

## SURVEILLANCE REPORT

Annual Epidemiological Report for 2016

# Invasive meningococcal disease

### Key facts

- In 2016, 3 280 confirmed cases of invasive meningococcal disease (IMD), including 304 deaths, were reported in 30 EU/EEA Member States.
- France, Germany, Spain and the United Kingdom accounted for 60% of all confirmed cases in 2016.
- The notification rate was 0.6 cases per 100 000 population, the same as in 2015.
- Age-specific rates were highest in infants, followed by 1-4-year-olds.
- Serogroup B caused 54% of cases overall and the majority of cases in all age groups below 65 years.
- From 2012 to 2016, the notification rates of serogroups B and C decreased and increased for W and Y.
- The notification rate of serogroup C was low in all countries regardless of whether meningococcal C conjugate (MCC) vaccine was included in national routine immunisation schedules.
- Continued strengthening of disease surveillance for IMD is essential to evaluate the impact of ongoing immunisation programmes and support decision makers in view of the availability of new vaccines.

### Methods

This report is based on data for 2016 retrieved from The European Surveillance System (TESSy) on 7 February 2018. TESSy is a system for the collection, analysis and dissemination of data on communicable diseases. EU Member States and EEA countries contribute to the system by uploading their infectious disease surveillance data at regular intervals.

For a detailed description of methods used to produce this report, please refer to the *Methods* chapter [1].

An overview of the national surveillance systems is available online [2].

Additional data on this disease are accessible from ECDC's online *Surveillance atlas of infectious diseases* [3].

Thirty EU/EEA Member States report data on invasive meningococcal disease (IMD) to ECDC. All Member States use the EU case definition (Commission Implementing Decision 2012/506/EU of 8 August 2012 of the European Parliament and of the Council) or a case definition compatible with the EU case definition for confirmed cases [2]. The majority of Member States report data from comprehensive passive surveillance systems with national

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coverage. Belgium reports data from a sentinel surveillance system. Bulgaria and Croatia reported aggregate data in 2016.

## Epidemiology

In 2016, 3 280 confirmed cases of IMD were reported in 30 EU/EEA countries (Table 1). Four countries (France, Germany, Spain and the United Kingdom) accounted for 60% of all confirmed cases. Iceland reported no cases in 2016. The overall notification rate was 0.6 cases per 100 000 population, similar to the notification rate for previous years. The highest notification rates were observed in Lithuania (2.4 per 100 000 population), Ireland (1.8), Cyprus (1.4), Malta (1.4) and the United Kingdom (1.3, Figure 1).

**Table 1. Number of invasive meningococcal disease cases and rate per 100 000 population by country and year, EU/EEA, 2012 to 2016**

