



Mpox

Risk Assessment of Mpox Resurgence and Vaccination Considerations

Updated April 4, 2023

[JYNNEOS Vaccine Coverage by Jurisdiction](#)

[MMWR, JYNNEOS Vaccination Coverage Among Persons at Risk for Mpox — United States, May 22, 2022–January 31, 2023](#)

Summary

The 2022 mpox outbreak in the United States has receded to very low levels. However, most jurisdictions in the United States may be at risk of resurgence or new mpox outbreaks without continued efforts to vaccinate people at risk, based on new modeling analyses. The chance of an outbreak and its predicted size will likely increase over time without continued efforts to vaccinate people at highest risk of mpox exposure.

Background

The 2022 mpox outbreak in the United States has slowed to about one case per day, down from a peak of about 460 cases per day on average in early August 2022.^[i] The outbreak has likely slowed because of a combination of vaccination, infection-induced immunity, and temporary changes in sexual behavior.^{[ii],[iii]} In this assessment, we explore the risk of resurgent mpox outbreaks at the jurisdiction level.

Assessment

If mpox reintroduction occurs and no additional vaccination or sexual behavior adaptations occur, the risk of a resurgent mpox outbreak is greater than 35% in most jurisdictions in the United States. Resurgent outbreaks in these communities could be as large or larger than the 2022 outbreak. This is because immunity is relatively low in populations who are highly affected, including sexually active men who have sex with men (MSM) in these jurisdictions. In jurisdictions where immunity is higher in these populations, the risk is anticipated to be low over the next year, although a renewed outbreak could occur. These jurisdictions include most jurisdictions that had large mpox outbreaks in 2022, such as California, the District of Columbia (DC), Illinois, and New York.

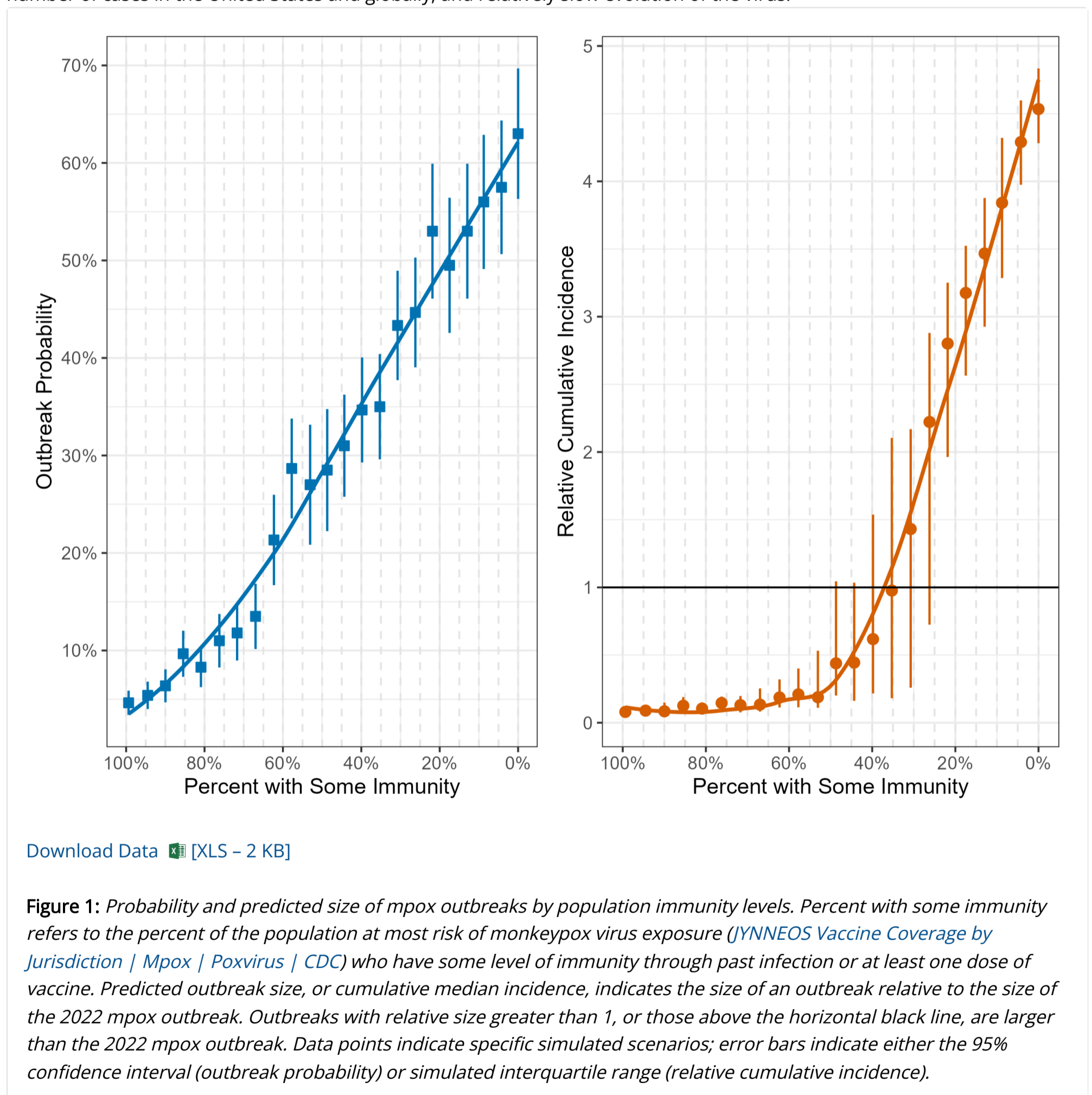
We have moderate confidence^[1] in our assessment, which is based on the epidemiologic characteristics of mpox,^[iv] estimates of vaccine coverage in jurisdictions across the United States ([JYNNEOS Vaccine Coverage by Jurisdiction | Mpox | Poxvirus | CDC](#)), and a simulation model^{[iii][v]} exploring potential mpox resurgence in DC following the cessation of the outbreak (CDC, unpublished), with results extrapolated to other jurisdictions. Our model showed:

- The risk of a resurgent mpox outbreak across U.S. jurisdictions is ongoing, should new infections enter from other areas or countries.
- The chance of a new outbreak and its predicted size will grow over time as new, never-vaccinated or never-infected people become sexually active, reducing overall population immunity.
 - In jurisdictions with high levels of vaccination coverage (>75%), and therefore population immunity, the risk of a renewed mpox outbreak is 5%–12% each year over the next five years if mpox reintroduction occurs. Outbreaks

could average only <15% of the 2022 outbreak size, even in the absence of additional vaccination or sexual behavior adaptations after an outbreak emerges (Figure 1).

- In jurisdictions with low levels of vaccination coverage (<35%) with at least one dose ([JYNNEOS Vaccine Coverage by Jurisdiction | Mpox | Poxvirus | CDC](#)), which includes most U.S. jurisdictions, resurgent outbreaks are more likely (>35% risk of occurring given reintroduction). Outbreaks could be as large or larger than the 2022 outbreak if no additional vaccination or sexual behavior adaptations take place (Figure 1).
- If the vaccine was not administered to those with higher sexual activity and thus greater likelihood of exposure in 2022, resurgent outbreaks are probably even more likely.

Another factor that could increase the risk of mpox resurgence in the United States is the degree of waning immunity. Monkeypox virus infection and vaccination are likely to confer some immune protection for years, based on evidence from smallpox disease and vaccination.^[vi] However, if this protection wanes quickly or does not effectively stop transmission of the virus, resurgent outbreaks would be more likely. Mutations to the virus could also increase the risk of mpox resurgence if they caused it to spread more readily or evade prior immunity. We believe this risk is low, however, given the relatively limited number of cases in the United States and globally, and relatively slow evolution of the virus.^{[vii],[viii]}



Implications

The risk of mpox resurgence in the United States warrants continued efforts to vaccinate people who are most likely to be exposed to mpox, including MSM who have had more than one sexual partner in the last six months and other risk groups outlined in the U.S. National Mpox Vaccination Strategy.^[ix] Outreach, education, and other public health interventions among affected populations, including the young and newly sexually active, could help improve vaccination targeting and other response measures.

