Changes in Group Sex Behavior Across Mpox Outbreak Phases Among DETECT 2 Participants in King County, Washington

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Abstract

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Background: Mpox is an infectious, viral disease endemic to West and Central Africa. In 2022, there was a global mpox outbreak with diagnoses in the United States concentrated among gay, bisexual, and other men who have sex with men (GBMSM). Since vaccine access was limited during the initial months of the outbreak, public health guidance highlighted the importance of behavioral changes to reduce mpox transmissions, including limiting the number of sexual partners, avoiding skin to skin contact, and reducing participation in group sexual events (GSEs). The aim of this analysis was to assess if reported group sex among cisgender men who have sex with men changed over the course of the 2022 mpox outbreak.

Methods: This was a secondary analysis of data from participants enrolled in Project DETECT part 2 (Project DETECT2) conducted at Public Health − Seattle King County's Sexual Health Clinic and Madison Clinic at Harborview Medical Center from August 2021 to May 2024. This

analysis included English- and Spanish-speaking cisgender GBMSM ages 18 or older seeking sexual health services, including HIV testing. Participants completed computer assisted self-interviews. The primary exposure was time in relation to the mpox epidemic in King County, Washington (pre-outbreak: August 2021 - April 2022; outbreak: May 2022 - April 2023; and post-outbreak: May 2023 - May 2024). The primary outcome was self-reported participation in group sex events (GSEs). Descriptive statistics were used to summarize demographic characteristics across time periods. Chi squared tests and Poisson regression models with robust standard errors were used to estimate prevalence ratios (PR) comparing GSE participation across time periods. Analyses were repeated stratifying by HIV status and PrEP use.

Results: During the study period, 702 surveys were completed and included in the analysis. The prevalence of GSE in the pre-outbreak was 30%, 36% in the outbreak period, and 42% in the post-outbreak period (post-outbreak versus pre-outbreak period PR: 1.22 [95% CI 1.06, 1.40]). Findings were qualitatively similar when stratified by HIV status. Among HIV-negative participants, overall, 49% reported using PrEP. Among participants using PrEP, the prevalence of GSE in the pre-outbreak period was 39%, 39% in the outbreak period, and 47% in the post-outbreak period (post-outbreak versus –pre-outbreak period PR: 1.15 [95% CI: 0.89, 1.48]). The proportion of participants who were not on PrEP who reported GSE was lower (28%) than reported for those on PrEP and was not associated with time period.

Conclusions: In this secondary analysis of cisgender GBMSM participating in a sexual health research study, we observed a non-statistically significant increase in reported GSE participation in the outbreak and post-outbreak periods compared to the pre-outbreak period. Despite high levels of GSE across outbreak period, public health efforts such as sex-positive, harm reduction messaging continue to be an important part of sexual health outreach for GBMSM.

Introduction

Mpox (clades I and II) is a viral zoonosis historically found in West and Central Africa. Before 2022, transmission occurred mainly through contact with infected animals such as rodents and primates, with human-to-human transmission limited mainly among household settings, and cases were concentrated among children in rural communities.[1] Cases outside of Africa were rare and commonly travel-related.[2] During 2022, non-travel related mpox cases were detected outside of endemic regions and ultimately resulted in a global outbreak. The first case in the United States (US) was detected in late May 2022 and national cases increased rapidly during that summer,[2] representing a significant epidemiologic shift for mpox. In the US, transmission was concentrated among gay, bisexual, and other men who have sex with men (GBMSM), where transmission was driven by physical and sexual contact within connected sexual networks.[2,3] Early epidemiologic investigations reported that sexual activity and intimate skin-to-skin contact were key drivers of transmission.[4,5]

