

**MEASLES: VACCINATION COVERAGE AND REASONS FOR THE RESURGENCE OF THE DISEASE****Abdisamatova Sarviniso Adisamatovna**

Tashkent State Medical University, Termez Branch

Termez, Uzbekistan

<https://doi.org/10.5281/zenodo.23103394>

**Abstract:** Measles is a highly contagious acute viral infection and remains one of the most important vaccine-preventable diseases worldwide. Despite the availability of an effective and safe vaccine, measles outbreaks continue to occur in different regions, especially where vaccination coverage is insufficient. The resurgence of measles in recent years has been associated with gaps in routine immunization, missed vaccination opportunities during the COVID-19 pandemic, migration, vaccine hesitancy, unequal access to health-care services, and the accumulation of susceptible individuals in certain communities. The purpose of this article is to analyze the epidemiological characteristics of measles, the role of vaccination coverage in controlling transmission, and the major factors contributing to the re-emergence of the disease. The study is based on a review of scientific literature and international public health recommendations. The findings indicate that maintaining high two-dose vaccination coverage, strengthening epidemiological surveillance, identifying unvaccinated individuals, improving public awareness, and ensuring timely outbreak response are essential for controlling measles. Sustained immunization efforts and strong public health systems are necessary to prevent future outbreaks and reduce measles-related complications and mortality.

**Keywords:** measles, vaccination, immunization, vaccination coverage, epidemiology, prevention, herd immunity, outbreak.

**Introduction**

Measles is an acute viral infectious disease caused by the measles virus, which belongs to the genus Morbillivirus. It is one of the most contagious human infections and can spread rapidly among susceptible individuals.

Transmission occurs primarily through respiratory droplets and airborne particles released when an infected person coughs, sneezes, talks, or breathes. The virus can spread efficiently in crowded environments, including kindergartens, schools, universities, hospitals, public transport, and households.

Clinically, measles is characterized by fever, cough, coryza, conjunctivitis, Koplik spots, and a typical maculopapular rash. Although many patients recover without long-term consequences, measles may lead to serious complications, especially in young children, pregnant women, malnourished individuals, and immunocompromised patients.

Complications may include otitis media, pneumonia, severe diarrhea, dehydration, laryngotracheobronchitis, encephalitis, and, in rare cases, subacute sclerosing panencephalitis. These complications demonstrate that measles should not be considered only a mild childhood disease.

## Multidisciplinary research and Innovation (SICMRI 2026)

The widespread use of measles-containing vaccines has substantially reduced measles incidence and mortality. However, vaccination coverage must remain consistently high because the virus can spread rapidly when immunity gaps develop within a population.

In recent years, measles outbreaks have reappeared in several regions of the world. These outbreaks have highlighted the importance of maintaining routine immunization and strengthening public health surveillance.

### Aim of the Study

The aim of this study is to analyze the epidemiological characteristics of measles, evaluate the role of vaccination coverage in controlling the disease, and identify the main causes of the recent resurgence of measles cases.

### Materials and Methods

This study was conducted as a narrative review of scientific literature and international recommendations related to measles epidemiology, vaccination, prevention, and outbreak control.

The analysis included information from:

- World Health Organization publications;
- UNICEF materials;
- international epidemiological surveillance reports;
- scientific articles on measles transmission and vaccination;
- public health recommendations concerning immunization programs.

The main areas of analysis included:

- epidemiological characteristics of measles;
- vaccine effectiveness;
- importance of two-dose vaccination;
- herd immunity;
- causes of declining vaccination coverage;
- vaccine hesitancy;
- migration and population movement;
- outbreak detection and control;
- public health strategies for prevention.

Descriptive, comparative, and analytical methods were used to summarize the available evidence.

### Results and Discussion

#### Epidemiological Characteristics of Measles

Measles is transmitted only among humans, and humans are considered the natural reservoir of the virus.

The disease has an extremely high level of contagiousness. When a susceptible person is exposed to the virus, the probability of infection is high, particularly in enclosed and poorly ventilated environments.

The incubation period is usually approximately 10–14 days, although clinical signs may appear within a broader time range.

