

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

A REPORT BY THE HEALTH PROTECTION SURVEILLANCE CENTRE (HPSC)  
IN COLLABORATION WITH  
THE IRISH MENINGITIS & SEPSIS REFERENCE LABORATORY (IMSRL) &  
THE NATIONAL VIRUS REFERENCE LABORATORY (NVRL)



Q2-2019

3<sup>rd</sup> September 2019

Provisional Figures

## Summary

- **Invasive meningococcal disease (IMD)**
  - 12 IMD cases were notified (crude incidence rate 0.25/100,000), with the highest incidence among infants (3.2/100,000); all cases were confirmed
  - Serogroup (Sg) was identified for nine of the cases; four (33.3%) SgB, two each of SgC and SgY (16.7% each) and one (8.3%) SgW
  - No cases of SgB <1 year of age were reported and of the two SgC cases (age range 21-41 years), both were unvaccinated
  - No deaths or outbreaks were reported
- **Other bacterial meningitis (specified and not otherwise specified)**
  - Four cases of meningitis were related to invasive *Streptococcus pneumoniae* infections (IPD)
  - Three cases of Group B Strep (*Streptococcus agalactiae*) meningitis (aged 3 months)
  - One case of Group A Strep (*Streptococcus pyogenes*) was notified
  - Five cases of bacterial meningitis due to pathogens not otherwise specified (NOS): three cases of *Escherichia coli* and one case of *Capnocytophaga canimorsus*. An additional possible case was reported
  - No deaths or outbreaks were reported
- ***Haemophilus influenzae* invasive**
  - 20 cases of *H. Influenzae* were reported, one of which had meningitis. The majority of cases (n=17) were due to non-typeable strains, one was due to type a and two were not typed
  - No outbreaks or deaths reported
- **Viral meningitis (specified and not otherwise specified)**
  - Ninety-one viral meningitis cases were notified; most (n=85) were due to organisms not otherwise specified (NOS), six were related to mumps infection
  - One death attributable to Coxsackievirus A2 occurred in a child aged one year
  - No outbreaks were reported

## Introduction

Meningococcal disease became a notifiable disease on the 1<sup>st</sup> 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 1<sup>st</sup> 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](http://www.hpsc.ie)).

An enhanced surveillance system is in place for [IMD and other forms of bacterial meningitis, not otherwise specified](#) and for [Haemophilus influenzae \(invasive\) disease](#), but not for viral meningitis, not otherwise specified. Details of these surveillance systems are described in the [HPSC Annual Report 2005](#). Both the enhanced surveillance forms for IMD (including other forms of bacterial meningitis) and *Haemophilus influenzae* (invasive) disease were updated in early December 2015.

**Table 1. Summary of meningococcal C and B vaccine schedules in Ireland from their introduction**

Schedule	No. doses	MenC			MenB	
		Oct '00-Jun '08	Jul'08-Jun '15	Jul'15-Sept '16	Oct '16-Present	
Routine	1 <sup>st</sup> dose	2 Months	4 Months	4 Months	6 Months	2 Months
	2 <sup>nd</sup> dose	4 Months	6 Months	13 Months	13 Months	4 Months
	3 <sup>rd</sup> dose	6 Months	13 Months	12 - 13 Years	12 - 13 Years	12 Months
	4 <sup>th</sup> dose	-	12 -13 Years <sup>†</sup>	-	-	-
Catch up*	1 dose	1 -22 years	NA	NA	NA	None

\*The MenC catch-up campaign was implemented over the 18-month period, October 2000 to March 2002, targeting those <23 years of age

<sup>†</sup>Adolescent dose introduced in 2014

NA: Not applicable

Data presented in this reported were extracted from CIDR from the **3<sup>rd</sup> September 2019**. **These figures are provisional**. Incidence rates for 2019 were calculated using the **2016** Census of Population as denominator data.

## Results

### *Meningococcal Disease (invasive) (IMD)*

#### IMD Cases by Serogroup & Case Classification

In Q2-2019, 12 cases of IMD were notified, all of which were classified as confirmed. No outbreaks or imported cases were reported during this period.

Serogroup B disease accounted for 33.3% (n=4/12) of all IMD notifications, 16.7% (n=2) each for SgC and SgY, 8.3% (n=1) for SgW and 25% (n=3) with no serogroup identified (Table 2, Figures 1-3, Appendix 1).

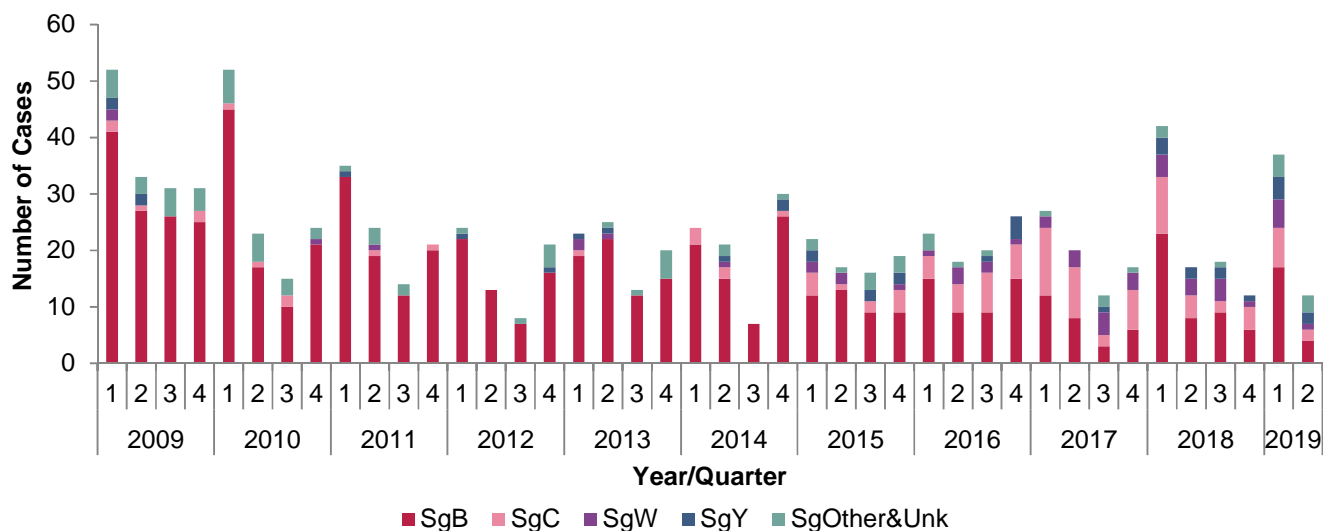
Ethnicity was recorded as White for four cases (33.3%) and eight (66.7%) as not specified.

There were no cases of SgB <1 year of age and of the two SgC cases (age range 21-41 years), both were unvaccinated.

