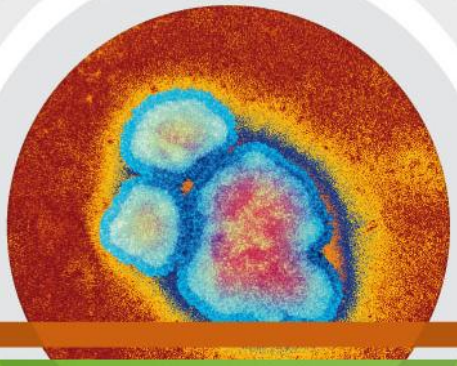


SURVEILLANCE REPORT

European monthly measles monitoring (EMMO)

Issue 9: 19 March 2012

Main developments

- In January 2012, 584 cases of measles were reported by the 29 contributing EU and EEA countries.
- Romania reported 63% (367) of the cases.
- There were substantially fewer cases in January 2012 than in the same month of 2011 (2 289 cases) and 2010 (2 673 cases).
- Measles is spreading in the Ukraine and transmission is expected to continue during the mass-gathering event of the UEFA European Football Championship in June 2012 unless effective control measures are implemented.

Background

Measles is a highly infectious and potentially fatal disease which can be prevented by a safe and effective vaccine. When given in two doses, at least 98% of vaccine recipients develop life-long protective immunity against the disease. As the measles virus only infects humans, the disease could theoretically be eradicated. The countries in the European Region of the World Health Organization, which includes all EU and EEA/EFTA countries, have committed to eliminate measles transmission by 2015. Elimination of measles requires sustained vaccination coverage above 95% with two doses of a measles-containing vaccine.

ECDC monitors measles transmission in Europe by collecting routine case reports from Member States and through epidemic intelligence activities. Twenty-nine EU and EEA countries conduct enhanced measles surveillance based on mandatory notification and submit monthly surveillance data to the European Surveillance System (TESSy) database at ECDC. Epidemic intelligence sources include the TESSy database, national websites, the Early Warning and Response System (EWRS), validated media reports, and personal communication from national authorities.

EMMO data on measles-containing vaccine coverage is retrieved from the official WHO Computerized Information System for Infectious Diseases (CISID) unless otherwise stated. CISID data originates from the WHO/UNICEF Joint Reporting Forms submitted annually by WHO Member States. It should be noted that countries use different methodologies and definitions for assessing vaccination uptake, and that direct comparisons of coverage between countries should be made with caution. The recommended age for the second dose of measles-containing vaccine varies considerably between countries, which further complicates the picture.

The purpose of this report is to provide timely public updates on the measles situation in Europe for effective disease control measures in support of the 2015 measles elimination target.

Surveillance data

The enhanced measles surveillance data was retrieved from TESSy on 29 February and the analysis covers the period from 1 to 31 January 2012. Data submitted in aggregated format (case classification, vaccination status, age group) were analysed for all 29 contributing countries, while variables reported in case-based format (complications, outcome, importation status) were analysed for 28 countries and exclude Romania, which submitted only aggregated data for the current period.

A total of 584 measles cases were reported to ECDC in January (Table 1). Romania is the only country exceeding one case per 100 000 population in the reporting period and contributed 63% (367) of all cases. The number of cases reported in January 2012 is considerably lower than for the same month in 2011 (2 289 cases) and 2010 (2 673 cases). Fifteen countries reported zero cases in January 2012 (Figures 2 and 4). As reported in the previous EMMO, only two countries, Iceland and Cyprus, remained measles-free in 2011 (Figure 5). Of the 30 474 cases recorded in 2011, France reported half, followed by Italy, Romania and Spain (Figure 4 and previous issue).

Of the cases reported in January, 76% (443 cases) were laboratory confirmed, 11% (64 cases) probable, 13% (74 cases) possible, and 0.5% (three cases) lacked classification. The 2008 EU case definition for measles was used by 19 (66%) countries.

The highest incidence was among infants under one year (1.2 cases per 100 000 population), followed by children aged between one and four years (0.9 cases per 100 000 population); see Figure 6.

Vaccination status was known for 94% (547) of the reported cases. Of these, 83% (450) were unvaccinated and 17% (97) were vaccinated. Among those vaccinated, 89% (86) had received one dose of measles vaccine and 11% (11) had received two or more doses.

Complication status was reported for 38% (82) of the 217 case-based notifications. Seventy cases had no complications, six cases were complicated by pneumonia, and six cases had other complications. The remaining 135 case-based reports (62%) missed information on complications either because the variable was not reported or because it was recorded as 'unknown'. No cases of encephalitis or deaths were reported this month. Unknown outcome status was reported for 20% of the cases (Table 2).

