

Measles: A primer for physicians in 2025 in North Dakota

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Disclosures

I have no relevant financial disclosures

I have cared for exactly one patient with measles

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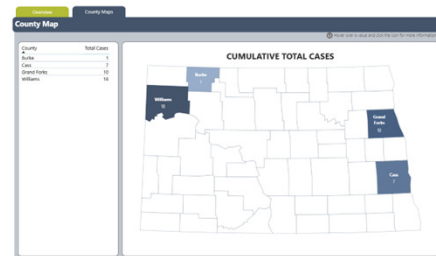
Measles in North Dakota



<https://www.hhs.nd.gov/immunizations/measles>

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Measles in North Dakota



<https://www.hhs.nd.gov/immunizations/measles>

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Measles in the United States

1,681 cases in 42 states

Only 23 cases were reported among international visitors

44 separate outbreaks

87% cases associated with an outbreak

<https://www.cdc.gov/measles/data-research/index.html>

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Measles in the United States

U.S. Cases in 2025

Total cases

1681

Age

Under 5 years: 445 (26%)

5-19 years: 666 (40%)

20+ years: 563 (33%)

Age unknown: 7 (0%)

Vaccination Status

Unvaccinated or Unknown: 92%

One MMR dose: 4%

Two MMR doses: 4%

<https://www.cdc.gov/measles/data-research/index.html>

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Measles in the United States

U.S. Hospitalizations in 2025

12%

12% of cases hospitalized (203 of 1681).

Percent of Age Group Hospitalized

Under 5 years: 22% (97 of 445)

5-19 years: 7% (44 of 666)

20+ years: 11% (62 of 563)

Age unknown: 0% (0 of 7)

<https://www.cdc.gov/measles/data-research/index.html>

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Measles in the United States

U.S. Deaths in 2025

3

There have been 3 confirmed deaths from measles.

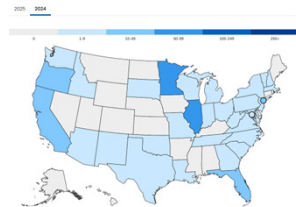
<https://www.cdc.gov/measles/data-research/index.html>

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Measles in the United States

Map of measles cases in 2024 & 2025

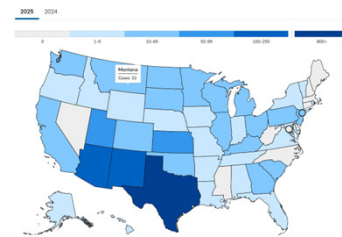
as of May 3, 2025



<https://www.cdc.gov/measles/data-research/index.html>

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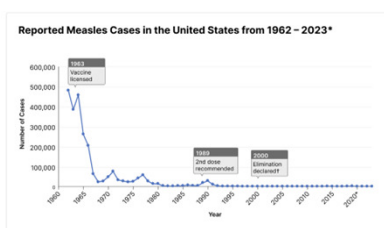
Measles in the United States



<https://www.cdc.gov/measles/data-research/index.html>

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Measles Cases in the USA (1960 to Present)



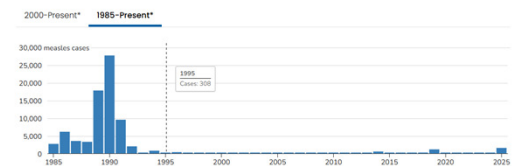
<https://www.cdc.gov/measles/data-research/index.html>

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Measles Cases in the USA (1985 to Present)

