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Serological Evidence of Mpox Virus Infection During Peak Mpox Transmission in New York City, July to August 2022

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Abstract

Background.—The extent to which infections may have been undetected in an epicenter of the 2022 mpox outbreak is unknown.

Methods.—A serosurvey (July and August 2022) assessed the seroprevalence and correlates of mpox infection among a diverse sample of asymptomatic patients with no prior mpox diagnoses and no known histories of smallpox or mpox vaccination. We present seropositivity stratified by participant characteristics collected via survey.

Results.—Two-thirds of 419 participants were cismen (281 of 419), of whom 59.1% (166 of 281) reported sex with men (MSM). The sample also included 109 ciswomen and 28 transgender/gender nonconforming/nonbinary individuals. Overall seroprevalence was 6.4% (95% confidence interval [CI], 4.1%–8.8%); 3.7% among ciswomen (95% CI, 1.0%–9.1%), 7.0% among cismen with only ciswomen partners (95% CI, 2.0%–11.9%), and 7.8% among MSM (95% CI, 3.7%–

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11.9%). There was little variation in seroprevalence by race/ethnicity, age group, HIV status, or number of recent sex partners. No participants who reported close contact with mpox cases were seropositive. Among participants without recent mpox-like symptoms, 6.3% were seropositive (95% CI, 3.6%–9.0%).

Conclusions.—Approximately 1 in 15 vaccine-naive people in our study had antibodies to mpox during the height of the NYC outbreak, indicating the presence of asymptomatic infections that could contribute to ongoing transmission.

Keywords

mpox; asymptomatic infections; subclinical infections; serosurvey; outbreak

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The worldwide mpox outbreak that started in May 2022 impacted more than 70 countries and led to more than 83 000 infections in 2022, including about 30 000 in the United States and 3821 in New York City (NYC) alone [1]. This outbreak primarily affected gay, bisexual, or other men who have sex with men (MSM). Presentations with mainly anogenital skin lesions differed from prior outbreaks of mpox [2] and raised questions about transmission, changes to the virus, detection in various specimen types, and risk factors for becoming sick. One priority area for research continues to be surveillance, including serosurveys to estimate the current prevalence of mpox infection, circulation of the virus preceding outbreak detection, and the extent to which mild or subclinical infections could contribute to ongoing transmission [3].

Monkeypox virus (MPXV) belongs to the genus *Orthopoxviruses* (OPXV), and it has close antigenic relationship with other OPXV species, such as variola virus (causative agent of smallpox) [4]. During the acute phase of infection by MPXV, antibodies (immunoglobulin M and G [IgM and IgG]) can be detected as early as 4 days after symptom onset. While IgG persist for longer duration, IgM wane over time [5, 6]. Antibodies are useful for estimating population-level infection status and immunity. Vaccination against mpox using replication deficient live vaccinia virus vaccine (JYNNEOS) produces similar antibody responses after 2 weeks of vaccination (2 doses) [7]. People who received smallpox vaccination in childhood can have detectable anti-OPXV IgG antibodies for more than 40 years [8]. Currently in the United States, MPXV-specific antibody testing is not routinely used to evaluate exposure and immunity; however, serologic testing for anti-OPXV–specific antibodies can reliably be used for serosurveys in outbreak settings.

Prior serological surveys of mpox and other OPXVs have largely been conducted in Africa. One such study involving smallpox vaccine-naive children from Central Africa in the 1980s found that 12%–15% had antibodies against OPXV, but most did not have a history of compatible illness, suggesting that subclinical infection occurred [9]. Other serosurveys in Africa have suggested that subclinical infection may have occurred in up to 28% of close contacts of mpox patients in some communities [9]. During the 2022 outbreak, a study conducted among asymptomatic people presenting at a mpox vaccine clinic in Washington, DC in August 2022 found that 11% (8 of 75) and 15% (47 of 324) were anti-OPXV IgM and IgG positive [10], and another study among asymptomatic patients attending 4 clinics in San Francisco found that 8.0% (18 of 225) were IgG positive [11]. Little is known about

the seroprevalence of mpox at the outset of the 2022 NYC outbreak, and the extent to which infections early on may have been undetected.

