Mpox Scenario-Based Human Health

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Evolving Outbreaks Updates

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 106,310 cases and more than 234 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. The US has reported 33,812 mpox cases and 61 deaths as of September 30, 2024. The US outbreak has continued to grow in 2024, with 2,179 new cases recorded year as of September 28, 2024.

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Multiple countries across the world have experienced increased mpox activity in July, August, and September of 2024, with new detections of clade I and IIb in at 16 countries in Africa and new cases reported in the Americas, Europe, and Asia.

Unlike clade IIb, which is primarily limited to the MSM community, the new clade Ib mpox now shows distinct epidemiological and clinical trends. Clade I has predominantly been detected in the DRC, with positive cases in all 26 provinces, however there have been outbreaks across Africa and cases reported in India, Sweden, Pakistan, and Thailand in the summer of 2024. Historically, clade I has disproportionately impacted children—both in incidence and severity—a dynamic that remains consistent in the current clade I DRC outbreak. Currently, 67% of cases and 78% of deaths from Clade I in the DRC have been among persons 15 years or younger. Clade I patients usually present with a more pronounced, diffuse rash, and the virus is more transmissible than clade IIb Infections with clade I mpox are also more severe and more deadly than infections with clade IIb. The fatality risk ranges from 1.4 to more than 10%, whereas the CFR for clade II is between 0.1% and 4% The exact animal reservoirs and routes of transmission placing the most affected populations at risk for clade I mpox currently remain unclear, although it is expected that many routes (zoonotic, household exposure, and sexual transmission) are the key drivers. whereas the CFR for clade II is between 0.1% and 4% The exact animal reservoirs and routes of transmission placing the most affected populations at risk for clade I mpox currently remain unclear, although it is expected that many routes (zoonotic, household exposure, and sexual transmission) are the key drivers.

The DRC declared mpox a national epidemic in December 2022 due to rising numbers of cases and deaths. Most cases have been reported in children aged 15 years and younger. The CFR is significantly higher among children than among adults, particularly infants younger than 1 year. Africa CDC reports that almost 70% of the cases in DRC are in children younger than 15 and that the caseload in this age group accounts for 85% of all deaths. Epidemiologists have also documented heterosexual transmission in the DRC epidemic, particularly involving sex workers, constituting another epidemiological difference compared to the global clade II epidemic.

**Please note:* *Detailed mpox situation updates are available on the CORI website.*

Mpox Scenario-Based Human Health Clade I Risk Assessment for the United States

Appendix: Additional Details on Process and Recommendations

Scenario 1: Clade I Surge in Africa

Summary

- Viral group: clade Ib and IIb
- Projected primary population impacted: MSM community, sex workers, and children

This scenario anticipates an increase in clade I and II mpox transmission in Africa, with similar severity of disease for each respective clade, though a faster and stronger surge in the more deadly clade Ib. For this scenario, we determined the health risk in the United States to the MSM community is moderate, the health risk to the sex workers is moderate, the health risk to healthcare workers is low, the health risk to children is low and the health risk to the general public is low.

Our confidence in these risk scores is moderate given the current level of information for each of these factors; historical knowledge from the 2022 US mpox outbreak, including our understanding of the transmission dynamics; current reliability and consistency of data on global spread; and the availability of vaccination and treatment resources.

Scenario 2: Sporadic Imported Clade I Cases

Summary

- Viral group: clade Ib and IIb
- Current primary populations impacted: children, sex workers and partners in the Democratic Republic of Congo (DRC)

This scenario anticipates the importation of occasional clade I cases into the US, but no sustained local transmission. For this scenario, we determined the health risk in the United States to the MSM community is moderate, the health risk to sex workers is moderate, the health risk to healthcare workers is low, the health risk to children is low-moderate, and the health risk to the general public is low.

Our confidence in these risk scores is low given the current level of information for each of these factors.

Scenario 3: Sustained Clade I Transmission in the US

Summary

- Viral group: clade Ib and IIb
- Projected primary populations impacted: MSM community, sex workers, children

While there have not been any documented cases of clade Ib within the US thus far, introduction of clade Ib to the US would be novel and could result in a larger outbreak affecting different vulnerable groups than those primarily impacted by clade IIb mpox virus. This could significantly change the risk levels should such a scenario occur in the US. The potential health consequences for a broader range of populations, including children, warrant additional preparedness efforts. Surveillance and reporting must increase, both across Africa and the US.