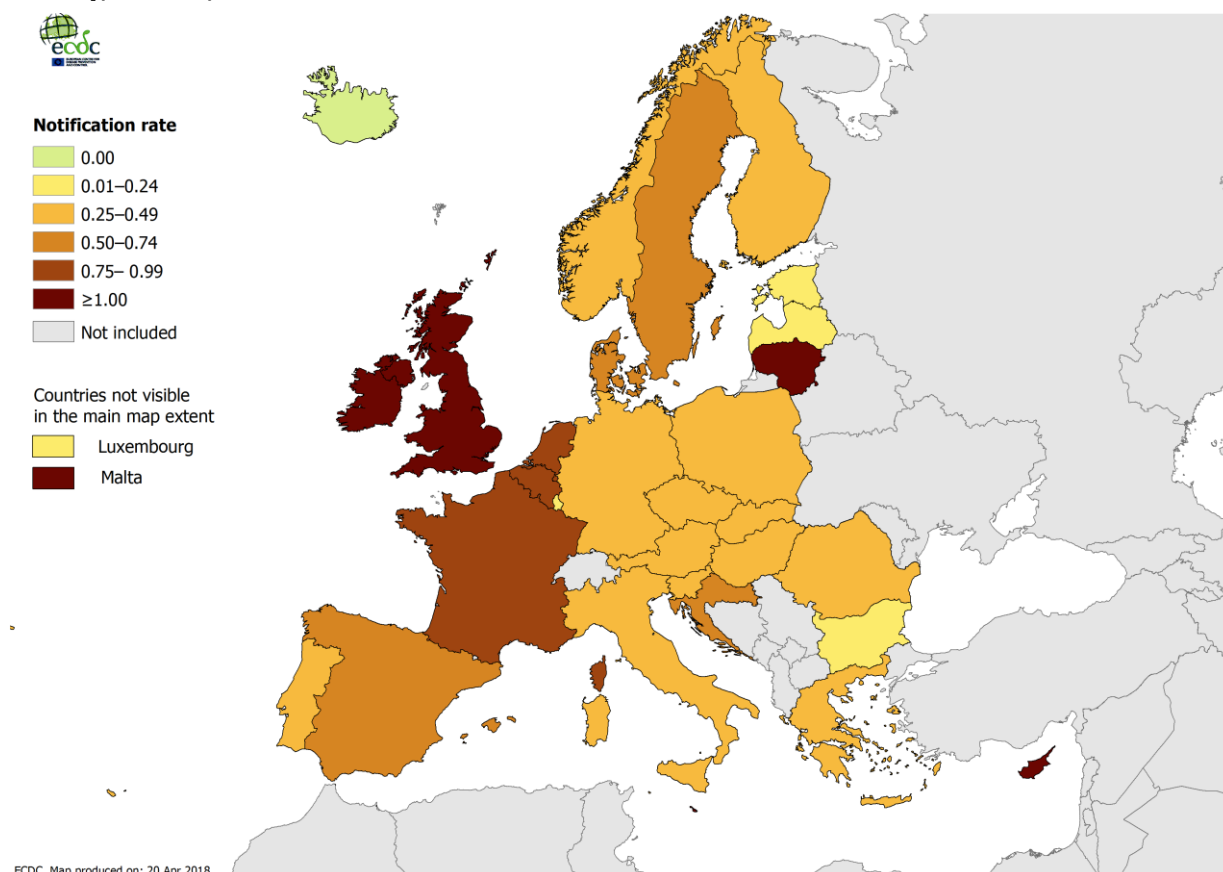
Country	2012		2013		2014		2015		2016			
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Confirmed cases	Rate	ASR	Reported cases
Austria	56	0.7	56	0.7	35	0.4	26	0.3	37	0.4	0.5	37
Belgium	123	1.1	134	1.2	87	0.8	99	0.9	107	0.9	0.9	107
Bulgaria	8	0.1	12	0.2	13	0.2	9	0.1	9	0.1	0.1	11
Croatia	41	1.0	26	0.6	33	0.8	42	1.0	30	0.7	0.8	30
Cyprus	6	0.7	2	0.2	4	0.5	4	0.5	12	1.4	1.3	12
Czech Republic	59	0.6	59	0.6	42	0.4	48	0.5	43	0.4	0.4	43
Denmark	56	1.0	55	1.0	45	0.8	22	0.4	38	0.7	0.7	38
Estonia	6	0.5	6	0.5	3	0.2	4	0.3	3	0.2	0.2	4
Finland	33	0.6	20	0.4	21	0.4	22	0.4	19	0.3	0.3	19
France	550	0.8	575	0.9	420	0.6	462	0.7	512	0.8	0.7	526
Germany	354	0.4	345	0.4	276	0.3	286	0.4	330	0.4	0.4	338
Greece	59	0.5	59	0.5	60	0.5	54	0.5	52	0.5	0.5	52
Hungary	51	0.5	47	0.5	33	0.3	35	0.4	47	0.5	0.5	49
Iceland	1	0.3	1	0.3	1	0.3	4	1.2	0	0.0	0.0	0
Ireland	60	1.3	77	1.7	76	1.7	68	1.5	85	1.8	1.7	87
Italy	135	0.2	162	0.3	156	0.3	187	0.3	228	0.4	0.4	228
Latvia	4	0.2	6	0.3	7	0.3	9	0.5	4	0.2	0.2	6
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-
Lithuania	53	1.8	76	2.6	53	1.8	55	1.9	68	2.4	2.3	75
Luxembourg	3	0.6	3	0.6	3	0.5	1	0.2	1	0.2	0.2	1
Malta	3	0.7	12	2.8	13	3.1	5	1.2	6	1.4	1.5	6
Netherlands	110	0.7	108	0.6	83	0.5	90	0.5	152	0.9	0.9	152
Norway	24	0.5	27	0.5	18	0.4	19	0.4	24	0.5	0.5	24
Poland	238	0.6	250	0.7	187	0.5	219	0.6	167	0.4	0.4	167
Portugal	69	0.7	61	0.6	52	0.5	65	0.6	38	0.4	0.4	38
Romania	71	0.4	52	0.3	67	0.3	50	0.3	55	0.3	0.3	58
Slovakia	31	0.6	18	0.3	23	0.4	24	0.4	23	0.4	0.4	26
Slovenia	9	0.4	11	0.5	8	0.4	16	0.8	7	0.3	0.3	7
Spain	335	0.7	262	0.6	146	0.3	210	0.5	262	0.6	0.6	312
Sweden	103	1.1	74	0.8	48	0.5	52	0.5	62	0.6	0.6	62
United Kingdom	862	1.4	852	1.3	750	1.2	935	1.4	859	1.3	1.3	859
<b>EU/EEA</b>	<b>3 513</b>	<b>0.7</b>	<b>3 448</b>	<b>0.7</b>	<b>2 763</b>	<b>0.5</b>	<b>3 122</b>	<b>0.6</b>	<b>3 280</b>	<b>0.6</b>	<b>0.6</b>	<b>3 374</b>

