

Challenges in Eliminating Measles and Rubella in Europe

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6th Danish Paediatric
Infectious Disease Symposium,
Copenhagen, Denmark

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Smallpox



Poliomyelitis



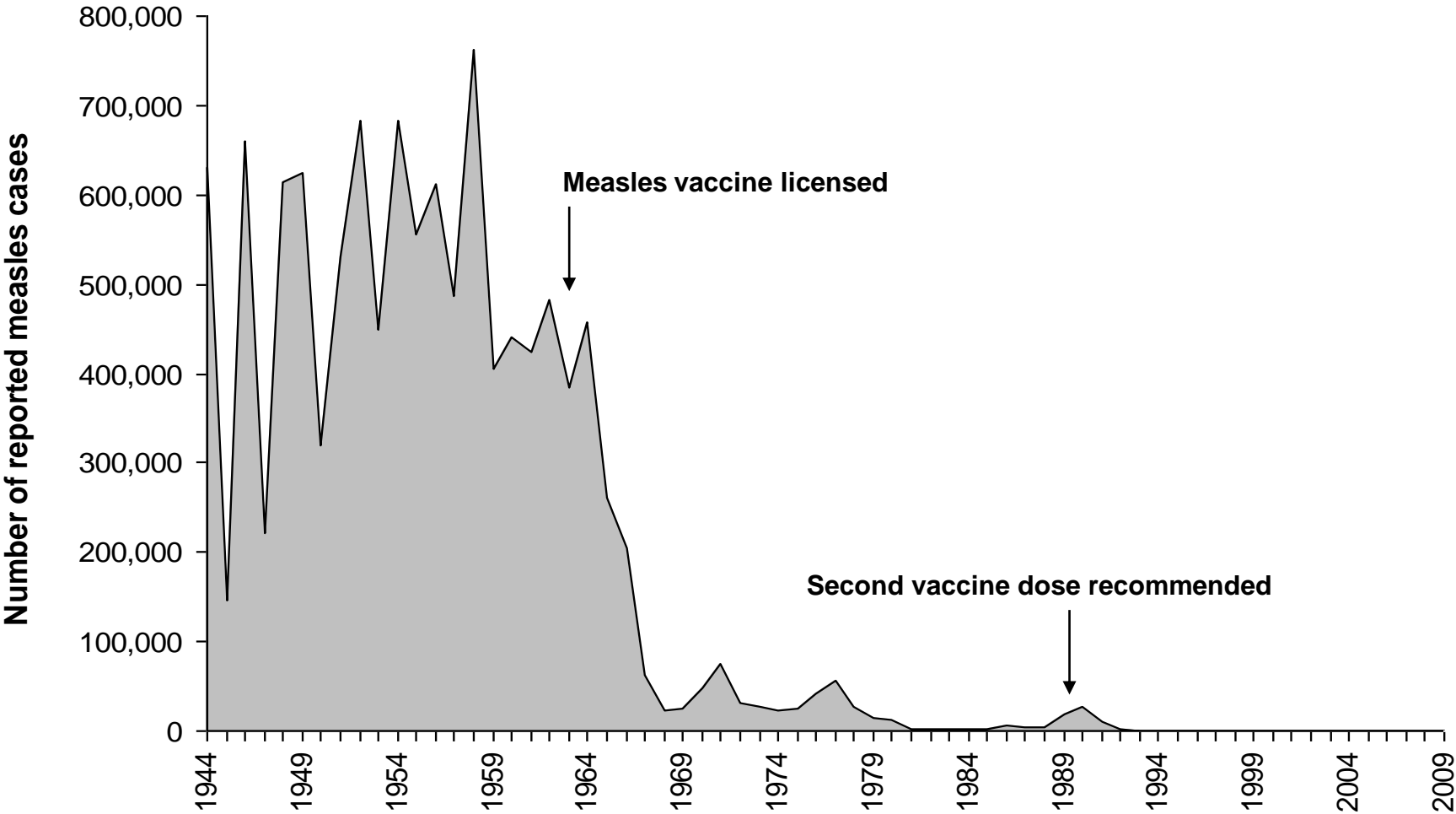
Rationale for eliminating measles

- Measles is a major cause of vaccine-preventable morbidity and mortality worldwide

Elimination: The interruption of indigenous transmission.

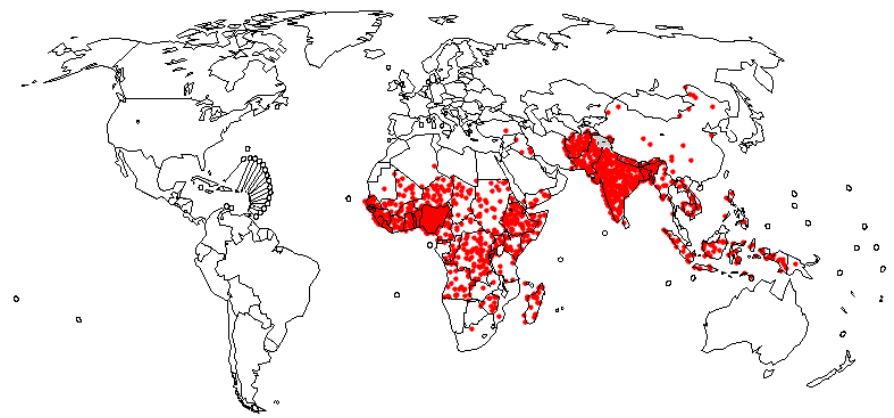
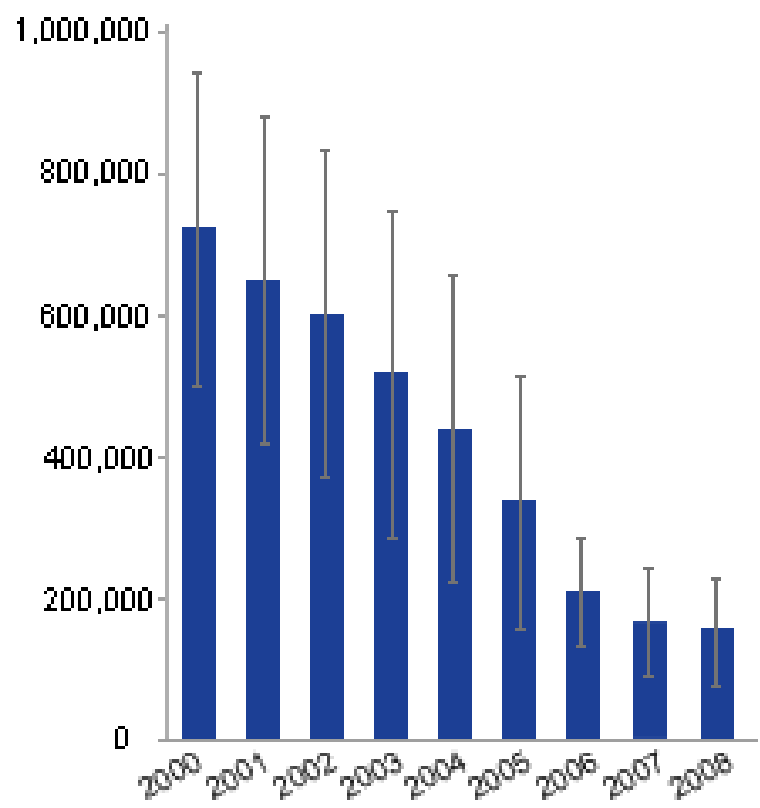
There may still be imported cases but circulation of the virus following importation ends naturally without intervention, usually after a limited number of generations of disease transmission.

Reported measles cases in the United States, 1944-2009

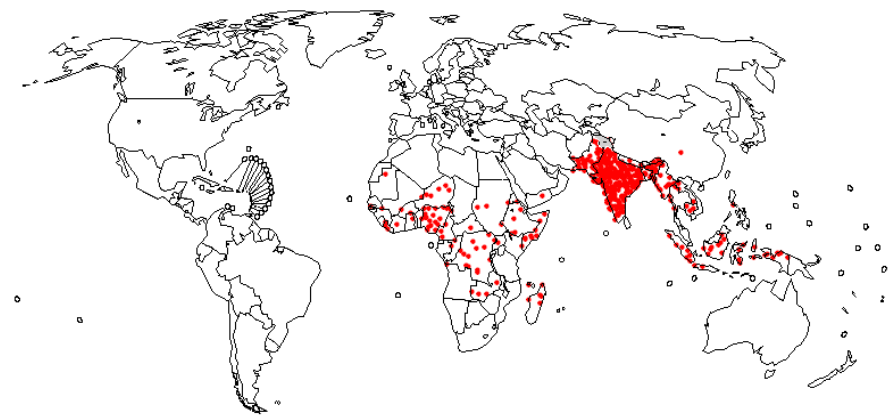


Data source: MMWR, CDC

Estimated number of measles deaths worldwide during 2000-08



2000 733 000 deaths



2008 164 000 deaths

● = 500 deaths Dots are randomly distributed in countries

Source: WHO, CDC

Measles and rubella are targeted for elimination in the European region



WHO European Region:

53 Member States

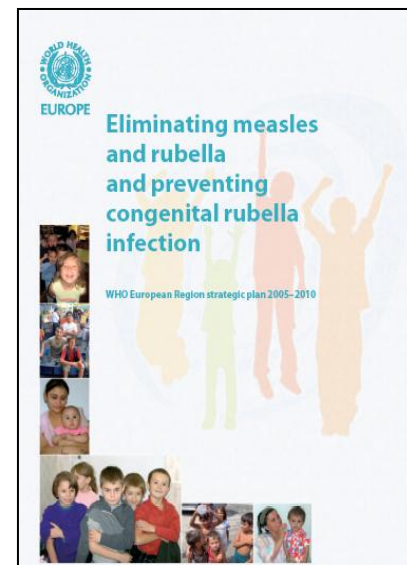
| | |
|------------|-------------|
| Population | 900,000,000 |
| Infants | 11,000,000 |
| < 5yr | 55,000,000 |
| <15yr | 157,000,000 |



New goal: 2015

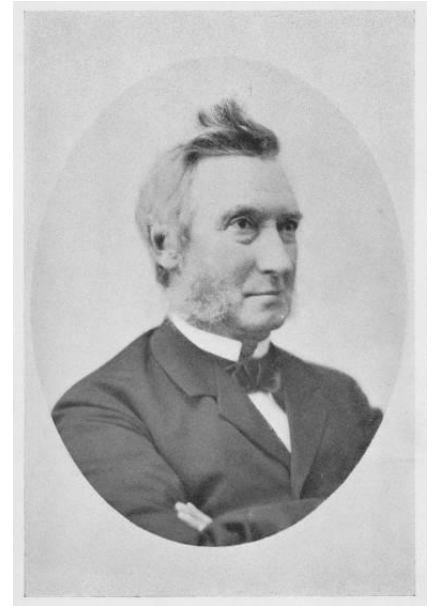
Measles and rubella elimination strategies

1. Achieve and sustain very high coverage ($\geq 95\%$) with two doses of measles and at least one dose of rubella vaccine through high-quality routine immunization services.
2. Provide a second opportunity for measles immunization through supplementary immunization activities to populations susceptible to measles.
3. Provide rubella vaccination opportunities, including supplementary immunization activities, to all rubella-susceptible children, adolescents and women of childbearing age.
4. Strengthen surveillance systems
5. Improve the availability of high-quality information for health professions and the public



“Observations made during the epidemic of measles on the Faroe Islands in the year 1846”

- Confirmed that measles was infectious
- Defined the 14-day interval between exposure and appearance of rash
- Recognized the higher case-fatality at the extremes of age
- Infection provided life-long immunity



**Peter Ludwig Panum
(1820-1885)**

Measles

- Highly contagious viral disease
- Fever, conjunctivitis, cough, coryza, rash
- Complications:
 - *Otitis media*
 - *Pneumonia*
 - *Diarrhoea*
 - *Encephalitis*
 - *Subacute-sclerosing panencephalitis*
- More severe in:
 - *infants and adults*
- High case fatality in developing countries



Rubella

- Viral disease caused by rubella virus
- Low-grade fever, headache, malaise, mild coryza and conjunctivitis, lymphadenopathy (post-auricular, occipital, posterior cervical), rash
- Rash indistinguishable from:
 - *Measles*
 - *Parvovirus B19*
 - *Coxsackie virus*
 - *Adenovirus*
 - *Scarlet fever*
- Complications:
 - *Arthralgia*
 - *Arthritis*
 - *Encephalitis (1:6000 cases)*
- Congenital rubella syndrome occurs in 90% of women infected in the first 10 weeks of pregnancy



Objectives

- To describe the epidemiology of measles and rubella in relation to the goal of elimination by 2015.
- To describe individuals susceptible to measles and to provide an overview of affected groups, and the public settings in which measles transmission occurred in Europe in 2005–09.
- To demonstrate the role of importations of measles and rubella virus

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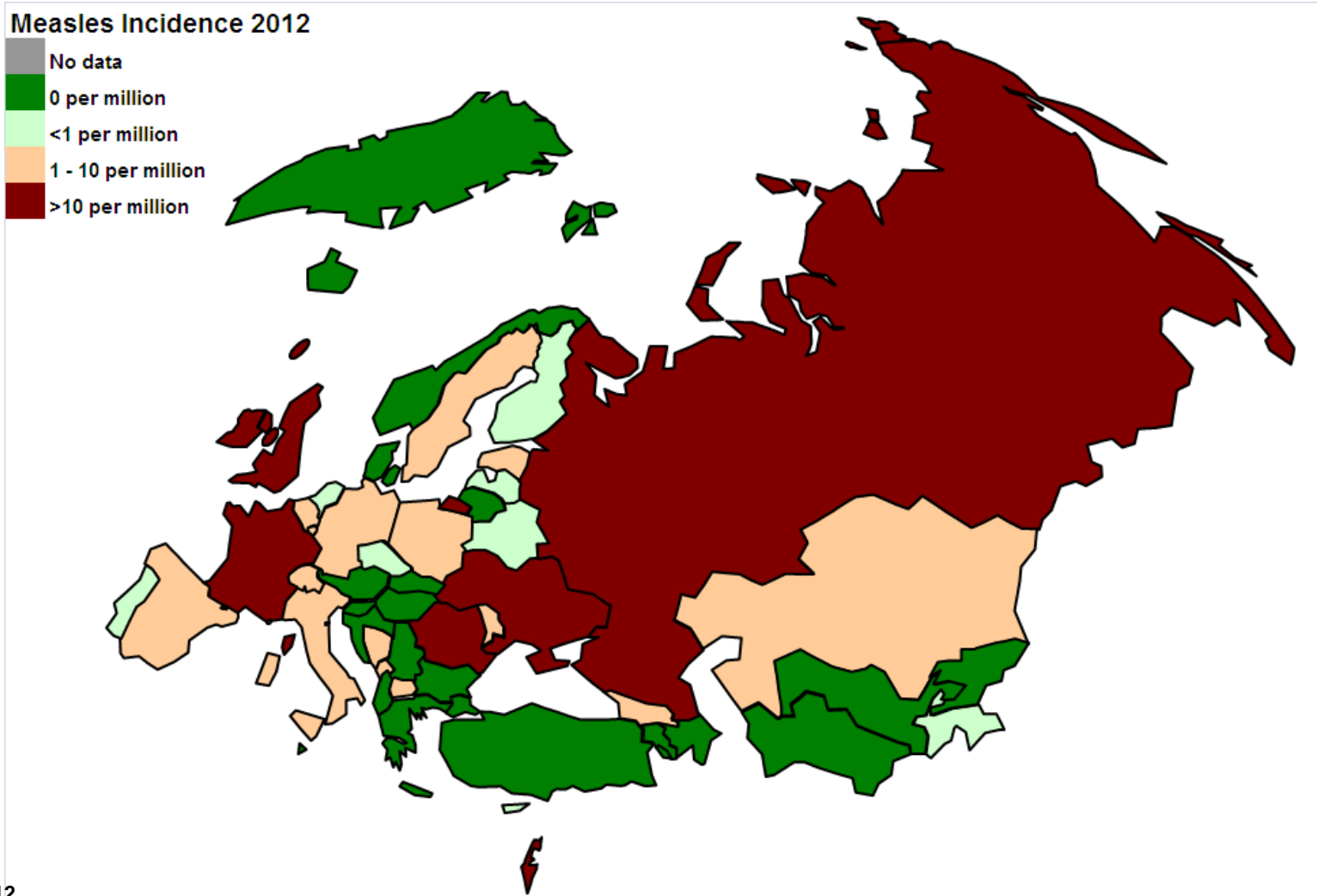
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Objective 1

