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ORIGINAL PAPER

Types of Female Partners Reported by Black Men Who Have Sex with Men and Women (MSMW) and Associations with Intercourse Frequency, Unprotected Sex and HIV and STI Prevalence

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Abstract We used baseline data from a study of Black MSM/MSMW in 6 US cities to examine the association of female partnership types with disease prevalence and sexual behaviors among the 555 MSMW participants. MSMW reported more than three times as many total and unprotected sex acts with each primary as they did with each non-primary female partner. We compared MSMW whose recent female partners were: (1) all primary ("PF only", $n = 156$), (2) both primary and non-primary ("PF & NPF", $n = 186$), and (3) all non-primary ("NPF only", $n = 213$). HIV/STI prevalence did not differ significantly across groups but sexual behaviors did. The PF only group had the fewest male partners and was the most likely to have only primary male partners; the PF & NPF group was the most likely to have transgender partners. PF & NPF men reported the most sex acts (total and unprotected) with females; NPF only men reported the fewest. Implications for HIV risk and prevention are discussed.

Resumen Se utilizó datos de un estudio de hombres quienes tienen sexo con hombres (MSM por las siglas en inglés) y hombres quienes tienen sexo con hombres y mujeres (MSMW por sus siglas en inglés) de raza negra, en 6

The members of this HPTN 061 study group are listed in the appendix.

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ciudades de los EEUU, para evaluar la asociación de los tipos de relaciones con mujeres con la prevalencia de enfermedades y comportamiento sexual de 555 participantes MSMW. Los MSMW reportaron tres veces más actos sexuales total y sin protección con cada pareja primaria al igual que con cada pareja no primaria femenina. Comparamos MSMW en quienes sus parejas femeninas fueron: (1) todas primarias ("solo PF", $n = 156$), (2) ambos, primarias y no primarias ("PF & NPF", $n = 186$), y (3) todas no primarias ("solo NP", $n = 213$). No hubo mucha diferencia significativa en la prevalencia de VIH/ITS entre los grupos, pero hubo diferencia en el comportamiento sexual. El grupo "solo PF" tuvo menos parejas masculinas y fue el de mayor probabilidad de tener solo una pareja primaria masculina; el grupo PF & NPF fue el de mayor probabilidad de tener parejas transgénero. Los hombres en el grupo PF & NPF reportaron el mayor número de actos sexuales (totales y sin protección) con mujeres; el grupo de hombres "solo NPF" reportaron el menor número. Las implicaciones del riesgo y prevención de VIH son discutidas.

Keywords Bisexual men · Black/African American · Sexual frequency · Relationship type · Condom use

Introduction

Black communities in the United States (US) experience disproportionate HIV and sexually transmitted (STI) infection rates [1, 2]. In 2010, Black individuals comprised 46 % of newly reported HIV cases, while representing 14 % of the US population analyzed [1]. Black men comprised 70 % and Black women 30 % of new HIV infections in Black communities [1]. Since early in the AIDS epidemic, Black women have been disproportionately affected in the US as compared to White or Hispanic women [3]. Epidemiological studies have reported a myriad of factors that contribute to the increased rates of HIV infection in Black communities, such as elevated background HIV prevalence in the population, high STI prevalence/co-infection, delays in HIV diagnosis and treatment, and sexual networks that facilitate transmission within and between risk groups. Unprotected sex with a man is the primary HIV sexual transmission risk among both women and men across race/ethnicities [1]. Although the HIV prevalence for Black men who have sex with men and women (MSMW) is lower than that observed in Black men who have sex with men only (MSMO), Black MSMW are at a considerable risk for acquiring and transmitting HIV as well as other STIs [4–7]. Research on MSMW's practices is critical to better addressing the complex interplay of relationship dynamics, sexual behavior, and gender-related factors influencing HIV risk in Black communities.

Sex with an HIV-positive male partner with unspecified risk is the most common HIV transmission category for reported HIV cases in U.S. women [1]. As such, the existing available data are insufficient to ascertain the total number of female heterosexual HIV/AIDS cases that may be attributed to HIV sexual risk behavior with MSMW partners. Understanding the relative contributions of sex with MSMW and other risk factors to women's risk for HIV is challenging because many MSMW do not disclose their same-sex behaviors to their female partners [8–10] for complex reasons, including concern about being stigmatized [11, 12]. In a study of 5,156 HIV-infected MSM conducted at health departments throughout the US, 34 % of the Black MSM cases also reported sex with females, while only 6 % of the Black female HIV cases reported sex with an MSMW [7]. Similarly, national-level data indicate that while less than 5 % of female HIV cases are known to have had sex with a MSMW [13–15], over 35 % of female HIV cases are assigned to unidentified transmission category and another 39 % report only being aware that a male sexual partner had HIV, not his transmission risk [14–16]. These data are consistent with the possibility that more HIV-positive women could have been infected through sex with MSMW, in addition to those infected through sex with men who have other risk factors. We also note that men who have both male and female partners may be at elevated risk of acquiring STIs, such as gonorrhea and chlamydia, that are more common among women than men [2, 17], at least when measured from genital samples.

