

# Measles

## Annual Epidemiological Report for 2018

### Key facts

- In 2018, 17 822 cases of measles were reported by 29 EU/EEA Member States. The overall notification rate was 34.4 cases per 1 000 000 population, similar to that reported in 2017 (35.5 cases) but much higher than the rates in 2014–2016 (7.1–9.0). Only one country (Iceland) reported no measles cases during the year.
- There were 37 reported deaths due to measles (case–fatality 0.2%), and over two-thirds of cases with data available for these outcomes were hospitalised or suffered complications.
- Age-specific notification rates decreased with increasing age, with unvaccinated children <1 years and aged 1–4 years most affected, while adults aged 20 years and above accounted for 36% of cases.
- 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 opportunities in the past.

### Methods

This report is based on data for 2018 retrieved from The European Surveillance System (TESSy) on 27 November 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].

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 definitions (Commission Implementing Decision 2012/506/EU of 8 August 2012 of the European Parliament and of the Council [4]) and reporting data from comprehensive surveillance systems with national coverage. Belgium reported aggregated data in 2018.

## Epidemiology

In 2018, 29 EU/EEA countries reported 17 822 cases of measles, of which 12 709 (71%) were laboratory confirmed. Only one country (Iceland) reported no measles cases during the year. The remaining 5 113 cases were reported as probable (17%), possible (12%) and of unknown classification (<1%). Five countries (Romania, France, Italy, Greece and the United Kingdom) accounted for 86% of all notified cases, although their combined populations only represent approximately 43% of the EU/EEA population. The overall notification rate in 2018 was 34.4 cases per 1 000 000 population, which is slightly lower than the notification rate observed in 2017 (35.5 cases) but much higher than the rates in 2014–2016 (7.1–9.0) (Table 1 and Figure 1).

Notification rates ranged from 0 to 327.6 cases per 1 000 000 population in EU/EEA countries in 2018. Romania reported the highest notification rate (327.6), followed by Greece (213.5), Slovakia (103.8), Italy (44.4) and France (43.6).

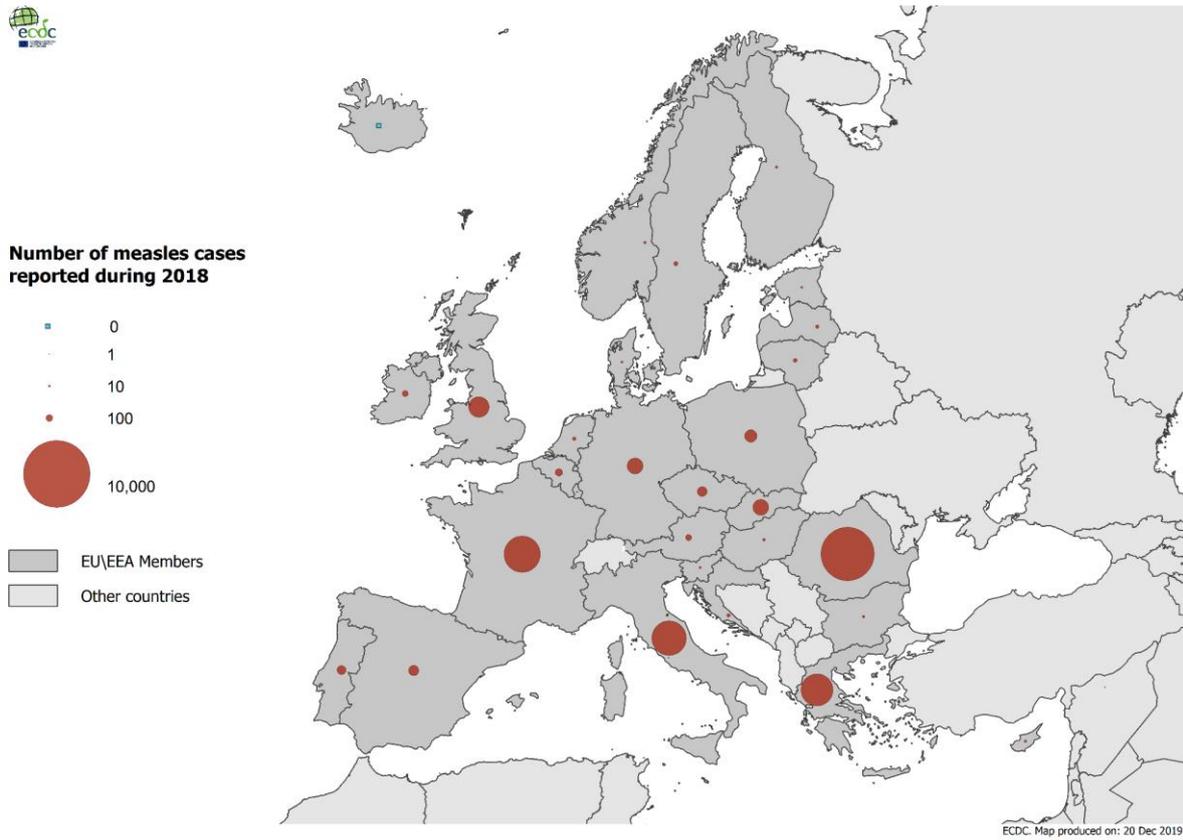
Countries reporting large increases in notification rates compared to previous years included Greece (213.5 in 2018, compared with 89.8 in 2017 and 0 in 2016), Slovakia (103.8 in 2018, compared with 1.1 in 2017 and 0 in 2016) and France (43.6 in 2018, compared with 7.8 in 2017 and 1.2 in 2016). Notable decreases compared to 2017 were reported in Romania (327.6 in 2018, compared with 462 in 2017 and 123 in 2016), Italy (44.4 in 2018, compared with 89.1 in 2017 and 14.2 in 2016), Belgium (10.3 in 2018, compared with 32.3 in 2017 and 6.9 in 2016) and Bulgaria (1.8 in 2018, compared with 23.2 in 2017 and 0.1 in 2016).

