Measles Resurgence:

Local public health control strategies

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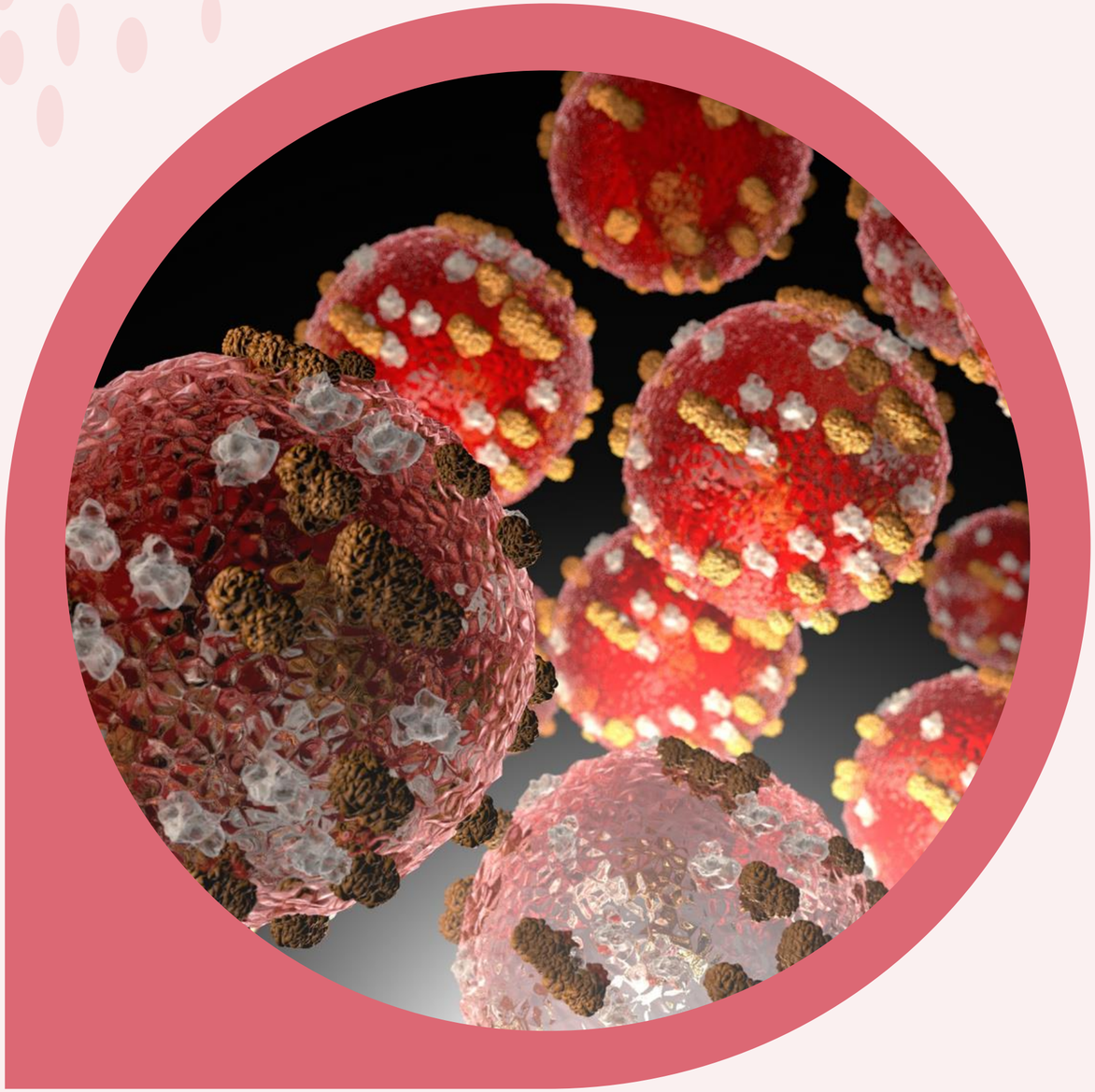

Objectives

1. Understand the epidemiology of measles and the risk of an outbreak in Ohio
2. Review measles diagnosis
    a. clinical features & measles mimics
    b. the role of laboratory testing
3. Discuss local measles prevention and public health control strategies

