Incidental Measles(?)

Christine Thomas, DO MPH | Epidemic Intelligence Service Officer
Caitlin Newhouse, MD MPH | Medical Director, Vaccine-Preventable Diseases & Immunization Program

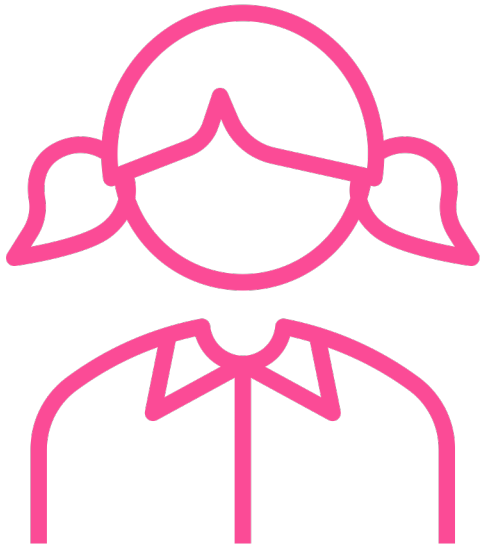
A clinician reported a 6-year-old had tested positive for measles.

She had no risk factors for measles infection.

- ✕ Travel
- ✕ Exposure to person with measles
- ✕ Measles cases in the state

Her clinical presentation was not classic for measles.

- ❑ Prodromal Period
  - ☑ Fever
  - ❑ Malaise
  - ☑ Cough
  - ❑ Coryza
  - ❑ Conjunctivitis
- ❑ Koplik spots
- ☑ Maculopapular Rash

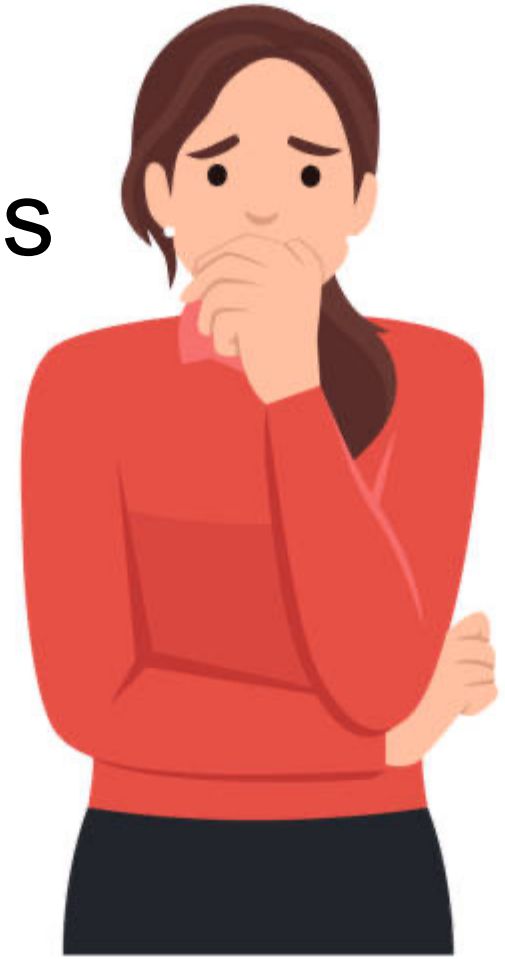


A syndromic PCR test was done to identify what might have caused the illness.

Exanthem:	DETECTED	NOT DETECTED
Streptococcus pyogenes (Group A)		X
Cytomegalovirus		X
Enterovirus group	**X**	
Epstein-Barr virus		X
Measles virus	**X[1]**	
Parechovirus		X
Parvovirus B19		X
Varicella Zoster virus		X

Exanthem:	DETECTED	NOT DETECTED	COMMENTS:
Streptococcus pyogenes (Group A)		X	LAB NOTES:
Cytomegalovirus		X	[1]The CDC recommends measles-specific IgM serum testing for confirmation. Patients who have received a recent measles live virus vaccine (MMR or Measles) within the past 14 days could test positive due to the vaccine and may not have a true measles infection.
Enterovirus group	**X**		
Epstein-Barr virus		X	
Measles virus	**X[1]**		
Parechovirus		X	
Parvovirus B19		X	
Varicella Zoster virus		X	

- ✗ Travel
- ✗ Exposure to person with measles
- ✓ Vaccine records
- ✓ Keep family home



Centers for Disease Control & Prevention

Viral Vaccine Preventable Diseases Branch

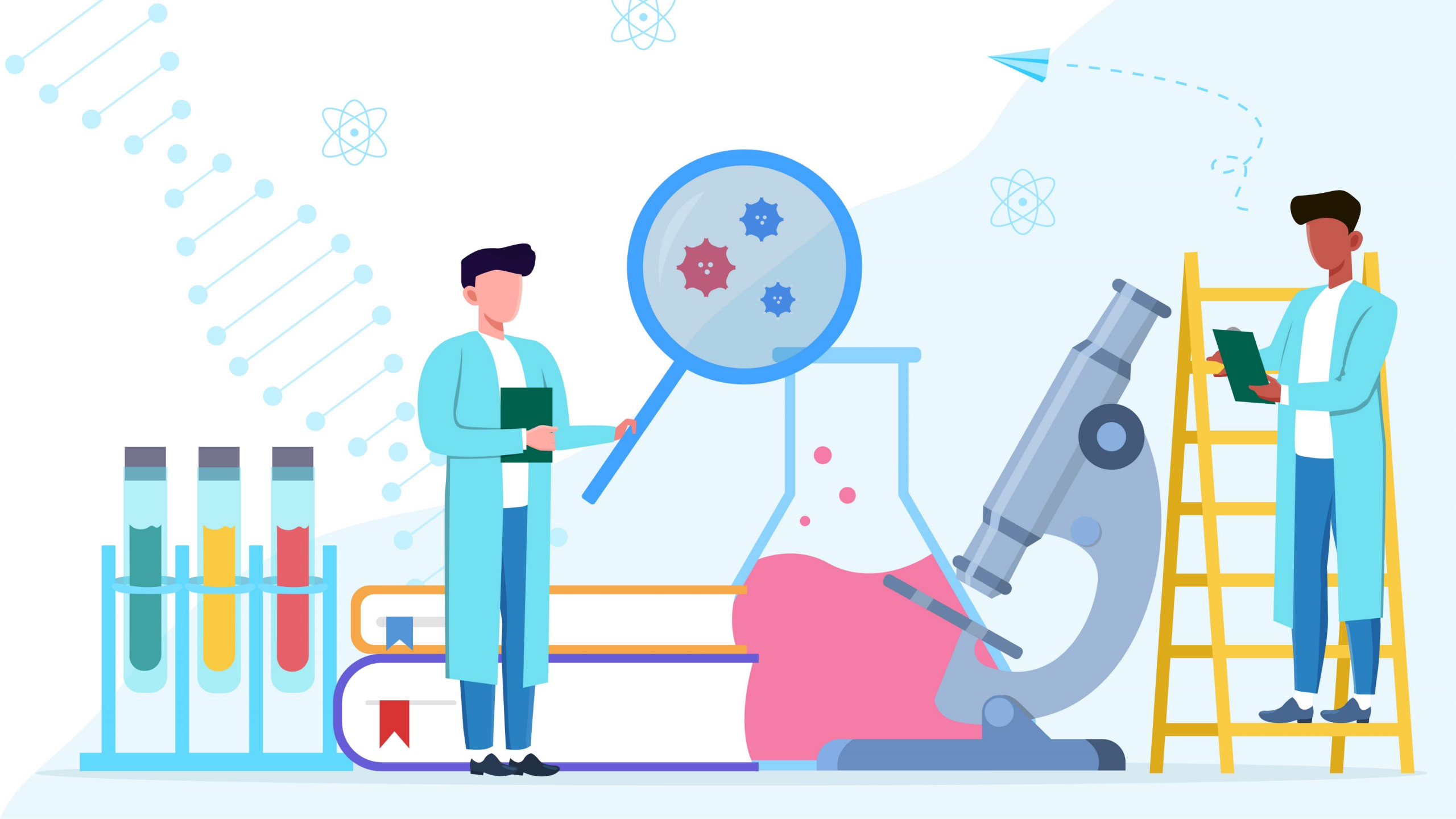
Event Report

CDC Event ID: [redacted]

CUID	Test	Interpretation
N8KH02DI	Measles RT-PCR	Positive
N8KH02DI	Measles sequence analysis and genotyping	Consistent with vaccine strain

A vaccinated 1-year-old had previously tested positive for measles.

