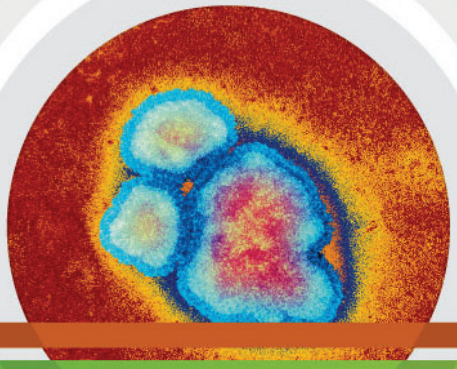


SURVEILLANCE REPORT

# Measles and rubella monitoring

September 2012

Measles and rubella are targeted for elimination in Europe by 2015. ECDC closely monitors progress towards interruption of endemic transmission of both diseases through enhanced surveillance and epidemic intelligence. Measles and rubella vaccinations are routinely delivered in the form of the measles-mumps-rubella (MMR) vaccine in Europe, and the first of the two recommended doses is normally given during the second year of life.

## Main developments

Starting with the September 2012 issue, ECDC will report measles and rubella notification rates per one million population and not, as previously, per 100 000 population. This conforms to the WHO incidence indicator for elimination, measured in number of confirmed cases per million population per year. The elimination target for both measles and rubella for Europe is less than one case per million population and year. The other main indicators are:
i) vaccination coverage (%) of first and second doses of measles- and rubella-containing vaccines, ii) monitoring of the size of all outbreaks, and iii) number of measles/rubella cases caused by an endemic virus strains. For further details about the elimination verification process, please refer to: Surveillance guidelines for measles, rubella and congenital rubella syndrome in the WHO European Region and Eliminating measles and rubella; framework for the elimination process in the WHO European Region.

## Measles

- The 29 contributing EU and EEA countries reported 5 037 cases of measles from 1 January to 31 July 2012 and 9 183 cases during the last 12-month period from August 2011 to July 2012.
- Reporting was complete for the 12-month period, with the exception of Austria (no reports for June and July 2012), and Iceland and the Netherlands (July 2012 data were not submitted in time).
- France, Italy, Romania, Spain and the United Kingdom accounted for 91% of the reported cases.
- Of the cases for which vaccination status was available (8130 cases), 73% were reported as unvaccinated (6723 cases). For infants under one year of age, 99% were reported as unvaccinated (n=1116).
- There have been no measles-related deaths during the last 12 months, but 10 cases were complicated by acute measles encephalitis.
- During the last 12 months, six countries have reported more than one case of measles per 1 000 000 population; the aggregated European incidence was 18.1 cases per 1 000 000 population.
- Measles transmission continued to be slow at the European level and no new large outbreaks have been reported since the previous monitoring report.

## Rubella

- 18 297 cases of rubella were reported from 1 January to 31 July 2012 by the 26 EU and EEA countries contributing to the enhanced surveillance for rubella.
- 23 023 cases were reported during the period from August 2011 to July 2012.
- Poland and Romania accounted for 99% of all reported rubella cases.
- Reporting for the 12-month period was incomplete for Italy (January to July), for Austria (June and July), and for Iceland and the Netherlands (July).

# Measles

## Surveillance data

The enhanced measles surveillance data were retrieved from TESSy on 27 August 2012; the analysis covers the 12-month period from 1 August 2011 to 31 July 2012. Twenty-nine countries reported case-based data for the entire period, with the exception of Austria which did not submit data for June and July, and Iceland and the Netherlands (July 2012 data were not submitted in time to be included).

The number of cases and notification rates for the past 12 months are shown in Table 1. Reported cases in 2012 are much lower than for the same period in 2011 and there was no increase in cases at the European level during the peak transmission season from February to June (Figure 1). The highest notification rate was among infants under one year (224.0 cases per 1 000 000 population), followed by children between one and four years of age (109.0 cases per 1 000 000 population) (Figure 2).

Vaccination status was known for 89% (8 130) of the 9 183 reported cases. Of the cases with known vaccination status, 83% (6 723 cases) were unvaccinated, 13% (1 032) had received one dose of measles vaccine, 4% (323) had received two or more doses, and 0.6% (52) had received an unknown number of doses. The proportion of unvaccinated cases was high across all age groups, including those targeted by vaccination programmes (Figure 3).

Over the last 12 months ten cases were complicated by acute measles encephalitis, but no measles-related deaths were reported.