Source: Country reports

-: No data reported

ASR: Age-standardised rate.

**Figure 1. Number of confirmed cases of invasive meningococcal disease per 100 000 population by country, EU/EEA, 2016**



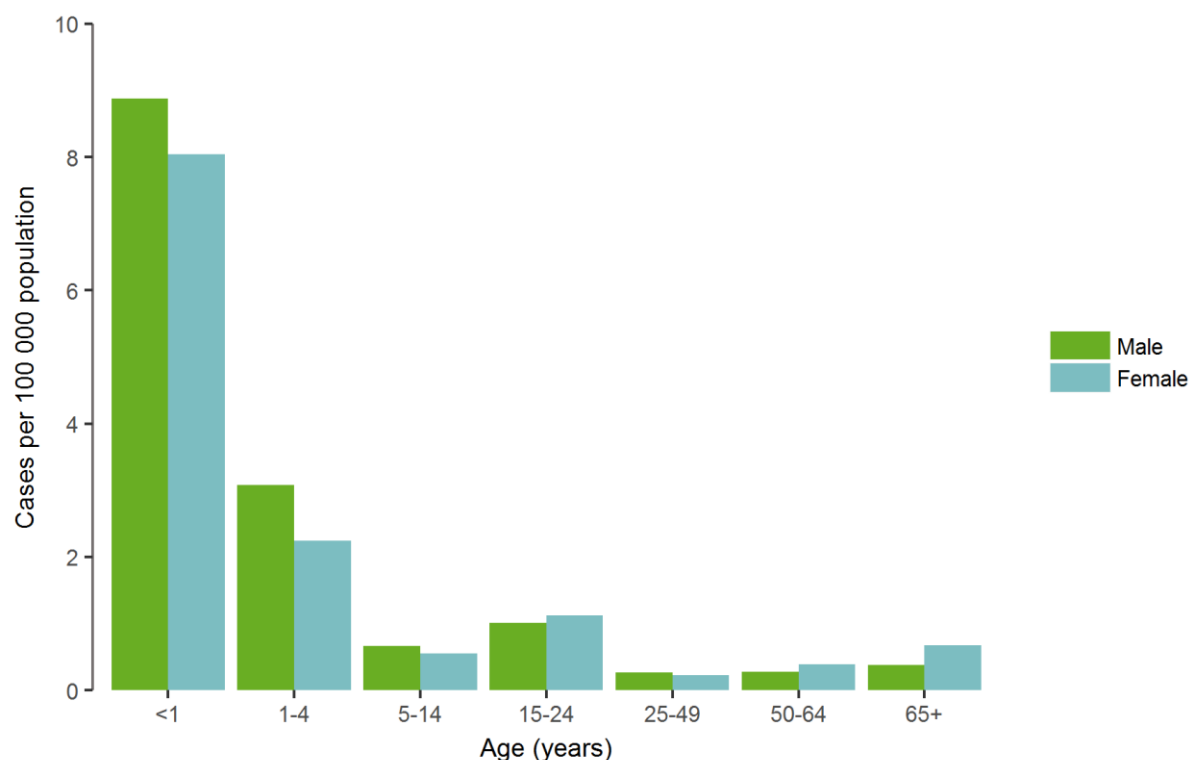
Source: Country reports from Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.

