

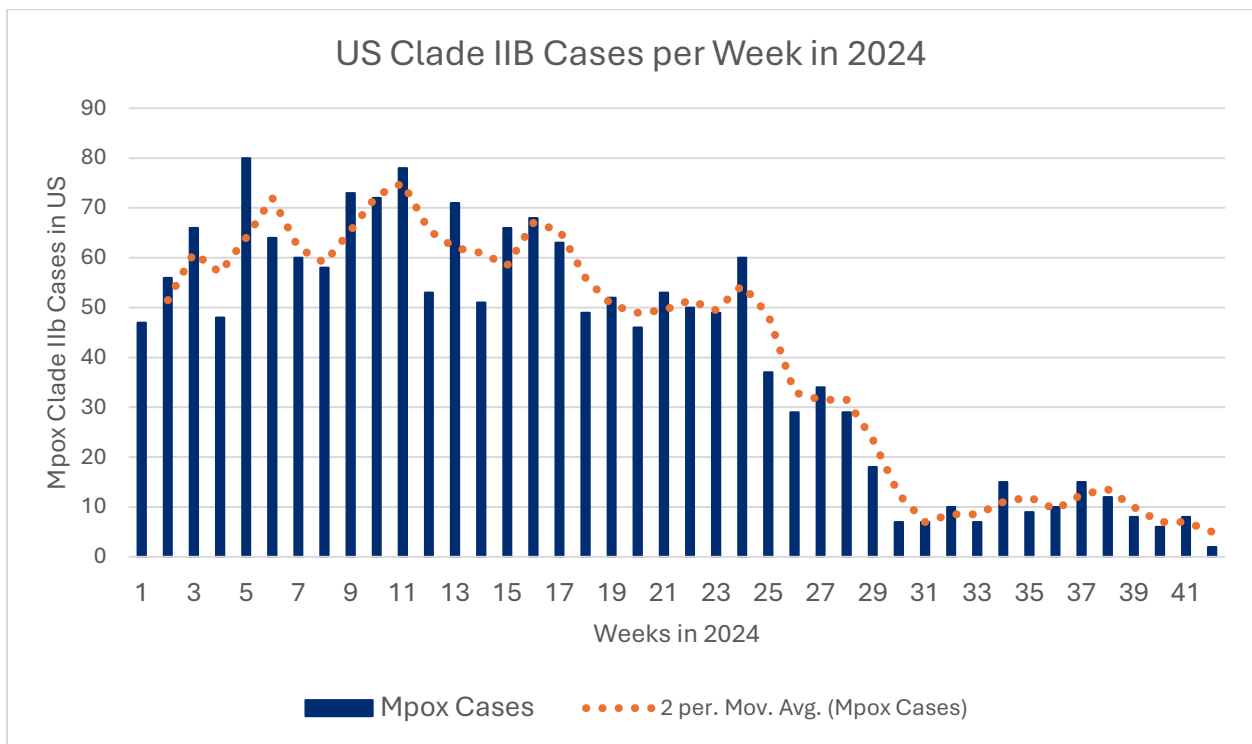
# Mpox Virus: Clade I and Clade II



## Summary

The mpox virus is classified into 2 main clades, clade I and clade II, with each further subdivided into clade Ia, the [newly identified clade Ib](#), clade IIa, and clade IIb, the clade which was responsible for the 2022 global outbreak. Since the 2022 clade IIb mpox outbreak began, there have [more than 109,699 cases](#) and more than 236 deaths reported in 123 countries, though world-wide reported data likely do not include the most recent outbreaks of clade I in the Africa region. According to the US Centers for Disease Control and Prevention (US CDC) and the World Health Organization (WHO), the [US has reported](#) 34,063 mpox cases as of September 30, 2024. The US outbreak has continued to grow at a low but steady pace in 2024, with [2,230 cases recorded year to date as of October 19, 2024](#). With the continued transmission of clade IIb in the US and globally and the increased transmission of clade I and II in the Africa region, experts are concerned that changes in the national and global landscape have the potential to increase health risks for specific US populations.