Importation status was reported for 58% (125) of cases. Of those, 53% (114 cases) were infected in their country of residence, 5% (10 cases) were infected abroad and recorded as imported cases*, and 0.5% (one case) were import related*.

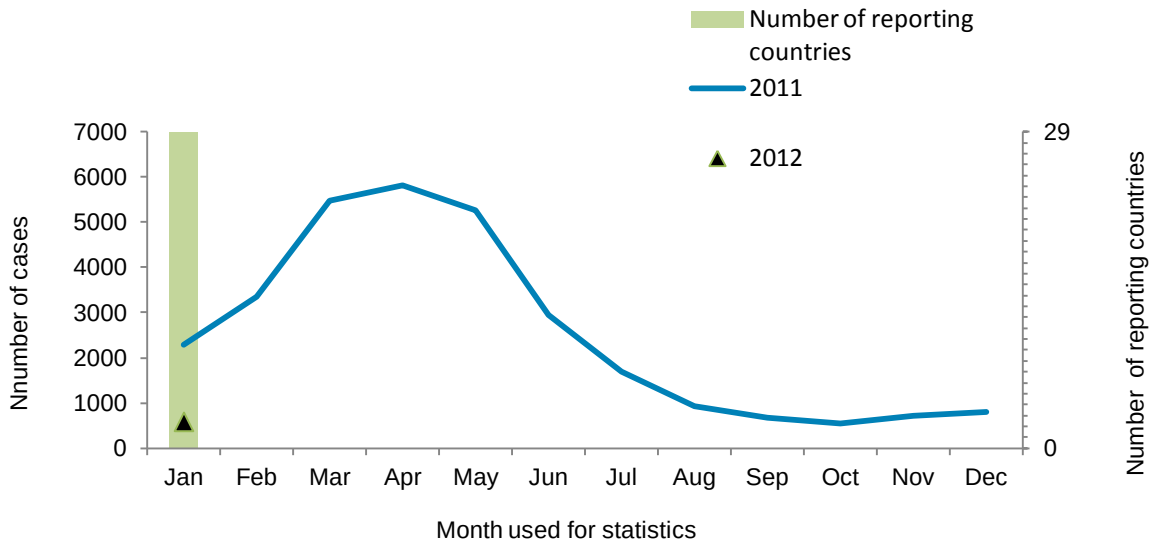
Table 1. Number of measles cases by month, notifications per 100 000 population, and comparison with previous reporting period in 2011; EU and EEA countries, 2012

	2012			2011		
Country	January	Cumulative cases	Notifications per 100 000 population in the year	January	Cumulative cases	Notifications per 100 000 population in the year
Austria	0	0	0	7	99	1.2
Belgium	7	7	0.1	9	576	5.3
Bulgaria	0	0	0	76	157	2.1
Cyprus	0	0	0	0	0	0
Czech Republic	2	2	0.02	0	17	0.2
Denmark	1	1	0.02	7	84	1.5
Estonia	0	0	0	0	7	0.5
Finland	0	0	0	1	29	0.5
France	96	96	0.1	1532	14971	23.0
Germany	3	3	0.004	48	1607	2.0
Greece	0	0	0	0	40	0.4
Hungary	0	0	0	0	5	0.1
Iceland	0	0	0	0	0	0
Ireland	6	6	0.1	0	303	6.8
Italy	27	27	0.04	336	5181	8.5
Latvia	0	0	0	0	1	0.04
Lithuania	0	0	0	0	7	0.2
Luxembourg	0	0	0	0	6	1.2
Malta	0	0	0	0	4	1.0
Netherlands	0	0	0	2	46	0.3
Norway	0	0	0	4	38	0.8
Poland	1	1	0.003	1	38	0.1
Portugal	1	1	0.01	0	2	0.02
Romania	367	367	1.7	131	4133	19.3
Slovakia	0	0	0	0	2	0.04
Slovenia	1	1	0.05	0	22	1.1
Spain	39	39	0.1	100	1990	4.3

	2012			2011		
Country	January	Cumulative cases	Notifications per 100 000 population in the year	January	Cumulative cases	Notifications per 100 000 population in the year
Sweden	2	2	0.02	4	26	0.3
United Kingdom	31	31	0.05	31	1083	1.7
Total	**584**	**584**	**0.1**	**2289**	**30474**	**6.0**

Source: TESSy.
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 in 2012 are highlighted in green.

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



Source: TESSy
Reporting countries: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom.

