Outbreak Outlook: Measles 2025

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Measles

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Disclosure statement

Dr. Hennessy does not have a relevant financial, professional, or personal relationship with a commercial interest producing health care goods/services related to this educational activity.

Learning Objectives

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01 Discuss the natural history of measles.

02 Review measles infections in the U.S.

03 Review available measles vaccines and vaccine coverage.

04 Delineate next steps

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Please Note…

- I am going to use brand names at times but this is not an endorsement of any particular product--it will just make it easier to communicate.
- I am relying on scientific principles. These immunizations are worthwhile. They are safe and effective and they save lives and decrease the risk of human suffering.

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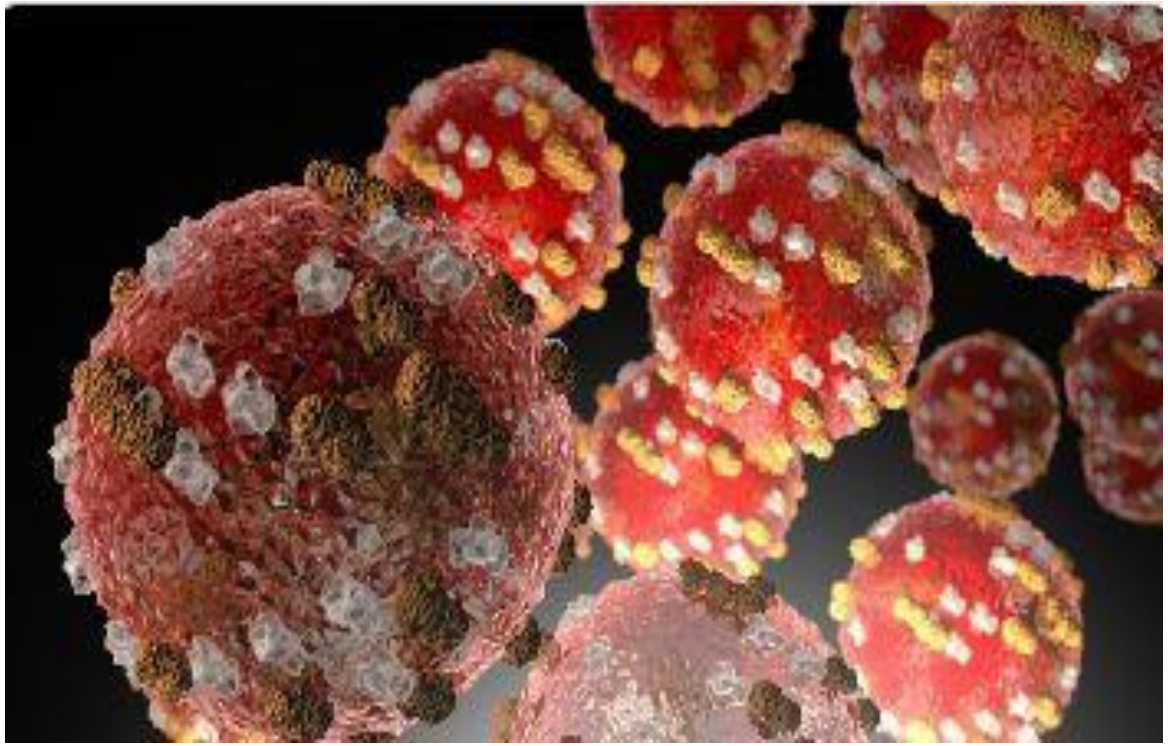

Natural History of Measles

Measles infection timeline

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Day 0--exposure to measles in a susceptible person

- Measles is highly contagious---90% of non-immune persons exposed will become infected with the measles
- Measles is spread through the air when a person who is infected coughs or sneezes.
- Measles stays in the air for up to 2 hours after the infected person has left the area

Day 7 to 14 – FIRST SYMPTOMS

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- High fever, may spike above 104°F
- Cough
- Rhinorrhea (Coryza)
- Red, watery eyes (Conjunctivitis)

THE 3 C'S OF MEASLES

At the point, the person with measles has already been contagious for at least 1-2 days

2-3 Days after first symptoms (Day 9-17)

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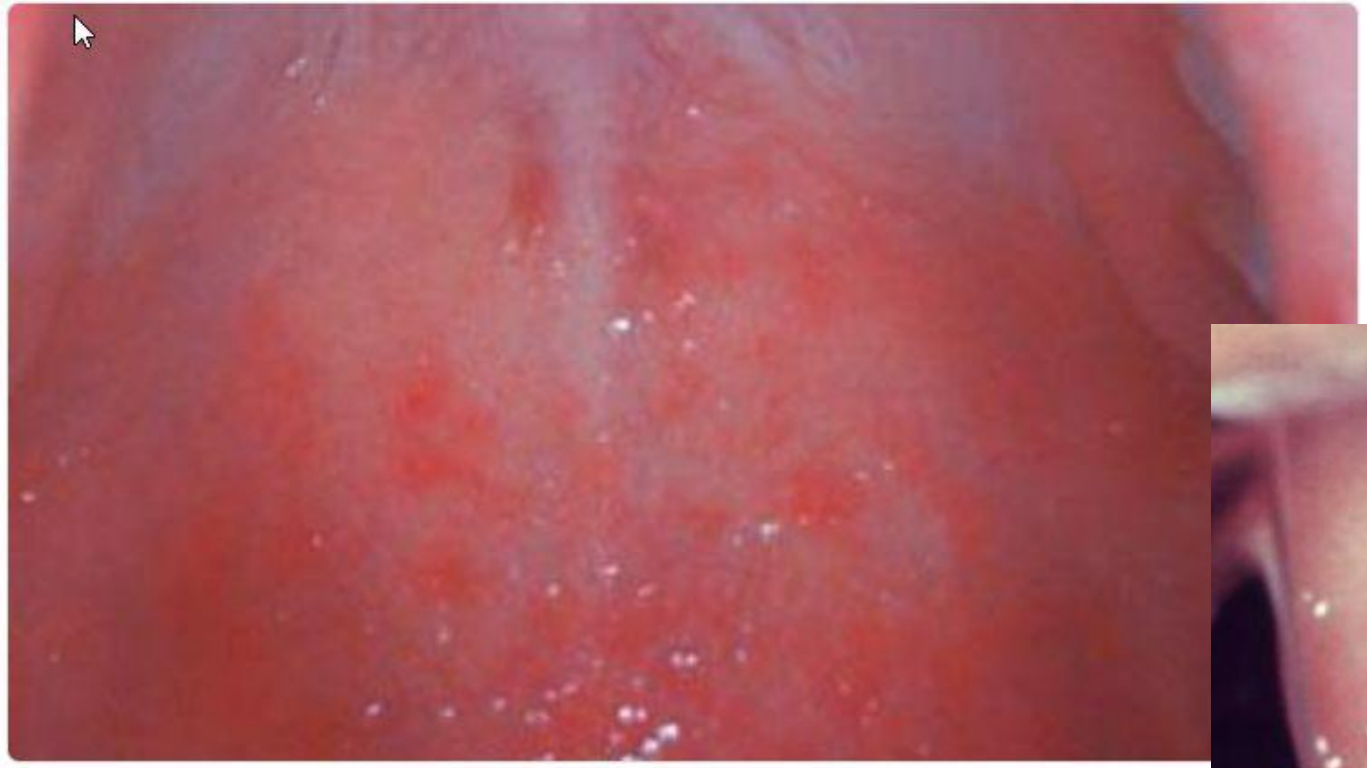

This was a patient who presented with Koplik's spots on palate due to pre-eruptive measles on
of the illness.

Koplik Spots appear

- tiny white spots inside the mouth

"Grains of salt" with a red halo

3-5 days after first symptoms (Day 10 to 19)

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Rash begins

- flat red spots that start at the hairline then spread down face to neck->torso->arms and legs-> feet

Rash may develop papules and spots may coalesce as it spreads.

As the rash spreads, fever spikes will likely continue.

Rash is not usually itchy.

Contagious period continues for 4 days after rash onset.

Persons with immunodeficiency may not get a rash

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Measles

Measles

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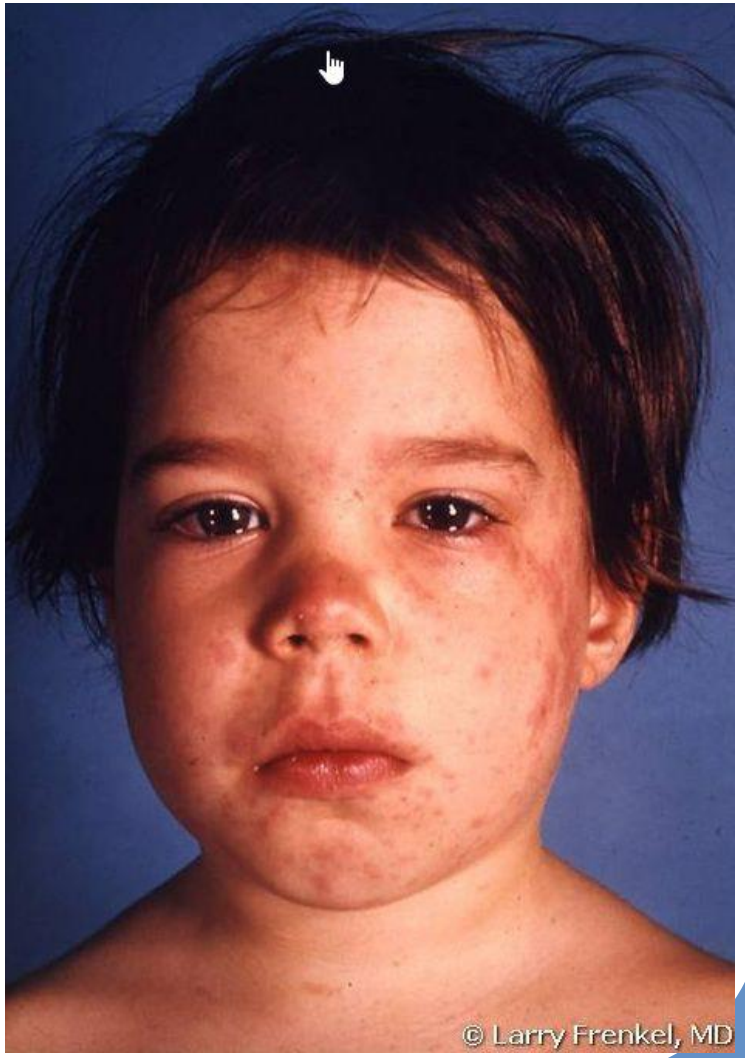

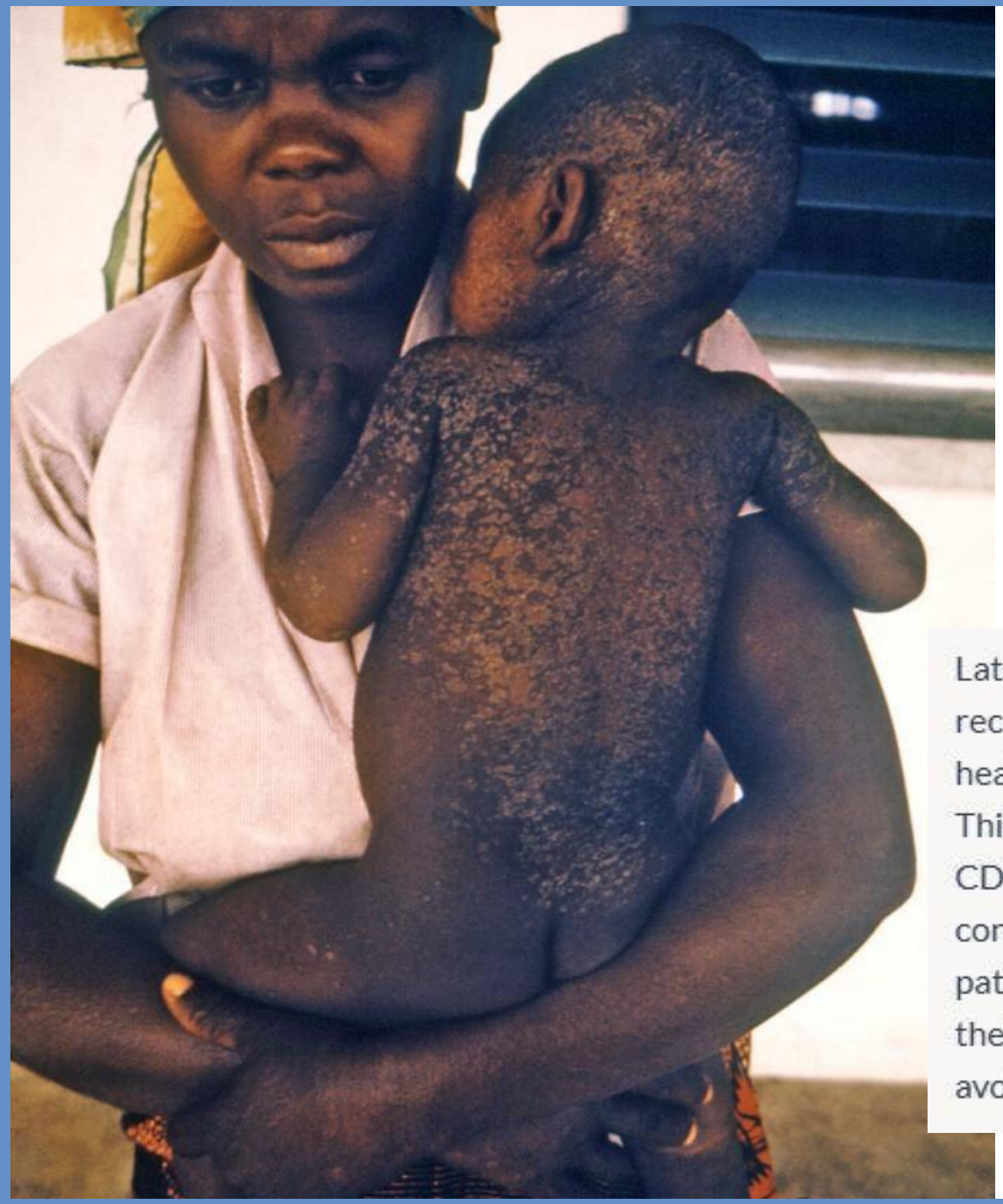

Rash tends to fade in same order that it appeared about a week after it started. It can cause desquamation to the skin as it resolves.

