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Correlates of Unprotected Vaginal or Anal Intercourse with Women among Substance-Using Men Who Have Sex with Men

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Abstract

The role men who have sex with men and women (MSMW) play in heterosexual HIV transmission is not well understood. We analyzed baseline data from Project MIX, a behavioral intervention study of substance-using men who have sex with men (MSM), and identified correlates of unprotected vaginal intercourse, anal intercourse, or both with women (UVAI). Approximately 10% (n=194) of the men reported vaginal sex, anal sex, or both with a woman; of these substance-using MSMW, 66% (129) reported UVAI. Among substance-using MSMW, multivariate analyses found unemployment relative to full/part-time employment (OR=2.28; 95% CI 1.01, 5.17), having a primary female partner relative to no primary female partner (OR=3.44; CI 1.4, 8.46), and higher levels of treatment optimism (OR=1.73; 95% CI 1.18, 2.54) increased odds of UVAI. Strong feelings of connection to a same-race gay community (OR=0.71; 95% CI 0.56, 0.91) and Viagra use (OR=0.31; 95% CI 0.10, 0.95) decreased odds of UVAI. This work suggests that although the proportion of substance-using MSM who also have sex with women is low, these men engage in unprotected sex with women, particularly with primary female partners. This work highlights the need for further research with the substance using MSMW population to inform HIV prevention interventions specifically for MSMW.

Keywords

bisexual; heterosexual; HIV; MSMW; condom usage

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Introduction

In 2010, 61% of new HIV diagnoses in the United States were attributed to male-to-male sexual contact; with heterosexual contact accounting for another 27% of new HIV diagnoses. Over 85% of diagnoses among women in 2010 were attributed to heterosexual contact [1], but it is unclear what proportion of these cases are attributable to sex with men who have sex with men and women (MSMW) as opposed to men who have sex exclusively with women (MSW). Several studies conducted in the United States [2–6] have proposed that MSMW may act as a bridge population [7–10] between high HIV-prevalence MSM and lower HIV-prevalence women [4]. But evidence to date has been mixed, with some studies finding the role of MSMW to be minimal [10–12] and others concluding that the role of MSMW is important and complex [13–16] even if the number of MSMW actively having sex with both men and women may be small [3]. Part of what is thought to be driving the MSMW “bridge” is the lack of disclosure of men’s male sex partners to their female sex partners among MSMW, so identifying the highest risk MSMW is particularly important to minimizing the impact of the potential “bisexual bridge” [14]. Not all men who have both male and female sexual partners hide and/or fail to disclose their relationships. Unfortunately, so-called men “on the down low” – MSMW who identify as heterosexual and hide their sexual behavior with men - have gained media attention in the past decade as important drivers of the heterosexual epidemic among African Americans [5; discussed in 35]. However, MSMW who hide their sexual contact with men may be the least risky of MSMW. While non-disclosure is certainly an important issue, MSMW who reported not disclosing their bisexual behaviors to their female partners also reported using other protective measures – condoms, not ejaculating – with those partners [16] and African-American MSMW in particular reported lower rates of unprotected anal intercourse (UAI) with male sex partners than their white counterparts [5]. A distinct issue is that some MSMW, particularly those who exchange sex for money and engage in other high-risk behaviors (such as drug use), may be “core transmitters” to both men and women [23].

The literature on MSMW is complex, with attention concentrated on specific sub-populations of MSMW, for example HIV-positive injection drug using MSMW [17], HIV-positive African American MSMW [18,19], African American MSMW [20], non-gay identified and non-disclosing MSMW [6] and methamphetamine-using HIV-positive MSMW [21]. Based on this work, we expected that MSMW in our sample of substance-using men would be more likely to be African American [15, 22–24], and to report a history of injection drug use [6], recent homelessness [23], incarceration [20], and engaging in exchange sex [17] than men who had sex exclusively with other men (MSMO). Further, we anticipated that MSMW in the sample would report higher levels of internalized homophobia than MSMO [24]. Within MSMW, we expected that HIV-positive MSMW would be less likely to report unprotected vaginal and/or anal sex (UVAI) with female partners.

In order to focus prevention messages and design HIV prevention interventions specifically for high-risk MSMW, we need baseline research that identifies factors associated with transmission risk behaviors among this group. To that end, the purpose of this analysis was two-fold. First, we described a sample of substance-using MSM who engage in anal sex with male sexual partners (protected and unprotected) and also have vaginal or anal sex with women (MSMW); we compare these men with MSMO in the sample. Second we identified correlates of UVAI with women among MSMW. Thus we assessed relations among a number of sociodemographic, psychosocial, condom use-related and other previously identified correlates of sexual HIV risk behavior among a sample of substance-using MSMW.

Methods

Study Sample and Procedures

From 2005 through 2006, a convenience sample of substance-using MSM residing in Chicago, Los Angeles, New York City, and San Francisco was recruited for inclusion in a randomized control trial called Project MIX, an HIV risk-reduction intervention trial for substance-using MSM. Details on study methodology are published elsewhere [25]. Briefly, a variety of recruitment strategies were used, including street and venue outreach, posters and flyers, advertisements in print media, and word of mouth. Men were eligible for the study if they reported the following in the prior 6 months: (a) being drunk or “buzzed” on alcohol two or more times, or high on non-injection drugs at least once, during or 2 hours before having anal sex; and (b) at least one unprotected anal sex episode with a male partner whose HIV serostatus was unknown or discordant. Men who reported injecting steroids, hormones, prescription medication or methamphetamine in the past 6 months were eligible if they met the other eligibility criteria listed above. Men were ineligible if they (a) reported only marijuana or use of erectile dysfunction medications (without any other substance use) soon before or during anal sex in the past 6 months; (b) reported injecting drugs other than steroids, hormones, prescribed medications, or methamphetamine in the past 6 months; (c) had known for less than 6 months that they were HIV-infected; or (d) were currently participating in another HIV behavioral intervention trial. Eligible men who enrolled were randomized to receive six 2-hour group intervention sessions (either experimental or “attention control”). There was also a non-randomized control group.

