

Measles

Annual Epidemiological Report for 2019

Key facts

- In 2019, 13 200 cases of measles were reported by 30 EU/EEA Member States. The overall notification rate was 25.4 cases per 1 000 000 population, which is lower than in 2018 and 2017 (34.4 and 35.5), but much higher than the rates observed in 2015–2016 (7.8–9.0) before the start of the epidemic in Europe. All countries reported cases.
- In 2019, there were 10 reported deaths due to measles (case-fatality 0.09%).
- Age-specific notification rates decreased with increasing age, with unvaccinated children <1 years and those aged 1–4 years most affected. Children below 5 years of age accounted for 28% of the cases, while adults aged 20 years and above accounted for 49% of the cases.
- For the measles elimination goal to be reached, many countries need to increase coverage and uptake of their routine childhood immunisation programmes. They also need to close immunity gaps in adolescents and adults who have missed vaccination in the past.

Methods

This report is based on data for 2019 retrieved from The European Surveillance System (TESSy) on 27 February 2020. 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].

ECDC has coordinated the surveillance of measles at the European level since the transfer of EUVAC.NET (European surveillance network for selected vaccine-preventable diseases, hosted by Statens Serum Institut, Denmark) to ECDC in 2011.

Thirty EU/EEA Member States routinely report measles data to ECDC, the majority using the 2008 or 2012 EU case definition (Commission Implementing Decision 2012/506/EU of 8 August 2012 of the European Parliament and of the Council [4]) and reporting data from comprehensive, passive surveillance systems with national coverage. Belgium reported aggregated data since 2017, and Poland from (and including) April 2019.

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Data submitted by EU/EEA Member States and the United Kingdom are shared with the WHO Regional Office for Europe on a monthly basis as part of the measles surveillance of the WHO European Region.

Epidemiology

In 2019, 30 EU/EEA countries reported 13 200 cases of measles, of which 10 561 (80%) were laboratory confirmed. The remaining 2 639 cases were reported as 'probable' (10%), 'possible' (10%) and 'unknown' (<1%).

Every country reported measles cases in 2019. Five countries (France, Romania, Italy, Poland and Bulgaria) accounted for 65% of all notified cases, although their combined populations only represent approximately 37% of the EU/EEA population. The overall notification rate in 2019 was 25.4 cases per 1 000 000 population, which is slightly lower than the notification rate observed in 2017 and 2018 (35.5 and 34.4) but much higher than the rates observed in 2015–2016 (Table 1 and Figure 1).

Notification rates ranged from 1 to 298.5 cases per 1 000 000 population in EU/EEA countries. Lithuania reported the highest notification rate (298.5), followed by Bulgaria (176.4), Romania (87.9), Malta (64.8) and Slovakia (58.5).

The countries reporting the largest decreases in notification rates, compared to previous years, included Romania, Greece, Slovakia and Italy.

- Romania reported a notification rate of 87.9 in 2019, compared with 327.6 in 2018 and 462 in 2017.
- Greece reported a notification rate of 4.2 in 2019, compared with 213.5 in 2018 and 89.8 in 2017.
- Slovakia reported a notification rate of 58.5 in 2019, compared with 103.8 in 2018.
- Italy reported a notification rate of 26.8 in 2019, compared with 44.4 in 2018 and 89.1 in 2017.

The countries reporting the largest increases in notification rates compared to previous years included Lithuania, Bulgaria and Malta.

- Lithuania reported a notification rate of 298.5 in 2019, compared with 10.7 in 2018 and 0.7 in 2017.
- Bulgaria reported a notification rate of 176.4 in 2019, compared with 1.8 in 2018 and 23.2 in 2017.
- Malta reported a notification rate of 64.8 in 2019, compared with 10.5 in 2018 and 0 in 2017.