## Age and gender

In 2016, IMD was predominantly notified in infants and young children (Figure 2), with a notification rate of 8.5 confirmed cases per 100 000 population in children under one year of age and 2.7 confirmed cases per 100 000 population in 1–4-year-olds. Infants were the most affected age group in the majority of Member States, with the highest rates reported in Lithuania (41.3 cases per 100 000 population) and Ireland (27.2), followed by the United Kingdom (11.7) and Poland (11.3).

Rates were higher among males in children under 15 years of age and 25–49-year-olds. The overall male-to-female ratio was 0.9:1.

**Figure 2. Rate per 100 000 population of confirmed cases of invasive meningococcal disease by age and gender, EU/EEA, 2016**

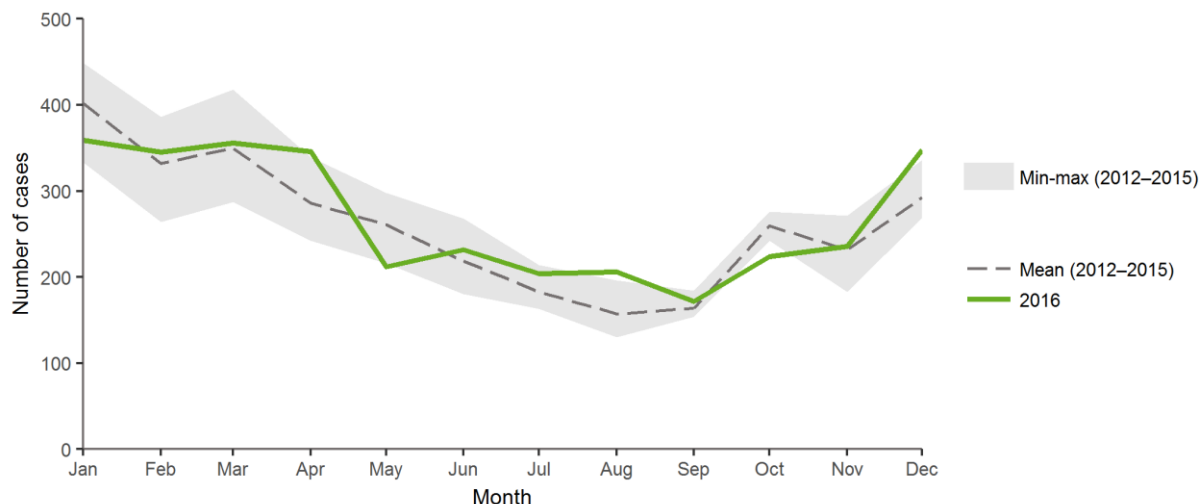


Source: Country reports from Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.