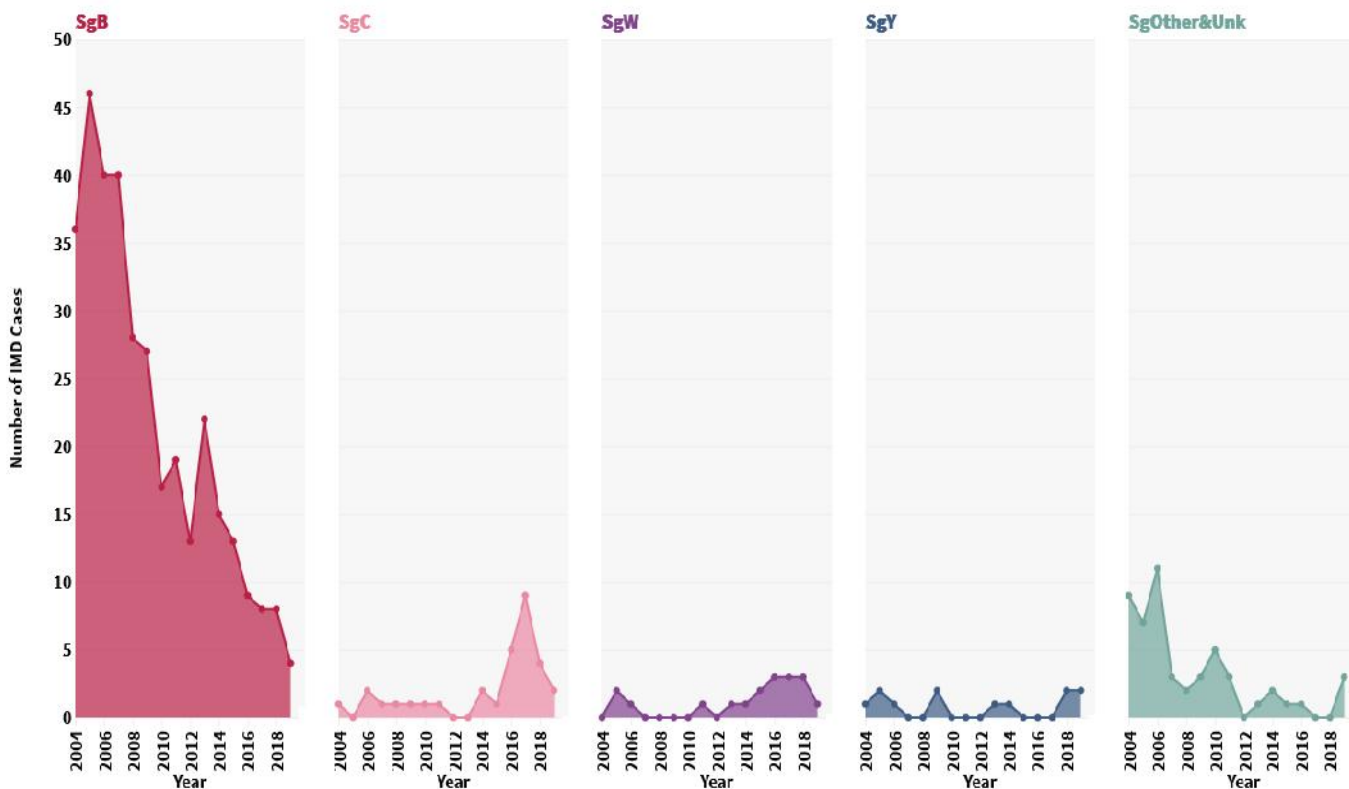
**Table 2. Classification of IMD cases notified by Serogroup in Q2-2019**

Case Classification	SgB	SgC	SgW	SgY	NG	Sg29E	No organism detected	Total
Confirmed	4	2	1	2	0	0	3	12
Probable	0	0	0	0	0	0	0	0
Possible	0	0	0	0	0	0	0	0
Not specified	0	0	0	0	0	0	0	0
<b>Total</b>	<b>4</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>12</b>

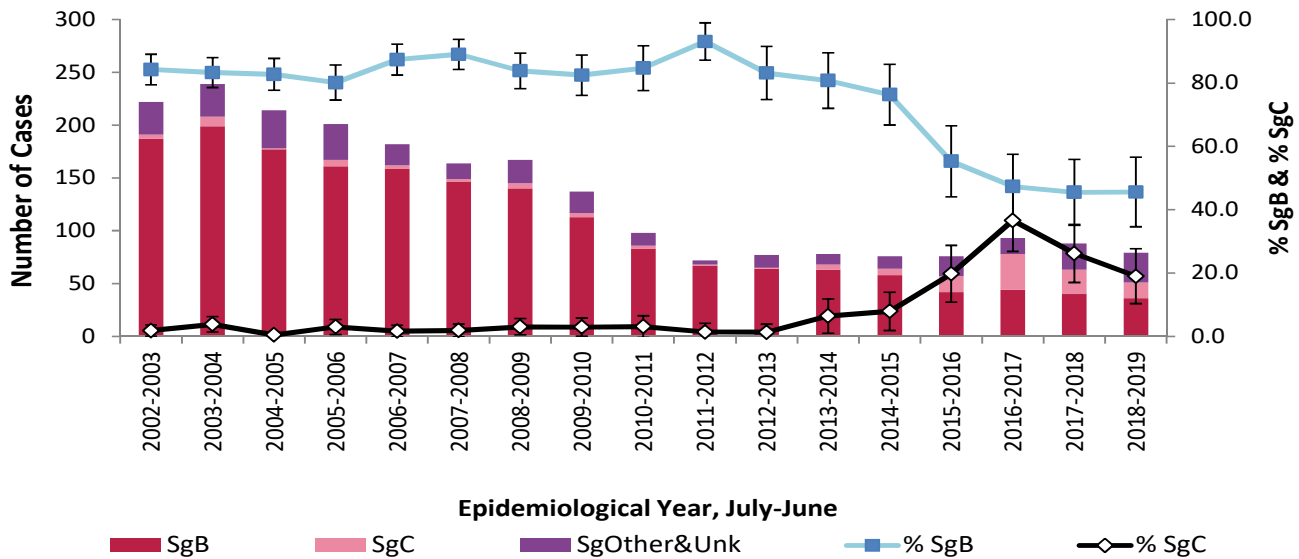
**Figure 1. Number of IMD cases notified in Ireland by serogroup by quarter and year, 2009-2019**



**Figure 2. Number of IMD cases notified in Ireland by serogroup (including SgB, SgC, SgW, SgY) in Q2 of each year between 2004 and 2019**



**Figure 3. Number & percentage of SgB, SgC and SgOther&Unknown IMD cases by epidemiological year between 2002-2003 and 2018-2019**



### IMD Trends & Outbreaks

The number of IMD cases reported in Q2-2019 (n=12) was significantly lower than the average number reported in the same quarter over the previous three years (average=18, 95%CI 16.6-20.1); for SgB the average was 8.3 and for SgC it was 6 (Appendix 1). The number of IMD cases reported in Q2 has fallen by 74.5% since 2004 (from 47 to 12 cases) (Appendix 2), most notably the SgB cases (88.9% decline from 66 to 4 cases), however SgC cases have increased by 100% (from one to two cases) in that time (Appendix 1).

