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Posttraumatic Stress Disorder Symptoms and Incarceration: The Impact on Sexual Risk-Taking, Sexually Transmitted Infections, and Depression Among Black Sexual Minority Men in HIV Prevention Trials Network (HPTN) 061

Faith Scanlon,
Massachusetts General Hospital

Molly Remch,
University of North Carolina at Chapel Hill

Joy D. Scheidell,
New York University

Russell Brewer,
University of Chicago

Typhanye V. Dyer,
University of Maryland

Blaise Albis-Burdige,
Reed College

Natalia Irvine,
New York University

Rodman Turpin,
George Mason University

Sharon Parker,
North Carolina Agricultural and Technical State University

Charles M. Cleland,
New York University

Christopher Hucks-Ortiz,
Black AIDS Institute

Charlotte A. Gaydos,
Johns Hopkins University

Kenneth H. Mayer,
The Fenway Institute

Faith Scanlon, Ph.D., (Corresponding Author), Massachusetts General Hospital, fscanlon@mgh.harvard.edu.

Previous versions of some of these results were presented in a poster at the 2020 American Psychological Association (APA) conference. The abstract of the 2020 APA poster is posted on the HIV Prevention Trials Network website (HPTN; hptn.org), as the data included in this project were collected from the HPTN 061 study.

Maria R. Khan
New York University

Abstract

Black men and people belonging to sexual minority groups are disproportionately impacted by criminal legal involvement and sexually transmitted infections (STIs). Traumatic experiences are often associated with later criminal legal involvement, depression symptoms, sexual risk behavior, and STIs. Research on the joint influence of trauma and incarceration on STI risk among racial and/or sexual minority people is limited. This study tested the association between post-traumatic stress disorder (PTSD) symptoms and incarceration on sexual risk behavior and STI among Black sexual minority men, a population that may be at higher risk for contracting STIs. Using data from the HIV Prevention Trials Network 061 Study, a longitudinal study of adult Black sexual minority men in six U.S. cities ($N = 855$), we tested associations between past six-month incarceration and subsequent sexual risk behavior, STI, and depression symptoms, for those with and without pre-incarceration PTSD symptoms. PTSD symptoms were elevated among participants who reported Hispanic ethnicity, having sex with both men and women, and previous incarceration. Although there were not significant differences between recent incarceration and sexual risk for those with and without PTSD, incarceration was linked to some sexual risk behaviors regardless of PTSD symptoms. Among people with PTSD symptoms, there was a higher prevalence of sexual risk and depression symptoms, regardless of incarceration. These findings suggest a potentially compounding influence of PTSD symptoms and incarceration on sexual risk and infection among Black sexual minority men.

Keywords

Black sexual minority men; post-traumatic stress disorder; trauma; incarceration; STIs

Incarceration in the U.S. disproportionately affects men generally, and Black men specifically (Carson, 2020). As of 2023, 90% of people incarcerated in United States federal prisons are men, and 38% are Black (Federal Bureau of Prisons, 2023). Across jails and prisons, Black men are incarcerated at the highest rate compared to any other gender or racial group (Wessler, 2022). Congruent with the well-documented racial biases and systemic racism in the criminal legal system (American Psychological Association, 2021; Hinton et al., 2018), Black men who have sex with men, or sexual minority men (SMM) are two times more likely to be incarcerated than non-Black SMM (Millett et al., 2012). Among Black SMM in particular, incarceration has been empirically linked to detrimental outcomes in mental and physical health, to include psychiatric symptoms like depression (see for example Wilper et al., 2009), sexual risk-taking behavior (e.g., English et al., 2020; Khan et al., 2022, Severe et al., 2021) and sexually transmitted infections (STIs; Centers for Disease Control and Prevention, 2018).

Criminal legal involvement is a social determinant of health, or a social condition that impacts physical and behavioral health outcomes (Rotter & Compton, 2022). One framework that provides a guiding theory for research on criminal legal involvement and subsequent negative outcomes is the Criminal Justice Involvement and STI/HIV Risk Model

for SMM (Khan et al., 2012). Adapted from the Proximate Determinants Framework (Mosley & Chen, 1984), this model offers a population-specific framework that identifies pathways from incarceration to sexual health outcomes. In the Criminal Justice Involvement and STI/HIV Risk for SMM model, the primary exposure is incarceration. As a high-stress, stigmatized experience that is taxing across multiple life domains, incarceration subsequently impacts intermediate determinants of health, including: mental health (to include depression), social and relationship factors, economic standing, and substance use (see Khan et al., 2012; American Psychological Association, 2021; Bailey et al., 2017; Rotter & Compton, 2022). These intermediate determinants, in turn, impact the health outcomes of sexual behavior and STI (Khan et al., 2012; see Brawner et al., 2017; Khan et al., 2018; Vosburgh et al., 2012).

The pathways linking incarceration to the determinants of health and outcomes in the Criminal Justice Involvement and STI/HIV Risk Model are empirically supported. However, the underlying mechanisms for these pathways are not fully elucidated. Stigma is one such mechanism for the negative health outcomes experienced by people with marginalized identities (see Friedman et al., 2022; Vogel & Wade, 2022), which includes racial, ethnic, or sexual minority group membership; and mental illness and incarceration status (captured in the Criminal Justice Involvement and STI/HIV Risk framework). Additionally, societal expectations for men can also perpetuate stigma. For men who do not conform to hegemonic masculinity (or stereotypical, dominant masculinity; e.g., being white, heterosexual; Wesley, 2015), belonging to minoritized masculinity groups (see Evans et al., 2011) can also be a source of gender-specific stigma (see Chatmon, 2020; Wester, 2022). The effects of discrimination are compounded for people with multiple intersecting marginalized identities —including Black SMM—who are subjected to intersectional stigma (see Andrysiak et al., 2022). Structural stigma, which is imposed on people with marginalized identities by systems (including institutional racism), perpetuates health inequities (Friedman et al., 2022; Hatzenbuehler, 2016). Outcomes worsened by stigma include depleting physical and mental health, economic resources, interpersonal relationships, and healthy coping (Hatzenbuehler et al., 2013). Additional research is needed to better understand the pathways to detrimental health outcomes for Black SMM, who have multiply marginalized and stigmatized identities.

