

SURVEILLANCE REPORT

European monthly measles monitoring (EMMO)

Issue 8: 21 February 2012

Main developments

- In 2011, 30 567 cases of measles were reported by the 29 contributing EU and EEA/EFTA countries. This is effectively the same number of cases as was reported in 2010 (30 264 cases) but a four-fold increase compared with 2009 (7 175 cases) and 2008 (7 817).
- Five countries – France, Italy, Romania, Spain and Germany – accounted for more than 90% of all measles cases reported in 2011.
- Twenty-four of the 29 contributing countries reported more measles cases in 2011 than in 2010.
- Only two countries remained measles-free in 2011: Iceland and Cyprus.
- There is an ongoing measles outbreak in Ukraine with focus in the western part of the country bordering Hungary, Poland and Slovakia. More than 3 000 cases have been reported so far in 2012. Ukraine will host the European Football Championship together with Poland in June 2012 and large numbers of visitors are expected. Unvaccinated participants and spectators will be at risk of measles infection.

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 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 26 January 2012 and the analysis covers the period from 1 January to 31 December 2011. All 29 countries reported case-based data for the entire period.

In 2011, 30 567 measles cases were reported to TESSy (Table 1), effectively the same number as for 2010 (30 264 cases) but considerably more cases than in 2009 (7 175 cases) and 2008 (7 817 cases). France reported the most cases as well as the highest notification rate per 100 000 population, and accounted for more than half of the cases. Other countries with a high number of cases were Italy, Romania, Spain and Germany. Together, these five countries accounted for more than 90% of all measles cases in the EU. Bulgaria, which experienced a large outbreak with more than 22 000 cases in 2010, reported only 157 cases in 2011. However, the decrease in case numbers in Bulgaria was offset by an increase in most of the other EU countries. Twenty-four countries reported more cases in 2011 than in 2010. Countries with marked increases in the number of cases include Belgium, Denmark, Finland, France, Italy, Norway, Romania, Slovenia, Spain, Sweden and the United Kingdom. The notification rate was higher or equal to one case per 100 000 population in 14 of the 29 reporting countries (Table 1, Figure 3). Only Cyprus and Iceland remained measles free during 2011 (Table 1, Figure 3). Hungary, which had not reported any measles cases in the last two years, notified one imported case* and four import-related* cases in December 2011.

One case of measles encephalitis has been reported since the previous [report](#), bringing the number of encephalitis cases to 27 in 2011, while measles-related deaths remain at eight. Data on outcomes and complications of measles are still incomplete in TESSy (Table 2): outcome was missing for 24% of the reported cases and more than 40% of reports from Belgium, Finland, Ireland and Italy did not include the outcome. Information on complications was missing from 75% of the case reports.

Of the reported cases, 43% (13 058 cases) were classified as laboratory confirmed, 23% (6 989 cases) as probable, 33% (10 194 cases) as possible, and 1% (326 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-old (44.0 cases per 100 000 population), followed by children aged between 1 and 4 years (24.3 cases per 100 000 population) (Figure 4).

Vaccination status was known for 83% (25 488) of the reported cases. Of these, 82% (20 902) were unvaccinated and 18% (4 586) vaccinated. Among those vaccinated, 74% (3 397) had received one dose of measles vaccine, 20% (920) had received two or more doses and 6% (269) had received an unknown number of doses. Among the cases with a known number of vaccinations, 96% were either unvaccinated or had received only one vaccine dose, while 4% had received two or more doses.

Importation status was reported for 70% (21 290) of cases. Of those, 96% (20 540 cases) were infected in their country of residence, 3% (716 cases) were infected abroad and recorded as imported cases*, and 0.2% (34 cases) were import-related*.

