

 **WVU** Medicine Children's

Measles

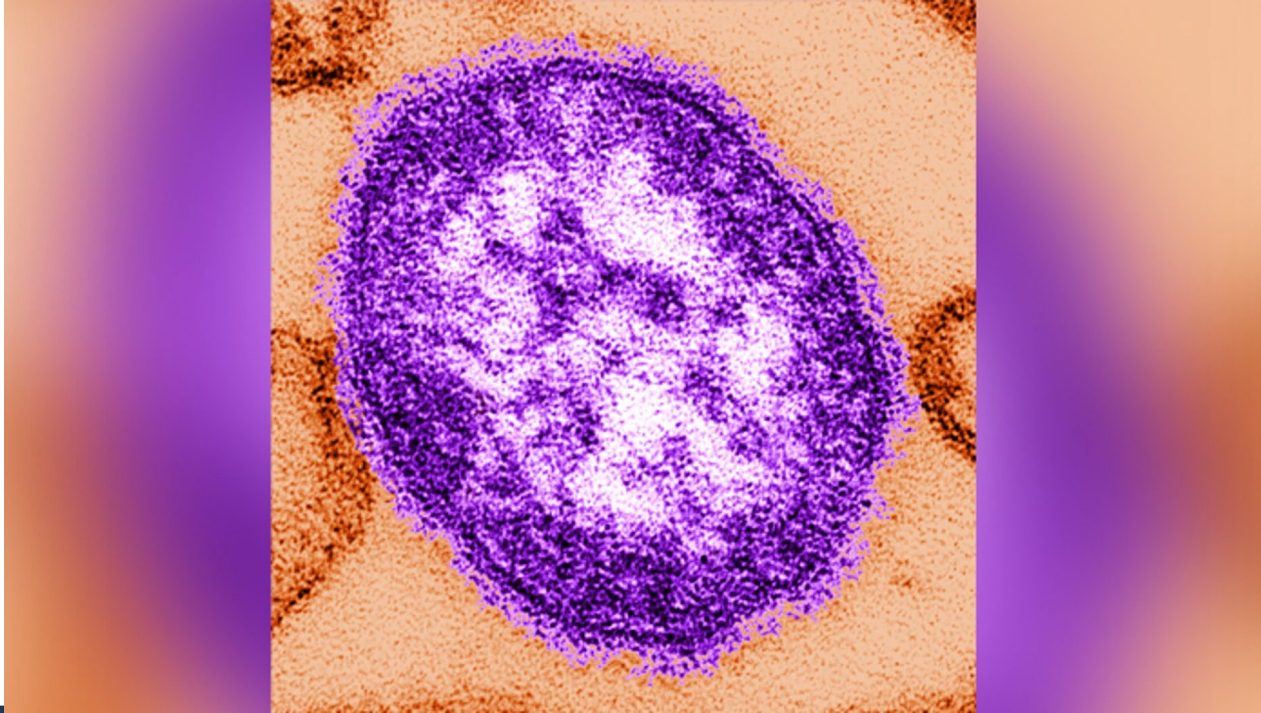
Kathryn Moffett, M.D.

WVU Pediatric Infectious Diseases





Measles Virus





Measles (Rubeola)

- Etiology- morbillivirus
- Contagiousness- > 90% of household contacts
- Incubation period- 10 - 14 days
- Prodrome- fever, cough, conjunctivitis, coryza, croup, and Koplik spots, lasts 3-5 days
- Rash- Progresses head to toe, lasts 6-7 days