Around the end of 2022, an estimated 30,000 cases of mpox cases were reported in the US, with majority of cases occurring in adult males (93%).[6] National surveillance showed racial and ethnic disparities, with 31% of people with mpox identifying as Black compared to 14% of the US population who identified as Black, and 30% of people with mpox identifying as Latino/a/e or Hispanic compared to 19% of the US population.[6,7] In Washington state, 654 mpox cases were reported in 2022, with King County, which includes Seattle, accounting for 77% of cases.[8] In King County, 94% of cases were among cisgender men (94%), with a high proportion identifying as gay, bisexual, queer, or another sexual identity (79%).[7] Similar to national trends, Latino/e or Hispanic residents in King County were disproportionately impacted by mpox, with 26% of people diagnosed with mpox identifying as Latino/e or Hispanic versus 11% of the population in King County.[7,9]

Vaccine access was limited during the initial months of the outbreak, therefore public health guidance emphasized the importance of modifying behaviors to reduce mpox transmission, including limiting the number of sexual partners, avoiding skin to skin contact with individuals with rashes, and reducing participation in group sexual events (GSEs).[2,3] This approach mirrored HIV prevention recommendations in the era before pre-exposure prophylaxis (PrEP), when behavioral modifications such as reducing the number of partners and condom use were primary prevention tools in the absence of effective biomedical interventions.[10,11] In the context of mpox, data are limited on the extent to which individuals in affected communities adopted these behavioral changes during different periods of the mpox outbreak or how these behaviors changed as vaccine availability expanded. The goal of this analysis was to assess if reported group sex among cisgender men who have sex with men changed over the course of the 2022 mpox outbreak.

Methods

Study Design and Participants

Data were analyzed from participants enrolled in Project DETECT part 2 (henceforth referred to as Project DETECT2). Project DETECT2 was a cross-sectional study that evaluated performance characteristics of new and existing point-of-care HIV tests.[12] Participants were enrolled between August 2021 to May 2024 at Public Health − Seattle King (PHSKC) Sexual Health Clinic and Madison Clinic (a Ryan White-funded primary care clinic for people with HIV or at risk for HIV acquisition). Participants were aged 18 years or older and included three groups: (1) English-speaking individuals seeking sexual health services at the PHSKC Sexual Health Clinic and reporting HIV-negative or unknown status; (2) English-speaking individuals

living with HIV whose first positive test was more than 90 days prior to referral; and (3) English- and Spanish-speaking individuals with possible or newly diagnosed acute or early HIV infection, recruited to enrich the sample of individuals who are likely to have discordant HIV test results (to address the primary aims of the project). Study procedures were reviewed and approved by the University of Washington's Institutional Review Board (IRB). Project DETECT participants provided informed consent and were compensated for participation in the study.[12]

Data on demographics, HIV testing history, sexually transmitted infection history, pre-exposure prophylaxis (PrEP) and antiretroviral therapy (ART) use among people living with HIV, and sexual behaviors were assessed using a computer assisted self-interview survey. While Project DETECT2 enrolled participants across the gender spectrum, questions about sexual partners, including group sex events (GSE), were only asked to cisgender men; therefore, this analysis is restricted to that population. Individuals were able to re-enroll in Project DETECT2 every 90 days if they continued to be HIV-negative, thus a small proportion of Project DETECT2 participants completed the survey several times. However, due to the data collection approach used in Project DETECT, repeat visits can be identified but cannot be linked to a participant.

The primary exposure was time period relative to the mpox epidemic in King County, Washington. Initially, three mpox-related time periods were defined based on the epidemiologic curve.[7] The pre-outbreak period (August 2021 - April 2022) represents the period before the start of the global mpox outbreak and before any cases were detected in King County. The outbreak period (May 2022 - April 2023) corresponds to the start of the mpox epidemic in King County through the end of the outbreak. During this time, public health guidance and increased perceived personal risk may have led to changes in sexual behaviors. Post-outbreak (May 2023 - May 2024) reflects the period after the outbreak peak, when decreased case counts may have lowered perceived personal risk leading to changes in sexual behaviors. Due to the long tail of

the outbreak, we performed a sensitivity analysis sub-dividing the Outbreak period into two sub-periods: Outbreak peak (May 2022 - November 2022) and Outbreak tail (November 2022 - May 2023).

