

This issue of WHO EpiBrief provides an overview of selected epidemiological characteristics of measles and rubella in the WHO European Region based on monthly surveillance data. It also includes short reports on events of these diseases in selected countries: Italy and Romania. A short report on pertussis in Denmark in 2016 is also included. These short reports are based on additional information supplied by these countries.

The surveillance data presented in this issue were reported by Member States and are incorporated in the centralized information system for infectious diseases.¹ Tabulated surveillance data by country for 2016 (as of 31 March 2017) are annexed to this issue. Preliminary data for the first two months of 2017 (as of 3 April 2017) are also presented. Tabulated surveillance data by country for these two months are published separately in WHO EpiData no. 3/2017.*

The analyses of these data are performed on cases with disease onset dates during 2016 and during the first two months of 2017, respectively. Where these dates were unavailable, cases with the date of notification reported during this period were included. The numbers of cases in a specified time period may differ from reports produced by national or partner agencies if different dates are used. Percentages in this report were rounded to the nearest whole number.

Measles in the WHO European Region in 2016 *Incidence – notifications and laboratory data*

For 2016, 5133 measles cases were reported in 33 countries of the WHO European Region among 50 (94%) countries that submitted measles data (including zero reporting) (Table 1 in annex). Three countries, namely Monaco, San Marino and Turkmenistan, did not submit reports. Measles-related deaths in infants, adolescents and adults were reported in two countries: 15 in Romania and one in the United Kingdom.

Of the total, 82% of cases (n=4194) were reported by four countries: Romania (n=2432; 47%), Italy (864; 17%), United Kingdom (571; 11%) and Germany (327; 6%). The highest incidence per million population for 2016 was in Romania (126) followed by Italy (14).

Of the total, 3403 (66%) cases were laboratory confirmed and 1284 (25%) were epidemiologically linked cases. The remaining 446 (9%) were classified as clinically compatible cases. During 2016, 1022 measles virus sequences were reported to the Measles Nucleotide Surveillance database (MeaNS)² by reference laboratories of the WHO European Region (as of 6 April 2017). The genotypes identified in the Region comprised D8 (n=669), B3 (323), H1 (28) and D4 (2).

The predominant measles virus genotypes reported for 2016 included several lineages of D8. These variants were reported by 22 countries, of which 10 countries reported the dominant named strain Cambridge.GBR/5.16. Other D8 named strains (Frankfurt-Main, Hulu Langat, Victoria, Villipuram) as well as other D8 variants were less frequently reported. Variants of measles virus genotype B3 were reported by 13 countries; named strains Niger.NGA/8.13, Dublin.IRL/8.16 and Como.ITA/32.15 accounted for more than 75% of B3 sequences. Genotype H1, which is usually found in Asia, was reported by six countries in the Region.

Age distribution

The age group was known in all but 32 cases (n=5101), of which 12% (605) were under one year of age, 31% (1579) were 1-4 years, 14% (728) were 5-9 years of age, 16% (831) were 10-19 years of age and 27% (n=1358) were 20 years and older (Fig. 1). Fig. 2 shows the age distribution of reported measles cases in the top four countries reporting most cases: Romania, Italy, United Kingdom and Germany by proportion and age-specific incidence.

Vaccination status

Vaccination status was known in 4646 cases (91%). Of these 4631 cases also had information on age and included 4025 cases that were unvaccinated (87%): 578 cases (14%) were <1 year old, 1308 cases (32%) were 1-4 years, 574 cases (14%) were 5-9 years, 640 cases (16%) were 10-19 years old and 925 cases (23%) were ≥20 years old. Of the 4646 cases with a known vaccination status, 606 cases (13%) were reportedly vaccinated with at least one measles-containing vaccine dose.

*WHO EpiData no. 3/2017 is available separately at www.euro.who.int/__data/assets/pdf_file/0010/336583/EpiData-No03-2017.pdf?ua=1

Hospitalization

Data on hospitalization status was available for 73% (n=3760) of all reported measles cases. Of these, 3003 were hospitalized, amounting to 80% of all cases with known hospitalization status. Of all the hospitalized cases, most were reported from Romania (n=2348; 78%) and the United Kingdom (179; 6%).

Imported cases

Importation status was known for 74% (n=3814) of cases. Of these, 284 were reported as imported cases, amounting to 7.4% of cases with a known importation status. Of all the imported cases, most (87%; n=247) were reported by Germany (56), Poland (45), United Kingdom (n=40), Italy (38), France (16), Austria (14), Belarus (14), Switzerland (13) and Spain (11).

Measles in the WHO European Region January-February 2017

Incidence – notifications and laboratory data

By 3 April 2017, 1443 measles cases were reported in 18 countries of the WHO European Region among 48 (91%) countries that submitted measles data (including zero reporting) for the first two months of 2017. Five countries, namely Monaco, Russian Federation, San Marino, Turkey and Turkmenistan, did not submit reports. During this period one measles-related death was reported in Romania.

Of the total, 83% of cases (n=1191) were reported by four countries: Italy (n=684; 57%), Romania (317; 27%),

Tajikistan (111; 9%) and France (79; 7%). The highest incidence per million population for the period was reported in Romania (16.4) followed by Italy (11.4) and Tajikistan (11.1).

Rubella in the WHO European Region in 2016

Incidence – notifications and laboratory data

For 2016, 1326 rubella cases were reported in 16 countries of the WHO European Region among 42 (79%) countries submitting rubella data (including zero reporting) (Table 2 in annex). Most cases were reported by Poland (n=1144; 86%), followed by Germany (96; 7%), Italy (29; 2%), Romania (13; 1%) and Georgia (12; 1%). Poland also had the highest incidence per million population (29.6).