## Seasonality and trend

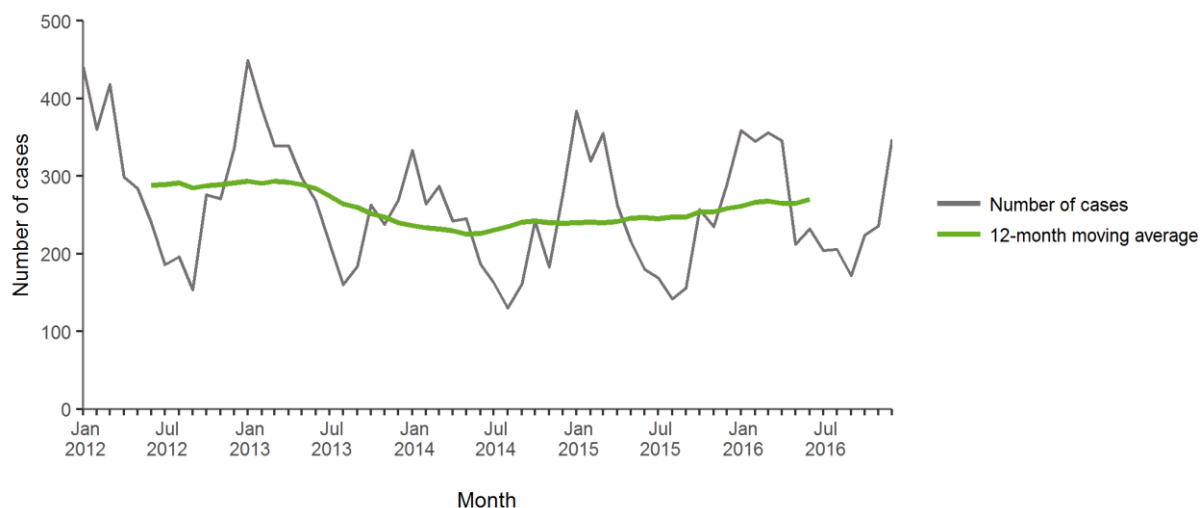
In 2016, seasonality followed a pattern similar to previous years. IMD occurred primarily in the winter months, while the number of cases was lowest in summer (Figure 3). The number of reported confirmed cases decreased from 2012 to mid-2014 and increased thereafter, showing an overall decrease of 7% from 2012 to 2016. (Figure 4). Since 2012, notification rates have decreased in all age groups below 15 years, remained stable among 15-64-year-olds and increased in those aged 65 years and over.

**Figure 3. Seasonal distribution of reported confirmed cases of invasive meningococcal disease, EU/EEA, 2016 compared with 2012 to 2015**



Source: Country reports from Austria, Belgium, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.

**Figure 4. Trend and number of confirmed cases of invasive meningococcal disease, EU/EEA, 2012 to 2016**



Source: Country reports from Austria, Belgium, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.

## Serogroup

Of the 3 280 IMD cases reported in 2016, 3 031 (92%) reported in 27 Member States had a known serogrouping result. The majority belonged to serogroup B (54%), followed by C and W (16% and 15% respectively, Table 2). Among 26 Member States that consistently reported serogroup data from 2012 to 2016, notifications of serogroup B decreased from 0.44 cases per 100 000 in 2012 to 0.32 in 2016 (Figure 5). The notification rate of serogroup C remained stable at 0.11 cases per 100 000 in 2012 compared with 0.10 in 2016. Serogroup W showed the most pronounced increase between 2012 (0.03 cases per 100 000) and 2016 (0.09), while serogroup Y increased slightly from 0.05 cases per 100 000 in 2012 to 0.07 cases in 2016.

