Measles Scenario-Based Human Health Risk Assessment for the United States

Updated as of December 6, 2024

Currently, the Center for Outbreak Response Innovation (CORI) judges the measles outbreak in the United States to be in Scenario 2:

	Risk to unvaccinated people	Risk to children	Risk to healthcare workers	Risk to the US general public
Scenario 2 – Development of small to medium-sized outbreaks	Moderate	Moderate	Low	Low

Our confidence in these risk scores is high given the amount of information available locally, nationally, and globally.

Updates of note since the last report on November 22, 2024:

- Currently, only sporadic cases and small-to-medium outbreaks are occurring nationwide.
- Recent measles cases are linked to international travel, emphasizing the need for measles-mumps-rubella (MMR) vaccination, especially with the upcoming holiday season when international travel increases.
    - New Jersey has reported no new cases since the October import-related outbreak (5 cases) which is likely now complete.
    - California reported 1 new import case (not included in CDC reports yet).
    - Minnesota reported 4 new import-related cases (1 not included in CDC reports yet).

Minnesota Outbreak Update:

- While the large Minnesota outbreak is now considered over, measles cases persist due to introduction from travel and gaps in immunity.
- The statewide MMR vaccination rate in Minnesota is approximately 87.7%, based on a 3-year average of kindergarten enrollment data. However, gaps in immunity are evident at the school level. Across Minnesota, 44% of schools with MMR coverage data report vaccination rates at or below 90%. Hennepin, Ramsey, and Anoka counties account for the highest numbers of schools with inadequate immunity, with 21%, 16%, and 6% of schools, respectively, falling below this threshold.
- These counties have also reported the most measles cases this year. While county-level MMR coverage in Hennepin, Ramsey, and Anoka counties ranges from 88.2% to 89.6%,

substantial gaps persist at the school level. For example, in Hennepin County, 45% of schools (excluding 5 schools without available data) have MMR vaccination coverage below 90%, and 11.8% of schools have coverage at or below 70%, placing them at significantly higher risk of outbreaks.

- The Minnesota Department of Health (MDH) has established strong partnerships within the community and among healthcare providers to raise awareness about the measles increase and to promote vaccination. To increase immunization rates, MDH advises healthcare providers to practice strategies such as utilizing the Minnesota Immunization Information Connection (MIIC) system to follow up with unvaccinated individuals, discussing travel plans with patients, reviewing MMR status at every visit, revisiting vaccination conversations with hesitant parents, offering vaccine-only appointments, and using MIIC tools like Client Follow-Up and the texting program for targeted outreach.
- Hennepin County offers free walk-in immunization clinics for infants to 18 years old.

Routine Surveillance Updates as of December 5th, 2024:

- In 2024, a total of 283 measles cases have been reported to the Centers for Disease Control and Prevention (CDC). The majority of cases (70%) have been outbreak-associated, occurred in children under 5 years (42%), and involved individuals who were either unvaccinated or had an unknown vaccination status (89%). There have been 16 outbreaks (defined as three or more related cases) reported in the US. The total also includes numerous sporadic cases, such as internationally imported, US-acquired, or unknown source cases. Out of all cases, 40% of U.S. measles cases required hospitalization, with the highest rate (51%) among children under 5 years old.
- Measles cases have been reported across 32 jurisdictions in the US. * The East North Central region of the US has reported the highest number of measles cases in 2024, with 83 cases, largely due to a now-complete outbreak in Illinois (67 cases). The West North Central Region follows with 72 cases, most of which occurred in Minnesota (69 cases), largely due to a now-complete outbreak (52 cases).

Limitations

- As of November 8th, 2024, the CDC transitioned to biweekly reporting of measles cases. CDC Wonder Table data is often behind.
- Recent data from Minnesota is limited. While information on imported and locally acquired cases is available, there are no detailed updates on the geographic distribution, demographics, or vaccination status of new cases.

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Scenarios

CORI identified 5 key scenarios that may shape the risk of measles in the US for the upcoming year. These scenarios consider the health risks of measles, taking into account the differing impacts to various population groups within the US.