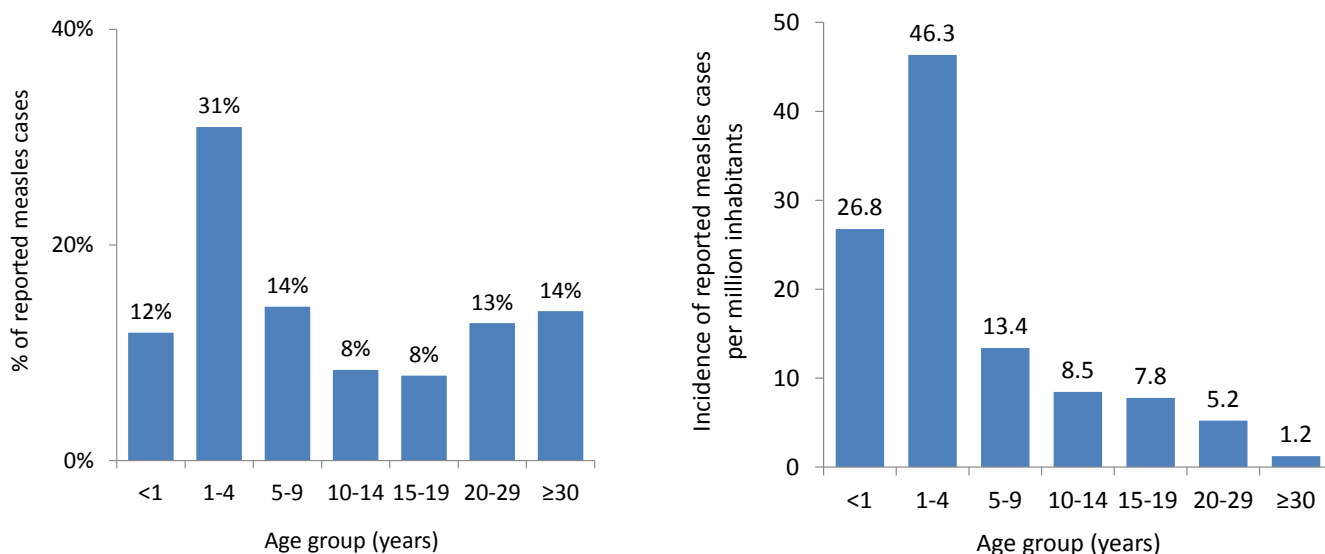
Of the total, 53 (4%) cases were laboratory confirmed, most of which were reported by Germany (22 cases), Romania (12 cases) and Italy (5 cases). All cases reported by Poland were clinically compatible cases.

During 2016, 11 rubella virus sequences were entered in the Rubella Nucleotide Surveillance database (RubeNS).³ The identified genotypes comprised 2B (n=8), 1G (1), 1H (1) and 1E (1).

Age distribution

The age group was known in all cases: 631 cases (48%) were <5 years old, 52 cases (4%) were 15–19 years old and 236 cases (18%) were ≥20 years old (Fig. 3, page 4).

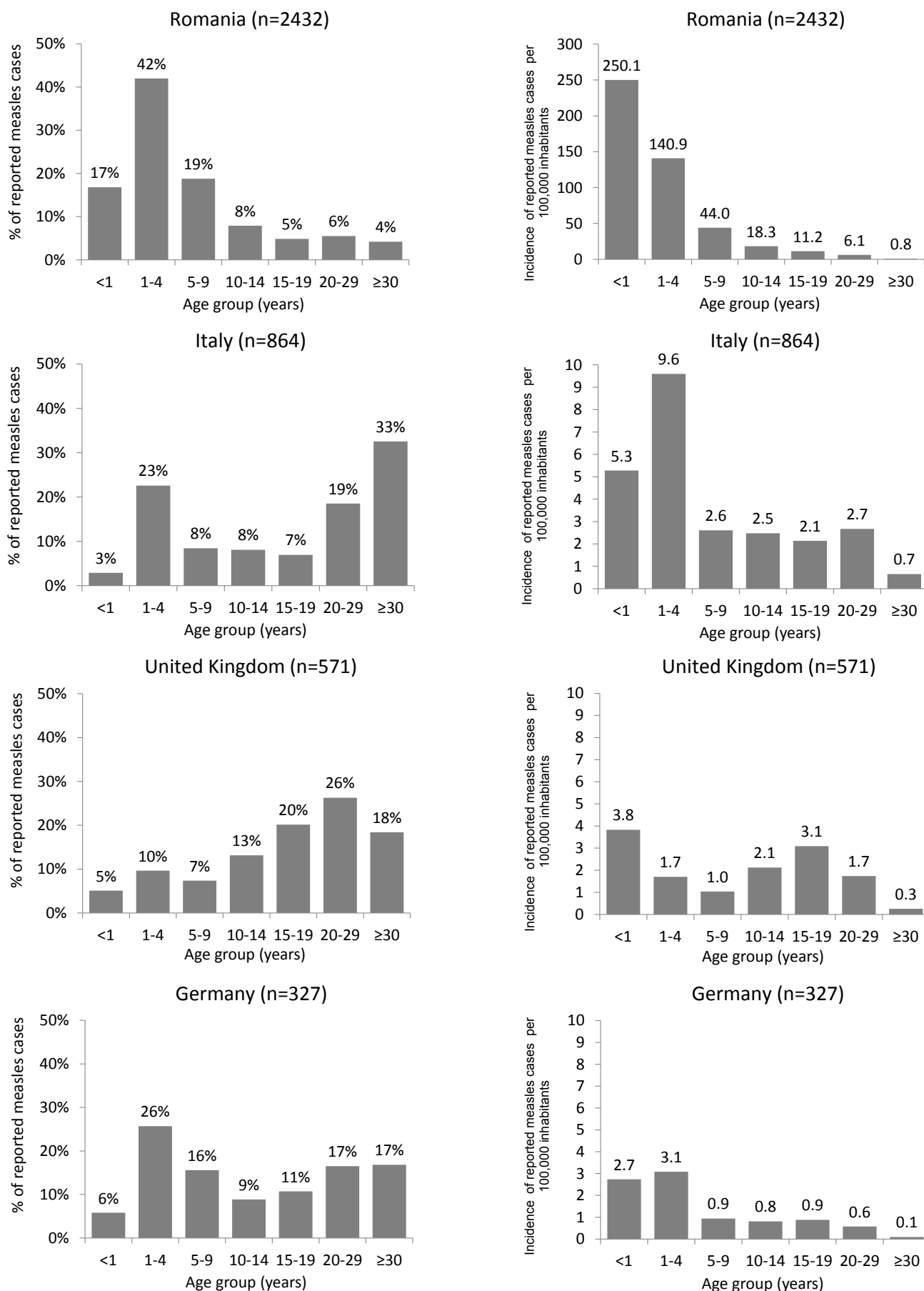
Fig. 1. Age distribution of measles cases by proportion (left) and incidence per 1 000 000 inhabitants (right) in the WHO European Region, 2016 (n=5101)*



N.B. Discarded cases are not included.

*For 32 cases the age group was not reported. These cases are therefore not included in the graphs.

