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HIV Serosorting, Status Disclosure, and Strategic Positioning Among Highly Sexually Active Gay and Bisexual Men

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Abstract

Researchers have identified harm reduction strategies that gay, bisexual, and other men who have sex with men (GBMSM) use to reduce HIV transmission—including serosorting, status disclosure, and strategic positioning. We report on patterns of these behaviors among 376 highly sexually active (i.e., 9+partners, <90 days) GBMSM: mean age of 37, 49.5% men of color, 87.8% gay identified, 57.5% college educated. We found evidence that many men engaged in serosorting, status disclosure, and strategic positioning; however, rates varied based on the participant's HIV status. HIV-positive and HIV-negative men both engaged in sex with men of similar status more often than they engaged in sex with men known to be a different HIV status (i.e., serosorting). However, HIV-negative men disclosed their HIV-status with about half of their partners, whereas HIV-positive participants disclosed with only about one-third. With regard to strategic positioning, HIV-positive participants were the receptive partner about half the time with their HIV-negative partners and with their HIV-positive partners. In contrast, strategic positioning was very common among HIV-negative participants—they rarely bottomed with HIV-positive partners, bottomed about one-third of the time with status-unknown partners, and 42% of the time (on average) with HIV-negative partners. Highly sexually active GBMSM are a critical population in which to both investigate HIV prevention strategies as well as develop effective intervention programs. Providers and clinicians might be well served to include a wide range of behavioral harm reduction strategies in addition to condom use and biomedical approaches to reduce onward HIV transmission.

Introduction

Male-to-male condomless anal sex (CAS) remains the most common method of HIV-transmission in the United States, accounting for 80% of all new infections among men in 2012.[1,2] Although the US population in general has seen declines in rates of new infections, rates have remained relatively stable for men who have sex with men (MSM),[1,3] with observed increases in recent years in rates of HIV diagnoses among young MSM, age 13–25, and MSM age 45 and older.[3] Roughly 18% of MSM are currently living with HIV and only 66% are aware of their positive HIV-status.[4] Further, recent years have seen an increase in rates of sexually transmitted infections among HIV-negative and HIV-positive MSM,[5] which can serve to increase the likelihood of transmission.

Efforts aimed at reducing the rate of new HIV infections among gay, bisexual, and other MSM (GBMSM) have largely emphasized the consistent use of condoms as an effective prevention strategy.[6] However, rates of inconsistent condom use have been high among GBMSM—between 15–20% for HIV-positive men and between 28–32% for HIV-negative men reported inconsistent condom use in the prior 6 months,[7,8] and these rates may be further increasing.[9]

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There are a number of reasons GBMSM may choose to forgo condoms, including a desire to increase intimacy and sexual pleasure, increased views of normalcy of condomless sex, condom fatigue, and an improved outlook on HIV treatments.[10–12]

In addition to condom use, GBMSM utilized a variety of harm reduction strategies aimed at reducing risk of HIV transmission.[7,13–16] Studies have begun examining these seroadaptive strategies, using a variety of operational definitions, and find support for the use of serosorting, strategic positioning, and HIV status disclosure.[13,17,18] Although they do not completely eliminate risk of HIV transmission, evidence suggests they reduce the likelihood.[19]

Serosorting is a strategy that involves selecting sexual partners of the same HIV status (i.e., seroconcordant), often for the purposes of engaging in CAS.[13,20] Studies have found that serosorting is a common practice among HIV-positive and HIV-negative GBMSM. Some evidence suggests that HIV-negative GBMSM are more likely to engage in serosorting,[21] while other studies suggest that rates of serosorting are similar, estimating that between 25–38% of HIV-negative and 14–44% of HIV-positive GBMSM engage in serosorting.[14,22]

A study of GBMSM visiting an STD clinic in Seattle, WA between 2001 and 2007 found that reported rates of serosorting are increasing among GBMSM but serosorting only offered limited protection from HIV-infection for HIV-negative men compared to those who engaged in serodiscordant CAS.[19] Similarly, a review of four studies, consisting of 12,000 HIV-negative GBMSM and more than 60,000 follow-ups (each 6 months apart), found that compared to consistent condom use, serosorting was associated with a twofold risk in HIV acquisition (HR: 2.03, 95% CI: 1.51–2.73).[13] However, compared to those who did not engage in any seroadaptive behaviors, serosorting was associated with a 38% reduction in HIV acquisition risk (HR: 0.62, 95% CI: 0.47–0.82).[13] Although serosorting may offer some benefit in regards to reduced risk of HIV transmission, this strategy does not protect against sexually transmitted infections.[23,24]