Table 1. Distribution of measles cases and notification rates per 1 000 000 population by country, EU/EEA, 2015–2019

Country	2015		2016		2017		2018		2019			
	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate	ASR	Confirmed cases
Austria	309	36	27	3.1	95	10.8	77	8.7	151	17	17.6	140
Belgium	46	4.1	78	6.9	367	32.3	117	10.3	496	43.3	41.9	382
Bulgaria	0	0	1	0.1	165	23.2	13	1.8	1235	176.4	192.5	1119
Croatia	219	51.8	4	1	7	1.7	23	5.6	52	12.8	13	52
Cyprus	0	0	0	0	3	3.5	15	17.4	6	6.9	6.9	5
Czechia	9	0.9	7	0.7	146	13.8	207	19.5	590	55.4	55.4	511
Denmark	9	1.6	3	0.5	4	0.7	8	1.4	15	2.6	2.5	15
Estonia	4	3	2	1.5	1	0.8	10	7.6	27	20.4	20.6	26
Finland	2	0.4	4	0.7	10	1.8	15	2.7	12	2.2	2.2	12
France	364	5.5	79	1.2	518	7.8	2919	43.6	2636	39.3	37.7	1659
Germany	2466	30.4	326	4	929	11.3	543	6.6	514	6.2	6.5	405
Greece	1	0.1	0	0	967	89.8	2293	213.5	45	4.2	4.4	28
Hungary	0	0	0	0	36	3.7	14	1.4	23	2.4	2.3	23
Iceland	0	0	1	3	3	8.9	0	0	9	25.2	24	9
Ireland	2	0.4	43	9.1	25	5.2	77	15.9	74	15.1	13.3	42
Italy	256	4.2	861	14.2	5399	89.1	2686	44.4	1620	26.8	28.4	1427
Latvia	0	0	0	0	0	0	25	12.9	3	1.6	1.6	3
Liechtenstein	.	.	.	.	.	.	.	.	.	.	.	.
Lithuania	50	17.1	22	7.6	2	0.7	30	10.7	834	298.5	295.4	834
Luxembourg	0	0	0	0	4	6.8	4	6.6	25	40.7	40.8	25
Malta	1	2.3	0	0	0	0	5	10.5	32	64.8	64.4	32
Netherlands	7	0.4	6	0.4	16	0.9	24	1.4	84	4.9	4.8	70
Norway	14	2.7	0	0	1	0.2	12	2.3	17	3.2	3.1	14

Country	2015		2016		2017		2018		2019			
	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate	ASR	Confirmed cases
Poland	48	1.3	133	3.5	63	1.7	340	9	1423	37.5	18.1	951
Portugal	0	0	0	0	34	3.3	171	16.6	10	1	1	10
Romania	7	0.4	2432	123.1	9076	462	6398	327.6	1706	87.9	88.5	1270
Slovakia	0	0	0	0	6	1.1	565	103.8	319	58.5	57.3	273
Slovenia	18	8.7	1	0.5	8	3.9	9	4.4	48	23.1	23.4	48
Spain	55	1.2	38	0.8	157	3.4	226	4.8	292	6.2	6.6	276
Sweden	22	2.3	3	0.3	41	4.1	43	4.2	20	2	1.9	19
United Kingdom	92	1.4	571	8.7	280	4.3	953	14.4	882	13.2	12.5	881
EU/EEA	4001	7.8	4642	9	18363	35.5	17822	34.4	13200	25.4	24.3	10561

