Measles in the community

Nava Yeganeh, MD MPH
Vaccine Preventable Disease Program

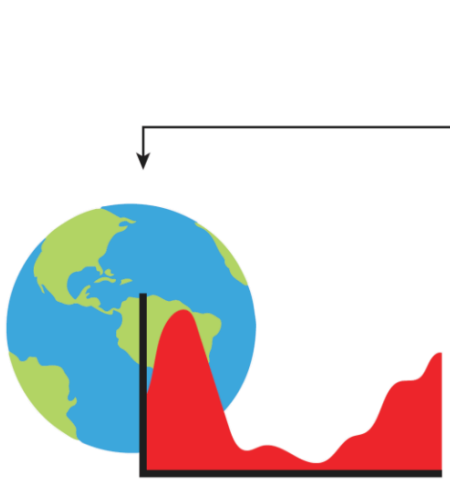
Outline

- What predicts transmission of measles
  - Epidemiology of measles
  - Vaccines and vaccination coverage
- Clinical diagnosis
- Actions taken to decrease transmission in the community
  - Post-exposure prophylaxis (PEP)
  - Notification
  - Risk assessment, exclusion, quarantine and monitoring

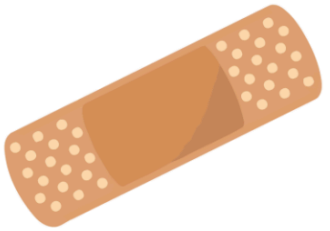
Measles overview

- Highly contagious viral illness
  - Spreads easily through the air through talking, breathing, coughing and sneezing
  - Can stay in the air and live on surfaces for 2 hours after case has left
  - 9 out of 10 people will become sick with measles if they are not protected
- Near universal infection in childhood in pre-vaccination era (before 1957)
- Need more than 95% immunization uptake to provide herd immunity

Measles outbreak risk in the U.S. depends on two main factors:



Global measles activity



MMR vaccination coverage in the U.S.

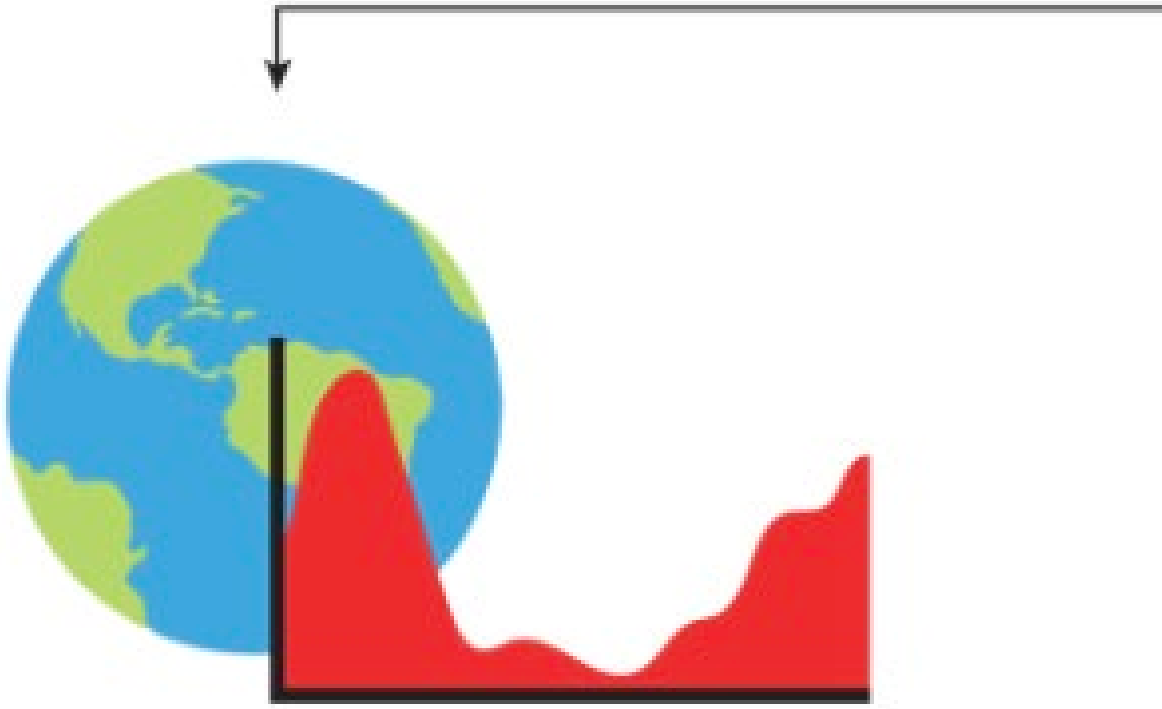
https://www.cdc.gov/ncird/whats-new/measles-outbreak-risk-in-us.html#

Measles activity:

Globally

United States

LAC



Global measles activity


International Travel Risk

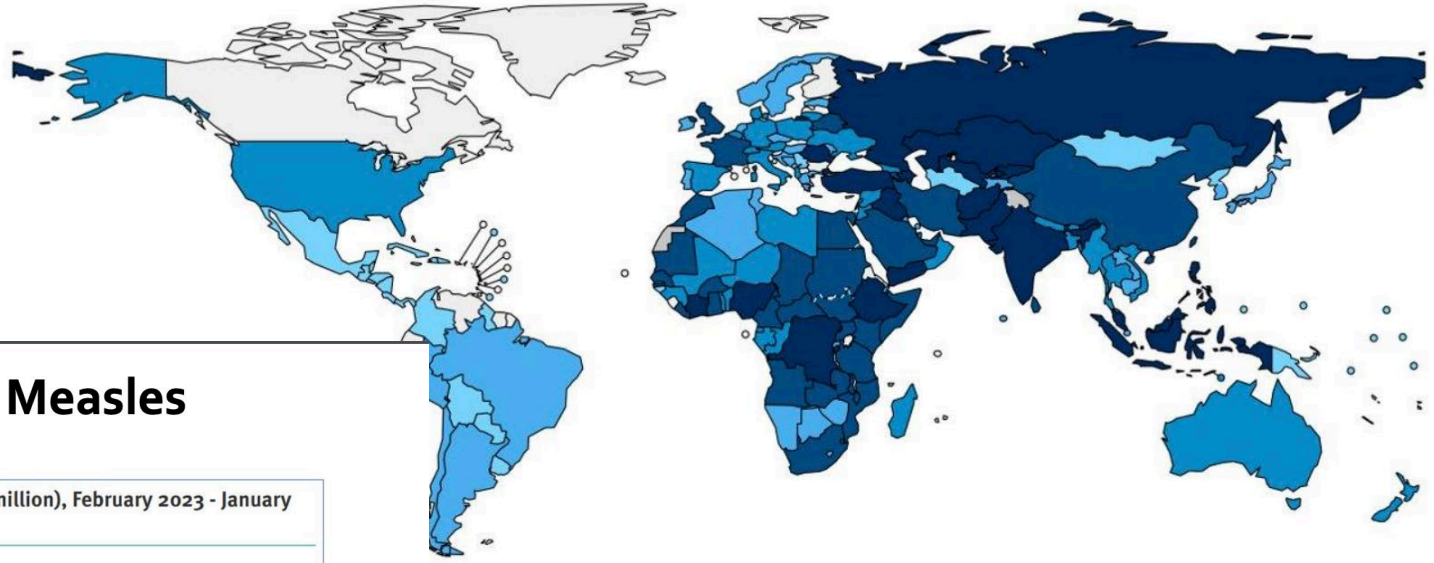
Top 10 Countries with Measles Outbreaks*

Rank	Country	Number of Cases
1	Kazakhstan	27,280
2	Azerbaijan	26,744
3	Iraq	20,469
4	India**	13,523

s.

