

INVASIVE MENINGOCOCCAL DISEASE (IMD), BACTERIAL/VIRAL MENINGITIS & *HAEMOPHILUS INFLUENZAE* INFECTIONS IN IRELAND

A REPORT BY THE HEALTH PROTECTION SURVEILLANCE CENTRE IN COLLABORATION WITH THE IRISH MENINGITIS & SEPSIS REFERENCE LABORATORY AND THE NATIONAL VIRUS REFERENCE LABORATORY



Q3-2016

23rd November 2016

Provisional Figures

Summary

- 20 invasive meningococcal disease cases (IMD) were notified in Q3-2016, including nine serotype B, seven serotype C, two serogroup W135, one serogroup Y and one not specified infection. Of the seven serogroup C cases, four were unvaccinated (age range one month to 61 years), one was a complete vaccine failure (aged 5-9 years), one was incompletely vaccinated (aged 10-14 years) and one had an unknown vaccine status (aged 65-69 years). No IMD cases were reported to have died, nor were there any imported cases during this quarter.
- Among the other specified cases of bacterial meningitis reported were three cases of *Streptococcus pneumoniae*, two cases of listeriosis and one *Streptococcus agalactiae*. Three cases of bacterial meningitis, not otherwise specified (NOS), were also notified during this quarter.
- 108 cases of viral meningitis (NOS) were reported with no related deaths or outbreaks.
- 12 cases of *Haemophilus influenzae* were reported, none of which were associated with meningitis. Seven were non-typeable/non-capsulated, one was a type e, one was a type f and three were not typed. No deaths were reported.

Introduction

Meningococcal disease became a notifiable disease on the 1st January 2004. Prior to this, it was notifiable under the category bacterial meningitis (including meningococcal septicaemia).

Most forms of bacterial meningitis are now notifiable under the 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)'. Since 1st January 2012, revised versions of the case definitions of meningococcal disease, bacterial and viral meningitis have come into effect and are detailed in the HPSC Case Definitions for Notifiable Diseases booklet on the HPSC website (www.hpsc.ie).

An enhanced surveillance system is in place for [IMD and other forms of bacterial meningitis, not otherwise specified](#). Details of this surveillance system are described in the meningococcal disease chapter of the [HPSC Annual Report 2005](#).

In October 2000, the Meningococcal C conjugate (MCC) vaccine was introduced in Ireland to the primary childhood immunisation (PCI) schedule at 2, 4 and 6 months of age. A catch-up campaign targeting those less than 23 years of age was also run at the time. In September 2008 the MenC vaccination schedule was changed for the administration of the vaccine at 4, 6 and 13 months of age.

In August 2014, NIAC recommended an adolescent MenC booster at 12-13 years to be offered in the first year of secondary level school, and was introduced into the HSE schools immunisation programme in September 2014. This was done in response to an increase in MenC cases and the emerging international evidence of waning immunity in populations that had

received MCC vaccine in early childhood in the United Kingdom. For all babies born on or after July 1st 2015 a single dose of MCC is given at 4 months, 13 months and at 12-13 years (if not previously vaccinated at >10 years of age). The PCI schedule was again updated in July 2016 to reflect the fact that babies born on or after 1st October 2016 will be offered the new MenB vaccine at 2, 4 and 12 months of age from 1st December 2016. The MenB vaccine cannot be given at same time as MenC vaccine (which is given at 6 months of age).

An enhanced surveillance system is also in place for *Haemophilus influenzae* (invasive) disease, but not for viral meningitis, not otherwise specified. Both the enhanced surveillance forms for IMD (including other forms of bacterial meningitis) and *Haemophilus influenzae* (invasive) disease were updated in early December 2015.

Data presented in this reported were extracted from CIDR on 23rd November 2016. **These figures are provisional.** Incidence rates for 2016 were calculated using the 2011 Census of Population as denominator data.

Results

Meningococcal Disease (invasive) (IMD)

IMD Cases by Serogroup & Case Classification

In Q3-2016, 20 cases of IMD were notified, nine of which were attributable to serogroup B, seven were serogroup C, two were serogroup W135 and one was serogroup Y and one not specified infection. All cases were classified as confirmed (Table 1). Of the seven serogroup C cases, four were unvaccinated (age range one month to 61 years), one was a complete vaccine failure (aged 5-9 years), one was incompletely vaccinated (aged 10-14 years) and one had an unknown vaccine status (aged 65-69 years).

Table 1. Classification of IMD cases notified by Serogroup in Q3-2016

Case Classification	B	C	W135	Y	NG	29E	No organism detected	Total
Confirmed	9	7	2	1	0	0	0	19
Probable	0	0	0	0	0	0	0	0
Possible	0	0	0	0	0	0	1	1
Not specified	0	0	0	0	0	0	0	0
Total	9	7	2	1	0	0	1	20