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

Figure 1. Distribution of measles cases by country, EU/EEA, 2019

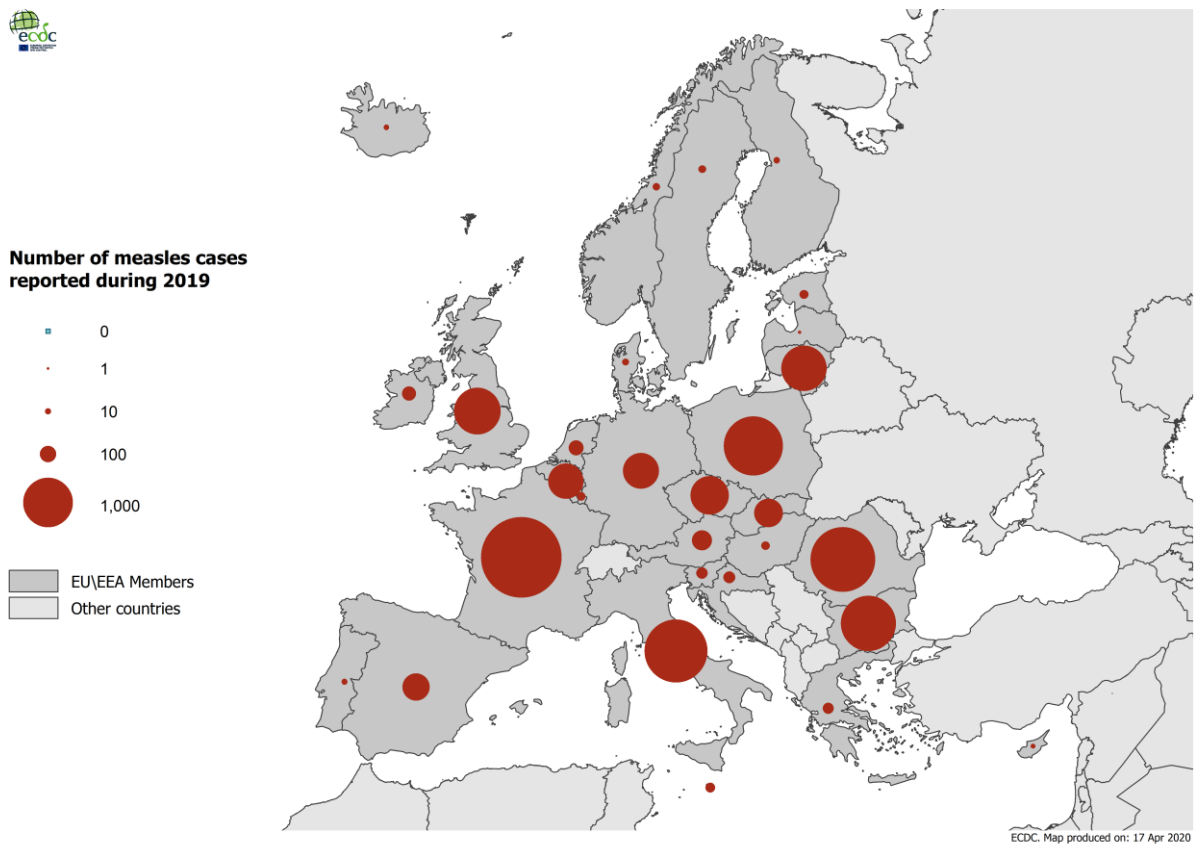
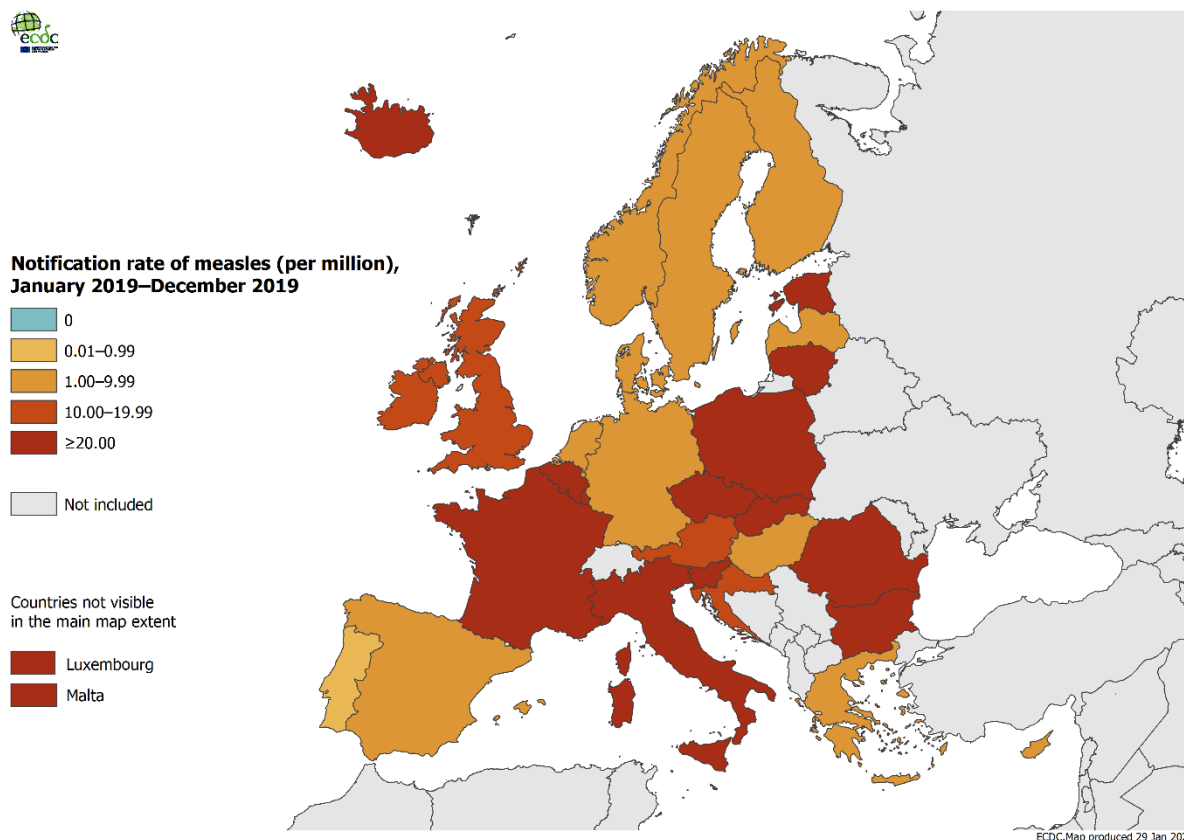


