Behaviorally Bisexual Men and their Risk Behaviors with Men and Women

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ABSTRACT *Gay and bisexual men are often treated as a homogenous group; however, there may be important differences between them. In addition, behaviorally bisexual men are a potential source of HIV infection for heterosexual women. In this study, we compared 97 men who have sex with men only (MSM) to 175 men who have sex with men and women (MSMW). We also compared the 175 MSMW to 772 men who have sex with women only (MSW). Bivariate and multiple logistic regression analyses were performed to assess correlates of MSMW risk behaviors with men and with women as well as whether MSMW, compared with MSW, engaged in more risky behaviors with women. Compared with MSM, MSMW were less likely to be HIV-positive or to engage in unprotected receptive anal intercourse. In contrast, MSMW were more likely than MSW to be HIV-positive and to engage in anal intercourse with their female partners; however, rates of unprotected anal intercourse were similar. The study findings suggest that there may be important differences in HIV risk behaviors and HIV prevalence between MSM and MSMW as well as between MSMW and MSW.*

KEYWORDS *Behaviorally bisexual men, Men who have sex with men, Risk behaviors, HIV*

INTRODUCTION

Although more than 50% of the cumulative AIDS cases among women were previously attributed to injection drug use or sex with partners who inject drugs, heterosexual contact has now become the leading cause of new HIV infections among women, especially within minority communities.¹ Simultaneously, throughout the United States, HIV is once again on the rise among men who have sex with men (MSM).² Several studies suggest that men who have sex with men and women (MSMW) may serve as a “bridge” between high-prevalence (i.e., MSM) and low-prevalence (i.e., heterosexual female) groups.^{3–6} There is debate, however, about the size of this bridge.^{3,6–9} The claim of a transmission bridge from MSMW to women who have sex with men (WSM) is strengthened by studies showing that many MSMW keep their MSM behavior secretive.^{10–15} In addition, studies show that MSMW who do not disclose are less likely to use condoms with women¹⁶ and more

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likely than men who have sex with women only (MSW) to engage in anal sex, a more efficient route of HIV transmission than other types of sex,^{17,18} with women.^{10,19}

The use of illicit drugs among MSMW may further heighten their risk of transmitting or contracting HIV by facilitating high-risk sex encounters. Most of the literature regarding drug use among MSM focuses on men who openly identify as gay or bisexual. Within this population, numerous studies found high rates of non-injection drug use,^{20–22} as well as an association between use of these drugs and risky sex behaviors, such as unprotected sex and anonymous sex encounters.^{23–25} In addition, several studies show that men who trade sex with other men often do so for drugs. Crack use and injection drug use, in particular, are often associated with men who trade sex.^{26–28} Men who trade sex often engage in riskier sex activities, including a higher number of partners, inconsistent condom use, and more frequent anal sex.^{26,29,30} These men are also less likely to identify as gay^{31,32} and more likely to be HIV-positive.^{30,33,34} Although not as well documented, the propensity for more sex partners and anal sex is not limited to MSM. Studies of heterosexual methamphetamine users found that users were more likely than nonusers to have more partners, casual or anonymous partners, and anal sex with those partners.^{35–37} To date, it is not clear whether these behaviors will lead to increased HIV transmission among heterosexual methamphetamine users.

Few studies have examined, in detail, the behaviors of MSMW with both their male and female partners. Such studies may provide important insight into the role of MSMW as potential bridges for the sexual spread of HIV from MSM to women, which could result in a more generalized epidemic. To better understand the potential of MSMW to serve as a bridge for HIV to spread from MSM to heterosexual women, it is also necessary to understand the behavior of MSMW with other men and adjust for this behavior in models examining their risk with women.³⁸ For example, MSMW who engage in receptive unprotected anal intercourse (UAI) with male partners may pose substantially more risk to their female partners than MSMW who only receive oral sex from male partners.

This paper first provides an in-depth comparison of MSM and MSMW. Then, it examines MSMW and their sex behavior with men and with women while adjusting for their behaviors with men. Next, it examines differences between MSMW and MSW, and then uses a propensity score approach that adjusts for those differences to evaluate differences in risk behaviors between MSMW and MSW.

