

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



Q3-2017

11th January 2018

Provisional Figures

Summary

- 12 invasive meningococcal disease cases (IMD) were notified in Q3-2017, including three serogroup B, two serogroup C, four serogroup W135, one each of serogroups Y and 29E and one not specified. Of the two serogroup C cases, one was unvaccinated (aged 20-24 years), the other had an unknown vaccination status (aged 15-19 years). One IMD related death was reported in a foreign-born child with a serogroup W135 infection; no vaccination details were reported with this case. No imported cases were identified in this quarter.
- Four cases of invasive *Streptococcus pneumoniae* infections presenting as meningitis were notified (range <1 to 70-74 years). Other meningitis-related infections reported included four cases of meningitis-related *Streptococcus agalactiae* (aged 1-3 weeks) and one case of leptospirosis (aged 20-24 years). Eight cases of bacterial meningitis due to pathogens not otherwise specified (NOS) were also notified, including five that had *Escherichia coli* as their causative organism (age range <1 week to 65-69 years), one of whom died. No imported cases were reported.
- 86 cases of viral meningitis NOS, were reported, 68 (79.1%) of which were enterovirus (four enterovirus group A, 48 enterovirus group B, one rhinovirus A and five whose genotype could not be generated and 10 not specified). Other causative organisms identified were 13 human herpes virus type 6, three herpes simplex virus and two parechovirus identified. One viral meningitis case (aged 4 months) was diagnosed with both HHV 6 and enterovirus, but for reporting purposes the infection has been attributed to human herpes virus type 6 only. No deaths or imported cases were reported in this quarter. A family cluster of two enterovirus-related viral meningitis cases (aged 3 months) was reported in HSE South.
- Seven cases of *Haemophilus influenzae* were reported, none of which was associated with meningitis. Four of the cases were non-typeable, one was a type b (aged 65+ years with no vaccination details), one was not a type b and one was not typed. No deaths were reported during this quarter, nor were there any imported cases.

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 < 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. This dose 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. Further changes occurred in 2015 when NIAC recommended that all babies born on or after July 1st 2015 should receive a single dose of MCC 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 following agreement to include meningococcal B vaccine (MenB) into the primary immunisation programme. All babies born on or after 1st October 2016 are now offered MenB vaccine at 2, 4 and 12 months of age. The programme started on 1st December 2016. The MenB vaccine cannot be given at same time as MenC vaccine (which is given at 6 and 13 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 11th January 2018. **These figures are provisional.** Incidence rates for 2017 were calculated using the 2016 Census of Population as denominator data.

Results

Meningococcal Disease (invasive) (IMD)

IMD Cases by Serogroup & Case Classification

In Q3-2017, 12 cases of IMD were notified, all but two were confirmed. Three were serogroup B, two serogroup C, four serogroup W135, one serogroup Y, one serogroup 29E and one not specified (Table 1). This quarter represents the first time that the number of MenW135 cases has exceeded that of MenB cases. Details of the number of doses of the meningococcal C conjugate vaccine received, age group and outcome of the two serogroup C cases are presented in Table 2. In Q3-2017 serogroup B disease accounted for 25% (n=3/12; 95%CI 0.5-49.52%) of all IMD notifications (Figure 1, Appendix 1).

Table 1. Classification of IMD cases notified by Serogroup in Q3-2017

Case Classification	B	C	W135	Y	NG	29E	No organism detected	Total
Confirmed	3	2	4	1	0	0	0	10
Probable	0	0	0	0	0	0	0	0
Possible	0	0	0	0	0	1	1	2
Not specified	0	0	0	0	0	0	0	0
Total	3	2	4	1	0	1	1	12

*Meningococcal conjunctivitis

Table 2. Details of the MenC cases notified in Q3-2017 including age group, outcome and age at vaccination

Case No.	Age Grp	Outcome	Vaccination Status	No. MenC doses given	Age at (Last) Vaccination
1	20-24	Recovering	Unvaccinated	0	.
2	15-19	Recovered	Unknown		.

IMD Trends & Outbreaks

The number of IMD cases reported in Q3-2017 (n=12) was less than the average number reported in the same quarter over the previous three years (average=14.3, 95%CI 6.6-22.1); for serogroup B the average was 8.3 and for serogroup C it was 3.0 (Figure 1; Appendix 1). Third quarterly IMD cases have fallen by 77.3% since 2002 (Appendix 2). Also since 2002, Q3 serogroup B cases have also declined by 92.9%, but the percentage of serogroup C cases has remained unchanged in that time (Appendix 1).

All meningococcal confirmed cases were reported on CIDR in Q3-2017 that were also included in the electronic listing of laboratory tested *N. meningitidis* isolates/specimens provided to the HPSC on November 20th 2017 by the Irish Meningitis and Sepsis Reference Laboratory (IMSRL).

IMD Cases by HSE Area and Age Group

The crude incidence rate in Q3-2017 was 0.25 cases per 100,000 population, ranging from the lowest (0.0/100,000) in HSE NE to the highest (0.68/100,000) in HSE M (Appendix 3). The burden of IMD disease is typically highest in the <1 year of age group and in Q3-2017 the incidence rate in this age group was 3.2 cases per 100,000 population, followed by 1.1 cases/100,000 in the 1-4 year age group (Appendix 4).