Number of Reported Measles Cases (last 6 months)

Data as of March 2024 (WHO)



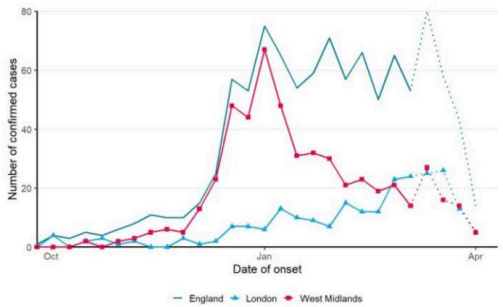
13

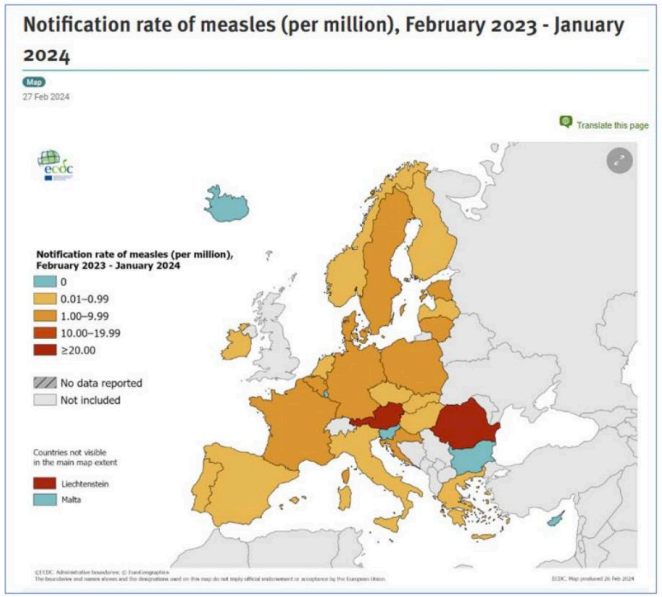
England and Western Europe Reporting Measles Outbreaks

Press release

London at risk of measles outbreaks with modelling estimating tens of thousands of cases

UKHSA modelling suggests that, unless MMR vaccination rates improve, London could see a measles outbreak with tens of thousands of cases.

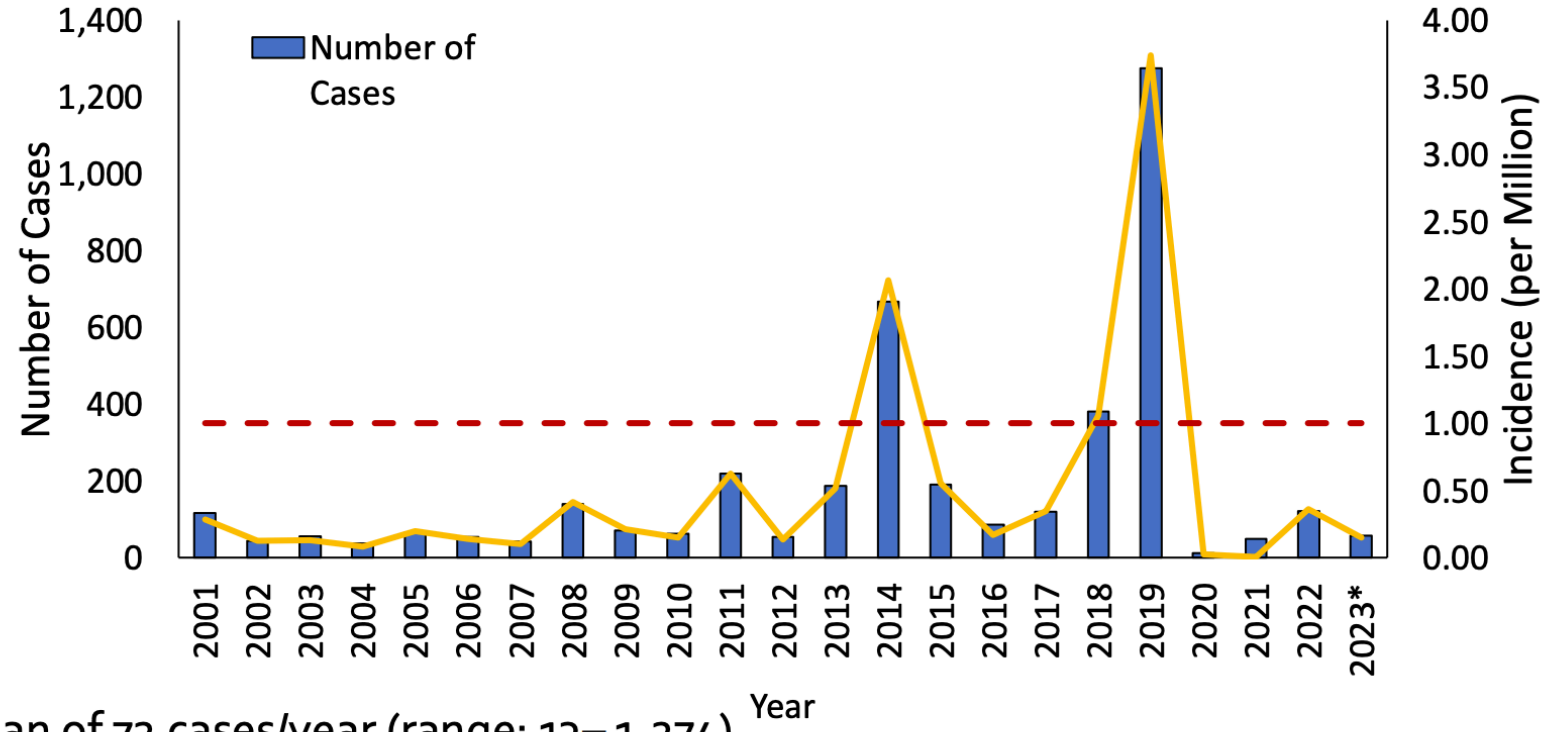




14

Measles activity in the United States

Reported Measles Cases, United States, 2001-2023 (N=4,114)



Median of 72 cases/year (range: 13– 1,274)

*2023 data are preliminary.

1.CDC/IDSA Clinician Call , April 17, 2024

Measles cases in 2024

As of April 26, 2024, a total of 128 measles cases were reported by 20 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, and West Virginia.

There have been 7 outbreaks (defined as 3 or more related cases) reported in 2024, and 67% of cases (86 of 128) are outbreak-associated. For comparison, 4 outbreaks were reported during 2023 and 48% of cases (28 of 58) were outbreak-associated. For more information on the see the [Chicago Department of Public Health Measles]

U.S. Cases in 2024

Total cases
128

Age
Under 5 years: **57 (45%)**
5-19 years: **30 (23%)**
20+ years: **41 (32%)**

Vaccination Status
Unvaccinated or Unknown: **81%**
One MMR dose: **13%**
Two MMR doses: **5%**

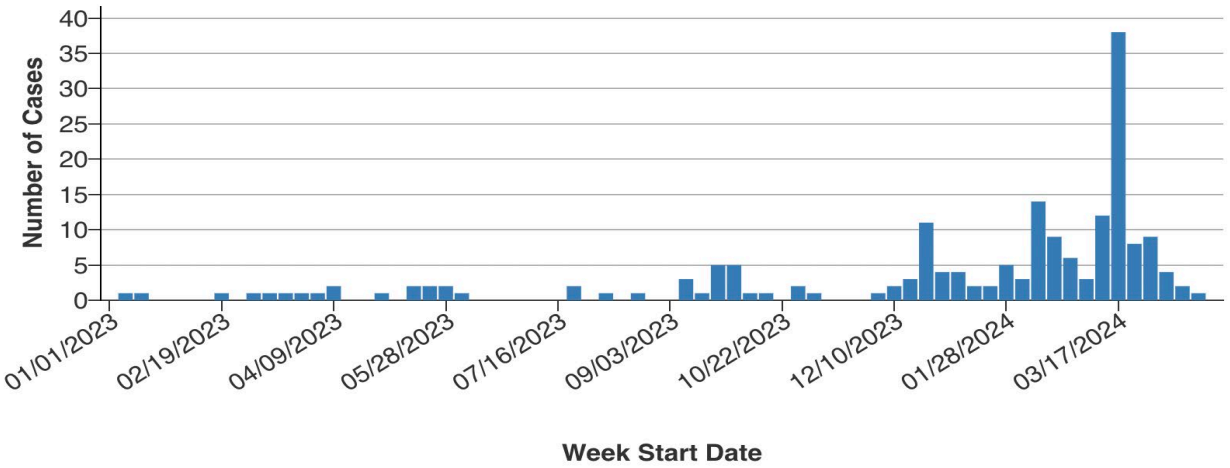
U.S. Hospitalizations in 2024

55%
of cases hospitalized (70 of 128 cases) for isolation or for management of measles complications.

