



Lifetime Burden of Incarceration and Violence, Internalized Homophobia, and HIV/STI Risk Among Black Men Who Have Sex with Men in the HPTN 061 Study

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Abstract

Black men who have sex with men (BMSM) have disproportionate HIV/STI acquisition risk. Incarceration may increase exposure to violence and exacerbate psychosocial vulnerabilities, including internalized homophobia, which are associated with HIV/STI acquisition risk. Using data from HIV Prevention Trials Network 061 (N = 1553), we estimated adjusted prevalence ratios (APR) and 95% confidence intervals (CIs) for associations between lifetime burden of incarceration and HIV/STI risk outcomes. We measured associations between incarceration and HIV/STI risk outcomes with hypothesized mediators of recent violence victimization and internalized homophobia. Compared to those never incarcerated, those with 3–9 or ≥ 10 incarcerations had approximately 10% higher prevalence of multiple partnerships. Incarceration burden was associated with selling sex (1–2 incarcerations: APR: 1.52, 95% CI 1.14–2.03; 3–9: APR: 1.77, 95% CI 1.35–2.33; ≥ 10 : APR: 1.85, 95% CI 1.37–2.51) and buying sex (≥ 10 incarcerations APR: 1.80, 95% CI 1.18–2.75). Compared to never incarcerated, 1–2 incarcerations appeared to be associated with current chlamydia (APR: 1.47, 95% CI 0.98–2.20) and 3–9 incarcerations appeared to be associated with current syphilis (APR: 1.46, 95% CI 0.92–2.30). Incarceration was independently associated with violence, which in turn was a correlate of transactional sex. Longitudinal research is warranted to clarify the role of incarceration in violence and HIV/STI risk in this population.

Keywords Incarceration · Violence · HIV · STI · MSM

Introduction

HIV persists as a critical public health priority, disproportionately impacting Black men who have sex with men (BMSM). Approximately one-third of BMSM are currently

living with HIV and if these rates persist, projections suggest 50% will acquire HIV in their lifetime [1, 2]. Though BMSM report less drug use, fewer male sexual partners, and have comparable rates of unprotected anal intercourse than White MSM, they face a much greater risk of acquiring HIV [2, 3]. Other sexually transmitted infections (STI), including gonorrhea and syphilis, are also disproportionately more common among BMSM [4]. These infections can cause serious complications if left undetected and untreated and increase the risk of acquiring or transmitting HIV [5, 6]. Given that individual-level drug and sex risk behaviors do not fully explain heightened infection risk among BMSM, there is a need to consider the potential importance of social and structural factors that may drive HIV/STI infection in this population.

Incarceration has consistently been associated with HIV/STI risk among heterosexual populations [7–12]. Though incarceration is prevalent among BMSM, with up to 60% having experienced incarceration in their lifetime [13–15],

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there has been little research examining its effects on HIV/STI risk specifically within this group. Extant studies on the relationship between incarceration and HIV/STI risk among MSM have been conducted primarily in non-generalizable samples (e.g., young MSM, specific geographic regions, those living with HIV) [16–19]. Extant studies often fail to estimate effects by race among MSM, despite evidence that the burden of incarceration is much higher for BMSM compared to White MSM [16, 18]. Within the studies that have done so, the findings regarding effects among BMSM are somewhat inconsistent. One study found that the interaction between Black race and history of incarceration was associated with increased HIV/STI risk behavior [16] while another found that White MSM had higher risk [18]. Finally, no known studies have examined lifetime cumulative number of incarcerations among BMSM rather than a dichotomous indicator of prior history. Considering that increasing number of incarceration events has demonstrated a dose–response relationship with HIV-related risk in other populations [20], there is a need to understand the total burden on incarceration among BMSM.

Incarceration may influence HIV/STI risk among BMSM by working through several pathways. HIV/STI may be transmitted during the incarceration [21] considering the high prevalence of untreated infections and same-sex segregation in correctional facilities [22]. As has been observed in heterosexual populations, incarceration disrupts social, sexual, and support networks as well as capital [23–26]. After release, network disruption may lead to new, multiple, and/or concurrent partnerships, proximate determinants of HIV/STI [27]. Reduced social capital and economic instability may also lead to other HIV/STI risk factors such as engagement in transactional sex, substance use, and depression [28, 29]; the relationships among incarceration and these factors may be bi-directional or cyclical, considering that transactional sex, substance use, and poor mental health may also lead to contact with the criminal justice system [30]. Because of the limited research on the role of incarceration on HIV/STI risk among BMSM, there is a need to examine this association in this population.

