

# Mumps

## Annual Epidemiological Report for 2017

### Key facts

- For 2017, 13 693 cases of mumps were reported to ECDC by 28 EU/EEA Member States with an overall notification rate of 3.1 cases per 100 000 population.
- There were no deaths reported and hospitalisation or complications due to mumps were rare, affecting 5-7% of the cases with data recorded on these outcomes.
- Czechia, Poland, Spain and the United Kingdom accounted for 80% of all notified cases, with new or continuing outbreaks in these countries during the first half of the year responsible for the majority of cases.
- Mumps was more common among males than females across all age groups in the EU/EEA, with an overall male to female notification rate ratio of 1.35.
- Those aged 10-19 years experienced the highest age-specific notification rates and the highest proportion of cases vaccinated with two or more doses of measles, mumps and rubella (MMR) vaccine.
- Despite evidence of incomplete protection or waning immunity following vaccination, high MMR vaccination coverage remains of paramount importance to prevent mumps outbreaks, reduce disease severity and achieve measles and rubella elimination goals.

### Methods

This report is based on data for 2017 retrieved from The European Surveillance System (TESSy) on 31 January 2019. TESSy is a system for the collection, analysis and dissemination of data on communicable diseases. 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].

A subset of the data used for this report is available through ECDC's online *Surveillance atlas of infectious diseases* [3].

Twenty-eight EU/EEA Member States routinely report mumps data to ECDC, the majority using the 2008 or 2012 EU case definitions [4] and reporting data from comprehensive, passive surveillance systems with national coverage. Belgium and Poland reported aggregated data in 2017.

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## Epidemiology

For 2017, 28 EU/EEA countries reported 13 693 cases of mumps, of which 7 274 (53%) were laboratory confirmed. The remaining 6 419 cases were reported as probable (28%) and possible (19%). Four countries (Czechia, Poland, Spain and the United Kingdom) accounted for 80% of all notified cases, although their combined populations only represented approximately 36% of the EU/EEA population. In Poland, the EU case definition was not used [2], and over 99% of cases were classified as 'possible' in accordance with the national case definition, which includes anyone meeting clinical criteria of fever and sudden swelling of the parotid or other salivary glands [5]. Austria, France and Liechtenstein reported no data. The overall notification rate in 2017 was 3.1 cases per 100 000 population, which is higher than the notification rate observed in 2014 (2.7), but the same as, or lower than, in 2013 (5.9), 2015 (3.1) and 2016 (3.4); (Table 1 and Figure 1).

Notification rates ranged from 0.0 to 13.3 cases per 100 000 population in EU/EEA countries in 2017 (Table 1 and Figure 1). Czechia reported the highest notification rate, followed by Spain and Ireland. In Czechia, the notification rate in 2017 (13.3) fell sharply compared to 2016 (54.3), returning to a similar levels as in 2013 (14.8) and 2015 (15.3). In Spain, the notification rate in 2017 (12.6) was similar to 2013 (12.4) and has been increasing gradually since 2014 (2.1) and more than doubling between 2016 (5.6) and 2017 (12.6). A sharp decrease in notification rates from 2015 to 2016, followed by a subsequent smaller decrease in 2017, was reported by Ireland (from 43.1 to 10.3 to 6.1) and Slovakia (from 31.5 to 3.7 to 0.5). Iceland reported a sharp decrease from 2015 (20.7) to 2016 (2.4), followed by a small increase in 2017 (3.0). In the majority of other countries, there were only small changes in reported notification rates since 2014.