Yearly measles cases

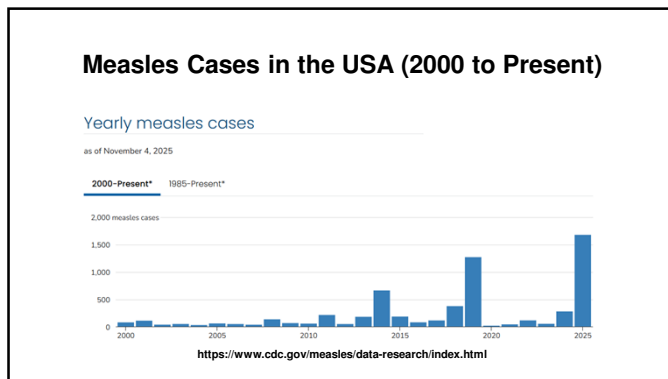
as of November 4, 2025



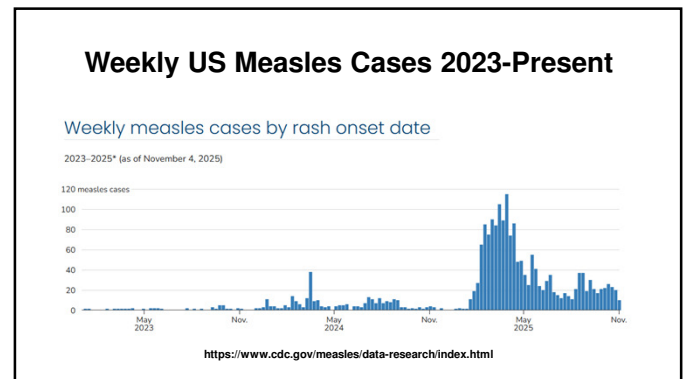
<https://www.cdc.gov/measles/data-research/index.html>

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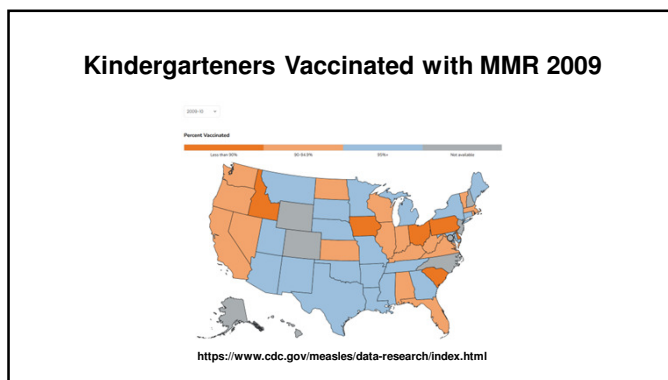
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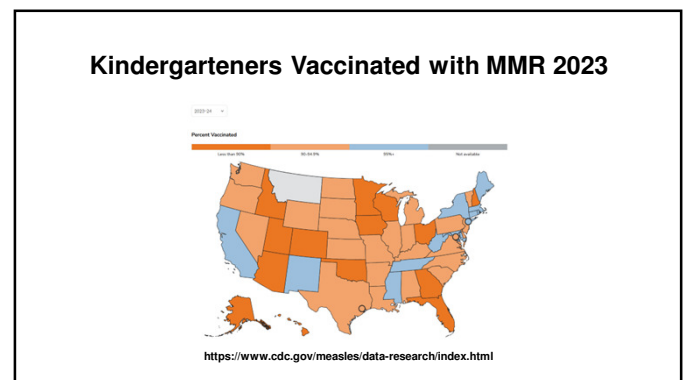
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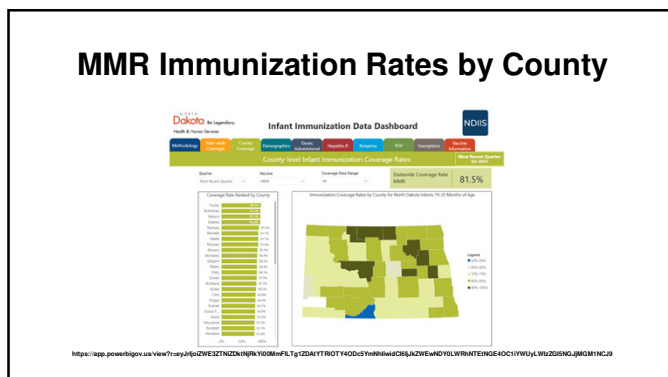
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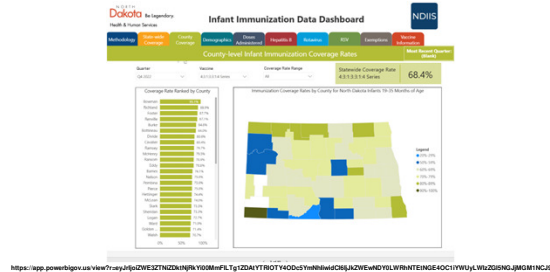


