Measles: United States, January 1 through June 10, 2011

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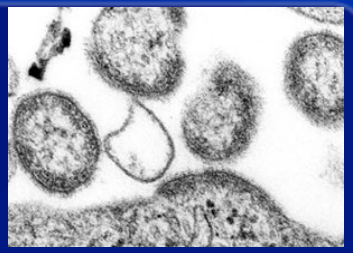
Measles

- Single-stranded RNA virus (*Paramyxovirus* family)
- Airborne route: Survive for at least 2 hours in fine droplets
- Incubation period: 7-18 days
- Infectious period: 4 days before and 4 days after rash onset
- Highly contagious: Secondary attack rate is 90% or greater

- Clinical signs and symptoms:
  - Prodome: Fever, cough, coryza, conjunctivitis (3 C's)
  - Generalized maculopapular rash
- Complications
  - Otitis media, diarrhea, dehydration
  - Pneumonia
  - Measles encephalitis
  - Subacute sclerosing panencephalitis (SSPE)

Measles: Laboratory



- Enzyme immunoassay (EIA):
  - Most commonly used method for detecting measles-specific IgM and IgG antibodies.
  - If IgM is negative within the first 72 hours, repeat testing is recommended

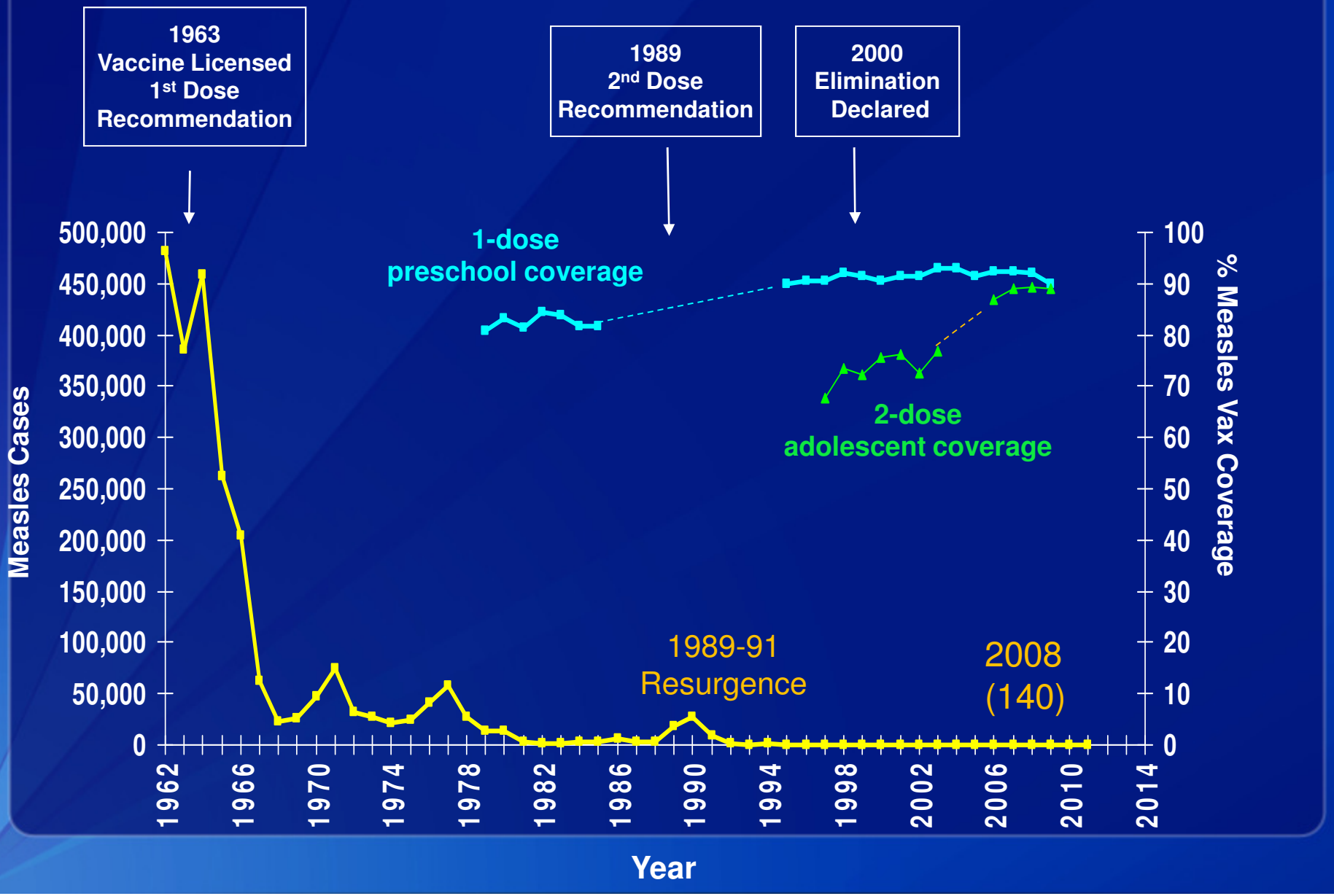
- Specimens for Virus Isolation or RT-PCR Detection:
  - Throat or nasopharyngeal swabs are generally the preferred sample
  - Urine samples may also contain virus
  - Virus isolation is most successful when samples are collected on the first day of rash through 3 days following onset of rash; however, it is possible to detect virus up to day 7 following rash onset.