Although most studies have shown lower HIV prevalences in MSMW than MSMO [6, 18–20], a growing number of studies indicate that MSMW practice more unprotected sex with their female than with their male partners [6, 10, 11, 18, 19, 21]. These studies include one showing a higher likelihood of serodiscordant unprotected sex with female than with male partners in Black MWMW who are HIV-positive [19]. Differences in the types of partnerships that MSMW form with men and women may partially explain these patterns because individuals are more likely not to use condoms with primary than with non-primary sexual partners.

Primary or main sex partners have been inconsistently defined in the literature, but definitions generally involve ongoing relationships in which there is some type of commitment that differentiates these partners from any others with whom an individual may be involved. Studies exploring partnership type in Black MSMW have shown some evidence of fewer primary partnerships with males among MSMW than MSMO [19, 22–24]. The majority of female partners among MSMW tend to be non-primary but both primary and non-primary partnerships with women appear common [8, 24]. Studies examining sexual behavior by partner type among MSM have shown a higher frequency of

unprotected anal intercourse with primary than with non-primary male partners [25–28]. This may lead to a greater proportion of HIV transmission events occurring during sex with primary than non-primary male partners [27, 29]. However, in a study limited to Black MSMW, Lauby et al. found that participants were twice as likely to report any unprotected sex with a non-main compared to a main male partner because relatively few participants reported having a main male sex partner [21]. These studies highlight the ways in which partner type influences sexual risk behavior patterns in male partnerships.

To improve our understanding of the current epidemiology of HIV among Black/African American subgroups and inform the development and targeting of HIV/STI prevention interventions, a better understanding of BMSMW's relationship patterns with female partners and potentially risky behaviors across types of female partners is needed [30]. We used baseline data from the HIV Prevention Trials Network (HPTN) 061 study to address this need among the 555 participants who reported recent sex with both males and females at baseline. First, we examine the frequency and relative distributions of protected and unprotected sex acts between primary and non-primary female partners. Next, we describe sociodemographics, HIV/STI prevalences, and risk behaviors of men who report that their recent female partners were only primary, both primary and non-primary, or only non-primary. Finally, we estimate the independent association of these three female partner profiles with respondents' frequency of unprotected sex with females. We hypothesize that primary female partners would be associated with greater frequencies of unprotected sex because primary partnerships provide longer and more frequent opportunities for sexual activity and because unprotected sex is more acceptable and preferred in primary than non-primary partnerships.

Methods

Participants and Procedures

Detailed methods for the HPTN 061 study, which was conducted in Atlanta, Boston, Los Angeles, New York City, San Francisco and Washington DC, can be found in Koblin et al. [31]. Institutional review boards at the participating institutions approved the study. Between July 2009 and October 2010, Black MSM/MSMW were recruited directly from the community or as sexual network partners referred by index participants. Index participants were identified as those who might be part of high-risk networks and in need of peer navigation support. An enrollment cap of 10 was applied at each site to community-recruited participants with a prior HIV diagnosis who were already in care or who reported only having unprotected anal sex with HIV-positive partners. Community recruitment methods included direct field-based outreach, engagement of key informants and community groups, advertising through various print and online media, and the use of chat room outreach and social networking sites. Key eligibility criteria included: self-identification as a man or male at birth and as Black, African American, Caribbean Black, or multiethnic Black and at least one instance of unprotected anal intercourse (UAI) with a man in the past six months.

Potentially interested participants were prescreened either in person or over the telephone. At the enrollment visit, eligibility was confirmed and written informed consent obtained. Participants provided locator and demographic information to an interviewer who recorded it on a paper intake form. Then, participants completed a behavioral assessment using audio computer-assisted self-interview (ACASI) technology. Following the ACASI, participants received HIV/STI prevention risk-reduction counseling and a rapid HIV antibody test. Preliminary positive rapid test results were confirmed by Western Blot testing. Quality assurance testing was also performed retrospectively at the HPTN Network Laboratory to confirm the HIV infection status of all study participants at enrollment. Participants provided urine and rectal swab specimens for Neisseria gonorrhoeae (GC) and Chlamydia trachomatis (CT) testing (Hologic Gen-Probe Aptima Combo 2, San Diego, CA) at the network laboratory, and staff collected a blood specimen for syphilis testing at local laboratories.