One of the epidemiological challenges of measles is that an infected person may transmit the virus before the characteristic rash appears. As a result, the virus can spread before a clinical diagnosis is established.

Individuals who are unvaccinated or incompletely vaccinated are at the greatest risk of infection.

## Multidisciplinary research and Innovation (SICMRI 2026)

If a measles case is introduced into a community with low vaccination coverage, the virus can spread rapidly and cause an outbreak.

### Importance of Measles Vaccination

Vaccination is the most effective method of preventing measles.

Measles-containing vaccines may be administered alone or as part of combination vaccines, such as measles-mumps-rubella vaccines.

A single dose provides strong protection for most recipients; however, some individuals may not develop adequate immunity after the first dose. For this reason, a two-dose vaccination schedule is recommended.

The second dose increases the proportion of individuals who develop effective immunity and reduces the number of people who remain susceptible.

High vaccination coverage provides two levels of protection.

First, vaccination protects the vaccinated individual from infection and severe complications.

Second, when a large proportion of the population is immune, circulation of the virus becomes more difficult. This indirect protection is known as herd immunity.

Because measles is extremely contagious, vaccination coverage must remain very high to interrupt transmission.

Maintaining at least 95% coverage with two doses is widely considered important for preventing sustained measles transmission.

### Reasons for the Resurgence of Measles

The re-emergence of measles is not caused by a single factor. It usually results from a combination of health-system, social, behavioral, and epidemiological factors.

#### 1. Declining Vaccination Coverage

Insufficient vaccination coverage is one of the main causes of measles outbreaks.

When children miss one or both vaccine doses, the number of susceptible individuals gradually increases.

Over time, these immunity gaps may become large enough to support sustained transmission.

Even if national vaccination coverage appears high, local communities may still have much lower levels of protection.

For example, one region may maintain coverage above 95%, while another district or community may have a considerably lower level. These local gaps can create conditions for an outbreak.

#### 2. Disruptions During the COVID-19 Pandemic

The COVID-19 pandemic disrupted routine immunization services in many countries.

Several factors contributed to these interruptions:

- health-care resources were redirected toward pandemic response;
- movement restrictions reduced access to health facilities;
- some parents postponed routine pediatric visits;
- vaccination campaigns were delayed;
- health workers faced increased workloads.

As a result, many children missed scheduled measles vaccinations.

These missed doses created immunity gaps that later contributed to the reappearance of outbreaks.

#### 3. Vaccine Hesitancy

## Multidisciplinary research and Innovation (SICMRI 2026)

Vaccine hesitancy is another important factor contributing to measles resurgence.

Some parents delay or refuse vaccination because of misinformation, fear of adverse effects, distrust in health systems, or misleading information on social media.

False claims about vaccine safety can significantly influence public attitudes.

When vaccine hesitancy becomes concentrated within specific communities, the number of unvaccinated individuals increases and the risk of local outbreaks rises.

Health-care professionals have an important role in addressing these concerns.

Clear, respectful, and evidence-based communication can help parents understand the benefits and safety of vaccination.

### 4. Missed Opportunities for Vaccination

Some children may come into contact with health services but still remain unvaccinated because their vaccination status is not checked or because opportunities for vaccination are missed.

Health-care institutions should regularly review immunization records and offer appropriate vaccination whenever possible.

This approach is particularly important for children who move frequently or have irregular contact with primary health-care services.

### 5. Migration and International Travel

Population movement can contribute to the introduction of measles into previously unaffected areas.

An infected traveler may introduce the virus into a country or community.

However, migration alone does not cause an outbreak.

Large outbreaks usually occur when the virus reaches a population with insufficient immunity.

Therefore, the key issue is not population movement itself but the presence of susceptible individuals in the receiving community.

### 6. Unequal Access to Health-Care Services

Limited access to vaccination services is another important cause of incomplete immunization.

Children living in remote areas, socially disadvantaged communities, conflict-affected areas, or mobile populations may have difficulty accessing regular vaccination services.

Barriers may include:

- long distance to health facilities;
- transportation difficulties;
- lack of information;
- shortage of health workers;
- vaccine supply problems;
- socioeconomic challenges.

