
Respiratory Infectious Diseases

12

Key Points

- Respiratory Infectious diseases cause considerable morbidity in Ireland
- Childhood vaccination programmes have positively impacted on many diseases but challenges remain to achieve a 95% uptake level in all areas
- Protection of those vulnerable to infection due to age or chronic disease, including respiratory disease, by vaccination is inadequate in Ireland

Background

Many infectious diseases of public health significance are notifiable. All medical practitioners including clinical directors of diagnostic laboratories in Ireland must notify the Medical Officer of Health (MOH) of these specified infectious diseases. These diseases can cause a variety of problems, including respiratory disease, for patients. In addition, all outbreaks of respiratory infectious diseases are notifiable, as are unusual clusters of symptoms as was the case initially with SARS and MersCoV. This chapter focuses on diseases where the impact is mainly on the respiratory system. The majority of these diseases/organisms are entered on a national computerised infectious disease reporting system (CIDR). However, seven pathogens are notified directly to the European Antimicrobial Surveillance System (EARSS) and with the exception of *Streptococcus pneumoniae* (invasive), are not recorded on CIDR.

These infectious diseases are important in their own right for all those affected but they can have added morbidity and even mortality consequences for those with underlying respiratory diseases (e.g., asthma, COPD, CF), for those who are immunosuppressed or where they occur in congregate settings such as Nursing Homes. Many are preventable or their risk reduced by vaccination and herd immunity. The structure of this chapter is different to other chapters as each of the diseases is taken as a separate entity. Additional information on aspects of some of these diseases is included in the chapter on Older People, the chapter on Paediatrics, and the chapter on Pneumonia and Lower Respiratory Infection (unspecified). Tuberculosis is discussed in chapter 13.

Incidence and prevalence

Most respiratory infectious diseases are managed in the community setting. As with many diseases their impact on health services in terms of those who attend GPs, those who attend out of hours services, those who attend Emergency Departments and those who attend hospital Outpatient Departments (OPD) is not available at national level. Inpatient data, only available from HIPE reporting publicly funded hospitals, considerably underestimate those affected. However, the indirect consequences for some of these diseases are available eg. hospitalisation for bronchiolitis as a marker for Respiratory Syncytial Virus (RSV) infection. In addition to the impact of a disease, is the impact on health services in terms of prevention programmes such as the childhood immunisation programme, influenza and pneumococcal vaccination programmes, antenatal vaccination programmes and contact or environmental tracing.

As these diseases are notifiable, national incidence data are available for those diagnosed clinically by a medical practitioner. This is true when the illness is severe but where the disease is self-limiting and/or where the person self-cares, national data reflect trends rather than true incidence. Examples of these include influenza and RSV.

Data for each of these key notifiable infectious diseases of respiratory significance is presented below. Table 12.1 shows the numbers and population rates for the years 2007-2016 as available on CIDR. The increasing notifications of influenza are at least in part due to an increase in availability of laboratory testing.

Table 12.1. Respiratory infectious diseases (notifiable) 2007-2016

Total	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
*RSV	n/a	n/a	n/a	n/a	n/a	1972	1282	2479	2201	2690
Rate/100,000						43.04	27.98	52.06	46.22	56.49
Legionellosis****	15	48	9	11	7	15	14	8	12	10
Rate/1,000,000	0.35	1.13	0.20	0.24	0.15	0.33	0.31	0.17	0.25	0.21
Streptococcus pneumonia*	361	464	432	391	425	427	637	679	549	381
Rate/100,000	8.51	10.94	9.43	8.53	9.28	9.32	13.90	14.28	11.53	8.00
Haemophilus Influenza***	31	22	43	28	44	41	41	61	52	58
Rate/100,000	0.68	0.48	0.94	0.61	0.96	0.89	0.89	1.33	1.14	1.27
Influenza	279	473	484	210	2077	743	1602	1757	2680	4764
Rate/100,000	6.58	9.98	10.56	4.58	45.34	16.22	34.97	36.90	56.28	99.67
Tuberculosis	481	467	479	420	413	359	372	313	303	318
Rate/100,000	10.9	11.01	10.46	9.17	8.97	7.81	8.08	6.57	6.6	6.68
Pertussis	77	104	78	114	229	458	173	73	117	213
Rate/100,000	1.82	0.33	1.70	2.49	5.00	10.00	3.78	1.53	2.46	4.47
Measles	53	55	162	403	267	103	53	33	2	43
Rate/100,000	1.16	1.20	3.54	8.80	5.83	2.25	1.16	0.72	0.04	0.94
Diphtheriae	0	0	0	0	0	0	0	0	<5	<5