After removing six participants because they reported extreme values for numbers of female partners (>200), transgender partners thought of as women (>100), or sex acts with females (>400), we analyzed data for the 555 MSMW participants who reported vaginal or anal sex with at least one biological male and at least one biological female in the prior six months and who self-identified as male on both the intake form and the ACASI. A minority of these included participants ($n = 50$) also self-identified with a second gender on the ACASI survey (e.g., "transgender", or "butch queen").

Assessments

Most of the data for this analysis were collected using ACASI (audio computer-assisted self-interview). The survey assessed the participants' socio-demographic characteristics including ethnicity, country of origin, socioeconomic status, and marital status. It assessed sexual and gender identity via two questions that allowed respondents to choose multiple options from a range of

identities. It assessed sexual behavior using items adapted from the Explore study [26] for activities over the prior six months with male, female, and transgender partners. The sexual behaviors were assessed separately by partner gender, type and HIV serostatus. Participants were asked, "Were you in a primary relationship with a woman (or a transgender partner who you think of as a woman) in the last 6 months?" with primary defined as someone "you have lived with or have seen a lot, have had vaginal or anal sex with, and to whom you have felt a special emotional commitment." Partner-specific information was collected on the most recent primary partner (e.g., frequency of sex with this partner) and aggregate information was collected for any other prior primary partners in the prior six months (e.g., frequency of sex with all other primary partners). Aggregate information was assessed for other types of partners (i.e., casual, non-primary steady, non-primary exchange, anonymous), all of which are were combined here as non-primary partners. Information on sex acts included the total number of times receptive anal sex with men and transgenders, insertive anal sex with men and transgenders, insertive anal or vaginal sex with women, and the number of each of these types of sex acts that were protected with condoms. Non-responses for specific values were set to missing, leading to exclusion from the analyses based on that sexual frequency outcome.

Data Analysis

All analyses were conducted using SAS 9.2 (SAS Institute, Inc.). First, we examined how MSMW's sexual activity was distributed across primary and non-primary female partner types (a partner-centric perspective), assessing the overall sample. Then, we examined this distribution within two subgroups that may have a greater likelihood of transmitting HIV to females—high-risk HIV-negative men and HIV-positive men. To do this, we computed the unduplicated total numbers of primary female partners and non-primary female partners, summing the numbers of female steady, casual, exchange, and anonymous partners reported to estimate the latter. For each participant, we then calculated the median numbers of sex acts (both total and unprotected) per-primary female partner (PF) and per-non-primary female partner (nonPF). The number of unprotected sex acts was computed by taking the difference between the total number of sex acts and the number of times that the participant reported using a condom with a female partner in the last 6 months. For male participants whose female partners were only primary (PF only), the per-non PF number of sex acts was set to missing. Similarly, for male participants whose female partners were only non-primary (NPF only), the per-PF number of sex acts was set to missing. We plotted the median number of per-PF and per-non PF sex acts (overall and unprotected) for (1) all 555 MSMW, (2) the riskiest HIV-negative MSMW ($n = 84$), and (3) those who tested HIV-positive ($n = 79$). The "riskiest" population was defined as those MSMW who tested HIV-negative and reported unprotected receptive anal intercourse (RAI) over the prior six months with at least one male or transgender partner whose HIV status was positive or unknown. Although we are aware that, in some cases, other participants may have been at equally high risk for HIV, these men's sexual position and lack of condom use likely elevates their average risk compared to the other participants in this study of higher-risk MSM.

Finally, using data from all 555 MSMW and treating the per-PF sex acts and per-nonPF sex acts from the same PF & NPF participants (those with both primary and non-primary female partners) as independent observations, we used the two-sample Wilcoxon rank-sum test to test whether the median number of sex acts per PF was different from the median number of sex acts per nonPF.

The remainder of our analyses focused on differences in the MSMW participants by the type of female partners they reported (a respondent-focused perspective). The three "female partnership profiles" comprised participants who reported sex with only primary (PF only), both primary and non-primary (PF & NPF), and only non-primary female partners (NPF only) in the prior six months. We summarized distributions of sociodemographic factors, STI diagnoses, and sexual behaviors in each partnership stratum. We used Chi square and Kruskal–Wallis tests to examine overall differences in the frequency distributions and medians for these characteristics across these female partnership profiles. The Fisher exact test using the Monte Carlo technique was performed if more than 20 % of the table cells had expected frequencies of less than 5.