At the baseline assessment, the men provided written informed consent, followed by completion of an audio computer-administered self-interview (ACASI). All men who completed the baseline assessment were eligible to be included in this analysis. The protocol was approved by institutional review boards at each of the local sites and the Centers for Disease Control and Prevention (CDC).

We had baseline data on 2041 men. Twenty-eight men were excluded from this analysis because they either reported having had no vaginal or anal sex partners (either male or female) in the three months prior to baseline or they had no valid data for female sexual partners (missing data or answers of “don’t know” or “refuse to answer”). In other words, in order to be eligible to be included in this analysis, a participant must have reported at least one male anal sex partner in the three months prior to baseline and must have manually entered a number between 0 and 9996 in response to the question “How many women have you had sex with in the past three months? (Include only women with whom you had vaginal or anal sex, with or without a condom, and with or without ejaculation). Answers of “Don’t know” (coded as 9997) and “Refuse to Answer” (coded as 9999) were re-coded as missing data and men giving these answers were deemed ineligible for this analysis. The full sample size was 2013 men eligible for analysis. If a participant refused to answer a question, was skipped out of a question, or answered with “don’t know” that response was recoded as missing data. The N values for each variable in the test and tables represent 100% of all valid responses, excluding the “don’t know” and “refuse to answer” recoded answers.

Measures

The baseline assessment collected information on demographic characteristics, substance use, sexual risk behaviors, and psychosocial and mental health measures during the prior 3 months. The primary dependent variable of this analysis was UVAI with at least one female partner in the past 3 months. This was assessed using two questions. First, respondents were asked the number of women with whom they had vaginal or anal sex during the three months prior to the study. If they reported vaginal or anal sex with at least one female

partner, then they were asked the number of women with whom they had vaginal or anal sex without a condom. Any respondent who indicated that they had vaginal or anal sex but did not use a condom with at least one female partner was coded as having had UVAI. Oral sex, with either men or women was not assessed.

In order to explore and describe the two sub-populations in our sample (MSMO and MSMW), we assessed a large range of sociodemographic characteristics including age, race/ethnicity (African American, Latino, white, mixed, or other), employment status (unemployed/employed full or part-time), annual income level (from “no income” to “more than \$100,000” in increments of \$10,000), education level (High school/GED or less vs. Some college or more), homelessness in the three months prior to baseline, lifetime history of incarceration, and research site (Chicago, New York, Los Angeles and San Francisco). We also assessed self-reported sexual orientation (heterosexual, homosexual, bisexual or unknown). Finally, exchange sex was assessed as a yes/no item using the following question: “In the past 3 months, have you had any partners with whom you had sex in exchange for things you needed, like food, shelter, transportation, drugs, or money?” Due to the number of bivariate comparisons generated to characterize the differences in these two populations, we used a more stringent p value ($p < 0.01$) for evaluating statistically significant differences between the MSMW and MSMO.

Substance use variables included alcohol and drug use (ecstasy, GHB, heroin, marijuana, methamphetamines, other hallucinogens, PCP, poppers, powdered cocaine, rock/crack cocaine, rohypnol, Special K, tranquilizers, Viagra) in the past three months. Injection drug use was defined as recent injection (within the three months prior to baseline interview).

Psychosocial variables were assessed using several scales: Depressive symptom scores were assessed using seven items from the Center for Epidemiological Studies Depression scale (26). We selected these items from Santor and Coyne’s 9-item short version of the scale (27), dropping two positively worded items because of low item-total correlations. Participants rated the following seven items: “[How often have you] felt that you couldn’t shake off the blues even with the help of family or friends [during the past week]?”, “[How often have you] had trouble keeping your mind focused on what you were doing [during the past week]?”, “[How often have you] felt that everything was an effort [during the past week]?”, “[How often have you] had trouble sleeping [during the past week]?”, “[How often have you] felt lonely [during the past week]?”, “[How often have you] felt like you just couldn’t ‘get going’ [during the past week]?” on a 4-point scale ranging from “never or rarely” to “mostly or always (5–7 days),” ($\alpha = 0.88$). Anxiety symptom scores were assessed using the Brief Symptom Inventory (BSI) scale ($\alpha = 0.90$) (28–29). Internalized homophobia was assessed using four items (30); participants answered the following items: “Sometimes I dislike myself for being gay or bisexual”, “Sometimes I wish I were not gay or bisexual”, “I sometimes feel guilty about having sex with men”, and “I feel stress or conflict within myself over having sex with men” on a 5-point scale ranging from “do not agree at all” to “strongly agree”, ($\alpha = .87$). We categorized the participants as high in internalized homophobia when they reported that they “agreed” or “strongly agreed” with more than half (i.e., three or more) of the items.