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Late 1960s photograph shows a Nigerian mother and her child who was recovering from measles; note that the skin is sloughing on the child as he heals from his measles infection.

This child was among many who were cared for in camps set up during the CDC-led refugee relief effort during the Nigerian-Biafran war. Measles was a constant threat in these camps. Sloughing of the skin in recovering measles patients was often extensive, and resembles that of a burn victim. Due to their weakened state, children like the one shown here, need nursing care to avoid subsequent infections.

Complications of measles

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CONDITION	OCCURRENCE
ear infections	1 in 10
diarrhea	<1 in 10
hospitalization	1 in 5
pneumonia	1 in 20 children, most common cause of death in measles
encephalitis	1 in 1000, can lead to loss of hearing and intellectual disability
death	1-3 in 1000

Risks of complications are higher in certain persons

- Children < 5 years
- Adults > 20 years
- Pregnant persons
- People with immunocompromising conditions

There is more

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- Measles infection during pregnancy can trigger premature birth and low birth weight in infant
- SSPE (subacute sclerosing panencephalitis) is a rare but deadly consequence of measles infections

➔ Causes brain inflammation that can linger for years, death in 1-3 years

➔ More common in children infected before age 2 years

➔ During outbreak in 1989-1991, risk of SSPE was 7 to 11 per 100,000 person with measles

➔ SSPE has 4 stages and there is no cure

I--personality changes, depression, fever, can last up to 6 months	II-muscle spasms, dementia, loss of vision, seizures	III-jerky movement turn to writhing movements and rigidity, complications can trigger death	IV-Respiratory rate, heart rate, blood pressure are impacted, coma, death

Still more

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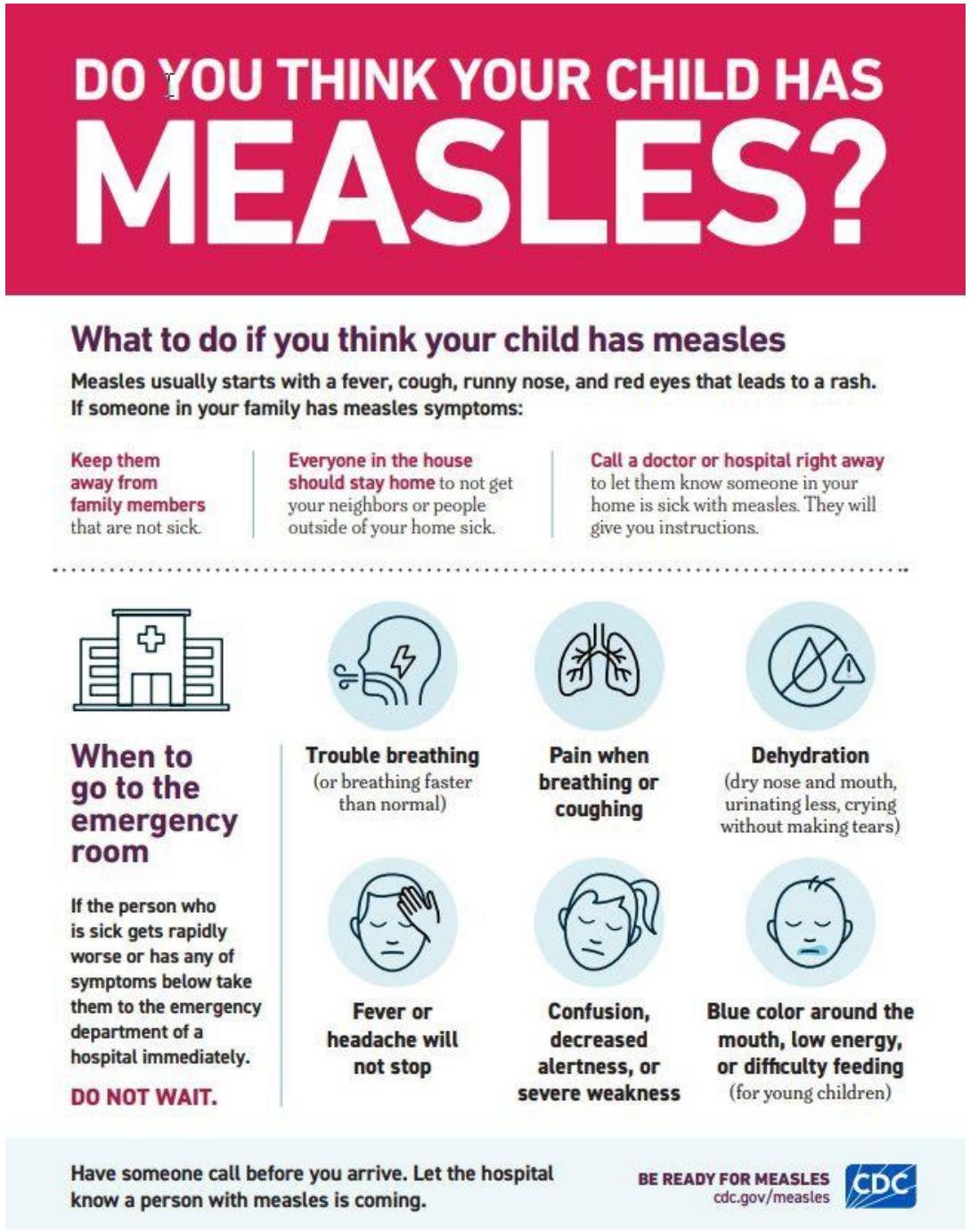
Measles virus triggers **immune amnesia**--this places the individual at increased risk for severe complications from other infections for months to years after measles.

➔ Leads to blunted response to other infections and increase risk of mortality.

➔ Increased susceptibility to infections that were previously encountered, including VPD.

- There is no cure for measles.
- Treatment is mostly supportive care.
- Ribavirin-special use
- Antibiotics would only be used for secondary bacterial infections
- Vitamin A--given QD X 2 days
  - Does not prevent measles infections and is not a substitute for vaccination
  - Supplementation will help when a person has vitamin A deficiency; WHO recommends supplementation in all countries
  - Should only be used under physician's supervision
  - Toxicity is an issue with overuse-->liver damage, harmful to bones, nervous system, and skin; birth defects when taken in large doses during pregnancy



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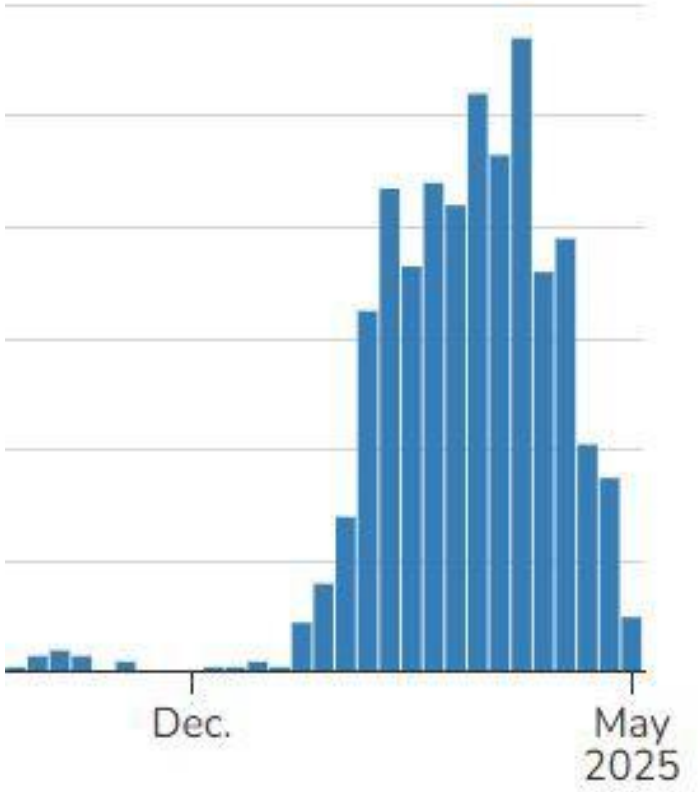
Patient Handout

https://www.cdc.gov/measles/downloads/measles-factsheet-seek-care-508.pdf



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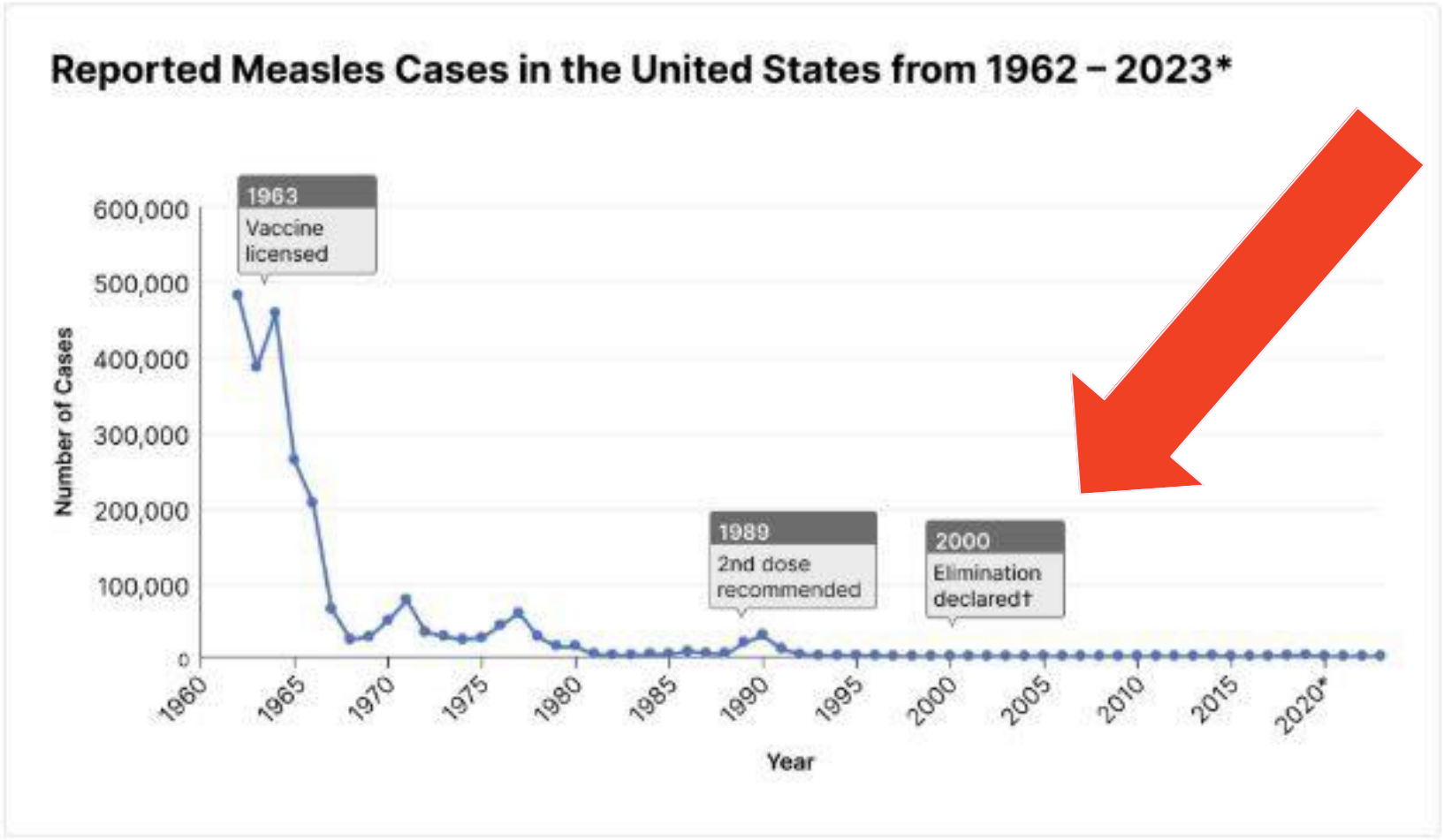
Review of measles infections in the U.S



*2023 data are preliminary and subject to change. †Elimination is defined as the absence of endemic measles transmission in a region for ≥ 12 months in the presence of a well-performing surveillance system.

Measles *had been* eliminated in the U.S. in 2000

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- 1912, measles becomes a nationally notifiable illness, i.e. labs and clinicians must report all measles infections
  - In the first decade of reporting, there were around 6,000 people who died with measles each year.
  - By the 1950's
    - 3-4 million were infected each year with measles.
    - 400-500 people died with measles each year.
    - 48,000 people estimated to be hospitalized with measles each year.
    - 1,000 people suffered from encephalitis from measles each year.
- Measles vaccine introduced to U.S. in 1963, updated in 1968
- Measles declared eliminated from the U.S. in 2000
  - Means that infection was not spreading from person to person in the U.S. but outbreaks were the results of persons getting measles outside of the country and returning to the U.S.

EARLY REPORT

Early report

Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children

A J Wakefield, S H Murch, A Anthony, J Linnell, D M Casson, M Malik, M Berelowitz, A P Dhillon, M A Thomson, P Harvey, A Valentine, S E Davies, J A Walker-Smith

Summary

Background We investigated a consecutive series of children with chronic enterocolitis and regressive developmental disorder.