Source: Computerised Infectious Disease Reporting System (CIDR) *RSV made notifiable in 2012 **EARSS pathogens not recorded on CIDR with the exception of *Streptococcus pneumonia* (figures since 1/7/15 refer only to confirmed cases). *** invasive disease ****Most notified cases of *Legionellosis* have *Legionnaires' disease*

Respiratory Outbreaks (notified)

There were 549 outbreaks affecting 6,937 people notified in 2016. These included 65 influenza outbreaks (700 cases), 12 pertussis outbreaks (31 cases), 10 RSV outbreaks (85 cases), 5 tuberculosis outbreaks (19 cases) and 26 Acute Respiratory Infection outbreaks (214 cases)¹. In the 2016/2017 influenza season (see influenza below) there were 91 influenza outbreaks, with 1,157 people diagnosed of whom 120 (10.4%) were hospitalised and 35 (3.0%) died¹.

Haemophilus influenzae (invasive)

There were 58 cases of *Haemophilus influenzae* (invasive) notified in 2016, giving a crude incidence rate of 1.2/100,000. The median age of those affected was 47 years with a range of 11 days to 91 years. The incidence was highest in those aged under 1 year (11.2/100,000) and aged 65 years and over (3.3/100,000). Those aged under 10 years of age and those aged 65 years and over accounted for 56.1% of cases. Of those diagnosed, 25% had pneumonia.¹ Nationally the vaccine coverage for *Haemophilus influenzae* type b (Hib) at both 12 months and 24 months in 2016 was 91%. Most cases reported in 2016 were non-capsular or non-typeable and preventable by the Hib vaccine.

Measles

Measles virus can cause significant disability and death. Although Ireland is currently deemed to be free of endemic measles, clusters and outbreaks continue to occur in Europe which impact on Ireland. One of the most common and serious complications of measles is pneumonia, which develops in 5–10% of children². It is caused either by direct invasion of the lungs by the measles virus or due to a secondary infection by other viral or bacterial pathogens².

In 2016, 43 cases were notified, giving a crude incidence rate of 0.9/100,000. Forty (93%) were part of an outbreak linked with mainland Europe. The median age was 8 years with a range of 3 months to 40 years. Three quarters (30) (75%) were unvaccinated, of whom 8 were aged under 1 year of age. Vaccine status was unknown in an additional 6 (15%) cases. Nationally the vaccine coverage at 24 months in 2016 for MMR1 was 92%¹.

Pertussis (whooping cough)

Pertussis is an acute respiratory infection caused by the bacterium *Bordetella pertussis*. In 2016, 213 cases were notified giving a crude incidence rate of 4.5/100,000 population. The highest age specific incidence rate was in those aged under 1 year of age followed by those aged 1-4 years. 35% (74) were aged under 6 months. In 2016, 64 were hospitalised (30%) and there were a number of deaths¹.

Of the 213 notified cases, 37% (78) were unvaccinated. Of these, 73% (57) were aged less than 6 months, and 36% (28) were aged less than 2 months and therefore too young for vaccination so relying on maternal immunity and antenatal vaccination. Of the 74 cases aged less than 1 year of age for whom details on antenatal vaccination of the mother were available, 83% (70) of mothers were unvaccinated in the antenatal period.

Nationally in 2016 the vaccine coverage at both 12 months and 24 months was 91% and 95% respectively.

Streptococcus pneumoniae (invasive)

In 2016, 381 confirmed cases of invasive *Streptococcus pneumoniae* were notified giving a crude incidence rate of 8.3/100,000 population. The term used is invasive pneumococcal disease (IPD) which includes meningitis, bacteraemia with/without pneumonia and invasive disease from other sterile sites. Of the 313 cases where the clinical diagnosis site was provided, 71% (222) had bacteraemia with pneumonia. For those for whom a risk factor was reported (256), 41% (59) had chronic lung disease.¹

The median age of those affected was 64 years with a range of one month to 94 years. Almost half (49% (188)) were aged 65 years and over. The highest age specific incidence rate (ASIR) was in those aged 85 years and over (44 cases, 75.3/100,000). In children aged under 2 years the ASIR was 17.2/100,000.¹

Outcome was reported in 323 (85%) of cases. For these, the overall case fatality was 18.8% (61) but for 13, IPD was not the cause of death. Most, but not all, deaths occurred in those aged 35 years and over.