Percent of Age Group Hospitalized
Under 5 years: **65%** (37 of 57)
5-19 years: **37%** (11 of 30)
20+ years: **54%** (22 of 41)

Weekly Measles Cases by Rash Onset Date

2023-2024* (as of April 25, 2024)



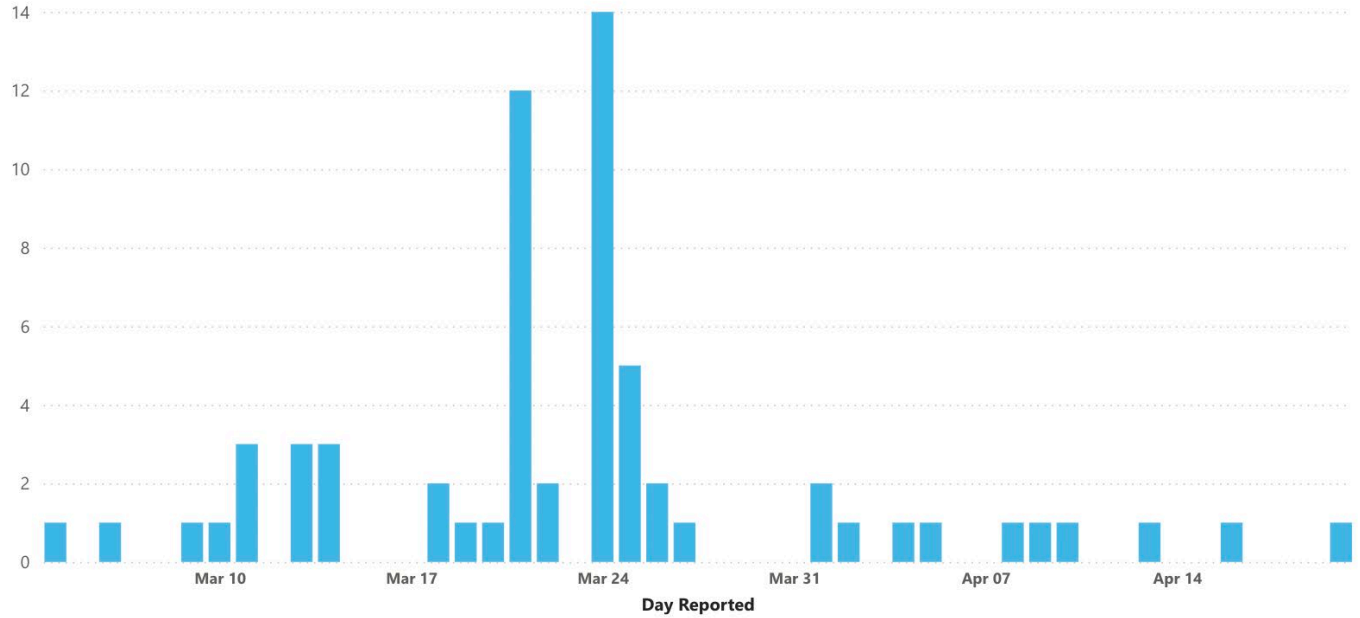
https://www.cdc.gov/measles/cases-outbreaks.html

Cases in Chicago

Chicago Measles Outbreak 2024

Cases This Year	Cases This Week: 04/28 - 05/04
64	0

Cases by Date Reported

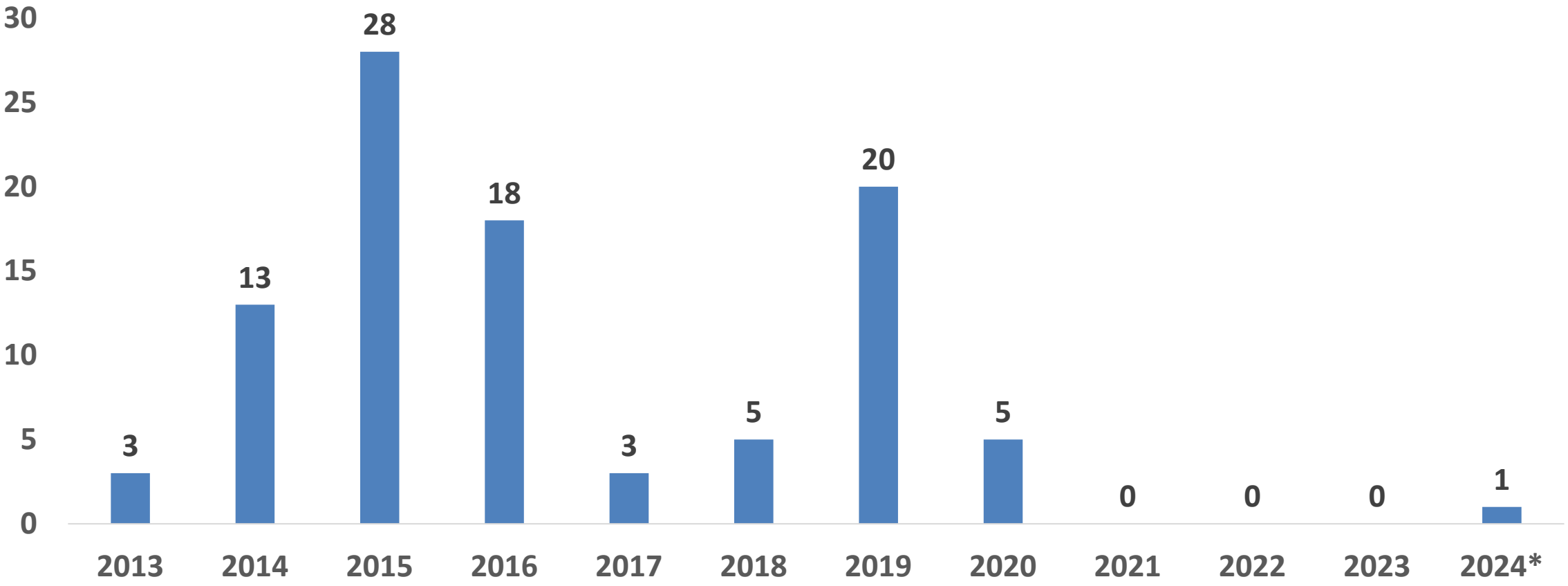


Cases by Age Group

Age Group	Count	%
0 - 4 years	33	52%
5 - 17 years	9	14%
18 - 49 years	18	28%
50+ years	4	6%

https://www.chicago.gov/city/en/depts/cdph/supp_info/infectious/get-the-facts--measles.html#dashboard

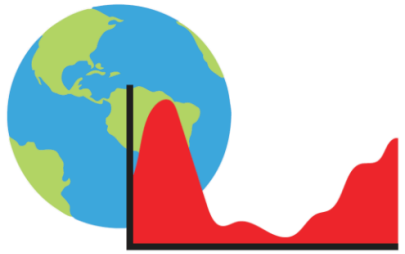
Confirmed Measles Cases, Los Angeles County, 2013-2024*



*Through April 11, 2024

Vaccine coverage

Measles outbreak risk in the U.S. depends on two main factors:



Global measles activity

https://www.cdc.gov/ncird/whats-new/measles-outbreak-risk-in-us.html#

Vaccine

- First licensed in 1963 in the United States as measles vaccine
- Licensed in 1971 as MMR
- Live attenuated vaccine
- Highly effective
- 1 dose: 93% protection
  - First dose recommended 12-15 months
- 2 doses: 97% protection
  - Recommended 4-6 years of age

Important notes

- A dose 6-11 months of age can be given for travel or outbreak response
  - Does not count towards 2 doses but can offer protection
- Additionally, can get an “accelerated” series, with second dose 4 weeks after first dose
  - Teenagers and adults without evidence of immunity

Infants under 12 months old who are traveling	Children over 12 months old	Teens and adults with no evidence of immunity*
• Get **an early dose at 6 through 11 months** • Follow the recommended schedule and get another dose at 12 through 15 months and a final dose at 4 through 6 years	• Get **first dose immediately** • Get second **dose 28 days after first dose**	• Get **first dose immediately** • Get second **dose 28 days after first dose**