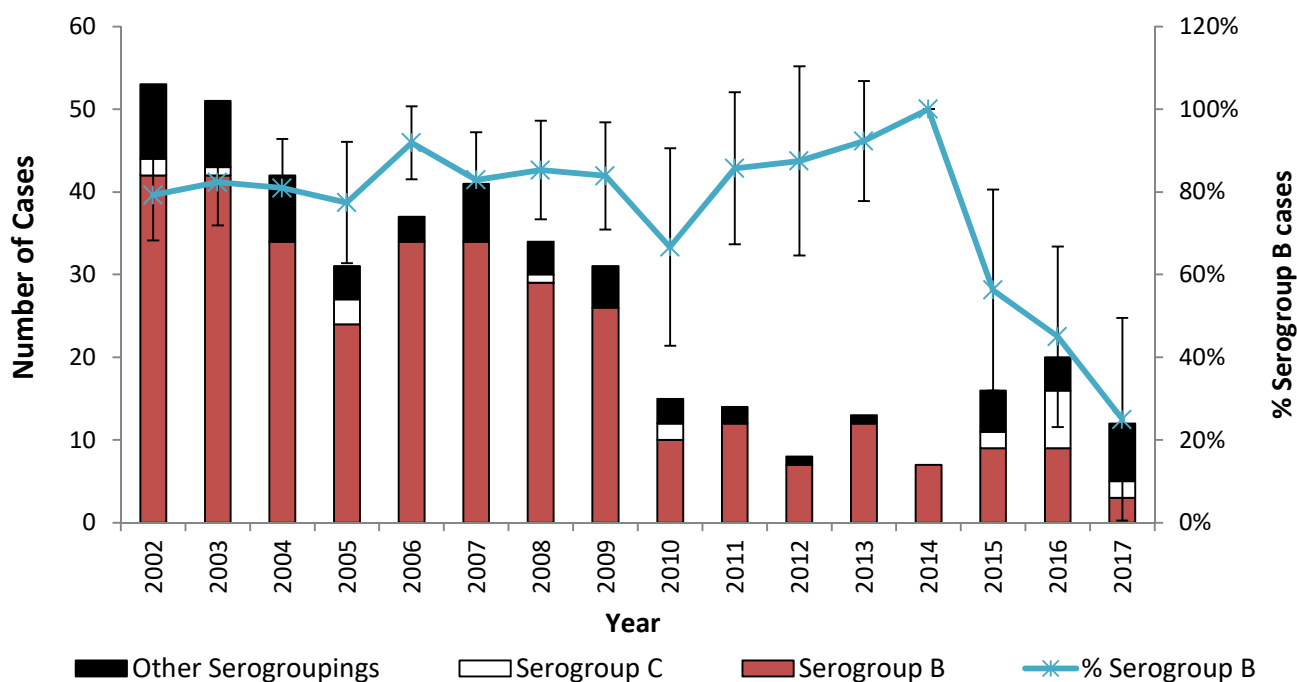


Figure 1. Number of IMD cases notified in Ireland by serogroup in Q3 of each year between 2002 and 2017 with percentage of quarterly cases attributable to serogroup B with 95% confidence intervals

IMD associated deaths

One IMD related death was reported in Q3-2017 in a foreign-born child aged 5-9 years with a serogroup W135 infection (Appendix 5); no vaccination details were reported with this case. This compares to an average of one death in Q3 between 2014 and 2016.

Other Forms of Bacterial Meningitis

Streptococcus pneumoniae meningitis

In Q3-2017, four cases of invasive *S. pneumoniae* infections (IPD) presenting as meningitis were notified. The age range was <1 and 70-74 years (Appendix 6). No IPD meningitis-related deaths were reported in this quarter. Two patients had a risk factor recorded. Details of the vaccination status, age group, risk factor and serotype of these four cases are presented in Table 3 below.

Table 3. Vaccination status, age and risk factors and serotype details of the *Streptococcus pneumoniae* meningitis cases reported in Q3-2017

Case. No.	Age Group	Risk factors	PCV vaccination status	PPV vaccination status	Serotype
1	40-44	Yes	Unvaccinated	Unvaccinated	.
2	<1	No specified	Vaccinated (1 dose)	Not specified	.
3	70-74	No	Unvaccinated	Unvaccinated	.
4	70-74	Yes	Unknown	Unknown	.

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*)

Four cases of meningitis-related *Streptococcus agalactiae* (aged 1- 3 weeks) and one case of leptospirosis (aged 20-24 years) were reported in this quarter. One CSF PCR positive case of *Streptococcus agalactiae* (aged 2 months) was also reported in this quarter; the latter case however, was not labelled as having clinical meningitis or any other clinical description. No imported cases were reported.

Bacterial meningitis (not otherwise specified)

Eight cases of bacterial meningitis due to pathogens not otherwise specified (NOS) were notified during Q3-2017. These included five that were case classified as confirmed, one as probable and two as possible. Of the eight cases, five had their causative organism identified, all of which were *Escherichia coli* (age range <1 week to 65-69 years) (Appendix 6). One death from an *E. coli* infection was reported in this quarter. No imported cases were reported.

Viral Meningitis (Specified and Not Otherwise Specified)

Eighty-six viral meningitis notifications (NOS) (aged 1 week to 43 years; median four months were reported in Q3-2017) (Figure 2), all had their causative organism identified: 68 enterovirus (aged 1 week to <45 years; median 4 months); 13 human herpes virus type 6 (HHV 6) (aged 3 weeks to 24 years); three herpes simplex virus (two type 2 and one type 1, age range 30-43 years), and two parechovirus (aged 2-4 months). There was one viral meningitis case (aged 4 months) diagnosed with both HHV 6 and enterovirus, but for the purposes of reporting, this case is presented in the summary results as having HHV 6 only because a second enterovirus related viral meningitis event was not created in CIDR for this patient in Q3-2017. No deaths or imported cases were reported in this quarter. However, a family cluster of two enterovirus-related viral meningitis cases was reported in HSE-South, both aged 3 months.