Next, we examined the association of female partnership profile and other predictors with the frequency of unprotected intercourse with females. We fitted an over-dispersed multivariate Poisson regression model using SAS^{TM} Proc Genmod. Candidate predictors in Tables 1 and 2 were considered for inclusion in the regression model predicting frequency of unprotected sex with females. First, we excluded predictors such as STI status that may result from, rather than influence, frequency of unprotected sex with females. Then, we selected covariates for predictors that yielded a $p < 0.2$ for their crude association with frequency of unprotected sex. Finally, we collapsed or eliminated covariates to avoid redundancy. For example, we included covariates for any versus no unprotected receptive (RAI) or insertive anal intercourse (IAI) but not any versus no participation in RAI or IAI with male partners.

Results

A total of 1,553 eligible study participants enrolled in the overall study; 98 % were men and 2 % were transgender. Of the men, 561 (36 %) reported having sex with both a biological male and biological female partner in the previous six months (i.e., MSMW). Removal of the six outliers left 555 participants for this analysis. The median age was 44 years (IQR: 34–49); nearly all (95 %) were born in the U.S. Only 24 % were currently employed, 14 % were full-time or part-time students, and 42 % had annual household incomes of less than $10,000.

Sexual Frequency by Female Partner Type

The 555 men reported a total of 3,370 female partners in the prior six months, including 945 primary female (PF) and 2,425 non-primary female (nonPF) partners. Nevertheless, because sexual frequency differed by female partner type, a larger number of sex acts occurred with PF than nonPF partners (6,435 vs. 4,983 total acts for PF vs. nonPF). Figure 1 shows the median per-partner sex acts by female partner type. The median numbers of total and unprotected sex acts were much higher per PF than per nonPF partner (total acts = 5.8 (IQR: 2.0–16.7) vs. 1.5 (IQR: 1.0–4.0), $p < 0.001$; unprotected acts = 4 (IQR: 0.5–12.0) vs. 1 (IQR: 0–2.3), $p < 0.001$). Similar differences in sexual frequency between PF and nonPF partners were observed in the subsamples of "riskiest" HIV-uninfected MSMW and HIV-infected MSMW. The largest numbers of unprotected sex acts per female partner and largest differences between PF and nonPF partners were observed in the "riskiest MSMW" subset. This group reported a median of 4.5 (IQR: 1.0–11.0) unprotected acts per PF compared to just 1 (IQR: 0.1–3.0) unprotected act per nonPF ($p < 0.001$). The paired comparison of median sex acts with PF and nonPF partners among the men reporting sex with both partner types yielded similar differences in sexual frequency between PF and nonPF partners (results not shown).

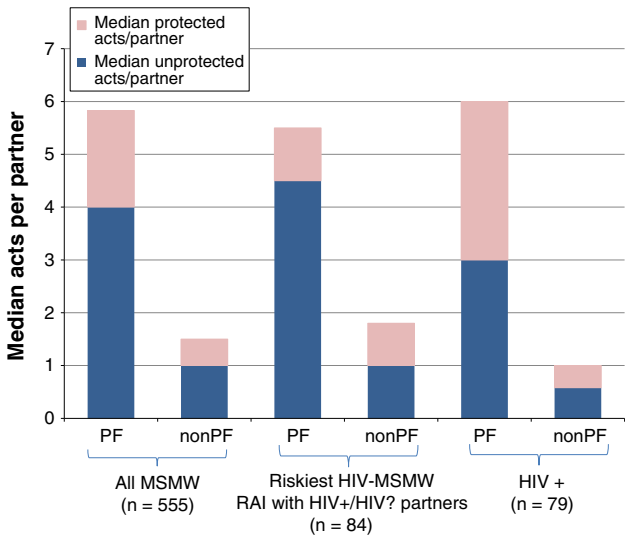

Fig. 1 Median sex acts per female partner, by partner type (*PF* primary, *nonPF* non-primary female partner)

Examining Female Partnership Profiles

Next we examined the participants according to their female partnership profiles. Table 1 illustrates the distribution of sociodemographics and STI diagnoses for each of the three groups of MSMW—28 % of whom reported only primary female partners (PFonly), 34 % of whom reported both primary and non-primary female partners (PF & NPF), and 38 % reported only non-primary female partners (NPF only). Close to 90 % of participants were community recruited. Just 11.5 % were referred and no statistically significant differences in recruitment source or sociodemographic characteristics were observed by female partnership profile, except that the NPF only group was significantly younger than the other two groups.

HIV and STIs

In spite of the caps limiting enrollment of some community-recruited HIV-positive men, 14.5 % of this sample tested positive at enrollment. HIV prevalence was 11.9 % among PFonly, 13.2 % among PF & NPF, and 17.5 % among NPFonly men; however, these differences were not statistically significant ($\chi 2 = 0.255$; $p = 0.28$). There were also no statistically significant differences across the groups in syphilis infection or in the diagnosis of either CT or GC at a genital or rectal site (Table 1). We also tested for but did not identify any statistically significant group differences in the overall prevalence of CT or GC (not shown).

