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Surveillance of Infectious Disease Outbreaks in Ireland, 2003

Introduction

The primary 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 of the system 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 July 2001, public health professionals have been requested to report all investigated infectious disease outbreaks to HPSC using a preliminary notification form. A follow-up investigation form and/or final report are then forwarded by the lead investigator at the end of the investigation. The data collected include information on the source of reporting of the outbreak, the extent of the outbreak, mode of transmission, location, pathogen involved, laboratory investigation, morbidity and mortality data, suspected vehicle and factors contributing to the outbreak. These data are stored and analysed in a Microsoft Access database in HPSC.

Table 1. All outbreaks of ID, number of IID outbreaks and total numbers ill in IID outbreaks reported by health board, 2003

Health Board	No. of outbreaks	Outbreak rate per 100,000 pop.	No. of IID outbreaks	No. ill in IID outbreaks
ERHA	42	3.0	39	1,103
MHB	3	1.3	2	70
MWHB	6	1.8	6	85
NEHB	6	1.7	6	151
NWHB	6	2.7	6	60
SEHB	19	4.5	16	204
SHB	26	4.5	26	412
WHB	1	0.3	1	28
Total	**109**	**2.8**	**102**	**2,113**

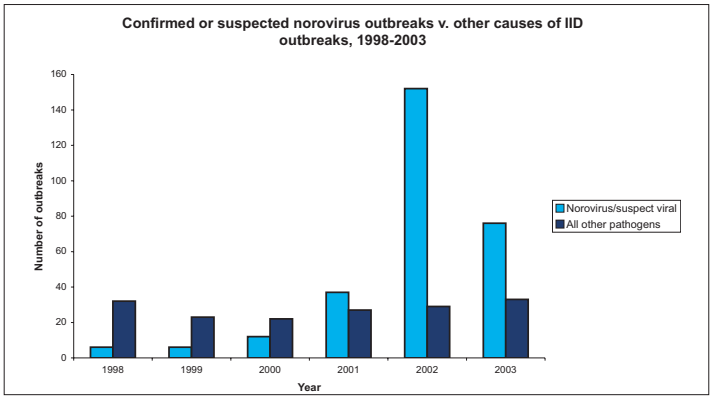

Figure 1. Number of outbreaks by year and by pathogen, 1998-2003 (Data prior to July 2001 provided by FSAI)

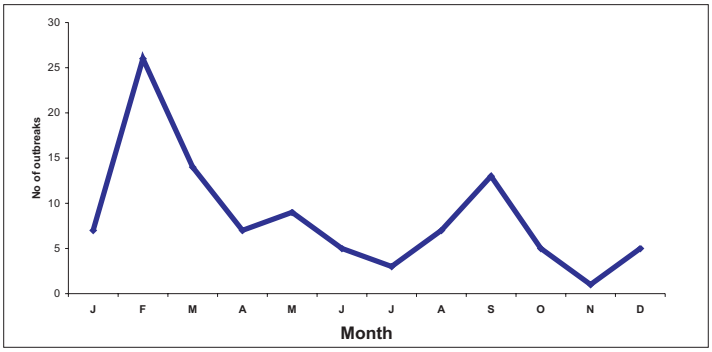

Figure 2. Seasonal distribution of IID outbreaks, 2003

Results

During 2003, 109 outbreaks of infectious disease were reported to HPSC, of which 102 were infectious intestinal disease (IID) outbreaks. The IID outbreaks were responsible for at least 2,113 people becoming ill. The regional distribution of all outbreaks of infectious disease, and those specifically IID are detailed in table 1. The highest number of outbreaks were reported from the ERHA Region (n=42), although the highest outbreak rates were in the South Eastern and Southern Health Board regions. The lowest rate was reported from the WHB.

Causative pathogen

Tables 2 and 3 outline the breakdown of IID and non-IID outbreaks by pathogen respectively. In 2003, as has been the trend since the year 2000, the IID outbreaks have been dominated by norovirus or suspected viral outbreaks, comprising 74% of all IID outbreaks in 2003. The overall numbers of IID outbreaks decreased in comparison with 2002, but was still an increase on all other previous years (figure 1). The only other confirmed viral cause of IID outbreaks in 2003 was rotavirus, causing an outbreak in a crèche in the Eastern Region.