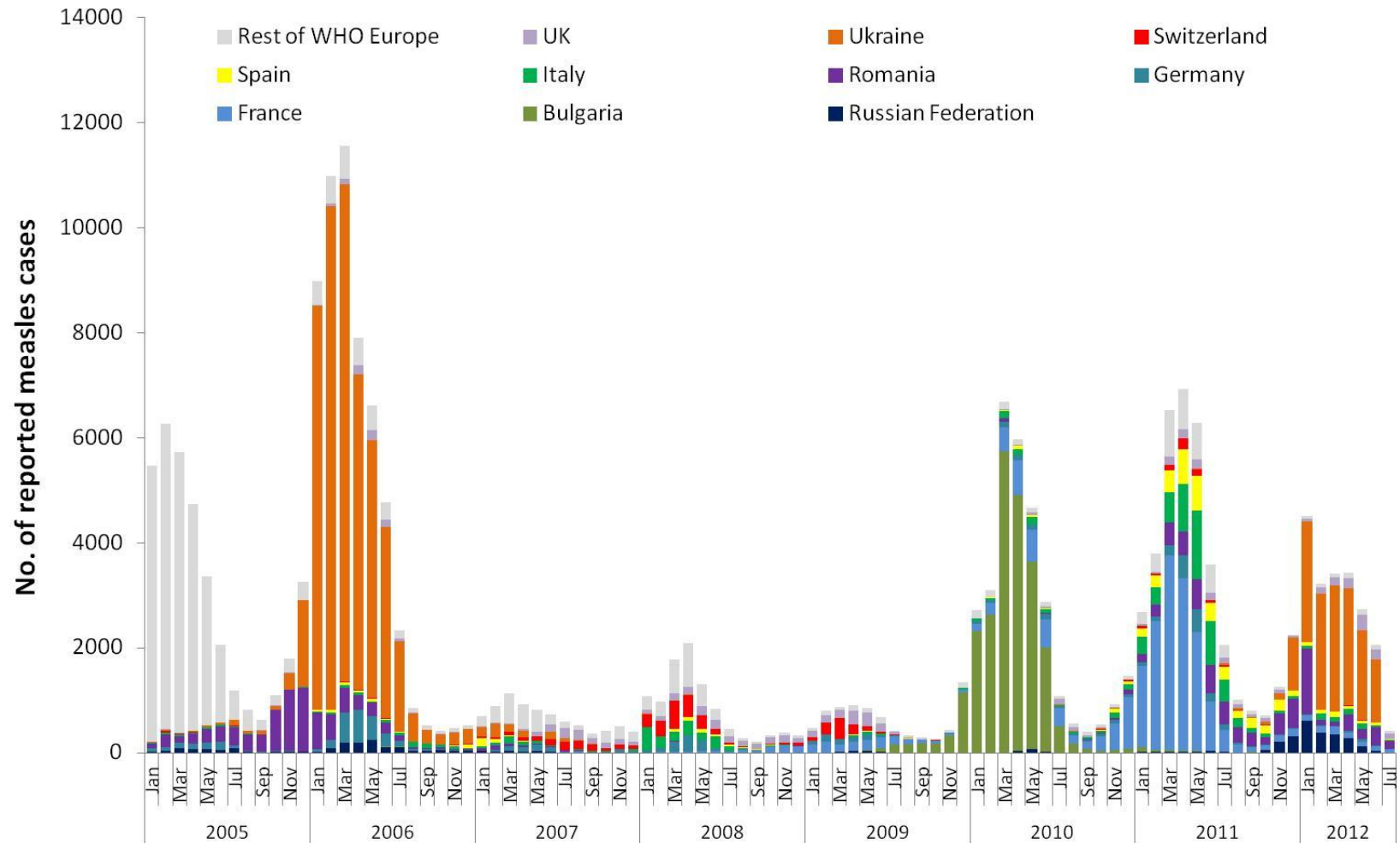
The statistics

To assess the epidemiology of measles and rubella in relation to the goal of elimination by 2015.

Incidence of measles per 100,000 inhabitants, 2012*



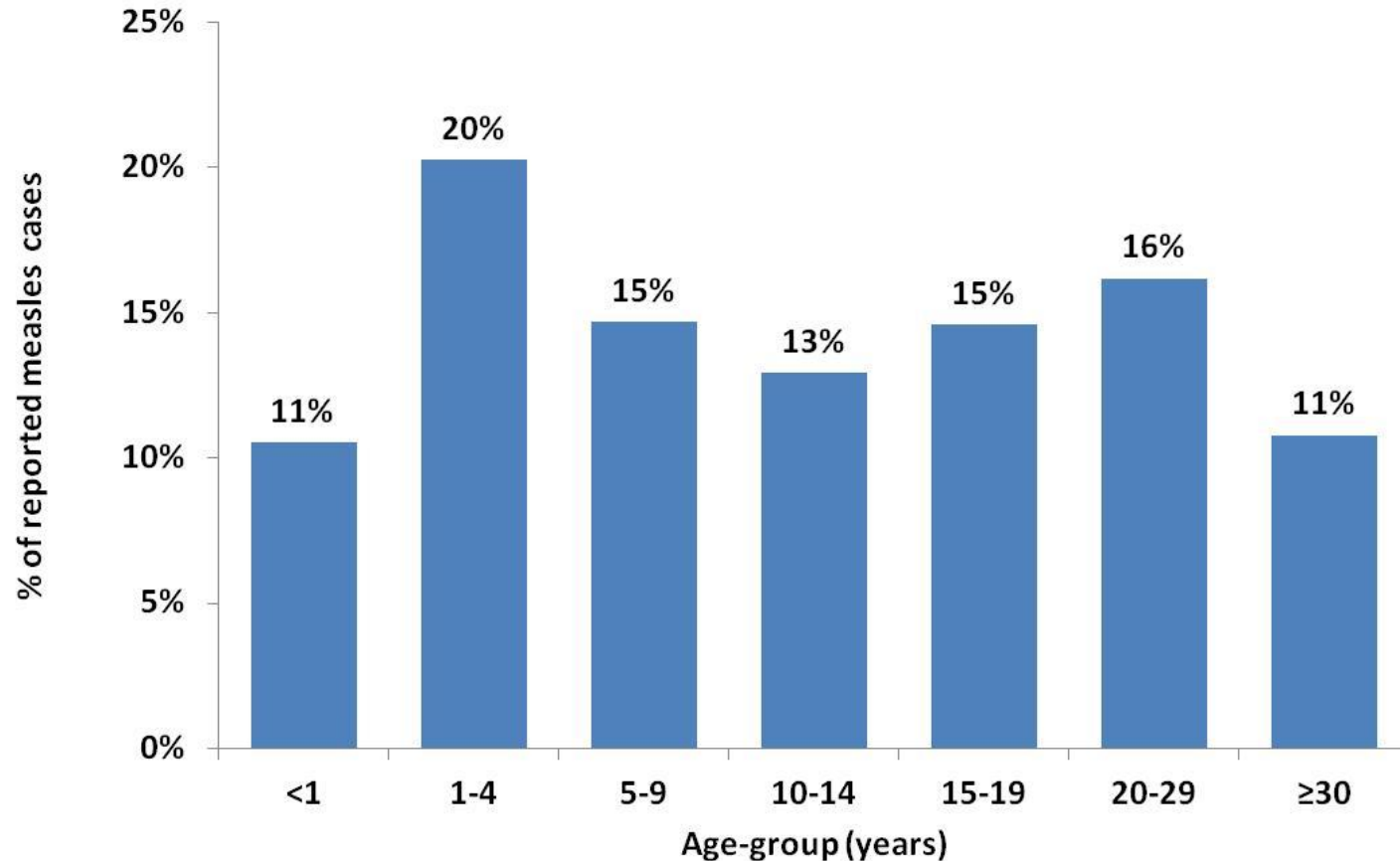
Number of reported measles cases, WHO European Region, 2005-2012*



Data Source: Monthly MR reporting to WHO European Region
Data as of 13 Sep 2012

Proportion of measles cases by age groups, WHO European Region 2009-12* (*n*=18,825)

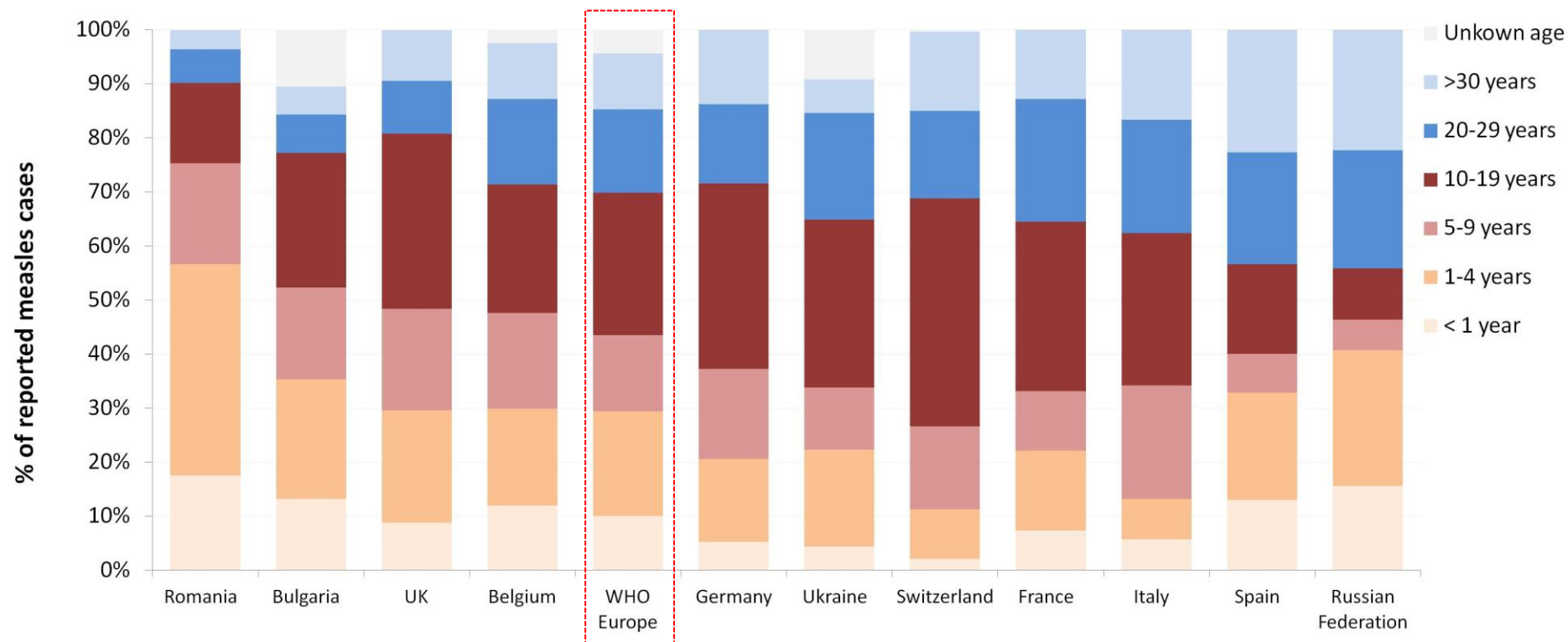
Age group known in 96% of cases



Data Source: Monthly MR reporting to WHO European Region
*Data as of 13 Sep 2012

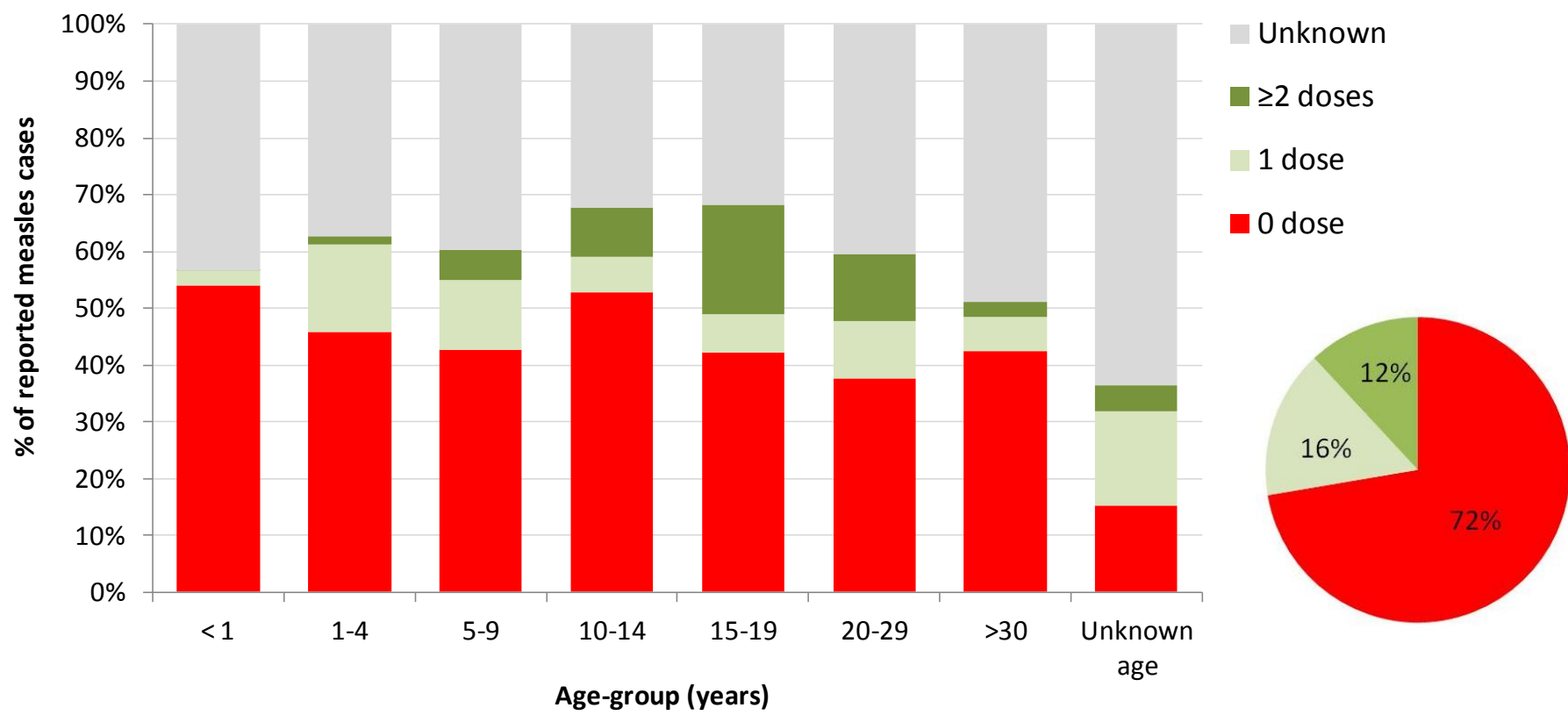
Proportion of measles cases by age groups, 11 countries and the WHO European Region, 2009-12*