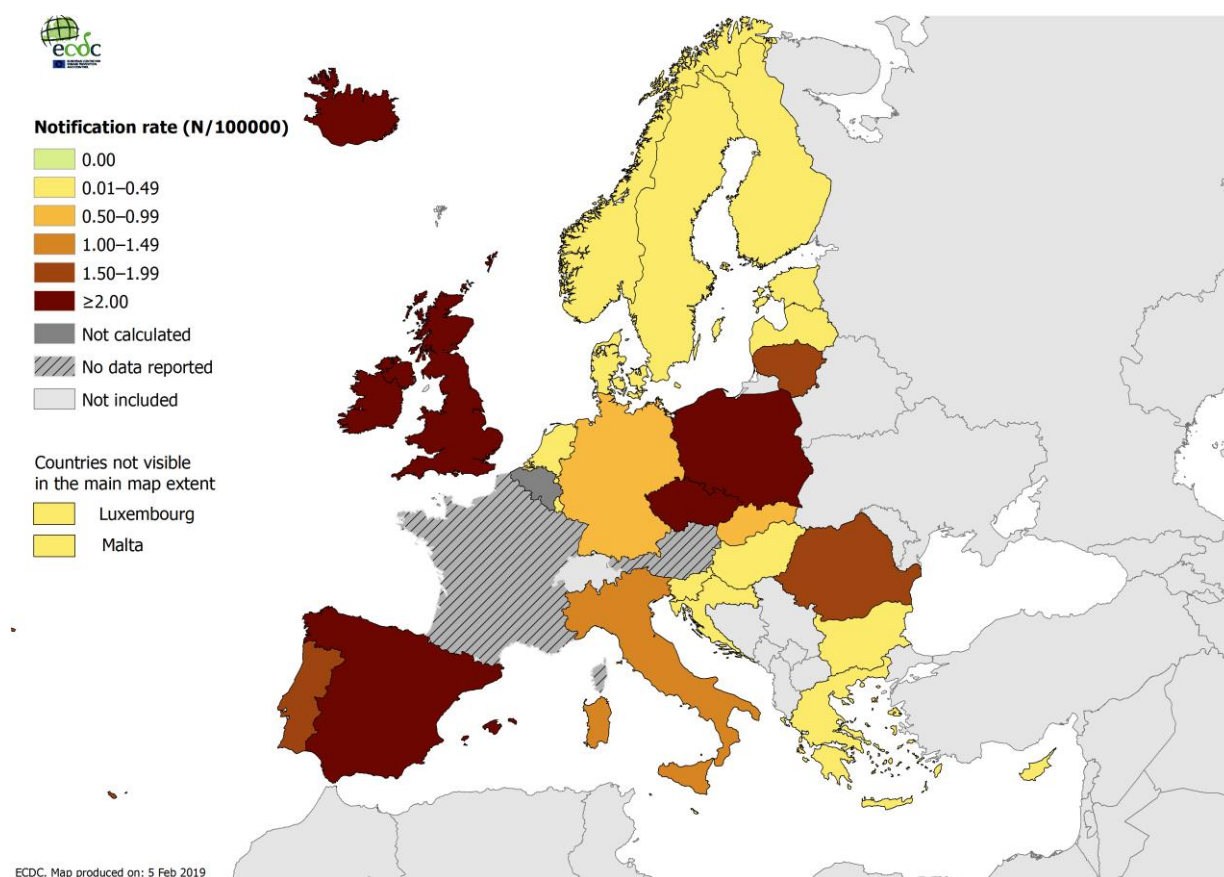
**Table 1. Distribution of mumps cases and rates per 100 000 population by country and year, EU/EEA, 2013–2017**

