Findings on the Monkeypox Exposure Mitigation Strategies Employed by Men Who Have Sex with Men and Transgender Women in the United States

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Introduction

As of August 26, 2022, there are over 47,000 cases of monkeypox globally (Centers for Disease Control & Prevention, 2022a). As of August 26, 2022, there are currently over 17,000 cases of monkeypox in the U.S., with all states documenting at least one case (Centers for Disease Control & Prevention, 2022b). On August 4, 2022, the U.S. Department of Health and Human Services declared the monkeypox outbreak a public health emergency. Most cases in the U.S. are among those assigned male at birth (AMAB). Among AMAB, 99% reported male-to-male sexual contact, men who have sex with men (MSM) and transgender women are disproportionately affected by monkeypox (Centers for Disease Control and Prevention, 2022f). However, monkeypox can impact members of any community regardless of their sex, gender identity, or sexual orientation (Daskalakis et al., 2022).

Monkeypox is transmitted from skin-to-skin contact (direct contact with lesions or body fluids), respiratory secretions through prolonged face-to-face contact, and fomite transmission. Monkeypox can spread from skin-to-skin and face-to-face contact that often occurs during sexual encounters, such as from kissing, oral sex, and anal sex; however, it is not exclusively sexually transmissible (Centers for Disease Control and Prevention, 2022c). In addition to being vaccinated, the U.S. Centers for Disease Control and Prevention (CDC) has recommended those at risk to reduce or avoid behaviors that increase monkeypox exposure, including but not limited to abstaining from risk exposure until two weeks after the second dose of the vaccine, avoiding kissing, limiting the number of sex partners, and wearing clothes or fetish gear (e.g., leather or latex) during sex to limit skin-to-skin contact with partners with monkeypox-unknown or monkeypox-positive status (Centers for Disease Control & Prevention, 2022e). However, it is uncertain whether MSM and transgender women in the U.S. are engaging in monkeypox exposure mitigation behaviors.

Given the monkeypox outbreak in the U.S. is rapidly evolving, no known research has assessed behavioral changes to mitigate monkeypox exposure—including among MSM and transgender women. The CDC notes that social, behavioral, communication, and health equity research is needed to inform and improve the implementation of monkeypox prevention programs (Centers for Disease Control and Prevention, 2022f). This study aimed to examine U.S. MSM and transgender women’s behavioral changes and employed exposure mitigation strategies due to the ongoing monkeypox outbreak. Results from this formative study can advise the tailoring of monkeypox prevention messaging campaigns and interventions for MSM and transgender women in the U.S.

Method

Participants and Procedure

Between August 6–15, 2022, MSM and transgender women (N = 703) from across the U.S. were recruited online using paid advertisements on Grindr, a popular sexual networking or hookup app for MSM. Eligibility criteria included age 18 years and older, assigned male at birth, gay or bisexual or another man who has sex with men or a transgender woman who has sex with men, and living in the U.S. All participants completed the online cross-sectional questionnaire on Qualtrics. Participants were drawn to win one of 100 $50 gift cards. Electronic informed consent was obtained, and the institutional review board at Purdue University approved the study.

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Measures

Sociodemographic Characteristics. Participants completed items assessing their sex assigned at birth, gender identity, sexual orientation, race and ethnicity, state and zip code of residence, educational level, and annual household income. We categorized states into the four U.S. Census regions. We categorized zip codes as urban or rural based on the index of relative rurality (Waldorf & Kim, 2015). Based on the Index of Relative Rurality, zip codes with an Index score of 0.0–0.39 were urban and those 0.40–1.00 were rural.

Recent Sexual Behavior. Participants completed two items assessing if they had oral sex and/or condomless anal sex with a non-primary male partner in the past 6 months (yes/no).

Monkeypox Exposure Mitigation. Participants indicated if the monkeypox outbreak changed their sexual behaviors or activities (yes/no). If a participant indicated a change, they were directed to select from a pre-determined list the changes in their sexual behavior to mitigate their risk of contracting monkeypox (yes/no). These response options were based on the CDC safer sex guidelines (Centers for Disease Control & Prevention, 2022e).