Measles Epidemiology

- One of the leading causes of death among young children worldwide
- United States: Prior to the introduction of the measles vaccine in 1963[1]
  - An estimated 3 to 4 million people in the United States acquired measles each year.
  - Approximately 500,000 of these measles cases were reported annually
    - 500 persons died, 48,000 were hospitalized, and another 1,000 had permanent brain damage from measles encephalitis
  - Highest occurrence of disease among children 5-9 years of age
  - Highest risk of death in children younger than 1 year of age

[1]Strebel, P.M., et al., *Measles Vaccine*, in *Vaccines*

Measles Epidemiology, United States, 1962- 2010



Vaccine Effectiveness and Vaccine Coverage in the United States

- MMR* vaccine is highly effective
  - One dose vaccine effectiveness for measles is 94-98%
  - Two-dose vaccine effectiveness for measles is 95-100%

- MMR* vaccine coverage is high
  - In 2009,
    - 90% of children 19-35 months of age had received one dose [1]
    - 89.1% of adolescents had evidence of two doses[2]
  - Nationally representative data on MMR* vaccine coverage of U.S. health care personnel are not available.

- During 1999–2004, the rate of measles seropositivity in the U. S. population aged 6-49 years was 95.9% (95% CI, 95.1%–96.5%) indicating high herd immunity.

•Measles, mumps and rubella vaccine

•[1] Centers for Disease Control and Prevention,. MMWR, 2010. 59(36): p. 1171-1177.
[2] Centers for Disease Control and Prevention, MMWR, 2010. 59(32): p. 1018-1023.
[3].McQuillan GM. JID 2007; 196:1459–64

United States MMR Vaccine Recommendations*

- Children
  - Routine:
    - 1st dose: 12–15 months
    - 2nd dose: 4–6 years of age
  - Traveling abroad:
    - 6-11 months – 1 dose
    - ≥12 months – 2 doses ≥28 days apart
- Adults:
  - 2 Doses:
    - Including health care personnel, international travelers, university students
  - 1 dose: Others (except during outbreaks)

*Advisory Committee on Immunization Practices, Measles, mumps and rubella vaccine, 1998

Health Care Settings

Measles in Health Care Settings

- A well-described health-care-associated problem
- Symptomatic cases are likely to seek medical care in primary health care facilities, emergency departments or hospital settings due to severity of illness.
- Approximately 33 states do not have laws mandating that all hospital personnel have proof of measles immunity
- Medical settings are a primary site of measles transmission
  - 1989-1991 measles resurgence and in a health-care-associated outbreak in 2008
  - During 2001-2011, 45 reported measles cases were transmitted in U.S. health care facilities accounting for 5% of all reported U.S. measles cases

Istre GR et al. Pediatrics 1987;79(3):356-8
NCIRD: Available from: http://www2a.cdc.gov/nip/StateVaccApp/statevaccsApp/default.asp /.
Farizo, KM et al. Pediatrics, 1991;87(1):74-79.
Rivera ME et al. J Pediatr, 1991;119(2): 183-6.