Methods 12 children (mean age 6 years [range 3–10], 11 boys) were referred to a paediatric gastroenterology unit with a history of normal development followed by loss of acquired skills, including language, together with diarrhoea and abdominal pain. Children underwent gastroenterological, neurological, and developmental assessment and review of developmental records. Ileocolonoscopy and biopsy sampling, magnetic-resonance imaging (MRI), electroencephalography (EEG), and lumbar puncture were done under sedation. Barium follow-through radiography was done where possible. Biochemical, haematological, and immunological profiles were examined.

Findings Onset of behavioural symptoms was associated by the parents, with measles, mumps, and rubella vaccination in eight of the 12 children, with measles infection in one child, and otitis media in another. All 12 children had intestinal abnormalities ranging from lymphoid nodular hyperplasia to aphthoid ulceration. Histology showed patchy chronic inflammation in 11 children and reactive ileal lymphoid hyperplasia in seven, but no granulomas. Behavioural disorders included autism (nine), disintegrative psychosis (one), and possible postviral or vaccinal encephalitis (two). There were no focal neurological abnormalities and MRI and EEG tests were normal. Abnormal laboratory results were significantly raised urinary methylmalonic acid compared with age-matched controls ($p=0.003$), low haemoglobin in four children, and low serum IgA in four children.

Interpretation We identified associated gastrointestinal disease and developmental regression in a group of previously normal children, which was generally associated in time with possible environmental triggers.

Lancet 1998; **351**: 637–41
See Commentary page

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Correspondence to: Dr A J Wakefield

Introduction

We saw several children who, after a period of apparent normality, lost acquired skills, including communication. They all had gastrointestinal symptoms, including abdominal pain, diarrhoea, and bloating and, in some cases, food intolerance. We describe the clinical findings, and gastrointestinal features of these children.

Patients and methods

12 children, consecutively referred to the department of paediatric gastroenterology with a history of a pervasive developmental disorder with loss of acquired skills and intestinal symptoms (diarrhoea, abdominal pain, bloating and food intolerance), were investigated. All children were admitted to the ward for 1 week, accompanied by their parents.

Clinical investigations

We took histories including details of immunisations and exposure to infectious diseases, and assessed the children. In 11 cases the history was obtained by the senior clinician (JW-S). Neurological and psychiatric assessments were done by consultant staff (PH, MB) with HMS-4 criteria.[3] Developmental history included a review of prospective developmental records from parents, health visitors, and general practitioners. Four children did not undergo psychiatric assessment in hospital; all had been assessed professionally elsewhere, so these assessments were used as the basis for their behavioural diagnosis.

After bowel preparation, ileocolonoscopy was performed by SHM or MAT under sedation with midazolam and pethidine. Paired frozen and formalin-fixed mucosal biopsy samples were taken from the terminal ileum; ascending, transverse, descending, and sigmoid colons, and from the rectum. The procedure was recorded by video or still images, and were compared with images of the previous seven consecutive paediatric colonoscopies (four normal colonoscopies and three on children with ulcerative colitis), in which the physician reported normal appearances in the terminal ileum. Barium follow-through radiography was possible in some cases.

Also under sedation, cerebral magnetic-resonance imaging (MRI), electroencephalography (EEG) including visual, brain stem auditory, and sensory evoked potentials (where compliance made these possible), and lumbar puncture were done.

Laboratory investigations

Thyroid function, serum long-chain fatty acids, and cerebrospinal-fluid lactate were measured to exclude known causes of childhood neurodegenerative disease. Urinary methylmalonic acid was measured in random urine samples from eight of the 12 children and 14 age-matched and sex-matched normal controls, by a modification of a technique described previously.[4] Chromatograms were scanned digitally on computer, to analyse the methylmalonic-acid zones from cases and controls. Urinary methylmalonic-acid concentrations in patients and controls were compared by a two-sample t test. Urinary creatinine was estimated by routine spectrophotometric assay.

Children were screened for antiendomyseal antibodies and boys were screened for fragile-X if this had not been done

From the World Health Organization:
"A minor setback for the success of the measles vaccination programme occurred in 1998, when a fraudulent research paper was published in 'The Lancet', asserting a link between the MMR vaccine and autism without any robust scientific evidence.

The influence of this paper, along with systemic misinformation by anti-vaccination groups in high-income countries, resulted in a drop in vaccination rates, below the level required for community protection, which caused a resurgence in measles cases in England and Wales, as well as parts of the USA and Canada.

In 2010 the British General Medical Council ruled that the study's lead author engaged in misconduct. The paper was formally retracted by 'The Lancet', and its author was banned from practising medicine."

CDC Data: Measles Case as of 5/9/25

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- 1001 people confirmed with measles
- People living 30 states in the United States
- 13% of people identified with measles have been hospitalized
- 3 people with measles have died (include 2 school-aged children)
- 96% of these people who have been identified with measles were on unvaccinated or had unknown vaccination status

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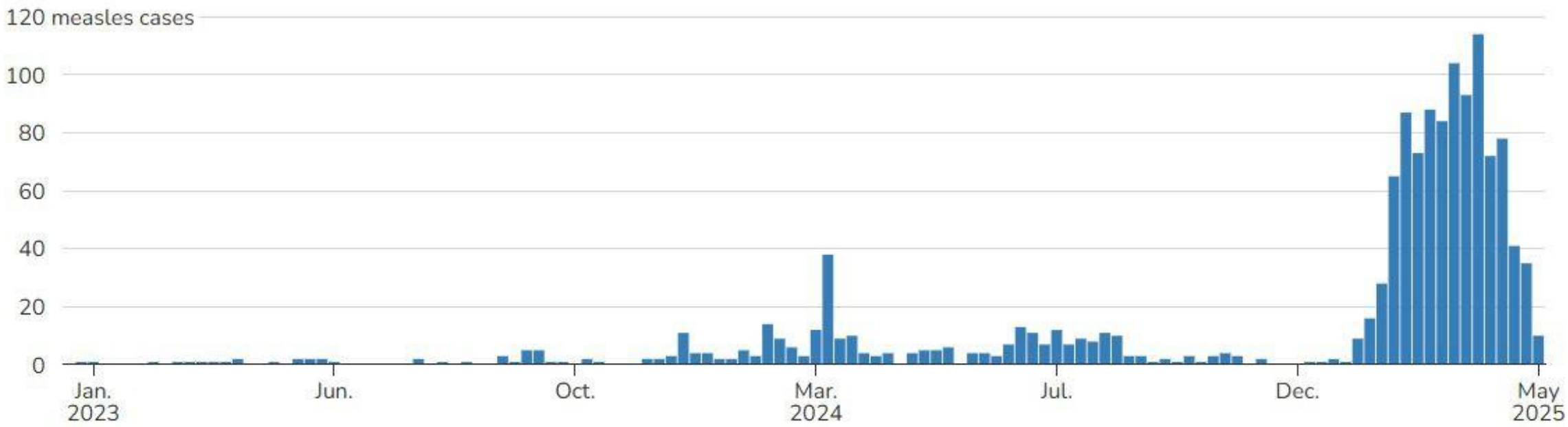
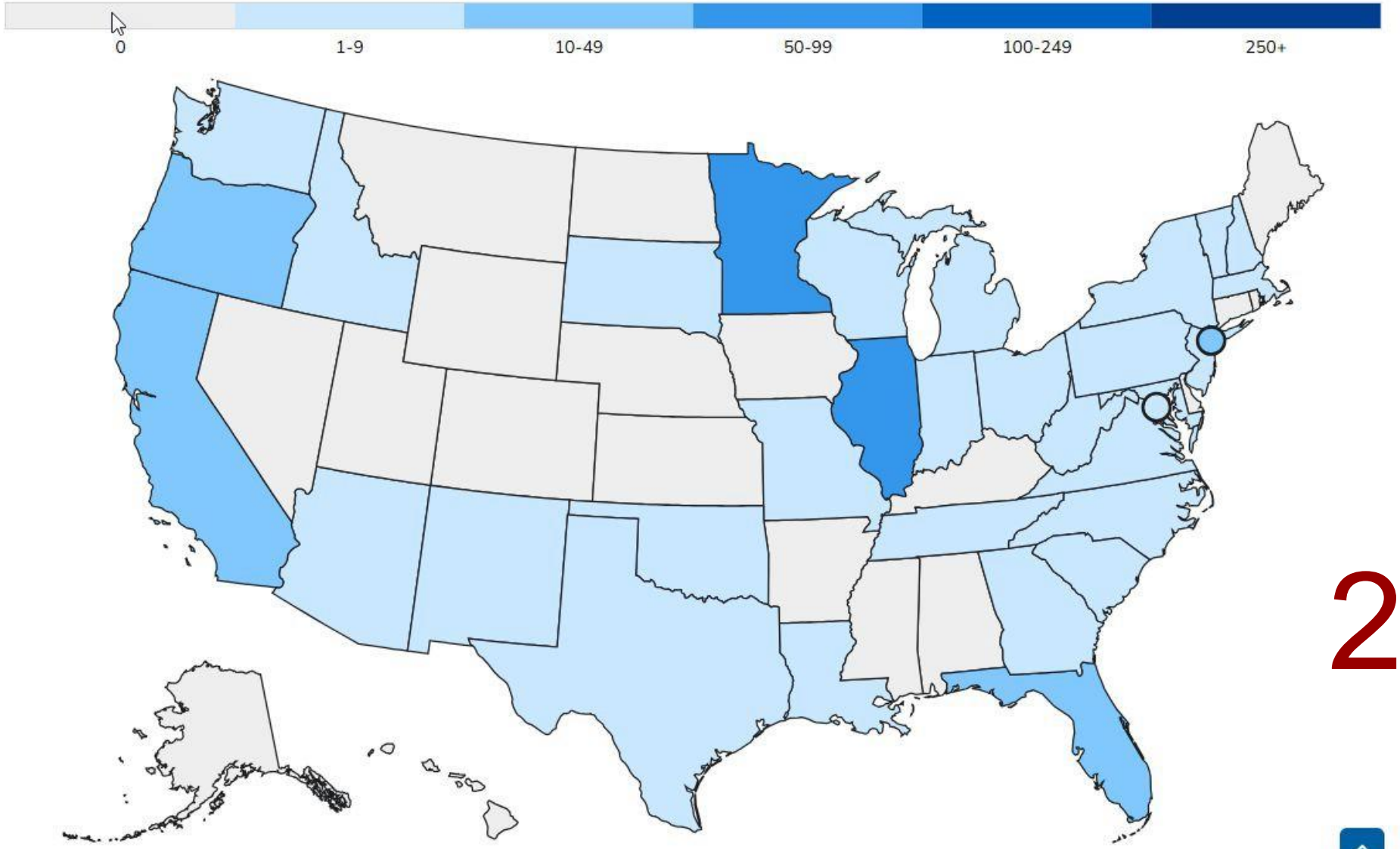
Weekly measles cases by rash onset date

2023–2025* (as of May 8, 2025)



2025 **2024**

Map of measles cases in 2024 & 2025



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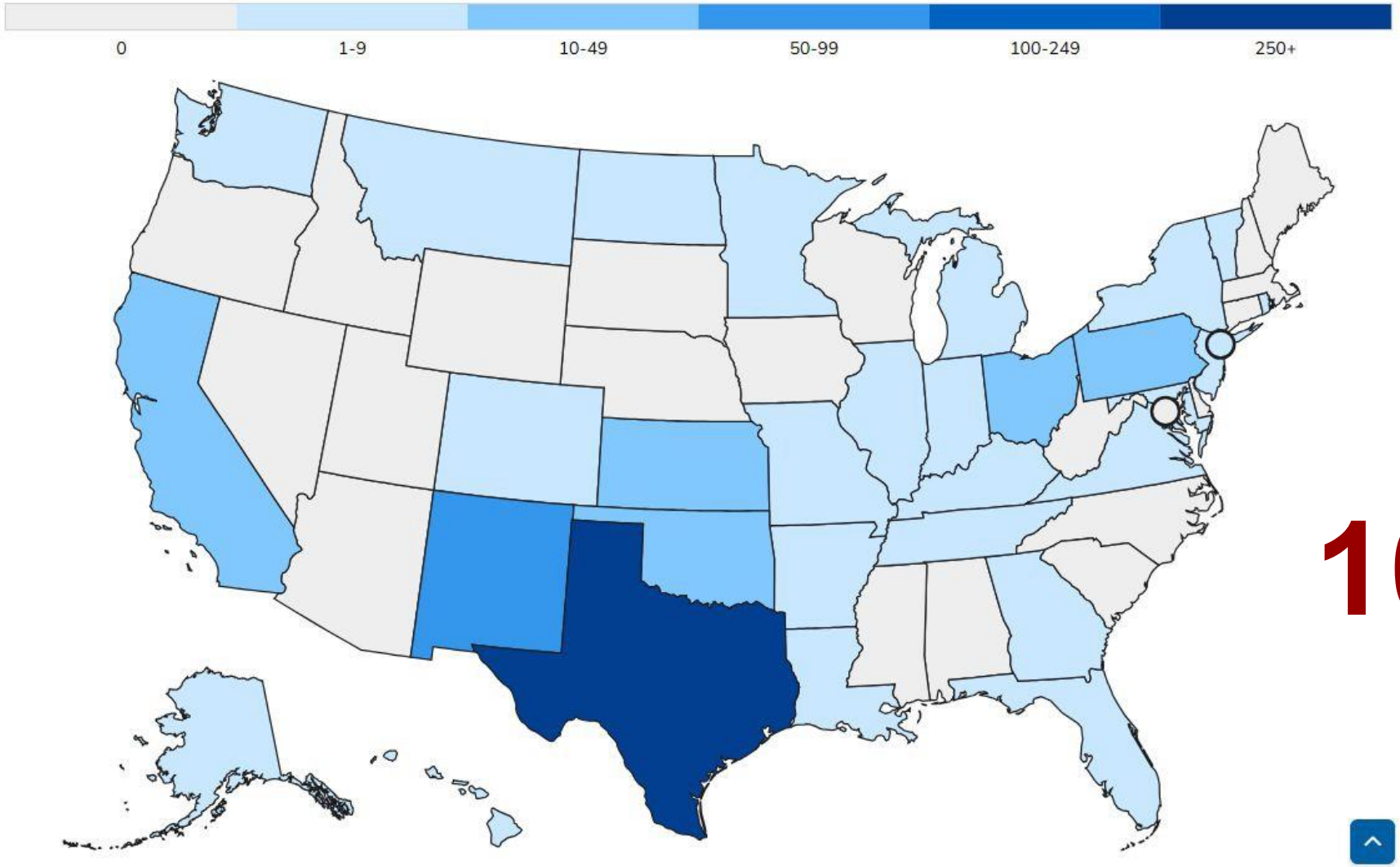
as of May 8, 2025