* An 'imported case' is defined as a case in which the source of infection was outside the country of residence, and the person in question was travelling abroad during the incubation period prior to the onset of the rash (measles: 7–18 days; rubella: 12–23 days). Classification as an imported case is also supported by epidemiological and/or virological evidence of foreign-acquired infection. An 'import-related' case is a case epidemiologically linked to an imported case, as supported by epidemiological and/or virological evidence. All import-related cases are to be considered as indigenous cases. See also: WHO. Surveillance guidelines for measles, rubella and congenital rubella syndrome in the WHO European Region. Copenhagen: WHO Regional Office for Europe; 2009.

Table 1. Number of measles cases by month, notifications per 100 000 population, and comparison with previous reporting period in 2010; EU and EEA countries, 2011

Country	January	February	March	April	May	June	July	August	September	October	November	December	Jan–Dec 2011		Jan–Dec 2010	
													No. of cases	Notifications per 100 000 pop.	No. of cases	Notifications per 100 000 pop.
Austria	7	5	5	9	18	33	16	4	2	0	0	0	99	1.2	43	0.5
Belgium	7	23	140	98	122	86	41	9	13	4	9	3	555	5.1	40	0.4
Bulgaria	76	27	27	6	18	1	0	0	1	0	1	0	157	2.1	22005	290.9
Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	2.2
Czech Rep.	0	0	4	4	4	0	1	3	0	0	0	1	17	0.2	0	0
Denmark	7	13	23	19	19	0	2	0	0	0	0	0	83	1.5	5	0.1
Estonia	0	0	4	1	1	1	0	0	0	0	0	0	7	0.5	0	0
Finland	1	1	1	4	12	2	0	5	2	1	0	0	29	0.5	5	0.1
France	1560	2447	3716	3304	2267	926	408	148	89	80	121	140	15206	23.4	5019	7.8
Germany	48	89	177	385	429	237	119	57	22	17	21	8	1609	2.0	780	1
Greece	0	2	6	17	10	2	0	3	0	0	0	0	40	0.4	149	1.3
Hungary	0	0	0	0	0	0	0	0	0	0	0	5	5	0.1	0	0
Iceland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ireland	0	5	11	17	12	30	33	65	72	33	20	5	303	6.8	403	9.0
Italy	336	340	577	920	1303	849	415	176	99	60	54	52	5181	8.5	863	1.4
Latvia	0	0	0	0	0	0	0	1	0	0	0	0	1	0.04	0	0
Lithuania	0	0	0	1	2	4	0	0	0	0	0	0	7	0.2	2	0.1
Luxembourg	0	0	1	0	2	1	0	1	1	0	0	0	6	1.2	0	0
Malta	0	1	0	1	0	0	0	1	1	0	0	0	4	1.0	0	0
Netherlands	2	1	10	16	11	5	0	1	0	0	0	0	46	0.3	15	0.1
Norway	4	12	7	2	3	5	1	1	2	1	0	0	38	0.8	3	0.1
Poland	1	2	1	3	9	5	1	10	5	1	0	0	38	0.1	13	0
Portugal	0	0	1	0	0	0	0	0	0	0	0	1	2	0.02	5	0
Romania	131	192	402	396	514	455	377	286	247	214	357	444	4015	18.7	187	0.9
Slovakia	0	0	0	1	0	1	0	0	0	0	0	0	2	0.04	0	0
Slovenia	0	0	0	2	1	7	12	0	0	0	0	0	22	1.1	2	0.1
Spain	100	162	252	448	362	181	162	93	78	64	77	7	1986	4.3	304	0.7
Sweden	4	1	1	8	4	1	2	1	0	0	4	0	26	0.3	6	0.1
UK	31	33	143	173	186	133	105	60	54	73	63	29	1083	1.7	397	0.6
Total	2315	3356	5509	5835	5309	2965	1695	925	688	548	727	695	30567	6.0	30264	6.0