**Figure 1. Number of measles cases in 2011 and 2012 and number of countries reporting in 2012, by month**

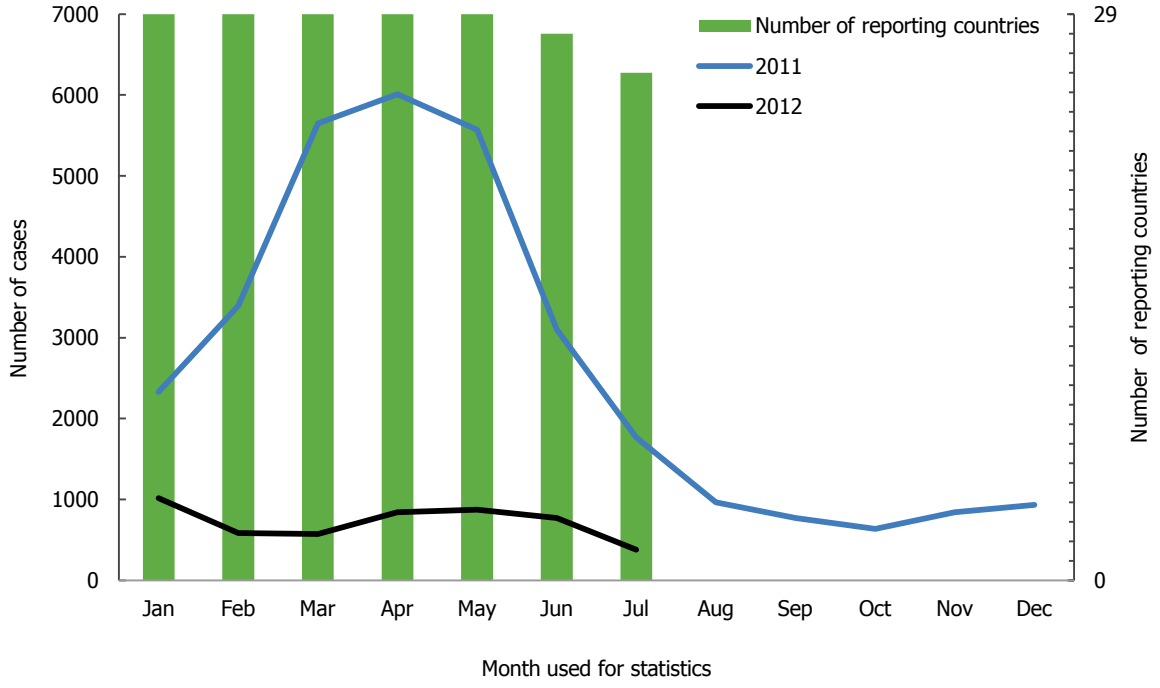


**Table 1. Number of measles cases by month and notifications rates (cases per million) in the last 12 months (August 2011–July 2012), EU/EEA countries**

| | 2011 | | | | | | | 2012 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Country** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Total cases** | **Cases per million** |
| **Austria** | 1 | 1 | 1 | 11 | 5 | 0 | 0 | 0 | 0 | 0 | NR | NR | **19** | 2.3 |
| **Belgium** | 9 | 10 | 3 | 12 | 2 | 6 | 6 | 3 | 9 | 4 | 9 | 5 | **78** | 7.2 |
| **Bulgaria** | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** | 0.3 |
| **Cyprus** | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | **1** | 1.2 |
| **Czech Republic** | 3 | 0 | 0 | 0 | 1 | 3 | 2 | 0 | 2 | 7 | 4 | 1 | **23** | 2.2 |
| **Denmark** | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **1** | 0.2 |
| **Estonia** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | **3** | 2.2 |
| **Finland** | 5 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 0 | 0 | 0 | **11** | 2.0 |
| **France** | 141 | 80 | 71 | 100 | 126 | 106 | 123 | 140 | 110 | 103 | 87 | 66 | **1253** | 19.3 |
| **Germany** | 57 | 22 | 16 | 21 | 7 | 4 | 18 | 7 | 19 | 56 | 16 | 18 | **261** | 3.2 |
| **Greece** | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | **6** | 0.5 |
| **Hungary** | 0 | 0 | 0 | 0 | 5 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | **7** | 0.7 |
| **Iceland** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | NR | **0** | 0 |
| **Ireland** | 60 | 61 | 27 | 15 | 3 | 3 | 5 | 5 | 3 | 53 | 19 | 4 | **258** | 57.6 |
| **Italy** | 176 | 99 | 61 | 56 | 54 | 58 | 120 | 88 | 97 | 99 | 43 | 8 | **959** | 15.8 |
| **Latvia** | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | **4** | 1.8 |
| **Lithuania** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | **2** | 0.6 |
| **Luxembourg** | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | **4** | 7.8 |
| **Malta** | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** | 4.8 |
| **Netherlands** | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 1 | 1 | NR | **8** | 0.5 |
| **Norway** | 1 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **5** | 1.0 |
| **Poland** | 10 | 5 | 1 | 0 | 0 | 1 | 1 | 1 | 13 | 11 | 9 | 4 | **56** | 1.5 |
| **Portugal** | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 4 | 0 | 0 | **7** | 0.7 |
| **Romania** | 286 | 247 | 214 | 357 | 592 | 729 | 110 | 85 | 317 | 186 | 338 | 157 | **3618** | 168.6 |
| **Slovakia** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | 0 |
| **Slovenia** | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | **2** | 1.0 |
| **Spain** | 146 | 185 | 168 | 203 | 108 | 60 | 69 | 88 | 64 | 56 | 50 | 14 | **1211** | 26.2 |
| **Sweden** | 1 | 0 | 0 | 4 | 0 | 2 | 14 | 4 | 4 | 1 | 0 | 1 | **31** | 3.3 |
| **United Kingdom** | 60 | 54 | 73 | 63 | 29 | 39 | 111 | 148 | 191 | 290 | 193 | 100 | **1351** | 21.6 |
| **Total** | **963** | **771** | **636** | **843** | **933** | **1015** | **583** | **573** | **843** | **873** | **771** | **379** | **9183** | **18.1** |