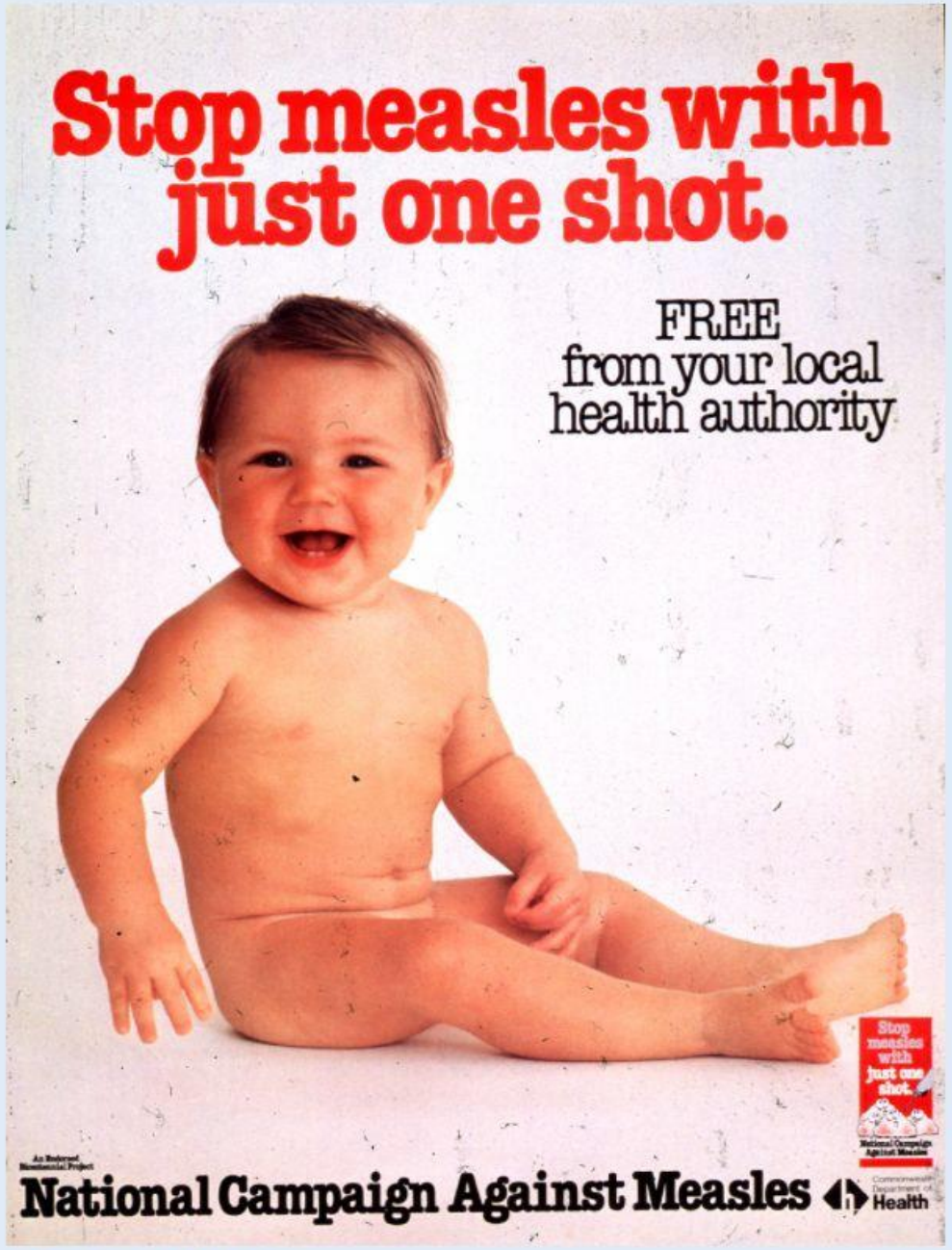
Map of measles cases in 2024 & 2025

2025 2024



1001

Stop Measles With Just One Shot



Title: *Stop Measles With Just One Shot*
Date: ca. 1990s
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Measles Vaccines in the U.S.

Measles Vaccination

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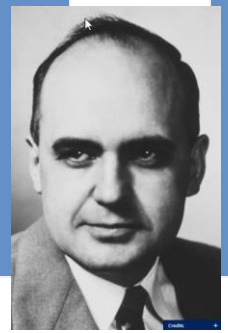
1963
Live,attenuated virus vaccine (Edmonston B)
and an inactivated vaccine licensed in U.S.

1967- the inactivated vaccine was inferior to the live, attenuated vaccine and was withdrawn from the market



Maurice Hilleman (1919–2005)

1968-New live,attenuated virus vaccine (Edmonston-Enders) licensed, causes less side effects; old version withdrawn in 1975

1971
Combination measles, mumps, and rubella vaccine licensed in U.S.

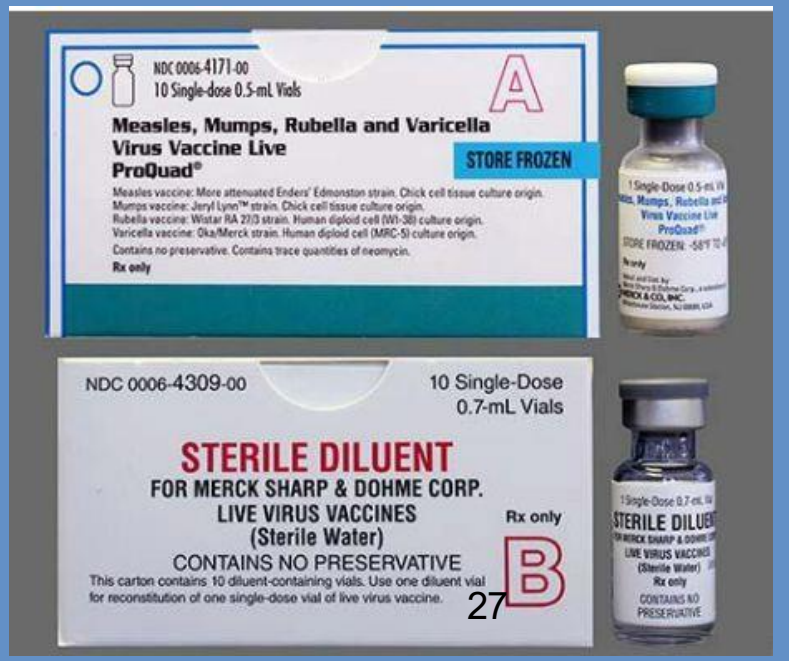
1989
Outbreaks in students lead to recommendation for 2 doses of MMR

2005
Combination measles, mumps, rubella, and varicella vaccine licensed in US

Measles Vaccination

Best way to fight measles infections is prevention

- Lyophilized antigen component mixed with sterile water diluent component, 0.5 ml dose
- MMR is stored in refrigerator, do not freeze, once reconstituted can be stored in fridge for up to 8 hours
- MMRV lyophilized component is stored in freezer and must be used with 30 minutes of reconstitution
- Recommended not to use MMRV for children under age 4 years
- Maximum age for MMRV is 12 years



Measles Vaccination

- Routine schedule is 2 doses
  - -1st dose at 12 -15 months
  - -2nd dose at 4-6 years
- Catch up for all children up to 18 years
- Special circumstances
  - -May give 2nd dose 4 weeks after 1st dose (MMRV is 3 months)
  - -May use down to age 6 months for travelers but does not count for 2-dose series
- For unvaccinated adults, recommended to get one dose of MMR if born after 1957
- For unvaccinated adults, 2 doses if post-HS education, household contacts of immunocompromised persons

Efficacy after dose one is 93%, after dose two it is 97%. Second dose is not a booster but meant to help with primary dose failure. Expect lifelong immunity.

Measles Vaccination Contraindications and Precautions

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Measles Vaccine Contraindications

- Contraindication
  - Severe allergic reaction to vaccine component or following a prior dose (neomycin, gelatin)
  - Severe immunocompromise
  - Systemic high-dose corticosteroid therapy for 14 days or more
  - HIV infection, regardless of immunocompetence status*
  - Family history of congenital or hereditary immunodeficiency in first-degree relatives
  - Pregnancy

*MMRV only

Measles Vaccine Precautions

- Precaution
  - Moderate or severe acute illness
  - Alpha-gal allergy (consult with physician)
  - Receipt of antibody-containing blood products (wait 3 to 11 months to vaccinate)
  - History of thrombocytopenic purpura or thrombocytopenia
  - Need for tuberculin skin testing or interferon-gamma release assay testing
  - Simultaneous use of aspirin or aspirin-containing products*
  - Personal or family history of seizures of any etiology*
  - Receipt of specific antiviral drugs 24 hours before vaccination*

*MMRV only

Side effects of measles vaccines

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- 5% to 15% of recipients develop a temperature of 103°F (39.4°C) or higher, often 7 to 12 days after vaccination and lasts 1 or 2 days.
- Very small risk of febrile seizures; about one case for every 3,000 to 4,000 doses of MMR vaccine administered, about 6 to 14 days after vaccination, no long-term sequelae. Increased risk for children children with a personal or family history of febrile seizures or family history of epilepsy. Some increased risk with MMRV
- 5% of recipients a transient rash, usually appearing 7 to 10 days after vaccination.
- Rare allergic reactions anaphylaxis occurs in 1.8 to 14.4 cases per million doses.
- 25% of adult women develop joint pain.
- Uncommon, transient lymphadenopathy and parotitis.
- Rare, low platelets within 2 months of MMR vaccine, risk higher in persons with ITP

NO RISK OF INFLAMMATORY BOWEL DISEASE!

NO RISK OF AUTISM!

Disease vs Immunization-measles

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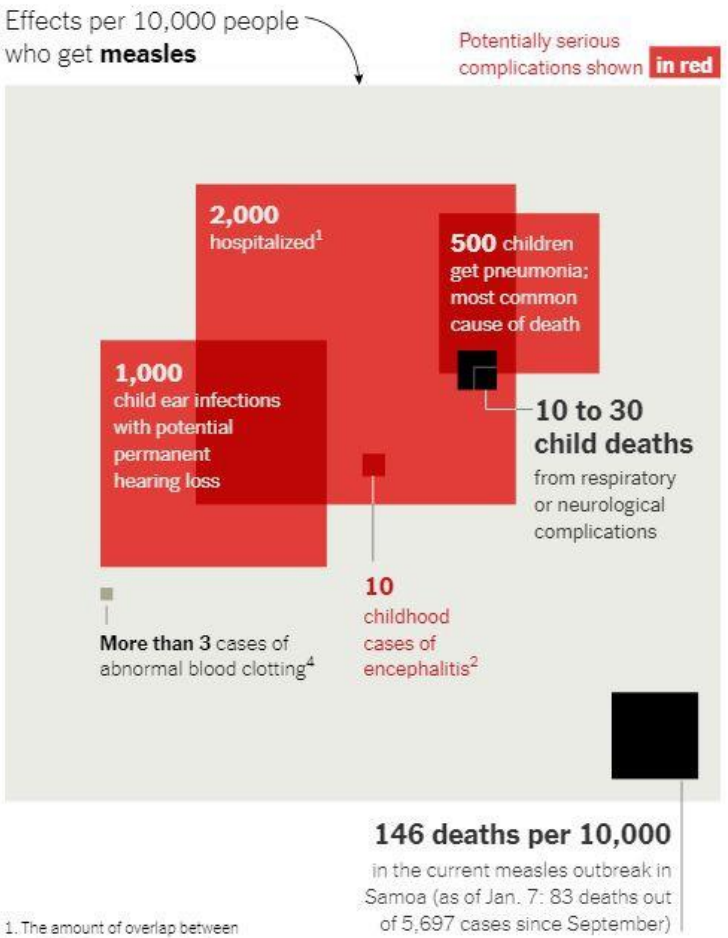
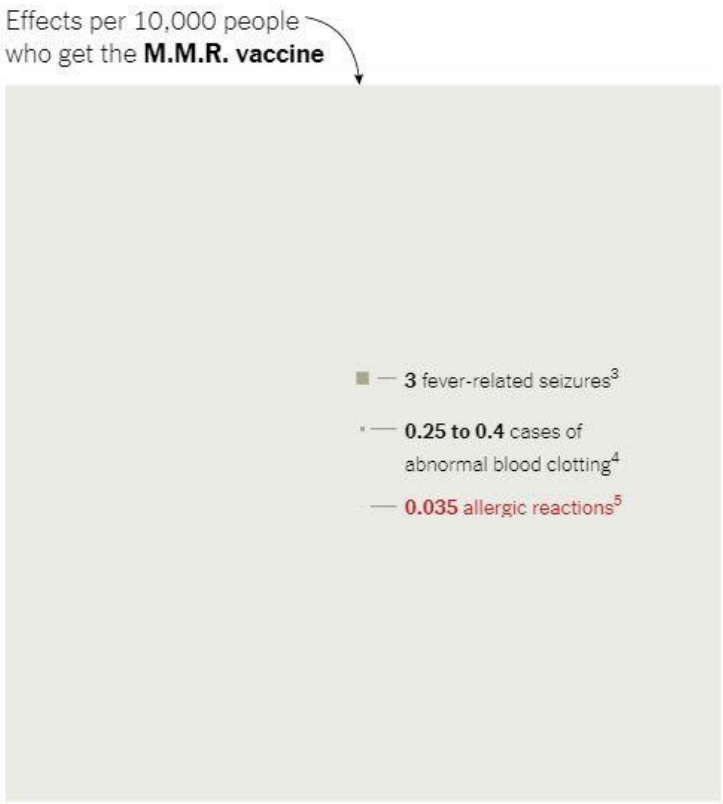
Clinical symptoms/disease	Wild Virus Infection in U.S.	Vaccine side effect
Highest number of cases	894,134 in US in 1941	N/A
Transmission rate to susceptible hosts	90%	none
Rate of death	2 in 1000 cases	397 cases reported to VAERS
Risk of encephalitis	1 in 1000 cases	1 in 3,000,000 vaccine recipients
Risk of pneumonia	1 in 20 cases	2 in 1,000,000 vaccine recipients
Risk of anaphylaxis	N/A	0.65 in 1,000,000 vaccine recipients

Source: Spencer JP, Trondsen Pawlowski RH, Thomas S. Vaccine Adverse Events: Separating Myth from Reality. Am Fam Physician. 2017 Jun 15;95(12):786-794. PMID: 28671426.