DATA AND METHODS

Background and Context

This study was part of the Sexual Acquisition and Transmission Cooperative Agreement Program (SATH-CAP) funded by the National Institute on Drug Abuse. Field sites for the North Carolina (NC) SATH-CAP project were located in Durham, Wake, Johnston, and Chatham counties. Wake and Durham Counties include the cities of Raleigh and Durham, respectively. Johnston and Chatham Counties are more rural counties that border Wake and Durham Counties. All four counties are located in central North Carolina, part of a region of the United States that has seen a disproportionate increase in HIV, particularly among African Americans, in both rural and urban areas.^{39,40}

A total of 1,985 MSM, drug users, and their sex partners were recruited for this cross-sectional study through respondent-driven sampling (RDS)^{41,42} between September 2005 and August 2008. Initially, seeds were selected in each county. Each seed and subsequent participants were given three coupons to recruit other drug users and MSM. Participants were also given coupons to recruit recent sex partners. Several changes related to the recruitment of sex partners were implemented after approximately 1 year of recruitment. These changes included discontinuing the distribution of a single coupon specifically for recruiting female sex partners of MSMW. Another change involved the distribution of coupons to sex partners of sex partners. In the initial data collection period, recruitment chains terminated with the sex partners of sex partners; in the second period, sex partner recruitment chains were allowed to continue. The overall RDS sampling methods are described by Iguchi et al.⁴³ elsewhere in this special issue. All procedures and the overall study were approved by RTI International's Institutional Review Board (IRBs) and Office of Research Protection.

Eligibility

All participants were required to be at least 18 years of age and provide written informed consent. Additional study eligibility criteria varied by risk group (i.e., drug user, MSM, sex partner). Participants recruited as drug users were required to report the use of heroin, powder cocaine, crack cocaine, methamphetamine, or injection drug use in the previous 6 months. Men recruited as MSM were required to report anal sex with a man in the previous 6 months. Participants recruited as sex partners were required to report engaging in sex with their recruiter. The sample included 1,044 men, of which 9% ($n=97$) reported sex with men only, 74% ($n=772$) reported sex with women only, and 17% ($n=175$) reported sex with men and women in the previous 6 months. The analyses comparing MSMW to MSW compared the 175 men who reported sex with men and women in the previous 6 months to the 772 who reported only sex with women during that period (the 772 men who reported having sex with women only in the previous 6 months include 177 men who identified as gay or bisexual). The analyses comparing MSM to MSMW included 97 men who reported having sex with men only and 175 who reported having sex with men and women.

Data Collection

Behavioral data were collected via audio computer-administered self-interviewing (ACASI) to minimize underreporting of stigmatized behaviors.^{44–46} The NC SATH-CAP collected biological specimens for HIV, hepatitis C virus (HCV) antibodies, syphilis, gonorrhea, and chlamydia testing. Rapid HIV tests were performed using OraQuick, and positive results were confirmed by Western Blot on OraSure specimens. HCV and syphilis tests were performed on blood samples. Participants were screened for HCV antibodies using the HCV EIA 3.0 test (Orthoclinical Diagnostics, Rochester, NY) with a signal-to-cutoff ratio of >8 . Syphilis screening was performed using the VDRL test, and active infection in reactive samples was confirmed with a rapid plasma reagin (RPR) test. Gonorrhea and chlamydia tests were performed on urine specimens using the COBAS Amplicor PCR test. Payment for the baseline interview was \$35, with \$15 payments for each additional eligible individual recruited into the study.

Analyses

The primary objective in this report is to examine the potential for the sexual diffusion of HIV from MSM to women via MSMW. We initially compared MSM and MSMW using descriptive analyses and multiple logistic regression analysis to identify similarities and differences between the groups. To further assess the potential for MSMW to serve as a bridge for diffusing HIV from MSM to women, we conducted an exploratory logistic regression analysis to examine the associations among MSMW risk behaviors with men and MSMW risk behaviors with women. The dependent variable was unprotected vaginal or anal intercourse with any female partner. Independent variables in the model included age, race, sexual identification, HIV status, disclosure of MSM behavior, and receptive UAI with at least one male partner.

