

# Measles

## Annual Epidemiological Report for 2023

### Key facts

- In 2023, 2 361 cases of measles were reported by 30 EU/EEA Member States. The overall notification rate was 5.2 cases per 1 000 000 population, which was significantly higher than the notification rate observed the last three years (2022:0.3, 2021:0.1, and 2020:4.3). Despite the rise, the 2023 rate remains lower than the pre-pandemic level observed in 2019 (27.2). In 2023, seven countries reported no measles activity. There were no reported deaths related to measles for this year.
- In 2023, measles cases were reported among all age groups, with an overall highest percentage of unvaccinated individuals (86%) observed in the past five years. The age-specific notification rates decreased with increasing age, with children <1 years and those aged 1–4 years most affected.
- The observed vaccine coverage estimates indicate that in many countries, routine childhood vaccination against measles is below the level recommended to achieve and sustain measles elimination. Only four countries in the EU/EEA have achieved the  $\geq 95\%$  threshold for two doses, in 2022.
- Continuous high-quality surveillance and outbreak investigations are key tools to closely monitoring measles epidemiology in the EU/EEA and identifying immunity gaps in the population. For the measles elimination goal to be reached, accelerated efforts are needed in order to increase vaccination coverage and uptake of both routine childhood immunisation and catch-up campaigns in adolescents and adults who have missed vaccination in the past.

### Introduction

Measles is an acute, highly contagious viral disease capable of causing epidemics. It is caused by a single-stranded ribonucleic acid (RNA) virus of the genus *Morbillivirus* and the family *Paramyxoviridae*. The virus is transmitted from person to person via respiratory droplets produced when infected people cough and sneeze. Virus-containing droplets can remain in the air for several hours, and the virus remains infectious on contaminated surfaces for up to two hours.

Measles is extremely communicable, and it is estimated that 90% of non-immune people exposed to an infective individual will contract the disease. Mathematical models estimate the basic reproductive number at 12–18, i.e. the average number of secondary infections that follow a single introduction into a susceptible population. Immunisation against measles started in the 1960s and has dramatically reduced the incidence of measles in Europe. But despite overall high immunisation coverage, measles continues to cause frequent outbreaks. Globally, measles remains a leading cause of childhood deaths and an estimated 140 000 children die each year from complications caused by the disease.

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## Methods

This report is based on data for 2023 retrieved from The European Surveillance System (TESSy) on 1 February 2024. 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] here additional information may also be found in relation to surveillance systems and historical changes to surveillance.

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 European Union/European Economic Area (EU/EEA) Member States report measles data to ECDC. The 2008, 2012, or 2018 EU case definition [4] is used by 26 countries and the majority report data from comprehensive, passive surveillance systems with national coverage. Belgium reported aggregated data since 2017, and Poland from (and including) April 2019. Up to December 2020, thirty countries (29 EU countries plus UK) reported measles data on a routine basis. The United Kingdom (UK) stopped reporting measles cases to TESSy in December 2020<sup>1</sup>.

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

Vaccination coverage estimates presented in this report were obtained from the *WHO Global Health Observatory* website, WUENIC estimates [5]. The method of calculating MCV1 and MCV2 coverage are outlined in the metadata available for each indicator online [6].

## Epidemiology

In 2023, a total of 2361 cases of measles were reported across the EU/EEA, of which 1607 (68%) were laboratory confirmed. The remaining 754 cases were reported as 'probable' (29%), 'possible' (3%) and 'unknown' (<1%).

Twenty-three countries reported measles cases in 2023 (Figure 1) while seven countries reported zero cases (Bulgaria, Cyprus, Greece, Iceland, Luxemburg, Malta, Slovenia). One country (Romania) accounted for 74% of all notified cases (n=1755).\*

The overall notification rate in 2023 was 5.2 cases per 1 000 000 population, which was significantly higher than the notification rate observed the last three years (2022:0.3, 2021:0.1 and 2020:4.3) but still lower than the rate observed in 2019 (27.2) (Table 1, Figure2).

Notification rates ranged from 0 to 92.2 cases per 1 000 000 population in EU/EEA countries. Romania reported the highest notification rate (92.2), followed by Liechtenstein (76.3, note: only 3 cases), Austria (20.7) and Belgium (5.9).

In comparison, in 2022 the EU/EEA countries reported a total of 123 cases of measles, of which 75 (61%) were laboratory confirmed, 41 were reported as 'possible' (33%) and 5 cases as 'probable' (4%) and 2 cases as 'unknown' (<2%). In 2019, 12320 cases of measles were reported in the EU/EEA (excluding the UK), of which 9685 (79%) were laboratory confirmed, 1335 as 'possible' (11%), 1285 were reported as 'probable' (10%), and 15 cases as 'unknown' (<1%).

*\*Note: As of the compilation of this report, more recent data from the Romanian Institute of Public Health reveal that Romania has notified a total of 3 419 measles cases between 1 January 2023 and 31 December 2023, accounting for 85% of the total cases reported for the year in the EU/EEA [3].*

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<sup>1</sup> The United Kingdom (UK) was a former Member State of the European Union (EU). The UK withdrew from the EU on 31 January 2020, but continued reporting measles cases to TESSy till December 2020.

**Table 1. Number of measles cases and rates per 1 000 000 population by country and year, EU/EEA and the UK, 2019–2023**