No risk from M.M.R. vaccine: autism

1. The amount of overlap between hospitalizations and complications or deaths listed here is not known; this chart assumes that many serious complications from measles result in hospitalizations.

2. Encephalitis (swelling of the brain) can cause convulsions and leave the child deaf or with an intellectual disability.

3. Child seizures may occur 72 hours to 14 days after vaccination, and are not associated with long-term effects. But these seizures also occur overall in 2 percent to 5 percent of all children 6 months to 5 years of age (200 to 500 seizures per 10,000 children).

4. Resolves within six months in 93 percent of cases. Rates of abnormal clotting (idiopathic thrombocytopenic purpura, or I.T.P.) after M.M.R. vaccination have been estimated at 1 case per 25,000 to 40,000 doses. Measles and rubella cause abnormal blood clotting at a far higher rate.

5. This translates to 1 to 3.5 reactions per 1 million doses. The lifetime risk of getting killed by lightning in the United States is as much as roughly four times greater: 1 in 218,106.

VACCINE INFORMATION STATEMENT

MMR Vaccine (Measles, Mumps, and Rubella): *What You Need to Know*

Many vaccine information statements are available in Spanish and other languages. See www.immunize.org/vis

Hojas de información sobre vacunas están disponibles en español y en muchos otros idiomas. Visite www.immunize.org/vis

1. Why get vaccinated?

MMR vaccine can prevent **measles, mumps**, and **rubella**.

- **MEASLES (M)** causes fever, cough, runny nose, and red, watery eyes, commonly followed by a rash that covers the whole body. It can lead to seizures (often associated with fever), ear infections, diarrhea, and pneumonia. Rarely, measles can cause brain damage or death.
- **MUMPS (M)** causes fever, headache, muscle aches, tiredness, loss of appetite, and swollen and tender salivary glands under the ears. It can lead to deafness, swelling of the brain and/or spinal cord covering, painful swelling of the testicles or ovaries, and, very rarely, death.
- **RUBELLA (R)** causes fever, sore throat, rash, headache, and eye irritation. It can cause arthritis in up to half of teenage and adult women. If a woman gets rubella while she is pregnant, she could have a miscarriage or the baby could be born with serious birth defects.

Most people who are vaccinated with MMR will be protected for life. Vaccines and high rates of vaccination have made these diseases much less common in the United States.

2. MMR vaccine

Children need 2 doses of MMR vaccine, usually:

- First dose at age 12 through 15 months
- Second dose at age 4 through 6 years

Infants who will be traveling outside the United States when they are between 6 and 11 months of age should get a dose of MMR vaccine before travel. These children should still get 2 additional doses at the recommended ages for long-lasting protection.

Older children, adolescents, and **adults** also need 1 or 2 doses of MMR vaccine if they are not already immune to measles, mumps, and rubella. Your health care provider can help you determine how many doses you need.

A third dose of MMR might be recommended for certain people in mumps outbreak situations.

MMR vaccine may be given at the same time as other vaccines. Children 12 months through 12 years of age might receive MMR vaccine together with varicella vaccine in a single shot, known as MMRV. Your health care provider can give you more information.

3. Talk with your health care provider

Tell your vaccination provider if the person getting the vaccine:

- Has had an **allergic reaction after a previous dose of MMR or MMRV vaccine**, or has any **severe, life-threatening allergies**
- Is **pregnant** or thinks she might be pregnant—pregnant women should not get MMR vaccine
- Has a **weakened immune system**, or has a **parent, brother, or sister with a history of hereditary or congenital immune system problems**
- Has ever had a **condition that makes him or her bruise or bleed easily**
- Has recently **had a blood transfusion or received other blood products**
- Has **tuberculosis**
- Has **gotten any other vaccines in the past 4 weeks**

In some cases, your health care provider may decide to postpone MMR vaccination until a future visit.

CDC U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION

People with minor illnesses, such as a cold, may be vaccinated. People who are moderately or severely ill should usually wait until they recover before getting MMR vaccine.

Your health care provider can give you more information.

4. Risks of a vaccine reaction

- Sore arm from the injection or redness where the shot is given, fever, and a mild rash can happen after MMR vaccination.
- Swelling of the glands in the cheeks or neck or temporary pain and stiffness in the joints (mostly in teenage or adult women) sometimes occur after MMR vaccination.
- More serious reactions happen rarely. These can include seizures (often associated with fever) or temporary low platelet count that can cause unusual bleeding or bruising.
- In people with serious immune system problems, this vaccine may cause an infection that may be life-threatening. People with serious immune system problems should not get MMR vaccine.

People sometimes faint after medical procedures, including vaccination. Tell your provider if you feel dizzy or have vision changes or ringing in the ears.

As with any medicine, there is a very remote chance of a vaccine causing a severe allergic reaction, other serious injury, or death.

5. What if there is a serious problem?

An allergic reaction could occur after the vaccinated person leaves the clinic. If you see signs of a severe allergic reaction (hives, swelling of the face and throat, difficulty breathing, a fast heartbeat, dizziness, or weakness), call **9-1-1** and get the person to the nearest hospital.

For other signs that concern you, call your health care provider.

Adverse reactions should be reported to the Vaccine Adverse Event Reporting System (VAERS). Your health care provider will usually file this report, or you can do it yourself. Visit the VAERS website at www.vaers.hhs.gov or call **1-800-822-7967**. *VAERS is only for reporting reactions, and VAERS staff members do not give medical advice.*

6. The National Vaccine Injury Compensation Program

The National Vaccine Injury Compensation Program (VICP) is a federal program that was created to compensate people who may have been injured by certain vaccines. Claims regarding alleged injury or death due to vaccination have a time limit for filing, which may be as short as two years. Visit the VICP website at www.hrsa.gov/vaccinecompensation or call **1-800-338-2382** to learn about the program and about filing a claim.

7. How can I learn more?

- Ask your health care provider.
- Call your local or state health department.
- Visit the website of the Food and Drug Administration (FDA) for vaccine package inserts and additional information at www.fda.gov/vaccines-blood-biologics/vaccines.
- Contact the Centers for Disease Control and Prevention (CDC):
  - Call **1-800-232-4636** (**1-800-CDC-INFO**) or
  - Visit CDC's website at www.cdc.gov/vaccines.

VACCINE INFORMATION STATEMENT

MMRV Vaccine (Measles, Mumps, Rubella, and Varicella): *What You Need to Know*

Many vaccine information statements are available in Spanish and other languages. See www.immunize.org/vis

Hojas de información sobre vacunas están disponibles en español y en muchos otros idiomas. Visite www.immunize.org/vis

1. Why get vaccinated?

MMRV vaccine can prevent **measles, mumps, rubella**, and **varicella**.

- **MEASLES (M)** causes fever, cough, runny nose, and red, watery eyes, commonly followed by a rash that covers the whole body. It can lead to seizures (often associated with fever), ear infections, diarrhea, and pneumonia. Rarely, measles can cause brain damage or death.
- **MUMPS (M)** causes fever, headache, muscle aches, tiredness, loss of appetite, and swollen and tender salivary glands under the ears. It can lead to deafness, swelling of the brain and/or spinal cord covering, painful swelling of the testicles or ovaries, and, very rarely, death.
- **RUBELLA (R)** causes fever, sore throat, rash, headache, and eye irritation. It can cause arthritis in up to half of teenage and adult women. If a woman gets rubella while she is pregnant, she could have a miscarriage or the baby could be born with serious birth defects.
- **VARICELLA (V)**, also called "chickenpox," causes an itchy rash, in addition to fever, tiredness, loss of appetite, and headache. It can lead to skin infections, pneumonia, inflammation of the blood vessels, swelling of the brain and/or spinal cord covering, and infection of the blood, bones, or joints. Some people who get chickenpox get a painful rash called "shingles" (also known as herpes zoster) years later.

Most people who are vaccinated with MMRV will be protected for life. Vaccines and high rates of vaccination have made these diseases much less common in the United States.

2. MMRV vaccine

MMRV vaccine may be given to **children 12 months through 12 years of age**, usually:

- First dose at age 12 through 15 months
- Second dose at age 4 through 6 years

MMRV vaccine may be given at the same time as other vaccines. Instead of MMRV, some children might receive separate shots for MMR (measles, mumps, and rubella) and varicella. Your health care provider can give you more information.

3. Talk with your health care provider

Tell your vaccination provider if the person getting the vaccine:

- Has had an **allergic reaction after a previous dose of MMRV, MMR, or varicella vaccine**, or has any **severe, life-threatening allergies**
- Is **pregnant** or thinks she might be pregnant—pregnant women should not get MMRV vaccine
- Has a **weakened immune system**, or has a **parent, brother, or sister with a history of hereditary or congenital immune system problems**
- Has ever had a **condition that makes him or her bruise or bleed easily**
- Has a **history of seizures**, or has a **parent, brother, or sister with a history of seizures**
- Is **taking or plans to take salicylates** (such as aspirin)
- Has recently **had a blood transfusion or received other blood products**
- Has **tuberculosis**
- Has **gotten any other vaccines in the past 4 weeks**

In some cases, your health care provider may decide to postpone MMRV vaccination until a future visit or may recommend that the child receive separate MMR and varicella vaccines instead of MMRV.

People with minor illnesses, such as a cold, may be vaccinated. Children who are moderately or severely ill should usually wait until they recover before getting MMRV vaccine.

Your health care provider can give you more information.

CDC U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION

4. Risks of a vaccine reaction

- Sore arm from the injection, redness where the shot is given, fever, and a mild rash can happen after MMRV vaccination.
- Swelling of the glands in the cheeks or neck or temporary pain and stiffness in the joints sometimes occur after MMRV vaccination.
- Seizures, often associated with fever, can happen after MMRV vaccine. The risk of seizures is higher after MMRV than after separate MMR and varicella vaccines when given as the first dose of the two-dose series in younger children. Your health care provider can advise you about the appropriate vaccines for your child.
- More serious reactions happen rarely, including temporary low platelet count, which can cause unusual bleeding or bruising.
- In people with serious immune system problems, this vaccine may cause an infection that may be life-threatening. People with serious immune system problems should not get MMRV vaccine.

If a person develops a rash after MMRV vaccination, it could be related to either the measles or the varicella component of the vaccine. The varicella vaccine virus could be spread to an unprotected person. Anyone who gets a rash should stay away from infants and people with a weakened immune system until the rash goes away. Talk with your health care provider to learn more.

Some people who are vaccinated against chickenpox get shingles (herpes zoster) years later. This is much less common after vaccination than after chickenpox disease.

People sometimes faint after medical procedures, including vaccination. Tell your provider if you feel dizzy or have vision changes or ringing in the ears.

As with any medicine, there is a very remote chance of a vaccine causing a severe allergic reaction, other serious injury, or death.

5. What if there is a serious problem?

An allergic reaction could occur after the vaccinated person leaves the clinic. If you see signs of a severe allergic reaction (hives, swelling of the face and throat, difficulty breathing, a fast heartbeat, dizziness, or weakness), call **9-1-1** and get the person to the nearest hospital.

For other signs that concern you, call your health care provider.