Two factors that may play a particularly important role in the relationship between incarceration and HIV/STI risk among BMSM are violence victimization [31, 32] and internalized homophobia [33], with high levels identified among BMSM [34], and which are strong correlates of HIV/STI risk [33, 35–37]. Incarceration may further exacerbate victimization among BMSM, with one in five individuals who are incarcerated reporting violence perpetrated by other inmates or correctional facility staff [38, 39]. Experiencing violence can result in emotional distress, difficulties adjusting to the community after release, greater risk of drug use and sexual risk behaviors, and sexual violence, leading directly to HIV/STI transmission [40–44]. Another

potentially important pathway from incarceration to HIV/STI among BMSM may be internalized homophobia. Incarceration is stigmatizing [40] and stigma has been shown to inhibit the development of protective network ties, resulting in social isolation, emotional distress, depressive symptoms, and HIV/STI-related infection transmission [41–43]. Groups that are already highly stigmatized, such as racial and sexual and gender minorities, may be particularly vulnerable to internalizing stigma due to their incarceration [44] and homophobic attitudes within correctional facilities [45–48]. However, research on the interplay between incarceration, social/structural factors (i.e., violence and internalized homophobia), and HIV/STI risk has been limited.

The purpose of the current study is to address a gap in the extant literature by measuring associations between the lifetime burden of incarceration and HIV/STI risk among BMSM. We used baseline data from The HIV Prevention Trials Network 061 Study (HPTN 061; the Brothers Study) to measure cross-sectional associations between lifetime number of incarcerations, HIV/STI risk indicators including sexual risk behaviors, and STI infection. Given the potential for incarceration-related increases in victimization and stigmatization that may translate to HIV/STI-related risk-taking, we also examined associations between incarceration and hypothesized mediators of violence and internalized homophobia as well as associations between these factors and other HIV/STI risk factors (Fig. 1).

Methods

Sample

The parent study’s enrollment and recruitment methods have been comprehensively described elsewhere [49]. In brief, HPTN 061 was conducted to test the feasibility and efficacy of a peer-health navigation intervention to prevent the acquisition and transmission of HIV among BMSM. Enrollment occurred from 2009 to 2010 in six metropolitan cities in the United States (US): Atlanta, New York City, Washington DC, Los Angeles, San Francisco, and Boston. Institutional review boards (IRB) at the participating institutions

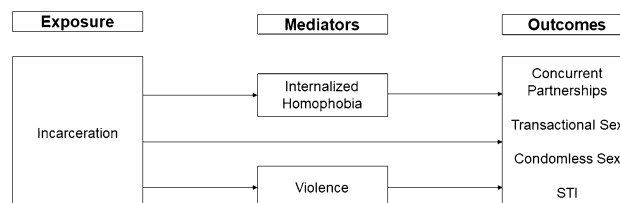


Fig. 1 Conceptual model of relationships among incarceration, internalized homophobia, violence, and HIV/STI risk

approved the study; NYU School of Medicine considers secondary analysis of de-identified data to be non-human subjects' research and thus did not require IRB review. HPTN 061 enrolled 1553 participants at least 18 years of age who identified as a man or male at birth; identified as Black, African American, Caribbean, African or multi-ethnic Black; and who reported at least one instance of condomless sex with a man in the past 6 months. Participants completed an audio computer-assisted self-interview (ACASI) survey that assessed demographic information, HIV risk behaviors, experiences of violence, and internalized homophobia. They also provided specimens for HIV/STI testing. Of the 1553 enrolled in the study, 252 participants reported a prior HIV diagnosis and 95 were diagnosed with HIV at enrollment; our analyses were restricted to 1521 participants who responded to the incarceration question at baseline.

Measures

Exposure: Incarceration

Participants were asked: “How many times in your life have you spent 1 or more days in jail or prison?” We then categorized incarceration frequency into a four-level variable (never, 1–2 times, 3–9 times and ≥ 10 times).

Outcomes: HIV/STI Risk Behaviors and STI Infection

Multiple Partnerships Participants reported the number of sexual partnerships in the past 6 months and those reporting three or more partners (i.e., the median in the sample) were categorized as having multiple partnerships.

