Measles Review for Health Care Providers

May 22, 2024

Debra Blog, MD, MPH
Medical Director Division of Vaccine Excellence

Measles

An Overview

NEW YORK STATE | Department of Health

Why are we here?

nature › news explainer › article

NEWS EXPLAINER | 31 January 2024

Measles outbreaks cause alarm: what the data say

A drastic rise in infections in the United Kingdom and Europe follows a drop in vaccine uptake.

By Carissa Wong

The New York Times

Europe Faces a Measles Outbreak

By Apoorva Mandavilli

Jan. 24, 2024

NEWS

Florida leads US in measles cases. Here's the latest update, by the numbers

The CDC reports 41 measles cases across the U.S.

Cheryl McCloud
USA TODAY NETWORK - Florida

Published 8:16 a.m. ET March 8, 2024 | **Updated 8:16 a.m. ET March 8, 2024**

Nassau health officials: Visitors at Cohen Children's Medical Center may have been exposed to measles

Mar 25, 2024, 5:35am • Updated 2d ago

By: **News 12 Staff**

NEW YORK STATE | Department of Health

Why are measles cases increasing?

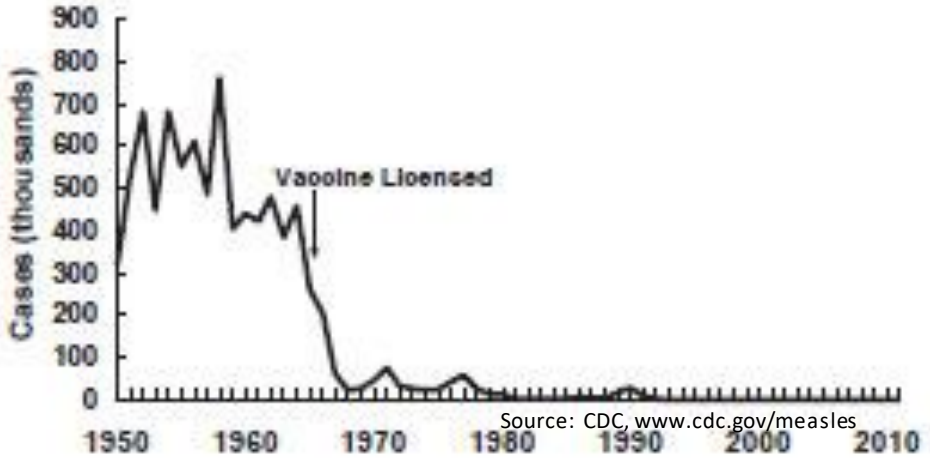
- Each year, measles cases can occur for any of the following reasons:
  - Increase in the number of travelers who are infected with measles abroad and bring it into the U.S.
  - Further spread of measles in U.S. communities with pockets of unvaccinated individuals
  - Increase in mis- and disinformation about vaccines
  - Measles seems to occur in 5-year cycles

History of measles in the United States

- Prior to 1963, measles occurred worldwide in an endemic or epidemic pattern.
- Nearly all children got measles by the time they were 15 years of age.
  - An estimated 3-4 million cases occurred annually
- When measles became a nationally notifiable disease in 1912, an average of 6,000 measles deaths were reported each year.
- In the decade before 1963, it is estimated that annually:
  - 400-500 people died
  - 48,000 people were hospitalized
  - 1,000 people suffered encephalitis

History of measles in the United States (cont.)

- In 1963, measles vaccine was introduced.
- In 1989, two-dose MMR vaccine schedule was introduced.
- In 2000, measles was declared eliminated from the U.S., meaning an absence of endemic measles transmission for 12 months or longer.

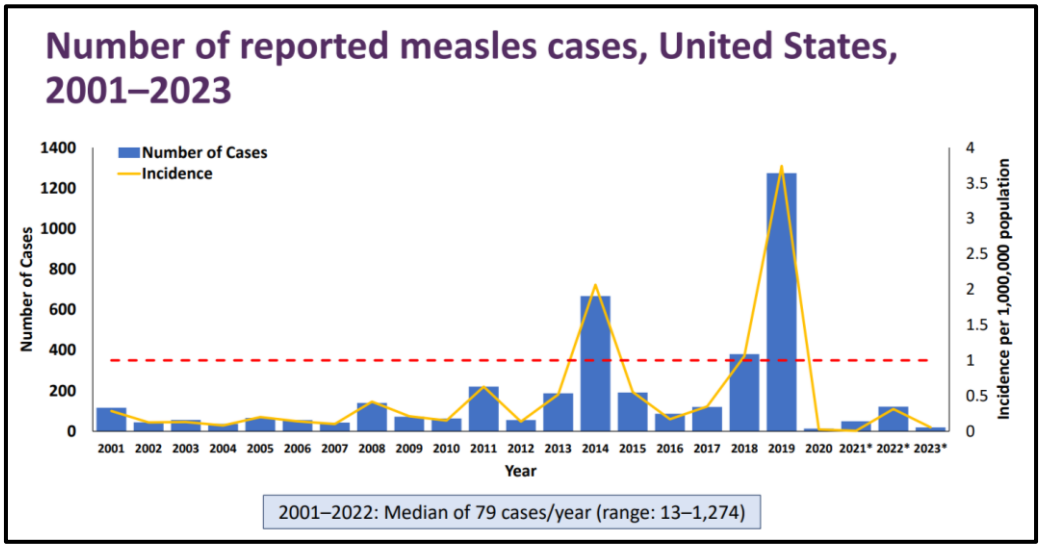


Source: CDC, www.cdc.gov/measles

NEW YORK STATE | Department of Health

History of measles in the United States (cont.)

- Elimination has been attributed to a highly effective vaccination program in the U.S. and better measles control.
- Since 2000, outbreaks have been reported throughout the U.S., most commonly related to international travel and communities with poor vaccination rates.
- Large outbreak in 2019 was mostly in New York State.