Adverse reactions should be reported to the Vaccine Adverse Event Reporting System (VAERS). Your health care provider will usually file this report, or you can do it yourself. Visit the VAERS website at www.vaers.hhs.gov or call **1-800-822-7967**. *VAERS is only for reporting reactions, and VAERS staff members do not give medical advice.*

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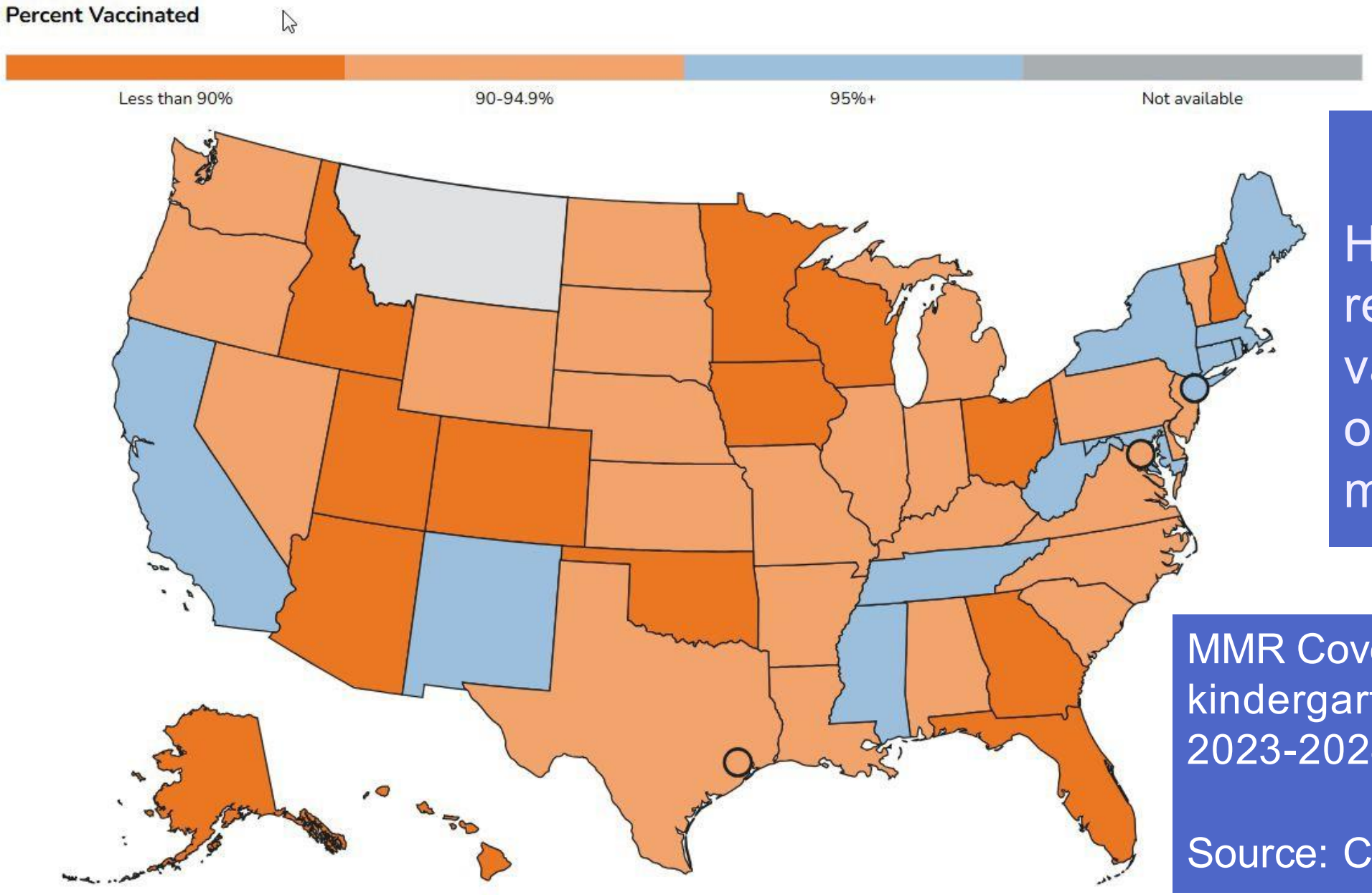

Herd immunity requires vaccine rates of 95% or more

MMR Coverage for kindergarteners in 2023-2024 school year.

Source: CDC

MMR coverage in Wisconsin

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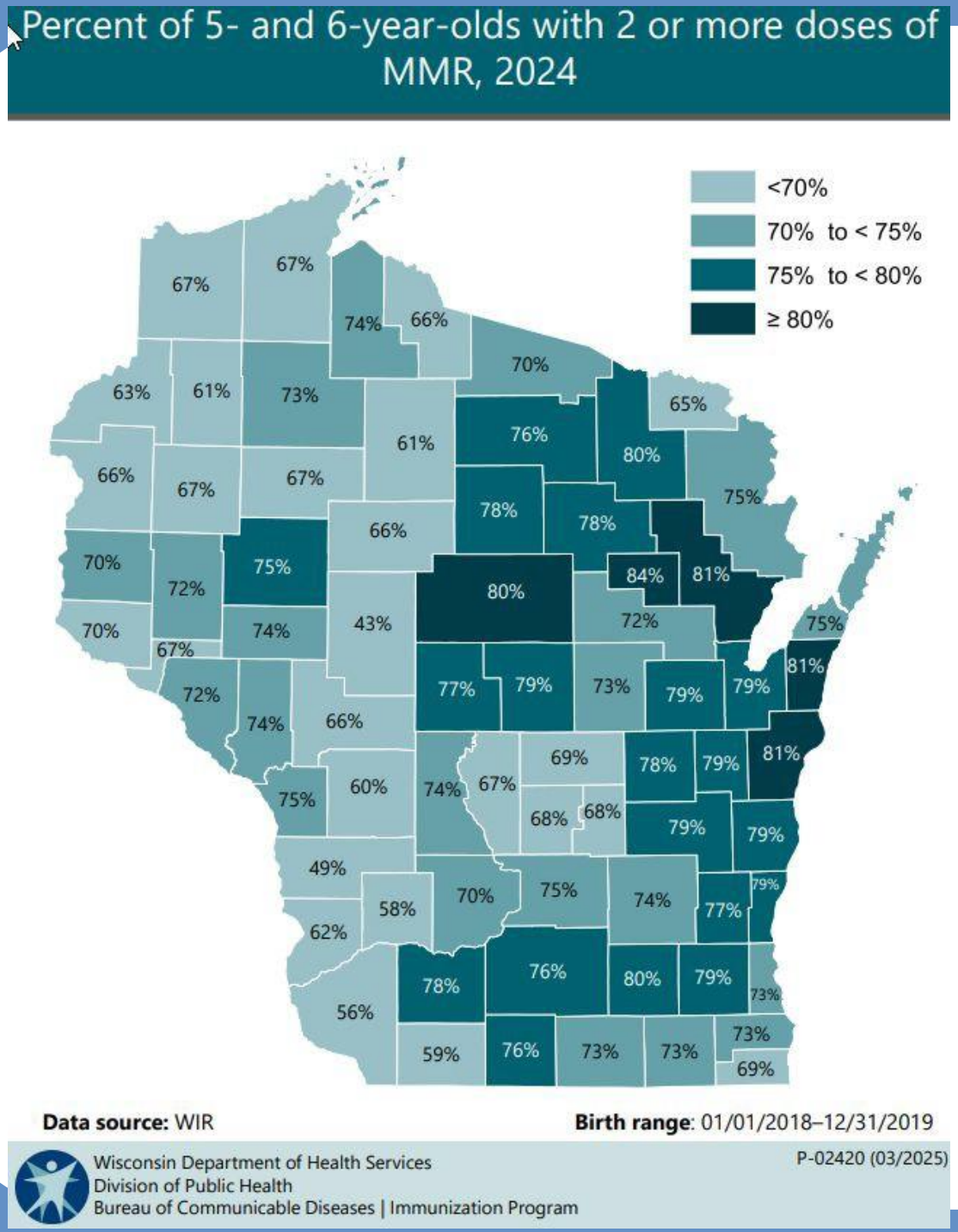


School requirements starting in the 2024-2025 school year

For entry to kindergarten through seventh grades students need:

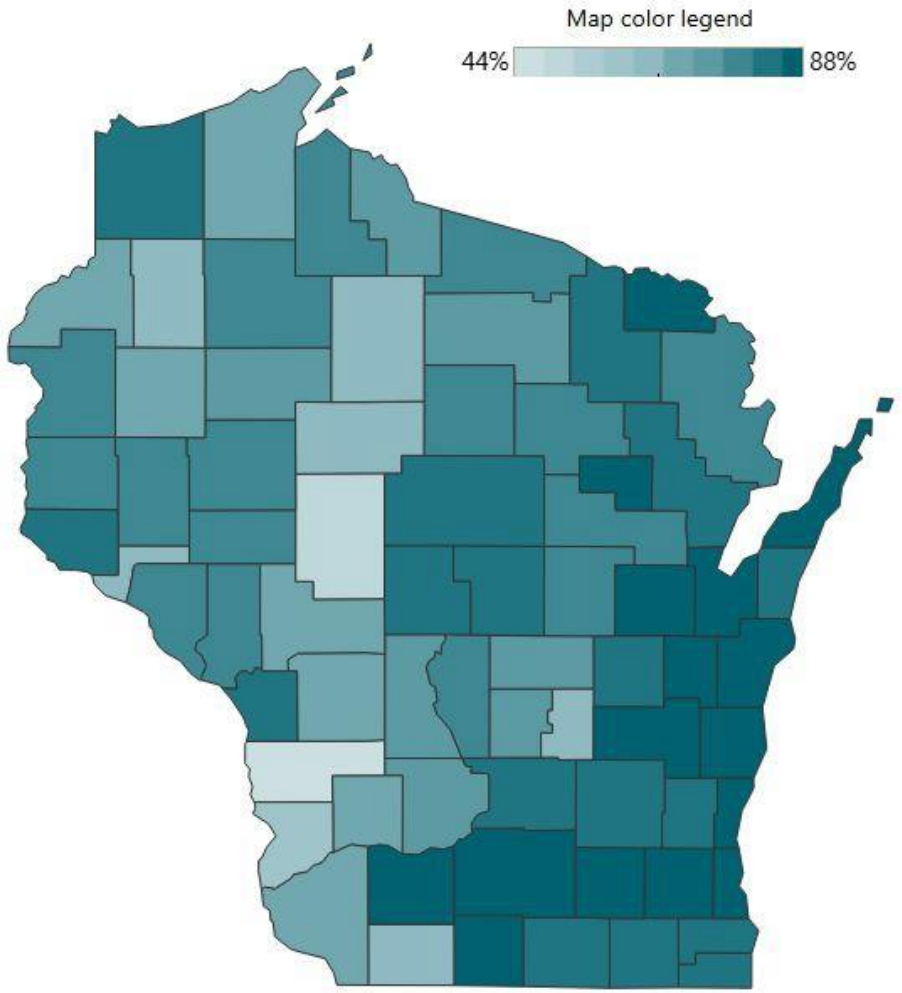
- 4 doses of polio vaccine
- 3 doses of hepatitis B
- 4 doses of DTaP/DTP/DT/TD
- 2 doses of varicella (chickenpox)*
- 2 doses of MMR
- 1 Tdap at seventh grade
- 1 MenACWY-containing vaccine at seventh grade

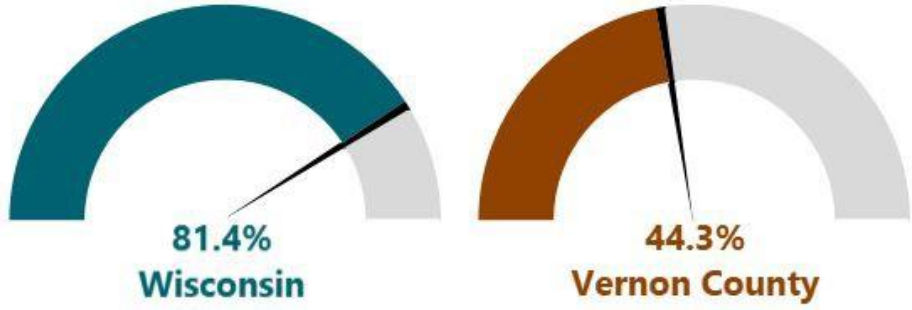
For entry to 12th grade

- 2 MenACWY-containing vaccines#

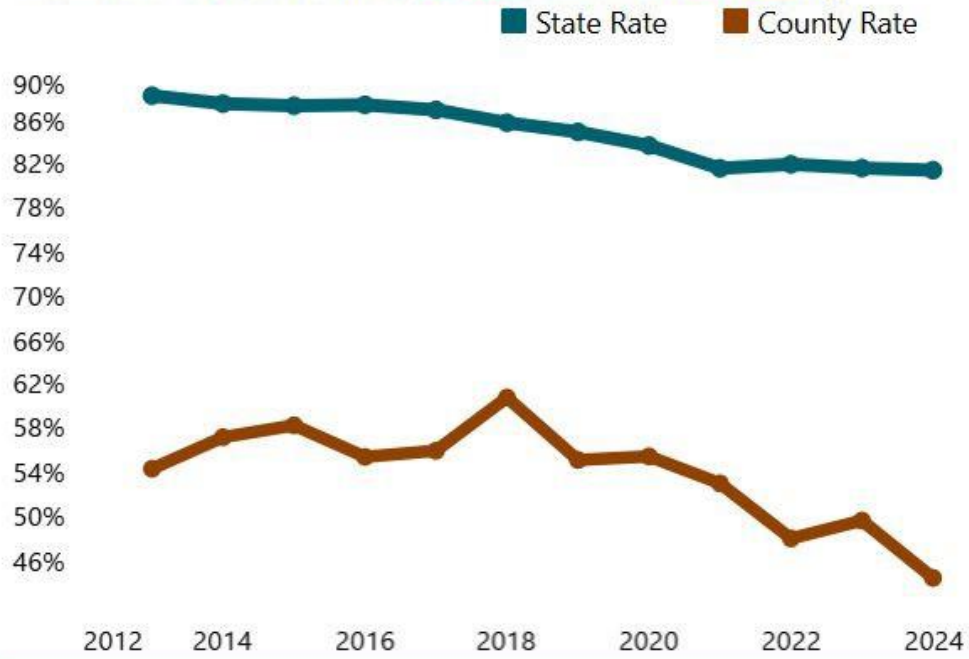
Percent of Wisconsin 24-month olds who received one or more doses of the MMR vaccine, 2024

Click a county on the map below to see the graph and gauge change.