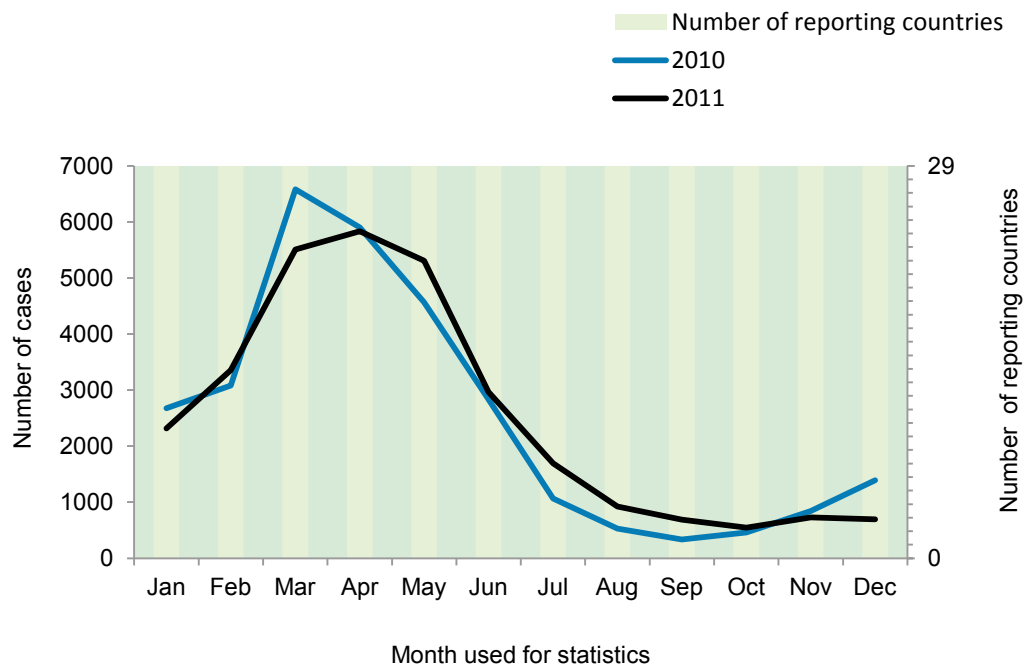
Source: TESSy.

Notification rates were calculated using the most recent population estimates available from Eurostat (nr = no data reported). Countries with a notification rate ≥ 1.0 per 100 000 population in 2011 are highlighted in green.

Table 2. Outcomes and complications of measles, reported by EU and EEA countries, January–December 2011

Outcome	Number of cases	%
Deaths	8	0.03
Cases with information on outcome status	23 317	76.3
No information provided/unknown	7 242	23.7
Complications		
Encephalitis	27	0.1
Pneumonia	1 482	4.9
Diarrhoea	149	0.5
Otitis media	234	0.8
Other complications	1 841	6.0
No complications	3 921	12.7
No information provided / unknown	22 913	75.0
Total cases	30 567	

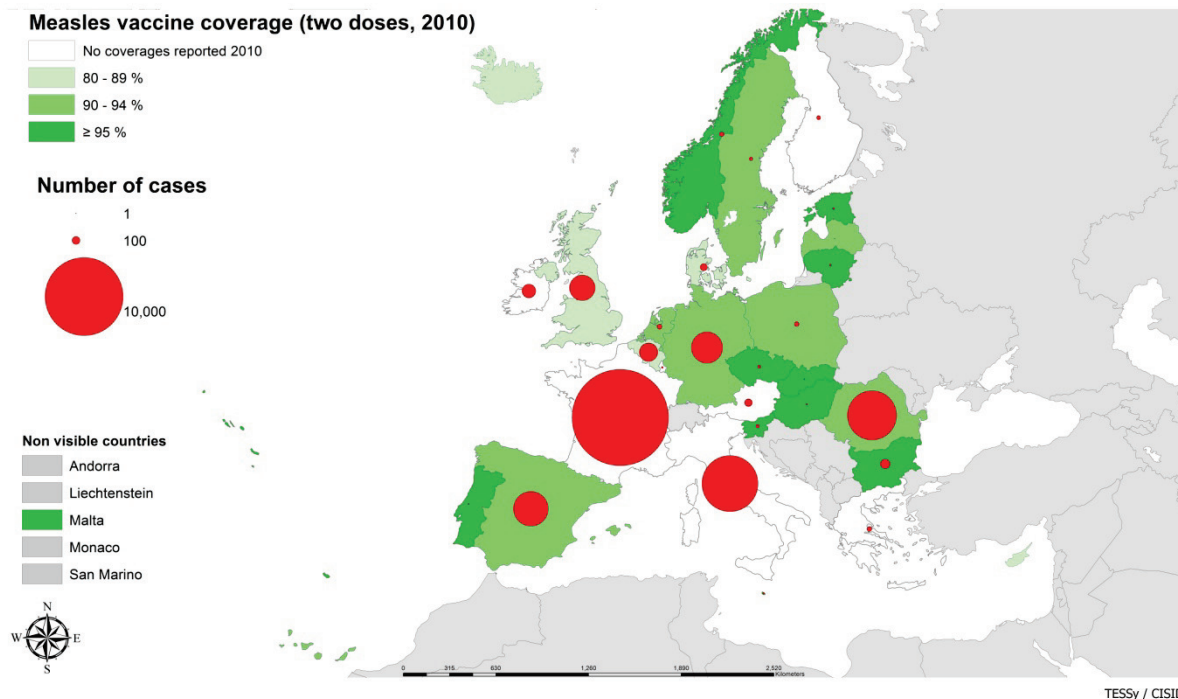
Source: TESSy.