A second strategy that has been discussed in the literature is strategic positioning. With strategic positioning, individuals adopt an insertive or receptive role during serodiscordant anal sex based on their own HIV status,[17, 25] the HIV-positive person takes on the receptive role and the HIV-negative person takes on the insertive role.[25] Evidence indicates that the risk of HIV transmission is lower when the HIV-negative person is the penetrating partner and the HIV-positive person is the receptive partner during anal sex.[26,27]

Compared to HIV-negative GBMSM, HIV-positive GBMSM are more likely to practice strategic positioning.[21] Studies have found that between 14–35% of HIV-positive GBMSM and 6–15% of HIV-negative GBMSM report engaging in strategic positioning.[14,22] In their review, Vallabhaneni and colleagues found that HIV-negative GBMSM who engaged in strategic positioning were at no greater risk of HIV acquisition (HR: 0.85, 95% CI: 0.50–1.44) compared to men who had no CAS.[13] Compared to men who did not utilize any seroadaptive behaviors, those who engaged in strategic positioning were 74% less likely to acquire HIV (HR: 0.26, 95% CI: 0.15–0.43).[13]

The effectiveness of serosorting, strategic positioning, and other seroadaptive strategies relies on the accurate knowledge and disclosure of the serostatus of all the individuals involved.[28,29] As such, serostatus disclosure is considered an important factor in HIV transmission risk reduction and a precursor to other seroadaptive behaviors. In essence, if two individuals disclose they do not share the same HIV status, they may choose to use a condom, not engage in sex, or engage in other behaviors that present lower HIV transmission (e.g., mutual masturbation, oral sex, strategic positioning).

One study found that 70.3% of MSM reported discussing their serostatus with at least one sex partner in the past 4 months, with 36.3% of those men disclosing to all of their sex partners, and with HIV-positive MSM being more likely to disclose compared to HIV-negative men.[30] However, some evidence suggests HIV-positive men may be more likely to disclose their status to an HIV-positive partner than an HIV-negative or unknown status partner due to perceived stigma surrounding HIV.[31,32] Racial differences have also been observed in serostatus disclosure, with some evidence indicating that black GBMSM are less likely to disclose compared to white GBMSM[33] and less likely to report feeling confident when their partner discloses having an HIV-negative status compared to GBMSM from whites and other racial/ethnic groups.[21]

Although GBMSM are at heightened risk for HIV transmission compared to other populations, highly sexually active GBMSM may be particularly vulnerable by virtue of their sheer volume of sex partners.[34,35] A probability-based sample of sexually active GBMSM noted that these individuals reported between two to three partners on average in the previous 90 days.[36–38] For the purpose of this study, we defined highly sexually active as three times that amount (i.e., 9 partners in the previous 90 days). To our knowledge, there are no published studies on harm reduction strategies being used among this population nor an investigation into whether strategies differ among HIV-positive and HIV-negative GBMSM with similarly high levels of sexual activity.

To that end, we report on a sample of 376 highly sexually active GBMSM living in New York City who reported on their sexual behavior and HIV status disclosure in the 6 weeks (42 days) prior to their assessment. The aims of the current study were to examine the prevalence of status disclosure, serosorting, and strategic positioning among highly sexually active GBMSM, and to examine differences in the use of these seroadaptive behaviors by HIV status and other key demographic factors.

Methods

Analyses for this study were conducted on data from *The Pillow Talk Project*, a study of highly sexually active (i.e., ≥9 male partners in 90 days) gay and bisexual men in New York City (NYC).[39] For the purposes of this project, we operationalized highly sexually active as having at least 9 sexual partners in the 90 days prior to enrollment. This entry criterion was based on prior research,[36–38] including a probability-based sample of urban GBMSM[40,41] that found 9 partners was 2 to 3 times the average number of sexual partners among sexually active GBMSM. Recruitment procedures -have been described elsewhere.[42] In brief, we utilized a combination of recruitment strategies: (1) respondent-driven sampling; (2) Internet-based advertisements on social and sexual networking websites; (3) e-mail blasts through New York City gay sex

party listservs; and (4) active recruitment in New York City venues such as gay bars/clubs, concentrated gay neighborhoods, and ongoing gay community events.