After norovirus, the next most commonly reported outbreaks were *Salmonella enterica* and *E. coli* O157. There were eight outbreaks of *S. enterica* reported in 2003, three general and five household outbreaks. The general outbreaks were all reported to be foodborne, and all occurred in restaurants/cafés. There was one general outbreak of *S.* Hadar (11 people ill), one of *S.* Rissen (11 people ill) and one outbreak of *S.* Typhimurium (6 people ill). There were four household outbreaks of *S.* Enteritidis and one of *S.* Kentucky.

Two general outbreaks of VTEC *E. coli* O157 occurred during the summer months of 2003. Both occurred in hotel restaurants in the Eastern Region. Five confirmed and twelve probable cases were reported in one

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Epidemiology of Influenza in Ireland, 2004/2005 Season

Introduction

The 2004/2005-influenza season was the fifth 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), the Irish College of General Practitioners (ICGP), Departments of Public Health, and sentinel schools and hospitals on this project.

Influenza activity was mild in Ireland for most of the 2004/2005 season, with a short peak of activity in January 2005. Influenza A (H3N2) and A (H1N1) co-circulated for the first part of the season, followed by circulation of influenza B for the last twelve weeks of the season. Influenza activity mainly affected 15 to 64 year olds.

The most significant global event during the 2004/2005-influenza season was the continuing spread of poultry outbreaks of avian influenza A (H5N1) in Asia, associated with sporadic cases/clusters of human infection and a significant proportion of human deaths.[1, 2]

Materials and Methods

Clinical data

Thirty-six general practices (located in all HSE areas and representing 2.9% of the national population) were recruited to report electronically, on a weekly basis, the number of patients with influenza-like illness (ILI). 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.

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 and respiratory syncytial virus (RSV) using immunoflouresence 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.

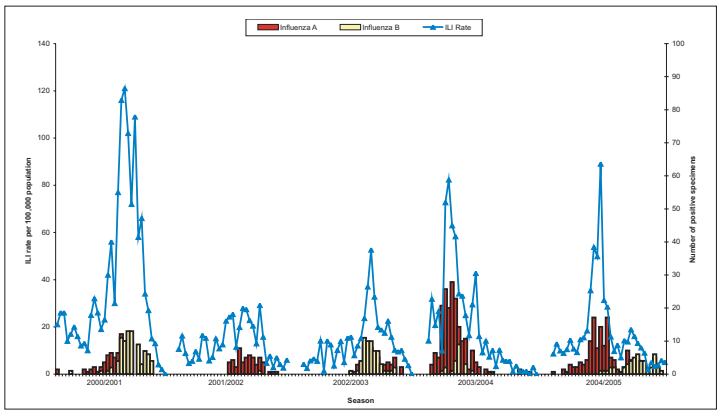

Figure 1. ILI rate per 100,000 population and the number of positive influenza specimens detected by the NVRL during the 2000/2001, 2001/2002, 2002/2003, 2003/2004 and 2004/2005 seasons.

The Departments of Public Health notified HPSC weekly of all cases of influenza and all influenza/ILI outbreaks. 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 Registrars Office.

Results

It should be noted that hospital admissions data and enhanced surveillance data for the 2004/2005 season are provisional.

Clinical data

Influenza activity in Ireland peaked later in the 2004/2005 season compared to the previous season. Activity was mild for most of the 2004/2005 influenza season, with a sharp peak during week 1 2005 at 89.0 per 100,000 population (the highest peak rate since the 2000/2001 season) (figure 1). During the peak of activity, the majority of cases reported were aged between 15-64 years.

Virological data

The NVRL tested 370 sentinel specimens for influenza virus during the 2004/2005 season. One hundred and forty-two (38.4%) sentinel specimens were positive for influenza: 103 influenza A (62 A H3N2, 36 A H1N1 and 5 A unsubtyped) and 39 influenza B. The predominant influenza virus subtype identified was influenza A (H3N2), accounting for 43.7% of positive specimens. The majority of positive influenza sentinel cases were in the 15-64 year age group (83.8%). Of the 370 sentinel specimens tested, 6 (1.6%) were positive for RSV.

The NVRL also tested 1,526 non-sentinel respiratory specimens. Of the 1,526 specimens tested, 52 (3.4%) were positive for influenza A, 8 (0.5%) for influenza B, and 349 (22.9%) were positive for RSV. The majority (86.1%) of influenza and RSV positive specimens were aged between 0 and 4 years of age.