All but two viral meningitis enterovirus typing records in Q3 and Q4 of 2017 provided by the NVRL (Figures 3, 4) provided to the HPSC on the February 2nd 2018 were matched to CIDR event ID numbers.

In Q3-2017, the highest frequency of cases occurred in children <1 year of age (n=49/86; 57.0%) and in adults aged 15-39 years (n=23/86; 26.7%) (Figure 2). Of the 49 cases <1 year of age reported in this quarter, 37 (75.5%) were attributable to enterovirus, 10 to HHV 6 (20.4%) and two to parechovirus (4.1%). (One of the 49 cases under <1 year of age was diagnosed with both HHV 6 and enterovirus, but for reporting purposes, the viral meningitis infection has been attributed to HHV 6 only). 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 six in Q3-2017), 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 2007. The average Q3 percentage of all viral meningitis NOS cases attributable to enterovirus since 2010 to date has been 80.3%. Details of enterovirus serotypes by age group in Q3-2017 are presented in Table 4 and shows that the numbers of cases are highest in the <1 and 15-39 year age groups.

Haemophilus influenzae (invasive) infections

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

In Q3-2017, seven cases of invasive *H. influenzae* (all case classified as confirmed) were notified (Figure 6): four of the cases were non-typeable, one was a type b (aged 65+ years with no vaccination details), one was not a type b and one was not typed. This total compares to an average of 11.3 cases for the same quarter in 2014 to 2016 (Table 5, Appendices 8, 9). Of all the Q3 cases reported between 2015 and 2017, 15.4% (n=4/26) had no clinical diagnosis reported (Table 6). There were no imported cases during this quarter were reported.

In the electronic listing provided by the Irish Meningitis and Sepsis Reference Laboratory (IMSRL) in Temple Street Children's Hospital to the HPSC on November 20th 2017, all classified confirmed *H. influenzae* events on CIDR in Q3-2017 were included on it.

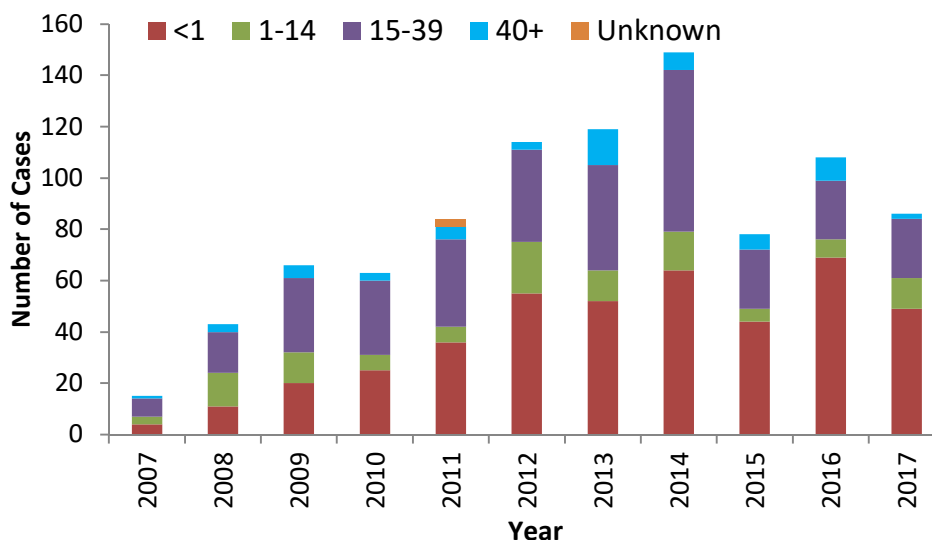


Figure 2. Quarter 3 number of viral meningitis (NOS) cases in Ireland by age group (years), 2007-2017

***H. influenzae* associated deaths**

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

***H. influenzae* meningitis**

No meningitis-related *H. influenzae* cases were reported in Q3-2017 (Table 7).

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 Q3-2017. The last reported TVF however was in Q4-2010, the only one in over ten years between Q3-2007 and Q3-2017: an indication of the continuing positive impact of the Hib immunisation catch-up booster campaign launched in November 2005 and introduction of a routine Hib booster for all children in the second year of life since 2006 (Figures 5, 6). 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.

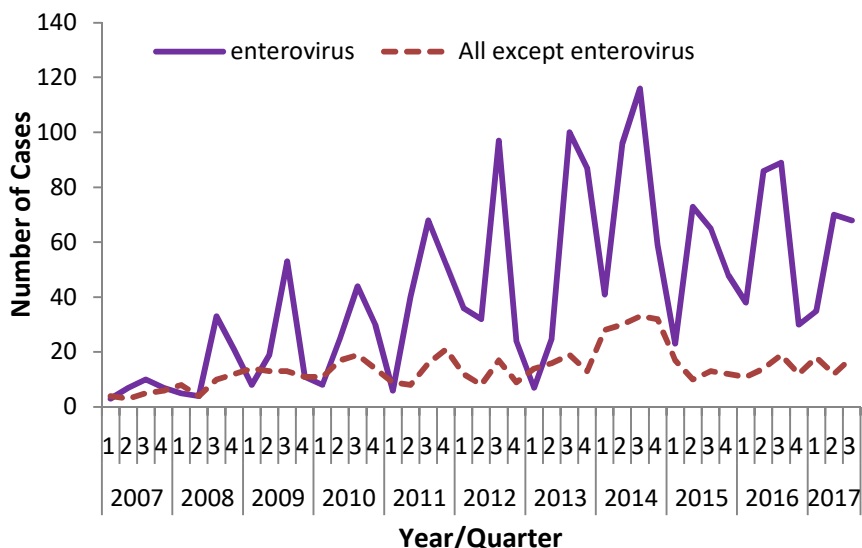


Figure 3. Number of viral meningitis (NOS) cases caused by enterovirus and not by enterovirus by quarter and year, 2007-2017 (excludes one case which was diagnosed with both HHV6 and enterovirus in Q3-2017)