Table 2. Outcomes and complications of measles, reported by EU/EEA countries (n=28*), January 2012

Outcome	Number of cases	%
Deaths	0	
Cases with information on outcome status	168	77.4
Unknown or not reported	49	22.6
Complications		
Encephalitis	0	0
Pneumonia	6	2.8
Diarrhoea	0	0
Otitis media	0	0
Other complications	6	2.8
No complications	70	32.2
No information provided /unknown	135	62.2
Total	**217**	100.0

Source: TESSy

** Data from Romania was not included in the analysis because the variable was not reported in a case-based format.*

Figure 2. Distribution of measles cases reported to TESSy by EU and EEA countries for January 2012 (n=584) and two-dose measles vaccine coverage* (2010 CISID)

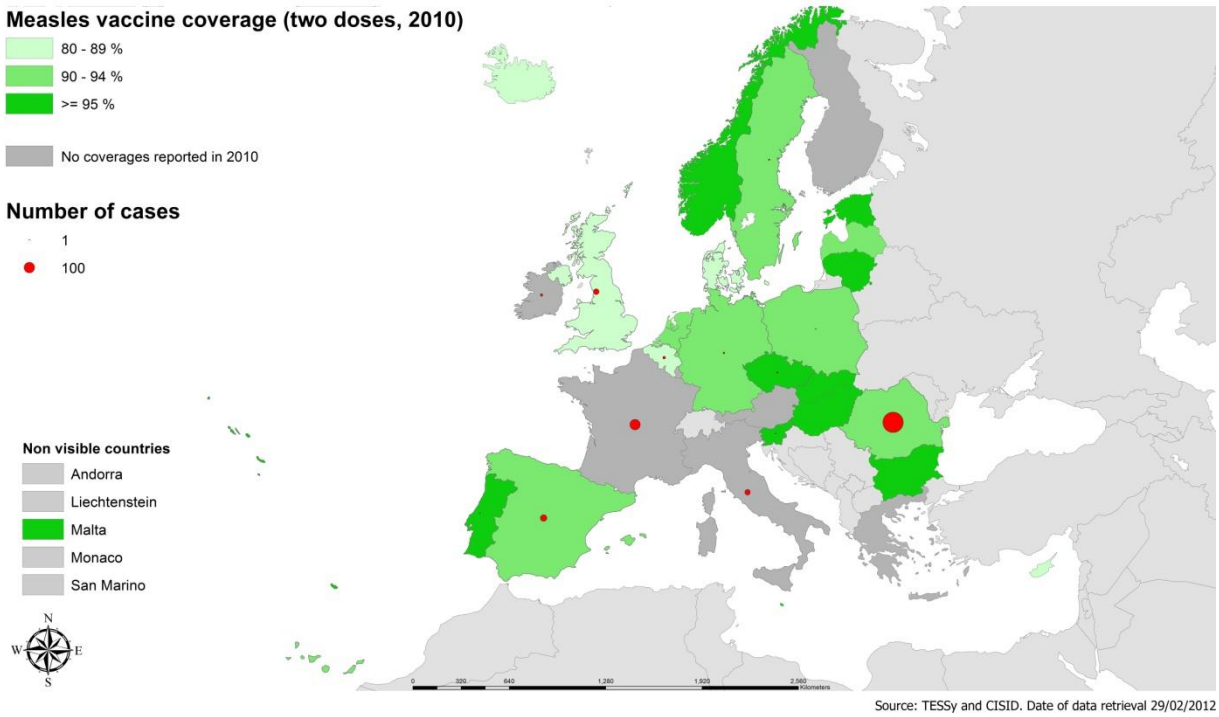
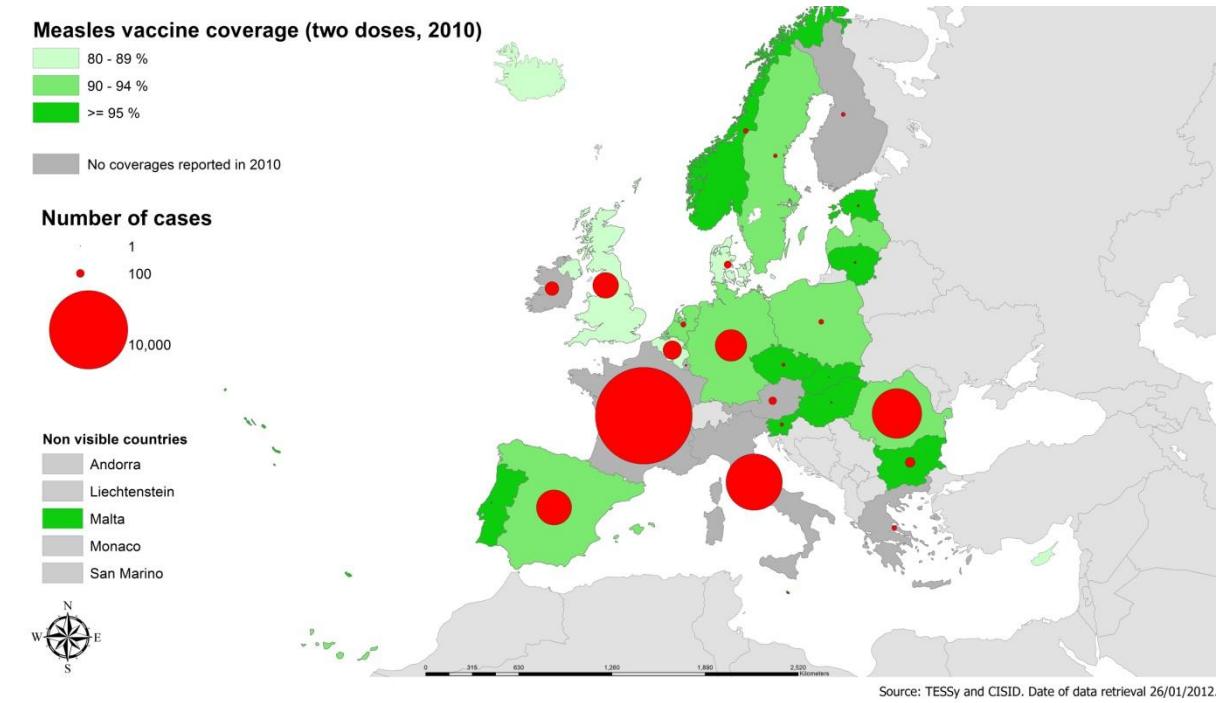
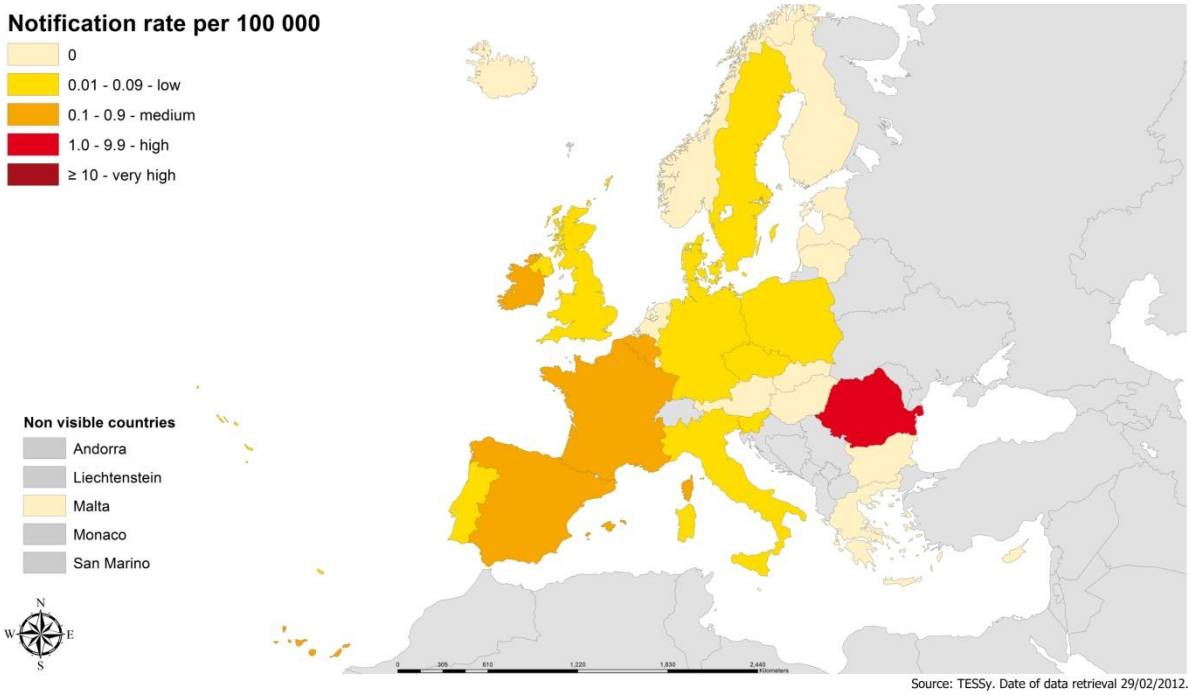


Figure 3. Distribution of measles cases reported to TESSy by EU and EEA countries for January–December 2011 (n=30 474) and two-dose measles vaccine coverage* (2010 CISID)