- ✗ Clinical presentation
- ✗ Risk factors
- ✓ Recent vaccination



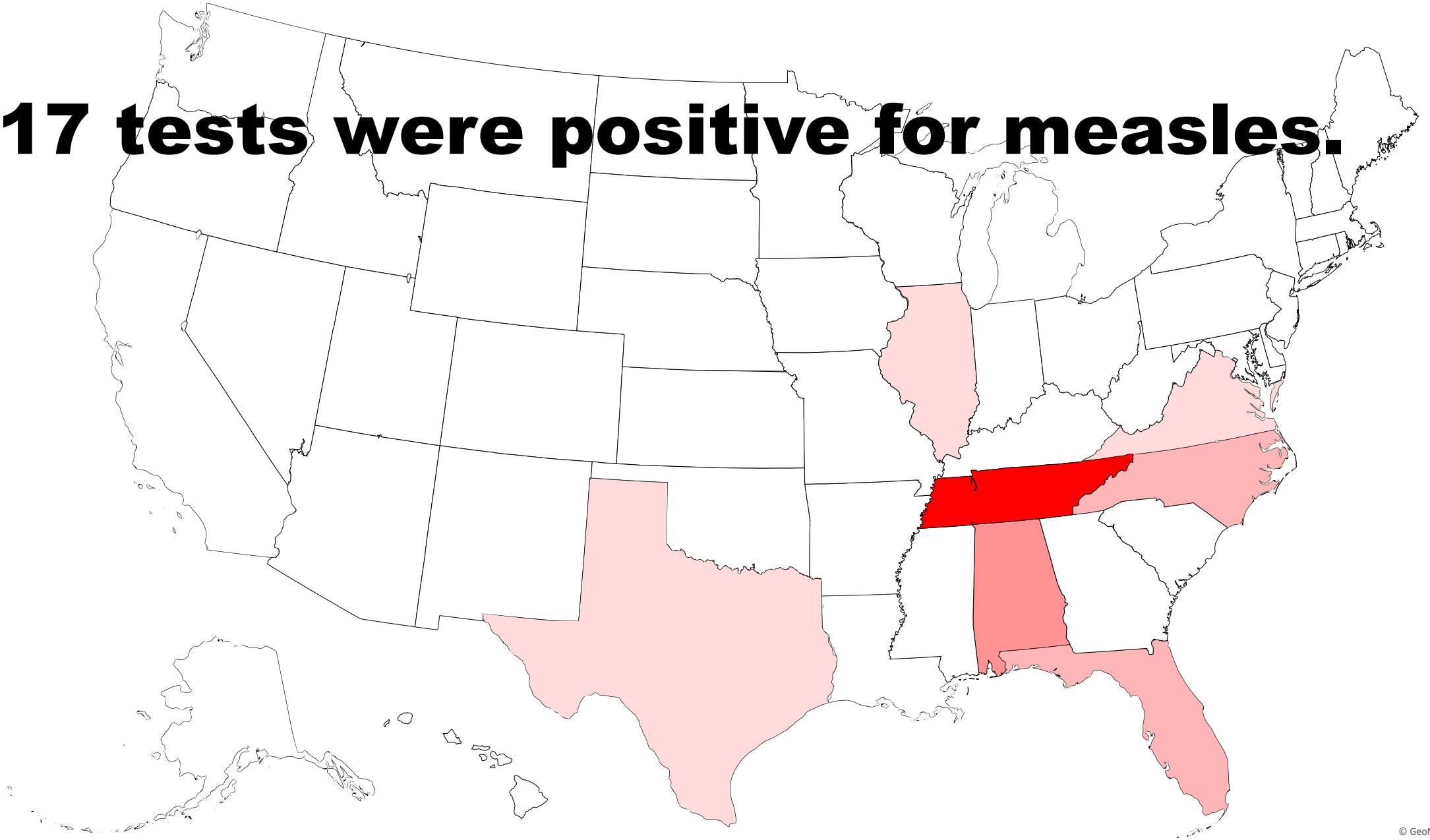
1. Group A streptococcus
2. Cytomegalovirus
3. Enterovirus group
4. Epstein-Barr virus
5. Measles virus
6. Parechovirus
7. Parvovirus B19
8. Varicella zoster virus
9. Human herpesvirus type 6*
10. Human herpesvirus type 7*

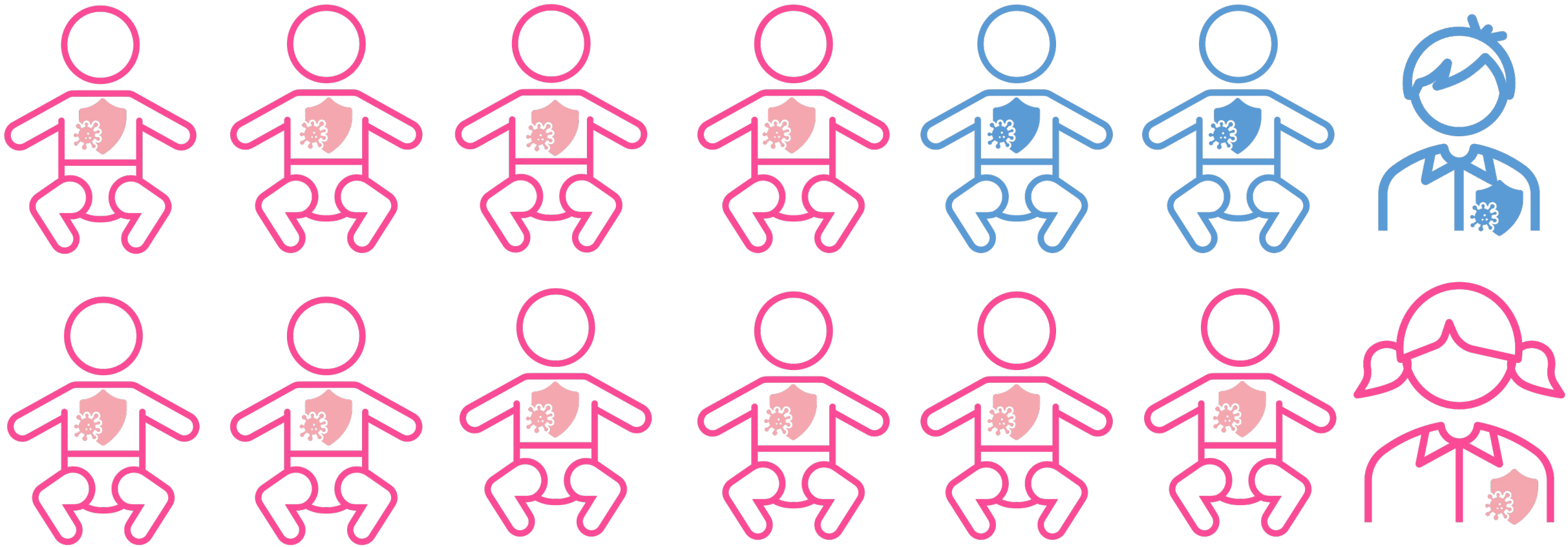
*exanthem + roseola

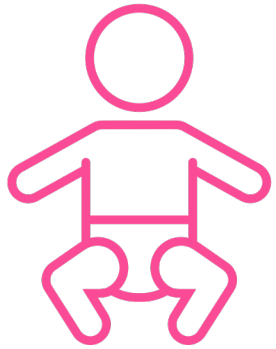
1. How often are the tests used?
2. How often are they positive?
3. Who tests positive?

1,500 tests were ordered in 25 states.

17 tests were positive for measles.

