vaccine. HPSC also received notification of an ILI outbreak in a primary school in HSE-ER during week 9 2006. A further two ILI outbreaks occurred in HSE-MA during week 10 2006, both occurred in sentinel schools, one in a primary school and the other in a secondary school. Influenza B was associated with the ILI outbreak in the sentinel secondary school.

Sentinel hospitals & sentinel schools
Hospital respiratory admissions (as a proportion of total hospital admissions) in sentinel hospitals peaked during week 52 2005 (figure 3), following the seasonal peak in RSV. A second smaller peak in hospital respiratory admissions was observed in week 12 2006, two weeks following the peak in sentinel GP ILI consultation rates. Absenteeism in several sentinel schools was also at elevated levels during the peak in ILI consultation rates.

Enhanced influenza surveillance
A total of ten influenza cases were reported through the enhanced surveillance system during the 2005/2006 season. Two cases were hospitalised in February 2006, four in March 2006 and four in April 2006. All enhanced cases were in the 0-4 year age group; seven were under 1 year of age and three were in the 1-4 year age group. All ten cases were notified from HSE-ER. This compares to 13 hospitalised influenza cases in 0-14 year olds reported during the 2004/2005 season (also from HSE-ER). ILI GP consultation rates were at elevated levels during February and March 2006 in HSE-ER. Nine enhanced cases were positive for influenza A and one was positive for influenza B. Symptoms included fever (10/10),

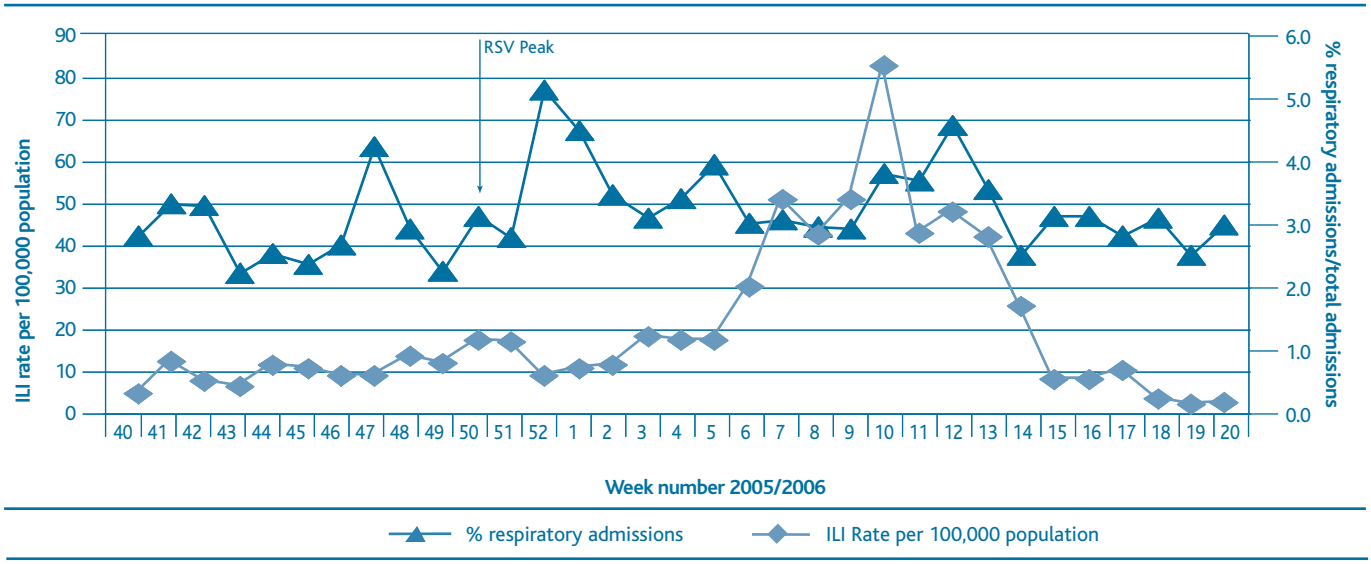

Figure 3. Respiratory admissions as a percentage of total hospital admissions in seven sentinel hospitals and ILI rates per 100,000 population by week for the 2005/2006-influenza season

cough (8/10), gastrointestinal manifestations (4/10), fatigue (4/10), sore throat (1/10), difficulty breathing (1/10) and myalgia (1/10). Complications included bronchitis, bronchiolitis, acute otitis media, secondary bacterial pneumonia, primary viral pneumonia and other respiratory complications. The mean number of days in hospital was 6.7 (ranging from 3-14). Four cases were in at risk categories for influenza vaccine, three of whom were not vaccinated and one was vaccinated. Nine cases have recovered and one case was lost to follow up.

Mortality data

There were 17,807 deaths from all causes and 3,567 pneumonia and influenza deaths (20.0% of all deaths) registered with the GRO during the 2005/2006 season. One death attributed to influenza was registered with the GRO during week 15 2006 (from HSE-MA). Influenza was the secondary cause of death and not the primary cause in this case. This was the only registered death attributed to influenza reported to HPSC during the 2005/2006 season.

Influenza notifications data

Influenza notifications for 2005 are discussed in a separate chapter on infectious disease notifications within this annual report.

Influenza activity worldwide

During the 2005/2006 season, the United Kingdom experienced the sixth consecutive year of low levels of influenza activity, peaking late in the season, with B/Hong Kong/330/2001-like virus identified as the dominant circulating strain. Seven hundred and seven school outbreaks of ILI were reported from across England and Wales this season, 70 of these were associated with influenza B.[5] Influenza activity was moderate in the majority of European countries this season, with influenza B virus identified as the dominant virus circulating.[3] In Canada and the US, influenza activity also started late this season, with influenza A (H3N2) predominating (the majority of strains were identified as A/California/7/2004(H3N2)-like).[6,7]

Discussion

Influenza activity was moderate and peaked late in Ireland during the 2005/2006 influenza season, with influenza A (H3) and B viruses co-circulating. Influenza activity also started later in most of Europe, Canada and the US, with low to moderate levels of activity reported.[3, 5, 6, 7]

Surveillance of hospital admissions and school absenteeism data plays a significant role in the early detection of influenza epidemics.[8] This was demonstrated during the 2005/2006 season in Ireland, with elevated levels of respiratory admissions in sentinel hospitals detected following peaks in RSV and influenza activity. The value of collating school absenteeism data as an indicator of influenza activity was also highlighted with the detection of ILI/influenza outbreaks in two sentinel schools.

The small number of influenza-attributed deaths reported to HPSC for the last number of seasons is not unexpected. Excess deaths due to influenza are often not registered as influenza deaths. Monitoring all-cause deaths and influenza and pneumonia deaths is one method of identifying these influenza-non-attributed deaths and from this, estimating the mortality burden caused by influenza each season.[9] A pilot project to monitor total deaths and deaths due to pneumonia

and influenza weekly in Ireland has been completed at HPSC. A system that monitors influenza deaths in Ireland could prove to be a significant early warning tool and would be invaluable for health system response planning in the event of an influenza pandemic.

Avian influenza A (H5N1) outbreaks have posed a significant threat to human health since 2003. Of greatest concern is the risk that continuing transmission of the virus to humans will give avian and influenza viruses an opportunity to reassort their genes, thereby acquiring the ability to transmit easily from human-to-human and thus triggering a pandemic.[1,2] As of July 7th 2006, Spain became the 14th EU Member State to report a case of highly pathogenic avian influenza A (H5N1) in wild birds. The other countries include Greece, Italy, Slovenia, Hungary, Austria, Germany, France, Slovakia, Sweden, Poland, Denmark, Czech Republic and the UK. Avian influenza H5N1 was confirmed in poultry in five EU Member States: France, Sweden, Germany, Denmark and Hungary.[10] Avian influenza A (H5N1) remains predominantly a disease of birds. A small number of human cases have been reported in South East Asia, Africa and Eastern Europe, all of which have been associated with close contact with dead or dying poultry. In all human cases to date there has been no evidence of efficient human-to-human transmission. Human infections remain a rare event.[1]

However, with the ever-greater threat of a pandemic posed by influenza A (H5N1), EU Member States are strengthening their preparedness for a potential human influenza pandemic.[11] As a result of this threat, a number of additional measures have been put in place in Ireland to improve surveillance of ILI/influenza. Work is in progress to increase the number of sentinel GPs, thereby improving geographical and population representation. Sentinel GPs are also currently monitoring ILI on a year round basis. In addition, influenza and all outbreaks became notifiable in Ireland on 1 January 2004. Reporting of such events is critical to early detection of influenza activity. An enhanced influenza surveillance system was set up to detect all hospitalised influenza cases aged between 0 and 14 years of age. Other activities that are being implemented to improve the surveillance of influenza include weekly surveillance of influenza and pneumonia registered deaths, monthly surveillance of influenza vaccine uptake data in those aged 65 years and older, and the construction of baseline and epidemic threshold levels for influenza activity in Ireland. An evaluation of sentinel hospital admissions and school absenteeism data has been completed and recommendations are currently being implemented. Contact and attendance data is also currently being collated from GP co-operatives, to act as a crude indicator of influenza activity. Work is ongoing in several other areas including: case and contact based reporting of avian influenza, surveillance of unexplained deaths/increased deaths due to respiratory tract infections in healthcare facilities, surveillance of ICU bed occupancy by influenza and pneumonia cases and surveillance of respiratory illness in healthcare workers. This information will in turn inform continuing national progress on pandemic preparedness and will be vital in the event of an influenza pandemic for planning and control measures.

Further information on influenza is available on the HPSC website at http://www.ndsc.ie/DiseaseTopicsA-Z/InfluenzaFlu/

Acknowledgements
Special thanks are due to the sentinel GPs, the NVRL, the departments of public health and sentinel schools and hospitals that provide data throughout the influenza season.

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Tuberculosis in Ireland, 2004

Key Points

- **There were 432 new cases of TB notified in 2004, giving a crude incidence rate of 11.0 per 100,000 population**
- **Two hundred and seventy nine (64.6%) of the cases were culture confirmed with *M. tuberculosis* isolated in 268 cases and *M.bovis* in five cases**
- **Of the 432 cases reported in 2004, 310 (71.8%) had a pulmonary component. Of the 310, 225 (72.6%) were culture positive and 136 (43.9%) were smear positive**
- **One hundred and twenty nine (29.9%) of the cases were born outside Ireland**
- **Outcome data were reported for 364 (84.3%) of the 432 cases**
- **Five deaths were attributed to TB in 2004**
- **There were 461 cases of TB provisionally notified in 2005**

Introduction

The World Health Organisation (WHO) has estimated that globally, there were 8.9 million new cases of tuberculosis (TB) in 2004, of which 3.9 million were smear positive. Approximately 2 million TB deaths occurred in 2004.[1]

In Ireland, national epidemiological data on TB have been collated by the HPSC since 1998. From January 2000, this information has included enhanced surveillance data items based on the minimum dataset reported to EuroTB, the European agency that collates national TB data within Europe and contributes that data to the WHO global TB control programme.[2]

Materials and Methods

An enhanced TB notification form was completed by public health doctors for each case of TB notified in 2004. These forms summarise all available clinical, microbiological, histological and epidemiological data. Forms were then collated in the regional departments of public health, where data were entered onto an Epi2000 database (NTBSS). Each HSE area provided finalised 2004 data with outcome information to HPSC in early to mid 2006. Data were validated with each area and national data were collated. Provisional 2005 data were obtained from each area in August 2006.

Population figures, used as the denominator, were taken from the 2002 census of population. In order to compare rates between groups of interest, 95% confidence intervals were used. Direct methods of standardisation were used to allow comparison of rates between geographical areas using the Irish population as the standard population.

Table 1. Notified TB cases in Ireland, 1991 – 2004, with 3-year moving averages, 1992 - 2003

Year	Number	Crude rate per 100,000pop.	3 year-moving average
1991	640	18.2	
1992	604	17.1	612
1993	598	17	581
1994	524	14.5	526
1995	458	12.6	469
1996	434	12	436
1997	416	11.5	423
1998	424	11.7	433
1999	469	12.9	439
2000	395	10.1	410
2001	381	9.7	391
2002	408	10.4	401
2003	407	10.4	414
2004	432	11	

As in previous years, the case definitions used were as recommended by the National Tuberculosis (TB) Working Group.[3]

Results

There were 432 cases of TB notified in 2004, giving a notification rate of 11.0/100,000 population. This compares to 407 cases notified in 2003 and 408 cases notified in 2002.