Figure 1. Distribution of measles cases in 2011 and 2010 and number of countries reporting in 2011, 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.

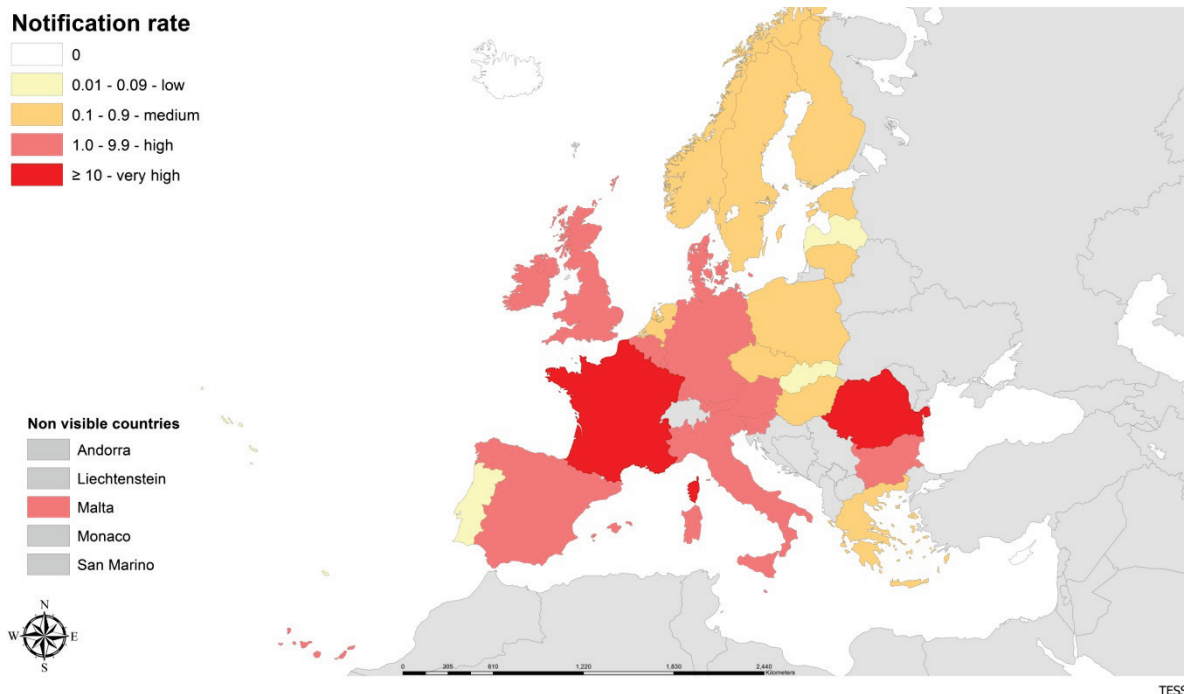
Figure 2. Distribution of measles cases reported to TESSy by EU and EEA countries for 2011 (n=30 567) and two-dose measles vaccine coverage* (2010 CISID)



Sources: TESSy and CISID.

