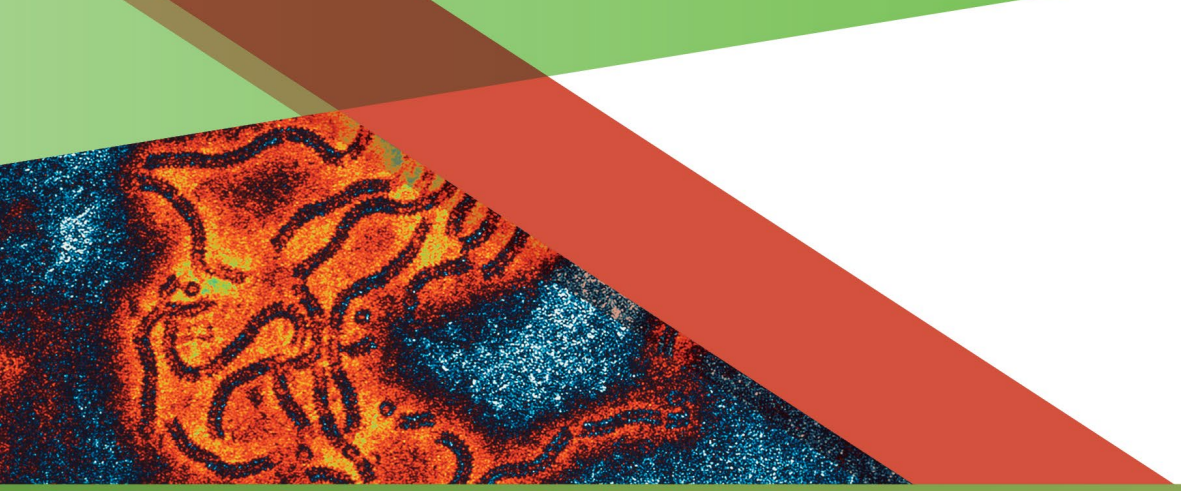


SURVEILLANCE REPORT

Mumps

Annual Epidemiological Report for 2021

Key facts

- In 2021, 1 567 cases of mumps were reported to ECDC by 27 European Union/European Economic Area (EU/EEA) Member States, with an overall notification rate of 0.4 cases per 100 000 population. This was significantly lower than the notification rates reported during the previous four years (range 1.7-4.2).
- In 2021, there was a shift towards younger age groups for mumps cases, with a median of 13 years compared to four years previously (median 19–21 years).
- The overall male-to-female ratio for mumps cases was 1:1.14. Notification rates for males were higher in the younger age groups (<1, 1–4 and 5–9 years) and slightly lower than females in adolescents and adult groups (15–19, 20–29, 30+ years groups)
- Those aged 1–4 and 5–9 years experienced the highest age-specific notification rates and the highest proportion of cases vaccinated with two or more doses of the measles, mumps, and rubella (MMR) vaccine.
- Adults aged 30 years and above accounted for 27% of cases in 2021, with 42% of them being unvaccinated, similar to previous years.
- Continuous high-quality surveillance, rigorous outbreak investigations, and accelerated efforts to increase the uptake of both routine childhood immunisation as well as catch-up campaigns aimed at adolescents and adults are key tools to closely monitor mumps epidemiology in the EU/EEA and close immunity gaps in the population.

Introduction

Mumps is a viral infection, caused by an RNA virus of the genus *Rubulavirus* in the family *Paramyxoviridae*. In its classical form it causes acute parotitis (inflammation of the parotid salivary glands) and less frequently, orchitis, meningitis and pneumonia. Complications include sensorineuronal deafness, oligospermia, subfertility (rarely) and occasionally death from encephalitis. It is spread from person to person by airborne or droplet transmission. People should be considered infectious from 12 to 25 days after exposure. The mean incubation period is 19 days, with a range of 14–25 days.

Immunisation is the only effective method of prevention. Mumps vaccine is given in the form of the combined trivalent MMR (measles-rubella-mumps) vaccine in all European countries, with a first dose traditionally in the second year of life. The timing of the second dose varies across countries. In the pre-vaccine area, mumps was primarily a childhood illness, but now it mostly causes outbreaks among military recruits or college students.

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

Stockholm, October 2023

Methods

This report is based on data for 2021 retrieved from The European Surveillance System (TESSy) on 14 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, please refer to the 'Methods' chapter in the 'Introduction to the Annual Epidemiological Report [1].

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

A subset of the data used for this report is available through ECDC's online Surveillance Atlas of Infectious Diseases [3].

Twenty-seven EU/EEA Member States routinely report mumps data to ECDC. The majority use the 2008, 2012, or 2018 EU case definitions [4] and report data from comprehensive, passive surveillance systems with national coverage. Belgium and Poland reported aggregated data in 2021. Austria has reported no data since 2013; France and Liechtenstein did not report any data.

Vaccination coverage estimates for mumps vaccine presented in this report use the measles-containing-vaccine (MCV) as a proxy indicator, since all EU/EEA countries use measles-mumps-rubella-containing-vaccines (MMR) [5]. The data were obtained from the websites of the WHO Global Health Observatory and the WHO and UNICEF estimates of national immunization coverage (WUENIC) [6]. The method of calculating measles-containing-vaccine first-dose (MCV1) and measles-containing-vaccine second-dose (MCV2) coverage are outlined in the metadata available for each indicator online [7,8].