Measles in Health Care Settings

- 1996, Washington[2]: Health care personnel (HCP) were 19 times more likely to develop measles than other adults.[1]
- 2005, Indiana: A hospital spent >$113,000 responding to a measles outbreak. One HCP was admitted to intensive care unit.[3]
- 2008, Arizona[4]:
  - 7 (50%) of the cases acquired measles in a health care setting; one was an unvaccinated HCP.
  - 11(79%) accessed health care services while infectious; one was masked and isolated.
  - Two hospitals spent $799,136 responding to and containing cases in their facilities.
  - 25% HCP lacked documentation of measles immunity.
    - 9% lacked measles IgG antibodies.
- 2001-2011: 13 cases occurred among HCP, 8(62%) of whom were unvaccinated or had unknown vaccination status.

[1]Atkinson WL et al. Am J Medi 1991; 91 (3): p S320-S324
[2] Steingart, K.R., et al., ICHE, 1999. 20(2): p. 115-119
[3] Parker, A.A., et al. N Engl J Med, 2006. 355(5): p. 447-55
[4] Chen, S.Y., et al.J Infect Dis, 2011.

ACIP Provisional Recommendations for Measles 'Evidence of Immunity' Requirements for Healthcare Personnel*

- June 2009
- All persons who work in health care facilities should have presumptive evidence of immunity to measles.
- *Presumptive evidence of immunity* for persons who work in health care facilities includes any of the following:
  - Written documentation of vaccination with 2 doses of live measles or MMR vaccine administered at least 28 days apart*
  - Laboratory evidence of immunity**
  - Laboratory confirmation of disease
  - Birth before 1957€ β £†

*The first dose of measles-containing vaccine should be administered on or after the first birthday; the second dose should be administered no earlier than 28 days after the first dose.

** Measles immunoglobulin (IgG) in the serum; equivocal results should be considered negative.

€Most persons born before 1957 are likely to have been infected naturally and may be presumed immune.