Table 1 shows the number of TB cases, crude incidence rates and three-year moving averages from 1991 to 2004. A summary profile of the epidemiology of TB in Ireland from 2000 to 2004 is shown in table 2.

Age standardised rates by HSE area are provided in table 3. The highest age standardised TB incidence rates were seen in HSE East at 13.3/100,000 population followed by HSE Midwest (13.0) and HSE South (12.6). HSE Midlands reported the lowest age-standardised rates at 4.1/100,000 population which was significantly lower than the national age-standardised incidence rate (10.3/100,000).

Age and sex distribution

There were 257 (59.5%) cases of TB notified in males in 2004 and 175 (40.5%) in females giving a male to female ratio of 1.5:1. The average age of those diagnosed with TB was 44 years (range: 2 to 95 years). The highest age-specific rate was observed in those aged 65 years and older (21.6/100,000 population). Figure 1 shows the 2004 cases by age and sex and the male and female age-specific rates.

Geographic origin

Of the 432 TB cases notified in 2004, 290 (67.1%) were born in Ireland, 129 (29.9%) were born outside Ireland and for the remaining 13 cases, the country of birth was unknown. Cases born outside Ireland originated from at least 38 countries. Of the 129 born outside Ireland in 2004, 49 were born in Asia, 47 in Africa, 22 in Europe and 3 in America. The country of birth was unknown for eight of the cases born outside Ireland. The crude rate of TB notifications in the indigenous population was 8.4/100,000 population while the crude rate in the foreign born population was 32.2/100,000.

Site of disease

Of the 432 cases notified in 2004, 274 (63.4%) were pulmonary, 121 (28.0%) were extrapulmonary, and 36 (8.3%) were pulmonary and extrapulmonary TB. Site of disease was unspecified for one case. Of the 310 cases with a pulmonary disease component, 225 (72.6%) were culture positive and 136 (43.9%) were smear positive.

TB meningitis

There were six cases of TB meningitis reported in 2004 giving an incidence rate of 0.15 per 100,000 population. All six cases were aged between 24 and 54 years.

Between 1998 and 2004, a total of 41 cases of TB meningitis have been reported giving a cumulative incidence rate of 8.9 per million population. Four of these cases were in children aged less than 5 years.

Bacteriological results

Of the 432 TB notifications, 279 (64.6%) were definite cases which were culture confirmed. Of the 279 culture-confirmed cases, 268 (96.1%) were *M. tuberculosis* and five (1.8%) were

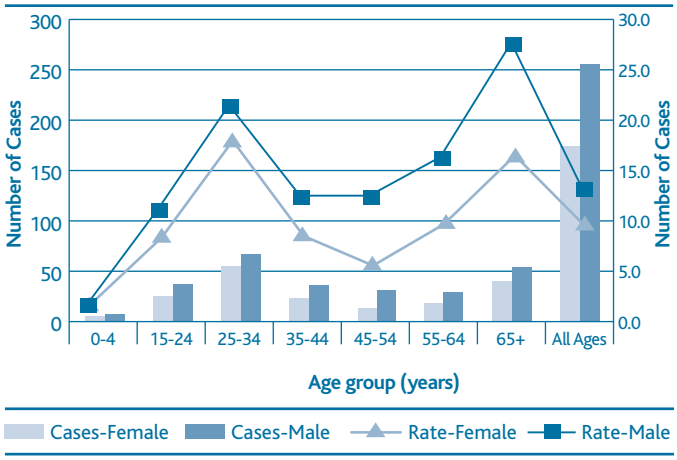

Figure 1: Cases of TB by age and sex, and age-specific rates per 100,000 population, 2004

Table 2. Summary of epidemiology of TB in Ireland, 2000 – 2004

	2000	2001	2002	2003	2004
Total number of cases	395	381	408	407	432
Notification rate per 100,000 population	10.1	9.7	10.4	10.4	11
Foreign born TB patients	44	63	123	89	129
% Culture positive patients	58	58.8	61.0	64.4	64.6
M. tuberculosis	222	204	234	250	268
M. bovis	2	7	5	5	5
M. africanum	3	1	0	0	0
% smear positive pulmonary cases	47.2	44.4	38.4	48.8	43.9
Monoresistance to isoniazid	2	4	8	8	12
Multi drug resistant cases	2	2	0	1	2
Deaths attributed to TB	6	5	5	6	5

M. bovis. No cases of *M. africanum* were reported in 2004. The isolate was not specified in six culture positive cases.

Resistance

Of the 268 *M. tuberculosis* isolates, resistance was documented in 22 cases (5.1% of total cases). Of the 22, 15 were resistant to isoniazid, including two cases of multi-drug resistant TB (MDR-TB). One of the MDR-TB cases was resistant to isoniazid and rifampicin and the other case was resistant to isoniazid, rifampicin and ethambutol. Mono-resistance to isoniazid was recorded in 12 cases, monoresistance to rifampicin in three cases, to ethambutol in one case, to pyrazinamide in one case and to streptomycin in two cases. One further case was resistant to both isoniazid and streptomycin. Thirteen of the 22 (59.1%) drug resistant cases, including one of the MDR-TB cases, were born outside Ireland.

Treatment outcome

Outcome was reported for 364 (84.3%) of the 432 cases notified in 2004. Details on treatment outcome for all cases and for smear positive cases only are shown in table 4.

Of the 364 cases, 283 completed treatment, 35 were lost to follow up, 24 died, treatment was interrupted in 11 cases and 11 cases were still on treatment at time of reporting. Of the 24 deaths reported, five (1.2% of total) were attributed to TB.

Of the 136 smear positive pulmonary cases notified in 2004, 99 completed treatment, 12 were lost to follow up, treatment was interrupted in four cases, four died and two were still on treatment at time of reporting. The outcome was unknown in 15 of the cases.

Of the 22 drug resistant cases, 16 completed treatment while one case was still on treatment, one case was lost to follow up, treatment was interrupted in one case and treatment was unknown for three of the cases. Of the two MDR-TB cases, one case had completed treatment and one case was still on treatment.

Case ascertainment

Of the 432 cases notified in 2004, 331 presented as a case of TB, 28 were found by contact tracing, four by immigrant screening, 13 by other methods of screening and 22 by other means, not specified. The method of case ascertainment was unknown for 34 cases.

Previous history of TB

Thirty six (8.3%) of the 432 cases were reported as having a previous history of TB with previous year of diagnosis provided for 27 cases. The year of diagnosis ranged from 1920 to 2003 with 13 of the 27 cases (48%) reported to have had TB in the previous 10 years.

HIV Status

Of the 432 cases, 13 were reported as being HIV positive. However, information on HIV status was not provided or was unknown for 408 (94.4%) of cases notified in 2004.

Provisional 2005 data

There were 461 cases of TB provisionally notified in 2005. It is important to note that these data are only provisional and may change significantly following validation.

- There were 273 (59.2%) cases in males and 182 (39.5%) in females. Sex was not reported in six cases.

Table 3: Number of cases of TB in Ireland and age standardised incidence rates with 95% confidence intervals (CI) by HSE area , 2004

HSE area	TB cases	Age standardised incidence rate	95% CI
HSE E	189	13.3	11.4-15.2
HSE M	9	4.1	1.4-6.8
HSE MW	44	13	9.2-16.7
HSE NE	23	6.9	4.1-9.7
HSE NW	16	6.6	3.4-9.9
HSE SE	34	8.1	5.4-10.8
HSE S	73	12.6	9.7-15.5
HSE W	44	11.2	7.9-14.6
Ireland	432	10.3	9.3-11.4

Table 4: Treatment outcome for all cases and smear positive cases, 2004.

Treatment outcome	Total cases		Smear positive cases	
	Number	%	Number	%
Completed treatment	283	65.5	99	72.8
Lost to follow up	35	8.1	12	8.8
Treatment interrupted	11	2.5	4	2.9
Still on treatment	11	2.5	2	1.5
Died (attributed to TB)	5	1.2	1	0.7
Died (not attributed to TB)	19	4.4	3	2.2
Outcome unknown	68	15.7	15	11.0
Total	**432**	**100.0**	**136**	**100.0**

- Two hundred and eighty eight cases (62.5%) were born in Ireland, 142 (30.8%) were born outside Ireland and country of birth was unavailable for 31 cases.

- Of the 461 cases provisionally notified, pulmonary TB was diagnosed in 283 cases (61.4%), extrapulmonary TB in 126 cases (27.3%), and pulmonary and extrapulmonary TB in 36 cases (7.8%).

- Provisionally, of the 319 TB cases with a pulmonary component, 155 (48.6%) were culture positive and 132 (41.4%) were smear positive.

- There were eight cases of TB meningitis provisionally notified in 2005 giving an incidence rate of 0.2/100,000 population.

- Resistance was reported in six cases in 2005. Three cases were mono-resistant to isoniazid and three cases were MDR-TB.

More detailed reports on the epidemiology of TB in Ireland can be found on the HPSC website at www.ndsc.ie/hpsc/A-Z/VaccinePreventable/TuberculosisTB/Publications/

Discussion

In 2004, 432 cases of TB were notified to HPSC giving a national crude incidence rate of 11.0/100,000 population. This rate is slightly higher than the rate in 2003 and 2002, which was 10.4/100,000. However, it remains lower than the crude incidence rates reported between 1991 and 1999, which ranged from 11.5/100,000 to 18.5/100,000. The overall notification rate in countries of the EU which reported to EuroTB was 12.8/100,000 in 2004, ranging from 3.6/100,000 in Cyprus to 73.0/100,000 in Lithuania.[2]

Differences in age-standardised TB incidence rates persist between HSE areas with HSE East having the highest rate in 2004 followed by HSE Midwest and HSE South. HSE Midlands had the lowest rate in 2004, followed by the HSE Northeast.

The highest age-specific rate in 2004 occurred among those aged 65 years and over (21.6/100,000 population). This was similar to the rate observed in this age group in 2003, 2002 and 2001. There were 10 cases in children under 15 years of age in 2004 giving a rate of 1.2/100,000. This is a decrease from the rate in 2003 (2.9) and 2002 (2.2). Between 2000 and 2004, the age-specific rate among the 25-34 year age group increased from 10.5 to 19.8 per 100,000 population.

There was a notable difference in age between those born in Ireland and those born outside Ireland. In cases born in Ireland, there was a peak among those aged greater than 64 years with a median age of 50 years. In cases born outside Ireland, the peak occurred in those aged 25-34 years old with a median age of 30 years. There were 73 foreign born cases out of a total of 122 (60%) in the 25-34 year age group in 2004 compared to 40 foreign born cases out of a total of 86 (47%) in this age group in 2003. Where available, data from other countries in the EU and Western Europe show similar trends with the highest rates in nationals aged greater than 64 years and the highest rates in foreign born cases in the 25-34 year age group.[2]

Rates among males were higher than females for all age groups. The highest rate among males was among those aged 65 years and over (28.0/100,000) while the highest rate among females was among those aged 25 to 34 years old (17.8/100,000). The male to female ratio (1.5:1) reported in 2004 was comparable with the rate reported in 2003 (1.6:1).

Thirty percent of TB cases notified in 2004 were born outside Ireland. This compares to 21.9% in 2003, 30.1% in 2002 and 16.5% in 2001. In 2004, among countries in the EU and Western Europe who reported data to the EuroTB network, 29% of notifications were in foreign born patients. In the United Kingdom, France, Germany and Belgium, where crude incidence rates are similar to those reported in Ireland, the percentage of cases of foreign origin in 2004 ranged from 44 to 61%.[2]

There were six cases of TB meningitis in 2004, giving a rate of 0.15/100,000 population. All cases of TB meningitis reported in 2004 were aged between 25-54 years. Between 1998 and 2004, four cases of TB meningitis were reported among 0-4 year olds.

There were 22 drug resistant cases notified in 2004, including two cases of MDR-TB. There was no case of extensive drug resistant TB (XDR-TB) notified to HPSC in 2004. Multi-drug resistant cases and cases resistant to isoniazid represented 0.5% and 3.5% of total cases respectively. This compares to 0.3% and 2.7% respectively in 2003. In 2004, combined multi-drug resistance and mean combined INH resistance were 19% and 32% respectively in the Baltic States and 2% and 8% respectively in the 15 other countries in the EU and Western Europe. Drug resistance is an issue that needs to be kept under close surveillance especially with the recent emergence of XDR-TB.[4]

In recent years, the quality of the data, and in particular data on treatment outcome, has improved greatly. In 2004, information on treatment outcome was provided for 84.3% of cases which is very similar to the proportion in 2003 (84.8%). This compares to 77.2% in 2002 and 59.8% in 2001. It is of critical importance to TB control in Ireland that surveillance of TB and reporting of outcome data be maintained at a high level.