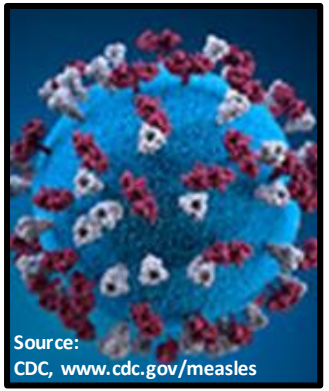
Source: https://emergency.cdc.gov/coca/ppt/2023/081723_slides.pdf

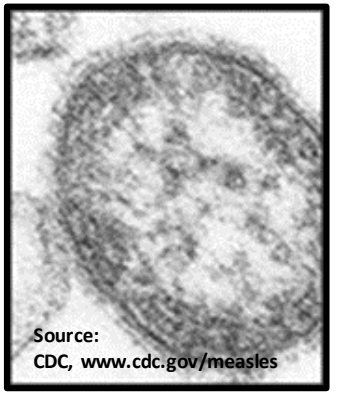
NEW YORK STATE | Department of Health

Measles Epidemiology

Background

- Measles is an acute, viral, infectious disease.
- The measles virus is a paramyxovirus of the genus *Morbillivirus.*
    - Same family as RSV, mumps, and parainfluenza viruses



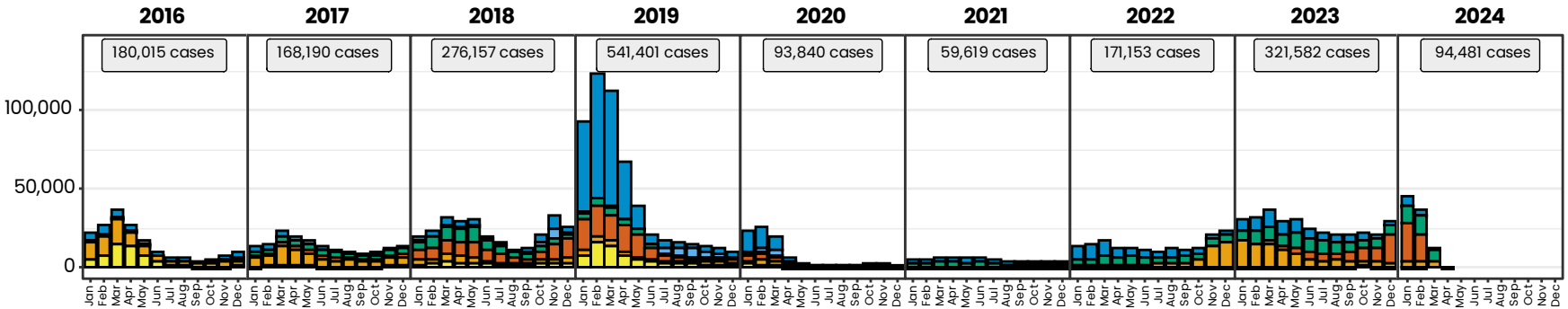


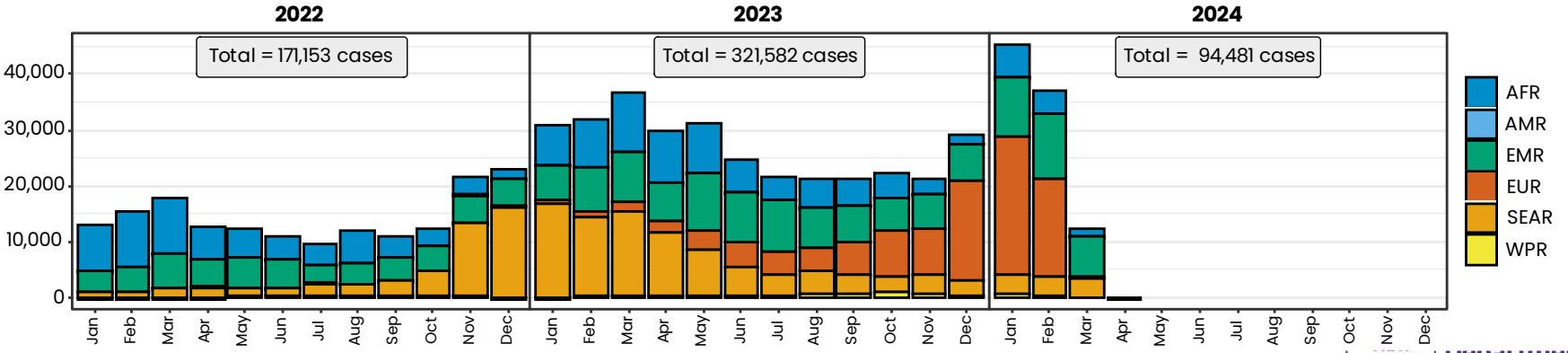
NEW YORK STATE | Department of Health

Measles epidemiology

- **Reservoir**
  - Human
- **Transmission**
  - Person-to-person via large respiratory droplets
  - Airborne in closed areas for up to 2 hours
- **Temporal pattern**
  - Primarily late winter and spring
- **Communicability**
  - Four days before through four days after rash onset

Measles case distribution by month and World Health Organization region (2016-2024)





YORK STATE Department of Health

- Notes: Based on data received 2024-04 - Data Source: IVB Database - This is surveillance data, hence for the last month(s), the data may be incomplete.

Current outlook - global

Top 10 Countries with Measles Outbreaks*

Rank	Country	Number of Cases
1	Azerbaijan	28,787
2	Kazakhstan	28,660
3	Iraq	25,429
4	India**	15,183
5	Kyrgyzstan	11,723
6	Russian Federation	11,537
7	Pakistan	8,648
8	Yemen	8,558
9	Burkina Faso	4,810
10	Nigeria	4,701

- COVID-19 has increased the risk of measles outbreaks.
- Over 61 million doses of measles-containing vaccine were postponed or missed from 2020 to 2022 due to COVID-19 related delays in supplementary immunization activities.
- This increases the risk of bigger outbreaks around the world, including the U.S.

Provisional data based on monthly data reported to World Health Organization as of early May 2024. Data covers October 2023 – March 2024

* Countries with highest number of cases for the period.