Country	2019		2020		2021		2022		2023		
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	ASR
Austria	151	17.0	25	2.8	1	0.1	1	0.1	186	20.7	NRC
Belgium	496	43.3	66	5.7	7	0.6	19	1.6	69	5.9	NRC
Bulgaria	1 235	176.4	257	37.0	0	0.0	1	0.1	0	0.0	0.0
Croatia	52	12.8	0	0.0	0	0.0	0	0.0	3	0.8	NRC
Cyprus	6	6.9	1	1.1	1	1.1	0	0.0	0	0.0	0.0
Czechia	590	55.4	4	0.4	0	0.0	0	0.0	1	0.1	NRC
Denmark	15	2.6	4	0.7	0	0.0	0	0.0	9	1.5	NRC
Estonia	27	20.4	0	0.0	0	0.0	0	0.0	4	3.0	NRC
Finland	12	2.2	5	0.9	3	0.5	1	0.2	1	0.2	NRC
France	2 636	39.2	240	3.6	16	0.2	19	0.3	118	1.7	NRC
Germany	516	6.2	76	0.9	10	0.1	15	0.2	82	1.0	NRC
Greece	45	4.2	2	0.2	0	0.0	0	0.0	0	0.0	0.0
Hungary	23	2.4	0	0.0	0	0.0	0	0.0	1	0.1	NRC
Iceland	9	25.2	0	0.0	0	0.0	0	0.0	0	0.0	0.0
Ireland	74	15.1	19	3.8	0	0.0	2	0.4	4	0.8	NRC
Italy	1 620	27.1	105	1.8	8	0.1	15	0.3	44	0.7	NRC
Latvia	3	1.6	0	0.0	0	0.0	0	0.0	1	0.5	NRC
Liechtenstein	NDR	NRC	NDR	NRC	NDR	NRC	0	0.0	3	76.3	NRC
Lithuania	834	298.5	2	0.7	0	0.0	0	0.0	3	1.1	NRC
Luxembourg	25	40.7	0	0.0	0	0.0	0	0.0	0	0.0	0.0
Malta	32	64.8	2	3.9	0	0.0	0	0.0	0	0.0	0.0
Netherlands	84	4.9	2	0.1	0	0.0	6	0.3	7	0.4	NRC
Norway	17	3.2	4	0.7	0	0.0	1	0.2	2	0.4	NRC
Poland	1 423	37.5	29	0.8	13	0.3	27	0.7	37	1.0	NRC
Portugal	10	1.0	9	0.9	0	0.0	0	0.0	1	0.1	NRC
Romania	1 706	87.9	1 004	51.9	0	0.0	10	0.5	1 755	92.2	NRC
Slovakia	319	58.5	0	0.0	0	0.0	0	0.0	6	1.1	NRC
Slovenia	48	23.1	6	2.9	0	0.0	0	0.0	0	0.0	0.0
Spain	292	6.2	93	2.0	2	0.0	1	0.0	13	0.3	NRC
Sweden	20	2.0	5	0.5	0	0.0	5	0.5	11	1.1	NRC
<b>EU/EEA (30 countries)</b>	<b>12 320</b>	<b>27.2</b>	<b>1 960</b>	<b>4.3</b>	<b>61</b>	<b>0.1</b>	<b>123</b>	<b>0.3</b>	<b>2 361</b>	<b>5.2</b>	<b>NRC</b>
United Kingdom	882	13.2	84	1.3	NA	NA	NA	NA	NA	NA	NA
<b>EU/EEA (31 countries)</b>	<b>13 202</b>	<b>25.4</b>	<b>2 044</b>	<b>3.9</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>

Source: Country reports.

ASR: Age-standardised rate.

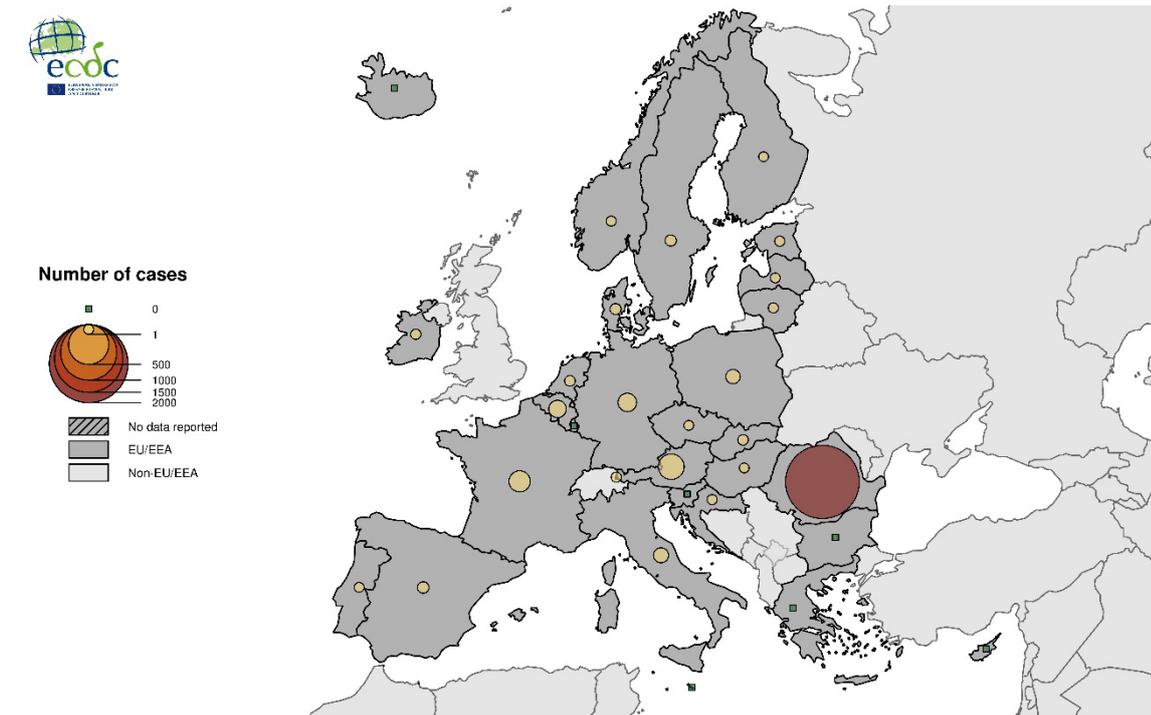
NDR: No data reported.

NRC: No rate calculated.

NA: Not applicable.

No data from 2021 onwards were reported by the United Kingdom, due to its withdrawal from the EU on 31 January 2020.