Known age group 96%



Measles cases by immunization status, WHO European Region 2009-12*

Known immunization status 60%



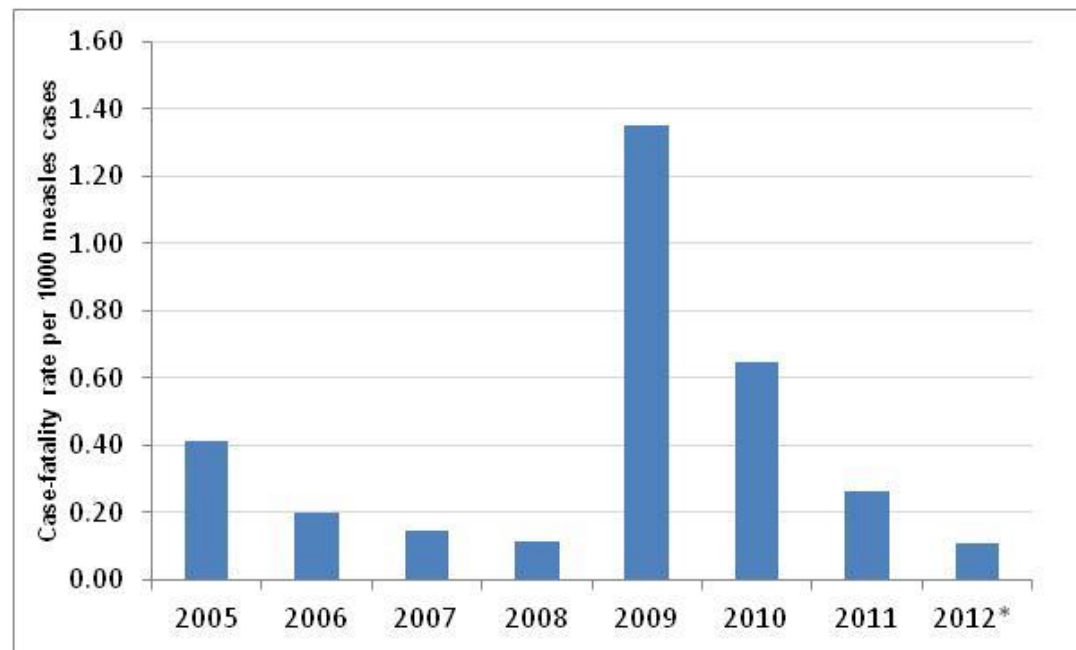
Data Source: Monthly MR reporting to WHO European Region
Data as of 13 Sep 2012

Measles case fatality rate, 2005-12*

Number of deaths = 70

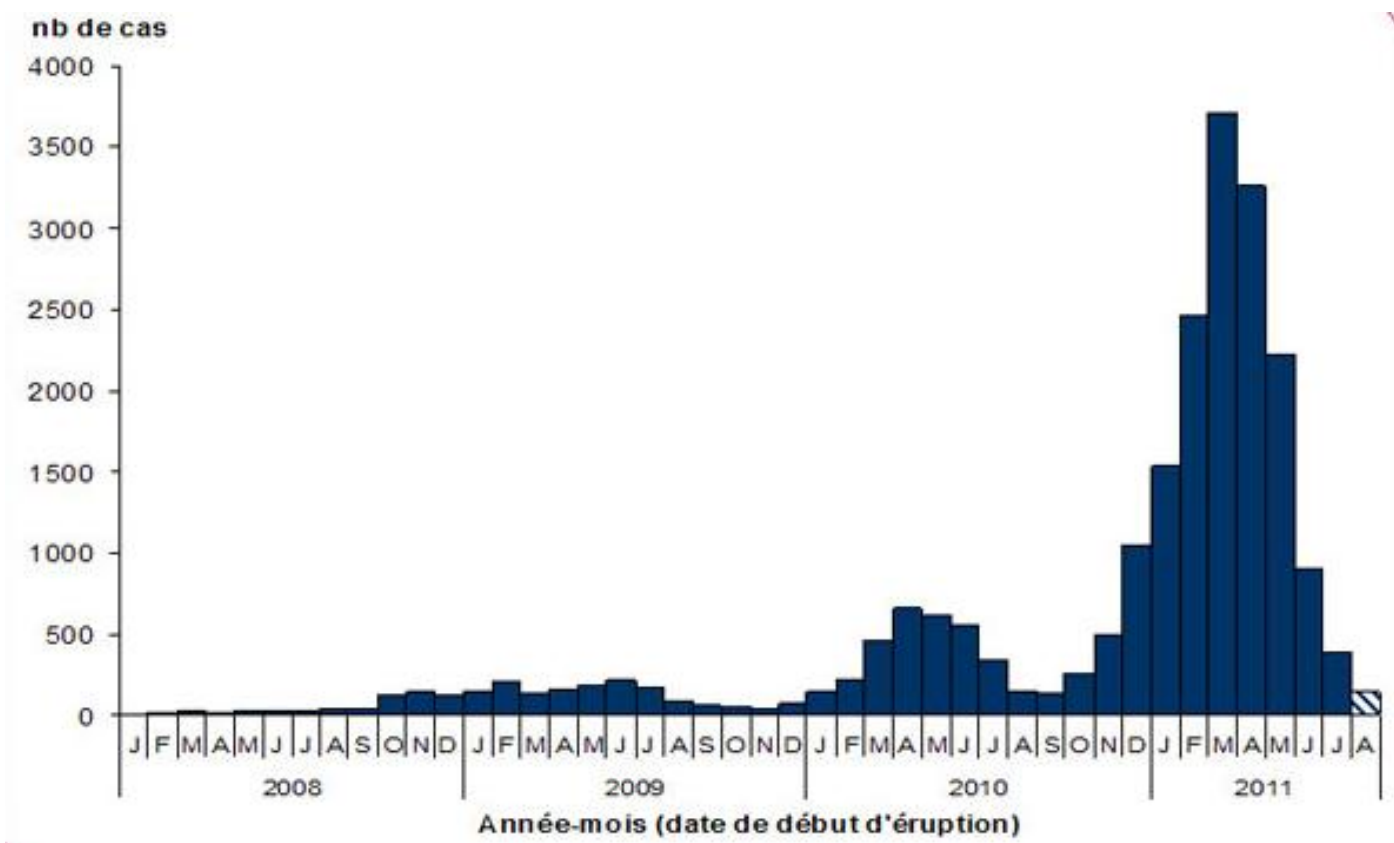
Main causes of death: Acute pneumonia and acute encephalitis

| Country | 2005- 2012* |
|--------------------|-------------|
| Albania | 3 |
| Bulgaria | 24 |
| France | 10 |
| Germany | 4 |
| Italy | 1 |
| Kazakhstan | 1 |
| Netherlands | 1 |
| Romania | 16 |
| Russian Federation | 3 |
| Spain | 1 |
| Turkey | 1 |
| Ukraine | 3 |
| United Kingdom | 2 |



Measles outbreak in France:

Number of measles cases per month – Mandatory notification, France, January 2008 – August 2011*



Data source: InVs

Measles outbreak in France:

First dose measles vaccination coverage at 24 months of age

| 2004 | 2005 | 2006 | 2007 | 2008 | 2009* |
|-------|-------|-------|-------|-------|--------|
| 87.5% | 87.2% | 89.4% | 90.1% | 89.1% | 89.0%* |

First and second dose measles vaccination coverage in 6 to 15 years old children based on school surveys

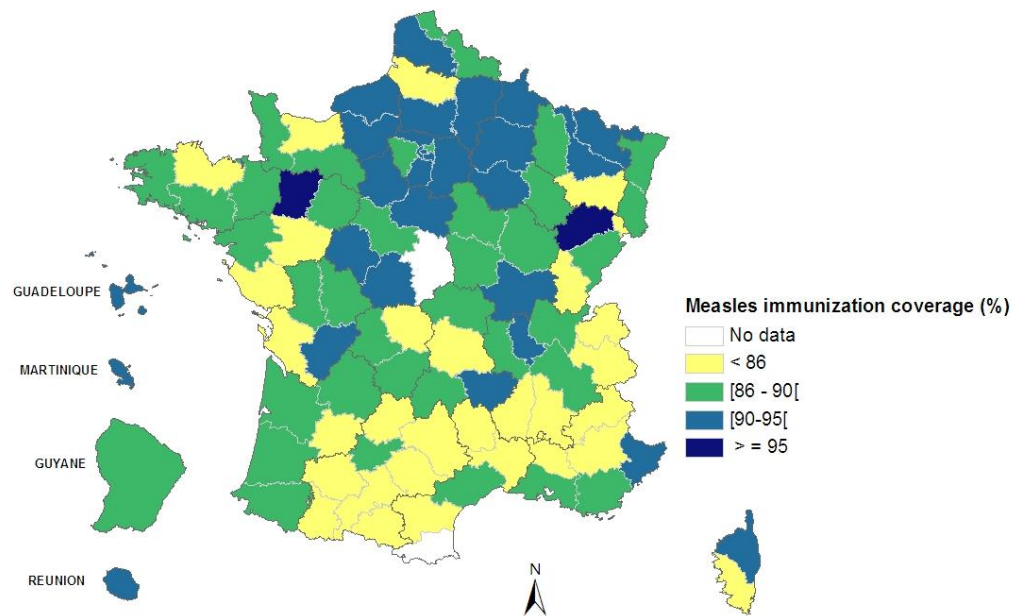
| Date of survey | School grade | Birth cohorts | Coverage « 1 dose » | Coverage « 2 doses » |
|----------------|-------------------------------|---------------|---------------------|----------------------|
| 2003-2004 | 9 th grade (15 yr) | 1988-1989 | 93.9% | 65.7% |
| 2004-2005 | 5 th grade (11 yr) | 1993-1994 | 95.7% | 74.2% |
| 2005-2006 | Preschool (6 yr) | 1999-2000 | 93.3% | 44.3% |

Data sources: InVS-Drees-DESCO

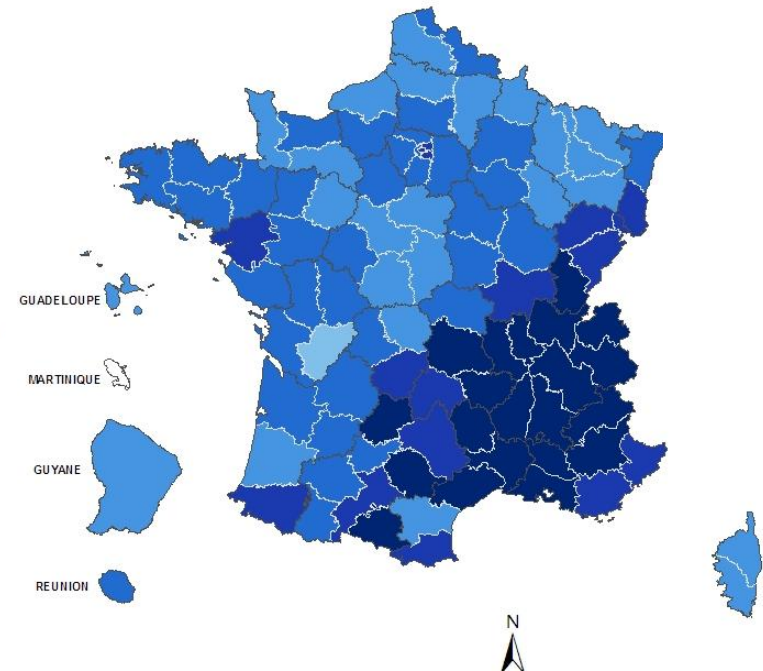
* Provisional data for 2009

Measles outbreak in France:

Measles immunization coverage at 24 months of age by district (département), France, 2003-08