The intermediate determinant of mental health, and specifically depression, is notably relevant for Black SMM. In Black communities, depression often goes under-diagnosed. Although there is evidence that the genuine rates of depression are the same regardless of race, the rate of major depressive disorder diagnoses is more than 30% lower among Black people than white (Blue Cross Blue Shield, 2022). There is also evidence that depression is under-diagnosed among men, given that the rates of depression are higher among women, but rates of suicide are three times higher among men (see Oliffe et al., 2019). Part of the lower rates of diagnosis are due to stigma impeding access to care for Black patients (Andrysiak et al., 2022; Blue Cross Blue Shield, 2022) and men (Oliffe et al., 2019). Meta-analytic evidence indicates that SMM have twice the risk of depressive symptoms than heterosexual men (King et al., 2008). However, the literature on the prevalence of depression among Black SMM is limited, with available estimates rates ranging from 30 to 43.8% (Cochran & Mays, 1994; Graham et al., 2011; Williams et al., 2015)—which are

likely underestimations, as depression rates have increased worldwide (Liu et al., 2020). Consistent with this research, the American Psychological Association (APA) published a 2018 report in which they identified sexual, racial, and ethnic minority men—to include Black SMM—as populations with significant health disparities and vulnerabilities and put forth a recommendation for researchers to examine stressors, trauma, and their "negative psychological consequences (e.g., depression)…" in these groups. Depressive disorders are also associated with incarceration, even after release (Schnittker, 2012). Therefore, examining depression among Black SMM, especially in the context of criminal legal involvement, is an important area for research to improve personal and public mental health.

STIs are critical biologic outcomes impacting public health. The rising rates of STIs constitute a "global public health crisis," one that especially impacts SMM (Eisinger et al., 2020, p. 1432). SMM comprised less than six percent of U.S. men in 2017 (Jones, 2021) but 69% of people diagnosed with HIV in 2018 (Centers for Disease Control, 2020). Black SMM have the greatest risk of lifetime HIV acquisition compared to any other sex, racial, ethnic, or behavioral risk groups, with a 41% probability of an HIV diagnosis (Hess et al., 2017) and higher rates of HIV than other races (Centers for Disease Control, 2020). The rates of STI are even higher for people with a history of incarceration (e.g., Nowotny et al., 2020; Rogers et al., 2012).

Sexual risk-taking behaviors (e.g., condomless sex, multiple sexual partners) are upstream predictors of STIs. Despite the high rates of STIs among Black SMM, reported sexual risk behaviors are largely similar between Black and White SMM. A large meta-analysis found that sex work was the only sexual behavior that Black SMM in the U.S. endorsed more than other SMM, which is uniquely related to socioeconomic disadvantage and structural vulnerability experienced by Black SMM (Millett et al., 2012). Incarceration is associated with higher sex risk among men (see Khan et al., 2009), Black men (see Khan et al., 2018; Knittel et al., 2015), and Black SMM (English et al., 2020; Khan et al., 2022, Severe et al., 2021). One cross-sectional study of Black SMM in Massachusetts found being incarcerated for more than 90 days was associated with endorsing symptoms of depression, post-traumatic stress disorder, and sexual risk behavior (i.e., having condomless sex with a woman; Bland et al., 2011). There is a need to continue examining the pathways leading to increased sexual risk behavior and STI for Black SMM, especially following incarceration.

Trauma is a very common negative life experience that is especially relevant for Black SMM. Overall, men report more trauma exposures, but half as many PTSD diagnoses compared to women (see Terhaag et al., 2021). Additionally, compared to white men, Black men who experience trauma have significantly lower rates of accessing mental health care (Motley & Banks, 2018). One reason for this discrepancy in exposures and diagnoses could be stigma; Singletary (2022) asserts that for Black men, the role of internalized stigma in trauma "cannot be overstated" (p. 532), such that when traumatic experiences go unshared, these symptoms can fester and be detrimental to mental and physical health. People in sexual minority groups, and especially those with intersectional minoritized racial or ethnic identities like Black SMM, also have high rates of traumatic experiences (Pantalone et al., 2020a).

Trauma symptoms may worsen incarceration's impact on depression and STI risk for Black SMM. Men involved in the criminal legal system exhibit very high rates of trauma: Among 592 adult males in a high security prison, 30 to 60% screened positive for experiencing trauma, approximately 10 times the proportion of trauma exposure in the general U.S. male population (Wolff et al., 2014). It has been suggested that PTSD may be an important consideration in the connection between traumatization and criminal legal involvement (Ardino, 2012). In a sample of young Black SMM, 98% of the respondents reported experiencing a traumatic event (e.g., experiencing an assault/attack, witnessing violence), and trauma symptoms were associated with higher depressive symptoms and sexual risk behaviors (Radcliffe et al., 2011). Yet, despite the stigmatization of trauma for Black men (Singletary, 2022), well-documented relations between trauma and criminal legal involvement, and the combined impact of PTSD and incarceration on depression, sexual risk-taking and STI, these associations have not yet been studied among Black SMM.

In line with APA's call (2018) to better understand the experiences of men in sexual, racial, and ethnic minority groups, the current study aims to potentially identify a population (i.e., Black SMM with trauma symptoms and criminal legal involvement) that could have a particular vulnerability to depression, sex risk behaviors, and STI, and therefore potentially need of supportive interventions to improve personal and public health. The extant research highlights that following incarceration, Black SMM may be especially at-risk for negative mental (depressive symptoms) and sexual (sex risk behaviors and STI) health outcomes, and trauma may worsen this risk. Therefore, the aim of this study was to examine the longitudinal associations between the stressor of incarceration and subsequent depression symptoms, sexual risk behavior, and STIs among Black SMM with and without PTSD symptoms. Based on the overarching Criminal Justice Involvement and STI/HIV Risk Model for SMM by Khan et al. (2012) and supporting literature, the following hypotheses were developed: among Black SMM with and without PTSD symptoms, incarceration will significantly predict 1a) depressive symptoms, 1b) sexual risk behaviors, and 1c) STIs; and 2) these associations will be stronger for Black SMM with PTSD symptoms versus those without (i.e., significant effect modification).