The primary outcome was self-reported participation in group sexual events (GSE). Consistent with other analyses using Project DETECT data (Violette et al. 2019), GSE were described as sexual encounters which involve three or more participants (threesomes and four-or-more-somes), including the respondent, in the past 3 months.[13] GSE participation was assessed as a binary outcome (yes/no) at each visit.

Data Analysis

Descriptive statistics were used to summarize participant characteristics by time period. We used chi-square tests to compare GSE prevalence across the three time periods. Poisson regression models with robust standard errors estimated prevalence ratios (PR) comparing GSE participation in the outbreak period and post-outbreak period to the pre-outbreak period. To assess whether including multiple observations from the same participant influenced the results, a sensitivity analysis was conducted excluding subsequent visits and restricting the analysis to first visits only. Given the potential for more severe mpox outcomes among individuals living with HIV, behavioral responses to mpox prevention guidance may differ by HIV status. Therefore, we conducted additional analyses stratified by HIV status (people living with HIV versus not living with HIV) and PrEP use (HIV negative people using PrEP versus not using PrEP) using the same methods as described above. Statistical significance was assessed at alpha = 0.05. Analyses were conducted using R statistical software.

Results

There were 622 individuals that completed 702 surveys during the analysis period, including 80 participants that contributed more than one survey. Demographic and clinical characteristics reported in the 702 surveys, overall and by outbreak period, are presented in Table 1. There were 199 participants who completed surveys in the pre-outbreak period, 255 participants in the outbreak period, and 245 in the post-outbreak period. Demographic characteristics were qualitatively similar across the three periods. Overall, 49% of HIV-negative participants reported using PrEP; however, the proportion of participants using PrEP was lower in the pre-outbreak period (37%) compared to the outbreak period (48%) and post-outbreak period (59%). Additionally, the proportion among participants who reported having 1 or more male partners in the past 3 months did not differ across all periods overall. When restricted to the participant's first survey (n=622), demographic characteristics across the three study periods (Table 1a) were qualitatively similar to those reported for all study interviews (Table 1).

The proportion of participants reporting GSE, overall and by study period, is presented in Table 2. Across all study visits, 37% reported GSE participation. Prior to the mpox outbreak, GSE participation was 30% compared to 36% during the outbreak period and 42% post-outbreak. While GSE participation was higher in the outbreak and post-outbreak periods compared to the pre-outbreak period, this increase was only statistically significant when comparing GSE in the post-outbreak versus pre-outbreak period (PR 1.22 [95% CI 1.06, 1.40]; Table 2).

Given that the outbreak peak included a clear peak and a relatively long tail and that GSE participation during the post-outbreak period was slightly higher than the pre-outbreak period, we conducted a sensitivity analysis subdividing the outbreak period into two parts: outbreak peak (May 2022 - November 2022) and outbreak tail (November 2022 - May 2023). During the outbreak peak and outbreak tail, 38% and 35% of participants reported GSE, respectively

(Table 2). Given that there was no substantive difference in GSE reporting across three versus four study periods, we used the three periods specified a priori as the exposure periods for subsequent analyses.

We repeated our analyses stratified by HIV status and by current PrEP use (Table 3). Overall, 35% of study participants who were HIV negative reported GSE participation. However, the proportion of HIV-negative participants who reported GSE participation in the post-outbreak period (42%) was higher compared to the outbreak period (34%) and the pre-outbreak period (29%). While GSE participation was higher in the post-outbreak and outbreak period compared to the pre-outbreak period, this increase was only statistically significant when comparing GSE in the post-outbreak versus pre-outbreak period (PR 1.23 [95% CI: 1.06, 1.43]; Table 3). Among study participants living with HIV, 43% of study participants reported GSE participation overall. However, among participants living with HIV, the proportion in the outbreak period (45%) and post-outbreak (44%) was higher compared to the pre-outbreak period (36%). While GSE participation was slightly higher in the outbreak and post outbreak period compared to the pre-outbreak period, this increase was not statistically significant when comparing GSE in the outbreak period versus pre-outbreak period (PR 1.17 [95% CI: 0.80, 1.72]; Table 3).

