

## SURVEILLANCE REPORT

Annual Epidemiological Report for 2015

# Invasive meningococcal disease

### Key facts

- In 2015, 3 121 confirmed cases of invasive meningococcal disease were reported by 30 EU/EEA Member States to ECDC.
- The notification rate was 0.6 cases per 100 000 population.
- Age-specific rates were highest in infants (10.0 cases per 100 000 population), followed by 1–4-year-olds (2.8 cases per 100 000 population).
- The majority of cases were caused by serogroup B (61%).
- 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 surveillance for invasive meningococcal disease is essential to evaluate the impact of ongoing immunisation programmes and to support decision-makers in view of the availability of new vaccines.

### Methods

This report is based on data for 2015 retrieved from The European Surveillance System (TESSy) on 26 October 2016. 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].

ECDC has coordinated the surveillance of invasive meningococcal disease (IMD) at the European level since the transfer of EU-IBIS (European Union Invasive Bacterial Infections Surveillance Network) to ECDC in 2007.

Thirty EU/EEA Member States report data on invasive meningococcal disease to ECDC. All Member States report data using the EU case definition (Commission Implementing Decision 2012/506/EU of 8 August 2012 of the

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European Parliament and of the Council) or use a case definition that is compatible with the EU case definition for confirmed cases. The majority of Member States report data from comprehensive, passive surveillance systems with national coverage. Belgium reports data from a sentinel surveillance system.

## Epidemiology

In 2015, 3 121 confirmed cases of IMD were reported in 30 EU/EEA countries (Table 1, Figure 1). The notification rate was 0.6 cases per 100 000 population, comparable with the notification rate for previous years. The highest notification rates were observed in Lithuania (1.9 per 100 000 population), Ireland (1.5) and the UK (1.4) (Table 1, Figure 2).