Country	2013		2014		2015		2016		2017			
	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate	ASR	Confirmed cases
Austria	.	.	.	.	.	.	.	.	.	.	.	.
Belgium	4554	40.9	228	-	163	-	152	-	183	-	-	183
Bulgaria	25	0.3	31	0.4	18	0.2	19	0.3	15	0.2	0.3	9
Croatia	32	0.8	32	0.8	32	0.8	27	0.6	16	0.4	0.4	2
Cyprus	0	0.0	1	0.1	2	0.2	1	0.1	2	0.2	0.2	2
Czechia	1553	14.8	677	6.4	1616	15.3	5734	54.3	1407	13.3	15.1	474
Denmark	59	1.1	42	0.7	15	0.3	15	0.3	12	0.2	0.2	12
Estonia	12	0.9	10	0.8	3	0.2	4	0.3	6	0.5	0.5	1
Finland	1	0.0	2	0.0	2	0.0	6	0.1	10	0.2	0.2	10
France	.	.	.	.	.	.	.	.	.	.	.	.
Germany	-	-	835	1.0	703	0.9	741	0.9	652	0.8	0.9	416
Greece	0	0.0	1	0.0	4	0.0	4	0.0	7	0.1	0.1	1
Hungary	8	0.1	2	0.0	6	0.1	1	0.0	1	0.0	0.0	1
Iceland	1	0.3	0	0.0	68	20.7	8	2.4	10	3.0	3.0	8
Ireland	222	4.8	739	15.9	2015	43.1	488	10.3	291	6.1	5.9	142
Italy	808	1.4	821	1.4	675	1.1	782	1.3	829	1.4	1.6	774
Latvia	15	0.7	11	0.5	21	1.1	6	0.3	4	0.2	0.2	1
Liechtenstein	.	.	.	.	.	.	.	.	.	.	.	.
Lithuania	67	2.3	45	1.5	39	1.3	53	1.8	45	1.6	1.7	45
Luxembourg	4	0.7	1	0.2	0	0.0	0	0.0	1	0.2	0.2	1
Malta	2	0.5	3	0.7	4	0.9	2	0.4	2	0.4	0.4	2
Netherlands	201	1.2	38	0.2	87	0.5	70	0.4	45	0.3	0.3	43
Norway	35	0.7	18	0.4	181	3.5	83	1.6	18	0.3	0.3	18
Poland	2436	6.4	2508	6.6	2208	5.8	1978	5.2	1670	4.4	-	0
Portugal	159	1.5	82	0.8	146	1.4	138	1.3	179	1.7	2.0	11
Romania	98	0.5	107	0.5	449	2.3	643	3.3	316	1.6	1.7	70
Slovakia	218	4.0	1559	28.8	1707	31.5	203	3.7	29	0.5	0.5	18
Slovenia	1	0.0	1	0.0	1	0.0	0	0.0	3	0.1	0.2	3
Spain	5813	12.4	959	2.1	1579	3.4	2614	5.6	5862	12.6	14.0	2949

Country	2013		2014		2015		2016		2017			
	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate	ASR	Confirmed cases
Sweden	44	0.5	21	0.2	23	0.2	22	0.2	32	0.3	0.3	32
United Kingdom	4568	7.1	2858	4.4	1800	2.8	999	1.5	2046	3.1	3.3	2046
EU/EEA	20936	5.9	11632	2.7	13567	3.1	14793	3.4	13693	3.1	3.4	7274

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

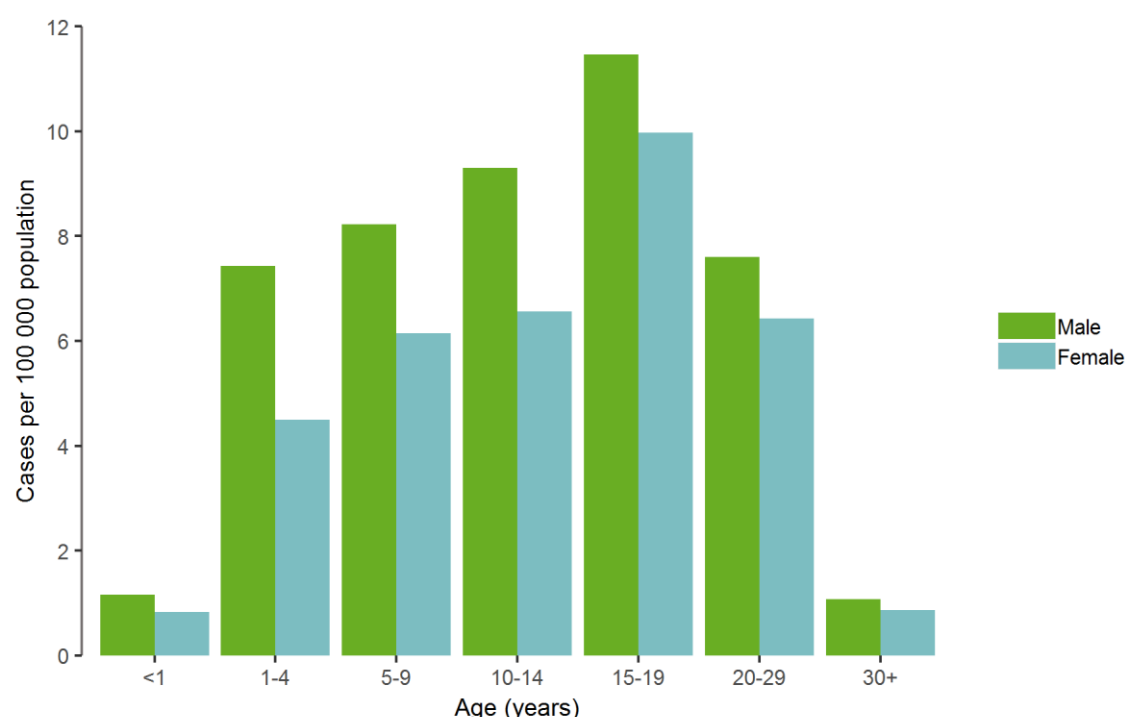
**Figure 1. Distribution of mumps cases per 100 000 population by country, EU/EEA, 2017**