Of the three non-groupable IMD cases this quarter, the serogroup of one case was not recorded on CIDR despite having been grouped by Irish Meningitis and Sepsis Reference Laboratory (IMSRL) in Temple Street Children's University Hospital and that two cases were not received by IMSRL for grouping.

### IMD Cases by HSE Area and Age Group

The crude incidence rate in Q2-2019 was 0.25 cases per 100,000 population, with regional variation (range 0.0/100,000 in HSE NW and HSE M to 0.44/100,000 in HSE W) (Appendix 3). Incidence rate was highest in the <1 year of age group at 3.2 cases per 100,000 population, followed by 1.1 cases/100,000 in the 20-24 year age group (Appendix 4).

### IMD associated deaths

There were no deaths reported in Q2-2019; the average number of deaths in the same quarter between 2016 and 2018 was 1.7.

### Other Forms of Bacterial Meningitis

#### *Streptococcus pneumoniae* meningitis

In Q2-2019 no deaths, imported cases or outbreaks were reported. Four cases of invasive *S. pneumoniae* infections (IPD) presenting as meningitis were notified with no serotype identified. The age range was 23-73 years (Appendix 6).

#### Bacterial meningitis by other specified notifiable diseases (excluding *Haemophilus influenzae* and *Streptococcus pneumoniae*)

Three cases of meningitis-related Group B Strep (*Streptococcus agalactiae*) (aged 1 month), along with three other CSF PCR positive cases of *S. agalactiae* (aged 3 months) were reported during Q2-2019; the latter three cases, however, were not labelled as having clinical meningitis or any other clinical description. One case of Group A Strep (*Streptococcus pyogenes*) (aged 1-4 years) was also reported.

#### Bacterial meningitis (not otherwise specified)

Five cases of bacterial meningitis due to pathogens not otherwise specified (NOS) were notified during Q2-2019. Among these cases were three cases of *Escherichia coli* (aged 3 months) and one case of *Capnocytophaga canimorsus* (aged 80-84 years) (Appendix 6). There was also one possible case reported (aged 35-39 years).

### **Haemophilus influenzae (invasive) infections**

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

In Q2-2019, 20 cases of *H. influenzae* were notified, all were case classified as confirmed (Figure 4): one type a, 17 non-typeable (including one which was meningitis-related) and two not typed (one of which was diagnosed by PCR only). This total compares to an average of 16.3 cases for the same quarter in 2016 to 2018 (Table 4, Appendices 7, 8).

No outbreaks, deaths, or imported cases were reported during this period. Of all the Q2 cases reported between 2017 and 2019, 22.0% (n=12/54) had no clinical diagnosis reported (Tables 5, 6). In Q2-2019, non-typeable cases accounted for 17 of the 20 cases (85%), higher than the average of 67.1% recorded during the same quarter between 2009 and 2018 (Figures 4-5).

**Table 3. Number of *H. influenzae* cases notified in the second quarter of 2017, 2018 and 2019**

Number of cases	Q2-2017	Q2-2018	Q2-2019
All <i>H. influenzae</i>	12	22	20
All <i>H. influenzae</i> <5yrs	2	4	0
All <i>H. influenzae</i> ≥65yrs	5	9	9
<i>H. influenzae</i> type b	0	1	0
<i>H. influenzae</i> type b <5yrs	0	0	0
<i>H. influenzae</i> type b ≥65yrs	0	1	0
<i>H. influenzae</i> non-typeable	9	14	17
<i>H. influenzae</i> non-typeable <5yrs	1	2	0
<i>H. influenzae</i> non-typeable ≥65yrs	4	5	9

**Table 4. Number of *H. influenzae* cases by clinical diagnosis notified in Q2 of 2017, 2018 and 2019**

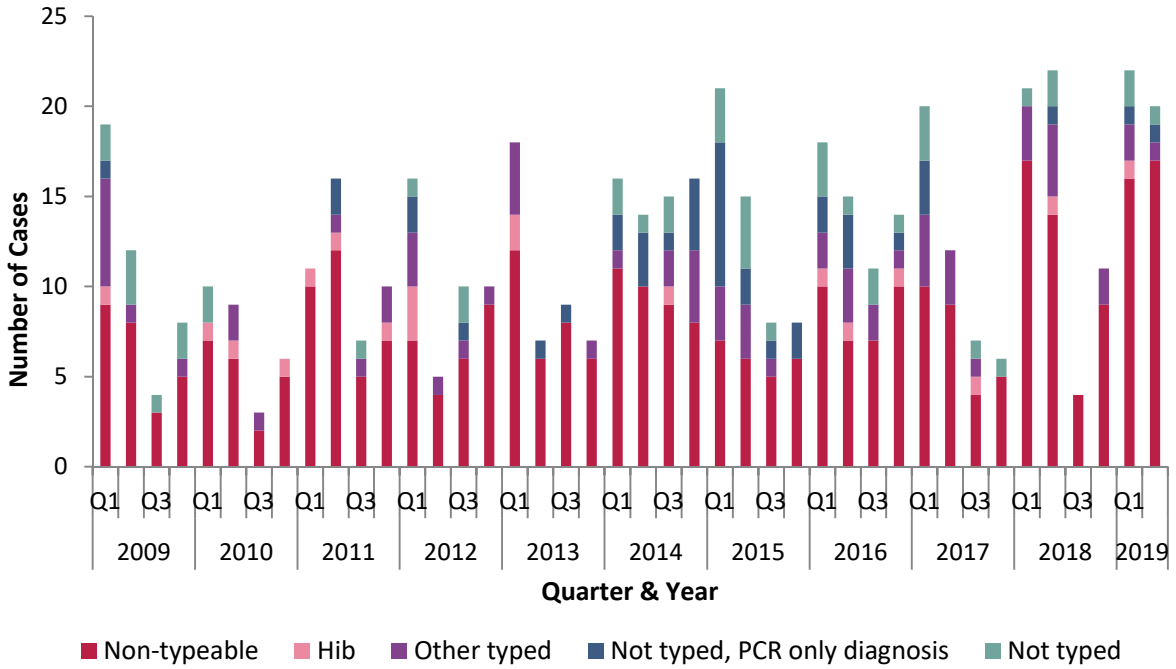
Number of cases	Q2-2017	Q2-2018	Q2-2019	Q2-2017 to 2019 Total	Q2-2017 to 2019 Total (%)
Septicaemia	3	11	5	19	35.2
Bacteraemia (without focus)	0	2	1	3	5.6
Pneumonia	5	3	4	12	22.2
Meningitis	0	1	1	2	3.7
Meningitis & septicaemia	0	0	0	0	0.0
Other	1	1	3	5	9.3
Cellulitis	0	0	0	0	0.0
Epiglottitis	0	1	0	1	1.9
Osteomyelitis	0	0	0	0	0.0
Septic arthritis	0	0	0	0	0.0
Clinical diagnosis not reported	3	3	6	12	22.2
<b>Total</b>	<b>12</b>	<b>22</b>	<b>20</b>	<b>54</b>	<b>100</b>