The analysis compared several behavioral groups; thus, many factors that could be associated with the outcomes (i.e., risk behaviors) could also be associated with the behavioral group (i.e., MSM, MSW, MSMW). Because the behaviors of MSM, MSW, and MSMW could be influenced by a complex interplay of biological, sociodemographic, and other factors, it may be difficult to separate particular behaviors from other determinants. Therefore, we used a propensity score approach in lieu of using numerous modifiers.^{47–49} The scores indicate the probability of being MSM, MSW, or MSMW. Thus, the inclusion of the scores in the regression serves as a compound marker for being MSM, MSW, or MSMW. Bivariate analyses were performed to compare MSW with MSMW as well as MSMW with MSM. Variables on which the groups varied significantly ($p < 0.2$) were entered into a multiple logistic regression analysis. As noted, predicted probabilities of group membership (i.e., MSM, MSW, and MSMW) were included as covariates in models to adjust for differences between MSMW and MSW and to assess the independent association between MSMW and prevalent HIV infection, heterosexual anal intercourse, unprotected intercourse with any of the last three sex partners, and having six or more sex partners in the previous 6 months. We also conducted an unadjusted logistic regression to evaluate the sensitivity of the results to the propensity scores.

RESULTS

Characteristics of the Sample

Of the men ($n=1,044$) included in these analyses, 74% reported sex with women only, 17% reported sex with men and women, and 9% reported sex with men only. The sample is 77% African-American, 20% non-Hispanic white, and 3% other ethnicities; 70% were 35 years of age or older. Over three-quarters (76%) of the sample came from Raleigh or Durham; 24% came from the rural counties. Only 29% of the sample was employed, 46% were homeless, 29% had health insurance, and 65% reported less than \$500 in income during the previous 30 days. Among the sample, 68% reported using at least one of the core drugs (e.g., heroin, powder cocaine, crack, or methamphetamine) in the previous 30 days, and 14% reported injecting during that period; 35% reported ever injecting. HIV prevalence was 9%, HCV prevalence was 19%, and 6% of the sample tested positive for one or more sexually transmitted infections (STIs). Over half (55%) of the sample reported a history of formal substance abuse treatment, 61% reported a history of incarceration, and 25% reported a period of incarceration greater than 1 year (Table 1).

TABLE 1 Characteristics of the sample by sexual behavior during previous 6 months

	Sexual behavior classification				Total %
	MSW (n = 772) %	MSMW (n = 175) %	MSM (n = 97) %		
Recruited in rural site***	29.5	9.1	12.4		24.5
Age ≥35 years*	68.2	79.3	73.2		70.5
African American*	79.1	69.7	74.2		77.1
Completed high school or GED**	66.3	74.9	78.4		68.9
Employed full time or part time	30.9	23.1	27.8		29.3
Health insurance***	28.1	20.6	47.4		28.6
Received >\$500 in income during previous month	34.8	30.5	42.3		34.8
Homeless***	41.2	66.9	49.5		46.3
Ever in formal substance abuse treatment	53.6	62.9	50.5		54.8
Ever incarcerated	62.0	60.4	52.9		60.9
Ever incarcerated for a period >1 year*	27.0	24.6	13.4		25.3
Ever tested for HIV*	79.6	80.2	91.8		80.9
Ever been told HIV-positive by health care provider or counselor***	3.0	8.6	27.8		6.2
HIV-positive***	4.9	12.1	37.9		9.1
Positive for syphilis, gonorrhea, or chlamydia	6.3	5.1	10.3		6.5
HCV positive	18.9	21.9	14.0		19.0
Drug use previous 30 days					
Used methamphetamine***	4.5	13.7	3.1		5.9
Used speedball (heroin and cocaine in combination)***	6.9	17.2	0.0		8.0
Used crack cocaine***	47.1	62.9	38.1		48.9
Used powder cocaine**	36.8	36.6	17.5		35.0
Used heroin past 30 days***	8.7	16.0	1.0		9.2
Used crack, cocaine, or methamphetamine in past 30 days***	66.3	74.0	48.5		65.9
Ever injected (lifetime)***	32.3	54.3	19.6		34.8
First sexual experience was forced***	4.4	13.1	23.7		7.7
More than 5 partners in past 6 months**	14.3	24.6	22.7		16.8