Fig. 2. Age distribution of measles cases by proportion (left) and incidence per 100 000 inhabitants (right) in the four countries that together reported 82% of cases with data on age in the WHO European Region, 2016 (n=4194)



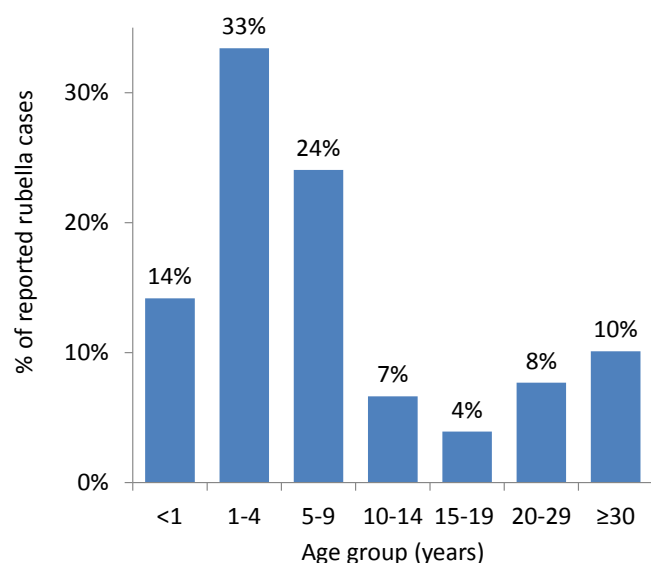
Vaccination status

Vaccination status was known in 86% of cases (n=1136). Of the 485 (43%) unvaccinated cases, 176 cases (36%) were <1 year old, 125 cases (26%) were 1–4 years old, 38 cases (8%) were 5–9 years old, 16 cases (3%) were 10–14 years old and 130 cases (27%) were ≥15 years old. The remaining 651 cases (57%) were reportedly vaccinated with at least one rubella-containing vaccine dose. Of these, 613 cases were reported by Poland.

Imported cases

Importation status was known in 9% (n=113) of rubella cases. Of these, six were reported as imported cases, amounting to 5.3% of cases with a known importation status. The imported cases were reported from the United Kingdom (n=1), Spain (1), Croatia (2) and Germany (2).

Fig. 3. Age distribution of rubella cases in the WHO European Region, 2016 (n=1366)



N.B. Discarded cases are not included.

Rubella in the WHO European Region January-February 2017

Incidence – notifications and laboratory data

By 3 April 2017, 68 rubella cases were reported in six countries of the WHO European Region among 43 (81%) countries submitting rubella data (including zero reporting). Most cases were reported by Poland (n=55; 81%), which also had the highest incidence per million population (1.4). All cases reported by Poland were clinically compatible cases. Laboratory

confirmed cases of rubella were reported by Italy (2 cases), Georgia (1 case), Germany (1 case), Romania (1 case) and Tajikistan (1 case).

Measles and rubella in Italy, 2016

Measles

In 2016, Italy reported 866 cases of measles (data as of 3 April 2017). This represented an increase of almost two-and-a-half times compared to 2015, when 259 cases were reported. Cases in 2016 were reported in 18 of the 21 regions of the country, however, most (79.1%) were reported in six regions: Campania (19.4%; n=168), Lombardy (18.9%; 164), Calabria (14.1%; 122), Lazio (10.0%; 87), Emilia-Romagna (9.2%; 80) and Sicily (7.1%; 64). Calabria had the highest incidence at the first administrative sub-national level (6.2 per 100 000 inhabitants).

One outbreak with a globally new measles virus B3.1 variant named MVs/Como.ITA/32.15/ was reported in the northern regions of Lombardy and Emilia-Romagna between November 2015 and April 2016.⁴ Out of the 67 cases in the outbreak 40 were persons of Roma and Sinti ethnic origin and three were migrants of various nationalities. Nosocomial transmission was also reported.

The median age of cases reported in 2016 was 20 years (range: 12 days–68 years). Half of the cases (n=438) were adults 20 years and older and 27% of cases (n=230) were under 5 years. Sixty-four cases (7%) were infants <1 year old, who were too young to be vaccinated according to the national childhood vaccination schedule. Of the total, 623 cases (72%) were laboratory confirmed, 107 cases (12%) were epidemiologically linked to laboratory confirmed cases and 136 cases (16%) were classified as clinically compatible.

Vaccination status was known for 778 cases (89.9%), of which 701 cases (90.1%) were unvaccinated, 51 cases (6.6%) were vaccinated with one dose, 13 cases (1.7%) received two doses and 13 cases (1.7%) had a history of vaccination but the number of doses was unknown.

Of the total, 399 cases (46.1%) were hospitalized and 154 cases (17.8%) visited an accident and emergency department of a hospital. Complications, including pneumonia, otitis media, encephalitis and convulsions, were reported in 349 cases (40.3%).

Rubella

In 2016 Italy reported a total of 30 cases of rubella (data as of 31 March 2017): 12 cases (40.0%) 1–4 years of age, 3 cases (10.0%) 5–9 years, 1 case (3.3%) 10–14 years, 10 cases (33.3%) 20–42 years (of which 4 were females) and 4 cases (13.3%) above 50 years.

Fifteen cases (50.0%) were laboratory confirmed, no cases were epidemiologically linked to a laboratory confirmed case and 15 cases (50.0%) were classified as clinically compatible. Of the laboratory confirmed cases four were females between the ages of 28 and 39 years.

Vaccination status was known for 23 cases (76.7%), of which 21 cases (91.3%) were unvaccinated and 2 cases (8.7%) were vaccinated with at least one vaccine dose.

Measles and rubella elimination activities in Italy

Wherever outbreaks were identified, the local health authorities urged physicians and paediatricians to notify the suspected cases immediately in order to trace contacts and offer them post-exposure prophylaxis and vaccination. Cultural mediators assisted the local health authorities to trace contacts in the context of outbreaks affecting the Roma and Sinti communities living in Lombardy. In Emilia Romagna, occupational physicians were reminded to implement the regional recommendation to verify the measles immunity status of all unvaccinated hospital staff and staff of community healthcare services, and offer vaccination to all those found to be susceptible.

The surveillance of measles and rubella at the national level is endorsed by the Ministry of Health and coordinated by the National Institute of Health (Istituto Superiore di Sanità - ISS) through an integrated system of measles and rubella surveillance carried out by sub-national levels. In order to strengthen the existing system, in 2016, the Ministry of Health funded an operational network of reference laboratories for measles and rubella “MoRoNet”. This network is coordinated by the WHO-accredited National Reference Laboratory for Measles and Rubella located at the ISS. The network meets WHO standard requirements and ensures that high-quality laboratory investigation is conducted for cases and for outbreaks notified to the integrated measles-rubella surveillance system.