Acknowledgements

We would like to thank all those who participated in the collection of information including the notifying physicians, public health doctors, surveillance scientists, microbiologists, nurses, laboratory and administrative staff.

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Antimicrobial Resistance in Ireland, 2005

Key Points

In 2005,

- **1,424 invasive isolates of *Staphylococcus aureus* were reported. The proportion of isolates that was meticillin-resistant *S. aureus* (MRSA) was 41.6%, which remains one of the highest in Europe**

- **401 invasive isolates of *Streptococcus pneumoniae* were reported. The proportion that was penicillin-non-susceptible *S. pneumoniae* (PNSP) was 11.7%, which is moderately high compared to most other European countries. Of the 47 PNSP isolates identified, 12 exhibited high-level resistant [minimum inhibitory concentration (MIC), >2 mg/L] while 35 were determined to have intermediate levels of resistance (MIC, 0.12-1.0 mg/L). The proportion of *S. pneumoniae* that was erythromycin-resistant was 12.1%, which is also moderately high compared to other European countries**

- **1,445 invasive isolates of *Escherichia coli* were reported. The proportions of isolates that were resistant to third-generation cephalosporins (3GCs), fluoroquinolones and aminoglycosides were 4.1%, 17.4% and 8.5%, respectively. Multi-drug resistance (MDR) was reported in 7.6% of isolates. Resistance to 3GCs, fluoroquinolones and gentamicin is increasing. Similar increases have been observed in other European countries**

- **290 invasive isolates of *Enterococcus faecalis* were reported. The proportion of isolates that were vancomycin-resistant was 2.5%. Although this figure is low, it is still higher than observed in most other European countries (<1%)**

- **224 invasive isolates of *Enterococcus faecium* were reported. The proportion of isolates that were vancomycin-resistant was 31.7%, which is one of the highest in Europe**

- **Enhanced surveillance of EARSS pathogens has shown that central venous catheters are the commonest identifiable source of *S. aureus* bloodstream infection. Analysis of enhanced data also showed that meticillin resistance is an independent risk factor for early mortality among patients with *S. aureus* bloodstream infection**

Introduction

The European Antimicrobial Resistance Surveillance System (EARSS) was established in 1998 and is funded by DG SANCO of the European Commission. It is an international network of national surveillance systems, encompassing approximately 800 laboratories serving 1300 hospitals in 31 countries, which aims to collect comparable and reliable antimicrobial resistance data on invasive infections caused by *Staphylococcus aureus, Streptococcus pneumoniae, Escherichia coli* and *Enterococcus faecium/faecalis* for public health action.[1] Two new pathogens, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*, were added to this list in 2005.

Forty-two Irish laboratories participated in EARSS in 2005 – two additional laboratories joined the program but one

Table 1. Summary of EARSS data by pathogen over the period 1999-2005 [with total numbers of isolates reported and proportion (%) resistance to the key antibiotics].

	1999	2000	2001	2002	2003	2004	2005
No. of labs*	12	19	20	23	28	41	42
S. aureus							
No. of isolates	510	639	815	1042	1140	1323	1424
Meticillin	38.8%	39.0%	41.3%	42.7%	42.1%	41.8%	41.6%
S. pneumoniae							
No. of isolates	157	201	245	278	364	400	401
Penicillin	19.1%	12.9%	12.2%	11.5%	11.8%	10.3%	11.7%
Erythromycin**	13.4%	12.0%	12.6%	12.7%	11.6%	14.2%	12.1%
E. coli							
No. of isolates				741	991	1256	1445
3GC**				3.0%	2.4%	2.4%	4.1%
Ciprofloxacin**				5.4%	9.5%	12.5%	17.4%
Gentamicin**				2.7%	3.9%	5.7%	8.5%
E. faecalis							
No. of isolates				168	218	242	290
Vancomycin**				2.4%	1.4%	1.3%	2.5%
HLG**				39.2%	34.1%	42.2%	43.1%
E. faecium							
No. of isolates				85	135	187	224
Vancomycin**				11.1%	19.4%	23.2%	31.7%
HLG**				16.7%	54.7%	57.8%	50.5%

**, Maximum number of laboratories participating by year end; **, Not all isolates tested; 3GC, 3rd-Generation Cephalosporin (e.g. cefotaxime, ceftriaxone, ceftazidime); HLG, High-Level Gentamicin*

withdrew due to resource issues. Based on acute public hospital activity data obtained from Department of Health and Children (DoHC), the estimated population coverage of EARSS in 2005 was approximately 98%, which was similar to that in 2004. In 2004, EARSS coverage in other European countries ranged from 11% in Italy and 14% in Spain to 100% in smaller countries such as Estonia, Iceland and Slovenia (details of coverage in France and Luxembourg were not available).[1]

Protocol

Data are collected on the first invasive isolate per patient per quarter (Q) of *S. aureus* and enterococci from blood only and of *S. pneumoniae*, *E. coli*, *K. pneumoniae* and *P. aeruginosa* from blood and cerebrospinal fluid (CSF) in accordance with the EARSS protocol, which is available on the EARSS website.[2] Laboratories report routinely generated qualitative disc diffusion data on:

- oxacillin, meticillin (Note: revised spelling in accordance with new International Pharmacopoeia guidelines) or cefoxitin for *S. aureus*
- oxacillin and/or penicillin; erythromycin and norfloxacin for *S. pneumoniae*
- ampicillin; cefotaxime, ceftriaxone and/or ceftazidime (3GCs); ciprofloxacin or ofloxacin (fluoroquinolones); and gentamicin or tobramycin (aminoglycosides) for *E. coli* and *K. pneumoniae*. Laboratories are also asked to specifically test for the presence of extended-spectrum beta-lactamases (ESBLs)
- ampicillin, high-level gentamicin (HLG) and vancomycin for enterococci
- piperacillin or piperacillin-tazobactam; ceftazidime; imipenem or meropenem (carbapenems); ciprofloxacin or ofloxacin; and gentamicin for *P. aeruginosa*

All MRSA isolates are submitted to the National MRSA Reference laboratory (NMRSARL) at St James's Hospital, where MICs are determined for oxacillin and vancomycin. Laboratories are requested to submit data on MICs performed in-house for penicillin and cefotaxime or ceftriaxone on all PNSP isolates.

Epi Info 6 software (Centers for Disease Control and Prevention, Atlanta, USA and World Health Organisation, Geneva, Switzerland) was used to determine 95% confidence intervals (CIs) for medians and to perform Chi-squared tests (X^2), and Chi-squared tests for trend (X^2trend).

Rates of MRSA bacteraemia per 1,000 bed days were calculated using the total number of patient bed days obtained from the Acute Public Hospital Activity Data provided by the DoHC for those hospitals that participated in EARSS over the relevant time period. Data from all private hospitals, even though participating in EARSS, were not included in the calculations as activity data were not available for these hospitals.

$$\text{MRSA rate} = \left\{ \frac{\text{No. of MRSA bacteraemias reported to EARSS}}{\text{Total No. of bed days used over the surveillance period}} \right\} \times 1000$$

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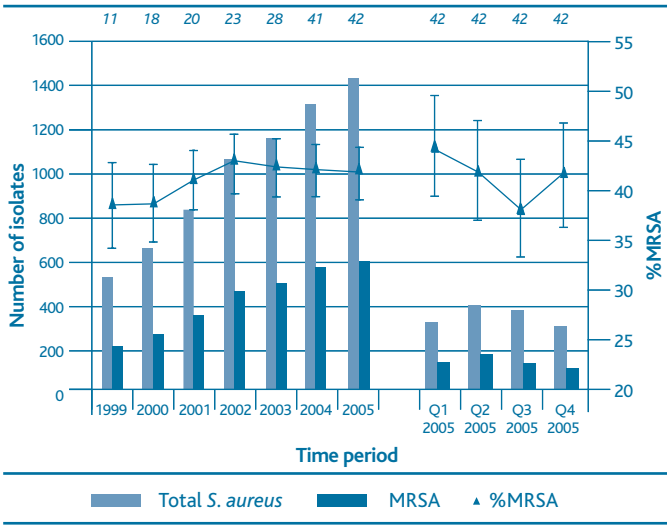

Figure 1. Trends for S. aureus by time period: by year for 1999-2005 and by quarter for 2005 – total numbers of S. aureus/MRSA and percentage MRSA with 95% confidence intervals.
Changes in the numbers of laboratories participating in the surveillance system by year-end are indicated above the chart.

Crude rates of invasive pneumococcal disease (IPD) per 100,000 population were calculated based on the estimated population coverage of hospitals participating in EARSS over the relevant time period and the total population of 3,917,203 in the Republic of Ireland as determined in the 2002 census.

The EARSS interactive database and the EARSS Annual Report 2004 were used to compare data from Ireland with the latest European data for 2004 and 2005 and trends over the relevant time periods for each pathogen under surveillance.[1,3]

Results and Comparisons With Data From Other Countries
Staphylococcus aureus
In 2004, 1,424 reports of *S. aureus* isolates from bacteraemia were received from 38 laboratories, of which 592 (41.6%) were resistant to meticillin (see table 1). By comparison, the proportion of *S. aureus* isolates that was meticillin-resistant in 2004 was 41.8%. In 2005, there was a peak in Q1 when the proportion of MRSA was 44.4% compared with the other three quarters of the year when the proportion ranged from 38.5–42.0% (see figure 1).

The median age of patients with *S. aureus* bacteraemia was 65 years (95% CI, 64-66 years). The difference in median ages of patients with meticillin-susceptible *S. aureus* (MSSA) [60 years (95% CI, 58–62 years)] and MRSA bacteraemia [70 years (95% CI, 69–71 years)] was considered to be significant as the CIs did not overlap. In patients with laboratory-confirmed *S. aureus* bacteraemia, the probability of the infecting organism being meticillin-resistant as opposed to meticillin-susceptible was 1.75 greater in patients over 65 years than in patients under 65 years [Relative Risk (RR), 1.75; 95% CI, 1.53 to 2.00; X^2 = 73.1, P <0.001]. There were significantly more isolates from males than from females for both MSSA (60% versus 39%; z-test = 6.4, P <0.001) and MRSA (61% versus 39%; z-test = 5.3, P <0.001).

Rates are considered to provide a better indicator of the burden of disease or infection in a population than raw figures (or proportions in the case of MRSA bacteraemia) as the denominator takes into account the population at risk while the numerator is the total number of people with the disease or infection. The national MRSA rate based on the EARSS case definition of the first isolate of *S. aureus* per patient per quarter (an MRSA isolate is not reported if it is isolated subsequent to an MSSA isolate within the same quarter) was 0.15 per 1000 bed days in 2005, which compares with 0.15 in 2004 and 0.14 in 2003. In Northern Ireland, the MRSA rate was 0.13 per 1000 bed days in 2005, a decrease from 0.14 in 2004.[4] By comparison, the rate in England for the period October 2005 to March 2006 was 0.17 per 1000 bed days.[5] The rates in Northern Ireland and England are calculated using a different case definition (a single episode of MRSA bacteraemia is counted every 14 days). The rate in Scotland fluctuated between 0.18 and 0.21 per 1000 bed days over the four quarters of 2005.[6] In Scotland, the system of data collection has recently been changed by combining data from two separate surveillance systems (from the Scottish Centre for Infection and Environmental Health's MRSA Reporting System and EARSS) to ensure more complete and accurate reporting on MRSA bacteraemia[7] and thus the most recent rates for Scotland are higher than those previously reported.