Transactional Sex Participants reported if they had given or received money from male sex partners in the past 6 months. Buying sex was defined as having given money, goods, or items in exchange for sex and selling sex was defined as having received money, goods, or items in exchange for sex.

Condomless anal Intercourse We measured whether participants had engaged in condomless receptive anal intercourse in the past 6 months (i.e., as a bottom). Among participants who were HIV negative, we also assessed any condomless receptive anal intercourse with partners whom the participants reported to be HIV positive or whose HIV status was unknown.

Sexually Transmitted Infections Urine and rectal swabs were collected to test for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* (Hologic Gen Probe Aptima Combo 2, San Diego, CA) at the HPTN Laboratory Center. A blood specimen was collected for *Treponema pallidum* testing at local laboratories.

Hypothesized Mediating Factors: Internalized Homophobia and Violence

Internalized Homophobia Internalized homophobia at baseline was assessed using a 7-item scale adapted from Herek and Glunt [50] measuring how strongly participants agreed or disagreed with statements describing how they felt in the past 90 days, such as: “I wish I weren't attracted to men,” “I feel bad about being attracted to men because my community looks down on men who are,” and “As a Black man, I try to act more masculine to hide my sexuality.” The items were summed, with increasing scores indicating higher levels of internalized homophobia, which we then dichotomized at the median (scores ≥ 8 ; range 0–28) given there was a lack of linearity in the log odds with some outcomes.

Violence Participants reported whether in the past 6 months any of the following three violent events occurred because of their race and/or sexuality: being punched, kicked, or beaten, having an object thrown at them; being threatened with physical violence; and being threatened with a knife, gun, or other weapon. Those who endorsed any of these violent experiences were coded as exposed to violence in the past 6 months (yes versus no).

Covariates

We included the following demographic and socio-economic confounders in multivariable models: categorical age (18–30 years, 31–50 years, and 51–70 years), since continuous age was not linear in the log odds of some outcomes; dichotomous past 6 month partnership history, categorized as Black men who have sex with men only (BMSMO) versus Black men who have sex with men and women (BMSMW); categorical site indicator (New York City, Washington DC, Boston, Los Angeles, San Francisco, and Atlanta); dichotomous education variable indicating receipt of greater than a high school education (yes versus no); dichotomous functional poverty indicator defined as reporting insufficient income fairly often and very often versus never or once in a while; and categorical marital status indicator categorized as married/civil union/legal partnership, with a primary partner and cohabiting, with a primary partner and not cohabiting, and single/divorced/widowed.

Analyses

Analyses were conducted using R Version 3.5.1 “Feather Spray.” [51] We used modified Poisson regression with robust standard errors to estimate prevalence ratios (PR) and 95% confidence intervals (CI) for associations between the number of times incarcerated and the HIV/STI-related

sexual risk behavior and biologically-confirmed STI outcomes. Adjusted models controlled for sociodemographic factors including age, BMSMO/BMSMW status, study site, education, insufficient income, and marital status. We conducted similar analyses to estimate associations between frequency of incarceration and potential mediators of internalized homophobia and exposure to violence, as well as associations between the potential mediators and HIV/STI behavioral risk and STI infection outcomes.

Results

Sample Characteristics by Exposure to Violence and Internalized Homophobia

Of the analytic study sample (N = 1521), approximately 76% of participants were exposed to violence. Older participants reported instances of violence more frequently (31–50 [79.4%] and 51–70 [78.5%]) compared with younger men (18–30 [69.6%]; Table 1). The highest percentages of

Table 1 Sociodemographic characteristics of HPTN 061 sample (N = 1521)