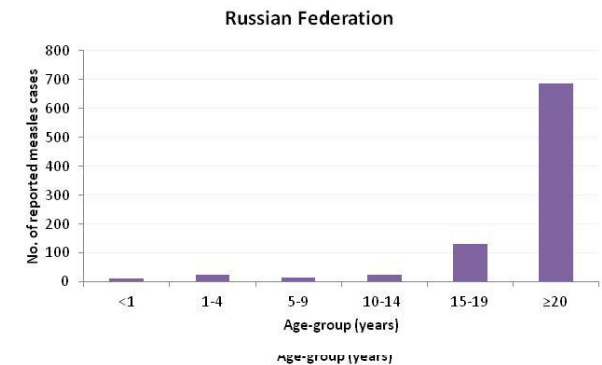
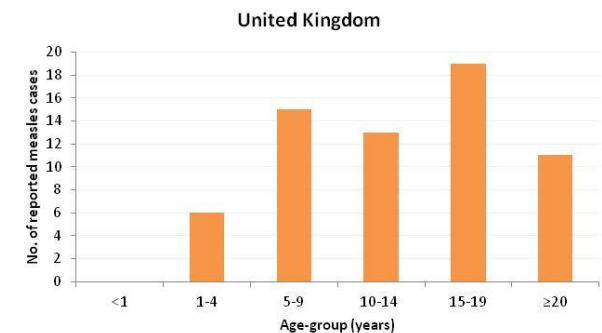
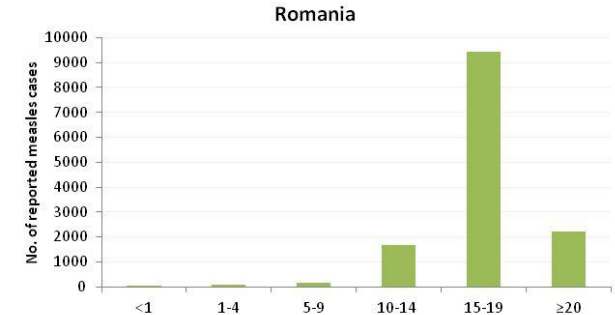
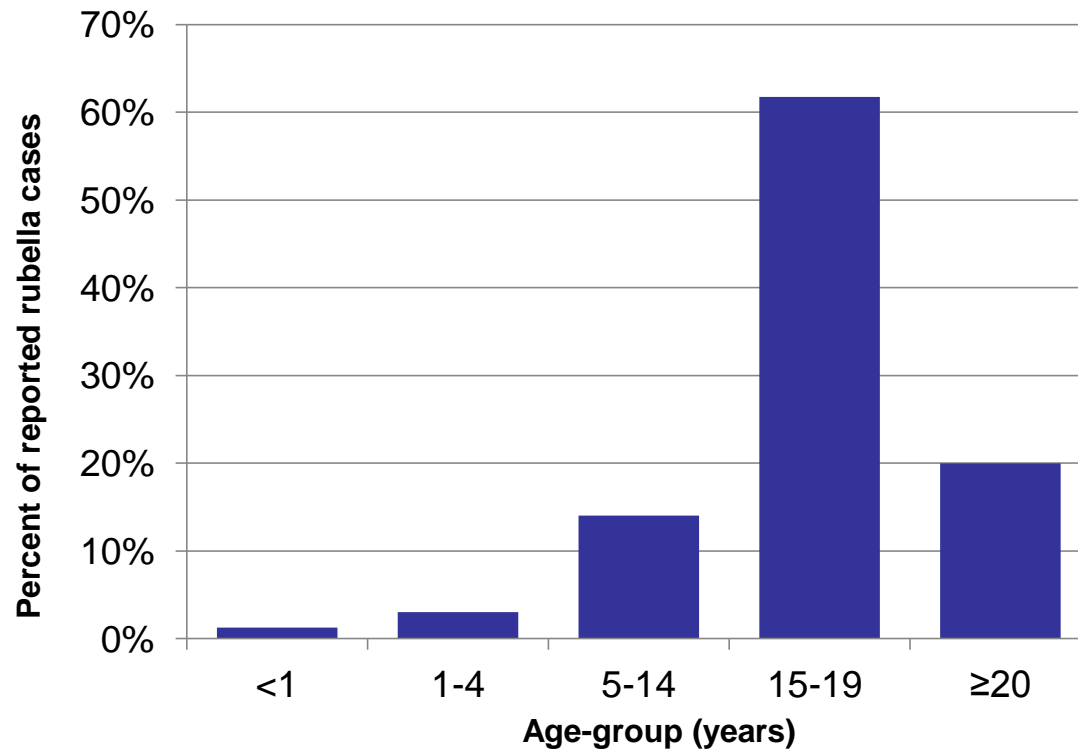


Geographical distribution of notified measles cases, France (October 2010 to September 2011)



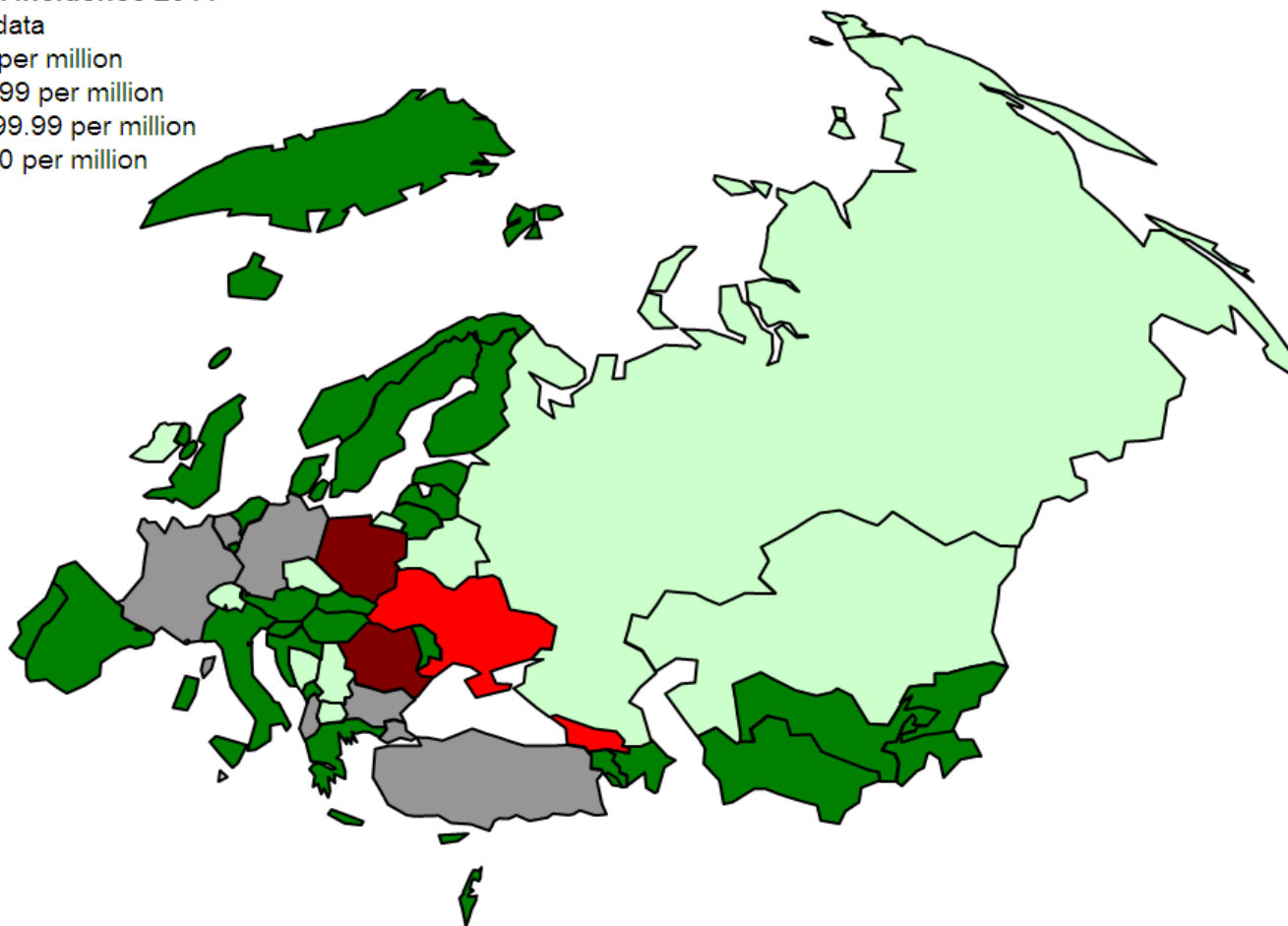
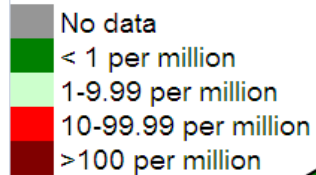
Age-distribution of reported rubella cases, WHO European Region, January-July 2012 (*n*=18,055)

Age group known in 89% of cases



Incidence of rubella per 100,000 inhabitants, 2012*

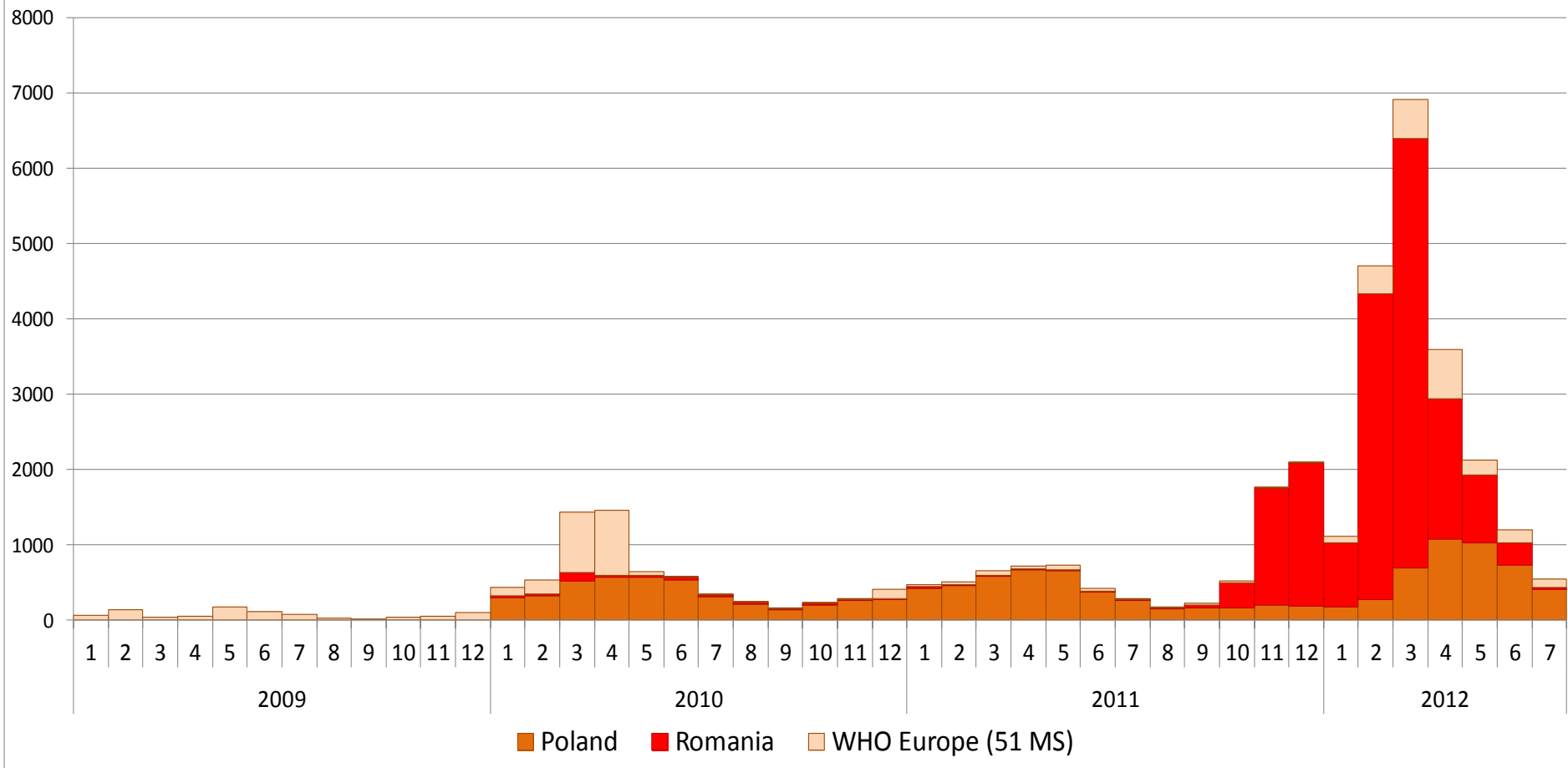
Rubella Incidence 2011



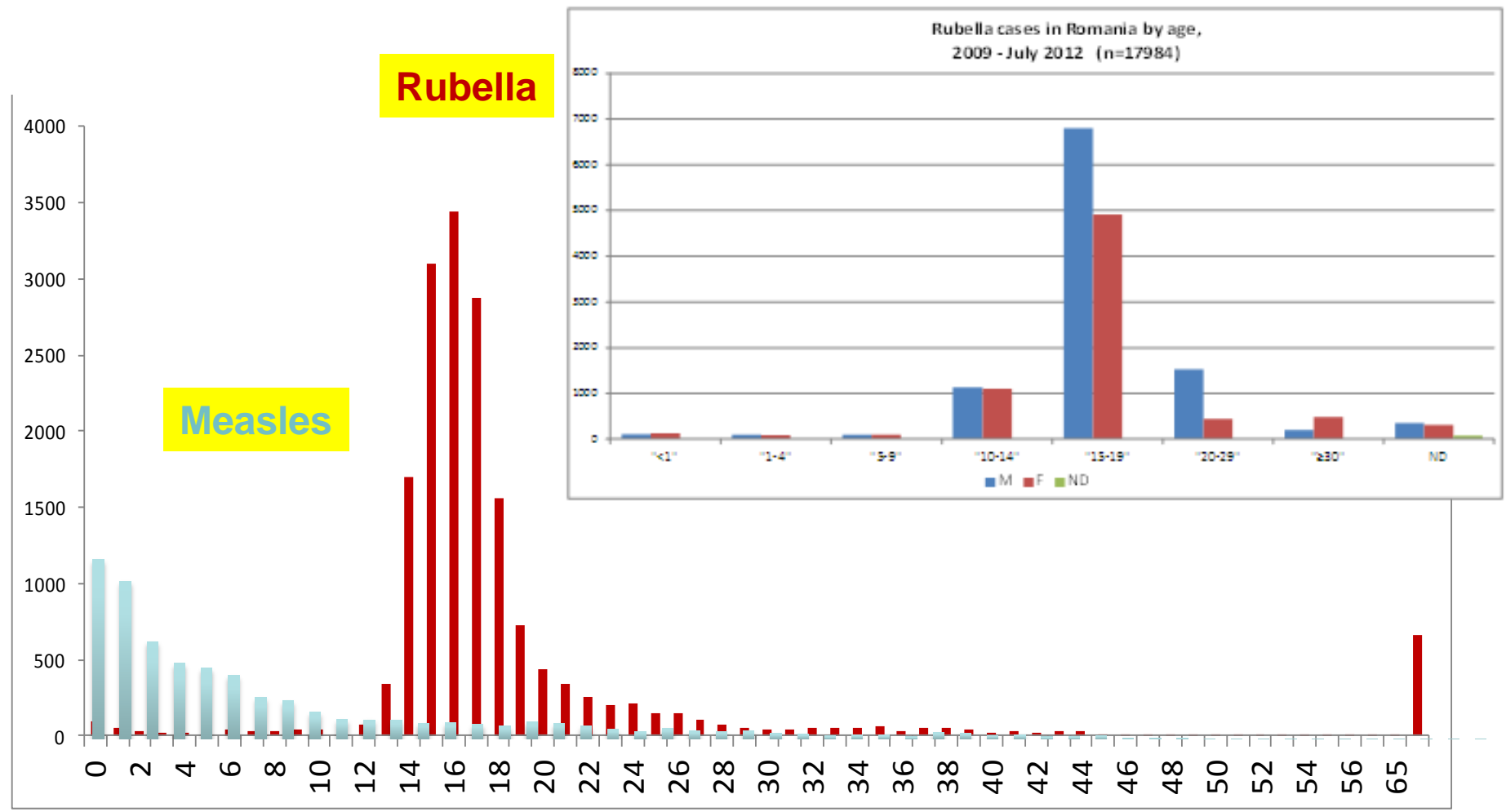
Update Date : 30-Aug-2012

The most challenged countries in the Region - Poland and Romania

Rubella cases in Poland, Romania and rest of WHO European Region by month, 2009 - July 2012