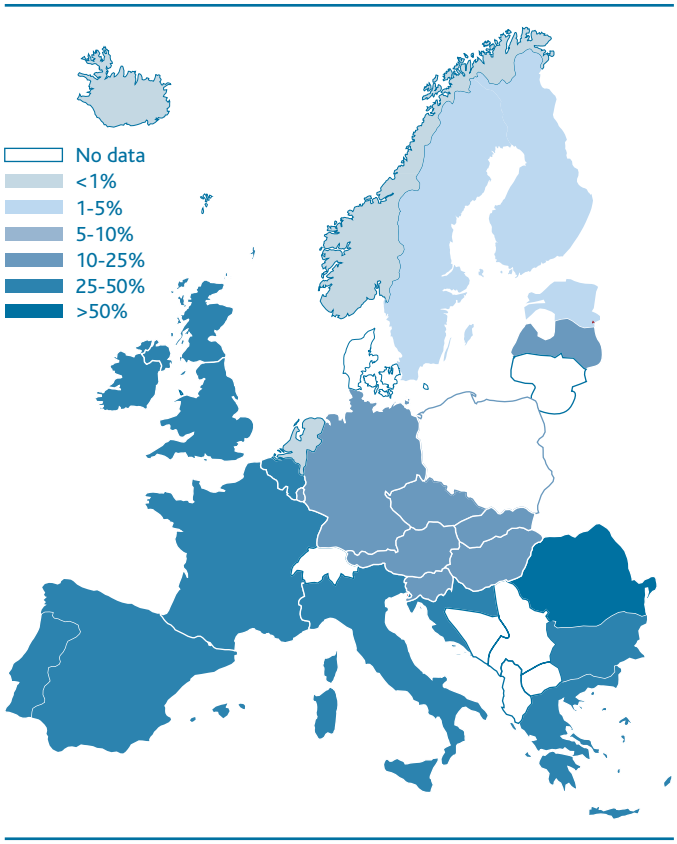

Figure 2. Map illustrating the distribution of MRSA in EARSS countries in 2005

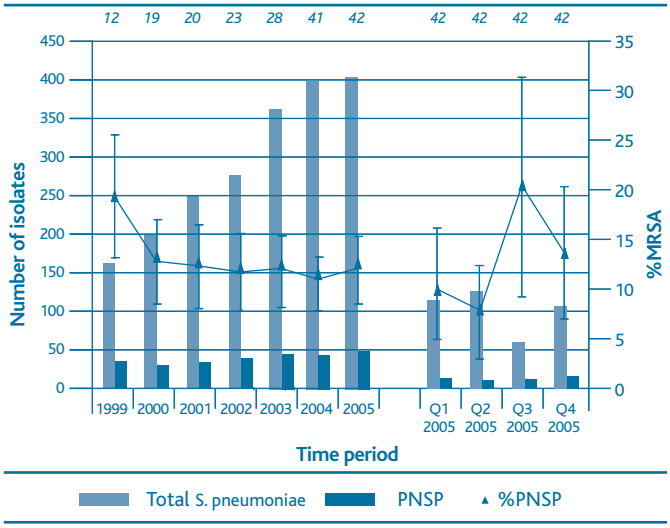

Figure 3. Trends for S. pneumoniae by time period: by year for 1999-2005 and by quarter for 2005 – total numbers of S. pneumoniae/PNSP and percentage PNSP with 95% confidence intervals.
Changes in the numbers of laboratories participating in the surveillance system by year-end are indicated above the chart.

In 2005, as in previous years, Ireland had one of the highest proportions of MRSA reported to EARSS together with the UK and the countries of Southern Europe (see figure 3).

Between 1999 and 2004, significant increases in MRSA proportions were reported in 14 of 29 countries, including the Netherlands and the Nordic countries, which still have the lowest levels of MRSA in Europe. This trend is potentially worrying according to EARSS as it indicates that MRSA could get out of control even in countries with traditionally low incidences of MRSA. By contrast, two countries, Slovenia and France, have managed to reverse this increasing trend with MRSA proportions in Slovenia decreasing significantly from 21% in 2000 to 12% in 2004 and in France from 33% in 2001 to 28% in 2004. Since 2001, the MRSA proportions in Ireland and the UK have levelled off at approximately 42% and 44%, respectively, which could simply represent saturation effects or, more optimistically, reflect the implementation of more successful control measures.[1]

Streptococcus pneumoniae

In 2005, 401 reports of *S. pneumoniae* isolates from bacteraemia/meningitis were received from 31 laboratories (see table 1). The majority of isolates (n=397) were from blood but four were from CSF. Forty-seven isolates (11.7%) were PNSP. By comparison, the proportion of *S. pneumoniae* isolates that were PNSP in 2004 was 10.3%.

As in previous years, a seasonal variation was seen in the numbers of *S. pneumoniae* isolates reported with a trough in Q3, reflecting the quieter summer period (see figure 4).

Of the 47 PNSP isolates reported, MIC data for penicillin and cefotaxime were available for 47 and 33 isolates, respectively. Twelve isolates exhibited high-level resistance (HLR) to penicillin (MIC, ≥2 mg/L) while the remaining 35 isolates had intermediate levels of resistance (MIC, 0.12–1.0 mg/L). All isolates were susceptible to cefotaxime (MIC, ≤1 mg/L).

Data on susceptibility to erythromycin were available for 379 isolates. Forty-six (12.1%) were resistant. By comparison, 14.2% of isolates in 2004 were erythromycin-resistant.

Twelve isolates were resistant to erythromycin in addition to being non-susceptible to penicillin. Of these 12 isolates, nine were intermediate and three were HLR. In 2004, 12 isolates were co-resistant to both penicillin and erythromycin.

The median age of patients with invasive *S. pneumoniae* infection was 60 years (95% CI, 55–64 years). The difference in the median ages of patients with PNSP [63 years (95% CI, 51–73 years)] and penicillin-susceptible *S. pneumoniae* (PSP) [59 years (95% CI, 55–64 years)] was not considered to be statistically significant as the CIs overlapped. Males were approximately 1.5-times more likely to have an invasive *S. pneumoniae* infection than females (59.9% and 40.1%, respectively; z-test = 4.05, P <0.001). By comparison, there were approximately equal numbers of *S. pneumoniae* isolates from males and females in 2004 (51.5% and 48.5%, respectively; z-test = 0.61, P = 0.55).

Of the four CSF isolates reported in 2005, one (from a one-year old child) was intermediately resistant to penicillin (MIC, 0.19 mg/L) but susceptible to cefotaxime (MIC, 0.064 mg/L)

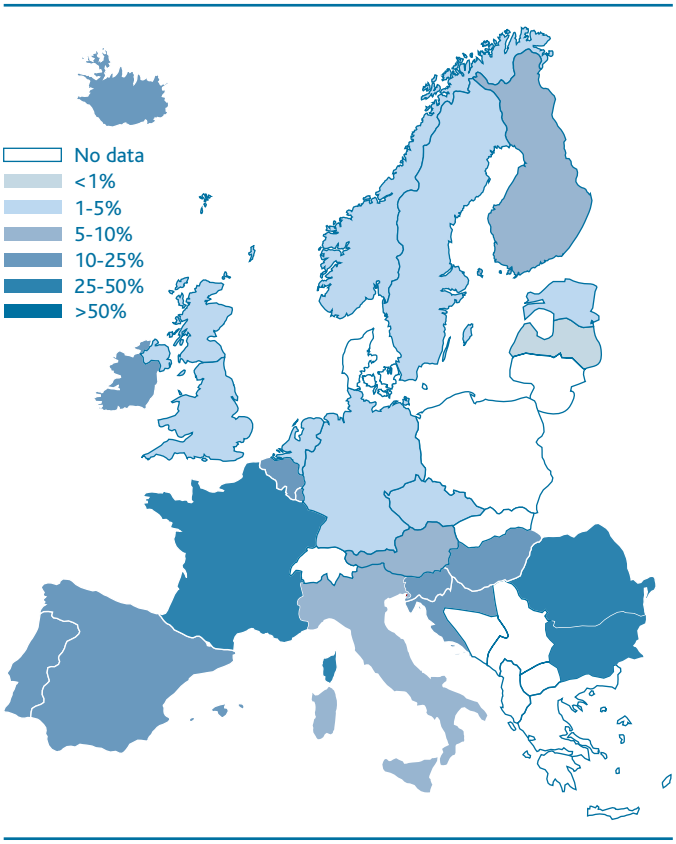

Figure 4. Map illustrating the distribution of PNSP in EARSS countries in 2005

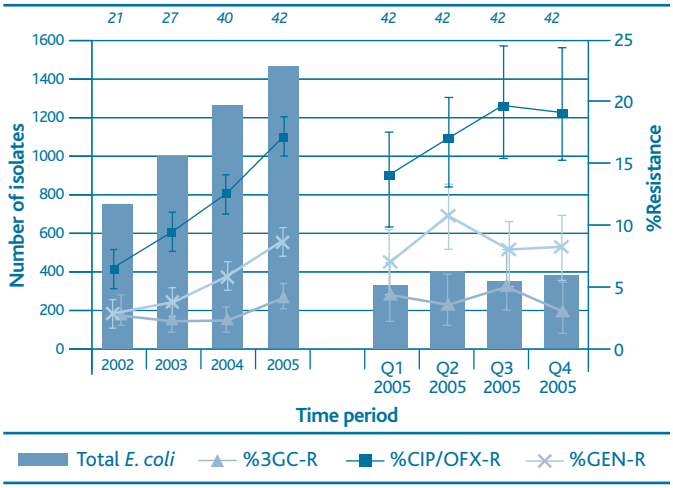

Figure 5. Trends for E. coli by time period: by year for 1999-2005 and by quarter for 2005 – total numbers of E. coli and percentage resistance to 3GCs, ciprofloxacin/ofloxacin (CIP/OFX) and gentamicin (GEN).
Changes in the numbers of laboratories participating in the surveillance system by year-end are indicated above the chart

when interpreted using Clinical Laboratory Standards Institute (CLSI) meningitis breakpoints. The other three isolates (one from a four-month old child and two from adults aged 53 and 60 years) were susceptible to penicillin.

The crude incidence rate of IPD in Ireland was estimated to be 10.4 per 100,000 population, which is the same as in 2003 and 2004. In 2005, the crude incidence rates of IPD in Ireland in children <5 years and adults ≥65 years were 21.6 and 40.8 per 100,000 population, respectively (the corresponding rates in 2004 were 24.1 and 37.6 per 100,000 population, respectively). These figures compare with projected provisional rates of 21.3 and 38.8 per 100,000 population, respectively, in the US in 2005, with an overall projected national rate of 13.7 per 100,000 population.[8]

Pneumococcal serotyping data were available for 24 isolates from 2 of the 42 laboratories participating in the surveillance of this pathogen in 2005. This represents only 6% of all pneumococcal isolates reported. From all age groups, the following serotypes were identified: 14 (5 isolates), 1 (4 isolates), 7F and 9V (3 isolates each), 23F (2 isolates), and 6B, 8, 9N, 15C, 19A, 33F and 38 (1 isolate each). From children aged <5 years, the following serotypes were found: 14 (3 isolates), 7F (2 isolates), 9V (1 isolate), 6B, 9N, 15C, 19A and 33F (1 isolate each). Of the latter 11 paediatric isolates (representing 17% of the 64 isolates reported in this age group), five would be covered by the new 7-valent vaccine targeted at this age group. Of the remaining 13 non-paediatric isolates, all are covered by the current 23-valent polysaccharide vaccine. Of the 24 isolates for which serotype data were available, four were PNSP (3 with serotype 9V and 1 with serotype 14) and the remainder were penicillin-susceptible. In countries reporting serotype data to EARSS, penicillin resistance is most common among isolates of serotypes 9 and 14.[1]

In 2005, the proportions of both PNSP and erythromycin-resistant *S. pneumoniae* in Ireland were at moderate levels compared to other countries reporting to EARSS (see figure 4). France and Israel reported the highest proportions of PNSP in 2005. Since 2001, the proportion of PNSP in Ireland has stabilised at approximately 12%.

Escherichia coli

In 2005, 1,445 reports of *E. coli* isolates from bacteraemia/meningitis were received from 39 laboratories (see table 1). The majority of isolates (n=1441) were from blood but four were from CSF.

The trends in total numbers of *E. coli* isolates and proportions of resistance to 3GCs, fluoroquinolones and gentamicin reported by year (2002–2005) and quarter for 2005 only are shown in figure 5.

The proportions of isolates resistant to ampicillin, 3GCs, fluoroquinolones and gentamicin were 67.6%, 4.1%, 17.4% and 8.5%, respectively, compared with 65.0%, 2.4%, 12.5% and 5.7%, respectively, in 2004.