In 2016, the Ministry of Health also funded a project “Actions in support of the National Plan for the

Elimination of Measles and Congenital Rubella (Piano nazionale per l'eliminazione del morbillo e della rosolia congenita - PNEMoRc)”, with wide participation of administrative regions, academia and the ISS. The project includes an articulated series of actions aimed at achieving the following objectives:

- to support epidemiological analysis of measles and rubella through the production of regular regional reports;
- to support specific training for healthcare workers including the preparation of material for distance learning;
- to develop and implement a communication plan to address the general population with particular emphasis on the use of the internet and social networks;
- to support the regions for further strengthening of the programme using systematic programme audits and regular monitoring through site visits;
- to conduct supplementary immunization activities at local levels, as needed.

In addition, the Ministry of Health is establishing a working group involving the ISS, the regional health authorities, identified scientific societies and civil societies, to assist the regions in implementing the National Measles and Rubella Elimination Plan (PNEMoRc). The working group will be formalized during 2017.

Measles in Romania

A measles outbreak that started in 2016 is currently ongoing in Romania. By 17 March 2017, a total of 3799 measles cases were reported since January 2016, in 37 of its 42 first-level administrative territories. Most cases (60%; n=2079) occurred in the counties of Caras Severin (853), Timis (742) and Arad (706), all located in the western part of Romania.

Of the total, 676 (18%) were infants <1 year, 1510 (40%) were young children 1–4 years of age and 674 (18%) were children 5–9 years of age. Adults aged 20 years and older constituted 12% (n=457) of the total reported cases.

Of the 2435 cases that were reported for 2016, 1363 cases were laboratory confirmed and 1058 cases were epidemiologically linked to laboratory confirmed cases. Fourteen cases were classified as

clinically compatible.

Molecular characterization of the circulating measles virus in Romania between January 2016 and February 2017 identified three different lineages of the B3 genotype. These lineages were not reported from Romania prior to 2016.

The vast majority of the cases had information on vaccination status (n=3792; 99.8%), of whom 3666 were unvaccinated (96.6%). Pneumonia as a complication of measles was reported in 805 cases. 145 cases had other complications including diarrhoea.

Measles-related deaths in Romania

Since the beginning of the outbreak, there have been 17 deaths as a result of complications from measles: six infants, eight children 1–2 years old, two teenagers 14 and 15 years old and a 27 year-old adult. The complications were pneumonia/bronchopneumonia in 15 cases, bronchiolitis in one case and septicaemia in another case. Three cases had an underlying pre-existing medical condition and two cases were reported as being malnourished.

The diagnosis of measles in the fatal cases was confirmed with positive IgM test results or with the detection of the measles virus. For two cases an epidemiologic link to another measles case was identified. Thirteen cases were unvaccinated, three cases were vaccinated during the incubation period and one case had received one measles, mumps and rubella (MMR) vaccine dose. The six infants were not eligible for vaccination as they had not reached 12 months of age – the recommended age to receive the first dose of a measles-containing vaccine according to the Romanian childhood vaccination schedule.

Outbreak response and control measures in Romania

In response to the outbreak, the recommended age to receive the first MMR vaccine dose was lowered from 12 months to nine months. At the same time a nationwide campaign of enhanced routine immunization activities was undertaken to identify unvaccinated and incompletely vaccinated children aged between 9 months and 9 years and to vaccinate them according to the national childhood immunization revised schedule. 290 040 children were identified, of whom 132 768 (46%) were

vaccinated with the MMR vaccine by 28 February 2017. The health authorities requested all family doctors providing vaccination to ensure that unvaccinated children under 5 years of age receive their first dose of MMR vaccine and that children 5 to 9 years of age are vaccinated with both vaccine doses.

Community nurses were deployed to identify unvaccinated children in vulnerable population groups and encouraged their parents and caretakers to ensure that they are registered with health services for vaccination. To increase awareness of the outbreak and the importance of vaccination against measles the health authorities provided information in posters, leaflets and booklets for family doctors and the general population. The National Institute of Public Health in Romania has also been regularly updating its website with situation reports since 23 September 2016.

Comments

Measles and rubella in the WHO European Region

With 5133 reported measles cases and 1326 reported rubella cases, 2016 saw the lowest number of reported cases of these diseases in the Region ever. At regional level, the incidence of measles in children <10 years old, and especially in those <5 years old, is high compared with that for other age groups. This is particularly evident in Romania where 48% of the cases in the country were children <5 years old.

With the exception of infants too young to be vaccinated, all eligible children <10 years old should have received at least one vaccine doses according to national immunization programme schedules. The reasons some children are not vaccinated vary and can include parental concerns about vaccines, parents' religious, philosophical or personal beliefs, or poor access to vaccination services, for example for children who are not registered in the health system.

As one of the most contagious infectious diseases known, measles has a great ability to spread rapidly and cause large outbreaks in unvaccinated populations. Therefore to prevent virus transmission, immunization coverage of at least 95% needs to be reached and maintained at national level and in all districts through the routine immunization programme.

As in previous years, the proportion of measles cases among adults 20 years and older (27% in 2016) is still relatively high. Additional immunization activities are required to target susceptible adults to avoid delay in

reaching the goal of measles elimination. Identifying susceptible individuals and closing the immunity gap in this age group present particular challenges as policies and technical capacities to systematically address the vaccination needs of adults are lacking in most countries. Nonetheless, every effort should be made to improve access and availability of vaccines to this age group.

Rubella continues to be reported in fewer countries than measles. The number of reported cases in the Region for 2016 was 45% lower than that reported for 2015 (n=2412). This is attributed to the 44% decline in reported rubella cases in Poland, from 2029 cases for 2015 to 1144 cases for 2016. All of the reported cases in Poland were clinically compatible. Laboratory testing would be needed to confirm cases as rubella.

In 2016, all 71 WHO measles and rubella reference laboratories in the Region were accredited. However, countries have included laboratory data from public, private or commercial laboratories outside of the WHO laboratory network in their surveillance and other relevant reports, including those of the national verification committees for measles and rubella. The lack of information on the proficiency of these laboratories in several countries remains of concern.⁵ Some countries, such as Italy have made remarkable progress in establishing national laboratory networks coordinated by WHO-accredited measles rubella national reference laboratories.