Sexual behavior with any recent partner				
Any unprotected intercourse	46.8	48.0	38.1	46.2
Any anal intercourse with female partners***	15.3	28.6	—	16.1
Unprotected anal sex with female partners	9.2	12.6	—	8.9
Gave money, drugs, or other goods for sex***	35.2	52.6	25.8	37.3
Received money, drugs, or other goods for sex***	19.4	47.4	28.9	25.0
Any unprotected male-to-male anal intercourse***	—	30.3	45.4	9.5
Unprotected male-to-male insertive anal intercourse	—	26.9	26.8	7.1
Unprotected male-to-male receptive anal intercourse***	—	15.4	34.0	5.8

MSW (men who had sex with women only in the previous 6 months regardless of sexual identity; MSMW (men who had sex with men and women in the previous 6 months regardless of sexual identity); MSM (men who had sex with men only in the previous 6 months regardless of sexual identity)

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Comparison of MSM and MSMW

MSM, compared with MSMW, had higher incomes, were more likely to have insurance, and were more likely to be HIV-positive. MSM were less likely than MSMW to be homeless, to have been incarcerated for a period greater than 1 year, and to have used stimulants in the previous 30 days. In terms of sex behavior, MSM were more likely than MSMW to report receptive UAI, but the groups were similar in their frequencies of unprotected insertive anal intercourse. MSMW were significantly more likely than MSM to report purchasing sex and exchanging sex for money or drugs with one of their any recent partner (Table 1).

In multiple logistic regression analyses, stimulant use in the previous 30 days, purchasing sex, and a history of injecting were independently associated with increased odds of being MSMW. Reporting that the first sex encounter was forced was associated with decreased odds of being MSMW (Table 2).

MSMW Sexual Identity, Disclosure to Women, and Sexual Behaviors with Men

Among MSMW, 8% identified as gay or homosexual; 45% identified as bisexual; 17% identified as heterosexual; 16% identified as “down low,” “same gender loving,” or “just messing around on the other team”; 2% identified as transgender; and 12% reported no label. Only 11% of MSMW reported that any of their female partners did not know that they had sex with men. Overall, 24% of heterosexually identified MSMW reported having at least one female partner who was unaware that they had sex with men. In contrast, 9% of men who identified as gay or bisexual and 8% of men who identified as “down low,” “same gender loving,” “just messing around with the other team,” or no label reported that any of their female partners were unaware that they had sex with men. Insertive anal intercourse with a male partner was reported by 47% of MSMW, and receptive anal intercourse was reported by 24%. Overall, 19% of MSMW reported engaging in both receptive and insertive anal intercourse with their male partners. Insertive UAI with a male partner was reported by 27% of MSMW, and 15% reported receptive UAI; 12% reported engaging in both insertive and receptive UAI. In addition, 13% of MSWM reported receiving oral sex from a male partner, and 47% reported performing oral sex on a male partner.

TABLE 2 Multiple logistic regression model of correlates of being MSM (*n*=97) compared with MSMW (*n*=175)

	Odds ratio	95% CI	<i>p</i> value
Age ≥ 35 years	0.63	(0.31–1.26)	0.192
African American	0.55	(0.28–1.08)	0.084
Homeless	1.40	(0.75–2.64)	0.290
Income >\$500 past 30 days	0.73	(0.40–1.34)	0.304
Incarcerated >1 year lifetime	1.54	(0.72–3.29)	0.269
Stimulant use past 30 days	2.56	(1.41–4.64)	0.002
Purchased sex from one of any recent partner	2.69	(1.40–5.16)	0.003
First sexual encounter forced	0.46	(0.22–0.96)	0.038
Ever injected	3.40	(1.78–6.51)	0.000

MSMW men who had sex with men and women in the previous 6 months, regardless of sexual identity, MSM men who had sex with men only in the previous 6 months, regardless of sexual identity
Coding: MSM=0; MSMW=1

MSMW Characteristics and Risk Behaviors with Women

Although the analyses are limited by the small number ($n=73$) of MSMW who reported engaging in unprotected intercourse (vaginal or anal) with women, we explored correlations between MSMW risk behaviors with men and unprotected intercourse with women (Table 3). In a model that adjusted for age, race, sexual identification, and HIV status, engaging in receptive UAI with a male partner was associated with increased odds of reporting unprotected intercourse with a female partner (OR=4.61; 95% CI, 1.72–12.38). Self-identifying as heterosexual was also associated with unprotected intercourse with a female partner (OR=2.62; 95% CI, 1.04–6.59), and nondisclosure of MSM behavior to female partners was marginally associated with unprotected intercourse with a female partner (OR=2.83; 95% CI, 0.96–8.36).

