

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 MENINGOCOCCAL AND MENINGITIS REFERENCE LABORATORY AND THE NATIONAL VIRUS REFERENCE LABORATORY



Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive



Q2-2016

27th September 2016

Provisional Figures

Summary

- 18 invasive meningococcal disease cases (IMD) were notified in Q2-2016, including nine serotype B, five serotype C, three serotype W135 and one not specified infection. The five serogroup C cases were aged between 14 and 69 years: three were unvaccinated (aged 50 to 69 years), one was a complete vaccine failure (aged 15 to 19 years) and one had an unknown vaccination status (aged 10 to 14 years). One IMD case, aged between 60-64 years, was reported to have died from a W135 infection during this quarter. There were no imported cases or outbreaks reported.
- Among the other specified cases of bacterial meningitis reported were eight cases of *Streptococcus pneumoniae* and one case of *Streptococcus agalactiae*. Three cases of bacterial meningitis, not otherwise specified (NOS), were also notified during this quarter.
- No specified cases of viral meningitis were reported during Q2-2016. One hundred cases of viral meningitis (NOS) were reported with no related deaths or outbreaks; 77 were attributable to enterovirus (serotype not reported).
- 15 cases of *Haemophilus influenzae* were reported, none of which were associated with meningitis. Six were non-typeable/non-capsulated, two were type f, one was a type b (aged 55-59 with an unknown vaccination status), one was not a type b and five were not typed (of which three were diagnosed by PCR only).

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. Emerging evidence of waning immunity and the recent increase in MenC cases led to the routine MenC vaccination programme being changed again. 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).

(<http://www.hse.ie/eng/health/immunisation/hcpinfo/guidelines/chapter13.pdf>). 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 (<https://www.hse.ie/eng/health/immunisation/infomaterials/newsletter/newsletter23.pdf>). 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 27th September 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 Q2-2016, 18 cases of IMD were notified. Nine were attributable to serogroup B, five were serogroup C, three were serogroup W135 and one was a non- specified infection (Table 1). Of the five serogroup C cases aged between 14 and 69 years, three were unvaccinated (aged 50 to 69 years), one was a complete vaccine failure (aged 15 to 19 years) and one had an unknown vaccination status (aged 10 to 14 years).

Table 1. Classification of IMD cases notified by Serogroup in Q2-2016

Case Classification	B	C	W135	Y	NG	No organism detected	Total
Confirmed	9	5	3	0	0	0	17
Probable	0	0	0	0	0	0	0
Possible	0	0	0	0	0	1	1
Not specified	0	0	0	0	0	0	0
Total	9	5	3	0	0	1	18

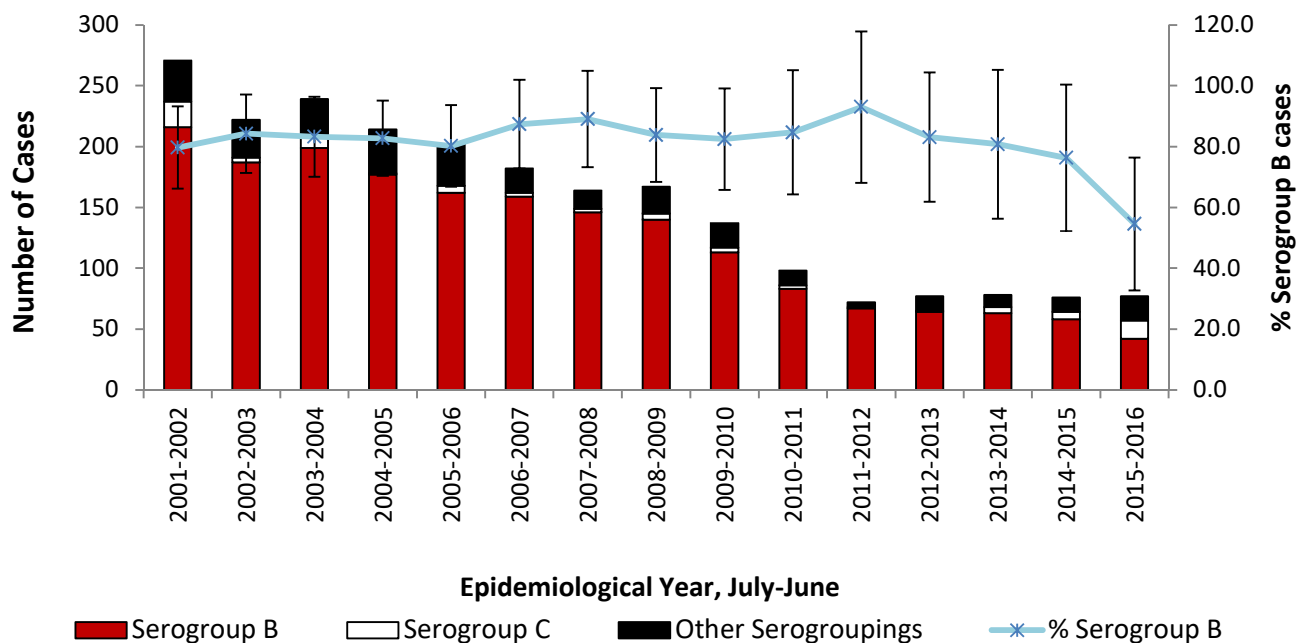


Figure 1. Number of IMD cases notified in Ireland by serogroup by epidemiological year, 2001-2002 to 2015-2016 with percentage of cases attributable to serogroup B with 95% confidence intervals

In Q2-2016 serogroup B disease accounted for 50% (n=9/18; 95% CI 23.9%-73.1%) of all IMD notifications (Appendix 1). All confirmed cases reported on CIDR in Q2-2016 were also included in the electronic listing of laboratory tested *N. meningitidis* isolates/specimens provided to the HPSC on September 13th 2016 by the Irish Meningococcal and Meningitis Reference Laboratory (IMMRL).