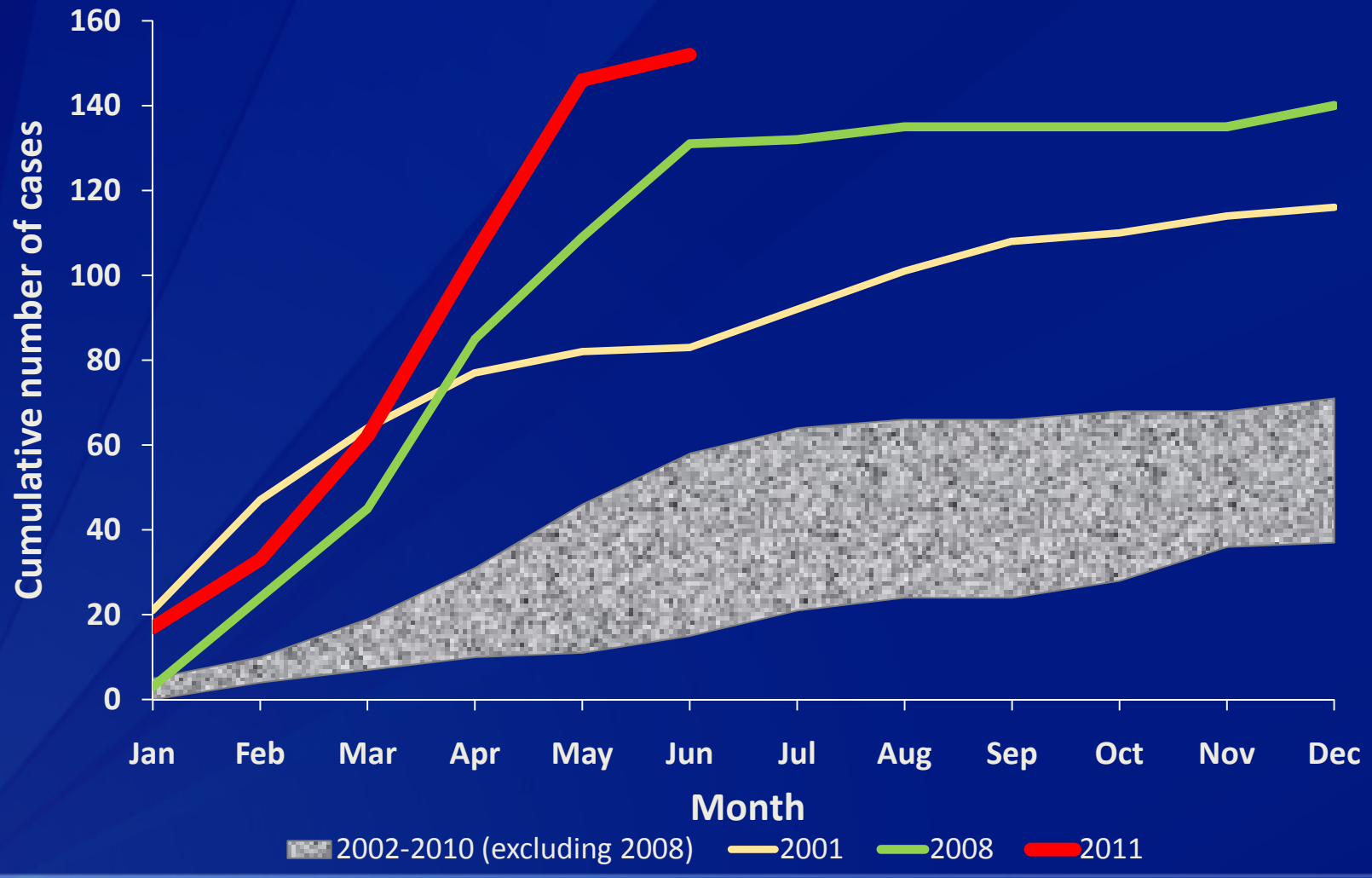
β May vary depending on current state or local requirements.

£For unvaccinated personnel born before 1957 who lack laboratory evidence of measles immunity or laboratory confirmation of disease, health-care facilities should consider vaccinating personnel with two doses of MMR vaccine at the appropriate interval.

† For unvaccinated personnel born before 1957 who lack laboratory evidence of measles immunity or laboratory confirmation of disease, health-care facilities should recommend two doses of MMR vaccine during an outbreak of measles.

United States
January 1 through June 10, 2011

Cumulative Number of Measles Cases Reported, by Month of Rash Onset – United States, January 1, 2001 through June 10, 2011



Distribution of Reported Measles Cases, United States, January 1 – June 10, 2011 (n = 152)