Gay-Racial Identity Importance (attachment to a gay community of one’s own race) (31) was assessed using a three item scale ($\alpha = 0.64$) and composed of the following items: “Do you feel that there is a community of gay/bisexual men of your race and ethnicity in your city?”, “How connected do you feel to the community of gay/bisexual men of your race and ethnicity?” and “What percentage of your time do you spend with the community of gay/bisexual men of your race and ethnicity?” Treatment Optimism (32) was assessed using two questions, querying how the availability of HIV treatment informed sexual behavior,

including “The new AIDS combination drugs make me less worried about having unprotected sex” and “I am less worried about having unprotected anal sex now that treatments may be given after unprotected sex” with answers on a 5-point scale ranging from strongly disagree to strongly agree. ($\alpha = 0.77$). Intent to use condoms (33) was assessed using a single statement item, “I intend to use condoms every time I have sex in the next three months” with participants responding on a 5-point scale ranging from strongly disagree to strongly agree.

Data were analyzed using PASW/SPSS 17.0 (Chicago, IL.). Overall, associations between independent variables and the outcome were calculated using chi-square, Mann-Whitney U and Kruskal-Wallis tests, as applicable. For the psychosocial scale variables, parametric (t-tests) and non-parametric (Mann-Whitney U and Kruskal-Wallis tests) statistical tests were performed as appropriate. For the MSMO/MSMW comparisons, bivariate analyses were run on sociodemographic, psychosocial, substance-use, and sexual risk behaviors and are reported in table 1.

For the within MSMW comparisons, multivariate logistic regression modeling was performed by adding variables significant at $p < 0.05$ to the equation in conceptually related sets, starting first with socio-demographic factors, then substance use, then sexual behavior with men, and finally psychosocial factors. We used the -2 log likelihood value and the deviance statistic to guide modeling decisions. We obtained the final model by first obtaining a final set of individual-level variables, and then considered whether each successive set of variables (e.g., substance use) improved the fit. With the exception of sociodemographic factors, variables that failed to retain statistical significance during the model building process were not retained in subsequent models.

Results

The average age of the 2,013 men in this substance-using MSM sample was 36.37 (SD = 9.21); 31% were African American, 19% Hispanic/Latino, 40% white, and 10% Other (Asian, Native American, Mixed and Other). Just over half of the men (51%) reported current unemployment, with 34% of men reporting current full-time employment and the remaining 15% employed part-time. Seventy-one percent of the sample had attended at least some college classes; 7% had less than a high school diploma or general equivalency degree (GED). Eighteen percent of the men reported having been homeless in the past 3 months. Thirty-nine percent (39%) reported a history of incarceration. Eight percent (8%) reported no income in the past year, with 44% reporting an income of \$1 – \$19,999, and 48% reporting an income of at least \$20,000 in the past year. Based on self-report, 44% of the men were HIV-positive, 46% were HIV-negative and 10% were unsure of their HIV status (HIV-Unknown).

MSMO vs. MSMW

One hundred and ninety-four (9.6%) men reported having had sex with at least one female partner in the previous 3 months. As shown in Table 1, compared to the rest of the sample, MSMW were older (37.97 [SD = 9.71] vs. 36.18 [SD = 9.15]; $t(2009) = -2.58$, $p = 0.010$), more likely to be African American (62% vs. 27%; $\chi^2(1, N = 2011) = 102.62$, $p < 0.001$) and more likely to have been recruited in Chicago than in the other three cities (40% vs. 27%; $\chi^2(3, N = 2013) = 24.38$, $p < 0.001$). They had lower annual incomes than MSMO, with 67% of MSMW reporting an income of \$0 – \$19,999 in the past year, while 50% of MSMO reported the same income ($\chi^2(1, N = 2011) = 21.16$, $p < 0.001$). MSMW were less likely to report having attended at least some college (49% vs. 73%; $\chi^2(1, N = 2013) = 46.71$, $p < 0.001$). Men who had sex with men and women were more likely to report [current] unemployment (70% vs. 48%; $\chi^2(1, N = 2011) = 31.55$, $p < 0.001$), homelessness

in the past three months (35% vs. 17%; χ^2 (1, N = 2011), = 39.34, $p < 0.001$) and [lifetime] history of incarceration (69% vs. 36%; χ^2 (1, N = 2011), = 81.71, $p < 0.001$) than MSMO. MSMW were less likely to identify as homosexual than MSMO (19% vs. 91%; χ^2 (3, N = 2011), = 709.09, $p < 0.001$), largely (71%) identifying as bisexual.

Sexual behavior and STI-related factors differed in a few respects between MSMO and MSMW. Men who had sex with men only reported a greater number of non-primary male partners than MSMW (9.00 [SD = 14.47] vs. 7.07 [SD = 12.7]; $U = 155005.5$, $p = 0.006$, $r = 0.061$) in the three months prior to baseline. Further, MSMO reported more unprotected anal sex partners than MSMW (6.44 [SD = 9.76] vs. 4.73 [SD = 7.17]; $U = 155162.0$, $p = 0.039$, $r = 0.047$) during the same timeframe. Men who have sex with men and women were no more likely than MSMO to report: being HIV-positive, or having a primary male partner in the past 3 months. Among HIV-negative MSM ($n=935$), we found that MSMW were significantly less likely than MSMO to report unprotected anal intercourse (UAI) with HIV-positive or unknown status male partners (51% vs. 67%; χ^2 (1, N = 935) = 9.316, $p = 0.002$). Men who had sex with men and women were more likely to report a urethritis diagnosis in the past 12 months than MSMO (8% vs. 4%; χ^2 (1, N = 2007) = 6.110, $p = 0.013$). Aside from urethritis, self-reported diagnosis of chlamydia, gonorrhea, or syphilis in the past 12 months did not differ between the groups. MSMW were more likely to report having engaged in exchange sex in the past 3 months than MSMO (49% vs. 27%; χ^2 (1, N = 2011) = 42.535, $p < 0.001$).