IMD Trends & Outbreaks

The number of IMD cases reported in Q2-2016 (n=18) was less than the average number reported in the same quarter over the previous three years (average=21.0; 95%CI 16.3-25.7); for serogroup B the average was 16.7 and for serogroup C it was 1.0. The latest Q2 figures appear to reflect the levelling off of overall cases since 2014, but with a recent increase in the number of MenC cases (Appendix 1). Second quarterly IMD cases have fallen by 79.1% since 2001 (Appendix 2). Since 2001, Q2 serogroup B cases have also declined by 85.9% whereas MenC cases have increased by 66.7% (from 3 to 5 cases) (Appendix 1). In Q2-2016, five serogroup C cases were reported, compared to three such cases in all second quarters combined over the previous four years. No IMD outbreaks or clusters were reported in Q2-2016.

IMD Cases by HSE Area and Age Group

The crude incidence rate in Q2-2016 was 0.39 cases per 100,000 population ranging from the lowest (0.20/100,000) in HSE SE to the highest (1.16/100,000) in HSE NW (Appendix 3). The burden of IMD disease is typically highest in the <1 year of age group and in Q2-2016 the incidence rate in this age group was 2.8 cases per 100,000 population, followed by 2.1 cases/100,000 in the 1-4 year age group (Appendix 4). Since the 2011-2012 epidemiological year (EY), the overall number of cases has remained relatively unchanged with an EY average of 76 cases (Figure 1). However, one notable change has been the reduction in the percentage of cases in the 1-4 year age group and the increase in the 25+ year age group in the 2015-2016 EY compared to previous EYs (Figure 2).

One IMD related death from a W135 type infection was reported in Q2-2016 in a 60-64 year old. This compares to no deaths reported in the same quarter in 2015 (Appendix 5).

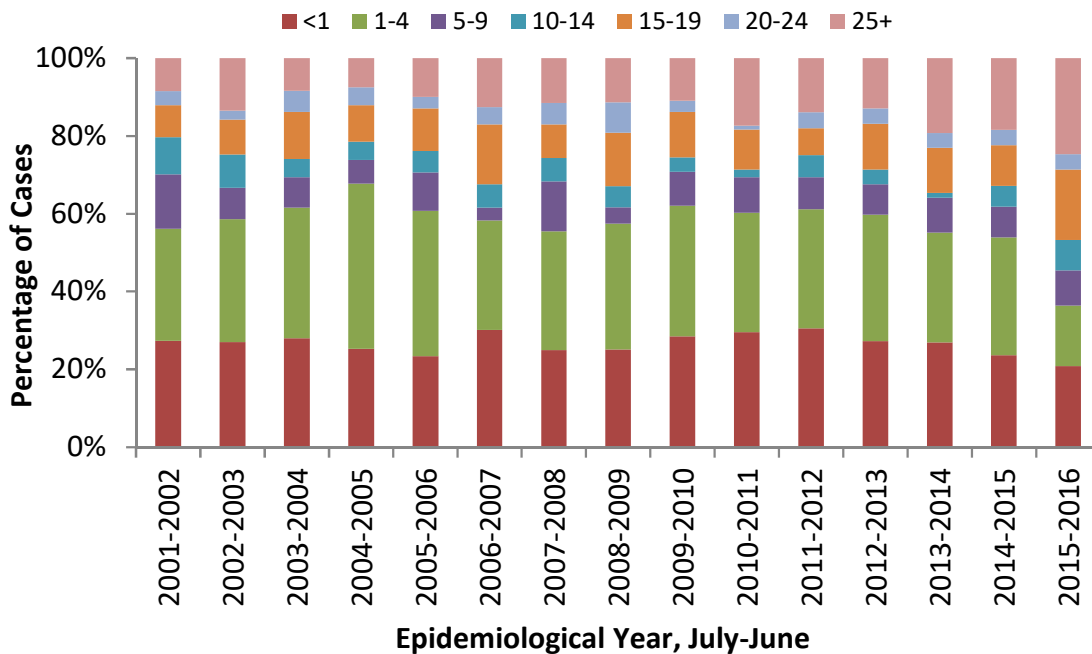


Figure 2. Percentage of IMD cases notified in Ireland by age group and epidemiological year, 2001-2002 to 2015-2016
IMD associated deaths

Other Forms of Bacterial Meningitis

Streptococcus pneumoniae meningitis

In Q2-2016, eight cases of invasive *S. pneumoniae* infections (IPD) presenting as meningitis were notified. The age range was between 0-3 months and 55-59 years (Appendix 6). Details of the vaccination status, age group, risk factor, and serotype associated with these eight cases are presented in Table 2 below.

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

In Q2-2016, there was one case of *Streptococcus agalactiae* in a one week old infant. Three CSF PCR positive cases with this infection were also reported in the same quarter, but were 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 Q2-2016. The age range was one month to 34 years, two of the cases were classified as possible and one as probable (Appendix 6).