Among HIV-negative participants, overall 49% reported PrEP use. Among those using PrEP, 43% reported GSE; however, the proportion of participants using PrEP in the post-outbreak period (47%) was higher compared to the outbreak period (39%) and the pre-outbreak period (39%). While GSE participation was higher in the post outbreak compared to the outbreak period and the pre-outbreak period, this increase was not statistically significant when comparing GSE in the post-outbreak period versus pre-outbreak period (PR 1.15 [95% CI: 0.89, 1.48]; Table 3). Among participants who were not on PrEP, 28% reported GSE; however, the proportion of participants who were not on PrEP in the post outbreak period (34%) was higher

compared to the outbreak period (29%) and the pre-outbreak period (23%). While GSE participation was higher in the post outbreak and outbreak period compared to the pre-outbreak period, these increases were not statistically significant (Table 3).

Discussion

In this secondary analysis of cisgender men participating in a sexual health research study, we observed moderate, but not statistically significant increases in reported GSE participation in the outbreak (36%) and post-outbreak (42%) periods compared to the pre-outbreak period (30%). Findings were similar when stratified by HIV status and PrEP use, although report of GSE was generally highest among individuals reporting PrEP use. During the 2022 mpox outbreak, public health guidance to reduce GSE participation was recommended; therefore, we hypothesized that the prevalence of GSE would be lower during the outbreak period compared to both pre- and post-outbreak periods. However, in our overall analysis and various sub-group analyses we did not observe decreases in the prevalence of GSE during the outbreak.

Our study findings contrast prior literature that GSE participation changed during the mpox outbreak. A study conducted by Orta Portillo *et al.* enrolled 91 GBMSM in Southern California from October 2022 to April 2023 and assessed changes in reported sexual behaviors during the mpox outbreak peak.[14] Among participants who reported any history of GSE, 48% reported modifying their sexual behaviors by limiting the number of sex partners to prevent mpox infection.[14] Since this study recruited at the community level after the start of the mpox outbreak and excluded individuals using PrEP and individuals living with HIV, the findings by Orto Portillo *et al.* differ from our findings because our analysis included individuals stratified by PrEP use and HIV status into three distinct periods which may have increased the report of the number of sex partners and GSE participation at the county versus community level.

Another study conducted between August and October 2022 at two Washington, D.C. health clinics by Copen *et al*., recruited 711 eligible adults 18 years and older that were receiving the mpox vaccination by completing a self-administered questionnaire that asked if they modified their sexual behaviors after learning about the mpox outbreak.[15] Among 52% of the total adults for whom group sex behavior changed after learning about mpox, 45% reported lower GSE participation compared to their pre-mpox behaviors.[15] It is possible that participants may have limited their numbers of sexual partners in response to public health messaging about mpox infection prevention prior to receiving the vaccine.[15] The findings in our analysis differed from the results in the study by Copen *et al.* because DETECT participants were asked about the reported number of partners and were not asked about how they changed behaviors to reduce mpox risk. This can likely influence the results of reported GSE participation due to social desirability bias if participants were asked about partners before getting their mpox vaccination.

A mpox substudy narrowed from a national parent study named “Keeping it LITE” was conducted in Illinois by Phillips *et al.* between September 10th and September 20th, 2022. In this mpox substudy of 322 sexual and gender minority individuals (SGM) and youth and young adults (YYA), participants were asked in a survey to report the number of sex partners and GSE participation.[16] They found a similar trend in sexual behavior modification in response to the mpox outbreak, in relation to the study by Copen *et al.* One key finding in this mpox substudy reported that among the SGM YYA participants, about 64% reported reducing the number of sex partners in response to the mpox outbreak.[16] SGM YYM communities in Illinois show a decreasing trend of having a lower number of sex partners in response to the mpox outbreak in comparison to our study population.

Our analyses leveraged data collection activities for Project DETECT2 to assess reported GSE prior to, during, and following the 2022 mpox epidemic – providing a unique opportunity to evaluate changes in reported sexual behavior over time. However, our results should be interpreted in the context of several limitations.

