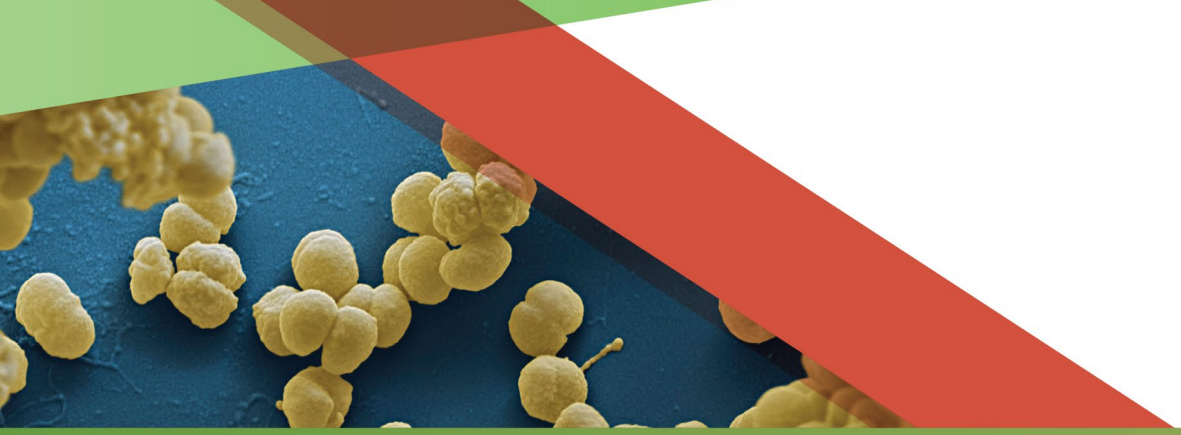


SURVEILLANCE REPORT

Invasive meningococcal disease

Annual Epidemiological Report for 2021

Key facts

- In 2021, 612 confirmed cases of invasive meningococcal disease (IMD), including 48 deaths, were reported in 30 EU/EEA countries.
- France, Germany and Poland accounted for 49% of all confirmed IMD cases in 2021.
- The overall EU/EEA notification rate was 0.1 cases per 100 000 population in 2021, which was the lowest it has been since 2017. The notification rate decreased by 83.3% in 2021 compared with 2017 to 2019 (0.6 cases per 100 000 population).
- Age-specific notification rates of IMD were highest in infants (aged under 1 year), followed by 1–4-year-olds and 15–24-year-olds.
- Serogroup B remains the major cause of IMD and accounted for 51% of serogroup-documented cases, though its notification rate decreased since 2019. The notification rate of serogroups W and Y also decreased.
- Serogroup W remained the second most common cause of IMD and was reported in 12% of serogroup-documented cases, followed by serogroup C (12%).
- Vaccination strategies have evolved since 2018. Continued strengthening of disease surveillance for IMD is essential to evaluate the impact of immunisation programmes and to support decision-makers in designing vaccination strategies that consider the lifelong immunisation course.

Introduction

Invasive meningococcal disease (IMD) is a serious bacterial infection caused by the Gram-negative diplococcus *Neisseria meningitidis*. The bacterium is often detected in the nasopharynx without causing disease, described as asymptomatic carriage. It occasionally invades the body and causes meningococcal infection. IMD is a major cause of meningitis (37%–49% of cases) and septicaemia (18%–33% of cases) [1]. It is of public health concern because of its severe morbidity and relatively high case fatality rate (8–15%), especially in young children.

Vaccines are available for primary prevention of disease caused by serogroups A, B, C, W and Y. Antibiotics are administered for elimination of carriage and treatment of disease.

Methods

This report is based on data for 2021 retrieved from The European Surveillance System (TESSy) on 20 April 2023. TESSy is a system for the collection, analysis and dissemination of data on communicable diseases.

For a detailed description of the methods used to produce this report, refer to the Methods chapter of the 'ECDC Annual Epidemiological Report 2021' [2].

An overview of the national surveillance systems is available online [3].

A subset of the data used for this report is available through ECDC's online 'Surveillance Atlas of Infectious Diseases' [4].

Suggested citation: European Centre for Disease Prevention and Control. Invasive meningococcal disease. In: ECDC. Annual epidemiological report for 2021. Stockholm: ECDC; 2023.