**Table 1. Cases of invasive meningococcal disease: number and rate per 100 000 population, EU/EEA, 2011–2015**

Country	2011		2012		2013		2014		National coverage	Reported cases	2015		
	Confirmed cases		Confirmed cases		Confirmed cases		Confirmed cases				Confirmed cases		
	Number	Rate	Number	Rate	Number	Rate	Number	Rate			Number	Rate	ASR
Austria	49	0.6	56	0.7	56	0.7	35	0.4	Y	27	26	0.3	0.3
Belgium	111	1.0	123	1.1	134	1.2	87	0.8	Y	99	99	0.9	0.9
Bulgaria	13	0.2	8	0.1	12	0.2	13	0.2	Y	12	9	0.1	0.1
Croatia	.	.	41	1.0	26	0.6	33	0.8	Y	42	42	1.0	1.0
Cyprus	1	0.1	6	0.7	2	0.2	4	0.5	Y	4	4	0.5	0.5
Czech Republic	63	0.6	59	0.6	59	0.6	42	0.4	Y	48	48	0.5	0.5
Denmark	72	1.3	56	1.0	55	1.0	45	0.8	Y	22	22	0.4	0.4
Estonia	7	0.5	6	0.5	6	0.5	3	0.2	Y	4	4	0.3	0.3
Finland	34	0.6	33	0.6	20	0.4	21	0.4	Y	22	22	0.4	0.4
France	563	0.9	550	0.8	575	0.9	420	0.6	Y	470	462	0.7	0.7
Germany	369	0.5	354	0.4	345	0.4	276	0.3	Y	289	286	0.4	0.4
Greece	52	0.5	59	0.5	59	0.5	60	0.5	Y	54	54	0.5	0.5
Hungary	67	0.7	51	0.5	47	0.5	33	0.3	Y	36	35	0.4	0.4
Ireland	89	1.9	60	1.3	77	1.7	76	1.7	Y	77	68	1.5	1.3
Italy	152	0.3	135	0.2	162	0.3	156	0.3	Y	187	187	0.3	0.3
Latvia	2	0.1	4	0.2	6	0.3	7	0.3	Y	12	9	0.5	0.5
Lithuania	42	1.4	53	1.8	76	2.6	53	1.8	Y	74	55	1.9	2.0
Luxembourg	2	0.4	3	0.6	3	0.6	3	0.5	Y	1	1	0.2	0.2
Malta	6	1.4	3	0.7	12	2.8	13	3.1	Y	10	5	1.2	1.2
Netherlands	106	0.6	110	0.7	108	0.6	83	0.5	Y	90	90	0.5	0.5
Poland	282	0.7	238	0.6	250	0.7	187	0.5	Y	219	218	0.6	0.6
Portugal	77	0.7	69	0.7	61	0.6	52	0.5	Y	68	65	0.6	0.7
Romania	68	0.3	71	0.4	52	0.3	67	0.3	Y	51	50	0.3	0.3
Slovakia	21	0.4	31	0.6	18	0.3	23	0.4	Y	30	24	0.4	0.4
Slovenia	13	0.6	9	0.4	11	0.5	8	0.4	Y	20	16	0.8	0.8
Spain	431	0.9	335	0.7	262	0.6	146	0.3	Y	276	210	0.5	0.5
Sweden	68	0.7	103	1.1	74	0.8	48	0.5	Y	53	52	0.5	0.5
United Kingdom	1036	1.6	862	1.4	852	1.3	750	1.2	Y	935	935	1.4	1.3
<b>EU</b>	<b>3796</b>	<b>0.8</b>	<b>3488</b>	<b>0.7</b>	<b>3420</b>	<b>0.7</b>	<b>2744</b>	<b>0.5</b>	.	<b>3232</b>	<b>3098</b>	<b>0.6</b>	<b>0.6</b>
Iceland	2	0.6	1	0.3	1	0.3	1	0.3	Y	4	4	1.2	0.9
Liechtenstein	.	.	.	.	.	.	.	.	.	.	.	.	.
Norway	37	0.8	24	0.5	27	0.5	18	0.4	Y	19	19	0.4	0.4
<b>EU/EEA</b>	<b>3835</b>	<b>0.8</b>	<b>3513</b>	<b>0.7</b>	<b>3448</b>	<b>0.7</b>	<b>2763</b>	<b>0.5</b>	.	<b>3255</b>	<b>3121</b>	<b>0.6</b>	<b>0.6</b>

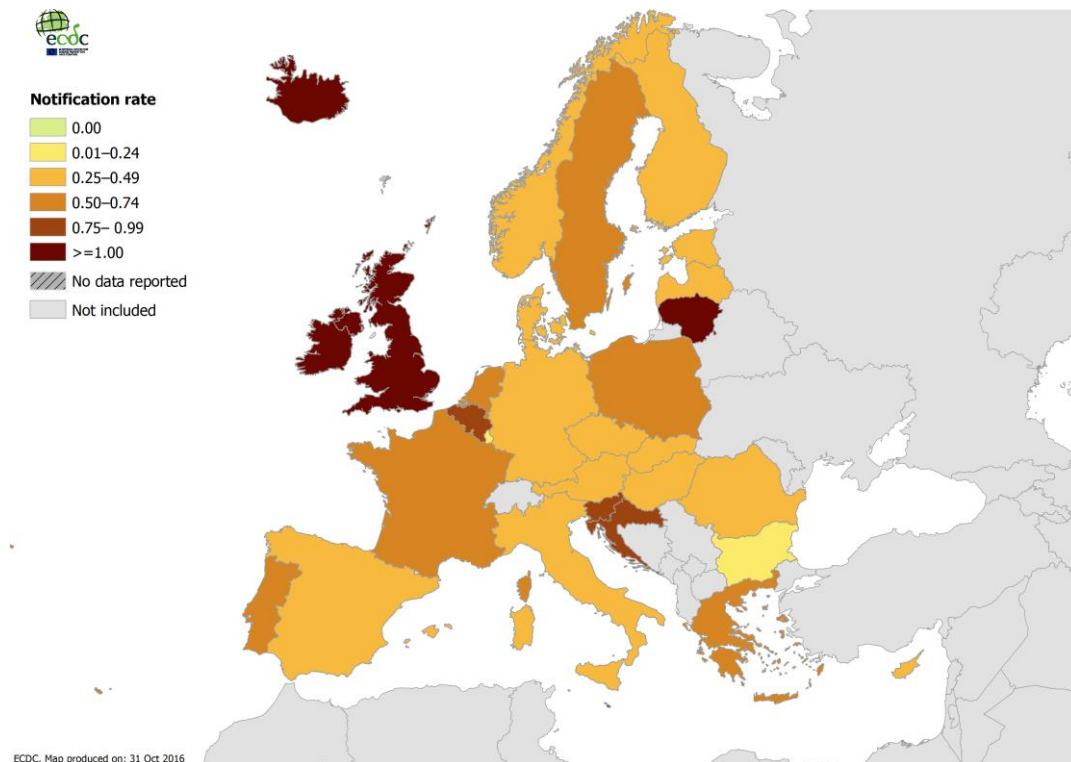
Source: Country reports. Legend: Y = yes, N = no, . = no data reported, ASR: age-standardised rate, - = no notification rate calculated.