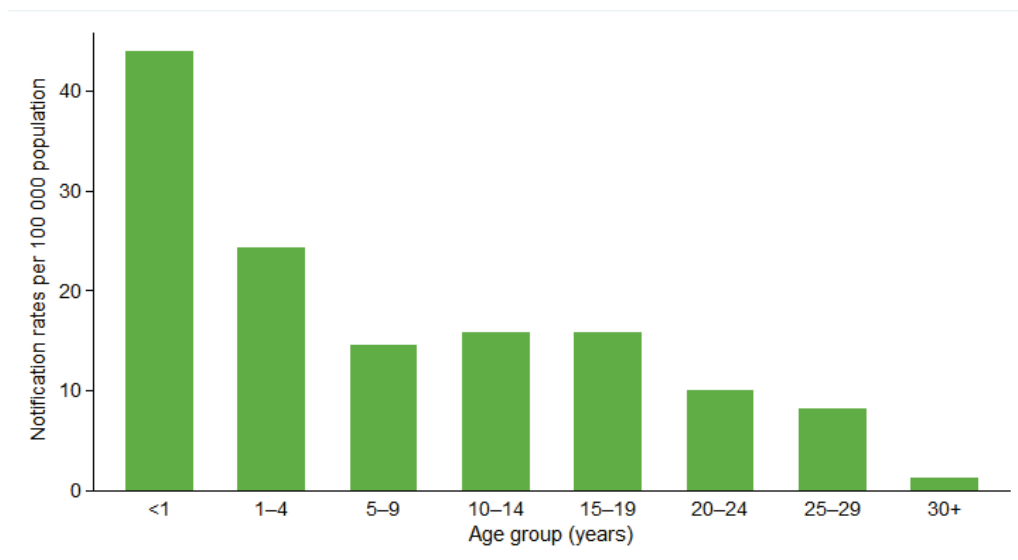
*Coverage figures (%) are official national figures reported via the annual WHO/UNICEF Joint Reporting Form and WHO Regional Office reports (as of 27 January 2012).

Figure 3. Distribution of notification rates (cases per 100 000 population) by country, EU and EEA countries, 2011 (n=30 567)



Source: TESSy

Figure 4. Notification rates (cases per 100 000 population), by age group, January – December 2011, EU and EEA countries (n= 30 158)



Source: TESSy.

Epidemic intelligence

New outbreaks and clusters

No new outbreaks have been detected in EU Member States.

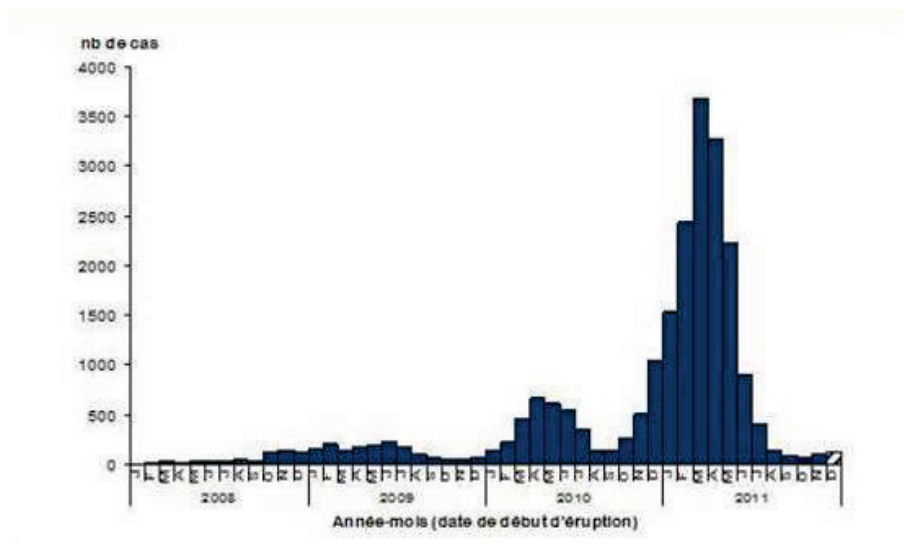
Updates on ongoing outbreaks and endemic transmission

