1.8 *Streptococcus pneumoniae* (invasive)

Summary

Number of cases, 2010: 391
Number of cases, 2009: 432
Number of deaths, 2010: 13
Number of deaths, 2009: 18
Crude incidence rate, 2010: 9.2/100,000

Background

Since January 2004, invasive *Streptococcus pneumoniae* infection is a notifiable disease in Ireland, clinicians and laboratories are legally obliged to notify. For the purposes of this report the term invasive pneumococcal disease (IPD) will be used to describe these infections.

A number of surveillance initiatives are in place in Ireland for IPD. Data on IPD notifications are collated in the Computerised Infectious Disease Reporting (CIDR) system. Enhanced surveillance on IPD notifications is undertaken by Departments of Public Health particularly on children born since 2000. A separate surveillance strand (EARS-Net project) involving the microbiology laboratories and HPSC is used to monitor in detail the antimicrobial resistance profiles of invasive *S. pneumoniae* isolates from blood and/or CSF. Since April 2007, the National Pneumococcal Typing Project has been offering a typing service to Irish laboratories for all invasive *S. pneumoniae* isolates submitted. This is a collaborative project involving Beaumont Hospital, the Children's University Hospital, Temple Street and HPSC.

In September 2008, the 7-valent pneumococcal conjugate vaccine (PCV7) was introduced in Ireland to the infant immunisation schedule at 2, 6 and 12 months of age. A catch-up campaign was also implemented at that time, targeting all children <2 years of age. In December 2010, PCV13 replaced PCV7 for new entrants to the infant schedule (i.e. for children born on or after 1st October 2010).

Notifications

In 2010, 391 cases of IPD (9.2/100,000) were notified in Ireland. This was a 9.5% decrease compared with 2009 when 432 cases were notified (10.2/100,000). Seventy seven percent (n=302) of notifications in 2010 were classified as confirmed, 1.0% (n=2) as probable and 22% as possible (n=87). The majority of the possible cases (80%, n=70/87) were notified by HSE-SE and most related to cases that were urinary antigen positive for *S. pneumoniae* (figure 1). These figures do not necessarily indicate a higher burden of IPD in this area relative to other areas, but rather more consistent reporting of urinary antigen positive cases from that area. Comparing the crude incidence rate of confirmed IPD cases by HSE area, the incidence rate in HSE-SE (8.9/100,000; 95% CI

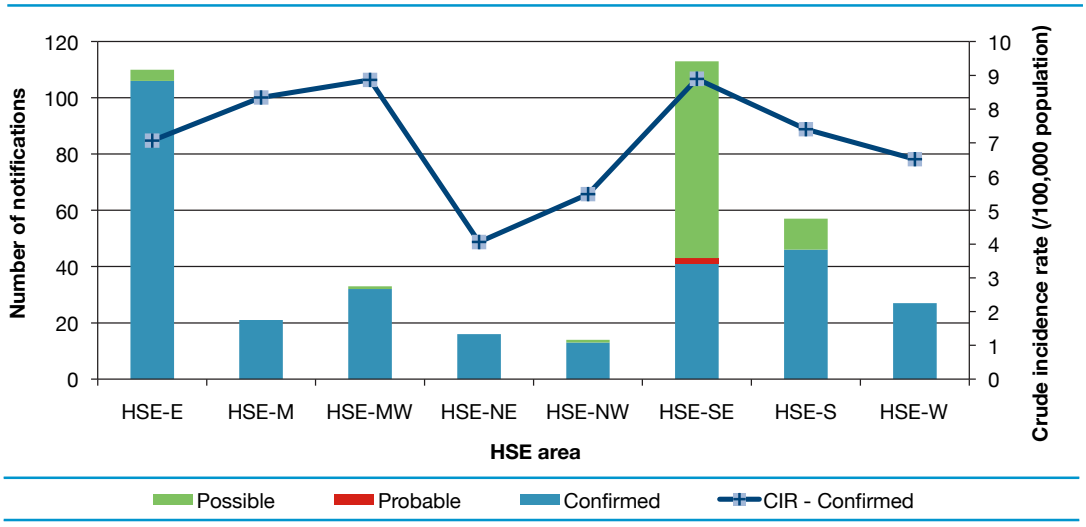

Figure 1. Number of IPD cases notified by case classification and HSE area and crude incidence rate (CIR) of confirmed cases by HSE area, 2010
Data source: CIDR