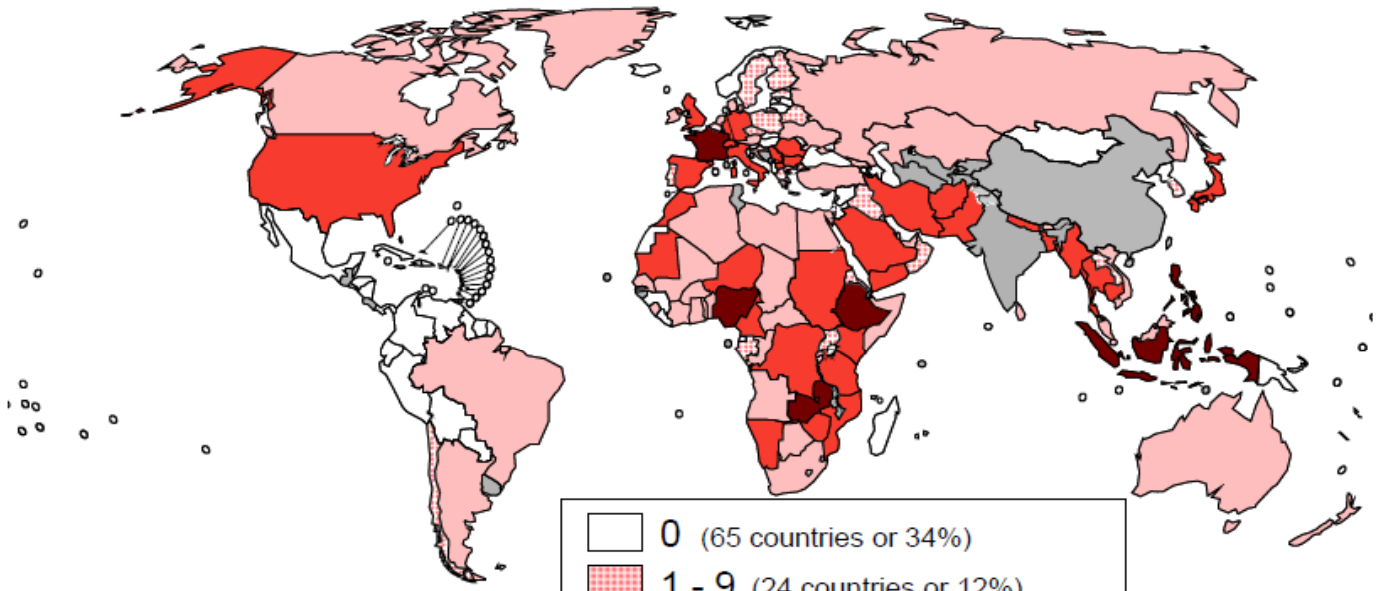
- Age: 3 months to 68 years
  - <12 months: 23 (15%)
  - 1-4 years: 30 (20%)
  - 5-19 years: 32 (21%)
  - ≥20 years: 67 (44%)
- Among those ≥12 months, 107 (70%) unvaccinated or unknown vaccination status .
- Import associated: 131 (86%)
- Health care setting exposure : 12 (8%)
- Hospitalizations: 53 (35%)
  - Pneumonia: 9

Measles Hospitalizations, United States, January 1, 2001 through June 10, 2011

*June 10,2011

International

Measles Cases Reported to World Health Organization: Onset Date October 2010 – April 2011



Timor-Leste:

As of 4 May 2011: 234 cases and 4 deaths reported

Data source: surveillance DEF file
Data in HQ as of 11 May 2011

WHO

http://www.who.int/immunization_monitoring/diseases/measles_monthlydata/en/index.html