## US Epi Curve:



# Mpox Virus: Clade I and Clade II



## Key Updates

### Global Response

- In a press briefing on October 24, 2024, Africa CDC discussed a new trend that [correlates measles and mpox infections](#), highlighting the need for vaccinations for both diseases. [Vaccination efforts in DRC](#) have begun in 6 provinces.
- In response to the mpox outbreaks, the WHO and member states activated the [Global Health Emergency Corps](#) to support countries with active outbreaks.
- [Africa CDC issued a statement](#) that urged countries to not implement travel bans, in accordance with International Health Regulation on October 8, 2024.
- The [WHO approved the age extension authorization](#) for the prequalified MVA-BN vaccine to include children ages 12-17, per the European Medicines Agency recommendation.

### Both Clades

- Zimbabwe announced their [first two cases of mpox](#) (clade unknown) on October 13, 2024.
- [Zambia announced their first case of mpox](#) (clade unknown) on October 10, 2024.
- The EU's [Health Emergency Preparedness and Response Authority delivered 5,420 doses](#) of MVA-BN to Rwanda on October 6, 2024.
- There are multiple new and ongoing outbreaks of mpox clades Ia, Ib, and IIb across Africa. [As of October 26, 2024](#), a total of 45,674 cases (9,298 confirmed) and 1,014 deaths (case fatality ratio [CFR] of 2.3%) were reported from 18 African Union Member States. DRC accounts for about 80% of cases and deaths.

### Clade I

- The [UK detected](#) their first case of clade Ib mpox on October 30, 2024 in an individual with a recent travel history.
- [Germany](#) detected their first case of mpox on October 18, 2024. EU CDC confirmed clade Ib was detected in an individual with a recent travel history.
- [Increases in clade I cases continue](#) to be documented across the African Continent (see details on country-specific case and death counts below).
- [Since the beginning of the year](#), DRC has recorded more than 42,000 confirmed or suspected cases, with over 1,000 deaths (see detailed DRC section below).
- The [likelihood that cases of clade I](#) will be imported to the US has increased in recent weeks as cases have begun to be detected in countries outside of the Africa region.

### Clade II

- A [MMWR from October 10, 2024](#) discussed a second cluster of mpox cases in the US that were caused tecovirimat-resistant monkeypox virus.

For more information about specific mpox scenarios and health risks, see the [CORI Mpox Resource Page](#).

# Mpox Virus: Clade I and Clade II



## Background

The monkeypox (mpox) virus—a serious viral zoonosis endemic in west and central Africa—is classified into 2 main clades, clade I and clade II, with each further subdivided into clade Ia, the [newly identified clade Ib](#), clade IIa, and clade IIb. Clade I mpox is generally associated with higher CFRs (1.4% to ~10%) compared with clade II (0.1% to 3.6%).

In 2022, the epidemiology of clade IIb mpox shifted dramatically. The virus, which is historically transmitted through close contact with infected wildlife or infected persons, found a foothold in the sexual networks of gay, bisexual, and other men who have sex with men, including in the United States and Europe. Although the clade IIb virus is capable of transmission via respiratory droplets, short-range aerosols, or contact with contaminated objects (fomite transmission), the [majority of cases from the global epidemic were acquired through close, extended physical contact](#), particularly intimate or sexual contact.

The change in epidemiology and rapid spread of the virus in 2022 required urgent public health action, and WHO declared the outbreak a public health emergency of international concern (PHEIC) on July 23, 2022. Public health officials and community-based organizations in the US and worldwide [mounted a response](#) that included health education, awareness raising, testing, treatment, and vaccination with a vaccine that was originally designed to protect against smallpox but is also effective against mpox. By late summer, the public health response began to slow transmission. Vaccination campaigns and targeted interventions significantly reduced the number of new weekly cases. However, [cases continue to occur among individuals at increased risk of infection](#), particularly those who have not been vaccinated or have received only 1 dose of the 2-dose vaccine.