Archival data were collected from a cohort of adult Black SMM living in six major U.S. cities across three timepoints: baseline, six months after baseline, and 12 months after baseline (Koblin et al., 2013). Given the complexities of the framework and how much is still unknown in this under-studied population, we use propensity score analysis (see Austin, 2011) in this study to isolate these primary associations of interest and reduce statistical noise and possible confounding. In each of our models, we adjusted for over 20 theoretically and empirically related covariates that did not directly pertain to the associations of interest but are theoretically relevant to the pathways of the Criminal Justice Involvement and STI/HIV Risk Model for SMM (i.e., stressors, sexual health, economic resources, interpersonal relationships, substance use; see Covariates).

Method

We conduced secondary data analysis on de-identified data from The HIV Prevention Trials Network (HPTN) 061 Study, also known as The BROTHERS Study. Described in detail

elsewhere (Koblin et al., 2013; hptn.org), the HPTN 061 Study was a longitudinal study among 1,553 adult Black respondents who self-identified as men or were assigned male at birth who reported at least one instance of condomless anal intercourse with a man in the preceding six months (operationalized as SMM in the current study) and living in one of the following U.S. cities: Atlanta, Boston, Los Angeles, New York, San Francisco, or Washington D.C. Broadly, the aim of the original HPTN 061 study was to evaluate factors that might influence and potentially mitigate HIV risk (e.g., indicators of mental health, sexual behavior, and substance use) among Black SMM. Between July 2009 and October 2010, respondents were recruited, interviewed using an audio computer-assisted self-interview, and offered HIV/STI testing and referral for treatment. Participants completed interviews measuring topics including criminal legal involvement, mental health, and sexual risk behavior, at baseline, six-, and 12-months timepoints. The current research team requested access to the raw HPTN 061 Study data, which was approved by HPTN 061 Research Team. A list of publications and presentations from the HPTN 016 data are available at https://www.hptn.org/research/publications. Two co-authors, KM (Protocol Co-Chair) and CHO (site Project Director), were involved in the development and/or operation of the original study. The original HPTN 061 study was approved by the Institutional Review Boards (IRBs) of each participating institution. [institution]'s IRB indicated the current analysis of these de-identified data was exempt. The current analyses were not pre-registered.

Measures

PTSD Symptoms—PTSD symptoms were measured at the baseline interview, using the SPAN self-report screener (Meltzer-Brody et al., 1999; Davidson, 2002). SPAN is an acronym for the symptoms the measure assesses--Startle, Physical upset by reminders, Anger, and Numbness; these symptoms related to a traumatic experience with four items that best discriminated between patients with and without PTSD (Meltzer-Brody et al., 1999). Respondents rated each symptom from 0 (this trauma has not occurred) to 4 (extremely distressing). SPAN has been found to significantly correlate with three other measures of PTSD and have 88% diagnostic accuracy (Meltzer-Brody et al., 1999). In HPTN 061, respondents completed the SPAN for 15 traumas (e.g., serious accident, sexual or physical assault). Per Davidson (2002), if one or more of the 15 SPAN screens was greater than or equal to five, the respondent was considered to have a positive SPAN screen, indicating the presence of PTSD symptoms. In this sample, the reliability of all 15 SPANs were acceptable (ranging from α = .97 to .99).

Recent Incarceration—At the six-month interview, respondents were asked how many times in the past six months they spent one or more nights in jail or prison. Consistent with other studies' operationalization of incarceration (e.g., Enns et al., 2019; Garcia-Grossman et al., 2022), we created a dichotomous indicator of having spent at least one night incarcerated versus none. Those responding at least one night incarcerated in the past six months were considered recently incarcerated.

Depression Symptoms—The 20-item Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977) measured depression symptoms at the 12-month interview.

Response options range from 0 (rarely or none of the time) to 3 (most or almost all of the time). A CES-D score greater than or equal to 16 is useful in identifying individuals at higher risk for depression (Lewinsohn, et al., 1997). A systematic review and meta-analysis of the CES-D found the measure has a diagnostic odds ratio of 16.2, indicating the odds of getting a positive screen are 16.2 times higher for a person with depression compared to a person without (Vilagut et al., 2016). In this sample, the reliability of CES-D was acceptable (α = .89).

Sexual Behavior—We focused on four types of risky sexual behaviors. Selling sex was defined as an affirmative response at the 12-month interview to *receiving* "money, drugs, other goods, or a place to stay" in exchange for receptive anal intercourse with a man in the past six months. Buying sex was indicated by an affirmative response at the 12-month interview to *giving* "money, drugs, other good or a place to stay" in exchange for receptive anal intercourse with a man in the past six months. Transactional sex was indicated by an affirmative response at the 12-month interview to buying sex or selling sex in the past six months.

Participants reporting having greater than or equal to the median number of sexual partners in the prior six months were classified as having a high number of partners (yes/no). Per the Centers for Disease Control and Prevention (2021), one reason SMM may have greater risk of STI is the number of sexual partners at a time. Since multiple partnerships (defined as two or more) was normative in the sample (41.97% at baseline, 43.1% at 12-months), we aimed to choose a higher partnership level cut point to identify those at highest potential STI. Therefore, the median cut point was chosen to ensure adequate cell counts in each group, to optimize statistical power.

Sexually Transmitted Infections—Three types of STIs were assessed at the 12-month interview. *Chlamydia trachomatis* (chlamydia; yes/no) and *Neisseria gonorrhoeae* (gonorrhea; yes/no) was assessed using the Hologic Gen-Probe Aptima Combo 2 (San Diego, CA) assay on urine and rectal swabs. Participants' blood was screened for syphilis using a rapid plasma reagin (RPR) test; those with a positive initial screener then completed a confirmatory diagnostic treponemal test for syphilis (yes/no). Both tests were required to be positive for a diagnosis of active syphilis.