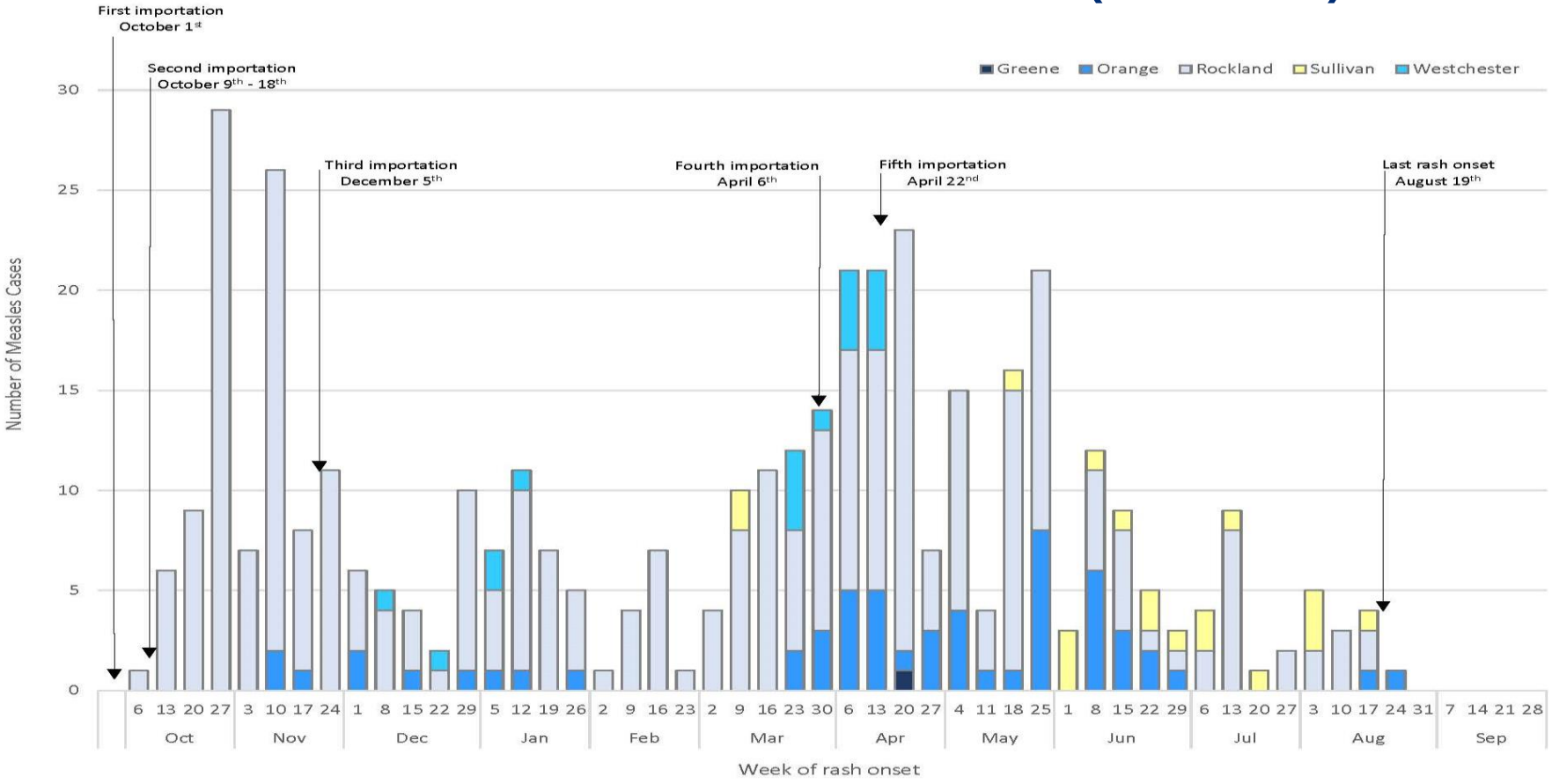
NEW YORK STATE Department of Health

https://www.cdc.gov/globalhealth/measles/data/global-measles-outbreaks.html

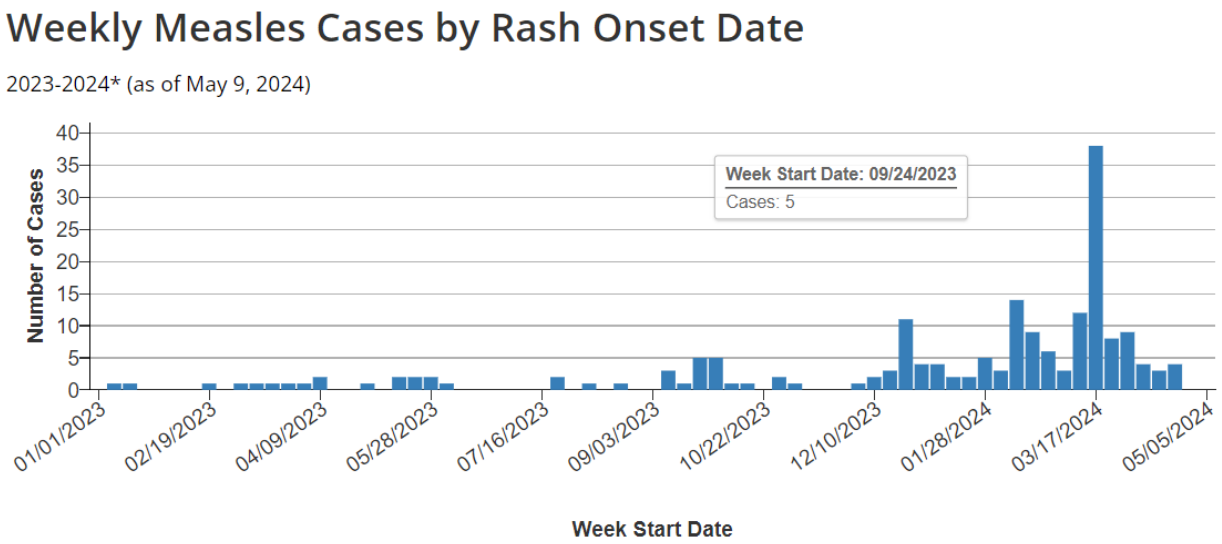
Past outbreak – New York State (2018-2019)

- The last large outbreak of measles in New York State was from 2018-19, with over 400 cases in New York State outside of New York City and more than 600 cases in New York City.
- In New York State outside of New York City, there have typically been 0 to 7 confirmed measles cases per year since 2009, not including the 2018-19 outbreak.
- There have been no cases in the last four years until now.

Past outbreak – New York State (2018-2019)



Current outlook – United States



- As of May 9, 2024, a total of 132 measles cases were reported by 21 jurisdictions: Arizona, California, Florida, Georgia, Illinois, Indiana, Louisiana, Maryland, Michigan, Minnesota, Missouri, New Jersey, New York City, New York State, Ohio, Pennsylvania, Vermont, Virginia, Washington, West Virginia, and Wisconsin.

NEW YORK STATE Department of Health

https://www.cdc.gov/measles/cases-outbreaks.html#print Measles Cases and Outbreaks | CDC

Situation in New York State - 2024

- To date in 2024, there has been one confirmed case of measles in an unvaccinated preschool aged child in New York State, outside of New York City.

- There are about 7 additional confirmed cases in New York City.

- Due to a rise in cases across the country, the New York State Department of Health is remaining vigilant and prepared.