Table 2. Vaccination status, age and risk factors, and serotype details of the *Streptococcus pneumoniae* meningitis cases reported in Q2-2016

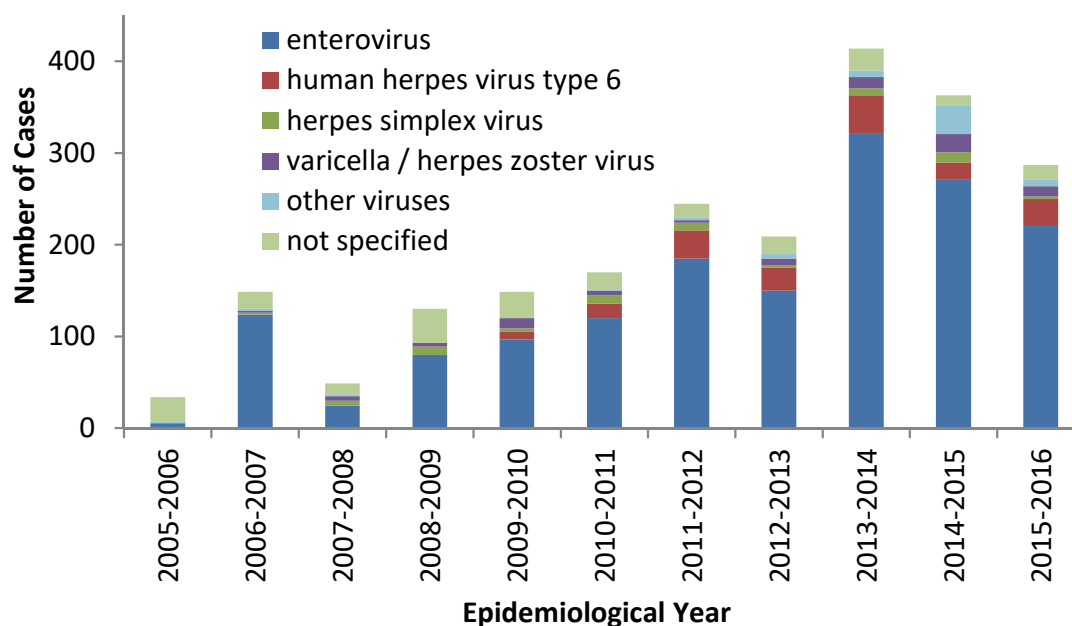
Case. No.	Age Group (years)	Risk factors	PCV vaccination status	PPV vaccination status	Serotype
1	<1	Not specified	Unvaccinated	Unvaccinated	Not specified
2	1-2	Under investigation	Vaccinated	Not specified	Not specified
3	30-34	Yes	Unvaccinated	Vaccinated (1 dose)	Not specified
4	45-49	No	Unvaccinated	Unvaccinated	Not specified
5	40-44	No	Unvaccinated	Unknown	Not specified
6	55-59	Yes	Unvaccinated	Unvaccinated	Not specified
7	55-59	Yes	Unvaccinated	Unvaccinated	15B/C*
8	55-59	Yes	Unvaccinated	Vaccinated (1 dose)	Not specified

*Only serotype 15B is covered by the PPV23 vaccine

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/>

Viral Meningitis (Specified and Not Otherwise Specified)

No specified cases of viral meningitis were reported during Q20-2016. However, 100 viral meningitis (NOS) notifications (age range 1 week to 84 years; median 67 days) were reported in Q2-2016, 91 of which (91%) had their causative organism identified: 77 enterovirus (serotypes not reported) (age range one week to 42 years, median 63 days), nine human herpes virus type 6 (HHV 6) (age range 1 month to 2 years), three varicella/herpes zoster virus (aged 17-84 years), one case each of coxsackievirus (aged 19 months) and of echovirus (aged 2 months) and nine with no pathogen identified (age 3 weeks to 33 years) (Appendix 7).

**Figure 3.** Number of viral meningitis (NOS) cases in Ireland by virus type and epidemiological year, 2005-2006 to 2015-2016

In Q2-2016, the highest frequency of cases occurred in children <1 year of age (n=71/100; 71.0%) and in adults aged 25-39 years (n=13/100; 13.0%). Of the 71 cases <1 year of age was reported in this quarter, 59 (83.1%) were attributable to enterovirus and six (8.5%) to HHV6. However, caution is recommended regarding the detection of HHV 6 DNA in cerebral spinal fluid (CSF) specimens, especially in those aged less than 3 months (of which all but one were < 3 months of age), 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 the number of viral meningitis, NOS cases by causative organism since EY 2005-2006. Figure 4 shows the percentage of enterovirus meningitis only cases by age group (years) since EY 2005-2006, with the majority of cases in the <1 and 25+ years age groups. Figure 5 presents both the number of viral meningitis, NOS cases caused by enterovirus and not caused by enterovirus by year and by quarter since 2006, with the characteristic, summer seasonal peak in enterovirus-meningitis numbers. The average Q2 percentage of all viral meningitis, NOS cases attributable to enterovirus since 2010 to date has been 75.0%.