Vaccination status and antigenic characterisation

Of the 142 positive influenza virus detections from sentinel specimens, 107 (75.3%) were not vaccinated, four (2.8%) were vaccinated and vaccination status was unknown in 31 (21.8%) cases. Of the four cases who were vaccinated, influenza A (H3N2) was detected in two cases, influenza A (H1N1) in one case, and influenza B in one case.

Three influenza specimens were sequenced at the NVRL and phylogenetic analysis was undertaken at the WHO laboratory (Mill Hill) in London. One influenza A (H1N1) isolate was antigenically characterised as A/New Caledonia/20/99-like and one influenza B isolate was characterised as being closely related to B/Jiangsu/10/03. The influenza A (H3N2) isolate was found to be closest in antigenic character to the reference viruses A/Shantou/1219/04 and A/Oslo/807/04.

Regional influenza activity

Regional influenza activity peaked during week 1 2005, with HSE, Eastern Region and HSE, South Eastern Area both reporting regional influenza activity (figure 2).

Outbreaks

Three influenza outbreaks were reported to HPSC during the 2004/2005 season. An influenza A outbreak in a sentinel school occurred during week 48 in HSE, Mid-Western Area. An outbreak of influenza A (H3N2) in a long-stay care facility for the elderly was reported by HSE, ER during week three. A school outbreak of influenza B occurred during week 16 in HSE, Midland Area.

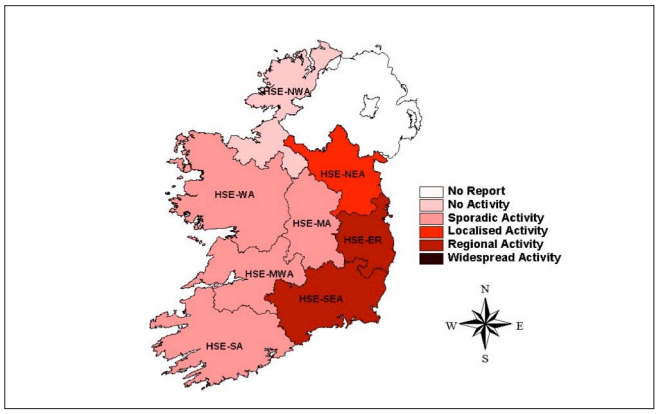

Figure 2. Map of influenza activity by HSE area during the 2004/2005 season peak of influenza activity, week 1 2005.

Sentinel hospitals & sentinel schools

Hospital respiratory admissions were at elevated levels in the two weeks preceding and/or during the peak of influenza activity (week 1 2005) in HSE, ER, North Eastern Area, SEA, Southern Area and Western Area. Respiratory admissions during the 2004/2005 season are shown in figure 3. Total hospital admissions and/or total accident and emergency admissions were also at elevated levels either prior to or during the peak of clinical influenza activity in HSE, MW, NE, North Western, SE, and WA. As the peak in clinical influenza activity occurred over the Christmas holiday period, schools were closed and sentinel school absenteeism levels could not be used as an indicator of influenza activity in the weeks preceding the peak in influenza activity.

Enhanced influenza surveillance

A total of 13 cases aged between 0 and 14 years were reported through the enhanced influenza surveillance system during the 2004/2005 season. All 13 cases were notified from HSE, ER. All cases were positive for influenza A. The number of days in hospital ranged from one to 62 days. Two cases were in at risk categories for influenza, one of whom was not vaccinated and the vaccination status was unknown for the second case.

Mortality data

Two deaths attributed to influenza were reported to HPSC during the 2004/2005 season. Both deaths were registered during week 1 2005, one in a child in the 5-14 age group with an underlying chronic medical condition who died in early December 2004 and the second in an adult aged over 65 years who died in early January 2005.