The two groups were not statistically different in their mean self-efficacy for sexual safety scores. MSMW reported higher mean scores of intent to use condoms in the future than did their MSMO counterparts; MSMW mean scores of 3.80 [SD = 1.23] were higher ($U = 148375.50$, $p < 0.001$, $r = 0.08$) than the MSMO mean scores of 3.39 [SD = 1.42]. Mean depressive symptom score, anxiety symptom score, and treatment optimism scores were not statistically significantly different across the two groups, but MSMW reported lower mean scores of gay-racial identity (3.17 [SD = 1.58] vs. 3.66 [SD = 1.56]; $U = 105470.50$, $p < 0.001$, $r = 0.09$) and higher mean levels of internalized homophobia (2.58 [SD = 1.28] vs. 1.97 [SD = 1.13]; $U = 12784.50$, $p < 0.001$, $r = 0.14$) than MSMO.

Some substance use in the past 3 months differed between the two groups. Men who had sex with men and women were less likely to report being drunk or buzzed on alcohol (52% vs. 67%; χ^2 (1, N = 2006) = 18.62, $p < 0.001$), use of GHB (6% vs. 13%; χ^2 (1, N = 2006) = 8.23, $p = 0.004$), methamphetamines (23% vs. 32%; χ^2 (1, N = 2006) = 6.40, $p = 0.011$), amyl nitrate (23% vs. 41%; χ^2 (1, N = 2006) = 23.41, $p < 0.001$), ketamine (3% vs. 7%; χ^2 (1, N = 2006) = 4.76, $p = 0.029$), and Viagra (generic name: sildenafil) (12% vs. 23%; χ^2 (1, N = 2006) = 11.78, $p = 0.001$) than MSMO. Although MSMW were less likely to report being drunk or buzzed on alcohol in the 3 months prior to baseline interview, ancillary analyses were performed among men who met the criteria for binge drinking (defined as 5 or more drinks per drinking session) and there was no statistically significant difference between MSMW and MSMO (results not shown.) They were, however, more likely to report using heroin (5% vs. 2%; χ^2 (1, N = 2006) = 4.84, $p = 0.028$) and crack (35% vs. 20%; χ^2 (1, N = 2006) = 26.20, $p < 0.001$) than did MSMO. Use of other substances (Ecstasy, marijuana, LSD/other hallucinogens, powdered cocaine, or recreational use of tranquilizers/other prescription drugs) did not differ between MSMW and MSMO.

Within MSMW: UVAI vs. No UVAI

Among the 194 MSMW (Table 2), 129 (66%) reported engaging in UVAI with at least one female sex partner in the in the three months prior to baseline assessment. MSMW who engaged in UVAI with their female partners were not significantly different from their peers who did not report UVAI with their female partners in terms of several sociodemographic

characteristics including: mean age, recruitment city, having attended at least some college, homelessness during the past 3 months, annual income, history of incarceration, primary race/ethnicity, bisexual sexual orientation, self-reported HIV-positive status, and engaging in exchange sex. On the other hand, MSMW who engaged in UVAI with female partners were more likely to report past three-month unemployment than their non-UVAI peers (75% vs. 58%; $\chi^2 (1, N = 194) = 5.72, p = 0.017$).

Among MSMW, participant self-reported HIV status was not statistically significantly associated with UVAI. Of the 75 men who reported being HIV-positive, 47 (63%) reported having UVAI with at least one female partner. Because data were not collected on the HIV-status of *all* female partners (only primary female partner) it is unclear if these men are having UVAI with HIV-positive non-primary female partners or HIV-negative/unknown status partners. Sexually transmitted diseases and sexual behaviors were not statistically different between men who reported UVAI with their female partners and those who did not engage in UVAI; similarly, past 12 month diagnosis of chlamydia, gonorrhea, syphilis, and urethritis did not differ. Further, the men who engaged in UVAI did not statistically differ from those who did not in terms of reporting having had a primary male partner in the three months prior to baseline. There was a statistical difference in the mean number of [past 3 month] non-primary male sexual partners reported between the two groups, with MSMW who engaged in UVAI reporting a mean of 6.88 (SD = 12.55) non-primary male partners while MSMW who did not engage in UVAI reported a mean of 7.45 (SD = 12.08) non-primary male partners ($U = 155005.50, p = 0.046, r = 0.061$). There was no statistically significant difference, however, in the number of unprotected male anal sex partners between those who reported UVAI and those who did not. The two groups did not statistically differ in either their mean self-efficacy for sexual safety scores or in intent to use condoms in the future. Among HIV-negative MSMW ($n=92$), we found no statistically significant difference in self-reported UAI with HIV-positive or unknown status male partners between MSMW who engaged in UVAI as compared with those who did not.