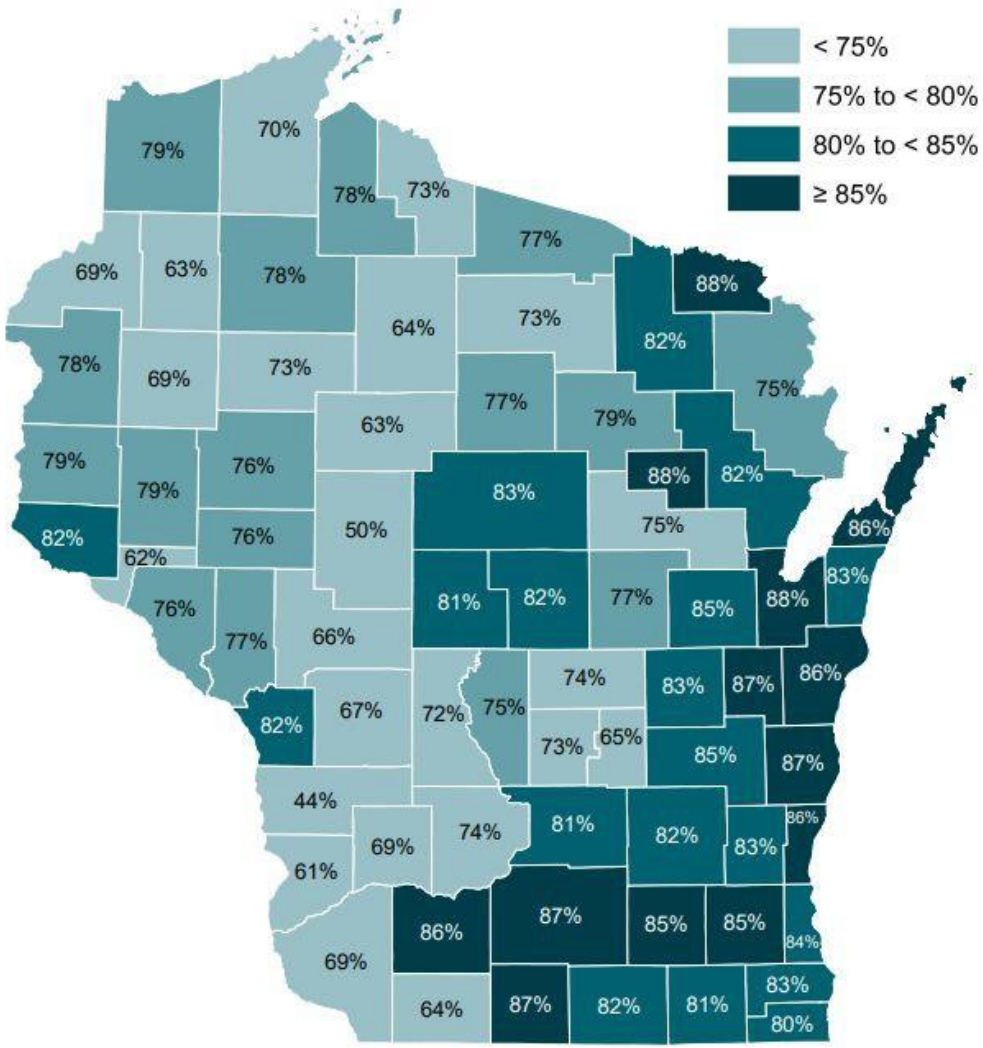
Trends in the percent of 24-month olds who received one or more doses of the MMR vaccine, statewide and in Vernon County



Click to view data by region

Click to view data tables

Percent of children with at least one dose of measles, mumps, and rubella (MMR) by 24 months of age, 2024

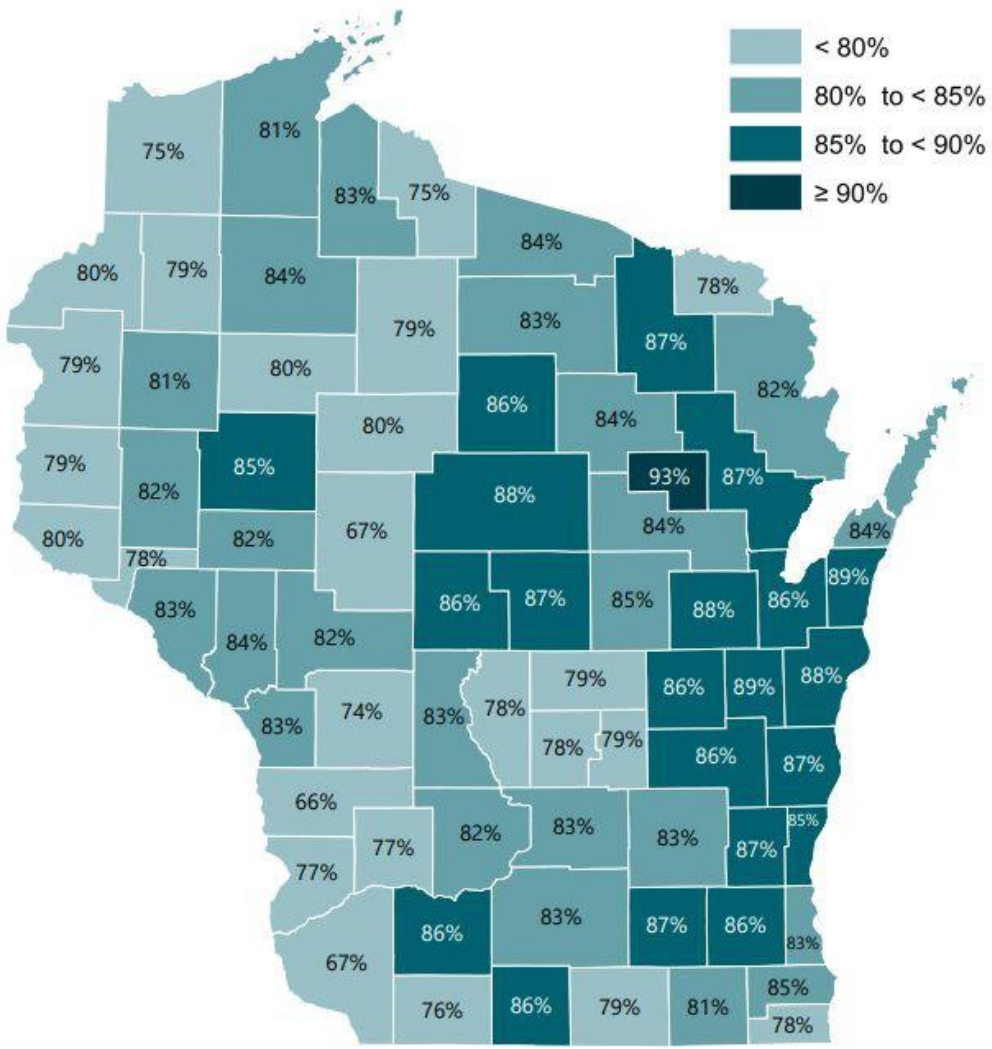


Data source: Wisconsin Immunization Registry (WIR) **Birth range**: 01/01/2022–12/31/2022

Wisconsin Department of Health Services
Division of Public Health
Bureau of Communicable Diseases | Immunization Program

P-02420 (03/2025)

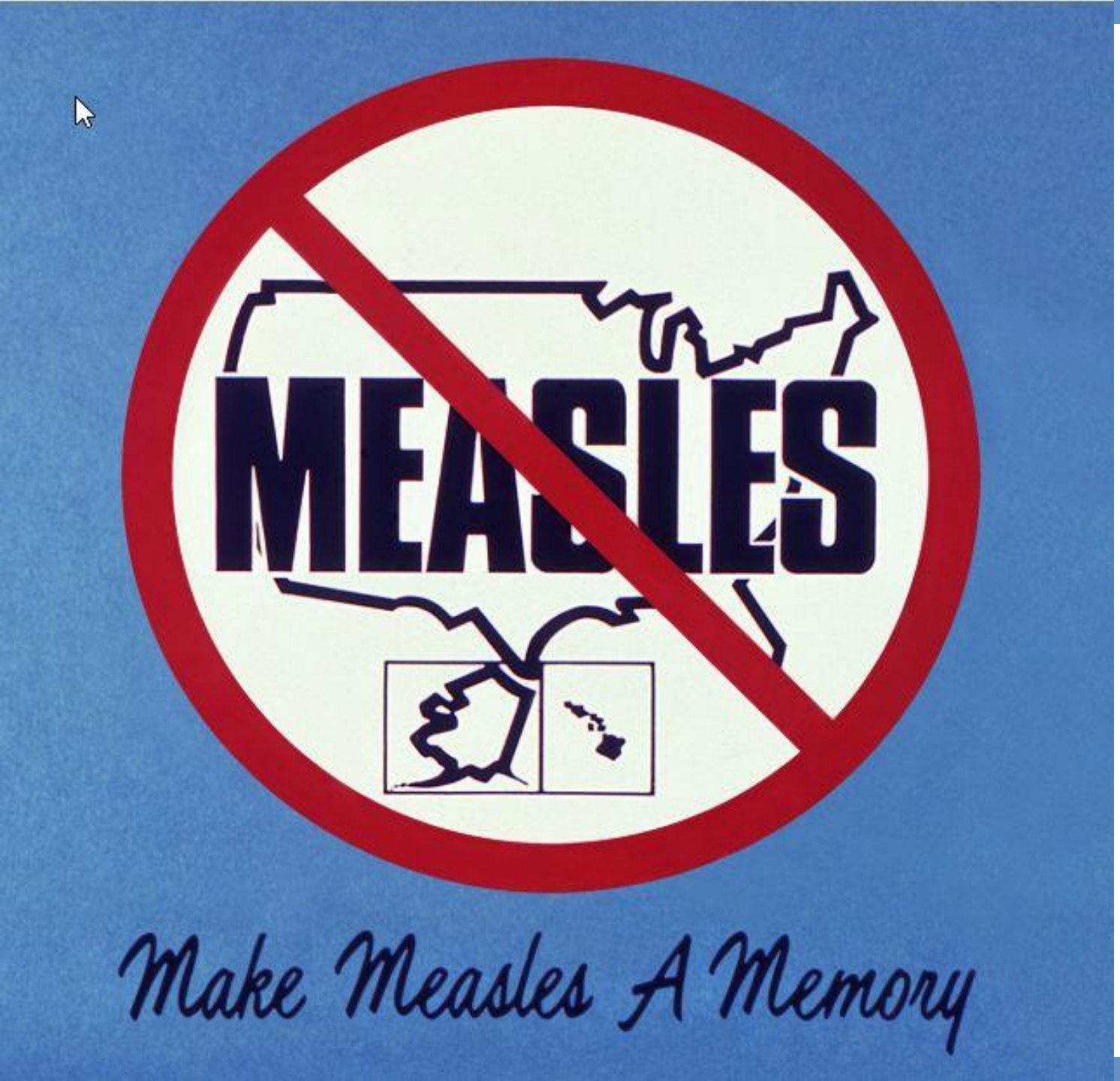
Percent of 5–18-year-olds with 2 or more doses of MMR, 2024



Data source: WIR **Birth range**: 01/01/2007–12/31/2019

Wisconsin Department of Health Services
Division of Public Health
Bureau of Communicable Diseases | Immunization Program

P-02420 (03/2025)



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What are the next steps we need to take?

Measles here to stay?

- Modeling study
- Table. Epidemiological Model Inputs, Vaccination, and Clinical Complications for Vaccine-Eliminated Infectious Diseases
- Assumed measles vaccine efficacy 100%

At current immunization rates, measles may become endemic again in the U.S.

Parameters used in modeling

	Vaccine-eliminated infectious disease
	Measles
Model inputs[a]	
Basic reproduction number[16-19,b]	12
Latent period, d[20-22,c]	10
Duration of infectiousness, d[20-22]	8
Infection importation rate, No. of cases/y[d]	34
Vaccine efficacy, %[16,20,23,24,e]	97
Population immunity[25-33]	Age- and state-specific
Risk of infection-related complications[f]	• Postmeasles neurological sequelae[34]: 0.1% • Hospitalization[20,35,36]: 20% • Death[37]: 0.3%

Source: Kiang MV, Bubar KM, Maldonado Y, Hotez PJ, Lo NC. Modeling Reemergence of Vaccine-Eliminated Infectious Diseases Under Declining Vaccination in the US. *JAMA*. Published online April 24, 2025. doi:10.1001/jama.2025.6495

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Modeling results over the next 25 years

- Using current state-specific coverage rates of 88-96%, over the next 25 years
  - 851,300 persons with measles (381,300 to 1.3 million)
  - 851 persons with post-measles neurologic complications (372-1270)
  - 170,200 persons requiring hospitalization (76,200-250,000)
  - 2,500 deaths from measles (1130-3760)

Model state	Change coverage	Persons with measles	95% Uncertainty Interval
Current state 88-96%	----------	851,300	381,300 to 1.3 million
Increase measles vaccine	+5% over 25 years	5,800	3,100 to 19,400
Increase measles vaccine	+10% over 25 years	2,700	2,200-3,400
Decrease measles vaccine	--10% over 25 years	11.1 million	10.1 to 12.1 million
Decrease measles vaccine	--25% over 25 years	26.9 million	25.5 to 28.1 million

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"A key finding is that, under current vaccination levels, measles may be likely to return to endemic levels within the next 20 years, driven by states with routine vaccination coverage below historical levels and below the threshold needed to maintain elimination of transmission."