**Table 1. Distribution of measles cases and notification rates per 1 000 000 population by country, EU/EEA, 2014–2018**

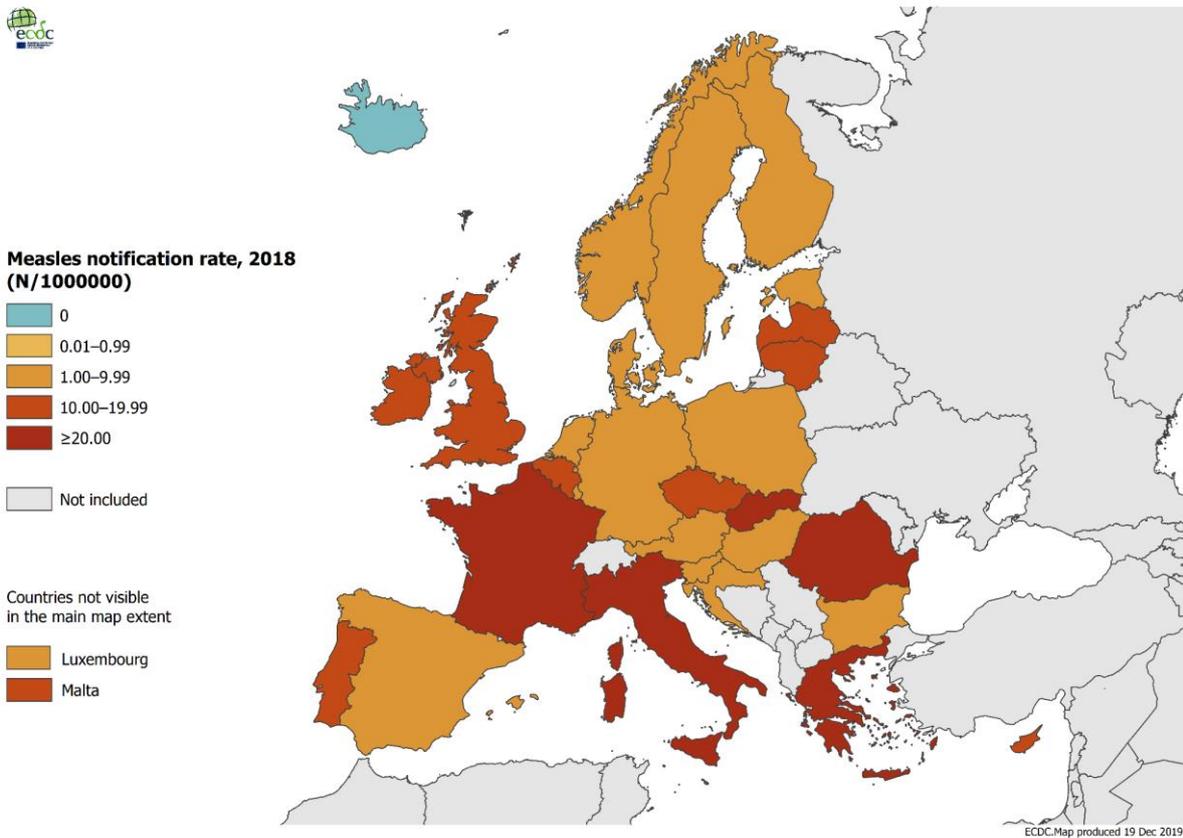
Country	2014		2015		2016		2017		2018			
	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate	ASR	Confirmed cases
Austria	117	13.8	309	36	27	3.1	95	10.8	77	8.7	9.5	70
Belgium	75	6.7	46	4.1	78	6.9	367	32.3	117	10.3	-	95
Bulgaria	0	0	0	0	1	0.1	165	23.2	13	1.8	2.2	13
Croatia	16	3.8	219	51.8	4	1	7	1.7	23	5.6	6.1	23
Cyprus	10	11.7	0	0	0	0	3	3.5	15	17.4	16.7	15
Czechia	222	21.1	9	0.9	7	0.7	146	13.8	207	19.5	20.2	200
Denmark	29	5.2	9	1.6	3	0.5	4	0.7	8	1.4	1.5	8
Estonia	0	0	4	3	2	1.5	1	0.8	10	7.6	7.7	10
Finland	2	0.4	2	0.4	4	0.7	10	1.8	15	2.7	3	15
France	267	4	364	5.5	79	1.2	518	7.8	2919	43.6	43.6	1462
Germany	443	5.5	2466	30.4	326	4	929	11.3	543	6.6	7.7	459
Greece	1	0.1	1	0.1	0	0	967	89.8	2293	213.5	241.3	1300
Hungary	0	0	0	0	0	0	36	3.7	14	1.4	1.5	14
Iceland	1	3.1	0	0	1	3	3	8.9	0	0	0	0