**Figure 1. Distribution of confirmed cases of invasive meningococcal disease, by country, EU/EEA, 2015**



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, the United Kingdom.

**Figure 2. Distribution of confirmed cases of invasive meningococcal disease per 100 000 population, by country, EU/EEA, 2015**

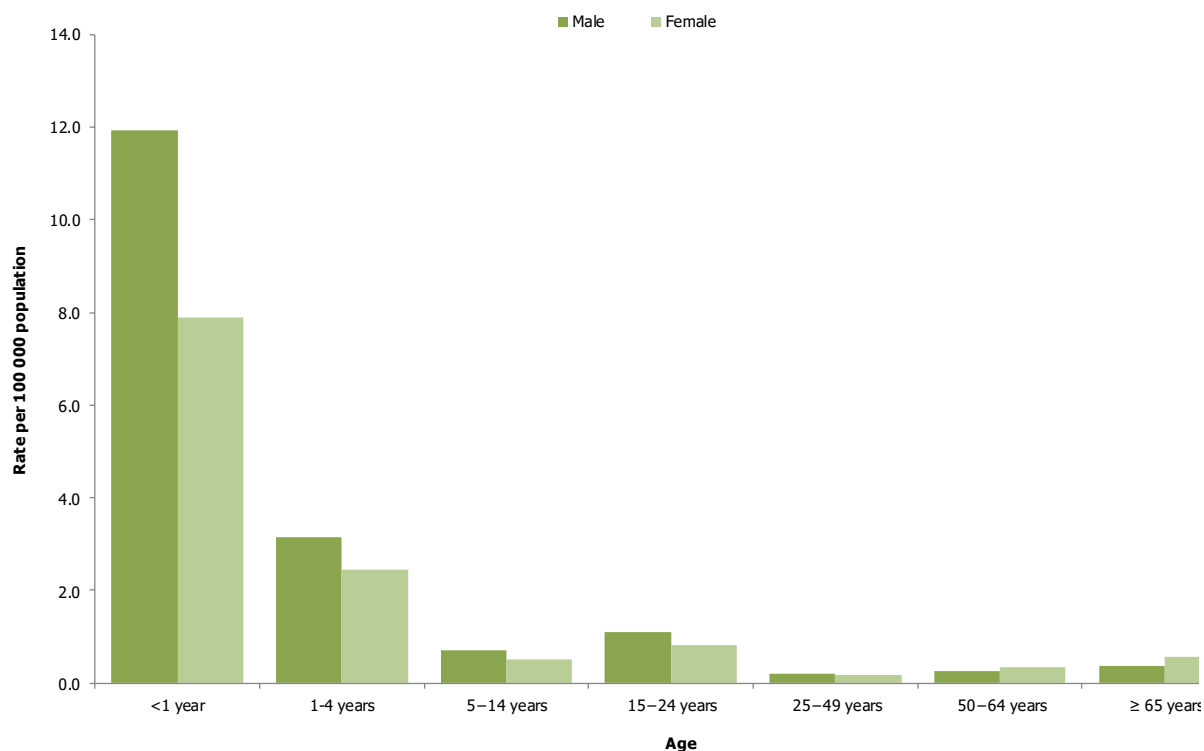


Source: Country reports from Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden,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