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ND MMR Coverage Rate 2022-Present

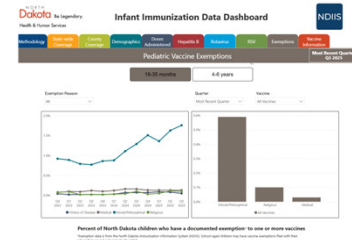
Quarter 3 2025	81.5%
Quarter 2 2025	82.1%
Quarter 1 2025	80.7%
Quarter 4 2024	80.9%
Quarter 3 2024	81.7%
Quarter 2 2024	82.4%
Quarter 1 2024	83.2%
Quarter 4 2023	83.6%
Quarter 3 2023	83.5%
Quarter 2 2023	83.6%
Quarter 1 2023	83.8%
Quarter 4 2022	83.7%

Immunization Rates by County



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ND Vaccine Exemptions for Kids < 3 years old



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What is Measles?

Disease caused by infection with Rubeola Virus

- Enveloped
- Non-segmented negative strand RNA virus
- Exactly one serotype
- Genus Morbillivirus
- Paramyxoviridae family
- Humans are the only reservoir

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Pre-vaccination Era Epidemiology

In the pre-vaccine era (before 1957), disease was universal

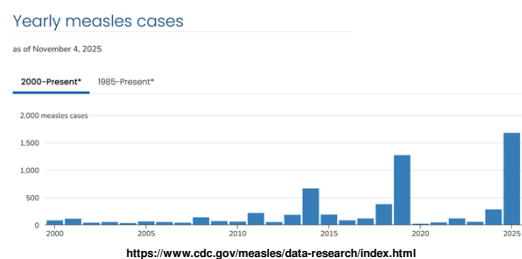
Cyclical epidemics would occur every 2-5 years

Predilection for seasonal transmission in the winter

Immunization rates >95% are required to prevent epidemics

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Measles Cases in the USA (2000 to Present)



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Clinical Characteristics

Incubation Period

Prodromal Phase

- Fever
- Cough
- Non-purulent conjunctivitis
- Coryza (rhinorrhea)
- Enanthem: Koplik spots (buccal mucosa)

Exanthematous Phase:

- Erythematous blanching macules
- Cephalocaudal and centrifugal spread

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Kinetics of Spread

Incubation Period:

Typically 11-12 days (to onset of prodrome)
Typically 14 days (to onset of rash)
Maximum incubation period is 21 days (to appearance of rash)
Minimum incubation period is 4-7 days

Highly contagious R_0 : 12-18

90% of exposed persons will develop disease

Contagious period 4 days prior to rash to 4 days after rash

Day of rash eruption is designated as day 0 for purposes of determining duration of isolation

The Measles Rash

Begins at the peak of respiratory symptoms

14 days after exposure

2-3 days after Koplik spots appear

Starts on the head spreads down to the trunk and out to the extremities

Lasts 3-5 days, followed by fine desquamation

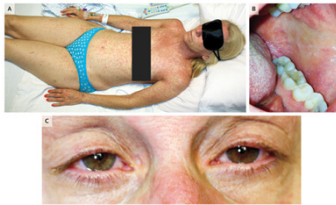
Can become hemorrhagic

High fever peaks 2-3 days after rash onset

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Pictures of Measles



Lilly E. and Srivastava B. N Engl J Med 2015;372:2217

Koplik Spots



Timney L.M. and Wang K.C. N Engl J Med 2006;354:740

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Diagnosis

Serology: Fraught with peril

RT-PCR (Preferred/Standard of Care): Fast, sensitive

Culture: Slow, relatively insensitive, obsolete

How do I order the Measles RT-PCR?