France

Source: *Institut de Veille Sanitaire*

Close to 22 000 cases of measles have been reported since 1 January 2008. The outbreak accelerated during the last year with nearly 15 000 cases and six deaths reported. Sixteen patients developed neurological complications and 650 suffered severe respiratory complications. A sharp decrease in the number of reported cases started in May 2011, signalling the end of the third wave of the outbreak. During the last week of December 2011, there was an increase in the number of reported cases, approximately of the same magnitude as that observed in late 2009–early 2010, suggesting the possible start of a fourth epidemic wave.

Figure 5. Distribution of reported measles cases by month, January 2008 – December 2011, France



Source: *Institut de Veille Sanitaire*.

Romania

Source: *romanialibera*

New local outbreaks were reported in the media, with 14 hospitalised children in Satu Mare and 15 cases at a Theological seminary in Arad, some of whom required hospitalisation. Romania reported over 4 000 cases of measles in 2011 and the country is also experiencing a simultaneous outbreak of rubella. Co-circulation of measles and rubella viruses is not unexpected considering that measles and rubella antigens are usually administered in a combination vaccine (MMR – measles, mumps and rubella). Rubella vaccine was first introduced in Romania in 2003 for girls aged 13–14 years, followed in 2004 by universal MMR-1 at 12–15 months of age and a second dose of MMR in the first year of school in 2005. This means that most women of reproductive age in Romania depend on natural rubella immunity for protection against congenital rubella syndrome (CRS). Rubella outbreaks are in general less frequent than measles outbreaks in populations with equal vaccine uptake because of rubella's lower R_0 .

Spain

Sources: *Instituto de Salud Carlos III, Las Provincias, DiarioInformacion*

Spain has had nearly 2 000 measles cases during 2011 with a peak in the reported number of cases in April and a decline during the summer months. Only seven cases were reported in December 2011. During last week local outbreaks in Valencia and Alicante were reported in the media. One hundred and seven cases have been reported this year across the whole country as of 6 February 2012.

Ukraine

Source: *Ministry of Health*

As of 9 February 2012, the Ministry of Health in Ukraine has reported 3 162 cases of measles since the beginning of the year. Eighty-five cases were reported on the last day of that period. The outbreak is concentrated in the western parts of the country. Ukraine 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 still be circulating in Ukraine in June and visitors to the event are encouraged to make sure they are vaccinated against measles.

Russia

There are ongoing outbreaks reported by the media in several regions, such as Volgograd, Chechnya and North Ossetia as well as in major cities like St. Petersburg and Moscow.