Measles in Europe: 2011

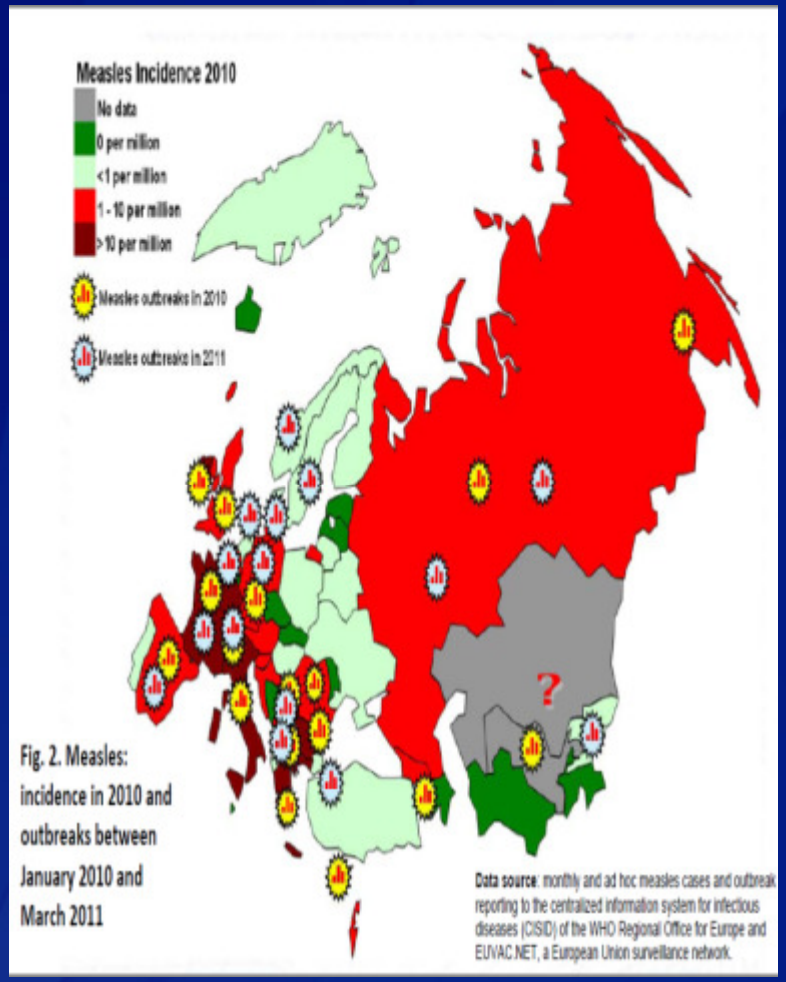
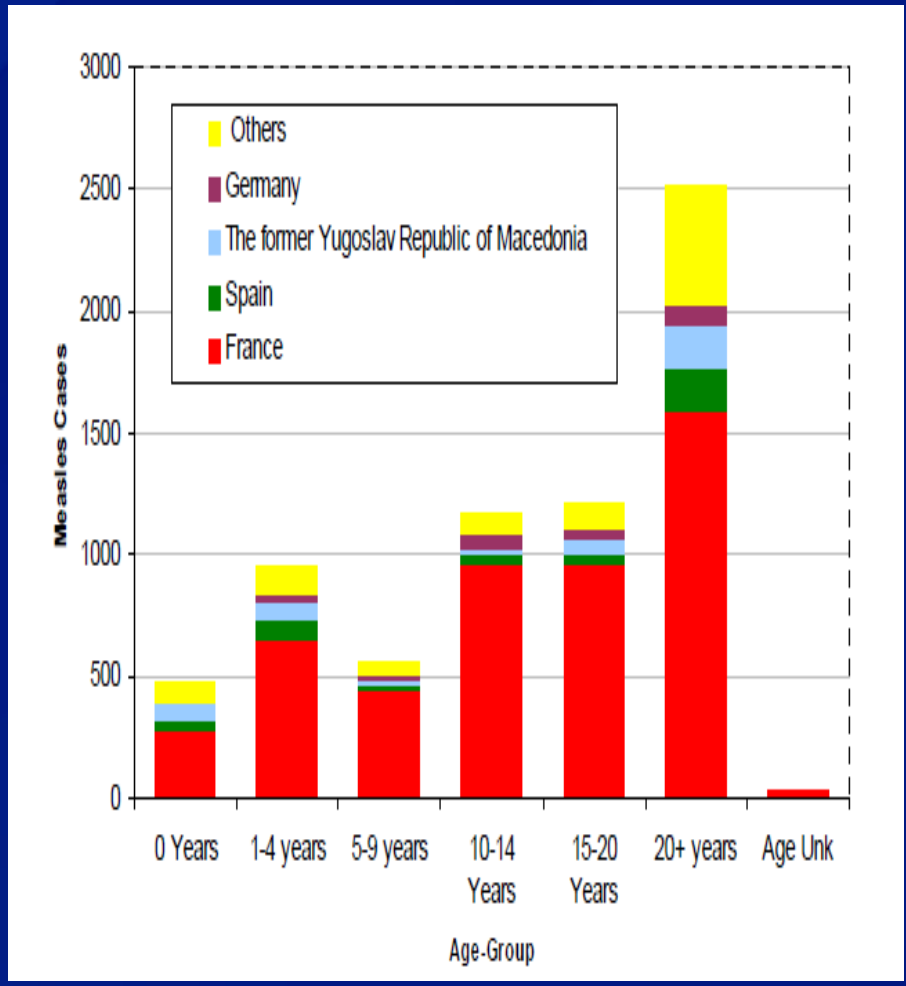