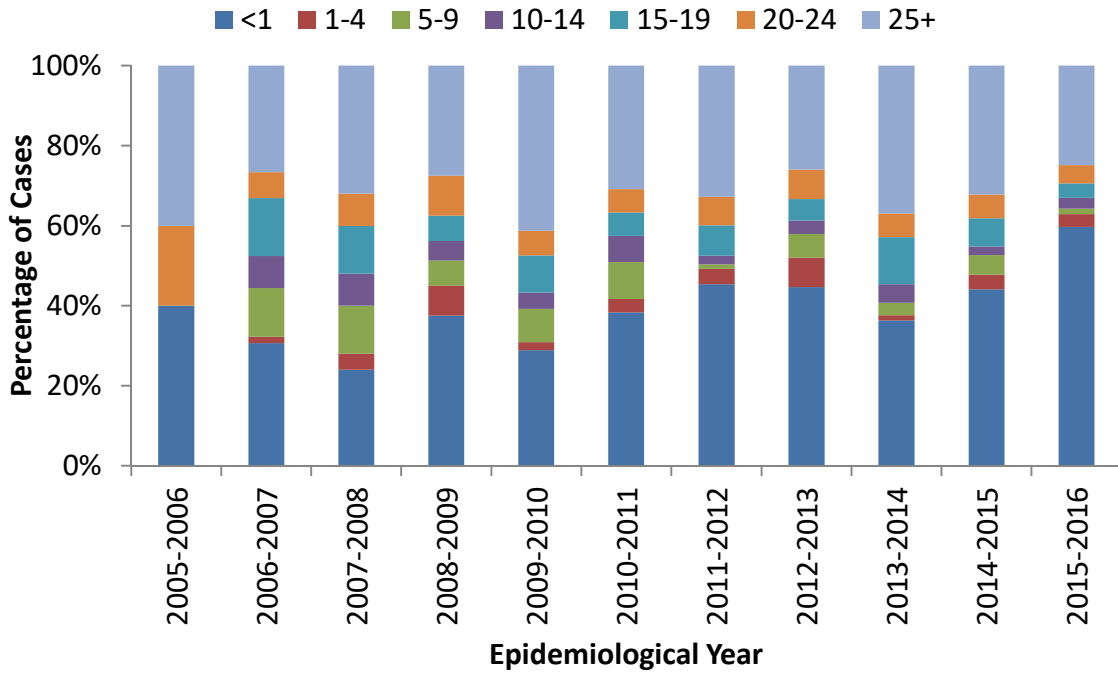


Figure 4. Percentage of enterovirus meningitis only cases in Ireland by age group (years) and epidemiological year, 2005-2006 to 2015-2016

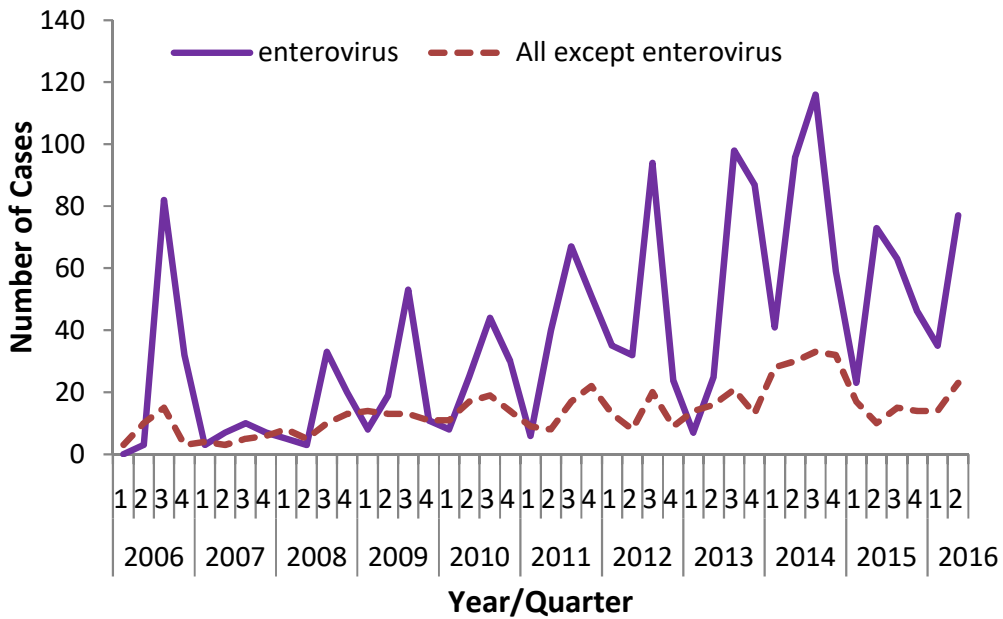


Figure 5. Number of viral meningitis (NOS) cases caused by enterovirus and not by enterovirus by quarter and year, 2006-2016

Haemophilus influenzae (invasive) infections

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

In Q2-2016, 15 cases of invasive *H. influenzae* (all case classified as confirmed) were notified in Ireland (Figure 6): Six were non-typeable/non-capsulated, two were type f, one was a type b (aged 55-59 with an unknown vaccination status), one was not a type b and five were not typed (of which three were diagnosed by PCR only). This total compares to an average of 12 cases for the same quarter in 2013 to 2015 (Appendices 8, 9). In the electronic listing provided by the Epidemiology and Molecular Biology Unit (EMBU) in Temple Street Children's Hospital on September 13th, 2016, two classified confirmed *H. influenzae* events on CIDR in Q2-2016 were not included on it: one each from HSE E and HSE NW. Appendices 10 and 11 give a breakdown of all Q2 cases notified since 2006 by HSE area and age group, respectively. Of all the Q2 cases reported between 2014 and 2016, 29.6% (n=13/44) had no clinical diagnosis reported (Table 4).