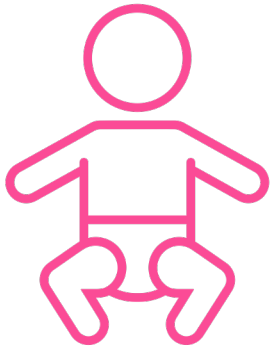






HHV-6

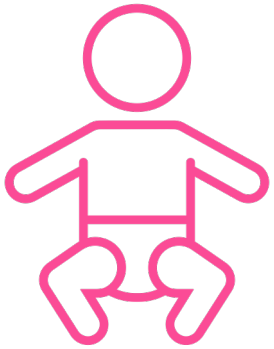
Enterovirus



HHV-6

HHV-7

EBV

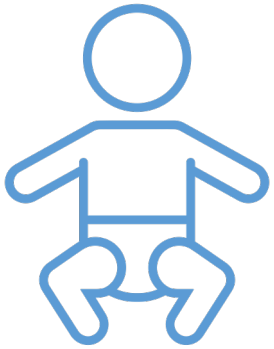


HHV-6

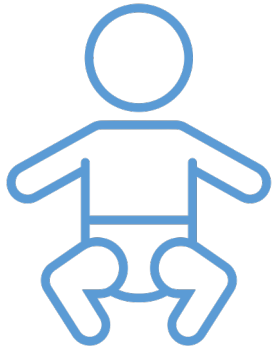
HHV-7

Enterovirus

EBV



HHV-6

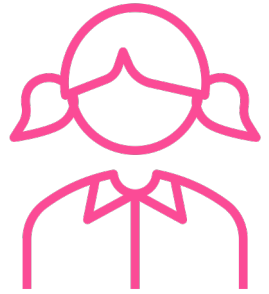


HHV-6

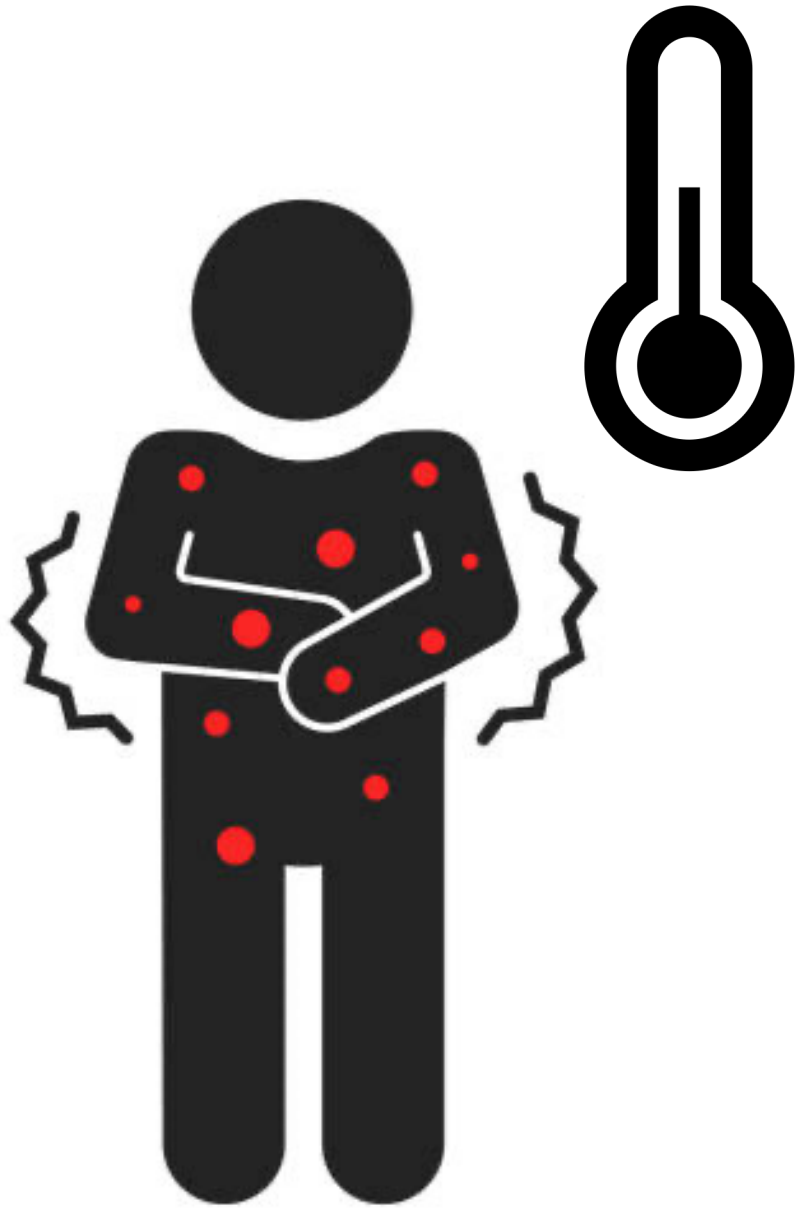
HHV-7

Enterovirus

HHV-6



Enterovirus



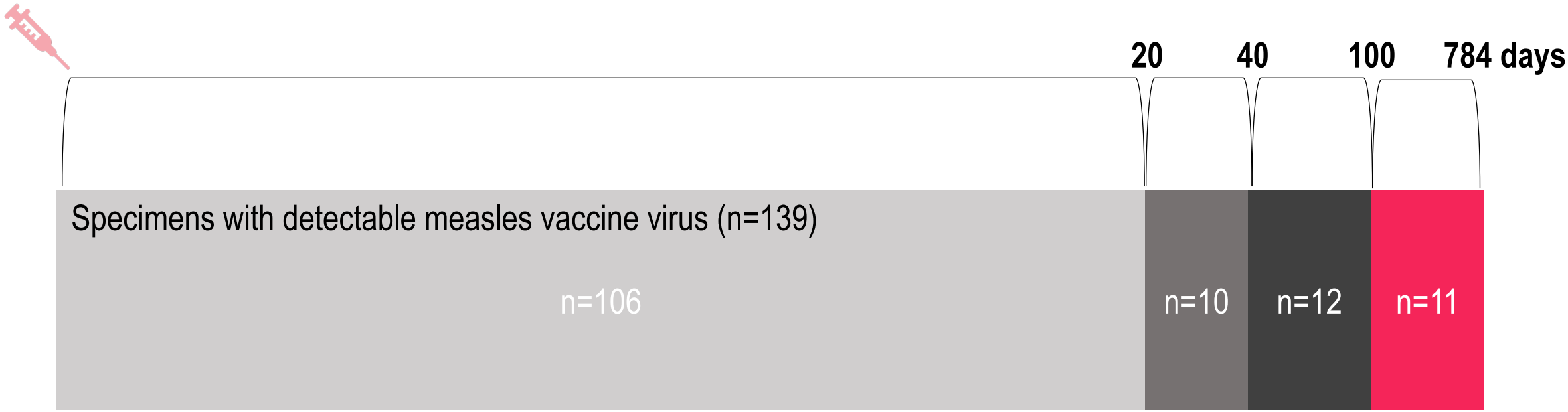
Syndromic PCR tests incidentally detected measles virus.

- ✗ Measles-consistent clinical presentation
- ✗ Known risk factors for measles
- ✓ Recent vaccination explained positive PCR

An incidental finding is something not related to the reason for the test. As technology gets better, incidental findings are more common.

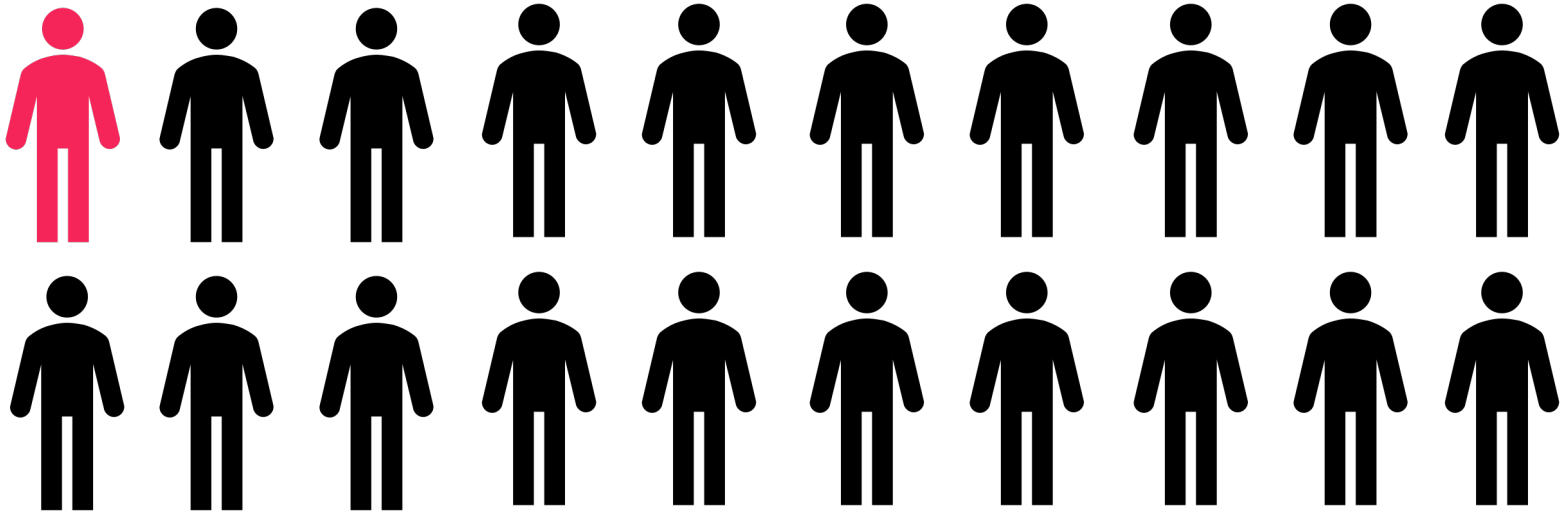
-paraphrased from Alberta Health Services

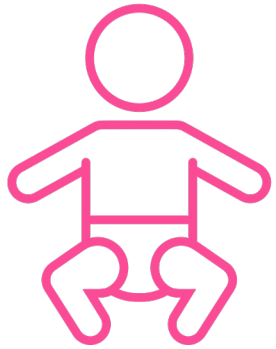
Measles vaccine virus RNA can be detected 100 days after vaccination.



McMahon J, Mackay IM, Lambert SB. Measles Vaccine Virus RNA in Children More Than 100 Days after Vaccination. *Viruses*. 2019;11(7):636. doi:10.3390/v11070636

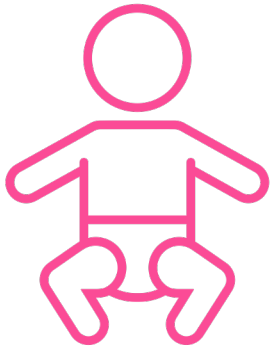
1 in 20 people develop a rash after receiving a measles vaccine.