Consistent with profiles of mpox cases in the 2022 outbreak, the majority of NYC cases in 2022 (>90%) were among MSM [12]. We conducted a serosurvey to assess the seroprevalence of mpox infection among a diverse sample of asymptomatic patients—including MSM and patients of other genders, gender identities, and sexual orientations—who presented for sexual health care during the height of the mpox outbreak in NYC.

METHODS

Specimen and Data Collection

Serosurvey participants aged 18 years and older were recruited during express testing visits at 2 NYC Department of Health and Mental Hygiene (DOHMH) Sexual Health Clinics (SHCs); express testing is offered to asymptomatic patients. Recruitment occurred via study flyers and periodic announcements in clinic waiting areas. Blood specimens are routinely collected for syphilis and/or human immunodeficiency virus (HIV) testing as a part of express testing, with approximately 90% of patients receiving venipuncture. For patients undergoing phlebotomy who elected to participate in this project, the phlebotomist drew an additional tube of blood for anti-OPXV antibody testing. Prior to blood draw, each participant provided informed consent and completed a short, self-administered survey in a confidential space within the SHCs. A unique study identification code linked each person's survey to their blood sample. Participants were offered $20 gift card incentives.

Study enrollment occurred from 7 July to 1 September 2022. Enrollment started at one clinic with a large MSM patient population. Due to slower than anticipated enrollment and to expand participation to a more diverse population in terms of gender, race, and ethnicity, a second clinic was added on 10 August 2022. Blood specimens were collected from consenting participants and coded before daily pick up from the clinics and transport to the NYC DOHMH Public Health Laboratory, where they were centrifuged to isolate serum and shipped to the Centers for Disease Control and Prevention (CDC) Poxvirus Laboratory for anti-OPXV antibody testing using a Clinical Laboratory Improvement Amendments (CLIA)-approved assay.

Laboratory Methods—Antiorthopoxvirus IgM and IgG Testing

Sera were tested as previously described [13]. Serum was tested at 1:50 or 1:100 dilution to detect anti-OPVX IgM and IgG antibodies. The IgG assay is an indirect detection assay utilizing purified vaccinia virus as the coated antigen to which anti-OPVX antibodies in serum bind and are subsequently detected. The IgM assay is an indirect sandwich assay that specifically captures human IgM (to eliminate cross-reactivity from other antibody isotypes), which then binds purified virus for subsequent detection. For each assay, sample positivity was determined by subtracting the specimen optical density (OD) by a cutoff value (COV) generated from 3 times the standard deviation of the average of the IgG or IgM negative controls. Sera were tested first by IgG enzyme-linked immunosorbent assay (ELISA) and samples that had detectable IgG (OD-COV > 0.0) underwent IgM testing.

Serosurvey Data Elements

Results of antibody testing were paired with participant characteristics from the survey. Completion of survey questions was voluntary. Survey data included demographics; history of previous mpox diagnosis; history of mpox-related symptoms since 22 April 2022; HIV status; numbers and genders of sex partners since 22 April 2022; type of sexual contact since 22 April 2022; history of nonsexual contact with mpox cases; concern about mpox infection; and interest in receiving the mpox vaccine. A total of 11 symptoms considered to be consistent with mpox infection were captured on the survey and grouped into 3 categories: (1) any rashes, lesions, sores; (2) anal symptoms other than rashes, lesions, sores; and (3) nonspecific symptoms (eg, fever, headache, aches, chills, malaise). We collected information on history of smallpox vaccine and, as the collection period spanned the time point at which first doses of the JYNNEOS vaccine were made available as postexposure prophylaxis against mpox, also receipt of mpox vaccine.

Data Analysis

For our main analysis, we assessed seropositivity as the presence of anti-OPXV antibodies —defined as IgG or IgM with OD-COV ≥ 0.1—among study participants who had available survey data and no self-reported history of smallpox vaccine (if aged ≥45 years) or mpox vaccine (at least 2 weeks before clinic visit), stratified by participant characteristics, for the entire study sample and separately for MSM, who comprised our largest subsample of participants. We excluded individuals who reported a prior mpox diagnosis, and those with reported smallpox vaccination (which could confer immunity for mpox) or mpox vaccinations more than 2 weeks before clinic visit to assess seropositivity resulting from probable mpox infection. While we would not have expected participants under age 50 to have received the smallpox vaccine (given dismantling of childhood vaccination programs in the early 1970s) and thus included those ages <45 with a self-reported history in our main analysis; we performed a sensitivity analysis to measure seroprevalence after exclusion of all participants who reported a history of smallpox vaccination.