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Epidemiology of Measles

2024

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Definitions

Eradication is defined as the “reduction of the worldwide incidence of a disease to zero as a result of deliberate efforts, obviating the necessity for further control measures” (International Task Force for Disease Eradication)

Measles elimination is defined as “the absence of endemic measles virus transmission in a defined geographical area for at least 12 months in the presence of a surveillance system that has been confirmed as performing well” (World Health Organization)

https://www-ncbi-nlm-nih-gov.ezproxy.libraries.wright.edu/pmc/articles/PMC11281665/

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Verification of Measles Elimination, 2000–2022

WHO region (no of countries in region)	Achieved Elimination	Measles Reestablished	Elimination not Achieved
African Region (47)	0	0	47
Region of the Americas (35)	33	2	0
Eastern Mediterranean Region (21)	4	0	17
Europe (53)	35	5	13
South-East Asia Region(11)	5	0	6
Western Pacific Region (27)	6	2	19
Total (194)	83 (43%)	9 (5%)	102 (52%)

Minta AA, Ferrari M, Antoni S, et al. Progress Toward Measles Elimination — Worldwide, 2000–2022. MMWR Morb Mortal Wkly Rep 2023;72:1262–1268.
DOI: http://dx.doi.org/10.15585/mmwr.mm7246a3

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Measles cases spike globally due to gaps in vaccination coverage -

“The resurgence of measles is of serious concern, with extended outbreaks occurring across regions, and particularly in countries that had achieved, or were close to achieving measles elimination,” said Dr Soumya Swaminathan, Deputy Director General for Programmes at WHO. “Without urgent efforts to increase vaccination coverage and identify populations with unacceptable levels of under-, or unimmunized children, we risk losing decades of progress in protecting children and communities against this devastating, but entirely preventable disease.”

29 November 2018

Factors impacting global measles vaccination rates

- Not all ages accounted for in vaccination campaigns
- Lack of capacity to identify and interrupt chains of transmission
- Increasing conflicts and political instability
- Refugees not included in national immunization efforts
- Economic crises
- Natural disasters
- Increasing “vaccine hesitancy”
- Growing complacency about the severity of disease
- Disruption in routine vaccination programs due to COVID-19 response

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Impact of COVID on global first dose measles vaccination coverage

Declined from 86% in 2019 to 83% in 2022,

leaving almost 22 million children aged <1 year susceptible to measles

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History of measles in US

- **Before development of a measles vaccine, most children were infected before they were 15 years old (holoendemic)**
  - Each year- 3-4 million people infected
  - 48,000 hospitalizations
  - 1000 cases of measles associated encephalitis
  - 400-500 deaths
- **1963**- the first measles vaccine was developed
- **1971**- measles, mumps, and rubella (MMR) vaccines were combined
- **2000**- elimination of measles in the US was declared

https://www-ncbi-nlm-nih-gov.ezproxy.libraries.wright.edu/pmc/articles/PMC10946219/