Stockholm, October 2023

Thirty EU/EEA countries reported data on invasive meningococcal disease (IMD) to ECDC. The majority of countries used the EU case definition [5] or a compatible case definition for confirmed cases [3].

The majority of countries reported data from comprehensive, passive surveillance systems with national coverage. Belgium reported data from a sentinel surveillance system. Bulgaria and Croatia reported aggregate data in 2021.

The United Kingdom (UK) contributed surveillance data up to 2019. No data were reported by the UK for 2020 or 2021 due to its withdrawal from the EU on 31 January 2020. The UK data that were reported up to 2019 are not included in the analysis of trends.

Epidemiology

In 2021, 612 confirmed cases of IMD were reported in 30 EU/EEA countries (Table 1). Three countries (France, Germany and Poland) accounted for 49% of all confirmed cases.

The overall EU/EEA notification rate was 0.1 cases per 100 000 population. By country, notification rates ranged from zero cases (Bulgaria, Cyprus, Finland, Greece, Iceland, Italy and Liechtenstein) to 1.6 cases per 100 000 population (Malta) (Table 1, Figure 1). The notification rate decreased by 83.3% in 2021 compared with 2017 to 2019 (0.6 cases per 100 000 population). It also decreased, although to a lesser extent, in 2020 (0.3 cases per 100 000 population).

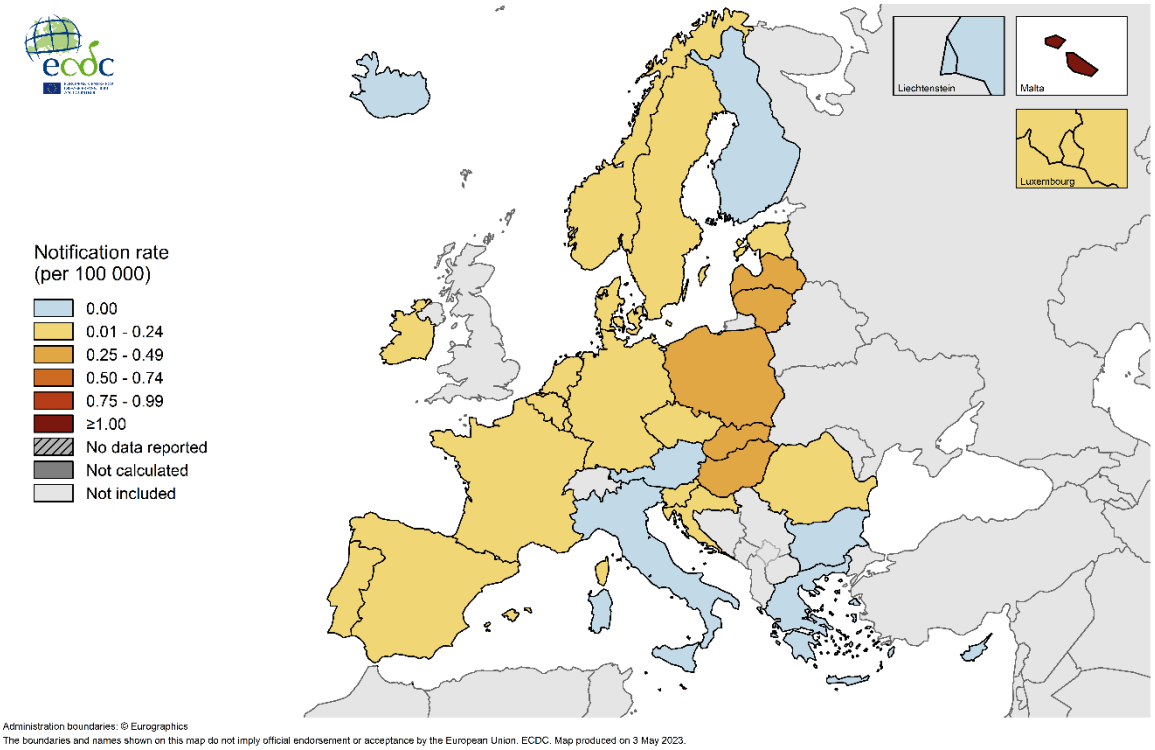
All countries experienced a decrease in notification rates compared with 2017 to 2019, except Latvia and Luxembourg, where these rates fluctuated between 0.3–0.4 and 0–0.3 per 100 000 population, respectively. In Malta, the notification rate increased in 2019 compared with 2017 and 2018, and although it decreased afterwards, it remained higher in 2021 than in 2017.