NEW YORK STATE | Department of Health

New York State – MMR vaccination rates

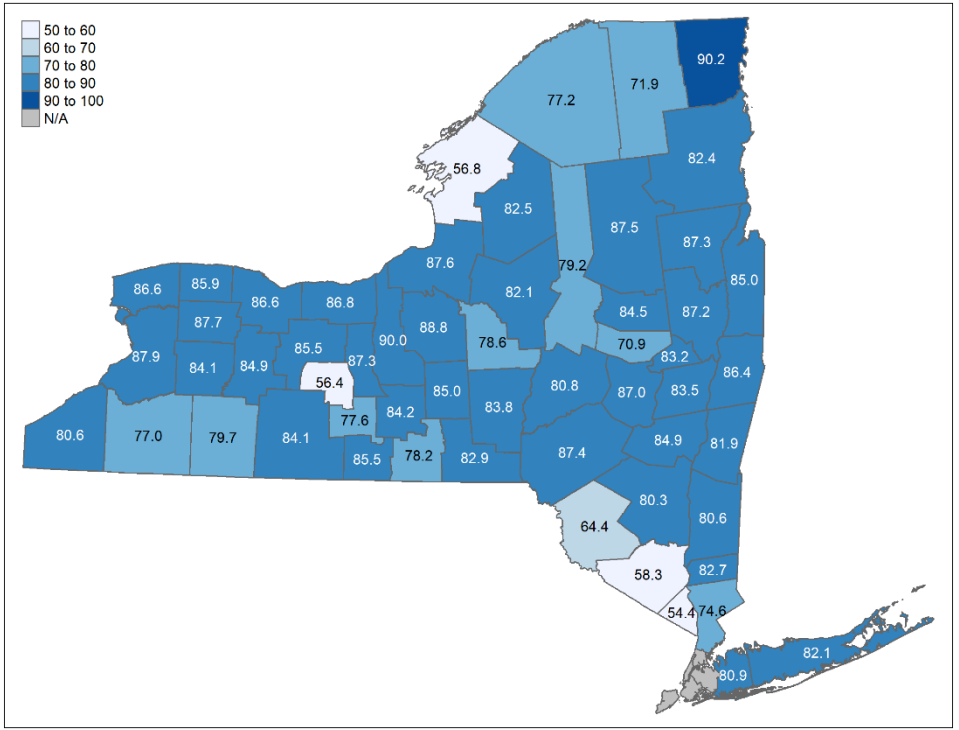
Receipt of 1 MMR dose by 2 years

- Children receive first dose at age 12-15 months
- Coverage has declined in younger age groups (1-4 years) since 2019 outbreak
- Statewide (79.4%)

Areas of Concern:

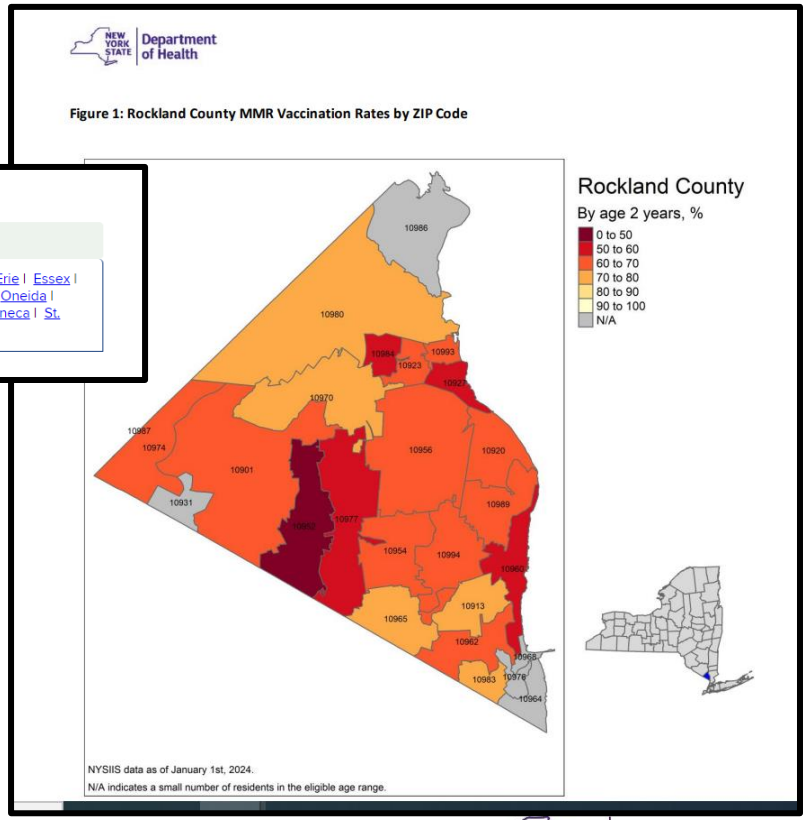
- Rockland (54.4%)
- Yates (56.4%)
- Orange (58.3%)
- Sullivan (64.4%)
- Jefferson (56.8%)*

Previous measles outbreak occurred primarily in Rockland County



NEW YORK STATE Department of Health

*Data/Figure Notes: Data as of January 1, 2024; *Some entities not under regulatory authority of the State of New York and may not report data to NYS.*



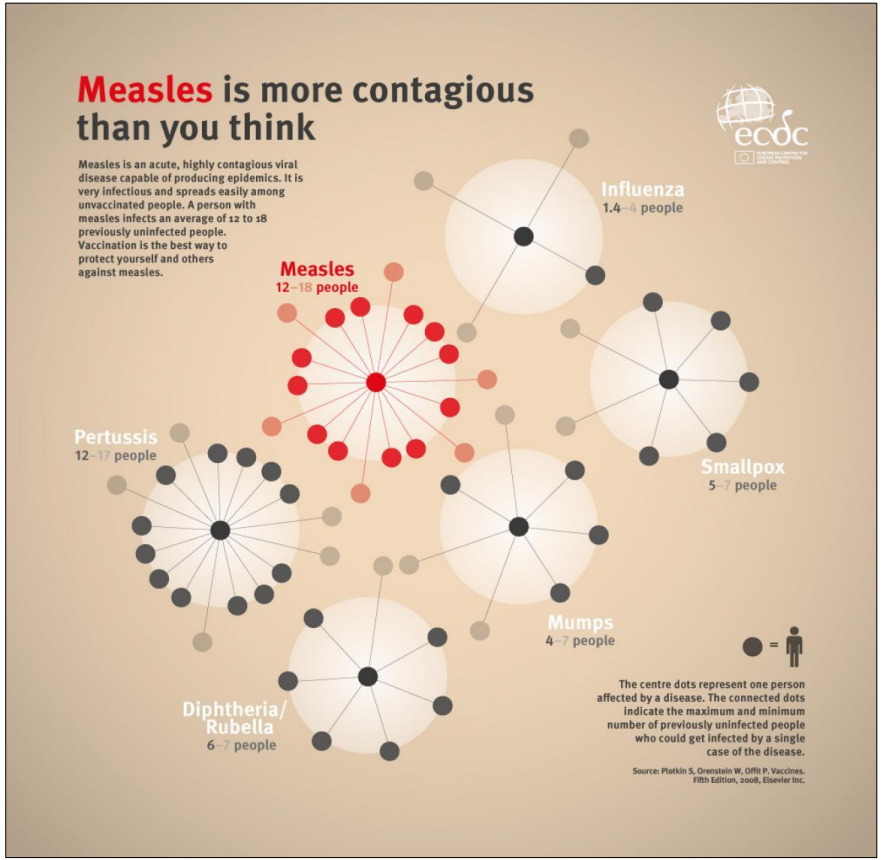
Publicly available MMR vaccination rates available by county on NYSDOH website