Enrollment began in February 2011 and closed in June 2013. The project enrolled both HIV-negative and HIV-positive men. Of the 376 men who enrolled in the project, 208 (55.3%) were confirmed to be HIV-negative with a rapid HIV antibody test during their assessment. HIV-positive participants presented proof of serostatus (e.g., HIV prescription bottle with their name on it). Any self-described HIV-negative men who screened HIV-positive at baseline were deemed ineligible for further continuation in the study. We referred these men to our community HIV providers to faciliated linkage to treatment and care.

Participants and procedures

Participants completed a phone-based screening interview to assess eligibility, which was defined as: at least 18 years of age; biologically male and self-identified as male; 9 or more male sexual partners in the prior 90 days, with at least 2 in the prior 30 days; self-identification as gay, bisexual, or some other non-heterosexual identity (e.g., queer); and daily access to the Internet (which was required for a portion of the study not discussed in this publication). Participants who met preliminary eligibility were e-mailed a link to an Internet-based computer-assisted self-interview (CASI), which included informed consent procedures. Men completed this 1-h online survey at home, followed by an in-person baseline appointment. Final eligibility and enrollment was confirmed during the in-person appointment.

All procedures were reviewed and approved by the Institutional Review Board of the City University of New York.

Measures

Using computer-assisted survey interview (CASI) software, participants reported demographic characteristics, including sexual identity, age, race/ethnicity, education, and relationship status.

During the in-person assessment, participants completed an interviewer-administered structured timeline follow-back (TLFB) interview,[43,44] which involved completing a detailed (day-by-day) calendar of their sexual events in the 42 days (6 weeks) prior to the study visit. For each sexual partner, participants indicated the serostatus of that partner (HIV-positive, HIV-negative, HIV-status unknown/undiscussed). Research staff were trained to probe specifically to differentiate between overtly disclosed status (i.e., a conversation happened between partners) and assumed status. If serostatus was undiscussed or assumed, it was coded as unknown/undiscussed. Oral sex and receptive and insertive anal sex (both with and without condoms) were also assessed. Further, we assessed if the partner was a new (first-time) partner or a repeat partner. We generated summary scores for a variety of sexual behaviors (number of male partners, number of male serodiscordant partners, receptive anal sex acts (with and without condoms), insertive acts (with and without condoms).

Analytic plan

First, using chi-square and *t*-tests, we compared HIV-positive and HIV-negative men on a variety of demographic characteristics (using the CASI data). Second, we report on HIV status differences in a variety of sexual behaviors with male partners in the 42 days prior to the interview (using the TLFB data). These included the number of partners (HIV-negative, HIV-positive, HIV-unknown, HIV-serodiscordant, new partners, repeat partners) as well as insertive and anal sex acts with those partners (both insertive and receptive, with and without condoms). To assess for strategic positioning, we calculated the percentage of the time that participants bottomed when having anal sex with (1) HIV-positive, (2) HIV-negative, and (3) HIV-status unknown partners. To account for the non-normal distribution of these variables, Mann Whitney *U* tests were used, and we report medians and interquartile ranges.

Finally, we ran a series of group logistic regression models to determine independent associations of HIV status, relationship status, education, and race on four sexual behavior outcomes: (1) the proportion of male partners who were of unknown HIV status (i.e., status disclosure), (2) the proportion of male partners who were HIV serodiscordant (i.e., serosorting), (3) the proportion of sex events that included CAS (i.e., HIV risk), and (4) the proportion of anal sex acts that were without condoms. This fourth model was nested among the men who reported at least one anal sex act in the prior 42 days [i.e., HIV risk (nested)].

Results

Shown in Table 1, the sample was diverse with regards to race and ethnicity, employment status, and educational achievement, while a majority of the sample was gay-identified and single. With the exception of relationship status, HIV-positive men differed from HIV-negative men in demographic characteristics. HIV-positive men were more racially/ethnically diverse, less likely to identify as bisexual, reported less education and lower incomes, and were less likely to be employed.

Overall, sex with female and transgender partners was uncommon. Out of the 376 participants, 17 (4.5%) reported having female partners (10 of these individuals reporting just one female partner) in the prior 42 days. One participant reported sex with a transman and five participants reported sex with a transwoman. There was insufficient statistical power to assess for HIV status differences in sexual behavior with female or transgender partners.