Epidemiology

For 2021, 27 EU/EEA countries reported 1 567 cases of mumps, of which 631 (40%) were laboratory-confirmed. Of the remaining cases, 316 were reported as probable (20%) and 620 as possible (40%).

Three countries (Italy, Poland, and Spain) reported 71% of all notified cases in 2021, of which 40% (631) were confirmed cases. Of these countries, Poland did not use the EU case definition for reporting purposes, as all their reported cases met the national case definition used for possible cases, which includes anyone meeting the clinical criteria of fever and sudden swelling of the parotid or other salivary glands [9]. For 2019 and 2020, the countries with the highest number of mumps cases were Ireland, Poland, and Spain (82% of all notified cases respectively) (Table 1).

The EU/EEA overall notification rate in 2021 was 0.4 cases per 100 000 population, which is the lowest rate reported compared to the notification rate observed in the previous four years (2020:1.7, 2019:4.2, 2018:2.6, 2017:3.1) (Table 1 and Figure 1).

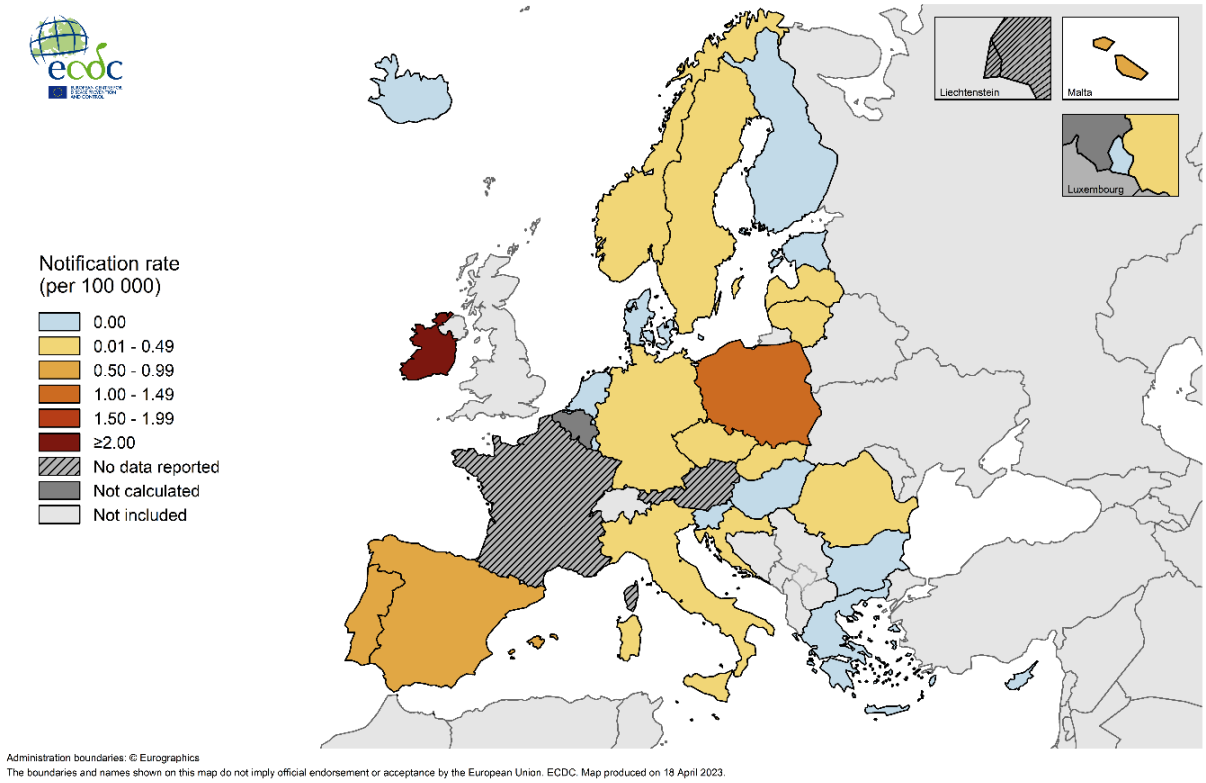
Notification rates ranged from 0.0 to 2.2 cases per 100 000 population in EU/EEA countries in 2021 (Table 1 and Figure 1). All countries reported a decrease in the notification rates compared to previous years. Although Ireland reported the highest notification rate for 2021, there was a sharp decrease observed compared to the notification rate of the year before (from 58.4 in 2020 to 2.2 cases in 2021). Seven countries (Bulgaria, Cyprus, Estonia, Greece, Hungary, Iceland, and Luxembourg) reported zero cases for 2021.