Men who reported engaging in UVAI with their female partners reported significantly higher mean depressive symptom scores (2.17 [SD = 0.68] vs. 1.91 [SD = 0.62]; $U = 3174.00, p = 0.009, r = 0.18$), internalized homophobia (2.75 [SD = 1.27] vs. 2.26 [SD = 1.25]; $U = 3236.00, p = 0.009, r = 0.04$), and treatment optimism (2.39 [SD = 1.20] vs. 1.78 [SD = 0.93]; $U = 2958.00, p = 0.001, r = 0.24$) than those who did not report UVAI with their female partners. Men who reported UVAI with female partners also reported weaker feelings of gay-racial identity (2.98 [SD = 1.55] vs. 3.57 [SD = 1.60]; $U = 2353.00, p = 0.048, r = 0.15$) than MSMW who did not report UVAI. The two groups did not statistically differ in anxiety symptom score.

The two groups differed only in the use of three substances: men who engaged in UVAI were more likely to report using heroin (8% vs. 0%; $\chi^2 (1, N = 192) = 5.40, p = 0.020$) and crack (41% vs. 25%; $\chi^2 (1, N = 192) = 5.01, p = 0.025$), but less likely to report use of Viagra (8% vs. 20%; $\chi^2 (1, N = 192) = 5.99, p = 0.014$) than men who did not engage in UVAI with their female partners.

Multivariate analyses among the 194 MSMW (Table 3) in the sample found MSMW who were unemployed, relative to those who were employed (full or part-time) (AOR=2.28; CI 1.01, 5.17), had a primary female partner relative to those who did not report a primary female partner (AOR=3.44; CI 1.4, 8.46), and higher levels of treatment optimism (AOR=1.73; CI 1.18, 2.54) had independently increased odds of reporting UVAI in the past three months. Strong feelings of connection to a same-race gay community (AOR=0.71; CI 0.56, 0.91) and Viagra use, relative to no reported Viagra use (AOR=0.31; CI 0.10, 0.95) independently decreased odds of reporting UVAI. Confirmatory analyses were run removing

primary female partner from the model and no substantive changes in the estimates of association were observed.

Discussion

In this analysis we sought to describe a sample of substance-using MSM who also have sex with women and identify correlates of unprotected vaginal or anal sex those female partners. Bisexual activity was not common in our sample of high-risk, substance-using urban MSM. We found that among substance using MSM, slightly less than 10% reported sex with a woman in the past 3 months. This is consistent with the prevalence reported among HIV-positive men by O'Leary and colleagues [34]. Overall, MSMW in our sample were older, African-American men with a history of incarceration, recent homelessness, and unemployment, who were less likely to have attended school beyond the high school or GED level. They were also less likely to be gay-identifying – preferring to identify as bisexual – and given the higher mean levels of internalized homophobia reported, seem less comfortable with their sexuality than the MSMO in our sample. Comparing the MSMW to the MSMO in this study found several key differences in terms of sociodemographics, sexual behaviors, and substance use patterns and our results offer further insights into this subpopulation of gay, bisexual and other MSM. The MSMW in this sample were also independently less likely to have attended or graduated from college than were their MSMO peers, a result reported in other studies [4, 20, 23] but did not always rise to the level of statistical significance. Stronger feelings of internalized homophobia and weaker feelings of connection to the same-race gay community were associated with having sex with women, a finding consistent with O'Leary's analysis among HIV-positive men [34]. It has been hypothesized based on other studies that men who are ambivalent about their homosexuality may also engage in sex with women [36], however our data do not allow us to speculate on this issue because we focused not on identity, but on sexual risk behaviors. Further, due to the cross-sectional nature of our study, we could not follow any changes in sexual identity over time, so we cannot speculate on the fluid nature of sexual identity and its impact on behavior.

Among the MSMW in our sample, two-thirds reported UVAI with at least one female partner in the three months prior to interview, a prevalence that is higher than previously published [31]. We identified several key correlates of recent UVAI with female partners. Overall, the men who engaged in UVAI reported more recent unemployment and a greater endorsement of depressive symptoms (higher mean depression scale score) and were less concerned about becoming HIV positive or transmitting HIV to their partners (treatment optimism) but were also less comfortable with their sexuality and felt less connected to a community of same-race gay community than the MSMW who did not have UVAI with their female partners. They were also more likely to have a primary female partner than MSMW who did not report UVAI with their female partners. Contrary to expectations, knowledge of one's own HIV-positive status was not associated with consistent condom use with recent female partners among this sample. This is a concerning observation and is inconsistent with previous research among MSMW, which has found that HIV-positive MSMW reported less UVAI with their female partners and less unprotected anal sex with their male partners than did HIV-negative MSMW [19]. No difference in number of male sex partners between MSMW reporting UVAI and those reporting no UVAI with female partners was found. In ancillary analysis among the HIV-negative MSM, MSMW were less likely than MSMO to report unprotected anal sex with HIV-positive or HIV-unknown status male partners. Among HIV-negative MSMW, however, UVAI was not statistically significantly associated with engaging in unprotected anal sex with HIV-positive or unknown status male partners. In addition, treatment optimism was associated with UVAI, which might explain the limited impact that HIV-positive status knowledge appeared to

have among the MSMW sample. The association between treatment optimism and sexual risk behaviors in this sample is consistent with other research among MSM [37–40], which has suggested that advances in HAART availability and treatment success have been associated with diminished concern about HIV infection among some MSM.

The positive association of gay-racial identity in reducing UVAI seen in this sample is consistent with earlier research on the protective role of strong feelings of racial identity among gay men and MSMO [41]. The protective role of strong feelings of gay-racial identity is an area that merits further study, as does the relationship between employment status and UVAI with female partners. In terms of drug use, Viagra (or similar drug) use was associated with lower odds of UVAI among this substance-using sample of MSMW. Men who engaged in UVAI were equally likely to report specific club drug use as MSMW who did not, but for most of these drugs overall use was low.