First, DETECT 2 is a cross-sectional study, so we cannot assess individual changes in behavior over time. Also, due to the serial cross-sectional design of the study, we cannot establish causality between mpox awareness and reports of sexual behavioral changes independent of social desirability, recall bias, seeking vaccinations, and other factors occurring during the outbreak period. Secondly, Project DETECT2 enrolled individuals accessing sexual health services or HIV care in King County; findings may not be generalizable to the broader community of individuals not seeking care. Thirdly, our analyses stratified by HIV status or PrEP use may have been underpowered due to small sample sizes, limiting our ability to detect meaningful differences. Lastly, social desirability bias may influence underreporting in sexual behaviors which includes group sex events.

This study highlights the importance of understanding the relationship between the 2022 mpox periods and GSE participation to investigate patterns of sexual risk behaviors and the observed stratification of HIV status and PrEP use in response to increasing mpox transmissions and vaccine availability. Despite not observing differences in the prevalence of GSE over the course of the 2022 mpox outbreak, it is important to continue to assess which public health approaches can best support the health of individuals at risk for mpox. Educating communities about mpox transmission risks and emphasizing harm reduction strategies can mitigate stigma and encourage promoting equitable vaccination access.

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Table 1. Participant Characteristics by Mpox-Related Time Period (Periods 1–3), DETECT 2 GSE Mpox Dataset (2021–2024) (*N* = 702)

Characteristic		Period 1 (Pre-outbreak) *N* = 199 n (%)	Period 2 (Outbreak Peak) *N* = 255 n (%)	Period 3 (Post-peak) *N* = 248 n (%)	Total *N* = 702 n (%)
Age (years), mean (SD)[1]		34.4 (10.4)	36.3 (11.1)	34.5 (9.8)	35.1 (10.5)
Gender Identity[2]	Male	199 (100%)	255 (100%)	248 (100%)	702 (100%)
Race and Ethnicity	American Indian or Alaskan Native	6 (3%)	7 (3%)	10 (8%)	23 (3%)
	Asian	25 (13%)	19 (7%)	31 (12%)	75 (11%)
	Black or African American	21 (11%)	24 (9%)	28 (11%)	73 (10%)
	Hispanic or Latinx	65 (33%)	69 (27%)	74 (30%)	208 (30%)
	Native Hawaiian or Pacific Islander	2 (1%)	4 (2%)	1 (0%)	6 (1%)
	White	76 (38%)	127 (50%)	95 (38%)	298 (42%)
	Another Race	4 (2%)	6 (2%)	9 (4%)	19 (3%)
Current PrEP Use[4]	Yes	64 (37%)	97 (48%)	126 (59%)	287 (49%)
	No	110 (63%)	103 (52%)	86 (40%)	299 (51%)
	Missing	0 (0%)	0 (0%)	2 (1%)	2 (1%)
HIV Status[5]	HIV-Negative/Unknown	174 (87%)	200 (78%)	214 (86%)	588 (84%)
	Living with HIV	25 (13%)	55 (21%)	34 (13%)	114 (16%)
	Established HIV (>3 months)	23/25 (92%)	49/55 (89%)	26/34 (76%)	98/114 (86%)
	Newly Diagnosed HIV (≤3 months)	2/25 (8%)	6/55 (11%)	8/34 (24%)	16/114 (14%)
Number of Male Sex Partners in the past 3 months	0–1	31 (16%)	42 (16%)	44 (18%)	117 (17%)
	2–3	74 (37%)	94 (37%)	70 (28%)	238 (34%)
	4+	94 (47%)	119 (47%)	134 (54%)	347 (49%)

Table 1. Continued.

[1] **Mean Age:** Among 702 study participants, 5 participants refused to answer age in the questionnaire, thus the mean of 697 study participants was calculated from available data.