There were a number of HIV status differences in sexual behavior with male partners. Although HIV-positive and HIV-negative men reported a statistically similar number of partners ($Mdn = 10$ in the last 42 days)—including the number of new ($Mdn = 7$) and repeat ($Mdn = 3$) male partner—there was evidence of serosorting. HIV-positive participants reported a significantly greater number of HIV-positive partners (compared to HIV-negative participants) and HIV-negative participants reported a significantly greater number of HIV-negative partners (compared to HIV-positive participants). However, compared to HIV-negative participants, HIV-positive participants reported a significantly greater number of partners with whom they did not know or did not discuss HIV-status, and thus a significantly greater number of partners coded as HIV-serodiscordant/unknown (Table 2).

Although there were no HIV-status differences in the number of oral sex acts, compared to HIV-negative participants,

Table 1. HIV Status Differences in Demographic Characteristics

	Full sample		HIV status: HIV-negative n = 208		HIV status: HIV-positive n = 168			
	M	*SD*	*M*	*SD*	*M*	*SD*	*t*	p
Age in years (range 18–73)	37.0	11.4	34.5	12.0	40.1	10.0	4.84	< 0.001
	n	%	n	%	n	%	χ^2	p
HIV-positive	168	44.7	–	–	–	–	–	–
Race/ethnicity								
Black	76	20.3	29	14.0	47	28.1	19.39	< 0.001
Latino	51	13.6	23	11.1	28	16.8		
White	189	50.5	124	59.9	65	38.9		
Other	58	15.5	31	15.0	27	16.2		
Sexual identity								
Gay	331	87.8	173	83.2	158	93.5	9.27	0.002
Bisexual	46	12.2	35	16.8	11	6.5		
Employment status								
Unemployed, including full-time students	161	43	58	28.0	103	61.7	42.72	< 0.001
Part-time	95	25.4	66	31.9	29	17.4		
Full-time	118	31.6	83	40.1	35	21.0		
Education								
Less than a 4-year college degree	159	42.5	60	29.0	99	59.3	34.88	< 0.001
4-year college degree	125	33.4	84	40.6	41	24.6		
Graduate school	90	24.1	63	30.4	27	16.2		
Income								
< $30,000	202	54.0	92	44.4	110	65.9	17.08	< 0.001
$30,000 +	172	46.0	115	55.6	57	34.1		
Relationship status								
Single	299	79.9	169	81.6	130	77.8	0.83	0.36
Partnered	75	20.1	38	18.4	37	22.2		

HIV-positive participants reported a significantly greater number of anal sex acts, as well as anal sex acts without a condom. HIV-negative participants reported a median of one (IQR 0–3) CAS events and HIV-positive participants reported a median of 6 (IQR 1.5–14) CAS events. However, a majority of these CAS events were with HIV-seroconcordant partners—HIV-negative participants reported a median of 0 (IQR 0–1) CAS events with HIV-serodiscordant partners and HIV-positive participants reported a median of 2 (IQR 0–7.25) CAS events with HIV-serodiscordant partners.

We next examined anal sexual behavior by serostatus of partner, finding that partner's serostatus played a role. First, when having anal sex with HIV-negative partners, HIV-positive and HIV-negative participants did not significantly differ with regard to the number of CAS receptive acts; however, HIV-negative participants reported significantly more CAS insertive acts than HIV-positive participants. Second, when having anal sex with HIV-positive partners, HIV-positive participants reported significantly more CAS insertive and receptive acts than HIV-negative participants. HIV-positive and HIV-negative participants did not differ with regard to the number of receptive anal sex acts with a condom, while HIV-negative participants reported a significantly greater number of insertive anal sex acts with a condom. Third, we examined sexual behavior when having anal sex with HIV-status unknown partners finding identical patterns of behavior as when having anal sex with HIV-positive partners.

Our data also suggested that many men were also engaged in strategic positioning. Overall, when having anal sex, and compared to HIV-negative participants, HIV-positive participants engaged in a significantly greater proportion of acts as a bottom (anal receptive partner). Among HIV-positive men, a median of 50% of their anal sex acts were as a bottom when with HIV-positive partners, and 50% when with HIV-negative partners. This number increased to a median of 59% when with HIV-status unknown partners. The strategic positioning pattern was more pronounced among HIV-negative participants—they spent a median of 0% of their anal sex acts with HIV-positive partners as a bottom, 33% of their anal sex acts with HIV-status unknown partners were as a bottom, and 42% of their anal sex acts with HIV-negative partners were as a bottom.