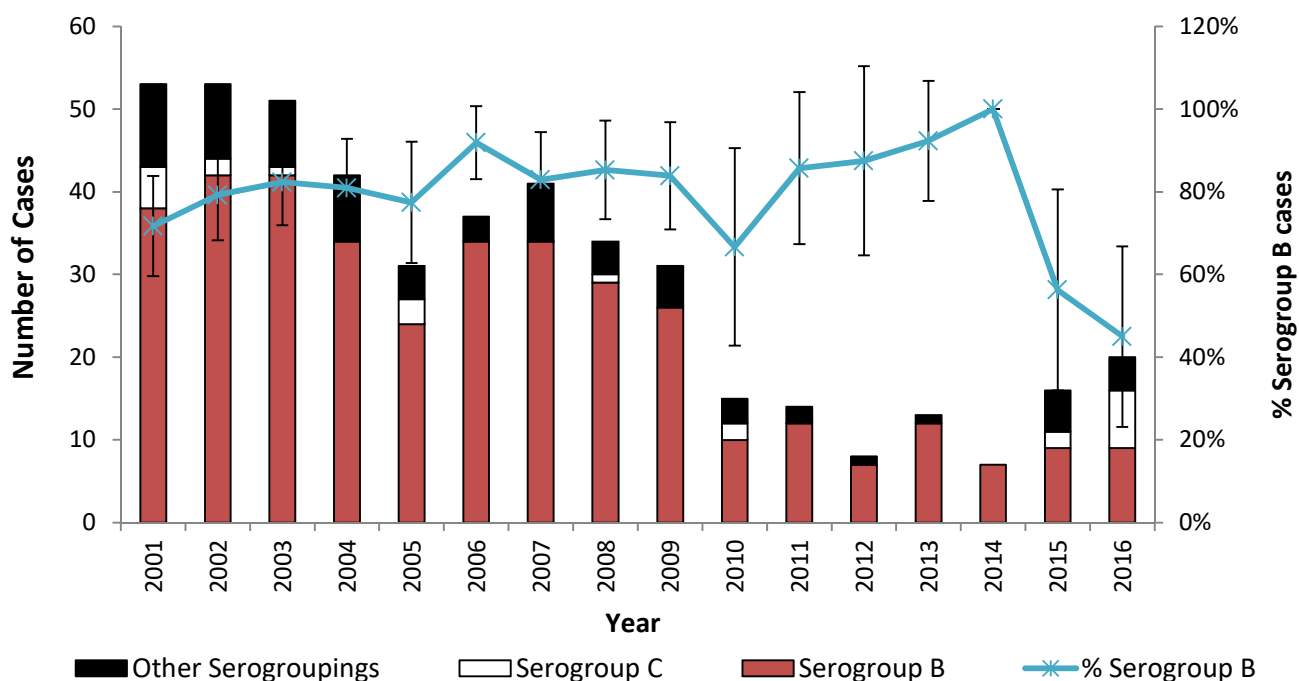


Figure 1. Number of IMD cases notified in Ireland by serogroup in Q3 of each year between 2001 and 2016 with percentage of quarterly cases attributable to serogroup B with 95% confidence intervals

In Q3-2016 serogroup B disease accounted for 45% (n=9/20; 95%CI 23.2%-66.8%) of all IMD notifications (Figure 1, Appendix 1).

IMD Trends & Outbreaks

The number of IMD cases reported in Q3-2016 (n=20) was greater than the average number reported in the same quarter over the previous three years (average=12; 95%CI 6.7-17.3); for serogroup B the average was 9.3 and for serogroup C it was 1 (Figure 1; Appendix 1). The latest Q3 figures appear to reflect an increase in numbers since 2014 (Figure 1, Appendix 1). Third quarterly IMD cases have fallen by 63.3% since 2001 (Appendix 2). Since 2001, Q3 serogroup B cases have also declined by 76.3% and serogroup C cases have increased by 40% (Appendix 1). In Q3-2016, seven serogroup C cases were reported, compared to four such cases in all third quarters over the previous six years. No IMD outbreaks or clusters were reported in Q3-2016.

Apart from one confirmed case from HSE MW, all confirmed cases reported on CIDR in Q3-2016 were also included in the electronic listing of laboratory tested *N. meningitidis* isolates/specimens provided to the HPSC on December 19th 2016 by the Irish Meningitis and Sepsis Reference Laboratory (IMSRL).

IMD Cases by HSE Area and Age Group

The crude incidence rate in Q3-2016 was 0.44 cases per 100,000 population ranging from the lowest (0.0/100,000) in HSE M to the highest 0.62/100,000) in HSE E (Appendix 3). The burden of IMD disease is typically highest in the <1 year of age group and in Q3-2016 the incidence rate in this age group was 8.3 cases per 100,000 population, followed by 0.71 cases/100,000 in the 15-19 year age group (Appendix 4).

IMD associated deaths

No IMD related deaths were reported in Q3-2016. This compares to two deaths in Q3-2015 (Appendix 5).

Other Forms of Bacterial Meningitis

Streptococcus pneumoniae meningitis

In Q3-2016, three cases of invasive *S. pneumoniae* infections (IPD) presenting as meningitis were notified. The age range was between 45-54 and 55-59 years (Appendix 6). No IPD meningitis-related deaths were reported in this quarter. One patient had a risk factor recorded. Details of the vaccination status, age group, risk factor, and serotype associated with these three cases are presented in Table 2 below.

Table 2. Vaccination status, age and risk factors, and serotype details of the *Streptococcus pneumoniae* meningitis cases reported in Q3-2016

Case. No.	Age Group	Risk factors	PCV vaccination status	PPV vaccination status	Serotype
1	45-54	Yes	Unvaccinated	Not specified	Not specified
2	55-59	Not Specified	Unvaccinated	Not specified	Not specified
3	55-59	No	Unvaccinated	Unvaccinated	Not specified

For further information on *Streptococcus pneumoniae* notifications please refer to the latest report available at <http://www.hpsc.ie/A-Z/VaccinePreventable/PneumococcalDisease/Publications/QuarterlyReportsonInvasivePneumococcalDisease/>

Bacterial meningitis by other specified notifiable diseases (excluding *Haemophilus influenzae* and *S. pneumoniae*)

In Q3-2016, there were two cases of meningitis-related listeriosis, one in a 55-59 year old and the other in a one week old baby. One case of *Streptococcus agalactiae* meningitis (baby aged one week) and one CSF PCR positive case with this infection (aged two weeks) were reported in the same quarter; the latter case however was not labelled as having clinical meningitis or any other clinical description.