Table 4. Enterovirus genotypes by age group (years) on CIDR in Q3-2017* (Enterovirus genotyping targets the VP1 gene of the virus)

Genus	Species	Type	Age Group (years)					Total
			<1	1-4	5-14	15-39	40+	
Enterovirus	Enterovirus A	Coxsackievirus A6	2	0	0	0	0	2
		Enterovirus 71 C1	2	0	0	0	0	2
	Enterovirus B	Coxsackievirus A9	1	1	0	0	0	2
		Coxsackievirus B1	1	0	1	0	0	2
		Coxsackievirus B2	1	2	0	0	0	3
		Coxsackievirus B3	1	0	0	0	0	1
		Coxsackievirus B5	1	0	0	0	0	1
		Echovirus 2	1	0	0	0	0	1
		Echovirus 3	1	0	0	0	0	1
		Echovirus 5	5	0	1	5	0	11
		Echovirus 6	1	0	0	2	0	3
		Echovirus 7	0	0	1	0	0	1
		Echovirus 9	2	0	0	1	0	3
		Echovirus 11	4	1	0	2	0	7
		Echovirus 25	3	0	0	1	0	4
	Echovirus 30	3	0	1	4	0	8	
	Enterovirus C		0	0	0	0	0	0
	Enterovirus D		0	0	0	0	0	0
	Rhinovirus A	Not specified	0	0	0	0	1	1
	Unable to generate sequence		3	0	1	1	0	5
Not specified		5	0	1	4	0	10	
Total			37	4	6	20	1	68

*excludes one case which was diagnosed with both HHV 6 and enterovirus in Q3-2017

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

In Q3-2017 the number of non-typeable cases reported was four (aged 20 to 65+ years), less than the average of seven cases in the same quarter between 2014 and 2016 (Figure 7).