MMR Coverage among U.S. Kindergartners

	2019-20	2020-21	2021-22	2022-23
MMR (2 doses)	95.2	93.9	93.0	93.1

National MMR coverage of 93.1% translates to **250,000** kindergartners at risk of measles infection each year

Coverage with Selected Vaccines and Exemption from School Vaccine Requirements Among Children in Kindergarten — United States, 2022–23 School Year | MMWR (cdc.gov)

Required Vaccines for Kindergarten and Childcare, 2022-23 School Year—Los Angeles County

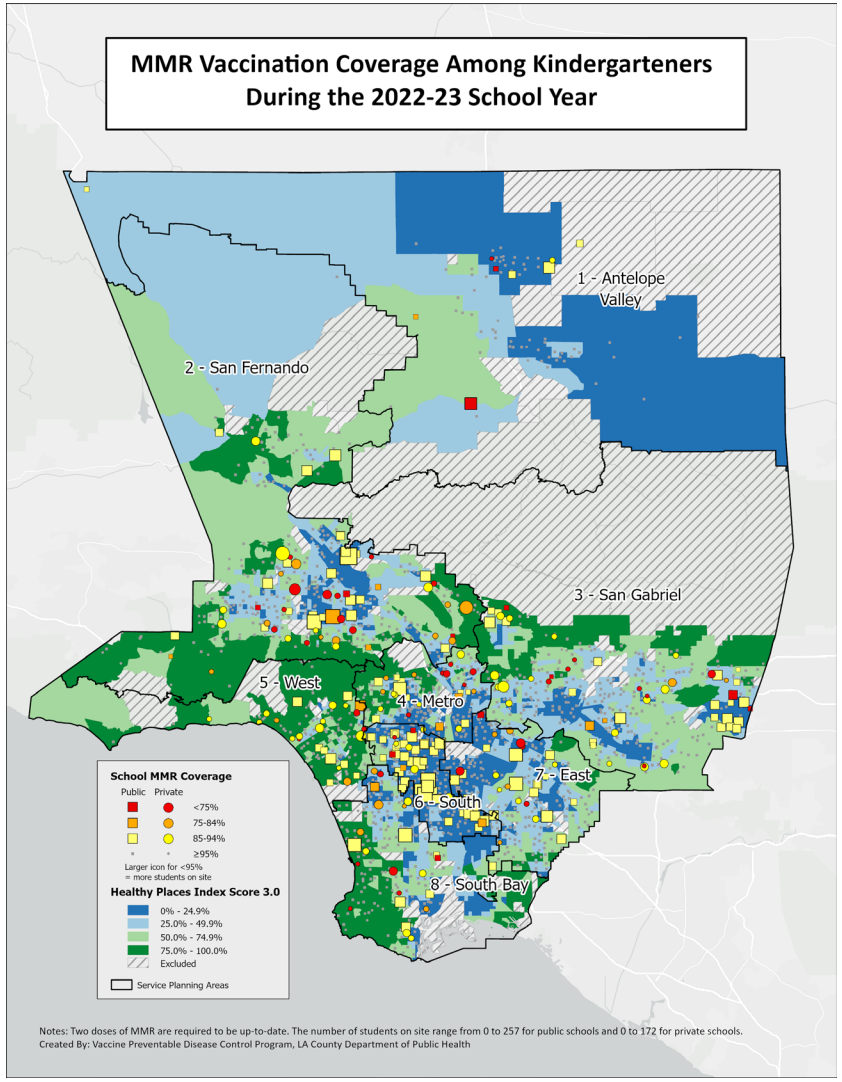
Up-to-date vaccination coverage among students in **kindergarten**

SPA	# Enrolled	# On-Site Students	All Vaccines	DTaP	Polio	MMR	Hep B	Varicella
1	7,022	6,695	96%	98%	95%	**95%**	96%	94%
2	27,925	27,909	94%	97%	97%	**97%**	98%	97%
3	19,769	19,712	96%	97%	98%	**98%**	99%	97%
4	11,042	11,001	95%	97%	97%	**98%**	98%	97%
5	6,354	6,353	94%	97%	98%	**97%**	98%	97%
6	14,189	14,188	93%	95%	96%	**97%**	98%	96%
7	17,309	17,305	96%	97%	98%	**98%**	99%	98%
8	13,780	13,758	95%	97%	98%	**98%**	99%	97%
Total	117,390	116,921	95%	97%	97%	**97%**	98%	97%

Up-to-date vaccination coverage among children in **childcare**

SPA	# Children	All Vaccines	DTaP	Polio	MMR	Hib	Hep B	Varicella
1	3,505	92%	94%	96%	**97%**	99%	98%	96%
2	24,455	96%	97%	98%	**99%**	99%	98%	98%
3	17,216	97%	98%	99%	**99%**	99%	99%	99%
4	9,275	92%	94%	95%	**96%**	98%	97%	96%
5	8,894	93%	96%	96%	**97%**	98%	97%	97%
6	7,171	93%	96%	98%	**99%**	98%	98%	98%
7	10,771	96%	97%	98%	**99%**	99%	99%	99%
8	13,267	96%	97%	98%	**98%**	99%	98%	98%
Total	94,554	95%	97%	98%	**98%**	99%	98%	98%

Many children are still vulnerable to infection



- 95%+ coverage is our target to prevent outbreaks
- Of schools/childcares that reported last year
  - Kindergartens with low coverage are clustered in San Fernando Valley, South, and East San Gabriel Valley

Does my patient have measles?

Classical Measles Presentation

Fever & 3 C's

- Cough
- Conjunctivitis
- Coryza
- Fever starts low grade and progresses to high