Figure 2. Distribution of measles cases per 1 000 000 population by country, EU/EEA, 2019

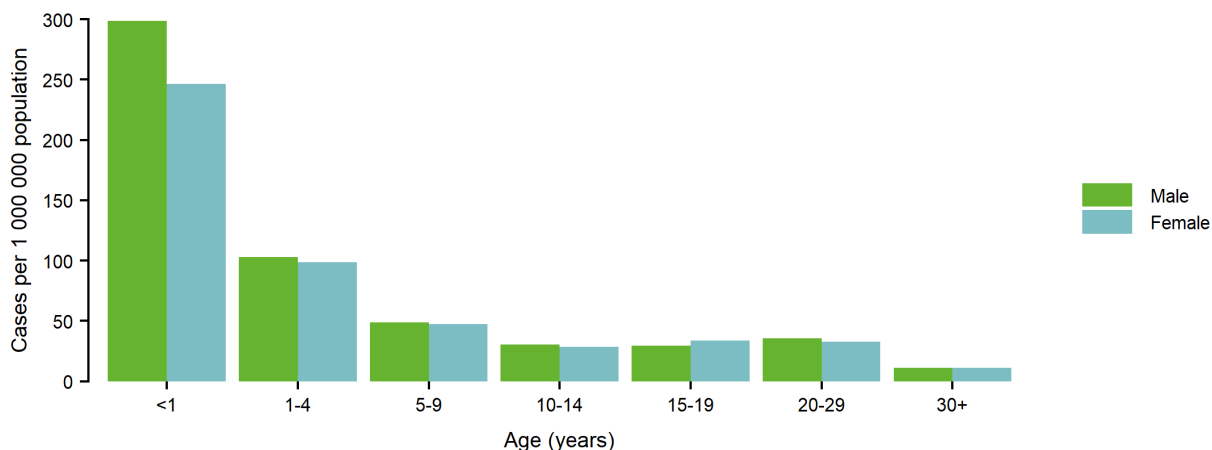
Age and gender

In 2019, the most affected age group was <1 year of age (notification rate of 273.2 cases per 1 000 000 population), followed by the group of 1–4-year olds (notification rate 100.6) (Figure 3). Overall, measles was more common among males (25.1 cases per 1 000 000 population) than females (22.9), with a rate ratio of 1.1:1 (95% confidence interval: 1.06–1.14). In all countries, the highest specific incidences were reported among those aged <1 year. The highest age-specific rates per 1 000 000 population were reported by Bulgaria, in infants below one year of age (2 853) and children between one and four years of age (1 501.8); by Romania, in infants below one year of age (1 903.1); by Lithuania, in infants below one year of age (1 455.7); and by Slovakia, also in infants below one year of age (1 437.2).

For the 12 435 cases with known age, the distribution of case numbers by age group was 11%, 17%, 11%, 6%, 7%, 17% and 32% in the age groups <1, 1–4, 5–9, 10–14, 15–19, 20–29 and 30+ years of age, respectively, adding up to a total of 56% of cases above the age of 14 years (Figure 3b). The median age of cases across all EU/EEA countries that submitted case-based data in 2019 was 18 years of age (interquartile range, IQR: 3–34); during the period 2015–18, the median age was between 6 and 15 years of age. Between 2015 and 2019, the median age and the distribution of different age groups affected varied depending on the countries reporting the majority of cases: Romania dominated the European picture with a high number of young children reported, contributing to a lower EU/EEA median age in 2016 and 2017; Italy, France and Greece reported high case numbers in 2018 and 2019, leading to a higher EU/EEA median age and higher proportions of adolescents and adults.