Source: https://www.health.ny.gov/diseases/communicable/measles/vaccine/

NEW YORK STATE | Department of Health

Clinical Overview

Measles transmission

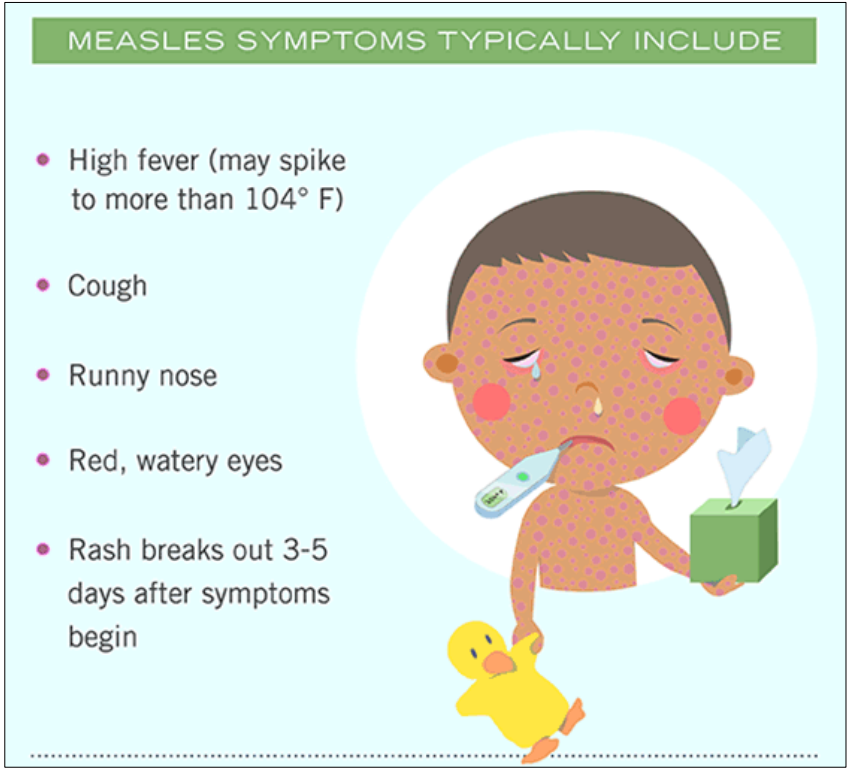


- Measles is one of the most contagious infections known.
- Measles can spread via the airborne route.
- Measles can ***live for up to two hours*** in the airspace where an infected person breathed, coughed or sneezed.
- Measles is so contagious that if one person has it, 90% of the people close to that 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.***

NEW YORK STATE | Department of Health

Clinical characteristics

- Prodromal symptoms
  - Begin 7-14 days after infection (up to 21 days)
  - Duration 2-4 days with a range of 1-7 days
  - Fever increases gradually up to 103° to 105º F
  - Symptoms include **cough, coryza, conjunctivitis**, malaise, diarrhea, anorexia, and lymphadenopathy
  - Koplik spots (scattered blue-white tiny spots on a bright red background) may appear inside the mouth before rash
  - Patients appear sick and miserable



Source: CDC, www.cdc.gov/measles

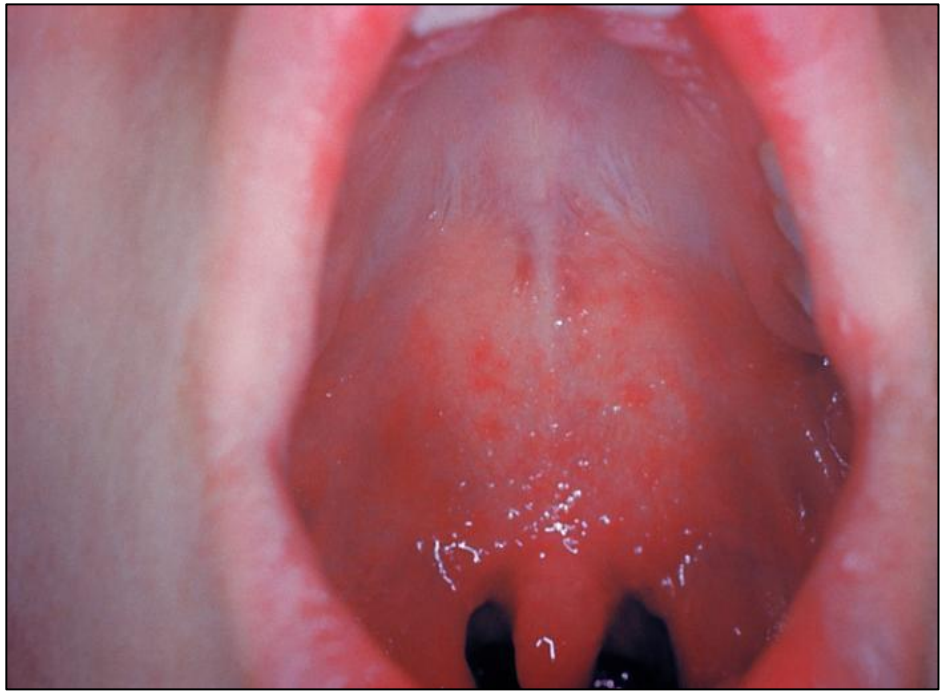
Suspect case identification: conjunctivitis and coryza

Source: Centers for Disease Control and Prevention

Suspect case identification and reporting

Koplik spots

- Pathognomonic for measles



Source: Centers for Disease Control and Prevention

Maculopapular rash

NEW YORK STATE Department of Health

Additional clinical information

- Rashes can be difficult to see on darker skin tones.
- Atypical presentations:
  - Characterized by less intense symptoms and a milder rash which may occur in individuals with pre-existing partial immunity:
    - Young infants with waning immunity from maternal antibodies
    - Patients who have received one or two MMRs
    - Patients who were born in 1956 or earlier
- Measles vaccine reaction:
  - Fever and rash may occur six to 12 days after vaccination
  - Viral specimens are needed to distinguish wild-type virus from vaccine strain virus

Differential diagnosis of measles

- Other febrile rash illnesses:
  - Parvovirus B19 (Fifth's Disease)
  - Human Herpesvirus – 6 (Roseola)
  - Enteroviruses
  - Streptococcal infection (Scarlet Fever)
  - Adenovirus
  - Infectious mononucleosis
  - Influenza: "Fleasles"
  - Dengue
  - Antibiotic sensitivity or allergies

- **If there is another diagnosis there is rarely a need to test for measles.**

If measles is a concern….

If you have a patient presenting with a febrile rash illness, consider the patient presentation and differential diagnosis carefully. If measles is a concern:

- **Enact infection control practices immediately.**
- **Immediately report the case to your local health department.**
  - **Do not wait for laboratory confirmation to report to the local health department.**
- **If sending patient to the emergency room, call ahead so that appropriate infection control practices can be implemented.**

NEW YORK STATE | Department of Health

Measles complications

- Diarrhea, otitis media, pneumonia, encephalitis, subacute sclerosing panencephalitis, death
- Most common among children younger than 5 years of age and adults older than 20 years, pregnant women, those who are immunosuppressed

NEW YORK STATE Department of Health

Measles complications (cont.)