2-3 days after initial sx onset

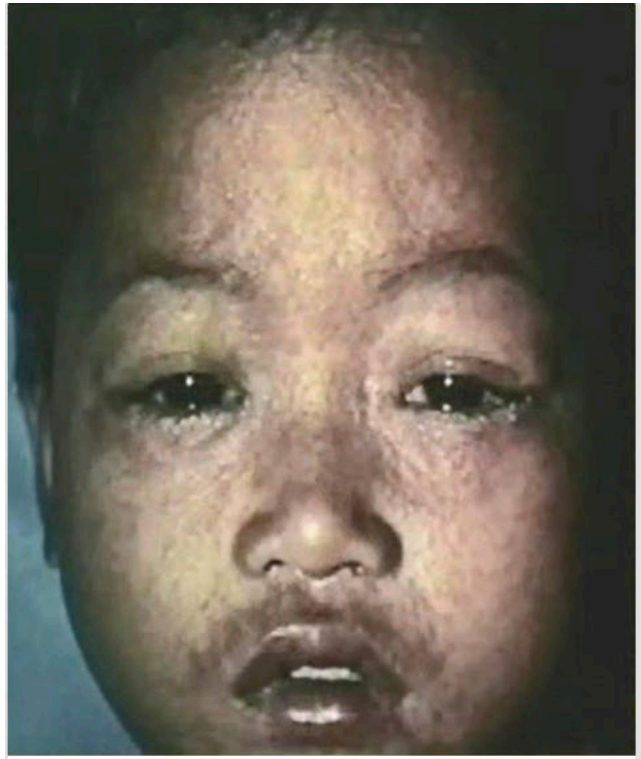
Koplik Spots

- Tiny white spots in mouth

3-5 days after initial sx onset

Rash

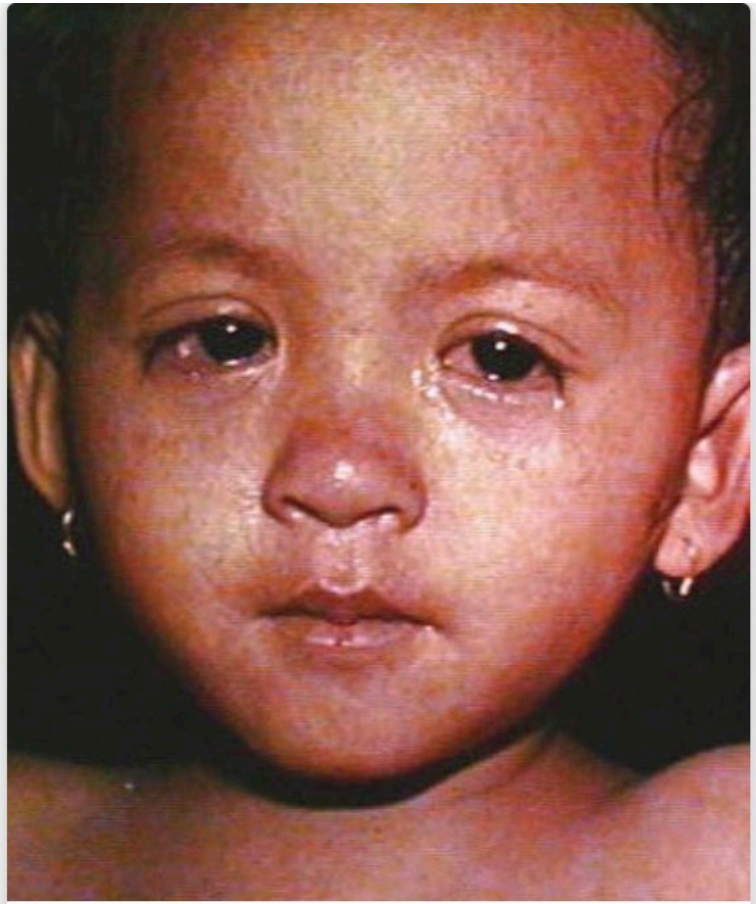
- Starts on face/hairline
- Spreads downward to neck, trunk extremities
- Not itchy
- Small raised bumps may also appear on top of the flat red spots.
- Maculopapular - The spots may become joined together as they spread from the head to the rest of the body (maculopapular)



Young, dark-skinned child with watery eyes, runny nose, and raised rash.

Source: "Measles Clinical Features" video

Child with a classic measles rash after four days.



Eyes of a child with measles

Source: CDC/PHIL

https://www.cdc.gov/measles/symptoms/photos.html

Complications:

- Common:
  - Diarrhea (8%)
  - Otitis Media (7-9%)
  - Pneumonia (1-6%)
  - Immune amensia--reset the immune systems
- Rare but serious
  - Hospitalizations (14-25%)
  - Encephalitis 1/1000
  - Death: 1-3/1000
  - Subacute sclerosing panencephalitis (SSPE): 7-11/100,000

Immunocompromised individuals

- MMR may be contraindicated
- With increasing levels of immunosuppression
  - More atypical signs and symptoms
    - Atypical rash that's transient OR severe and desquamating
  - High risk for complications
    - 20% without rash, diagnosed after complications (pneumonia, liver failure, encephalitis) or at autopsy
- Key to diagnosis in this population is an awareness of community and epidemiologic risk.

Diagnosis

Diagnosis: PCR of NP/throat and Urine specimens

- RT-PCR can be performed on NP, throat swabs and urine
  - Most sensitive from onset of rash—>10 days after rash
- Offered by public health labs, but also Quest/Labcorp as well as other commercial labs
- Preferred public health lab
  - PCR can assist in genotyping and MeVA
  - Outbreak tracking
  - Can determine if virus is community vs vaccine derived

Diagnosis-Serology

- It important to have high clinical suspicion for measles when ordering tests to make the diagnosis
- IgG: Can be used to measure immunity
  - Avidity: Can help with breakthrough measles cases among vaccinated individuals
- IgM detection starts 1-3 days after rash, detected for 6-8 weeks
  - Can be used in conjunction with PCR to confirm diagnosis
  - Can have cross reactivity with other viruses-–meaning positive predictive value declines when disease likelihood is low
    - Fully vaccinated individuals
    - No epidemiologic link

UPDATED WEBSITE: ph.lacounty.gov/measles

- The WHO recommends vitamin A for all children with acute measles, regardless of complications.

Additional Resources

LAC DPH

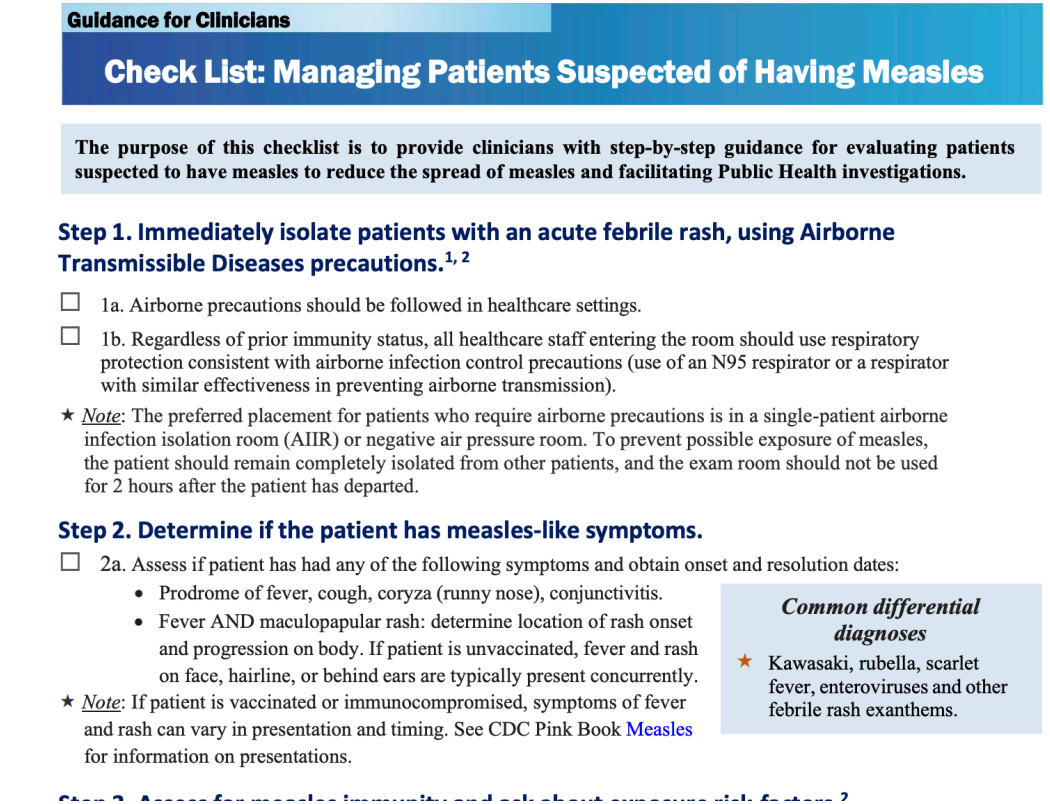
- Measles B73
- Check List: Managing Patients Suspected of Having Measles

CDC

- Measles for Healthcare Providers
- Infection Prevention and Control for Measles in Healthcare Settings
- Plan for Travel patient measles resource
- Measles Trainings:
  - You Call the Shots
  - The Pink Book Webinar Series

CDPH

- Measles investigation Quick Sheet
- Immunization and Immunity Testing Recommendations for Healthcare Personnel



Guidance for Clinicians

Check List: Managing Patients Suspected of Having Measles

The purpose of this checklist is to provide clinicians with step-by-step guidance for evaluating patients suspected to have measles to reduce the spread of measles and facilitating Public Health investigations.

Step 1. Immediately isolate patients with an acute febrile rash, using Airborne Transmissible Diseases precautions.[1, 2]

☐ 1a. Airborne precautions should be followed in healthcare settings.

☐ 1b. Regardless of prior immunity status, all healthcare staff entering the room should use respiratory protection consistent with airborne infection control precautions (use of an N95 respirator or a respirator with similar effectiveness in preventing airborne transmission).

★ *Note*: The preferred placement for patients who require airborne precautions is in a single-patient airborne infection isolation room (AIIR) or negative air pressure room. To prevent possible exposure of measles, the patient should remain completely isolated from other patients, and the exam room should not be used for 2 hours after the patient has departed.

Step 2. Determine if the patient has measles-like symptoms.

☐ 2a. Assess if patient has had any of the following symptoms and obtain onset and resolution dates:

- Prodrome of fever, cough, coryza (runny nose), conjunctivitis.
- Fever AND maculopapular rash: determine location of rash onset and progression on body. If patient is unvaccinated, fever and rash on face, hairline, or behind ears are typically present concurrently.