NBLD0637 – Measles (Rubeola) Virus PCR, Acute

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What swab do I use?



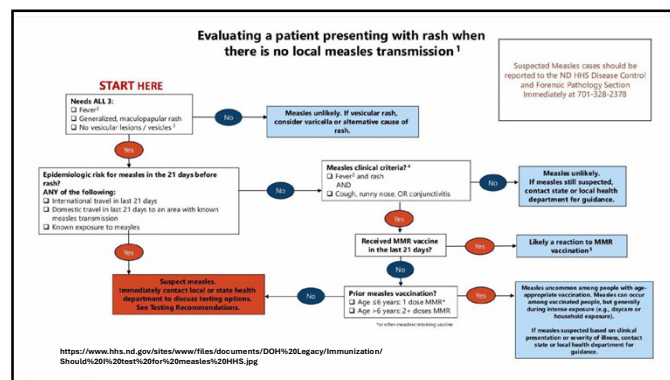
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How do I decide to test or not test?

History of the illness (prodrome, fever, rash)
 Duration of illness
 Exposure history
 Travel history
 Vaccination history
 Examine the rash (is the rash consistent, spread consistent)
 Fever history
 Prodrome

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Evaluating a patient presenting with rash when there is no local measles transmission¹



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If you test, you must report!

CALL IMMEDIATELY!
(701)-328-3386.

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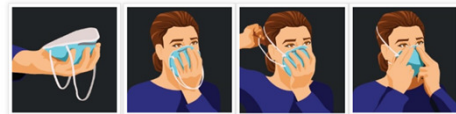
Whom Should I Admit?

Patients who are dehydrated
 Patient who are in respiratory distress or failure or shock
 Patient who are encephalopathic

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Isolation

Airborne precautions until four days after the onset of rash



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Treatment

Supportive Cares!

No approved anti-virals for routine use

Ribavirin for the most profoundly immunocompromised

No monoclonal antibodies

Vitamin A (2 day course)

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Acute Complications

30% of measles cases are complicated

AOM (7-9% of cases)

Croup

Secondary bacterial pneumonia

1-6% of cases

accounts for 60% of deaths

Diarrhea

8% of cases

Acute Encephalitis (1 per 1000 cases)

Anicteric hepatitis

Myopericarditis

Death (1-3 per 1000 cases)

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Post Infectious Neurological Syndromes

Measles inclusion body encephalitis (with 1 year of infection)

Subacute, progressive neurological dysfunction

Subacute sclerosing pan-encephalitis (within 7 years of infection)

Degenerative central nervous system disease

Intellectual deterioration

Behavioral deterioration

Seizures

Nearly universally fatal

Incidence of 1/100,000

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Immunologic Amnesia

Suppression of cell mediated immunity

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Vitamin A Dosing

574

MEASLES

- 200 000 IU (60 000 µg retinol activity equivalent [RAE]) for children 12 months or older;
- 100 000 IU (30 000 µg RAE) for infants 6 through 11 months of age; and
- 50 000 IU (15 000 µg RAE) for infants younger than 6 months.
- An additional (ie, a third) age-specific dose of vitamin A should be given 2 through 6 weeks later to children with clinical signs and symptoms of vitamin A deficiency.

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Prevention

Active Immunization (Useful for Pre and Post Exposure)

Passive Immunization

IMIG

IVIG

Quarantine/Isolation

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Whom Should I Immunize?



NORTH Dakota | Health & Human Services
Be Legendary.