## Age and gender distribution

In 2015, IMD was predominantly found in infants and young children (Figure 3), with a notification rate of 10.0 confirmed cases per 100 000 population in children under one year of age, and 2.8 confirmed cases per 100 000 population in 1–4-year-olds. When stratifying by gender, there was a predominance of cases in males versus females in the age groups under 50 years of age (Figure 3). The overall male-to-female ratio was 1.1:1.

**Figure 3. Rate per 100 000 cases of confirmed invasive meningococcal disease cases, by age and gender, EU/EEA, 2015**

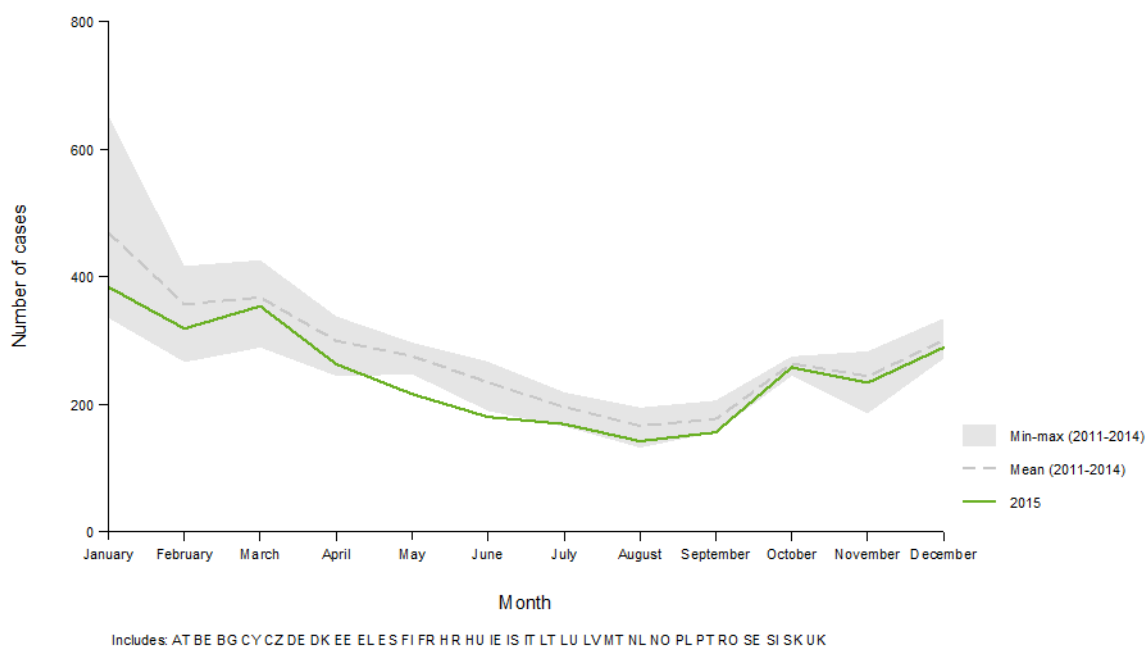


Source: Country reports from Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden,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