6.1-11.6/100,000) was not statistically different from the national rate (7.1/100,000; 95% CI 6.3 – 7.9/100,000). In fact the IPD incidence rates for confirmed cases in seven out of the eight HSE areas were not statistically different from the national rate. The only exception was HSE-NE where the incidence rate was significantly lower (4.1/100,000; 95% CI 2.1 – 6.1/100,000) (figure 1).

Clinical diagnosis was reported for just 125 of the 391 cases (32%), which included bacteraemia with pneumonia (n=63), bacteraemia without focus (n=35), meningitis (n=20), peritonitis (n=3), muscoskeletal (n=3) and abscess (n=1). More cases occurred in males (55%; n=215) than in females (45%; n=176), giving a male to female ratio of 1.2:1.0. Cases ranged in age from 6 days to 96 years, with an average age of 58.3 years and a median age of 66 years. Those aged 65 years and older accounted for over half of the cases (51%, n=201). The age specific incidence rate was highest in those 85 years of age and older (106.2/100,000; n=51), followed by 75-84 years age group (48.3/100,000; n=76) and then those aged between 65 and 74 years (28.2/100,000; n=74) (figure 2). In children < 2 years of age the age specific incidence rate was 18.9 cases per 100,000 population (n=23). In this age group the incidence has dropped by more than half when compared with 2008 (42.8/100,000; n=52), highlighting the positive impact the introduction of PCV7 to the infant schedule in September 2008 has had on reducing the burden of IPD in young children (figure 2).
Medical risk factor information was reported for 82 cases (21%), with some patients having multiple risk factors. For those where this information was reported, the main risk factors included immunosuppressive condition or therapies (n=37), chronic lung disease (n=21), diabetes mellitus (n=12) and chronic liver disease (n=12). It should also be noted that being elderly, aged 65 years and older is also a recognised IPD risk factor; 201 cases in 2010 were in this age group.

Outcome was reported on just 27% (n=107) of the IPD notifications in 2010. Therefore, figures presented underestimate IPD mortality in Ireland. Based on the data available, 16 deaths in individuals with IPD in 2010 were reported. The cause of death was reported as directly due to IPD in five cases, not due to IPD in three cases and for the remaining eight the cause of death was not reported. Therefore, based on the outcome data available 13 deaths potentially associated with IPD infection occurred in 2010, giving an IPD case fatality rate of 12%. One death was in a child <5 years of age and 12 deaths were in adults >35 years of age.

IPD notification data was extracted from CIDR on 30th August 2010. These figures may differ slightly from those previously published due to ongoing updating of notification data on CIDR.

Impact of PCV7

Data from the National IPD Typing Project was used to assess the impact of introducing PCV7 on the distribution of *S. pneumoniae* serotypes associated with IPD and on the burden of IPD in Ireland.