**Table 5. Number of *H. influenzae* cases by clinical diagnosis and type of infection, Q2-2019**

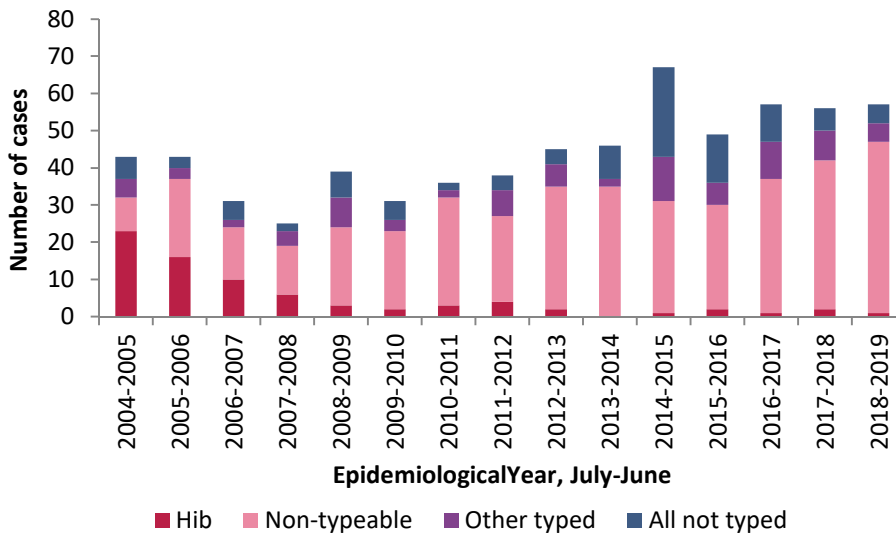
Number of cases	Typed (a, b, d, e, f, d or not-b)	Non-typeable	Not typed*	Total
Septicaemia	0	5	0	5
Bacteraemia (without focus)	0	1	0	1
Pneumonia	1	3	0	4
Meningitis	0	1	0	1
Meningitis & septicaemia	0	0	0	0
Other	0	3	0	3
Cellulitis	0	0	0	0
Epiglottitis	0	0	0	0
Osteomyelitis	0	0	0	0
Septic arthritis	0	0	0	0
Clinical diagnosis not reported	0	4	2	6
<b>Total</b>	<b>1</b>	<b>17</b>	<b>2</b>	<b>20</b>

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

**Figure 4. Quarterly number of *H. influenzae* cases by type since 2009**



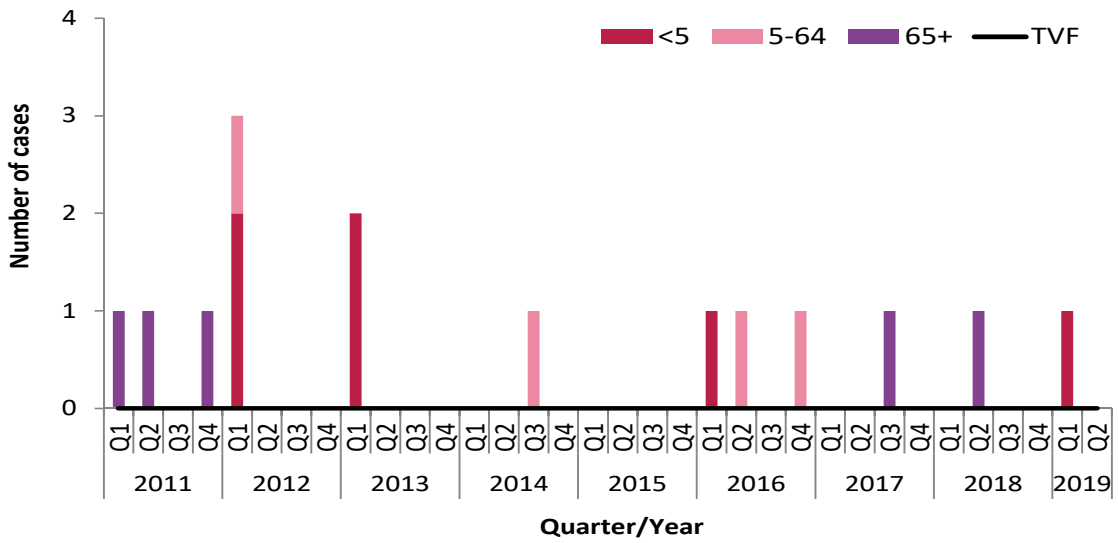
**Figure 5. Number of *H. influenzae* cases by type and by epidemiological year, 2004-2005 to 2018-2019**



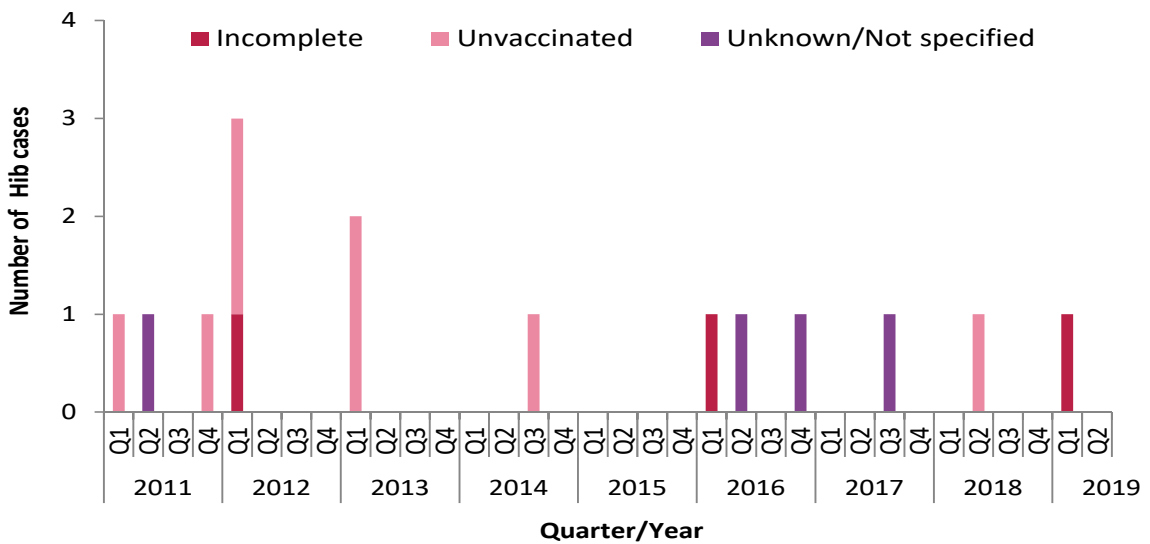
The IMSRL received 19 isolates in Q2 of this year, 18 non-typeable and 1 type a.

Figures 6 and 7 presents the number of type b cases (Hib) by age group and vaccination status since 2011 and the absence of total vaccine failures (TVFs) during that period. In Q2-2019, 17 non-typeable cases was reported (aged 7 to 89 years), more than the average of 10 cases in the same quarter between 2016 and 2018 (Figure 8).