Ireland	33	7.1	2	0.4	43	9.1	25	5.2	77	15.9	15	73
Italy	1695	27.9	256	4.2	861	14.2	5399	89.1	2686	44.4	52.6	2081
Latvia	36	18	0	0	0	0	0	0	25	12.9	13.7	25
Liechtenstein	.	.	.	.	.	.	.	.	.	.	.	.
Lithuania	11	3.7	50	17.1	22	7.6	2	0.7	30	10.7	11.4	30
Luxembourg	2	3.6	0	0	0	0	4	6.8	4	6.6	6.5	4
Malta	0	0	1	2.3	0	0	0	0	5	10.5	11.4	5
Netherlands	144	8.6	7	0.4	6	0.4	16	0.9	24	1.4	1.5	23
Norway	3	0.6	14	2.7	0	0	1	0.2	12	2.3	2.2	10
Poland	110	2.9	48	1.3	133	3.5	63	1.7	340	9	9.1	214
Portugal	0	0	0	0	0	0	34	3.3	171	16.6	18.7	160
Romania	59	3	7	0.4	2432	123.1	9076	462	6398	327.6	343.9	4778
Slovakia	0	0	0	0	0	0	6	1.1	565	103.8	107.8	399
Slovenia	52	25.2	18	8.7	1	0.5	8	3.9	9	4.4	4.4	9
Spain	159	3.4	55	1.2	38	0.8	157	3.4	226	4.8	5.2	220
Sweden	26	2.7	22	2.3	3	0.3	41	4.1	43	4.2	4.4	41
United Kingdom	142	2.2	92	1.4	571	8.7	280	4.3	953	14.4	14.5	953
<b>EU/EEA</b>	<b>3655</b>	<b>7.1</b>	<b>4001</b>	<b>7.8</b>	<b>4642</b>	<b>9</b>	<b>18363</b>	<b>35.5</b>	<b>17822</b>	<b>34.4</b>	<b>36.9</b>	<b>12709</b>