HHV-6

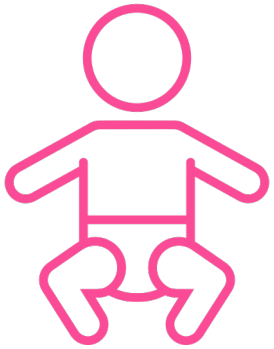
Enterovirus



HHV-6

HHV-7

EBV

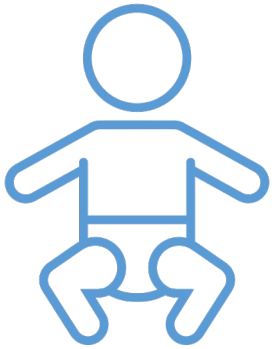


HHV-6

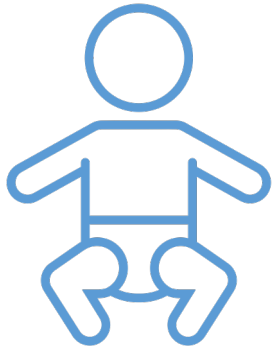
HHV-7

Enterovirus

EBV



HHV-6

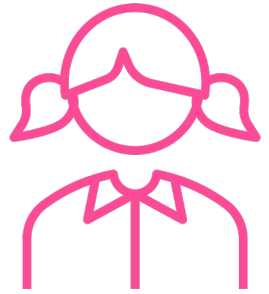


HHV-6

HHV-7

Enterovirus

HHV-6



Enterovirus

Much remains to be determined…

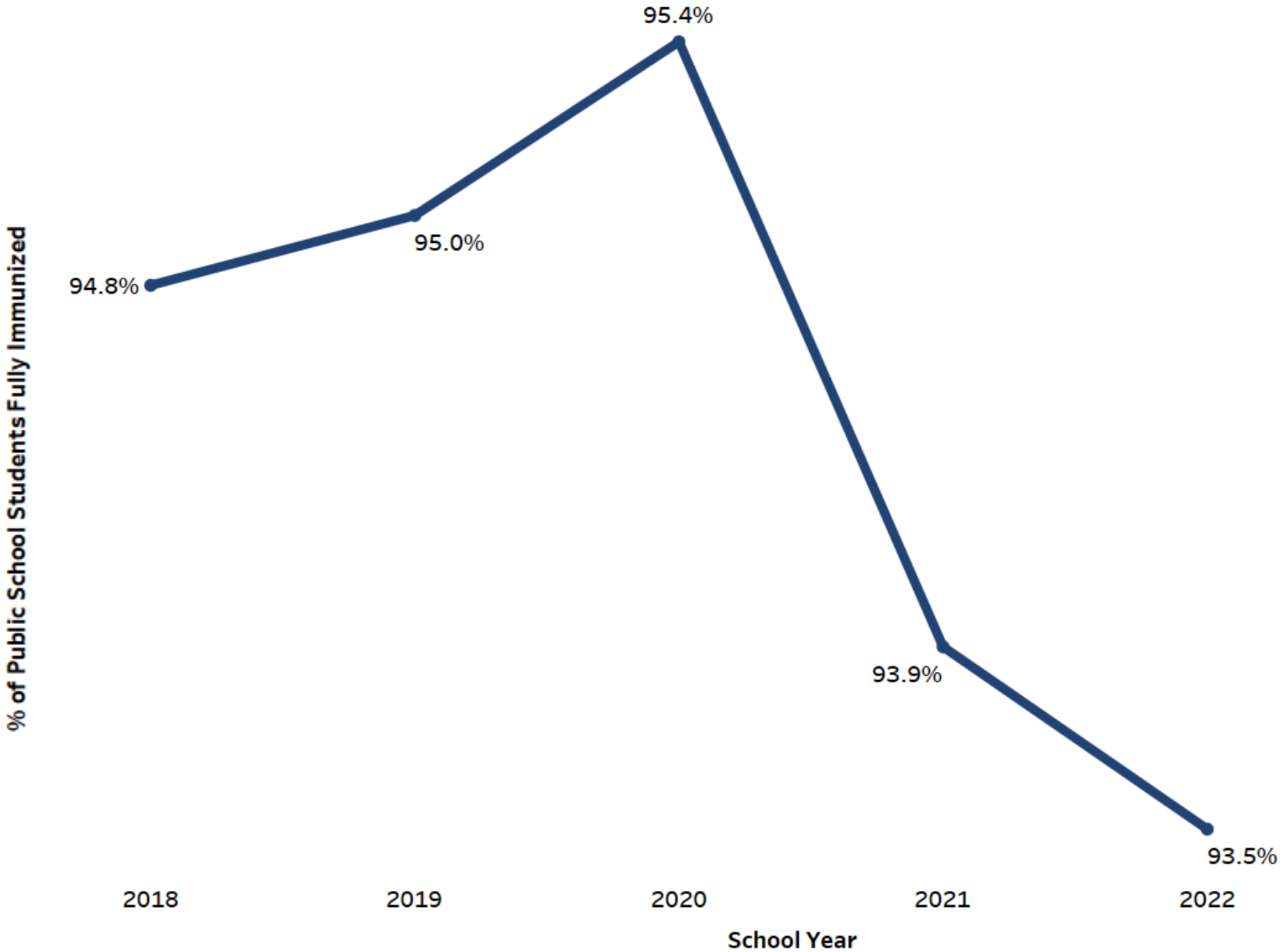
- What is the role of measles testing by syndromic PCR panels?
- What is the likelihood of detecting an otherwise unsuspected measles case?
- What is the harm of telling vaccinated individuals they might have measles?
- How much public health work is created by incidental measles detections?

Kindergarten Compliance Assessment

In the 2022-23 school year,

93.5%

of all public school kindergarten students **were fully immunized.**


95.4%
95.0%
94.8%
93.9%
93.5%
% of Public School Students Fully Immunized
2018
2019
2020
2021
2022
School Year

Kindergarten Survey Sneak Peek

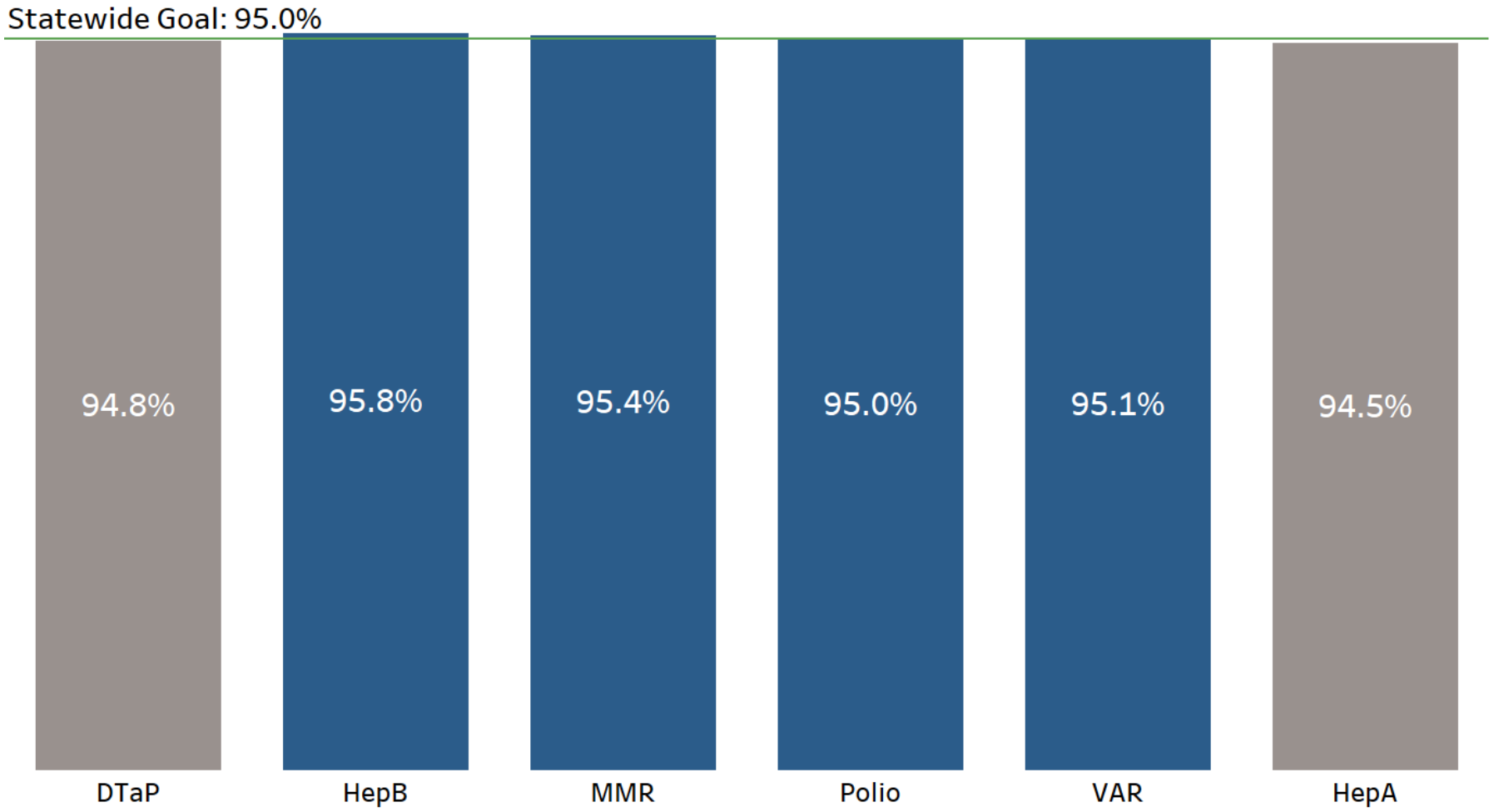
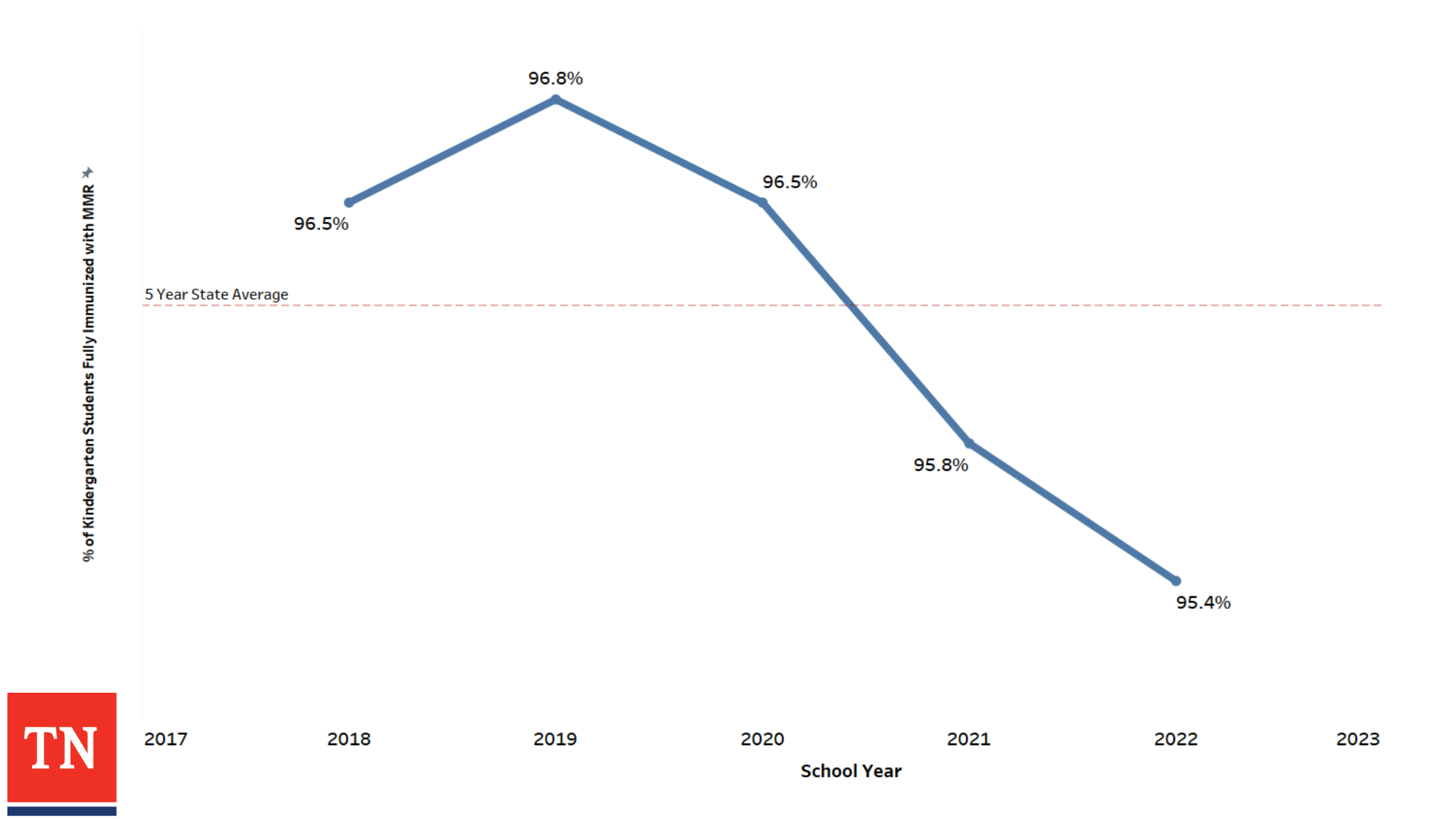
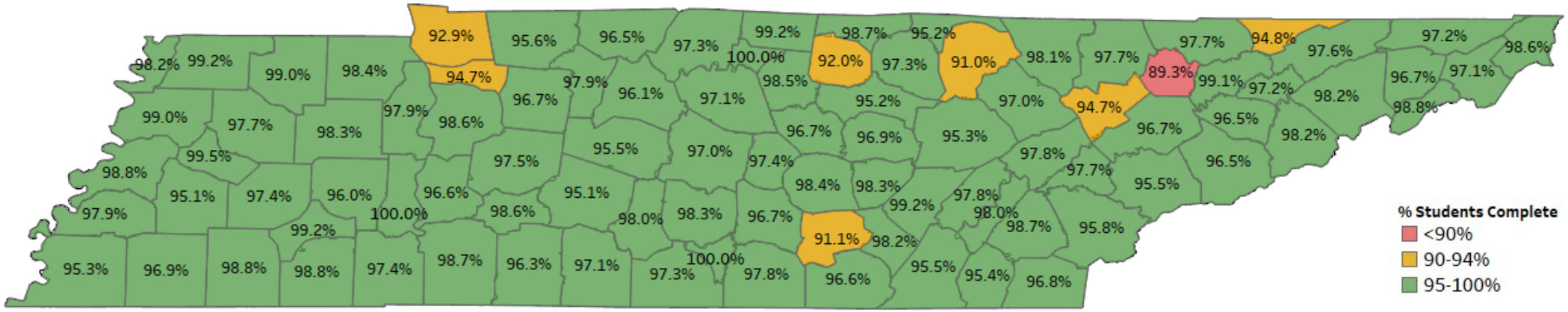