Data Analysis

Data were analyzed using SPSS (version 27). First, descriptive statistics were calculated to present demographic and monkeypox exposure mitigation using mean and SD for continuous variables and frequency (%) for categorical variables. A binary logistic regression was completed to identify variables associated with sexual behavior and/or activity changes. Variables included in the model were: race (non-Hispanic White [ref], Hispanic or Latin America, all other racial groups), gender identity (cisgender male [ref], other gender identities), and educational level (no high school diploma through high school diploma/GED [ref], some college through bachelor’s degree, graduate degree).

Results

Sociodemographic Characteristics

Table 1 shows the sociodemographic characteristics of the sample. The average age was 38.08 years (SD = 13.38). About three-quarters lived in an urban county (73.3%), and respondents were dispersed throughout the regions: Northeast (10.1%), Midwest (25.8%), South (45.4%), and the West (18.7%). Most were cisgender (91.0%) and gay (72.8%). About half of the respondents were non-Hispanic White (56.7%), followed by Hispanic or Latin American (15.3%) and Black or African American (10.2%). Nearly two-thirds had a bachelor’s degree or higher (61.0%), and 49.7% had an annual household income of $60,000 or higher. Of the total sample, 85.5% had oral sex and 66.4% had condomless anal sex with a non-primary partner during the past 6 months.

Monkeypox Exposure Mitigation

As seen in Table 2, 393 (55.9%) participants reported a change in their sexual behaviors due to the monkeypox outbreak. Of those, 382 endorsed using at least one of the 14 pre-defined strategies provided (M = 3.96, SD = 2.15, range: 1–11). The most common monkeypox mitigation strategies employed were limiting the number of sexual partners one has (40.8%) and avoiding bars, clubs, and other parties (33.4%). Approximately a quarter of participants became abstinent or avoided having any type of sex (24.8%), asked their sexual partners if they had monkeypox symptoms (25.0%), or inspected their sexual partners to see if they had monkeypox symptoms (24.3%). Fewer participants reported engaging in sexual activities that eliminated skin-to-skin contact, such as virtual or cybersex (10.5%), masturbating to each other in the same room without physically touching each other (5.3%), or dry humping (2.4%) to mitigate monkeypox exposure. Similarly, 12.7% reported washing bedding and other fabrics (e.g., towels) after having sex with a partner.

Binary Logistic Regression

For the binary logistic regression model, 2.1% of the sample had missing data. List wise deletion was used for missing data, and this resulted in a final sample of 688 participants. The model significantly predicted changes in sexual behavior or activities due to Monkeypox better than the constant only model, $\chi^2(10) = 79.75, p < 0.001$. Hosmer and Lemeshow’s test was non-significant, $\chi^2(8) = 6.70, p = 0.569$, indicating good model fit. The model accounted for about 15% (Nagelkerke’s $R^2 = 0.147$) of the variance in changes in sexual behavior or activities due to Monkeypox, producing an overall correct classification rate of 64.8%. Table 3 shows that three of the included 10 variables significantly predicted changes in sexual behavior or activities. The regression analysis indicates rurality was negatively associated with changes in behavior, whereas being non-White (race) and having oral sex with a non-primary partner in the past six months was positively associated with changing their sexual behaviors.

Discussion

To our knowledge, this is the first study that examined the monkeypox exposure mitigation strategies of MSM and transgender women in the U.S. Results of this study can help inform the
Table 1 Sociodemographic characteristics ($N=703$)