Covariates.: Demographic factors measured at baseline (age, ethnicity, sexual orientation, gender identity, highest level of education, city, currently having health insurance) were adjusted for in all models. In addition to demographics, the following variables were also included in the current models as covariates to reduce potential confounding and focus on the primary associations of interest. These covariates were selected due to theoretical and empirical relevance of these covariates and the primary variables of interest and fall into the following categories: stressors experienced by people with stigmatized identities, sexual health, economic resources, interpersonal relationships, and substance use.

Stressors.: At baseline, participants who endorsed they had ever been incarcerated were considered a "yes" for this variable. At baseline, if a respondent answered yes to any of the following, they were considered to have experienced violence: ever been punched, kicked

or beaten, or had an object thrown at me because of their sexuality or race; threatened with violence due to sexuality or race; or threatened at gun or knifepoint due to sexuality or race.

Internalized homophobia was measured using a modified version of the 5-item Revised Internalized Homophobia scale (IHP-R; Herek et al., 1998), which was developed from Diagnostic and Statistical Manual of Mental Disorders - III (DSM-III; American Psychiatric Association, 1980) criteria for ego-dystonic homosexuality. Two questions were added at the end of the 5-item scale to specifically capture the experiences of Black SMM. At baseline, score greater than or equal to the median was considered a high internalized homophobia score. In this sample, the reliability of the internalized homophobia scale was acceptable (α = .93).

At the 12-month interview, the Racism and Life Experience Scales (RaLES) Daily Life Experiences (DLE-R) 20-item scale measured the extent to which daily racism microaggressions cause microstress due to experiences of racism (Harrell et al., 1997). Participants reported how much in the prior six months they have been bothered by racial microaggressions. A score greater than or equal to the median was considered a high microstress due to experience of racism score. In this sample, the reliability of the microstress due to experiences of racism was acceptable (α = .97).

The RaLES-DLE was modified for experiences motivated by homophobia. At baseline, score greater than or equal to the median was considered a high microstress due to experiences of homophobia score, consistent with a prior study using these data (Turpin et al., 2021). In this sample, the reliability of the microstress due to experiences of homophobia was acceptable (α = .97).

Sexual Health.: At baseline, participants who endorsed ever being tested for HIV at baseline were considered a “yes” for HIV Testing. If at baseline any of a respondent’s STI testing came back positive for syphilis, chlamydia, or gonorrhea, the respondent was considered to have a current STI. Respondents’ baseline HIV serostatus test results (negative or positive) were also included as a covariate.

Economic Resources.: At baseline, if a participant endorsed that in the last six months, they did not have enough money to pay for housing, food, or utilities, they were considered to have insufficient income; those who did not endorse this item were considered to have sufficient income. When asked about their household at baseline, endorsing having a stable home was considered stable housing; not endorsing this response was considered to indicate unstable housing.

Interpersonal Relationships.: At baseline, those who indicated that in the last six months, they had sex with other men during the same time period they were with their partner in the last six months were considered an affirmative for the concurrent partnership variable. Cohabitation status was assessed at baseline by asking respondents if they currently living with partner or not. Consistent with previous research using these data (Scheidell et al., 2021), social support was measured at baseline using items modified from the Medical Outcomes Study (Sherbourne & Stewart, 1993), with six questions including ‘how often is

there someone available to whom you can count on to listen to you when you need to talk' and 'how often is there someone available to you to give you good advice about a problem'. Larger total scores indicate greater levels of social support and a score greater than or equal to the median was considered high social support.

Substance Use.: Self-reported stimulant use was measured at the 12-month interview, and included using crack cocaine, powder cocaine, or methamphetamine in the prior six months. Hazardous alcohol use was measured using the Alcohol Use Disorders Identification Test (AUDIT; Saunders & Aasland, 1987) 10-item screener for alcohol use disorder developed by the World Health Organization. A score of eight or more was considered indicative of hazardous drinking. In this sample, the reliability of the AUDIT was acceptable (α = .88).

Data Analysis

Of the 1,553 Black SMM who completed a baseline interview for the HPTN 061 study, 866 had non-missing responses for baseline PTSD symptoms and recent incarceration at six months and were included in this study. The subset of participants used in this study were similar in sociodemographic and behavioral factors to those in the complete sample. For each demographic factor of interest (e.g., sociodemographic, sex risk/STI, and substance use variables), the differences in the prevalence rates between the subsample and complete sample ranged from .06% to 3.46%, with a mean difference of .92%. Missing baseline covariates and 12-month outcome data were imputed 25 times using predictive mean matching (Little, 2019).

Using the raw unimputed data, baseline demographic information and STI risk information as well as prevalence of baseline PTSD was calculated for the sample. Unadjusted risk ratios (RRs) and 95% confidence intervals (CIs) for associations between the baseline covariates and baseline PTSD were also calculated in the unimputed data.

To estimate the association between incarceration (predictor) and depressive symptoms, sexual risk behaviors, and STIs (outcomes) stratified by baseline PTSD symptoms (effect modifier), we calculated unadjusted and adjusted RRs and 95% CIs using a log binomial model with robust standard errors in each of the 25 datasets. Because the aim of effect modification is to test the size of the association between the predictor and outcomes at different levels of the effect modifier variable (see for example Corraini, 2017) the associations between incarceration and the outcome variables are presented separately for respondents with PTSD symptoms, and respondents without PTSD symptoms. If the associations are significantly different for those with and without PTSD symptoms (i.e., the interaction of predictor*effect modifier is significant), that indicates effect modification is taking place.