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

**Figure 1. Distribution of measles cases by country, EU/EEA, 2018**



**Figure 2. Distribution of measles cases per 1 000 000 population by country, EU/EEA, 2018**



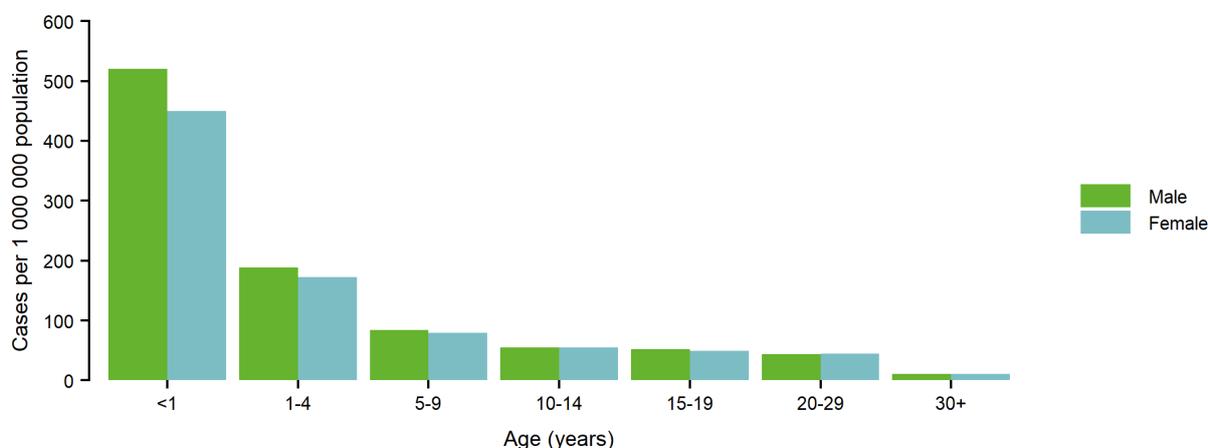
## Age and gender

In 2018, the most affected age group was the group <1 years (notification rate: 486 cases per 1 000 000 population), followed by the children in the age group 1–4 years (notification rate: 180.7) (Figure 3). Overall, measles was more common among males (36.2 cases per 1 000 000 population) than females (32.6), with a rate ratio of 1.11 (95% confidence interval: 1.08–1.15).

Among the 17 800 cases with known age, the distribution of case numbers by age group was 14%, 21%, 13%, 8%, 8%, 15% 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 in all EU/EEA countries that submitted case-based data in 2018 was 10 (interquartile range, IQR: 2–26) years.

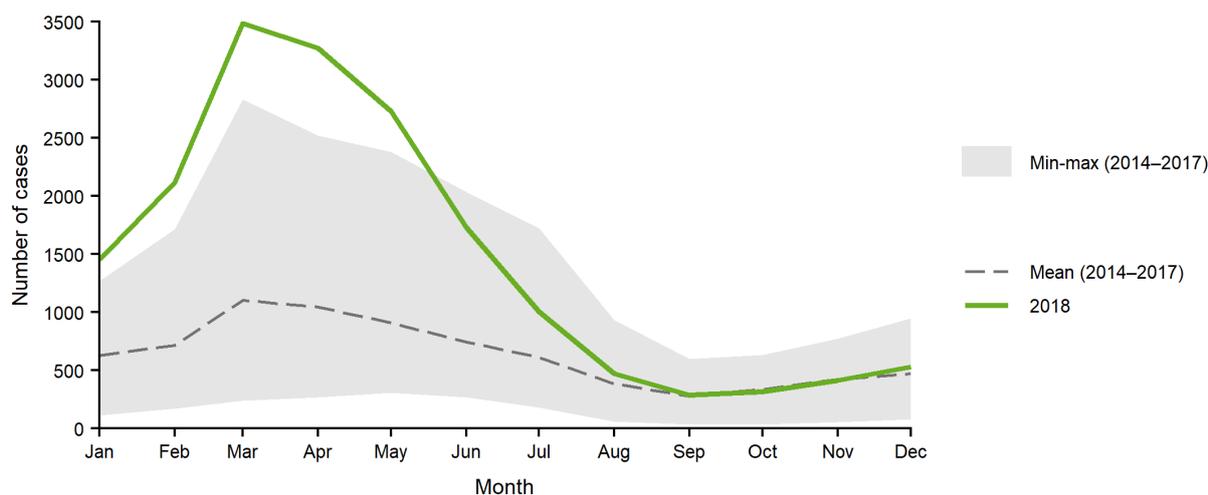
The highest age-specific rates were reported by Romania: 7 158.1 cases/1 000 000 population were reported in children <1 year of age; 2 325.3 cases/1 000 000 population were reported in children between 1 and 4 years of age. Greece reported 2 724.1 cases/1 000 000 population in children <1 year of age and 1 358 cases/1 000 000 population were in children between 1 and 4 years of age. In Slovakia, 2 128.2 cases/1 000 000 population were in children <1 year of age.