★ *Note*: If patient is vaccinated or immunocompromised, symptoms of fever and rash can vary in presentation and timing. See CDC Pink Book Measles for information on presentations.

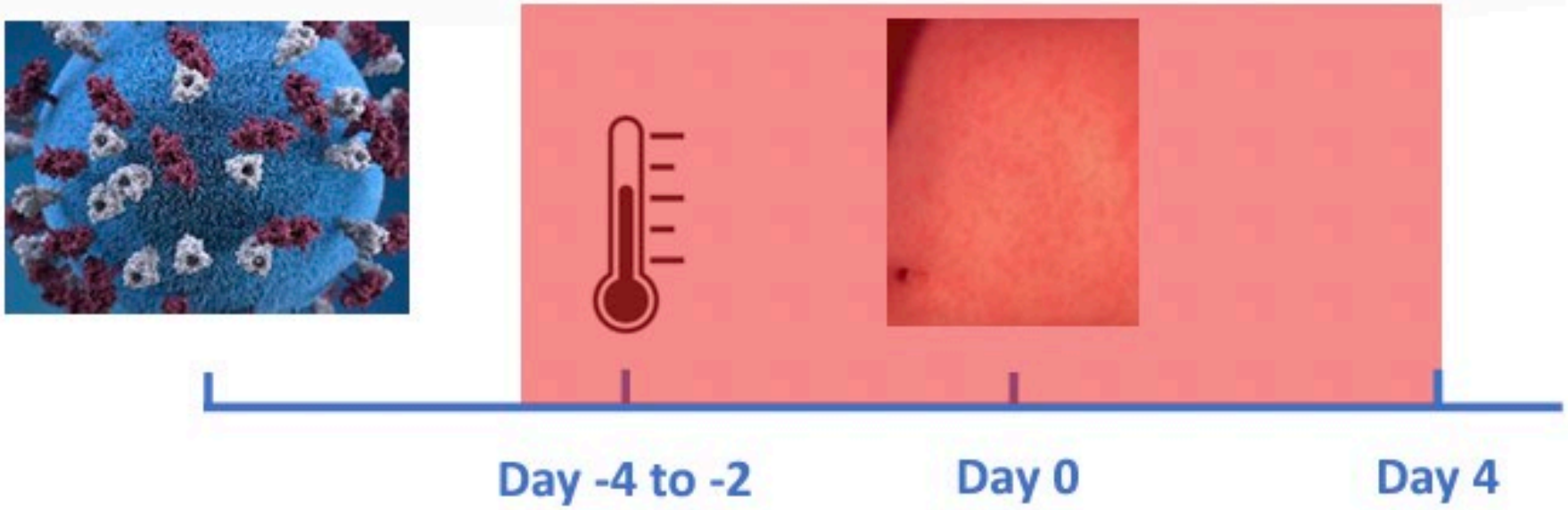
Common differential diagnoses

★ Kawasaki, rubella, scarlet fever, enteroviruses and other febrile rash exanthems.

Secondary Prevention

Contact investigation

Measles – Typical Timeline



Incubation Period: -21 to -7 days

Infectious Period:
4 days before rash to 4 days after rash

CDC COCA Call 2023

Case management

Isolation:

- Case-patients should be isolated for **four** days after rash onset
  - People with immunocompromising conditions with measles may require more prolonged isolation

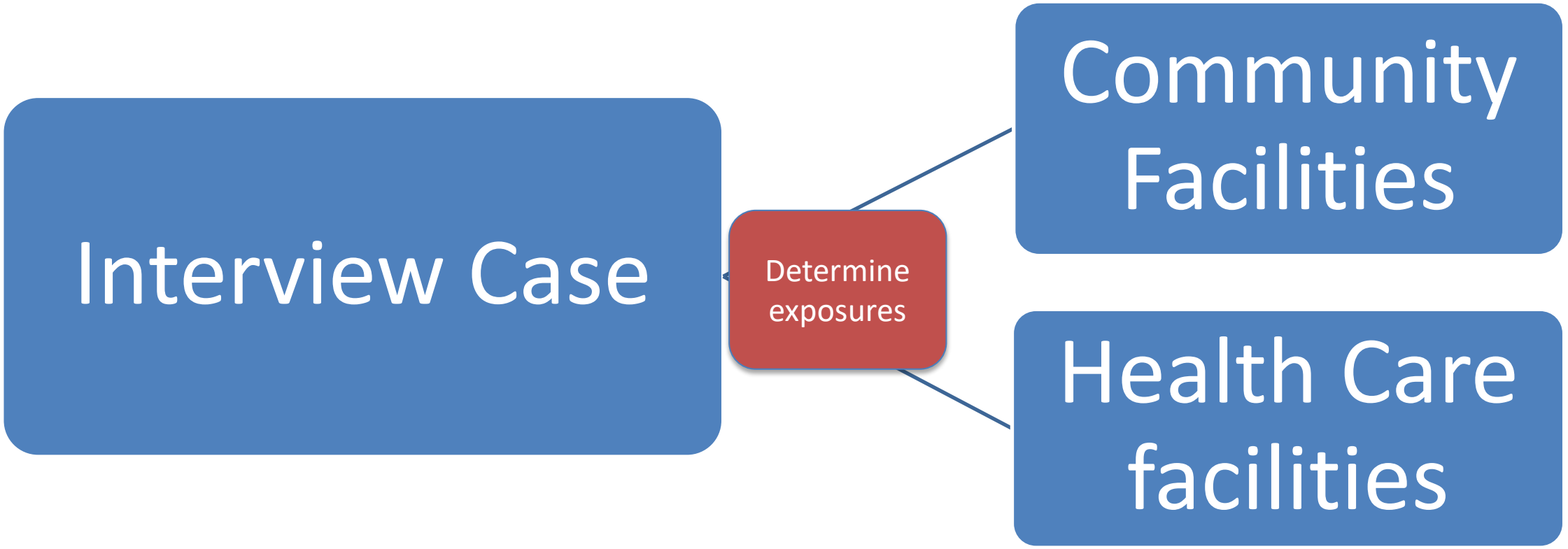
Contact tracing:

- Detailed history of activities during infectious period
  - All individuals in the same airspace 4 days before and 4 days after rash onset