Table 1. Distribution of mumps cases and 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	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
Belgium	183	NRC	238	NRC	234	NRC	207	NRC	105	NRC
Bulgaria	15	0.2	27	0.4	50	0.7	13	0.2	0	0.0
Croatia	16	0.4	26	0.6	15	0.4	13	0.3	5	0.1
Cyprus	2	0.2	3	0.3	0	0.0	1	0.1	0	0.0
Czechia	1 407	13.3	537	5.1	191	1.8	93	0.9	38	0.4
Denmark	12	0.2	17	0.3	NDR	NDR	NDR	NDR	1	0.0
Estonia	6	0.5	6	0.5	4	0.3	3	0.2	0	0.0
Finland	10	0.2	4	0.1	4	0.1	4	0.1	1	0.0
France	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
Germany	653	0.8	535	0.6	593	0.7	338	0.4	112	0.1
Greece	7	0.1	1	0.0	2	0.0	2	0.0	0	0.0
Hungary	1	0.0	1	0.0	1	0.0	0	0.0	0	0.0
Iceland	10	3.0	3	0.9	4	1.1	1	0.3	0	0.0
Ireland	291	6.1	580	12.0	2 780	56.7	2 899	58.4	111	2.2
Italy	829	1.4	777	1.3	657	1.1	241	0.4	222	0.4
Latvia	4	0.2	2	0.1	6	0.3	10	0.5	2	0.1
Liechtenstein	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
Lithuania	45	1.6	19	0.7	32	1.1	10	0.4	3	0.1
Luxembourg	1	0.2	1	0.2	4	0.7	13	2.1	0	0.0
Malta	2	0.4	0	0.0	8	1.6	3	0.6	3	0.6
Netherlands	45	0.3	72	0.4	128	0.7	64	0.4	1	0.0
Norway	18	0.3	11	0.2	20	0.4	9	0.2	4	0.1
Poland	1 670	4.4	1 585	4.2	1 338	3.5	582	1.5	484	1.3
Portugal	179	1.7	106	1.0	152	1.5	57	0.6	50	0.5
Romania	316	1.6	120	0.6	105	0.5	28	0.1	16	0.1
Slovakia	29	0.5	13	0.2	16	0.3	0	0.0	3	0.1
Slovenia	3	0.1	0	0.0	0	0.0	0	0.0	1	0.0
Spain	5 862	12.6	5 423	11.6	6 039	12.9	1 766	3.7	399	0.8
Sweden	32	0.3	21	0.2	33	0.3	23	0.2	6	0.1
United Kingdom	2 046	3.1	1 135	1.7	5 718	8.6	NDR	NDR	NDR	NDR
EU-EEA	**13 694**	**3.1**	**11 263**	**2.6**	**18 134**	**4.2**	**6 380**	**1.7**	**1 567**	**0.4**

Source: country reports
NRC: no rate calculated
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 mumps cases per 100 000 population by country, EU/EEA, 2021



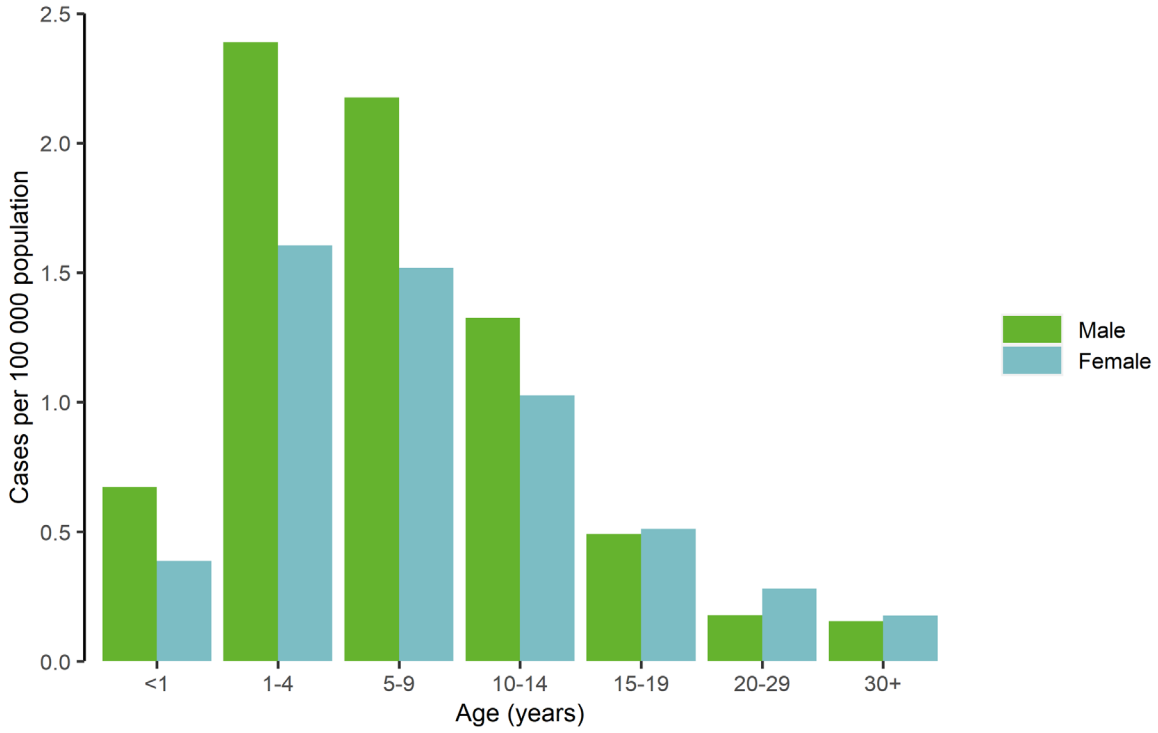
Age and gender

In 2021, the most affected age group was 1–4 years with a notification rate of 2 cases per 100 000 population followed by the 5–9 years group (notification rate 1.9). In terms of absolute case numbers, the most affected group was the 30+ years group (27%) followed by the 5–9 years group (25%) and the 1–4 years (19%). For the rest, the distribution over the total was: 10–14 years was 15%, 20–29 years and 15–19 years was 6% each and <1 year was 2% (Figure 2).