Grouped logistic regression

Finally, we ran a series of group logistic regression models to determine independent associations of HIV status, relationship status, education, and race on four sexual behavior

Table 2. HIV Status Differences in Sexual Behaviors with Male Partners in the Last 42 days

			HIV status					
			HIV-negative n = *208*		*HIV-positive* n = *168*			
	Mdn	*IQR*	*Mdn*	*IQR*	*Mdn*	*IQR*	U	p
Total number of partners	10	6–17	10	6–16	10	7–17	18469	0.40
Number of HIV-negative partners	2	0–5	4	1–7	1	0–2	8093	< 0.001
Number HIV-positive partners	0	0–2	0	0–0	2	1–5	28896	< 0.001
Number HIV-unknown partners	4	2–10	4	1–9	5	2.25–11	20173	0.01
Number of HIV-serodiscordant[a] partners	5	2–11	4	2–9.75	7	4–12.5	21878	< 0.001
Number of new partners	7	4–12	6.5	4–11.75	7	4–14	18573	0.29
Number of repeat partners	3	1–5	3	1–5	3	1–5	17173	0.77
Number of anal sex acts[b]	8	3–16	6	3–12	9	4–20	21799	< 0.001
Number of anal sex acts, no condom	2	0–7	1	0–3	6	1.5–14	25995	< 0.001
Number of anal sex acts with HIV-serodiscordant/unknown[a] partners, no condom	0	0–3	0	0–1	2	0–7.25	21303	< 0.001
Number of anal sex acts with HIV-serodiscordant/unknown[a] partners, with a condom	1	0–3	1	0–3	1	0–4	14935	0.65
Number of oral sex acts	17	10.5–30	17	10–29	18	11.5–33	18980	0.18
Number of anal insertive acts	3	0–8.5	3	1–8	3	0–9	17843	0.80
Number of anal receptive acts	2	0–7.5	1	0–5	4	0–11	22143	< 0.001
With HIV-negative partners								
Number of receptive anal sex acts, no condom	0	0–1	0	0–1	0	0–1	7584	0.75
Number of insertive anal sex acts, no condom	0	0–1	0	0–2	0	0–1	6373	0.03
Number of receptive anal sex acts, with a condom	0	0–2	0	0–2	0	0–1	6542	0.08
Number of insertive anal sex acts, with a condom	0	0–3	1	0–4	0	0–4	4860	< 0.001
With HIV-positive partners								
Number of receptive anal sex acts, no condom	0	0–2	0	0–0	1	0–3	3820	< 0.001
Number of insertive anal sex acts, no condom	1	0–4	0	0–1	1.5	0–5.75	3495	< 0.001
Number of receptive anal sex acts, with a condom	0	0–0	0	0–0	0	0–0	2419	0.65
Number of insertive anal sex acts, with a condom	0	0–0	0	0–1	0	0–0	2056	0.01
With HIV-status unknown partners								
Number of receptive anal sex acts, no condom	0	0–1	0	0–0	0	0–3	18324	< 0.001
Number of insertive anal sex acts, no condom	0	0–1	0	0–0	0	0–2	16600	< 0.001
Number of receptive anal sex acts, with a condom	0	0–1	0	0–1	0	0–1	13769	0.50
Number of insertive anal sex acts, with a condom	0	0–1	0	0–2	0	0–1	11198	0.01
Strategic positioning								
Proportion of the time bottoms when with male HIV-positive partners (valid *n* = 139)	0.40	0–0.75	0.00	0–0.50	0.50	0–0.87	1896	0.01
Proportion of the time bottoms when with male HIV-negative partners (valid *n* = 221)	0.42	0–1.0	0.42	0–0.76	0.50	0–1.0	6259	0.03
Proportion of the time bottoms when with male HIV-status unknown partners (valid *n* = 254)	0.50	0–1.0	0.33	0–0.97	0.59	0–1.0	1896	0.01

IQR, Interquartile Range; Mdn, Median; *U*, Mann Whitney *U*.

[a]HIV-serodiscordant partners include those who were known to be of a different HIV status as well as those in which HIV status disclosure did not occurr, or status was assumed (but without disclosure)

[b]Note that the number of anal sex acts was a non-normally distributed variable. As such, we report the median (instead of mean) which is less apt to influence by outliers. The values of median values of zero for anal sexual behaviors reflect the fact that for many variables, greater than 50% of the sample said they had not engaged in the behavior. however, it could also mean that as much as 49% of the sample did engage in the behavior. Given that participants were asked about 12 different behaviors, it is reasonable that, as an aggregate, the median value would be 8.