Although clade Ib and clade IIb are genetically similar enough that vaccines and treatments are expected to be effective, it is not well understood how prior infection with clade IIb or vaccination might protect from infection with or complications from clade I. The antiviral drug Tecoverimat that is used to reduce symptoms and shorten the length of infection for clade IIb mpox infections, has produced no medical benefit when used in clade Ib cases.

The drivers and modes of transmission of clade Ib mpox are still not well understood, making it challenging to predict the potential trajectory of a US epidemic scenario. Based on existing knowledge of the current clade Ia and Ib outbreak in the DRC, we know the most at-risk populations include the MSM community, sex workers, and children. If the US experienced a sustained clade Ib outbreak, we believe those in the MSM community and sex workers who engage in higher risk sexual conduct and close contact would be more likely to be infected. These populations might also experience more severe disease. We expect a lower likelihood of children becoming infected with mpox clade Ib in the US because the main risk factors for transmission to children in the DRC are reported to be exposure to 1) animal reservoirs, 2) higher numbers of household occupants, and 3) limited resources for sanitation and hygiene, factors that are not expected to be as relevant in the US. Although the risk of transmission to US children is expected to be lower in the event of a clade Ib outbreak than in the current DRC epidemic, the consequences would be similarly high due to the increased morbidity and mortality rates among children aged 15 and younger with suspected clade I mpox in the DRC.

For this scenario, we determined the health risk in the United States to the MSM community is moderate-high, the health risk to sex workers is moderate-high, the health risk to healthcare workers is low, the health risk to children is moderate-high, and the health risk to the general public is low-moderate.

Our confidence in these risk scores is low.

Recommendations for all scenarios and to minimize risk of a clade Ib mpox outbreak in the US:

- Vaccination and other medical counter measures
  - All individuals with an increased risk of infection should receive 2 doses of JYNNEOS vaccine and are encouraged to check for symptoms such as a rash with blisters on any part of the body (often starting around the mouth, anus, or genitals), inflammation and pain in the rectum, swollen lymph nodes, and/or fever.
  - Those with any mpox symptoms should seek medical advice from a healthcare professional. They should also get tested, take a break from sex, ask close contacts and sexual partners if they have similar symptoms, and avoid close physical contact.
  - Clinicians and other healthcare professionals should also wear all recommended personal protective equipment (PPE) when completing mpox testing.
  - People who have been in contact with someone with mpox infection should seek medical advice even if they do not have symptoms. They may be eligible for vaccination, which can reduce the risk of infection and developing severe disease
- Behavior-related activities
  - Individuals can reduce their risk by talking with sexual partners about mpox and practicing safer sex and good hygiene.
- Mass gatherings and other social gatherings
  - Mass and large gathering event planning and preparedness activities should foster community-based actions aimed at spreading precise and practical public health advice with a nondiscrimination approach across different media and incorporate educational and awareness-raising initiatives related to mpox and other diseases of concern.
- Surveillance, case detection, and management
  - Clinicians should consider mpox when lesions consistent with mpox are observed in a patient, even if an alternate etiology (eg, herpes simplex virus, syphilis) is considered more likely.
  - Continuing efforts to enhance case detection and surveillance in the DRC and neighboring countries.
  - Continuing distribution of sample collection and transport kits to reference hospitals and logistical support for collecting, transporting, and examining samples from suspected cases in Kenge, Kinshasa, and other affected areas.
  - Continuing provision of funding, personnel support, and technical assistance to the DRC

- Clinicians and public health practitioners in the US and globally should be alert for possible cases in travelers from DRC and request clade-specific testing.

Mpox Scenario-Based Human Health: Clade II Risk Assessment for the United States

Appendix: Additional Details on Process and Recommendations

Scenario 1: Baseline

Summary

- Viral group: clade IIb
- Current primary population impacted: MSM community

In this scenario, we considered the risk to human health if there is no change in the current epidemiology of mpox in the US. This involves steadily growing cases of only clade IIb mpox primarily affecting gay, bisexual, and other men who have sex with men (MSM community), particularly those who have not been previously infected, are not vaccinated, or are under vaccinated. This baseline scenario anticipates a continuation of this transmission level and disease severity, and no change in the demographic characteristics of individuals for whom mpox cases are reported.

For this scenario, we determined the health risk **in the United States** to the **MSM community** is low-moderate, the health risk to the **sex worker community** is low-moderate, the health risk to **healthcare workers** is low, the risk to children is low, and the health risk to the **general public** is low.