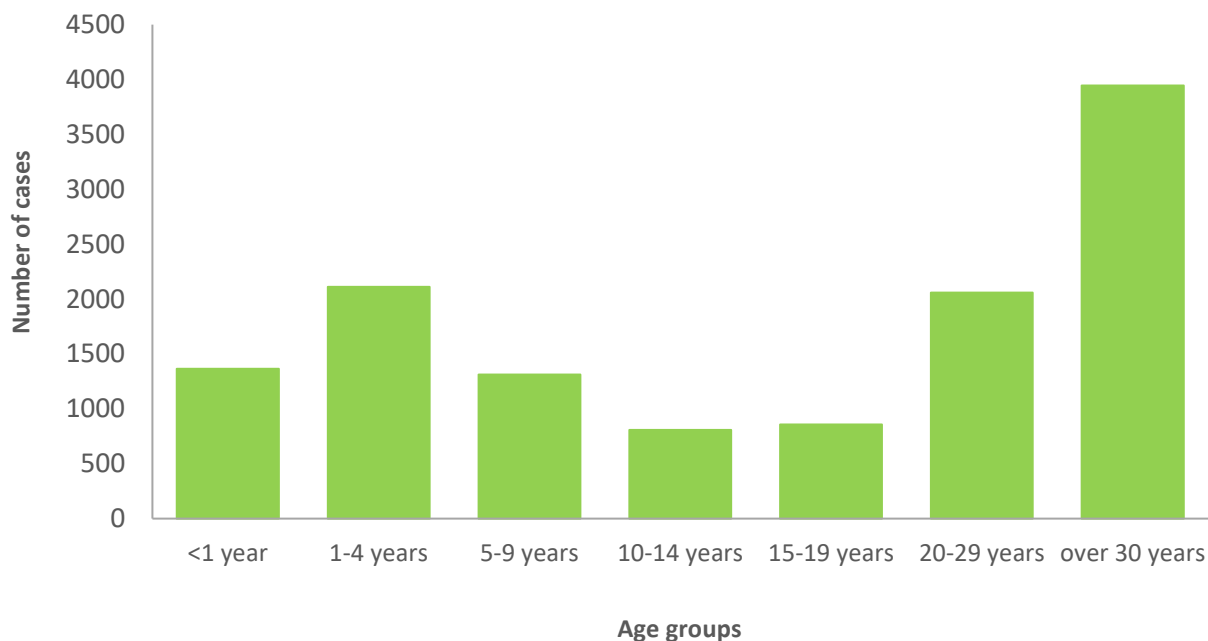
Of the countries reporting the majority of EU/EEA cases in 2019, France, Italy and Poland reported a particularly high proportion of cases over 14 years of age (52%, 85%, and 79%, respectively), while the same age group accounted for 27% and 19% of the Romanian and Bulgarian cases, respectively.

Figure 3a. Notification rates of measles, by age and gender, EU/EEA, 2019



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

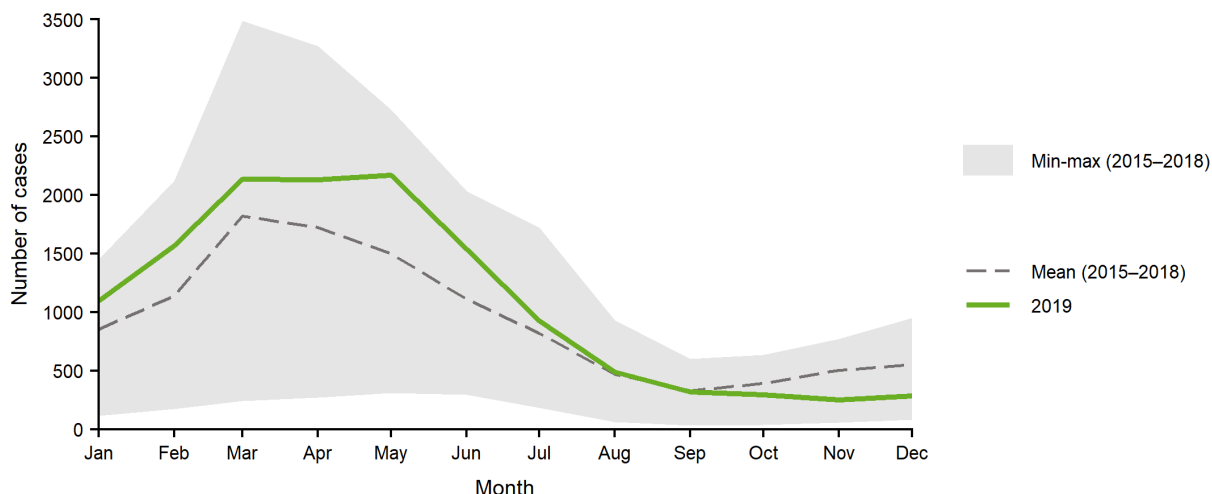
Figure 3b. Number of measles cases by age group, EU/EEA, 2019