Indicator	Prevalence of covariate in total sample %	Prevalence of recent violence victimization	Prevalence ratio for association between covariate and recent violence victimization ^a	Prevalence of high levels internalized homophobia	Prevalence ratio for association between covariate and internalized homophobia ^b
<i>Age in years</i>					
18–30	33.4	69.61	Ref.	47.88	Ref.
31–50	52.4	79.35	1.13 (1.06–1.22)	52.93	1.10 (0.98–1.24)
51–70	14.16	78.50	1.13 (1.03–1.23)	54.68	1.14 (0.97–1.33)
	Missing = 4				
<i>Sexual partnerships</i>					
BMSMO	56.33	73.33	Ref.	38.26	Ref.
BMSMW	43.67	79.34	1.08 (1.02–1.14)	69.11	1.81 (1.63–2.00)
	Missing = 5				
<i>Study site</i>					
New York City	19.96	75.17	Ref.	46.10	Ref.
Washington DC	14.62	64.38	0.86 (0.76–0.96)	45.50	0.99 (0.81–1.20)
Boston	15.26	78.11	1.04 (0.94–1.14)	62.78	1.36 (1.16–1.60)
Los Angeles	18.22	79.36	1.06 (0.97–1.15)	46.21	1.00 (0.84–1.20)
San Francisco	13.14	82.41	1.10 (1.00–1.20)	50.79	1.10 (0.93–1.40)
Atlanta	18.80	76.06	1.01 (0.92–1.11)	58.52	1.27 (0.91–1.33)
	Missing = 0				
<i>Above a high school degree</i>					
No	52.71	79.47	1.10 (1.04–1.17)	55.41	1.17 (1.05–1.30)
Yes	47.29	72.01	Ref.	47.32	Ref.
	Missing = 5				
<i>Insufficient income</i>					
Never/once in a while	76.68	74.68	Ref.	48.76	Ref.
Fairly/very often	23.32	80.11	1.07 (1.01–1.15)	66.42	1.24 (1.12–1.38)
	Missing = 5				
<i>Marital status</i>					
Married/civil union	2.39	81.08	1.07 (0.92–1.26)	69.44	1.36 (1.09–1.70)
Living with primary partner	5.02	77.92	1.03 (0.91–1.66)	41.67	0.81 (0.61–1.08)
Not living primary partner	3.67	80.36	1.06 (0.93–1.21)	59.26	1.16 (0.93–1.45)
Single/divorced/widowed	88.89	75.58	Ref.	51.15	Ref.
	Missing = 5				

^aN = 1153 (75.96%) participants experienced violence, defined as respondent has ever been threatened with being punched or kicked, ever been punched or kicked, or threatened at knifepoint or gunpoint

^bN = 755 (51.47%) participants expressed internalized homophobia measured using a 7-item scale (range: 1–5; Disagree Strongly–Agree Strongly). Those who had a score \geq median considered to have elevated levels of internalized homophobia

participants who experienced violence were from San Francisco (82.4%), followed by Los Angeles (79.4%), Boston (78.1%) and Atlanta (76.1%). Participants with lower education and income reported a higher prevalence of violence.

The prevalence of elevated internalized homophobia was approximately 1.8 times higher among BMSMW compared to BSMO. Geographic differences were also observed, with participants in Boston (62.8%) reporting the highest prevalence of internalized homophobia, which was significantly higher compared to the referent city of New York. The prevalence of internalized homophobia was higher among participants with lower educational attainment and those reporting insufficient income. Compared to single/divorced/widowed participants, those who were married/in a civil union had approximately 1.4 times (95% CI 1.09–1.70) the prevalence of internalized homophobia. Though a larger proportion of participants aged 51–70 years had internalized homophobia compared to younger participants (54.7% vs 47.9%), the confidence intervals crossed the null and was not significant.

Frequency of Incarceration and HIV/STI-Related Sexual Risk Behaviors

Approximately 61% of participants reported having been incarcerated at least one time in their lives; 21% reported 1–2 incarcerations, 24% reported 3–9 incarcerations, and 15% reported ≥ 10 incarcerations (data not presented in tables). In the 6 months before the baseline interview, 75% reported multiple partnerships, 13% bought sex, 22% sold sex, and, among those reporting receptive anal sex in the past 6 months, 50% reported having had condomless receptive anal sex.

Incarceration was modestly associated with multiple partnerships (Table 2). In adjusted analyses, those incarcerated 3–9 times and those incarcerated ≥ 10 times had approximately 10% increased prevalence of multiple partnerships compared to those who had never been incarcerated (3–9 times APR: 1.11, 95% CI 1.03–1.20; ≥ 10 times APR: 1.10, 95% CI 1.01–1.19).

Increasing frequency of incarceration demonstrated a strong, approximately dose–response relationship with both buying and selling sex. In unadjusted analyses, those who were incarcerated ≥ 10 times had over two and half times the prevalence of buying sex (PR 2.58; 95% CI 1.76–3.79) and selling sex (PR 2.73; 95% CI 2.07–3.62) compared to those who were never incarcerated. Though these associations were attenuated in adjusted analyses, the dose–response relationships generally remained for both buying (1–2 times APR: 1.42, 95% CI 0.96–2.10; 3–9 times APR: 1.58, 95% CI 1.08–2.33; ≥ 10 times APR: 1.80, 95% CI 1.18–2.75) and selling sex (1–2 times APR: 1.52, 95% CI 1.14–2.03; 3–9

times APR: 1.77, 95% CI 1.35–2.33; ≥ 10 times APR: 1.85, 95% CI 1.37–2.51).