Comparison of MSW and MSMW

Compared with MSW, MSMW were older and better educated, but they were also more likely than MSW to be homeless, unemployed, and HIV-positive (Table 1). MSMW were more likely than MSW to report current use of methamphetamine, crack cocaine, or heroin. They also reported higher rates of current and lifetime injection drug use. In addition to drug use, anal sex with women, higher numbers of sex partners, giving money or drugs for sex, and receiving money or drugs in exchange for sex were all more common among MSMW than among MSW. MSMW were less likely, however, than MSW to be African American or to be recruited in a rural county.

The multiple logistic regression model comparing MSMW with MSW behavior revealed an increased odds ratio for reporting homelessness, use of speedball (i.e., heroin and cocaine in combination), a history of injecting, that the first sex encounter was forced, and trading sex for money or drugs with at least one of the last three sex partners. Being recruited in a rural county and being African American were both associated with decreased odds of reporting bisexual behavior in the previous 6 months (Table 4).

MSMW, MSM, Prevalent HIV Infection, and Sexual Risk Behaviors with Men

In models that used a propensity score approach to adjust for differences between MSM and MSMW, MSMW were approximately one-quarter (OR=0.26; 95% CI, 0.13–0.52) as likely to be HIV-positive (Table 5). In a similar model, MSMW were

TABLE 3 Multiple logistic regression model of MSMW ($n=175$) engaging in unprotected intercourse with women

	Odds ratio	95% CI	<i>p</i> value
Age ≥ 35 years	1.63	(0.71–3.72)	0.247
African American	0.73	(0.35–1.55)	0.421
Sexual identification			0.119
Gay or bisexual	Ref		
Down low or no label	1.16	(0.53–2.51)	0.710
Heterosexual	2.62	(1.04–6.59)	0.041
HIV-positive	0.40	(0.13–1.27)	0.120
Unprotected receptive anal intercourse with male partners	4.61	(1.72–12.38)	0.002
Did not disclose MSM behavior to female partners	2.83	(0.96–8.36)	0.059

MSMW men who had sex with men and women in the previous 6 months regardless of sexual identity

TABLE 4 Multiple logistic regression model of correlates of MSMW ($n=175$) compared with MSW ($n=772$)

	Odds ratio	95% CI	<i>p</i> value
Recruited in a rural county	0.31	(0.17–0.56)	<0.001
Age ≥ 35 years	1.42	(0.89–2.26)	0.146
African American	0.64	(0.41–0.99)	0.043
Completed high school or GED	1.53	(1.00–2.35)	0.049
Currently unemployed	1.38	(0.92–2.07)	0.115
Received >\$500 income in previous month	1.41	(0.91–2.17)	0.124
Currently homeless	1.52	(1.01–2.29)	0.047
Ever in substance abuse treatment	0.84	(0.56–1.26)	0.407
Incarcerated for a period of >1 year	0.67	(0.43–1.03)	0.067
Used methamphetamine previous 30 days	1.72	(0.88–3.36)	0.114
Used speedball (heroin and cocaine in combination) previous 30 days	1.77	(0.94–3.34)	0.078
Used crack cocaine previous 30 days	1.49	(1.01–2.20)	0.044
Used heroin previous 30 days	0.84	(0.45–1.57)	0.589
Ever injected	1.58	(1.04–2.40)	0.032
First time had sex was forced	3.96	(2.09–7.5)	<0.001
Traded money or drugs to one of any recent partner for sex	0.90	(0.58–1.40)	0.636
Traded sex for money or drugs to one of any recent partner	3.42	(2.17–5.39)	<0.001

Coding: MSW=0, MSMW=1

MSW men who had sex with women only in the previous 6 months regardless of sexual identity, MSMW men who had sex with men and women in the previous 6 months, regardless of sexual identity

also less likely (OR=0.49; 95% CI, 0.25–0.97) than MSM to report receptive UAI. There was no difference; however, between the groups in engaging in unprotected insertive anal intercourse.