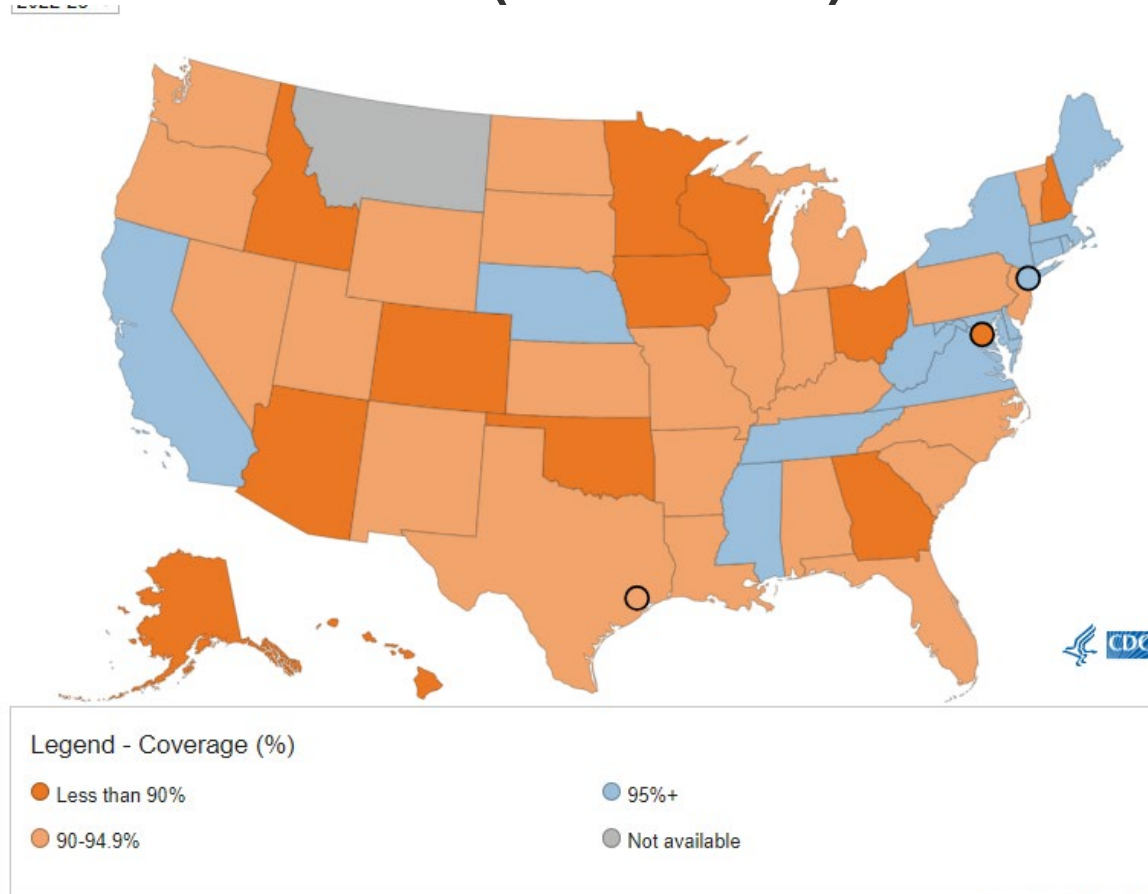




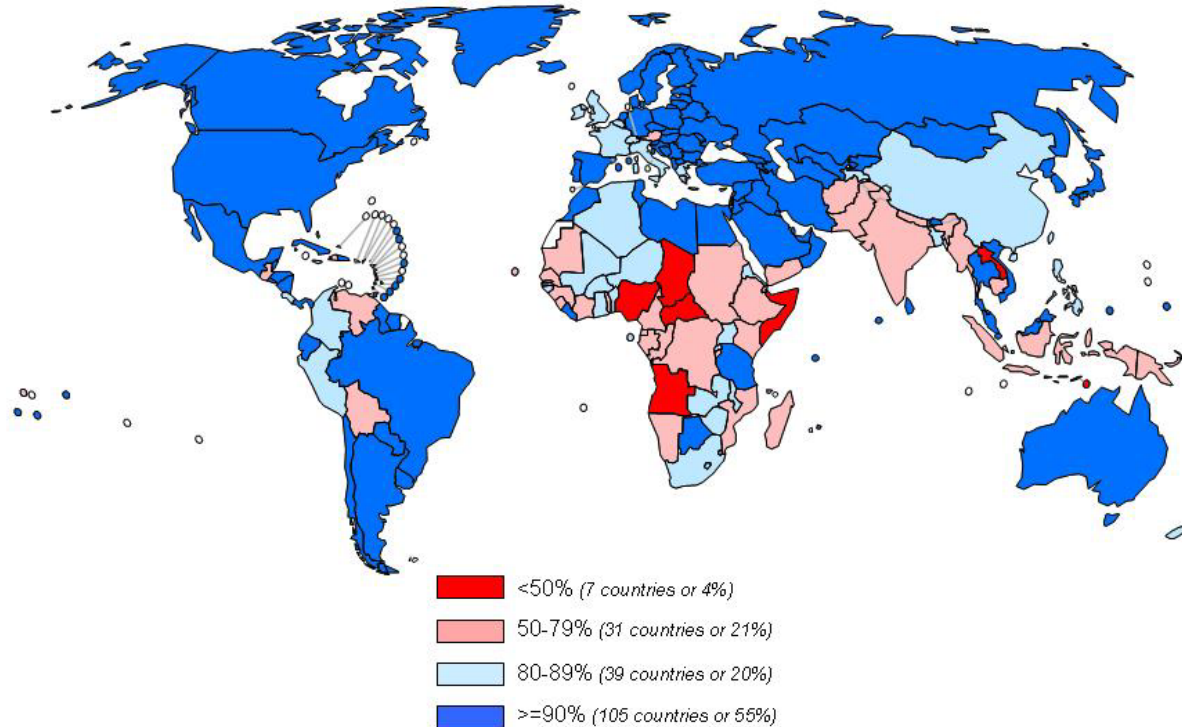
**Best *treatment*
is prevention!**



MMR Vaccine Coverage for Kindergarteners by School Year (2009-2023)



Immunization coverage with measles containing vaccines in infants, 2005



Source : WHO/UNICEF Coverage estimates 1980-2005, August 2006

192 WHO Member States.

Date of slide : 25 august 2005

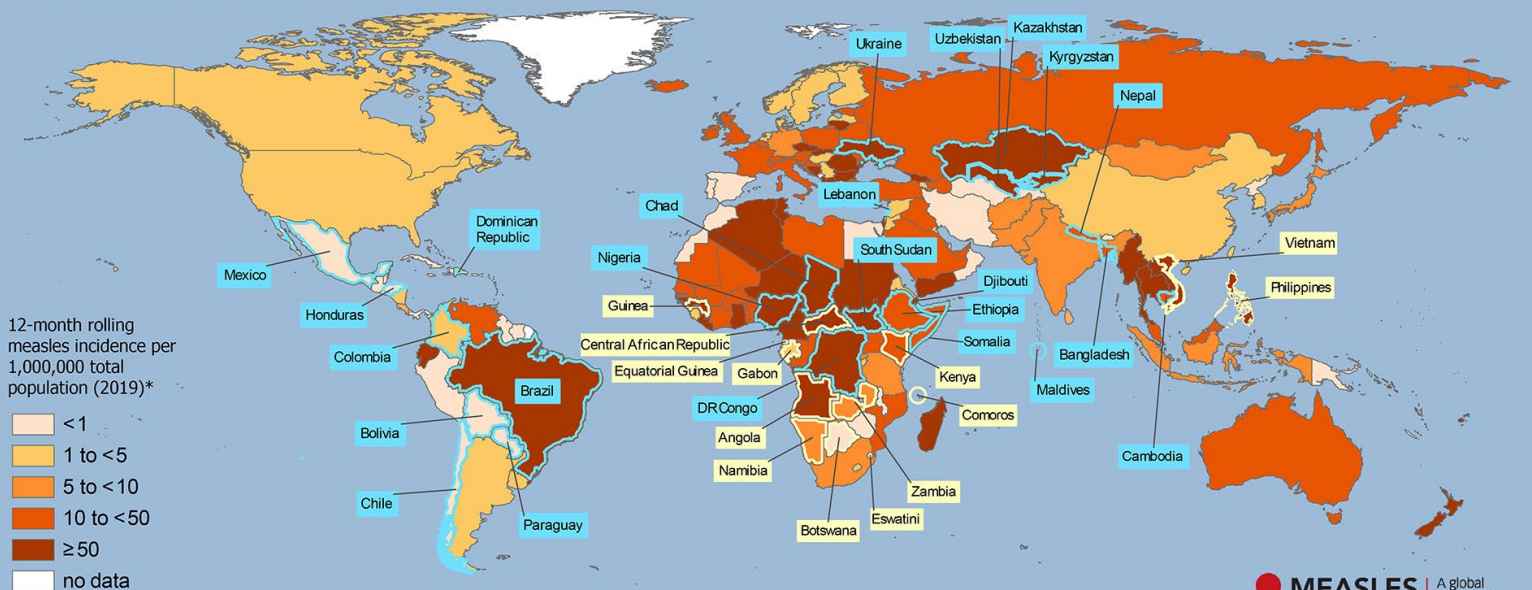
The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legitimacy of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.
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More than 117 million children at-risk of missing out on measles vaccines, as COVID-19 surges

- Postponed measles vaccination campaign¹
- Measles vaccination campaign may be postponed¹