In 2016, almost all countries in the Region notifying measles cases submitted genomic sequence information to MeaNS (although not always meeting the 80% target for viral detection). In contrast, few countries submitted genomic sequence information on rubella cases RubeNS.⁶ It is important to note that these genotype reports are not fully representative of the regional distribution of measles and rubella viruses. This is primarily because Member States differ in the rate of collecting specimens for viral sequencing but also due to differences in the reporting of sequence data to MeaNS/RubeNS.⁷

According to the assessment conducted in 2016 by the European Regional Verification Commission for Measles and Rubella on reports submitted by 50 countries for 2015, 24 countries have eliminated measles. A further 13 countries provided evidence for the interruption of measles transmission for a period of <36 months. However, 14 countries remain endemic for measles with transmission of the disease

continuing into 2016. For rubella, 24 countries have eliminated the disease and 11 have interrupted transmission. Yet, 16 were still considered endemic for rubella.

Although 2016 has seen the lowest number of reported measles cases in the Region ever, continuing transmission and outbreaks in the Region that started in 2016 have been reported in several countries in 2017. Despite intensified efforts overall, strong and sustained political commitment to eliminate measles is still lacking in some countries. The cornerstones for eliminating measles remain high population immunity to stop disease transmission and high-quality surveillance to monitor disease occurrence for public health action but also to adequately ascertain its absence in the elimination process.

Pertussis in Denmark

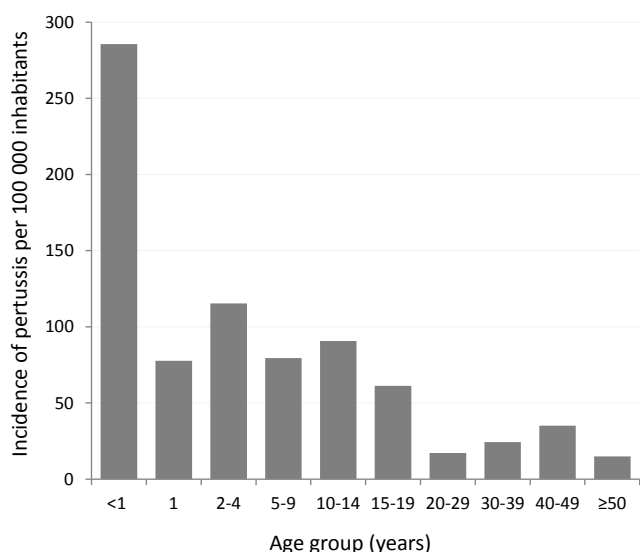
In 2016, Denmark experienced an epidemic of pertussis despite long-standing high vaccination coverage. The last major epidemic occurred in 2002. By the end of 2016, there were 2096 laboratory confirmed cases corresponding to an incidence of 37 per 100 000 inhabitants. Cases were reported across Denmark. The largest number of cases (n=289) was reported in November 2016.

1743 cases of pertussis were confirmed with polymerase chain reaction (PCR), the main laboratory test used. Serology was used to confirm cases in those aged 8 years and older. 347 cases were confirmed using serological testing; and 6 cases were confirmed by culture.

The highest incidence per 100 000 inhabitants was observed in infants <12 months of age (286) followed by 2–4-year-old children (115) (Fig. 4). Hospitalization data was available for cases <2 years of age (n=203). Of the 110 cases admitted to hospital, 62 were infants below 3 months of age, 46 were 3–11 months old and the remainder were 1–2 years old. No pertussis-related deaths were reported.

Out of 159 notified cases among infants, 69 were below the age of 3 months, which is the recommended age for the first pertussis vaccine dose according to the national vaccination schedule. Of the remaining 90 infants, 22 had received no vaccines, 24 had received one vaccine dose and 40

Fig. 4. Age-specific incidence of pertussis cases in Denmark, 2016



Data source: Statens Serum Institut, Denmark and Statistikbanken

had received two vaccine doses. In four cases the vaccination status was unknown. In Denmark, the primary doses using the acellular pertussis vaccine are given at 3, 5 and 12 months followed by a booster dose (low-dose acellular pertussis) administered at 5 years of age. As of 9 February

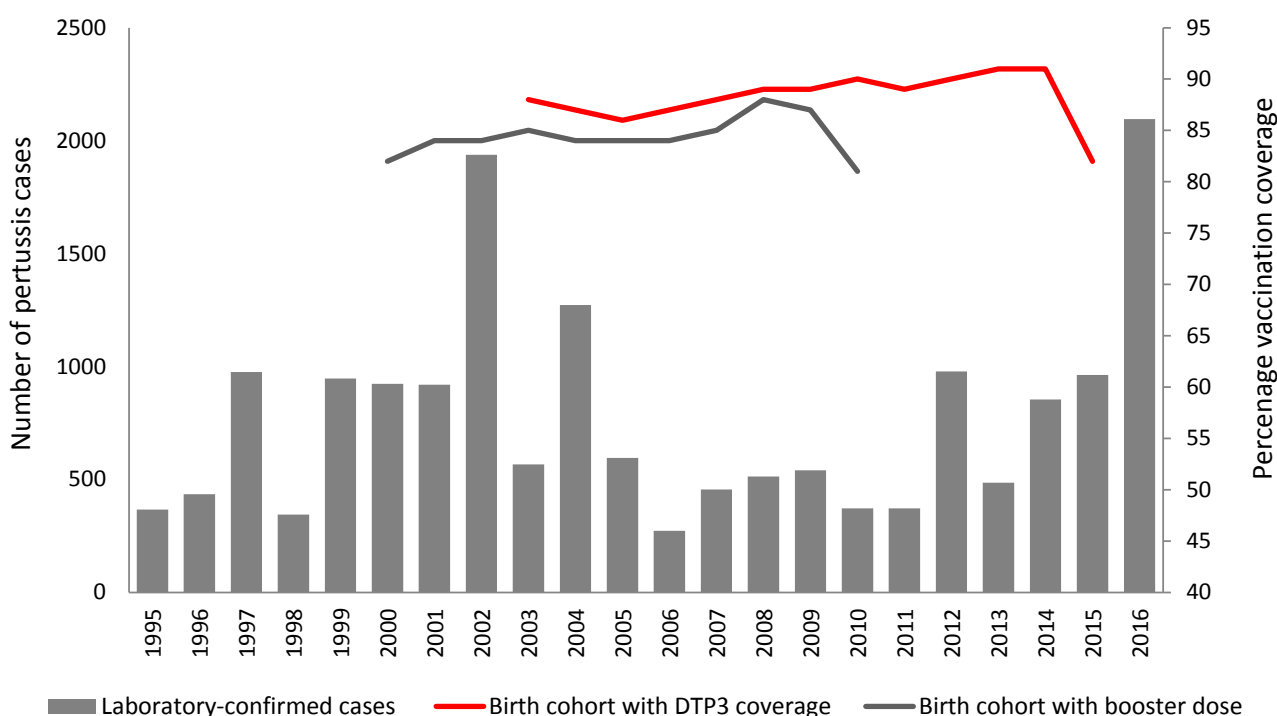
2017, vaccination coverage with the three primary doses for cohorts born in 2003–2014 was 86–91%. Coverage with the booster dose for cohorts born in 2000–2009 was 82–88% (Fig. 5) and for the cohort born in 2010 was 81%. The relatively lower coverage achieved for the 2010 cohort, so far, is most likely due to delayed vaccination. Coverage is expected to increase to similar levels as for previous cohorts.