The median age of cases across all EU/EEA countries submitting case-based data in 2021 (i.e. excluding Belgium and Poland) was 13 years (interquartile range, IQR: 6–43 years) and which is significantly lower than the previous four years, where the median age fluctuated between 19 and 21 years.

Mumps was more slightly common among males (53%) than females with overall male to female ratio of 1:1.14. Notification rates for males were higher in the younger age groups (<1, 1–4 and 5–9 years) and slightly lower than females in adolescents and adults (15–19, 20–29, 30+ years groups) (Figure 2).

Figure 2. Distribution of mumps cases per 100 000 population, by age and gender, EU/EEA, 2021

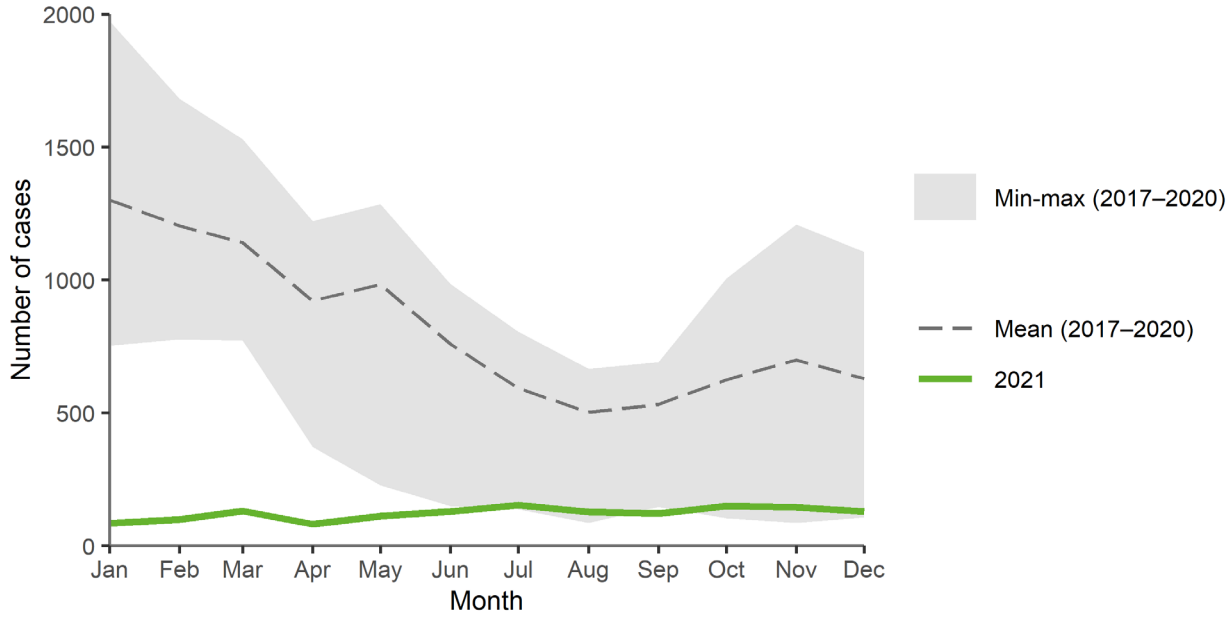


Source: Country reports from Bulgaria, Croatia, Cyprus, Czechia, Estonia, Finland, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden

Seasonality and trend

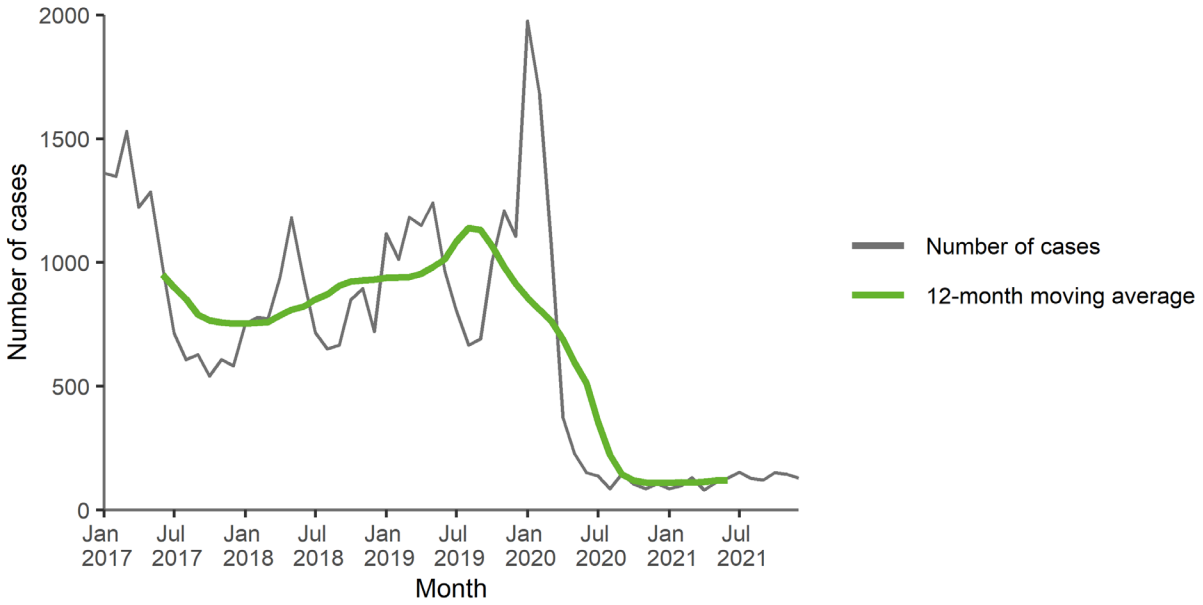
Between 2017 and 2020, the seasonal trends of reported mumps cases were characterised by a peak in late spring (May) and the lowest number of cases reported in the late summer (August), which is consistent with what is described in the literature. For 2021, the number of cases remained low throughout the year, with not much seasonal variation. However, small peaks were recorded in July and October (20% of cases).