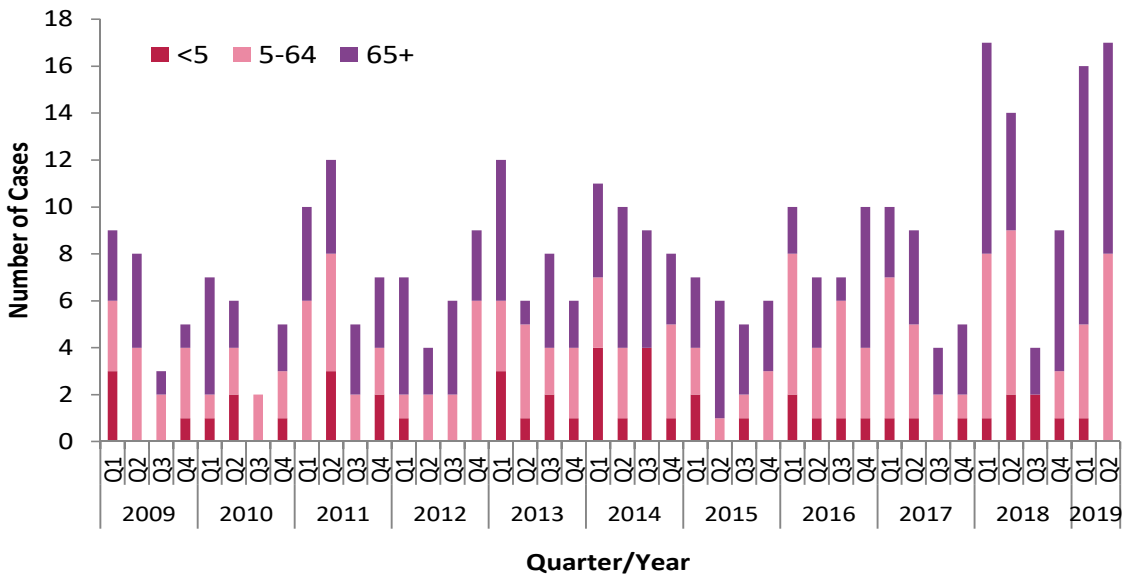
**Figure 6. Quarterly number of Hib cases by age group since 2011**



**Figure 7. Quarterly number of Hib cases by vaccination status since 2011**



**Figure 8. Quarterly number of non-typeable/non-capsulated cases by age group, since 2009**



**Viral Meningitis (Specified and Not Otherwise Specified)**

Six cases of mumps-related meningitis were reported in Q2-2019, all aged 17-20 years and all had received two doses of the MMR vaccine, but three of them did not have details of both MMR vaccination dates and batch numbers reported.

Eighty-five viral meningitis (VE) notifications (NOS) (aged 1 week to 44 years; median 2.5 months) were reported in Q2-2019 (Figures 9, 10). All but one had their causative organism identified: 74 (87.1%) enterovirus (aged 1 week to 44 years; median 2.3 months); eight (9.4%) human herpes virus type 6 (HHV 6) (aged 1 month-2 years); two (2.4%) herpes simplex virus type 1 (aged 2-3 weeks) and one (1.1%) with an unspecified cause (aged 25-29 years). Figure 8 presents both the total number of viral meningitis NOS cases and those not caused by enterovirus by year and by quarter since 2009. One death attributable to Coxsackievirus A2 occurred in a one year old. No viral-meningitis outbreaks were reported in this quarter.

In Q2-2019, the highest frequency of VE, NOS cases occurred in infants <1 years of age (n=50/85; 58.8%) and in adults aged 15-39 years (n=21/85; 24.7%) (Figure 10). Of the 50 cases aged <1 year, 43 (86%) were attributable to enterovirus, five (10%) to HHV6 and two (4%) to HSV, one each of types 1 and 2. In contrast, of the 21 cases aged 15-34 years, all but one were attributable to enterovirus, and the causative pathogen of the remaining case was not specified.

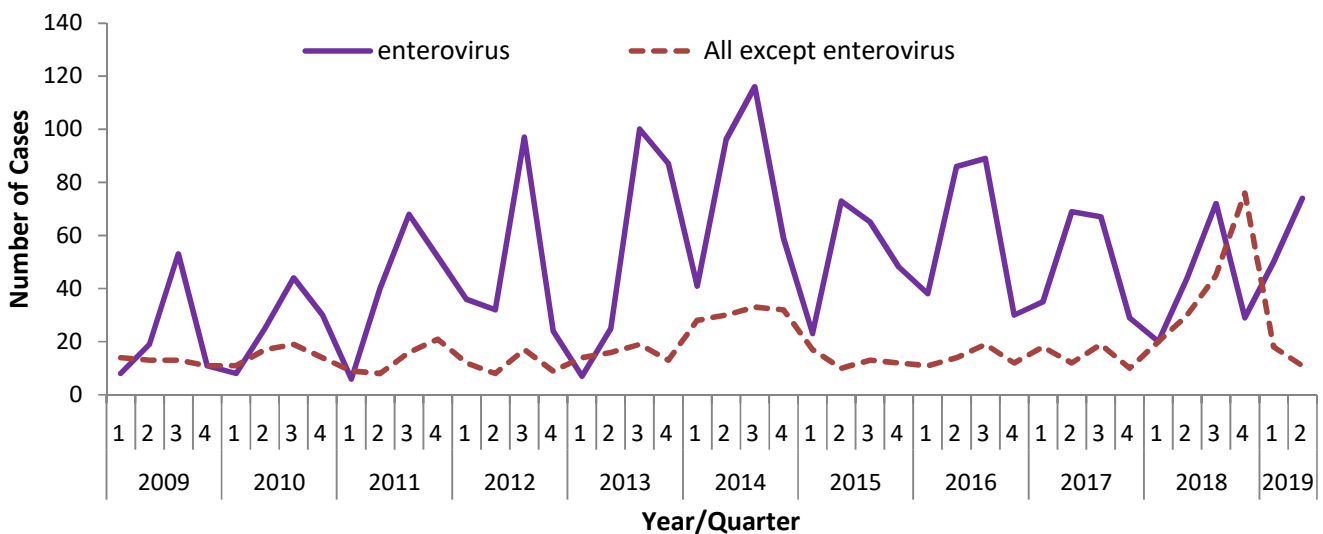
Caution is recommended regarding the detection of HHV 6 DNA in cerebral spinal fluid (CSF) specimens, especially in those aged less than three months (90 days) (of which there were four in Q2-2019), as HHV 6 DNA can be chromosomally integrated. When this occurs the HHV 6 DNA can be inherited through the germ line and therefore when it is detected, it may not be clinically relevant.

The average Q2 percentage of all viral meningitis (VM) cases attributable to enterovirus since 2015 to date has been 74.5%. Details of enterovirus serotypes by age group in Q2-2019 are presented in Table 6 and shows that the numbers of cases are highest in the <1 and 15-39 year age groups.

All but 12 of the 74 enterovirus related viral meningitis events in CIDR in Q2-2019 were matched to NVRL enterovirus typing records provided to the HPSC on September 3<sup>rd</sup>, 2019 (Table 6); at the time of writing, there was one NVRL lab record in this same listing, an echovirus 9, that was unmatched to its corresponding CIDR event.