Preventive measures

Over the course of 2016, the health authorities issued two press releases to increase awareness among physicians and the public and to stress the importance of timely vaccination. The health authorities also published two epidemiological updates of pertussis in the weekly national epidemiological bulletin “EPI-NEWS” on weeks 27 and 46 covering the first 6 and 10 months of 2016, respectively.^{8,9} The national epidemiological bulletin has a wide readership among healthcare providers in Denmark. On both occasions, reference was made to the updated guidelines for post-exposure prophylaxis (PEP) and treatment of cases with antibiotics published earlier in 2016 in the same bulletin.¹⁰

The updates also reminded readers of the clinical features of pertussis, highlighting atypical presentations of the disease in older children and

Fig. 5. Number of laboratory confirmed pertussis cases in Denmark, 1995-2016 and diphtheria-tetanus-pertussis vaccination coverage with three doses (DTP3) for cohorts born 2003-2014 and with a booster dose for cohorts born 2000-2010



Data source: Statens Serum Institut, Denmark

adults. They also described the preferred confirmatory testing method according to the age and point in time during the course of the disease. The health authorities stressed the importance of avoiding delays in vaccination and stated that the primary vaccine doses used in Denmark are approved for use from two months of age. Where exposure of unvaccinated children <2 years of age to another case is identified, vaccination as early as possible together with PEP was recommended.

Comments

An increase in the number of pertussis cases has been observed in other countries of the WHO European Region in recent years and has been attributed to naturally recurrent cycles of the disease. The pertussis epidemic in Denmark in 2016 is probably due to such a cycle, but with an unusually high peak. The widespread use of PCR to confirm cases and increased use of serology have probably contributed to the increased number of detected cases. Increased awareness about the disease among healthcare professionals probably also contributed to this increase particularly after the publication of "EPI-NEWS" on 16 November (week 46)⁹ describing pertussis reaching an epidemic level.

The high incidence observed in infants suggests

increased transmission of pertussis in the community as a whole. An important factor in maintaining disease transmission is waning immunity among adolescents and adults.¹¹ Immunity against pertussis following natural infection is estimated to wane after 3.5–20 years and immunity conferred by vaccination wanes after 4–12 years. Pertussis in adolescents and adults not only carries a burden in these age groups but also carries a risk of transmission to vulnerable infants.¹² Infants have the highest risk of severe complications including death due to pertussis.

To reduce the risk of severe pertussis in infants and young children every effort should be made to vaccinate infants in a timely manner and maintain high coverage ($\geq 90\%$) with at least 3 doses of pertussis vaccine at national and sub-national levels. In addition, to protect the newborns in settings with high or increased morbidity/mortality from pertussis, the Strategic Advisory Group of Experts (SAGE) on immunization is requesting countries to consider the immunization of pregnant women with one dose of tetanus, low-dose diphtheria and acellular pertussis (Tdap) vaccine in the 2nd or 3rd trimester in addition to routine primary infant pertussis vaccination.¹³

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Annex

Table 1. Measles cases: classification, reporting and surveillance performance 2016 (as of 31 March 2017)