*nr: data not reported.*

*Notification rates were calculated using the most recent population estimates available from Eurostat (2011).*
*Countries with a notification rate ≥ 1.0 per million population are highlighted in green.*
*For countries that did not report data for all 12 months, notification rates might be underestimated.*
*All confirmed, probable, possible or unknown cases as defined by the EU 2008 case definitions are included.*

For tables relating to number of measles cases in previous years, see:
http://ecdc.europa.eu/EN/HEALTHTOPICS/MEASLES/EPIDEMIOLOGICAL_DATA/Pages/annual_epidemiological_reports.aspx

**Figure 2. Measles notification rates (cases per million) by age group in the last 12 months (August 2011–July 2012), EU/EEA countries (n=9 089 cases with known age)**

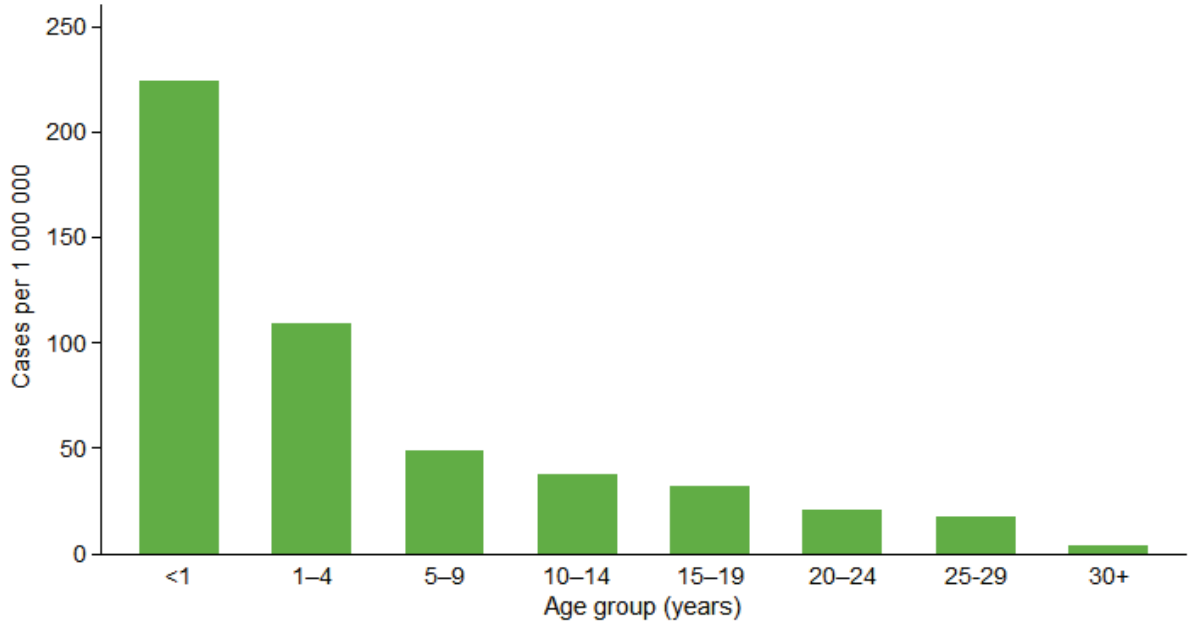



**Figure 3. Proportion of vaccination status among measles cases by age group in the last 12 months (August 2011–July 2012), EU/EEA countries (n=9 089 cases with known age)**