Adjustment for confounding was achieved using stabilized inverse probability of treatment weights. Rather than using a data-driven approach to identifying covariates, we selected a-priori covariates based on extant literature and theory-based Directed Acyclic Graphs (DAGs; for an introduction, see for example Greenland et al., 1999) to identify factors that would impact the association in the target population. Using a propensity score method (see Data Analysis), the current models were adjusted for the following variables: age, Hispanic

ethnicity, men who have sex with men and women (SMMW) status, transgender identity, less than or equal to high school education, insufficient income, unstable housing, city, health insurance coverage, incarceration history, HIV status, any STI, AUDIT (hazardous alcohol use) score, weekly marijuana use, any stimulant use in the past six months, sex trade involvement, high number of partnerships, CES-D score, social support scale score, microstress due to experienced racism scale score, microstress due to experienced homophobia scale score, and internalized homophobia scale score, concurrent partnership, cohabitation status, experiences of violence, and HIV testing history. It should be noted that this list of variables includes predictors, outcomes, and covariates of interest, as well as others as demographic factors and potential confounders that were available in the dataset but not directly pertinent to the current research questions.

In each of the 25 datasets, propensity scores of recent incarcerations were calculated using logistic regression with the ridge penalty to reduce the risk of overfitting the model, creating 25 sets of inverse probability weights. These weights were stabilized by the probability of the observed exposure. Parameter estimates and variances were extracted from each model and pooled to obtain unadjusted and adjusted risk ratios and standard errors for the association between exposure and outcome variables, stratified by baseline PTSD symptoms.

This study is a secondary data analysis of a larger extant HPTN 061 data set that was not originally designed to answer the current research questions. Because the sample was not targeted for or tailored to this particular study, the incident rates of some variables of interest are low. Due to small cell counts, models testing the effect modification of STI outcomes were underpowered; therefore, in addition to statistical significance, measures of effect size (OR, RR) indicate clinical significance. R version 3.5.1 was used for data cleaning and imputation. SAS version 9.4 was used for all analysis.

Results

Sociodemographic characteristics and STI status by PTSD symptom prevalence

Overall, 51.5% of the sample reported PTSD symptoms at baseline. Compared with non-Hispanic Black respondents, Hispanic Black respondents had significantly increased risk of PTSD symptoms (Risk Ratio [RR] = 1.26, 95% [CI] = 1.04, 1.43; Table 1). Participants who have sex with both men and women had increased risk of PTSD symptoms relative to those who have sex with men only (RR = 1.23, 95% CI = 1.08, 1.40). Reporting stable housing was associated with decreased risk of PTSD symptoms (RR = 0.80, 95% CI = 0.67, 0.96). Having ever been incarcerated was associated with increased risk of PTSD symptoms (RR = 1.34, 95% CI = 1.16, 1.55). Engaging in hazardous alcohol use (RR = 1.28, 95% CI = 1.13, 1.46), weekly marijuana use (RR = 1.20, 95% CI = 1.05, 1.37), and any stimulant use in the past six months (RR = 1.14, 95% CI = 1.00, 1.30) were associated with increased risk of PTSD symptoms. Age, gender identity, education, sufficient income, city, having health insurance, HIV serostatus, having a current STI at baseline, and monthly stimulant use were not associated with PTSD symptoms (Table 1).

Incarceration and depression by PTSD symptoms

We hypothesized incarceration would significantly predict depression for men with and without PTSD symptoms. We also hypothesized that having PTSD symptoms would significantly modify this effect, such that the association would be stronger among those with trauma symptoms. Inconsistent with our hypotheses, among those with PTSD symptoms, incarceration was not significantly associated with increased risk of depressive symptoms in unadjusted (RR = 1.07; 95% CI = .85, 1.35, $p = .58$; Table 2) or adjusted analyses (ARR = .91, 95% CI = .69, 1.19, $p = .51$). Among those without PTSD symptoms, incarceration was associated with increased risk of depressive symptoms in unadjusted analyses (RR = 1.40; 95% CI = .99, 1.98, $p = .06$; Table 2), which is consistent with our hypothesis, but this association was eliminated in adjusted analyses (Adjusted Risk Ratio [ARR] = 1.21, 95% CI = .77, 1.90, $p = .42$). Finally, inconsistent with our effect modification hypothesis, the interaction term for the incarceration and depression model was not significant in unadjusted ($p = .21$) or adjusted ($p = .28$) analyses, indicating PTSD symptom status does not modify the effect of this association.

Incarceration and sexual behavior by PTSD symptoms

We hypothesized incarceration would significantly predict sexual behavior regardless of PTSD symptoms, and that PTSD symptoms would significantly modify this association. Congruent with our hypothesis, among those with PTSD symptoms, incarceration was strongly associated with increased risk of buying sex in unadjusted analyses (RR = 2.19; 95% CI = 1.16, 4.15, $p = .02$; Table 2); after adjusting for confounders, this relation diminished (ARR = 1.51; 95% CI = 0.72, 3.19, $p = .28$). For respondents without symptoms of PTSD, incarceration was not associated with higher risk of buying sex (RR = 1.11; 95% CI = .34, 3.63, $p = .87$; ARR = 1.02, 95% CI = .28, 3.72, $p = .97$), which is inconsistent with our predictions.

As hypothesized, in unadjusted and adjusted models, among those with PTSD symptoms, incarceration was strongly associated with an increased risk of selling sex (RR = 2.12, 95% CI = 1.23, 3.63, $p = .01$; ARR = 1.96, 95% CI = 1.15, 3.35, $p = .01$; Table 2) and transactional sex (RR = 1.87, 95% CI = 1.14, 3.08, $p = .01$; ARR = 1.73; 95% CI = 1.05, 2.85, $p = .03$). Also as hypothesized, among those without PTSD symptoms, incarceration was strongly associated with an increased risk of selling sex in unadjusted analyses (RR = 2.37, 95% CI = 1.06, 5.28, $p = .03$), although this association was attenuated and lost precision in adjusted analyses (ARR = 1.80, 95% CI = 0.68, 4.74, $p = .24$). Inconsistent with our a-priori predictions, transactional sex was not associated with incarceration for respondents without PTSD symptoms in unadjusted or adjusted models (RR = 1.76, 95% CI = 0.82, 3.78, $p = .15$; ARR = 1.36; 95% CI = 0.53, 3.46, $p = .53$).