The uptake of three doses of PCV vaccine by 24 months of age was 91% in 2016.

Legionellosis

In 2016, 10 cases of Legionnaires' disease were notified giving a crude incidence rate of 2.1/1,000,000. Of the cases, 60% were males. The median age of all cases was 62 years with a range of 28 years to 82 years.¹

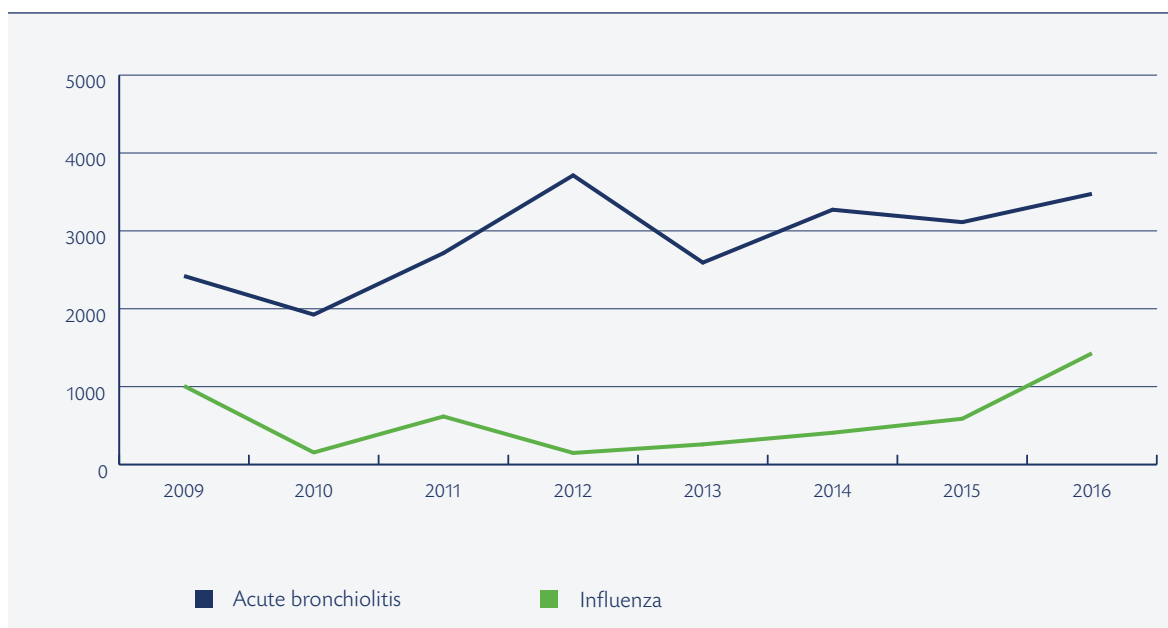
Tuberculosis

See Chapter 13

Influenza and Other Seasonal Respiratory Viruses

Influenza is the world's most important viral disease³. Rates of serious illness and death from influenza are highest in individuals aged 65 years and older, children under 2 years of age and persons of any age who have medical conditions that predispose to increased risk of complications from influenza. More than 90% of influenza-related deaths occur in patients in the older age group³. The attack rates during seasonal influenza can vary considerably from year to year, but usually 5–20% of the population are affected³.

Figure 12.1 below reflects the numbers of hospitalisations for influenza and bronchiolitis for the years 2009-2016. RSV, a notifiable disease since 2012, is one of most common causes of acute bronchiolitis hence the inclusion here of bronchiolitis as a proxy marker of the impact of RSV on hospital health services.

Figure 12.1. Inpatient hospitalisations with a primary diagnosis of acute bronchiolitis or influenza, 2009-2016

Source: HIPE 2009-2016. All hospitals reporting data to HIPE

In view of its seasonality, influenza notifications are reported not by calendar year but by influenza season which in the Northern Hemisphere runs from October to May each year. As mentioned earlier in this chapter, data on influenza and RSV reflect trends rather than true numbers and hospitalisations are over-represented.