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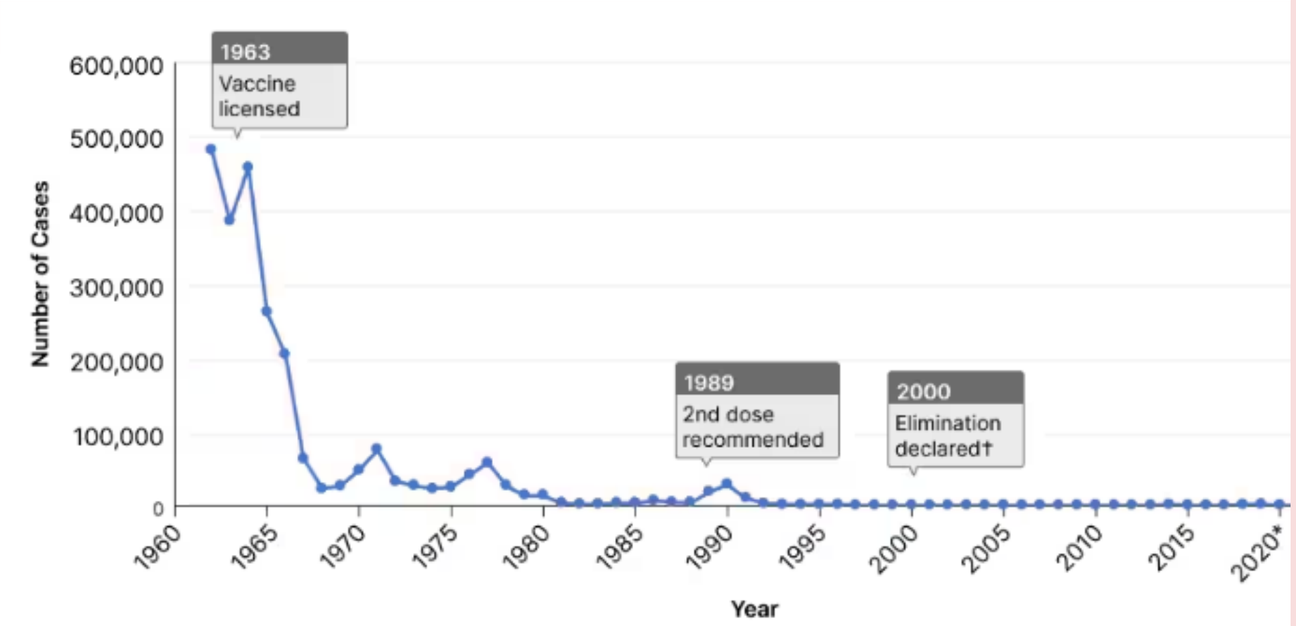
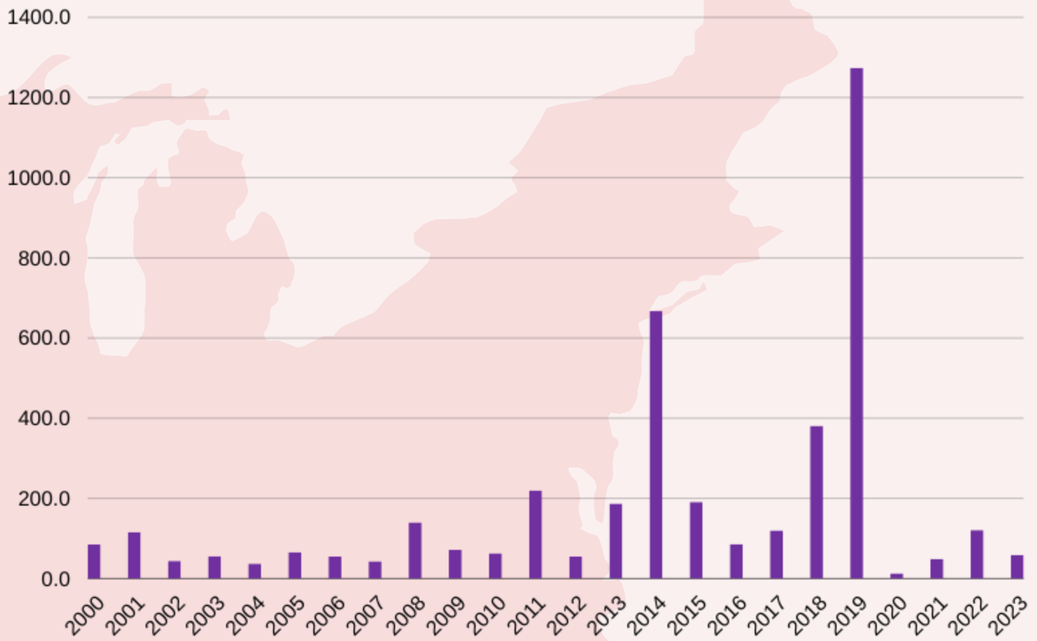
Reported measles cases in the U.S., 1962-2024





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US measles cases in 2024, N=227*

Age	# of cases (% of total)	Hospitalized (% hospitalized)
Under 5 years	89 (39%)	52/89 (58%)
5-19 years	67 (30%)	20/67 (30%)
20+ years	71 (31%)	28/71 (39%)
	227 (100%)	**100/227 (44%)**