Marital Status and Sexual Orientation

Distributions of marital status and self-identified sexual orientation are shown in Table 2. Just 6.5 % of MSMW reported being married, in a civil union/legal partnership, or living with a sexual partner, with the highest percentage (11.5 %) reported among PF only. Seventy percent of all MSMW identified as bisexual. Statistically significant differences in self-identification as bisexual were not observed across female partnership profiles; however, self-identification as gay ($\chi 2 = 0.566$; $p < 0.001$) or as queer/polyamorous/pansexual ($p = 0.002$) differed and was highest in NPF only. Approximately 19 and 20 % of the PF only and PF & NPF men identified as heterosexual and/or

Table 1 Sociodemographics and baseline HIV/STI diagnosis, by MSMW's female partnership profile

	Total ($n = 555$)	Primary only (PF only) ($n = 156$)	Primary & non-primary (PF & NPF) ($n = 186$)	Non-primary only (NPF only) ($n = 213$)	Test statistics	p value[a] (Chi-sqr./ t test)
Recruitment method						
Community recruited	491/555 (88.5 %)	88.5 %	86.6 %	90.1 %	1.249	0.536
Referred	64/555 (11.5 %)	11.5	13.4	9.9		
Age at enrollment					11.252	0.024
18–30	116/555 (20.9 %)	20.5 %	14.0 %	27.2 %		
31–44	186/555 (33.5 %)	31.4	36.6	32.4		
≥45	253/555 (45.6 %)	48.1	49.5	40.4		
Median	44	44	44	42	7.349	0.025
25th, 75th percentile	34, 49	35, 49	37, 50	29, 48		
Latino or hispanic?					0.853	0.653
Yes	45/555 (8.1 %)	6.4 %	8.6 %	8.9 %		
No	510/555 (91.9 %)	93.6	91.4	91.1		
Country of origin					3.922	0.141
United States	526/555 (94.8 %)	95.5 %	96.8 %	92.5 %		
Outside United States	29/555 (5.2 %)	4.5	3.2	7.5		
Highest education					9.372	0.154
Less than high school	125/554 (22.6 %)	28.2 %	23.7 %	17.5 %		
High school graduate	221/554 (39.9 %)	36.5	41.4	41.0		
Some college	167/554 (30.1 %)	27.6	26.3	35.4		
Finished college or higher degree	41/554 (7.4 %)	7.7	8.6	6.1		
Currently a student (full or part time)					1.962	0.375
Yes	78/555 (14.1 %)	10.9 %	14.5 %	16.0 %		
No	477/555 (85.9 %)	89.1	85.5	84.0		
Current working?					0.481	0.786
Yes	132/555 (23.8 %)	24.4 %	22.0 %	24.9 %		
No	423/555 (76.2 %)	75.6	78.0	75.1		
Currently lack stable housing					5.451	0.066
No	474/555 (85.4 %)	89.1 %	80.6 %	86.9 %		
Yes	81/555 (14.6 %)	10.9	19.4	13.1		
Annual household income					9.590	0.143
<$9,999	235/555 (42.3 %)	50.6 %	36.6 %	41.3 %		
$10,000–19,999	132/555 (23.8 %)	19.2	29.0	22.5		
$20,000–49,999	157/555 (28.3 %)	25.6	29.6	29.1		
$50,000 or more	31/555 (5.6 %)	4.5	4.8	7.0		
HIV status at enrollment					0.255	0.279
HIV positive	466/545 (85.5 %)	88.1 %	86.8 %	82.5 %		
HIV negative	79/545 (14.5 %)	11.9	13.2	17.5		
Syphilis diagnosis[a,b]					<0.001	0.333
Not infected	518/546 (94.9 %)	92.1 %	96.7 %	95.3 %		
New active infection	12/546 (2.2 %)	3.3	1.6	1.9		
Treated infection	14/546 (2.6 %)	4.6	1.6	1.9		
Genital gonorrhea & chlamydia infection by urine NAAT[a]					0.009	0.140
Positive for either or both infections	14/548 (2.6 %)	4.5 %	1.1 %	2.4 %		
Negative for both infections	534/548 (97.4 %)	95.5	98.9	97.6		