Source: TESSy and CISID
** Coverage figures (%) are official national figures reported via the annual WHO/UNICEF Joint Reporting Form and WHO Regional Office for Europe reports (as of 27 January 2012).*

Figure 4. Distribution of notification rates (cases per 100 000 population) by country, EU and EEA countries, 1 to 31 January 2012 (n=584)



Source: TESSy

Figure 5. Distribution of notification rates (cases per 100 000 population) by country, EU and EEA countries, January–December 2011 (n=30 474)

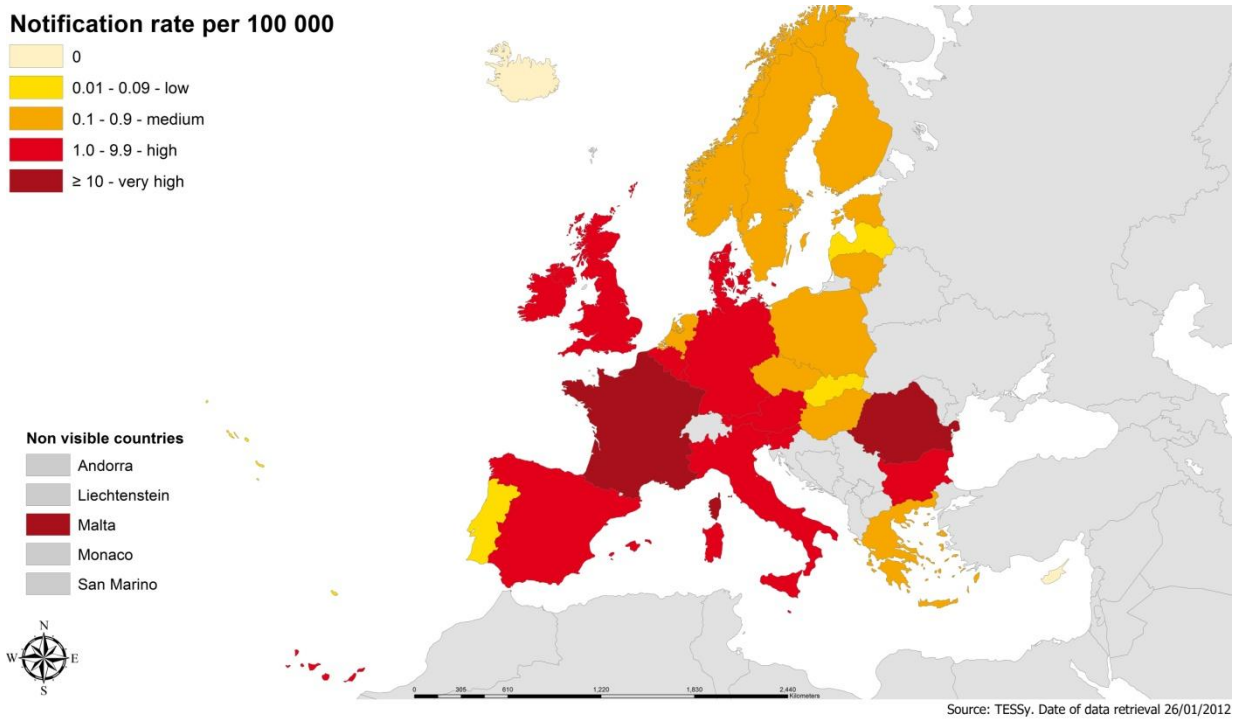
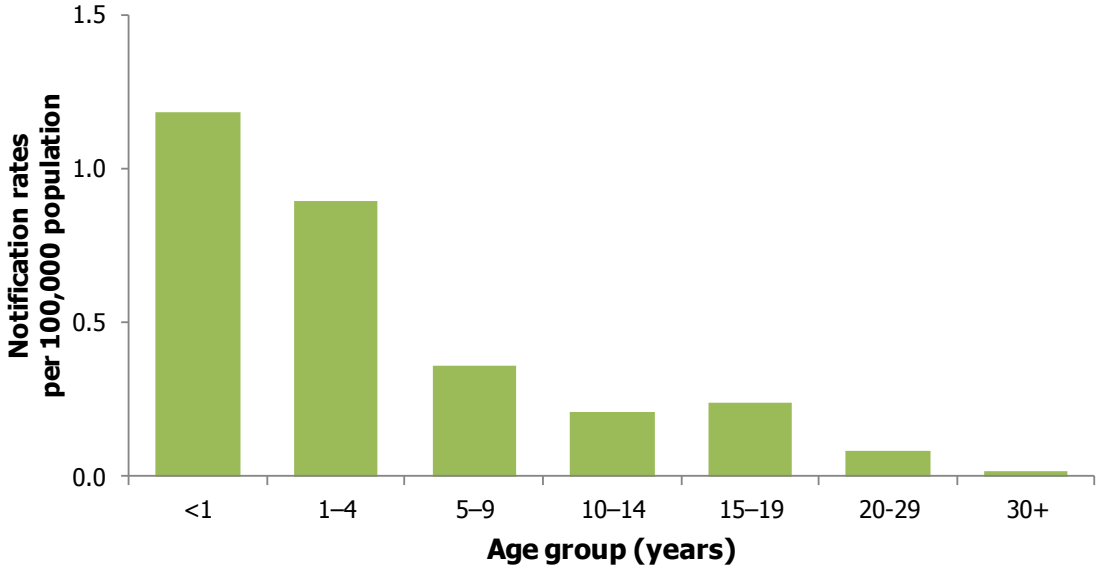