Table 1. Distribution of confirmed invasive meningococcal disease cases and notification rates per 100 000 population by country and year, EU/EEA, 2017–2021

Country	2017		2018		2019		2020		2021	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Austria	20	0.2	30	0.3	24	0.3	8	0.1	2	<0.1
Belgium	96	0.8	116	1.0	107	0.9	55	0.5	24	0.2
Bulgaria	7	0.1	5	0.1	9	0.1	3	0.0	1	<0.1
Croatia	37	0.9	31	0.8	34	0.8	14	0.3	6	0.1
Cyprus	4	0.5	1	0.1	2	0.2	0	0.0	0	0.0
Czechia	67	0.6	56	0.5	49	0.5	25	0.2	11	0.1
Denmark	39	0.7	38	0.7	50	0.9	16	0.3	9	0.2
Estonia	4	0.3	8	0.6	4	0.3	3	0.2	1	0.1
Finland	16	0.3	16	0.3	16	0.3	5	0.1	2	0.0
France	545	0.8	439	0.7	456	0.7	214	0.3	117	0.2
Germany	285	0.3	288	0.3	254	0.3	137	0.2	74	0.1
Greece	42	0.4	34	0.3	32	0.3	21	0.2	4	<0.1
Hungary	39	0.4	40	0.4	46	0.5	32	0.3	30	0.3
Iceland	3	0.9	0	0.0	0	0.0	0	0.0	0	0.0
Ireland	71	1.5	88	1.8	67	1.4	20	0.4	10	0.2
Italy	197	0.3	170	0.3	189	0.3	73	0.1	25	<0.1
Latvia	7	0.4	5	0.3	8	0.4	6	0.3	5	0.3
Liechtenstein	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR	0	0.0
Lithuania	68	2.4	31	1.1	32	1.1	7	0.3	11	0.4
Luxembourg	0	0.0	2	0.3	2	0.3	4	0.6	1	0.2
Malta	2	0.4	4	0.8	33	6.7	17	3.3	8	1.6
Netherlands	198	1.2	206	1.2	159	0.9	68	0.4	37	0.2
Norway	18	0.3	26	0.5	16	0.3	5	0.1	5	0.1
Poland	226	0.6	199	0.5	193	0.5	106	0.3	107	0.3
Portugal	49	0.5	57	0.6	56	0.5	34	0.3	10	0.1
Romania	50	0.3	64	0.3	50	0.3	24	0.1	12	0.1
Slovakia	37	0.7	36	0.7	29	0.5	23	0.4	20	0.4
Slovenia	9	0.4	18	0.9	9	0.4	5	0.2	3	0.1
Spain	268	0.6	392	0.8	395	0.8	213	0.5	68	0.1
Sweden	49	0.5	56	0.6	65	0.6	28	0.3	9	0.1
United Kingdom	773	1.2	772	1.2	582	0.9	NDR	NDR	NDR	NDR
EU/EEA	**3 226**	**0.6**	**3 228**	**0.6**	**2 968**	**0.6**	**1 166**	**0.3**	**612**	**0.1**

Source: country reports
NDR: no data reported
The United Kingdom did not report data for 2020 or 2021 due to its withdrawal from the EU on 31 January 2020.

Figure 1. Distribution of confirmed invasive meningococcal disease cases per 100 000 population by country, EU/EEA, 2021