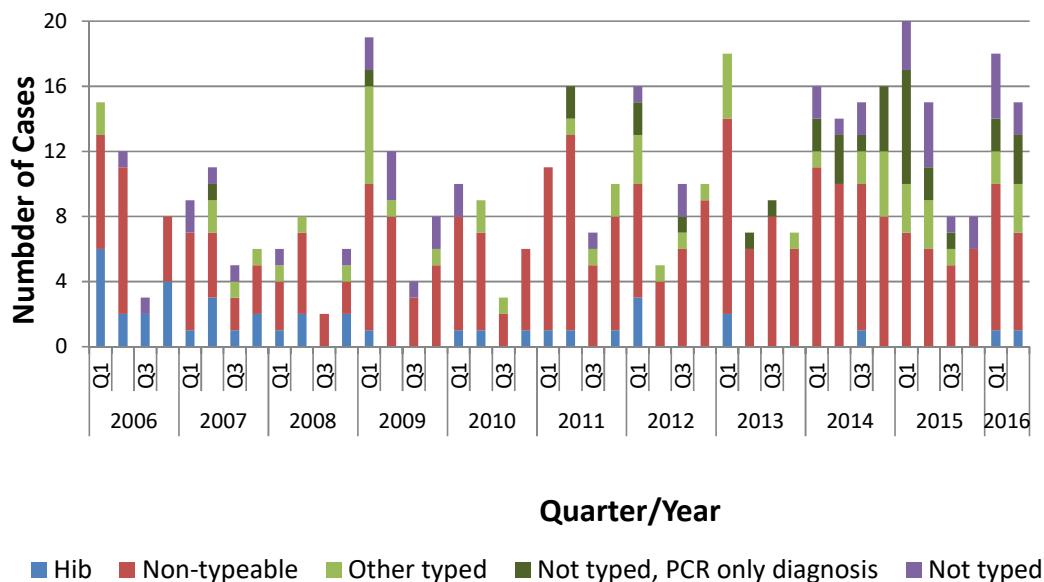


Figure 6. Quarterly number of *H. influenzae* cases by type since 2006

***H. influenzae* associated deaths**

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

***H. influenzae* meningitis**

No meningitis-related *H. influenzae* cases were reported in Q2-2016 (Table 5).

***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. One Hib case was reported in Q2-2016 in a 55-59 year old with no vaccination history. The last reported TVF however was in Q4-2010, the only one in nine years between Q3-2007 and Q2-2016: an indication of the continuing positive impact of the Hib immunisation catch-up booster campaign launched in November 2005 (Figure 7). 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.

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

In Q2-2016 the number of non-typeable cases was six (aged 6 months to 90 years), less than the average of 7.3 cases in the same quarter between 2013 and 2015 (Figure 8).

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

Number of cases	Q2-2014	Q2-2015	Q2-2016
All <i>H. influenzae</i>	14	15	15
All <i>H. influenzae</i> <5yrs	4	5	5
All <i>H. influenzae</i> ≥65yrs	6	6	4
<i>H. influenzae</i> type b	0	0	1
<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	10	6	6
<i>H. influenzae</i> non-typeable <5yrs	1	0	1
<i>H. influenzae</i> non-typeable ≥65yrs	6	5	2

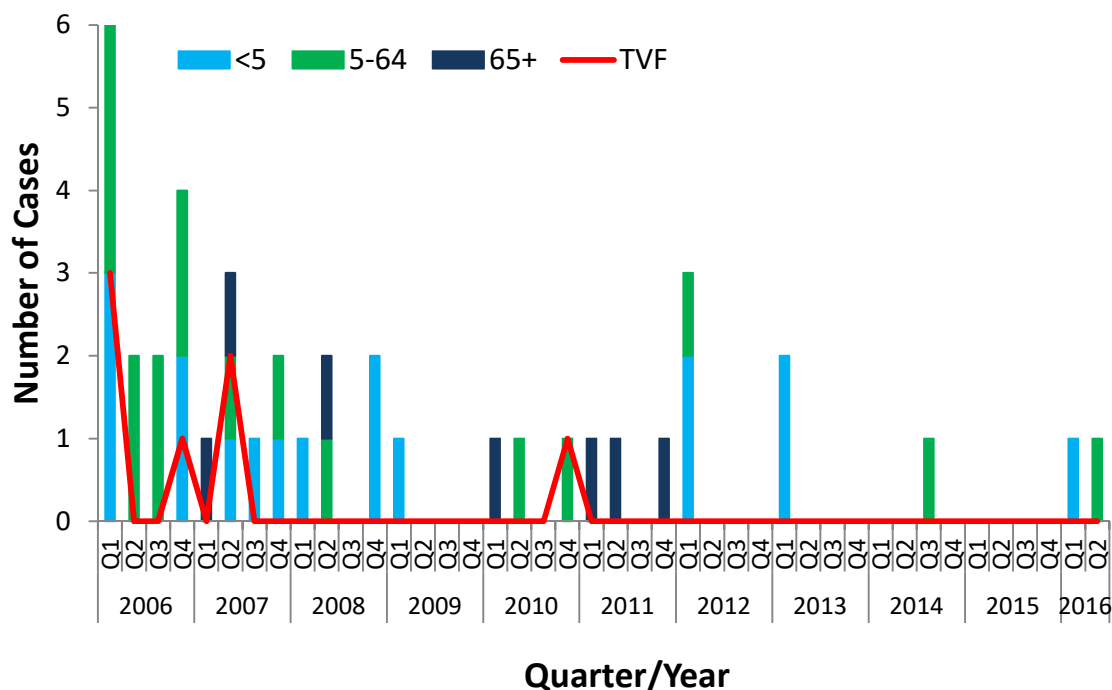
Table 4. Number of *H. influenzae* cases by clinical diagnosis notified in the second quarter of 2014, 2015 and 2016