CDC data, as of 8.22.2024

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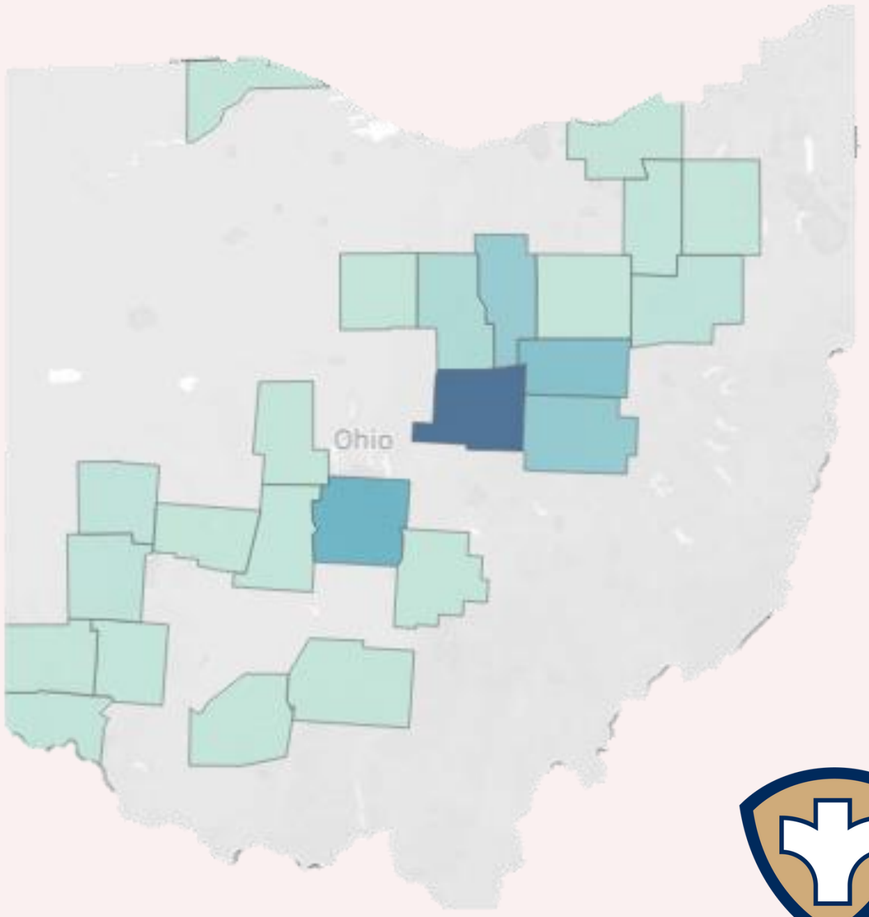
Ohio measles cases, 2000-2024, n=496

Outbreaks	
Year	**Number of cases**
2014	382
2022	85
2024	4
Total outbreak cases = 471	

[CDC data, as of 8.22.2024]



Data source: Ohio Department of Health, as of 8.13.2024

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What is the risk of a measles outbreak in Ohio?

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

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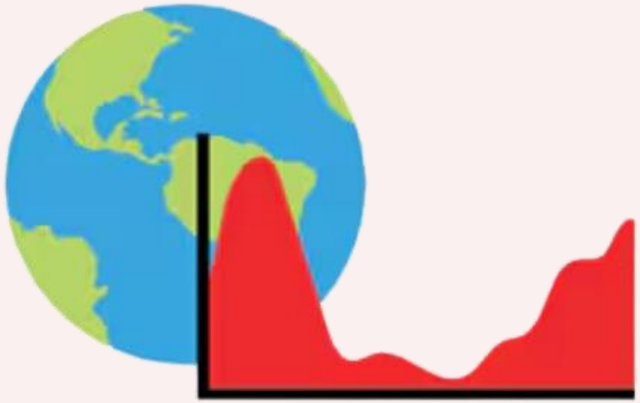
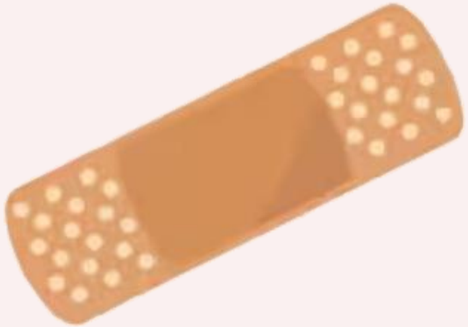


Global measles activity



Declining MMR vaccination coverage in the U.S.

The likelihood an imported case of measles generates an outbreak in the U.S.