- **Subacute Sclerosing Panencephalitis (SSPE)**
  - SSPE is a rare but fatal complication of measles
  - May occur 7-10 years after a natural measles infection
  - Type of brain swelling that is progressive and has no known cure
  - Most individuals with SSPE will die within 1-3 years of diagnosis, but some have a more rapid disease progression that leads to death within three months of diagnosis
  - Risk of developing SSPE may be higher in those who are infected with measles before the age of two years
    - The incidence of SSPE declined by at least 90% in countries that have practiced widespread measles vaccination
    - This highlights the importance that children should receive their first MMR vaccination between the age of 12-15 months

Measles complications (cont.)

- Immune amnesia
  - There is evidence that measles can interfere with immune memory
  - There can be increased vulnerability to other pathogens

American Society for Microbiology, 5/18/18: asm.org/articles/2019/may/measles-and-immune-amnesia

Measles and pregnancy

- Persons who are pregnant and have measles are more likely to be
  - Hospitalized
  - Develop pneumonia
  - Die
- Measles and adverse outcomes of pregnancy
  - Pregnancy loss—in some studies
  - Preterm birth
  - Low birth weight
- Risk of congenital birth defects does not appear to be increased
- Neonates with congenital measles are at increased risk of Subacute Sclerosing Panencephalitis

NEW YORK STATE | Department of Health

Pregnancy

- MMR vaccine cannot be given during pregnancy.
- For post-exposure prophylaxis, pregnant women must be given immune globulin via the intravenous route.
- Pregnant women can be around someone who has received the MMR vaccine. Transmission of measles from the MMR vaccine has never been documented.

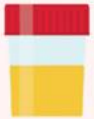
Measles vaccination

- Getting the measles vaccine is the best way to prevent measles, especially during an outbreak.
  - Two doses of measles, mumps, and rubella or MMR vaccine are about 97% effective at preventing measles; one dose is about 93% effective
  - Children (1-12 years of age) may also get MMRV vaccine, which protects against measles, mumps, rubella, and varicella (chickenpox)
- Regular schedule—two dose series at age 12 through 15 months and at age four through six years
  - Minimum age for dose one is 12 months
  - Minimum interval between dose one to two is four weeks for MMR and three months for MMRV (but four weeks is okay)

Laboratory Testing

Laboratory testing

- Collection of viral and serology specimens is recommended for **every** case.
- **Both viral and serology specimens should be collected at the first contact with the suspected measles case.**
- Clinical specimens for detecting measles virus include a nasopharyngeal swab or throat swab and a urine sample.
  - Collection of both respiratory and urine samples can increase the likelihood of detecting virus
- A serum specimen for measles IgM and IgG should also be collected.

		Measles Tests	When to Collect?
Acute Disease	PCR	Nasopharyngeal (NP) or Throat (OP) Swab 	As soon as possible upon suspicion of measles: ideally **0-3 days** after rash onset, up to **10 days** after rash onset.
Acute Disease	PCR	Urine 	**Within 10 days** of rash onset **Collecting a urine specimen along with an NP/OP swab may improve test sensitivity, especially if at the end of the PCR detection window.*
Acute Disease	IgM	Serum 	Collect with specimen for PCR. Can be negative up to 3 days after rash onset. IgM **can be detected for 6–8 weeks** after acute measles.
Immunity	IgG	Serum 	When assessing evidence of immunity, can be detected ~**2 weeks** after MMR vaccination

Polymerase chain reaction (PCR) and viral culture

- Optimal timing is within three days of rash onset (PCR may be successful up to 10 days after rash onset).
- A nasopharyngeal swab is the preferred respiratory specimen type for PCR but a throat swab is acceptable if a nasopharyngeal swab cannot be collected.
- Urine specimen can increase the likelihood of virus detection.
- Viral specimens are also used for genotyping.
  - Can distinguish wild-type virus from vaccine-type virus in a recently vaccinated person
  - Can tell relatedness between cases

NEW YORK STATE | Department of Health

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

Serologic testing

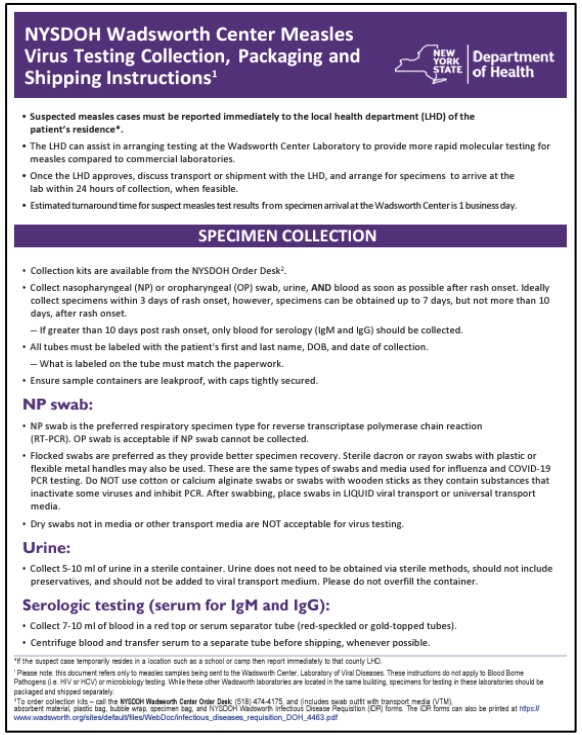
- **IgM**
  - Antibodies appear within 1-4 days of rash onset in unvaccinated persons; IgM response may be transient and not detected in a previously vaccinated person

- **IgG**
  - Antibodies should be detectable by 7-10 days after the rash onset; levels peak ~2 weeks post rash onset and persist for life

- In recently vaccinated persons—neither IgM nor IgG antibody responses can distinguish measles disease from the response to vaccination (viral specimen for genotyping is needed)

Laboratory testing – Wadsworth Center

- Expedited testing
- IgM more sensitive/specific than commercially available tests
- Consult with NYSDOH, who will alert Wadsworth staff of an expected shipment
- Refer to the Wadsworth Center Measles Virus Testing Collection, Packaging and Shipping Instructions.
- Consult with your local health department before shipping specimens. **DO NOT SEND TO A COMMERCIAL LAB!**
- Ship packages Monday – Thursday for delivery Tuesday – Friday.
    - Weekend specimen receipt on an as needed basis—it is especially important to make sure the samples are packaged and shipped appropriately
    - Call and discuss any shipments to Wadsworth but especially weekend ones



NYSDOH Wadsworth Center Measles Virus Testing Collection, Packaging and Shipping Instructions[1]

NEW YORK STATE | Department of Health

- **Suspected measles cases must be reported immediately to the local health department (LHD) of the patient's residence*.**
- The LHD can assist in arranging testing at the Wadsworth Center Laboratory to provide more rapid molecular testing for measles compared to commercial laboratories.
- Once the LHD approves, discuss transport or shipment with the LHD, and arrange for specimens to arrive at the lab within 24 hours of collection, when feasible.
- Estimated turnaround time for suspect measles test results from specimen arrival at the Wadsworth Center is 1 business day.