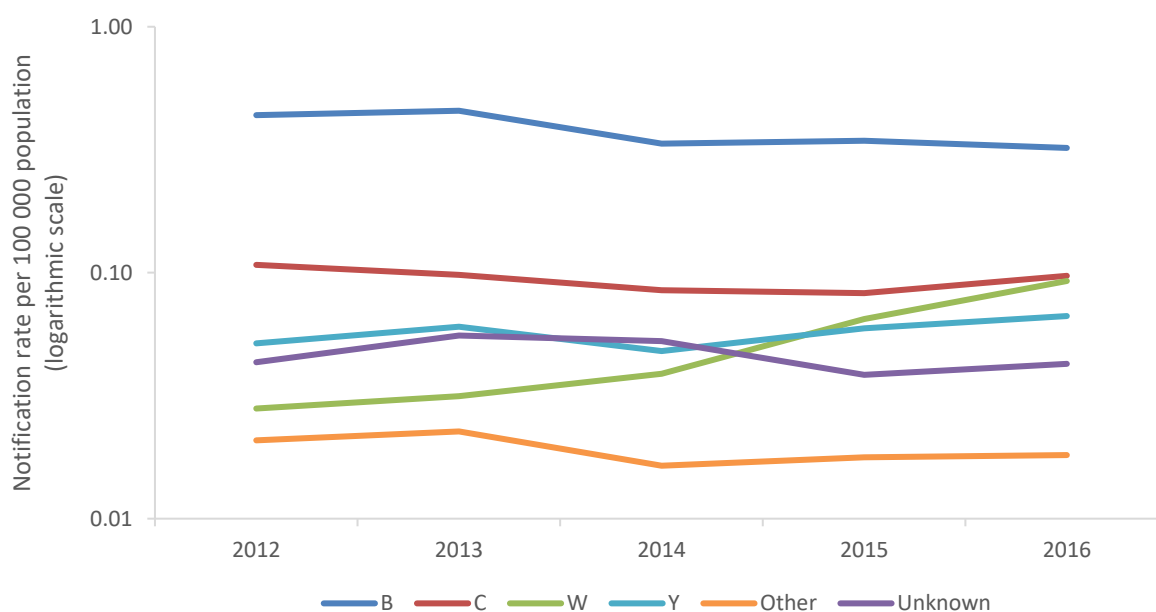
Serogroup B caused the majority of cases in all age groups below 65 years and accounted for more than 75% of IMD in children under the age of five, but only 24% of cases aged 65 years and over (Figure 6). Serogroup C was most prominent in 25–49-year-olds, accounting for 29% of cases in this age group. Serogroups Y and W were most prominent in those aged 65 years and over, causing 26% and 31% of IMD cases respectively in this age group.

**Table 2. Serogroup distribution of confirmed cases of invasive meningococcal disease, EU/EEA, 2016**

Serogroup	Cases	%
B	1 647	54
C	485	16
W	464	15
Y	344	11
Other	91	3
Total	3 031	100

'Other' refers to all cases reported as serogroup A, X, 29E, non-groupable or 'other'.

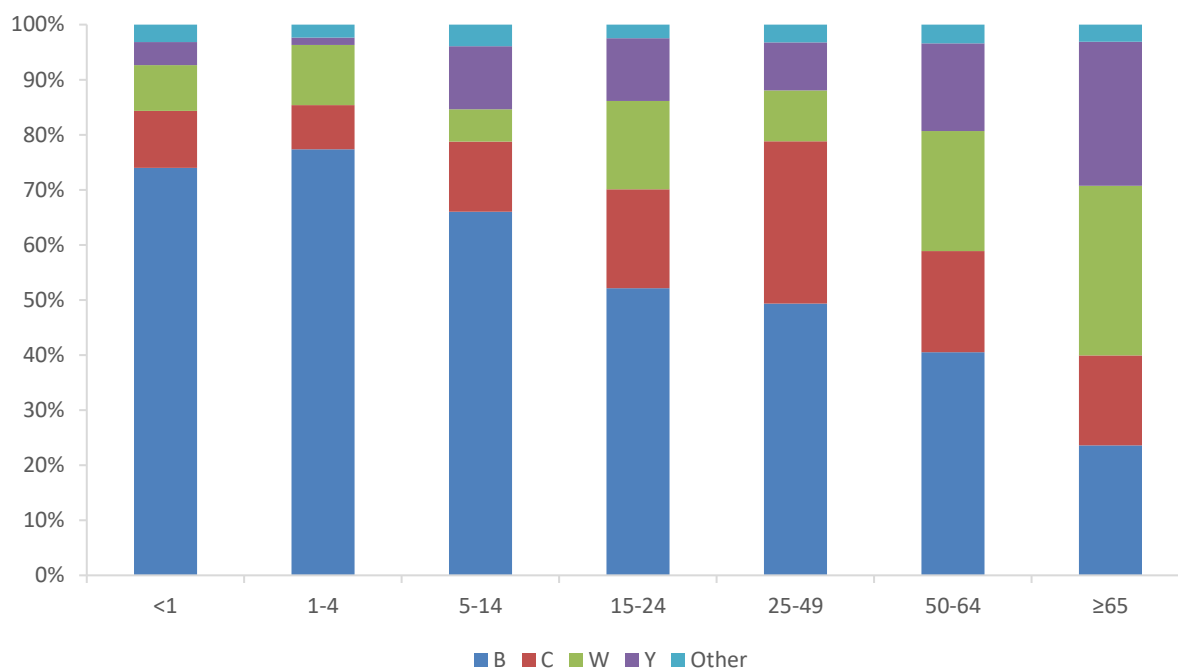
Source: Country reports from Austria, Belgium, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.