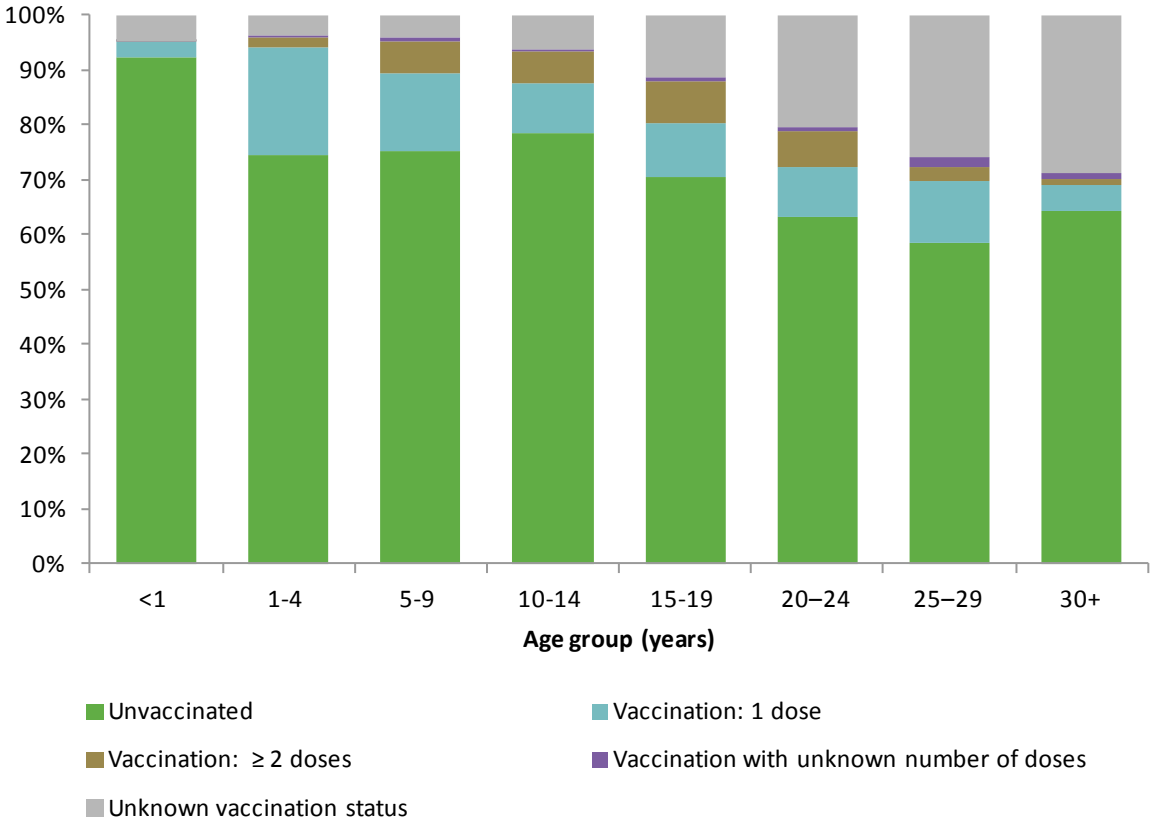
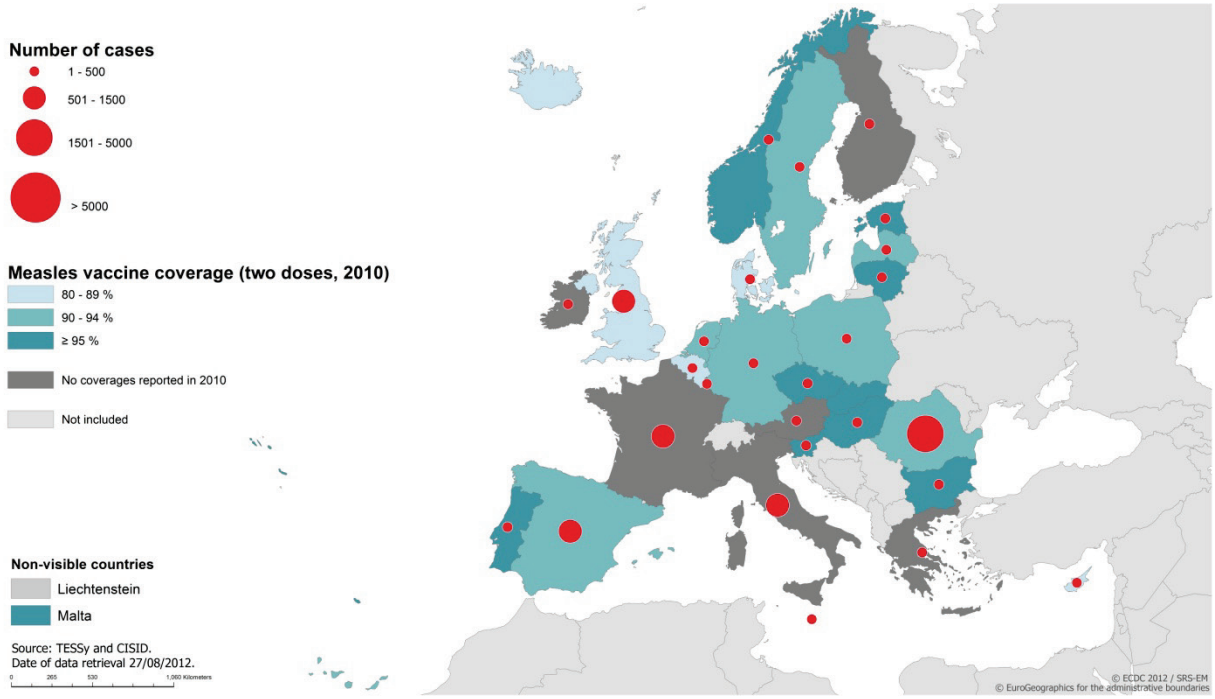
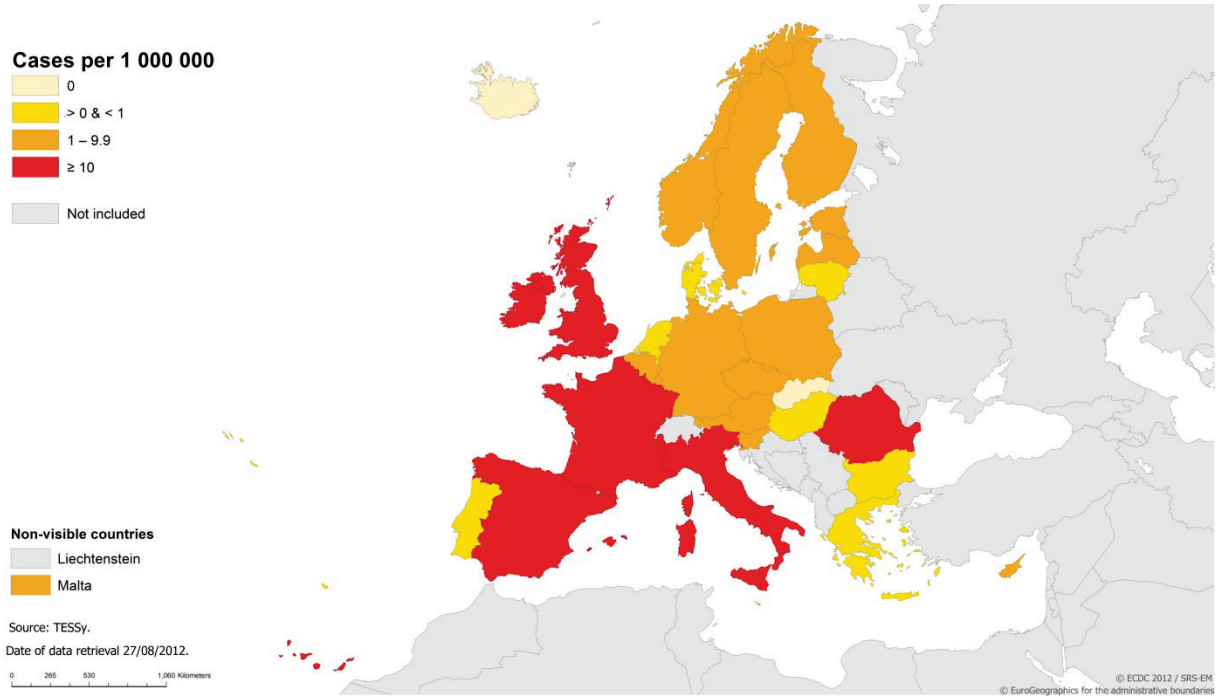