## Age and gender

In 2017, notification rates were 6–10 times higher among those aged between 1 and 29 years than among those aged under one year or 30 years and over. The most affected age group was 15–19 years with a notification rate of 10.6 cases per 100 000 population followed by the 10–14 year group (notification rate 7.8). Mumps was more common among males than females in all age groups (Figure 2), with overall notification rates of 3.6 and 2.6 per 100 000 population, respectively (rate ratio 1.35; 95% confidence interval, CI: 1.30–1.39).

In terms of absolute case numbers, the highest burden fell among adolescents and adults. Of the 13 486 cases with known age, around two thirds were aged 15 years and above, with a distribution by age group of <1%, 8%, 12%, 13%, 18%, 27% and 21% in the <1, 1–4, 5–9, 10–14, 15–19, 20–29 and 30+ years age groups, respectively. The median age of cases across all EU/EEA countries submitting case-based data in 2017 (i.e. excluding Belgium and Poland, n = 11 633) was 20 years (interquartile range, IQR: 13–28 years) and has remained stable since 2013, fluctuating between 18 and 20 years.

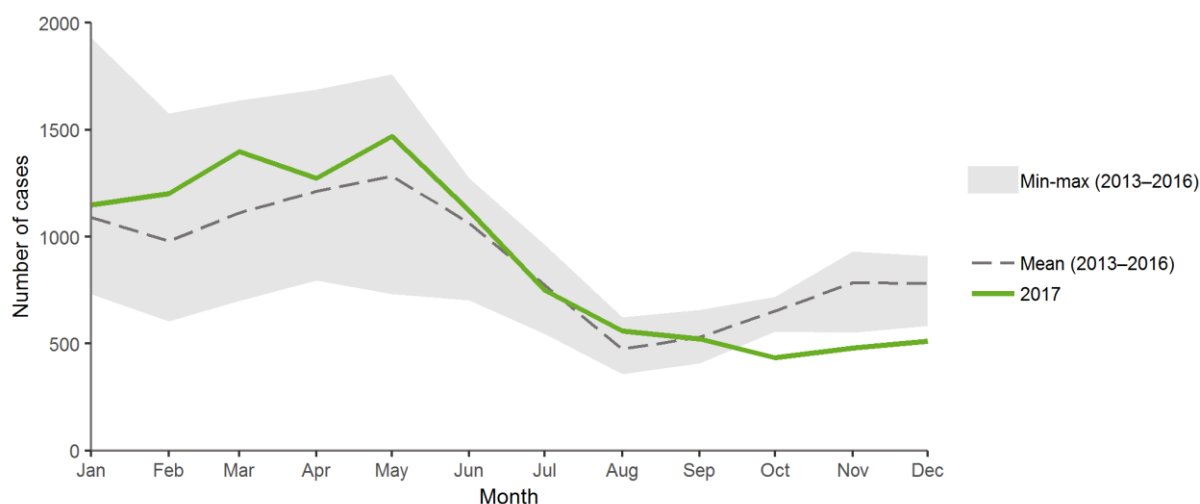
**Figure 2. Distribution of mumps cases per 100 000 population, by age and gender, EU/EEA, 2017**

The burden of mumps varied considerably by age between countries in 2017, with the median age of cases ranging between 0 and 65 years (among the 26 countries reporting case-based data). Seven countries reported the highest notification rate among those aged 5–9 years, five countries each among those aged 1–4, 10–14 and 15–19 years, four countries among those aged 20–29 years, and one country each among children under 1 year of age and adults aged 30 years and above. Notably high age-specific notification rates were reported by Czechia (95.5 and 80.7 per 100 000 population in the 10–14 and 15–19-year groups, respectively, compared to an average all-ages rate of 13.3), Spain (45.6 and 43.5 in the 15–19 and 20–29 year groups, compared to an all-ages rate of 12.6) and Poland (27.1 and 22.0 in the 5–9 and 1–4 year groups, compared to an all-ages rate of 4.4).