Country	Total Population in 2016 ¹	Incidence Rate Feb 2017 (per 1 million population) ²	Total measles cases ³	Classification			Discarded Measles	Imported cases	Reporting			Surveillance Indicators			
				Lab confirmed	Epi-Link	Clinically compatible ⁴			Completeness	Timeliness	Month & year of last report	Laboratory investigation rate	Rate of discarded cases	Origin of infection	Timeliness of investigation
Albania	2 903 700	0	0	0	0	0	0	0	100%	58%	Dec-16	-	0	-	-
Andorra	69 165	0	0	0	0	0	0	0	100%	33%	Dec-16	-	0	-	-
Armenia	3 026 048	0.7	2	1	1	0	96	0	75%	58%	Dec-16	100%	3.17	100%	100%
Austria	8 569 633	1.6	28	26	2	0	25	14	100%	100%	Dec-16	71%	0.29	100%	4%
Azerbaijan	9 868 447	0	0	0	0	0	113	0	100%	100%	Dec-16	97%	1.15	58%	83%
Belarus	9 481 521	1.6	29	28	0	1	412	14	100%	83%	Dec-16	100%	4.35	5%	4%
Belgium	11 371 928	10.2	119	34	5	80	82	3	100%	100%	Dec-16	59%	0.72	44%	0
Bosnia and Herzegovina	3 802 134	11.8	45	0	0	45	0	0	17%	0%	Feb-16	100%	0	0	0
Bulgaria	7 097 796	0.1	1	1	0	0	1	0	100%	92%	Dec-16	100%	0.01409	0	100%
Croatia	4 225 001	0	4	4	0	0	2	4	100%	75%	Dec-16	100%	0.05	100%	0
Cyprus	1 176 598	0	0	0	0	0	0	0	100%	83%	Dec-16	-	0	-	-
Czech Republic	10 548 058	0.2	7	7	0	0	0	5	100%	92%	Dec-16	100%	0	71%	57%
Denmark	5 690 750	0	3	3	0	0	0	3	100%	100%	Dec-16	100%	0	100%	0
Estonia	1 309 104	0	2	2	0	0	10	2	100%	100%	Dec-16	100%	0.76	17%	100%
Finland	5 523 904	0.5	5	5	0	0	0	2	100%	92%	Dec-16	100%	0	60%	0
France	64 668 129	1.0	79	50	3	26	0	16	100%	83%	Dec-16	82%	0	96%	0
Georgia	3 979 781	3.5	14	5	0	9	44	0	100%	83%	Dec-16	78%	1.11	91%	98%
Germany	80 682 351	3.4	327	272	36	19	0	56	100%	100%	Dec-16	91%	0	65%	0
Greece	10 919 459	0	0	0	0	0	0	0	100%	92%	Dec-16	-	0	-	-
Hungary	9 821 318	0	0	0	0	0	1	0	100%	100%	Dec-16	100%	0.01	200%	0
Iceland	331 778	0	1	1	0	0	0	1	100%	83%	Dec-16	100%	0	100%	100%
Ireland	4 713 993	8.9	44	43	0	1	0	2	100%	100%	Dec-16	100%	0	18%	100%
Israel	8 192 463	1.0	10	7	0	3	0	2	83%	33%	Dec-16	0%	0	60%	0
Italy	59 801 004	13.8	864	621	106	137	72	38	100%	100%	Dec-16	86%	0.12	92%	0
Kazakhstan	17 855 384	5.9	106	92	0	14	0	0	92%	33%	Dec-16	0%	0	0	0
Kyrgyzstan	6 033 769	0	0	0	0	0	142	0	92%	58%	Nov-16	100%	2.35342	100%	0
Latvia	1 955 742	0	0	0	0	0	0	0	100%	92%	Dec-16	-	0	-	-
Lithuania	2 850 030	7.7	22	22	0	0	0	0	100%	92%	Dec-16	100%	0	100%	73%
Luxembourg	576 243	0	0	0	0	0	0	0	100%	92%	Dec-16	-	0	-	-
Malta	419 615	0	0	0	0	0	0	0	100%	100%	Dec-16	-	0	-	-
Monaco	37 862	-	-	-	-	-	-	-	-	-	No Report	-	-	-	-
Montenegro	626 101	0	0	0	0	0	0	0	100%	17%	Dec-16	-	0	-	-
Netherlands	16 979 729	0.1	6	5	1	0	0	4	100%	100%	Dec-16	100%	0	83%	0
Norway	5 271 958	0	0	0	0	0	0	0	100%	100%	Dec-16	-	0	-	-
Poland	38 593 161	2.4	138	81	52	5	0	45	100%	92%	Dec-16	97%	0	45%	100%
Portugal	10 304 434	0	0	0	0	0	13	0	100%	100%	Dec-16	54%	0.13	100%	69%
Republic of Moldova	4 062 862	0	0	0	0	0	0	0	100%	75%	Dec-16	-	0	-	-
Romania	19 372 734	125.3	2432	1362	1056	14	0	5	100%	100%	Dec-16	100%	0	159%	100%
Russian Federation	143 439 832	0	0	0	0	0	0	0	8%	8%	No Report	-	0	-	-
San Marino	31 950	-	-	-	-	-	-	-	-	-	No Report	-	-	-	-
Serbia	8 812 705	1.6	14	1	0	13	0	0	100%	50%	Dec-16	0%	0	0	0
Slovakia	5 429 418	0	0	0	0	0	3	0	100%	100%	Dec-16	33%	0.06	100%	67%
Slovenia	2 069 362	0	1	1	0	0	0	1	100%	100%	Dec-16	100%	0	100%	100%
Spain	46 064 604	0.6	38	25	10	3	59	11	100%	100%	Dec-16	99%	0.13	70%	98%
Sweden	9 851 852	0	3	3	0	0	0	3	100%	100%	Dec-16	100%	0	100%	0
Switzerland	8 379 477	6.3	66	53	9	4	97	13	100%	92%	Dec-16	100%	1.16	39%	100%
Tajikistan	8 669 464	6.0	52	49	3	0	169	0	100%	100%	Dec-16	100%	1.95	74%	100%
The former Yugoslav Republic of Macedonia	2 081 012	0	0	0	0	0	0	0	83%	25%	Dec-16	-	0	-	-
Turkey	79 622 062	0.1	9	9	0	0	1	0	50%	25%	No Report	100%	0.00	0	0
Turkmenistan	5 438 670	-	-	-	-	-	-	-	-	-	No Report	-	-	-	-
Ukraine	44 624 373	2.0	90	18	0	72	0	0	83%	83%	Dec-16	0%	0	0	0
United Kingdom	65 111 143	8.2	571	571	0	0	0	40	100%	100%	Dec-16	100%	0	8%	9%
Uzbekistan	30 300 446	0.0	1	1	0	0	6	0	75%	58%	Dec-16	100%	0.02	0	0
Total/Averages	912 640 057	5.3	5133	3403	1284	446	1348	284	87.9%	74.2%		100.0%	0.15	92.8%	75.5%

Data source: Monthly aggregated and case-based data reported by Member States to WHO/Europe or via ECDC/TESSy.

¹ Source: "World Population Prospects: The 2015 Revision", New York, United Nations.

² Incidence not meeting the target (<1) and countries not reporting monthly measles data are highlighted in red. The measles imported cases are excluded from Total measles cases (numerator).

³ All confirmed measles cases regardless of origin.

⁴ Unless specified as laboratory confirmed or epi-linked, cases are classified as clinically compatible.

Member States submitting aggregate data: Bosnia and Herzegovina, Kazakhstan, Republic of Moldova, San Marino, Serbia, the former Yugoslav Republic of Macedonia, Turkmenistan, Ukraine.

Table 2. Rubella cases: classification, reporting and surveillance performance 2016 (as of 31 March 2017)