Features that would characterize each scenario include:

- **Scenario 1 – Sporadic cases of measles, no outbreaks (baseline):** In this scenario, the measles virus is occasionally introduced, usually by international travelers, into a community, but transmission lasts for less than 12 months. While sporadic cases can occur in any community with varying vaccination coverage, they often occur in well-vaccinated communities (over 90% coverage). There is no or limited transmission from these cases, with a total of 1–2 related cases, and they do not lead to an outbreak.
- **Scenario 2 – Development of small-to-medium outbreaks:** In this scenario, small-to-medium outbreaks occur, with or without reports of sporadic cases, and do not result in sustained transmission beyond 12 months. These outbreaks usually occur when the measles virus is introduced to an undervaccinated community (90% coverage or less), which leads to a small-to-medium outbreak, ranging from 3 to 49 related cases.
- **Scenario 3 – Development of 1–2 large outbreaks:** In this scenario, large outbreaks occur, with or without reports of small-to-medium outbreaks and/or sporadic cases, and do not result in sustained transmission beyond 12 months. Large outbreaks typically occur in close-knit, undervaccinated settings with high population density, especially when there are pockets of unvaccinated individuals, such as migrant shelters or mass gatherings. This results in a large outbreak, ranging from 50 or more cases.
- **Scenario 4 – Development of 3+ large outbreaks:** In this situation, three or more large outbreaks (50+ cases) occur across different communities, with or without reports of small-to-medium outbreaks and/or sporadic cases and does not result in sustained transmission beyond 12 months. These outbreaks are not connected by a shared chain of transmission but emerge independently due to various factors such as localized drops in vaccination coverage, mass gatherings, or travel-related introductions. Additionally, there may be an increase of sporadic cases in highly vaccinated communities due to widespread prevalence of the virus.
- **Scenario 5 – Sustained transmission beyond 12 months leading to loss of measles elimination status:** In the fifth scenario, the virus maintains sustained transmission, regardless of vaccination coverage levels, for at least 1 year. The sustained transmission

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of the virus results in measles once again becoming endemic in the US. CDC defines endemic transmission as a chain of measles virus transmission that is continuous for 12 months or more within the US. Under this scenario, the US would lose its measles elimination status, which was achieved in 2000.

Scenario-Based Human Health Risk Assessment for the US

Please note: *We are evaluating the risks to human health should each scenario occur,* ***not*** *the relative risk of any one scenario occurring. This risk assessment will be updated regularly.*

	Risk to unvaccinated people	Risk to children	Risk to healthcare workers	Risk to the US general public
Scenario 1 – Sporadic cases of measles, no outbreaks (baseline)	Low-Moderate	Low-Moderate	Low	Low
Scenario 2 – Development of small-to-medium outbreaks	Moderate	Moderate	Low	Low
Scenario 3 – Development of 1-2 large outbreaks	Moderate-High	Moderate-High	Low	Low
Scenario 4 – Development of 3+ large outbreaks	High	High	Low-Moderate	Moderate
Scenario 5 – Sustained transmission beyond 12 months leading to loss of measles elimination status:	High	High	Low-Moderate	Moderate

Our overall **confidence** in these risk scores is high given the current level and availability of information for each of these factors, historical knowledge from past outbreaks on transmission dynamics, and the availability of vaccination and treatment resources.

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Recommendations

To minimize the spread of measles in general, CDC recommends:

- All children receive a routine 2-dose measles, mumps, and rubella (MMR) vaccine: the first dose at age 12 through 15 months and the second dose at age 4 through 6 years (before school entry).
- Adults and teens should also be up to date on MMR vaccinations, with either 1 or 2 doses (depending on risk factors), unless they have other presumptive evidence of immunity to measles, mumps, and rubella.
- Healthcare personnel without presumptive evidence of immunity should get 2 doses of MMR vaccine, separated by at least 28 days.

To minimize the risk of measles transmission due to international travel, CDC recommends:

- Individuals DO NOT travel while sick, especially with a fever and rash.
- Individuals planning to travel outside of the US are fully vaccinated against measles at least 2 weeks prior to departure, in accordance with CDC guidelines.
- Individuals traveling internationally with infants under 12 months old should ensure that their child receives an early dose of vaccine between 6 and 11 months, a second dose at 12 to 15 months, and a final dose at 4 to 6 years, in accordance with CDC guidelines.
- Individuals returning to the US after international travel should monitor their health for 3 weeks and contact their local health department or provider if symptoms such as high fever, cough, or rash develop.

To minimize the spread of measles and the potential for small to medium-sized outbreaks, CDC recommends:

- Provision of post-exposure prophylaxis (PEP) as needed to possibly provide protection or alter the progression of illness.
- Implementation of temporary, accelerated vaccination schedules at the discretion of the state and local health departments.
- Routine documentation of measles immunity status among healthcare professionals to facilitate appropriate PEP or quarantine of individuals in the event of an occupational exposure.

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