[2] **Gender:** As noted in the table, all participants across all periods identified as male (100%), so gender identity is not displayed as a stratified variable in Table 1. Gender identity was assessed using the question: "What gender do you consider yourself?" with response options: Male, Female, Transgender Male to Female, Transgender Female to Male, and Non-binary or Genderqueer. Sex assigned at birth was assessed using the question: “What was your sex assigned at birth?” with response options: Male and Female.

[3] **Race and Ethnicity**: Participants who selected "Another group or groups not listed" and provided free-text responses indicating Hispanic, Latino/e/a/x, Mexican, Mexican American, Mestizo, Hispano, or mixed Hispanic heritage were reclassified into the Hispanic or Latinx category. Participants who selected "Another group or groups not listed" without free-text responses indicating Hispanic or Latinx identity, or who provided free-text responses indicating other identities (e.g., Middle Eastern), were classified as Other.

[4] **Current PrEP Use:** Current PrEP use was only asked of participants who reported HIV-negative/unknown status and who reported taking PrEP in the last 3 months. Participants who reported not taking PrEP in the last 3 months were not asked about current PrEP use and were reclassified as "No" for current PrEP use. Participants who refused to answer or did not remember were classified as "Missing." HIV-positive participants were excluded from the PrEP variable entirely.

[5] **HIV Negative:** HIV status was assessed at the start of each visit. "Living with HIV" includes participants with an established HIV diagnosis (>3 months prior to visit) and those newly diagnosed with HIV (≤3 months prior to visit). HIV-negative and unknown status participants were combined into a single category from the study questionnaire design.

Table 1a. First Visit Participant Characteristics by Mpox-Related Time Period (Periods 1–3), DETECT 2 GSE Mpox Dataset (2021–2024) (*N* = 622)

Characteristic		Period 1 (Pre-outbreak) *N* = 199 n (%)	Period 2 (Outbreak Peak) *N* = 255 n (%)	Period 3 (Post-peak) *N* = 248 n (%)	Total *N* = 622 n (%)
Age (years), mean (SD)[1]		34.6 (10.5)	36.5 (11.3)	34.8 (10.2)	35.4 (10.7)
Gender Identity[2]	Male	183 (100%)	255 (100%)	214 (100%)	622 (100%)
Race and Ethnicity	American Indian or Alaskan Native	5 (3%)	7 (3%)	8 (4%)	20 (3%)
	Asian	23 (13%)	17 (8%)	29 (14%)	69 (11%)
	Black or African American	21 (11%)	20 (9%)	23 (11%)	64 (10%)
	Native Hawaiian or Pacific Islander	2 (1%)	3 (1%)	1 (0%)	6 (1%)
	White	75 (41%)	113 (50%)	84 (39%)	272 (44%)
	Hispanic or Latinx	54 (30%)	59 (26%)	60 (28%)	173 (28%)
	Another Race	3 (2%)	6 (3%)	9 (4%)	18 (3%)
Current PrEP Use[4]	Yes	58 (37%)	82 (48%)	104 (58%)	244 (48%)
	No	100 (63%)	88 (52%)	74 (41%)	262 (52%)
	Missing	0	0	2	2
HIV Status[5]	HIV-Negative/Unknown	158 (86%)	170 (76%)	180 (84%)	508 (82%)
	Living with HIV	25 (14%)	55 (24%)	34 (16%)	114 (18%)
	Established HIV (>3 months)	23/25 (92%)	49/55 (89%)	26/34 (76%)	98/114 (86%)
	Newly Diagnosed HIV (≤3 months)	2/25 (8%)	6/55 (11%)	8/34 (24%)	16/114 (14%)
Number of Male Sex Partners (past 3 months)	0–1	30 (16%)	37 (16%)	32 (15%)	99 (16%)
	2–3	67 (37%)	82 (36%)	63 (29%)	212 (34%)
	4+	86 (47%)	106 (47%)	119 (56%)	311 (50%)

Table 1a. Continued.

[1] **Mean Age:** Among 622 study participants who completed only first study visits, 5 participants refused to answer age in the questionnaire, resulting in a total of 617 study participants.