Age and gender

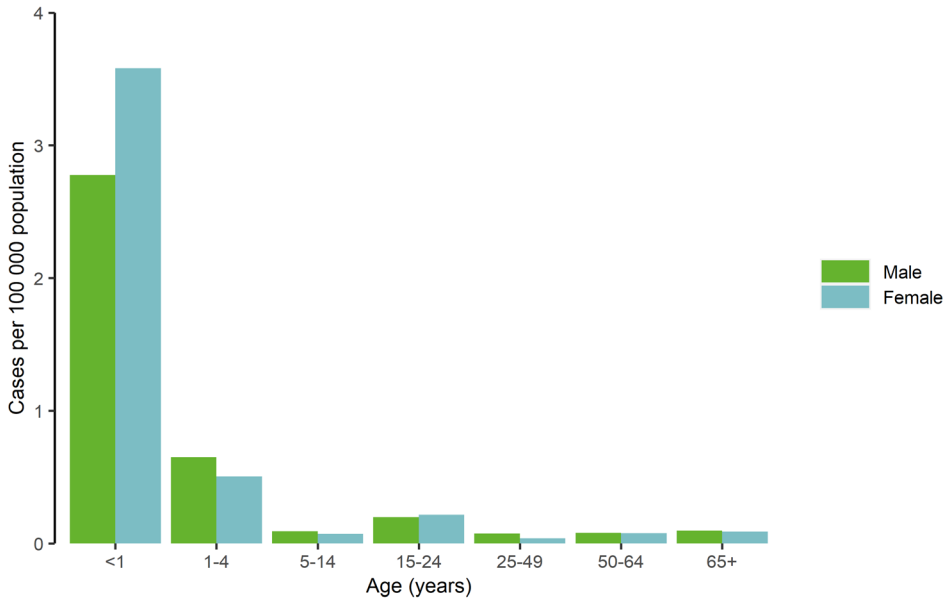
In 2021, IMD incidence in the EU/EEA was highest among the youngest age groups. The notification rate was 3.2 confirmed cases per 100 000 population in infants (under one year of age) and 0.6 confirmed cases per 100 000 population in children one to four years old (Figure 2), similar to previous years. The notification rate in 15–24-year-olds (0.2 per 100 000 population) was slightly higher than in 5–14-year-olds (0.1 per 100 000 population). Although there is usually a seasonal peak in the notification rate for individuals aged 65 years and older, no peak was observed in 2021.

Infants were the most affected age group in most countries, with country-specific notification rates varying from 0–15.4 cases per 100 000 population.

Compared with 2018, the trend in notification rates by age group was similar.

The overall male-to-female ratio of IMD cases was 1:1.1. Notification rates were highest in female infants (less than one year old): 3.8 versus 2.8 confirmed cases per 100 000 population.

Figure 2. Distribution of confirmed invasive meningococcal disease cases per 100 000 population by age and gender, EU/EEA, 2021

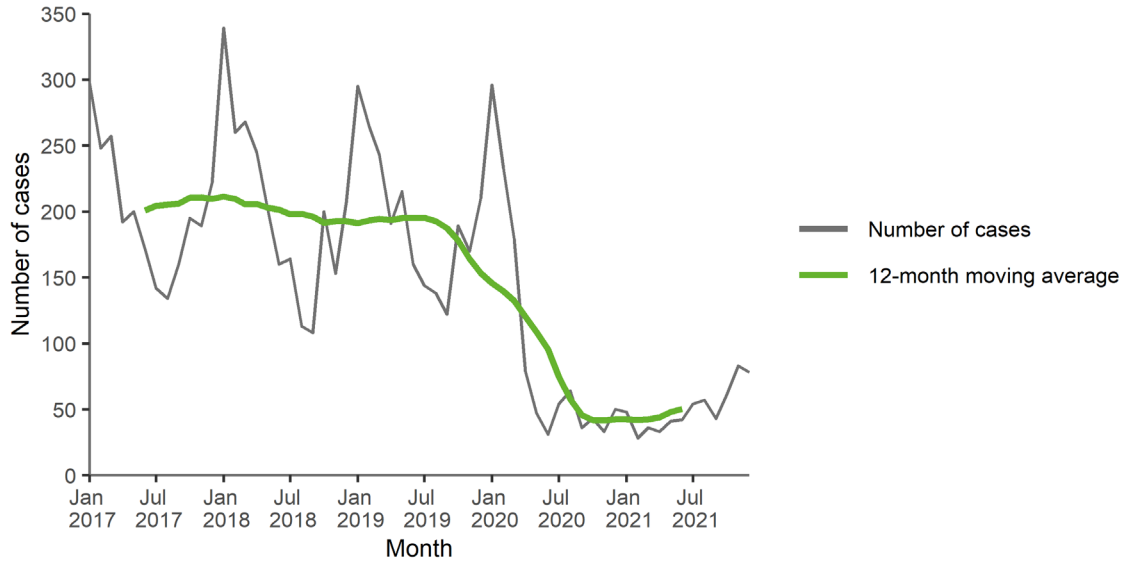


Source: Country reports from Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden

Seasonality and trend

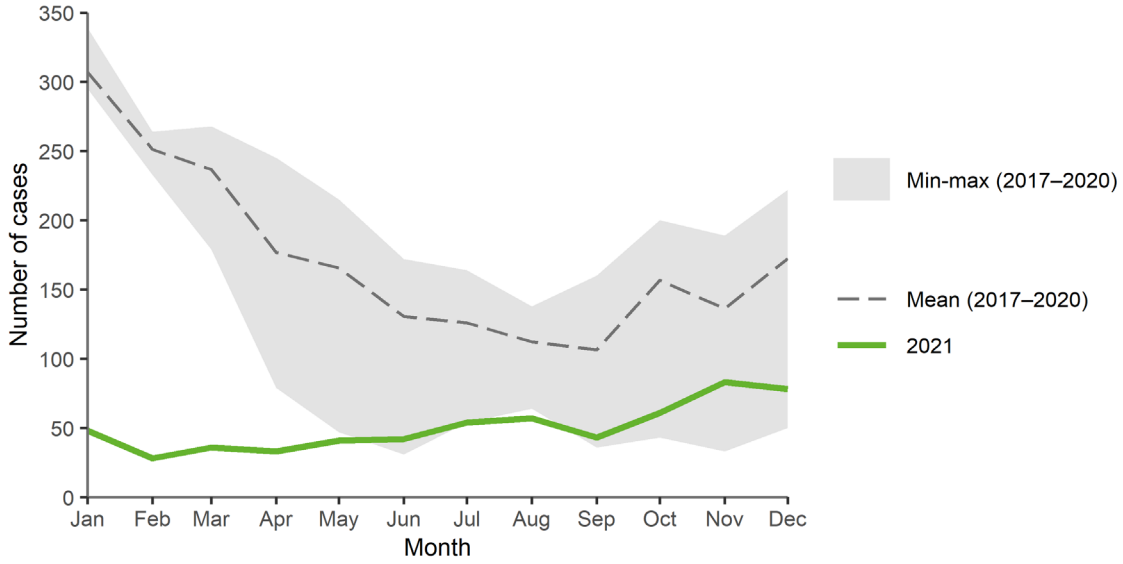
IMD usually occurs primarily in the winter months, with the lowest number of cases in summer. In 2021, the seasonality pattern of IMD was much less pronounced compared with previous years. Similarly, the number of confirmed cases decreased dramatically in 2020 and 2021, after being quite stable from 2017 to 2019 (Figure 4). This decrease coincided with the implementation of control measures such as social distancing during the COVID-19 pandemic. These measures likely impacted the epidemiology of IMD, as transmission occurs via direct contact and through droplets. Between 2017 and 2021, notification rates decreased in all age groups.

Figure 3. Distribution of confirmed invasive meningococcal disease cases by month, EU/EEA, 2017–2021



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

Figure 4. Distribution of confirmed invasive meningococcal disease cases by month, EU/EEA, 2017–2020 and 2021



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

Serogroup

Out of 612 confirmed IMD cases reported in 2021, 514 (84%) had a documented serogroup (Table 2). Most cases with a documented serogroup belonged to serogroup B (64%), followed by serogroups W (12%) and C (10%). As the proportion of cases with unknown serogroup (16%) increased in 2021 compared with 2017 to 2019 (range: 6–9%), the observed serogroup distribution should be interpreted with caution.

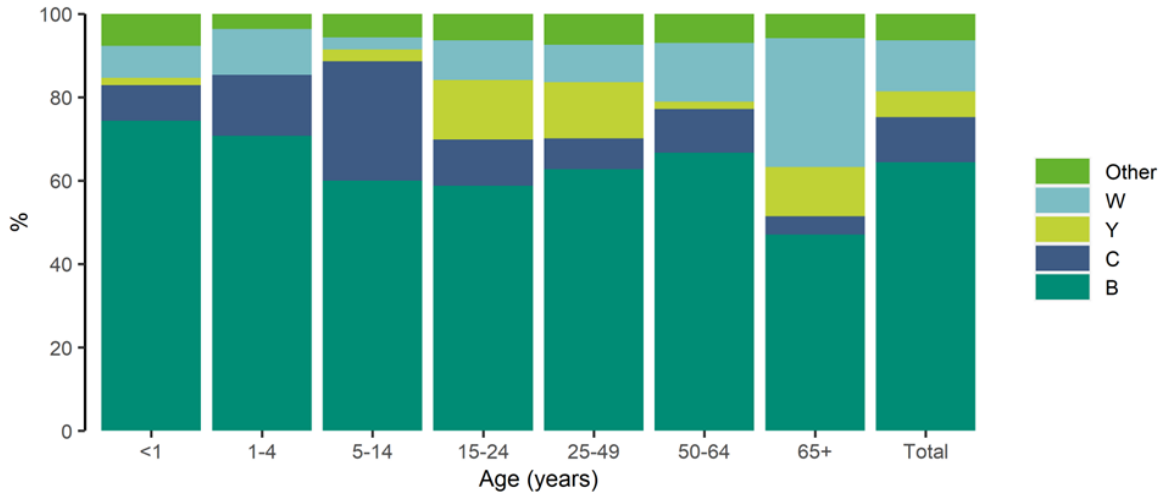
Serogroup B was predominant in all age groups. In total, serogroup B accounted for 74% of cases aged less than one year (Figure 5) and 47% of cases aged 65 years and above (the age group with the lowest number of cases). Serogroup C was most common in 5–14-year-olds, causing 28% of cases in this age group, and was the second most common serotype identified in this age group. Serogroup Y was most common in 14–24-year-olds, causing 17% of cases in this age group. The proportion of serogroup Y cases was also high in 25–49-year-olds (13%). Serogroup W was most common in the 65 years and above age group, causing 31% of cases, and was the second most common serotype identified in this age group.