SPECIMEN COLLECTION

- Collection kits are available from the NYSDOH Order Desk[2].
- Collect nasopharyngeal (NP) or oropharyngeal (OP) swab, urine, **AND** blood as soon as possible after rash onset. Ideally collect specimens within 3 days of rash onset, however, specimens can be obtained up to 7 days, but not more than 10 days, after rash onset.
  – If greater than 10 days post rash onset, only blood for serology (IgM and IgG) should be collected.
- All tubes must be labeled with the patient's first and last name, DOB, and date of collection.
  – What is labeled on the tube must match the paperwork.
- Ensure sample containers are leakproof, with caps tightly secured.

NP swab:

- NP swab is the preferred respiratory specimen type for reverse transcriptase polymerase chain reaction (RT-PCR). OP swab is acceptable if NP swab cannot be collected.
- Flocked swabs are preferred as they provide better specimen recovery. Sterile dacron or rayon swabs with plastic or flexible metal handles may also be used. These are the same types of swabs and media used for influenza and COVID-19 PCR testing. Do NOT use cotton or calcium alginate swabs or swabs with wooden sticks as they contain substances that inactivate some viruses and inhibit PCR. After swabbing, place swabs in LIQUID viral transport or universal transport media.
- Dry swabs not in media or other transport media are NOT acceptable for virus testing.

Urine:

- Collect 5-10 ml of urine in a sterile container. Urine does not need to be obtained via sterile methods, should not include preservatives, and should not be added to viral transport medium. Please do not overfill the container.

Serologic testing (serum for IgM and IgG):

- Collect 7-10 ml of blood in a red top or serum separator tube (red-speckled or gold-topped tubes).
- Centrifuge blood and transfer serum to a separate tube before shipping, whenever possible.

*If the suspect case temporarily resides in a location such as a school or camp then report immediately to that county LHD.

[1] Please note: this document refers only to measles samples being sent to the Wadsworth Center, Laboratory of Viral Diseases. These instructions do not apply to Blood Borne Pathogens (i.e. HIV or HCV) or microbiology testing. While these other Wadsworth laboratories are located in the same building, specimens for testing in these laboratories should be packaged and shipped separately.

[2] To order collection kits – call the **NYSDOH Wadsworth Center Order Desk:** (518) 474-4175, and (includes swab outfit with transport media (VTM), absorbent material, plastic bag, bubble wrap, specimen bag, and NYSDOH Wadsworth Infectious Disease Requisition (DR) forms. The IDR forms can also be printed at https://www.wadsworth.org/sites/default/files/WebDoc/infectious_diseases_requisition_DOH_4463.pdf

NEW YORK STATE | Department of Health

Source: https://www.health.ny.gov/prevention/immunization/providers/measles/docs/testing_collection.pdf

Post-Exposure Prophylaxis

Post-Exposure Prophylaxis (PEP)

Post-exposure prophylaxis is for exposed individuals without evidence of immunity (priority includes pregnant women, infants <12 months and severely immunocompromised).

- May prevent or modify disease.
- MMR vaccine or immune globulin (IG) can be used.
  - **MMR and IG cannot be given at the same time!**
  - **MMR vaccine**
    - **Within 72 hours** of initial exposure
    - Persons age ≥ 6 months to 11 months can receive MMR but will need a total of three doses **(the one given as PEP at this age does not count towards their routine schedule)**
    - Vaccination should be offered at any interval following exposure to protect from future exposures

Post-Exposure Prophylaxis (cont.)

- **Immune Globulin**
  - Individuals who are at risk for severe disease and complications from measles should receive immune globulin
  - **Must be given within 6 days** of initial exposure
  - IGIV for pregnant women and severely immunosuppressed
  - IGIM can be given to other exposed persons without evidence of immunity
    - Priority for those with intense, prolonged contact, infants less than 6 months of age, if vaccine is contraindicated

Voluntary restrictions of movement and premises

- Key points of information to convey to individuals for whom voluntary restriction is recommended include:
  - Stay home
  - Restrict visitors and other residents of the home to those with immunity to measles
  - Monitor for signs and symptoms of measles & call a healthcare provider as soon as possible if symptoms occur
  - Alert the healthcare provider's office of the measles exposure **before** a visit (including emergency medical services if needed)

Infection Control

Infection control in health care facilities

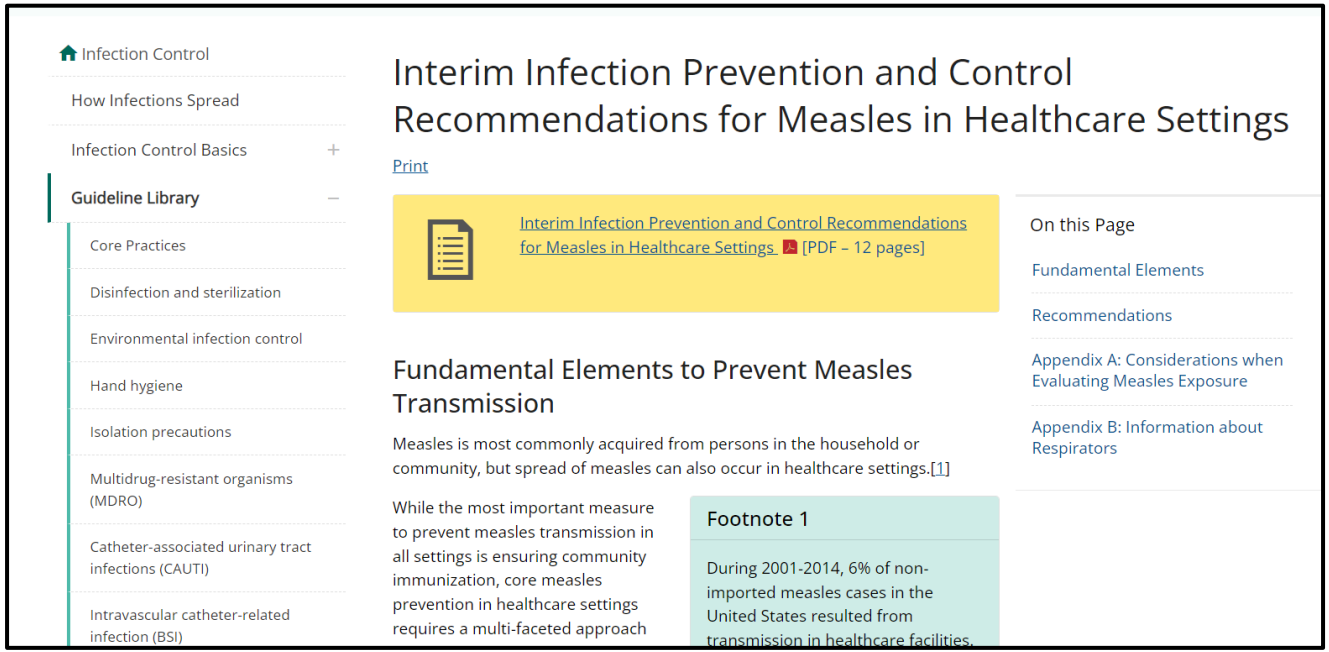
During 2001-2014, 6% of non-imported measles cases in the United States resulted from transmission in healthcare facilities.