Table 1 continued

	Total ($n = 555$)	Primary only (PF only) ($n = 156$)	Primary & non-primary (PF & NPF) ($n = 186$)	Non-primary only (NPF only) ($n = 213$)	Test statistics	p value[a] (Chi-sqr./ t test)
Rectal gonorrhea & chlamydia infection by rectal swab[c]					1.123	0.570
Positive for either or both infections	22/508 (4.3 %)	4.9 %	3.0 %	5.1 %		
Negative for both infections	486/508 (95.7 %)	95.1	97.0	94.9		

[a] p value and test statistic from Fisher exact test are reported because more than 20 % of the table cells have expected frequencies of less than 5

[b] Two participants had indications of syphilis infection but unclear treatment status

[c] Forty-seven men refused rectal testing for STIs or provided inadequate samples for testing

Table 2 Marital status, self-reported sexual identity, and sexual activity with males, females, and transgenders, by MSMW's female partnership profile

	Total ($n = 555$)	Primary only (PF only) ($n = 156$)	Primary & non-primary (PF & NPF) ($n = 186$)	Non-primary only (NPF only) ($n = 213$)	Test statistics	p value (Chi-sqr. test)[a]
Current marital status					10.192	0.006
Married/civil union/legal partnership/living with primary or main partner	36/554 (6.5 %)	11.5 %	5.9 %	3.3 %		
Not married to or living with a primary or main partner	518/554 (93.5 %)	88.5	94.1	96.7		
Sexual orientation labels(s)						
Homosexual	34/555 (6.1 %)	5.8 %	4.3 %	8.0 %	2.386	0.303
Gay	60/555 (10.8 %)	9.6	4.3	17.4	17.912	<0.001
Bisexual	386/555 (69.5 %)	66.7	69.4	71.8	1.139	0.566
Heterosexual	40/555 (7.2 %)	7.7	8.6	5.6	1.384	0.500
Straight	64/555 (11.5 %)	12.2	12.4	10.3	0.493	0.781
Same gender loving	31/555 (5.6 %)	3.8	4.8	7.5	2.590	0.274
Two spirited	33/555 (5.9 %)	5.8	7.0	5.2	0.060	0.740
Sexual	80/555 (14.4 %)	12.2	14.5	16.0	1.047	0.592
Queer, polyamorous, or pansexual	17/555 (3.1 %)	0.0	2.2	6.1	12.082	0.002
Questioning	22/555 (4.0 %)	3.8	5.4	2.8	1.716	0.424
Number of male partners					18.541	<0.001
1	116/555 (20.9 %)	32.1 %	18.8 %	14.6 %		
2–4	281/555 (50.6 %)	46.2	52.2	52.6		
5+	158/555 (28.5 %)	21.8	29.0	32.9		
Median	3	2	3	3	19.252	<0.001
25th, 75th percentile	2, 5	1, 4	2, 5	2, 6		
Male partner composition (type)					27.621	<0.001
Primary partners only	47/546 (8.6 %)	15.9 %	8.2 %	3.8 %		
Both primary and non-primary partners	167/546 (30.6 %)	31.8	37.0	24.2		
Non-primary partners only	332/546 (60.8 %)	52.3	54.9	72.0		
Number of transgender partners					19.289	0.004
0	316/555 (56.9 %)	61.5 %	45.7 %	63.4 %		
1	47/555 (8.5 %)	7.1	9.1	8.9		
2–4	126/555 (22.7 %)	23.1	26.9	18.8		
5+	66/555 (11.9 %)	8.3	18.3	8.9		

Table 2 continued

	Total ($n = 555$)	Primary only (PF only) ($n = 156$)	Primary & non-primary (PF & NPF) ($n = 186$)	Non-primary only (NPF only) ($n = 213$)	Test statistics	p value (Chi-sqr. test)[a]
Median	0	0	1	0	18.923	<0.001
25th, 75th percentile	0, 2	0, 2	0, 4	0, 2		
RAI with any male/transgender male partners						
Any RAI	212/552 (38.4 %)	37.7 %	37.1 %	40.1 %	0.426	0.808
Any unprotected RAI	175/551 (31.8 %)	32.0	30.6	32.5	0.172	0.917
IAI with any male/transgender male partners						
Any IAI	517/555 (93.2 %)	88.5 %	94.6 %	95.3 %	7.561	0.023
Any unprotected IAI	454/555 (81.8 %)	78.8	80.6	85.0	2.525	0.283
Number of female partners					144.719	<0.001
1	141/544 (25.9 %)	50.0 %	0.0 %	31.2 %		
2–4	244/544 (44.9 %)	40.4	47.3	46.0		
5+	159/544 (29.2 %)	9.6	52.7	22.8		
Median	2	2	5	2	157.74	<0.001
25th, 75th percentile	1, 5	1, 2	3, 8	1, 4		
Type of female partners						
Any steady, non-primary female partner	191/498 (38.4 %)	–	67.2 %	31.0 %	131.964	<0.001
Any casual female partner	208/498 (41.8 %)	–	61.8	43.7	102.097	<0.001
Any exchange female partner	95/498 (19.1 %)	–	28.5	19.7	34.082	<0.001
Any anonymous female partner	102/498 (20.5 %)	–	28.5	23.0	33.664	<0.001
Number of sexual acts with female partners					110.834	<0.001
Median	8	10	20	4		
25th, 75th percentile	2, 20	3, 26	7, 40	2, 10		
Number of unprotected acts with female partners					59.398	<0.001
Median	4	6	11	2		
25th, 75th percentile	1, 15	1, 20	3, 30	0, 6		