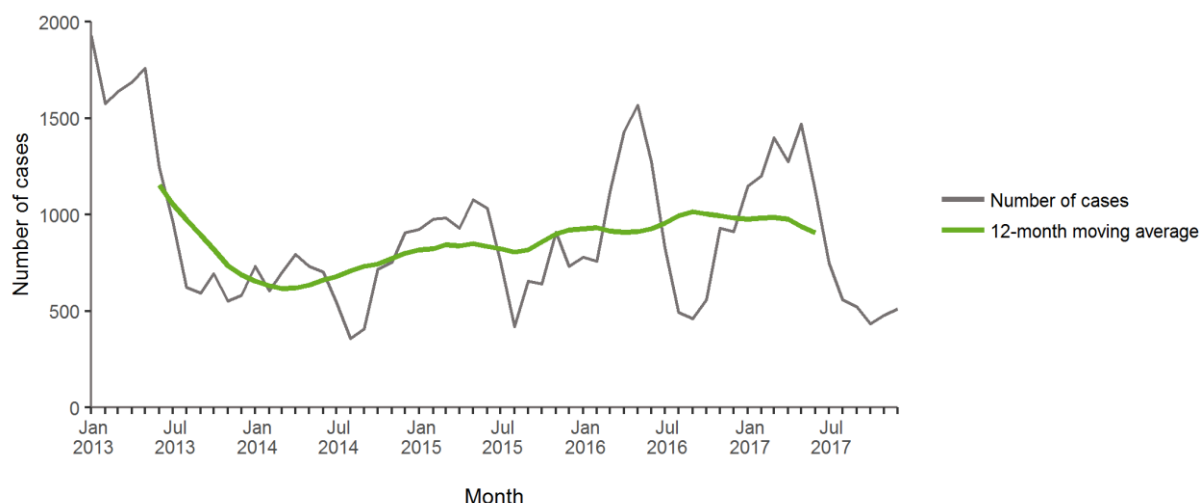
In no country were either the all-age or age-specific notification rates significantly higher among females than males. Notification rates in eight countries (Czechia, Germany, Italy, the Netherlands, Poland, Romania, Spain and the United Kingdom) were significantly higher among males than females, with rate ratios ranging from 1.11 (95% CI: 1.02–1.21) in the United Kingdom to 2.50 (95% CI: 1.31–4.75) in the Netherlands.

## Seasonality and trend

Between 2015 and 2017, the seasonality of reported mumps cases was characterised by a peak in late spring (May); the lowest number of cases was reported in late summer/autumn. In all years since 2013, the highest number of cases was reported in the first half of the year. In 2013 and 2017, this seasonality was more pronounced than in 2014–2016, with between 2.3 and 2.5 times as many cases in the first half of the year than the second half, compared to between 1.2 and 1.7 times in 2014–2016 (Figures 3 and 4).

**Figure 3. Distribution of mumps cases by month, EU/EEA, 2017 and 2013–2016**

Source: Country reports from Bulgaria, Cyprus, Czechia, Denmark, Estonia, Greece, Spain, Finland, Croatia, Hungary, Ireland, Iceland, Italy, Lithuania, Latvia, Malta, the Netherlands, Norway, Portugal, Sweden, Slovenia, Slovakia and the United Kingdom.

**Figure 4. Distribution of mumps cases by month, EU/EEA, 2013–2017**

Source: Country reports from Bulgaria, Cyprus, Czechia, Denmark, Estonia, Greece, Spain, Finland, Croatia, Hungary, Ireland, Iceland, Italy, Lithuania, Latvia, Malta, the Netherlands, Norway, Portugal, Sweden, Slovenia, Slovakia and the United Kingdom.