## Seasonality

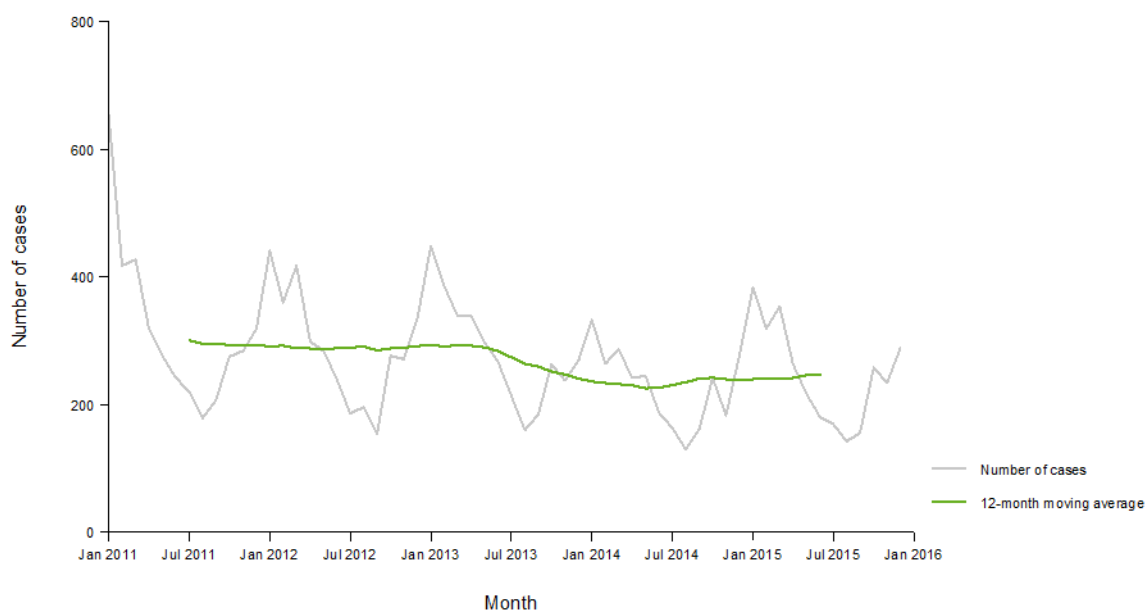
In 2015, seasonality followed a pattern similar to previous years. IMD occurred primarily in the winter months, while the number of cases was lowest in summer (Figures 4 and 5). The monthly number of cases in 2015 was consistently lower than the mean number of cases in 2011–2014 (Figure 4).

**Figure 4. Seasonal distribution of confirmed cases of invasive meningococcal disease, EU/EEA, 2015 compared with 2011–2014**



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, the United Kingdom.

**Figure 5. Distribution of confirmed cases of invasive meningococcal disease, by month, EU/EEA, 2011–2015**



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, the United Kingdom.

## Serogroup

Of the 3 121 IMD cases reported in 2015, 2 780 (89%), reported by a total of 26 Member States, had a known serogrouping result. Of the cases with known serogroup, the majority belonged to serogroup B (61%), followed by serogroup C (14%) (Table 2). Among 26 Member States that consistently reported serogroup data from 2011 to

2015, there was a decrease in serogroup B from 0.56 cases per 100 000 in 2011 (n=2 710) to 0.34 cases per 100 000 in 2015 (n=1 682) (Figure 6). The notification rate of serogroup C also decreased, from 0.11 cases per 100 000 in 2011 (n=545) to 0.08 cases per 100 000 in 2015 (n=403). Serogroup W increased consistently from 2011 (0.02 cases per 100 000, n=90) to 2015 (0.06, n=317), while serogroup Y remained stable. Serogroup B accounted for more than 75% of IMD in children under the age of five years, but for only 35% of cases aged 65 years and over (Figure 7). Serogroup C was most prominent in 25–49-year-olds, accounting for 27% of cases in this age group. Serogroups Y and W were most prominent in those aged 65 years and over, each causing 25% of IMD cases in this age group.