Seasonality and trend

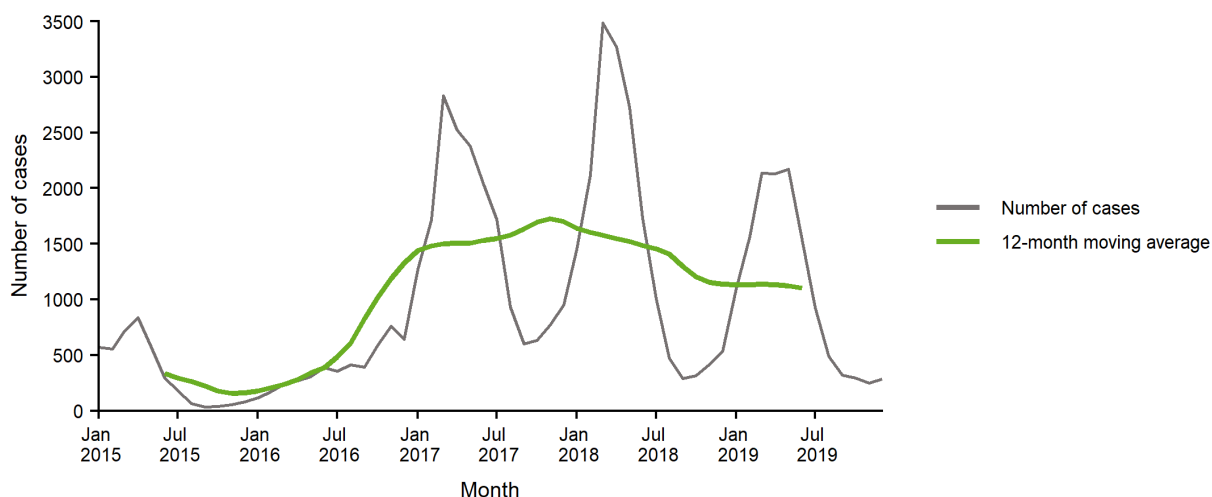
In 2019, the highest number of cases was reported during the first half of the year. Such distribution is consistent with the seasonality for measles in temperate climates, where the disease occurs more frequently in late winter and spring. The number of reported cases steadily increased over the 2016–2018 period (Figures 4 and 5).

Figure 4. Seasonal distribution of measles cases, EU/EEA, 2019 compared to 2015–2018