Figure 6. Notification rates (cases per 100 000 population), by age group, January 2012, EU /EEA countries (n= 584)



Source: TESSy

Epidemic intelligence

Outbreaks and clusters

Since the previous EMMO, outbreaks or clusters have been detected by epidemic intelligence in the following countries:

European Member States

Spain

Source: DiarioInformacion

Spain reported nearly 2 000 measles cases in 2011, and transmission occurred in most of its regions. The highest number of cases was recorded in April, followed by a decline during the subsequent months. Only seven cases were reported in December 2011. Since the beginning of 2012, new outbreaks have been reported in Valencia (255 cases) and in Alicante (353 cases) as of the beginning of March. The Department of Health in the region has undertaken various measures to control the outbreaks, including changing the recommended age for the first MMR dose from 15 to 12 months and promoting measles vaccinations for adults aged 20 to 45 years who are unvaccinated and do not have the disease. Family physicians and paediatricians are encouraged to trace unvaccinated population groups.

The United Kingdom

Sources: HPA, NHS Wales

Several outbreaks are ongoing in the United Kingdom. As of 6 March 2012, the HPA is investigating 48 laboratory-confirmed cases, 37 probable cases, and 108 possible cases in Merseyside. The majority of cases are children under five years who did not receive the first MMR dose at 13 months, and children who are too young to be vaccinated. A small number of adults have also been affected. In North Wales, 36 cases were diagnosed by 6 March. Thirty of the cases were associated with an outbreak in a secondary school and the remaining six cases live near the school. Letters were sent to schools and general practitioners across the region to remind them of the need to ensure up-to-date measles vaccinations. Vaccination catch-up sessions are being organised in schools in the affected area.

Sweden

Source: Smittskyddsinstitutet

Sixteen cases of measles have been notified so far in 2012, compared with 26 in the whole of 2011. Thirteen of the sixteen cases were unvaccinated and information on vaccination status was missing for three cases. Thirteen of the cases are linked to an outbreak in an anthroposophic community in Järna, a community just south of Stockholm. The index case was an adult who was infected abroad and transmitted the disease to his two children. Three of the cases in Sweden were infected abroad.

Romania

Source: Observator de Constanta (newspaper)

During the first two months of 2012, there were 110 measles cases (57 laboratory confirmed) in Constanta county. Romania reported over 4 000 cases during 2011.

Latvia

Source: Infectology Center of Latvia

Three laboratory-confirmed cases were reported. Latvia had one case of measles in 2011.

Neighbouring countries

Ukraine

Source: *Ministry of Health*

As of 3 March 2012, the Ministry of Health, Ukraine reported 4 447 cases of measles since the beginning of the year. Eighty-nine cases were reported on the last day of the period. At current, the outbreak is concentrated in the western parts of the country which borders on Hungary, Poland, and Slovakia. The epidemic is expected to accelerate and spread geographically during the measles peak transmission season from February to June. Ukraine has experienced vaccine shortages for routine childhood immunisations since 2010. The reported control measures implemented to date focus on slowing transmission through social distancing.

The country will host the European Football Championship together with Poland in June 2012. In the absence of effective control measures it is likely that measles will be circulating in Ukraine in June. Visitors to the event are encouraged to make sure they are vaccinated against measles.

Russia

Sources: Rospotrebnadzor and Regnum online

Cases of measles were registered in 47 regions of Russia in 2012. As of mid-February, nearly 1000 cases were reported in the country. The largest number of cases of measles was reported from Moscow, St. Petersburg, Volgograd and Stavropol. Control measures include free measles re-vaccination to people aged 18 to 35 years. Particular attention will be given to vaccinate occupational risk groups (health workers, teachers, students, trade workers, etc.), migrant workers, and nomadic people.