|                           | N   | %    | M   | SD  |
|---------------------------|-----|------|-----|-----|
| Age (in years)            | 38.11 | 13.39 |
| Rurality                  | 0.30 | 0.13 |
| Urban                     | 500 | 71.1 |
| Rural                     | 203 | 28.9 |
| Region                    |     |      |     |     |
| Northeast                 | 71 | 10.1 |
| Midwest                   | 181 | 25.7 |
| South                     | 319 | 45.4 |
| West                      | 132 | 18.8 |
| Sex assigned at birth     |     |      |     |     |
| Male                      | 703 | 100.0 |
| Gender identity           |     |      |     |     |
| Cisgender                 | 640 | 91.0 |
| Genderqueer or gender queer | 22 | 3.1 |
| Non-binary                | 28 | 3.9 |
| Agender                   | 4 | 0.5 |
| Two-spirit                | 2 | 0.3 |
| Transgender               | 9 | 1.2 |
| Sexual orientation        |     |      |     |     |
| Gay                       | 512 | 72.8 |
| Bisexual                  | 115 | 16.4 |
| Queer                     | 29 | 4.1 |
| Unsure or questioning     | 14 | 2.0 |
| Straight or heterosexual  | 2 | 0.3 |
| Pansexual                 | 24 | 3.4 |
| Asexual                   | 1 | 0.1 |
| Another option            | 6 | 0.9 |
| Race                      |     |      |     |     |
| American Indian or Alaskan Native | 8 | 1.1 |
| Asian or Asian American   | 40 | 5.7 |
| Black or African American | 71 | 10.1 |
| Hispanic or Latin American | 107 | 15.2 |
| Middle Eastern or Arab American | 4 | 0.6 |
| Native Hawaiian or Pacific Islander | 2 | 0.3 |
| Non-Hispanic White        | 400 | 56.9 |
| Multiracial               | 65 | 9.2 |
| Another option            | 4 | 0.6 |
| Education level           |     |      |     |     |
| No high school diploma    | 6 | 0.9 |
| High school diploma or GED | 70 | 10.0 |
| Some college, no degree   | 129 | 18.4 |
| Associate's or technical degree | 68 | 9.7 |
| Bachelor's degree         | 238 | 33.9 |
| Master's degree           | 125 | 17.8 |
| Doctoral or professional degree | 66 | 9.4 |
| Annual household income   |     |      |     |     |
| Under $20,000             | 101 | 14.6 |
| $20,000 to 39,999         | 120 | 17.3 |
| $40,000 to 59,999         | 126 | 18.2 |
| $60,000 to 79,999         | 104 | 15.0 |
| $80,000 to 99,999         | 68 | 9.8 |
development and tailoring of monkeypox prevention strategies geared towards these populations. Similar to work conducted during the early days of the COVID-19 pandemic (Corneli et al., 2022; Griffin et al., 2022; McKay et al., 2021; Starks et al., 2022; Stephenson et al., 2021; Walsh et al., 2021), our results demonstrate that MSM and transgender women employ a variety of exposure mitigation strategies currently endorsed by the CDC (2022e). This includes limiting their exposure by avoiding

| Table 1 (continued) | N  | %  | M    | SD  |
|---------------------|----|----|------|-----|
| $100,000 or more    | 173| 25.0|      |     |
| Oral sex with non-primary partner (past 6 mos.) | 601| 85.7|      |     |
| Condomless anal sex with non-primary partner (past 6 mos.) | 467| 66.8|      |     |

| Table 2 Monkeypox exposure mitigation (N = 703) | N  | %  | M    | SD  | Range |
|-------------------------------------------------|----|----|------|-----|-------|
| Has the monkeypox outbreak changed your sexual behaviors or activities? | Yes | 393| 55.9 |     |       |
| No                                              | 310| 44.1|      |     |       |
| Monkeypox Exposure Mitigation Strategies         |     |    |      |     |       |
| Limited the number of sexual partners            | 287| 40.8|      |     |       |
| Avoided attending bars, clubs, and other parties | 235| 33.4|      |     |       |
| Asked sexual partners if they have monkeypox symptoms | 176| 25.0|      |     |       |
| Became abstinent or avoided having any type of sex | 174| 24.8|      |     |       |
| Inspected sexual partners to see if they have monkeypox symptoms | 171| 24.3|      |     |       |
| Avoided kissing                                  | 107| 15.2|      |     |       |
| Used condoms or anal sex                         | 96 | 13.7|      |     |       |
| Washed bedding and other fabrics (e.g., towels) after having sex | 89 | 12.7|      |     |       |
| Had virtual sex or cybersex (e.g., sexting, using webcams) | 74 | 10.5|      |     |       |
| Masturbated to each other in the same room without physically touching each other | 37 | 5.3 |      |     |       |
| Wore a mask (e.g., cloth, surgical, or N95) during sex | 26 | 3.7 |      |     |       |
| Dry humped, or when one person rubs part of their body on someone for sexual arousal with clothes on | 17 | 2.4 |      |     |       |
| Used condoms for oral sex                        | 15 | 2.1 |      |     |       |
| Used gloves for anal fingering or fisting        | 8  | 1.1 |      |     |       |
| Number of Strategies Used                        |    |    | 3.96 | 2.15| 1–11  |