Our **confidence** in these risk scores is high given the current level of information for each of these factors, our understanding of transmission dynamics, and the availability of treatment resources.

Scenario 2: Autumn Clade II Surge

Summary

- Viral group: clade IIb
  Projected primary population impacted: MSM community and sex workers

This scenario anticipates an increase in clade IIb mpox transmission throughout the autumn months, with similar severity of disease and affected populations.

For this scenario, we determined the health risk **in the United States** to the **MSM community** is moderate, the health risk to **sex workers** is moderate, the health risk to **healthcare workers** is low, and the health risk to the **general public** is low.

Our **confidence** in these risk scores is **moderate** given the current level of information for each of these factors; historical knowledge from the 2022 US mpox outbreak, including our understanding of the transmission dynamics; current reliability and consistency of data on global spread; and the availability of vaccination and treatment resources.

Scenario 3: Autumn Clade IIb Case Decline

Summary

- Viral group: clade IIB
- Current primary populations impacted: MSM community, sex workers

In this scenario, we consider the impacts on human health in the US if there were to be a decline of clade IIb mpox cases through the autumn months.

For this scenario, we determined the health risk **in the United States** to the **MSM community** is **moderate**, the health risk to **sex workers** is **moderate**, the health risk to **healthcare workers** is **low**, and the health risk to the **general public** is **low.**

Our **confidence** in these risk scores is **low** given the current level of information for each of these factors.

Recommendations for all scenarios and to minimize the transmission of mpox clade IIb in the US:

- Vaccination and other medical counter measures
    - All individuals with an increased risk of infection should receive 2 doses of JYNNEOS vaccine and are encouraged to check for symptoms such as a rash with blisters on any part of the body (often starting around the mouth, anus, or genitals), inflammation and pain in the rectum, swollen lymph nodes, and/or fever.
    - Those with any mpox symptoms should seek medical advice from a healthcare professional. They should also get tested, take a break from sex, ask close contacts and sexual partners if they have similar symptoms, and avoid close physical contact.
    - Clinicians and other healthcare professionals should also wear all recommended personal protective equipment (PPE) when completing mpox testing.
    - People who have been in contact with someone with mpox infection should seek medical advice even if they do not have symptoms. They may be eligible for vaccination, which can reduce the risk of infection and developing severe disease
- Behavior-related activities

    - Individuals can reduce their risk by talking with sexual partners about mpox and practicing safer sex and good hygiene.
- Mass gatherings and other social gatherings
    - Mass and large gathering event planning and preparedness activities should foster community-based actions aimed at spreading precise and practical public health advice with a nondiscrimination approach across different media and incorporate educational and awareness-raising initiatives related to mpox and other diseases of concern.
- Surveillance, case detection, and management
    - Clinicians should consider mpox when lesions consistent with mpox are observed in a patient, even if an alternate etiology (eg, herpes simplex virus, syphilis) is considered more likely.

References

- Africa CDC. Africa CDC Epidemic Intelligence Report. Published August 16, 2024. Accessed August 19, 2024. https://africacdc.org/download/africa-cdc-weekly-event-based-surveillance-report-august-2024/?ind=1723909959421&filename=Africa-CDC-Epidemic_Intelligence_Report_16-August-2024-2.pdf&wpdmdl=17080&refresh=66c32bd6695b11724066774
- Africa CDC. Africa CDC Epidemic Intelligence Report. Published August 23, 2024. Accessed August 24, 2024. https://africacdc.org/download/africa-cdc-weekly-event-based-surveillance-report-august-2024/?ind=1724577618413&filename=Africa-CDC-_Epidemic-Intelligence_Weekly-Report_23-August-2024.pdf&wpdmdl=17080&refresh=66cc1f9ecee3a1724653470
- Africa CDC. Africa CDC Epidemic Intelligence Report. Published September 30, 2024. Accessed September 30, 2024. https://africacdc.org/download/africa-cdc-weekly-event-based-surveillance-report-september-2024/?ind=1727777051433&filename=Africa_CDC_Epidemic_Intelligence_Weekly_Report_27_September_2024.pdf&wpdmdl=18246&refresh=66fbcb86825281727777670
- Africa CDC. Africa CDC Epidemic Intelligence Report. Published October 6, 2024. Accessed October 6, 2024. https://africacdc.org/download/africa-cdc-weekly-event-based-surveillance-report-october-2024/?ind=1728284921707&filename=Africa-CDC-Epidemic-Intelligence-Weekly-Report-06-October-2024.pdf&wpdmdl=18247&refresh=67038bb08ef221728285616
- Africa CDC. Mpox Situation in Africa. Released September 13, 2024. Accessed September 16, 2024. https://africacdc.org/download/outbreak-report-13-september-2024-mpox-situation-in-africa/
- AP News. UN Health Agency Convening Experts to Determine if the Mpox Outbreak in Africa is a Global Emergency. Published August 7, 2024. Accessed August 27, 2024. https://apnews.com/article/who-mpox-outbreak-experts-meeting-6fbd377ba1a9f3b2e344673978ff47c7