**Figure 4. Number of measles cases by country in the last 12 months (August 2011–July 2012, n=9 183) and two-dose measles vaccine coverage* (2010 CISID), EU/EEA countries**




** Coverage figures (%) are official national figures reported via the annual WHO/UNICEF Joint Reporting Form and WHO Regional Office for Europe reports.*

**Figure 5. Measles notification rates (cases per million) by country in the last 12 months (August 2011–July 2012), EU/EEA countries (n=9 183)**




For maps relating to measles cases and notification rates in 2011, see
http://ecdc.europa.eu/en/activities/surveillance/euvac/data/Pages/measles_maps.aspx

# Epidemic intelligence

There were no new measles outbreaks or important developments reported since the previous report.

# Rubella

## Surveillance data

The enhanced rubella surveillance data were retrieved from TESSy on 27 August 2012; the analysis covers the 12-month period from 1 August 2011 to 31 July 2012. Twenty-two countries reported case-based data for the entire period, Austria did not report for June and July, Iceland and the Netherlands did not report for July, and Italy has not reported any data on rubella in 2012. Belgium, France and Germany do not report population-based rubella data.

An overview of the number of cases and notification rates in the past 12 months is shown in Table 2. Poland and Romania accounted for 99% of the reported cases.

**Table 2. Number of rubella cases by month and notifications rates (cases per 100 000) in the last 12 months (August 2011–July 2012), EU/EEA countries**