Figure 3. Distribution of mumps cases by month, EU/EEA, 2021 and 2017–2020



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

Figure 4. Distribution of mumps cases by month, EU/EEA, 2017–2021



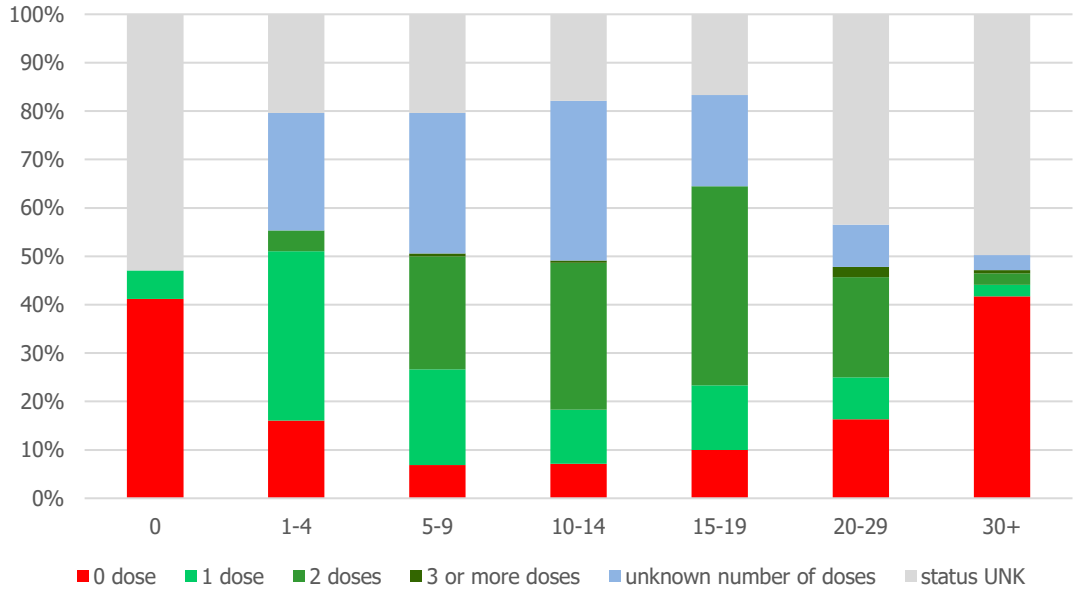
Source: Country reports from Bulgaria, Croatia, Cyprus, Czechia, Estonia, Finland, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden

Vaccination status

Data on vaccination status were available for 1 462 cases (93.3%). Of these cases, 292 (20%) were unvaccinated, 220 (15%) were vaccinated with one dose of the MMR vaccine, 224 (15%) with two doses, and eight (1%) with three or more doses. Additionally, of these cases, 277 (19%) were reported as having been vaccinated with an unknown number of doses. Among laboratory-confirmed cases with known vaccination status, 15% were unvaccinated, compared with 18% of probable cases and 23% of possible cases.

The highest proportion of unvaccinated cases were among those aged under one year (below the age of routine vaccination against mumps) and the 30+ years group. The number of unvaccinated cases 30 years and older accounted for 61% (n=177 of the total number of unvaccinated cases. The majority of fully vaccinated cases (with at least two doses) were aged 1–14 years, with the 1–4, 5–9 and 15–19-years age groups, representing 25%, 33% and 21% of the total cases, respectively. Vaccination status was more likely to be unknown among cases aged <1, 20–29 and 30+ years (50% of cases in those age groups) (Figure 5).

Figure 5. Distribution (%) of mumps cases by age group and vaccination status, EU/EEA, 20121



Vaccination coverage

In 2021, the overall population-weighted vaccination coverage for mumps-containing vaccine for the EU/EEA countries was 93% for the first dose and 89% for the second dose (Table 2). Fifteen countries reported a decrease in the vaccination coverage for the first dose of mumps-containing vaccine (range -1 to -14%) compared to the coverage reported in 2018, and 14 countries reported a decrease in coverage for the second dose (range -1 to -89%).