Of the 74 enterovirus-related VM cases in Q2-2019, 34 (45.9%) were in HSE E and 18 (24.3%) in HSE S, compared to Q2-2018, when there were 44 cases reported: 12 (27.3%) in HSE-E and five (11.4%) in HSE-S (Appendices 12, 13). Of the 74 cases in this quarter, 12 (16.2%) were attributable to echovirus B30 (Table 6), seven occurred in HSE E, four in HSE S and one in HSE M.

**Figure 9. Number of viral meningitis (NOS) cases caused by enterovirus and all except enterovirus by quarter and year, 2009-2019\***



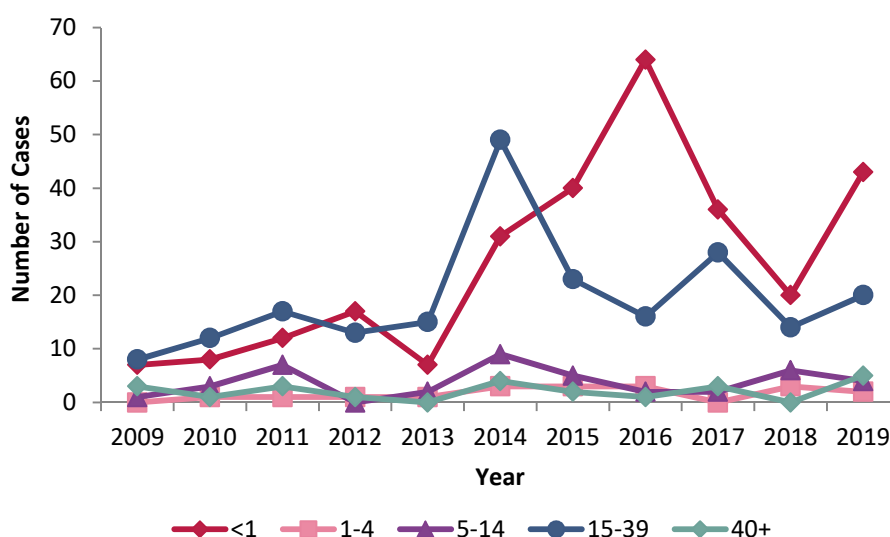
\*Includes 52 late retrospective/late notifications of parechovirus in Q3 to Q4 in 2018, three in Q3 and 49 in Q4



**Table 6. Enterovirus genotypes by age group (years) on CIDR in Q2-2019**  
 (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 A2	0	1	0	0	0	1
		Coxsackievirus A6	1	0	0	0	0	1
		Coxsackievirus A16	1	0	0	0	0	1
	Enterovirus B	Coxsackievirus A9	3	0	0	2	0	5
		Coxsackievirus B1	3	0	0	1	2	6
		Coxsackievirus B2	1	0	0	0	0	1
		Coxsackievirus B3	4	0	0	0	0	4
		Coxsackievirus B4	2	0	0	0	0	2
		Coxsackievirus B5	4	0	0	0	0	4
		Echovirus 6	0	0	1	1	1	3
		Echovirus 7	1	0	0	0	0	1
		Echovirus 9	4	1	0	0	0	5
		Echovirus 18	0	0	0	1	0	1
		Echovirus 21	1	0	0	0	0	1
		Echovirus 25	4	0	1	0	0	5
		Echovirus 30	5	0	0	6	1	12
		NVRL unable to generate sequence	Enterovirus-NVRL unable to generate sequence	4	0	0	1	0
	NVRL not tested	Enterovirus -NVRL not tested	2	0	0	2	0	4
	Not specified	Enterovirus-not specified	3	0	2	6	1	12
	<b>Total</b>			<b>43</b>	<b>2</b>	<b>4</b>	<b>20</b>	<b>5</b>

**Figure 10. Quarter 2 number of enterovirus-related viral meningitis (NOS) cases in Ireland by age group (years), 2009-2019**



## ACKNOWLEDGEMENTS

- HPSC wishes to thank all who provided data for this report: Departments of Public Health, the Irish Meningitis & Sepsis Reference Laboratory (IMSRL) in Temple Street Children's Hospital, National Virus Reference Laboratory (NVRL) and other Microbiology Laboratories
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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/HPSC%20BacMen%202017%20Web.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/>
- If there are more than two weeks between meningococcal positive sterile site laboratory results from the same patient then they should be regarded as two separate episodes and therefore two notifications should be reported to CIDR

### 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 (e.g. asplenia/hyposplenism/complement deficiency, haematopoietic Stem Cell Transplant recipients) are recommended the Hib vaccine). Please see NIAC guidance for further details
- An enhanced surveillance form should be completed for each Hib notification. A copy is available at: <https://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/>
- If there are more than two weeks between *H. influenzae* positive sterile site laboratory results from the same patient then they should be regarded as two separate episodes and therefore two notifications should be reported to CIDR

### 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: [https://nvrl.ucd.ie/sites/default/files/uploads/pdfs/UCD\\_NVRL\\_User\\_Manual\\_17.0.pdf](https://nvrl.ucd.ie/sites/default/files/uploads/pdfs/UCD_NVRL_User_Manual_17.0.pdf)

## APPENDICES

### Appendix 1. IMD Cases by Serogroup in Quarter 2, 2004-2019

Serogroup	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	Q2-2017	Q2-2018	Q2-2019
SgB	36	46	40	40	28	27	17	19	13	22	15	13	9	8	8	4
SgC	1	0	2	1	1	1	1	1	0	0	2	1	5	9	4	2
SgW	0	2	1	0	0	0	0	1	0	1	1	2	3	3	3	1
SgY	1	2	1	0	0	2	0	0	0	1	1	0	0	0	2	2
NG	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Sg29E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No organism detected	9	7	11	3	2	3	5	3	0	1	1	1	1	0	0	3
<b>Total</b>	<b>47</b>	<b>57</b>	<b>55</b>	<b>44</b>	<b>31</b>	<b>33</b>	<b>23</b>	<b>24</b>	<b>13</b>	<b>25</b>	<b>21</b>	<b>17</b>	<b>18</b>	<b>20</b>	<b>17</b>	<b>12</b>

NG=non-groupable

### Appendix 2. IMD Cases by Quarter, 2004-2019

Qr	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2004-2019 change
Q1	66	72	72	57	55	52	52	35	24	23	24	22	23	27	42	37	-43.9%
Q2	47	57	55	44	31	33	23	24	13	25	21	17	18	20	17	12	-74.5%
Q3	42	31	37	41	34	31	15	14	8	13	7	16	20	12	18	-	-
Q4	43	43	44	37	48	31	24	21	21	20	30	19	26	17	12	-	-
<b>Total</b>	<b>198</b>	<b>203</b>	<b>208</b>	<b>179</b>	<b>168</b>	<b>147</b>	<b>114</b>	<b>94</b>	<b>66</b>	<b>81</b>	<b>82</b>	<b>74</b>	<b>87</b>	<b>76</b>	<b>89</b>	<b>-</b>	<b>-</b>