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, Sweden and United Kingdom

Figure 5. Distribution of measles cases by month, EU/EEA, 2014–2018

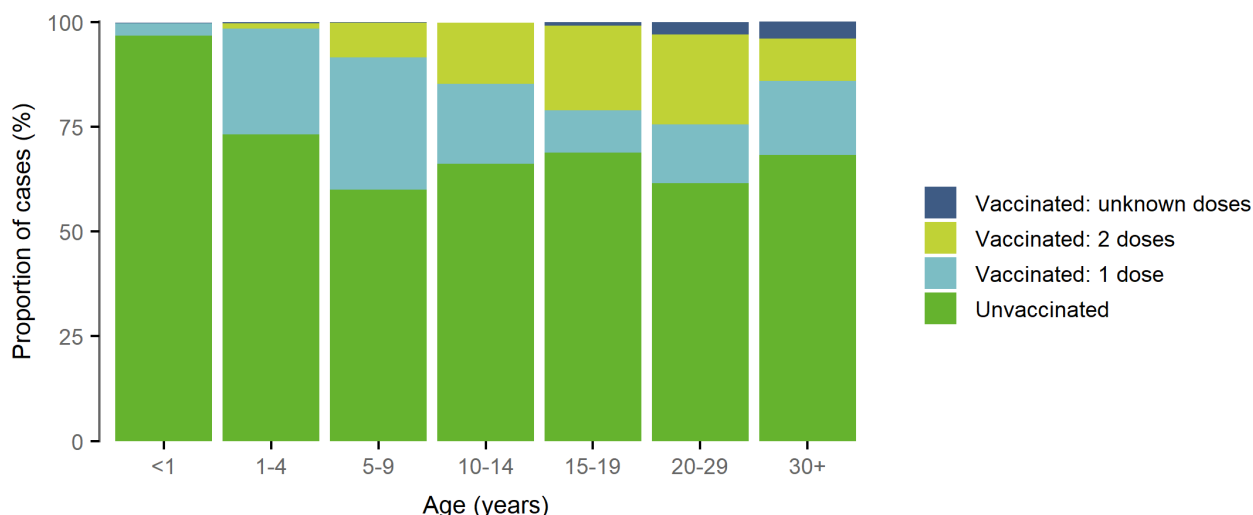


Source: Country reports from Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United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

Vaccination status

Data on vaccination status were available for 9 587 cases (73%). Of these cases, 6 768 (71%) were unvaccinated, 1 710 (18%) were vaccinated with one dose of measles, mumps and rubella (MMR) vaccine, 951 (10%) were vaccinated with two or more doses, and 158 (2%) were vaccinated with an unknown number of doses. Among cases with known vaccination status, the highest proportion of unvaccinated cases by age group was among those aged <1 year (97%), a group not routinely targeted by vaccination with MMR in most countries, followed by those aged 1–4 years (73%) and 15–19 years (69%) (Figure 6). When those with unknown vaccination status were included, the proportion unvaccinated in these age groups fell to 85%, 64% and 59%, respectively. Vaccination status was more likely to be unknown with increasing age, accounting for 24% and 39% of cases aged 20–29 years and 30+ years, respectively.

Figure 6. Distribution of measles cases by age group and vaccination status among cases with a known vaccination status, EU/EEA, 2019



Outcome

The outcome of disease was available for 10 601 (89%) cases, with 10 deaths attributable to measles (case-fatality 0.09%) reported in 2019. Data on complications were available for 9 of the fatal cases; pneumonia (6), acute encephalitis (2) and unknown (1). The distribution of deaths (case-fatality) by age group was 2 (0.16%), 1 (0.05%), 1 (0.09%), 1 (0.14%), 2 (0.12%) and 3 (0.09%) among those aged <1, 1-4, 5-9, 15-19, 20-29 and 30+ years, respectively.

Hospitalisation and complications

Hospitalisation status was available for 10 000 (84%) cases; 5 462 (55%) of the cases with known hospitalisation status were hospitalised in 2019; of these patients, no complications were reported for 3 049 (54%). Data on hospitalisations showed a high degree of heterogeneity between countries, with a level of completeness between 0 and 100%. In some countries, the majority of reported cases were hospitalised (Bulgaria: 96%, Hungary 87%, Romania 90%).

Data on complications were reported for 6 846 (43%) cases, 5 148 of which (75%) had no complications. Reported complications included 759 cases of pneumonia, 156 cases of diarrhoea, 38 cases of otitis media and 8 cases of acute encephalitis. Unspecified complications ('other') were reported for 737 cases.

Importations

Importation status was available for 9 979 (83%) cases. Of these cases, 762 (8%) were classified as imported in 2019 and 466 as import-related (5%). Among the 692 imported cases for which a single probable country of infection was available, most imported cases were thought to have acquired their infection in Europe (EU/EEA: 33%, non-EU/EEA: 32%), followed by Asia (18%), Africa (13%), America (3%) and Oceania (1%). Of the 88 different countries listed as the likely origin of infection of imported cases, ten countries accounted for 55% of these infections: Ukraine (149), Italy (39), Thailand (37), Romania (31), Algeria (27), France (24), Germany (20), Madagascar (17), Vietnam (17) and the United Kingdom (17).

Discussion

The year 2019 saw a relatively high transmission of measles in the EU/EEA, well above the levels of 2015, but most countries reported a decrease in notification rates as compared with the two previous years. A smaller number of countries saw an increase of incidence in 2019 over the previous year (Bulgaria, Hungary, Lithuania, Luxemburg, Malta and Poland). Of these, high notification rates of reported measles cases continued in Bulgaria in the first months of 2020 [5]. The epidemiology of measles in the EU/EEA in 2019 was heavily influenced by five countries: France, Romania, Italy, Poland and Bulgaria reported 65% of all notified cases. Three of these countries (France, Italy and Romania) were also among the top five countries reporting the majority of cases in 2018, together with the United Kingdom and Greece.