Bacterial meningitis (not otherwise specified)

Three cases of bacterial meningitis due to pathogens not otherwise specified (NOS) were notified during Q3-2016. These included one case each that was case classified as confirmed, probable and possible. The confirmed case did not have a causative organism identified. The age range for all three cases was two weeks to 73 years (Appendix 6).

Viral Meningitis (Specified and Not Otherwise Specified)

One hundred and eight viral meningitis notifications (NOS) (age range 1 week to 85 years; median 3 months) were reported in Q3-2016 (Figure 2), 104 of which (96.3%) had their causative organism identified: 88 enterovirus (serotypes not reported) (age range one week to 82 years, median 2.6 months); nine human herpes virus type 6 (HHV 6) (age range 2 weeks to 13 months); three parechovirus virus (all aged 1 month); two varicella/herpes zoster virus (age range 53-85 years); two herpes simplex virus (one type 1 aged 40-45 years and one two type 2 aged 65-69 years); and four with no pathogen identified (aged 14 to 73 years) (Figure 3, Appendix 7).

In Q3-2016, the highest frequency of cases occurred in children <1 year of age (n=69/108; 63.9%) and in adults aged 25-39 years (n=19/108; 17.6%) (Figure 2). Of the 69 cases <1 year of age reported in this quarter, 58 (84.1%) were attributable to enterovirus, eight (11.6%) to HHV6 and three (4.3%) to parechovirus. However, caution is recommended regarding the detection of HHV 6 DNA in cerebral spinal fluid (CSF) specimens, especially in those aged less than three months (of which

there were five cases in Q3-2016), as HHV 6 DNA can be chromosomally integrated. When this occurs the HHV 6 DNA can be inherited through the germ line and therefore when it is detected, it may not be clinically relevant. Figure 3 presents both the total number of viral meningitis NOS cases and those not caused by enterovirus by year and by quarter since 2006. The average Q3 percentage of all viral meningitis NOS cases attributable to enterovirus since 2010 to date has been 79.2%.

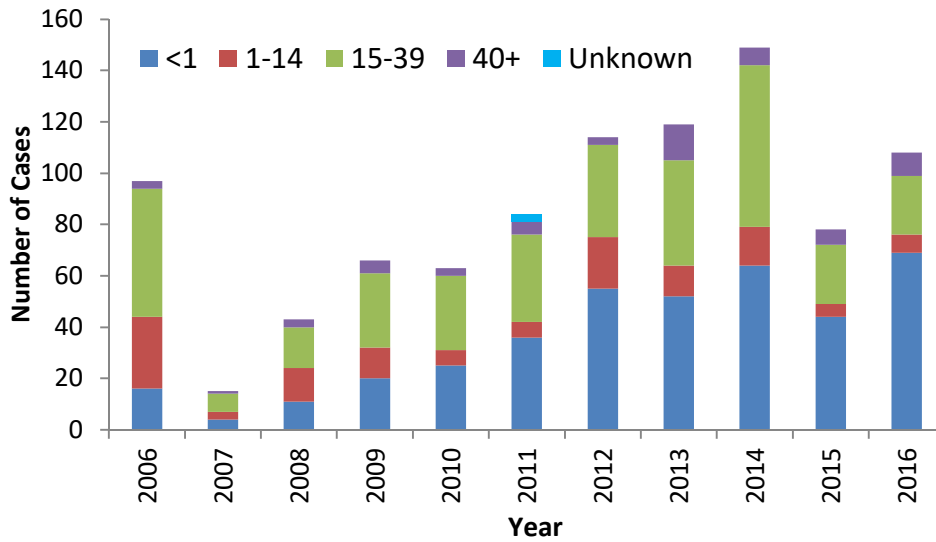


Figure 2. Quarter 3 number of viral meningitis (NOS) cases in Ireland by age group (years), 2006-2016

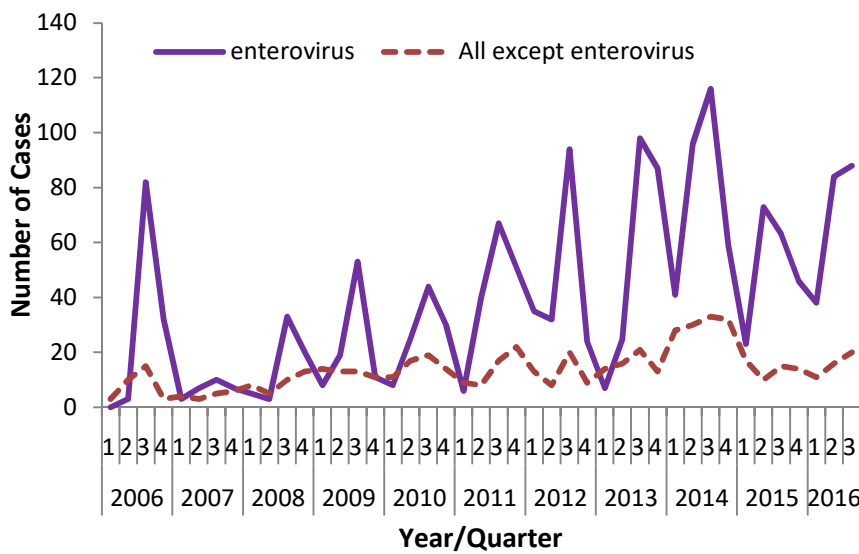


Figure 3. Number of viral meningitis (NOS) cases caused by enterovirus and not by enterovirus by quarter and year, 2006-2016

Haemophilus influenzae (invasive) infections

***H. influenzae* Cases by Type, Case Classification**

In Q3-2016, 12 cases of invasive *H. influenzae* (all case classified as confirmed) were notified in Ireland (Figure 4): Seven were non-typeable/non-capsulated, one was a type e, one was a type f and three were not typed. This total compares to an average of 10.7 cases for the same quarter in 2013 to 2015 (Table 3, Appendices 8, 9). Of all the Q3 cases reported between 2014 and 2016, 14.3% (n=5/35) had no clinical diagnosis reported (Table 4).