This study has several limitations. It relied on convenience sampling, which, while achieving a demographically diverse sample of high-risk, substance-using, urban MSM, means that we are unable to estimate the true portion of all MSM who are also MSMW. The proportion of HIV infected was similar between MSMO and MSMW in this study and persons who injected drugs were excluded since the focus was on sexual transmission. Thus, the MSMW participating in a study focusing on MSM may not be representative of all MSMW. The outcome and independent variables are based on self-report, which could lead to at least two types of bias: recall bias and socially desirable responding. In order to minimize recall bias, we used a limited timeframe for recall – three months for most sexual and substance use behaviors and 12 months for STI diagnosis. To reduce the effect of social desirability on responses, and because we were collecting sensitive information on substance use and sexual behaviors, ACASI was used, which has been shown to improve validity of self-reported information regarding sensitive behaviors [42]. In addition, we assessed UVAI with any female partner in the past three months without information on the female partner's HIV status. Related to this, we did not assess disclosure of HIV status or bisexual activity to female partners. The cross-sectional study design does not allow for studying the stability of sexual and HIV risk behaviors over time [17], which may be fluid. Finally, due to the cross-sectional nature of the data, causal relations cannot be inferred.

Conclusions

Identifying correlates of UVAI among high-risk MSMW is an important research goal to understanding the nuances of the HIV epidemic for women in the United States. Our analysis of substance-using MSMW who participated in a study targeting MSM found that two-thirds of the MSMW reported engaging in UVAI with women and that men's own positive HIV status was not associated with this behavior. However, only 2% of the entire MSM sample consisted of HIV-positive MSMW who reported UVAI with women. For this reason, and because we did not collect information on the HIV status of the female partners, we urge caution in interpreting the degree to which this population is contributing to the heterosexual HIV epidemic. Most of the sexual risk behavior studies that included MSMW conducted to date, including this one, have been cross-sectional and not designed to comprehensively examine risk factors for UVAI with female partners among MSMW. To overcome the limitations of this and other studies of UVAI with female partners among MSMW and truly build our knowledge base, comprehensive data on all aspects of the social and sexual lives of MSMW must be collected and over time. Collecting such longitudinal data will allow us to assess the frequency and stability of risky behavior with female partners over time, identify the characteristics most strongly associated with sero-discordant UVAI, and to identify the subgroups of MSMW most at risk for both HIV transmission and acquisition via heterosexual sex. Such work ought to be carried out from a bisexual health

perspective, addressing a range of social, sexual and health behaviors that contribute to the health and well-being of bisexually active individuals and their sexual partners.

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Table 1

Bivariate comparisons of substance-using men who have sex with men only (MSMO) to men who have sex with men and women (MSMW), Project MIX, 2005–06 (N = 2013)

Variable Sociodemographics	MSMO ^a N (%) N=1819	MSMW ^b N (%) N=194	Test statistic (df)
Chicago	482 (26.5%)	77 (39.7%)	$\chi^2 = 24.38 (3)^*$
Los Angeles	407 (22.4%)	45 (23.2%)	
New York	417 (22.9%)	45 (23.2%)	
San Francisco	513 (28.2%)	27 (13.9%)	
Mean Age (SD) ^c	36.18 (9.15)	37.97 (9.71)	$t = -2.58 (2009)^*$
Unemployed	879 (48.3%)	135 (69.6%)	$\chi^2 = 31.55 (1)^*$
Homeless (p3m)	303 (16.7%)	68 (35.0%)	$\chi^2 = 39.34 (1)^*$
Incarceration	650 (35.8%)	134 (69.1%)	$\chi^2 = 81.71 (1)^*$
HS/GED or less	491 (27.0%)	98 (50.5%)	$\chi^2 = 46.71 (1)^*$
African American	493 (27.1%)	121 (62.4%)	$\chi^2 = 102.62 (1)^*$
Annual Income of less than \$20,000	902 (49.6%)	130 (67.0%)	$\chi^2 = 21.16 (1)^*$
HIV-positive (self- report)	808 (44.5%)	75 (38.7%)	$\chi^2 = 2.40 (1)^{ns}$
Heterosexual	8 (0.4%)	15 (7.7%)	$\chi^2 = 709.09 (3)^*$
Homosexual	1657 (91.1%)	36 (18.6%)	
Bisexual	140 (7.7%)	138 (71.1%)	
Other	12 (0.8%)	5 (2.6%)	
Sexual risk behaviors			
Exchange Sex	492 (27.1%)	96 (49.5%)	$\chi^2 = 42.53 (1)^*$
Primary Male Partner (p3m)	777 (42.8%)	87 (44.9%)	$\chi^2 = 0.30 (1)^{ns}$
HIV-positive primary male Partner	254 (32.6%)	27 (31.0%)	$\chi^2 = 0.08 (1)^{ns}$
Mean Number of Non-primary male partners (SD)	9.00 (14.47)	7.70 (12.70)	$U = 155005.5^*$
Mean number of unprotected male anal sex partners (SD)	4.73 (7.17)	6.44 (9.76)	$U = 155162.5^*$
Among HIV-negative participants, Unprotected Anal Sex with Male HIV- positive or HIV-status- unknown Partners (n=935)	565 (67.0%)	47 (51.1%)	$\chi^2 = 9.32^*$
Psychosocial measures			
Depression (SD)	2.01 (0.69)	2.09 (0.67)	$U = 160077.5^{ns}$
Anxiety (SD)	1.89 (0.66)	1.96 (0.72)	$U = 162941.0^{ns}$
Internalized Homophobia (SD)	1.97 (1.13)	2.59 (1.28)	$U = 127894.5^*$
Gay-Race ID ^d Importance (SD)	3.66 (1.56)	3.17 (1.58)	$U = 105470.5^*$
Treatment Optimism (SD)	2.12 (1.12)	2.19 (1.15)	$U = 170922.0^{ns}$
Condom Intent Mean (SD)	3.39 (1.42)	3.80 (1.23)	$U = 148375.5^*$
Self-Efficacy for Sexual Safety (SD)	3.35 (0.78)	3.35 (0.82)	$U = 59316.0^{ns}$
STIs			
Chlamydia	134 (7.4%)	15 (7.7%)	$\chi^2 = 0.03 (1)^{ns}$
Gonorrhea	226 (12.5%)	24 (12.4%)	$\chi^2 = 0.00 (1)^{ns}$