MSMW, Prevalent HIV Infection, and Sex Risk Behaviors with Women

In models that used a propensity score approach to adjust for differences between MSW and MSMW, MSMW were over three times more likely than MSW to be HIV-positive (OR=3.87; 95% CI, 2.05–7.30); they were also more likely than MSW to

TABLE 5 HIV and risk models using a propensity score adjustment approach

	Odds ratio	95% CI	<i>p</i> value
HIV model			
Predicted probability	0.51	(0.11–2.23)	0.368
MSM	0.26	(0.13–0.53)	<0.001
Unprotected receptive anal intercourse model			
Predicted probability	0.28	(0.07–1.19)	0.084
MSM	0.49	(0.25–0.97)	0.04
Unprotected insertive anal intercourse model			
Predicted probability	0.42	(0.11–1.63)	0.209
MSM	1.24	(0.64–2.40)	0.518

MSM ($n=97$) and MSMW ($n=175$) models

Coding: MSMW=0; MSM=1

report anal intercourse with women (OR=2.16; 95% CI, 1.40–3.32; Table 6). MSMW were no more likely than MSW to report having more than five sex partners in the previous 6 months (OR=1.44; 95% CI, 0.92–2.27). MSMW were not significantly more likely than MSW to report any unprotected intercourse (OR=1.11; 95% CI, 0.77–1.60) or unprotected anal intercourse with a female partner (OR=1.30; 95% CI, 0.74–2.28).

DISCUSSION

Men in this study were classified according to their self-reports of the gender (i.e., male, female, or both) of their sex partners during the previous 6 months, not according to their sexual identity. MSM and MSMW in this sample differed in several important ways. MSMW had lower incomes, were more likely to be homeless, were more likely to report purchasing and selling sex, and were much more likely to report stimulant use than MSM. However, MSM were significantly more likely to be HIV-positive and report engaging in receptive UAI than MSMW. A majority (65%) of MSM identified as gay or homosexual, whereas only 8% of MSMW identified as gay or homosexual. MSMW were more likely than MSM to identify as either bisexual (45% vs. 20%), as “down low” or similar term (18% vs. 3%), or no label (12% vs. 1%). MSMW were also somewhat more likely than MSM to identify as heterosexual (17% vs. 11%). Overall, the findings suggest that MSM and MSMW are different populations with differing identities, HIV risks, and drug-use patterns, and they may benefit from tailored interventions. In addition, MSMW may be less likely than MSM to be reached by service providers who traditionally work with gay men.

Almost half (47%) of MSMW in this sample did not identify as gay or bisexual (including “down low” or similar term). However, 89% of MSMW reported that

TABLE 6 HIV and risk models using a propensity score adjustment approach

	Odds ratio	95% CI	p value
HIV model			
Predicted probability	0.13	(0.02–0.88)	0.037
MSMW	3.87	(2.05–7.30)	<0.001
Male–female anal intercourse model			
Predicted probability	1.45	(0.50–4.18)	0.496
MSMW	2.16	(1.40–3.32)	< 0.001
>5 sex partners previous 6 months model			
Predicted probability	5.85	(2.05–16.69)	0.001
MSMW	1.44	(0.92–2.27)	0.112
Any unprotected intercourse model			
Predicted probability	0.90	(0.38–2.13)	0.819
MSMW	1.11	(0.77–1.60)	0.576
Any unprotected male–female anal intercourse			
Predicted probability	2.53	(0.69–9.33)	0.162
MSMW	1.30	(0.74–2.28)	0.355

MSW (n=772) and MSMW (n=175) models
Coding: MSW=0; MSMW=1

MSW men who identified as heterosexual and had sex with women only in the previous 6 months, MSMW men who had sex with men and women in the previous 6 months, regardless of sexual identity, MSM men who had sex with men only in the previous 6 months, regardless of sexual identity

their female partners knew that they had sex with men. Despite their female partners being aware of their MSM behavior, 42% of MSMW reported engaging in unprotected intercourse with at least one of their female partners. Although only 15% of MSMW reported engaging in receptive UAI with their male partners, HIV prevalence was 31% among MSMW who did. Moreover, receptive UAI was independently associated with engaging in unprotected intercourse with their female partners (OR=4.61; 95% CI, 1.72–12.38). Although the absolute numbers are small ($n=7$), 26% (7/27) of MSMW who engaged in receptive UAI reported engaging in UAI with their female partners. These findings suggest that, similar to other groups, HIV risk behaviors among MSMW may be higher among some subgroups of MSMW. Additional research, including studies of the sexual networks of MSMW and their female partners, will be needed to assess the potential for the sexual diffusion of HIV from MSMW to their female partners and from their female partners to heterosexual men.