Measles had been eliminated from the U.S. in 2000

What we need to do

- Be aware of measles signs and symptoms
- Set up a plan for infection control
- Be ready for proper testing for suspected measles
- **Encourage measles vaccination for all eligible children and adults**

Infection Control

- Be vigilant for patients with potential measles
- Ideally person notifies clinic/hospital prior to arrival
- Patient and family wear masks, clinician wears N95
- Isolate person in airborne infection isolation room (AKA negative pressure room)
- If not available then use private room with door closed
- Immediately notify local public health department dhs.wisconsin.gov/lh-depts/index.htm
- Instruct patient to isolate at home through Day 4 with first day of rash being Day 0

For Local Health Departments

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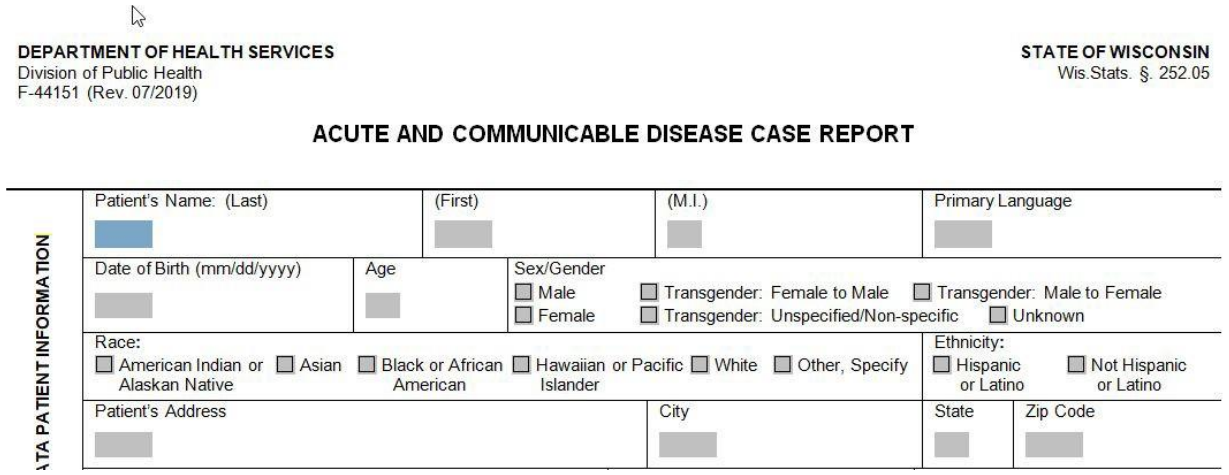
Measles is a Wisconsin Disease Surveillance Category I disease

Report it right away to the patient's local public health department. Call as soon as you identify a confirmed or suspected case. The health department then notifies the state epidemiologist.

Within 24 hours, submit a case report through one of the following:

- Wisconsin Electronic Disease Surveillance System (WEDSS)
  https://ct.wedss.wisconsin.gov/WEDSS/pages/login/login.aspx
- Mail or fax—Acute and Communicable Disease Case Report, F44151 (Word)

Read more about required disease reporting in Wisconsin.
https://www.dhs.wisconsin.gov/disease/reporting.htm



DEPARTMENT OF HEALTH SERVICES
Division of Public Health
F-44151 (Rev. 07/2019)

STATE OF WISCONSIN
Wis.Stats. §. 252.05

ACUTE AND COMMUNICABLE DISEASE CASE REPORT

Patient's Name: (Last)	(First)	(M.I.)	Primary Language	
Date of Birth (mm/dd/yyyy)	Age	Sex/Gender ☐ Male ☐ Female ☐ Transgender: Female to Male ☐ Transgender: Male to Female ☐ Transgender: Unspecified/Non-specific ☐ Unknown		
Race: ☐ American Indian or Alaskan Native ☐ Asian ☐ Black or African American ☐ Hawaiian or Pacific Islander ☐ White ☐ Other, Specify			Ethnicity: ☐ Hispanic or Latino ☐ Not Hispanic or Latino	
Patient's Address	City		State	Zip Code

Definition of Immunity for Measles

- Born before 1957, except for HCW
- HCW, regardless of age, 2 doses of MMR
- Documentation of 2 doses of MMR
- Laboratory evidence of immunity or disease (clinical diagnosis does not count)

Workflow for HCW exposed to measles

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- Exposure is defined by spending any time with a person with measles and includes up to 2 hours after they vacated the space.
- If immune to measles
  - No work restrictions but monitor for Day 5 through Day 21 after exposure
- If not immune to measles

  Provide prophylaxis per CDC

  - Exclude from work for Day 5 through Day 21 after exposure, regardless of prophylaxis
- If only one dose of MMR prior to exposure
  - No restriction but monitor for Day 5 through Day 21 after exposure, get 2nd MMR

- If you have measles and are immunocompetent

  Exclude from work for 4 days after rash appears

- If you have measles and are immunocompromised

  Exclude from work for duration of illness

Post Exposure Prophylaxis for Persons who are Nonimmune

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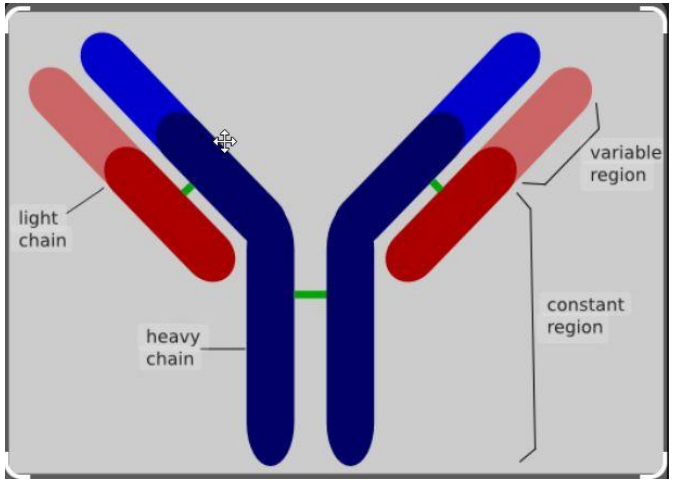
MMR Vaccine Criteria

1. Can be used within 72 hours of exposure
2. For persons 12 months and older if not immune but can consider use in children 6 months through 11 months
3. Not for use in pregnancy
4. Preferred to IG if not contraindicated



Immunoglobulin Criteria (IGIM and IGIV)

1. Can be used within 6 days of exposure
2. Not recommended for someone 12 months and older who has received MMR in the past after 1st birthday unless they are several immunocompromised
3. Should be used in infants, pregnant persons, severely immunodeficient persons without evidence of immunity
4. If not contraindicated, catch-up persons with MMR at least 6 months after IGIM or 8 months after IGIV

Table 3.32. Postexposure Prophylaxis (PEP) for People Exposed to Measles Who Are NOT Pregnant or Immunocompromised

Age Range	Measles Immune Status[a]	PEP Type Depending on Time After Initial Exposure		
		≤3 days (≤72 hours)	4–6 days	>6 days
All ages (≥6 mo)	Immune	• PEP not indicated. Exposed person has documented immunity.		
<6 mo	Nonimmune (because of age[b])	• Administer immune globulin intramuscular (IGIM)[c] • Home quarantine[d]		• PEP not indicated (too late). • Home quarantine[d]
6–11 mo	Nonimmune	• Administer MMR vaccine (MMR vaccine preferred over immune globulin [IG]) • No quarantine needed.[e]	• Administer IGIM[c] • Home quarantine[d]	• PEP not indicated (too late). • Home quarantine[d]
≥12 mo	Nonimmune	• Administer MMR vaccine • No quarantine needed[e]	• IG PEP usually not administered[f] • Home quarantine,[d] then administer MMR vaccine to protect from future exposures	
≥12 mo	1 dose of MMR vaccine	• Administer 2nd MMR vaccine dose if ≥28 days from the first dose • No quarantine needed (person had 1 dose when exposed)		

Table 3.33. Postexposure Prophylaxis (PEP) for People Exposed to Measles Who ARE Pregnant or Immunocompromised

Category	Measles Immune Status[a]	PEP Type Depending on Time After Initial Exposure		
		≤3 days (≤72 hours)	4–6 days	>6 days
Severely immunocompromised[b]	IG recommended regardless of measles immune status	• Administer immune globulin intravenous (IGIV)[c] • Home quarantine[d]		• PEP not indicated (too late) • Home quarantine[d]
Pregnant	Immune	• PEP not indicated		
	Nonimmune	• Administer IGIV[c] • Home quarantine[d]		• PEP not indicated (too late) • Home quarantine[d]

[d]The quarantine period is 21 days after the last exposure; most health departments would extend the monitoring period to 28 days if IG is administered as PEP because IG can prolong the incubation period. Decisions on whether exposed persons who received IG as PEP appropriately (ie, within 6-day window) should return to settings such as child care, school, or work (ie, not be quarantined) should include consideration of the immune status and intensity of contacts in the setting and presence of high-risk individuals. These persons should be excluded from health care settings.

Laboratory Testing for Measles

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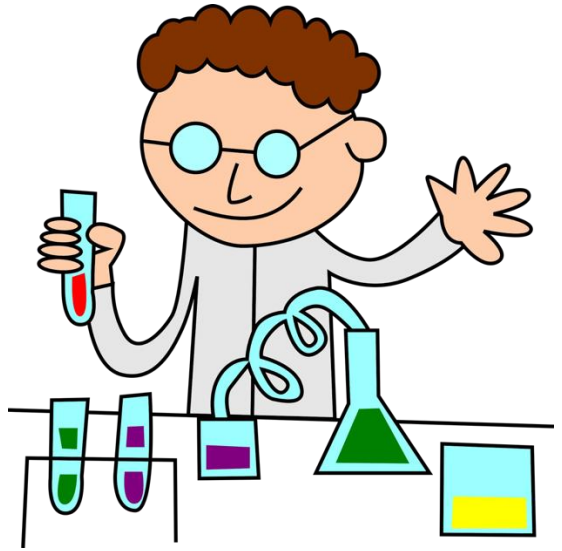
Testing for infection

- Get NP and throat swab for measles PCR
  - -Ideally within 3 days of illness
  - -No later than 10 days after rash onset
  - -Use synthetic swab
  - -both swabs in VTM
- Get Serum IgG and IgM
  - -if both negative and tested within 72 hours of rash onset, consider testing a 2nd time

Testing for immunity

- Check Serum IgG only
- Do not do NP/OP swabs in asymptomatic contacts--there are NOT asymptomatic carriers of measles



Wisconsin State Lab of Hygiene

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Maintain specimens at refrigerator temperature. Ship with cool pack.

Send the sample to the Wisconsin State Lab of Hygiene (WSLH) or, if in Milwaukee, send to the City of Milwaukee Health Department Laboratory. If IgM testing is required, the specimen should only be sent to WSLH. Do not send to an out-of-state or commercial lab.

Note: When the index of suspicion is high, weekend testing may be possible. Contact 608-267 9959 or after hours 608-258-0099 to get confirmation.

Additional resources

Wisconsin State Lab of Hygine (WSLH)

http://www.slh.wisc.edu/

Contact WSLH Customer Service at 800-862-1013 or 608-224-4272:

- To request a copy of the lab requisition form.
- For courier service information.
- For assistance with packaging or storage requirements.

Division of Public Health

https://www.dhs.wisconsin.gov/immunization/measles.htm

After hours number: 608-258-0099

Center for Disease Control and Prevention

https://www.cdc.gov/measles/index.html

Wisconsin local health departments

https://www.dhs.wisconsin.gov/lh-depts/counties.htm

Wisconsin State Laboratory of Hygiene
UNIVERSITY OF WISCONSIN–MADISON

What about measles during pregnancy?

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- If not immune to measles, then provide one-time 400-mg/kg dose of immune globulin IV (IVIG) within 6 days of exposure.
- Vitamin A supplementation is contraindicated in pregnancy
- Defer vaccination until postpartum
- May breastfeed with measles but wear a mask and limit skin to skin x 3 days, consider pumping
- MMR vaccination is safe for breastfeeding people. Breastfeeding does not interfere with immunity, and the vaccine is not transmitted through breast milk.

Guidance from the Society for Maternal-Fetal Medicine (SMFM)

What measles complications are unique to pregnancy?

Measles during pregnancy is associated with an increased risk for adverse maternal and fetal outcomes.[3] Measles during pregnancy has been associated with an increased maternal risk of hospitalization, pneumonia, need for oxygen support or mechanical ventilation, and death. Fetal and neonatal risks include an increased risk of miscarriage, stillbirth, low birth weight, prematurity, and infant mortality. Congenital viral syndrome has not been described; however, some case reports have described an increased risk of congenital malformations with first-trimester exposure.[4]

Overview of Measles Control Plan

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- Be prepared if someone with measles walks into your clinic
  - Educate yourself on the natural history of measles
  - Contagious period is 4 days before and 4 days after rash onset
  - Be prepared with infection control
  - Develop triage protocols to consider treating outside of clinic space
  - Notify local health department immediately (don't wait for results)
  - Testing
  - Treatment
- Promote immunizations
  - Attend IMWI Spring Conference
  - Attend IMWI webinars on Vaccine Hesitancy with Dr. Naik on June 17th
  - Distribute immunization promotion materials for clinics
  - Develop scripting for staff and clinicians
  - Practice immunization promotion and address immunization hesitancy--DON'T OFFER IMMUNIZATIONS, RECOMMEND THEM!

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Patient Handout

https://www.cdc.gov/measles/downloads/measles-factsheet-outbreak-508.pdf

References for data and pictures

- cdc.gov/measles
- cdc.gov/pinkbook/hcp/table-of-contents/chapter-13-measles.html
- publications.aap.org/redbook/resources/15187
- publications.aap.org/redbook/book/755/chapter/14079321/Measles
- aap.org/en/news-room/campaigns-and-toolkits/measles-toolkit/
- vaccinateyourfamily.org/vaccines-diseases/#measles
- immunize.org/clinical/image-library/measles/
- immunize.org/official-guidance/fda/pkg-inserts/
- dhs.wisconsin.gov/immunization/measles.htm
- who.int/news-room/spotlight/history-of-vaccination/history-of-measles-vaccination
- highriskpregnancyinfo.org/measles

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VACCINES CAUSE ADULTS