Serosurvey data were analyzed using SAS version 9.4. The DOHMH Institutional Review Board approved this project under 45 CFR §46.110(b)(1)(i)(category F2a and F7) as research.

RESULTS

Study Sample

Between 7 July and 1 September 2022, 1600 patients aged ≥18 years attended the 2 NYC SHCs during periods of enrollment and were eligible for the study. A total of 530 patients were enrolled, representing 33% of eligible clinic attendees. Of those, 525 who had both blood draws and available survey data were included in the study sample. Study participants were similar to all eligible patients with regard to race/ethnicity and age. We observed differences in the distribution of gender/gender of sex partner among the study sample (overall $P < .0001$), with a greater proportion of study participants belonging to MSM (48.4% vs 39.0%) or transgender, gender nonconforming, or nonbinary (TGNCNB) (7.2% vs 3.4%) groups.

Of the 525 participants, 1 reported a prior mpox diagnosis and was excluded from analysis. Ninety-five individuals (13 aged ≥45 years and 82 aged <45) reported past receipt of a smallpox vaccine; we excluded the 13 individuals aged ≥45 (range, 51–74 years). Of the remaining 511 participants, 92 reported having received the mpox vaccine, either ≥14 days prior to clinic visit date or with a missing vaccination date that resulted in an unknown interval between vaccination and specimen collection; these individuals could possibly have had vaccine-induced antibodies and were therefore excluded. The remaining 419 participants with no (n = 352) or unknown (n = 15) mpox vaccination, vaccination less than 14 days before clinic visit (n = 50), or reported receipt of mpox vaccine before May 2022 (prior to the outbreak and availability of JYNNEOS vaccine, and hence considered as likely incorrect mpox vaccine status information [n = 2]), were included in the final main analytic sample.

Of 418 participants with known gender, 71.0% (297 of 418) and 28.9% (121 of 418) were assigned male sex at birth and female sex at birth, respectively (Table 1). Based on collected gender and gender of sex partner(s), two-thirds of participants were cismen (281 of 418), of whom over half (59.1%; 166 of 281) reported sex with men since April 2022. The sample also included 109 ciswomen and 28 TGNCNB individuals (26.1% and 6.7% of the total, respectively). Approximately one-third of the sample (36.5%) was non-Hispanic white, and roughly similar proportions of participants (19%–24%) belonged to Hispanic/Latinx, non-Hispanic Black, and non-Hispanic groups of other races. The median age of participants was 29 years (interquartile range, 25–33). Twenty people (4.8%) self-reported a previous HIV diagnosis. The vast majority (98.1%) reported not having had close contact with someone diagnosed with mpox, and 94 participants had experienced symptoms since April 2022 that could suggest mpox infection.

Seroprevalence

Twenty-seven of 419 participants had detectable antibodies, yielding an overall seroprevalence of 6.4% (95% confidence interval [CI], 4.1%–8.8%; Table 1). Twenty-three had IgG-positive results (OD-COV ≥ 0.1), of which 8 were also IgM positive. Of the 15 participants with only IgG-positive results, 3 reported nonspecific symptoms (eg, fever, malaise) since April 2022, and 2 of them also reported rashes or lesions. Of 24 with IgG OD-COV values that were between 0.0 and 0.1, 4 were IgM positive, indicating likely recent orthopoxvirus infection. Seroprevalence was lowest among ciswomen (3.7%; 95% CI, 1.0%–9.1%), while other gender/partner gender groups had higher estimates ranging from 7.0% (cismen with only cis female partners) to 7.8% (cisMSM). There was little variation in seroprevalence by major race/ethnicity group (Hispanic, non-Hispanic Black, non-Hispanic white), age group, HIV status, or number of recent sex partners. None of the participants who reported close contact with mpox cases were seropositive. Approximately one-fifth of participants (19%) with recent rashes, sores, or lesions were seropositive. Among participants with no reported symptoms, 6.3% were seropositive (95% CI, 3.6%–9.0%); due to wide and overlapping confidence intervals, differences between symptom status groups were not significant. In the sensitivity analysis that excluded all 95 participants with a self-reported smallpox vaccination history, overall seroprevalence was 6.2% (95% CI, 3.7%–8.7%).