Influenza activity worldwide

In the United Kingdom, low levels of influenza activity were experienced throughout the 2004/2005 season, peaking late in the season, with influenza A/Wellington/1/2004 (H3N2)-like viruses identified as the dominant circulating strain.[5] Influenza activity in other European countries also started later than in the 2003/2004 season, with spatial analysis indicating both a west to east and south to north spread of influenza across Europe, with influenza A/California/7/2004 (H3N2)-like viruses predominating.[3] In Canada and the US, influenza activity also started later than the 2003/2004 season with the majority of strains identified as A/Fujian/411/2002 (H3N2)-like and A/California/7/2004 (H3N2)-like viruses.[6, 7]

Discussion

Influenza activity peaked late in Ireland during the 2004/2005-influenza season with influenza A (H3N2) being the predominant circulating virus, occurring mostly in 15–64 year olds. Influenza activity also started later in most of Europe, Canada and the US, with lower levels of activity reported than the previous season.[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

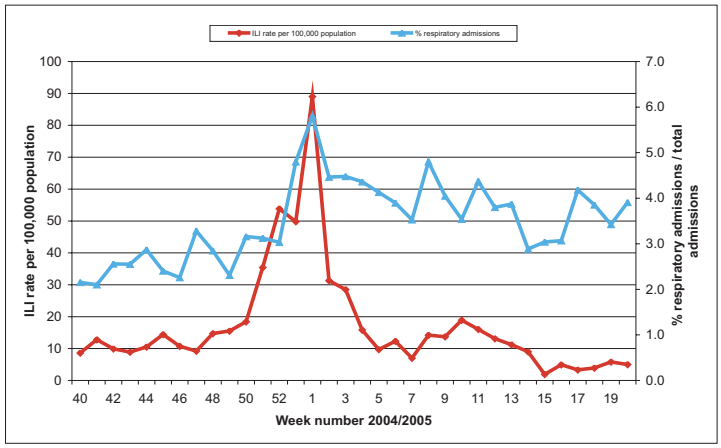

Figure 3. Respiratory admissions as a percentage of total hospital admissions in six sentinel hospitals and ILI rates per 100,000 population by week for the 2004/2005 influenza season.

demonstrated during the 2004/2005 season, with elevated levels of admissions in some sentinel hospitals detected prior to the peak in influenza activity. The value of collating school absenteeism data as an indicator of influenza activity was also highlighted with the detection of an ILI outbreak in a sentinel school.

The small number of influenza associated deaths reported to HPSC for the 2004/2005 season is not unexpected. Excess deaths due to influenza are often not registered as influenza deaths. Monitoring 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]

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] In July 2005, avian influenza A (H5N1) outbreaks spread westwards to Russian bird populations, posing an ever-greater threat of a pandemic in Europe. EU Member States are strengthening their preparedness for a potential human influenza pandemic.[10] As a result of the threat posed to human health, 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 influenza on a year round basis. In addition, influenza and all outbreaks became notifiable in Ireland on 1 January 2004. Good 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, an evaluation of sentinel hospital admissions and school absenteeism data, and the construction of baseline and epidemic threshold levels for influenza activity in Ireland. This information will in turn inform continuing progress on the Irish national influenza pandemic preparedness plan.

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

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References on request

Table 2. Pathogens associated with IID outbreaks, 2003

Pathogen	No. of outbreaks	No. ill
Suspected viral	39	576
Norovirus	37	1,168
S. enterica	8	44
E. coli O157	7	188
Campylobacter spp	2	25
Clostridium difficile	1	5
Rotavirus	1	12
Staph. aureus	1	4
Not known	6	91
Total	**102**	**2,113**

Table 3. Non -IID outbreaks reported in 2003

Pathogen	No. of outbreaks	No. ill
Influenza A	3	302
Measles	1	95
Tuberculosis	2	32
MRSA	1	12
Total	**7**	**441**

Table 4. Principal mode of transmission reported in outbreaks of IID, 2003

Mode of transmission	No. of outbreaks	No. ill
Animal Contact	1	3
Foodborne	6	45
Person-to-person	62	1,646
P-P/Airborne	11	197
P-P/Foodborne	1	16
Other	1	6
Unknown	20	200
Total	**102**	**2,113**

outbreak, with seven cases hospitalised. An intensive investigation took place, but no food or water items were identified as the source of the outbreak. In the second general outbreak of VTEC, three confirmed cases were identified. One of the cases developed haemolytic uraemic syndrome (HUS) and two cases were hospitalised. No source was identified. Five family outbreaks of VTEC were reported in 2003.

There were two outbreaks of *Campylobacter spp* reported in 2003. One occurred in a residential institution (19 ill) and the other in a hospital (6 ill). The sources were not identified in either of these outbreaks.

There were seven non-IID outbreaks reported in 2003 (table 3) namely, influenza A (3), measles (1), tuberculosis (2) and MRSA (1).

Mode of transmission

In the majority of outbreaks of IID reported in 2003, the principal mode of transmission was reported as person-to-person (table 4). The majority of these outbreaks were due to norovirus/ suspected viral, similar to the trend in 2002. There were six outbreaks where the primary mode of transmission was described as foodborne. Four of these were due to *Salmonella enterica*, one was *S. aureus* and one was suspected norovirus. No waterborne outbreaks were reported in 2003.

Location

Similar to the trend reported in 2002, the commonest location in which outbreaks occurred in 2003 was healthcare settings (table 5) with 64% of all reported outbreaks occurring in these settings. Almost 1,000 people were known to be ill as a result of hospital outbreaks alone.

A significant number of suspected foodborne outbreaks also occurred in private homes and in eating establishments, emphasising the need for reinforcement of good hygiene and food safety practices in these settings.

Seasonal distribution

The majority of outbreaks occurred in the month of February (figure 2). This is explained by the large number of outbreaks of norovirus that occurred at this time of the year. A smaller peak was noted in September when the majority of *S. enterica* and *E. coli* outbreaks occurred.

Table 5. IID Outbreaks by location and numbers ill, 2003

Location	No. of outbreaks	No. ill
Hospital	34	945
Residential institution	31	577
Private house	12	51
Hotel	8	163
Restaurant/ café	5	196
Crèche	4	35
Other	3	20
Tour bus	2	20
Guest house/ B&B	1	22
School	1	22
Travel related	1	62
Total	**102**	**2,113**

Discussion

Analysis of the outbreak data for 2003 shows a decrease in the overall number of outbreaks reported nationally compared to 2002. There were 102 outbreaks of IID reported nationally in 2003, compared to 188 in 2002. The overall number of outbreaks for 2003 however, is still higher than that reported from 1998 to 2001.

The trend in recent years of a predominance of norovirus outbreaks evident since 2001 has continued in 2003 with the highest proportion of IID outbreaks being either confirmed as norovirus or suspected viral. This trend has also been noted across much of Europe.[1] Interestingly, the numbers ill in these outbreaks seems to be much lower than in 2002. There were over 7,650 people ill due to norovirus outbreaks in 2002. In 2003, however, that figure had decreased to 1,744. It is likely that with the institution of early control measures, these outbreaks were being contained at a much earlier stage and hence there was a marked reduction in person-to-person spread of the virus. It is also likely that short-term immunity had developed to the new norovirus sub-type that was first seen in Ireland in 2002 (GII-4).[2] The national norovirus outbreak guidelines developed by the Viral Gastroenteritis Sub-Committee of HPSC appear to be in wide use and serve to assist in the management of these outbreaks particularly in healthcare settings.

Similar to 2002, all of the *Salmonella enterica* outbreaks reported in 2003 were small in size. Two very significant general outbreaks of E. coli O157 occurred in 2003. Both were associated with hotel restaurants in the Eastern part of the country. In one outbreak, over 130 possible cases were identified during the intensive investigation, and the final outcome was five confirmed and twelve probable cases with seven cases hospitalised. Despite the thorough investigation, no food or water items were identified as a source of the outbreak. Similarly, despite an intensive investigation of the second VTEC O157 outbreak, no source was identified.

For the first time, data on non-IID outbreaks were reported to the national outbreak surveillance system in 2003. With the introduction of the new ID legislation, all outbreaks and unusual clusters of illness became statutorily notifiable on 1st January 2004, so it is hoped that more complete reporting of all outbreaks will occur in the coming years. In addition, with the advent of the CIDR system in 2004, real time data on outbreaks should become available to all users nationally as they go-live on the system. This will enable key epidemiological, microbiological and environmental data relating to the outbreak to be shared and assist in the management and control of the outbreak.

Outbreak investigations remain one of the most important components of public health in terms of learning more about the epidemiology of infectious diseases and their transmission routes. The lessons learnt from outbreak investigations should always be documented, so that information on the causes and factors contributing to outbreaks can be used to inform future prevention strategies.

Barbara Foley, Fiona Cloak and Paul McKeown, HPSC

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