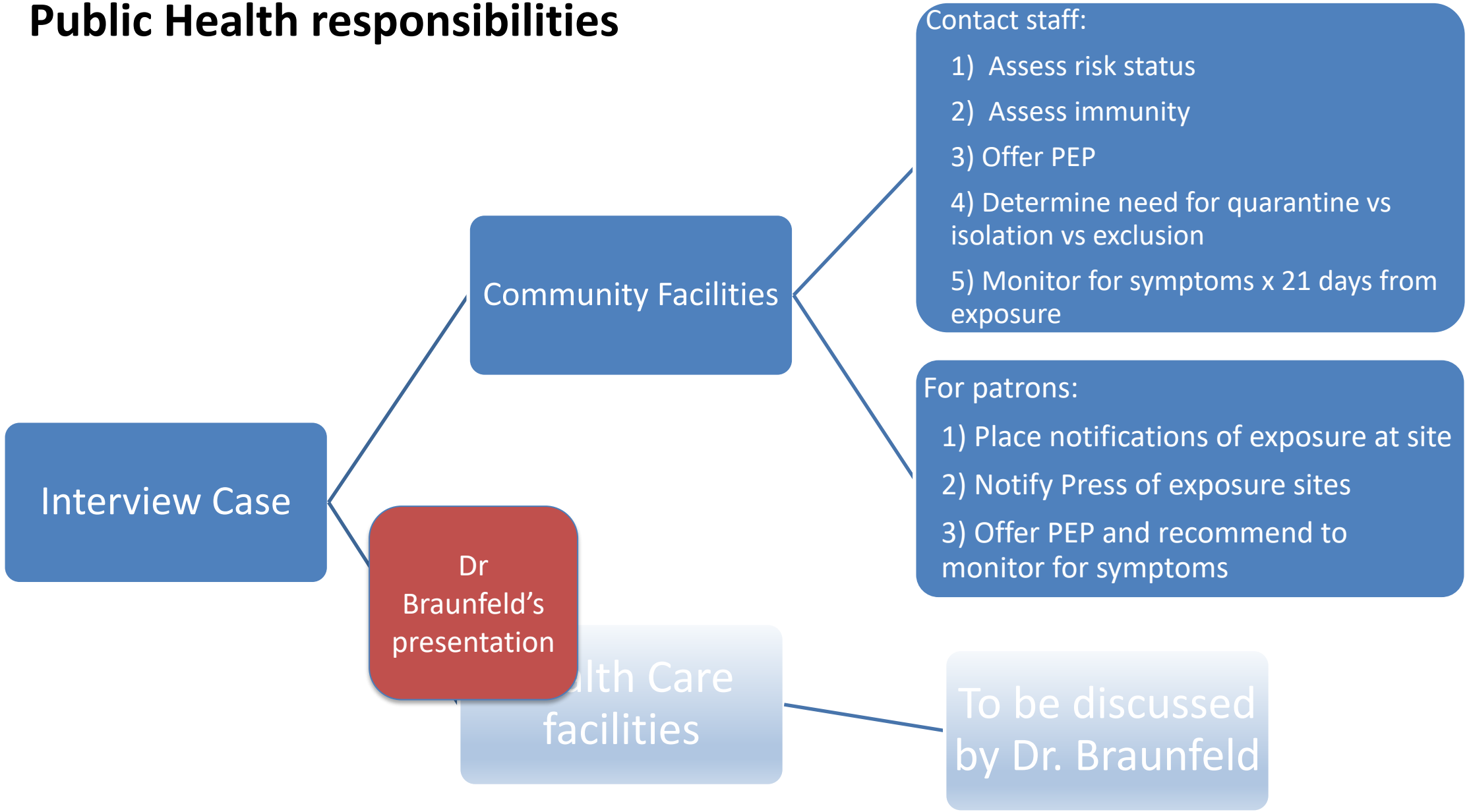
Contacts

- Sharing the same airspace with a person infectious with measles e.g., same classroom, home, clinic waiting room, airplane etc., or being in these areas up to 1 hour after the infectious person has left the area
  - Although CDC recommends using a 2-hour window, there is little evidence for measles transmission >60 minutes after an infectious person has left the setting.
- Exposure criteria apply even if the infectious person was masked.

Public Health responsibilities



Public Health responsibilities



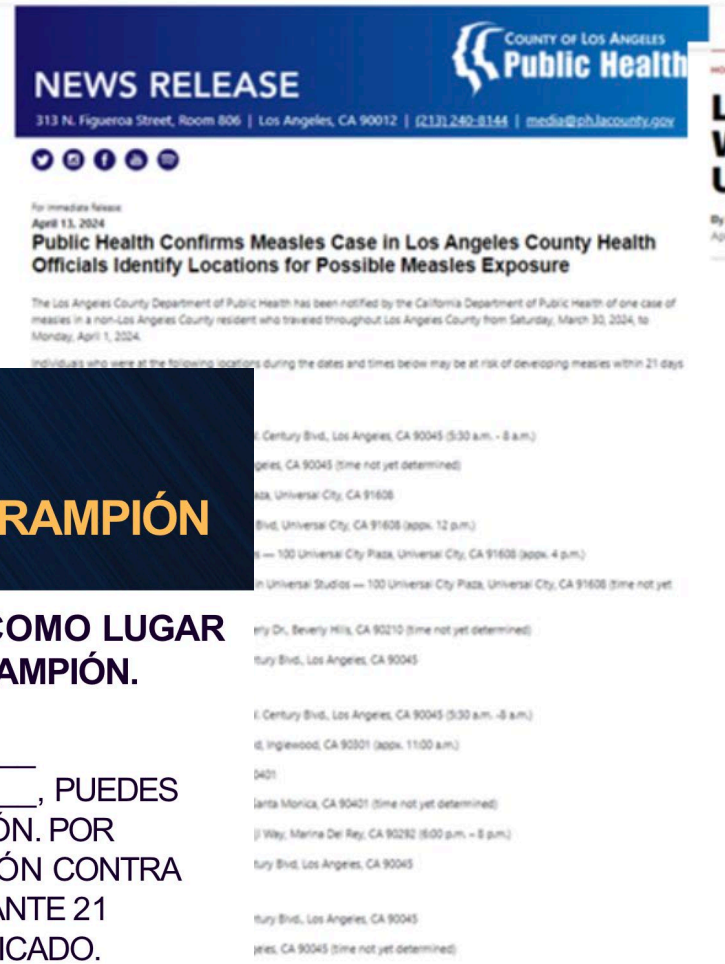
Notification of Public

ATENCIÓN:
AVISO DE EXPOSICIÓN AL SARAMPIÓN

ESTE LUGAR HA SIDO IDENTIFICADO COMO LUGAR DE EXPOSICIÓN AL SARAMPIÓN.

SI ESTUVISTE EN ESTE LUGAR_____
ENTRE LAS HORAS DE_____, PUEDES CORRER EL RIESGO DE CONTRAER SARAMPIÓN. POR FAVOR, CONFIRMA TU ESTADO DE VACUNACIÓN CONTRA EL SARAMPIÓN Y VIGILA LOS SÍNTOMAS DURANTE 21 DÍAS DESPUÉS DEL DÍA ANTERIORMENTE INDICADO.
LLAMA INMEDIATAMENTE A UN PROFESIONAL SANITARIO SI EXPERIMENTAS:

- FIEBRE ALTA


NEWS RELEASE

313 N. Figueroa Street, Room 806 | Los Angeles, CA 90012 | (213) 240-8144 | media@ph.lacounty.gov

April 13, 2024

Public Health Confirms Measles Case in Los Angeles County Health Officials Identify Locations for Possible Measles Exposure

The Los Angeles County Department of Public Health has been notified by the California Department of Public Health of one case of measles in a non-Los Angeles County resident who traveled throughout Los Angeles County from Saturday, March 30, 2024, to Monday, April 1, 2024.


HOME / BUSINESS / NEWS

L.A. County Public Health Warns About Traveler With Measles Visiting Local Attractions, Including Universal Studios And Santa Monica Pier

L.A. public health officials issue measles exposure warning for Universal Studios, other locations

UNIVERSAL STUDIOS

Subscribers are Reading

1) Assess Risk Status: Low-Risk

- Low-risk setting:
  - A low-risk setting is one in which transmission risk is low and multiple high-risk contacts are not present (NOT HCW, work with infants, work with immunocompromised individuals)
- Low-risk contact:
  - Not high risk of experiencing severe measles illness, or to/from whom the transmission potential is not high.
    - Examples: immunocompetent, >12 months of age
    - NOT pregnant, NOT a healthcare worker, and NOT a household contact (or other person with prolonged exposure)

2) Assess immunity:

For Low-Risk Contacts: Presumptive Immunity

- were born in the U.S. prior to 1957
- were born outside the U.S. prior to 1970 AND moved to the U.S. in 1970 or later
- were born in any country in 1970 or later AND attended a U.S. primary or secondary school
- have written documentation with date of receipt of at least one dose of measles-containing vaccine given on or after their first birthday in 1968 or later
- have a documented IgG positive test for measles
- have laboratory confirmation of previous measles disease
- served in the U.S. armed forces
- entered the U.S. as a permanent U.S. resident or became one in 1996 or later (i.e., have a “green card”)

Exposure management:

3) Post Exposure prophylaxis (PEP)

PEP within the target window may provide measles protection or modify the clinical course of disease among susceptible people