Topic of the month

The paradox of measles cases among the vaccinated

When measles occurs in partially vaccinated populations, a proportion of the infected will be vaccinated. In fact, the proportion of vaccinated among the cases will often grow with increasing vaccine uptake. This paradox is sometimes exploited by vaccine opponents as an argument against vaccination. Opponents like to conclude that measles vaccine does not provide protection against disease because many, sometimes a majority, of the cases in measles outbreaks are vaccinated. The conclusion is obviously false but you may find yourself at a loss when trying to convince an undecided audience.

When children are routinely vaccinated against measles, the vaccinated proportion of the population at risk is much larger than the unvaccinated proportion. Let us assume there are 1000 students in a school, and vaccine uptake among students is 96%, i.e. 960 students are vaccinated and 40 students are unvaccinated. None of the students had measles in the past. Next, assume an attack rate of 75% among all susceptible individuals. Among the 40 unvaccinated students, three quarters (30 students) will get measles. But how many will get measles among the vaccinated students? This is decided by the **primary** and **secondary vaccine failure** rates.

Primary vaccine failure is when a vaccinated individual fails to develop protective antibodies (seroconvert) when vaccinated.

Secondary vaccine failure is when a vaccinated individual first develops protective antibody levels but over time the antibody level falls below the protective concentration.

Primary vaccine failure can result from:

- inactive vaccine (re-constituted measles vaccine is heat sensitive and easily becomes inactivated);
- inappropriate administration of the vaccine;
- failure of an infant to seroconvert because maternal antibodies block vaccine virus replication; or
- inability in the recipient to develop antibody (humoral) immunity or cell-mediated immunity or both.

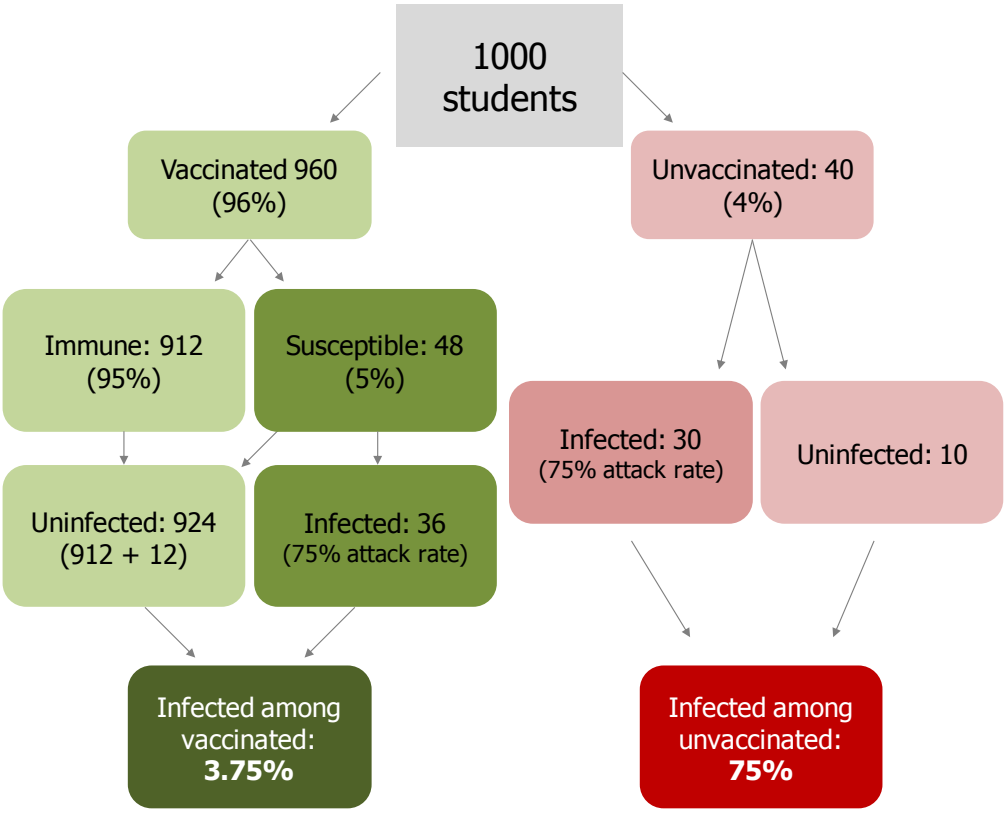
Measles vaccine efficacy is very high. When measles vaccine is administered under controlled conditions, such as during a randomised controlled vaccine trial, the efficacy is around 99%. Effectiveness during routine administration conditions is lower. WHO estimates effectiveness in developed countries to be at least 95%, which is the percentage we will use for our example.