ND HHSS measles outbreak vaccination recommendations for children who live in or visit counties with ongoing measles transmission*		
Age	Number of previous vaccine doses	MMRV vaccine recommendations
0-6 months	0	Vaccination is not recommended
6-11 months	0	- Should receive an early dose of MMRV vaccine immediately - Should receive two additional doses of MMRV vaccine on the regular schedule - First dose at 12-15 months - Second dose at 4-6 years - Receive each dose at least 28 days apart
1-17 years	0	- Should receive first dose immediately - Should receive second dose at least 28 days later
	1	Should receive a second dose of MMRV vaccine at least 28 days after first dose
	2	Fully vaccinated; no additional doses needed

*As of 04/01/2020 counties with ongoing measles transmission include: Beulah, Minot, and Devils Lake. Measles, Mumps, Rubella, and Varicella (MMRV) vaccine should not be utilized in infants under 12 months of age. Last updated: 04/20/2020

Whom Should I Immunize?



North Dakota
Be Legendary

Health & Human Services

ND HHMS measles outbreak vaccination recommendations for adults who live in or visit counties with ongoing measles transmission*		
If you were born	Number of previous vaccine doses	MMR vaccine recommendations
Before 1957	N/A	• Likely exposed to measles as a child; vaccination not needed
Between 1957-1968	0 1 dose of inactivated MMR vaccine 1 dose of live attenuated MMR vaccine	• Should receive first dose immediately • Should receive second dose at least 28 days later • Should receive second dose
After 1968	0 1 2	• Should receive first dose immediately • Should receive second dose at least 28 days later • Should receive a second dose of MMR vaccine at least 28 days after first dose • Fully vaccinated; no additional doses needed
*As of 05/01/2022 counties with ongoing measles transmission includes Williams County Last updated: 05/01/2022		

Whom Should I Immunize?



Health & Human Services

Measles, Mumps, and Rubella (MMR) Vaccine Recommendations for Specific Populations	
Pregnant Women	• Vaccination is not recommended during pregnancy
Severely Immunocompromised Individuals	• MMR vaccine is not recommended for individuals with severe immunodeficiency • Severe immunodeficiency includes hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, long-term immunosuppressive therapy or patients with HIV infection who are severely immunocompromised.
Healthcare Personnel	• Healthcare personnel without presumptive evidence of immunity should get two doses of MMR vaccine, at least 28 days apart.

Last updated: 05/16/2023

[illegible][illegible]

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Post Exposure Prophylaxis

[illegible]

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Who is Immune?

Evidence of Immunity to Measles.² Evidence of immunity to measles includes any of the following:

1. Description of age-appropriate vaccination with a live measles-containing vaccine:
 - Preschool-aged children: 1 dose administered after the first birthday;
 - School-aged children (grades K-12): 2 doses; the first dose administered after the first birthday and the second dose administered at least 28 days after the first dose;
 - Adults not at high risk: 1 dose administered after the first birthday;
 - Adults at high risk (eg, students in postsecondary education institutions, health care workers, international travelers): 2 doses; the first dose administered after the first birthday and the second dose administered at least 28 days after the first dose;
2. Laboratory evidence of immunity;
3. Laboratory confirmation of disease; or
4. Born before 1957.

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Who is contagious?

Persons with measles are contagious from four days prior to rash onset to four days after rash onset.

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Who needs to quarantine?

Susceptible (unvaccinated) persons exposed to contagious persons with measles need to isolate for 21 days (or 28 days from IMIG administration) from the LAST exposure.

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[illegible]

<https://www.hhs.nd.gov/sites/www/files/documents/Public%20Health/immunizations/Measles%20quarantine%20public%20Final.pdf>

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MMR Vaccination

Is safe.....
93% effective after the first dose
97% effective after the second dose

MMR and babies >6 months but < 12 months of age

Safe to give MMR

Dose does not count towards the series

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Should I accelerate MMR series?