Resources

[How to Protect Yourself | Mpox | Poxvirus | CDC](#)

[Safer Sex, Social Gatherings, and Mpox | Mpox | Poxvirus | CDC](#)

[Vaccines | Mpox | Poxvirus | CDC](#)

[Information for Health Departments](#)

[Information for Healthcare Professionals](#)

Annex: Methodologic notes and limitations

We have moderate confidence in our assessment on resurgence risks which are in part based on the results of new modeling work. We acknowledge limitations of this work that increase uncertainty in our assessment and thus consider our results as preliminary and subject to change.


- Our assessment builds on a model calibrated to DC, and we believe conclusions are generalizable. However, our results would be more precise if we had tailored the model to individual U.S. jurisdictions.
- Vaccination coverage estimates for our model are based on assumptions about the population sizes of those most at risk of mpox and assumptions about how vaccines were distributed among those exposure risk groups. If vaccination is more concentrated among higher sexual activity groups than we assume, outbreaks may be less likely than we assessed. If vaccination is less concentrated among higher sexual activity groups, outbreaks may be more likely than we assessed. Relatedly, our conclusions could change if individuals are more likely to have sexual partners of the same vaccination status.
- Our model results assume mpox reintroduction occurs when five cases are reintroduced into a city or jurisdiction. If fewer or no infections are imported after mpox outbreaks subside, resurgence risks could be lower than we assess. However, imported infections could be higher, for example if a global resurgence of the disease occurred.^[x]
- Our model assumptions about sexual behavior include categorization of people into sexual activity groups based on surveys of sexually active MSM that primarily took place in Atlanta, Georgia from 2011–2013 which we believe apply to other urban MSM networks in the United States. However, if actual sexual networks differ, our results could change. For example, if surveys missed individuals with an extremely high number of sexual partners – those in the tail end of this distribution – future outbreaks could be less likely than we have predicted, because infection-induced immunity could be higher for individuals at most risk of acquiring and spreading infection. Or, if people move in and out of sexual activity groups more frequently than our model assumes, resurgence risks could be greater.

References

[i] [U.S. Mpox Case Trends Reported to CDC | Mpox | Poxvirus | CDC](#)

[ii] Endo, A. et al. Heavy-tailed sexual contact networks and monkeypox epidemiology in the global outbreak. 2022. *Science* Oct 7; 378 (6615):90-94 [↗](#).

[iii] Clay et al. Modelling the impact of vaccination and behavior change on mpox transmission in Washington, D.C. Preprint at: <https://doi.org/10.1101/2023.02.10.23285772> [↗](#)

[iv] [Monkeypox: epidemiology, pathogenesis, treatment and prevention | Signal Transduction and Targeted Therapy \(nature.com\)](#) 

[v] [Modeling the impact of sexual networks in the transmission of Monkeypox virus among gay, bisexual, and other men who have sex with men — United States, 2022](#)

[vi] [Human monkeypox — After 40 years, an unintended consequence of smallpox eradication \(nih.gov\)](#) 

[vii] [Phylogenomic characterization and signs of microevolution in the 2022 multi-country outbreak of monkeypox virus | Nature Medicine](#) 

[viii] [Multi-country outbreak of mpox, External situation report #18 – 16 March 2023 \(who.int\)](#) 

[ix] [Vaccination | Mpox | Poxvirus | CDC](#)

[x] [Mpox emergence in Japan: risks of establishment in Asia and the global resurgence | Research Square](#) 

[1] We use the following definitions for confidence levels: High confidence judgments are based on high-quality information from multiple sources, although such judgments are not a certainty. Moderate confidence judgments are based on credibly sourced and plausible information, but the information is not of sufficient quality or corroboration to warrant a high level of confidence. Low confidence judgments are based on information that is fragmented, poorly corroborated, or based upon data sources for which there are significant concerns or problems.

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