While a history of 10 or more incarcerations was associated with engaging in condomless receptive anal intercourse with an HIV-positive partner (PR 1.28 95% CI 1.00–1.64) in unadjusted analyses, the association was attenuated and non-significant after adjustment.

Frequency of Incarceration and STI

In unadjusted analyses, a history of 1–2 incarcerations or 3–9 incarcerations was not associated with a combined indicator of any STI (Table 2). When adjusting for covariates, compared to never being incarcerated, 1–2 incarcerations appeared to be associated with chlamydia (APR: 1.47, 95% CI 0.98–2.20) but not gonorrhea (APR: 1.24, 95% CI 0.71–2.15) or syphilis (APR: 1.18, 0.73–1.90), while 3–9 incarcerations appeared to be associated with syphilis (APR: 1.46, 95% CI 0.92–2.30) but not chlamydia (APR: 1.20, 95% CI 0.72–1.98) or gonorrhea (APR: 0.95, 95% CI 0.47–1.91). Those with ≥ 10 incarcerations appeared to have lower prevalence of each STI compared to those with no incarceration history (chlamydia: 0.44, 95% CI 0.22–0.87; gonorrhea: 0.07, 95% CI 0.01–0.51; syphilis: 0.53, 95% CI 0.27–1.02), but in adjusted analyses incarceration was not an independent correlate of infection.

Frequency of Incarceration and Hypothesized Mediators

Both before and after adjustment, incarceration was associated with increased experience of violence (1–2 times APR: 1.13, 95% CI 1.04–1.23; 3–9 times APR: 1.16, 95% CI 1.08–1.26; ≥ 10 times APR: 1.23, 95% CI 1.14–1.33; Table 3). In unadjusted models, having been incarcerated 3–9 times and ≥ 10 times were both significantly associated with elevated levels of internalized homophobia (APR: 1.23 95% CI 1.08–1.39 and APR: 1.27 95% CI 1.11–1.46, respectively), though in adjusted models these associations were reduced to null and no longer significant.

Hypothesized Mediators and HIV/STI-Related Sexual Risk Behavior and Infection

In unadjusted and adjusted analyses, violence exposure was associated with buying sex (APR: 1.50 95% CI 1.03–2.19) and selling sex (APR: 1.48 95% CI 1.14–1.92) but not with multiple partnerships or STI (Table 4). Internalized homophobia was not an independent correlate of risk behavior or infection in adjusted analyses, with the exception of a modest association with multiple partnerships (APR: 1.10, 95% CI 1.04–1.16).

Table 2 Association between incarceration and past 6 month HIV sexual risk behavior and current STI (N = 1521)