If you live in a county with transmission: Yes

If you are travelling to a county with transmission: Yes

If travelling to a foreign country: Yes

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Resources

The Red Book

The ND Department of Health

<https://www.hhs.nd.gov/sites/www/files/documents/DOH%20Legacy/Immunization/Measles%20Fact%20Sheet.pdf>
<https://www.hhs.nd.gov/measles-resources-schools-and-childcare-facilities>

<https://www.hhs.nd.gov/messles-resources-schools-and-childcare-facilities>

<https://www.hhs.nd.gov/messles-resources-healthcare-providers>
<https://www.hhs.nd.gov/sites/www/Files/documents/Public%20M>

<https://www.hhs.nd.gov/sites/www/files/documents/Public%20Health/Immunizations/Measles%20quarantine%20public%20Final.pdf>

<https://www.hhs.nd.gov/sites/www/files/documents/Public%20Health%20Immunizations%20Measles%20isolation%20public%20Final.pdf>
<https://www.hhs.nd.gov/sites/www/files/documents/Public%20Health%20Immunizations%20Measles%20Postexposure%20Prophylaxis%20Guid>

<https://www.hhs.gov/sites/www/files/documents/Public%20Health%20Immunizations%20Manual.pdf>

<https://www.hhs.nd.gov/sites/www/files/documents/Public%20Health/immunizations/Updated%20MMR%20Recommendations.pdf>

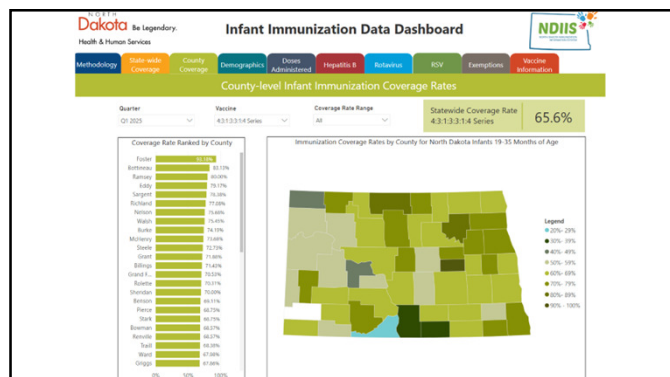
The CDC Website

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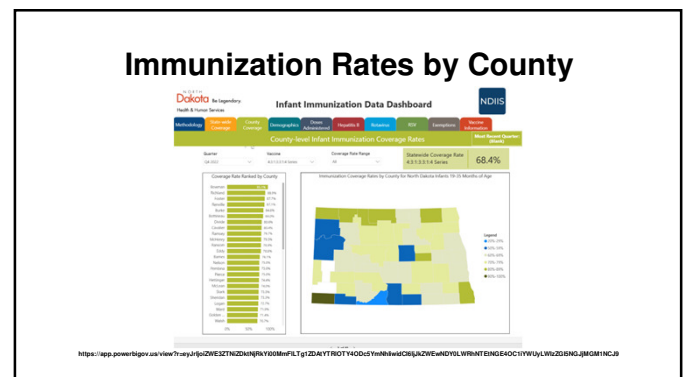
Will other vaccine preventable illnesses re-emerge?

Almost certainly!

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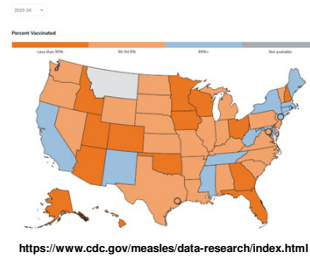
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Will measles go away?

Certainly not!

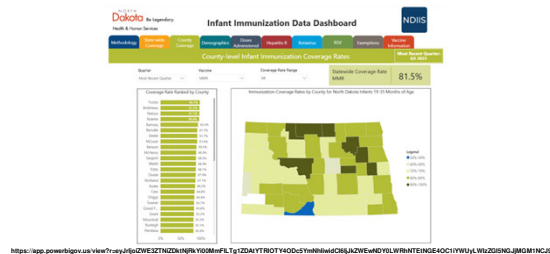
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Kindergarteners Vaccinated with MMR 2023



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MMR Immunization Rates by County



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Advocacy!

**We must fight disinformation within and without.
We must restore what has been torn down.
We must demand more from elected officials.**

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**Thanks to our
Friends at ND
DOH!**

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