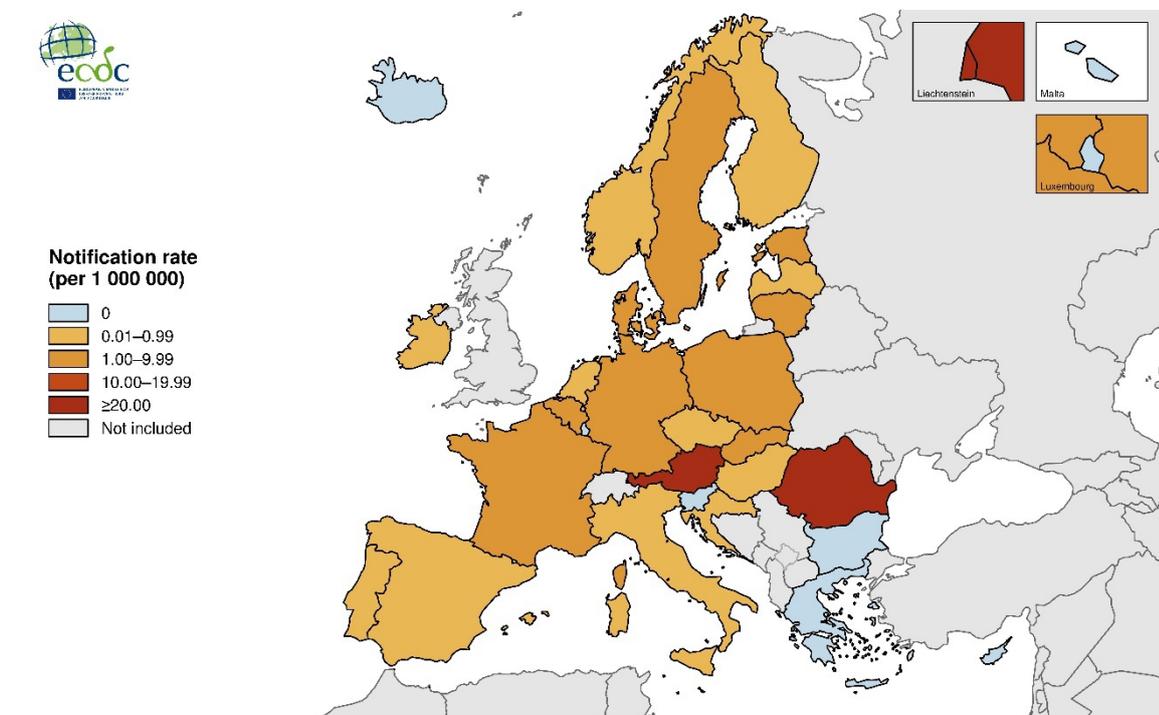
**Figure 1. Number of measles cases by country, EU/EEA, 2023**



Administration boundaries: © Eurographics  
 The boundaries and names shown on this map do not imply official endorsement or acceptance by the European Union. ECDC. Map produced on 1 February 2024.

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

**Figure 2. Number of measles cases per 1 000 000 population by country, EU/EEA, 2023**

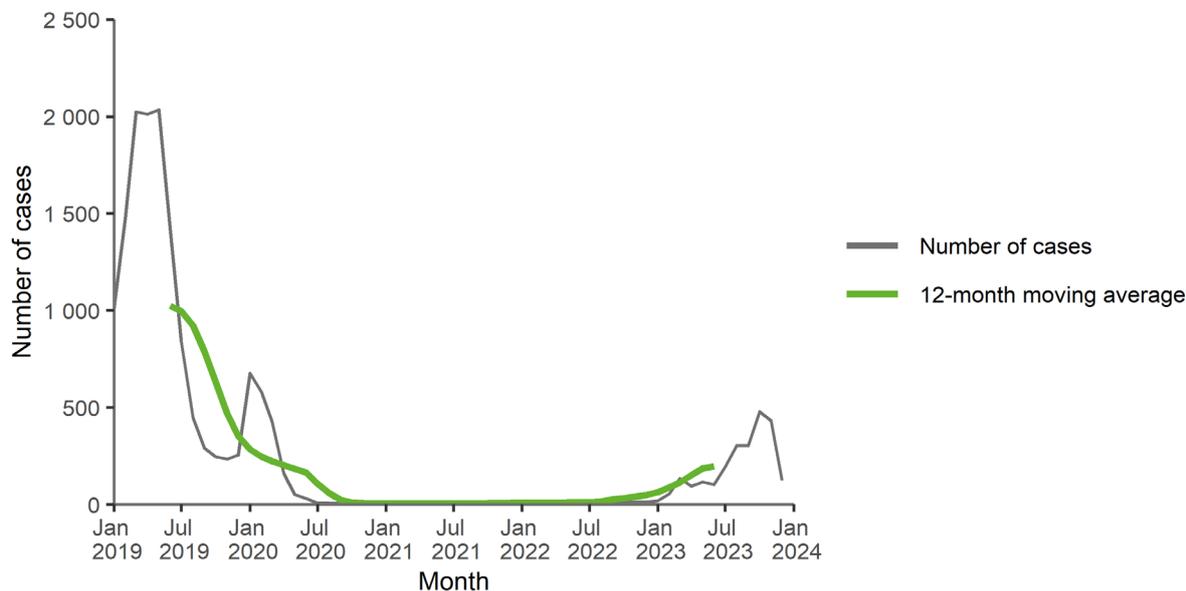


Administration boundaries: © Eurographics  
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### Seasonality and trend

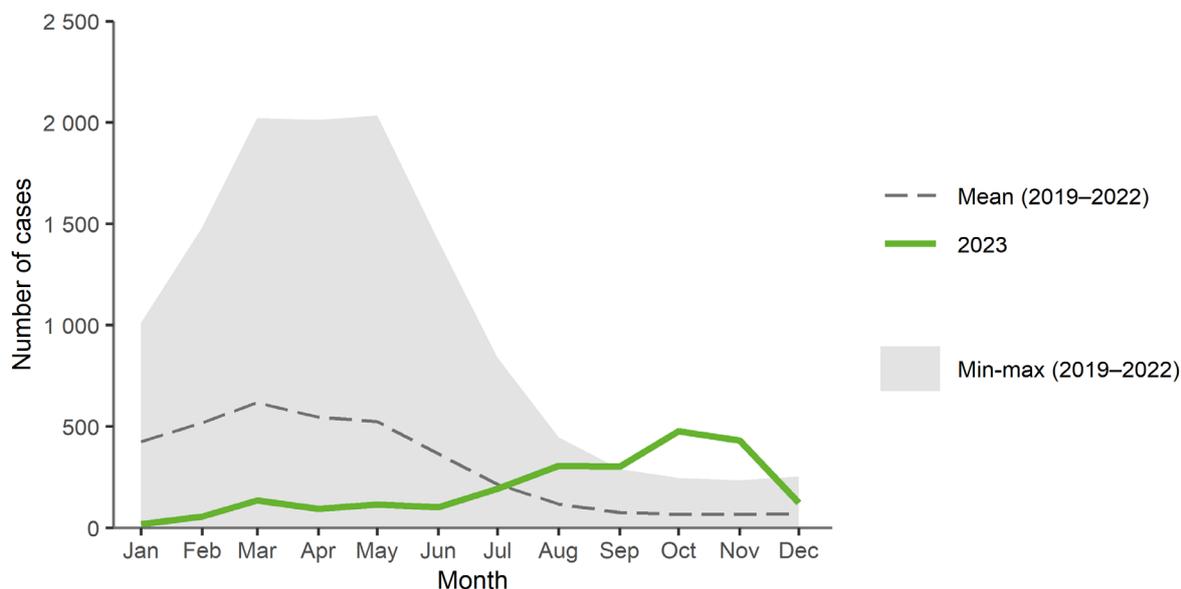
In 2023, the number of cases reported was low during the first half of the year, with an increase observed from July to November. This distribution is slightly different from the seasonal patterns we usually see for measles in temperate climates, where the disease occurs more frequently in late winter and spring (Figures 3 and 4).