Figure 1. Percentage of **public and private school** kindergarten students who were complete for each vaccine series, compared to the Statewide Goal of 95%. Grey colored bar indicates less than 95% coverage.


% of Kindergarten Students Fully Immunized with MMR
96.8%
96.5%
96.5%
5 Year State Average
95.8%
95.4%
2017
2018
2019
2020
2021
2022
2023
School Year

Percent of Students Complete for MMR During the 2018-2019 School Year, By County

Statewide MMR rate: 96.5%

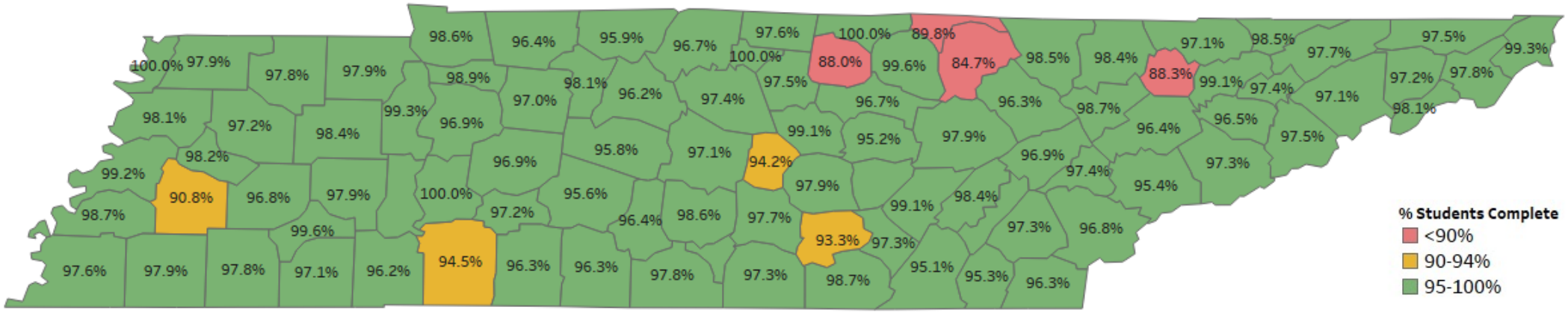


Counties by Percent Complete for MMR by School Year

Percent Complete	2018-2019
At least 95%	87 (92%)
90-94.9%	7 (7%)
<90%	1 (1%)

Percent of Students Complete for MMR During the 2019-2020 School Year, By County

Statewide MMR rate: 96.8%

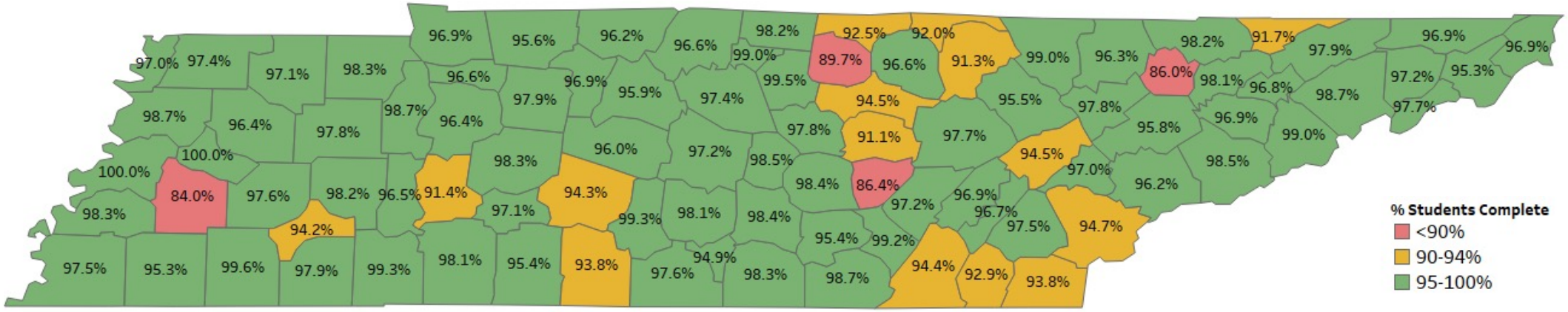


Counties by Percent Complete for MMR by School Year

Percent Complete	2018-2019	2019-2020
At least 95%	87 (92%)	88 (93%)
90-94.9%	7 (7%)	3 (3%)
<90%	1 (1%)	4 (4%)