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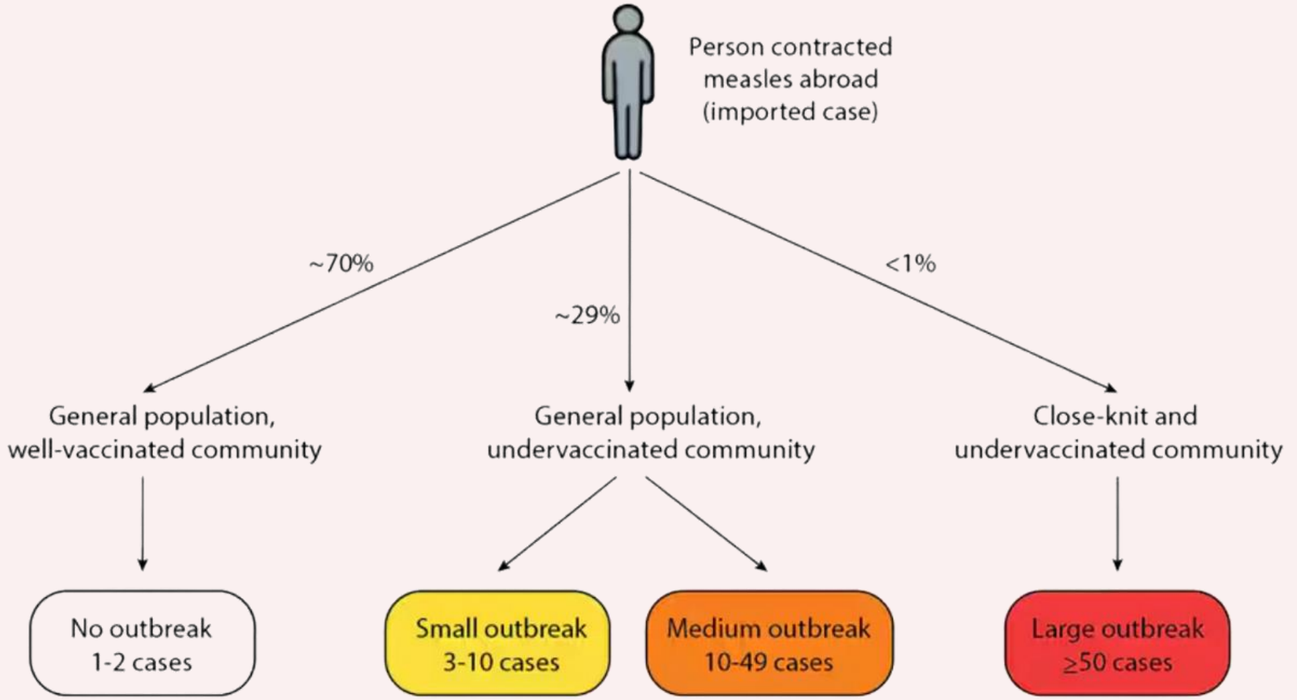