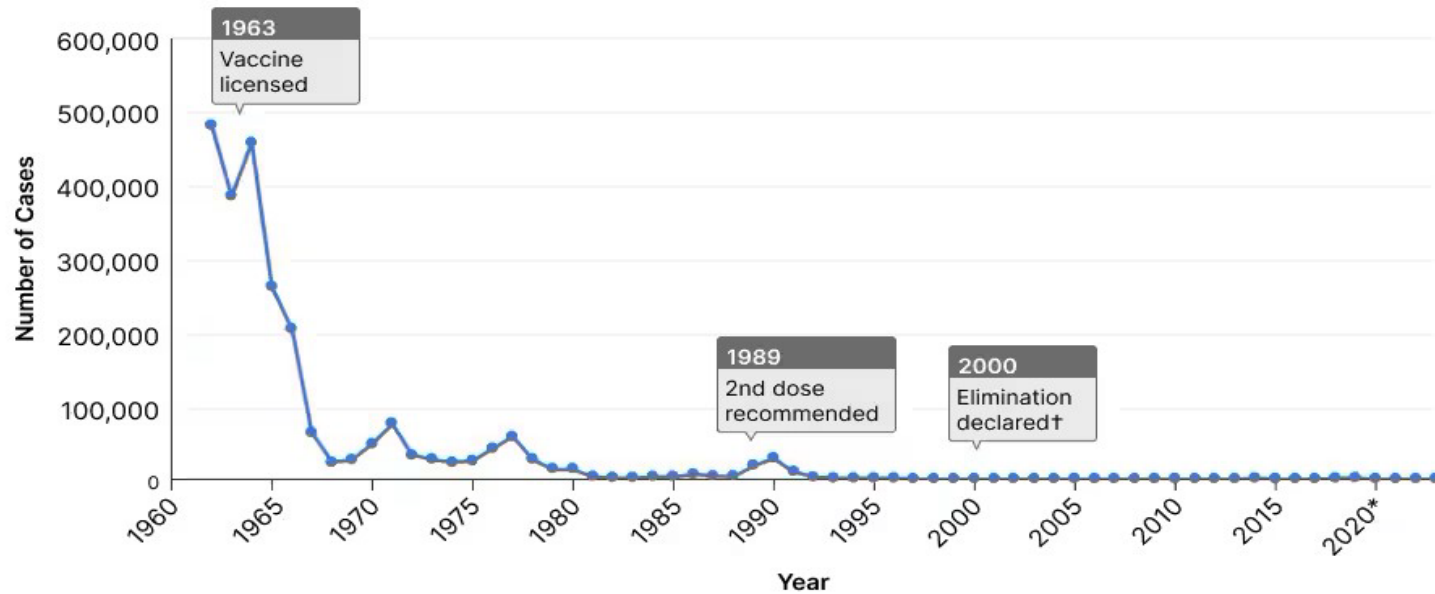
*WHO reported measles cases and incidence rates by Member States (provisional data as of March 11, 2020).

¹ Source: Provisional information provided by immunization partners as of April 10, 2020 for planned or likely planned nationwide or subnational measles supplemental immunization activities (SIAs) and outbreak response immunization (ORI) campaigns through December 2020.





Reported Measles Cases in the United States from 1962 – 2023*





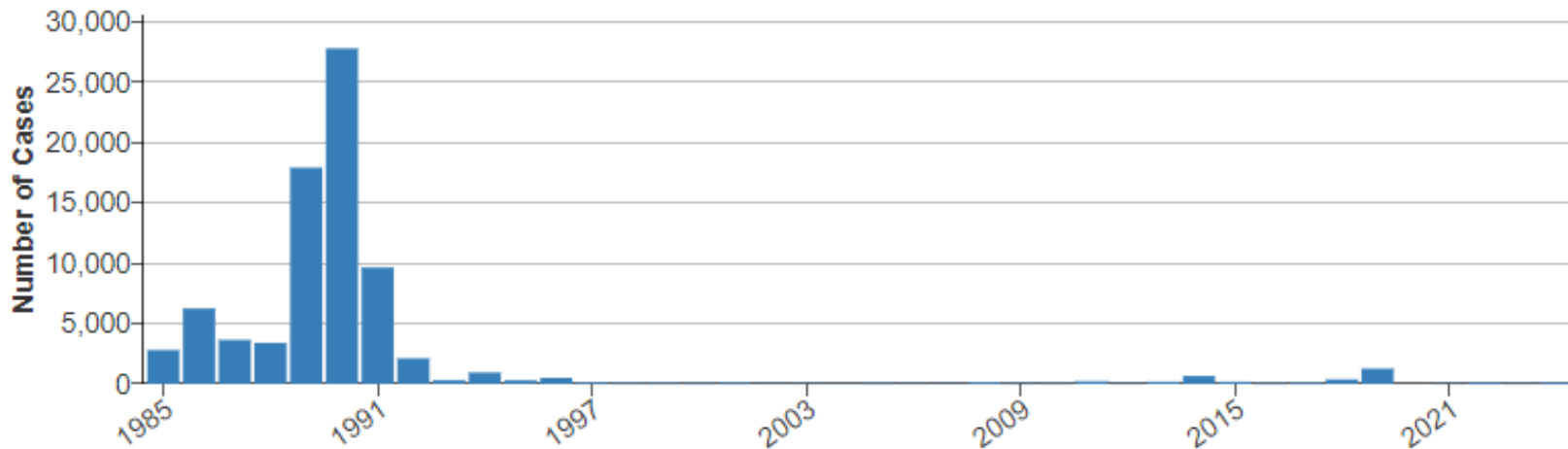
Number of measles cases reported by year

as of April 11, 2024

Make a selection from the filters to change the visualization information.