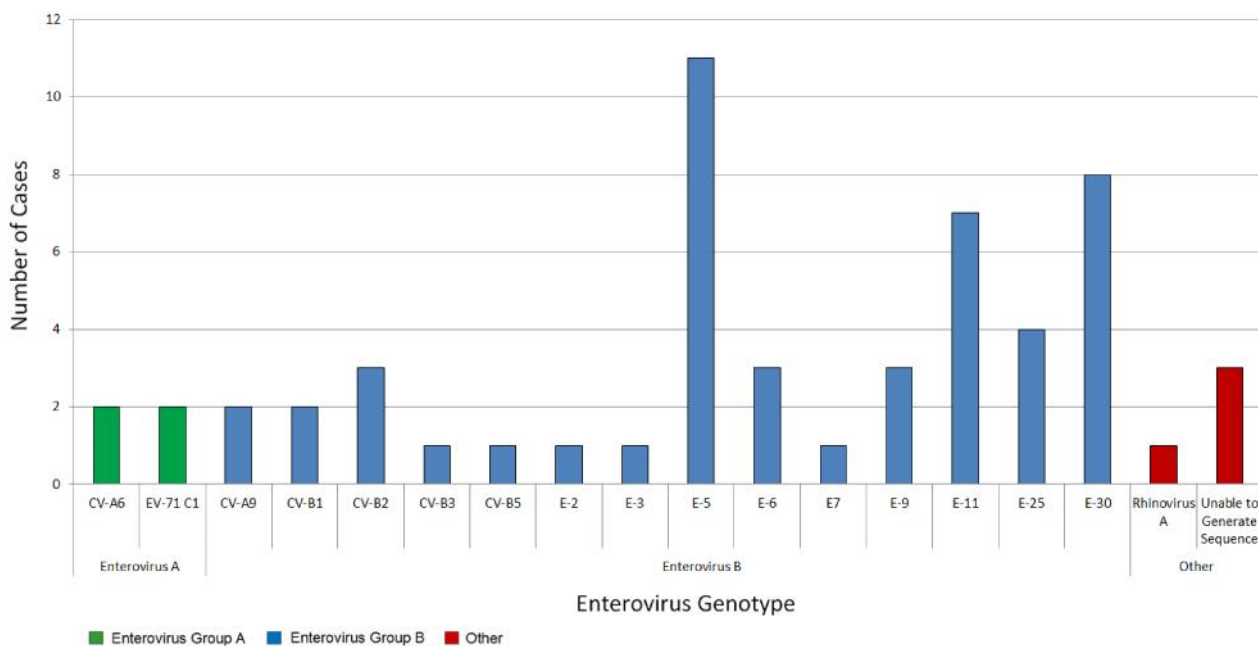


Figure 4. Breakdown of enterovirus genotypes reported by NVRL in Q3-2017

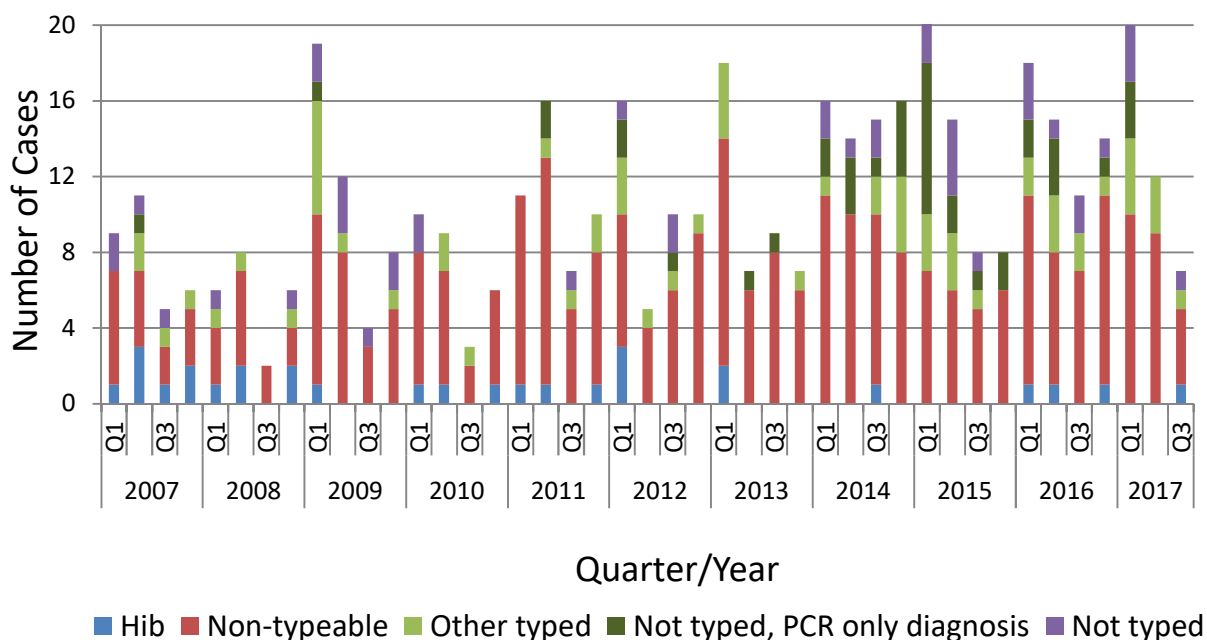


Figure 5. Quarterly number of H. influenzae cases by type since 2007

Table 5. Number of H. influenzae cases notified in the third quarter of 2015, 2016 and 2017

Number of cases	Q3-2015	Q3-2016	Q3-2017
All H. influenzae	8	11	7
All H. influenzae <5yrs	2	1	1
All H. influenzae ≥65yrs	4	4	3
H. influenzae type b	0	0	1
H. influenzae type b <5yrs	0	0	0
H. influenzae type b ≥65yrs	0	0	1
H. influenzae non-typeable	5	7	4
H. influenzae non-typeable <5yrs	1	1	0
H. influenzae non-typeable ≥65yrs	3	1	2

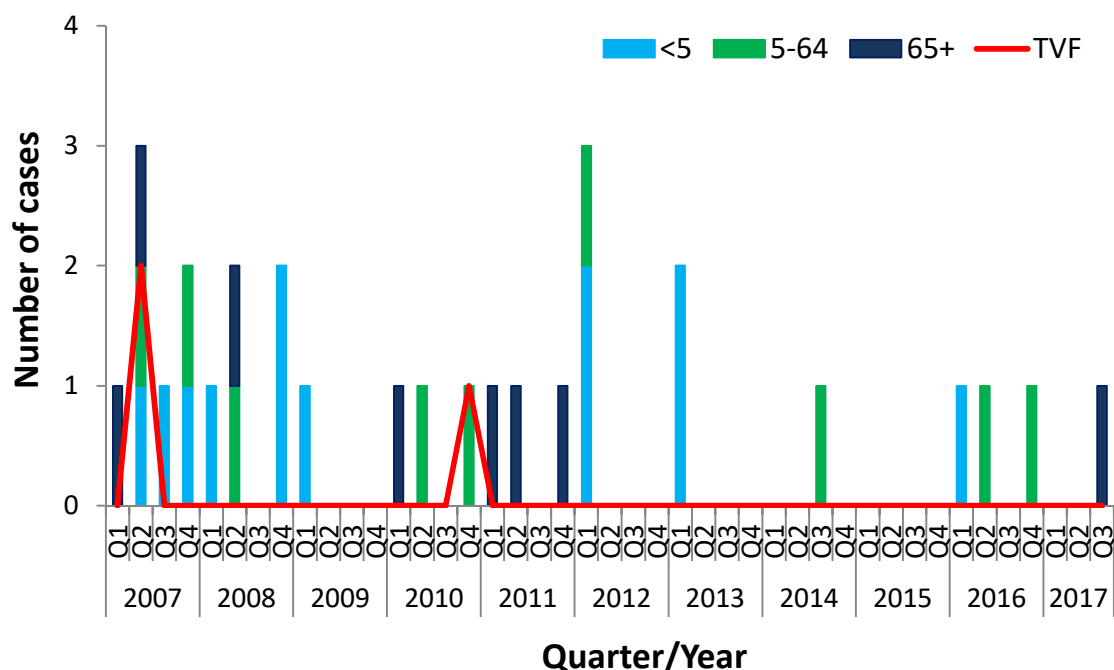
Table 6. Number of *H. influenzae* cases by clinical diagnosis notified in the third quarter of 2015, 2016 and 2017