https://www.cdc.gov/ncird/whats-new/measles-outbreak-risk-in-us.html

Risk of an outbreak depends upon clustering of susceptible persons

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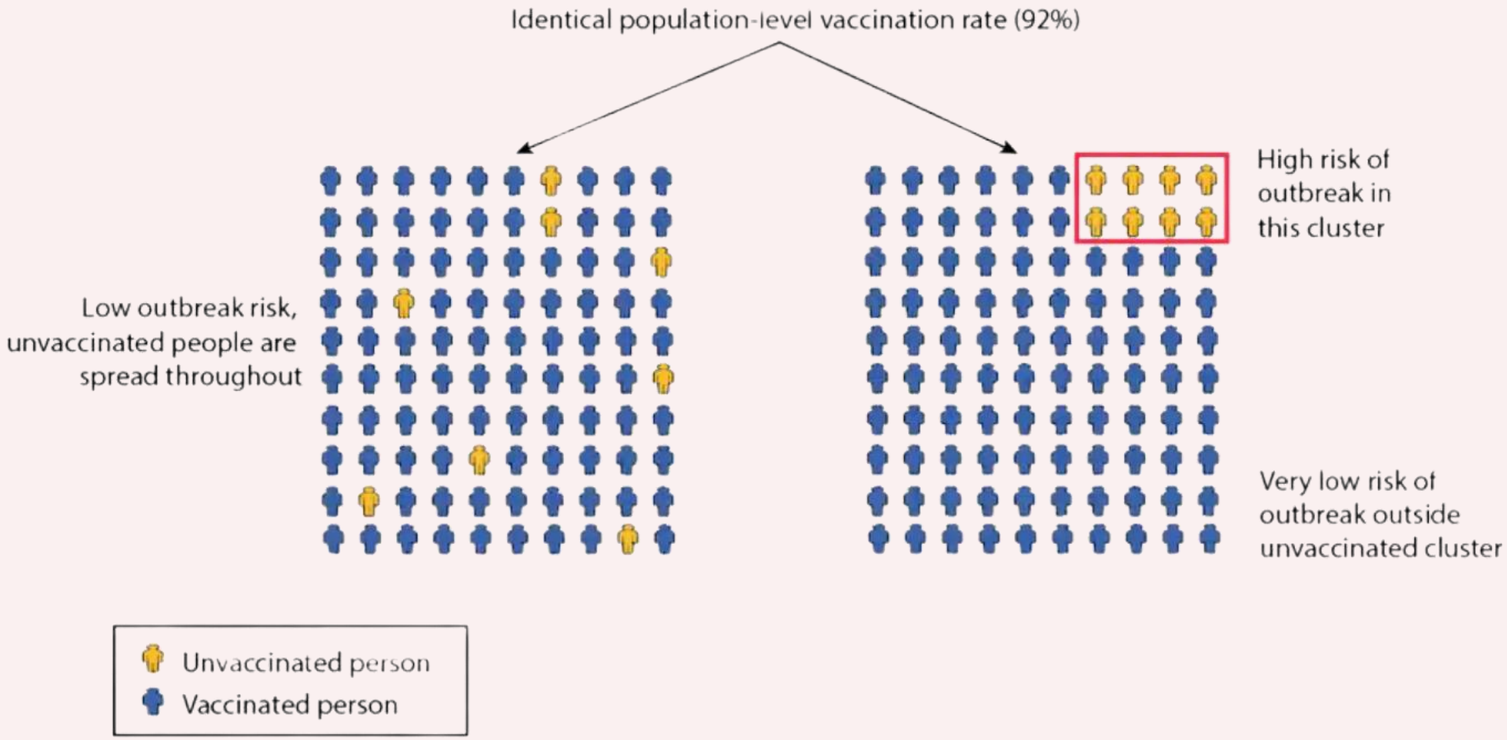

https://www.cdc.gov/ncird/whats-new/measles-outbreak-risk-in-us.html

The MMR vaccination rate for entering kindergarteners by school year, US and Ohio