In 2024, the DRC has experienced an unprecedented number of clade I mpox cases, with transboundary cases occurring in several neighboring countries. Additionally, a [new offshoot of clade I has emerged](#), called clade Ib, that may be causing more severe disease. Before April 2023, [there were no formally documented cases of sexual transmission of clade I mpox](#), but many clusters of sexual transmission have since been recorded in the DRC. Notably, 4.3%–5.7% of all suspected and confirmed clade I cases in DRC reported from January 1, 2023, to April 14, 2024, have been fatal. Additionally, 67% of all cases and 78% of deaths have [occurred among children aged 15 years and younger](#).

This new mode of sexual transmission, as well as other possible modes of transmission, and newly or more severely affected groups such as heterosexual sex workers and children, raise additional concerns over the continuing rapid expansion of the DRC outbreak.

# Mpox Virus: Clade I and Clade II



## Key Public Health Recommendations

To minimize the health impact of mpox in the US, [CDC](#) and WHO recommend the following for clinicians and health departments:

- Implement prevention strategies:
  - Recommend all [adults at an elevated risk of infection](#) and those planning travel to affected countries [receive 2 doses of JYNNEOS](#) vaccine administered 28 days apart.
  - Mass gathering [event planning and preparedness activities](#) should foster community-based actions aimed at spreading precise and practical public health advice with a nondiscriminatory approach, utilizing different media and incorporate educational and awareness-raising initiatives related to mpox and other diseases of concern.
- Consider mpox as a potential diagnosis:
  - In patients with consistent symptoms and epidemiological risk factors, including those with recent travel to DRC or neighboring countries or contact with symptomatic individuals from affected areas.
  - In vaccinated individuals or those previously diagnosed with mpox.
- Implement proper infection control and patient management:
  - Follow CDC guidance on infection prevention and control to minimize transmission risk.
  - Advise suspected cases to isolate from others and counsel on preventing household transmission through disinfection practices.
  - Consult health departments or CDC for severe cases, especially those with advanced HIV.
- Ensure thorough laboratory testing:
  - Evaluate all suspected cases with laboratory testing, not only clinical diagnosis.
  - Follow specimen collection guidelines and send specimens to appropriate state or commercial laboratories.

## Available Medical Countermeasures

While clades I and II mpox viruses are genetically similar enough that [vaccines and treatments are expected to be effective](#), it is [not well understood](#) how prior infection with clade IIb (responsible for the ongoing global outbreak) or vaccination might protect from infection with or complications from clade I. [CDC recommends](#) that all individuals with an elevated risk of infection receive 2 doses of JYNNEOS vaccine for the best protection against both clades I and II.

The DRC National Regulatory Authority [recently authorized](#) 2 vaccines for emergency use, MVA-BN (brand name JYNNEOS in the US) and LC16 (Japan). As part of its standing recommendations, [WHO advises](#) countries to make vaccines available to nations in need.

In March 2024, the US Food and Drug Administration (FDA) issued Emergency Use Authorizations (EUAs) for an [in vitro mpox diagnostic device](#) and an [mpox home test collection kit](#).

# Mpox Virus: Clade I and Clade II



## Current Global Response

### *World Health Organization*

The [WHO added the MVA-BN vaccine to its prequalification list](#) on September 13, 2024, which will allow speedier procurement and country-based approval processes of the Bavarian Nordic vaccine.

In his opening remarks at an information session on mpox on August 23, 2024, WHO Director-General called for [\\$135 million in emergency funding](#) to address the growing mpox outbreak

On August 14, 2024 the World Health Organization (WHO) [declared the current outbreaks](#) of multiple clades of mpox in the Democratic Republic of Congo (DRC), and nearby countries in Africa, to be a [Public Health Emergency of International Concern \(PHEIC\)](#). WHO also:

- Elevated the global mpox outbreak to an acute Grade 3 emergency in accordance with the WHO Emergency Response Framework and issued guidance to WHO Member States.
- Released funds from its Contingency Fund for Emergencies (CFE), developed a US\$15 million regional response plan, and authorized an additional US\$1 million of emergency funding to boost response efforts.
- Extended for an additional year the WHO Director General's [Standing Recommendations for mpox](#) first issued on August 21, 2023.
- Began the process for Emergency Use Listing for 2 mpox vaccines to ease access and distribution processes, including distribution aid from GAVI and UNICEF.