**Figure 3. Number of measles cases by month, EU/EEA, 2019–2023**



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

**Figure 4. Number of measles cases by month, EU/EEA, 2023 and 2019–2022**



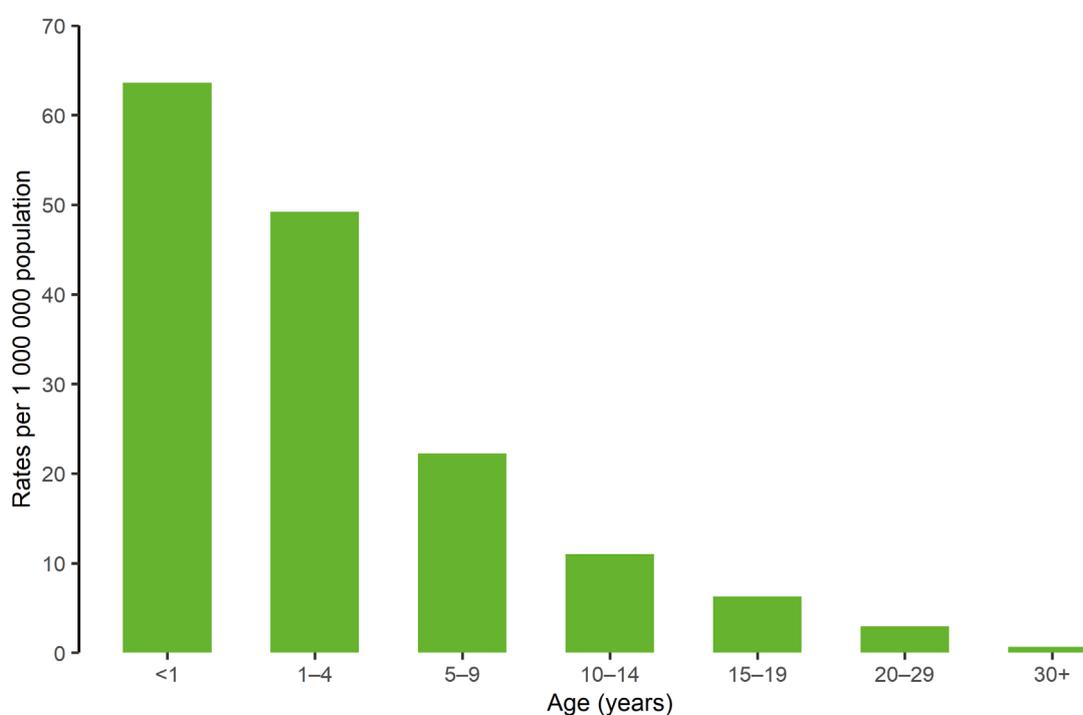
Source: Country reports from Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden.

## Age and gender

In 2023, infants aged <1 year were the most affected age group (notification rate of 63.6 cases per 1 000 000 population), followed by children aged 1–4 and 5–9 years (notification rate 49.2 and 22.2 respectively) (Figure 5). Overall, measles was slightly more common among males (5.3 cases per 1 000 000 population) than females (5.1 cases per 1 000 000 population) but not significantly. The highest age-specific rates per 1 000 000 population were reported by Romania in infants aged <1 year (1323.5), children aged 1–4 and 5–9 years (915.8 and 369.3 respectively), teenagers aged 10–14 and 15–19 years (146.3 and 102 respectively); by Austria in infants aged <1 year (106.4) and children aged 5–9 and 10–14 years (112.6 and 63.6 respectively), and by Belgium in infants aged <1 year (67.5).

For the 2361 cases the distribution of case numbers by age group were: 11% aged <1 year, 36% aged 1–4 years, 21% aged 5–9 years, 11% aged 10–14 years, 6% aged 15–19 years, 6% aged 20–29 years and 9% aged 30+ years. Overall, 21% of cases were aged above 14 years. The median age of cases across all EU/EEA countries that submitted case-based data in 2023 was 5 years of age (interquartile range, IQR:2-12); in comparison, during the period 2019–22, the median age ranged between 5 and 19 years of age. This overall trend is largely driven by the situation in Romania, and a few other countries follow the same trend. However, other EU/EEA countries have reported the highest proportion of cases in other age groups, such as children aged 10–14 years (e.g. France), or adults aged 30 years and older (e.g. Germany, Italy, and the Netherlands). This highlights that measles affects all age groups.

**Figure 5. Number of measles rates per 1 000 000 population, by age, EU/EEA, 2023**



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, and Sweden.

## Vaccination status

Data on vaccination status were available for 2068 cases (88%) reported in 2023. Of these cases, 1786 (86%) were unvaccinated, 155 (8%) were vaccinated with one dose of measles containing vaccine, 117 (6%) were vaccinated with two or more doses, and ten cases (0.5%) were vaccinated with an unknown number of doses (Figure 6). The proportion of reported unvaccinated cases for 2023 was the highest, observed in the last five years. Among cases with known vaccination status, the highest proportion of unvaccinated cases by age group was among those aged <1 year (100%), a group not routinely targeted with measles-mumps-rubella (MMR) vaccination in most countries, followed by those aged 1–4 years (91%), 5–9 years (86%) and 20–29 years (83%). Vaccination status was more likely to be unknown with increasing age, accounting for 36% and 25% of cases aged 30+ years and 20–29 years, respectively. For the years 2019–2023, the overall distribution of cases by age group

and vaccination status, followed the same pattern, with the unvaccinated population of 0–9 years and >20 years of age, attributing for approximately 86% of the total cases (Figure 7).