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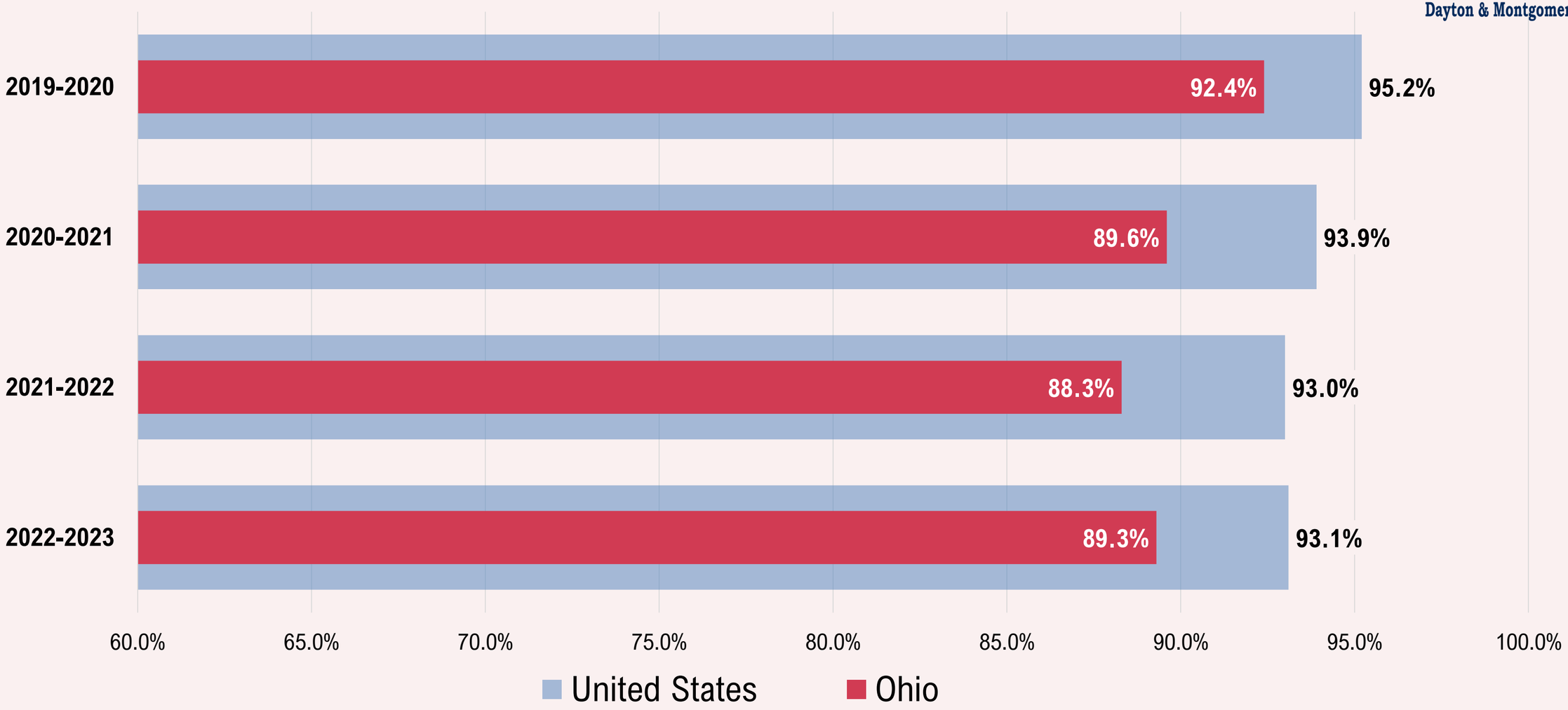

Data source: CDC– School Vax View Interactive

Chance of an outbreak at a school with 100 children and 1 child who is infectious with measles

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MMR coverage	# Children susceptible	Chance of an outbreak
97%	6	16%
95%	8	29%
93%	10	36%
90%	13	51%
85%	18	61%
80%	22	64%
70%	32	78%

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

Measles diagnosis

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The time course of measles infection

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Exposure

Onset of symptoms:
- **High Fever**
- **Cough**
- **Coryza**
- **Conjunctivitis**

Koplik spots may appear (usually 2-3 days after symptoms begin)

Maculopapular rash appears on face near hairline (usually 3-5 days after symptoms begin and 14 days after exposure)

Over the next few days, **rash** spreads from head to trunk to the extremities. **Fever** may spike to more than 104˚F.

Rash lasts 5-6 days and will disappear in the same order that it appeared from head to extremities

Measles mimics

Parvovirus B-19 (Fifth Disease)

"Slapped cheek" rash (photo) which can spread to trunk and extremities; more common in school-aged children than infants

Human Herpesvirus 6 (Roseola, Sixth Disease)

Common cause of fever and rash in children; fever often resolves, and rash appears the next day starting on trunk and spreading outwards

Enteroviruse

- Rash can be maculopapular or urticarial
- Often on hands/feet (Hand Foot Mouth, photo)
- Antibiotic sensitivity reactions or allergies

Slapped Cheek rash

HF M

Laboratory Testing

- Both serum (IgM, IgG) and NP/OP swabs (RT-PCR) should be collected for all suspect cases.

- ODHL testing versus private lab testing

Laboratory testing- Case scenario #1

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A 4-year-old child was seen by her primary care provider with a 2-day history of fever and maculopapular rash. Additional symptoms included coryza and a mild cough that preceded the rash by 3 days. There was no reported exposure to measles, and no reported domestic or international travel in the 21 days prior to symptom onset. The child had received a single dose of MMR vaccination according to the routine U.S. vaccination schedule at 12 months of age. Laboratory testing was limited to the detection of measles-specific IgM in serum, which returned a positive result. Due to delayed reporting, the local public health agency was notified of the positive result 7 days after the case's rash onset, at which time the child had fully recovered.