Table 2. Serogroup distribution of confirmed cases of invasive meningococcal disease, EU/EEA, 2021

Serogroup	Number of cases	% of total cases
B	331	64
C	53	10
Y	36	7
W	62	12
Other	32	6
Total	**514**	**100**

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

Figure 5. Serogroup distribution of confirmed cases of invasive meningococcal disease by age group, EU/EEA, 2021



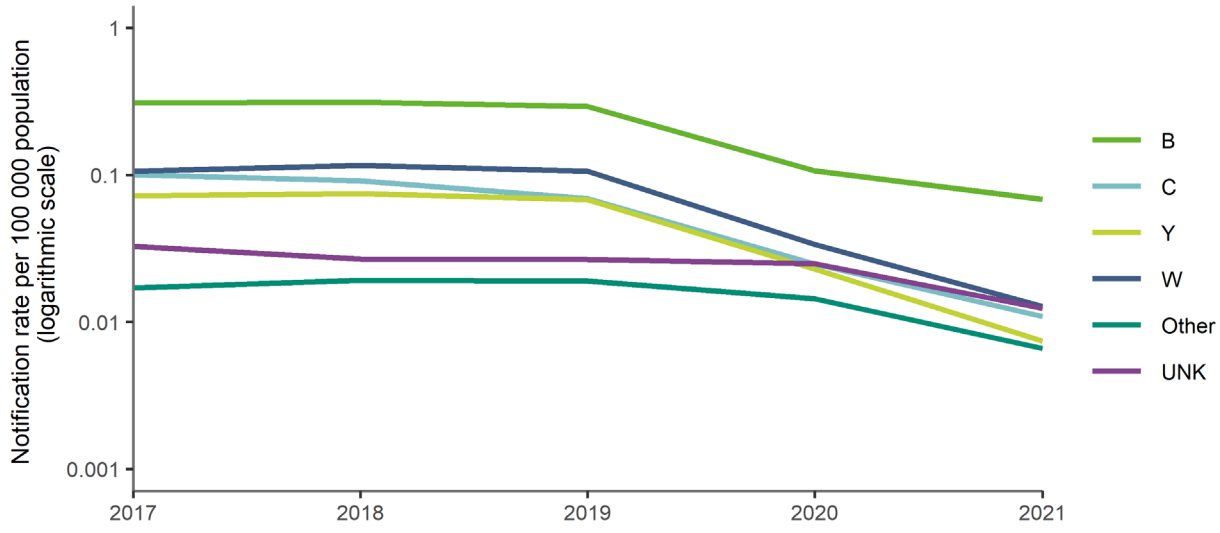
'Other' refers to all cases reported as serogroups A, X, Z, 29E, non-groupable or other.

Serogroup distribution trends should also be interpreted with caution, as the notification rate of IMD of unknown serogroup fluctuated over the study period and the overall number of reported cases was low between 2019 and 2021 (Figure 6).