2000-2024*

1985-2024*



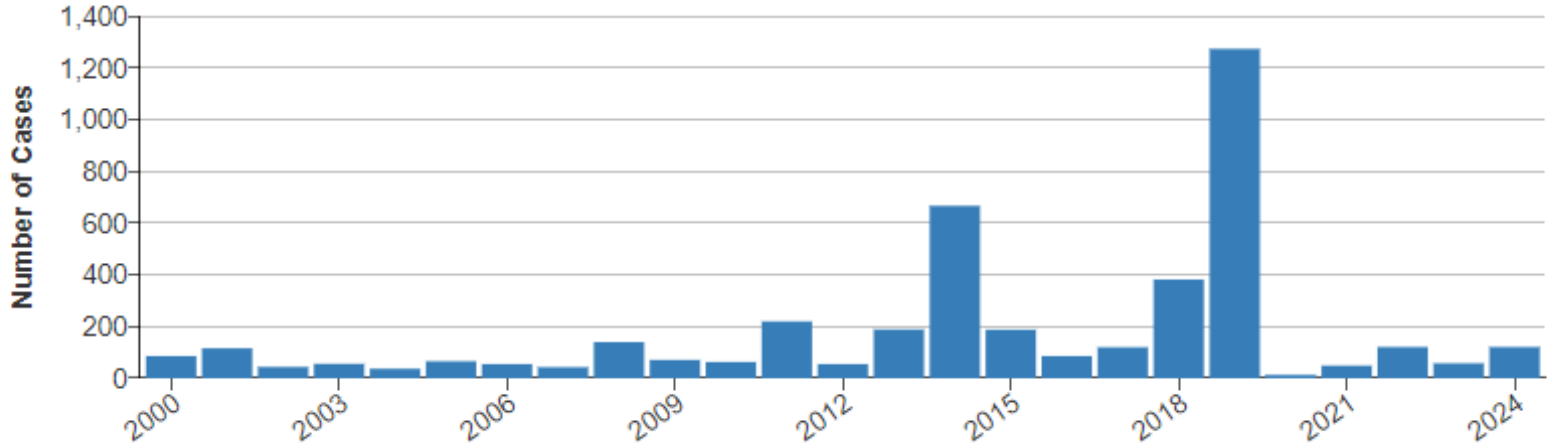


Number of measles cases reported by year

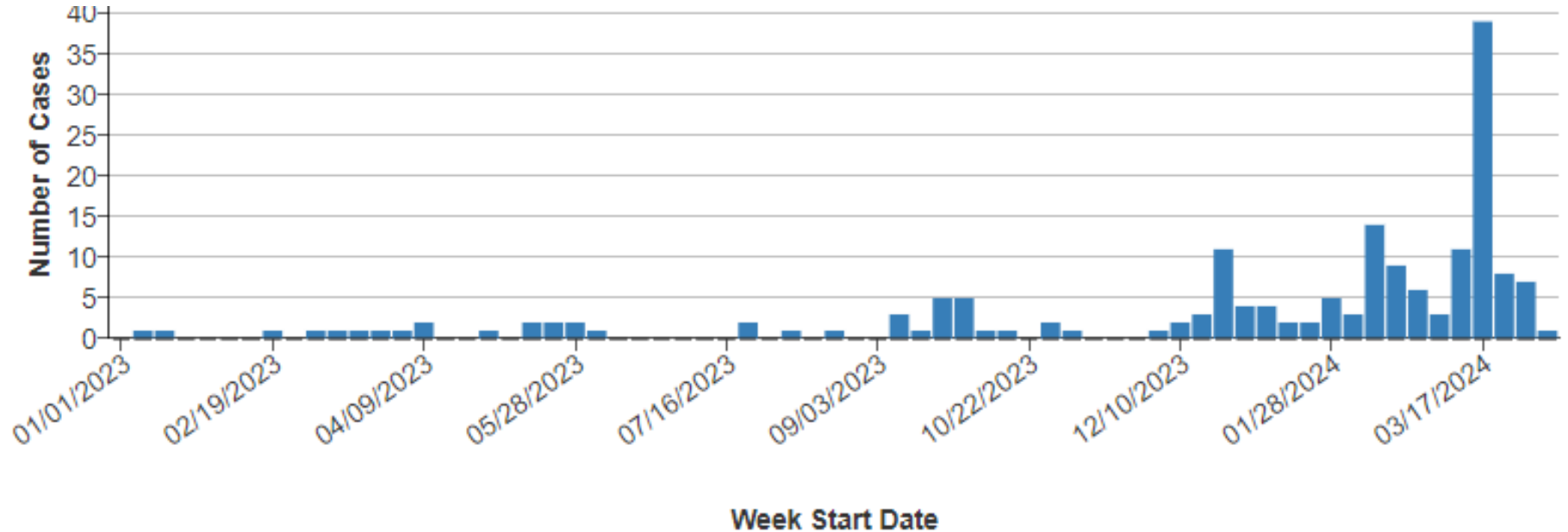
as of April 11, 2024

Make a selection from the filters to change the visualization information.

2000-2024* 1985-2024*



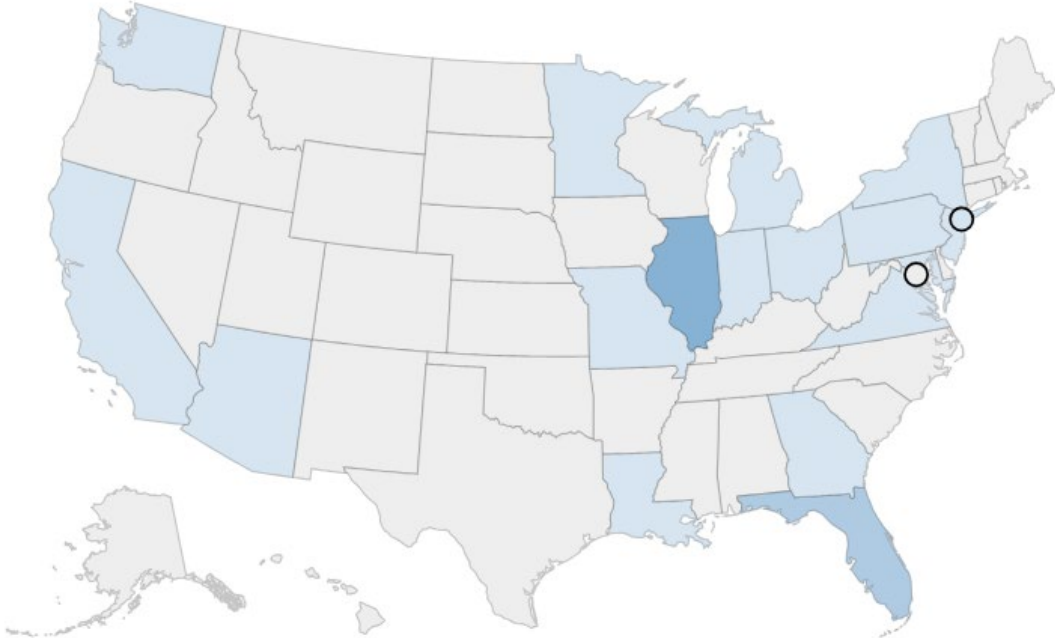
Number of measles cases reported by week 2023-2024* (as of April 11, 2024)





Measles Cases Reported in 2024

as of April 11, 2024



○ 0

○ 1-9

○ 10-19

● 50-99

● 100+





Measles

- Symptoms of measles usually
 - begin 10–14 days after exposure to the virus
 - prominent rash is the most visible symptom after early symptoms





Measles



- Early symptoms usually last 4–7 days. They include:
 - Fever
 - running nose (Coryza)
 - Cough/ croup
 - red and watery eyes (Conjunctivitis)
 - small white spots inside the cheeks (Koplik spots)