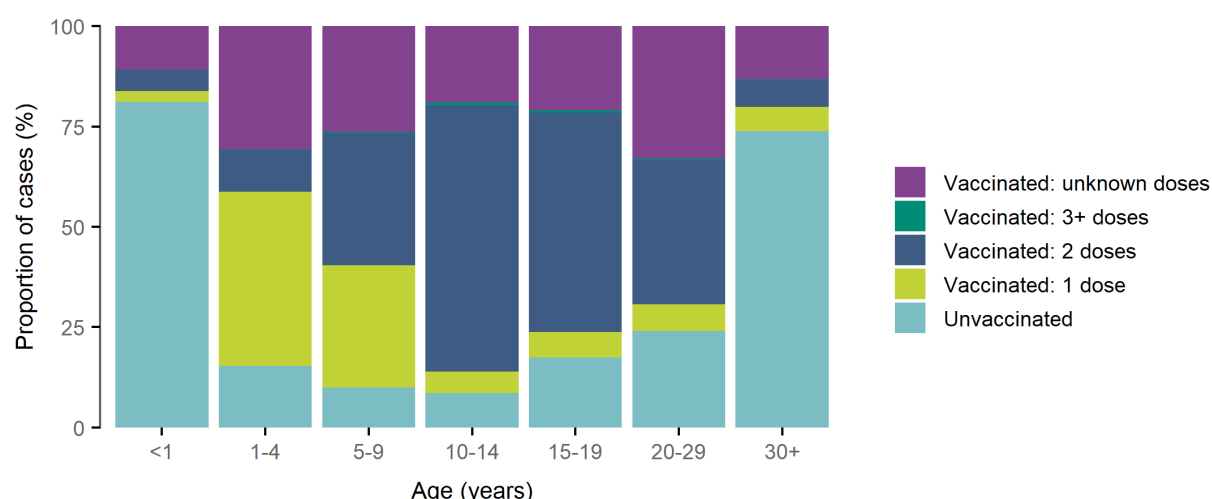
The seasonality observed in 2017 in the EU/EEA was driven largely by sharp rises in the first half of the year in case numbers in Spain and the United Kingdom as well as by outbreaks in Czechia and Poland, followed by declines in each of these countries in the second half of the year. In the nine countries (Czechia, Germany, Ireland, Italy, Poland, Romania, Slovakia, Spain and the United Kingdom) reporting large outbreaks of more than 100 cases per month during the period 2013–2017, the peak frequently occurred in the first half of the year.

## Vaccination status

Data on vaccination status were available for 10 798 cases (79%). Of these cases, 2 874 (27%) were unvaccinated, 1 349 (13%) were vaccinated with one dose of measles, mumps and rubella (MMR) vaccine, 3 975 (37%) with two doses, and 57 (<1%) with three or more doses. Additionally, 2 543 cases (24%) had been vaccinated with an unknown number of doses. Among laboratory-confirmed cases with known vaccination status, 32% were unvaccinated, compared with 17% of probable and 27% of possible cases.

The highest proportion of unvaccinated cases were among those aged under 1 year of age (below the age of routine vaccination against mumps) and those aged 30 years and above, accounting for around three-quarters of the cases with known vaccination status in these age groups. When those with unknown vaccination status were included, this proportion fell to 70% (<1 year age group) and 48% (30+ years). The majority of cases vaccinated with at least two doses were aged 5–29 years, with fully vaccinated 15–19 and 10–14-year age groups overrepresented at 55% and 67% of cases, respectively (Figure 5).



**Figure 5. Distribution of mumps cases by age group and vaccination status, EU/EEA, 2017**

Vaccination status was more likely to be unknown among cases aged 20–29 years (25% of cases in that age group) and 30+ years (36%) than for the younger age groups (11–15% of cases by age group).

## Outcome

The outcome of disease was known for 6 159 (45%) of all cases, with no deaths reported in 2017.

## Hospitalisation and complications

Of 6 937 cases with known hospitalisation status (59%), 455 (7%) were hospitalised. Data on complications were reported by 18 countries for 4 892 cases, of which 4 656 (95%) had no complication. Ten countries reported 236 cases with complications, 81% of which were reported by Czechia (29%), Germany (24%), the United Kingdom (17%) and Romania (11%). Reported complications included 109 cases of orchitis, 14 cases of pancreatitis, 19 cases of meningitis and 6 cases of encephalitis. Unspecified complications ('other') were reported for another 88 cases. Complications were more frequently reported in adolescents and young adults than in children, with a median age of cases per complication of 16 (IQR: 8–18) years for encephalitis, 20 (IQR: 17–32) years for 'other', 25 (IQR: 18–31) years for orchitis, 26 (IQR: 14–32) years for meningitis, and 41 (IQR: 24–48) years for pancreatitis.

## Discussion

Following a large decrease between 2013 and 2014, the notification rate for mumps in the EU/EEA has remained relatively stable, fluctuating between 2.7 (in 2013) and 3.1 (in 2017) cases per 100 000 population. The epidemiology of mumps in the EU/EEA in 2017 was heavily influenced by four countries (Czechia, Poland, Spain and the United Kingdom) that together accounted for 80% of the 13 693 notified cases, with Spain alone contributing 43% of all cases.

The fact that all EU/EEA Member States have added mumps vaccination via MMR to their routine childhood immunisation schedules has significantly reduced the associated disease burden compared to the pre-vaccine period. Case numbers in TESSy in 2017 represent a 7-fold decrease compared to 2000 (92 000 cases) and a 16-fold decrease compared to the peak in 2004 (215 000 cases). However, mumps epidemics continue to occur in the EU/EEA. Inspection of monthly time series for the 12-year period 2006–2017 reveals between-country heterogeneity in periodicity and trends. For example, the United Kingdom has reported increases in the first half of almost every year with larger epidemics every 3–4 years, but an overall decreasing trend with fewer annual cases between 2015 and 2017 than in 2006–2014. The inter-epidemic period in Spain and Czechia appears to be longer (4–6 years) with smaller and less regular intermediate increases. Czechia reported a decline in 2017 from an epidemic that peaked in 2016, whereas Spain has experienced an annual increase since 2014: case numbers in 2017 were more than double those of 2016 and comparable to numbers reported in previous peak years (2006–2007, 2012–2013).

Several factors may explain the observed differences in the epidemiology between Member States, including differences in surveillance systems, historical or current vaccination policies, and vaccination coverage levels. However, general features of mumps epidemiology common to many EU/EEA countries and North America include an increase in the age of infection compared to the pre-vaccine period, particularly in the years following the

introduction of a two-dose MMR vaccination schedule and a high proportion of cases among adolescents or young adults that have received two doses of MMR.

Increases over time since 2004 in age-specific incidence rates among people aged 15 years and above during Spanish mumps epidemics have been demonstrated [6], and in the USA a resurgence of mumps outbreaks affecting mainly those aged 18–29 years has been reported since 2006 [7, 8]. The annual age distributions of mumps cases from the EU/EEA since 2000 support these observations, with the highest proportion between 2000 and 2006 among those aged 5–9 years, increasing to 15 years and above between 2007 and 2017. Overall, two-thirds of cases in Europe in 2017 were aged 15 years and above, and this age group accounted for 92%, 79% and 53% of all cases in the United Kingdom, Spain and Czechia, respectively.

Many large outbreaks have been reported 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 [7, 9–16]. EU/EEA data from 2017 showed a third of cases with known vaccination status vaccinated with at least two doses and a substantial over-representation of these cases among those aged 10–19 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 [7, 9]. Genotypic variation between the vaccine strain and the circulating virus may also be a factor [14, 15], but its contribution to changes in vaccine effectiveness over time has been disputed [7]. While administration of MMR in childhood may not offer complete individual protection against mumps in later life, the importance of maintaining high population MMR coverage cannot be overstated. The vaccine has been highly effective at reducing the overall morbidity and mortality of each of the three of the diseases it protects against [17], sustained high vaccination coverage lowers the likelihood of outbreaks occurring in a population [18, 19], and being vaccinated also has a direct protective effect on mumps disease severity [16, 20, 21]. A third dose of MMR vaccine can be effective at lowering the risk of mumps during an outbreak [22], but the relatively short duration of the antibody response following a third dose has raised questions about its general applicability beyond outbreak control [23].

## Public health implications

Mumps epidemics continue to occur in the EU/EEA, with vaccinated adolescents and young adults particularly affected. Further research is needed into ways to improve the effectiveness and duration of protection offered by the mumps component of the MMR vaccine [24]. Despite evidence of incomplete protection or waning immunity following vaccination, high MMR vaccination coverage remains of paramount importance to prevent mumps outbreaks, reduce disease severity, and achieve measles and rubella elimination goals. Administering a third dose of MMR to adolescents and young adults can be considered as an outbreak control measure.

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