**Figure 5. Notification rate of confirmed cases of invasive meningococcal disease by serogroup and year, EU/EEA, 2012–2016**

'Other' refers to all cases reported as serogroup A, X, 29E, non-groupable or 'other'.

Source: Country reports from Austria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.

**Figure 6. Percentage distribution of serogroup among confirmed cases of invasive meningococcal disease by age group in years, EU/EEA, 2016**



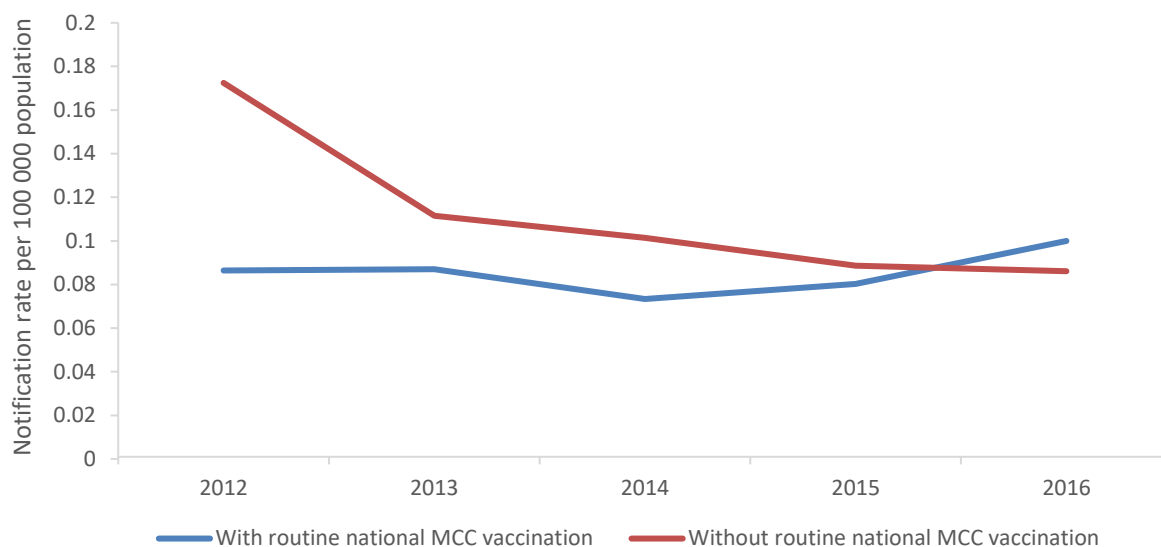
'Other' refers to all cases reported as serogroup A, X, 29E, non-groupable or 'other'.

Source: Country reports from Austria, Belgium, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.

By 2016, meningococcal C conjugate (MCC) vaccine was integrated into the national routine childhood immunisation programmes of 14 EU/EEA countries. In countries without national routine MCC vaccination, serogroup C accounted for 21% of cases. In countries with national routine MCC vaccination, 15% of cases were attributed to serogroup C.

The notification rate of serogroup C was low in all countries regardless of vaccination programme: 0.10 cases per 100 000 cases were reported in countries with a national routine MCC vaccination programme, while countries without such a programme reported 0.09 cases per 100 000 (Figure 7).

**Figure 7. Notification rate of confirmed cases of serogroup C invasive meningococcal disease in countries with or without national routine MCC vaccination programmes by year, EU/EEA, 2012 to 2016**



'Other' refers to all cases reported as serogroup A, X, 29E, non-groupable or 'other'. Only countries that provided complete data from 2012 to 2016 are included in the figure.

Contributing countries with national routine MCC vaccination: Austria, Cyprus, France, Germany, Greece, Iceland, Ireland, Italy, the Netherlands, Portugal, Spain and the United Kingdom. Contributing countries without national routine MCC vaccination: the Czech Republic, Denmark, Estonia, Finland, Hungary, Latvia, Lithuania, Malta, Norway, Poland, Romania, Slovakia, Slovenia and Sweden.