MMR

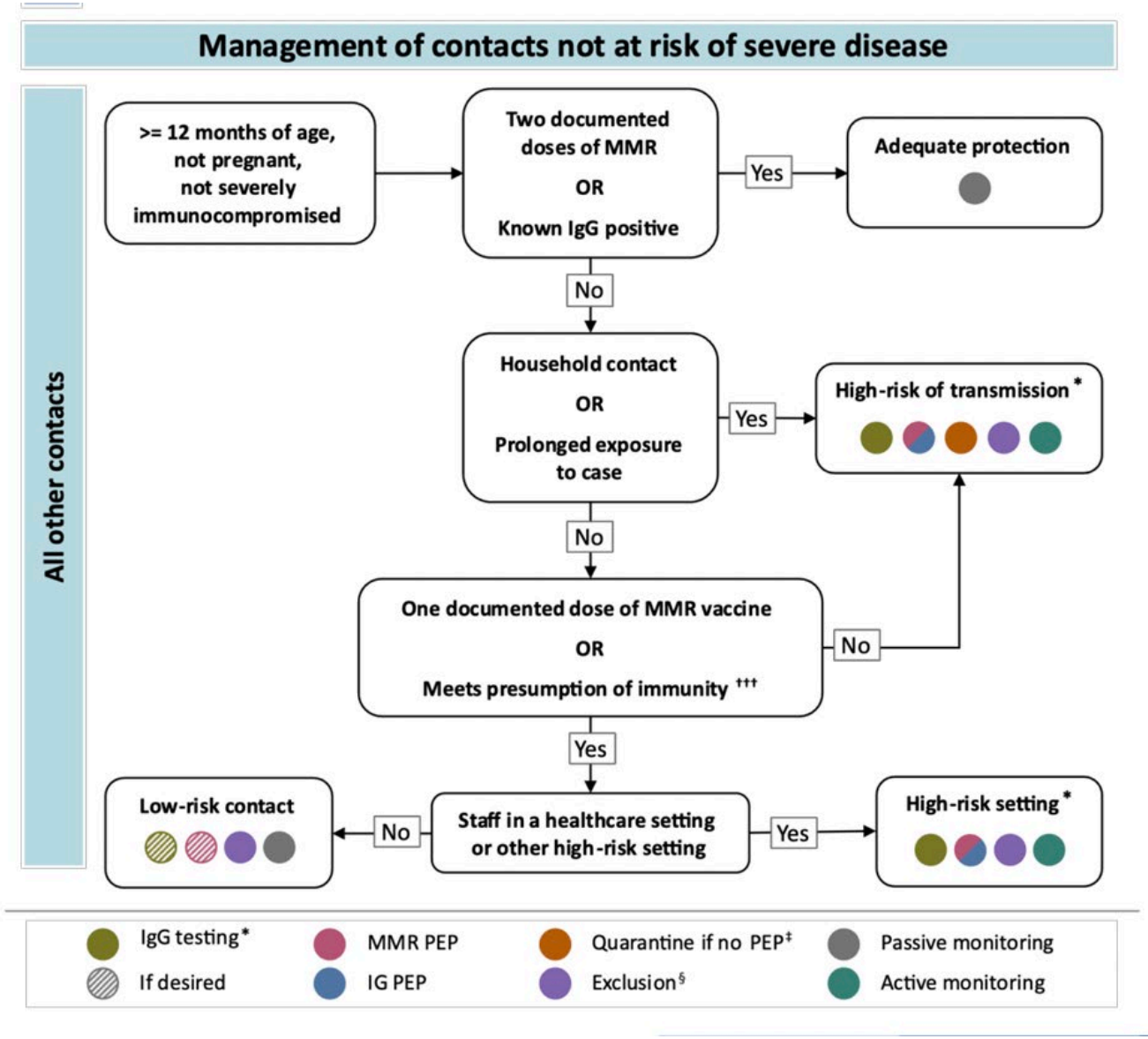
- Should be given within 72 hours (3 days) of initial measles exposure
- Vaccination can be given after this window, but would only be expected to protect from future exposures and is not considered “adequate PEP”

Immunoglobulin

- Needs to be given within 6 days of initial exposure
- Can be given intramuscularly (IMIG) or intravenously (IVIG)
  - IVIG should be prioritized for adults at high risk of severe disease

4) Monitor for Symptoms
If there is no evidence of immunity AND appropriate PEP: Exclusion vs Quarantine

- Quarantine: Home isolation for non-immune contacts who have not received PEP
  - If quarantine is implemented, it should begin on day 7 after the date of first exposure through day 21 after the date of last exposure.
- Exclusion: high-risk settings (healthcare settings, infant daycare etc)
  - If exclusion of those other than healthcare workers is implemented, it should begin on day 7 after the date of first exposure through day 21 after the date of last exposure (day of exposure is day 0)
  - For healthcare workers, CDC recommends starting exclusion on day 5.



CDPH Quicksheet (https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/Immunization/Measles-Quicksheet.pdf)

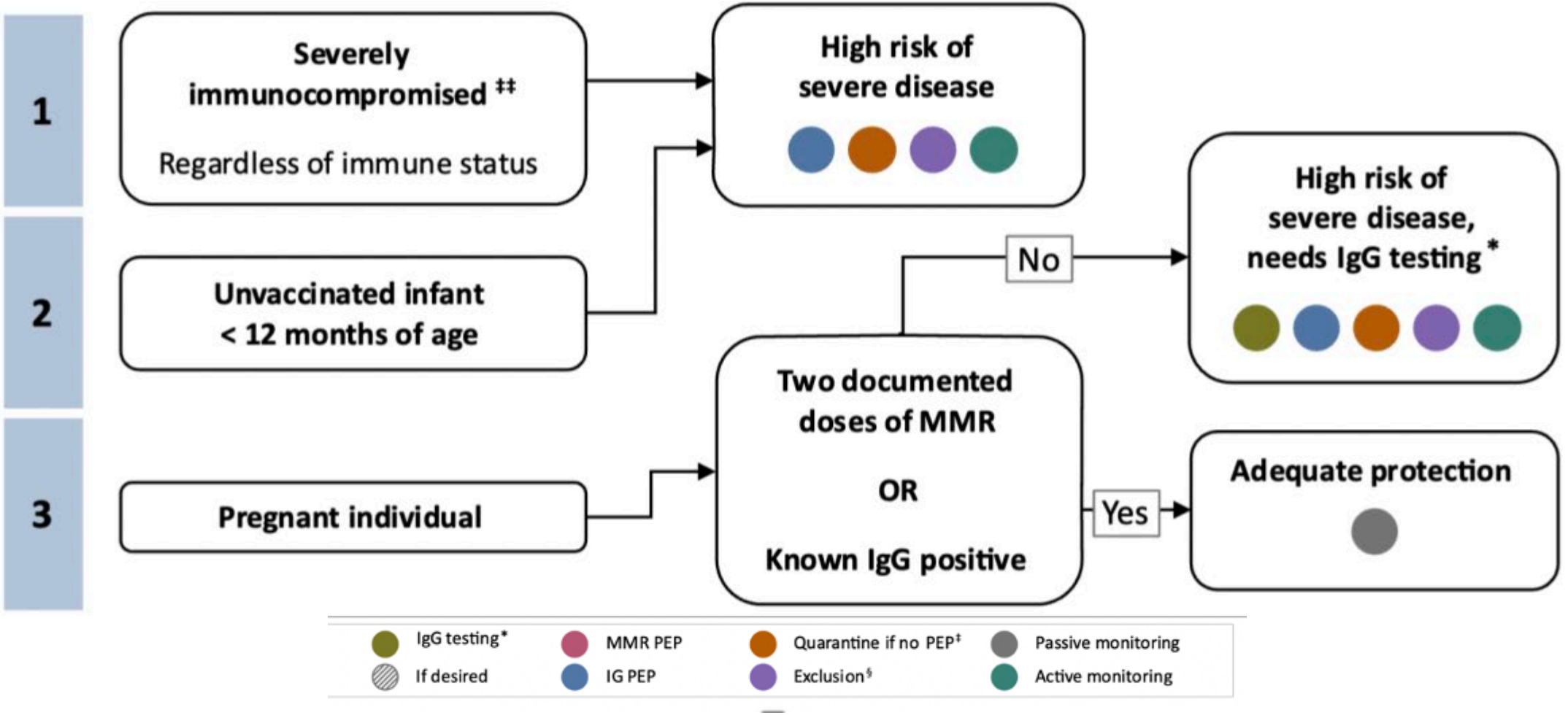
High-Risk contacts

- May experience severe illness if they become infected with measles or to whom the transmission potential is high.
  - Infants
  - Household contacts or other prolonged exposure (eg Uber driver)
  - Immunocompromised persons
  - Pregnant persons

Presumptive Immunity for High-Risk Individuals

- Documentation of two doses of measles vaccine given in 1968 or later, separated by at least 28 days, with the first dose on or after the first birthday
- A documented IgG positive test for measles
- Laboratory confirmation of previous disease.

Management of contacts at risk of severe disease



CDPH Quicksheet (https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/Immunization/Measles-Quicksheet.pdf)