Why the monkeypox outbreak is mostly affecting men who have sex with men

The virus did not spread well between people in the past but may have found a new niche in tightly connected sexual networks

Ever since monkeypox started to sicken thousands of people worldwide this spring, two big questions have loomed: Why is a virus that has never managed to spread beyond a few cases outside Africa suddenly causing such a big, global outbreak? And why are the overwhelming majority of those affected men who have sex with men (MSM)?
A long history of work on sexually transmitted infections (STIs) and early studies of the current outbreak suggest the answers may be linked: The virus may have made its way into highly interconnected sexual networks within the MSM community, where it can spread in ways that it cannot in the general population.

An epidemiological modeling study posted as a preprint last week by researchers at the London School of Hygiene & Tropical Medicine (LSHTM) supports that idea. It suggests the outbreak will keep growing rapidly if the spread isn’t curtailed. It also has implications for how to protect those most at risk and limit spread, while suggesting the risk for the wider population remains low.

But there are still many uncertainties, and communication is fraught because of the risk of stigmatizing MSM—and because communicating frankly about sexual behavior is hard. “I think we have to talk more about sex,” says Yale School of Public Health epidemiologist and former HIV activist Gregg Gonsalves. “Everybody has been very clear about stigma, and saying it over and over again. The point is that you still have to address the risk of infection in our community.”

Since early May, more than 2000 monkeypox cases have been reported in more than 30 countries where the virus is not normally seen. (Outbreaks are more common in at least a dozen countries in West and Central Africa, where the virus has animal reservoirs. More than 60 cases and one death have been confirmed there this year.)

The vast majority of cases in the current outbreak have been in MSM. Researchers at the UK Health Security Agency (UKHSA), for example, asked patients to fill out questionnaires. Of 152 who did, 151 said they were MSM, the team wrote in a technical briefing published on 10 June; the remaining patient refused to answer. Other countries have seen similar patterns.

That could be a skewed picture, of course. “MSM have a better relationship with medical practitioners than heterosexual men,” says Lilith Whittles, an infectious disease modeler at Imperial College London, which could mean they are more likely to report monkeypox symptoms and get tested for the virus. “I don’t know that we’re necessarily looking enough in heterosexual social networks to make the conclusion that this is not a broader problem,” says Boghuma Titanji, a virologist at Emory University who works at a sexual health clinic.

But most researchers say such “ascertainment bias” is unlikely to explain the striking pattern. Although some monkeypox patients have mild infections that may be missed or misdiagnosed, others have very characteristic rashes and agonizing pains that require hospitalization for pain treatment. If many people outside the MSM community had monkeypox, more would have shown up in the statistics by now.

Ashleigh Tuite, an infectious disease epidemiologist at the University of Toronto, says she “understands the hesitation” to focus on MSM, given the risk of stigma that could worsen discrimination and cause those who are affected to delay seeking care. “But based on the data that we have, and based on the contact tracing that’s been done, it’s very clear that this is an MSM-focused outbreak at this point,” she says. “Anyone can get monkeypox, but we’re seeing disease activity primarily among” MSM, confirms Demetre Daskalakis, an HIV prevention specialist at the U.S. Centers for Disease Control and Prevention.

Sexual encounters clearly play a role in transmission. Of the 152 people in the UKHSA data set, 82 were invited for additional interviews focusing on their sexual health. Among the 45 who participated, 44% reported more than 10 sexual partners in the previous 3 months, and 44% reported group sex during the incubation period. Exactly how the virus is passed on is less clear. Researchers have found viral DNA, and even infectious virus, in the semen of some patients, but they aren’t sure that is important for transmission; skin-to-skin contact may be enough. (Other STIs, including herpes and scabies, also primarily spread this way.)
To those who study how pathogens spread through social and sexual networks, the pattern is not a big surprise. In the 1970s and '80s, researchers trying to understand the spread of sexually transmitted diseases such as gonorrhea were stumped, says LSHTM epidemiologist Adam Kucharski: Survey data showed people's average numbers of sexual partners were too low to sustain transmission. But averages obscured that although many people have few sexual partners, some have large numbers. This helps drive transmission because, if infected, they are also more likely to infect others.