As hypothesized, incarceration was associated with having a high number of sexual partners among those without PTSD symptoms in both unadjusted and adjusted models (RR = 1.59, 95% CI = 1.19, 2.12, $p < .01$; ARR = 1.55; 95% CI = 1.13, 2.14, $p = .53$; Table 2). Also consistent with our prediction, having a high number of partners seems to be associated with incarceration among those with PTSD symptoms in unadjusted analyses (RR = 1.21, 95% CI

= 0.96, 1.53, p = .11), a relation which weakened after adjustment (ARR = 1.13, 95% CI = 0.88, 1.44, p = .34).

The interaction terms for all incarceration and sexual behavior models (unadjusted or adjusted) were not significant (ps ranging from .12 to .89, see Table 2); that is, sexual behavior did not vary by PTSD symptom status in this sample, contradictory to our hypotheses.

Incarceration and STI by PTSD symptoms

We predicted that among Black SMM, incarceration would be significantly associated with STI, and that this association would be worse for people with PTSD symptoms. In unadjusted models, as hypothesized, incarceration was strongly linked to contracting gonorrhea among respondents with PTSD symptoms in this sample (RR = 3.49, 95% CI = 1.02, 11.97, p = .05; Table 2), although this association did not remain statistically significant in adjusted models due to wide confidence intervals (ARR = 2.60, 95% CI = 0.65, 10.41, p = .18). There were no respondents without PTSD symptoms who also endorsed gonorrhea and incarceration. Inconsistent with our hypotheses, in adjusted and unadjusted models, incarceration was not significantly related to syphilis, chlamydia, or having any STI, among respondents with and without PTSD symptoms (RR ranging from .49 to 1.62, ps > .05; Table 2). PTSD symptoms status was a significant effect modifier for the unadjusted association between incarceration and gonorrhea ($p_{\text{unadjusted}}$ = .01; p_{adjusted} = .36), but not for any other STI models (ps ranging from .32 to .89, see Table 2), offering mixed support for our hypothesized effect modifications.

Discussion

Given the links between incarceration, STI, depression, and trauma among men—and especially men who are Black and sexual minorities—in the U.S., this study aimed to better understand the pathways between recent incarceration and negative behavioral and biological health outcomes for Black SMM, and how these pathways may be further impacted by trauma symptoms. In this large sample of Black SMM in six United States cities, over half the respondents endorsed current PTSD symptoms. The reported trauma symptoms were also associated with criminal legal involvement: more than half of people with a recent incarceration also reported symptoms of PTSD. Informed by the guiding Criminal Justice Involvement and STI/HIV Risk Model for SMM (Khan et al., 2012), these results provided some evidence that incarceration (a stigmatized life event that is related to negative health sequalae; see Hatzenbuehler et al., 2013; Khan et al., 2012) creates pathways to depression and STI risk among Black SMM.

Consistent with the hypothesized pathway from incarceration to depression, we found some support for incarceration predicting depressive symptoms for men without PTSD symptoms in unadjusted models. Regarding sexual behavior, we found strong support for the hypotheses that incarceration predicts selling sex and transactional sex among those with PTSD. We also found strong support for the hypothesized association between incarceration and having a high number of sexual partners for men without PTSD. Also consistent with our hypotheses, in unadjusted analyses, incarceration predicted buying sex, high number

of sexual partners, and having gonorrhea for respondents with PTSD. As hypothesized, we found some support for incarceration predicting selling sex for those without PTSD symptoms in unadjusted models. Finally, PTSD symptoms significantly modified the unadjusted association between incarceration and gonorrhea-- in fact, no one in this sample endorsed gonorrhea and incarceration in the absence of PTSD symptoms.

Despite the notable overlap between incarceration and PTSD symptoms in this sample, our current results do not provide much support for consistent effect modification by PTSD symptoms. That is, the effects of incarceration on post-release sex risk and STIs were comparable for men with and without trauma symptoms in this sample. The current results showed that regardless of PTSD symptoms, there was a trend toward incarceration being linked to selling sex and a high number of sexual partnerships; this is consistent with previous research finding higher rates of sexual risk behavior after incarceration among men in the U.S. (Khan et al., 2009; Khan et al., 2018; Knittel et al., 2015).

Although the effects of incarceration on psychosocial and sexual risk behaviors did not significantly differ by PTSD symptom status in adjusted models, the levels of depression symptoms and risk behavior among men with PTSD (regardless of incarceration) were high and followed a consistent pattern. Black SMM with a recent incarceration and PTSD symptoms had higher rates of endorsing symptoms of depression (56%) compared to those with a recent incarceration and no PTSD symptoms (46%), and those without PTSD symptoms or incarceration (34%). For Black SMM with a recent incarceration and PTSD symptoms, the rate of buying sex nearly tripled (17%) compared to people with a recent incarceration and no PTSD symptoms (6.8%), and those without a recent incarceration or PTSD symptoms (5%). Respondents with a recent incarceration and PTSD symptoms had higher rates of engaging in transactional sex (23%), compared to those with a recent incarceration and no PTSD symptoms (16%), and no incarceration and no PTSD symptoms (8%). Overall, in line with the underlying Criminal Justice Involvement and STI/HIV Risk Model (Khan et al., 2012) and extant evidence on the pathways between incarceration, depression, sex risk, and trauma, these prevalences suggest that depressive symptoms and sexual risk may be particularly evident for Black SMM with a history of incarceration and PTSD symptoms.

Although the existing literature on men with a history of incarceration engaging in sex trade is limited, in samples of incarcerated women, engaging in sex trade has been linked to prior traumatic experiences, including child abuse (Kim et al., 2011) and sexual assault (Raj et al., 2008). Despite low rates of endorsing selling sex in this sample, the current results demonstrated a similar association between incarceration and selling sex for Black SMM with PTSD symptoms, which may be influenced by infection risk. Additionally, the risk of gonorrhea was much higher (almost three times) among respondents with PTSD symptoms and a recent incarceration, compared to those who were not recently incarcerated. Given the empirically elucidated link between sexual risk behaviors and symptoms of avoidance and numbness (Choi et al., 2017; both of which were assessed in the current indicator of PTSD symptoms), and evidence that PTSD mediates the associations between trauma and HIV/STI for men (Brown et al., 2017), the current results also provided evidence for the

link between trauma symptoms and sexual risk behaviors, while expanding this literature to include incarceration and specifically focusing on the sub-population of Black SMM.