Table 3. Grouped Logistic Regression Models (Events Out of Trials—Proportions)

	Model 1: Status disclosure Proportion of male partners who were of unknown HIV status				*Model 2: Serosorting Proportion of male partners who were seroconcordant*				*Model 3: HIV risk Proportion of sex events that included CAS acts*				*Model 4: HIV risk (nested) Proportion of anal acts that were without a condom*[a]			
	B	*S.E.*	*AOR*	p	*B*	*S.E.*	*AOR*	p	*B*	*S.E.*	*AOR*	p	*B*	*S.E.*	*AOR*	p
HIV status (Ref: negative)																
Positive	0.23	0.06	**1.26**	<0.001	−0.65	0.07	**0.52**	<0.001	1.75	0.07	**5.73**	<0.001	2.17	0.08	**8.79**	<0.001
Relationship status (Ref: single)																
Partnered	0.17	0.08	**1.18**	0.03	−0.30	0.08	**0.74**	<0.001	−0.02	0.07	0.98	0.76	0.01	0.09	1.01	0.90
Education (Ref: less than 4-year college degree)																
4-year degree or more	−0.34	0.07	**0.71**	<0.001	0.29	0.07	**1.34**	<0.001	0.28	0.07	**1.33**	<0.001	0.47	0.08	**1.60**	<0.001
Race/ethnicity (Ref: white)																
Black	0.18	0.09	**1.20**	0.03	−0.10	0.09	0.91	0.28	0.08	0.08	1.09	0.31	−0.32	0.10	**0.73**	0.001
Latino	−0.42	0.09	**0.66**	<0.001	0.41	0.10	**1.50**	<0.001	0.05	0.09	1.06	0.56	−0.38	0.11	**0.68**	<0.001
Other	0.01	0.09	1.01	0.92	0.02	0.09	1.03	0.79	−0.15	0.09	0.86	0.09	−0.38	0.11	**0.69**	<0.001

AOR, Adjusted odds ratio. Items in **bold** are significant at $p < 0.05$.
[a]This only includes participants who had at least one anal sex act, $n = 341$.

outcomes: (1) the proportion of male partners who were of unknown HIV status (i.e., status disclosure), (2) the proportion of male partners who were HIV serodiscordant (i.e., serosorting), (3) the proportion of sex events that included CAS (i.e., HIV risk), and (4) the proportion of anal sex acts that were CAS [i.e., HIV risk (nested)]. Results are in Table 3.

Model 1. Having a greater proportion of male partners who were of unknown HIV status was independently associated with being HIV-positive (vs. HIV-negative), being partnered (vs. being single), having less than a 4-year college degree (vs. 4-year degree or more), and race/ethnicity. Compared to white participants, black participants had greater odds of having status unknown partners, and Latino participants had lower odds.

Model 2. Having a greater proportion of male partners who were HIV seroconcordant was independently associated with being HIV-negative (vs. HIV-positive), being single (compared to being partnered), having a 4-year college degree (vs. less education), and being Latino (vs. white).

Model 3. Having a greater proportion of sexual events involve CAS was independently associated with being HIV-positive (vs. HIV-negative) and having a 4-year college degree (vs. less education). Relationship status and race/ethnicity were not significant.

Model 4. Having a greater proportion of anal sex events that involved CAS was independently associated with being HIV-positive (vs. HIV-negative), having a 4-year college degree (vs. less education), and being white (vs. black, vs. Latino, and vs. other races/multiracial).

Discussion

Since the beginning of the HIV/AIDS epidemic, researchers have identified a number of harm reduction strategies that GBMSM use to reduce HIV transmission risks. Although not exhaustive, these include condom use, serosorting, HIV-status disclosure, and strategic positioning.[7,8,13,32,45–49] In this study, we investigated the prevalence and predictors of such behaviors in a sample of highly sexually active GBM—individuals, who by virtue of the frequency of sexual behavior alone, are at elevated risk for HIV and STI transmission. We found evidence to suggest that these men engaged in high levels of HIV serosorting, HIV status disclosure, and strategic positioning; however, rates varied based on the participant's HIV status. HIV-positive and HIV-negative men both engaged in sex with men of similar status more often than they engaged in sex with men known to be a different HIV status; however, there were distinctive patterns in HIV-status disclosure.