In the electronic listing provided by the Epidemiology and Molecular Biology Unit (EMBU) in Temple Street Children’s Hospital on December 19th, 2016, two classified confirmed *H. influenzae* events on CIDR in Q3-2016 were not included on it: one each from HSE M and HSE S.

***H. influenzae* associated deaths**

No deaths occurred among the 12 *H. influenzae* cases reported during this quarter.

H. influenzae meningitis

No meningitis-related *H. influenzae* cases were reported in Q3-2016 (Table 5, Appendix 9).

***H. influenzae* type b (Hib)**

A true vaccine failure (TVF) is the occurrence of invasive Hib infection in an individual, despite having been fully vaccinated against Hib disease in the past. No Hib cases were reported in Q3-2016. The last reported TVF however was in Q4-2010, the only one in nine years between Q3-2007 and Q3-2016: an indication of the continuing positive impact of the Hib immunisation catch-up booster campaign launched in November 2005 (Figure 5). A routine Hib booster is now recommended for all children at 13 months of age. Ensuring high uptake of the Hib vaccine during infancy and a booster in the second year of life is recommended to provide continued protection of the population from invasive Hib disease. Individuals with risk conditions for Hib, regardless of age are also recommended the Hib vaccine.

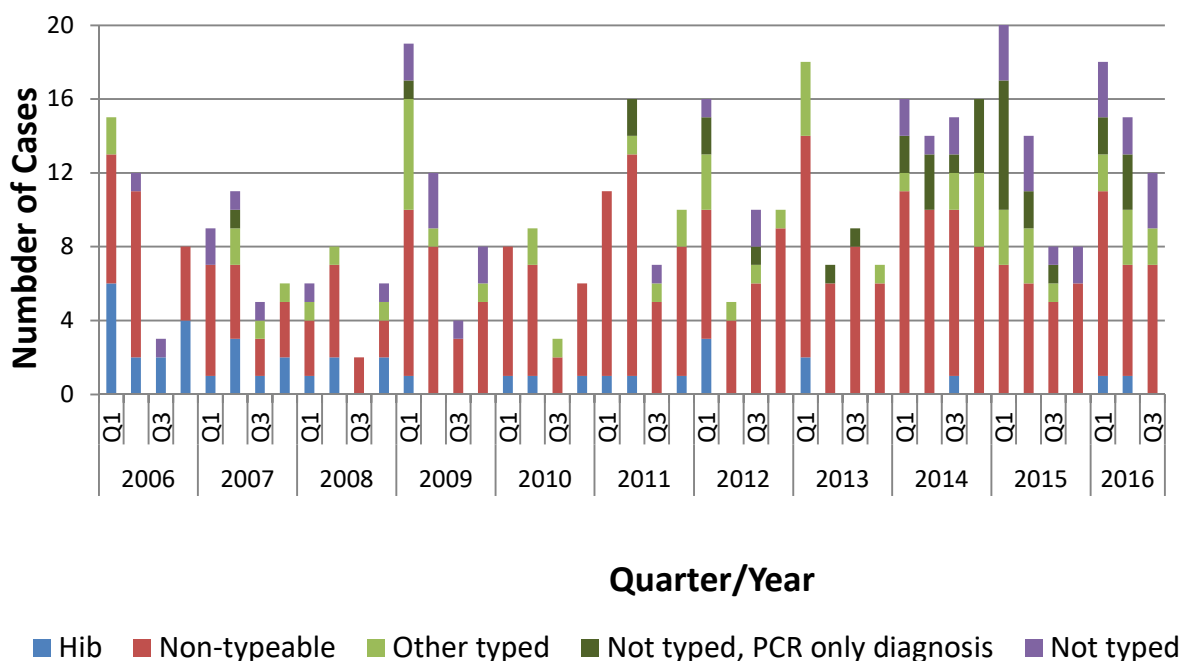


Figure 4. Quarterly number of *H. influenzae* cases by type since 2006

Non-typeable/non-capsulated *H. influenzae*

In Q3-2016 the number of non-typeable cases was seven (aged 3 to 76 years), similar to the average of 7.3 cases in the same quarter between 2013 and 2015 (Figure 6, Table 3).

Table 3. Number of *H. influenzae* cases notified in the third quarter of 2014, 2015 and 2016

Number of cases	Q3-2014	Q3-2015	Q3-2016
All <i>H. influenzae</i>	15	8	12
All <i>H. influenzae</i> <5yrs	7	2	1
All <i>H. influenzae</i> ≥65yrs	6	4	4
<i>H. influenzae</i> type b	1	0	0
<i>H. influenzae</i> type b <5yrs	0	0	0
<i>H. influenzae</i> type b ≥65yrs	0	0	0
<i>H. influenzae</i> non-typeable	9	5	7
<i>H. influenzae</i> non-typeable <5yrs	5	3	1
<i>H. influenzae</i> non-typeable ≥65yrs	4	1	1