Overall seroprevalence among 166 cisMSM was 7.8% (95% CI, 3.7%–11.9%). Eleven had IgG-positive results, of which 4 were also IgM positive. Of 11 with IgG OD-COV values that were 0.0–0.1, 2 were IgM positive, indicating likely recent OPXV infection. Patterns of seroprevalence among them mirrored those for the overall sample, with little variation according to major race/ethnicity group, age group, behaviors such as sex partner number and types of intimate/sexual contact, or symptom status (Table 2).

Attitudes About Mpox Risk and Vaccination Among MSM

The majority of MSM participants (70.5%; 117 of 166) reported that they were very or somewhat concerned about acquiring mpox; 16.2% were a little or not at all concerned, and the remaining 13.3% had neutral concern about infection. Of those with high or intermediate concern, 10.3% (12 of 117) had anti-OPXV antibodies. Most (71.1%) MSM participants were very interested in getting the mpox vaccine; 16.9% were somewhat interested; 9.6% felt neutral about it; and 2.4% had little or no interest in the vaccine.

DISCUSSION

To our knowledge, this is the third published US report on mpox seroprevalence during the 2022 US mpox outbreak, and the first to present seroprevalence among MSM and people of other gender groups who were highly likely not to have been vaccinated against OPXV species, further stratified by several key participant characteristics. Our findings contribute to knowledge about the prevalence of mpox that was attributable to natural immunity resulting from undetected infections.

We found that approximately 6% (or 1 in 15 people) in our study population had antibodies to mpox during the height of the NYC outbreak, similar to the seroprevalence estimate from San Francisco (8%). Seroprevalence in our study was approximately half of the seroprevalence estimate reported from Washington, DC [10]. As the Washington, DC study included participants with a history of smallpox vaccination and there is a close antigenic relationship between vaccinia virus and MPXV, many seropositive participants in that study likely had antibodies from prior smallpox vaccination rather than from MPXV infection. In addition, that study was conducted a few months into the mpox outbreak (mid-to-late August 2022) and had enrolled people presenting for mpox vaccination, factors that might have led to the inclusion of people with higher levels of exposure to mpox.

Serological findings from the NYC, San Francisco, and Washington, DC studies provide evidence for past infection among persons without a previous mpox diagnosis. Sexual health center-based studies using other specimen types have not demonstrated extensive asymptomatic carriage and transmission, or subclinical presentations, of mpox. In the Washington, DC study, 1 of 522 pharyngeal (0.2%) and 2 of 164 rectal specimens (1.2%) were polymerase-chain reaction (PCR)-positive for mpox DNA. Of 193 archived anorectal samples from asymptomatic MSM patients in the Netherlands and 690 archived rectal and urethral samples from asymptomatic patients in Germany collected before mid-May 2022, none were mpox-positive by PCR [14, 15]. In Seattle, WA, 1.2% (8 of 658) of asymptomatic MSM had a positive rectal and/or pharyngeal mpox PCR during the time of the outbreak [16]. In our study, 12 participants had IgM-positive results, likely related

to contemporaneous asymptomatic/paucisymptomatic or presymptomatic mpox infection. Overall, 6% of participants who did not report any symptoms of illness in the several months before the study were seropositive. Of 15 participants with only IgG-positive results, only 2 reported rashes or lesions. It is possible that any lesions among the others were minimal, not recognized as mpox, or present in anatomic sites (eg, rectum, oropharynx) not easily visualized by the participant. Individuals with undiagnosed or unrecognized mpox may unknowingly transmit the disease; challenges with identifying those with asymptomatic or clinically inapparent infections, or in presymptomatic stages of infection at the time of medical evaluation, pose challenges for the elimination of mpox.