Incarceration	Prevalence	PR (95% confidence intervals)	Adjusted PR ^a (95% confidence intervals)
<i>Multiple partners</i>			
0 (Never incarcerated)	72.16	Ref.	Ref.
1–2 Times	75.08	1.04 (0.96–1.13)	1.02 (0.94–1.10)
3–9 Times	81.52	1.13 (1.06–1.21)	1.11 (1.03–1.20)
10+ Times	80.44	1.11 (1.03–1.21)	1.10 (1.01–1.19)
<i>Buying sex</i>			
0 (Never incarcerated)	7.58	Ref.	Ref.
1–2 Times	13.08	1.73 (1.16–2.57)	1.42 (0.96–2.10)
3–9 Times	16.30	2.15 (1.50–3.09)	1.58 (1.08–2.33)
10+ Times	19.56	2.58 (1.76–3.79)	1.80 (1.18–2.75)
<i>Selling sex</i>			
0 (Never incarcerated)	12.36	Ref.	Ref.
1–2 Times	22.43	1.82 (1.35–2.44)	1.52 (1.14–2.03)
3–9 Times	30.71	2.49 (1.91–3.23)	1.77 (1.35–2.33)
10+ Times	33.78	2.73 (2.07–3.62)	1.85 (1.37–2.51)
<i>Any condomless receptive anal sex</i> (Among N = 835 reporting receptive anal sex in past 6 months)			
0 (Never incarcerated)	94.97	Ref.	Ref.
1–2 Times	95.05	1.00 (0.96–1.04)	0.99 (0.95–1.03)
3–9 Times	94.35	0.99 (0.95–1.04)	0.98 (0.93–1.02)
10+ Times	96.77	1.02 (0.97–1.06)	0.99 (0.95–1.04)
<i>Any condomless receptive anal sex with HIV-positive partner</i> (Among N = 147 reporting receptive anal sex with HIV-positive partner in past 6 months)			
0 (Never incarcerated)	69.39	Ref.	Ref.
1–2 Times	68.42	0.99 (0.74–1.31)	0.95 (0.70–1.29)
3–9 Times	77.50	1.12 (0.87–1.43)	1.00 (0.75–1.34)
10+ Times	88.89	1.28 (1.00–1.64)	1.18 (0.89–1.56)
<i>Any condomless receptive anal sex with partner of unknown status</i> (Among N = 347 reporting insertive anal sex with HIV+ partner in past 6 months)			
0 (Never incarcerated)	68.38	Ref.	Ref.
1–2 Times	71.26	1.04 (0.87–1.24)	1.03 (0.86–1.23)
3–9 Times	70.73	1.03 (0.86–1.24)	1.01 (0.83–1.23)
10+ Times	68.42	1.00 (0.78–1.28)	0.99 (0.76–1.30)
<i>Chlamydia</i>			
0 (Never incarcerated)	9.79	Ref.	Ref.
1–2 Times	10.86	1.11 (0.74–1.67)	1.47 (0.98–2.20)
3–9 Times	6.43	0.66 (0.41–1.06)	1.20 (0.72–1.98)
10+ Times	4.27	0.44 (0.22–0.87)	0.93 (0.45–1.92)
<i>Gonorrhea</i>			
0 (Never incarcerated)	6.67	Ref.	Ref.
1–2 Times	5.59	0.84 (0.48–1.46)	1.24 (0.71–2.15)
3–9 Times	2.92	0.44 (0.22–0.87)	0.95 (0.47–1.91)
10+ Times	0.47	0.07 (0.01–0.51)	0.19 (0.03–1.42)
<i>Syphilis</i>			
0 (Never incarcerated)	8.40	Ref.	Ref.
1–2 Times	8.10	0.96 (0.61–1.52)	1.18 (0.73–1.90)
3–9 Times	8.70	1.03 (0.68–1.58)	1.46 (0.92–2.30)
10+ Times	4.44	0.53 (0.27–1.02)	0.77 (0.38–1.54)
<i>Any STI</i>			
0 (Never incarcerated)	20.56	Ref.	Ref.
1–2 Times	19.67	0.96 (0.72–1.26)	1.22 (0.92–1.60)

Table 2 (continued)

Incarceration	Prevalence	PR (95% confidence intervals)	Adjusted PR ^a (95% confidence intervals)
3–9 Times	16.47	0.80 (0.60–1.07)	1.29 (0.95–1.75)
10+ Times	9.00	0.44 (0.28–0.69)	0.77 (0.47–1.24)

^aAdjusted for age, sexual partnerships, study site, education, insufficient income, marital status

Table 3 Association between incarceration and hypothesized mediators

Incarceration	Prevalence	PR (95% confidence intervals)	Adjusted PR ^a (95% confidence intervals)
<i>Recent violence victimization</i>			
0 (Never incarcerated)	67.00	Ref.	Ref.
1–2 Times	78.12	1.17 (1.08–1.26)	1.13 (1.04–1.23)
3–9 Times	81.62	1.22 (1.13–1.31)	1.16 (1.08–1.26)
10+ Times	87.56	1.31 (1.21–1.41)	1.23 (1.14–1.33)
<i>Internalized homophobia</i>			
0 (Never incarcerated)	47.16	Ref.	Ref.
1–2 Times	46.43	0.98 (0.85–1.14)	0.91 (0.79–1.05)
3–9 Times	57.93	1.23 (1.08–1.39)	1.00 (0.88–1.14)
10+ Times	60.00	1.27 (1.11–1.46)	1.04 (0.90–1.20)

^aAdjusted for age, sexual partnerships, study site, education, insufficient income, marital status