Moreover, six countries reported an increase in vaccination coverage for the first dose (range 1–2%) and seven countries for the second dose (1–7%). Fifteen countries (50%) reported a coverage of ≥95% for the first dose.

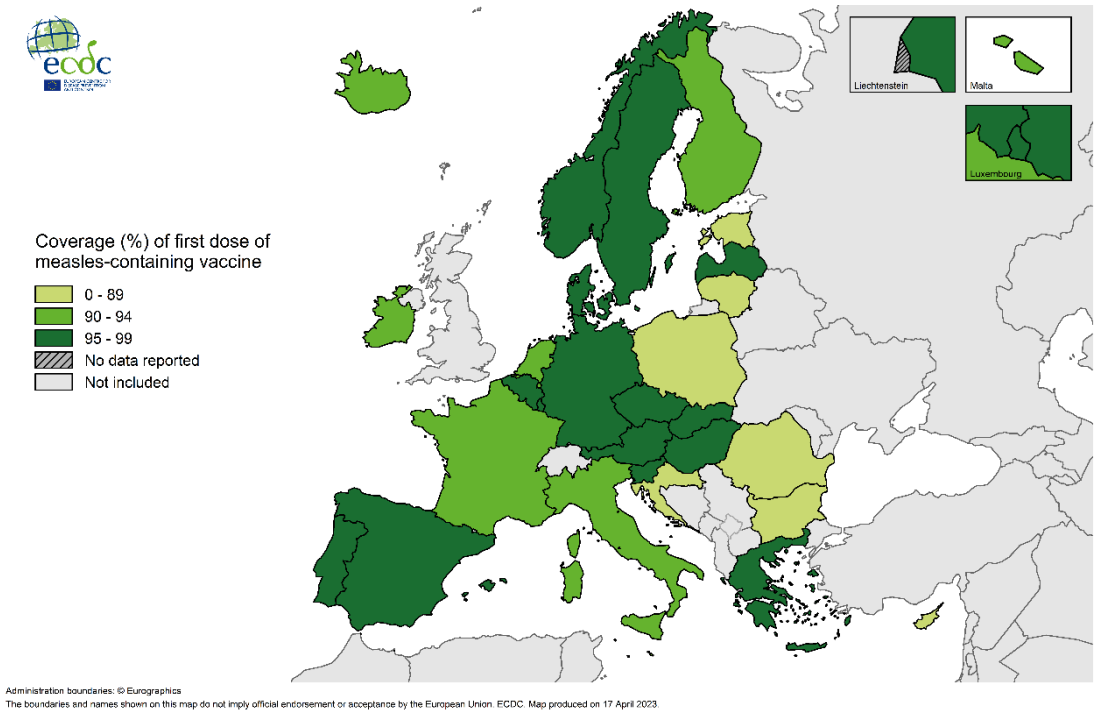
Only five countries (17%) (Hungary, Norway, Poland, Portugal, and Slovakia) had a coverage of ≥95% for the second dose (Figures 6 and 7).

Table 2. Vaccination coverage for first and second dose of measles-containing-vaccine*, EU/EEA, 2018–2021

Country	2018		2019		2020		2021		Percentage of change** (2018-2021)	
	Dose 1	Dose 2	Dose 1	Dose 2	Dose 1	Dose 2	Dose 1	Dose 2	Dose 1	Dose 2
Austria	94.0	84.0	95.0	86.0	95.0	88.0	95.0	88.0	1%	5%
Belgium	96.0	85.0	96.0	85.0	96.0	85.0	96.0	85.0	0%	0%
Bulgaria	93.0	87.0	95.0	95.0	88.0	84.0	89.0	86.0	-4%	-1%
Croatia	93.0	95.0	93.0	95.0	91.0	91.0	89.0	90.0	-4%	-5%
Cyprus	90.0	88.0	86.0	88.0	86.0	88.0	86.0	88.0	-4%	0%
Czechia	96.0	84.0	92.0	87.0	94.0	90.0	97.0	90.0	1%	7%
Denmark	95.0	90.0	96.0	90.0	94.0	90.0	95.0	94.0	0%	4%
Estonia	87.0	88.0	88.0	90.0	91.0	87.0	89.0	84.0	2%	-5%
Finland	96.0	93.0	96.0	93.0	95.0	93.0	93.0	93.0	-3%	0%
France	90.0	83.0	92.0	86.0	92.0	86.0	92.0	86.0	2%	4%
Germany	97.0	93.0	97.0	93.0	97.0	93.0	97.0	93.0	0%	0%
Greece	97.0	83.0	97.0	83.0	97.0	83.0	97.0	83.0	0%	0%
Hungary	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	0%	0%
Iceland	93.0	95.0	93.0	94.0	93.0	93.0	92.0	10.0	-1%	-89%
Ireland	92.0	NRC	91.0	NRC	92.0	NRC	90.0	NRC	-2%	-
Italy	93.0	89.0	94.0	88.0	92.0	86.0	92.0	86.0	-1%	-3%
Latvia	98.0	94.0	99.0	96.0	99.0	94.0	97.0	85.0	-1%	-10%
Liechtenstein	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NRC	NRC
Lithuania	92.0	92.0	93.0	93.0	90.0	91.0	88.0	88.0	-4%	-4%
Luxembourg	99.0	90.0	99.0	90.0	99.0	90.0	99.0	90.0	0%	0%
Malta	96.0	95.0	96.0	95.0	95.0	99.0	90.0	93.0	-6%	-2%
Netherlands	93.0	89.0	94.0	90.0	94.0	89.0	93.0	90.0	0%	1%
Norway	96.0	93.0	97.0	95.0	97.0	95.0	97.0	95.0	1%	2%
Poland	93.0	92.0	93.0	92.0	80.0	95.0	80.0	95.0	-14%	3%
Portugal	99.0	96.0	99.0	96.0	99.0	95.0	98.0	95.0	-1%	-1%
Romania	90.0	81.0	90.0	76.0	87.0	75.0	86.0	75.0	-4%	-7%
Slovakia	96.0	97.0	96.0	98.0	96.0	98.0	95.0	96.0	-1%	-1%
Slovenia	93.0	94.0	94.0	94.0	94.0	91.0	95.0	91.0	2%	-3%
Spain	98.0	94.0	98.0	94.0	96.0	94.0	95.0	91.0	-3%	-3%
Sweden	97.0	94.0	97.0	93.0	97.0	92.0	97.0	91.0	0%	-3%
EU/EEA* **	**94.1**	**89.4**	**94.4**	**89.6**	**93.1**	**89.7**	**92.9**	**89.4**	-	-