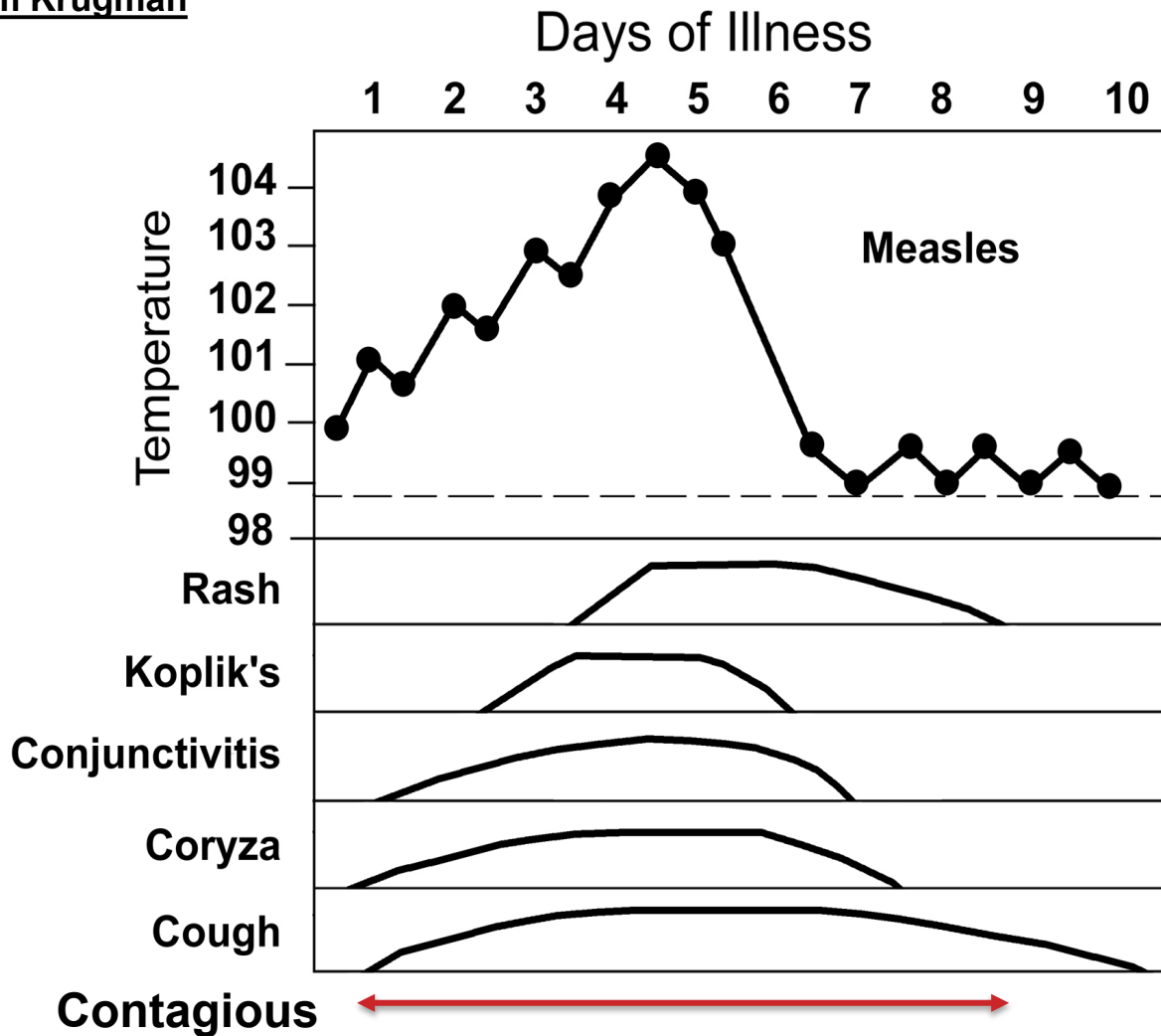




Measles

- Diarrhea, dehydration
- Rash begins:
 - about 7–18 days after exposure (3-4 d after fever starts)
 - usually on the face and upper neck
 - spreads over about 3 days, eventually to the hands and feet, chest/abdomen
 - usually lasts 5–6 days before fading





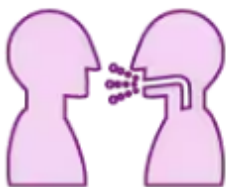


Who is at risk?

EVERYONE but....

- Pregnancy:
 - dangerous for the mother
 - can result in her baby being born prematurely with a low birth weight
- Complications are most common:
 - children under 5 years
 - adults over age 30
 - children who are malnourished, especially those without enough vitamin A or with a weak immune system from HIV or other diseases.
- Measles itself:
 - weakens the immune system
 - makes the body “forget” how to protect itself against infections, leaving children extremely vulnerable





It spreads when an infected person coughs or sneezes.

How measles spreads

Measles is a highly contagious virus that lives in the nose and throat mucus of an infected person. It can spread to others through coughing and sneezing.

If other people **breathe the contaminated air or touch the infected surface**, then touch their eyes, noses, or mouths, they can become infected.

Animals do not get or spread measles.



The virus can live for up to two hours in an airspace.

Measles is one of the most contagious diseases

Measles is so contagious that if one person has it, up to 90% of the people close to that person who are not immune will also become infected.

Infected people can **spread measles to others from four days before through four days after the rash appears**.

Measles virus can **live for up to two hours in an airspace after an infected person leaves an area**.



Vaccination rate and measles outbreak simulation

February 5, 2015

vaccinated susceptible vaccinated but susceptible infected contact with an infected person

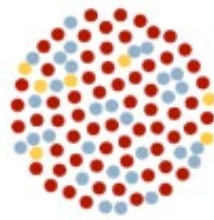
Topic

Infographics /
Guardian,
measles,
simulation,
vaccination



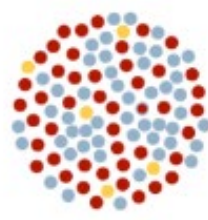
NOT PROTECTED

10.0% vax rate



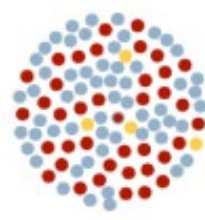
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30.0% vax rate



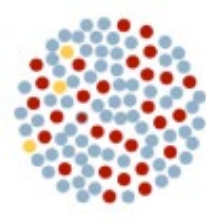
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50.0% vax rate



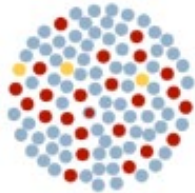
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58.5% vax rate, similar
to Okanagan County, WA



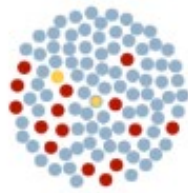
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68.9% vax rate, similar
to Thurston County, WA



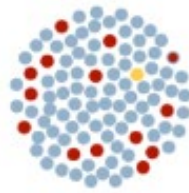
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74.4% vax rate, similar
to Island County, WA



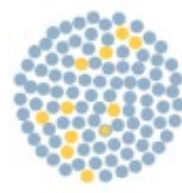
NOT PROTECTED

83.8% vax rate, similar
to Santa Cruz County,
CA



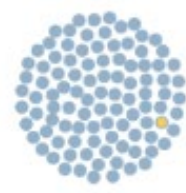
NOT PROTECTED

86.0% vax rate, similar
to Los Angeles County,
CA



PROTECTED

90.0% vax rate, similar
to Orange County, CA



PROTECTED

99.7% vax rate, similar
to Gadsden County, FL





Early prodrome

- Fever
- 3 C's, croup
- Could have photophobia
- Myalgias
- Koplik spots





- Photophobia from conjunctivitis
- Coryza
- Looks miserable





- Koplik Spots
 - Pre molar
 - Present from 1 day before rash to 2 days into rash





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Figure Legend:

Koplik spots of measles in a 7-year-old. Courtesy of Larry Frenkel, MD





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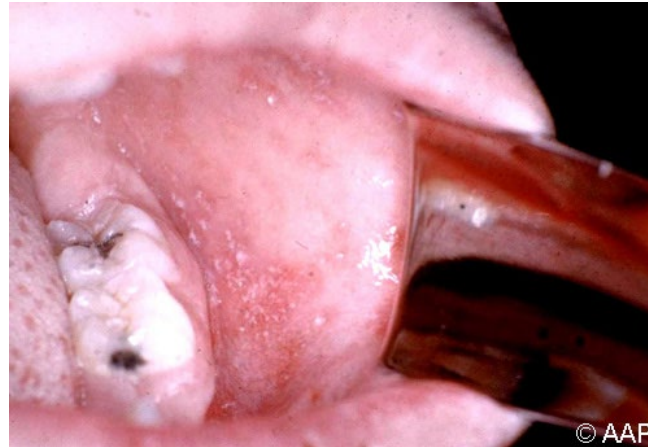


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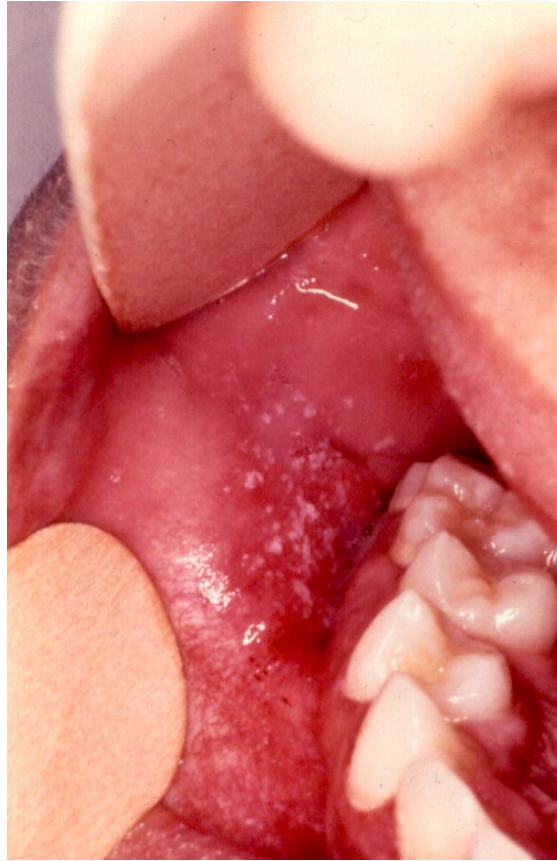
Measles (rubeola). Koplik spots on second day of rash. Note characteristic white lesion with erythematous margin.





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Differential Diagnosis

- Early: Fever & cough/conjunctivitis/coryza, fussy/irritable
 - Viral (adenovirus); Croup (Parainfluenza, Influenza, RSV)
 - Could consider: Kawasaki (no cough/coryza)

Look in MOUTH!!! (Koplik spots)
- Addition of rash broadens to include:
 - Stevens Johnson Syndrome
 - Rubella
 - Viral (adenovirus, enterovirus)
 - RMSF
 - Parvo
 - HHV-6
 - (Dengue, Chikungunya, Zika)



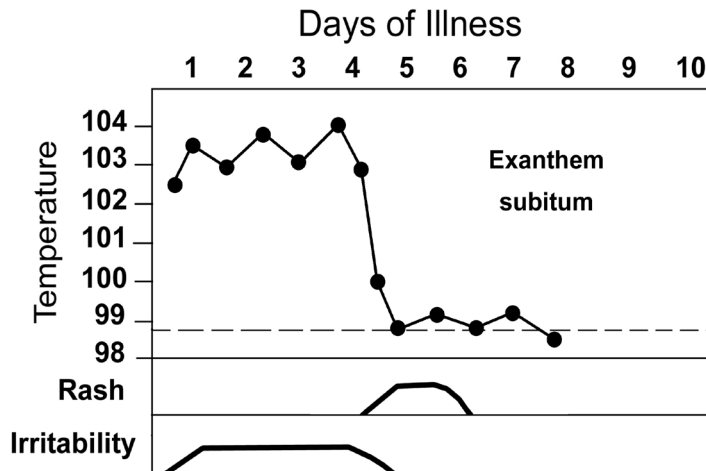
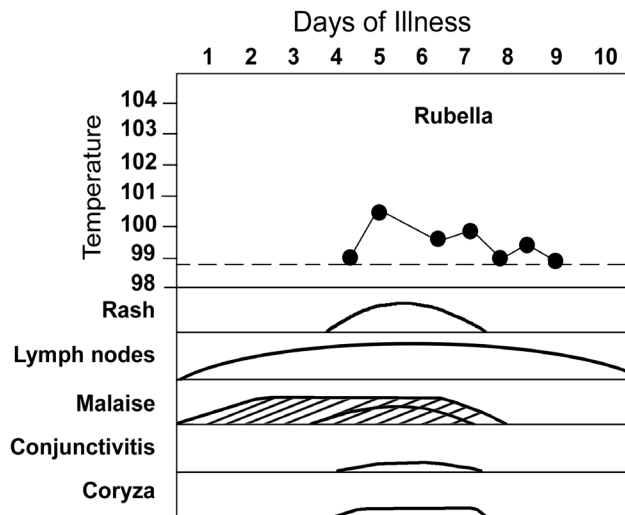
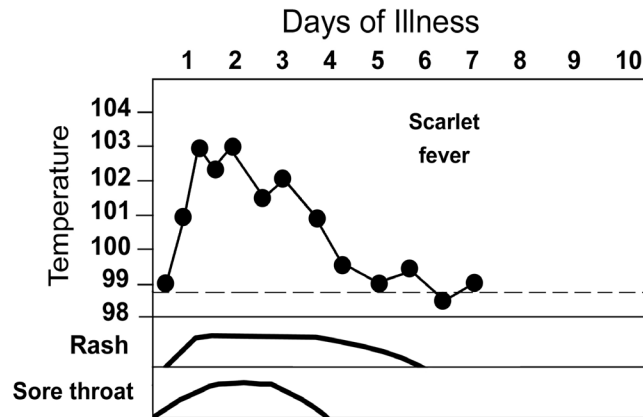
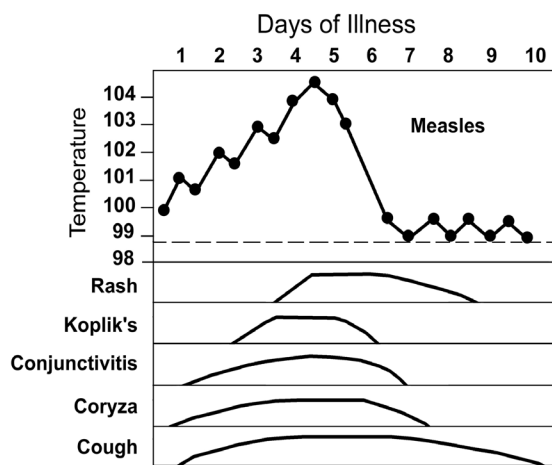
Differential Diagnosis Study