Discussion

In this US sample of BMSM, history of incarceration and repeat incarcerations were common: sixty percent of the sample had been incarcerated at least once in their lifetime, as has been documented previously [14], and of those, many had cycled through the criminal justice system numerous times, with 24% reporting 3–9 prior incarcerations and 15% reporting 10 or more. Increasing exposure to incarceration was associated in a dose–response fashion with risk of transactional sex and also suggested low-level incarceration may be linked to elevations in chlamydia and moderate levels of incarceration were associated with syphilis. Our analyses also suggested that incarceration was associated with violence exposure, an established HIV/STI risk factor [36, 37]. Our findings are among the first to document associations between the cumulative burden of incarceration, sexual risk behaviors, and STI infection among BMSM, a population facing a disproportionately elevated risk of both HIV/STI and incarceration compared to the general population [1, 13, 14]. Future research using longitudinal data should measure the prospective relationships linking incarceration, violence, and

Table 4 Association between hypothesized mediators and past 6 month HIV sexual risk behavior and current STI^a

	Prevalence	PR (95% confidence intervals)	Adjusted PR (95% confidence intervals)
<i>Recent violence victimization</i>			
<i>Multiple partnership</i>			
No	73.97	Ref.	Ref.
Yes	76.58	1.04 (0.97–1.11)	1.02 (0.95–1.09)
<i>Buying sex</i>			
No	7.95	Ref.	Ref.
Yes	13.96	1.76 (1.20–2.56)	1.50 (1.03–2.19)
<i>Selling sex</i>			
No	14.25	Ref.	Ref.
Yes	24.37	1.71 (1.30–2.24)	1.48 (1.14–1.92)
<i>Any STI</i>			
No	19.83	Ref.	Ref.
Yes	17.10	0.86 (0.67–1.11)	1.05 (0.82–1.35)
<i>Internalized homophobia</i>			
<i>Multiple partnership</i>			
No	71.49	Ref.	Ref.
Yes	80.53	1.13 (1.06–1.19)	1.10 (1.04–1.16)
<i>Buying sex</i>			
No	11.94	Ref.	Ref.
Yes	12.72	1.07 (0.81–1.40)	0.83 (0.62–1.10)
<i>Selling sex</i>			
No	17.98	Ref.	Ref.
Yes	25.43	1.41 (1.16–1.73)	1.02 (0.83–1.25)
<i>Any STI</i>			
No	20.35	Ref.	Ref.
Yes	15.84	0.78 (0.62–0.98)	0.95 (0.76–1.19)

^aWhen associations between incarceration and sex risk outcomes were observed, we examined associations between hypothesized mediators and sex risk outcomes

HIV/STI risk and investigate mediating paths among these factors in this population.

To date, there is limited information about the relationships between incarceration and HIV/STI-related risk behaviors among BMSM [13, 16, 18, 52]. Most prior studies on the incarceration-HIV/STI link have been conducted in population-based samples composed largely of heterosexual populations [8, 9, 12, 53–56]. Findings from those studies suggest that incarceration is associated with 1.5–2

times greater likelihood of sexual risk behaviors including multiple and/or concurrent partnerships and buying and selling sex [57], and we likewise observed comparable relationships between incarceration and transactional sex in this sample of BMSM. Incarceration-related disruptions of networks including primary partnerships may result in buying sex after release from incarceration, while incarceration-related impacts on economic stability may result in selling sex, which may increase the risk of HIV/STI infection [8, 58]. We did not observe a strong association between incarceration and multiple partnerships as has been observed in primarily heterosexual samples [55, 56, 59, 60]. The extent to which incarceration may increase risk not only of high-risk sex such as transactional sex among BMSM, as well as elevations in partnership exchange rates, warrants further investigation.

Even prior to adjusting for covariates, STI prevalence was not higher among those with incarceration histories compared to those with no prior incarceration. In fact, we observed those with highest levels of repeat incarceration had consistently lower rates of STI, a finding that may reflect improved access to STI screening and treatment during incarceration compared to when in the community, and/or decreased access to new partners while incarcerated and decreased social mobility after incarceration [61]. It is also possible that individuals who cycle through jails and prisons frequently have higher levels of drug and sex risk-taking [55] and potentially greater perceived risk of infection, which may lead them to seek care. That said, in analyses adjusting for covariates, low and moderate incarceration levels appeared to be associated with a higher prevalence of STI and suggest that the experience of detainment and release may be linked among many involved in the criminal justice system to sexual risk-taking and also to increased risk of infection. Our results are aligned with a study conducted among young BMSM, which found that prior CJI was linked to better HIV care continuum metrics although frequent and cyclic CJI adversely impacted HIV care [62]. These findings underscore the importance of frequent STI screening for BMSM involved in the criminal justice system [63].