[a] p value and test statistic from Fisher exact test are reported where more than 20 % of the table cells have expected frequencies of less than 5

straight, compared to 15 % of the NPF only group; these differences were not statistically significant ($\chi2 = 1.749$; $p = 0.41$).

Sex with Male and Transgender Partners

The overall median number of male partners in the prior 6 months was 3 (2–5 interquartile range). The frequency distribution, median number, and types of male partners differed across female partnership profiles ($p < 0.001$). A substantially higher proportion of PF only reported having only one male partner in the past six months than did PF & NPF or NPF only (32 % vs. 19 and 15 %). Men who only had sex with females who were primary partners (PF only) were also more likely to report only having sex with males who were primary partners compared to PF & NPF and NPF only men (16 vs. 8 and 4 %). Over 40 % of the MSMW also reported sex with transgender partners in the prior six months, with 80 % of these men reporting 2 or more transgender partners. The median number of transgender partners differed across female partner profiles ($\chi2 = 18.923$; $p < 0.001$), and these partners were most common among PF & NPF men (54 %) (see Table 2).

Nearly all (93 %) MSMW reported insertive anal intercourse (IAI) with a male or transgender partner in the past six months, with significant differences observed across strata ($\chi2 = 7.561$; $p = 0.023$). Eighty-eight percent of these men reported at least one episode of unprotected IAI. PFonly were the least likely to report any IAI with males; nevertheless, among those reporting IAI the frequency of any unprotected IAI did not differ across groups ($\chi2 = 2.525$;$p = 0.283$). Just 38 % of MSMW reported any receptive anal intercourse (RAI) with a male or transgender partner, of whom 83 % reported unprotected RAI. Differences were not observed in the frequency of reporting any RAI or any unprotected RAI across the three profiles.

Sex with Female Partners

The overall median number of female partners in the past six months was 2 (IQR: 1–5). The range was lowest among PF only, 2 (IQR: 1–2) and highest among those with both types of female partners, 5 (IQR: 3–8). The median total number of vaginal/anal sexual acts with females in the past six months was 8 (IQR: 2–20). PF & NPF reported substantially higher median numbers of sex acts (20; IQR: 7–40) than PF only (10; IQR: 3–26) or NPF only (4; IQR: 2–10). The median number of unprotected sex acts with females was 4 (IQR: 1–15); again the highest numbers were reported by PF & NPF (11; IQR: 3–30) and the lowest numbers were reported by NPF only (2; IQR: 0–6). All of these frequencies differed significantly across the three female partnership profiles ($p < 0.001$, see Table 2).

Predicting Unprotected Sex with Female Partners

The results of the multiple regression support that female partnership profile is an independent predictor of frequency of unprotected sex with females but indicate little differences between the two partnership profiles involving primary female partners. In the crude analyses, PF only men reported 4.3 times (95 % CI: 2.9–6.8) times as many unprotected sex acts with females as did NPF men and PF & NPF men reported 5.2 times (95 % CI: 3.5, 7.6) as many unprotected sex acts. After control for other variables, rates of unprotected sex with females for both the PF only and the PF & NPF men were a little more than four times as high as for NPFonly men (RR = 4.5; 95 % CI 2.9, 7.1; $p < 0.0001$ and RR = 4.2; 95 % CI 2.7, 6.6; $p < 0.0001$, respectively).

Discussion

In this large, multi-city sample of Black MSM, over one-third (36 %) reported having at least one recent female sexual partner, 28 % of whom were primary female partners. Consistent with what has been observed within male partners [25–28], unprotected sex was more common and more frequent with primary than non-primary female partners. Consistency was also observed across genders in unprotected sexual activity, as MSMW who reported unprotected insertive intercourse with other males were also more likely to report a higher frequency of it with females. The findings further highlight a subgroup of this at-risk Black MSMW who report particularly high rates of potentially risky sexual activity—those who report sex with both primary and non-primary female partners. Because these men may link together lower and higher-risk individuals by engaging in frequent unprotected sexual activity with both primary and non-primary partners of any gender, they should be a priority group for intervention efforts.