Sexual networks among MSM are not different in nature from those of other groups, Whittles stresses, but a core group of people are much more densely connected than people outside the MSM community. They change partners more frequently and are more likely to have several partners at the same time. “These things occur in all sexual networks, it is just a question of the degree,” Whittles says. And in a densely connected network, the virus is less likely to hit a dead end.

“It’s entirely possible for this epidemic to rage among a subset of people just because that subset is connected in a network differently than everyone else,” says Keletso Makofane, a social network epidemiologist at the FXB Center for Health and Human Rights at Harvard University. Together with colleagues, Makofane hopes to launch a study in New York City in August to better understand the spread of the disease. “The idea is to get a sense of how many people report symptoms that are consistent with monkeypox and how they are connected,” he says.

The LSHTM study, posted on medRxiv on 13 June, used U.K. data about sexual partnership patterns to model the spread of monkeypox among MSM and outside that group. Because it is not yet clear how contagious the virus is, the researchers modeled scenarios based on different risk levels. Without effective intervention measures or behavioral changes, a large and sustained outbreak with more than 10,000 cases among MSM globally is “highly likely,” they write. “In contrast, sustained transmission in the non-MSM population is unlikely in all scenarios considered.”

Because the model is based on U.K. data, the findings may not apply elsewhere, first author Akira Endo says. And other factors may have made the outbreak worse. Monkeypox may have mutated in ways that allow it to transmit more easily, and the share of the population who have had the smallpox vaccine—which also offers some protection against monkeypox—is declining.
because smallpox vaccination was abandoned worldwide starting in the 1970s. But the modeling shows “we do not necessarily need [those factors] to explain the observed patterns,” Endo says.

Such conclusions put epidemiologists in a delicate position, and some declined to talk to *Science* for fear of stigmatizing MSM. Endo says he understands that and agrees the findings could easily be misunderstood. “Meanwhile I also understand that there’s a risk in the other direction—that the information doesn’t reach those who need it most before it’s too late,” he says.

Whittles agrees, calling the findings “practical information, in terms of where it’s spreading. It is a morally neutral thing,” she says. “Knowledge of what’s happening is power, even though that knowledge is imperfect and will change,” Daskalakis adds.

The virus could still find other networks with similar characteristics. Daskalakis recalls a U.S. outbreak of methicillin-resistant *Staphylococcus aureus* in the 2000s that started in the MSM community but later spread in gyms, among athletes, and in prisons. Monkeypox could also start to spread among sex workers and their clients, Tuite says.

How fast the virus will spread in the months ahead depends on control efforts. National health authorities in Europe, Canada, and the United States have issued guidance about how to reduce the risk of infection, and dating apps have alerted users to the risk of monkeypox and to its symptoms, which may change contact patterns. Increasing awareness among health care workers may have an impact as well, Whittles says: Faster diagnoses mean patients will isolate sooner in their infection, reducing onward transmission. “So there’s a couple of different ways that behavior can change, even if it’s not people having less sex,” she says. And the model did not account for infected individuals developing immunity. That means “we may see a slowdown of the outbreak earlier than we might imagine,” Endo says.

Many countries are also gearing up to start immunization campaigns. Targeting those with many sexual partners may be the most efficient approach. In new guidance published on 21 June, UKHSA announced it would start to offer vaccines to MSM at highest risk—“Risk criteria would include a recent history of multiple partners, participating in group sex, attending sex on premises venues or a proxy marker such as recent bacterial STI (in the past year).”

It’s important to alert that community and do it the right way, Gonsalves says. “We should say: It’s not about who you are. It’s about what you’re doing. And we’re not going to stigmatize it. But just know that you’re at greater risk if you fit this profile.”

*Correction, 22 June, 10:10 a.m.:* This story has been changed to note Lamb is an employee at, not a manager of, the Toronto bathhouse.

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