### *Africa Centres for Disease Control and Prevention (Africa CDC)*

Africa CDC declared this outbreak to be a [Public Health Emergency of Continental Security \(PHECS\)](#), signaling the increased threat of international spread posed by this virus. A large driver of these declarations is the spread of clade Ib.

### *European Union (EU)*

The [EU announced](#) that they aim to deliver 566,000 doses of Bavarian Nordic mpox vaccine to affected countries throughout Africa. The first batch of 99,000 doses arrived in the DRC on September 6, 2024, and more are routed for Burundi.

[The European Medicines Agency recommended](#) expanding the indication for the MVA-BN vaccine to include children ages 12-17 years old on September 19, 2024.

### *GAVI*

[GAVI announced](#) on September 18, 2024, that they will purchase, transport, deliver, and administer 500,000 doses of the Bavarian Nordic vaccine across Africa. Details on timing have not yet been disclosed.

# Mpox Virus: Clade I and Clade II



## *Global Fund*

[The Global Fund announced](#) on September 18, 2024 that it will be supporting the DRC's efforts to combat mpox with \$9.5 million in emergency funds. Contributions include enhancing surveillance systems, boosting laboratory capacity, risk communication, infection prevention and control measures, supporting country-level coordination efforts, and strengthening health facility capacity.

## *United States*

[50,000 doses](#) of US-donated JYNNEOS vaccine arrived in DRC on September 10, 2024.

## *USAID*

USAID has announced on August 20, 2024 [an additional \\$35 million](#) in support for the mpox outbreak in Central and Eastern Africa, bringing total US financial support to \$55 million. [USAID announced](#) on August 7, 2024, that the agency will donate 50,000 Bavarian Nordic mpox vaccines to the DRC and \$10 million in health assistance for critical public health interventions in response to the mpox outbreak in DRC and the region.

## *US Centers for Disease Control and Prevention (US CDC)*

CDC issued a [Health Alert Network notice](#) (HAN) on August 7, 2024, the first CDC health advisory on mpox since December 2023. Details include expanded guidance for clinical examination, treatment and prevention, state and local health departments, laboratories, and the general public.

## **Current Outbreak Country Profiles**

### *United States (Clade IIb Outbreak)*

To date, [all mpox cases reported within the US are of the clade IIb subtype](#). Since 2022, the US outbreak has grown to more than [34,063 cases](#) and 63 deaths. The recorded number of mpox cases was relatively stable in the US from July 2023 to January 2024, with few ongoing sporadic cases and clusters. In 2024, outbreaks of clade IIb mpox remain a concern in the US, especially as summer festivals, increased travel, celebrations, and other events that bring people together from around the world occur. High levels of immunity from prior infections and vaccination help mitigate the risk of large outbreaks. Individuals at highest risk for clade IIb infection are gay, bisexual, and other men who have sex with men; people with multiple sexual partners; sex workers; and healthcare workers caring for infected patients.

### *Democratic Republic of the Congo (Clade I Outbreak)*

The [DRC government declared a national epidemic](#) in December 2022 for what is the largest surge in mpox cases ever recorded in the country. Since the beginning of this year and as of October 26, 2024, [WHO has reported](#) 7,534 confirmed and 35,925 suspected cases of clade I mpox and 1,006 deaths in DRC, for a CFR of 2.9%. Based on the extent of the DRC outbreak, in combination with the

# Mpox Virus: Clade I and Clade II



demographic characteristics and the genetic diversity of cases, [experts suspect that multiple transmission factors](#) are driving the outbreak, including zoonotic, household, and sexual.

The current DRC clade I outbreak is widespread, [affecting all of the country's 26 provinces](#), including the capital city of Kinshasa. The highest transmission rates have been in Equateur and Sud-Kivu. The province of Equateur remains the epicenter, contributing more than [half of the country's suspected cases](#) and three-quarters of deaths in 2024 alone. The clade I outbreak has [mostly affected children](#), with 66% of cases and 82% of deaths among individuals ages 15 and younger. Experts believe this is likely because younger children were never vaccinated against the related smallpox virus; vaccination was discontinued shortly after smallpox was eradicated in 1980. Many children in the region also suffer from malnutrition, making it more difficult for their bodies to fight infection.