**Figure 3. Notification rates of measles, by age and gender, EU/EEA, 2018**



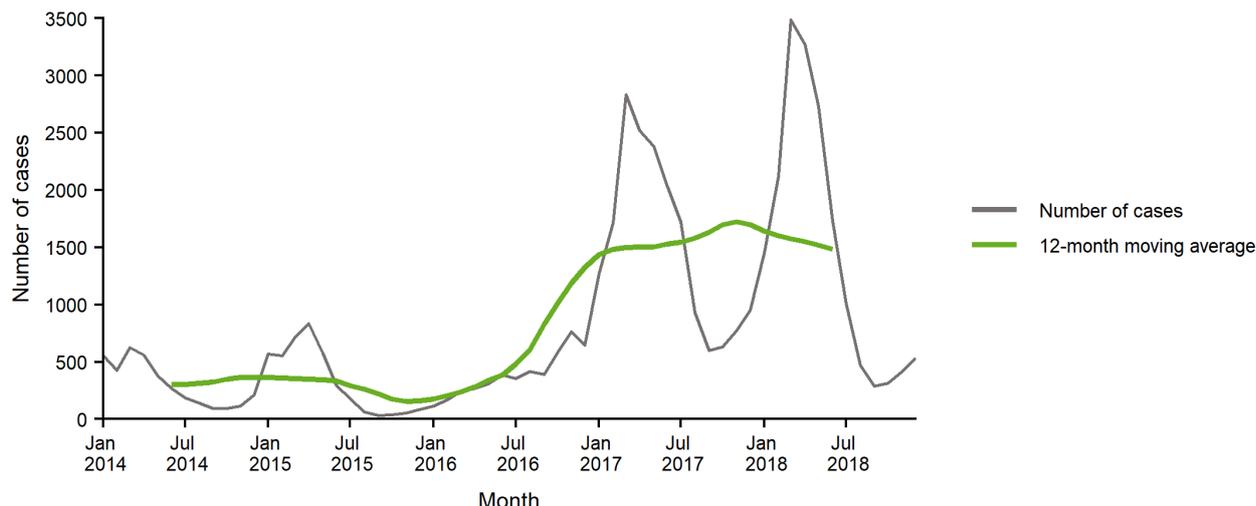
## Seasonality and trend

**Figure 4. Seasonal distribution of measles cases, EU/EEA, 2018 compared to 2014–2017**



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

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



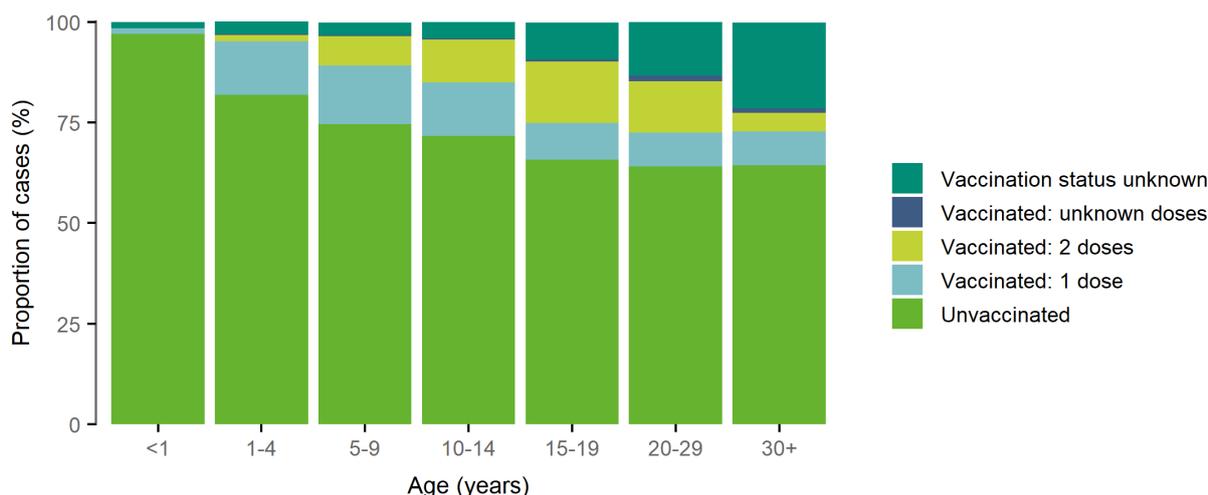
Source: Country reports from Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom

### Vaccination status

Data on vaccination status were available for 16 254 cases (91%). Of these cases, 13 299 (82%) were unvaccinated, 1 734 (11%) were vaccinated with one dose of measles, mumps and rubella (MMR) vaccine, 1 113 (7%) with two doses, and 108 cases (<1%) had been vaccinated with an unknown number of doses. Of all laboratory-confirmed cases with known vaccination status, 81% were unvaccinated, compared with 84% of the probable cases and 82% of the possible cases.

Of the cases with known vaccination status, the highest proportion of unvaccinated cases by age group was in children <1 year of age (99%), a group below the age of routine MMR vaccination MMR, followed by children between 1 and 4 years of age (84%) and those 30 years and older (82%). When those with unknown vaccination status were included, the proportion of unvaccinated persons in these age groups fell to 97%, 82% and 64%, respectively. Vaccination status was more likely to be unknown with increasing age, accounting for 21% of cases aged 30+ years (Figure 6).

**Figure 6. Distribution of measles cases by age group and vaccination status, EU/EEA, 2018**



### Outcome

The outcome of disease was known for 16 023 (91%) of cases submitted as case-based data, with 37 deaths (case-fatality 0.2%) reported in 2018.

## Hospitalisation and complications

Data on hospitalisation status were available for 14 125 cases (80%). Of these cases, 9 647 (68%) were hospitalised. Data on complications were reported for 9 111 cases (52%), of which 6 660 (73%) had no complications. Reported complications included 1 977 cases of pneumonia, 43 cases of diarrhoea, 13 cases of otitis media, and 11 cases of acute encephalitis. Unspecified complications ('other') were reported for 407 cases.

Complications were most common among cases aged <1 and 1–4 years, affecting 36% and 31% of cases in these age groups for whom data on complications were available. Among cases aged 5–9, 10–14, 15–19, 20–29 and 30+ years the proportion reporting complications was 26%, 23%, 18%, 19% and 22%, respectively. The median age of cases per complication was 25 (IQR: 6–33) years for acute encephalitis, 15 (IQR: 2–34) years for diarrhoea, 8 (IQR: 1–27) years for 'other', 3 (IQR: 1–28) years for otitis media, and 3 (IQR: 0–11) years for pneumonia.

## Discussion

The two years 2014–15 saw relatively low transmission of measles in the EU/EEA, with seasonally expected peaks in cases numbers. During 2016, measles activity began to increase gradually, driven in part by a large outbreak in Romania in the second half of the year that was still ongoing in 2018. Notification rates for measles in the EU/EEA remained greatly elevated in 2018 at 34.4 cases per 1 000 000 population, comparable to the notification rate observed in 2017 (35.5) and much higher than the rates in 2014–2016 (7.1–9.0). The epidemiology of measles in the EU/EEA in 2018 was heavily influenced by five countries (Romania, France, Italy, Greece and the United Kingdom) which together accounted for 86% of the 17 822 notified cases, with Romania alone accounting for 36% of all cases.

ECDC undertook a risk assessment, published in May 2019, which included a detailed analysis of measles epidemiology in the period 2016–2019, both at the EU/EEA and the individual country level. The risk assessment provides a detailed picture of the heterogeneity between countries in the EU/EEA in terms of the age-specific immunity gaps, vaccination coverage and patterns of measles importations. A high burden of measles among adults in the majority of Member States revealed large immunity gaps in a part of the population not routinely targeted by immunisation services [5]. Furthermore, 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 [6] and second [7] doses of MMR in 2018, highlighting that routine childhood immunisation against measles is also below the level recommended to achieve and sustain elimination [8].