In the United States, Black communities (Blue Cross Blue Shield, 2022; Andrysiak et al., 2022) and men (Oliffe et al., 2019) have psychological treatment needs that are going unmet. In particular, there is evidence that Black people largely (Nobles et al., 2016), and Black men specifically (Singletary, 2022) are experiencing symptoms of trauma for which they have not received adequate care, likely due to intersectional (Andrysiak et al., 2022) and structural stigmas that impede appropriate healthcare (Hatzenbuehler, 2016). A systematic review found that over 50% of Black men who experienced a trauma may have unmet treatment needs (Motley & Banks, 2018). Despite the high rates of trauma among men involved in the legal system, there has also been a recent call for more interventions and related research on trauma for men who are incarcerated, a population noted to be "significantly underserved" (Grady et al., 2023, p. 14). The results from this study highlight the potential importance of and need for interventions for newly released Black SMM with PTSD symptoms—a population that may be at a heightened risk for contracting STIs. These results suggest that adequately intervening upon Black SMM's trauma symptoms may play a role in addressing the "major public health crisis" of HIV/STI infection among SMM (Eisinger et al., 2020, p. 1432). There is growing evidence that psychotherapeutic intervention can reduce sexual risk and infection (Sikkema et al. 2010) and facilitate effective HIV prevention efforts (Safren et al., 2011). Current interventions for SMM are associated with small, but significant, effects in mental health, substance use, and behavioral outcomes of interest; and individual therapy programs of nine or more sessions were particularly helpful (Pantalone et al., 2020b). Comprehensive and collaborative care across systems; trauma-informed and culturally tailored treatment (including cognitive behavioral therapy); and developing a strong working alliance with Black men clients may be especially important with this clientele (Fleurant, 2019). Finally, because of the structural oppression and stigmatization encountered by Black SMM, advocacy and deconstruction of systematic policies promoting marginalization and health inequity are needed (Bailey et al., 2021; Friedman et al., 2022).

The current findings provided a novel contribution in identifying the confluence of trauma, PTSD, and incarceration among Black SMM, although there some important limitations. The current effect modification of STI outcomes were underpowered, with some very small cell counts, including low rates of incident incarceration; therefore, these associations should continue to be explored in other large samples of Black SMM. Research should continue to test these relations, and the potential for effective interventions to decrease sexual risk behavior and STI among Black SMM with PTSD symptoms. Future research in this area is especially important given evidence that PTSD among Black people is less likely to be identified and treated (Graves et al., 2011; Nobles et al., 2016). Additional research and clinical work on trauma sequelae in this population should also expand to include racial trauma (see Butts, 2002), which may present differently than non-race related trauma symptoms (Roberson & Carter, 2021). Through appropriate service provision—assessment, intervention, and community referrals—aimed at identifying and addressing stigma and stressors contributing to psychosocial and health risk factors, the field can better meet Black SMM's mental and physical needs and improve public health at large.

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Public Health Significance Statement:

The results of this study show that sexual risk and infection may be amplified for Black sexual minority men with PTSD symptoms and criminal legal involvement. This study highlights the potential importance of further assessment, intervention, and referrals for newly released racial and sexual minority men with trauma histories, to reduce sexually transmitted infection promote sexual health.

Table 1

Sample demographic characteristics (N = 866)

	n (%)	% with PTSD symptoms	Unadjusted RR (95% CI)
Age			
18–20	49 (5.66)	44.90	Referent
21–30	241 (27.83)	48.90	1.09 (0.78, 1.53)
31–40	160 (18.48)	58.13	1.29 (0.92, 1.81)
41–50	302 (34.87)	51.66	1.15 (0.83, 1.60)
51–60	106 (12.24)	50.00	1.11 (0.77, 1.60)
61 and up	8 (0.92)	50.00	1.11 (0.52, 2.38)
Missing	0	---	---
Ethnicity			
Non-Hispanic	797 (92.03)	50.44	Referent
Hispanic	69 (7.97)	63.77	1.26 (1.04, 1.43)
Missing	0	---	---
Sexual orientation			
Men who have sex with men only	485 (56.00)	46.80	Referent
Men who have sex with men and women	381 (44.00)	57.48	1.23 (1.08, 1.40)
Missing	0	---	---
Gender identity			
Cisgender	826 (95.49)	51.21	Referent
Transgender	39 (4.51)	58.97	1.15 (0.88, 1.51)
Missing	1	---	---
Education			
Less than HS	453 (52.37)	50.77	Referent
High School or more	412 (47.63)	52.18	1.03 (0.90, 1.17)
Missing	1	---	---
Sufficient income			
No	499 (57.62)	54.31	Referent
Yes	367 (42.38)	47.68	0.88 (0.77, 1.00)
Missing	0	---	---
Stable housing			
No	86 (9.93)	62.79	Referent
Yes	780 (90.07)	50.26	0.80 (0.67, 0.96)
Missing	0	---	---
City			
Atlanta, GA	159 (18.36)	47.80	Referent
New York, NY	188 (21.71)	56.38	1.18 (0.96, 1.45)
Washington, DC	118 (13.63)	46.61	0.98 (0.76, 1.26)
Boston, MA	132 (15.24)	53.79	1.13 (0.90, 1.41)
Los Angeles, CA	161 (18.59)	51.55	1.08 (0.86, 1.35)
San Francisco, CA	108 (12.47)	50.93	1.07 (0.83, 1.36)