Efficacy: The extent to which a specific intervention, procedure, regimen, or service produces a beneficial result under ideal conditions. Ideally, the determination of efficacy is based on the results of a randomised controlled trial.

Effectiveness: The extent to which a specific intervention, procedure, regimen, or service, when deployed in the field, does what it is intended to do for a defined population.

If 95% of the 960 vaccinated students have developed immunity from vaccination, then 5% (48) students are susceptible to the virus. The attack rate among the students with primary vaccine failure is 75%, the same as among those never vaccinated, so 36 of the vaccinated students will develop measles.

Among the 66 measles cases in the school, 36 (54%) belong to the vaccinated group, and 30 (46%) to the unvaccinated group. This is the point at which vaccine opponents falsely deduct that measles vaccine does not protect against measles because more than half of the infected cases have been vaccinated. How far this is from the truth becomes apparent when we look at percentages: only 3.75% (36) of the 960 vaccinated students were infected compared with 75% (30) of the 40 unvaccinated students. An unvaccinated student is in fact 20 times more likely to acquire measles compared with a vaccinated one.



Vaccine failure and its implications for measles elimination

It is important to understand the impact of primary and secondary vaccine failure on measles epidemiology and the implications for elimination strategies.

A particular form of primary vaccine failure is the impact of transplacental maternal antibodies on the vaccination of infants. Maternal antibodies block vaccine virus replication, which is required for an immune response. Approximately 85% of children develop protective antibodies when given one dose of measles vaccine at nine months of age, and 90% to 95% develop protection when vaccinated at 12 months of age. The response to measles vaccine also depends on the maturity of the immune system. This means that the efficacy of the first dose of measles vaccine is age-dependent, even in the absence of maternal antibodies. The timing of the first dose of measles vaccine is a trade-off between individual protection and herd protection. It is desirable to vaccinate as early as possible when the measles virus circulates in a population because of the increased risk of complications among infants. However, reducing the age at which the first dose is given may impact negatively on herd protection as the primary vaccine failure rate due to maternal antibody inhibition is likely to increase if the vaccine is given before 12 months of age.

The primary reason for a two-dose vaccination strategy is to provide a second opportunity for those who did not seroconvert after the first dose or did not receive the scheduled first dose at all. About 95% of the primary vaccine failures will develop immunity from the second dose, bringing the overall effectiveness of measles vaccine to above 98%. It is debated what role the second dose plays for boosting immunity. Studies of outbreaks have demonstrated an association between the elapsed time after the last vaccine dose and the risk of developing measles. People who received the last dose of measles vaccine more than 10 years ago have a small but significantly increased risk of becoming infected compared with people who received the last vaccine dose more recently.

Infants born to mothers with vaccine-induced measles immunity have lower antibody titers than infants born to naturally immune mothers. It has been speculated that the reduced exposure to wild measles virus in populations where measles has been controlled could result in increased secondary vaccine failure among adults and a shortened period of protection from maternal antibodies among infants. Although there is some evidence that this could be the case, it is not clear what the practical implications for measles elimination would be. It can be argued that if increased secondary vaccine failure rates and a shortened period of protective maternal antibodies had a significant impact on epidemiology, this would by now have become obvious since the majority of Europeans born after the 1970s have vaccine-induced immunity to measles.

One important area where this may play a role is outbreak control. If indeed the period of maternal antibody protection was getting shorter, then this would be a reason to start vaccination in younger ages. Extending vaccination to younger age groups would then be a sensible outbreak control measure because of the increased risk of acute and long-term complications from measles in infants. Vaccinating mothers and family members will also reduce the risk of unvaccinated infants to become infected as the risk of exposure to the measles virus reduces if the primary caregivers are immune.

Acknowledgements

ECDC would like to thank the Member States for reporting measles and other vaccine-preventable diseases in a timely manner to the TESSy database.

Related links

More information about measles is available on the ECDC website:
http://ecdc.europa.eu/en/healthtopics/Pages/Measles.aspx

Information about vaccines and immunisation from the World Health Organization's Regional Office for Europe website. Available at:
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:
EUVAC-Net

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 and other vaccine-preventable diseases to TESSy at their own convenience. This implies that the date of retrieval can influence the presentation of data. For this reason, the date of data retrieval is indicated for all EMMO issues. The date of retrieval for this issue was 29 February 2012. Inconsistencies with measles data reported in previous issues might arise as countries may update their data in TESSy retrospectively.