Variable Sociodemographics	MSMO ^a N (%) N=1819	MSMW ^b N (%) N=194	Test statistic (df)
Syphilis	192 (10.6%)	15 (7.8%)	$\chi^2 = 1.55$ (1) ^{ns}
Urethritis	78 (4.3%)	16 (8.2%)	$\chi^2 = 6.11$ (1) [*]
Substance Use			
Alcohol	1226 (67.6%)	100 (52.1%)	$\chi^2 = 18.62$ (1) [*]
Ecstasy	381 (21.0%)	29 (15.1%)	$\chi^2 = 3.72$ (1) ^{ns}
GHB	233 (12.8%)	11 (5.7%)	$\chi^2 = 8.23$ (1) [*]
Heroin	45 (2.5%)	10 (5.2%)	$\chi^2 = 4.84$ (1) [*]
Marijuana	964 (53.1%)	102 (53.1%)	$\chi^2 = 0.00$ (1) ^{ns}
Meth/Other Amphetamines	587 (32.4%)	45 (23.4%)	$\chi^2 = 6.40$ (1) [*]
LSD/Other Hallucinogens	74 (4.1%)	11 (5.7%)	$\chi^2 = 1.16$ (1) ^{ns}
Poppers	751 (41.4%)	45 (23.4%)	$\chi^2 = 23.40$ (1) [*]
Powdered Cocaine	573 (31.6%)	54 (28.1%)	$\chi^2 = 0.97$ (1) ^{ns}
Rock/Crack Cocaine	355 (19.6%)	68 (35.4%)	$\chi^2 = 26.20$ (1) [*]
Ketamine	133 (7.3%)	6 (3.1%)	$\chi^2 = 4.76$ (1) [*]
Prescription Drugs, Recreational Use	251 (13.8%)	26 (13.5%)	$\chi^2 = 0.01$ (1) ^{ns}
Viagra	412 (22.7%)	23 (11.9%)	$\chi^2 = 11.78$ (1) [*]
Injection Drugs	192 (10.6%)	29 (14.9%)	$\chi^2 = 3.46$ (1) ^{ns}

^aMSMO, Men who have sex with men only

^bMSMW, Men who have sex with men and women

^cSD, Standard deviation

^dID, Identity

^{*}p<0.05, ns, not significant

Table 2

Bivariate comparison of substance-using MSMW^a who reported unprotected vaginal and/or anal sex with women (UVAI) with MSMW not reporting UVAI, Project MIX, 2005–06 (N = 194)