Notably, a new [more dangerous strain of clade I mpox virus was documented in June 2024](#) in Sud-Kivu, described as an outbreak having pandemic potential that warrants urgent public health and case management support and targeted vaccination. However, vaccines are so far unavailable in the DRC, although their distribution and use has been authorized. According to experts, the clade Ib infections in DRC are being transmitted through sexual contact, particularly among sex workers and their contacts, as well as household and direct contact, and presenting with whole body or genital lesions that last longer than clade IIb symptoms. The more severe cases have a mortality rate near 5% in adults and 10% in children and have been associated with pregnancy loss.

Other cases and clusters of mpox have been reported in Africa, Asia, and Europe in 2024, including:

## **Africa**

### *Burundi (Clade Ib Outbreak)*

On July 25, 2024, the Burundi Ministry of Health and [Africa CDC](#) reported the first-ever cases of mpox in the country, with 3 confirmed cases. [By October 26, 2024](#), there 3,026 confirmed or suspected cases and no deaths. Children <15 account for 48% of the cases.

### *Cameroon (Clade II Outbreak)*

Since the beginning of 2024, [Cameroon has recorded](#) 109 confirmed and suspected mpox cases and 2 deaths. Children under 15 years of age account for 60% of all confirmed cases.

### *CAR (Clade II Outbreak)*

Since the start of the year, CAR has detected [103 confirmed and suspected clade Ia mpox cases](#) and two deaths across 6 of its 10 regions. Of the confirmed cases, children <15 years of age account for 60% of the cases.

# Mpox Virus: Clade I and Clade II



## *Cote d'Ivoire (Clade II Outbreak)*

As of August 16, 2024, the [Cote d'Ivoire](#) reported 2 confirmed mpox cases and activated its emergency health system in response. Africa CDC [reports on October 12, 2024](#) a total of 343 confirmed or suspected cases and one death due to clade II mpox.

## *Gabon (Clade Ia Outbreak)*

On August 22, 2024, the [Gabon Ministry of Health](#) confirmed a case of mpox in an individual with travel history to Uganda. By October 26, 2024, [Africa CDC reports](#) 24 cases and no deaths.

## *Ghana (Clade IIb Outbreak)*

On October 2, 2024, [Ghana reported their first confirmed mpox case of the year to Africa CDC](#). The case was detected in a 15-year-old male with no travel or sexual history. [Since the beginning of the year](#), there have been 230 suspected cases, two of which have been confirmed and no deaths.

## *Guinea (Unknown Clade Outbreak)*

On [September 3, 2024](#), the Guinea National Agency for Health Security reported 1 confirmed case and 23 suspected cases, the first outbreak since 2022. The confirmed case had no history of recent travel. There currently is no available clade-specific data. As of September 30, 2024, [Africa CDC reports](#) 41 cases (1 confirmed).

## *Kenya (Clade Ib Outbreak)*

On July 31, 2024, the [Kenyan Ministry of Health](#) announced a case of mpox linked to an individual who traveled from Uganda to Rwanda via Kenya. On October 26, 2024, [Africa CDC reports](#) 14 confirmed cases and one death.

## *Liberia (Clade II Outbreak)*

Since the beginning of the year, [Liberia has detected](#) 8 confirmed and 85 suspected mpox cases and no deaths. [WHO reports](#) that the outbreak is clade II. [Africa CDC reports](#) a total of 254 suspected or confirmed cases and no deaths as of October 26, 2024.

## *Morocco (Clade IIb Outbreak)*

On September 12, 2024, [Morocco reported their first case of mpox](#). Africa CDC released an updated outbreak report as cases of [mpox continue to expand within the continent](#) and have now reached all 5 regions.