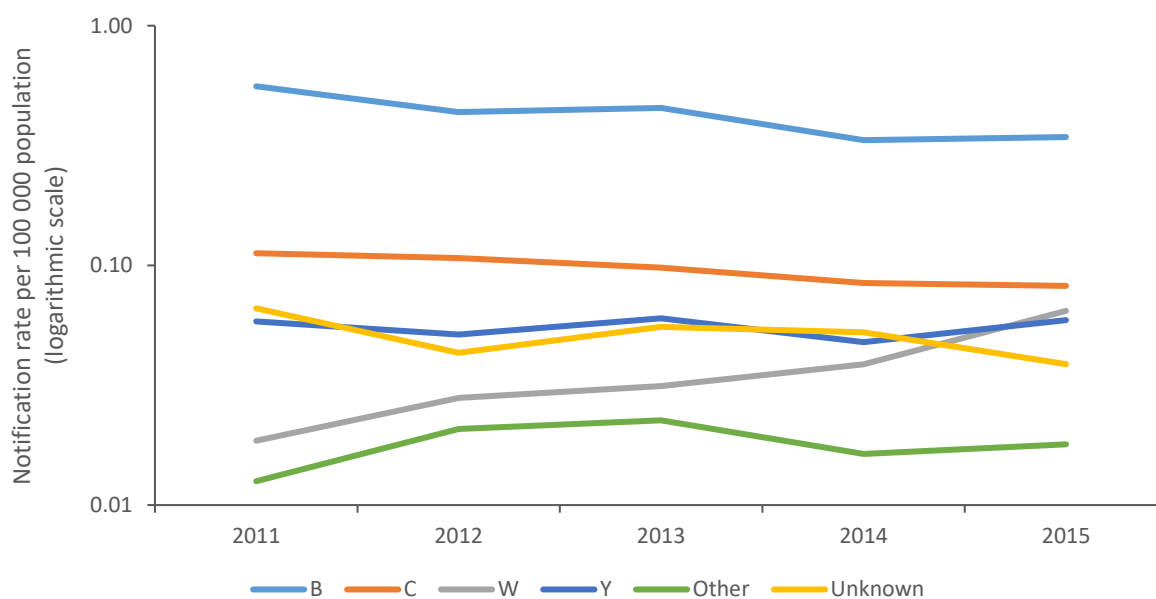
**Table 2. Serogroup distribution of confirmed cases of invasive meningococcal disease, EU/EEA, 2015**

Serogroup	Cases	%
B	1 682	61
C	403	14
Y	290	10
W	317	11
Other	88	3
Total	2 780	100

'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, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, the United Kingdom.

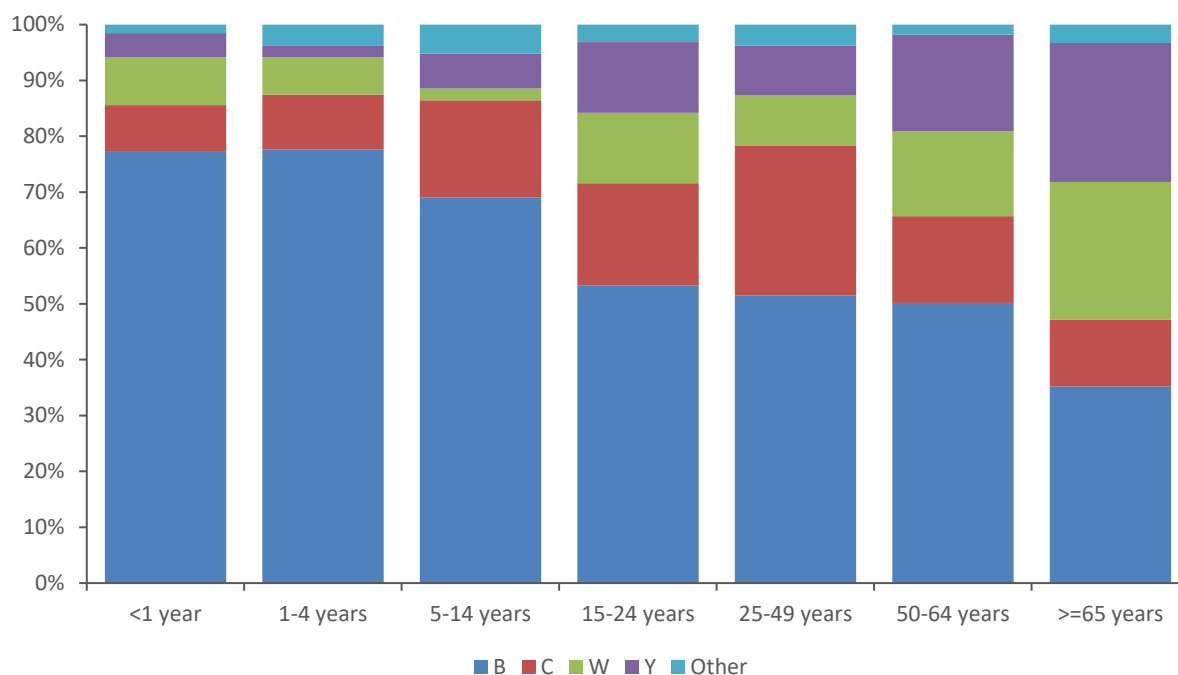
**Figure 6. Notification rate of confirmed cases of invasive meningococcal disease, by serogroup and year, EU/EEA, 2011–2015**