Percent of Students Complete for MMR During the 2020-2021 School Year, By County

Statewide MMR rate: 96.5%

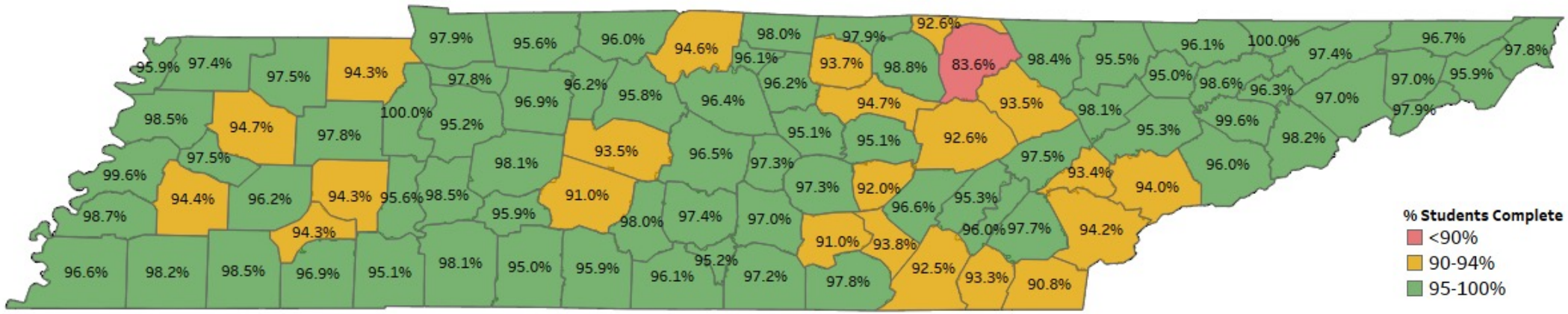


Counties by Percent Complete for MMR by School Year

Percent Complete	2018-2019	2019-2020	2020-2021
At least 95%	87 (92%)	88 (93%)	77 (81%)
90-94.9%	7 (7%)	3 (3%)	15 (16%)
<90%	1 (1%)	4 (4%)	3 (3%)

Percent of Students Complete for MMR During the 2021-2022 School Year, By County

Statewide MMR rate: 95.8%

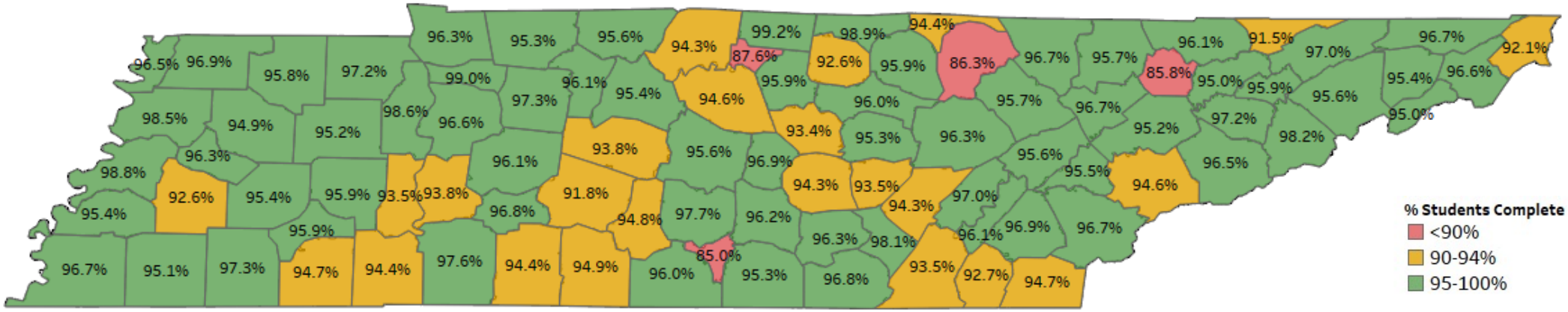


Counties by Percent Complete for MMR by School Year

Percent Complete	2018-2019	2019-2020	2020-2021	2021-2022
At least 95%	87 (92%)	88 (93%)	77 (81%)	72 (76%)
90-94.9%	7 (7%)	3 (3%)	15 (16%)	22 (23%)
<90%	1 (1%)	4 (4%)	3 (3%)	1 (1%)

Percent of Students Complete for MMR During the 2022-2023 School Year, By County

Statewide MMR rate: 95.4%



Counties by Percent Complete for MMR by School Year

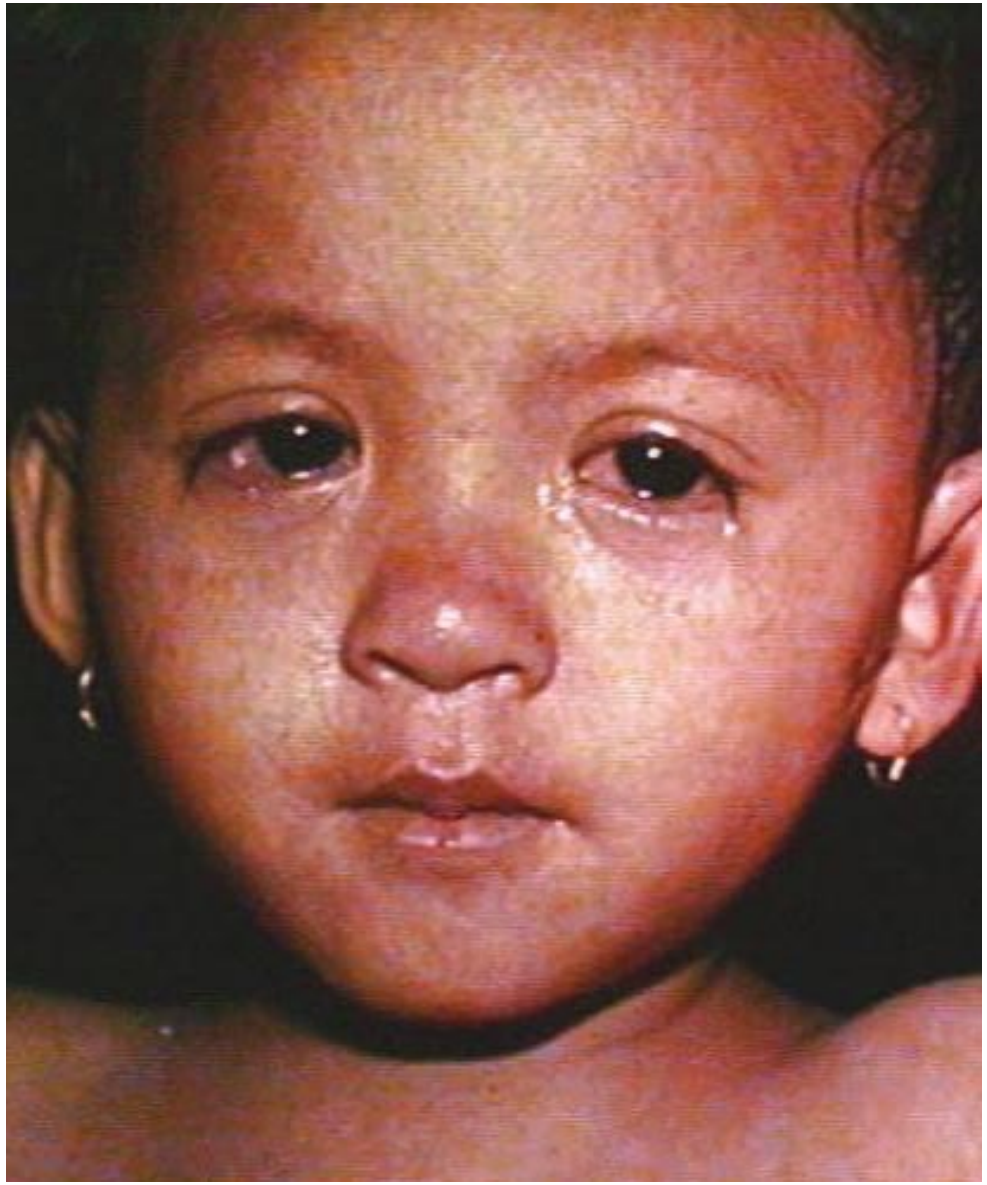
Percent Complete	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
At least 95%	87 (92%)	88 (93%)	77 (81%)	72 (76%)	67 (71)%
90-94.9%	7 (7%)	3 (3%)	15 (16%)	22 (23%)	24 (25%)
<90%	1 (1%)	4 (4%)	3 (3%)	1 (1%)	4 (4%)

Suspect measles if:

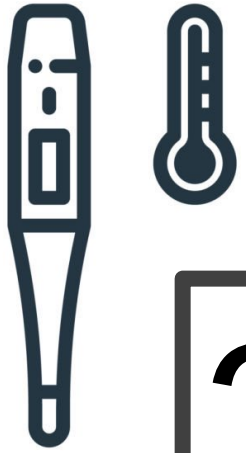
clinically consistent illness

+

risk factor(s)



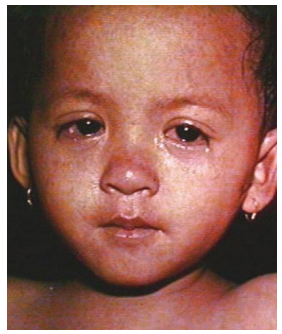
Measles presents as a prodrome followed by descending rash.