### Appendix 3. IMD Cases by HSE Area in Quarter 2, 2004-2019

HSE Area	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	Q2-2017	Q2-2018	Q2-2019	Q2-2019 CIR*
E	13	11	19	17	6	10	6	9	4	10	6	6	4	4	5	4	0.23
M	4	11	7	0	4	2	2	0	0	2	3	1	3	3	1	0	0.00
MW	4	5	7	3	3	6	0	3	1	1	0	6	1	5	1	1	0.26
NE	2	3	5	7	5	3	5	3	4	2	2	0	2	2	0	1	0.22
NW	3	1	3	4	2	0	2	1	0	1	1	0	3	0	3	0	0.00
SE	9	7	2	2	3	4	3	4	2	4	3	1	1	3	2	3	0.43
S	10	14	7	6	6	6	5	3	1	3	4	2	3	3	3	1	0.20
W	2	5	5	5	2	2	0	1	1	2	2	1	1	0	2	2	0.44
<b>Total</b>	<b>47</b>	<b>57</b>	<b>55</b>	<b>44</b>	<b>31</b>	<b>33</b>	<b>23</b>	<b>24</b>	<b>13</b>	<b>25</b>	<b>21</b>	<b>17</b>	<b>18</b>	<b>20</b>	<b>17</b>	<b>12</b>	<b>0.25</b>

\* CIR, crude incidence rate per 100,000

### Appendix 4. IMD Cases by Age Group in Quarter 2 2004-2019

Age Group (Yrs)	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	Q2-2017	Q2-2018	Q2-2019	Q2-2019 CIR*
<1	13	13	9	13	10	10	8	8	2	10	4	1	2	4	3	2	3.21
1-4	20	20	25	16	10	9	8	7	7	7	7	4	6	4	2	1	0.37
5-9	3	5	6	2	2	1	2	1	0	2	2	2	1	0	0	0	0.00
10-14	2	6	4	2	0	1	1	0	0	1	1	2	1	1	3	0	0.00
15-19	6	5	4	6	2	5	1	3	2	2	2	1	1	3	1	0	0.00
20-24	1	2	1	0	2	2	0	0	0	1	0	1	1	1	1	3	1.10
25-34	1	2	3	2	2	0	0	2	0	0	2	1	1	0	0	2	0.30
35-44	0	0	1	1	2	1	0	0	0	0	1	3	0	0	1	2	0.27
45-54	1	0	1	2	0	0	0	0	0	1	1	0	1	3	1	1	0.16
55-64	0	1	0	0	1	0	2	1	0	0	0	0	2	0	1	0	0.00
65+	0	3	1	0	0	4	1	2	2	1	1	2	2	4	4	1	0.16
<b>Total</b>	<b>47</b>	<b>57</b>	<b>55</b>	<b>44</b>	<b>31</b>	<b>33</b>	<b>23</b>	<b>24</b>	<b>13</b>	<b>25</b>	<b>21</b>	<b>17</b>	<b>18</b>	<b>20</b>	<b>17</b>	<b>12</b>	<b>0.25</b>

\* CIR, crude incidence rate per 100,000

### Appendix 5. Deaths associated with IMD by Serogroup in Quarter 2, 2004-2019

Serogroup	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	Q2-2017	Q2-2018	Q2-2019
SgB	1	0	1	2	1	0	1	0	0	2	0	1	0	0	2	0
SgC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
SgW	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
SgY	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sg29E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No organism detected	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>0</b>
%CFR* (Total)	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	0.0	23.5	0.0

\* %CFR, case fatality ratio; NG=non-groupable

### Appendix 6. Other Bacterial Meningitis Cases by Causative Organism (Specified and Not Otherwise Specified) in Quarter 2, 2009-2019 (excluding IMD and *Haemophilus influenzae*)

	Causative organism	Q2-2009	Q2-2010	Q2-2011	Q2-2012	Q2-2013	Q2-2014	Q2-2015	Q2-2016	Q2-2017	Q2-2018	Q2-2019	Q2:2009-2019
Specified	<i>Leptospira</i> spp.	0	0	0	0	0	0	0	0	0	0	0	0
	<i>Listeria</i> spp.	0	1	1	0	0	0	3	0	1	1	0	7
	<i>Mycobacterium tuberculosis</i> #	0	2	1	1	2	1	0	0	0	1	0	9
	<i>Streptococcus pneumoniae</i>	3	4	6	11	10	8	9	12	9	9	4	85
	<i>Streptococcus agalactiae</i> *	na	na	na	0	0	2	1	1	0	2	3	9
	<i>Streptococcus pyogenes</i>	0	0	0	1	1	0	0	0	1	0	1	4
	<i>Salmonella</i> spp.	0	0	0	0	0	0	0	0	0	0	0	0
Not otherwise specified	<i>Capnocytophaga canimorsus</i>	0	0	0	0	0	0	0	0	0	0	1	1
	<i>Escherichia coli</i>	0	0	1	1	1	0	3	1	4	2	3	16
	<i>Micrococcus luteus</i>	0	0	0	0	0	1	0	0	0	0	0	1
	<i>Pasteurella multocida</i>	0	0	0	0	0	0	1	0	0	0	0	1
	<i>Staphylococcus aureus</i>	1	3	0	0	0	0	0	0	0	1	0	5
	<i>Streptococcus agalactiae</i> †	3	2	3	0	0	0	0	0	0	0	0	8
	<i>Streptococcus bovis</i> biotype II/2	1	0	0	0	0	0	0	0	0	0	0	1
	<i>Streptococcus constellatus</i>	0	0	0	0	0	0	0	0	1	0	0	1
	Unknown/Not specified	5	6	5	5	1	5	5	2	2	0	1	37
<b>Total</b>	<b>13</b>	<b>18</b>	<b>17</b>	<b>19</b>	<b>15</b>	<b>17</b>	<b>22</b>	<b>16</b>	<b>18</b>	<b>16</b>	<b>13</b>	<b>185</b>	

#TB meningitis figures for 2019 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 cases reported here are based on the difference between CIDR event creation date and date of birth, not the difference between onset date and date of birth

†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

na not applicable for the years prior to 2012

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

### Appendix 7. *H. influenzae* Cases by Type in Quarter 2, 2009-2019

Type	Q2-2009	Q2-2010	Q2-2011	Q2-2012	Q2-2013	Q2-2014	Q2-2015	Q2-2016	Q2-2017	Q2-2018	Q2-2019
a	0	0	0	0	0	0	0	0	0	0	1
b	0	1	1	0	0	0	0	1	0	1	0
d	0	0	0	0	0	0	0	0	0	0	0
e	1	0	1	0	0	0	0	0	1	1	0
f	0	2	0	1	0	0	1	2	2	2	0
not type-b	0	0	0	0	0	0	2	1	0	1	0
non-typeable	8	6	12	4	6	10	6	7	9	14	17
not typed*	3	0	2	0	1	4	6	4	0	3	2
<b>Total</b>	<b>12</b>	<b>9</b>	<b>16</b>	<b>5</b>	<b>7</b>	<b>14</b>	<b>15</b>	<b>15</b>	<b>12</b>	<b>22</b>	<b>20</b>