MDR [defined as resistance to three or more of the mandatory antibiotics (ampicillin, 3GCs, fluoroquinolones and gentamicin)] was identified in 107 isolates as follows:

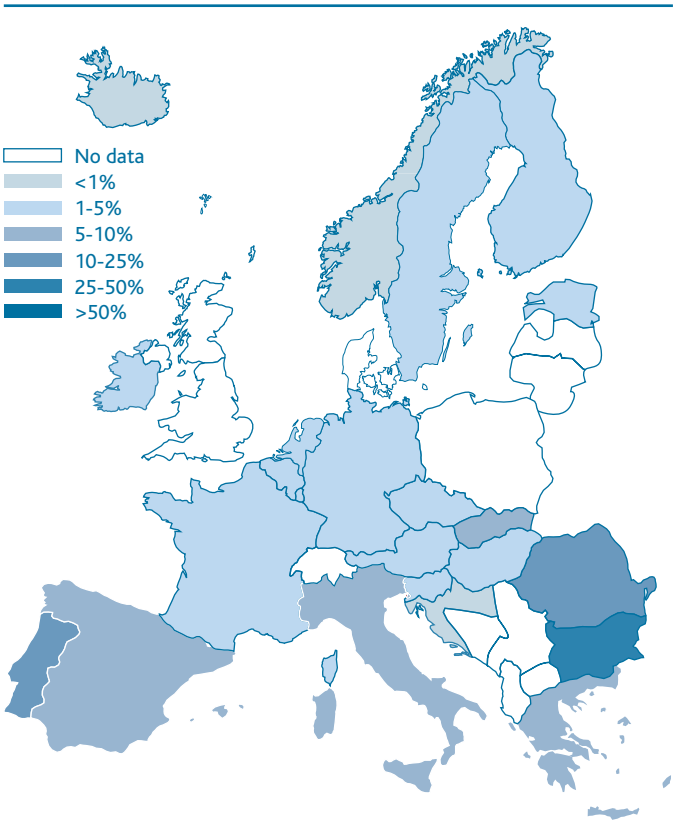

Figure 6. Map illustrating the distribution of resistance to third-generation cephalosporins among E. coli in EARSS countries in 2005

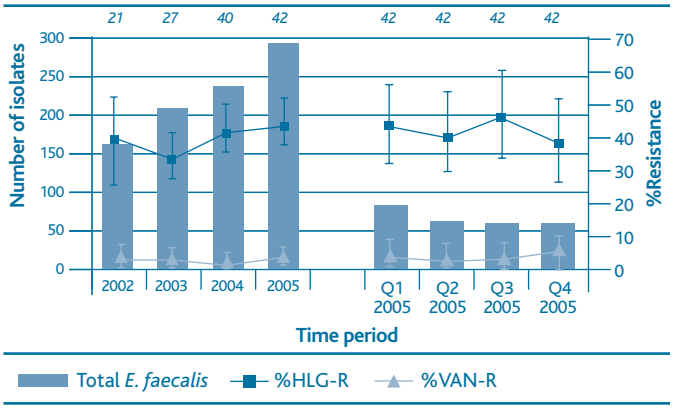

Figure 7. Trends for E. faecalis by time period: by year for 1999-2005 and by quarter for 2005 – total numbers of E. faecalis and percentage resistance to ampicillin (AMP), high-level gentamicin (HLG) and vancomycin (VAN).
Changes in the numbers of laboratories participating in the surveillance system by year-end are indicated above the chart

- 18 isolates were resistant to ampicillin, 3GCs, fluoroquinolones and gentamicin. Five of these were ESBL-positive
- 22 were resistant to ampicillin, 3GCs and fluoroquinolones. Ten of these were ESBL-positive
- 65 were resistant to ampicillin, fluoroquinolones and gentamicin
- Two were resistant to ampicillin, 3GCs and gentamicin

MDR isolates accounted for 7.6% of all *E. coli* isolates tested against all four mandatory antibiotic groups in 2005 compared with 5.6% (66 isolates) in 2004, 3.6% (34 isolates) in 2003 and 2.4% (17 isolates) in 2002. This increase in MDR *E. coli* was statistically significant (X^2trend = 32.54; P <0.001).

In total, 79% of the isolates (1144/1445) were examined for the presence of ESBLs compared with 69% in 2004. ESBLs were detected in 2.6% of these (30/1144) compared with 1.3% in 2004.

The median age of patients with invasive *E. coli* infection was 71 years (95% CI, 70–72 years). The difference in the median ages of patients with MDR [70 years (95% CI, 66–73 years)] and non-MDR isolates [71 years (95% CI, 70–72 years)] was not considered to be significant as their CIs overlapped. Overall, there were more isolates from females than from males (57% versus 43%; z-test = -5.3, P <0.001) but there were more MDR isolates from males than from females although this was only borderline significant (59% versus 41%; z-test = 1.87, P = 0.03).

The four CSF isolates from patients aged 24, 55, 69 and 78 years, respectively, were resistant to ampicillin but susceptible to 3GCs, fluoroquinolones and gentamicin.

Ireland has seen an increase in the proportions of resistance to fluoroquinolones (X^2trend = 73.02; P <0.001) and gentamicin (X^2trend = 36.99; P <0.001) over the past four years. In 2005, an increase in 3GC resistance from 2.4% to 4.1% was also observed (see figure 6). This increase was found to be statistically significant (X^2 = 6.05; P = 0.02), although the 95% CIs overlapped. The apparent increase and spread of 3GC resistance in Europe is thought to be due in part to the emergence of a particular class of ESBL (CTX-M) in *E. coli*.[1] Between 2001 and 2004, increasing trends in resistance to 3GCs, fluoroquinolones and gentamicin in *E. coli* were observed in 12, 15 and nine European countries, respectively. The lowest proportions of resistance to all classes of antibiotics in Europe are typically observed in the Scandinavian countries and the Netherlands while the highest proportions are seen in Southern Europe.

Enterococcus faecalis

In 2004, 290 reports of *E. faecalis* isolates from bacteraemia were received from 33 laboratories (see table 1).

The trends in total numbers of *E. faecalis* isolates and proportion of resistance to HLG and vancomycin reported by year (2002–2005) and quarter for 2005 only are shown in figure 7.

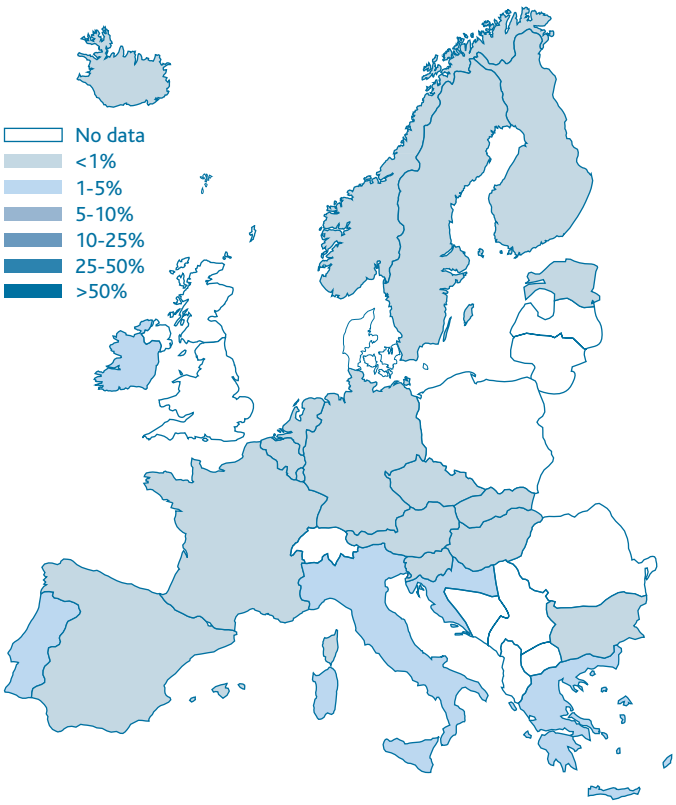

Figure 8. Map illustrating the distribution of resistance to glycopeptides among E. faecalis in EARSS countries in 2005

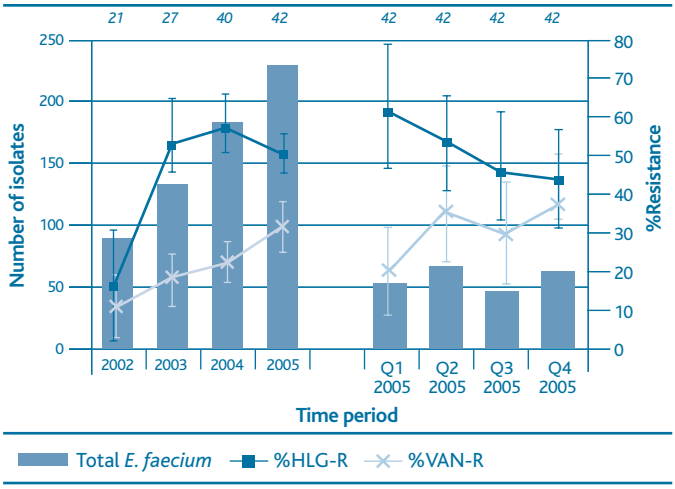

Figure 9. Trends for E. faecium by time period: by year for 1999-2005 and by quarter for 2005 – total numbers of E. faecium and percentage resistance to ampicillin (AMP), high-level gentamicin (HLG) and vancomycin (VAN).
Changes in the numbers of laboratories participating in the surveillance system by year-end are indicated above the chart.

Ten isolates (3.5%) were reported to be ampicillin-resistant (compared to 0.8% in 2004). Ampicillin resistance in *E. faecalis* is unusual and further investigation of these isolates is warranted to confirm their identity as it is generally acknowledged that speciation of enterococci can be problematic.

One hundred and seven isolates (43.1%) of the 248 tested were HLG resistant, of which 48 were confirmed by MIC determination. By comparison, 42.2% of isolates were HLG resistant in 2004.

Seven isolates (2.5%) were reported to be vancomycin resistant (one of which was confirmed by MIC). Six of these were also tested for susceptibility to teicoplanin: four were resistant and two were intermediately-resistant. By comparison, 1.3% of isolates were vancomycin-resistant in 2004.
No isolates were resistant to all three "indicator" antibiotics (ampicillin, HLG and vancomycin). Three isolates were resistant to HLG and vancomycin but susceptible to ampicillin.

The median age of patients with *E. faecalis* bacteraemia was 66 years (95% CI, 62–69 years). There were more isolates from males than from females (58% versus 42%, respectively; z-test = 2.61, P = 0.01).

Although the proportion of vancomycin-resistant *E. faecalis* (VREfa) in Ireland is low, it is still higher than that reported in most other countries reporting to EARSS (see figure 8). Only Greece, Italy and Portugal had higher proportions of VREfa in 2005. HLG resistance is quite common throughout Europe. There were no obvious trends in vancomycin and HLG resistance in Ireland between 2002 and 2005.

Enterococcus faecium
In 2005, 224 reports of *E. faecium* isolates from bacteraemia were received from 23 laboratories (see table 1).

The trends in total numbers of *E. faecium* isolates and proportion of resistance to HLG and vancomycin reported by year (2002–2005) and quarter for 2005 only are shown in figure 9.

The proportions of isolates resistant to ampicillin, HLG and vancomycin were 92.8%, 50.5% and 31.7%, respectively, compared with 95.7%, 57.8% and 23.2%, respectively, in 2004. Globally, most *E. faecium* are ampicillin-resistant.

Forty-four of the 71 isolates reported as resistant to vancomycin were additionally tested for susceptibility to teicoplanin: 40 were resistant, one was intermediately-resistant and three were susceptible. In addition, one isolate was reported as intermediately-resistant to vancomycin and susceptible to teicoplanin.

Fifty-three isolates were resistant to ampicillin, HLG (18 were confirmed by MICs) and vancomycin (20 confirmed by MICs). Such MDR isolates accounted for 25.6% of all *E. faecium* reported in 2005 compared with 19.0% in 2004, 12.4% in 2003 and 3.6% in 2002. This increase in MDR *E. faecium* was statistically significant (X^2trend = 12.80; P <0.001).