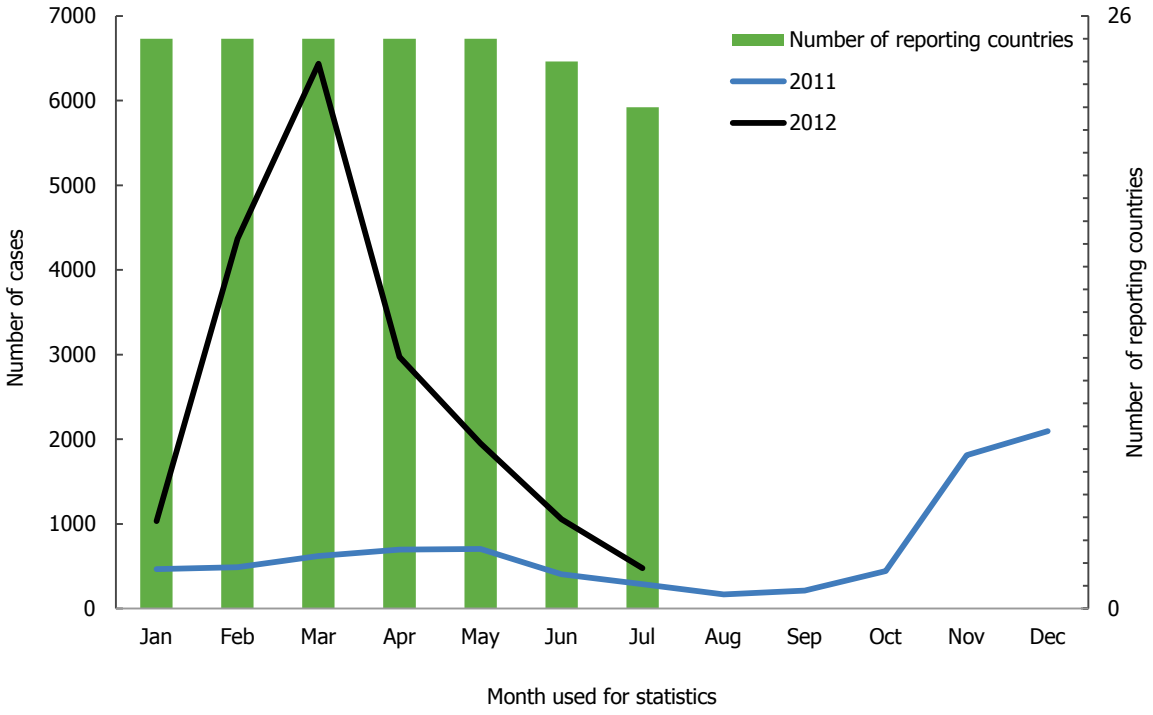
| | 2011 | | | | | 2012 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Total cases | Cases per million |
| **Austria** | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | NR | NR | **1** | 0.1 |
| **Belgium** | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | **NR** | - |
| **Bulgaria** | 0 | 2 | 0 | 1 | 1 | 1 | 2 | 4 | 1 | 2 | 2 | 1 | **17** | 2.3 |
| **Cyprus** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | 0.0 |
| **Czech Republic** | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 2 | 1 | 1 | 0 | 0 | **8** | 0.8 |
| **Denmark** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | 0.0 |
| **Estonia** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | 0.0 |
| **Finland** | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** | 0.2 |
| **France** | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | **NR** | - |
| **Germany** | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | NR | **NR** | - |
| **Greece** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | 0.0 |
| **Hungary** | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 4 | 0 | 0 | 0 | **7** | 0.7 |
| **Iceland** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | NR | **0** | 0.0 |
| **Ireland** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 5 | 2 | 1 | **10** | 2.2 |
| **Italy** | 4 | 3 | 1 | 4 | 0 | NR | NR | NR | NR | NR | NR | NR | **12** | 0.2 |
| **Latvia** | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 0 | **6** | 2.7 |
| **Lithuania** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | 0.0 |
| **Luxembourg** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **1** | 2.0 |
| **Malta** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | 0.0 |
| **Netherlands** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | NR | **1** | 0.1 |
| **Norway** | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | **1** | 0.2 |
| **Poland** | 153 | 161 | 160 | 205 | 186 | 174 | 279 | 695 | 1071 | 1027 | 731 | 405 | **5247** | 137.4 |
| **Portugal** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | 0.0 |
| **Romania** | 9 | 45 | 276 | 1595 | 1905 | 850 | 4054 | 5698 | 1874 | 899 | 299 | 34 | **17538** | 817.2 |
| **Slovakia** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | 0.0 |
| **Slovenia** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | 0.0 |
| **Spain** | 0 | 1 | 1 | 0 | 2 | 4 | 12 | 15 | 12 | 6 | 2 | 2 | **57** | 1.2 |
| **Sweden** | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 1 | 2 | 15 | 29 | **50** | 5.3 |
| **United Kingdom** | 2 | 0 | 0 | 0 | 0 | 3 | 19 | 17 | 9 | 8 | 4 | 4 | **66** | 1.1 |
| **Total** | **168** | **212** | **442** | **1810** | **2094** | **1034** | **4368** | **6435** | **2974** | **1953** | **1057** | **476** | **23023** | **45.3** |

*NR: data not reported.*

*Notification rates were calculated using the most recent population estimates available from Eurostat (2011).*
*Countries with a notification rate ≥ 1.0 per 100 000 population are highlighted in green.*
*For countries that did not report data for all 12 months, notification rates might be underestimated.*
*All confirmed, probable, possible or unknown cases as defined by the EU 2008 case definitions are included.*

For tables relating to number of rubella cases in previous years, see:
http://ecdc.europa.eu/en/activities/surveillance/euvac/data/Pages/status-rubella-reporting.aspx

**Figure 6. Number of rubella cases in 2011 and 2012 and number of countries reporting in 2012, by month**




## Epidemic intelligence

There were no new rubella outbreaks or important developments reported since the previous report.