Among 23 countries that consistently reported serogroup data from 2017 to 2021, there was an overall decrease in the notification rate of all serogroups in 2020 and 2021 compared with 2017 to 2019. Serogroup B remained the dominant serogroup, and its notification rate decreased from 0.3 cases per 100 000 population in 2017 to 0.08 cases per 100 000 population in 2021. The notification rates of serogroups C and W both decreased to 0.01 cases per 100 000 population in 2021, compared with 0.1 cases per 100 000 population in 2017. While the notification rate of serogroup Y remained similar to the those of serogroups C and W between 2017 and 2020, a decrease to 0.010 cases per 100 000 population was observed in 2021.

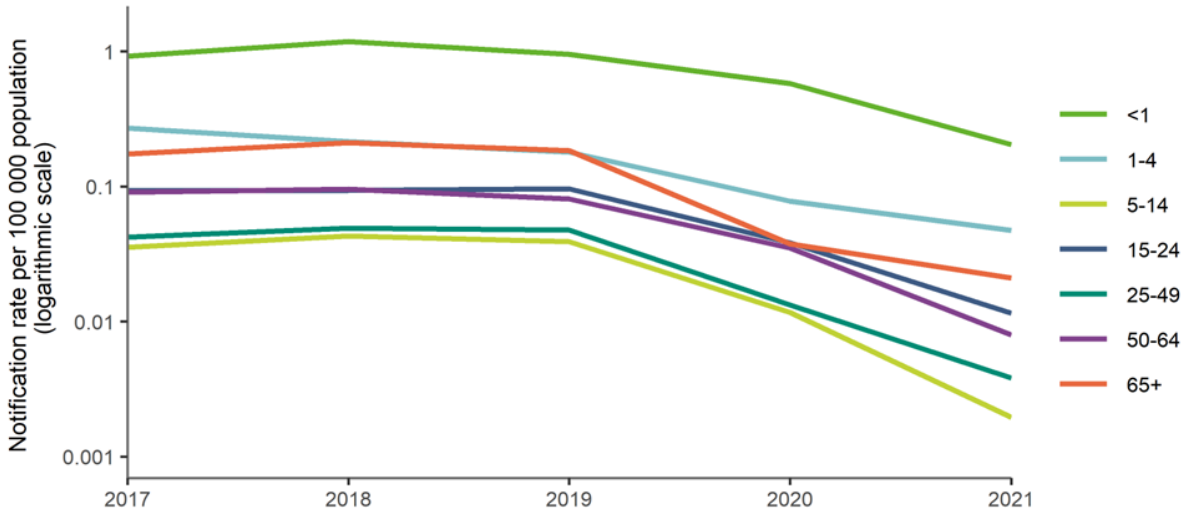
Serogroup W, the second most common serogroup, had the highest notification rates in young children (under four years old) and in those 65 years and above (Figure 7).

Figure 6. Notification rates of confirmed cases of invasive meningococcal disease by serogroup and year, EU/EEA, 2017–2021



Source: Country reports from Austria, Belgium, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Luxembourg, the Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain and Sweden
UNK: unknown serogroup
'Other' refers to all cases reported as serogroups A, X, Z, 29E, non-groupable or other.

Figure 7. Notification rates of confirmed invasive meningococcal disease cases caused by serogroup W by age group, EU/EEA, 2021



Source: Country reports from Austria, Belgium, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain and Sweden

Clinical presentation and outcome

Clinical presentation was reported for 464 cases (76%). Meningitis was the most commonly reported clinical presentation (41%), associated with septicaemia (15%). Septicaemia was the second most common clinical pattern (36%). Pneumonia (<1%) and 'other' clinical presentations (7%) were reported in the remaining cases.

The outcome was reported for 469 cases (77%). There were 48 fatal cases reported (e.g a case fatality of 10% among cases with known outcome). Case fatality was the highest among cases of serogroups W (17%) and C (16%). Case fatality was 9% among cases of serogroup B. No deaths were reported among cases of serogroup Y.

Case fatality was highest in cases aged 65 years and above (19%). It was also high in infants (aged less than one year old; 13%). High case fatality was also observed in 50–64-year-olds (10%) and 24–40-year-olds (9.5%), followed by 1–4-year-olds (7%) and 14–24-year-olds (5%).

Vaccination status

Vaccination status was reported for 253 cases (41%). Most cases were unvaccinated, with proportions varying from 92% unvaccinated (in 1–4-year-olds) to 100% unvaccinated (in those aged 65 years old and above).