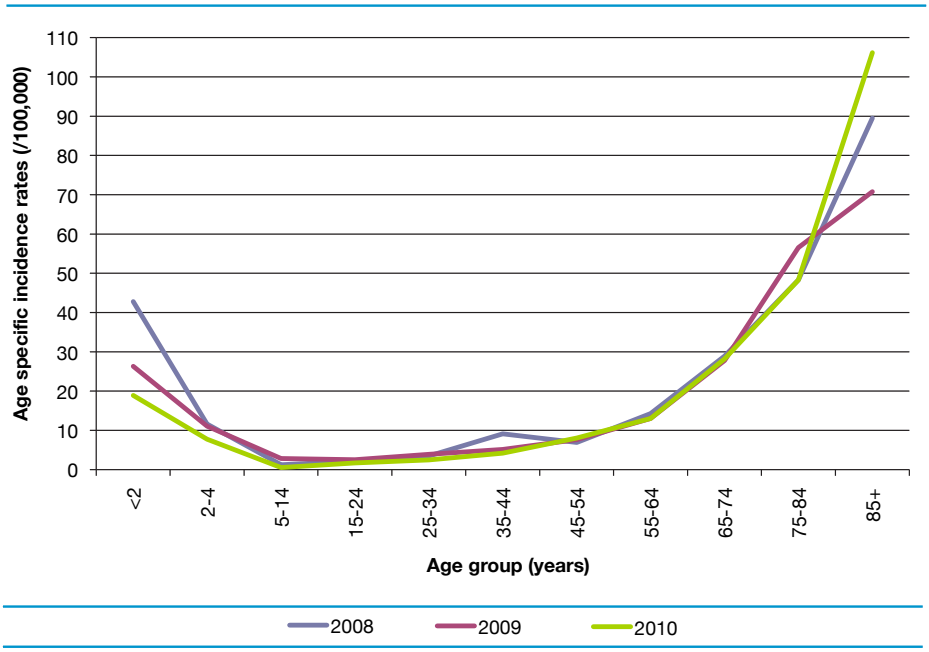

Figure 2. Age specific incidence rate of invasive pneumococcal disease by age group, 2008-2010

Table 1. Number of IPD cases in 2008 and 2010 and percentage change in burden of IPD since introducing PCV7 in September 2008

	PCV7 serotypes			Non-PCV7 serotypes			All IPD serotypes		
	<2 yrs	≥2 yrs	All ages	<2 yrs	≥2 yrs	All ages	<2 yrs	≥2 yrs	All ages
2008	34	145	179	15	180	195	49	325	374
2010	3	73	76	17	186	203	20	259	279
% change	**-91.2**	**-49.7**	**-57.5**	**13.3**	**3.3**	**4.1**	**-59.2**	**-20.3**	**-25.4**

Date source: National IPD Typing Project

In 2010, isolates relating to 279 cases of IPD were typed, compared to 314 in 2009 and 374 in 2008. In 2010, 27% of IPD infections were due serotypes covered by PCV7, 11% of infections were associated with the three additional serotypes covered by PCV10 (1, 5 and 7F) and a further 17% of IPD infections were due to the other three serotypes covered by PCV13 (3, 6A and 19A) (figure 3). Forty five percent of IPD infections in 2010 were associated with non-vaccine types (NVTs, serotypes excluding the 13 covered by PCV13) (figure 3).

The introduction over two years ago of PCV7 to the Irish immunisation schedule has had a dramatic impact in reducing the burden of IPD, particularly in disease due to the serotypes covered by PCV7. Most impressively disease burden due to PCV7 serotypes has declined by 91% in children under 2 years of age (figure 4 and table 1), by 50% in children 2 years of age and older and by 58% in all age groups (table 1) . An increase in incidence of disease due to non-PCV7 serotypes has been seen, a 13% increase in <2 year olds and 4% increase when all age groups are taken into account (table 1). Overall the incidence of IPD has declined by a quarter when all serotypes and ages are taken into consideration (table 1). For ongoing updates, see "Slides – Impact PCV in Ireland" at http://www.hpsc.ie/hpsc/A-Z/VaccinePreventable/PneumococcalDisease/PostersPresentations/