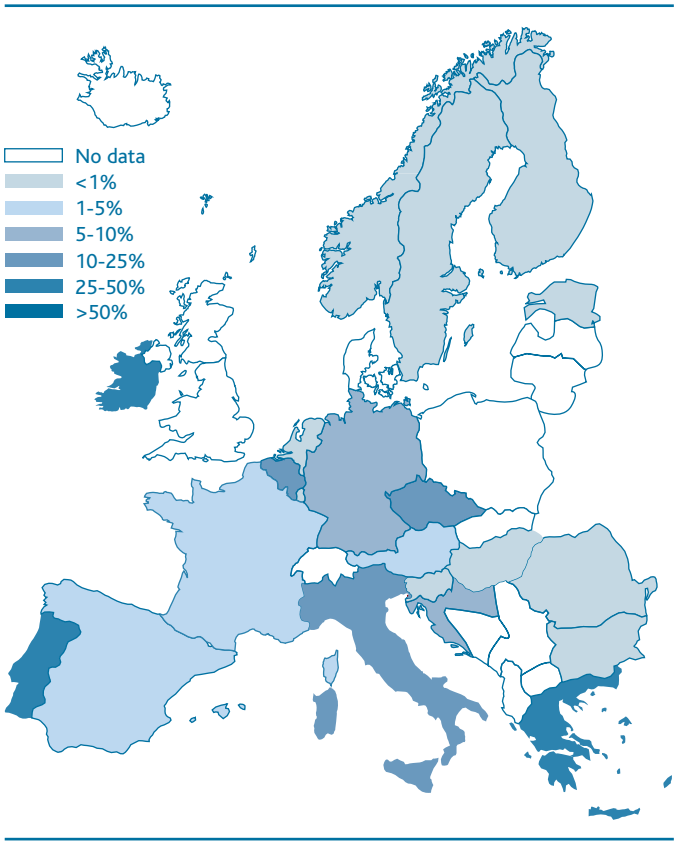

Figure 10. Map illustrating the distribution of resistance to glycopeptides among E. faecium in EARSS countries in 2005

The median age of patients with *E. faecium* bacteraemia was 63 years (95% CI, 59–66 years). There was no difference in the median ages of patients with vancomycin-resistant versus vancomycin-susceptible *E. faecium* [both 61 years (95% CI, 59–68 years)]. The difference in the median ages of patients with MDR [65 years (95% CI, 59–68 years)] and non-MDR isolates [67 years (95% CI, 63–70 years)] was not considered to be significant as their CIs overlapped. There were slightly more isolates from females than from males but this was not statistically significant (52% versus 48%, respectively; z-test = 0.53, P = 0.60).

Ireland had one of the highest proportions of vancomycin-resistant *E. faecium* (VREfm) in Europe in 2005 (see figure 10). Of countries reporting to EARSS, only Greece, Israel and Portugal had higher proportions of VREfm. The proportion of VREfm increased significantly from 11% in 2002 to 32% in 2005 (X^2trend = 73.02; P <0.001). The overlapping CIs from year to year reflect the low numbers of isolates reported. Ireland also had one of the highest proportions of resistance to HLG. Between 2002 and 2003, there was a significant increase in the proportion of HLG resistance from 17% to 55% (X^2trend = 13.6; P <0.001). Between 2003 and 2005, there was no obvious trend in HLG resistance.

Enhanced Surveillance of EARSS Pathogens

Collection of enhanced data on patient demographics, risk factors and clinical features of the EARSS pathogens began in 2004. Data are analysed to determine the factors that contribute to the acquisition of bloodstream infections (BSI) caused by EARSS organisms and their resistant variants.

A report on the progress of the enhanced surveillance system to 2005 was published in an Epi-Insight article.[9] Eleven hospitals contributed to the data over the two years, 2004-2005. Enhanced data on 2,011 isolates were collected and all seven EARSS organisms were discussed. Factors affecting *S. aureus* BSI were examined further. A regression study showed that age, length of stay (LOS) and stay in the intensive care unit are significant predictors of MRSA BSI while skin/soft tissue as a primary source is more relevant to MSSA BSI. Factors found to be relevant to both MRSA and MSSA, were surgical site infections and recent surgery, and central venous catheter, which is the most common source of the *S. aureus* BSI.

An analysis of MRSA BSI mortality, using 2005 enhanced data, was presented at an international meeting.[10] Meticillin resistance was found to be a significant risk factor for 14-day mortality among patients who already have *S. aureus* BSI when other risk factors, including age and LOS, are taken into account. The other factors become more significant over meticillin resistance for greater than 14-day mortality.

Analysis of 2005 enhanced data on fluoroquinolone-resistant *E. coli* BSI found that resistant *E. coli* BSI isolates are more likely to be hospital-acquired than sensitive forms. As reliance on fluoroquinolone antibiotics in Irish hospitals continues to rise, there is concern that the levels of this resistant pathogen will also rise.

Enhanced data on resistance in enterococcal BSI, *K. pneumoniae* and *P. aeruginosa* will be analysed once sufficient data are collected over the following years. Analysis

of risk factors associated with BSI arising from the community-acquired pathogen, *S. pneumoniae*, are more difficult as the enhanced data collection is primarily hospital-based. Further improvements in the data collection are planned for 2006. The current surveillance form and protocol are available from the HPSC website at: http://www.ndsc.ie/hpsc/A-Z/MicrobiologyAntimicrobialResistance/EuropeanAntimicrobialResistanceSurveillanceSystemEARSS/EnhancedBacteraemiaSurveillance/

Additional Information
Surveillance of *K. pneumoniae* and *P. aeruginosa* commenced from 1st October 2005.

The quarterly EARSS Newsletters and other reports and documents produced by HPSC can be accessed on the HPSC website at: http://www.ndsc.ie/hpsc/AZ/MicrobiologyAntimicrobial Resistance/EuropeanAntimicrobialResistanceSurveillanceSystemEARSS/

Antimicrobial resistance data, including the most up-to-date maps (in full colour) showing the distributions of resistance, for all seven pathogens surveyed in the 31 countries participating in this surveillance system can be obtained from the interactive database available on the EARSS website at: http://www.rivm.nl/earss/

Conclusions
The continuing high prevalence of MRSA and PNSP, along with increasing resistance levels in *E. coli* and enterococci, underline the importance of full implementation of the Strategy for the control of Antimicrobial Resistance in Ireland (SARI).

The marked increase in fluoroquinolone resistance among isolates of *E. coli*, and the finding that these isolates appear to be mostly hospital-acquired, underlines the importance of implementing the SARI recommendations on prudent antibiotic prescribing in hospitals.

Central venous catheters are a common, and potentially modifiable, risk factor for *S. aureus* BSI. Future surveillance of healthcare-associated infection should include targeted surveillance of central venous catheter-related BSI.

Serotyping data were only available for 6% of *S. pneumoniae* isolates reported. Ready access to serotyping is required, particularly in light of the proposed addition of the conjugate pneumococcal vaccine to the routine childhood immunisation schedule.

Acknowledgements
The success of EARSS in Ireland is due to everyone involved in the surveillance system. Grateful thanks are extended to:
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Antibiotic Consumption in Ireland, 2005

Key Points

- **Outpatient antibiotic consumption was 21.8 DDD per 1000 inhabitants per day in Ireland in 2005, mid-range compared to other European countries**
- **Rate has gradually increased by 35% since 1993 when the rate was 16.2 DDD per 1000 inhabitants per day**
- **Consumption of specific antibiotics showed accelerated increases since 2000**
- **Wide regional variation, seasonal fluctuation, and differences in consumption between private and non-private patients were observed**
- **Hospital antibiotic consumption was 81.5 DDD per 100 bed-days, an overall rise on previous year's rate, although some hospitals recorded a marked decrease**

Introduction

Surveillance of antimicrobial use has been identified as a key component of the Strategy for the Control of Antimicrobial Resistance in Ireland (SARI) and Ireland now fully participates in the European Surveillance of Antimicrobial Consumption (ESAC). This report covers antibiotic consumption in both outpatient (sometimes referred to as ambulatory, community or primary care) and hospital care areas collected under ESAC guidelines for 2005 in Ireland.[1]

ESAC uses the WHO Anatomical Therapeutic Chemical (ATC) index to classify drugs through hierarchical levels. Consumption is measured in Defined Daily Dose (DDD), which is the assumed average maintenance dose per day for a drug used for its main indication in adults.

Methods

HPSC has purchased Irish pharmaceutical sales data from IMS Health. This dataset contains regional, monthly wholesaler to retail pharmacy sales data for 2005 from over 95% of the wholesalers and manufacturers in Ireland. Hospital prescribed antibiotics data were supplied directly by clinical pharmacists from a representative sample of 15 public acute hospitals for each quarter of 2005. Hospitals having greater than 400 beds were here classed as "large" and comprised all the tertiary-care centres in the survey (n=4), and the remainder, "smaller and medium" sized hospitals (n=11) were either acute general or single speciality hospitals.

An automated data-extraction protocol was devised at HPSC to obtain the ATC/DDD outputs for antibiotics. The WHO ATC/DDD version 2005 was used throughout and

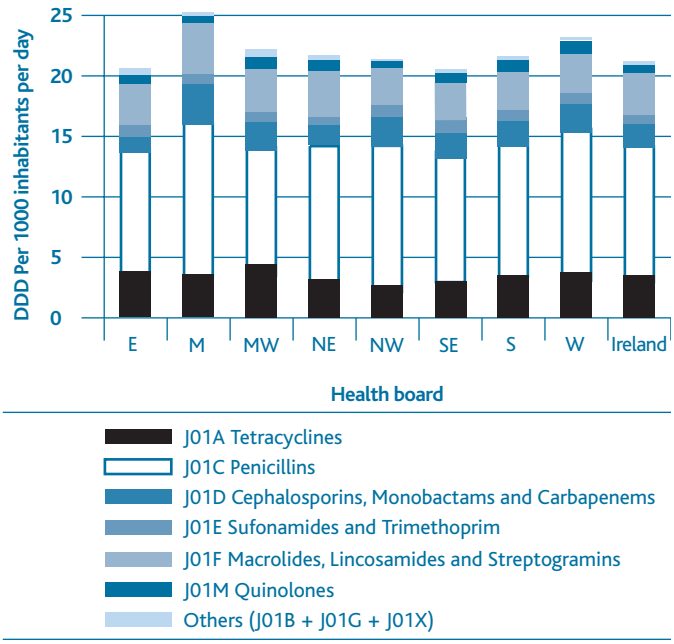

Figure 1. Outpatient antibiotic consumption by therapeutic class in each HSE Area in Ireland, 2005.

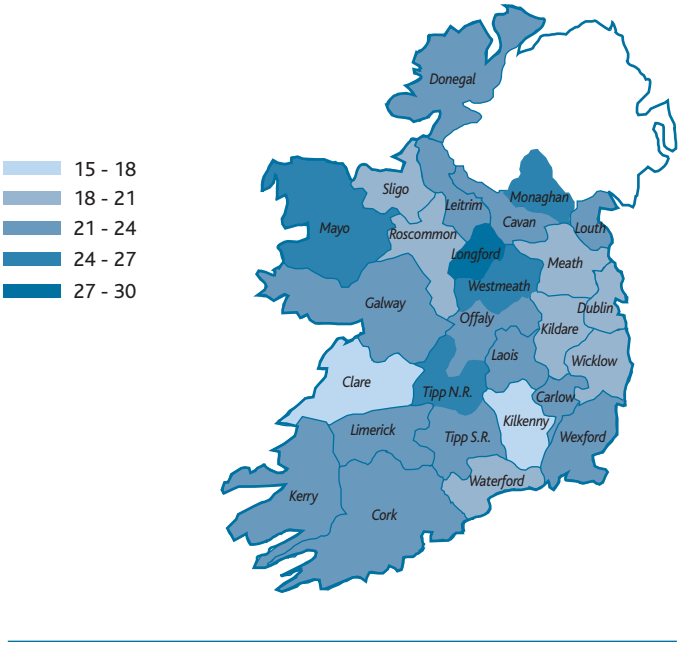

Figure 2. Total antibiotic consumption by county in Ireland, 2005.

retrospective data were re-analysed accordingly.

The 2002 Census of Population was used to calculate rates in DDD per 1000 inhabitants per day (DID) for the outpatient data. For a limited analysis, a linear interpolation method was used to estimate the population for 2004 and 2005 from the preliminary census of 2006 and the final census of 2002. Hospital activity data were obtained from the Department of Health and Children and used to calculate rates in DDD per 100 bed-days used (DBD).

Results

Outpatient Antibiotic Consumption

Overall rates

The overall outpatient antibiotic consumption for Ireland in 2005 was 21.8 DID, a rise from the previous year's rate of 20.8 DID. Figure 1 shows the breakdown by antibiotic class for each HSE area and for Ireland as a whole. In 2005 outpatient consumption, penicillins accounted for the largest class used (50% of total at 10.8 DID), followed by tetracyclines (16%, 3.5 DID), macrolides (15%, 3.3 DID), cephalosporins (9%, 2.0 DID), quinolones (4%, 0.9 DID) and sulphonamides (4%, 1.0 DID). "Others" comprising aminoglycosides and miscellaneous accounted for 2% at 0.4 DID.