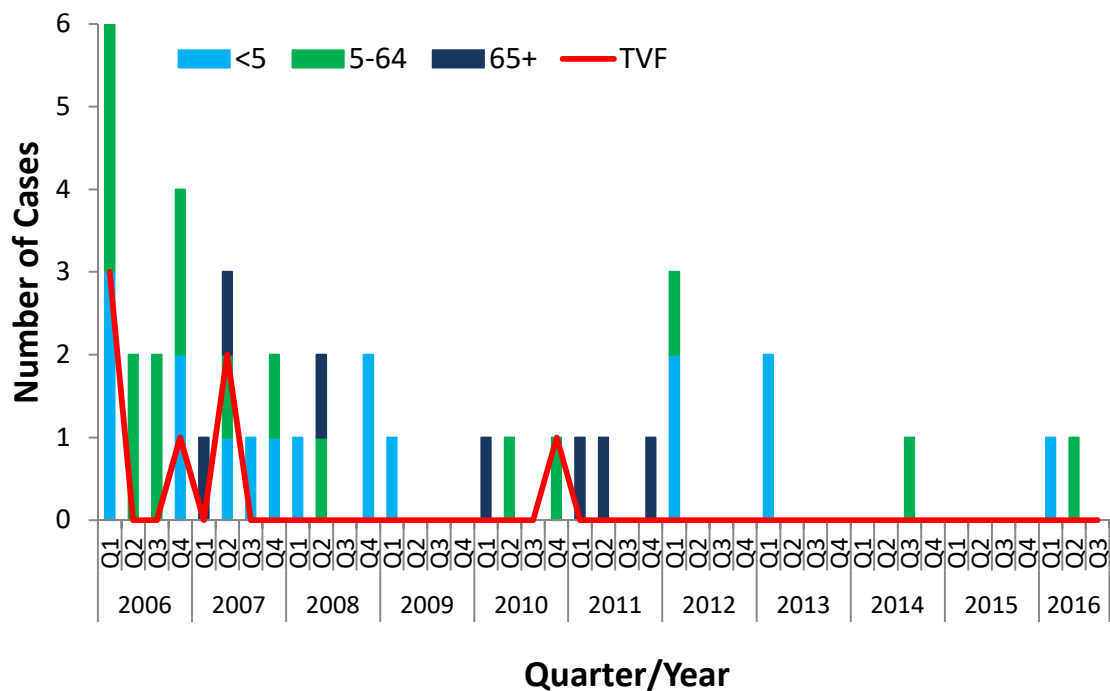
Table 4. Number of *H. influenzae* cases by clinical diagnosis notified in the third quarter of 2014, 2015 and 2016

Number of cases	Q3-2014	Q3-2015	Q3-2016	Total	Total (%)
Septicaemia	6	4	7	17	48.6
Bacteraemia (without focus)	1	2	2	5	14.3
Pneumonia	2	0	1	3	8.6
Meningitis	2	0	0	2	5.7
Meningitis & septicaemia	0	1	0	1	2.9
Other	1	0	0	1	2.9
Cellulitis	0	0	0	0	0.0
Epiglottitis	1	0	0	1	2.9
Osteomyelitis	0	0	0	0	0.0
Septic arthritis	0	0	0	0	0.0
Clinical diagnosis not reported	2	1	2	5	14.3
Total	15	8	12	35	100

Table 5. Number of *H. influenzae* cases by clinical diagnosis and type of infection, Q3-2016

Number of cases	Typed (b, e, f or not-b)	Non-typeable	Not typed*	Total
Septicaemia	1	5	1	7
Bacteraemia (without focus)	0	2	0	2
Pneumonia	1	0	0	1
Meningitis	0	0	0	0
Meningitis & septicaemia	0	0	0	0
Other	0	0	0	0
Cellulitis	0	0	0	0
Epiglottitis	0	0	0	0
Osteomyelitis	0	0	0	0
Septic arthritis	0	0	0	0
Clinical diagnosis not reported	0	0	2	2
Total	2	7	3	12

*including not typed, PCR diagnosis only (if any)