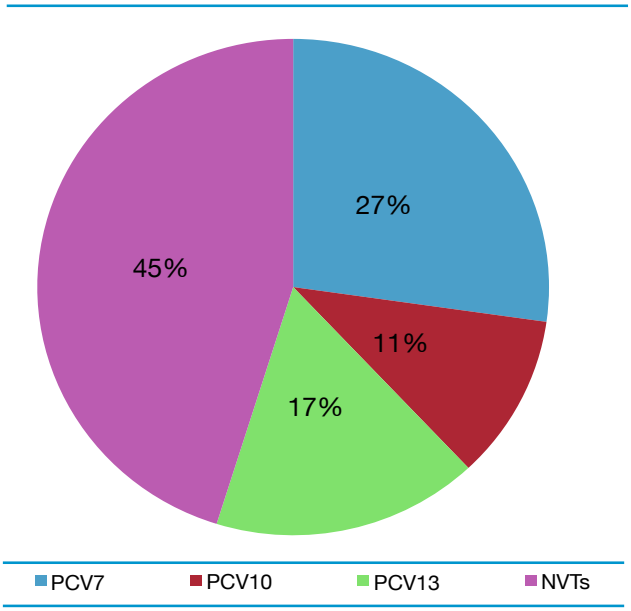

Figure 3. Proportion of IPD cases in 2010 due to serotypes covered by PCV7, the additional serotypes in PCV10 and PCV13 and due to the non-vaccine types (NVTs)
PCV7: 4, 6B, 9V, 14, 18C, 19F and 23F; PCV10: 1, 5 and 7F; PCV13: 3, 6A and 19A
Data source: National IPD Typing Project

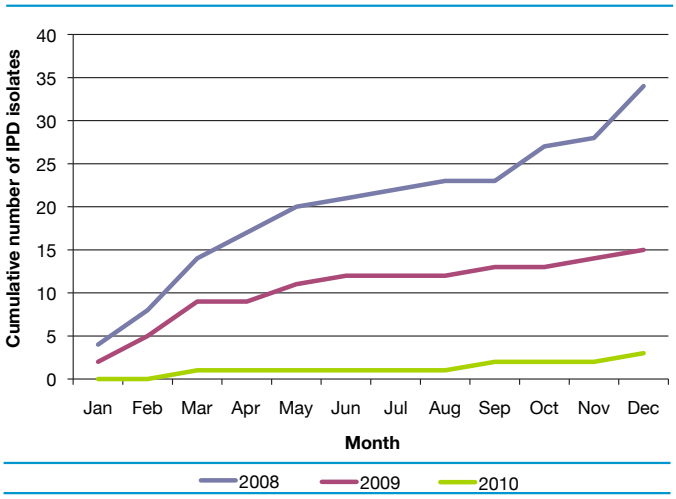

Figure 4. Cumulative number of IPD cases due to PCV7 serotypes in children <2 years of age, 2008 – 2010
Data source: National IPD Typing Project

The predominant serotypes associated with IPD infection in 2010 were 8, 22F, 7F and 19A. In children <2 years of age, the predominant serotype was 7F and this accounted for one third of the cases in this age group.

PCV7 vaccine failures
Based on data obtained through the IPD enhanced surveillance system, two PCV7 vaccine failures occurred in 2010. One was in a 2 year old with serotype 14 *S. pneumoniae* infection; the other in 3 year old due to serotype 19F infection. Both had received one dose of PCV7 vaccine at >12 months of age and therefore were considered fully vaccinated. Two PCV7 vaccine failures also occurred in 2009, also associated with serotype 14 and 19F infections.

Penicillin non-susceptible *S. pneumoniae* (PNSP)
The proportion of penicillin-non-susceptible *S. pneumoniae* (PNSP) decreased from 23.1% in 2008 to 20.2% in 2009, followed by a further decline in 2010 to 18.2% (Data source: EARS-Net). For details on the antimicrobial resistance patterns of *S. pneumoniae*, please see the chapter on Antimicrobial Resistance within this report.

Discussion
The incidence of IPD continued to decline in Ireland, in 2010. Introducing PCV7 has been a major contributory factor in this decline. Compared with 2008, there has been an impressive 91% reduction in IPD in young children due to serotypes covered by PCV7 and the burden of all types of IPD in the total population has been reduced by a quarter. In 2010, 28% of IPD infections were due to one or other of the six additional serotypes covered by PCV13. The impact of introducing PCV13 at the end of 2010 on the burden of IPD and in particular on the burden of disease due to the additional six serotypes covered by PCV13 should become evident over the next year or two.

Considerable progress has been made in recent years in improving the various IPD surveillance initiatives in Ireland. Data from these surveillance systems provide invaluable information in monitoring the incidence of this disease and in determining the impact of interventions such as the introduction of PCV7. The establishment of the National IPD Typing Project and the data available from this project has been vital in this regard, as has the enhanced surveillance undertaken by Departments of Public. Not only can the impact of various interventions be monitored but changes in serotype distribution patterns can also be studied. The data obtained through such initiatives are all vital elements when informing public health decisions on vaccination policy and immunisation schedules.