The peak influenza-like illness rate over the season 2016/2017 was 90.4/100,000¹. There were 3,336 influenza and 2,583 RSV notifications during the season 2016/17 (as previously noted these numbers differ from notification numbers for calendar year 2016). Of those notified with influenza in the 2016/2017 season, 95 (2.9%) died and influenza was reported as the cause of death in 68.99% (3,299) of the notified influenza cases were laboratory confirmed¹.

Of the confirmed cases of influenza in 2016/17, 1,425 were hospitalised (43%) giving an age specific rate of 29.9/100,000 population. The highest age specific hospitalisation rate in 2016/17 was in those aged under 1 year of age (74, 118.9/100,000 population) and those aged 65 years and over (699, 109.6/100,000). For those aged 1-4 years the figure was 111 (41.2/100,000) while for 5-14 year olds it was 83 (12.3/100,000)¹.

Of the 51 people admitted to critical care units in the 2016/2017 season with influenza, 13 (25.5%) were aged under 15 years and 29 (56.9%) were aged 65 years and over. Of those admitted to critical care in 2016/2017 (median age 67 years), 33 of the adults had underlying medical conditions, of whom 54.5% (18) had an underlying chronic respiratory disease. Six of the paediatric cases had underlying health

problems. Of those admitted to critical care for whom vaccination status was recorded (36), 58% (14) of the adults were not vaccinated, and 92% (11) of the children. The case fatality rate for those admitted to critical care was 39% (46% for adults, 21.4% for children)¹.

Of the notified influenza cases in the 2016/2017 season, 470 of the confirmed cases were aged 0-14 years of whom 268 (57%) were hospitalised. The median age of the latter group was 2 years. Of those hospitalised aged 0-14 years, 49% were in a risk group, with chronic respiratory disease the commonest risk. Of those confirmed cases with a reported underlying condition for whom data was complete, 88% were not vaccinated¹.

The crude mortality rate/100,000 among the notified cases over the years 2009/2010 to 2016/2017 ranged from 0.3 to 2.0. The latter was for 2016/2017¹.

The excess mortality associated with influenza in those aged 65 years and over is estimated across Europe (FluMOMO). The data (unpublished) from Ireland using this model gives an average excess mortality associated with influenza in those aged 65 years and older of 531 (95% CI 464, 540) each influenza season. These estimates ranged from 291 to 1,156 between the 2012/2013 and 2016/2017 influenza seasons⁴.

The number of acute respiratory infections/influenza outbreaks in the 2016/2017 season was 111. Of these 91 were influenza outbreaks affecting 1,157 people of whom 120 were hospitalised and 35 (3.0%) died. 87% (79) of these influenza outbreaks were associated with community hospitals/residential homes for whom the uptake of vaccination was high for residents but

was low for health care workers. For the 2014/2015 season, across nine EU/EEA members, the median uptake of influenza vaccination by those in clinical risk groups was 44.4%. For Ireland it was 28.7%. The median uptake across seventeen EU/EEA countries for health care workers was 26.9%. The figure for Ireland was 23.8%. Three countries including Ireland provided data on staff of long term care facilities. The median uptake was 27.2% but the figure for Ireland was 19.2%⁵. The uptake by residents of long term care facilities across four countries was 81.6%. The figure for Ireland was 84.3%. Twenty six countries provided data on influenza vaccine uptake by the older age group. The median was 47.6% (range 2.1%-76.3%) but for Ireland it was 59.8%⁶.

In the 2015/2016 season, the uptake of influenza vaccination by those with a chronic respiratory disease attending respiratory OPD clinic at one major Irish hospital (40% of whom were aged 65 years and over) was 54%⁷.

In the 2016/2017 season the uptake of influenza vaccination by hospital healthcare workers on average was 31.9%, by all health care workers in HSE funded long term care facilities it was 28.1% and by residents in long stay care facilities it was 93.5%.

As mentioned at the start of this section on influenza, it is the world's most important viral disease³. Vaccination remains the most important factor in its prevention. Yet, many health care workers continue to fall short in their responsibilities to protect their patients with chronic conditions, including those with chronic respiratory conditions, by neglecting to ensure that their patients are aware of and get vaccinated and also by getting vaccinated themselves so as to both reduce their risk of transmitting influenza to their patients and to increase the herd immunity around those vulnerable by virtue of age or chronic disease.

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