	n (%)	% with PTSD symptoms	Unadjusted RR (95% CI)
Missing	0	---	---
Health Insurance			
No	342 (39.49)	47.95	Referent
Yes	524 (60.51)	53.82	1.12 (0.98, 1.29)
Missing	0	---	---
Ever Incarcerated			
No	334 (38.97)	42.81	Referent
Yes	523 (61.03)	57.36	1.34 (1.16, 1.55)
Missing	9	---	---
HIV Serostatus			
Negative	688 (80.66)	51.45	Referent
Positive	165 (19.34)	52.12	1.01 (0.86, 1.19)
Missing	13	---	---
Current STI			
No	749 (87.81)	51.94	Referent
Yes	104 (12.19)	48.08	0.93 (0.75, 1.14)
Missing	13	---	---
Hazardous Alcohol Use			
No	606 (72.66)	48.18	Referent
Yes	228 (27.34)	61.84	1.28 (1.13, 1.46)
Missing	32	---	---
Weekly Marijuana Use			
No	587 (67.78)	48.38	Referent
Yes	279 (32.22)	58.06	1.20 (1.05, 1.37)
Missing	0	---	---
Any stimulant use in the past six months			
No	473 (56.51)	48.84	Referent
Yes	364 (43.49)	55.77	1.14 (1.00, 1.30)
Missing	48	---	---
Monthly stimulant use			
No	600 (73.35)	50.83	Referent
Yes	218 (26.65)	54.59	1.07 (0.93, 1.24)
Missing	48	---	---

Table 2

Incarceration as a predictor of depressive symptoms, sexual behavior, and STI, stratified among those with and without PTSD symptoms

	No PTSD Symptoms				PTSD Symptoms				Interaction
	N (%)	Unadjusted RR (95% CI)	Adjusted RR (95% CI)	*p* unadjusted (adjusted)	*N* (%)	Unadjusted RR (95% CI)	Adjusted RR (95% CI)	*p* unadjusted (adjusted)	*p* unadjusted (adjusted)
Depression Symptoms									
No incarceration	111 (34.26)	Referent	Referent		166 (52.20)	Referent	Referent		--
Incarceration	19 (46.34)	1.40 (0.99, 1.98)	1.21 (0.77, 1.90)	.06 (.42)	38 (55.88)	1.07 (0.85, 1.35)	0.91 (0.69, 1.19)	.58 (.51)	0.21 (0.28)
Sexual Behavior									
Buying sex									
No incarceration	18 (5.31)	Referent	Referent		21 (6.33)	Referent	Referent		--
Incarceration	3 (6.82)	1.11 (0.34, 3.63)	1.03 (0.28, 3.72)	.87 (.97)	12 (17.39)	2.19 (1.16, 4.15)	1.51 (0.72, 3.19)	.02 (.28)	0.29 (0.61)
Selling sex									
No incarceration	20 (5.90)	Referent	Referent		30 (9.04)	Referent	Referent		--
Incarceration	7 (15.91)	2.37 (1.06, 5.28)	1.80 (0.68, 4.74)	.03 (.24)	15 (21.74)	2.12 (1.23, 3.63)	1.96 (1.15, 3.35)	.01 (.01)	0.80 (0.88)
Transactional sex									
No incarceration	27 (7.96)	Referent	Referent		36 (10.84)	Referent	Referent		--
Incarceration	7 (15.91)	1.76 (0.82, 3.78)	1.36 (0.53, 3.46)	.15 (.53)	16 (23.19)	1.87 (1.14, 3.08)	1.73 (1.05, 2.85)	.01 (.03)	0.89 (0.66)
High number of partners									
No incarceration	118 (35.22)	Referent	Referent		152 (46.34)	Referent	Referent		--
Incarceration	25 (56.82)	1.59 (1.19, 2.12)	1.55 (1.13, 2.14)	.001 (.01)	39 (57.35)	1.21 (0.96, 1.53)	1.13 (0.88, 1.44)	.11 (.34)	0.15 (0.12)
STI									
Syphilis									
No incarceration	12 (3.76)	Referent	Referent		6 (1.86)	Referent	Referent		--
Incarceration	3 (6.82)	1.61 (0.49, 5.33)	1.62 (0.46, 5.70)	.44 (.46)	1 (1.47)	0.94 (0.15, 6.10)	1.07 (0.18, 6.26)	.95 (.95)	0.52 (0.71)
Chlamydia									
No incarceration	22 (6.63)	Referent	Referent		16 (4.92)	Referent	Referent		--
Incarceration	1 (2.27)	0.49 (0.08, 3.05)	0.92 (0.23, 3.74)	.45 (.91)	3 (4.48)	0.89 (0.27, 2.92)	1.05 (0.34, 3.20)	.86 (.94)	0.50 (0.89)
Gonorrhea									
No incarceration	10 (3.01)	Referent	Referent		4 (1.23)	Referent	Referent		--
Incarceration	0 (0.00)	---	---		4 (5.97)	3.49 (1.02, 11.97)	2.60 (0.65, 10.41)	.05 (.18)	0.01 (0.36)

	No PTSD Symptoms				PTSD Symptoms				Interaction
	***N* (%)**	**Unadjusted RR (95% CI)**	**Adjusted RR (95% CI)**	***p* unadjusted (adjusted)**	***N* (%)**	**Unadjusted RR (95% CI)**	**Adjusted RR (95% CI)**	***p* unadjusted (adjusted)**	***p* unadjusted (adjusted)**
Any STI									
No incarceration	39 (12.23)	Referent	Referent		24 (7.48)	Referent	Referent		--
Incarceration	4 (9.09)	0.89 (0.35, 2.13)	1.13 (0.48, 2.67)	.81 (.79)	8 (11.94)	1.53 (0.75, 3.15)	1.50 (0.72, 3.11)	.25 (.28)	0.32 (0.63)

Note. The *N*s and %s in Table 2 use unimputed data, whereas the Risk Ratios (RR)s (including Confidence Intervals [CI] and *p*values) were calculated used imputed data. Therefore, the unadjusted RR may not exactly match the percents shown. Adjusted for: age, transgender identity, unstable housing, less than or equal to high school education, any stimulant use in the past six months, weekly marijuana use, incarceration history, HIV testing history, insufficient income, men who have sex with men and women (SMMW) status, AUDIT score, experienced of violence, sex trade involvement, high number of partnerships, concurrent partnership, city, cohabitation status, health coverage, current STI, HIV status, CES-D score, social support scale score, microstress due to experienced racism scale score, microstress due to experienced homophobia scale score, and internalized homophobia scale score, Hispanic ethnicity.