Rubella and measles by age of onset, Romania, 2011 - 2012

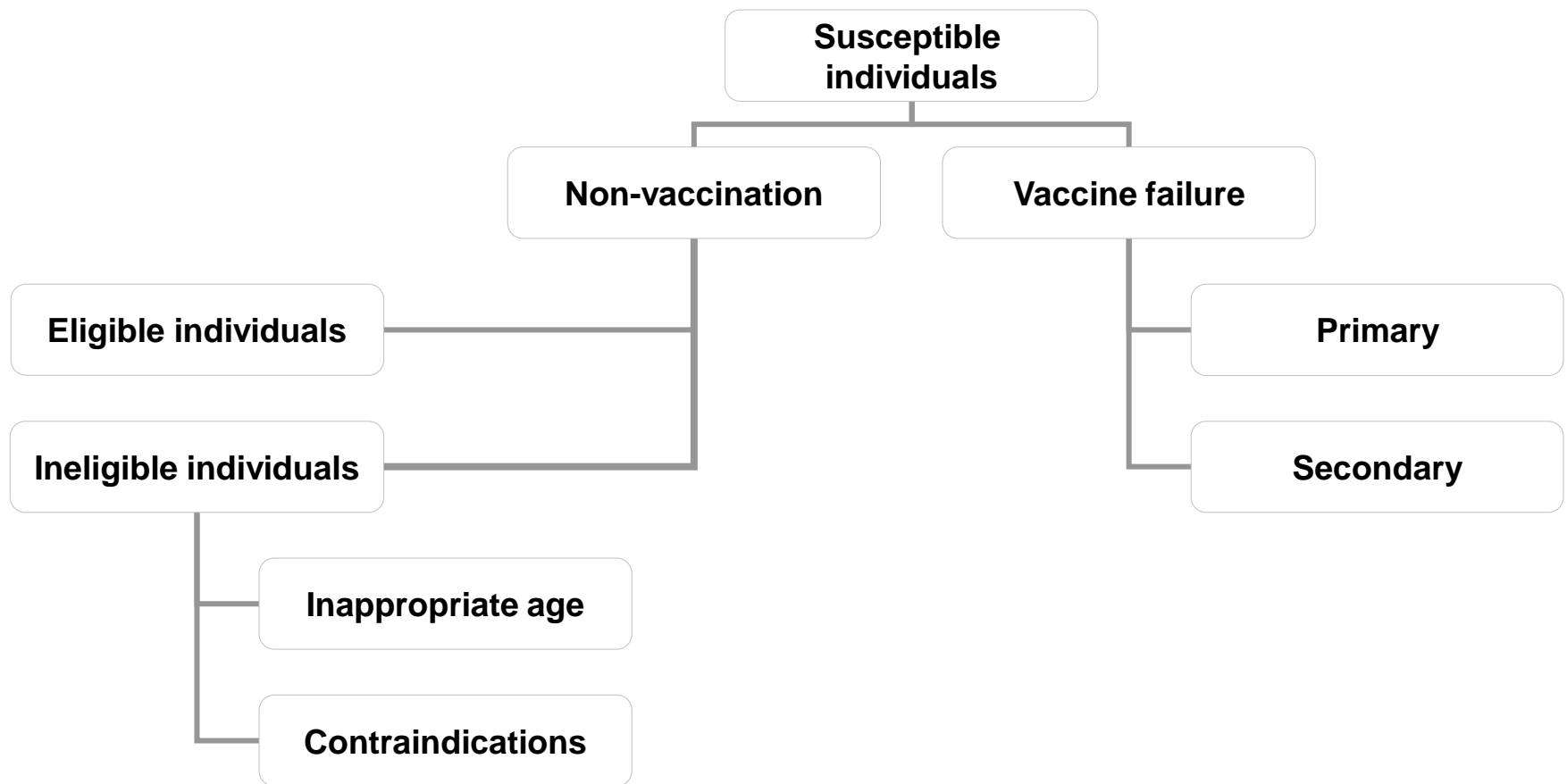


Objective 2

Who Gets Measles in Europe?

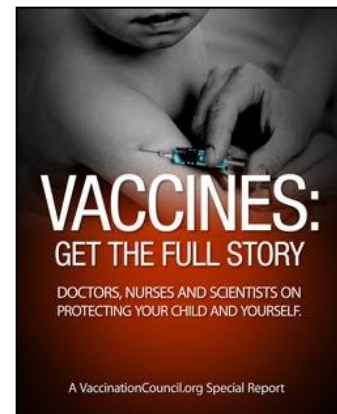
To describe individuals susceptible to measles and to provide an overview of affected groups, and the public settings in which measles transmission occurred in Europe in 2005–09.

Susceptibility chart

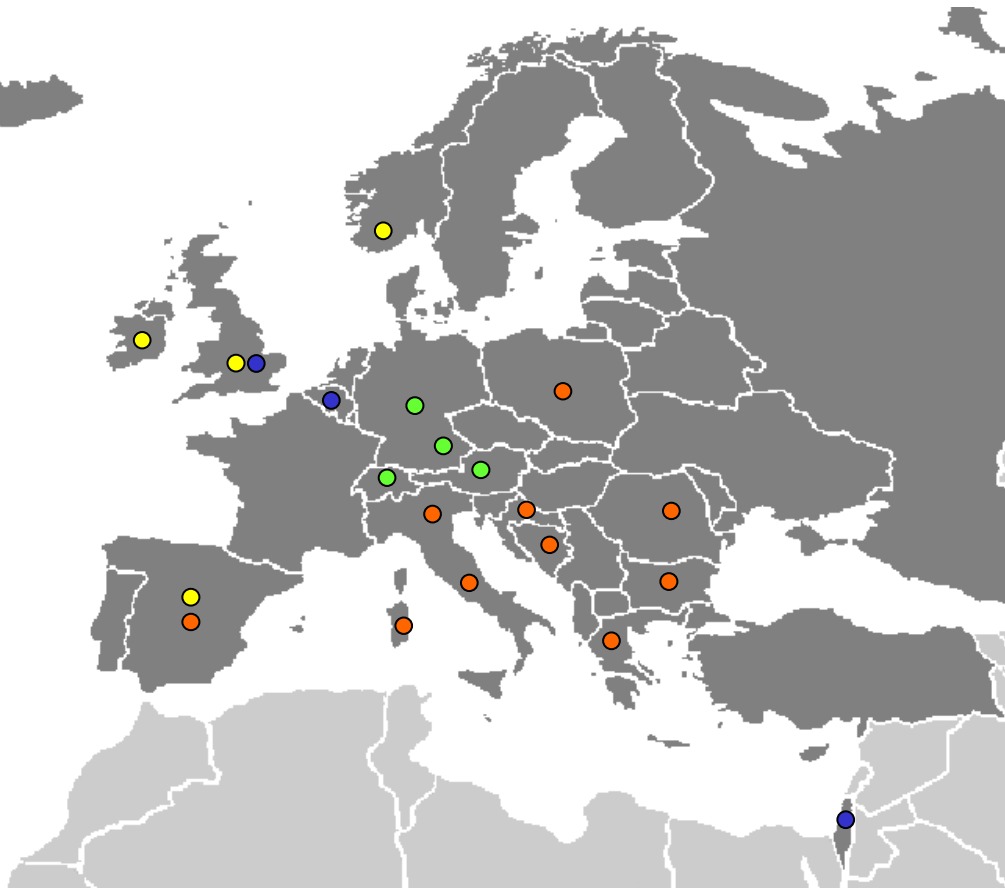


Reasons for not vaccinating against measles

- Lack of information
- Misconceptions
 - Child benefited from the illness
 - Mild inter-current diseases
 - Incorrect information on the contraindications
- Concerns about safety
- Philosophical beliefs
- Doctors against vaccines
- Religious community lifestyle



Measles outbreaks in under-vaccinated groups, Europe, 2005-10



● Roma and Sinti communities



● Followers of Anthroposophy



● Traveller communities



● Ultra-Orthodox Jewish communities

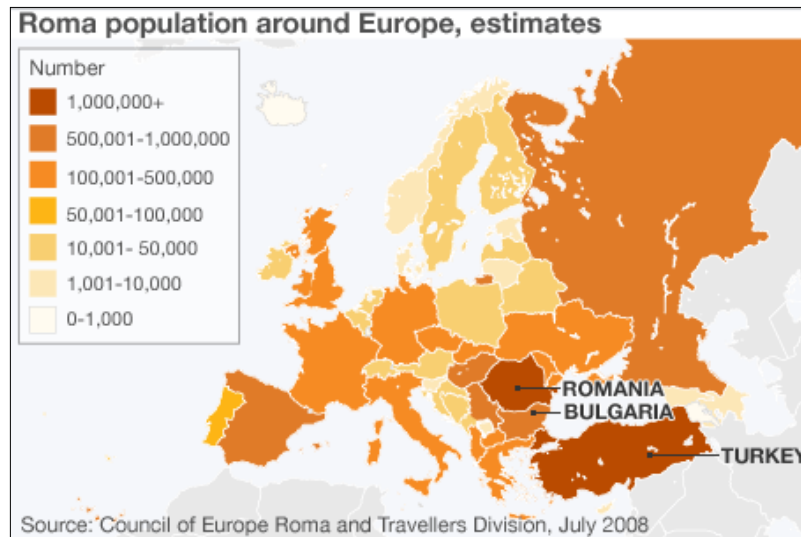
Increased measles transmission is facilitated by social factors

- Large families
- Large social gatherings
- Attending same schools



Distinct groups that suffered measles outbreaks

- Roma



Distinct groups that suffered measles outbreaks

- Traveller communities



Distinct groups that suffered measles outbreaks

- Anthroposophic communities



Rapid communications

AN ONGOING MULTI-STATE OUTBREAK OF MEASLES LINKED TO NON-IMMUNE ANTHROPOSOPHIC COMMUNITIES IN AUSTRIA, GERMANY, AND NORWAY, MARCH-APRIL 2008

D Schmid¹, H Holzmann², S Abele², S Kasper¹, S Köntg³, S Meusburger¹, Hubert Hrabčik¹, A Luckner-Hornischen¹, E Bechten¹, A DeMartini¹, Jana Stirling¹, A Heißenhuber⁴, A Siedler⁴, H Bernard⁴, G Pfaff⁴, D Schorr⁵, M S Ludwig⁵, HP Zimmerman⁵, Ø Løvoll⁶, P Aavitsland⁶, F Allerberger (franz.allerberger@ages.at)¹

Rapid communications

MEASLES OUTBREAK IN AN ANTHROPOSOPHIC COMMUNITY IN THE HAGUE, THE NETHERLANDS, JUNE-JULY 2008

E van Velzen (e.v.h.vanvelzen@ocw.denhag.nl)¹, E de Coster¹, R van Binnendijk², S Hahné²

Distinct groups that suffered measles outbreaks

- Ultra-orthodox Jewish communities



Surveillance and outbreak reports

AN OUTBREAK OF MEASLES IN ORTHODOX JEWISH COMMUNITIES IN ANTWERP, BELGIUM, 2007-2008: DIFFERENT REASONS FOR ACCUMULATION OF SUSCEPTIBLES

T Lernout (tlnne.lernout@sante.gouv.fr)¹, E Kissling^{1,2}, V Hutse³, K De Schrijver⁴, G Top⁴

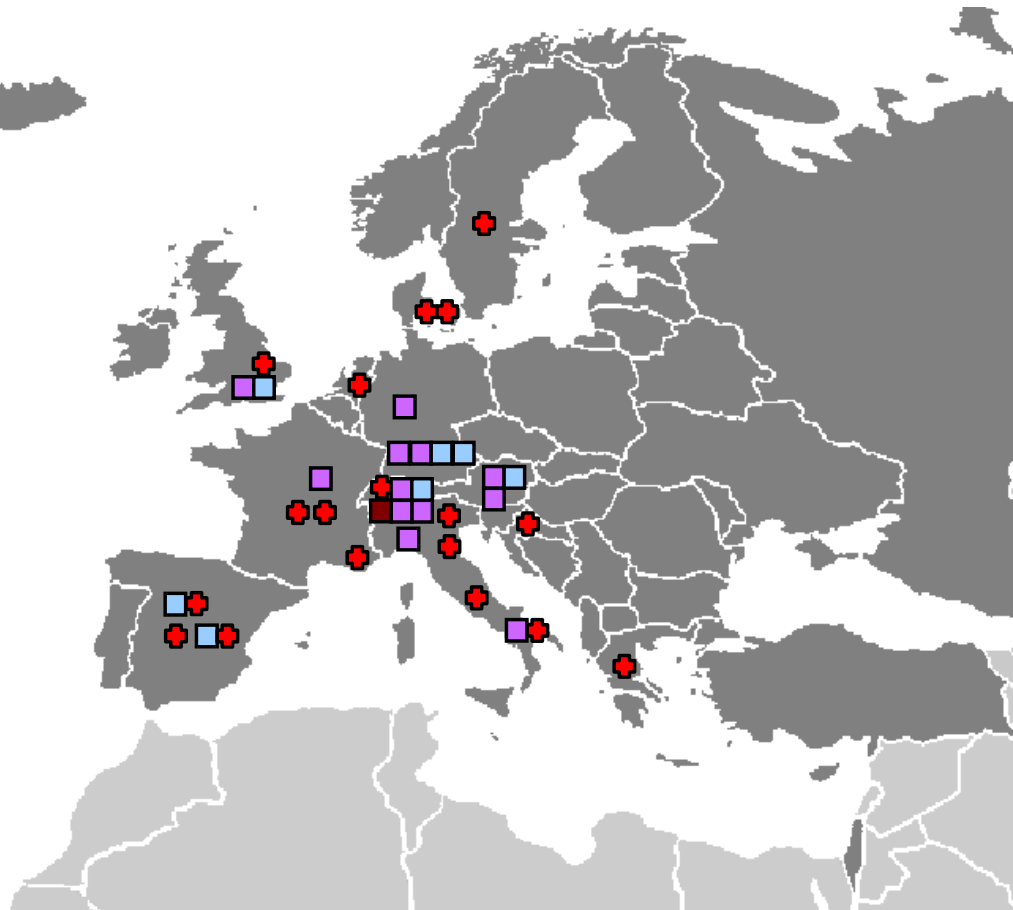


Surveillance and outbreak reports

AN OUTBREAK OF MEASLES IN AN ULTRA-ORTHODOX JEWISH COMMUNITY IN JERUSALEM, ISRAEL, 2007 - AN IN-DEPTH REPORT

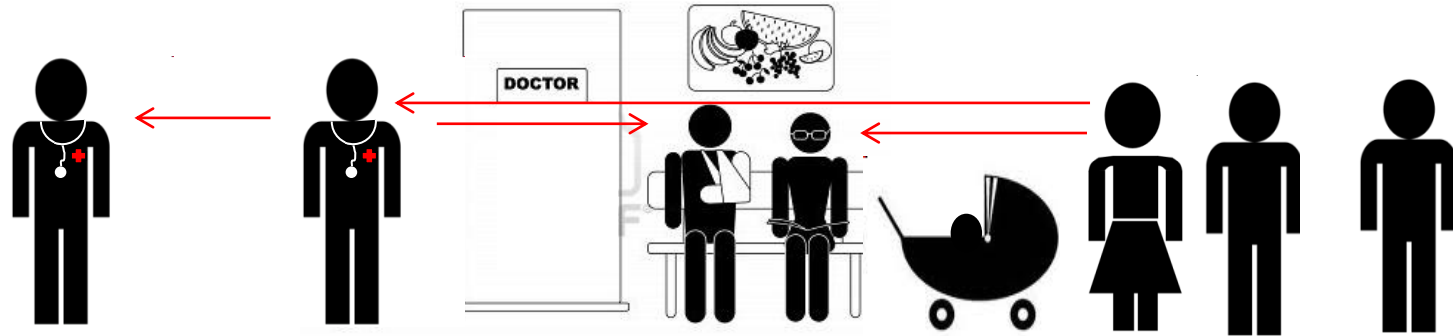
C Stein-Zamir (chen@lbjer.health.gov.il)¹, N Abramson¹, H Shoo¹, G Zentner¹
1. Jerusalem District Health Office, Ministry of Health, Israel