Belarus

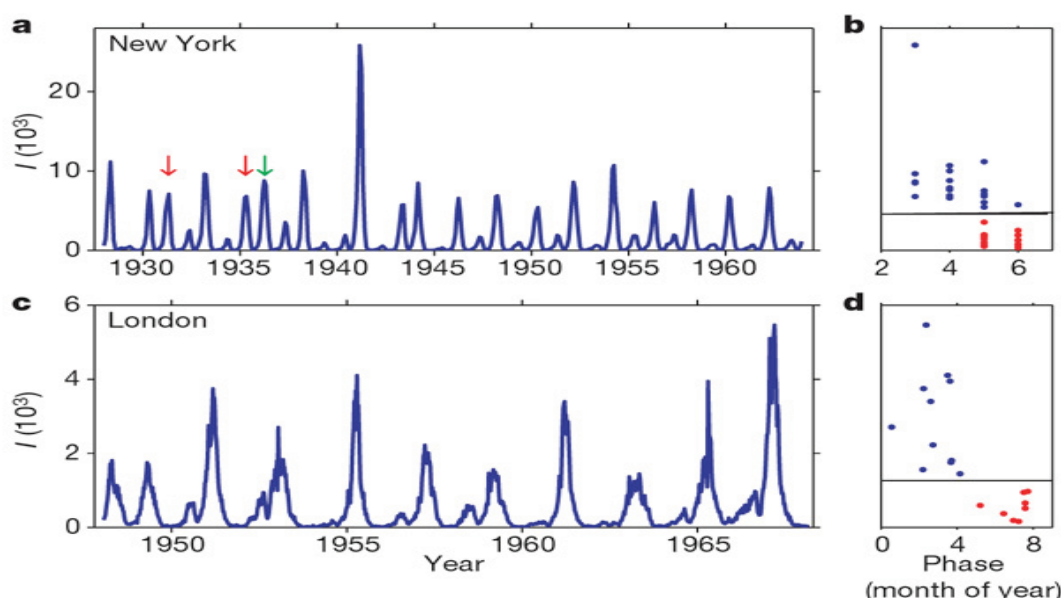
An outbreak involving eight people has been reported in the Brest district bordering Poland and Ukraine. A vaccination campaign is planned to be carried out in February and March.

Topic of the month

On the ups and downs of measles

Measles spreads very easily. The basic reproductive number (R_0) has been estimated at 15–20, which means that one case of measles will result in at least 15 new infections when introduced into a fully susceptible population. It is, in fact, one of the most infective viruses known. In the pre-vaccine era, measles transmission in Europe followed distinct and statistically significant biennial cycles. Major outbreaks every second year alternated with minor outbreaks in the intervening years (Figure 6). The major outbreaks normally peaked between March and May while the minor outbreaks peaked a little later in the year. With the exception of small and isolated populations, such as those of Iceland and the Faeroe islands, development of natural immunity during childhood was close to universal in the pre-vaccine period of the 20th century. Serology data from Denmark in 1983, three years before the introduction of measles vaccine, showed that more than 98% of 10-year-old children were immune to measles ($n=2\ 253$). In the large cities and densely populated areas of Europe, measles continued to circulate at a low transmission rate between outbreaks and new outbreaks were not dependent on reintroduction of the virus from outside. Once two birth cohorts of susceptible children had accumulated, the conditions would once again be favourable for a major outbreak. Observations and modelling show that a population of about 250 000–500 000 people is required for measles to remain endemic in a population.

Figure 6. Measles transmission in the pre-vaccine era in the USA and the UK



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Explanation: Graphs a and c show measles incidence per 1000 population in New York and London respectively, while graphs b and d show the month of the year when major outbreaks (blue dots) and minor outbreaks (red dots) peaked. The horizontal lines in graphs b and d show the mean annual incidence over the period.

The dynamics are different in smaller and isolated populations in which the susceptible individuals will quickly be depleted and the outbreak will 'burn out' naturally. Because there is no reservoir for measles once the chain of transmission is broken, the timing of the subsequent outbreak depends on reintroduction of the virus from outside. Outbreak patterns in small populations and in scarcely populated areas are less predictable than for densely populated urban areas. The classic outbreak in the Faeroe Islands in 1846, famously documented by the Danish physician Peter Ludvig Panum, and the well documented outbreaks in Iceland during the 20th century provide examples of this epidemiological pattern.