Epidemiol Infect. 2001 Dec;127(3):509-16



- Rash diseases in Niteroi, Rio de Janeiro, Jan 1994 to April 1998.
- 327 patients with fever and rash were tested for IgM and IgG.
- 71.3% of the cases were positive
 - dengue fever (33.0%)
 - rubella (20.2%)
 - parvovirus B19 (9.2%)
 - measles (6.7%)
 - HHV-6 (2.1%)
 - No diagnosis was established for 94 cases (28.7%)
 - An outbreak of measles occurred in 1997, with a peak in Sept-Oct.
- All presented with clinical features similar to measles
- **Classic symptoms** were found in **all measles** confirmed cases.
- The large overlap of combinations of signs and symptoms seen in this study highlights the difficulties of diagnosing a rash illness on clinical grounds alone





From Krugman





2 year-old child brought to clinic with 4 day h/o fever, red eyes and cough, and now with rash.

Has not been eating or drinking as well, and is now having watery diarrhea.

On exam he is thin, febrile, and ill-appearing. The rash is slightly palpable, and more confluent on his face and trunk, and starting on his buttocks and legs.





A 13 y/o teen begins with a low grade fever, runny nose, itchy eyes, and a cough.

Over the ensuing 2 days, the fever heightens, the cough deepens and a rash erupts on the face.

The rash spreads down the body over the next 4-5 days.





Measles

- Complications- pneumonia, blindness, encephalitis (acute or SSPE)
- Treatment- Vitamin A
- Prognosis- 1- 25% fatal
- Leading cause of death in world of vaccine-preventable diseases
- Significant global cause of blindness





1st day of rash solitary lesions on face





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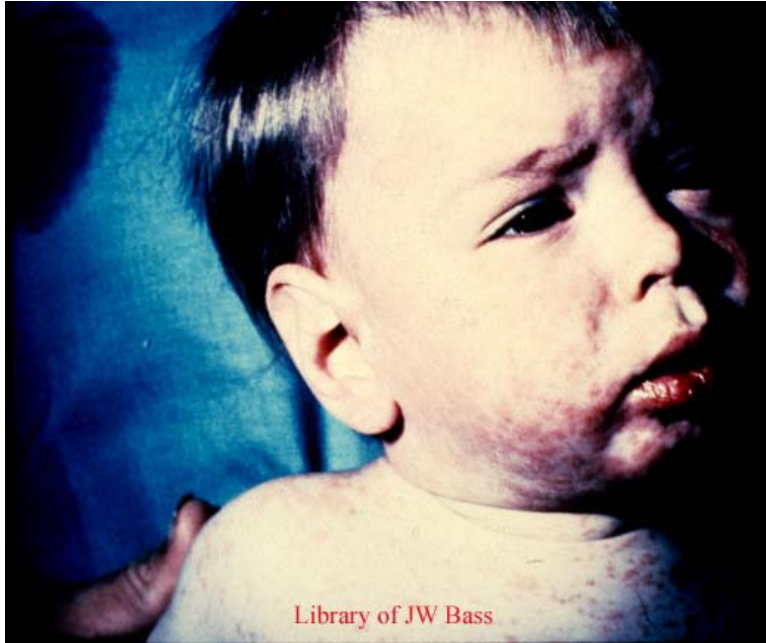
Figure Legend:

A child with measles rash and conjunctivitis. Courtesy of Centers for Disease Control and Prevention



Morbilliform rash





- Day 2-3 of rash
 - facial rash becomes confluent
 - Lesions on trunk





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Figure Legend:

This unvaccinated 11-month-old acquired measles while traveling to the Philippines to visit relatives. Note the bilateral conjunctivitis, crusting rhinorrhea, and morbilliform rash; he also had a prominent staccato cough. Courtesy of Carol J. Baker, MD





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Day 4-5





Day 5-6

- rash is confluent on trunk





Day 5-6

- Rash is confluent on entire body



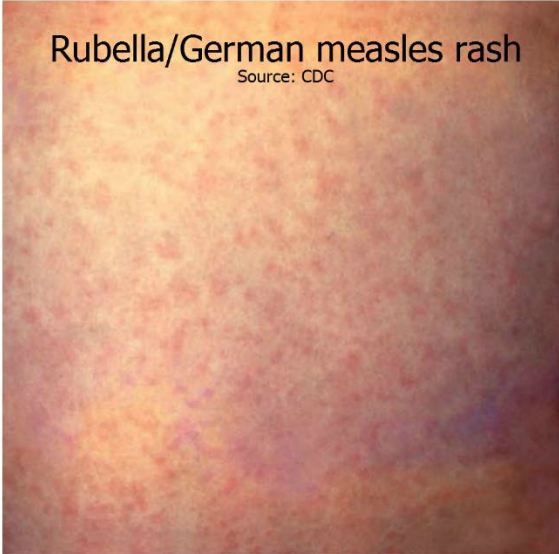






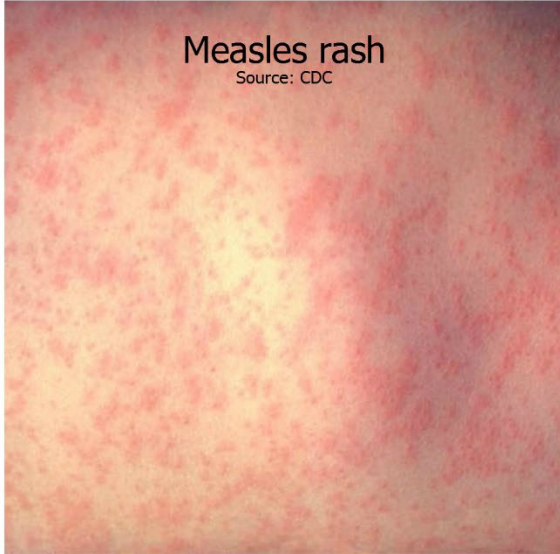
Rubella/German measles rash

Source: CDC



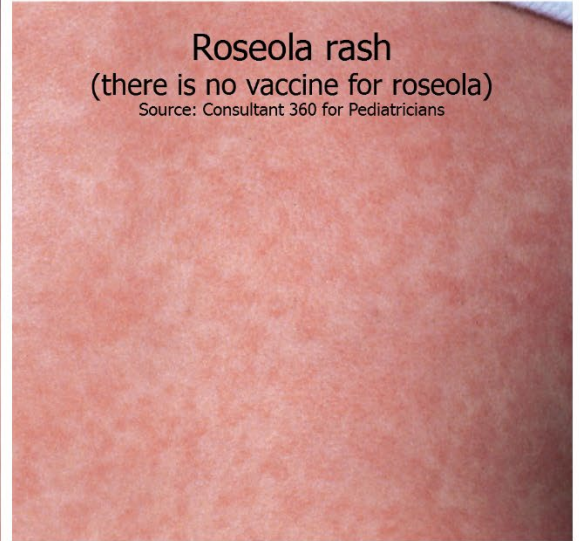
Measles rash

Source: CDC



Roseola rash (there is no vaccine for roseola)

Source: Consultant 360 for Pediatricians



Negative impact of clinical misdiagnosis of measles on health workers'



confidence in measles vaccine.