'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, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, the United Kingdom.

**Figure 7. Serogroup distribution of confirmed cases of invasive meningococcal disease, by age group, EU/EEA, 2015**



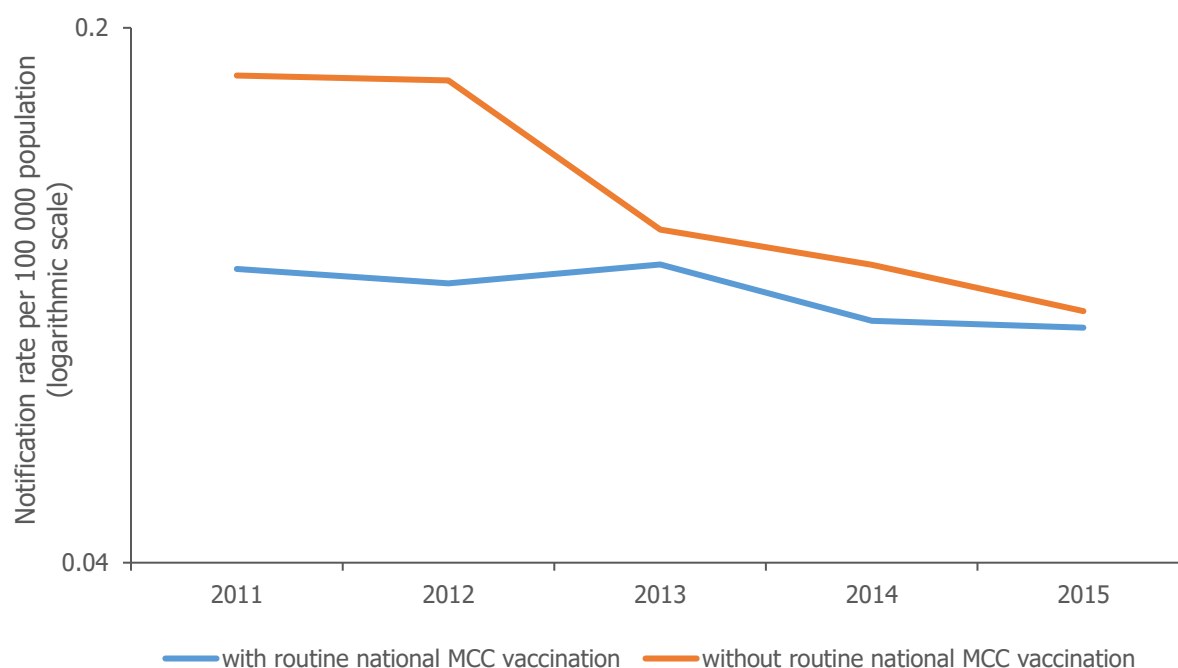
'Other' refers to all cases reported as serogroup A, X, 29E, non-groupable or 'other'.