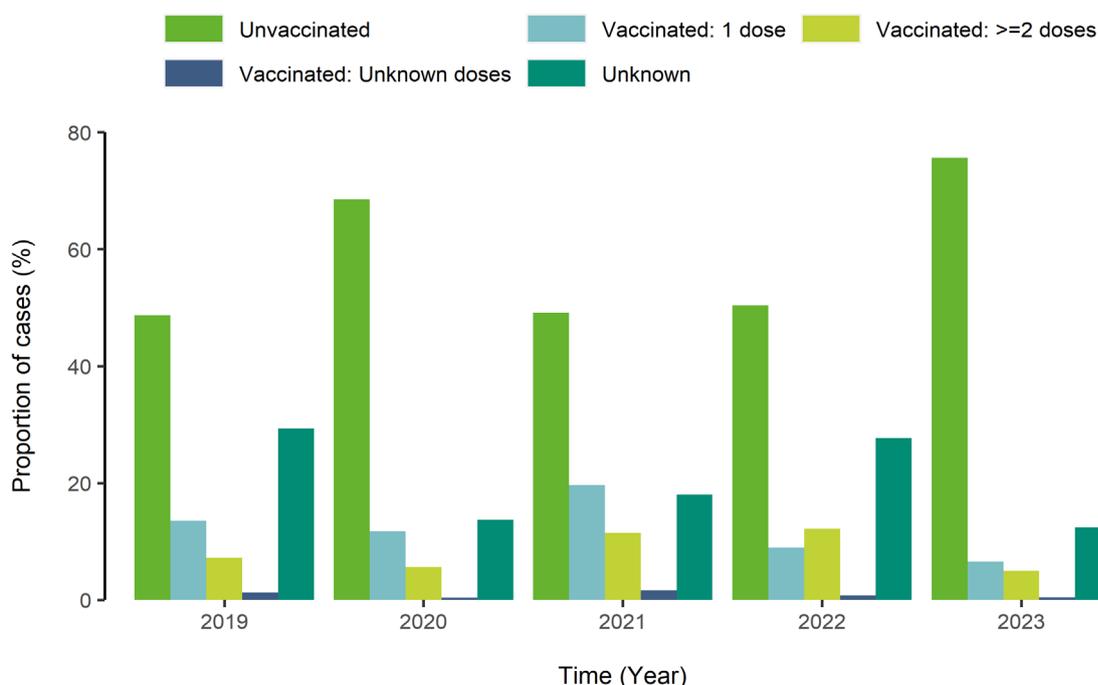
The proportion of children aged 1–4 years who were unvaccinated in 2023 (88%) was slightly higher to that observed in the period 2019–2022, when 80% of children of this age group were unvaccinated and 98% of children aged <1 year were unvaccinated.

In 2023, 15% of reported measles cases were among adults (>20 years) with 53% of them being unvaccinated. This group was less represented compared to the period 2019–2022, when adult cases consisted of 42% of total reported measles cases (42% being unvaccinated).

## Vaccination coverage

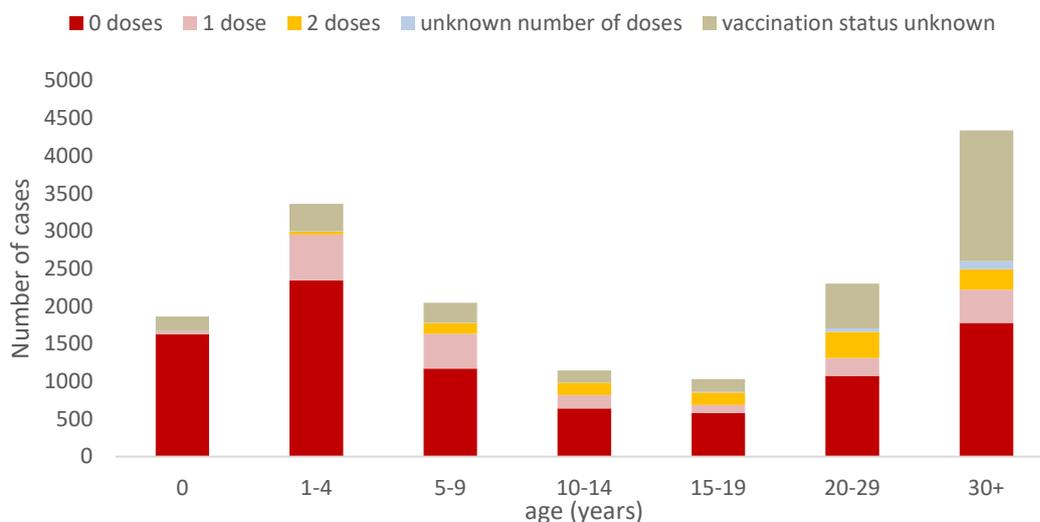
Data on vaccination coverage for the first and second dose of measles-containing vaccine were available up to 2022. In 2022, the overall population weighted vaccination coverage for the EU/EEA countries was 92% for the first dose and 90% for the second dose (Table 2). Seventeen countries reported a decrease in the vaccination coverage for the first dose of measles (range -1 to -24%) compared to the coverage reported in 2019 and 15 countries for the second dose (range -1 to -24%). Moreover, three countries reported an increase in vaccination coverage for dose one (range 1-5%) and six countries for dose two (1-9%). Fourteen countries (50%) reported a coverage  $\geq 95\%$  for dose one and only five countries (17%) (Hungary, Malta, Poland, Portugal, and Slovakia) had a coverage of  $\geq 95\%$  for the second dose (Figure 8, Figure 9). Only four countries had an estimated coverage of  $\geq 95\%$  for both MCV1 and MCV2 in 2022 (Hungary, Malta, Portugal, and Slovakia).

**Figure 6. Proportion of measles cases by vaccination status, EU/EEA, 2019–2023**



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, and Sweden.

**Figure 7. Number of measles cases by age group and vaccination status, EU/EEA, 2019–2023 (n=16 087)**



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

## Outcome

The outcome of disease was available for 2 228 (98%) cases reported in 2023. No deaths attributable to measles were reported in 2023, nor the previous two years (2021–2022). In 2020 and 2019, two and nine deaths were reported, respectively.

## Hospitalisation and complications

Hospitalisation status was available for 2217 (94%) cases, of which 1766 (80%) were hospitalised in 2023. Among the hospitalised cases, 1506 (85%) cases were unvaccinated. 107 (6%) cases had received one dose of measles containing vaccine, 50 (3%) cases had received two or more doses, and 102 cases had unknown vaccination status. Most hospitalised cases (92%) were reported by Romania. The median age of hospitalised cases reported was four years (IQR: 1–10 years).