Consistent with previous studies,^{10,16,19} compared with MSW, MSMW reported significantly higher numbers of sex partners and were significantly more likely to engage in anal intercourse with their female partners. However, MSMW were no more likely than MSW to engage in unprotected intercourse (vaginal or anal) with their female partners. While the higher prevalence of HIV among MSMW compared with MSW (12.1% vs. 4.9%) raises the possibility that MSMW could contribute disproportionately to HIV infections in women, the relative importance of MSMW compared with MSW to HIV infections in women is likely to be offset by the difference in the size of the two populations.

Although bisexual behavior among African-American men has received considerable attention,^{50,51} African Americans were significantly less likely than other men in this sample to report bisexual behavior. It is not clear to what extent these findings can be generalized to other groups of African-American and non-Hispanic white men.

There is also speculation that high rates of incarceration may lead to increases in male bisexual behavior that continues after release from prison;¹² however, there was no association between incarceration and bisexual behavior in this sample. These results should be viewed cautiously, however, because incarceration was highly correlated with drug use, poverty (e.g., homelessness, unemployment, and income less than \$500 per month), and sex trading in this sample, making it difficult to disentangle its effects. In addition, we did not distinguish between incarceration in jail and prison.

Limitations

As with most studies of sexual behavior and drug use, this study is subject to a number of limitations. A potentially important limitation is that we focused on the behaviors and characteristics of the men in the sample without examining the characteristics of their female sex partners. Therefore, although we have framed the study in terms of behaviorally bisexual men posing a risk to women, we cannot rule out the possibility that their female partners are already infected through injection drug use or unprotected sex with heterosexual men. If this were the case, bisexual men could serve as a bridge for the transmission of HIV from women to MSM. In this sample, however, HIV prevalence was 6% among women who had sex with men only, 1% among behaviorally bisexual women, 12% among MSMW, and 38% among MSM. While our study design limits the inferences that may be drawn, diseases often spread from high-prevalence to low-prevalence populations.

Another potential limitation is that the representativeness of the sample is unknown. However, RDS was used to reduce bias often associated with chain-referral and other types of nonprobability sampling. The drug users in this sample are similar to drug users in other studies that we have conducted in the Raleigh-Durham area, which used a combination of street outreach and targeted sampling to recruit participants. This study specifically included MSM (including MSMW) as a target group, so we cannot be certain how the MSM and MSMW in this sample compare with other groups of MSM and MSMW in the area. The eligibility criteria, however, which included MSM behavior or drug use, may have resulted in an overrepresentation of drug-using MSM and drug-using MSMW. Thus, caution should be applied in generalizing these findings to non-drug-using MSM and MSMW.

A third potential limitation is that, with the exception of the biological test results, data analyzed in this study were based on self-reports. The reliability and validity of self-reported data may be reduced because of intentional misreporting or faulty recall. However, data were collected using ACASI, which has been shown to reduce intentional underreporting of illegal and stigmatized behaviors, such as illicit drug use and male-to-male sex.⁴³ Although ACASI does not reduce errors due to faulty recall, errors introduced by faulty recall are likely to reduce precision without introducing substantial bias. If this assumption were true, it would reduce statistical power without changing the direction of results.

CONCLUSION

The study findings are consistent with the idea that MSMW may serve as a conduit for HIV transmission between MSM and heterosexuals. Additional research using a network approach or similar design is needed to evaluate accurately the potential of MSMW to serve as a bridge for the diffusion of HIV from MSM to women and heterosexual men. In addition, within this sample of MSMW, we observed considerable variation in their risk behaviors with both men and women. HIV risk behavior and prevention studies often group MSM and MSMW together; however, MSM and MSMW in this study, as well as in other recent studies, differ in ways that may influence risk behaviors and intervention needs. Further research is needed to determine if MSMW, MSM, and MSMW would benefit from tailored interventions, and if the benefits would outweigh the costs of providing multiple interventions.

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