Number of cases	Q3-2015	Q3-2016	Q3-2017	Total	Total (%)
Septicaemia	4	7	2	13	50.0%
Bacteraemia (without focus)	2	2	1	5	19.2%
Pneumonia	0	2	0	2	7.7%
Meningitis	0	0	0	0	0.0%
Meningitis & septicaemia and/or other	1	0	0	1	3.8%
Other	0	0	1	1	3.8%
Cellulitis	0	0	0	0	0.0%
Epiglottitis	0	0	0	0	0.0%
Osteomyelitis	0	0	0	0	0.0%
Septic arthritis	0	0	0	0	0.0%
Clinical diagnosis not reported	1	0	3	4	15.4%
Total	8	11	7	26	100%

Table 7. Number of *H. influenzae* cases by clinical diagnosis and type of infection, Q3-2017

Number of cases	Typed (b, d, e, f, d or not-b)	Non-typeable	Not typed*	Total
Septicaemia	0	2	0	2
Bacteraemia (without focus)	0	1	0	1
Pneumonia	0	0	0	0
Meningitis	0	0	0	0
Meningitis & septicaemia and/or other	0	0	0	0
Other	1	0	0	1
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	1	1	1	3
Total	2	4	1	7

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

**Figure 6.** Quarterly number of Hib cases by age group and of true Hib vaccine failures (TVFs), since 2007

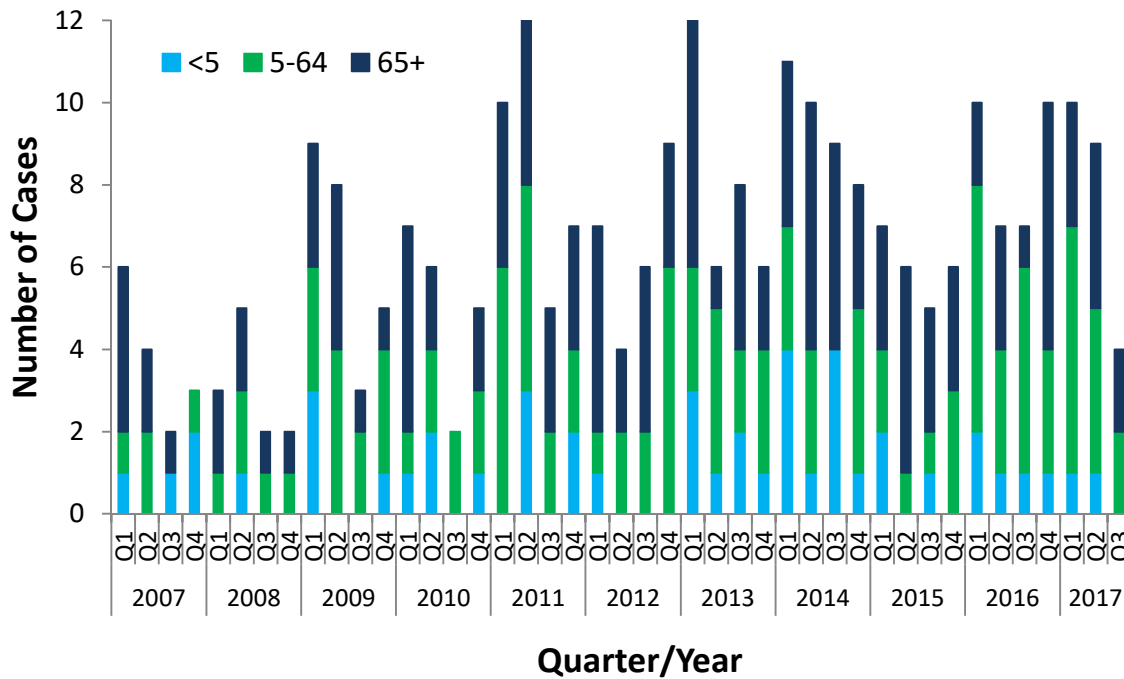


Figure 7. Quarterly number of non-typeable/non-capsulated cases by age group, since 2007

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. If an isolate is not available, please forward residual sample or PCR extract for confirmation/typing. Details are available at <http://www.cuh.ie/healthcare-professionals/departments/laboratory/> and at <http://www.cuh.ie/healthcare-professionals/departments/irish-meningitis-sepsis-reference-laboratory-imsrl/>

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. Details are available at <http://www.cuh.ie/healthcare-professionals/departments/laboratory/> and at <http://www.cuh.ie/healthcare-professionals/departments/irish-meningitis-sepsis-reference-laboratory-imsrl/>

APPENDICES

Appendix 1. IMD Cases by Serogroup in Quarter 3, 2002-2017

Serogroup	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	Q3-2017
B	42	42	34	24	34	34	29	26	10	12	7	12	7	9	9	3
C	2	1	0	3	0	0	1	0	2	0	0	0	0	2	7	2
W135	2	0	0	0	0	0	1	0	0	0	0	0	0	0	2	4
Y	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1
Non-groupable (NG)	0	0	0	0	0	0	1	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	1
No organism detected	7	8	8	4	3	7	2	5	3	2	1	1	0	2	1	1
Total	53	51	42	31	37	41	34	31	15	14	8	13	7	16	20	12