- Bunge EM, Hoet B, Chen L, et al. The changing epidemiology of human monkeypox—A potential threat? A systematic review. PLoS Negl Trop Dis. 2022;16(2):e0010141. doi:10.1371/journal.pntd.0010141
- Department of Health, South Africa. Health Department Calla for Vigilance as Mpox Cases Re-emerge. Issued August 4, 2024. Accessed August 19, 2024. https://www.nicd.ac.za/wp-content/uploads/2024/08/Health-Department-calls-for-vigilance-as-mpox-cases-re-emerge.pdf
- Dutt, A. India Reports 1st Mpox Case Which Matches Strain that Triggered WHO Public Health Emergency Alert: Govt Sources. *The Indian Express*. Published September 23, 2024. Accessed September 23, 2024. https://indianexpress.com/article/india/india-mpox-case-who-public-emergency-alert-9584086/
- European Centre for Disease Prevention and Control. Mpox infographics: staying prepared for the summer season. Published June 1, 2023. Accessed August 27, 2024. https://www.ecdc.europa.eu/en/news-events/mpox-infographics-staying-prepared-summer-season
- Ghazy RM, Elrewany E, Gebreal A, et al. Systematic Review on the Efficacy, Effectiveness, Safety, and Immunogenicity of Monkeypox Vaccine. Vaccines. 2023;11(11):1708. doi:10.3390/vaccines11111708
- Jonsson, L. Ett Fall av Mpox Konstaterat i Sverige. *Dagens Nyteter*. Published August 15, 2024. Accessed August 27, 2024. https://www.dn.se/sverige/ett-fall-av-mpox-konstaterat-i-sverige/
- Khan, R. Pakistani Health Ministry Confirms a Case of the New Variant of Mpox, the 1st in Asia. *Toronto Star*. Published August 16, 2023. Accessed August 27, 2024. https://www.thestar.com/news/world/asia/pakistani-health-ministry-confirms-a-case-of-the-new-variant-of-mpox-the-1st-in/article_cffeeb52-e3de-5bbc-affa-e94da09ccb88.html
- Kibungu EM, Vakaniaki EH, Kinganda-Lusamaki E, et al. Clade I–Associated Mpox Cases Associated with Sexual Contact, the Democratic Republic of the Congo. Emerg Infect Dis. 2024;30(1):172-176. doi:10.3201/eid3001.231164
- Muzaffar, M. Thailand Detects First Suspected Case of Dangerous Mpox Strain in European Traveler. *Independent.* Published August 21, 2024. Accessed August 27, 2024. https://www.independent.co.uk/asia/southeast-asia/thailand-mpox-virus-outbreak-monkeypox-symptoms-b2599382.html
- McQuiston JH, Braden CR, Bowen MD, et al. The CDC Domestic Mpox Response — United States, 2022–2023. MMWR Morb Mortal Wkly Rep. 2023;72:547-552. doi:10.15585/mmwr.mm7220a2
- McQuiston JH, Luce R, Kazadi DM, et al. U.S. Preparedness and Response to Increasing Clade I Mpox Cases in the Democratic Republic of the Congo — United States, 2024. MMWR Morb Mortal Wkly Rep. 2024;73:435-440. doi:10.15585/mmwr.mm7319a3
- National Institutes of Health. The Antiviral Tecovirimat is Safe but Did Not Improve Clade I Mpox Resolution in Democratic Republic of the Congo. Published August 15, 2024. Accessed August 27, 2024. https://www.nih.gov/news-events/news-releases/antiviral-tecovirimat-safe-did-not-improve-clade-i-mpox-resolution-democratic-republic-congo