Variable Sociodemographics	No UVAI ^b N (%) N=65	UVAI ^b N (%) N=129	Test Statistic (df)
Chicago	25 (38.5%)	52 (40.3%)	$\chi^2 = 0.52$ (3) ^{ns}
Los Angeles	14 (21.5%)	31 (24.0%)	
New York	17 (26.2%)	28 (21.7%)	
San Francisco	9 (13.8%)	18 (14.0%)	
Mean Age (SD) ^c	36.62 (9.25)	38.66 (9.91)	t = -1.39 (192) ^{ns}
Unemployed	38 (58.5%)	97 (75.2%)	$\chi^2 = 5.72$ (1) [*]
Homeless (p3m)	18 (27.7%)	50 (38.8%)	$\chi^2 = 2.32$ (1) ^{ns}
Incarceration	42 (64.6%)	92 (71.3%)	$\chi^2 = 0.91$ (1) ^{ns}
HS/GED or less	33 (21.4%)	65 (50.4%)	$\chi^2 = 0.00$ (1) ^{ns}
African-American	37 (56.9%)	84 (65.1%)	$\chi^2 = 1.24$ (1) ^{ns}
Annual Income of less than \$20,000	38 (58.5%)	92 (71.3%)	$\chi^2 = 3.23$ (1) ^{ns}
HIV-positive (self- report)	28 (43.1%)	47 (36.4%)	$\chi^2 = 0.80$ (1) ^{ns}
Heterosexual	2 (3.1%)	13 (10.1%)	$\chi^2 = 7.71$ (3) ^{ns}
Homosexual	18 (27.7%)	18 (13.9%)	
Bisexual	44 (67.7%)	94 (72.9%)	
Other	1 (1.5%)	4 (3.1%)	
Sexual risk behaviors			
Exchange Sex	27 (41.5%)	69 (53.5%)	$\chi^2 = 2.47$ (1) ^{ns}
Primary Male Partner (p3m)	27 (41.5%)	60 (46.5%)	$\chi^2 = 0.43$ (1) ^{ns}
HIV-positive primary male Partner	11 (40.7%)	16 (26.7%)	$\chi^2 = 1.72$ (1) ^{ns}
Mean Number of Non-primary male partners (SD)	7.45 (13.08)	6.88 (12.55)	U = 3462.0 [*]
Mean number of unprotected male anal sex partners (SD)	4.04 (4.76)	4.86 (8.15)	U = 4004.0 ^{ns}
Among HIV-negative participants, Unprotected Anal Sex with Male HIV- positive or HIV-status- unknown Partners (n=92)	14 (50.0%)	33 (51.6%)	$\chi^2 = 0.02$ ^{ns}
Primary Female Partner (p3m)	12 (18.5%)	58 (44.5%)	$\chi^2 = 13.16$ [*]
Primary Female Partner HIV-positive (N=46 total)	1 (11.1%)	4 (10.8%)	$\chi^2 = 0.00$ ^{ns}
Mean Number of Non- primary female partners (SD)	3.94 (13.46)	3.78 (9.40)	U = 3731.0 ^{ns}
Psychosocial measures			
Depression (SD)	1.91 (0.62)	2.17 (0.68)	U = 3174.0 [*]
Anxiety (SD)	1.83 (0.65)	2.03 (0.74)	U = 3474.0 ^{ns}
Internalized Homophobia (SD)	2.26 (1.25)	2.75 (1.27)	U = 3236.0 [*]
Gay-Race ID ^d Importance (SD)	3.57 (1.60)	2.98 (1.55)	U = 2353 [*]
Treatment Optimism (SD)	1.78 (0.93)	2.39 (1.20)	U = 2958.0 [*]
Condom Intent Mean (SD)	3.94 (1.24)	3.74 (1.23)	U = 3731.0 ^{ns}
Self-Efficacy for Sexual Safety (SD)	3.45 (0.88)	3.31 (0.80)	U = 1315.0 ^{ns}

Variable Sociodemographics	No UVAI ^b N (%) N=65	UVAI ^b N (%) N=129	Test Statistic (df)
STIs			
Chlamydia	6 (9.2%)	6 (4.6%)	$\chi^2 = 0.31$ (1) ^{ns}
Gonorrhea	7 (10.8%)	17 (13.2%)	$\chi^2 = 0.23$ (1) ^{ns}
Syphilis	5 (7.7%)	10 (7.7%)	$\chi^2 = 0.00$ (1) ^{ns}
Urethritis	6 (9.2%)	10 (7.7%)	$\chi^2 = 0.12$ (1) ^{ns}
Substance use			
Alcohol	32 (49.2%)	68 (52.7%)	$\chi^2 = 0.32$ (1) ^{ns}
Ecstasy	11 (16.9%)	18 (14.2%)	$\chi^2 = 0.25$ (1) ^{ns}
GHB	4 (6.1%)	7 (5.5%)	$\chi^2 = 0.03$ (1) ^{ns}
Heroin	0 (0.0%)	10 (7.9%)	$\chi^2 = 5.40$ (1) [*]
Marijuana	36 (55.4%)	66 (51.9%)	$\chi^2 = 0.20$ (1) ^{ns}
Meth/Other Amphetamines	13 (20.0%)	32 (25.2%)	$\chi^2 = 0.65$ (1) ^{ns}
LSD/Other Hallucinogens	2 (3.1%)	9 (7.1%)	$\chi^2 = 1.28$ (1) ^{ns}
PCP	0 (0.0%)	3 (2.4%)	$\chi^2 = 1.56$ (1) ^{ns}
Poppers	20 (30.8%)	25 (19.7%)	$\chi^2 = 2.94$ (1) ^{ns}
Powdered Cocaine	19 (29.2%)	35 (27.6%)	$\chi^2 = 0.06$ (1) ^{ns}
Rock/Crack Cocaine	16 (24.6%)	52 (40.9%)	$\chi^2 = 5.01$ (1) [*]
Ketamine	4 (6.1%)	2 (1.6%)	$\chi^2 = 2.97$ (1) ^{ns}
Prescription Drugs, Recreational Use	11 (16.9%)	15 (11.8%)	$\chi^2 = 0.96$ (1) ^{ns}
Viagra	13 (20.0%)	10 (7.9%)	$\chi^2 = 5.99$ (1) [*]
Injection Drugs	9 (13.8%)	20 (15.7%)	$\chi^2 = 0.09$ (1) ^{ns}

^aMSMW, Men who have sex with men and women

^bUVAI, Unprotected vaginal and/or anal sex with women

^cSD, standard deviation

^dID, Identity

^{*}p<0.05, ns, not significant

Table 3

Multivariate logistic regression: significant correlates of substance-using MSMW^a reporting UVAI^b (no UVAI, referent) with female partners, Project MIX, 2005–06 (N = 194)

Variable	AOR ^c	95% Confidence Interval
Unemployment	2.28	1.01, 5.17
Primary Female Partner (past 3 months)	3.44	1.40, 8.46
Treatment Optimism	1.73	1.18, 2.54
Connection to Same Race-Gay Community	0.71	0.56, 0.91
Viagra (or analogous) Use	0.31	0.10, 0.95

^aMSMW, men who have sex with men and women

^bUVAI, Unprotected vaginal and/or anal sex with women

^cAOR, Adjusted odds ratio