[2] **Gender Identity**: As noted in the table, all participants across all periods identified as male (100%), so gender identity is not displayed as a stratified variable in Table 1. Gender identity was assessed using the question: "What gender do you consider yourself?" with response options: Male, Female, Transgender Male to Female, Transgender Female to Male, and Non-binary or Genderqueer. Sex assigned at birth was assessed using the question: “What was your sex assigned at birth?” with response options: Male and Female.

[3] **Race and Ethnicity**: Participants who selected "Another group or groups not listed" and provided free-text responses indicating Hispanic, Latino/e/a/x, Mexican, Mexican American, Mestizo, Hispano, or mixed Hispanic heritage were reclassified into the Hispanic or Latinx category. Participants who selected "Another group or groups not listed" without free-text responses indicating Hispanic or Latinx identity, or who provided free-text responses indicating non-Hispanic identities were classified as Another Race.

[4] **Current PrEP Use:** Current PrEP use was only asked of participants who reported HIV-negative/unknown status and who reported taking PrEP in the last 3 months. Participants who reported not taking PrEP in the last 3 months were not asked about current PrEP use and were reclassified as "No" for current PrEP use. Participants who refused to answer or did not remember were identified and classified as "Missing." HIV-positive participants were excluded from the PrEP variable.

[5] **HIV Negative:** HIV status was assessed at the start of each visit. "Living with HIV" includes participants with an established HIV diagnosis (>3 months prior to visit) and those newly diagnosed with HIV (≤3 months prior to visit). HIV-negative and unknown status participants were combined into a single category from the study questionnaire design.

Table 2. Group Sex Participation by Epidemic Period, DETECT 2 (2021–2024)

Exposure	N	GSE Participation n (%)	Prevalence Ratio (95% CI)
Overall – 3 periods	702	257 (37%)	
Period 1 (Pre-outbreak)	199	59 (30%)	ref
Period 2 (Outbreak)	255	93 (36%)	1.11 (0.97, 1.26)
Period 3 (Post-outbreak)	248	105 (42%)	1.22 (1.06, 1.40)
Overall – 4 periods	702	257 (37%)	
Period 1 (Pre-outbreak)	199	59 (30%)	ref
Period 2a (Outbreak peak)	131	50 (38%)	1.14 (0.97, 1.34)
Period 2b (Outbreak tail)	124	43 (35%)	1.08 (0.92, 1.26)
Period 3 (Post-outbreak)	248	105 (42%)	1.22 (1.06, 1.40)

Table 3. Group Sex Participation by Period and HIV or PrEP Status, DETECT 2 (2021–2024)

Exposure	N	GSE Participation n (%)	Prevalence Ratio (95% CI)
HIV Status[1]			
HIV Negative	588	208 (35%)	
Period 1 (Pre-outbreak)	174	50 (29%)	ref
Period 2 (Outbreak)	200	68 (34%)	1.08 (0.94, 1.24)
Period 3 (Post-outbreak)	214	90 (42%)	1.23 (1.06, 1.43)
Living with HIV	114	49 (43%)	
Period 1 (Pre-outbreak)	25	9 (36%)	ref
Period 2 (Outbreak)	55	25 (45%)	1.17 (0.80, 1.72)
Period 3 (Post-outbreak)	34	15 (44%)	1.15 (0.75, 1.74)
PrEP Use among HIV-negative participants	586		
PrEP	287	122 (43%)	
Period 1 (Pre-outbreak)	64	25 (39%)	ref
Period 2 (Outbreak)	97	38 (39%)	1.00 (0.78, 1.29)
Period 3 (Post-outbreak)	126	59 (47%)	1.15 (0.89, 1.48)
No PrEP	299	84 (28%)	
Period 1 (Pre-outbreak)	110	25 (23%)	ref
Period 2 (Outbreak)	103	30 (29%)	1.09 (0.93, 1.28)

Period 3 (Post-outbreak)	86	29 (34%)	1.17 (0.97, 1.40)

[1] **HIV Negative:** Includes participants who reported being HIV-negative at the time of completing the survey.