**Figure 5.** Quarterly number of Hib cases by age group and of true Hib vaccine failures (TVFs), since 2006

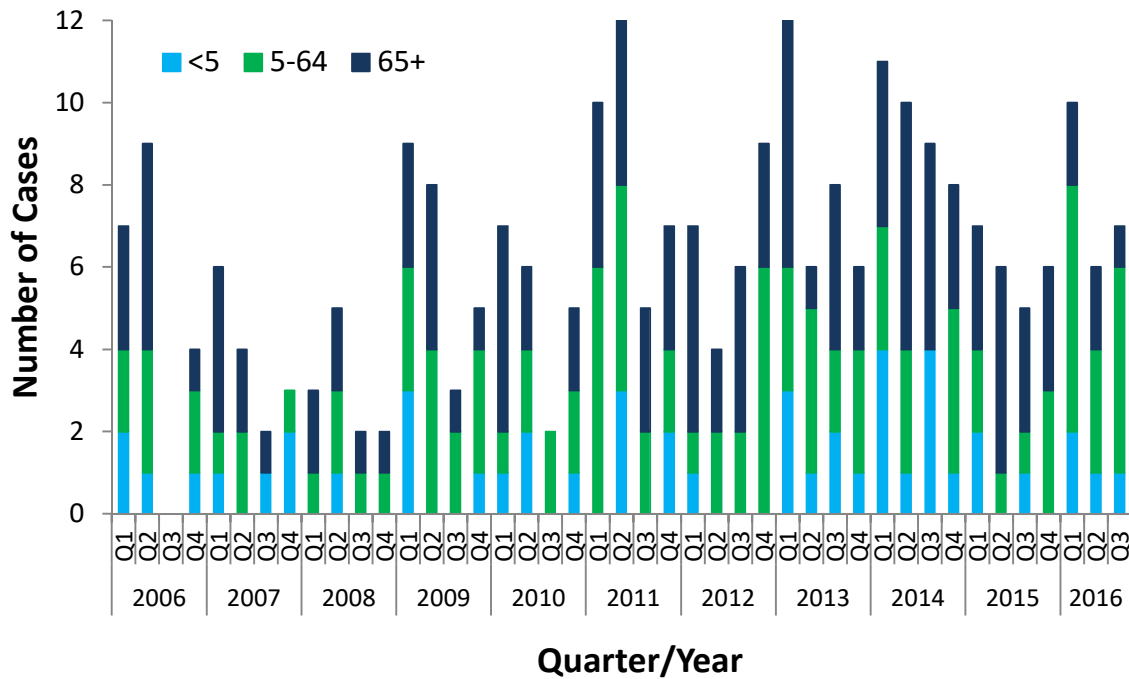


Figure 6. Quarterly number of non-typeable/non-capsulated cases by age group, since 2006

Acknowledgements

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NOTES

Invasive IMD and other bacterial meningitis notifications:

- The collection of specimens for all bacterial meningitis diagnostic testing should be performed as per recommendations outlined in the HPSC's 'Guidelines for the Early Clinical and Public Health Management of Bacterial Meningitis (including Meningococcal Disease). Report of the Scientific Advisory Committee of HPSC' published in January 2012, a copy of which is available at: <http://www.hpsc.ie/A-Z/VaccinePreventable/BacterialMeningitis/Guidance/File.12977.en.pdf>
- An enhanced surveillance form should be completed for each notification. A copy is available at: <http://www.hpsc.ie/A-Z/VaccinePreventable/BacterialMeningitis/SurveillanceForms/File.1832.en.pdf>.
- All suspected/confirmed *Neisseria meningitidis* isolates recovered from any site (blood/CSF/other sterile-site or nose/throat) from an individual with suspected or confirmed IMD should be forwarded by laboratories to the IMSRL for confirmation of identity and epidemiological typing

Invasive viral meningitis notifications:

- The collection of specimens for viral meningitis diagnostic testing should be performed as per recommendations in the NVRL's user manual, which is available at: http://nvrl.ucd.ie/sites/default/files/uploads/pdfs/NVRL_USER_MANUAL_13.0.pdf.

Invasive *H. influenzae* notifications:

- Serotype should be determined for all isolates, regardless of patient age, and the results reported to HPSC.
- For all type b cases born since 1987, Hib vaccination status should be ascertained and the vaccine details reported to HPSC.
- On time Hib vaccinations (at 2, 4, 6 and 13 months of age) are strongly recommended to prevent unnecessary Hib disease occurring in children. Older children/adults with risk conditions (asplenia/hyposplenism/complement deficiency) are recommended the Hib vaccine (two doses, at least two months apart).
- An enhanced surveillance form should be completed for each Hib notification. A copy is available at: <http://www.hpsc.ie/A-Z/VaccinePreventable/Haemophilusinfluenzae/SurveillanceForms/File.1847.en.pdf>. Details of the clinical diagnosis of each case should also be provided when completing this form.
- All suspected/confirmed *H. influenzae* isolates recovered from any site from an individual with suspected or confirmed invasive *Haemophilus* infection should be forwarded by laboratories to the IMSRL for confirmation of identity and epidemiological typing

Appendices

Appendix 1. IMD Cases by Serogroup in Quarter 3, 2001-2016

Serogroup	Q3-2001	Q3-2002	Q3-2003	Q3-2004	Q3-2005	Q3-2006	Q3-2007	Q3-2008	Q3-2009	Q3-2010	Q3-2011	Q3-2012	Q3-2013	Q3-2014	Q3-2015	Q3-2016
B	38	42	42	34	24	34	34	29	26	10	12	7	12	7	9	9
C	5	2	1	0	3	0	0	1	0	2	0	0	0	0	2	7
W135	2	2	0	0	0	0	0	1	0	0	0	0	0	0	0	2
Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1
Non-groupable (NG)	3	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0
29E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No organism detected	5	7	8	8	4	3	7	2	5	3	2	1	1	0	2	1
Total	53	53	51	42	31	37	41	34	31	15	14	8	13	7	16	20

Appendix 2. IMD Cases by Quarter, 2001-2016

Qr	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2001-2016 change
Q1	115	82	73	66	72	73	57	55	52	52	35	24	23	24	22	23	-80.0%
Q2	86	60	38	47	57	55	44	31	33	23	24	13	25	21	17	18	-79.1%
Q3	53	53	51	42	31	37	41	34	31	15	14	8	13	7	16	20	-62.3%
Q4	76	58	75	43	43	44	37	48	31	24	21	21	20	30	19	-	-
Total	330	253	237	198	203	209	179	168	147	114	94	66	81	82	74	-	-

Appendix 3. IMD Cases by HSE Area in Quarter 3, 2001-2016

HSE Area	Q3-2001	Q3-2002	Q3-2003	Q3-2004	Q3-2005	Q3-2006	Q3-2007	Q3-2008	Q3-2009	Q3-2010	Q3-2011	Q3-2012	Q3-2013	Q3-2014	Q3-2015	Q3-2016	Q3-2016 CIR*
E	24	23	12	12	16	14	12	11	15	3	6	2	3	2	5	10	0.62
M	4	4	6	0	2	0	1	4	2	0	0	2	0	1	0	0	0.00
MW	6	5	5	5	1	2	5	1	3	0	1	2	2	0	1	1	0.26
NE	4	5	6	6	2	5	6	3	2	1	1	0	1	1	3	2	0.45
NW	2	5	1	2	3	1	3	1	3	1	0	1	2	0	2	1	0.39
SE	5	3	7	10	0	5	3	4	0	3	1	0	2	1	3	1	0.20
S	6	5	13	6	5	6	7	7	3	4	3	1	1	1	2	4	0.60
W	2	3	1	1	2	4	4	3	3	3	2	0	2	1	0	1	0.22
Total	53	53	51	42	31	37	41	34	31	15	14	8	13	7	16	20	0.44