# Publications

## Measles

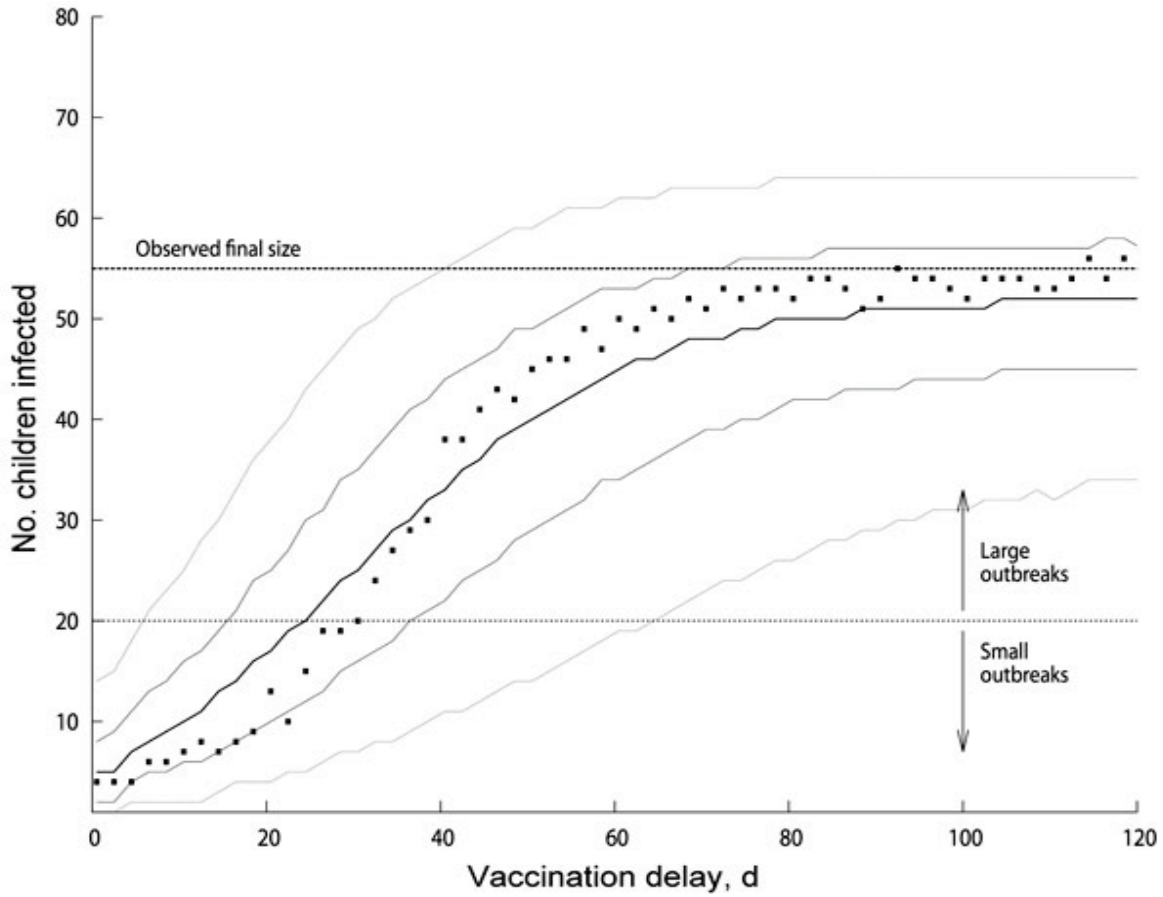
### Effectiveness and timing of vaccination during school measles outbreak

Bonačić Marinović AA, Swaan C, Wichmann O, van Steenbergen J, Kretzschmar M. Effectiveness and timing of vaccination during school measles outbreak. Emerg Infect Dis. 2012 September. Available from: http://wwwnc.cdc.gov/eid/article/18/9/11-1578_article.htm

This article uses stochastic modelling to explore the impact of vaccination on the number of cases in an outbreak of measles in a school. Modelling simulations are based on a well-documented real-life outbreak in a German school. The number of children who will develop measles during a school outbreak is determined by a number of factors including immunity level, size of the group, mixing patterns, delay in detecting the outbreak, and delay in outbreak response vaccination.

The researchers found that the longer it took to implement a response vaccination campaign, the more likely it was that a large outbreak would occur. Outbreaks were expected to remain small (fewer than 20 infected children) if the vaccination delay was 12 to 24 days. Although the response had to be quick to prevent an outbreak of more than 20 children, vaccination as late as 50 days after onset still reduced the final size of the outbreak in 95% of the simulations. When the vaccination delay exceeded 80 days, vaccination campaigns did not reduce the size of the outbreak.