Number of cases	Q2-2014	Q2-2015	Q2-2016	Total	Total (%)
Septicaemia	4	3	2	9	20.5%
Bacteraemia (without focus)	0	2	3	5	11.4%
Pneumonia	3	3	3	9	20.5%
Meningitis	1	1	0	2	4.5%
Meningitis & septicaemia	0	0	0	0	0.0%
Other	2	1	2	5	11.4%
Cellulitis	0	0	0	0	0.0%
Epiglottitis	0	1	0	1	2.3%
Osteomyelitis	0	0	0	0	0.0%
Septic arthritis	0	0	0	0	0.0%
Clinical diagnosis not reported	4	4	5	13	29.5%
Total	14	15	15	44	100%

Table 5. Number of *H. influenzae* cases by clinical diagnosis and type of infection, Q2-2016

Number of cases	Typed (b, e, f or not-b)	Non-typeable	Not typed*	Total
Septicaemia	1	1	0	2
Bacteraemia (without focus)	0	2	1	3
Pneumonia	2	0	1	3
Meningitis	0	0	0	0
Meningitis & septicaemia	0	0	0	0
Other	1	1	0	2
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	2	3	5
Total	4	6	5	15

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

**Figure 7.** Quarterly number of Hib cases by age group and of true Hib vaccine failures (TVFs), since 2006

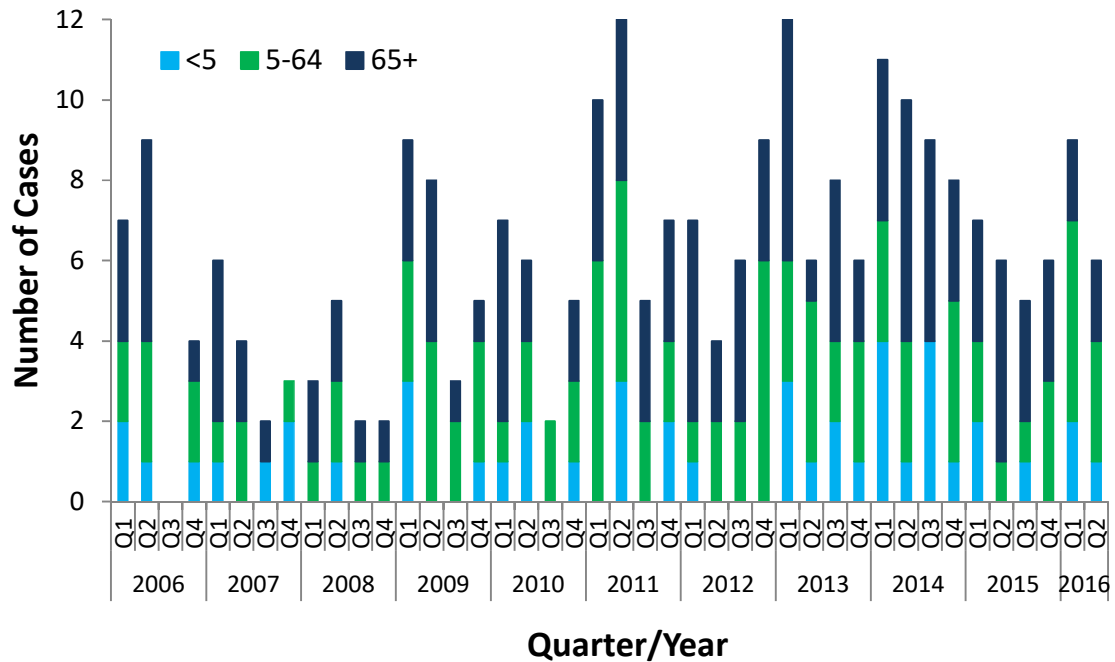


Figure 8. Quarterly number of non-typeable/non-capsulated cases by age group, since 2006

Acknowledgements

- HPSC wishes to thank all who provided data for this report: Departments of Public Health, the Irish Meningococcal and Meningitis Reference Laboratory (IMMRL) and Epidemiology and Molecular Biology Unit (EMBU) in Temple Street Children’s Hospital, National Virus Reference Laboratory (NVRL) and other Microbiology Laboratories

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>
- <http://www.hpsc.ie/A-Z/VaccinePreventable/BacterialMeningitis/SurveillanceForms/File,1832.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 IMMRL 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 IMMRL for confirmation of identity and epidemiological typing**