Appendix 2. IMD Cases by Quarter, 2002-2017

Qr	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2002-2017 change
Q1	82	73	66	72	73	57	55	52	52	35	24	23	24	22	23	27	-67.1%
Q2	60	38	47	57	55	44	31	33	23	24	13	25	21	17	18	20	-66.7%
Q3	53	51	42	31	37	41	34	31	15	14	8	13	7	16	20	12	-77.4%
Q4	58	75	43	43	44	37	48	31	24	21	21	20	30	19	26	-	-
Total	82	73	66	72	73	57	55	52	52	35	24	23	24	22	23	-	-

Appendix 3. IMD Cases by HSE Area in Quarter 3, 2002-2017

HSE Area	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	Q3-2017	Q3-2017 CIR*
E	23	12	12	16	14	12	11	15	3	6	2	3	2	5	10	3	0.18
M	4	6	0	2	0	1	4	2	0	0	2	0	1	0	0	2	0.68
MW	5	5	5	1	2	5	1	3	0	1	2	2	0	1	1	1	0.26
NE	5	6	6	2	5	6	3	2	1	1	0	1	1	3	2	0	0.00
NW	5	1	2	3	1	3	1	3	1	0	1	2	0	2	1	1	0.39
SE	3	7	10	0	5	3	4	0	3	1	0	2	1	3	1	1	0.14
S	5	13	6	5	6	7	7	3	4	3	1	1	1	2	4	2	0.39
W	3	1	1	2	4	4	3	3	3	2	0	2	1	0	1	2	0.44
Total	53	51	42	31	37	41	34	31	15	14	8	13	7	16	20	12	0.25

* CIR, crude incidence rate per 100,000

Appendix 4. IMD Cases by Age Group in Quarter 3, 2002-2017

Age Group (Yrs)	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	Q3-2017	Q3-2017 CIR*
<1	19	21	13	10	15	13	11	11	4	4	2	7	3	5	6	2	3.21
1-4	14	14	18	12	7	11	9	7	6	4	2	1	2	0	2	3	1.11
5-9	1	1	1	2	3	4	1	3	1	0	0	0	0	1	1	2	0.56
10-14	5	3	1	1	0	4	2	1	0	1	0	0	0	1	2	0	0.00
15-19	4	5	3	1	6	5	5	5	0	1	1	2	1	4	2	1	0.33
20-24	3	1	3	1	3	0	2	1	0	3	1	1	0	0	2	2	0.73
25-34	3	1	3	0	0	1	1	0	1	0	0	0	0	0	0	0	0.00
35-44	3	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0.00
45-54	0	1	0	0	1	1	0	1	1	0	2	0	1	1	2	0	0.00
55-64	0	3	0	2	0	1	3	1	0	0	0	0	0	1	2	0	0.00
65+	1	1	0	1	1	1	0	0	2	1	0	2	0	3	1	2	0.31
Total	53	51	42	31	37	41	34	31	15	14	8	13	7	16	20	12	0.25

* CIR, crude incidence rate per 100,000

Appendix 5. Deaths associated with IMD by Serogroup in Quarter 3, 2002-2017

* %CFR, case fatality ratio

Serogroup	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	Q3-2017
B	2	4	1	1	2	1	1	1	1	1	0	1	0	1	0	0
C	0	1	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	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	1	0	0
29E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No organism detected	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2	5	3	1	2	1	1	1	1	1	0	1	0	2	0	1
%CFR* (Total)	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	8.3

Appendix 6. Other Bacterial Meningitis Cases by Causative Organism (Specified and Not Otherwise Specified) in Quarter 3, 2007-2017 (excluding IMD and *Haemophilus influenzae*)

Causative organism	Q3-2007	Q3-2008	Q3-2009	Q3-2010	Q3-2011	Q3-2012	Q3-2013	Q3-2014	Q3-2015	Q3-2016	Q3-2017	Q3: 2007-17
Specified												
<i>Leptospira</i> spp.	0	1	0	0	1	1	0	0	0	0	1	4
<i>Listeria</i> spp.	1	0	1	2	0	1	0	1	0	2	0	8
<i>Mycobacterium tuberculosis</i> #	1	2	3	2	0	0	0	0	2	0	0	10
<i>Streptococcus pneumoniae</i>	n/a	3	3	4	4	7	5	4	6	3	4	43
<i>Streptococcus agalactiae</i> *	na	na	na	na	na	4	2	0	0	1	4	11
<i>Streptococcus pyogenes</i>	0	0	0	0	0	0	0	0	1	0	0	1
<i>Salmonella</i> spp.	0	0	0	0	0	0	0	0	0	0	0	0
Not specified												
<i>Citrobacter koseri</i>	0	1	0	0	0	0	0	0	0	0	0	1
<i>Enterococcus faecalis</i>	0	1	1	0	0	0	0	0	0	0	0	2
<i>Enterococcus faecium</i>	0	0	0	0	0	1	0	0	0	0	0	1
<i>Escherichia coli</i>	0	3	0	0	0	4	0	4	4	1	5	21
<i>Escherichia coli</i> / <i>Haemophilus influenzae</i>	0	0	0	0	0	0	0	0	0	1	0	1
<i>Gamella</i> spp.	1	0	0	0	0	0	0	0	0	0	0	1
<i>Klebsiella pneumoniae</i>	0	0	0	0	0	0	0	1	0	0	0	1
<i>Staphylococcus aureus</i>	0	1	1	0	1	1	0	0	1	0	0	5
<i>Staphylococcus aureus</i> & <i>Staphylococcus capitis</i>	0	0	0	0	0	1	0	0	0	0	0	1
<i>Staphylococcus capitis</i>	0	0	0	1	0	0	0	0	0	0	0	1
<i>Streptococcus agalactiae</i> †	1	1	1	3	7	0	0	0	0	0	0	13
<i>Streptococcus salivarius</i>	0	0	0	0	0	0	1	0	0	0	0	1
<i>Streptococcus suis</i>	0	0	0	0	0	0	0	1	0	0	0	1
Unknown/Not specified	4	6	9	2	4	4	6	2	4	2	3	46
Total	8	19	19	14	17	24	14	13	18	10	17	173