There was little variation in seroprevalence by major race/ethnicity group, reflecting masked actual patterns of transmission that, locally and nationally, were not evident early in the outbreak. Early on, detected cases were primarily among white persons due to lower access to mpox testing and diagnosis for black and Latino individuals [17]. CisMSM had the highest seroprevalence (7.8%) and comprised 40% of seropositive study participants, which was unsurprising given that the global mpox outbreak in 2022 was concentrated in networks of sexually active MSM. During the mpox outbreak in NYC, people who identified as TGNCNB were also considered at higher risk of mpox infection; approximately 4% of all cases were among people who identified as TGNCNB [12]. Our sample included only 28 TGNCNB participants, of whom 2 (7.1%) were seropositive. Additionally, we enrolled roughly 100 cismen who have sex with women (cisMSW) and 100 ciswomen, and observed seropositivity among them, with 26% and 15% of the 27 total positive samples among cisMSW and ciswomen, respectively. The seroprevalence among cisMSW approximated that seen among cisMSM and TGNCNB groups. Groups of people reporting only heterosexual sexual contact comprised a relatively small proportion of NYC cases (9% of 1916 interviewed cases in 2022) [unpublished data], and it is possible that additional infections among them may have been missed if the nature of risk communication during the outbreak and early eligibility criteria for vaccination contributed to lower levels of risk perception and presentation to health care for mpox evaluation by such groups. People seeking care at SHCs may be expected to have an overall higher risk of STI acquisition compared with those who do not access care in those settings, possibly resulting in the comparable mpox seroprevalence rates among cisMSM and cisMSW and 4% seropositivity among ciswomen study participants that we observed. However, asymptomatic infections and transmission among people in sexual networks with low connectivity (ie, low rates of partner change and concurrency) likely also occur; further research into transmission dynamics within selected heterosexual groups could elucidate evolving prevention needs, such as broadening vaccine recommendations in future outbreak settings.

The extent to which key populations remained at risk for mpox acquisition underscored the particularly critical need for vaccination as a prevention strategy. A large proportion of surveyed cisMSM in our study were very or somewhat concerned about mpox acquisition, and over two-thirds were very interested in getting the mpox vaccine. Despite this encouraging finding among a group highly recommended for the vaccine, vaccination rates in NYC were suboptimal throughout 2022; of almost 155 000 doses administered, about 102 000 were first doses. Vaccine series completion decreased with decreasing age, and the overall low series completion rate (approximately 50%) was consistent across race and

ethnicity groups [12]. Although NYC vaccine coverage was higher than that of most other jurisdictions [18] and the number of mpox cases decreased sharply starting in fall 2022, there is potential for resurgence of disease. Given the increased protection provided by full vaccination compared with partial vaccination [19–22], health care providers should continue to recommend second doses to partially vaccinated individuals.

Our findings are subject to limitations. First, we used a convenience sample of sexual health clinic attendees consisting of a disproportionate number of MSM and TGNCNB participants. The gender distribution of our study population was similar to the distribution of mpox cases citywide, although results may not be generalizable to all individuals at risk for mpox acquisition. Second, our sample size resulted in wide confidence intervals for selected prevalence estimates that may have precluded detecting real differences between subgroups of participants. Third, any cross-reactivity of anti-OPXV antibodies with antibodies to other pathogens could have affected the specificity of the assay we used and the results that we observed. Fourth, we counted 2 participants who reported receipt of mpox vaccine before May 2022 as unvaccinated. If they had indeed received the vaccine, inclusion of them in our sample would have led to a higher seropositivity estimate not fully attributable to prior infection; however, such vaccinations would have predated the outbreak and were likely to have been reported inaccurately, and furthermore, both individuals ultimately had IgG-negative results. Fifth, while JYNNEOS has been found to elicit a strong OPXV-specific antibody response that peaks around 2 weeks after the second vaccine dose [23], some mpox-vaccinated participants we included may have had antibody responses within 2 weeks of vaccination and been seropositive due to vaccination versus asymptomatic mpox infection. Most with IgG-positive results were asymptomatic, a finding that may also have been related to vaccine-induced antibodies rather than antibodies from prior mpox infection. Finally, questionnaire data were subject to recall bias, including self-reported mpox testing results that may not have reflected true mpox history and other specific information used to help interpret serologic results, such as a previous smallpox vaccination history. However, the exclusion of all participants who reported a smallpox vaccine history—including those who were relatively young and likely had inaccurate recall—did not change the overall seroprevalence we observed.

Our findings from the 2022 NYC outbreak suggest that strategies that rely solely on testing patients with lesions, and subsequent case investigation and contact tracing, may be insufficient to completely curb future mpox outbreaks. Surveillance studies to measure the extent to which mild or subclinical infections could contribute to ongoing transmission are needed and, despite ongoing divestments from public health, resources must be made available to develop and sustain infrastructure to do this work. Finally, public health prevention interventions—such as provider outreach, community engagement, and ensuring sustained and equitable access to mpox vaccination—must be maintained to protect individuals and communities against a resurgence of mpox.