We hypothesized that violence and internalized homophobia may potentially link incarceration to HIV/STI risk. We did not observe an association between incarceration and internalized homophobia or between internalized homophobia and HIV/STI risk. The nature of this cross-sectional study may have precluded the ability to detect an association considering the incarceration may have occurred much earlier in a participant's lifetime and their feelings of internalized homophobia measured at the time of this study have subsequently evolved. However, the elevated experience of violence, reported by over three-quarters of participants, demonstrated a modest dose–response relationship with increasing incarceration frequency. In turn, violence was

linked to approximately 50% higher prevalence of transactional sex. Exposure to violence may increase HIV/STI risk by heightening a number of psychosocial factors (e.g., substance use, depression) that are also associated with sexual risk behaviors such as condomless sex, sex after drug use, and sex with multiple partners [64]. The already-prevalent experience of violence among BMSM in the community may be exacerbated by violence experienced within the criminal justice system [38, 39], considering that violence frequently co-occurs with high incarceration rates in communities where economic inequity and social disadvantages are high. Improving our understanding of the relationships among incarceration, violence, and HIV/STI risk is critical, as is preventing the unacceptably high levels of violence experienced by BMSM in general, particularly those who cycle through the criminal justice system.

Prevention efforts are needed to reduce the grossly disproportionate exposure to incarceration among Black men including BMSM in the US. In 2017, the rate of incarceration in the US dropped to its lowest level in 20 years yet a vast racial/ethnic disparity persists, and Black individuals are still approximately six times more likely to be imprisoned compared to White individuals [65]. Further, sexual minority individuals such as MSM have historically been overrepresented in the criminal justice system and therefore disproportionately exposed to violence therein [31], heightening the urgency for alternatives to incarceration, especially for this population. In addition to primary prevention efforts to reduce incarceration, HIV/STI prevention interventions tailored to BMSM impacted by the criminal justice system should be strengthened. Extant HIV/STI interventions for individuals involved in the criminal justice system are efficacious [66], though none are culturally tailored for MSM [67], let alone BMSM. A simulation study on the effects of a test, treat, retain, and condom use intervention for BMSM in the criminal justice system in Fulton County, Georgia, found that such an intervention strategy has the potential to substantially reduce HIV incidence, prevalence, and mortality among BMSM in jails and prisons as well as those within the community [68]. However, to inform the development of similar interventions that are tailored and target the salient factors for this population, we must continue to examine the pathways linking incarceration to HIV/STI risk for BMSM.

Several limitations of the present study should be noted. Cross-sectional data present challenges when making inferences. We are unable to determine the temporal relationships between incarceration and the outcomes, and there is potential for reverse causality. For example, individuals who engage in transactional sex may be more likely to come in contact with the police and be incarcerated; while we do not know where the transactional sex occurred, it was common to meet sex partners, including transactional partners, in public places within studies conducted around the same

period as HPTN 061, which could increase risk of encountering police [69, 70]. The issue of temporality may be especially important for the measure of STI; even if incarceration did precede STI acquisition, the infection could have been treated and hence we did not detect an association. Future analyses with longitudinal data would allow for more rigorous assessment of temporality among these indicators. The self-reported measures are vulnerable to social desirability and recall bias, particularly for potentially highly stigmatized factors such as incarceration and sexual behavior. Although these data represent a large sample from diverse regions of the US, the current findings may not be generalizable to all BMSM and recruitment and context differ across the six cities included in this study. Incarceration was measured by participants' response to a question asking how many times in their lifetime they had spent one or more nights in jail/prison, but given the range of reported number of incarcerations (from one to as many as > 300 times), it is possible that a small number of participants misinterpreted the question and reported the total number of nights they had been incarcerated in their lifetime.

This study contributes to and strengthens emerging evidence documenting the detrimental effects of incarceration, which unduly impacts already marginalized and vulnerable groups including BMSM. Our findings highlight that the epidemics of incarceration and HIV/STI among BMSM are interconnected and may be exacerbated by violent experiences. Preventing criminal justice involvement and mitigating its negative effects are crucial and may be a promising means of reducing HIV/STI risk among BMSM.

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Compliance with Ethical Standards

Conflict of interest No conflicts were declared.

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