Discussion

Invasive meningococcal disease (IMD) remains rare in EU/EEA countries but is a severe and life-threatening disease in all age groups. Between 2019 and 2021, the total number of notified cases and the notification rates sharply decreased across all age groups compared with 2017 to 2019. This decreasing trend was likely due to the control measures implemented during the COVID-19 pandemic (from March 2020 through 2021). Social distancing measures, extensive use of face masks and other confinement measures (such as closure of schools) may all have contributed to reduced transmission of *Neisseria meningitidis*, as this was also observed for other respiratory pathogens transmitted by droplets [6]. In addition, we cannot rule out underreporting or—to a lesser extent—underdiagnosis while healthcare systems were overwhelmed by the pandemic. Therefore, the number of reported cases of meningococcal disease and the observed trends should be interpreted with caution [7].

In addition, more EU/EEA countries (n = 20) have adopted meningococcal vaccine recommendations since 2018 [8,9], with the conjugate monovalent Meningococcal-C vaccine (Men-C), the 4-component MenB protein-based vaccine (4CMen-B) and/or the quadrivalent Meningococcal ACWY vaccine (Men-ACWY). Recommendations differed across countries in terms of targeted age groups (infants, adolescents, adults), targeted serogroups (different vaccine products cover different serogroups), mandatory versus voluntary vaccine policies, and funding schemes. As the highest burden of IMD is found in infants and adolescents, Men-C and Men-B vaccination recommendations mostly target infants, while recommendations with Men-ACWY mostly target adolescents and, to a lesser extent, infants.

Serogroup B was responsible for the majority of IMD cases in 2021, particularly in infants and young children, although incidence has been declining since 2014 [8] and declined even more during the COVID-19 pandemic. Immunisation strategies involving the 4CMenB vaccine aim to impact the incidence of serogroup B IMD [10,11] by providing direct individual protection [12], as the vaccine does not have any effect on carriage [13]. Local epidemiology appears to be a main driver of national immunisation strategies.

In 2018, three EU/EEA countries (Italy, Ireland and Lithuania) recommended and publicly funded the 4CMenB vaccine in children aged under 24 months. Austria also recommended the vaccine but did not publicly fund it. As of 2023, an additional six countries (Czechia, France, Malta, Portugal, Spain and Slovakia) adopted recommendations for 4CMenB vaccination and publicly funded it. Although the notification rate remained high in adolescents, none of the countries introduced specific vaccination programmes in these age groups, with the exception of Slovakia, which has a catch-up programme in 15–16-year-olds.

In 2021, serogroup C continued to have the highest case fatality rate and was the second most common cause of IMD in individuals aged 15 years old and below in EU/EEA countries. An increasing number of countries adopted MenC vaccination recommendations in young children using either the monovalent (not publicly funded: Austria and Poland; publicly funded: France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Portugal and Spain) or the quadrivalent vaccine MenACWY (publicly funded: Belgium, Cyprus, Czechia, Malta, Netherlands, Slovakia). Due to waning of MenC titres after infant vaccination [14-17], some countries provide adolescents with a dose of MenACWY vaccine, which provides additional protection against the most prevalent serogroups (not publicly funded: Belgium; publicly funded: Austria, Czechia, Greece, Ireland, Italy, Malta, Netherlands and Spain) [18].

No EU/EEA country has universal recommendations in place against IMD in adults. The highest proportion of serogroups W and Y were observed in individuals aged 65 years and above. This group also had the highest case fatality rate. Before the COVID-19 pandemic, the incidence of IMD in adults was increasing [3]. The epidemiology of IMD post-pandemic must be closely monitored to observe how the trend is evolving in this group. Lifelong vaccination against IMD should be considered, in light of the unpredictable clinical pattern of IMD, the high mortality rates, the cost of hospital care and the potential for severe life-long sequalae at any age of life [19].

Public health implications

Several vaccines targeting different serogroups are available for the prevention of IMD. The choice of introducing a vaccine into a country's national routine immunisation programme depends on multiple factors, such as vaccine efficacy and expected coverage, disease and serogroup burden, cost effectiveness and feasibility.

The dynamic nature of IMD epidemiology, increasing trends in certain serogroups in some countries and the rapid expansion of hypervirulent clones highlight the need for continued high-quality surveillance, including molecular methods, to accurately detect and assess changes in IMD epidemiology and to better understand the effectiveness and impact of current vaccination recommendations in the EU/EEA. ECDC is working towards strengthening surveillance of IMD using whole genome sequencing, which can improve the understanding of multi-country outbreaks and enhance long-term monitoring to inform vaccination strategies.

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