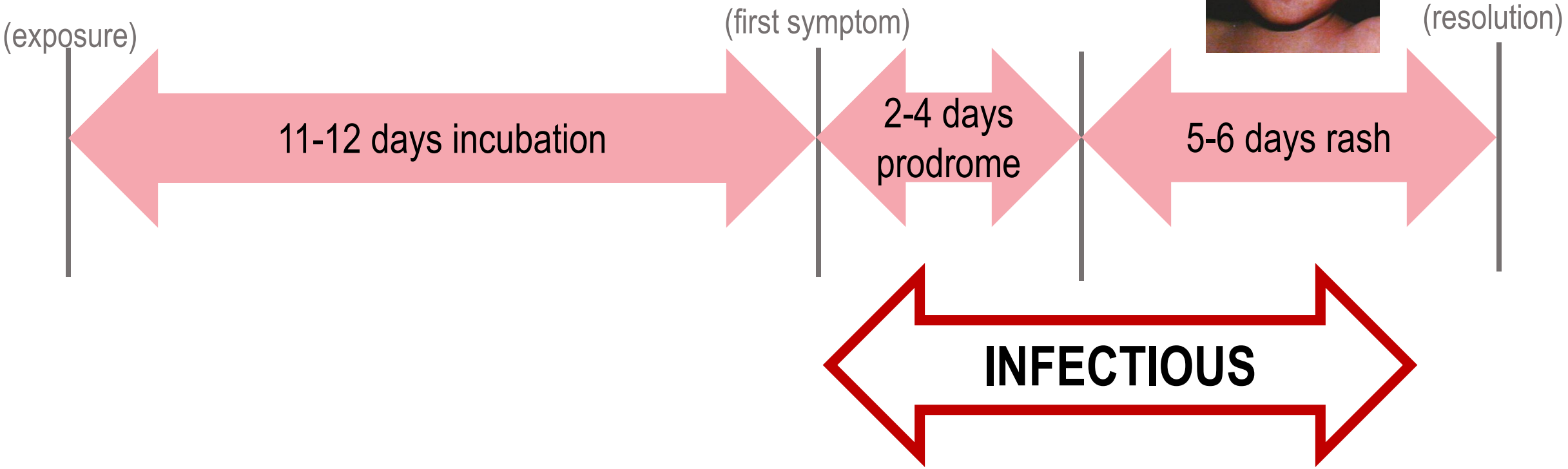


3 “C”s

Measles risk is greatest in unvaccinated persons who travel to regions with endemic measles.

Measles is infectious 4 days before and after rash onset.





(measles suspected)

test needed?

(no)

don’t test

(yes)

testing guided by differential diagnosis

(measles detected)

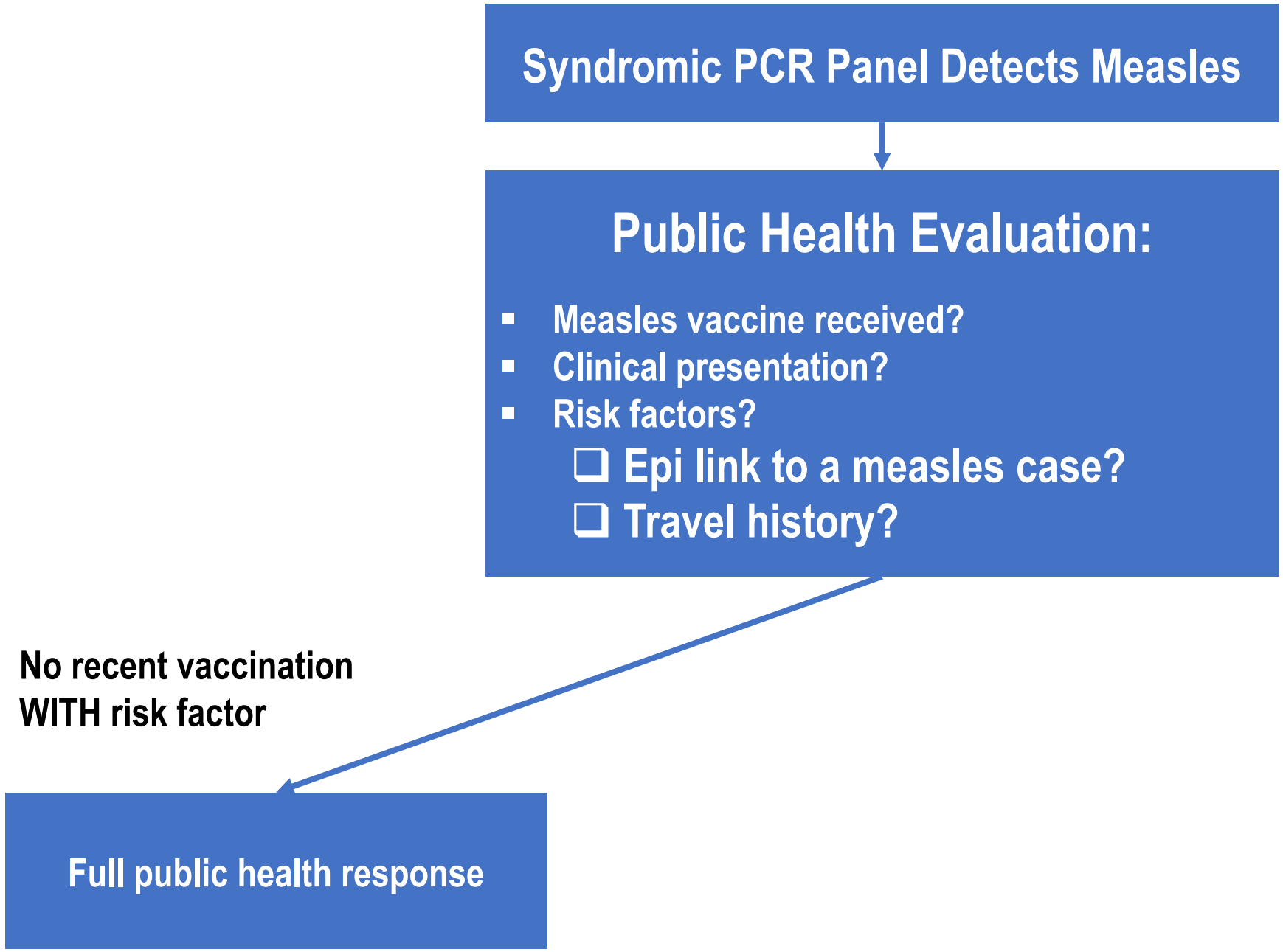
The public health response for measles typically includes:

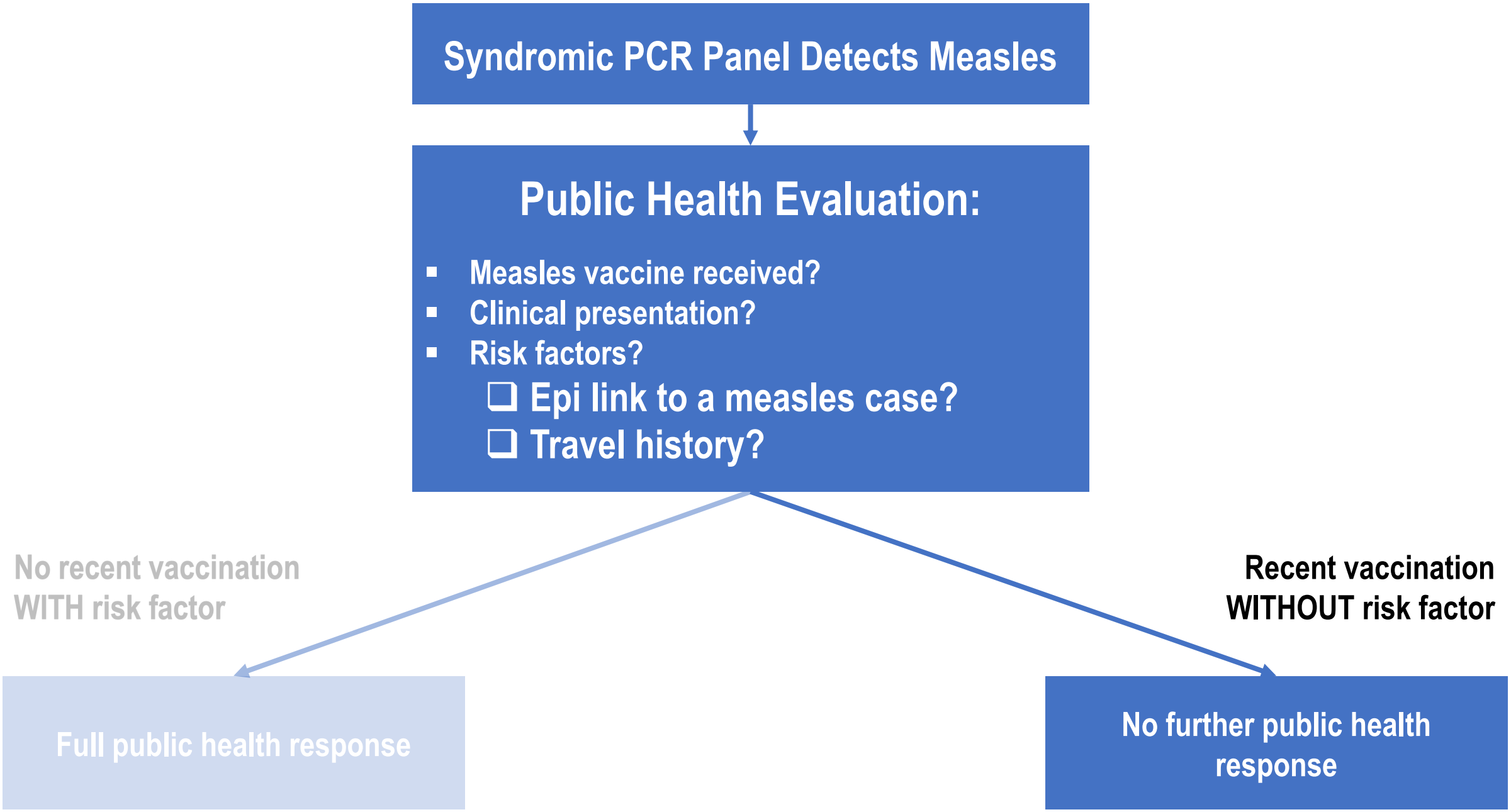
- ❑ Contact tracing
- ❑ Verifying immunity
- ❑ Post-exposure prophylaxis
- ❑ Isolation and quarantine