Does this child have measles?

Case scenario #1- False positive IgM?

Given that there had been no reported measles cases during the prior 6 months in the state and county of the child's residence, and there were no clear risk factors for measles infection in the child.

Consider further testing-

- PCR
- Repeat IgM
- Acute and convalescent IgG

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Laboratory testing- Case scenario #2

A 6-year-old male is seen in the ED for a two-day history of fever and cough, followed by an onset of a maculopapular rash just prior to presentation. He arrived in the United States from a measles-endemic country 14 days before being seen in the ED. Ten days ago, he was seen in a refugee clinic for intake examination and, given that he had no available prior vaccine records, was given a dose of MMR vaccine. With concern for measles illness, the emergency clinicians contact local public health authorities, who recommend PCR testing; PCR performed on a throat swab returns positive 2 days later, by which time the patient's symptoms have resolved. Local and state public health authorities contact the CDC to help determine if the patient's symptoms were due to wild-type measles infection or a reaction to MMR vaccination.

Does this child have measles infection?

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Case scenario #2- Vaccine reaction or measles?

Patients who receive live attenuated measles-containing vaccine may go on to develop self-limited fever and rash approximately 7–10 days after vaccination, which can be clinically indistinguishable from wild-type measles infection in some cases

Consider further testing:

- Genotyping
- MeVA

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Diagnostic Take-aways

1. Diagnosis requires considering epidemiological AND laboratory evidence.
2. IgM/IgG and PCR testing provide complementary information- ALWAYS DO BOTH!
3. As soon as measles is suspected, public health must be notified.
4. Advanced lab techniques are helpful but take time.

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Public health prevention & control

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Local measles prevention strategies

- Increase community vaccination rates
- Advocate for ImpactSiiS use
- Message the availability of VFC vaccine
- Provider education re: measles signs/symptoms, testing, and reporting requirements
- Recommend measles vaccinations for all travelers without presumptive evidence of measles immunity, including infants who will be travelling abroad (6-12 months)

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Local outbreak readiness activities

- Explore how you might use technology for exposure notifications
- Develop standard community protocols for outbreak PEP
- Add case investigation & contact tracing as a PH nurse competency
- Create a robust communication plan for timely provider notifications
- Solidify community partnerships

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Proven measles outbreak strategies

- Rapid set-up of Incident Management Team
- Sharing line list templates with exposure locations of suspect cases
- Phone bank for hotline
- Site visits for exposure locations
- School toolkit

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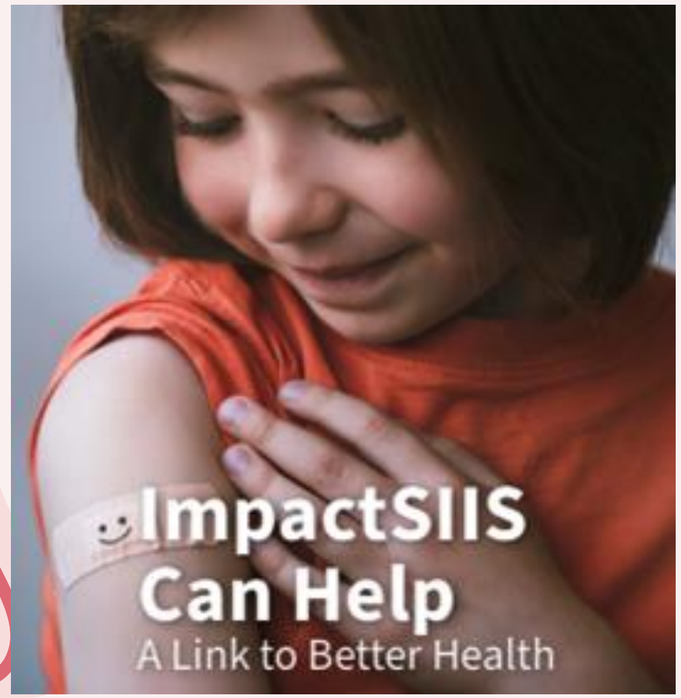
ImpactSIIS- Ohio statewide immunization registry



The link for online enrollment is https://www.ohiopublichealthreporting.info/Enrollment.

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Thank you!

Questions?

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