* CIR, crude incidence rate per 100,000

Appendix 4. IMD Cases by Age Group in Quarter 3, 2001-2016

Age Group (Yrs)	Q3-2001	Q3-2002	Q3-2003	Q3-2004	Q3-2005	Q3-2006	Q3-2007	Q3-2008	Q3-2009	Q3-2010	Q3-2011	Q3-2012	Q3-2013	Q3-2014	Q3-2015	Q3-2016	Q3-2016 CIR*
<1	17	19	21	13	10	15	13	11	11	4	4	2	7	3	5	6	8.29
1-4	12	14	14	18	12	7	11	9	7	6	4	2	1	2	0	2	0.70
5-9	9	1	1	1	2	3	4	1	3	1	0	0	0	0	1	1	0.31
10-14	6	5	3	1	1	0	4	2	1	0	1	0	0	0	1	2	0.66
15-19	1	4	5	3	1	6	5	5	5	0	1	1	2	1	4	2	0.71
20-24	2	3	1	3	1	3	0	2	1	0	3	1	1	0	0	2	0.67
25-34	3	3	1	3	0	0	1	1	0	1	0	0	0	0	0	0	0.00
35-44	0	3	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0.00
45-54	1	0	1	0	0	1	1	0	1	1	0	2	0	1	1	2	0.35
55-64	1	0	3	0	2	0	1	3	1	0	0	0	0	0	1	2	0.43
65+	1	1	1	0	1	1	1	0	0	2	1	0	2	0	3	1	0.19
Total	53	53	51	42	31	37	41	34	31	15	14	8	13	7	16	20	0.44

* CIR, crude incidence rate per 100,000

Appendix 5. Deaths associated with IMD by Serogroup in Quarter 3, 2001-2016

Serogroup	Q3-2001	Q3-2002	Q3-2003	Q3-2004	Q3-2005	Q3-2006	Q3-2007	Q3-2008	Q3-2009	Q3-2010	Q3-2011	Q3-2012	Q3-2013	Q3-2014	Q3-2015	Q3-2016
B	1	2	4	1	1	2	1	1	1	1	1	0	1	0	1	0
C	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
W135	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-groupable (NG)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
29E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No organism detected	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Total	3	2	5	3	1	2	1	1	1	1	1	0	1	0	2	0
%CFR* (Total)	5.7%	3.8%	9.8%	7.1%	3.2%	5.4%	2.4%	2.9%	3.2%	6.7%	7.1%	0.0%	7.7%	0.0%	12.5%	0.0%

* %CFR, case fatality ratio

Appendix 6. Other Bacterial Meningitis Cases by Causative Organism (Specified and Not Otherwise Specified) in Quarter 3, 2006-2016 (excluding IMD and *Haemophilus influenzae*)

	Causative organism	Q3-2006	Q3-2007	Q3-2008	Q3-2009	Q3-2010	Q3-2011	Q3-2012	Q3-2013	Q3-2014	Q3-2015	Q3-2016	Q3:2006-2016
Specified	<i>Leptospira</i> spp.	0	0	1	0	0	1	1	0	0	0	0	3
	<i>Listeria</i> spp.	0	1	0	1	2	0	1	0	1	0	2	8
	<i>Mycobacterium tuberculosis</i> #	0	1	2	3	2	2	3	3	2	2	0	20
	<i>Streptococcus pneumoniae</i>	n/a	n/a	3	3	4	4	7	5	4	5	3	38
	<i>Streptococcus agalactiae</i> *	na	na	na	na	na	na	4	2	0	0	1	7
	<i>Streptococcus pyogenes</i>	0	0	0	0	0	0	0	0	0	1	0	1
Not specified	<i>Citrobacter koseri</i>	0	0	1	0	0	0	0	0	0	0	0	1
	Coagulase Negative Staphylococci	1	0	0	0	0	0	0	0	0	0	0	1
	<i>Enterococcus faecalis</i>	0	0	1	1	0	0	0	0	0	0	0	2
	<i>Enterococcus faecium</i>	0	0	0	0	0	0	1	0	0	0	0	1
	<i>Escherichia coli</i>	1	0	3	0	0	0	4	0	4	4	0	16
	<i>Gamella</i> spp.	0	1	0	0	0	0	0	0	0	0	0	1
	<i>Klebsiella pneumoniae</i>	0	0	0	0	0	0	0	0	1	0	0	1
	<i>Staphylococcus aureus</i>	0	0	1	1	0	1	1	0	0	1	0	5
	<i>Staphylococcus aureus</i> & <i>Staphylococcus capitis</i>	0	0	0	0	0	0	1	0	0	0	0	1
	<i>Staphylococcus capitis</i>	0	0	0	0	1	0	0	0	0	0	0	1
	<i>Streptococcus agalactiae</i> †	0	1	1	1	3	7	0	0	0	0	0	13
	<i>Streptococcus salivarius</i>	0	0	0	0	0	0	0	1	0	0	0	1
	<i>Streptococcus suis</i>	0	0	0	0	0	0	0	0	1	0	0	1
	Unknown	15	4	6	9	2	4	4	6	2	4	3	59
Total	17	8	19	19	14	19	27	17	15	17	9	181	

#TB meningitis figures for 2014, 2015 and 2016 are provisional

**Streptococcus agalactiae* causing meningitis aged < 90 days old notifiable under the disease category Streptococcus Group B infection (invasive) after 01/01/2012