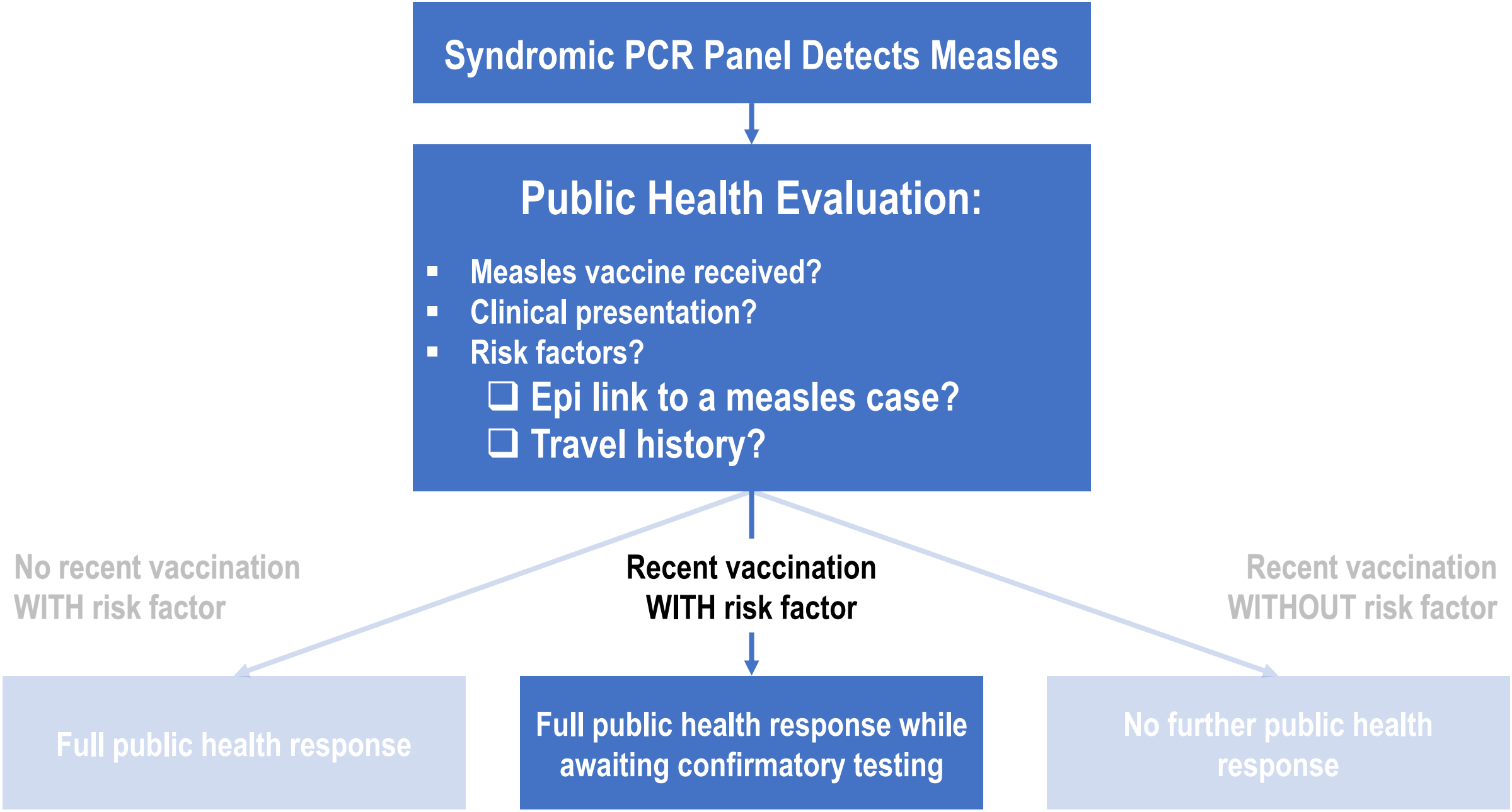
Syndromic PCR Panel Detects Measles

Public Health Evaluation:

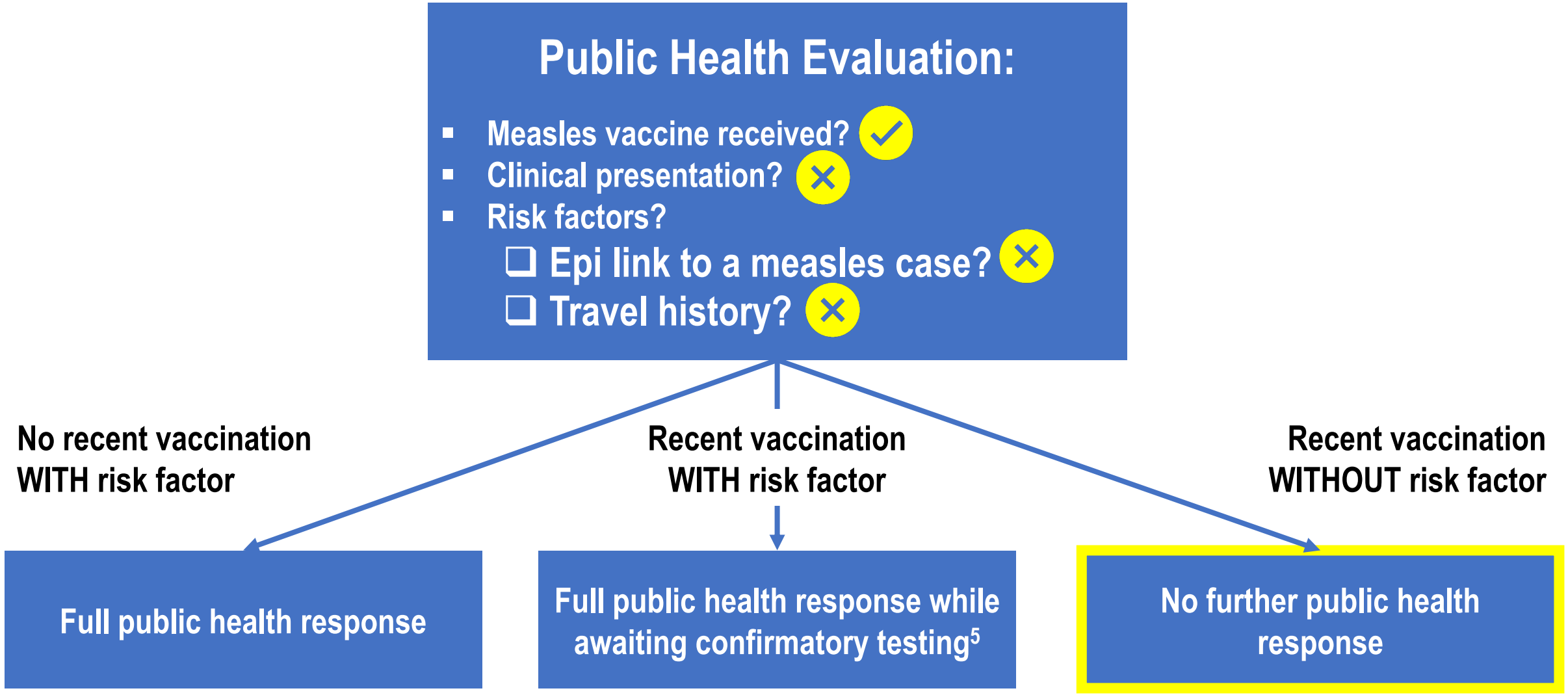
- Measles vaccine received?
- Clinical presentation?
- Risk factors?
  - ❑ Epi link to a measles case?
  - ❑ Travel history?


Syndromic PCR Panel Detects Measles
Public Health Evaluation:
Measles vaccine received?
Clinical presentation?
Risk factors?
Epi link to a measles case?
Travel history?
No recent vaccination
WITH risk factor
Full public health response


Syndromic PCR Panel Detects Measles
Public Health Evaluation:
Measles vaccine received?
Clinical presentation?
Risk factors?
Epi link to a measles case?
Travel history?
No recent vaccination
WITH risk factor
Recent vaccination
WITHOUT risk factor
Full public health response
No further public health response


Syndromic PCR Panel Detects Measles
Public Health Evaluation:
Measles vaccine received?
Clinical presentation?
Risk factors?
Epi link to a measles case?
Travel history?
No recent vaccination
WITH risk factor
Recent vaccination
WITH risk factor
Recent vaccination
WITHOUT risk factor
Full public health response
Full public health response while awaiting confirmatory testing
No further public health response

Tennessee had 2 more measles detections by syndromic PCR assays.



Thank You!

To partners at the commercial laboratory and other state health departments

To the TDH VPDIP team and especially Amanda Hartley

(and to Getty Images for the illustrations)

Please send questions to:

Christine.Thomas@tn.gov