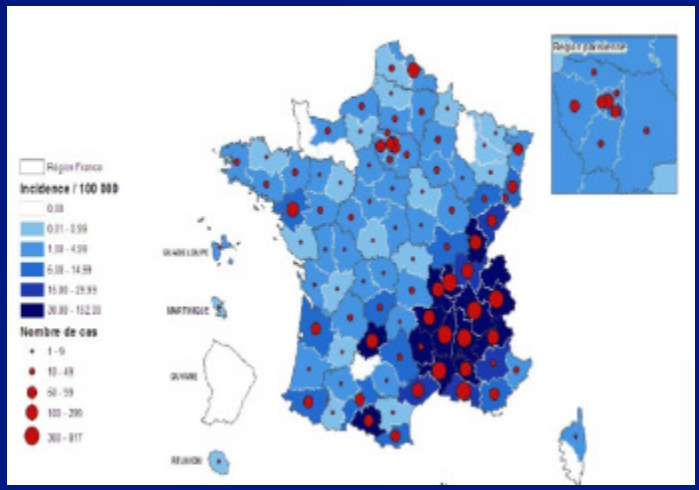
Fig. 2. Measles: incidence in 2010 and outbreaks between January 2010 and March 2011

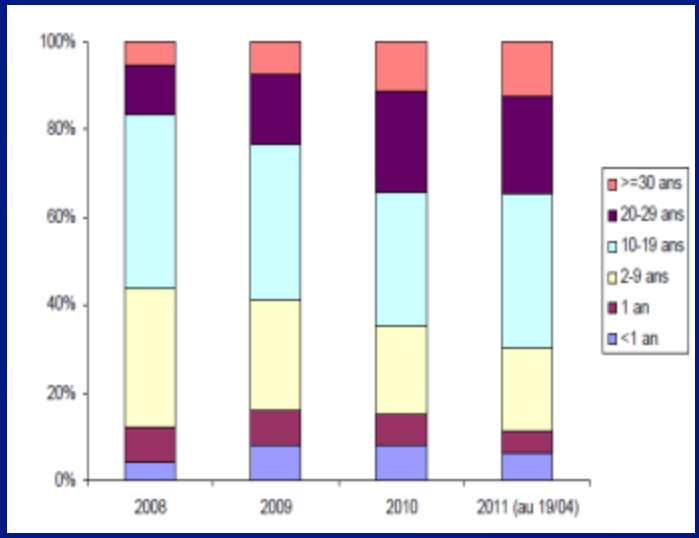


WHO: http://www.euro.who.int/__data/assets/pdf_file/0003/142176/WHO_EPI_Brief__May_2011e.pdf

Measles in Europe: France

- As of 19 April, over 7500 cases reported for 1st three months of 2011
- Complications:
  - Encephalitis: 12
  - Guillian-Barré: 1
  - Death: 2 deaths due to pneumonia





http://www.invs.sante.fr/surveillance/rougeole/Point_rougeole_190411.pdf

Summary

- Increase in the number of measles cases in 2011 in United States:
  - Highest since 1996
  - Majority among unvaccinated U.S. travelers
  - High proportion accessing healthcare
- Health care personnel
  - Should have adequate immunity or be up to date with measles vaccination
  - Have awareness of measles among travelers
  - Ensure adequate isolation precautions
  - Active Surveillance in hospitals when measles is reported in the community
  - Inform public health departments immediately
- Maintaining high vaccine coverage is critical to sustaining measles elimination

Acknowledgments

- State and Local health departments
- CDC
  - Division of Viral Diseases

The findings and conclusions are those of the authors and do not necessarily represent the view of the Centers for Disease Control and Prevention.

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention