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*

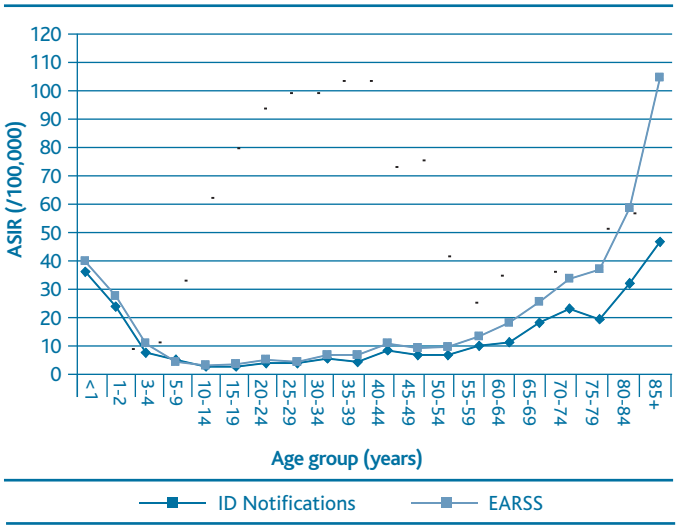

Figure 1. Number of cases of invasive pneumococcal disease reported through the infectious disease notification system and EARSS in 2005

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).

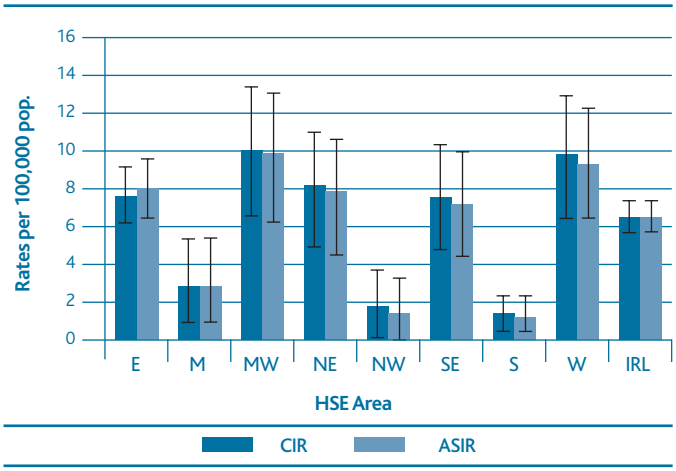

Figure 2. Age standardised and crude incidence rates with 95% confidence intervals by HSE area for invasive pneumococcal disease reported through the infectious disease notification system in 2005

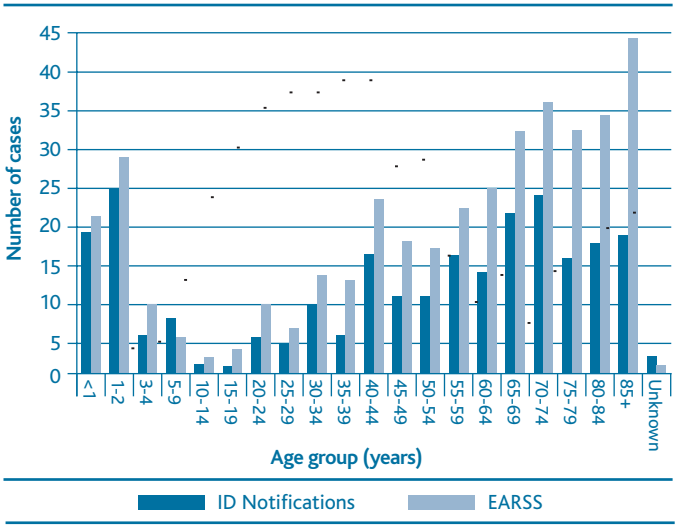

Figure 3. Number of cases of invasive pneumococcal disease reported through the infectious disease notification system and EARSS in 2005

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

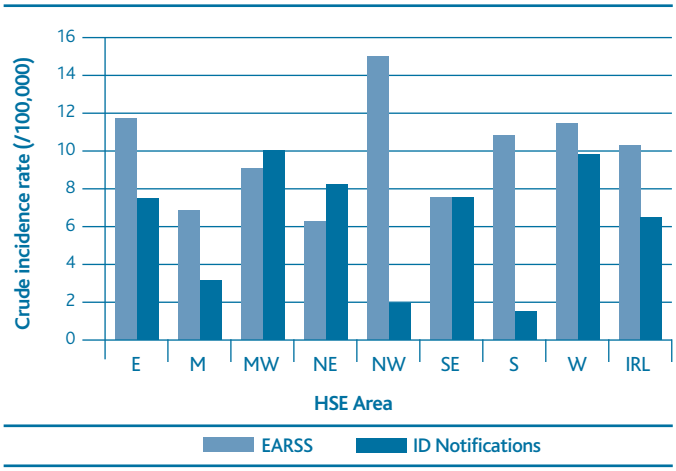

Figure 4. Crude incidence rates of invasive pneumococcal disease reported through the infectious disease notification system and EARSS in 2005

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.

References

1. Immunisation Guidelines for Ireland, 2002. Prepared by the National Immunisation Advisory Committee of the Royal College of Physicians of Ireland. Available at http://www.hpsc.ie
2. Case Definitions for Notifiable Diseases. Infectious Diseases ~ (Amendment) (No. 3) Regulations 2003 (SI No. 707 of 2003). Available at http://www.hpsc.ie