Among all reported cases in 2023, data on complications were reported for 726 (31%) cases, 140 of which (2%) had no complications. Reported complications included 561 cases of pneumonia, 12 diarrhoea, four cases of otitis media and one acute encephalitis. Unspecified complications ('other') were reported for eight cases. Of these 586 cases reported with complications, 518 (88%) cases were unvaccinated. The median age of the cases presented with complications was four years (IQR: 1–10 years).

## Importations

In 2023, importation status was available for 2249 (95%) cases. Of these cases, 128 (5%) were classified as imported in 2023 and 22 as import-related (1%) meaning the source of infection (exposure) was outside the reporting country. Twenty countries reported imported measles cases for 2023, the majority of which were reported by three countries (Germany, France, Italy) accounting for 61% of all imported cases. The median age of these cases was 11.5 years (range 0–52 years).

Among the 128 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: 21%, non-EU/EEA: 40%), followed by Asia (23%), Africa (9%) and unknown origin of infection for 7% of the cases. Of the 35 different countries listed as the likely origin of infection of imported cases, five countries accounted for 48% of these infections: Turkey (18), Russia (17), Romania (12), India (8), and Indonesia (7).

The proportion of imported measles cases for 2023 appeared to be lower than the 2022 and 2021; 22 (18%) cases and 9 (15%) cases respectively, but similar compared to the previous years; 62 (3%) cases in 2020, 644 (5%) cases in 2019.

**Table 2. Vaccination coverage for first dose of a measles- and rubella-containing vaccine and second dose of a measles-containing vaccine, EU/EEA, 2019–2022**

Country	2019		2020		2021		2022		Percentage of change* (2019-2022)	
	Dose 1	Dose 2	Dose 1	Dose 2						
Austria	95.0	86.0	95.0	88.0	99.0	97.0	95.0	94.0	0%	9%
Belgium	96.0	82.0	96.0	83.0	96.0	83.0	96.0	83.0	0%	1%
Bulgaria	95.0	95.0	88.0	84.0	89.0	86.0	91.0	87.0	-4%	-8%
Croatia	93.0	95.0	91.0	91.0	89.0	90.0	90.0	90.0	-3%	-5%
Cyprus	86.0	88.0	86.0	88.0	86.0	88.0	86.0	88.0	0%	0%
Czechia	92.0	87.0	94.0	90.0	97.0	90.0	97.0	90.0	5%	3%
Denmark	96.0	90.0	94.0	90.0	95.0	94.0	95.0	94.0	-1%	4%
Estonia	88.0	90.0	91.0	87.0	89.0	84.0	82.0	68.0	-7%	-24%
Finland	96.0	93.0	95.0	93.0	93.0	93.0	94.0	92.0	-2%	-1%
France	92.0	86.0	94.0	90.0	94.0	90.0	94.0	90.0	2%	5%
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	94.0	93.0	93.0	92.0	10.0	91.0	80.0	-2%	-15%
Ireland	91.0	NDR	92.0	NDR	90.0	NDR	90.0	NDR	-1%	-
Italy	94.0	88.0	92.0	86.0	94.0	86.0	94.0	85.0	0%	-3%
Latvia	99.0	96.0	99.0	94.0	97.0	85.0	96.0	86.0	-3%	-10%
Liechtenstein	NDR	-	-							
Lithuania	93.0	93.0	90.0	91.0	88.0	88.0	87.0	87.0	-6%	-6%
Luxembourg	99.0	90.0	99.0	90.0	99.0	90.0	99.0	90.0	0%	0%
Malta	96.0	95.0	95.0	99.0	90.0	93.0	96.0	95.0	0%	0%
Netherlands	94.0	90.0	94.0	89.0	93.0	90.0	89.0	85.0	-5%	-6%
Norway	97.0	95.0	97.0	95.0	97.0	95.0	96.0	94.0	-1%	-1%
Poland	93.0	92.0	80.0	95.0	71.0	95.0	71.0	95.0	-24%	3%
Portugal	99.0	96.0	99.0	95.0	98.0	95.0	98.0	96.0	-1%	0%
Romania	90.0	76.0	87.0	75.0	86.0	75.0	83.0	71.0	-8%	-7%
Slovakia	96.0	98.0	96.0	98.0	95.0	96.0	95.0	96.0	-1%	-2%
Slovenia	94.0	94.0	94.0	91.0	95.0	91.0	96.0	92.0	2%	-2%
Spain	98.0	94.0	96.0	94.0	95.0	91.0	96.0	92.0	-2%	-2%
Sweden	97.0	93.0	97.0	92.0	97.0	91.0	92.0	91.0	-5%	-2%
<b>EU/EEA** (30 countries)</b>	<b>94.9</b>	<b>89.9</b>	<b>93.4</b>	<b>90.3</b>	<b>92.7</b>	<b>90.1</b>	<b>92.4</b>	<b>89.7</b>		
United Kingdom	91.0	87.0	NA	NA	NA	NA	NA	NA		
<b>EU/EEA (31 countries)</b>	<b>94.4</b>	<b>89.6</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>		

No data from 2021 onwards were reported by the United Kingdom, due to its withdrawal from the EU on 31 January 2020.

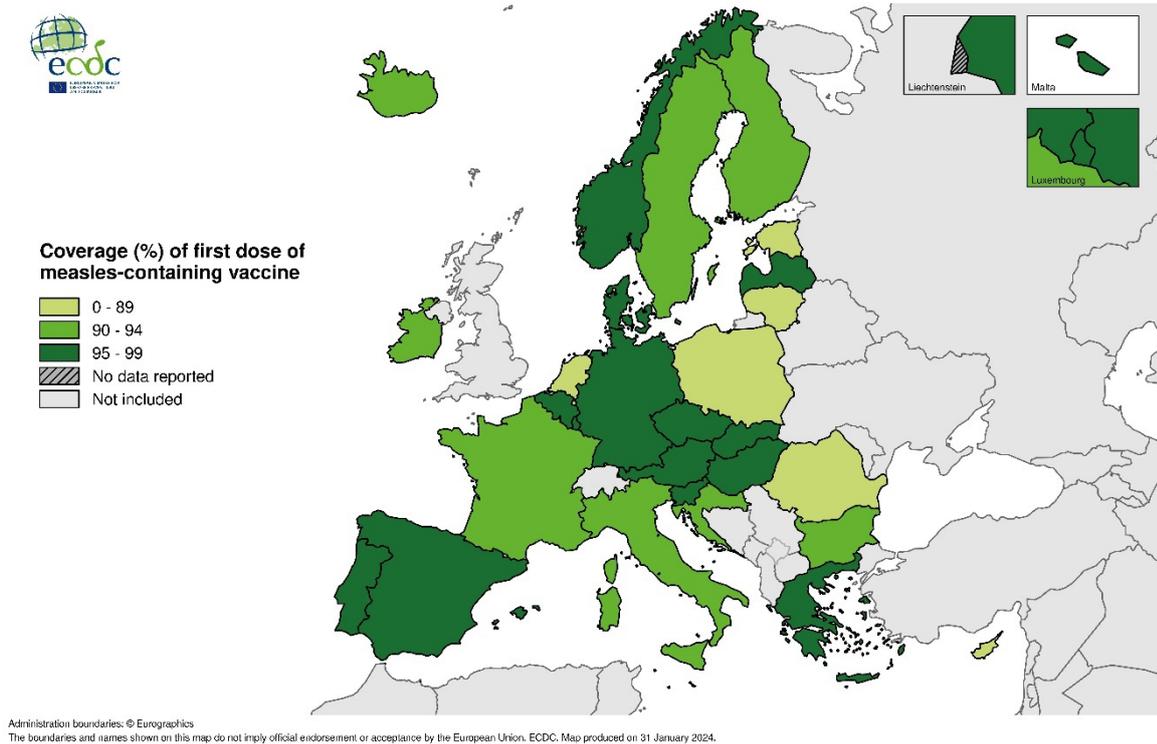
Source: WHO Immunisation data portal, WUENIC estimates. from Austria, Belgium, Bulgaria, Croatia, Cyprus, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden.