Appendices

Appendix 1. IMD Cases by Serogroup in Quarter 2, 2001-2016

Serogroup	Q2-2001	Q2-2002	Q2-2003	Q2-2004	Q2-2005	Q2-2006	Q2-2007	Q2-2008	Q2-2009	Q2-2010	Q2-2011	Q2-2012	Q2-2013	Q2-2014	Q2-2015	Q2-2016
B	64	47	33	36	46	40	40	28	27	17	19	13	22	15	13	9
C	3	4	0	1	0	2	1	1	1	1	1	0	0	2	1	5
W135	1	2	0	0	2	1	0	0	0	0	1	0	0	1	2	3
Y	0	1	0	1	2	1	0	0	2	0	0	0	1	1	0	0
Non-groupable (NG)	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
29E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No organism detected	17	6	4	9	7	11	3	2	3	5	3	0	2	1	1	1
Total	86	60	38	47	57	55	44	31	33	23	24	13	25	21	17	18

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	17	-	-
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	75	-	-

Appendix 3. IMD Cases by HSE Area in Quarter 2, 2001-2016

HSE Area	Q2-2001	Q2-2002	Q2-2003	Q2-2004	Q2-2005	Q2-2006	Q2-2007	Q2-2008	Q2-2009	Q2-2010	Q2-2011	Q2-2012	Q2-2013	Q2-2014	Q2-2015	Q2-2016	Q2-2016 CIR*
E	31	25	10	13	11	19	17	6	10	6	9	4	10	6	6	4	0.25
M	3	5	2	4	11	7	0	4	2	2	0	0	2	3	1	3	1.06
MW	7	4	7	4	5	7	3	3	6	0	3	1	1	0	6	1	0.26
NE	2	4	5	2	3	5	7	5	3	5	3	4	2	2	0	2	0.45
NW	5	3	4	3	1	3	4	2	0	2	1	0	1	1	0	3	1.16
SE	15	8	7	9	7	2	2	3	4	3	4	2	4	3	1	1	0.20
S	14	8	3	10	14	7	6	6	6	5	3	1	3	4	2	3	0.45
W	9	3	0	2	5	5	5	2	2	0	1	1	2	2	1	1	0.22
Total	86	60	38	47	57	55	44	31	33	23	24	13	25	21	17	18	0.39

* CIR, crude incidence rate per 100,000

Appendix 4. IMD Cases by Age Group in Quarter 2, 2001-2016

Age Group (Yrs)	Q2-2001	Q2-2002	Q2-2003	Q2-2004	Q2-2005	Q2-2006	Q2-2007	Q2-2008	Q2-2009	Q2-2010	Q2-2011	Q2-2012	Q2-2013	Q2-2014	Q2-2015	Q2-2016	Q2-2016 CIR*
<1	24	11	10	13	13	9	13	10	10	8	8	2	10	4	1	2	2.8
1-4	26	22	15	20	20	25	16	10	9	8	7	7	7	7	4	6	2.1
5-9	8	11	4	3	5	6	2	2	1	2	1	0	2	2	2	1	0.3
10-14	6	7	2	2	6	4	2	0	1	1	0	0	1	1	2	1	0.3
15-19	9	4	2	6	5	4	6	2	5	1	3	2	2	2	1	1	0.4
20-24	9	2	1	1	2	1	0	2	2	0	0	0	1	0	1	1	0.3
25-34	3	2	1	1	2	3	2	2	0	0	2	0	0	2	1	1	0.1
35-44	1	0	2	0	0	1	1	2	1	0	0	0	0	1	3	0	0.0
45-54	0	1	1	1	0	1	2	0	0	0	0	0	1	1	0	1	0.2
55-64	0	0	0	0	1	0	0	1	0	2	1	0	0	0	0	2	0.4
65+	0	0	0	0	3	1	0	0	4	1	2	2	1	1	2	2	0.4
Total	86	60	38	47	57	55	44	31	33	23	24	13	25	21	17	18	0.39

* CIR, crude incidence rate per 100,000

Appendix 5. Deaths associated with IMD by Serogroup in Quarter 2, 2001-2016

Serogroup	Q2-2001	Q2-2002	Q2-2003	Q2-2004	Q2-2005	Q2-2006	Q2-2007	Q2-2008	Q2-2009	Q2-2010	Q2-2011	Q2-2012	Q2-2013	Q2-2014	Q2-2015	Q2-2016
B	2	3	1	1	0	1	2	1	0	1	0	0	2	0	1	0
C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Y	0	0	0	0	1	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	0	0
29E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No organism detected	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Total	2	3	1	1	1	1	3	1	0	2	0	0	2	0	1	1
%CFR* (Total)	2.3%	5.0%	2.6%	2.1%	1.8%	1.8%	6.8%	3.2%	0.0%	8.7%	0.0%	0.0%	8.0%	0.0%	5.9%	5.6%

* %CFR, case fatality ratio

Appendix 6. Other Bacterial Meningitis Cases by Causative Organism (Specified and Not Otherwise Specified) in Quarter 2, 2006-2016 (excluding IMD and *Haemophilus influenzae*)