Main public settings for measles outbreaks in Europe, 2005-09



- Schools
- Kindergartens and day-care centres
- University
- ✚ Hospitals and healthcare facilities

Transmission patterns during nosocomial measles outbreaks



1. Patient to patient
2. Patient to HCW
3. HCW to patient
4. HCW to HCW

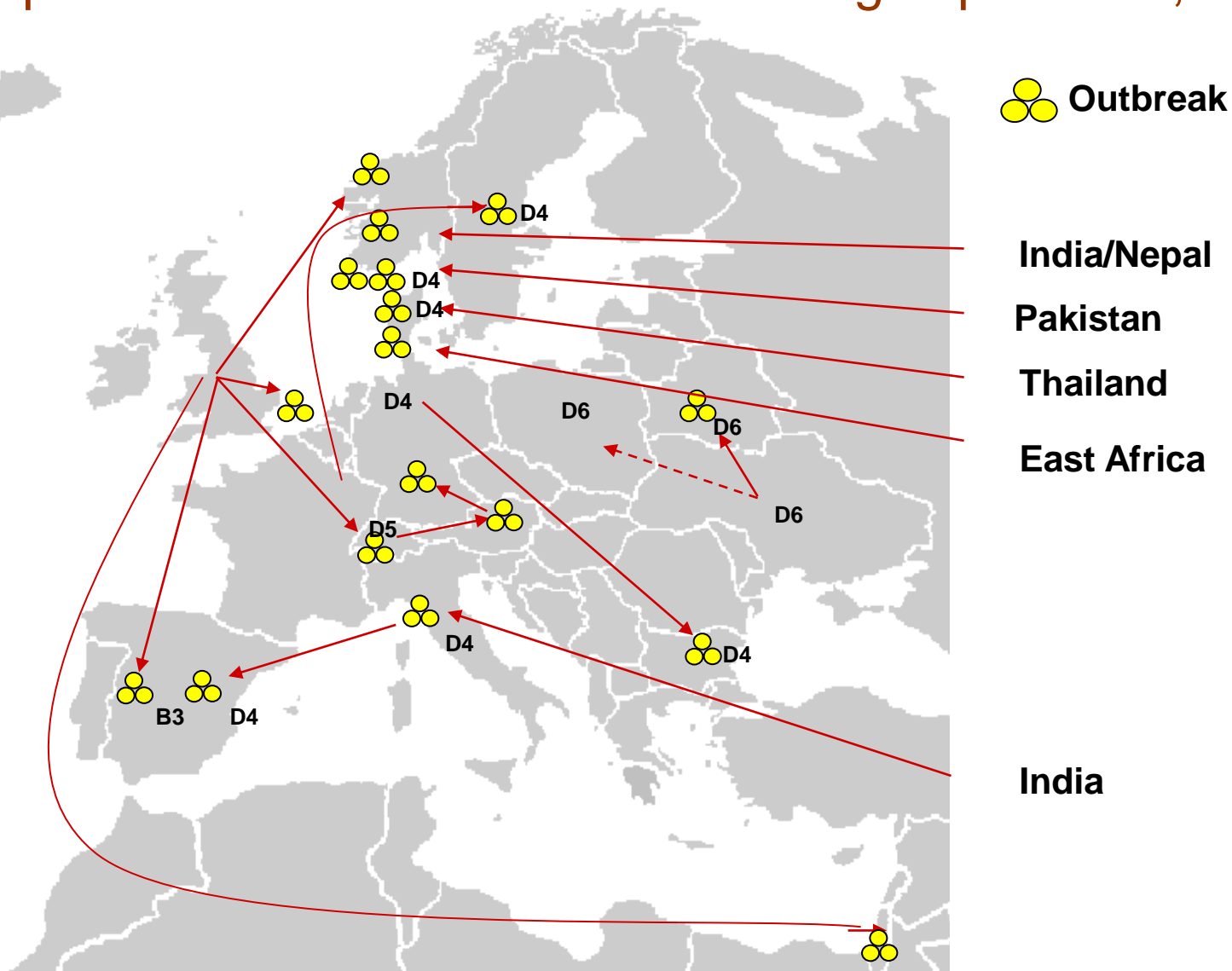
Risk of acquiring measles is estimated to be 13-19 times higher for susceptible HCWs than for the general public

Objective 3

Importations

To demonstrate the role of importations of measles and rubella virus

Examples of measles outbreaks following importation, 2006-10



Source of measles importation, 2010 ($n=217$)

3% of those cases with known importation status

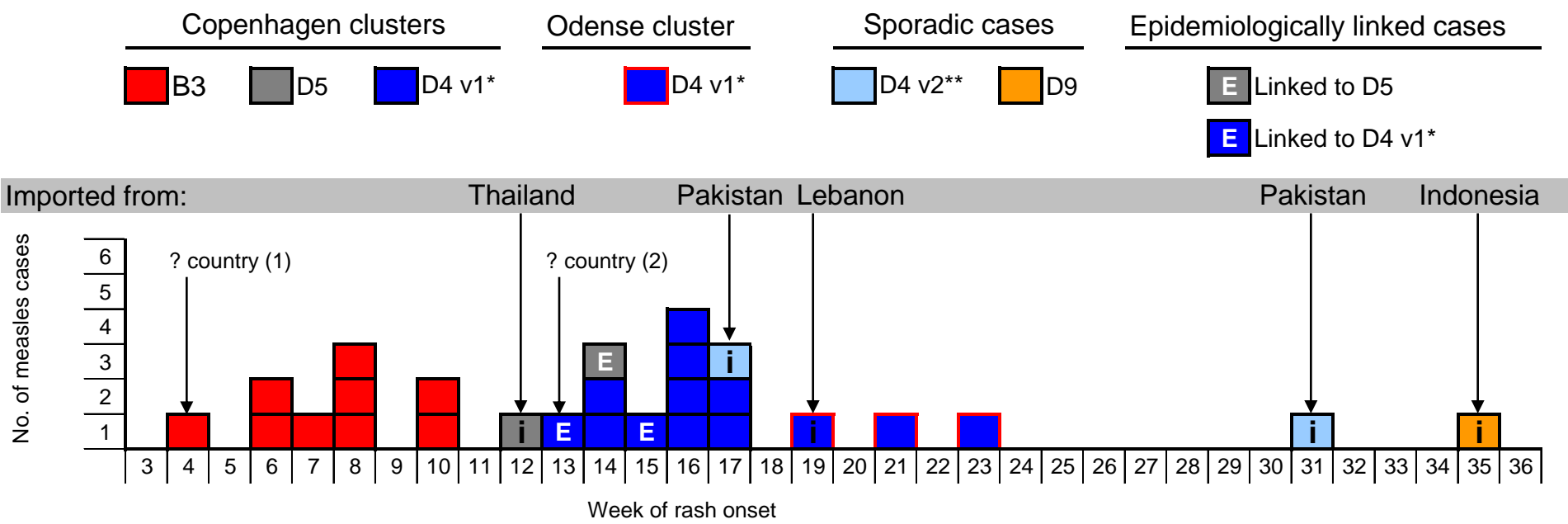


Top exporters:

| | |
|--------------|----|
| France | 44 |
| Bulgaria | 27 |
| Italy | 20 |
| Spain | 16 |
| UK | 15 |
| India | 13 |
| South Africa | 12 |
| Ireland | 7 |
| Morocco | 7 |
| China | 4 |

Data source: EUVAC.NET

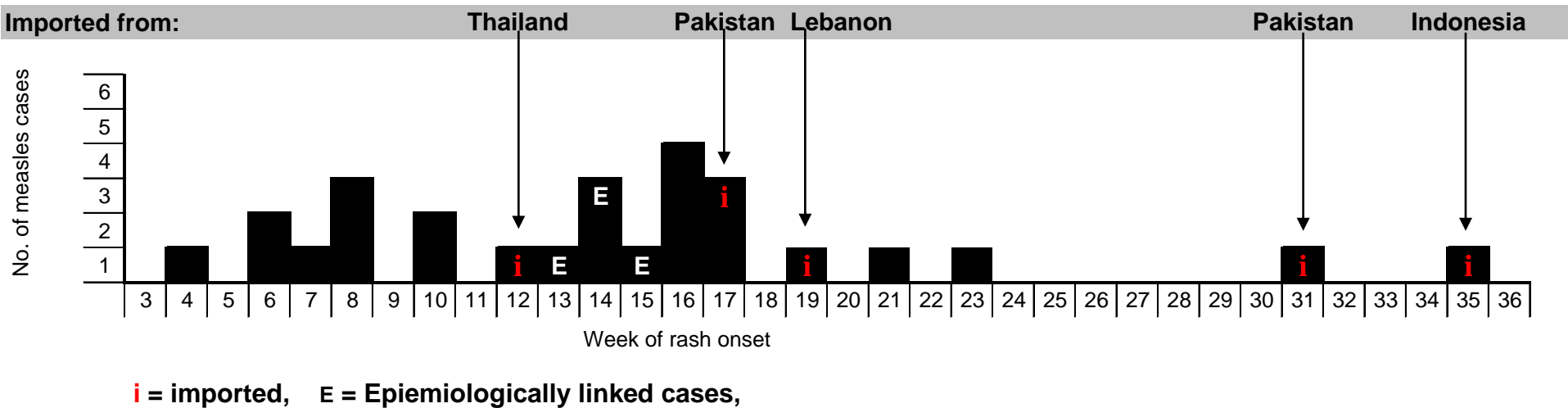
Reported measles cases by week of onset, Denmark, 2006 (n=27)



i = imported, E = Epiemiologically linked cases, * D4 variant 1, ** D4 variant 2
(1) = Case linked to Copenhagen airport (2) = Connected with the Middle East

Reported measles cases by week of onset, Denmark, 2006 ($n=27$)

- without genotyping

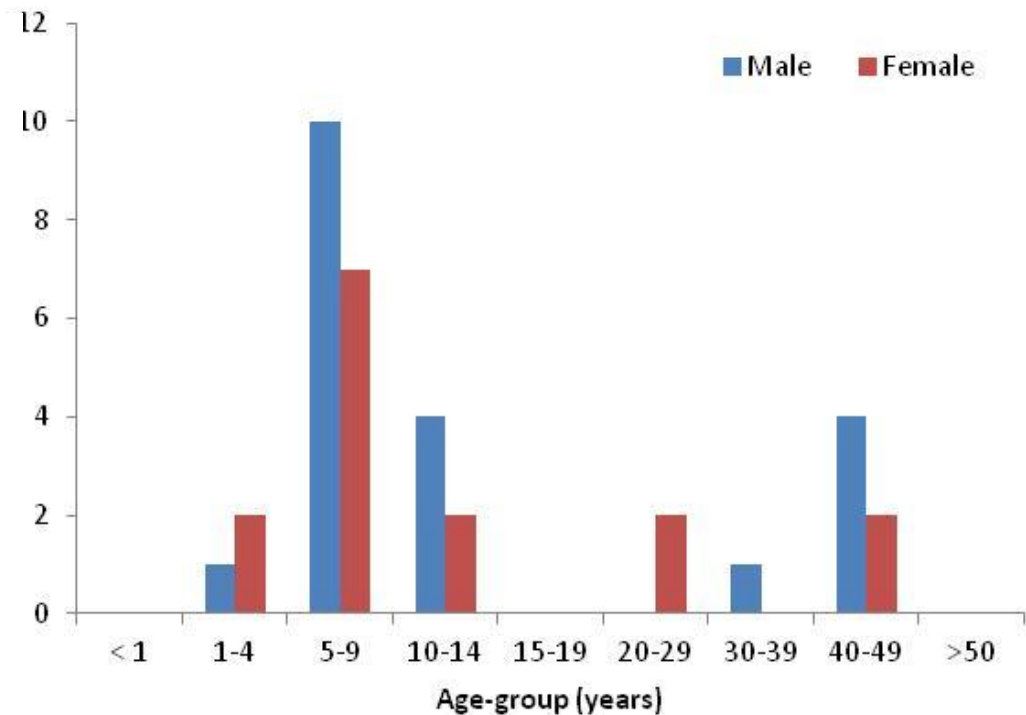
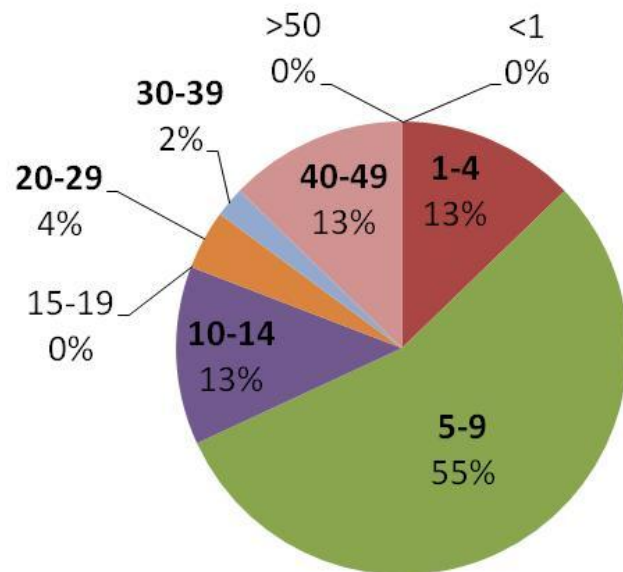


Data source: Department of Epidemiology, SSI

Rubella outbreak in Sweden

Number of laboratory confirmed rubella cases by age-group in Sweden, April-August 2012* ($n=35$)