The overall epidemiological picture of measles confirms what observed in previous years, with some variation within countries, on the age profile of the cases as well as other characteristics. Measles affects all age groups, but all countries reported the highest incidence in infants who are too young to be protected by vaccination. There is also a considerable burden in older age groups. A total of 73% of the cases between one and four years of age were unvaccinated in 2019; this is the age group when most EU/EEA countries administer the first dose through their vaccination programmes; a number of countries also administer the second dose between one and four years of age. Despite the fact that current programmes in the EU/EEA specifically target children in this age group, a number of children are not reached.

An analysis of hospitalisations revealed major differences between countries, which could be partially explained by different approaches that lead to hospitalisation after a measles diagnosis. Indeed more than half of the hospitalised cases had no complications. Therefore, data on hospitalisation must be interpreted with caution. Deaths were reported in infants, children, adolescents and adults, indicating that severe measles can affect all age groups.

Measles continued to spread in 2019, and importation of cases between countries was also reported: one third of the imported cases were imported from another EU/EEA country and another third from the larger European Region. When overall vaccination coverage is low or the virus finds its way towards pockets of susceptible populations, transmission may occur and may lead to extensive outbreaks. In situations in which importations manage to be contained, even small outbreaks can create a severe burden on the health system in countries that have eliminated measles. This illustrates again the importance of maintaining a high immunisation coverage [6].

The latest WHO–UNICEF estimates of national immunisation coverage show that only five EU/EEA countries (Hungary, Malta, Portugal, Slovakia and Sweden) reported at least 95% vaccination coverage for both the first [8] and second [9] doses of MMR in 2018, highlighting that in most countries routine childhood immunisation against measles is below the level recommended to achieve and sustain elimination [10].

During 2017–2019, France (2018), Germany (2019) and Italy (2017) implemented mandatory vaccination policies, mostly through school-based mechanisms. Preliminary results are encouraging [11;12]; further analysis will be needed to confirm the long-term effects of this approach and the impact of other concomitant factors. A recent modelling study underlined that in countries with large immunity gaps additional measures may be needed for individuals currently not targeted by these programmes in order to interrupt measles circulation [13].

While measures have been taken by Member States affected by the outbreaks in 2016–2019, measles circulation has been continuing in the EU/EEA. Overall vaccination coverage is still not sufficient to prevent the spread of the virus. It is likely that the epidemics propagate from one country to another, leading to different EU/EEA countries affected by outbreaks at different points in time. This trend will continue until a high population immunity will interrupt the circulation of the virus.

Public health implications

Bulgaria, France, Italy, Poland and Romania reported the majority of measles cases in 2019. Of these countries, only Bulgaria was declared as having eliminated measles by the European Regional Verification Commission for Measles and Rubella Elimination in June 2019, which reviewed data from 2018 [14]. The other four countries were classified as endemic during the same commission session. The UK, which had the sixth-highest number of reported cases in 2019, was considered as a country with 're-established measles transmission' by the Regional Verification Commission; the data presented in this report show a similar incidence to that reported in 2018. The Regional Verification Commission also considered Czechia as a country with 're-established measles transmission' (2018 data); data reported from 2018 and 2019 show a similar incidence. Greece, which in 2018 was a country with 're-established transmission', showed a substantial decline in the number of reported cases in 2019.

The conclusions of the 2019 ECDC risk assessment remain valid: the risk of continued widespread circulation of measles in the EU/EEA in the near future is high and 'there is a high probability of continued mutual importation and exportation of measles', which makes the disease a serious cross-border threat to health in the EU/EEA. For the measles elimination goal to be reached, many countries need to make sustained improvements in the coverage of their routine childhood immunisation programmes and close immunity gaps in adolescents and adults who have missed vaccination in the past [7].

Vaccination programmes across EU/EEA countries vary in their implementations and in the timing of the two doses.

Evidence from modelling studies indicates that a 95% immunity (hence, vaccination coverage with measles-containing-vaccine second-dose (MCV2)) by the age of 5–9 years is needed to reach and maintain measles elimination [15]. Member States where MCV2 is administered at ≥ 10 years of age may consider lowering the recommended age to reach higher immunity levels in younger children [16]. However, the choice of the optimal age for delivery of the routine MCV2 in each Member State should be based primarily on programmatic considerations to achieve the highest possible MCV2 vaccination coverage [17]. In order to be effective, MCV2 should be administered at least four weeks apart from MCV1 [17].

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