Sources: WHO Immunization Data Portal, WHO and UNICEF estimates of national immunization coverage (WUENIC) from Austria, Belgium, Bulgaria, Croatia, Cyprus, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden.
NDR: no data reported
NRC: no rate calculated
** Measles-containing-vaccine is used as a proxy indicator for mumps-containing-vaccine*
*** The percentage of change was calculated for each dose as the percentage of increase or decrease between 2018 and 2021 i.e. ((coverage in 2021 - coverage in 2018)/coverage in 2018) x 100.*
**** EU/EEA: population-weighted average vaccination coverage rate*

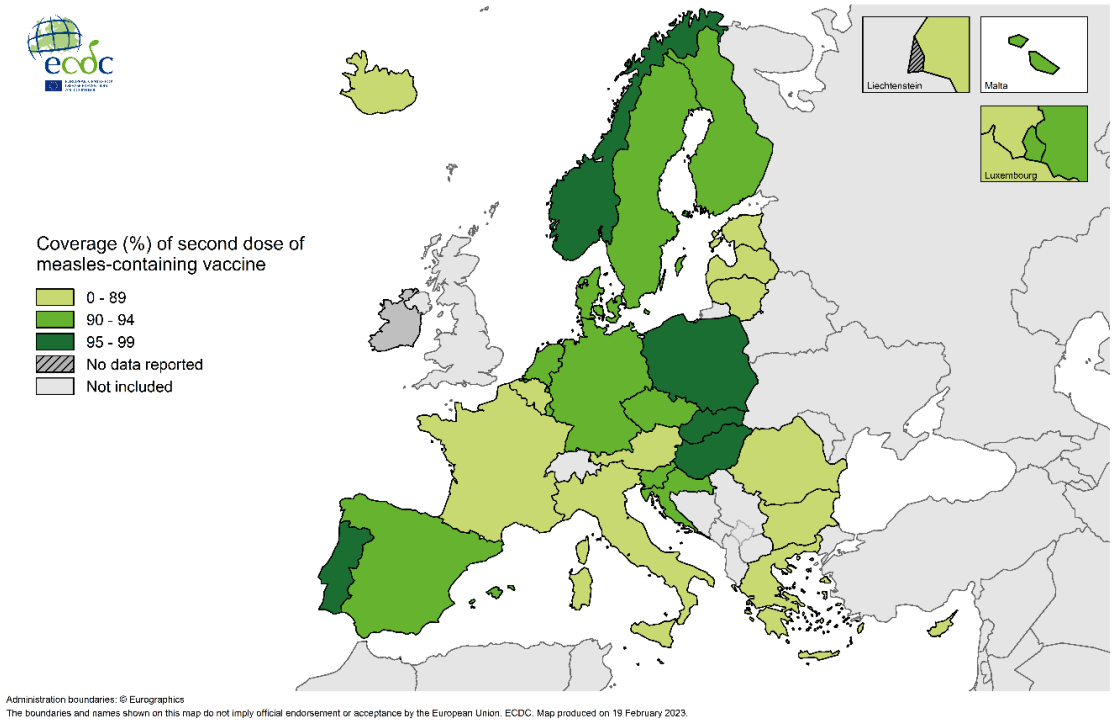
Figure 6. Vaccination coverage for the first dose of a measles-containing-vaccine*, EU/EEA, 2021



Source: WHO Immunization Data Portal, WHO and UNICEF estimates of national immunization coverage (WUENIC), from Austria, Belgium, Bulgaria, Croatia, Cyprus, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden.

** Measles-containing-vaccine is used as a proxy indicator for mumps-containing-vaccine.*

Figure 7. Vaccination coverage for the second dose of a measles-containing-vaccine*, EU/EEA, 2021



Source: WHO Immunization Data Portal, WHO and UNICEF estimates of national immunization coverage (WUENIC), from Austria, Belgium, Bulgaria, Croatia, Cyprus, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden

** Measles-containing-vaccine is used as a proxy indicator for mumps-containing-vaccine.*

Outcome

The outcome of disease was known for 331 (34%) of all cases, with no deaths reported in 2021.