#TB meningitis figures for 2016 and 2017 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 notifiablen/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, 2007-2017

Causative Organism	Q3-2007	Q3-2008	Q3-2009	Q3-2010	Q3-2011	Q3-2012	Q3-2013	Q3-2014	Q3-2015	Q3-2016	Q3-2017
enterovirus group A	0	0	0	0	0	0	0	0	0	0	4
enterovirus group B	0	0	0	0	0	0	0	0	0	0	48
enterovirus group C	0	0	0	0	0	0	0	0	0	0	0
enterovirus group D	0	0	0	0	0	0	0	0	0	0	0
rhinovirus A	0	0	0	0	0	0	0	0	0	0	1
enterovirus group not specified	10	33	53	44	67	94	98	116	63	89	15
human herpes virus type 6	0	0	2	6	8	8	13	8	3	9	13**
varicella/herpes zoster virus	1	2	1	3	2	2	2	4	6	3	0
herpes simplex virus*	0	2	1	2	2	0	0	4	2	3	3
parechovirus	1	0	0	1	0	1	0	15	1	3	2
adenovirus	0	0	1	0	0	0	0	0	0	0	0
not specified	3	6	8	7	4	5	5	2	1	1	0
Total	15	43	66	63	83	110	118	149	76	108	86

*includes types 1 and 2; **one case diagnosed with both HHV 6 and enterovirus

Appendix 8. *H. influenzae* Cases by Type in Quarter 3, 2007-2017

Type	Q3-2007	Q3-2008	Q3-2009	Q3-2010	Q3-2011	Q3-2012	Q3-2013	Q3-2014	Q3-2015	Q3-2016	Q3-2017
b	1	0	0	0	0	0	0	1	0	0	1
d	0	0	0	0	0	0	0	0	0	0	0
e	0	0	0	0	0	0	0	0	0	1	0
f	1	0	0	1	0	0	0	2	0	1	0
not type-b	0	0	0	0	1	1	0	0	1	0	1
non-typeable/non-capsulated	2	2	3	2	5	6	8	9	5	7	4
not typed*	1	0	1	0	1	3	1	3	2	2	1
Total	5	2	4	3	7	10	9	15	8	11	7

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

Appendix 9. *H. influenzae* Cases by Quarter, 2007-2017

Qr	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2007-2017 change
Q1	9	6	19	10	11	16	18	16	21	18	20	+122.2%
Q2	11	8	12	9	16	5	7	14	15	15	12	+9.1%
Q3	5	2	4	3	7	10	9	15	8	11	7	+40.0%
Q4	6	6	8	6	10	10	7	16	8	14	-	-
Total	31	22	43	28	44	41	41	61	52	58	-	-
<i>Meningitis</i>	2	3	3	2	4	3	2	7	5	1	-	-
<i>Type b meningitis</i>	1	1	0	1	0	1	0	0	0	0	0	-

Appendix 10. *H. influenzae* Cases by HSE Area in Quarter 3, 2007-2017

HSE Area	Q3-2007	Q3-2008	Q3-2009	Q3-2010	Q3-2011	Q3-2012	Q3-2013	Q3-2014	Q3-2015	Q3-2016	Q3-2017	Q3-2017 CIR*
E	1	0	1	1	4	5	1	2	4	2	4	0.23
M	2	0	1	0	0	1	0	0	0	3	0	0.00
MW	0	1	0	1	1	2	0	2	0	0	1	0.26
NE	0	0	0	0	1	0	1	3	0	0	0	0.00
NW	0	0	0	0	0	1	1	0	1	2	1	0.39
SE	0	0	1	0	0	0	3	4	2	1	0	0.00
S	1	1	1	0	0	0	1	3	0	3	1	0.20
W	1	0	0	1	1	1	2	1	1	0	0	0.00
Total	5	2	4	3	7	10	9	15	8	11	7	0.15

* CIR, crude incidence rate per 100,000

Appendix 11. *H. influenzae* Cases by Age Group in Quarter 3, 2007-2017

Age Grp (Yrs)	Q3-2007	Q3-2008	Q3-2009	Q3-2010	Q3-2011	Q3-2012	Q3-2013	Q3-2014	Q3-2015	Q3-2016	Q3-2017	Q3-2017 CIR*
<1	2	0	0	0	0	0	0	4	1	0	0	0.00
1-4	0	0	0	0	1	1	3	3	1	1	1	0.37
5-9	0	0	0	0	0	0	0	0	0	0	0	0.00
10-14	0	0	0	0	0	0	0	0	0	0	0	0.00
15-19	0	0	0	1	0	1	0	0	0	0	0	0.00
20-24	0	0	0	1	0	0	0	1	1	1	1	0.37
25-34	0	0	1	0	2	1	1	0	1	1	0	0.00
35-44	0	0	1	0	0	1	0	0	0	3	1	0.13
45-54	0	1	0	0	0	0	0	0	0	0	0	0.00
55-64	0	0	1	0	0	0	1	1	0	1	1	0.20
65+	3	1	1	1	4	6	4	6	4	4	3	0.47
Total	5	2	4	3	7	10	9	15	8	11	7	0.15

* CIR, crude incidence rate per 100,000