Given the observed differences across female partnership profiles in condom use and in partnering with each gender and male/female differences in bacterial STI susceptibility and symptomatology [17], we expected to find differences in disease status across female partnership profiles. It is difficult to assess whether the insignificant differences in HIV/STI prevalence we observed were a result of chance or insufficient power. We note that STI testing and treatment may play a role in these findings, as men with both partner types may be more likely to have viewed themselves at risk and to have had their asymptomatic STIs diagnosed and treated prior to enrollment.

Perhaps our most unanticipated finding was the observation that nearly half of the MSMW also reported transgender sex partners, and most of these men reported multiple transgender sex partners. Other studies have also shown that MSMW are more likely than MSM to report transgender partners but have not indicated such high levels of sex with these partners [6, 32–35]. Regardless, the frequency with which MSMW report transgender sex partners highlights the importance of utilizing survey assessments that elicit this information and that clarify for respondents when they should and should not report sexual activity with sexual partners who are transgender. It also points to the need for MSM interventions that explicitly address sexual risk behaviors with transgender partners. An estimated 21.7 % (95 % CI 18.4–25.1 %) of the male-to-female population of the United States has HIV and most of this risk is associated with unprotected sex with men [36].

Other aspects of our findings also point out variations within Black MSMW that may require specific attention in order to ensure that all at-risk men in this population are adequately reached. The elevated proportions of married/cohabitating participants among the men with PF partners, the elevated proportions of participants with transgender partners among the men with both female partner types, and the elevated numbers of male partners among men with only nonPF partners point to group differences in lifestyle, sexual networks and identity. These factors likely also reflect important differences in patterns of socialization and utilization of HIV/STI-related services that can help shape the design of interventions and outreach efforts.

Study limitations include the self-selected nature of the study sample, use of cross-sectional data, reliance on self-report, and the protocol's limits on enrollment of previously diagnosed HIV-positive men in care or reporting sex only with HIV-positive men. This last limitation cautions the interpretation of findings based on HIV status. Nevertheless, we have no reason to believe that the enrollment limits would differentially influenced previously diagnosed, HIV-positive MSM

by their female partnership profile. Due to the questionnaire structure, we could not determine what proportion of the sex acts with women was with biological women or with those transgender partners the respondents thought of as female. Finally, we note that information on number of sex acts with primary female partners was missing for 20 % of the respondents with these partners compared to just 4 % missing for non-primary female partners. This limitation likely led to an underestimation of the association of primary female partners with sexual frequency, as it harder for those who engage in frequent than infrequent sex to estimate their number of sex acts. Study strengths include the large sample size from multiple urban centers; the direct collection of data on HIV, chlamydia, syphilis and gonorrhea; and the use of ACASI to reduce self-report bias and to minimize reporting errors.

These data offer clues to one aspect of the multiple contextual and structural factors contributing to Black women's elevated risk for HIV infection—sexual frequency with high-risk men. For example, a recent study involving data collected during 15,650 tests to females at publicly-funded HIV testing sites in Los Angeles County found that among tests to women with multiple sex partners, HIV prevalence differed little between those who reported MSMW partners and those who did not. However, among tests to women with just one sex partner, HIV prevalence was 4.4 times higher among those reporting that this partner was an MSMW than those who did not (2.8 vs. 0.63 %, $p = 0.03$) [30]. Data on sexual frequency were not available but hypothesized to account for these findings, assuming that the women with just one partner had more frequent unprotected sex with that one man than the women with multiple partners had with each of their partners [30].

Because of the substantial rates of unprotected sex reported with both males and females, the potential for HIV infection and transmission to women and men remains high in this HPTN study population. Individuals like these participants, who were selected because of recent unprotected sex with men, may move in and out of researcher-defined categories regarding the gender and type of their sexual partners [37]. Hence, prevention strategies designed to reach behaviorally bisexual men and the women in primary partnerships with them may need to employ a broad reach [38]. Preventive measures are less likely to be adopted consistently by individuals in primary than in non-primary partnerships because the cost/benefit ratio of condom use and HIV testing tends to be viewed less favorably in the context of more serious relationships [39–41]. Nevertheless, at least one published intervention has successfully addressed this challenge directly through couples-based approaches [42]. Furthermore, MSM-targeted interventions, with modules that discuss relationship issues, power dynamics, and the relative risks of sexual intercourse as the insertive or receptive partner [43, 44] could be adapted to sensitively address gender issues and risks to female partners. Innovative culturally congruent prevention approaches are needed to successfully address this challenge and the ongoing stigma associated with male bisexuality.

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