Improving access to primary health care and vaccination services is therefore essential.

### 7. Weak Epidemiological Surveillance

Delayed recognition of measles cases can allow the virus to spread before control measures are introduced.

Effective surveillance requires:

- early recognition of suspected cases;
- rapid notification;
- laboratory confirmation;

## Multidisciplinary research and Innovation (SICMRI 2026)

- identification of contacts;
- assessment of vaccination status;
- immediate outbreak response.

Weaknesses in any of these steps can increase the size and duration of outbreaks.

### **Herd Immunity and Its Role in Measles Prevention**

Herd immunity is especially important for measles because of the extremely high transmissibility of the virus.

When most people in a community are immune, the virus has fewer opportunities to spread.

This also helps protect individuals who cannot be vaccinated for medical reasons.

However, herd immunity depends on maintaining consistently high vaccination coverage.

If coverage declines, the protective effect weakens.

For this reason, vaccination programs should focus not only on national averages but also on local communities where vaccination coverage may be lower.

### **Groups at Increased Risk of Severe Measles**

Although anyone without immunity can develop measles, some groups are at greater risk of severe disease and complications.

These include:

- children younger than five years;
- malnourished children;
- immunocompromised individuals;
- pregnant women;
- patients with chronic diseases;
- unvaccinated individuals.

Young children are particularly vulnerable because complications such as pneumonia and dehydration can develop rapidly.

Immunocompromised patients may experience prolonged and severe disease.

Pregnant women with measles may also face increased risks of adverse pregnancy outcomes.

### **Clinical Complications of Measles**

Measles may cause both common and severe complications.

Common complications include:

- otitis media;
- diarrhea;
- dehydration;
- respiratory tract infections.

More serious complications include pneumonia and encephalitis.

Pneumonia is one of the most important causes of measles-related hospitalization and mortality.

Encephalitis may result in neurological damage.

A rare but serious late complication is subacute sclerosing panencephalitis, a progressive neurological disorder that may develop years after the initial infection.

These complications further emphasize the importance of prevention through vaccination.

### **Prevention Measures**

#### **Routine Two-Dose Vaccination**

**Multidisciplinary research and Innovation (SICMRI 2026)**

Routine vaccination remains the central strategy for measles prevention.

Children should receive measles-containing vaccines according to the national immunization schedule.

Both doses should be administered on time.

A strong routine immunization system prevents the accumulation of susceptible children and reduces the likelihood of outbreaks.

**Catch-up Vaccination**

Children and adolescents who missed scheduled vaccination should be identified and offered catch-up vaccination.

Catch-up programs are particularly important after disruptions to routine immunization services.

Health-care providers should review vaccination records and ensure that missing doses are administered.

**Epidemiological Surveillance**

Surveillance systems should rapidly identify suspected measles cases.

Every suspected outbreak should be investigated promptly.

Laboratory confirmation is important because several other diseases may cause fever and rash.

Surveillance data should be used to identify areas with low vaccination coverage and to guide targeted interventions.

**Isolation of Infected Patients**

Patients with suspected or confirmed measles should be isolated from susceptible individuals.

This is especially important in hospitals, clinics, schools, and other settings where transmission can occur quickly.

Appropriate infection-control procedures should be followed to prevent health-care-associated transmission.

**Public Education**

Public awareness is a major component of measles prevention.

Parents should receive reliable information about:

- the seriousness of measles;
- the effectiveness of vaccination;
- the safety of vaccines;
- the importance of receiving both doses;
- the consequences of delaying vaccination.

Health education should also address common misconceptions and misinformation.

**Training of Health-Care Workers**

Health-care workers should be trained to recognize early signs of measles and respond appropriately.

They should know how to:

- obtain an epidemiological history;
- identify suspected cases;
- implement isolation measures;
- report cases;
- recommend vaccination;
- communicate effectively with patients and parents.

## Multidisciplinary research and Innovation (SICMRI 2026)

Regular professional training can improve outbreak preparedness.

### **The Role of Public Health Institutions**

Measles prevention requires coordinated action at several levels.

Primary health-care institutions should maintain accurate vaccination records and actively follow children who miss scheduled doses.