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

By 2015, meningococcal C conjugate (MCC) vaccine was integrated into the national routine childhood immunisation programme of 14 EU/EEA countries. In countries without national routine MCC vaccination, serogroup C accounted for 22% of cases. In countries with national routine MCC vaccination, 13% of cases were attributed to serogroup C.

The notification rate of serogroup C was low in all countries, regardless of vaccination programme: 0.81 cases per 100 000 cases were reported in countries with a national routine MCC vaccination programme, while countries without such a programme reported 0.85 cases per 100 000 (Figure 8).

**Figure 8. Notification rate of confirmed cases of serogroup C invasive meningococcal disease in countries with/without national routine MCC vaccination programmes, EU/EEA, 2011–2015**



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

Contributing countries without national routine MCC vaccination: Czech Republic, Denmark, Estonia, Finland, Hungary, Latvia, Lithuania, Malta, Norway, Poland, Romania, Slovakia, Slovenia, Sweden.

Contributing countries with national routine MCC vaccination: Austria, Cyprus, France, Germany, Greece, Iceland, Ireland, Italy, the Netherlands, Portugal, Spain, the United Kingdom.

## Clinical presentation

The clinical presentation was known for 1 465 cases (47%). Septicaemia was reported in 524 cases (36%), and meningitis was reported in 521 cases (36%). Both septicaemia and meningitis were reported in 269 cases (18%). Five cases were reported as pneumonia. For the remaining 146 cases, the reported clinical presentation was 'other'.

## Outcome

The outcome was known for 2 763 cases, or 88% of all cases. There were 259 fatal cases reported, a case fatality of 9%, considering only cases with known outcome. Of the four most common serogroups, case fatality was highest among cases of serogroup W (14%, n=43/301), followed by serogroup C (11%, n=40/355). Case fatality among serogroup Y cases was 10% (n=26/267). Among serogroup B cases, case fatality was 8% (n=121/1 602). Case fatality was highest in cases aged 65 years and over (18%, n=75/351), followed by the age group of 50–64-year-olds (14%, n=39/271).

## Discussion

Invasive meningococcal disease remains rare in EU/EEA countries, with the greatest burden in infants and young children. In 2015, country-specific notification rates ranged from 0.1 to 1.9 cases per 100 000 population. Although IMD is rare, it is a severe and life-threatening disease with a relatively high case fatality and with up to one fifth of all survivors suffering from long-term sequelae [4].

There continues to be a decreasing trend in serogroup B, which may be a naturally occurring secular trend [5,6]. However, serogroup B continues to cause the majority of cases of IMD, predominantly affecting younger age groups. 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 circulating serogroup B strains between 73% and 87%, 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, and Ireland did so in October 2016.

Since 1999, 14 EU/EEA countries have introduced MCC vaccination into their national routine childhood immunisation programme [10], and the impact of MCC vaccination has been well demonstrated [6,11-14]. In Europe, serogroup C continues to show a decreasing trend and has a low notification rate in all countries [5].

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 [5,6,13,15]. Serogroup W has been increasing at the European level since 2011, predominantly due to the rapid epidemic expansion of a single clone in the UK that started in 2009–2010 [16], but other EU Member States also experienced an increase in serogroup W [5,17,18]. In recent years, four countries (the UK, Greece, Austria and the Czech Republic) have introduced the quadrivalent conjugate vaccine MenACYW into their routine vaccination schedules, predominantly as booster doses for adolescents [10]. As carriage rates of *Neisseria meningitidis* are highest in adolescents and young adults [19], high levels of immunity in this age group are critical to ensure the protection of other vulnerable age groups [20].

## Public health implications

Several vaccines targeting different serogroups are available for the prevention of invasive meningococcal disease. The choice of introducing a vaccine into the national routine immunisation programme depends on the 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 some 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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