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Table 1.

Characteristics and Seropositivity of Participants in Mpox Serosurvey, New York City, 7 July to 1 September 2022

	Participants Tested		Seroprevalence		
Characteristic	**No.**	**(%)**	**No. Positive**	**(% Positive)**	**% Positive 95% CI**
All	419	(100.0)	27	(6.4)	4.1–8.8
Sex assigned at birth (n = 418)					
Female	121	(28.9)	4	(3.3)	.9–8.3
Male	298	(71.1)	23	(7.7)	4.7–10.8
Gender and gender of sex partner (n = 418)					
CisMSM, ± partners of other genders	166	(39.7)	13	(7.8)	3.7–11.9
CisMSW only	101	(24.2)	7	(6.9)	2.0–11.9
Ciswomen	109	(26.1)	4	(3.7)	1.0–9.1
Other cismen	14	(3.3)	1	(7.1)	.2–33.9
TGNCNB	28	(6.7)	2	(7.1)	.9–23.5
Race/ethnicity (n = 414)					
Hispanic	98	(23.7)	6	(7.1)	1.4–14.0
Non-Hispanic Asian/Pacific-Islander	49	(11.8)	0	(0.0)	…
Non-Hispanic Black	88	(21.3)	7	(9.1)	2.3–13.6
Non-Hispanic White	151	(36.5)	12	(8.6)	3.6–12.3
Non-Hispanic Native American/Alaska Native/other/multiple races	28	(6.8)	1	(3.6)	.1–18.4
Age group (n = 419)					
18–29 y	225	(53.7)	13	(5.8)	2.7–8.8
30–39 y	155	(37.0)	11	(7.1)	3.1–11.1
40–49 y	30	(7.2)	2	(6.7)	.8–22.1
50+ years	9	(2.1)	1	(11.1)	.3–48.3
Borough of residence (n = 418)					
Bronx	19	(4.5)	4	(21.1)	6.1–45.6
Brooklyn	148	(35.4)	12	(8.1)	4.3–13.7
Manhattan	167	(40.0)	9	(5.4)	2.5–10.0
Queens/Staten Island	46	(11.0)	2	(4.3)	.5–14.8
Non-New York City	38	(9.1)	3	(7.9)	1.7–21.4

Characteristic	Participants Tested		Seroprevalence		
	No.	(%)	No. Positive	(% Positive)	% Positive 95% CI
With HIV (n = 418)					
Yes	20	(4.8)	1	(5.0)	1.0–24.9
No/unknown	398	(95.2)	28	(6.5)	
Number of sex partners from April 2022 to survey date (n = 418)					
0–1	86	(20.6)	5	(5.8)	1.9–13.1
2–5	227	(54.3)	13	(5.7)	2.7–8.8
6–10	65	(15.6)	6	(9.2)	2.2–16.3
>10	40	(9.6)	3	(7.5)	1.6–20.4
Intimate contact from April 2022 to survey date (n = 420)					
Yes	412	(98.1)	29	(7.0)	4.8–10.0
No/unknown	8	(1.9)	1	(12.5)	.3–52.7
Types of intimate contact, not mutually exclusive (n = 419)					
Anal rimming	169	(40.3)	11	(6.5)	2.8–10.2
Anal sex	210	(50.1)	14	(6.7)	3.3–10.0
Genital to genital contact	218	(52.0)	16	(7.3)	3.9–10.8
Oral sex	379	(90.5)	23	(6.1)	3.7–8.5
Skin to skin contact	295	(70.4)	20	(6.8)	3.9–9.7
Vaginal sex	238	(56.8)	12	(5.0)	2.3–7.8
Close contact with someone diagnosed with mpox, mutually exclusive (n = 397)					
Shared a bed	9	(2.3)	0	(0.0)	…
Housemates, no shared bed	0	(0.0)	0	(0.0)	…
Not applicable	388	(97.7)	27	(7.0)	4.4–9.5
Symptoms from April 2022 to survey date, symptomatic categories not mutually exclusive (n = 395)					
Genital or nongenital rash/lesions/sores	26	(6.5)	5	(19.0)	6.6–39.4
Fever/aches/chills/swollen lymph nodes/malaise/exhaustion/headache	81	(20.5)	6	(8.5)	3.5–13.1
Anal symptoms besides rash/lesions/sores	10	(2.5)	1	(18.2)	2.3–44.5
None/unknown	302	(76.3)	19	(6.3)	3.6–9.0

Abbreviations: MSM, men who have sex with men; MSW, men who have sex with women; TGNCNB, transgender, gender nonconforming, nonbinary.