Public health authorities should monitor vaccination coverage and disease incidence.

Laboratories should provide timely confirmation of suspected cases.

Educational institutions should cooperate with health authorities during outbreaks.

Mass communication campaigns should provide clear information and counter misinformation.

A strong coordination system helps ensure early detection and rapid response.

### **Discussion**

The available evidence shows that measles outbreaks are closely associated with immunity gaps in the population.

The existence of an effective vaccine does not automatically guarantee disease elimination.

High vaccination coverage must be sustained over time and across all geographic and social groups.

The recent resurgence of measles demonstrates that even temporary disruptions in immunization services may have long-term consequences.

The COVID-19 pandemic provided a clear example of this process. When routine vaccination declined, the number of susceptible children increased.

Once population movement and social contact returned to normal levels, measles transmission became easier in communities with immunity gaps.

Vaccine hesitancy represents an additional challenge.

Traditional vaccination programs may not be sufficient if parents do not trust vaccines or health-care providers.

Therefore, modern measles prevention must include both vaccination services and effective risk communication.

Another important lesson is that national averages may hide local vulnerabilities.

A country may report high overall vaccination coverage while still having districts, communities, or social groups with much lower protection.

For this reason, local data should guide public health interventions.

Strengthening surveillance is also essential.

Rapid detection allows public health authorities to isolate cases, identify contacts, assess immunity, and organize emergency vaccination when necessary.

Therefore, the most effective strategy combines routine vaccination, catch-up campaigns, surveillance, public education, and rapid outbreak response.

### **Practical Recommendations**

To reduce the risk of measles outbreaks, the following measures are recommended:

1. Maintain at least 95% coverage with two doses of measles-containing vaccine.
2. Identify children who have missed scheduled doses.
3. Implement catch-up vaccination programs.
4. Strengthen electronic or paper-based vaccination registries.
5. Improve access to vaccination in remote and disadvantaged communities.

## Multidisciplinary research and Innovation (SICMRI 2026)

6. Provide evidence-based information to parents.
7. Counter vaccine misinformation through trusted health professionals.
8. Ensure rapid laboratory confirmation of suspected cases.
9. Strengthen infection-control measures in health-care facilities.
10. Monitor vaccination coverage at national, regional, district, and community levels.
11. Train health-care workers in early diagnosis and outbreak response.
12. Improve communication between public health institutions, educational organizations, and primary health-care services.

**Conclusion**

Measles remains a major vaccine-preventable public health problem despite the availability of an effective vaccine.

The recent resurgence of the disease is mainly associated with insufficient two-dose vaccination coverage, disruptions in routine immunization, missed vaccination opportunities, vaccine hesitancy, migration, unequal access to health services, and weaknesses in epidemiological surveillance.

The most effective strategy for measles control is to maintain consistently high two-dose vaccination coverage in every community.

Particular attention should be given to identifying unvaccinated and incompletely vaccinated children.

Catch-up immunization programs should be implemented whenever immunity gaps are detected.

At the same time, epidemiological surveillance, laboratory diagnosis, outbreak response, public education, and professional training of health-care workers should be strengthened.

Preventing measles requires continuous and coordinated action rather than temporary interventions during outbreaks.

Sustained immunization, public trust in vaccination, and strong surveillance systems are essential for reducing measles incidence, preventing severe complications, and ultimately achieving long-term control of the disease.

**References**

1. World Health Organization. Measles. Geneva: WHO.
2. World Health Organization. Immunization Coverage. Geneva: WHO.
3. World Health Organization. Measles and Rubella Strategic Framework 2021–2030. Geneva: WHO.
4. WHO, UNICEF. Estimates of National Immunization Coverage.
5. UNICEF. Measles and immunization in Europe and Central Asia.
6. Centers for Disease Control and Prevention. Measles Vaccination. Atlanta: CDC.
7. Centers for Disease Control and Prevention. Clinical Overview of Measles. Atlanta: CDC.
8. Moss W.J. Measles. *The Lancet*. 2017;390:2490–2502.
9. Hübschen J.M., Gouandjika-Vasilache I., Dina J. Measles. *The Lancet*. 2022;399:678–690.