NDR: no data reported; NA: Not applicable.

\* Trend was calculated for each dose as the percentage of change between 2021 and 2018, i.e. [(coverage in 2021 – coverage in 2018)/coverage in 2018].

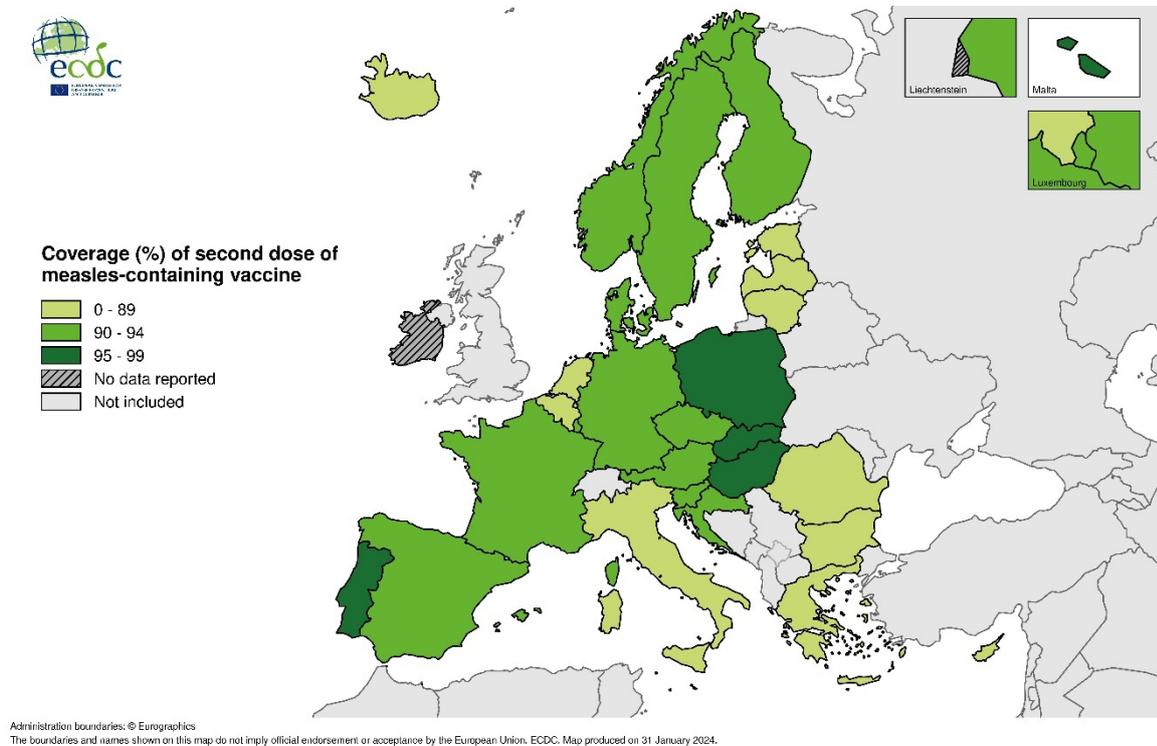
\*\*EU/EEA: population weighted average vaccination coverage rate.

**Figure 8. Vaccination coverage for first dose of a measles-containing vaccine, EU/EEA, 2022**



Source: WHO Immunisation data portal, WUENIC estimates. 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, Sweden.

**Figure 9. Vaccination coverage for second dose of a measles-containing vaccine, EU/EEA, 2022**



Source: WHO Immunisation data portal, WUENIC estimates. 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, Sweden.

## Discussion

The epidemiological data for measles in the EU/EEA during 2023 indicates a notable increase in transmission compared to the previous year. The overall notification rate surged to 5.3 cases per 1 000 000 population, a significant rise from the 2022 rate of 0.3 per 1 000 000 population. Romania reported the highest notification rate in the region (92.2 per 1 000 000 population). This represents a substantial escalation compared to the 2022 rate of 0.5%, highlighting a significant increase in measles activity within the country. Despite the overall increase, it is noteworthy that seven member states reported zero measles activity during 2023. This contrasts with historical epidemiological patterns, where most countries typically reported at least one case per year. The overall rate, although elevated in 2023, remains considerably lower than pre-pandemic levels recorded in 2019, which stood at 27.2 cases per 1 000 000 population.

The overall epidemiological profile of measles cases confirms what was observed in previous years. Measles still affects all age groups, but the infants below one year of age, remain the group with the highest incidence (63.6 per 1 000 000 population). These infants are generally too young to be eligible for or protected by direct vaccination and should therefore be protected by herd immunity. A total of 91% of the reported cases between one and four years of age were unvaccinated in 2023. This is the age group in which most EU/EEA countries administer the first dose through their national vaccination programmes, and several countries also administer the second dose between one and four years of age. Reported data for 2023, similar to that reported in previous years, indicate that even though current programmes in the EU/EEA specifically target children in this age group, a number of children are not reached.