## *Nigeria (Clade IIb Outbreak)*

On October 21, 2024 [Nigeria has reported](#) 1,297 cases (94 laboratory confirmed) of clade II mpox and no deaths for the year to date



# Mpox Virus: Clade I and Clade II



## *Republic of the Congo (ROC) (Clade Ia Outbreak)*

[ROC has recorded](#) 162 confirmed and suspected cases of clade I mpox and 1 death since the beginning of the year. [WHO confirmed](#) that the subclade is clade Ia. On October 26, 2024, [Africa CDC](#) reported a total of 239 cases (22 confirmed) and no deaths. Children under 15 years of age account for 38% of all cases.

## *Rwanda (Clade Ib Outbreak)*

The Rwandan Ministry of Health [reported 4 confirmed](#) cases of clade Ia mpox [WHO confirmed](#) that the subclade is clade Ib.

## *South Africa (Clade IIb Outbreak)*

In May 2024, South Africa announced its first confirmed case of mpox clade IIb. By [September 9, 2024](#), South Africa has reported [25 confirmed cases and 3 deaths](#). The cases are all male, aged between 17-43 years, almost all self-identified as MSM, most are living with HIV, and many [displayed severe clinical presentation](#) and were hospitalized for mpox. Of 5 cases with available viral sequence data, all were [confirmed to be clade IIb](#).

## *Uganda (Clade Ib Outbreak)*

On August 3, 2024, Uganda reported its first 2 cases of mpox ever in people who had crossed the border into DRC. [WHO confirmed](#) the cases were clade Ib. As of October 26, 2024, there are a total of [152 confirmed cases and no deaths](#) of clade Ib mpox.

## *Zambia (Unknown Clade Outbreak)*

On October 10, 2024, [the Zambian Ministry of Health confirmed the first case](#) of mpox in a 32-year old male Tanzanian truck driver. There is no clade-specific data currently available.

## *Zimbabwe (Unknown Clade Outbreak)*

The [Zimbabwe Ministry of Health](#) declared their first case of mpox on October 13, 2024, detected in an 11-year-old male with a recent travel history. [By October 21, 2024](#), there have been 2 cases and no deaths. There is no clade-specific information available currently.

## **Asia**

### *India (Clade Ib and IIb Outbreaks)*

On September 23, 2024, [India reported their first case of clade Ib mpox](#). There was no mention of travel history in the case.

# Mpox Virus: Clade I and Clade II



On September 8, 2024, [India reported](#) a case of [clade IIb mpox](#) on September 8, 2024 in an individual with a recent travel history. [As of September 23, 2024](#), there have been at least 32 cases and one death since 2022. On [September 30, 2024](#), an individual tested positive after travel from the UAE.

## *Jordan (Unknown Clade Outbreak)*

On September 2, 2024 [Jordan's health ministry](#) announced that they had detected their first case of mpox since 2022. The 33-year-old man is not a resident of the country and is currently in isolation. No clade specific information is available at this time.

## *Pakistan (Clade I Outbreak)*

On August 16, 2024, [Pakistan detected its first case](#) of clade I mpox (no subclade detected). The individual who tested positive has a recent travel history to the Middle East.

## *Philippines (Clade IIb Outbreak)*

On August 19, 2024, the [Philippines detected](#) a case of mpox in an individual with no recent travel history, the first case since December 2023. [As of September 16,](#) 2024, the Health Secretary announced 18 cases, all of which are clade II.

## *Singapore (Clade IIb Outbreak)*

On August 22, 2024, the Singapore Ministry of Health confirmed [13 cases of clade II](#) mpox.

## *Thailand (Clade Ib Outbreak)*

[Thailand reported](#) its first suspected case of [clade Ib](#) on August 23, 2024. The individual who had tested positive had recently traveled from the Africa region.

## **Europe**

### *Germany (Clade Ib Outbreak)*

On October 18, 2024, Germany acquired and detected [their first case of clade Ib](#) mpox, diagnosed in an individual with a recent travel history.

### *Sweden (Clade Ib Outbreak)*

On August 15, 2024, [Sweden reported its first case](#) of clade I mpox, detected in an individual who has recently traveled to areas with cases of mpox in Africa.

### *UK (Clade Ib Outbreak)*

The UK Health Security Administration announced on October 30, 2024. that they had detected [their first case of clade Ib mpox](#) in an individual with a recent travel history.



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# Mpox Virus: Clade I and Clade II



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