| Table 3 Binary logistic regression analysis predicting monkeypox exposure mitigation | Correlates | B    | SE  | Adjusted OR | 95% CI |
|-------------------------------------------------------------------------------------|------------|------|------|-------------|-------|
| Age                                                                                 | 0.002      | 0.006| 1.002| 0.989–1.015 |
| Rurality                                                                            | −4.161     | 0.648| 0.016**| 0.004–0.055|
| Region                                                                              | 0.034      | 0.094| 1.034| 0.861–1.243 |
| Gender identity                                                                     | −0.040     | 0.302| 0.961| 0.532–1.735 |
| Sexual orientation                                                                  | 0.366      | 0.297| 1.442| 0.806–2.581 |
| Race                                                                                | 0.701      | 0.194| 2.015**| 1.378–2.948|
| Education level                                                                     | 0.113      | 0.148| 1.119| 0.838–1.495 |
| Annual household income                                                             | 0.061      | 0.051| 1.063| 0.962–1.175 |
| Oral sex with non-primary partner (past 6 mos.)                                     | 0.652      | 0.276| 1.919*| 1.116–3.299 |
| Condomless anal sex with non-primary partner (past 6 mos.)                        | −0.025     | 0.205| 0.975| 0.652–1.459 |

*p < .05, **p < .001
crowded social venues where close, personal, skin-to-skin contact is likely to occur—such as a party, dance club, or sex club where minimal clothing may be worn.

Various news outlets have focused on the transmission of monkeypox primarily during sexual activity between MSM (Kimball, 2022; Ryan, 2022; Thrasher, 2022). Although there is a current debate on how this messaging may further stigmatize MSM (Bragazzi et al., 2022a; Rabiul Islam et al., 2022; Titanji, 2022), the larger discussion has prompted scholars and advocates to publish media pieces discussing methods to have safer sex during the current outbreak (Diamond et al., 2022). Research is warranted to understand preferences for monkeypox prevention messaging among MSM and transgender women, including studies assessing the impact of current messaging on monkeypox transmission mitigation behaviors. Additionally, stigma and equity should be considered regarding monkeypox prevention, testing, and vaccination. Although respondents of color were more likely to change their behaviors than non-Hispanic White respondents, persons of color are disproportionately represented in monkeypox cases than non-Hispanic White respondents but almost half of the monkeypox vaccine uptake has been among non-Hispanic Whites (Centers for Disease Control & Prevention, 2022d). Research and interventions are critical to address the racial/ethnic inequities in monkeypox vaccination uptake.

Fewer respondents took actions to decrease the potential spread of monkeypox via fomites, such as bedding or towels. This finding is not surprising given that messaging has predominantly focused on transmission during sexual activity, specifically between MSM (Bragazzi et al., 2022a; Centers for Disease Control & Prevention, 2022e; Girometti et al., 2022; Gonsalves et al., 2022). Although fomite transmission of monkeypox is less common, public health messaging should convey using of clean bedding and/or towels during sex with a partner and washing these fabrics immediately after.

**Limitations**

Results should be considered in light of the study’s limitations. We exclusively recruited U.S. MSM and transgender women from Grindr. Although Grindr is a popular sexual networking application among this population in the U.S., our sample likely had self-selection bias. Our findings might not be representative of the population of Grindr users or the U.S. MSM and transgender women populations. Additionally, our sample mainly consisted of cisgender gay, bisexual, and other sexual minority males, with nine participants being transgender women. Although MSM consist of the majority of current monkeypox cases within the U.S. and European countries (Bragazzi et al., 2022b), everyone is at risk regardless of sex, gender identity, and sexual orientation. Monkeypox cases might be disproportionate among MSM because MSM might utilize monkeypox testing more than other groups because of their use of medical and sexual health care services, history and vigilance of infectious diseases that can be transmitted sexually, and current media about monkeypox has focused on them (Daskalakis et al., 2022; Minhaj et al., 2022). More research is needed to examine the monkeypox mitigation behaviors of other populations, including heterosexual men and women. Our study was cross-sectional and future research should examine monkeypox mitigation strategies longitudinally, especially as more individuals are able to be vaccinated and the U.S. monkeypox outbreak evolves.

These findings can be immediately applied to public health intervention campaigns addressing monkeypox exposure among MSM and transgender women. Although slightly more than half of respondents indicated they had engaged in mitigation strategies, a large proportion reported taking no efforts to reduce their exposure risk. Continued public health and media messaging addressing practical risk reduction strategies that engage this population is essential to curtailing the monkeypox incidence in the U.S.

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