Total cases 47

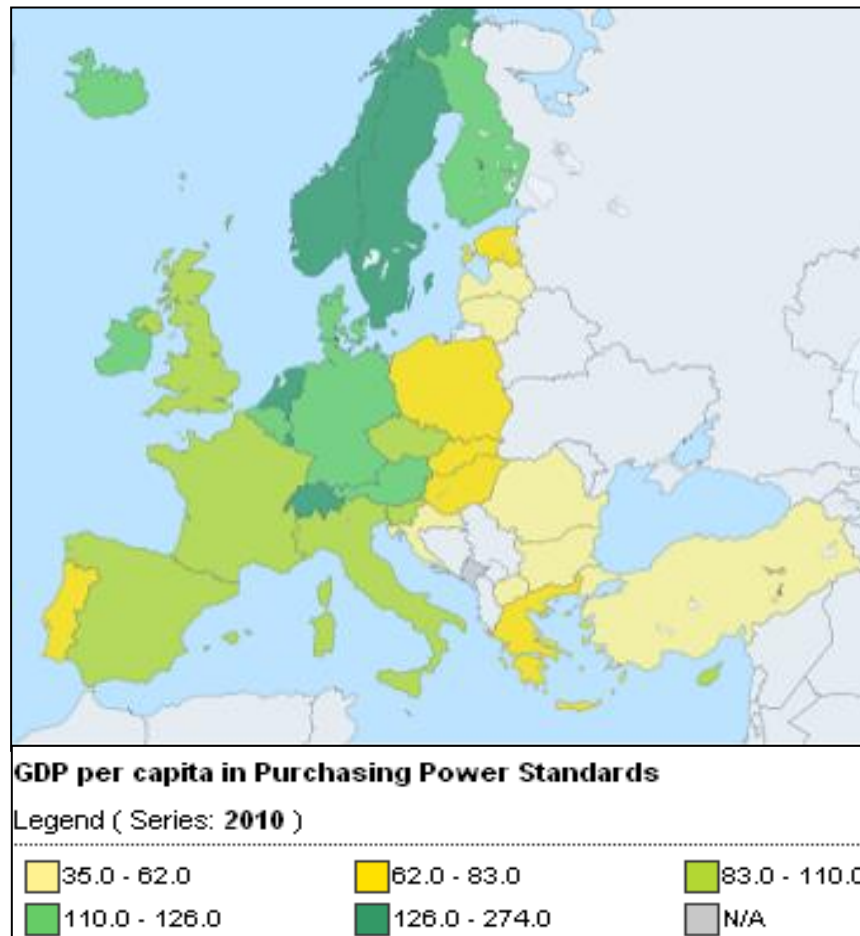


Conclusions

- Outbreaks of measles and rubella continue to occur in countries with suboptimum vaccination coverage
- Achieving and maintaining high vaccination coverage with MMR presents numerous challenges and issues that need to be addressed

Challenges in eliminating measles in Europe

- Socio-economic and political diversity

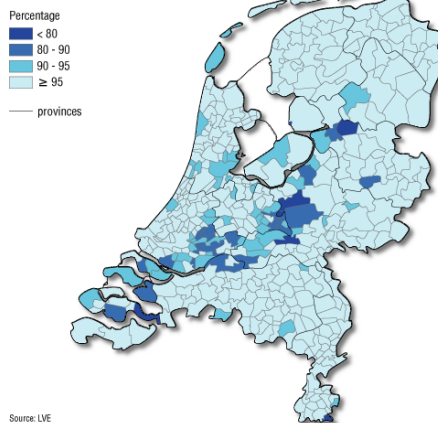


Challenges in eliminating measles in Europe

- Multi-ethnic society often with large cultural, lifestyle, philosophical, religious and linguistic diversity



Mumps, Measles and Rubella vaccination 1-1-2005
by municipality, cohort 2002, first vaccination babies (14 months)



Source: LVE

Outbreaks among Christian Reformed Church communities in the Netherlands:

Polio 1992-93: 71 cases

Measles 1999-00: 3292 cases

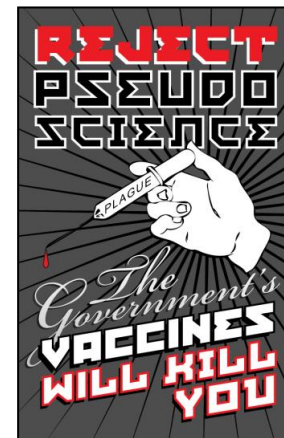
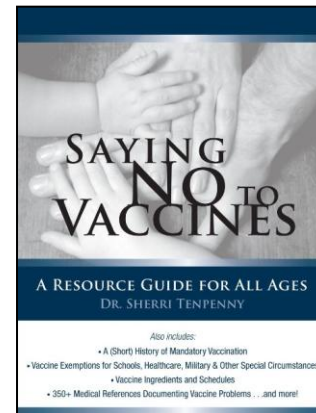
Rubella 2004-05: 387 cases

Mumps 2007-08: 87 cases



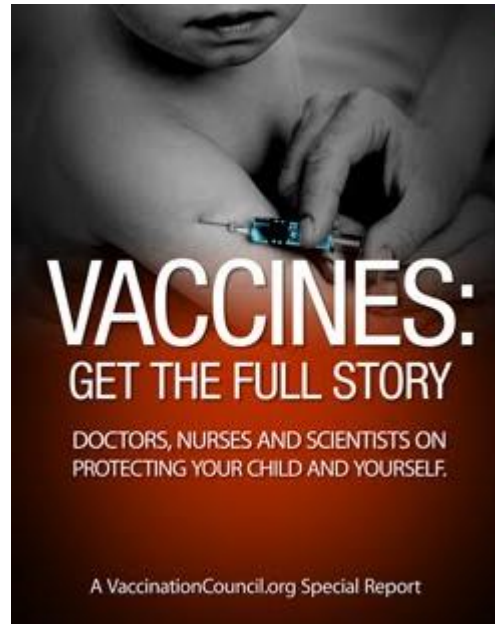
Challenges in eliminating measles in Europe

- Vociferous anti-vaccination lobbying groups, vaccine sceptics, alternative medicine, vaccine opponents



Challenges in eliminating measles in Europe

- “Doctors without ~~out~~ borders”



EDITORIALS

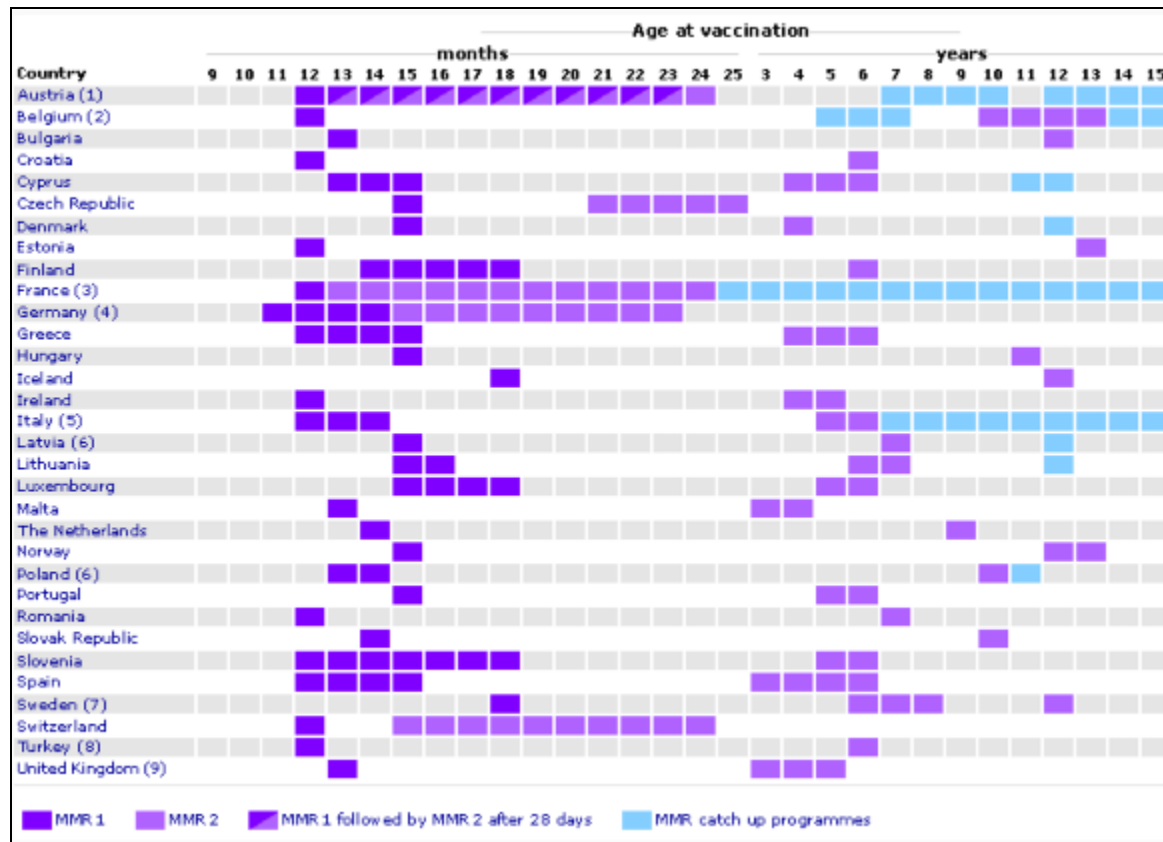
Do European doctors support measles, mumps, rubella vaccination programmes enough?

P L Lopalco (Pierluigi.lopalco@ecdc.europa.eu)¹, M Sprenger¹

1. European Centre for Disease Prevention and Control, Stockholm, Sweden

Challenges in eliminating measles in Europe

- Different healthcare delivery systems



Challenges in eliminating measles in Europe

- The frequency of international travel and migrations



Challenges in eliminating measles in Europe

- Greater importance to individual rights over public health concerns



"... other anti-vaccination parents believe that it is unreasonable to expect parents to risk their children's lives for the sake of public health"



"... contemporary advocates for mandatory vaccinations contend that immunizations are necessary to maintain public health."

What do we need to do to attain measles elimination in Europe?

- Continued efforts to identify barriers for vaccine uptake
 - Steady commitment
 - Reminders and recall systems
- To focus on under-vaccinated groups
 - Understanding attitudes
 - Better communication strategies
 - Improve integration with health-care systems

What do we need to do to attain measles elimination in Europe?

- Enhance surveillance
 - Rapid investigation of suspected cases with laboratory tests
 - Seroprevalence studies
- Policies to improve prevention and control
 - Hospitals and healthcare settings
 - School entry requirement
 - Adult vaccination:
 - pre-travel vaccination
 - "infant-parents" vaccination

What do we need to do to attain measles elimination in Europe?

- Improve availability of high-quality information
 - Websites
 - Medical and nursing curricula

Changing perception about infectious diseases



New York, 1939 - Queing for the smallpox vaccine



England, 2010 - Mega Monday: bargain-hunters join half-mile queue



Copenhagen, 1943 - Queing for the diphtheria vaccine



Thank you

Supplementary slides

MEASLES MORTALITY: A RETROSPECTIVE LOOK AT THE VACCINE ERA¹

ROGER M. BARKIN²

Barkin, R. M. (Bureau of Epidemiology, CDC, Atlanta, GA 30333). Measles mortality: A retrospective look at the vaccine era. *Am J Epidemiol* 102:341-349, 1975.

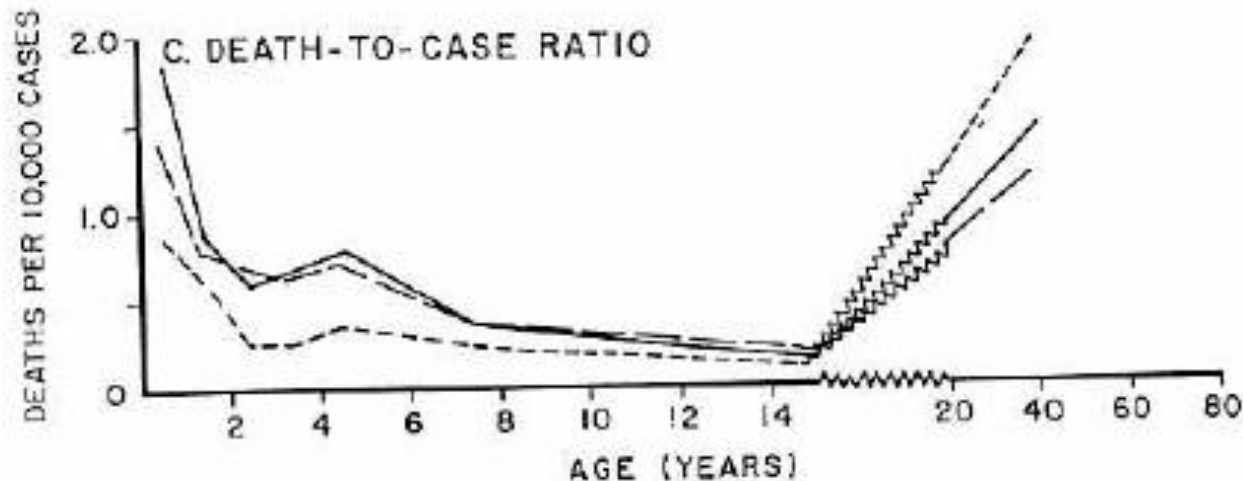


FIGURE 3. Measles age-specific rates, United States, 1958-1970.

| I Aarene 1835—45 incl. døde efter gennemsnitlig Beregning aarlig i de respektive Aldere: | I de første 3 af Aaret 1846 døde | Hvormange pCt. der aarlig pleje at dse af de resp. Alderes Folke- mængde, beregnet efter Folketællingen i 1845 for Aarene 1835—45 incl. | Hvormange pCt. af de resp. Alderes Folke- mængde der døde i de første 3 af Aaret 1846, beregnet efter Folke- tællingen for 1845 og egne Optægnelser. | Hvormange Gange Dø- deligheden i de første 3 af Aaret 1846 var stør- re end den plejer at være i et sædvanligt helt Aar. |
|--|-------------------------------------|---|--|---|
| Under 1 Aar . . . 18 $\frac{1}{11}$ | 50 | 10 $\frac{9}{11}$ pCt. | 30 pCt. | e. 2 $\frac{9}{11}$ |
| imellem 1 og 10 Aar 7 $\frac{3}{11}$ | 6 | $\frac{6}{11}$ — | $\frac{6}{11}$ — | 0 |
| — 10 - 20 — 5 $\frac{5}{11}$ | 5 | $\frac{5}{11}$ — | $\frac{4}{11}$ — | ÷ |
| — 20 - 30 — 6 $\frac{6}{11}$ | 8 | $\frac{11}{22}$ — | $\frac{15}{22}$ — | e. 1 $\frac{4}{11}$ |
| — 30 - 40 — 6 $\frac{2}{11}$ | 13 | $\frac{17}{22}$ — | 2 $\frac{1}{11}$ — | e. 2 $\frac{1}{2}$ |
| — 40 - 50 — 7 $\frac{4}{11}$ | 18 | 1 $\frac{1}{11}$ — | 2 $\frac{8}{11}$ — | e. 2 $\frac{1}{2}$ |
| — 50 - 60 — 5 $\frac{5}{11}$ | 28 | $\frac{10}{11}$ — | 4 $\frac{4}{9}$ — | e. 5 |
| — 60 - 70 — 8 $\frac{2}{11}$ | 31 | 2 — | 7 $\frac{8}{11}$ — | e. 3 $\frac{3}{4}$ |
| — 70 - 80 — 14 $\frac{10}{11}$ | 30 | 6 $\frac{5}{10}$ — | 13 $\frac{1}{11}$ — | e. 2 |
| — 80 - 100 — 16 $\frac{9}{11}$ | 26 | 16 $\frac{9}{11}$ — | 26 — | e. 1 $\frac{1}{2}$ |
| Summa: 96 $\frac{3}{11}$ | 215 | | | |