Type	Causative organism	Q2-2006	Q2-2007	Q2-2008	Q2-2009	Q2-2010	Q2-2011	Q2-2012	Q2-2013	Q2-2014	Q2-2015	Q2-2016	Q2:2006-2016
Specified	<i>Leptospira</i> spp.	0	0	0	0	0	0	0	0	0	0	0	0
	<i>Listeria</i> spp.	0	0	1	0	1	1	0	0	0	2	0	5
	<i>Mycobacterium tuberculosis</i> #	4	3	1	0	2	1	0	2	1	0	0	14
	<i>Streptococcus pneumoniae</i>	n/a	n/a	9	3	4	6	11	10	8	8	8	67
	<i>Streptococcus agalactiae</i> *	na	na	na	na	na	na	0	0	2	1	1	4
	<i>Streptococcus pyogenes</i>	1	0	1	0	0	0	1	1	0	0	0	4
Not otherwise specified	<i>Escherichia coli</i>	0	0	2	0	0	1	1	1	0	3	0	8
	<i>Micrococcus luteus</i>	0	0	0	0	0	0	0	0	1	0	0	1
	<i>Pasteurella multocida</i>	0	0	0	0	0	0	0	0	0	1	0	1
	<i>Staphylococcus aureus</i>	1	0	2	1	3	0	0	0	0	0	0	7
	<i>Streptococcus agalactiae</i>	2	2	0	3	2	3	0	0	0	0	0	12
	<i>Streptococcus bovis</i> biotype II/2	0	0	0	1	0	0	0	0	0	0	0	1
	Unknown/Not specified	7	7	0	5	6	5	5	1	5	5	3	49
Total	15	12	16	13	18	17	18	15	17	20	12	173	

#TB meningitis figures for 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 2 2006-2016

Causative Organism	Q2-2006	Q2-2007	Q2-2008	Q2-2009	Q2-2010	Q2-2011	Q2-2012	Q2-2013	Q2-2014	Q2-2015	Q2-2016
enterovirus	3	7	3	19	25	40	32	25	96	73	77
human herpes virus type 6	0	0	0	0	2	4	6	8	11	2	9
varicella / herpes zoster virus	0	0	3	0	5	1	0	1	2	6	3
herpes simplex virus (incl. types 1 or 2)	0	1	0	2	1	2	0	0	1	1	0
parechovirus	0	0	0	0	0	0	0	0	5	0	0
echovirus (incl. types, 6, 9, 13, 30 or 33)	0	0	1	0	0	0	0	0	0	0	1
coxsackievirus (incl. types A, B or B4)	0	0	0	0	0	0	0	0	0	0	1
adenovirus	0	0	0	0	0	0	0	0	0	0	0
not specified	10	2	1	11	9	1	2	7	11	1	9
Total	13	10	8	32	42	48	40	41	126	83	100
% enterovirus	23.1%	70.0%	37.5%	59.4%	59.5%	83.3%	80.0%	61.0%	76.2%	88.0%	77.0%
% known organism	23.1%	80.0%	87.5%	65.6%	78.6%	97.9%	95.0%	82.9%	91.3%	98.8%	91.0%

Appendix 8. *H. influenzae* Cases by Type in Quarter 2, 2006-2016

Type	Q2-2006	Q2-2007	Q2-2008	Q2-2009	Q2-2010	Q2-2011	Q2-2012	Q2-2013	Q2-2014	Q2-2015	Q2-2016
b	2	3	2	0	1	1	0	0	0	0	1
e	0	0	0	1	0	1	0	0	0	0	0
f	0	2	1	0	2	0	1	0	0	1	2
not type-b	0	0	0	0	0	0	0	0	0	2	1
non-typeable/non-capsulated	9	4	5	8	6	12	4	6	10	6	6
not typed*	1	2	0	3	0	2	0	1	4	6	5
Total	12	11	8	12	9	16	5	7	14	15	15

*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	-	-
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 2, 2006-2016

HSE Area	Q2-2006	Q2-2007	Q2-2008	Q2-2009	Q2-2010	Q2-2011	Q2-2012	Q2-2013	Q2-2014	Q2-2015	Q2-2016	Q2-2016 CIR*
E	4	4	3	1	2	8	0	0	4	8	8	0.49
M	1	0	0	1	1	1	0	1	3	1	2	0.71
MW	2	0	2	2	0	0	0	2	1	1	1	0.26
NE	1	0	0	0	1	3	1	2	1	1	1	0.23
NW	1	0	0	1	1	0	0	0	0	0	1	0.39
SE	1	3	1	2	1	2	3	0	3	0	2	0.40
S	2	1	1	5	3	0	0	2	1	2	0	0.00
W	0	3	1	0	0	2	1	0	1	2	0	0.00
Total	12	11	8	12	9	16	5	7	14	15	15	0.33

* CIR, crude incidence rate per 100,000

Appendix 11. *H. influenzae* Cases by Age Group in Quarter 2, 2006-2016

Age Grp (Yrs)	Q2-2006	Q2-2007	Q2-2008	Q2-2009	Q2-2010	Q2-2011	Q2-2012	Q2-2013	Q2-2014	Q2-2015	Q2-2016	Q2-2016 CIR*
<1	0	1	2	0	2	3	0	0	3	2	4	5.52
1-4	1	0	0	0	0	2	0	1	1	3	1	0.35
5-9	2	0	1	1	1	0	0	0	0	0	0	0.00
10-14	0	1	0	0	0	0	0	0	0	0	0	0.00
15-19	0	0	0	0	0	1	1	0	0	0	0	0.00
20-24	0	0	1	0	1	0	0	1	0	2	1	0.34
25-34	0	0	0	0	1	2	0	1	0	1	1	0.13
35-44	0	1	0	1	2	0	2	2	2	0	0	0.00
45-54	1	0	1	0	0	0	0	0	0	1	2	0.35
55-64	2	3	0	3	0	2	0	1	2	0	2	0.43
65+	6	5	3	7	2	6	2	1	6	6	4	0.75
Total	12	11	8	12	9	16	5	7	14	15	15	0.33

* CIR, crude incidence rate per 100,000