In 2023, in the EU/EEA there was an overall decrease in the reported number of measles cases among adults (15%) compared to previous years (2019–2022: 42%). However, this picture is largely skewed by the age distribution of the cases in Romania, which is mostly affecting younger children [8]. For the rest of the EU/EEA member states, 35% of cases are among the adult population, with 67% of them being unvaccinated. This observation serves as a crucial reminder that measles is not exclusively a childhood disease and that can affect all age groups. Adults are still susceptible to measles, emphasizing the importance of vaccination throughout the lifespan.

Moreover, the data for the current year reveals a substantial increase in hospitalisations related to measles, with 80% of cases requiring hospitalisation compared to 33% in 2022 and 55% in 2019. About 85% of the hospitalized cases, were among individuals who were unvaccinated. In addition to the increased hospitalisations, the data indicates that complications arising from measles were prevalent, with 88% of cases experiencing complications being unvaccinated. These findings underscore the critical role of vaccination and emphasize the urgency of promoting and maintaining high vaccination coverage to mitigate the impact of outbreaks, reduce hospitalisations, and prevent complications [9].

While most measles cases in 2023 appear to have been acquired through community or local transmission within the reported country, there is evidence of international spread. Approximately 5% of the total measles cases reported in 2023 were imported from another country. Notably, one-fourth of these imported cases contracted the infection from another EU/EEA country. Efforts to address measles outbreaks should not only focus on domestic strategies but also include collaborative measures at the regional and international levels. Checking and updating vaccination against measles should be a routine practice during travel medicine consultations and general health checks prior to travelling, including those travelling within the EU/EEA [10]. Key measures to mitigate the importation and spread of measles across borders include maintaining a high vaccination coverage globally, enhancing surveillance and reporting systems and coordinating public health responses across countries. Strengthening exchange of information on cross-border cases via established EU and international channels is important to avoid re-establishment of measles in receiving countries.

The latest WHO estimates of national immunisation coverage show that the overall vaccine coverage estimates, remained relatively consistent over the last four years in the EU/EEA region; however, country variation was observed, with seven countries reporting an increase in the second dose of measles vaccine in 2022 as compared to 2019, and 14 countries reporting a decrease. In 2022, only four EU/EEA countries (Hungary, Malta, Portugal, and Slovakia) reported meeting the 95% vaccination coverage threshold for both doses. This marks a decrease from the seven countries (Bulgaria, Hungary, Latvia, Malta, Norway, Portugal, and Slovakia) that achieved this benchmark in 2019 (Table 2). The impact of the COVID-19 pandemic on routine immunisation services is a crucial factor to consider in understanding this shift. During the COVID-19 pandemic, the vulnerability of national immunisation programmes was revealed with a sharp decline in immunisation coverage during the first quarter of 2020 observed globally [11,12]. However, aside from this, within the EU/EEA the immunisation programs generally appeared to be more resilient. The dedication and efforts of staff rolling out these programs in the EU/EEA countries should be commended.

However, it is critical to note that even before the pandemic very few countries had achieved at least 95% vaccination coverage of the first dose of measles-containing vaccine, and even fewer had achieved at least 95% coverage for the second dose. The number of countries meeting these coverage targets declined further during the

pandemic. The observed vaccine coverage estimates highlight that in most countries routine childhood immunisation against measles is below the level recommended to achieve and sustain elimination [13]. The recently developed [European Immunization Agenda \(EIA2030\)](#) stressed the importance of building more resilient immunisation systems and structures, based on the key pillars of immunisation equity, life course immunisation and tailored local solutions that address vaccination demand and acceptance in the population [12].

The Regional Verification Committee for Measles and Rubella elimination (RVC) recognises that the COVID-19 pandemic has taken considerable number of resources from immunisation programme staff over the past three years and has affected measles and rubella activities towards the elimination goal. During the 11th RCV meeting, it was concluded that 20 EU/EEA Member States provided evidence to demonstrate the elimination of endemic measles, whereas five countries were considered endemic, three countries were considered to have re-established measles transmission and for one country, the status is still pending. The RVC commended that continuous efforts are needed in order to collect higher quality data and have a deeper understanding of measles epidemiology. Moreover, it was concluded that insights gained from successful approaches in vaccinating entire populations against COVID-19 should be applied to enhance routine immunisation initiatives across the region, to address missed and postponed routine immunisations and close all immunity gaps developed during the pandemic and existing from years before it [14]. At the Meeting of the Strategic Advisory Group of Experts (SAGE) on Immunisation in March 2023, it was noted that one of the highest priorities for 2023–2025 was strengthening of routine immunisation programs (including catch-up programs) for measles and other outbreak prone diseases [15].

During 2017–2019, France (2018), Germany (2019), and Italy (2017) implemented mandatory vaccination policies, mostly through school-based mechanisms. Preliminary results are showing an increase of vaccination coverage in the groups targeted by these policies, but 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 [16].

ECDC published a Threat Assessment Brief in the beginning of 2024, assessing the measles situation in the EU/EEA and altering on the expected rise of measles cases, and suggesting options for public health response for the member states. The main areas of focus identified were: closure of immunity gaps by achieving and maintaining a high vaccination coverage for MCV (>95% with the second dose), strive towards high quality surveillance, and adequate public health capacity, especially for early detection, diagnosis, response and control of outbreaks at local, regional, and national level; increasing clinical awareness of health professionals for the prompt diagnosis of measles and identify drivers of sub-optimal vaccine uptake to ensure tailored interventions for increasing vaccine uptake [10].

## Public health implications

In 2023, there was a notably increased measles activity in the EU/EEA region, after three years of unusually low numbers of cases reported, coinciding with the COVID-19 pandemic. Measles cases are expected to continue increasing in the EU/EEA in the coming months. Compared with pre-pandemic levels, some countries saw a decline in MCV coverage estimates, some maintained similar coverage, and others reported small improvements. However overall, most EU/EEA countries have not reached or sustained high vaccination coverage of  $\geq 95\%$  with two doses of measles-containing vaccine. Continuous enhanced epidemiological surveillance and timely investigation of measles outbreaks are the cornerstones for measles to be controlled and eliminated. Emphasis should be given to achieving and maintaining a high vaccination coverage, including identifying and closing immunisation gaps with catch up campaigns for those who missed the vaccination opportunities due to the pandemic as well as include hard-to-reach populations (refugees, immigrants, asylum seekers and Roma population). Accelerated efforts to improve immunisation campaigns and increase vaccine acceptance are necessary in order to achieve and sustain high vaccination coverage of  $\geq 95\%$  with two doses of measles-containing vaccine and achieve regional measles elimination targets [12,17].

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