Country	Total Population in 2016 ¹	Incidence Rate (per 1 million population) ²	Total rubella cases ³	Classification			Discarded Rubella	Imported cases	Reporting			Surveillance Indicators			
				Lab confirmed	Epi-Link	Clinically compatible ⁴			Completeness	Timeliness	Month of last report	Laboratory investigation rate	Rate of discarded cases	Origin of infection	Timeliness of investigation
Albania	2 903 700	0	0	0	0	0	0	0	100%	58%	Dec-16	-	0	-	-
Andorra	69 165	0	0	0	0	0	0	0	100%	33%	Dec-16	-	0	-	-
Armenia	3 026 048	0	0	0	0	0	20	0	75%	58%	Dec-16	100%	0.66	100%	100%
Austria	8 569 633	0.4	3	1	2	0	0	0	100%	100%	Dec-16	100%	0	100%	0%
Azerbaijan	9 868 447	0	0	0	0	0	64	0	100%	100%	Dec-16	100%	0.65	0%	94%
Belarus	9 481 521	-	-	-	-	-	-	-	-	-	No Report	0%	-	-	0%
Belgium ⁵	11 371 928	-	-	-	-	-	-	-	-	-	See footnote	-	-	-	-
Bosnia and Herzegovina	3 802 134	0	0	0	0	0	0	0	17%	0%	Feb-16	-	0	-	-
Bulgaria	7 097 796	0.4	3	0	0	3	0	0	100%	75%	Dec-16	0%	0	67%	100%
Croatia	4 225 001	0	2	2	0	0	0	2	100%	25%	Dec-16	100%	0	100%	0%
Cyprus	1 176 598	0	0	0	0	0	0	0	100%	83%	Dec-16	-	0	-	-
Czech Republic	10 548 058	0	0	0	0	0	0	0	100%	67%	Dec-16	-	0	-	-
Denmark ⁵	5 690 750	0	0	0	0	0	0	0	58%	58%	See footnote	-	0	-	-
Estonia	1 309 104	0	0	0	0	0	12	0	100%	100%	Dec-16	100%	0.92	100%	100%
Finland	5 523 904	0	0	0	0	0	0	0	100%	92%	Dec-16	-	0	-	-
France ⁵	64 668 129	-	-	-	-	-	-	-	-	-	See footnote	-	-	-	-
Georgia	3 979 781	3.0	12	1	0	11	91	0	100%	83%	Dec-16	77%	2.29	100%	99%
Germany	80 682 351	1.2	96	22	8	66	0	2	100%	100%	Dec-16	24%	0	47%	0%
Greece	10 919 459	0	0	0	0	0	0	0	100%	92%	Dec-16	-	0	-	-
Hungary	9 821 318	0	0	0	0	0	3	0	100%	100%	Dec-16	100%	0.03	200%	100%
Iceland	331 778	0	0	0	0	0	0	0	100%	92%	Dec-16	-	0	-	-
Ireland	4 713 993	0.8	4	0	0	4	0	0	100%	100%	Dec-16	0%	0	25%	25%
Israel	8 192 463	0.1	1	1	0	0	0	0	83%	33%	Dec-16	0%	0	0%	0%
Italy	59 801 004	0.5	29	5	9	15	24	0	100%	100%	Dec-16	100%	0.04	98%	0%
Kazakhstan	17 855 384	0.2	4	2	0	2	0	0	92%	33%	Dec-16	0%	0	0%	0%
Kyrgyzstan	6 033 769	0.3	2	2	0	0	0	0	92%	58%	Nov-16	100%	0	100%	0%
Latvia	1 955 742	0	0	0	0	0	0	0	100%	92%	Dec-16	-	0	-	-
Lithuania	2 850 030	0	0	0	0	0	0	0	100%	92%	Dec-16	-	0	-	-
Luxembourg	576 243	0	0	0	0	0	0	0	100%	92%	Dec-16	-	0	-	-
Malta	419 615	0	0	0	0	0	0	0	100%	100%	Dec-16	-	0	-	-
Monaco	37 862	-	-	-	-	-	-	-	-	-	No Report	-	-	-	-
Montenegro	626 101	0	0	0	0	0	0	0	100%	17%	Dec-16	-	0	-	-
Netherlands	16 979 729	0	0	0	0	0	0	0	100%	92%	Dec-16	-	0	-	-
Norway	5 271 958	0	0	0	0	0	0	0	100%	100%	Dec-16	-	0	-	-
Poland	38 593 161	29.6	1144	0	0	1144	0	0	100%	100%	Dec-16	0%	0	0%	0%
Portugal	10 304 434	0.8	8	0	0	8	10	0	100%	100%	Dec-16	50%	0.10	100%	61%
Republic of Moldova	4 062 862	0	0	0	0	0	0	0	58%	42%	Dec-16	-	0	-	-
Romania	19 372 734	0.7	13	12	0	1	0	0	100%	75%	Dec-16	100%	0	185%	100%
Russian Federation	143 439 832	-	-	-	-	-	-	-	-	-	No Report	-	-	-	-
San Marino	31 950	-	-	-	-	-	-	-	-	-	No Report	-	-	-	-
Serbia	8 812 705	-	-	-	-	-	-	-	-	-	No Report	-	-	-	-
Slovakia	5 429 418	0	0	0	0	0	0	0	100%	100%	Dec-16	-	0	-	-
Slovenia	2 069 362	0	0	0	0	0	0	0	100%	100%	Dec-16	-	0	-	-
Spain	46 064 604	0.0	2	2	0	0	6	1	100%	100%	Dec-16	100%	0.01	88%	100%
Sweden	9 851 852	0	0	0	0	0	1	0	100%	100%	Dec-16	100%	0.01	0%	100%
Switzerland	8 379 477	0	0	0	0	0	30	0	100%	92%	Dec-16	97%	0.36	0%	13%
Tajikistan	8 669 464	0.1	1	1	0	0	66	0	100%	83%	Dec-16	100%	0.76	101%	100%
The former Yugoslav Republic of Macedonia	2 081 012	0	0	0	0	0	0	0	83%	25%	Dec-16	-	0	-	-
Turkey	79 622 062	-	-	-	-	-	-	-	-	-	No Report	-	-	-	-
Turkmenistan	5 438 670	-	-	-	-	-	-	-	-	-	No Report	-	-	-	-
Ukraine	44 624 373	-	-	-	-	-	-	-	-	-	No Report	-	-	-	-
United Kingdom	65 111 143	0.0	2	2	0	0	0	1	100%	100%	Dec-16	100%	0	50%	0%
Uzbekistan	30 300 446	0	0	0	0	0	1	0	75%	58%	Dec-16	100%	0.00	0%	0%
Total/Averages	912 640 057	1.4	1326	53	19	1254	328	6	78.3%	62.3%		19.4%	0.04	22.1%	15.5%

Data source: Monthly aggregated and case-based data reported by Member States to WHO/Europe or via ECDC/TESSy.

¹ Source: World Population Prospects: The 2015 Revision, New York, United Nations.

² Incidence not meeting the target (<1) and countries not reporting monthly rubella data are highlighted in red. The rubella imported cases are excluded from Total rubella cases (numerator).

³ All confirmed rubella cases regardless of origin.

⁴ Unless specified as laboratory confirmed or epi-linked, cases are classified as clinically compatible.

⁵ Belgium, Denmark, and France do not have comprehensive rubella surveillance systems.

Member States submitting aggregate data: Bosnia and Herzegovina, Kazakhstan, Republic of Moldova, San Marino, Serbia, the former Yugoslav Republic of Macedonia, Turkmenistan, Ukraine.