The outpatient rates using the interpolated population estimates were 20.1 DID for 2004 and 20.5 for 2005, a rise of 2%.

Regional variation

There was little variation in outpatient antibiotic usage among the different HSE areas (20.6 to 25.3 DID). However, as shown in Figure 2, there was considerable variability in outpatient antibiotic usage at county level (17.3 to 28.7 DID).

Time series analysis

Figure 4 shows consumption of antibiotics in outpatient care, in DID, for Ireland by quarter since 1993. Antibiotic usage has been rising steadily from 16.2 DID in 1993 to 21.8 DID in 2005, and was 23.8 DID for the last quarter of 2005. Overall antibiotic use was highest during winter. For the complete dataset of 13 years (1993-2005), the mean difference between troughs (quarters 2 and 3) and peaks (quarters 1 and 4) in antibiotic use was 23% (range 12% - 34%), and was 15% for 2005.

The fluctuation in outpatient antibiotic utilisation during the course of a year is further demonstrated in Figure 5. The mean monthly rate for the last five years (2000-2004) dropped steadily from January to July and stayed low for August. The level rose sharply to a plateau in September, October and November then peaked in December. The pattern was the same for 2005, but higher than the previous years' mean rate, particularly in months March through to June.

Penicillins

Figure 3 shows the breakdown of penicillin usage by subclass in outpatients. Penicillin in combination with beta-lactamase inhibitor (such as amoxicillin/clavulanate) accounted for the largest proportion of penicillins and showed a dramatic rise over the last six years (2000-2005). Broad-spectrum penicillins (such as ampicillin and amoxicillin) usage was stable but high. Beta-lactamase resistant penicillins (such as

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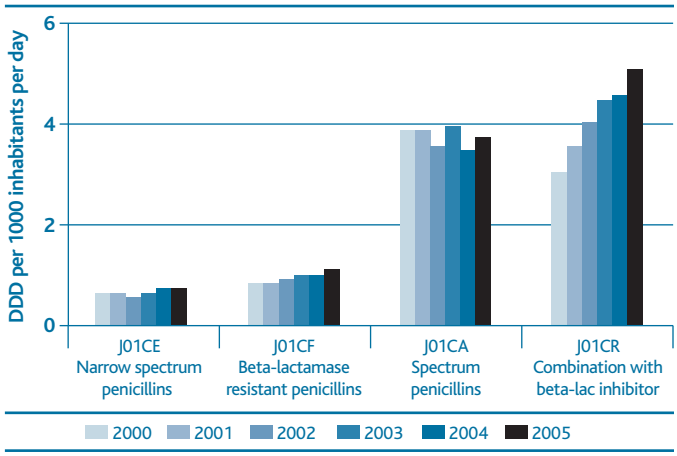

Figure 3. Outpatient consumption of penicillin subclass in Ireland, 2000-2005.

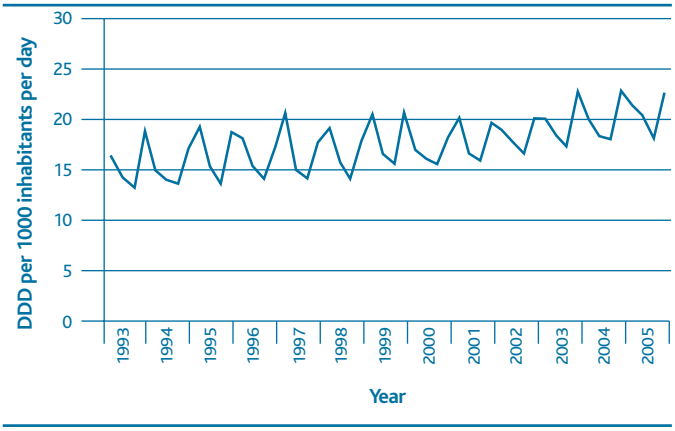

Figure 4. Seasonal variation in outpatient antibiotic consumption in Ireland, 1993-2005.

flucloxacillin) and narrow-spectrum penicillins (such as benzylpenicillins) usage were lower but showed slight increases.

Cost estimates

According to IMS data, which represent private and non-private community antibiotic sales, the total ingredient cost of antibiotics for 2005 was €51.7 million. This is a rise of 5% from 2004 when the cost was €49.5 million. The HSE National Shared Services Primary Care Reimbursement Service (formerly GMS Payments Board) stated that the antibiotic ingredient cost for 2004 under its three main schemes was €29.7 million, which is 60% of the total cost (private plus GMS) while the eligible persons only represent about 30% of the population.[2]

Hospital Antibiotic Consumption

Overall rates

The overall hospital antibiotic consumption for Ireland in 2005 is estimated at 81.5 DBD, a rise from the previous year's rate of 78.2 DBD. In 2005 hospital consumption, penicillins accounted for the largest class used (47% of total at 38.6 DBD), followed by macrolides (16%, 13.1 DBD), quinolones (11%, 9.0 DBD), cephalosporins (8%, 6.7 DBD), sulphonamides (5%, 3.8 DBD) and tetracyclines (2%, 1.7 DBD). "Others" comprising aminoglycosides, imidazole and nitrofuran antimicrobials accounted for 11% at 8.6 DBD.

Variation by hospital and changes over time

There was wide variation in terms of total antibiotic consumption among the different hospitals (range 22.7 to 121.6 DBD). Figure 6 shows the breakdown by antibiotic class for 2004 and 2005 for the sample of 15 Irish hospitals and by approximate hospital size. For 2005, the rate for large hospitals was 85.6 DBD and 78.3 DBD for small/medium hospitals. The proportionate consumption of quinolones in larger hospitals was 14% and 8.4% in small/medium facilities.

While, of the 15 hospitals taking part in the survey, three showed a decrease with one showing a 15% drop, between 2004 and 2005, the overall rate rose slightly from 78.2 DBD to 81.5 DBD. The rise was greater among the larger hospitals (Figure 6). In terms of proportional amount of each class of antibiotics, there was a decrease in cephalosporin usage (8.9% to 8.2%), but rises in penicillins (46.6% to 47.3%) and quinolones (10.0% to 11.0%).

Cephalosporins

The overall cephalosporin use in hospital care dropped from 7.0 DBD to 6.7 DBD. Figure 7 shows the breakdown of cephalosporin antibiotics by generation in 2004 and 2005, and by size of hospital. In 2005, first-generation cephalosporin (such as cefalexin) was 9%, second-generation cephalosporin (such as cefuroxime) was 61% and third-generation cephalosporin (such as cefotaxime) was 30% of the total usage. The relative proportion of third-generation cephalosporin use was higher in 2004 at 34%. In 2005, this level was higher in larger hospitals (35%) than in small/medium sized hospitals (28%). Fourth-generation cephalosporins (such as cefepime) are not used in Ireland.

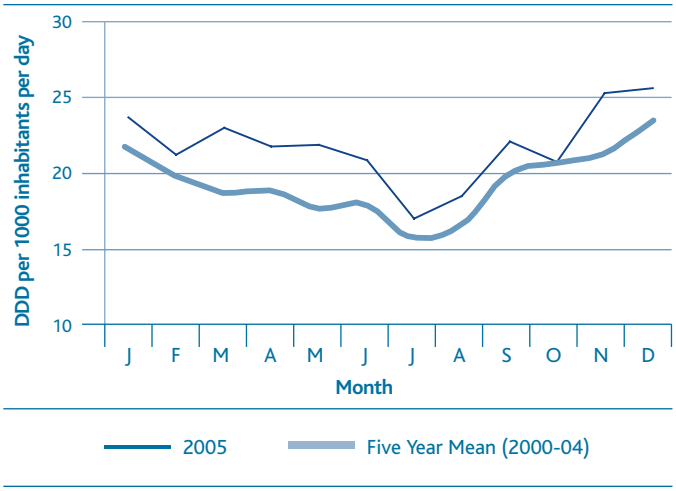

Figure 5. Variation in outpatient antibiotic consumption by month in Ireland, mean of five years (2000-2004) and 2005.

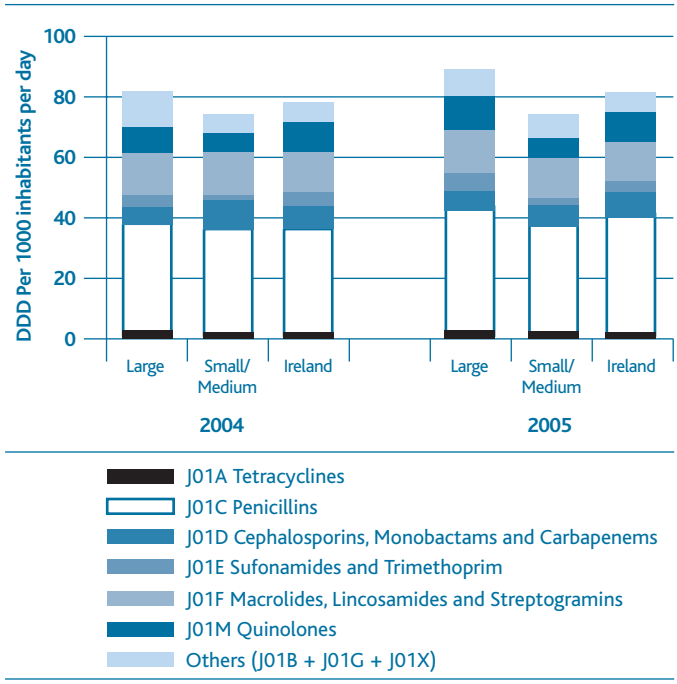

Figure 6. Hospital antibiotic consumption by therapeutic class in Ireland, 2004 and 2005. The sample of 15 Irish hospitals is divided into small/medium sized hospitals (<400 beds), and larger hospitals.

Cost estimates

The mean ingredient cost of antibiotics per hospital in the survey was €807,998 in 2005, which equates to €33.7 million for all public acute hospitals in Ireland. The cost was estimated as €33.5 million in 2004.

Discussion

In an ESAC report of 2002 data for 32 EU countries, the range of outpatient antibiotic usage was 10.0 DID (the Netherlands) to 32.2 DID (France).[3] Outpatient antibiotic usage in Ireland was 21.8 DID for 2005 and has been around 18-21 DID over the last 5 years, therefore the rate in Ireland is mid-range in Europe. However, the marked seasonal fluctuation coupled with a higher proportional of broad-spectrum penicillin consumption in Ireland is consistent with those countries having a higher level of resistance among key indicator pathogens, as in Portugal and Italy, unlike the Nordic countries, which generally have low levels of resistance. Furthermore, the overall outpatient usage, and particularly penicillins such as amoxicillin/clavulanate, is increasing.

Outpatient antibiotic usage in some Irish counties appears to be considerably different from the national rate. This regional variation is similar to the pattern from 2004 and may reflect differences in prescribing practices, socioeconomic factors or pharmaceutical marketing.[4] This is further reflected in the analysis of the GMS data, which showed that those entitled to reimbursement (representing 30% of the population) are prescribed about 60% of the antibiotics in terms of cost. Seasonal fluctuation has been seen every year in outpatient antibiotic consumption and is probably related to over-prescribing of antibiotics for respiratory tract infections in winter months.

The three factors – regional, seasonal and socioeconomic – may work together to produce very high rates of antibiotic consumption in some primary care areas at certain times, resulting in increased pressure for selection of resistant variants of important bacterial pathogens.