- Owens, LE, Currie, DW, Krawmarow, EA, et al. JYNNEOS Vaccination Coverage Among Persons at Risk for Mpox – United States, May 22, 2022 – January 31, 2023. MMWR Morb Mortal Wkly Rep. 2023;342-347. doi:10.15585/mmwr.mm723a4
- Pittman PR, Martin JW, Kingebeni PM, et al. Clinical characterization and placental pathology of mpox infection in hospitalized patients in the Democratic Republic of the Congo. PLoS Negl Trop Dis. 2023;17(4):e0010384. doi:10.1371/journal.pntd.0010384
- Reuters. Philippines Detects First Mpox Case this Year, Yet to Determine Strain. *Reuters.* Published August 19, 2024. Accessed August 19, 2024. https://www.reuters.com/business/healthcare-pharmaceuticals/philippines-detects-new-mpox-case-first-since-december-2023-2024-08-19/
- Reuters. Philippines Says Recent Mpox Case is Mild Clade 2 Variant. *Reuters.* Published August 20, 2024. Accessed August 21, 2024. https://www.reuters.com/world/asia-pacific/philippines-says-recent-mpox-case-is-mild-clade-2-variant-2024-08-21/
- US Centers for Disease Control and Prevention. 2022-2023 Mpox Outbreak Global Map. Updated August 6, 2024. Accessed August 22, 2024. https://www.cdc.gov/poxvirus/mpox/response/2022/world-map.html
- US Centers for Disease Control and Prevention. Infection Control: Healthcare Settings | Mpox. Updated August 2, 2024. Accessed August 27, 2024. https://www.cdc.gov/poxvirus/mpox/clinicians/infection-control-healthcare.html
- US Centers for Disease Control and Prevention. Information For Healthcare Professionals. Updated April 22, 2024. Accessed August 27, 2024. https://www.cdc.gov/poxvirus/mpox/clinicians/index.html
- US Centers for Disease Control and Prevention. Mpox Vaccine Recommendations. Updated April 22, 2024. Accessed August 27, 2024. https://www.cdc.gov/poxvirus/mpox/vaccines/vaccine-recommendations.html
- US Centers for Disease Control and Prevention. Ongoing 2022 Global Outbreak Cases and Data | Mpox. Updated March 5, 2024. Accessed August 27, 2024. https://www.cdc.gov/poxvirus/mpox/response/2022/index.html
- US Centers for Disease Control and Prevention. Vaccination | Mpox. Updated June 13, 2024. Accessed August 27, 2024. https://www.cdc.gov/poxvirus/mpox/interim-considerations/overview.html
- US Centers for Disease Control and Prevention. Ongoing 2022 Global Outbreak Cases and Data. Updated March 5, 2024. Accessed August 22, 2024. https://www.cdc.gov/poxvirus/mpox/response/2022/index.html
- US Centers for Disease Control and Prevention. Weekly Cases of Notifiable Diseases, United States, U.S. Territories, and Non-U.S. Residents Week Ending September 21, 2024 (Week 38). Updated September 21, 2024. Accessed September 30, 2024. https://wonder.cdc.gov/nndss/static/2024/38/2024-38-table968.htmlWorld Health Organization. 2022-24 Mpox (Monkeypox) Outbreak: Global Trends. Updated September 30, 2024. Accessed September 30, 2024. https://worldhealthorg.shinyapps.io/mpx_global/_w_fd030bc5/#33_Maps
- World Health Organization. Department of Immunizations, Vaccines, and Biologicals (IBV). SAGE Meeting Slide Decks. Published March 2024. Accessed August 27, 2024.

https://terrance.who.int/mediacentre/data/immunization/SAGE_Slidedeck_March_2024.pdf

- World Health Organization. Mpox (monkeypox) - Democratic Republic of the Congo. Published November 23, 2023. Accessed August 27, 2024. https://www.who.int/emergencies/disease-outbreak-news/item/2023-DON493
- World Health Organization. Holding mass and large gathering events during the multi-country mpox outbreak in the WHO European Region: lessons identified for future mass gathering preparedness: meeting report, 22 February 2023. Published May 4, 2023. Accessed August 27, 2024. https://www.who.int/europe/publications/i/item/WHO-EURO-2023-7420-47186-69127 World Health Organization. Multi-Country Outbreak of Mpox. Published June 28, 2024. Accessed August 22, 2024. https://cdn.who.int/media/docs/default-source/ health-emergency-information-risk-assessment/20240628_mpox_external-sitrep_34.pdf?sfvrsn=7a4abfce_1&download=true
- World Health Organization. WHO Chief Convenes Expert Meeting on Mpox Spread. Published August 7, 2024. Accessed August 22, 2024. https://news.un.org/en/story/2024/08/1152931