The introduction of measles vaccination in Europe in the 1960s and 1970s dramatically changed the epidemiology of measles. The proportion of a population which must be immune in order for transmission to be interrupted is called the critical proportion and its size depends on R_0 . It is estimated that vaccination uptake with two doses of measles vaccine must be sustained at a level above 95% for population immunity to remain above the critical proportion. This is a pragmatic target since the basic reproductive number (R_0) is determined by several factors which are specific for any given population, such as birth rate, population density, age distribution and mixing patterns. While some EU countries virtually eliminated measles within a few years after introducing measles vaccination, other countries who failed to achieve the high vaccination uptake required for interruption of transmission, noticed only limited impact on incidence. Vaccination coverage below the critical proportion will result in prolonged inter-epidemic intervals and reduced force of infection (slower transmission). Thus, countries with sub-optimal vaccine uptake will experience slowly propagating outbreaks at longer intervals unless the number of

immune people is kept above the critical proportion through catch-up vaccination campaigns at regular intervals. Longer inter-epidemic intervals will have an effect on the age distribution of cases during outbreaks. Although the highest age-specific incidence is normally among the youngest children, particularly those too young to have been immunised, the number of cases among older children, teenagers and adults will be much higher than it was in the pre-vaccination era. The level of population immunity will also influence the epidemic curve. The rapidly evolving outbreaks over 6–8 months in the pre-vaccine era have been replaced by comparatively slowly propagating outbreaks over longer periods, sometimes several years. The seasonal variation, with the highest incidence in the Spring, is often maintained during these multi-year outbreaks. The 2009–2011 outbreak in France with, so far, three distinct epidemic waves provides an illustrative example (Figure 5).

In populations in which measles transmission has been interrupted by vaccination, the timing of the next large outbreak is basically determined by two factors: the accumulation of susceptible individuals above the critical proportion and the re-introduction of measles virus through importation of an infective case. It is therefore of critical importance for countries to monitor the susceptible proportion of the population in addition to detecting and controlling imported outbreaks. Immunity can be estimated indirectly by monitoring vaccine uptake over time. However, few countries have national vaccination registries or other administrative systems which are complete enough to generate reliable estimates of the risk of measles outbreaks. Because vaccination registries will normally not record ethnicity or the socio-economic status of children, pockets of low vaccine uptake are easily missed, particularly when the data are aggregated. Such pockets of low vaccine uptake can be found in specific geographical areas, in ethnic groups or along socio-economic divisions. A more sensitive method which better predicts the risk of an outbreak is to measure immunity to measles in representatively sampled blood tests. Convenience testing of measles antibodies can be done from blood samples collected from children admitted to hospital (testing of residual sera). Routine screening of antibodies to rubella, HIV and hepatitis B for pregnant women offers another opportunity for directly measuring measles immunity. Routine antenatal care includes testing for rubella antibodies in many countries. Rubella immunity among pregnant women is indicative of measles vaccine uptake during childhood if the woman was born after MR or MMR vaccine was introduced.

Other news

Rubella outbreak in Romania

There has been an ongoing rubella outbreak in Romania since October 2011. As of the beginning of February 2012, more than 3 700 cases have been reported. Thirty-two of 42 districts have been affected, mostly in the north-western part of the country. Rubella is a milder disease than measles with fewer and less serious complications; the important exception being infection during pregnancy. Rubella infection during the first part of pregnancy is associated with a high risk of intra-uterine death and congenital foetal defects including blindness, deafness, heart malformations and cognitive impairment, a condition often referred to as Congenital Rubella Syndrome, CRS.

Fatal measles without rash in an adult, France

A fatality from measles with acute respiratory distress syndrome, but without rash, has been reported in a study published in US CDC's *Emerging Infectious Diseases* journal underscoring the need for physicians to consider the diagnosis of measles, even in the absence of classical clinical features, during measles outbreaks.

WHO epidemiological briefs

A new epidemiological brief has been published on [WHO European Region website](#).

Increased transmission and outbreaks of measles in Europe, 2011

[The Journal of the American Medical Association](#) has published an article on the European measles outbreaks during 2011.

Acknowledgements

ECDC would like to thank the Member States for reporting measles and other vaccine preventable diseases in a timely manner in 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](http://www.euro.who.int/en/what%20we%20do/health%20topics/communicable%20diseases/measles%20and%20rubella)

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 26 January 2012. Inconsistencies with measles data reported in previous issues might arise as countries may update their data in TESSy retrospectively.