Previous research suggests that HIV-positive men are more likely to disclose their HIV-status compared to HIV-negative men.[30,32] In contrast, we found HIV-negative men tended to disclose HIV status with about half of their partners, whereas HIV-positive participants disclosed with only about one-third. One potential explanation for our discrepant findings is the unique nature of our highly sexually active sample. Another potential explanation is that the lower rate observed among HIV-positive men is likely a result of pervasive HIV-stigma against HIV-positive individuals.[50–54] HIV-positive men may wait until they feel the risk of rejection is low before they disclose (i.e., after a few dates and thus low disclosure with new/first time partners).[53,54]

Alternately, because some sex acts present lower risks for HIV transmission than others, HIV-positive men may not feel disclosure is necessary with partners that involved anal sex *with* a condom, or just oral sex. Similarly, HIV-positive men who are virally suppressed by anti-retroviral medication may recognize their infectiousness is low, and thus not feel it as necessary to disclose, particularly with new partners.[55] Note, our study did not have an objective measure of viral load; however, many HIV-positive participants told us they were taking anti-retroviral medication and were virally suppressed.

Much of what is discussed with regard to strategic positioning is based on data from HIV-positive individuals, or in terms of a behavior that is done predominately by HIV-positive individuals.[7,21] Prior research has suggested that HIV-positive GBMSM more often engage as the receptive partner when with HIV-negative partners than when with HIV-positive partners.[7,21] Our data found that HIV-positive participants were the receptive partner about half the time with their HIV-negative and HIV-positive partners. Compared to previous research, the HIV-positive men in our study reported higher rates of strategic positioning.[17,25] Of note, however, much of the prior research on strategic positioning was published before it was widely known that men with undetectable viral loads are at reduced risk of transmitting HIV.

Interestingly, strategic positioning appeared to be very common among HIV-negative participants. They rarely bottomed with HIV-positive partners, bottomed about one-third of the time with status-unknown partners, and 42% of the time (on average) with HIV-negative partners. Our findings demonstrate slightly elevated rates of strategic positioning among HIV-negative individuals compared to previous research.[47 56] This suggests that HIV-negative individuals actively engage in strategic positioning and may maintain strong beliefs about the association between HIV transmission risks during receptive versus insertive anal sex. Future research would be well served to investigate motivations and beliefs regarding HIV transmission risks inherent to strategic positioning among HIV-negative individuals.

In multivariable modeling, demographic characteristics were associated with HIV-status disclosure, serosorting, and HIV risk behavior in noteworthy ways. Compared to white participants, black men were at significantly higher odds of not knowing their partners HIV status, while Latino men were at significantly lower odds. These patterns mirror those found by other researchers.[57] A 2011 study of 1199 GBMSM in San Francisco noted that partnerships of black men were among the least likely to involve serodisclosure,[21] and a 2010 study of 549 self-reported HIV-negative GBMSM in Atlanta reported that white men were more likely to endorse serosorting beliefs and favorable HIV disclosure beliefs than black GBMSM.[58]

Meanwhile, in multivariable modeling, white men did not differ from others with regard to the proportion of sex events that involved CAS (out of all sex events), and men of color were significantly *less* likely than white men to engage in CAS when having anal sex (nested events). This suggests that although race was associated with HIV status disclosure, it was not associated with CAS (i.e., the actual behavior that conveys HIV transmission risk), thus our findings provide further evidence that disparities in HIV burden among men of color are not explained by differential rates of CAS.[59] Future researchers might be well served to investigate other factors such as composition of sexual networks, STI burden, and structural factors that contribute to HIV disparities.[59,60]

In multivariable modeling, level of education was significantly associated across all four models. Accounting for other variables in the model, having a 4-year degree was associated with greater HIV status disclosure and serosorting (presumably protective behaviors), but also CAS. It may be that those with a college degree have a greater familiarity of the many complexities involved in HIV transmission risks (e.g., viral load, transmission fluids) and are better equipped to navigate difficult, and potentially uncomfortable, discussions around HIV status with their partners. These too remain important areas for future consideration as it highlights the complexity that goes into sexual decision making processes.