## Clinical presentation and outcome

Clinical presentation was known for 1 672 cases (51%). Septicaemia was reported in 607 cases (36%) and meningitis in 539 cases (32%). Both septicaemia and meningitis were reported in 301 cases (18%). Seventeen cases were reported as pneumonia. For the remaining 208 cases (12%), the reported clinical presentation was 'other'.

The outcome was known for 2 920 cases or 89% of all cases. There were 304 fatal cases reported, a case fatality of 10% among cases with known outcome. Of the four most common serogroups, case fatality was highest among cases of serogroup W (18%), followed by C (15%). Case fatality among serogroup Y cases was 11% and 7% for B. Case fatality was highest in cases aged 65 years and over (17%), followed by 50–64-year-olds (14%).

## Discussion

IMD remains rare in EU/EEA countries, but is a severe and life-threatening disease. The greatest burden is in infants and young children. The case fatality is relatively high and up to 20% of all survivors suffer from long-term sequelae [4]. In 2016, the notification rate was 0.6 cases per 100 000 population, the same as in 2015, and country-specific notification rates ranged from 0.1 to 2.4 cases per 100 000 population.

Despite the decreasing trend in serogroup B, which may be a naturally occurring secular trend, serogroup B continues to cause the majority of cases of IMD, predominantly affecting younger age groups [5,6]. In Europe, a recombinant protein vaccine including outer membrane vesicles against serogroup B (4CMenB) was licensed in 2013 and was estimated to provide protection against between 73% and 87% of circulating serogroup B strains depending on the country [7]. In addition, the recombinant protein vaccine provides potential cross-protection against IMD caused by other serogroups [8,9]. The United Kingdom introduced 4CMenB into its national routine childhood immunisation programme in September 2015 with promising preliminary results [10], followed by Ireland in October 2016 and Italy in January 2017. Additionally, the vaccine is recommended but not publicly funded in Austria, the Czech Republic and the state of Saxony in Germany and recommended for high-risk groups in Belgium, France, Luxembourg, Norway, Portugal and Spain. An ECDC expert opinion on the introduction of the 4CMenB vaccine in EU/EEA countries was published in December 2017 to support national decision-making concerning vaccine introduction into national immunisation programmes [11].



Since 1999, 14 EU/EEA countries have introduced MCC vaccination into their national routine childhood immunisation programme [12] and the impact of MCC vaccination has been well demonstrated [6,13–16]. In Europe, serogroup C shows a stable trend and has a low notification rate in all countries regardless of whether MCC vaccine was included in national routine immunisation schedules. The slight increase since 2014 in MCC notification rates among countries where MCC vaccination has been introduced needs to be monitored.

Although the trend in serogroup Y was stable at the EU level during the time period presented in this report, several EU/EEA countries have reported increasing trends in serogroup Y in recent years [5,6,15,17]. Serogroup W has increased at the European level since 2011, predominantly due to the rapid epidemic expansion of a single clone in the UK that started in 2009 [18], but other EU Member States also experienced an increase in serogroup W [5,19,20]. In recent years, Austria, the Czech Republic, Greece, Italy and the UK have introduced the quadrivalent conjugate vaccine MenACYW into their routine vaccination schedules, predominantly as booster doses for adolescents [12]. As carriage rates of *Neisseria meningitidis* are highest in adolescents and young adults [21], high levels of immunity in this age group are critical to ensure the protection of other vulnerable age groups [22].

## Public health implications

Several vaccines targeting different serogroups are available for the prevention of IMD. The choice of introducing a vaccine into the national routine immunisation programme depends on multiple factors, including disease and vaccine attributes, as well as context-specific factors in each country, such as the disease and serogroup burden, cost-effectiveness and feasibility.

Increasing trends in certain serogroups in some countries highlight the need for continued high-quality surveillance, including molecular methods, to accurately detect and assess changes in the epidemiology of IMD, the effectiveness and impact of implemented vaccines and the need for future vaccines.

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