†All *Streptococcus agalactiae* causing meningitis cases notifiable under the disease category Bacterial Meningitis (NOS) except after 01/01/2012 when cases aged >=90 days old only notifiable

n/a not available-details of meningitis-related *Streptococcus pneumoniae* currently not complete on CIDR for the years 2006-2007

na not applicable for the years prior to 2012

§Meningitis-related Lyme neuroborreliosis cases are not included in this report

Appendix 7. Viral Meningitis Cases, Not Otherwise Specified, by Causative Organism in Quarter 3 2006-2016

Causative Organism	Q3-2006	Q3-2007	Q3-2008	Q3-2009	Q3-2010	Q3-2011	Q3-2012	Q3-2013	Q3-2014	Q3-2015	Q3-2016
enterovirus	82	10	33	53	44	67	94	98	116	63	88
human herpes virus type 6	0	0	0	2	6	8	8	13	8	3	9
varicella & varicella zoster virus	0	1	2	1	3	2	3	1	4	6	2
herpes simplex virus types 1 or 2	0	0	2	1	2	2	0	0	4	2	2
parechovirus	0	1	0	0	1	0	1	0	15	1	3
echovirus types, 6, 9, 13, 30 or 33	2	0	0	0	0	1	2	2	0	2	0
coxsackievirus A, B or B4	0	0	0	0	0	0	1	0	0	0	0
adenovirus	0	0	0	0	0	0	0	0	0	0	0
not specified	13	3	6	9	7	4	5	5	2	1	4
Total	97	15	43	66	63	84	114	119	149	78	108
% enterovirus	84.5%	66.7%	76.7%	80.3%	69.8%	79.8%	82.5%	82.4%	77.9%	80.8%	81.5%
% known organism	86.6%	80.0%	86.0%	86.4%	88.9%	95.2%	95.6%	95.8%	98.7%	98.7%	96.3%

Appendix 8. H. influenzae Cases by Type in Quarter 3, 2006-2016

Type	Q3-2006	Q3-2007	Q3-2008	Q3-2009	Q3-2010	Q3-2011	Q3-2012	Q3-2013	Q3-2014	Q3-2015	Q3-2016
b	2	1	0	0	0	0	0	0	1	0	0
e	0	0	0	0	0	0	0	0	0	0	1
f	0	1	0	0	1	0	0	0	2	0	1
not type-b	0	0	0	0	0	1	1	0	0	1	0
non-typeable/non-capsulated	0	2	2	3	2	5	6	8	9	5	7
not typed*	1	1	0	1	0	1	3	1	3	2	3
Total	3	5	2	4	3	7	10	9	15	8	12

*including not typed, PCR diagnosis only (if any)

Appendix 9. H. influenzae Cases by Quarter, 2006-2016

Qr	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2006-2016 change
Q1	15	9	6	19	10	11	16	18	16	21	18	+20.0%
Q2	12	11	8	12	9	16	5	7	14	15	15	+25.0%
Q3	3	5	2	4	3	7	10	9	15	8	12	+300.0%
Q4	8	6	6	8	6	10	10	7	16	8	-	-
Total	38	31	22	43	28	44	41	41	61	52	-	-
<i>Meningitis</i>	4	2	3	3	2	4	3	2	7	5	-	-
<i>Type b meningitis</i>	3	1	1	0	1	0	1	0	0	0	-	-

Appendix 10. H. influenzae Cases by HSE Area in Quarter 3, 2006-2016

HSE Area	Q3-2006	Q3-2007	Q3-2008	Q3-2009	Q3-2010	Q3-2011	Q3-2012	Q3-2013	Q3-2014	Q3-2015	Q3-2016	Q3-2016 CIR*
E	2	1	0	1	1	4	5	1	2	4	2	0.12
M	0	2	0	1	0	0	1	0	0	0	3	1.06
MW	0	0	1	0	1	1	2	0	2	0	0	0.00
NE	0	0	0	0	0	1	0	1	3	0	0	0.00
NW	0	0	0	0	0	0	1	1	0	1	2	0.77
SE	0	0	0	1	0	0	0	3	4	2	1	0.20
S	1	1	1	1	0	0	0	1	3	0	4	0.60
W	0	1	0	0	1	1	1	2	1	1	0	0.00
Total	3	5	2	4	3	7	10	9	15	8	12	0.26

* CIR, crude incidence rate per 100,000

Appendix 11. *H. influenzae* Cases by Age Group in Quarter 3, 2006-2016

Age Grp (Yrs)	Q3-2006	Q3-2007	Q3-2008	Q3-2009	Q3-2010	Q3-2011	Q3-2012	Q3-2013	Q3-2014	Q3-2015	Q3-2016	Q3-2016 CIR*
<1	0	2	0	0	0	0	0	0	4	1	0	0.00
1-4	0	0	0	0	0	1	1	3	3	1	1	0.35
5-9	0	0	0	0	0	0	0	0	0	0	1	0.31
10-14	0	0	0	0	0	0	0	0	0	0	0	0.00
15-19	0	0	0	0	1	0	1	0	0	0	0	0.00
20-24	0	0	0	0	1	0	0	0	1	1	1	0.34
25-34	0	0	0	1	0	2	1	1	0	1	1	0.13
35-44	1	0	0	1	0	0	1	0	0	0	3	0.43
45-54	1	0	1	0	0	0	0	0	0	0	0	0.00
55-64	0	0	0	1	0	0	0	1	1	0	1	0.22
65+	1	3	1	1	1	4	6	4	6	4	4	0.75
Total	3	5	2	4	3	7	10	9	15	8	12	0.26

* CIR, crude incidence rate per 100,000