Limitations

Our findings should be understood in light of their limitations. First, we recognize that behaviors such as serosorting, strategic positioning, and HIV status disclosure are harm reduction strategies; however, they do not eliminate HIV transmission risks.[61] Our staff were trained to clearly differentiate instances of sero-''assuming'' (or sero-''guessing'')[32] versus overt HIV status disclosure. Yet, we cannot be certain of partners' HIV statuses, how recently these partners were tested, nor do we have data on discussions of viral load, or—of increasing importance—PrEP. Studies have indicated that engaging in harm reduction strategies such as serosorting and strategic positioning are better than having nothing in place,[8,13,19,45,48,62] but the protections afforded by these strategies are nowhere near as effective as condom use.

We believe we can conclude that men were serosorting; however, given that there are more HIV-negative men available as potential partners than HIV-positive men (i.e., HIV-negative men outnumber HIV-positive men in the world), random selection of partners among HIV-negative men could *look* like serosorting. Yet, differences we observed in seropositioning among HIV-negative participants based on the status of their partner suggests there is an interaction between the two. Because we did not collect data on participant's intentions and motivations to engage in harm reduction strategies (e.g., choosing one strategy over another, reasons for engaging in harm reducation strategies) and because our data are cross-sectional, we also cannot attest as to whether harm reduction strategies are a result of HIV-status, or vice versa (e.g., men who act as the anal receptive partner would be more likely to contract HIV).

Nevertheless, on a purely descriptive level, our data do indicate that HIV-positive men subscribe to different sets of harm reduction strategies than HIV-negative men. And certainly, although the goal of this article was to describe HIV status differences in the use of harm reduction strategies, we recognize that many other factors, including sociodemographic characteristics not assessed in this study, have also been associated with sexual behavior.[63]

To be eligible for *Pillow Talk*, men had to report at least nine male partners in the prior 90 days. Although by virtue of the frequency of their sexual behavior, these men are at increased risk for HIV/STI transmission, these men do not represent all gay and bisexual men. Some measures were collected via online survey, which allowed men to complete the survey from the comfort of their homes and on their own schedule. However, we cannot know what types of distractions might have been drawing their attention away from the survey while they completed it. Behavioral measures were captured via the TLFB interview, which has demonstrated strong reliability and validity with a variety of populations; however, as a face-to-face interview, there is the potential for bias due to socially desirable responses. Participants for this study were enrolled at a time in which PrEP was becoming available, but not widely used.[64]

Much as researchers should consider the role of viral suppression in the behaviors of HIV-positive individuals, future researchers should consider the role of PrEP in their operational definitions of risk for HIV-negative GBMSM and their partners. For this study, we generated a wide range of sexual behavior outcomes; however, in the interest of parsimony, this list was not exhaustive. There were many nuances to our participants' sexual behavior that, given the already complex nature of the TLFB interview, we were unable to assess. These include, for example, the ages and races of partners, how partners were met, and as mentioned discussions around viral load/suppression. In addition, because all participants' HIV statuses were confirmed at baseline, we cannot attest to the behavior of men who do not know their HIV status.

Conclusions

Highly sexually active GBMSM are a critical population in which to both investigate HIV prevention strategies as well as develop effective intervention programs. We found that these men employed a wide range of harm reduction strategies and that adoption of a strategy was associated with participants' own HIV status. This suggests providers and clinicians might be well served to embrace a wide range of harm reduction strategies in addition to condom use and biomedical approaches to HIV prevention. Given stigma that HIV-positive individuals face, HIV status disclosure may prove more difficult for these men.

Although status disclosure itself may not reduce HIV transmission risk (i.e., knowing someone's status does not increase the chances of contracting/transmitting HIV compared to not knowing it), it serves as a necessary precursor in order to engage in behavioral strategies that actually reduce HIV transmission risk (e.g., serosorting, strategic positioning, oral sex only, mutual masturbation only). Much of what is known about strategic positioning has been described as a phenomenon among HIV-positive GBMSM. In this study, strategic positioning was more common among HIV-negative men, highlighting the need to further investigate shifting views around HIV transmissibility and sexual positioning.

Finally, our findings were consistent with that of others, suggesting that although status disclosure may be lower among black GBMSM, the proportion of acts involving CAS is either not significantly associated with race, and among anal sex events, significantly lower among people of color. Our findings support that ongoing HIV disparities among GBMSM of color are not a result of racial differences in rates of CAS. Finally, with the intersection of biomedical strategies (PrEP and treatment-as-prevention) with behavioral ones, it is becoming increasingly necessary for both researchers and providers to update their definitions of ''risky'' sexual behavior as well as their measurement of harm reduction strategies.

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