**Figure 7. Outbreak size as a function of delay in vaccinating unvaccinated students**




*Reprinted with permission: Emerg Infect Dis. 2012 September*

This article is highly relevant for measles elimination in Europe because response vaccination is likely to play an important role for reaching the elimination target. The WHO document Surveillance guidelines for measles, rubella and congenital rubella syndrome in the WHO European Region lists four main indicators for measuring progress towards elimination: vaccination coverage, outbreak size, incidence per million population per year and endemic measles virus strains. The target for outbreak size states that 80% or more of the outbreaks should include fewer than 10 cases. Many school outbreaks are likely to exceed 10 cases (even in populations with high vaccine uptake),

and the article indicates that controlling an outbreak through timely response vaccination could he a highly successful approach in combating measles outbreaks in schools.

## Measles outbreak in Europe: Susceptibility of infants too young to be immunized

Leuridan E, Sabbe M, Van Damme P. Vaccine 30 (2012) 5905-5913

The article reviews the burden of measles in the too-young-to-be-immunised population group in EU and EFTA countries. The authors found that 10.5% of the notified cases linked to outbreaks were among young children who had not yet been vaccinated. The significance of the 'susceptibility gap', defined by the authors as the time between the loss of passive protection from maternal antibodies to first vaccination, is discussed in the article. The recommended age of the first dose of measles vaccine is a trade-off between the risk of exposure to measles virus and the probability of developing protective immunity from vaccination. If the first dose is given before 12 months of age, the sero-conversion rate drops because of young children's immature humoral immune system. This also means that the primary vaccine failure rate goes up. As the risk of complications from measles is associated with young age, a first dose at nine months or earlier may still be the best option during measles outbreaks or when endemic transmission is high. The authors suggest that the susceptibility gap may have widened since the introduction of universal measles immunisation because measles vaccine induces lower antibody titers than natural infection and because the natural boosting of immunity through exposure to wild virus has become rare in the vaccination era. The risk of the too-young-to-be-immunised to become infected during the susceptibility gap can be effectively reduced if herd immunity is strong. The authors conclude that 'The most effective way to stop the measles virus is to reduce the susceptible cohorts by timely administration of the measles vaccines according to country's immunisation schedule and achieving high vaccination coverage [...].'

## Seroprevalence of measles-, mumps- and rubella-specific IgG antibodies in German children and adolescents and predictors for seronegativity

Poethko-Muller C, Mankertz A (2012) PLoS ONE 7(8): e42867. doi:10.1371/journal.pone.0042867

This seroprevalence study of 13 000 German children aged 1–17 years from the German 2003–2006 KiGGS survey found an overall MMR uptake of 88.8% and an average prevalence of IgG antibodies to measles, mumps and rubella of 76.8%. A negative antibody test was most common for mumps, followed by measles and rubella. Two-thirds of the unvaccinated children were seronegative with regard to measles, mumps and rubella antibodies indicating that exposure to wild viruses has become uncommon in the vaccination era. The accumulation of susceptible individuals mean that a larger proportion of the unvaccinated reach adulthood without having developed natural immunity, which is of particular concern for rubella because of the devastating consequences of rubella infection during pregnancy. Although girls were less likely to be seronegative for rubella than boys, as many as 6.8 % of the 14–17-year-old girls lacked rubella antibodies. Children in former West Germany and children born outside of Germany were more likely to lack measles and rubella antibodies, while first generation immigrant children were less likely to be seronegative. There was an association between lack of antibodies and the time passed since vaccination indicating waning immunity over time for all three antigens.

Repeated representative seroprevalence surveys provide important information about changes in immunity and the results can guide vaccination programmes to target services to groups with critically low immunity.

Available from:
http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0042867?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+plosone%2FPLoSONE+%28PLoS+ONE+Alerts%3A+New+Articles%29

# Useful links

More information about measles and rubella is available on the ECDC website:

http://ecdc.europa.eu/en/healthtopics/measles/Pages/index.aspx

http://ecdc.europa.eu/EN/HEALTHTOPICS/RUBELLA/Pages/index.aspx

Information about vaccines and immunisation from the World Health Organization's Regional Office for Europe website: http://www.euro.who.int/en/what-we-do/health-topics/communicable-diseases/measles-and-rubella

Website for WHO CISID database: http://data.euro.who.int/cisid/

More information on the surveillance of vaccine-preventable diseases in the European Union is available from the EUVAC-Net website.

# Notes

1) The European Surveillance System (TESSy) reports 'date used for statistics', which is a date chosen by the country for reporting purposes. Such date may indicate onset of disease, date of diagnosis, date of notification, or date of laboratory confirmation.

2) Countries report on measles, rubella and other vaccine-preventable diseases to TESSy at their own convenience. This means that the date of retrieval can influence the data presented in this report. For this reason, the date of data retrieval is indicated for each issue. For this issue, measles data and rubella data were compiled on 27 August 2012. Later retrievals of data may result in slightly different numbers as countries have the possibility to update data in TESSy retrospectively.