The pattern of antibiotic usage in hospitals is different from primary care usage but again the consumption in Ireland is mid-range in Europe according to ESAC data.[5] In another ESAC report, aggregate data from 15 countries in 2002 produced a median of 2.1 with a range of 1.3 to 3.9 DDD/1000 inhabitants/day. [This unit of measure was applied as the recommended bed-days denominator is not obtainable in some countries. The figure is based on the catchment population of each hospital studied and can be only roughly estimated for the Irish data]. The equivalent rate for hospital antibiotic consumption in Ireland is 2.2 DDD/1000 inhabitants/day, which is similar to the ESAC median, although variation in therapeutic choice was observed. The relative proportion of third-generation cephalosporin usage in Ireland (30%) is similar to that of high-level consumers of third-generation cephalosporins including Belgium and Greece. In Ireland although there has been a decrease in the proportion of third-generation cephalosporin usage (34% to 30%), the level remains much higher than those ESAC participants, such as Denmark (<10%), that have low levels of resistant infections. The

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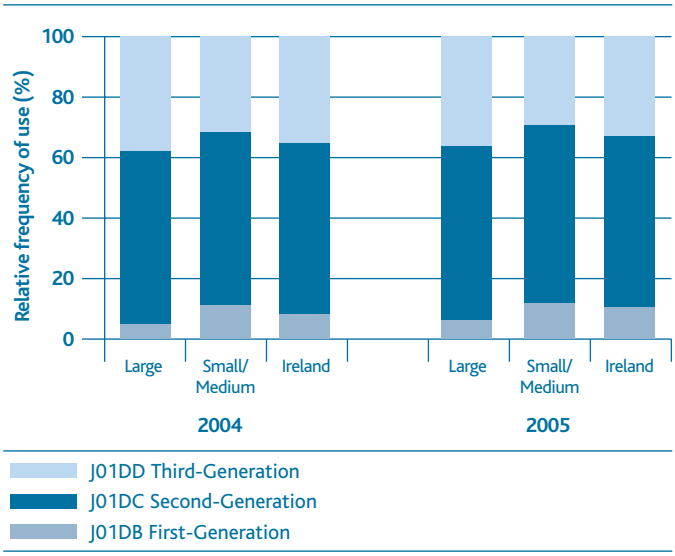

Figure 7. Hospital antibiotic consumption by generation of cepthalosporin in Ireland.

overall level of antibiotic usage has increased from 2004 when the survey of hospitals began and quinolone use showed the highest increase. This is of particular concern as high levels of fluorquinolone use has been linked to increased rates of MRSA and *Clostridium difficile* in hospitals.

While overall hospital antibiotic consumption increased, some hospitals have shown a clear reduction in antibiotic usage in 2005. HSPC aims to continue to coordinate with regional community- and individual hospital-based multidisciplinary teams to target reduction of antibiotic consumption in Ireland in the coming years.

Acknowledgements

HPSC wish to thank the hospital pharmacy departments in Ireland who voluntarily supplied their data, the Information Management Unit at DoHC for the hospital activity data, IMS Health and the ESAC management team.

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Invasive Group A Streptococcal Disease in Ireland, 2005

Key points

- **Incidence of iGAS in Ireland in 2005 was 1.25/100,000, lower than most EU countries with consistent data but higher than 2004 rate in Ireland**
- **Bacteraemia was common clinical feature. Necrotising fasciitis, streptococcal toxic shock syndrome, and other invasive conditions were also reported**
- **Cluster of cases noted in early-2005 in HSE-W**
- **Multidisciplinary sub-committee produced guidelines on iGAS Diagnosis, Management and Surveillance. Recommendations included need for enhanced surveillance of iGAS in Ireland**

Introduction

Group A Streptococcal disease (GAS) covers a wide range of illnesses from pharyngitis and scarlet fever, to more severe invasive illnesses such as necrotising fasciitis. Invasive Group A Streptococcal diseases (iGAS) are infections associated with the isolation of *Streptococcus pyogenes* from normally sterile body sites, and carry significant risk of mortality. Clinical features of iGAS are: streptococcal toxic shock syndrome (STSS) which can result in multi-organ system failure early in the course of the illness; necrotising fasciitis (NF) characterised by extensive local necrosis of subcutaneous soft tissues and skin; and other syndromes such as bacteraemia, meningitis, pneumonia, peritonitis, myositis, septic arthritis, puerperal sepsis, cellulitis, osteomyelitis and surgical wound infections.[1]

Worldwide, cases of iGAS rose during the 1980s and 1990s but the rates have since stabilised and remain around 3.8/100,000 in recent years in the United Kingdom (UK) and other European countries with adequate surveillance.[2] The epidemiology of iGAS in Ireland was unknown until 2004 when the disease became notifiable. There were 35 notifications in 2004 (0.89/100,000). The HPSC Scientific Advisory Committee set up a multidisciplinary sub-committee in mid-2005 to produce guidelines on the Detection, Surveillance and Management of iGAS Infections in Ireland. The recommendations were published in 2006.

Table 1. Clinical features of cases in 2005

Clinical Feature	Number of cases
STSS, Cellulitis	1
NF	2
NF, Bacteraemia	1
Bacteraemia	4
Bacteraemia, Cellulitis	3
Bacteraemia, Osteomyelitis	1
Cellulitis	2
Meningitis	1
Pneumonia	1
Peritonitis	1
Septic Arthritis	1
Others (both abscess)	2
Unknown	8

Table 2. Sex and age-group distribution of iGAS cases for 2004 and 2005 combined

Age group (years)	Females	Males	Totals (%)
<1 yrs	2	0	2 (2)
1-4 yrs	4	2	6 (7)
5-9 yrs	2	3	5 (6)
10-14 yrs	1	1	2 (2)
15-19 yrs	0	4	4 (5)
20-24 yrs	1	2	3 (4)
25-34 yrs	5	7	12 (14)
35-44 yrs	4	4	8 (10)
45-54 yrs	0	3	3 (4)
55-64 yrs	7	3	10 (12)
65+ yrs	14	14	28 (33)
Unknown	0	1	1 (1)
Total	**40**	**44**	**84**

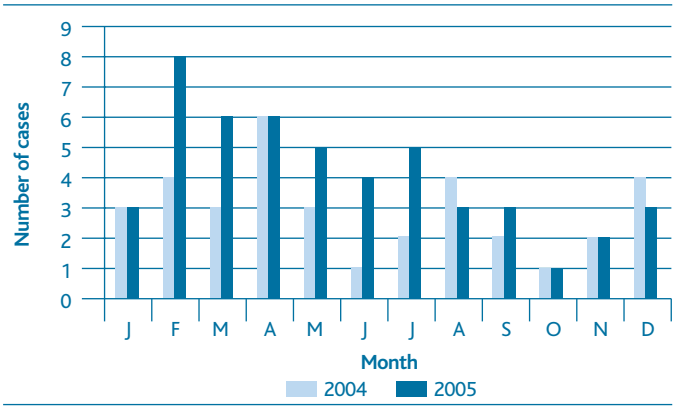

Figure 1. Notified cases of iGAS by month 2004 and 2005.

Method

Reports of iGAS cases in Ireland in 2005 on CIDR were analysed at the HPSC.[3] Additional information was available on some cases for which microbiology laboratories and Departments of Public Health completed enhanced surveillance forms. Rates were calculated using the 2002 Census of Population.

Results

In Ireland there were 49 cases (1.25/100,000) of iGAS notified in 2005, a rise on the 35 cases (0.89/100,000) in 2004. There were more cases reported in February and March of 2005 than in those months in 2004 (Figure 1). This was due to a temporal and geographic clustering of cases of iGAS noted in HSE-W (Figure 2). Typing data were available for 13 of the 17 isolates in the cluster. Serotype M-1 (six isolates), M-12 (two isolates), M-87 (two isolates) and one isolate each of M-3, M-5 and M-28 were reported. No epidemiological link was established among the cases.

Enhanced surveillance forms were returned for 28 of the 49 cases in 2005 (table 1). There were three cases with NF (one with bacteraemia) and one case of STSS (with cellulitis). In all, there were nine cases of bacteraemia with or without a focus. Clinical presentation for eight of the cases was unknown.

Age and sex breakdown for the two years, 2004 and 2005, combined (Figure 3. and table 2.) showed that all age groups were affected but the incidence was higher among the very young and the elderly; 33% of all infections occurred in the age-group 65 years or over. Overall, slightly more males (52%) were affected than females.

No national-level data on antibiotic-resistance profiles of the *Streptococcus pyogenes* isolates associated with invasive disease were available.

Discussion

The rise in 2005 of cases of iGAS over 2004 was largely due to an increase of cases reported in HSE-W, where 18 cases were reported in 2005 while none were seen in 2004 in that region. Most of the cases in HSE-W occurred in February and March but there was a wide distribution of serotypes among the cases in the cluster. The serotypes were those commonly recorded internationally. Furthermore, the cases were not epidemiologically linked and thus the cluster did not constitute a single outbreak of iGAS.

The crude incidence rate for iGAS in Ireland in 2005 was 1.25/100,000. This is much lower than the rate reported in recent years in the UK and other European countries (3.8/100,000). It is possible that there is under-reporting of cases, or that there is an actual low rate in Ireland. In either situation, it is important to collect timely and detailed information on each episode of the disease.

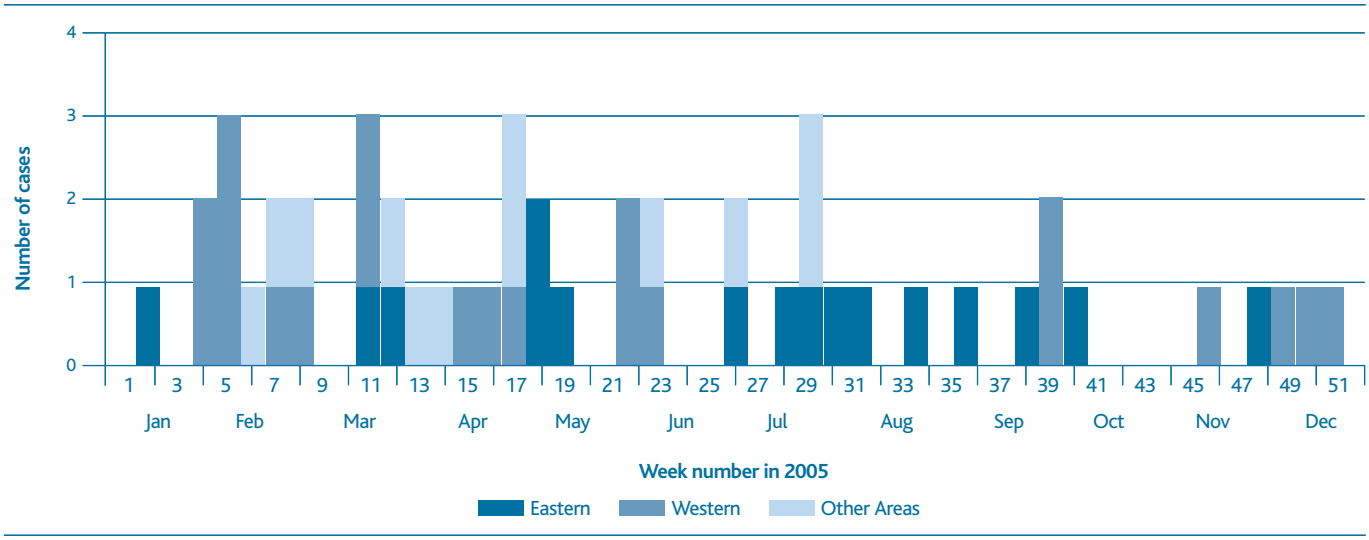

Figure 2. Epidemic curve for 2005 showing number of cases occurring in the Eastern and Western HSE-Health Areas

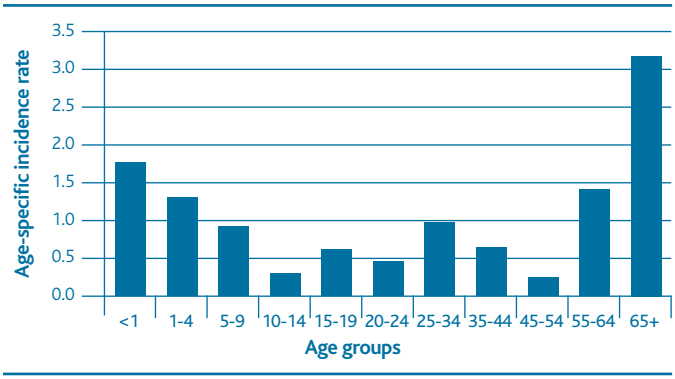

Figure 3. Age-specific incidence rate (per 100,000) of iGAS cases for 2004 and 2005 combined

Enhanced surveillance data were received for only two-thirds of the cases in 2005, and most of the fields were marked as "unknown". The HPSC iGAS sub-committee is due to publish its report in 2006. Included in the document will be a recommendation that enhanced surveillance questions, which are available on a form from the HSPC website and which will be on CIDR in late-2006, are completed. Further recommendations include strain typing and antimicrobial-resistance monitoring of all of the iGAS bacterial isolates. Adherence to these along with recommendations on disease management in the report should provide a clearer epidemiological picture and help to control iGAS.

Acknowledgements

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