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

### Appendix 8. *H. influenzae* Cases by Quarter, 2009-2019

Qr	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2009-2019 change
Q1	19	10	11	16	18	16	21	18	20	21	22	+15.7%
Q2	12	9	16	5	7	14	15	15	12	22	20	+66.7%
Q3	4	3	7	10	9	15	8	11	7	4	-	-
Q4	8	6	10	10	7	16	8	14	6	11	-	-
<b>Total</b>	<b>43</b>	<b>28</b>	<b>44</b>	<b>41</b>	<b>41</b>	<b>61</b>	<b>52</b>	<b>58</b>	<b>45</b>	<b>58</b>	-	-
<i>Meningitis</i>	3	2	4	3	2	7	5	1	1	4	-	-
<i>Type b meningitis</i>	0	1	0	1	0	0	0	0	0	0	-	-

### Appendix 9. *H. influenzae* Cases by HSE Area in Quarter 2, 2009-2019

HSE Area	Q2-2009	Q2-2010	Q2-2011	Q2-2012	Q2-2013	Q2-2014	Q2-2015	Q2-2016	Q2-2017	Q2-2018	Q2-2019	Q2-2019 CIR*
E	1	2	8	0	0	4	8	8	5	10	3	0.18
M	1	1	1	0	1	3	1	2	0	1	0	0.00
MW	2	0	0	0	2	1	1	1	3	1	3	0.78
NE	0	1	3	1	2	1	1	1	0	1	2	0.43
NW	1	1	0	0	0	0	0	1	0	2	2	0.78
SE	2	1	2	3	0	3	0	2	2	1	4	0.58
S	5	3	0	0	2	1	2	0	2	5	4	0.78
W	0	0	2	1	0	1	2	0	0	1	2	0.44
<b>Total</b>	<b>12</b>	<b>9</b>	<b>16</b>	<b>5</b>	<b>7</b>	<b>14</b>	<b>15</b>	<b>15</b>	<b>12</b>	<b>22</b>	<b>20</b>	<b>0.42</b>

\* CIR, crude incidence rate per 100,000

### Appendix 10. *H. influenzae* Cases by Age Group in Quarter 2, 2009-2019

Age Grp (Yrs)	Q2-2009	Q2-2010	Q2-2011	Q2-2012	Q2-2013	Q2-2014	Q2-2015	Q2-2016	Q2-2017	Q2-2018	Q2-2019	Q2-2019 CIR*
<1	0	2	3	0	0	3	2	4	0	1	0	0.00
1-4	0	0	2	0	1	1	3	1	2	3	0	0.00
5-9	1	1	0	0	0	0	0	0	1	1	1	0.28
10-14	0	0	0	0	0	0	0	0	0	1	0	0.00
15-19	0	0	1	1	0	0	0	0	0	1	2	0.66
20-24	0	1	0	0	1	0	2	1	0	0	0	0.00
25-34	0	1	2	0	1	0	1	1	2	1	2	0.30
35-44	1	2	0	2	2	2	0	0	0	2	2	0.27
45-54	0	0	0	0	0	0	1	2	2	2	1	0.16
55-64	3	0	2	0	1	2	0	2	0	1	3	0.59
65+	7	2	6	2	1	6	6	4	5	9	9	1.41
<b>Total</b>	<b>12</b>	<b>9</b>	<b>16</b>	<b>5</b>	<b>7</b>	<b>14</b>	<b>15</b>	<b>15</b>	<b>12</b>	<b>22</b>	<b>20</b>	<b>0.42</b>

\* CIR, crude incidence rate per 100,000

### Appendix 11. Viral Meningitis Cases, Not Otherwise Specified, by Causative Organism in Quarter 2, 2009-2019

Causative Organism	Q2-2009	Q2-2010	Q2-2011	Q2-2012	Q2-2013	Q2-2014	Q2-2015	Q2-2016	Q2-2017	Q2-2018	Q2-2019
enterovirus group A	0	0	0	0	0	0	0	0	7	3	3
enterovirus group B	0	0	0	0	0	0	0	0	52	28	50
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	0
enterovirus group not specified	19	25	40	32	25	96	73	86	10	13	21
human herpes virus type 6	0	2	4	6	8	11	2	10	6	20	8
varicella/herpes zoster virus	0	5	1	0	1	2	6	3	4	2	0
herpes simplex virus*	2	1	2	0	0	1	1	0	1	1	2
parechovirus	0	0	0	0	0	5	0	0	0	6	0
adenovirus	0	0	0	0	0	0	0	0	0	0	0
not specified	11	9	1	2	7	11	1	1	1	1	1
<b>Total</b>	<b>32</b>	<b>42</b>	<b>48</b>	<b>40</b>	<b>41</b>	<b>126</b>	<b>83</b>	<b>100</b>	<b>81</b>	<b>74</b>	<b>85</b>
% known causative organism	65.6	78.6	97.9	95.0	82.9	91.3	98.8	99.0	98.8	98.6	98.8

\*Includes types 1 and 2; not included in this report are meningitis-related cases of neonatal (aged ≤42 days) herpes simplex virus on or after 18/12/2019, if any

**Appendix 12. Enterovirus-related Viral Meningitis Cases by HSE Area in Quarter 2, 2009-2019**

HSE Area	Q2-2009	Q2-2010	Q2-2011	Q2-2012	Q2-2013	Q2-2014	Q2-2015	Q2-2016	Q2-2017	Q2-2018	Q2-2019
E	8	6	15	18	7	55	37	52	19	12	34
M	1	1	2	0	1	5	1	6	6	4	7
MW	2	0	6	3	0	0	7	6	5	0	0
NE	3	4	2	1	2	9	11	8	14	4	3
NW	1	8	2	2	1	2	1	3	3	3	4
SE	1	1	1	5	6	5	5	4	7	8	6
S	3	4	11	3	2	15	6	5	5	5	18
W	0	1	1	0	6	5	5	2	10	8	2
<b>Total</b>	<b>19</b>	<b>25</b>	<b>40</b>	<b>32</b>	<b>25</b>	<b>96</b>	<b>73</b>	<b>86</b>	<b>69</b>	<b>44</b>	<b>74</b>

**Appendix 13. Enterovirus-related Viral Meningitis Cases by Quarter, 2009-2019**

Qr	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2009-2019 change
Q1	8	8	6	36	7	41	23	38	35	20	50	+525.0%
Q2	19	25	40	32	25	96	73	86	69	44	74	+289.5%
Q3	53	44	68	97	100	116	65	89	67	72	-	-
Q4	11	30	52	24	87	59	48	30	29	29	-	-
<b>Total</b>	<b>91</b>	<b>107</b>	<b>166</b>	<b>189</b>	<b>219</b>	<b>312</b>	<b>209</b>	<b>243</b>	<b>200</b>	<b>165</b>	<b>-</b>	<b>-</b>