## Public health implications

In 2019, an ECDC risk assessment concluded that the risk of continued widespread circulation of measles in the EU/EEA in the near future is high and that, with the continued importation of measles cases between EU/EEA Member States, the disease is a serious cross-border threat to health in the EU/EEA. The European Regional Verification Commission for Measles and Rubella Elimination concluded in June 2019 that three EU/EEA Member States (Czechia, Greece and the United Kingdom) that had previously eliminated measles had re-established transmission during 2018 [9], and that five EU/EEA Member States (France, Germany, Italy, Poland and Romania) remained endemic for measles.

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 opportunities in the past [5].

## References

1. European Centre for Disease Prevention and Control. Introduction to the Annual Epidemiological Report [Internet]. Stockholm: ECDC; 2017 [cited 16 September 2019]. Available from: <http://ecdc.europa.eu/annual-epidemiological-reports/methods>.
2. European Centre for Disease Prevention and Control. Surveillance systems overview for 2017 [Internet, downloadable spreadsheet]. Stockholm: ECDC; 2018 [cited 16 September 2019]. Available from: [http://www.ecdc.europa.eu/sites/portal/files/documents/surveillance-systems-overview-2017\\_2.xlsx](http://www.ecdc.europa.eu/sites/portal/files/documents/surveillance-systems-overview-2017_2.xlsx).
3. European Centre for Disease Prevention and Control. Surveillance atlas of infectious diseases [Internet]. Stockholm: ECDC; 2019 [cited 16 September 2019]. Available from: <https://atlas.ecdc.europa.eu/public/index.aspx?Dataset=27&HealthTopic=37>.
4. Commission Implementing Decision (2012/506/EU) of 8 August 2012 amending Decision 2002/253/EC laying down case definitions for reporting communicable diseases to the Community network under Decision No. 2119/98/EC of the European Parliament and of the Council (notified under document C(2012) 5538). Available from: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32012D0506>.
5. European Centre for Disease Prevention and Control. Risk assessment: Who is at risk of measles in the EU/EEA? Identifying susceptible groups to close immunity gaps towards measles elimination. Stockholm: ECDC; 2019. Available from: <https://www.ecdc.europa.eu/en/publications-data/risk-assessment-measles-eu-eea-2019>.
6. World Health Organization. WHO-UNICEF estimates of MCV1 coverage [Internet] Geneva: WHO; 2019 [cited 3 September 2019]. Available from: [http://apps.who.int/immunization\\_monitoring/globalsummary/timeseries/tswucoveragemcv1.html](http://apps.who.int/immunization_monitoring/globalsummary/timeseries/tswucoveragemcv1.html) [
7. World Health Organization. WHO-UNICEF estimates of MCV2 coverage [Internet] Geneva: WHO; 2019 [cited 3 September 2019]. Available from: [http://apps.who.int/immunization\\_monitoring/globalsummary/timeseries/tswucoveragemcv2.html](http://apps.who.int/immunization_monitoring/globalsummary/timeseries/tswucoveragemcv2.html) [
8. World Health Organization Regional Office for Europe. Eliminating measles and rubella – Framework for the verification process in the WHO European Region. . Copenhagen: WHO; 2014. – Available from: [http://www.euro.who.int/\\_data/assets/pdf\\_file/0009/247356/Eliminating-measles-and-rubella-Framework-for-the-verification-process-in-the-WHO-European-Region.pdf](http://www.euro.who.int/_data/assets/pdf_file/0009/247356/Eliminating-measles-and-rubella-Framework-for-the-verification-process-in-the-WHO-European-Region.pdf).
9. World Health Organization Regional Office for Europe. Eighth meeting of the European regional verification commission for measles and rubella elimination (RVC), 12–14 June 2019 Warsaw, Poland. Copenhagen: WHO; 2019. Available from: [http://www.euro.who.int/\\_data/assets/pdf\\_file/0019/413236/8th-RVC-Report.pdf](http://www.euro.who.int/_data/assets/pdf_file/0019/413236/8th-RVC-Report.pdf).