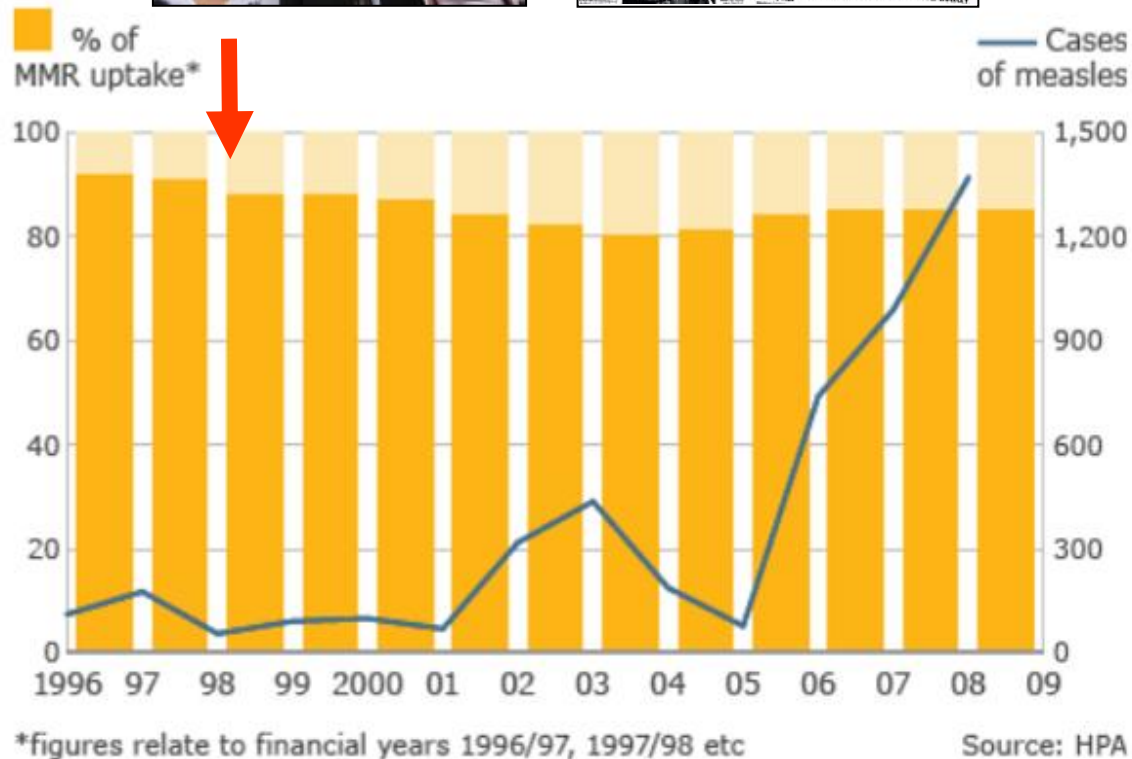
Tegnelser fra Peronne.

| | From 1835-1845 inclusive, died yearly, by average computation at the respective ages | In the first two-thirds of of the year 1846 died | Per cent of persons of the resp. ages taken by death yearly, for 1835- 1845, reckoned from the census of 1845 | Per cent of persons of the resp. ages died in first two-thirds of 1846, counted from census of 1845 and my own notes | Number of times mortality in first two-thirds of 1846 was greater than that usual in an ordinary whole year. |
|--------------------------|---|---|--|--|--|
| Under 1 year | 18 $\frac{1}{11}$ | 50 | 10 $\frac{9}{11}$ | 30 | About 2 $\frac{9}{11}$ |
| Between 1 and 10 years | 7 $\frac{3}{11}$ | 6 | $\frac{6}{11}$ | $\frac{6}{11}$ | 0 |
| Between 10 and 20 years | 5 $\frac{5}{11}$ | 5 | $\frac{5}{11}$ | $\frac{4}{11}$ | ÷ |
| Between 20 and 30 years | 6 $\frac{6}{11}$ | 8 | $\frac{11}{22}$ | $\frac{15}{22}$ | About 1 $\frac{4}{11}$ |
| Between 30 and 40 years | 6 $\frac{2}{11}$ | 13 | $\frac{17}{22}$ | 2 $\frac{1}{11}$ | About 2 $\frac{1}{2}$ |
| Between 40 and 50 years | 7 $\frac{4}{11}$ | 18 | 1 $\frac{1}{11}$ | 2 $\frac{8}{11}$ | About 2 $\frac{1}{2}$ |
| Between 50 and 60 years | 5 $\frac{5}{11}$ | 28 | $\frac{10}{11}$ | 4 $\frac{4}{9}$ | About 5 |
| Between 60 and 70 years | 8 $\frac{2}{11}$ | 31 | 2 | 7 $\frac{8}{11}$ | About 3 $\frac{3}{4}$ |
| Between 70 and 80 years | 14 $\frac{10}{11}$ | 30 | 6 $\frac{5}{10}$ | 13 $\frac{1}{11}$ | About 2 |
| Between 80 and 100 years | 16 $\frac{9}{11}$ | 26 | 16 $\frac{9}{11}$ | 26 | About 1 $\frac{1}{2}$ |
| Total | 96 $\frac{3}{11}$ | 215 | | | |

“The impact of vaccination on the health of the world’s peoples is hard to exaggerate. With the exception of safe water, no other modality has had such a major effect on mortality reduction and population growth.”

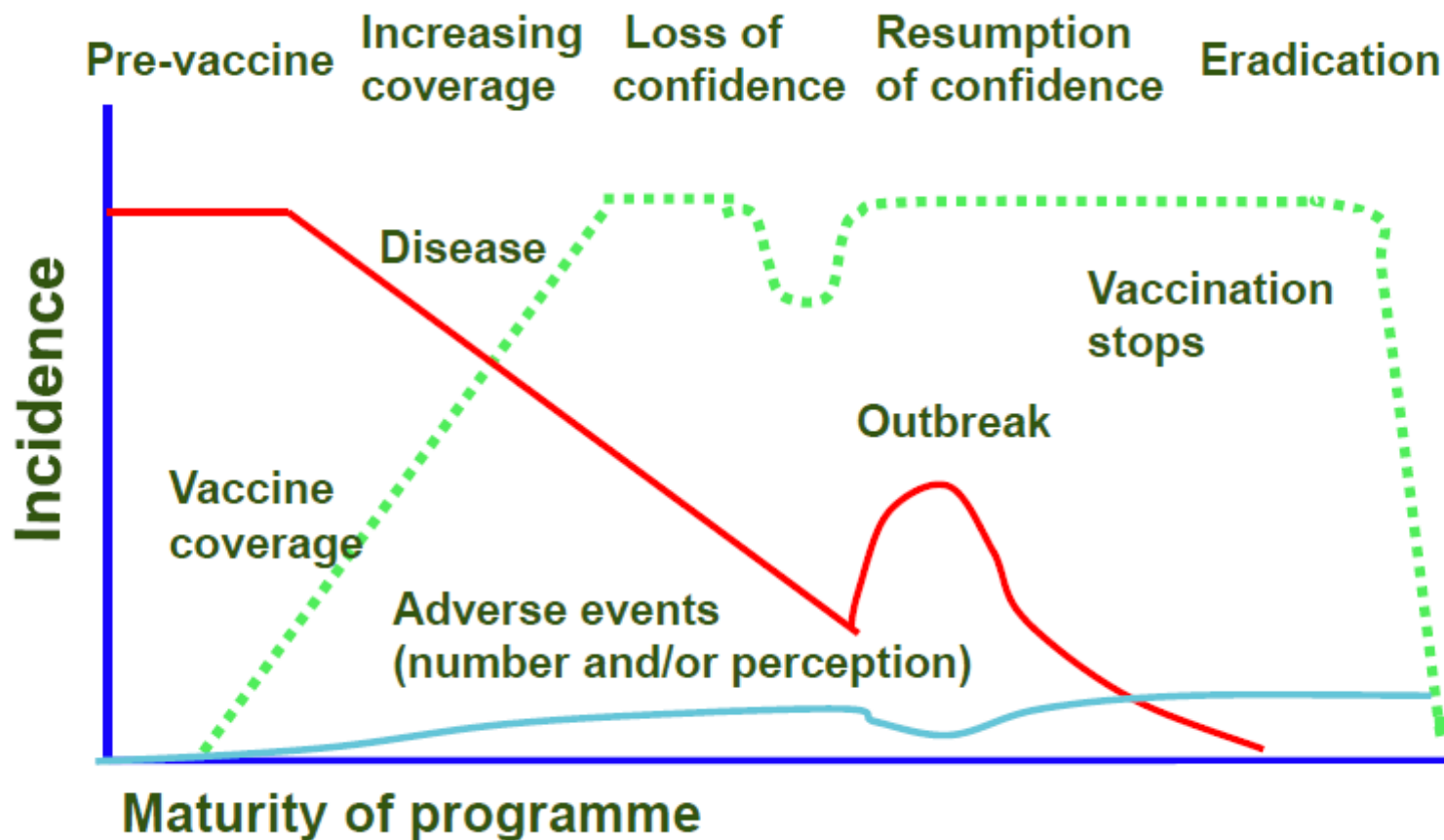
Susan and Stanley Plotkin, A Short History of Vaccination, in *Vaccines* 1st Edition, 1988

Percentage MMR uptake and number of measles cases, UK 1996/97-2008/09



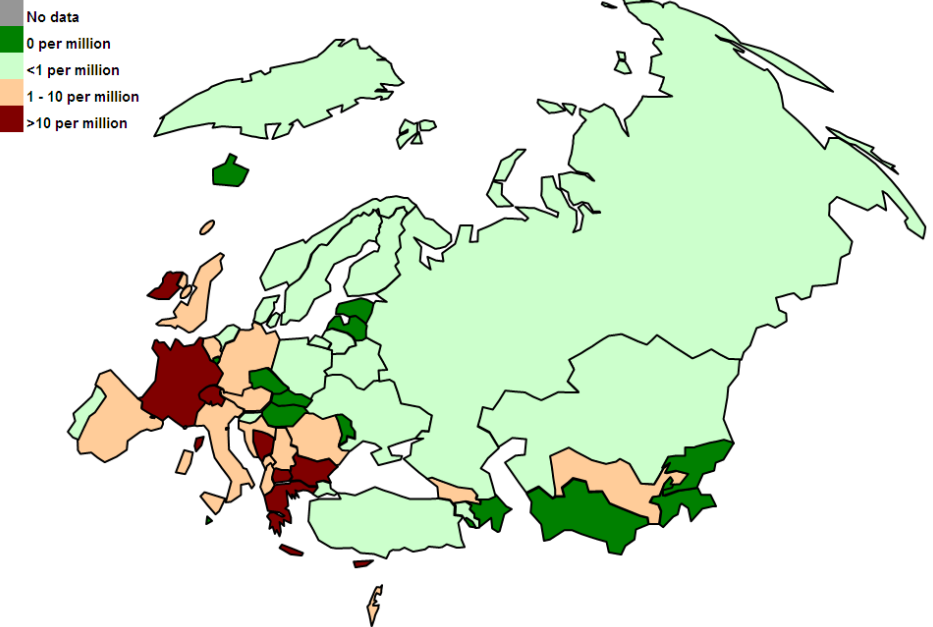
Data source: Health Protection Agency, UK

Risk assessment shift with time

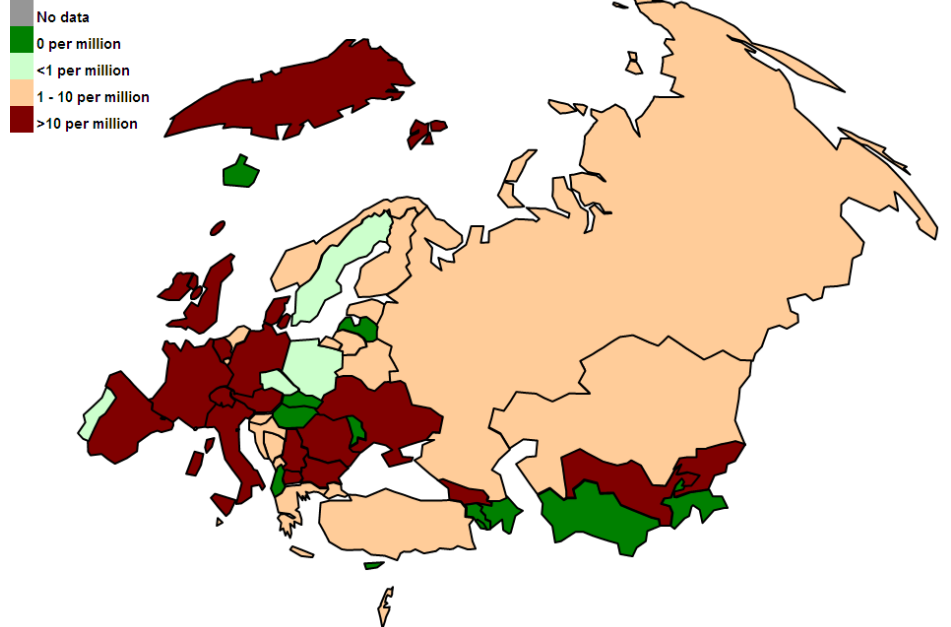


Incidence of measles per 100,000 inhabitants, 2010 and 2011

Measles Incidence 2010

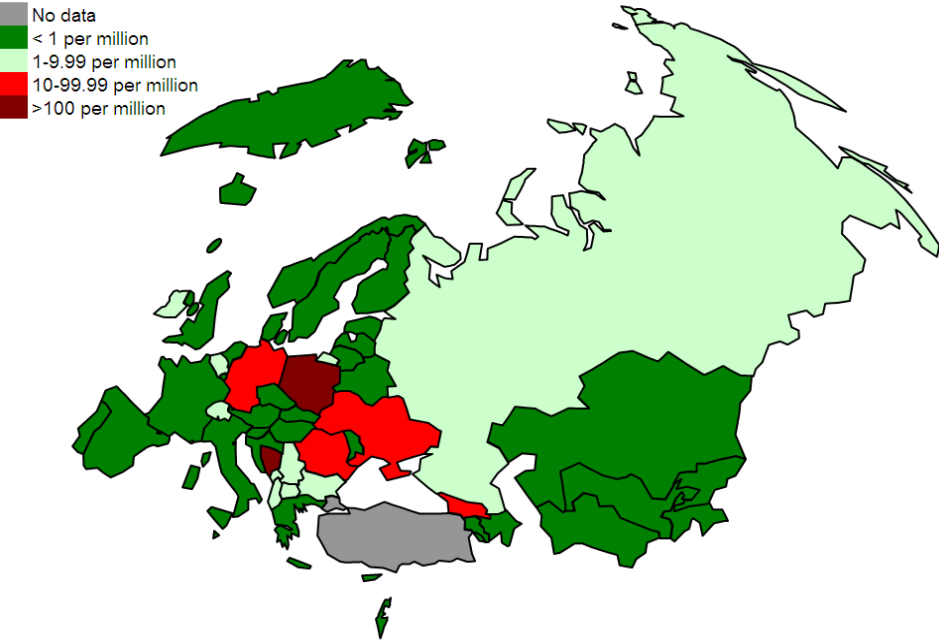


Measles Incidence 2011



Incidence of rubella per 100,000 inhabitants, 2010 and 2011

Rubella Incidence 2010



Rubella Incidence 2011