Hospitalisation and complications

Of 367 cases with known hospitalisation status (23%), 39 (11%) cases were hospitalised. Reported complications included two episodes of orchitis, five episodes of pancreatitis, three episodes of meningitis and five unspecified complications ('other'). Most of the complications (73%) were reported in the adult group of 30 years or older.

Discussion

Between 2017 and 2021, there was a decreasing trend in the notification of mumps cases in EU/EEA countries, from 3.1 (in 2017) to 0.4 (in 2021) cases per 100 000 population, with the exception of 2019, which peaked at 4.2 cases per 100 000 cases. For 2021, all countries reported a decrease in the notification rates compared to the previous years, with Ireland having the sharpest (from 58.4 in 2020 to 2.2 cases in 2021). Seven countries (Bulgaria, Cyprus, Estonia, Greece, Hungary, Iceland, and Luxembourg) reported zero cases for the 2021.

The COVID-19 pandemic could have played a significant role in the reduction of the numbers in 2021, as seen worldwide, especially in the respiratory diseases [10–13]. Indeed, the control measures implemented during the pandemic, such as stay-at-home measures, the closure of schools, and the reduction of social contacts could have contributed to a reduction in the transmission of various respiratory diseases, including mumps. Alongside the shift in healthcare services and the extra burden on public healthcare services, this might have resulted in the under-reporting of mumps, both from clinicians and public health professionals. The reported numbers and observed epidemiology reflected in this report (including the period at the beginning of the COVID-19 pandemic) should therefore be interpreted with caution.

The peak in the notification rate in mumps cases observed in 2019 (EU/EEA overall rate 4.2) was mainly influenced by a large extended outbreak reported by Ireland. The outbreak started during the second half of 2019 and continued to produce cases until the early 2020, and was mainly among adolescents and young adults. The main factors contributing to this outbreak were reported as the crowded social environments of students, the historical low uptake of MMR vaccine, the insufficient effectiveness of the mumps component of the MMR vaccine, and the possibility of waning immunity in those appropriately immunised [14]. This outbreak confirms that mumps epidemics can continue to occur in the EU/EEA and that sustaining a high vaccination coverage of at least two-dose MMR vaccine for all children and young adults is of highest importance.

Similar outbreaks in which a high proportion of cases have been fully vaccinated with two doses of MMR, usually characterised by high attack rates among adolescents and young adults and often occurring in closed settings such as universities, boarding schools and military barracks have been reported extensively in literature [14–23] . EU/EEA data between 2017-2021 showed that 40% of cases with known vaccination status were vaccinated with at least two doses and there was a substantial over-representation of these cases among those aged 10-29 years. This may be due to a combination of incomplete protection offered by two doses of the mumps component of the MMR vaccine, waning immunity and intensity of social contact that facilitates virus transmission [15,17].

The latest WHO estimates of national immunisation coverage show that overall vaccine coverage estimates have remained within the same levels over the last four years in the EU/EEA (Table 2). The impact of the COVID-19 pandemic on routine immunisation services should be considered. During the pandemic, the vulnerability of national immunisation programmes was observed globally, with a sharp decline in immunisation coverage during the first quarter of 2020. One stark example comes from Iceland, where the second dose of measles-containing-vaccine coverage dropped from 95% in 2018 to 10% in 2021, due to the de-prioritisation of MMR administration in schools on account of the need to accommodate COVID-19 vaccinations during that year. However, aside from this, immunisation programmes within the EU/EEA generally appeared to be more resilient. Many countries were able to achieve similar vaccination coverage during 2020 and 2021 compared to that they reported for 2018 and 2019. The dedication and efforts of healthcare staff in rolling out these programmes in EU/EEA countries should be commended.

Genotypic variation between the vaccine strain and the circulating virus may also be a factor [22–24], but its contribution to changes in vaccine effectiveness over time has been disputed [15]. While the administration of the MMR vaccine in childhood may not offer complete individual protection against mumps in later life, the importance of maintaining a high level of MMR vaccination coverage cannot be overstated. The vaccine has been highly effective at reducing the overall morbidity and mortality of each of the three diseases it protects against [25], sustained high vaccination coverage lowers the likelihood of outbreaks occurring in a population [26,27], and being vaccinated also has a direct protective effect on mumps disease severity [14,28,29]. A third dose of the MMR vaccine can be effective at lowering the risk of mumps during an outbreak [30], but the

relatively short duration of the antibody response following a third dose has raised questions about its general applicability beyond outbreak control [31].

Public health implications

Despite the reduction observed in numbers of mumps cases reported in 2021 compared to previous years, continuous enhanced epidemiological surveillance and investigation of mumps outbreaks it is of paramount importance for the control of the disease in the EU/EEA. Further research is needed into ways to improve the effectiveness and duration of protection offered by the mumps component of the MMR vaccine [32]. Despite evidence of incomplete protection or waning immunity following vaccination, high MMR vaccination coverage is essential in order to prevent mumps outbreaks, reduce disease severity, and progress towards measles and rubella elimination. Administering a third dose of MMR vaccine to adolescents and young adults can be considered as an outbreak control measure.

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