Table 2.

Characteristics and Seropositivity of Cis Male Participants Who Report Sex With Men, Mpox Serosurvey, New York City, 7 July to 1 September 2022

	Participants Tested		Seroprevalence		
Characteristic	**No.**	**(%)**	**No. Positive**	**(% Positive)**	**% Positive 95% CI**
All	166	(100.0)	16	(7.8)	3.7–11.9
Race/ethnicity (n = 164)					
Hispanic	46	(28.0)	4	(8.7)	2.4–20.8
Non-Hispanic Asian/Pacific-Islander	16	(9.8)	0	(0.0)	…
Non-Hispanic Black	21	(12.8)	1	(4.8)	.1–23.8
Non-Hispanic White	71	(43.3)	7	(9.9)	2.9–16.8
Non-Hispanic Native American/Alaska Native/other/multiple races	10	(6.1)	1	(10.0)	.3–44.5
Age group (n = 166)					
18–29 y	78	(47.0)	5	(6.4)	2.1–14.3
30–39 y	67	(40.4)	7	(10.4)	3.1–17.8
40–49 y	15	(9.0)	0	(0.0)	…
50+ years	6	(3.6)	1	(16.7)	.4–64.1
Borough (n = 164)					
Bronx	3	(1.8)	0	(0.0)	…
Brooklyn	48	(29.3)	3	(6.3)	1.3–17.2
Manhattan	80	(48.8)	7	(8.8)	2.6–14.9
Queens/Staten Island	17	(10.4)	1	(5.9)	.2–28.7
Non-New York City	15	(9.1)	2	(13.3)	1.7–40.5
With HIV (n = 165)					
Yes	11	(6.7)	1	(9.1)	.2–41.3
No/unknown	154	(93.3)	12	(7.8)	3.6–12.0
Number of sex partners from April 2022 to survey date (n = 166)					
0–1	12	(7.2)	0	(0.0)	…
2–5	84	(50.3)	9	(10.7)	5.0–19.4
6–10	39	(23.4)	4	(10.3)	2.9–24.2
>10	32	(19.2)	3	(9.4)	2.0–25.0
Intimate contact from April 2022 to survey date (n = 166)					

Characteristic	Participants Tested		Seroprevalence		
	No.	(%)	No. Positive	(% Positive)	% Positive 95% CI
Yes	166	(100.0)	16	(7.8)	3.7–11.9
No/unknown	0	(0.0)	0	(0.0)	…
Types of intimate contact, not mutually exclusive (n = 166)					
Anal rimming	118	(71.3)	9	(7.6)	2.8–12.4
Anal sex	151	(91.0)	12	(7.9)	3.6–12.3
Genital to genital	118	(71.3)	12	(10.2)	4.7–15.6
Oral sex	163	(98.2)	13	(8.0)	3.8–12.1
Skin to skin	127	(76.6)	13	(10.2)	5.0–15.5
Vaginal sex	22	(13.8)	2	(9.1)	1.1–29.2
Close contact with someone diagnosed with mpox, mutually exclusive (n = 156)					
Share a bed only	5	(3.2)	0	(0.0)	…
Housemates only	0	(0.0)	0	(0.0)	…
Not applicable	151	(96.8)	16	(8.6)	4.1–13.1
Symptoms from April 2022 to survey date, symptomatic categories not mutually exclusive (n = 157)					
Genital or nongenital rash/lesions/sores	15	(9.5)	4	(26.7)	7.8–55.1
Fever/aches/chills/swollen lymph nodes/malaise/exhaustion/headache	39	(24.8)	2	(5.1)	.6–17.3
Other anal symptoms besides rash/lesions/sores	8	(5.1)	1	(12.5)	.3–52.7
None/unknown	110	(70.1)	9	(8.2)	3.1–13.3