Core measles prevention efforts include:

- Ensure healthcare workers have presumptive evidence of immunity to measles
- Rapidly identify and isolate patients with known or suspected measles
- Adhere to Standard and Airborne Precautions for patients with known or suspected measles
- Routinely promote and facilitate respiratory hygiene and cough etiquette
- Appropriately manage exposed and ill healthcare workers

Source: https://www.cdc.gov/infectioncontrol/guidelines/measles/index.html

CDC infection control resources



Source: https://www.cdc.gov/infectioncontrol/guidelines/measles/index.html

NEW YORK STATE Department of Health

CDC Guidance on Infection Control in Healthcare Workers

Infection Control in Healthcare Personnel:
Epidemiology and Control of Selected Infections Transmitted Among Healthcare Personnel and Patients

Measles

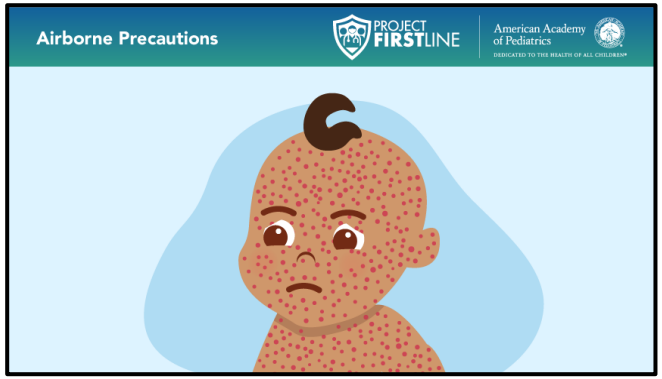
Recommendations

1. For asymptomatic healthcare personnel ***with*** presumptive evidence of immunity to measles (https://www.cdc.gov/mmwr/preview/mmwrhtml/rr6204a1.htm#Tab3)[1] who have an exposure to measles:
   - Postexposure prophylaxis is not necessary.
   - Work restrictions are not necessary.
   - Implement daily monitoring for signs and symptoms of measles from the 5th day after their first exposure through the 21st day after their last exposure.
2. For asymptomatic healthcare personnel ***without*** presumptive evidence of immunity to measles who have an exposure to measles:
   - Administer postexposure prophylaxis in accordance with CDC and ACIP recommendations (https://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/mmr.html).[2]
   - Exclude from work from the 5th day after their first exposure through the 21st day after their last exposure, regardless of receipt of postexposure prophylaxis.
   - Work restrictions are not necessary for healthcare personnel who received the first dose of MMR vaccine prior to exposure:
     - They should receive their second dose of MMR vaccine as soon as possible (at least 28 days after their first dose).
     - Implement daily monitoring for signs and symptoms of measles from the 5th day after their first exposure through the 21st day after their last exposure.
3. For healthcare personnel with known or suspected measles, exclude from work for 4 days after the rash appears.
4. For immunocompromised healthcare personnel with known or suspected measles, exclude from work for the duration of their illness.
5. During a measles outbreak, administer measles vaccine to healthcare personnel in accordance with CDC and ACIP recommendations (https://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/mmr.html).[2]

Source: https://www.cdc.gov/infectioncontrol/pdf/guidelines/IC-Guidelines-HCP-H.pdf

NEW YORK STATE Department of Health

Infection control in health care facilities



- A fit-tested NIOSH-approved N95 or higher-level respirator for healthcare team and patient
- Hand hygiene before and after each patient encounter
- Mask and place patient in an airborne infection isolation room (AIIR). If one is not available, place the patient in a private room with the door closed until they can be transferred to an AIIR, or they are transferred to a different facility
- Limit transport or movement of patients outside of the room unless medically necessary.
- Always alert receiving facility prior to patient transfer so that appropriate infection control can be implemented

https://www.aap.org/en/patient-care/infection-prevention-and-control/project-firstline/cleaning-and-disinfecting-resources/
https://www.aap.org/en/patient-care/infection-prevention-and-control/project-firstline/infection-prevention-and-control-precaution-tools/
https://www.aap.org/Infection-Prevention-and-Control-for-Pediatric-Clinics

NEW YORK STATE Department of Health

The Provider's Role in Outbreak Control

Measles response

- One case of measles triggers a public health response
- Case investigation includes
  - Finding everywhere the case has been while contagious
  - Identifying the source patient, if possible
  - Identifying health care exposures
  - Notifying people who were exposed
  - Tracking people who were exposed
  - Ensuring post-exposure prophylaxis is available and given
  - Monitoring for secondary cases
- Burden is shared between health care, local health department and the state health department

Suspect case identification and reporting

- **Early recognition, case investigation, and prompt public health response can limit the spread of disease**

- **Clinical Suspicion:**
  - Know the presentations
  - This includes classical and atypical presentations

- **Patient History:**
  - Vaccination record
  - Travel history (during incubation period)
  - Contact with international traveler
  - Contact with person with similar symptoms

Reporting requirements

Reporting of suspected and confirmed communicable diseases by providers is mandated under the NYS Sanitary Code

- Who must report?
  - Physicians
  - Nurses
  - Laboratory Directors
  - Infection Control practitioners
  - Healthcare facilities
  - State institutions
  - Schools

Call the Local Health Department upon suspicion immediately – <u>do not wait to call!</u>

NEW YORK STATE | Department of Health

County Health Department contact information: https://www.health.ny.gov/contact/contact_information/

Summary of the provider's role

- **Remain vigilant for measles**
- **Know the signs and symptoms**
- **Identify suspect cases and report to the local health department (LHD) where the case resides**
- Work with the LHD to conduct testing to confirm case
- Implement infection control practices to prevent further transmission
- Ensure staff are immune
- Provide post-exposure prophylaxis for case contacts
- Provide primary community prevention through MMR vaccination
- Assist in patient and community education

NEW YORK STATE | Department of Health

Thank you!

NEW YORK STATE | Department of Health

Resources

- NYSDOH
  - NYSDOH Measles

- CDC
  - Manual for the Surveillance of Vaccine-Preventable Diseases – Chapter 7: Measles
  - Epidemiology and Prevention of Vaccine-Preventable Diseases (The Pink Book) – Chapter 13: Measles
  - CDC Measles webpage
  - Interim Infection Prevention and Control Recommendations for Measles in Healthcare Settings, 2019

Questions?

Please don't hesitate to contact us at:

Immunize@health.ny.gov