- Survey of accuracy of clinical diagnosis of measles in Zimbabwe, December 1996 to February 1997
- 105 children with a clinical diagnosis of measles
- Blood samples, clinical and demographic information collected
- A clinical case of measles was defined as:
 - History of fever & rash for ≥ 3 days, & either cough, coryza, or conjunctivitis.
- A laboratory-confirmed case of measles or rubella was defined as IgM against measles virus or rubella virus.
- A total of 91% of children met the clinical case definition
 - 72% were IgM-positive for measles virus only
 - 23% were IgM-positive for rubella virus only
 - 3% were IgM-positive for both measles and rubella viruses
 - 2% were IgM-negative for both viruses.



Rash after measles vaccination: laboratory analysis of cases reported in Sao Paulo, Brazil.



17 children suspected of measles or rubella infection post-vaccination:

- Parvo B19 infection 17.6% (3 of 17)
- HHV 6 infection 76.5% (13 of 17)
- measles vaccine 5.9% (1 in 17)





During Outbreak/ Exposure

- Isolation is Airborne
 - quarantine
- Exposure
 - Vaccine if not had 2-dose series (if ≥ 28 d from live vaccine)
 - IVIG for immune compromised



Treatment and Measles: Vitamin A

- 1986- Vitamin A to prevent xerophthalmia in Sumatra
- 1987- Vitamin A treatment of measles in Tanzania reduced mortality 50%
- Subsequent trials all show benefit
 - different doses used in various studies





Vitamin A

- WHO and UNICEF recommend Vitamin A (100,000 to 200,000 IU PO) to all patients with Measles
 - where vitamin A deficiency is prevalent or
 - where the mortality from measles exceeds one percent





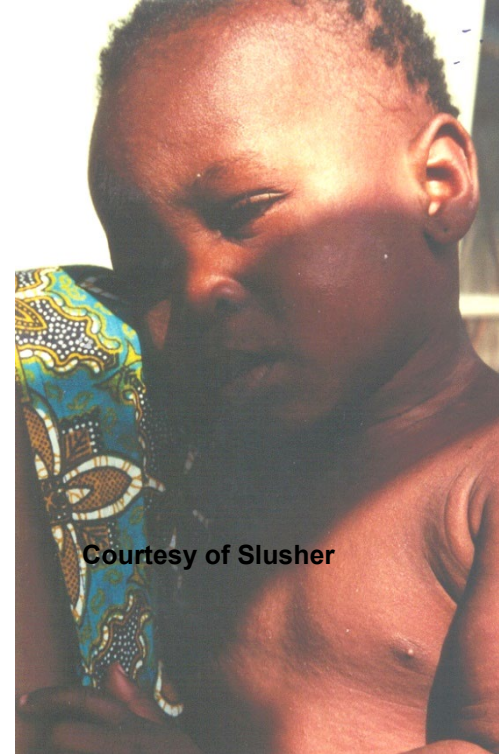
Complications

- Morbidity:
 - ear infections
 - Blindness
- Most deaths from measles are from complications:
 - encephalitis (an infection causing brain swelling and potentially brain damage)
 - severe diarrhea and related dehydration
 - severe breathing problems including pneumonia



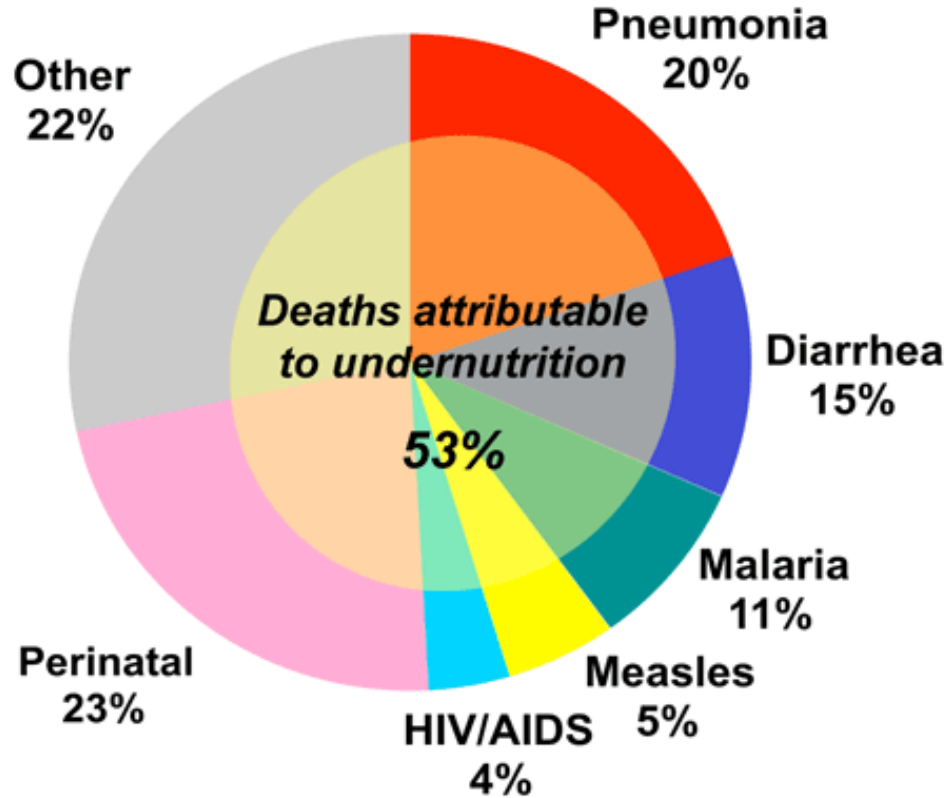


- Remains the leading killer of vaccine-preventable diseases in children.
- Because measles is so contagious **MUST** have >90% vaccination coverage to stop transmission of the virus
- Still over 30 million cases every year
- Malnourished children more susceptible to complications/death



Courtesy of Slusher







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© AAP

Figure Legend:

Hemorrhagic measles (black measles). Although uncommon, hemorrhagic measles may result in bleeding from the mouth, nose, and gastrointestinal tract. Courtesy of Edgar O. Ledbetter, MD, FAAP





When Measles does not
kill it can cause

- Blindness
- Malnutrition
- Deafness
- Pneumonia

Supplementation with high dose
Vitamin A decreases risk of
death and blindness



Advocate to keep Vaccination Rates Strong in WV



Questions?

