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The association between serious mental impairment and sexual risk behaviors prior to incarceration among HIV-positive jail detainees: A cross-sectional observational study

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Abstract

The association between serious mental impairment and sexual risk behaviors prior to incarceration among HIV-positive jail detainees: A cross-sectional observational study

By Kimberly Miller

Background: Mental illness and history of incarceration have been linked separately to increased engagement in unsafe sexual behaviors, including concurrent partners and sex without a condom. Although sexual risk behaviors among human immunodeficiency virus (HIV)-positive jail inmates pre- and post-release have been examined, there is a paucity of data regarding the impact of mental impairment on sexual risk behaviors among this population.

Methods: We performed a cross-sectional secondary analysis of baseline data from the EnhanceLink demonstration project. Data were available on 185 sexually-active jail detainees enrolled at five jail systems between 2008 and 2011. Serious mental impairment was defined as having an Addiction Severity Index psychiatric composite score ≥0.22; higher scores indicated poor mental health and social functioning. Multiple logistic regression was used in four separate models to analyze the associations of serious mental impairment with four unsafe sexual risk behaviors: 1) sexual intercourse under the influence of drugs or alcohol, 2) concurrency, 3) failure to use a condom during last sexual intercourse, and 4) having two or more unsafe sexual risk behaviors.

Results: Serious mental impairment (ASI psychiatric CS ≥0.22) was common. A high ASI psychiatric composite score (≥0.22) was associated with increased odds of having had sexual intercourse under the influence of drugs or alcohol (adjusted odds ratio (aOR): 3.90; 95% confidence interval (CI): 1.64-9.27) and concurrency (aOR: 2.56; 95% CI: 1.08-6.08), but was not associated with failure to use a condom (aOR: 1.15; 95% CI: 0.47-2.81).

Conclusion: Serious mental impairment is associated with unsafe sexual risk behaviors. Substance use in tandem with sexual intercourse is common among incarcerated populations and poses a transmission risk for HIV-positive jail detainees, as substance use may also increase likelihood of sex with individuals of unknown HIV status. Future initiatives directed towards improving safe sex behaviors among HIV-positive jail populations should consider these issues when designing interventions.

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CHAPTER 1: BACKGROUND AND LITERATURE REVIEW

Sexual risk behaviors among persons with serious mental impairment is an understudied but important area of research for individuals infected with human immunodeficiency virus (HIV) in correctional facilities. Mental illness and history of incarceration have been linked separately to increased engagement in unsafe sexual behaviors, including multiple concurrent partners and sex without a condom (1-4). These associations have important public health implications for HIV-infected individuals detained in jails.

Jails differ from other correctional settings such as prisons in that they are often city- or county-run facilities and have a much higher turnover rate. In 2006, U.S. jails released 8.6 million inmates, approximately 95% of all releases from correctional facilities that year (5). HIV-positive individuals incarcerated in jail are at risk for interruptions in HIV care and adherence due to housing instability and recidivism post-release, leading to increased likelihood of elevated HIV viral load (6-8). Because these individuals are also vulnerable to relapses in previous sexual risk behaviors, those with unsuppressed HIV viral load are at risk of transmitting the virus to others upon release

Although sexual risk behaviors among HIV-positive inmates pre- and post-release have been examined (9-12), there is a paucity of data regarding the impact of mental impairment on sexual risk behaviors among this population. The following background summarizes the available data on the dynamics of HIV, serious mental impairment, and unsafe sexual risk behaviors, both in the context of the jail setting and among the general U.S. population.

HIV/AIDS in Jails

The overall number of individuals incarcerated in jails on a given day remains higher than a decade ago, although the annual number of persons admitted to jails in the U.S. has declined since 2008 (13, 14). At mid-year 2012, there were 744,524 individuals detained in jails, 8.4% higher than the number of jail detainees at mid-year in 2000 (13, 14).

In 2006, the Centers for Disease Control and Prevention (CDC) recommended opt-out HIV screening for incarcerated individuals as part of routine medical evaluation (15). However, HIV testing in the jail setting is logistically problematic due to the high turnover rates; inmates are likely to be released before they are tested unless offered testing within 24 hours (16-18). In a retrospective review of jail admissions and administered HIV tests from 2000-2007, the Rhode Island Department of Corrections found that it administered HIV tests to 73% of admissions (although some admissions were duplicates) (16). Among 169 newly diagnosed infections, 72 (43%) individuals would have gone undiagnosed if testing had been delayed for 7 days (16). Two controlled trials in Connecticut jails found similar findings, highlighting the importance of early provision of testing within 24 hours of incarceration (17, 18).

Despite these challenges, high rates of timely opt-out HIV test delivery in the jail setting have been shown to be attainable and cost-effective for society (19, 20). In addition, HIV testing in the jail setting may provide a unique opportunity for intervention, as it is estimated that up to 0.8% of incarcerated individuals of unknown HIV status are positive (20), which could account for a large number of the overall number of individuals in the community with unknown serostatus. Testing also identifies and provides access to otherwise difficult-to-reach HIV-positive populations, such as injection drug users and sex workers.

Minorities are not only overrepresented in the correctional system but also account for the majority of HIV infections in the jail setting. Non-Hispanic black and Hispanic individuals accounted for 36.9% and 15.1% of the jail population in 2012, respectively (13). In 2002, non-Hispanic black and Hispanic inmates in jails were 1.5 and 3.6 times more likely, respectively, to have ever tested positive for HIV in comparison to non-Hispanic white inmates (21).

The number of women admitted to correctional facilities has increased substantially in the last three decades. Since 1985, the number of women in jail has increased five-fold, even though in 2012 women represented only a small percentage (13.2%) of the jail population in the United States (13, 22). Historically, incarcerated women in U.S. jails have been more likely than men to have tested positive for HIV (2.3% compared to 1.2%, respectively, in 2002) (21). The increased HIV prevalence may be a result of the fact that sex work, a risk factor for HIV acquisition, is also a common reason for incarceration among women (11, 23, 24).

Serious Mental Impairment

Serious Mental Impairment: Definition and Measures

Serious mental impairment, as it is used in this study, refers to mental health associated with social and role functioning that ranks below the 25th percentile of the general United States population norms. This breakpoint for mental impairment has been used in studies utilizing the mental component summary (MCS) of the 36-Item Short Form Health Survey (SF-36) (25, 26). The SF-36 is a 36-question health survey designed for use in a diverse range of populations and yields an eight-scale profile of functional health and well-being scores that are standardized to general population norms. It is a useful screening tool

for several conditions (27-29). The MCS is derived from four of the eight scales in the SF-36, including vitality, general mental health, role-emotional (e.g., problems performing in roles at work due to emotional problems), and social functioning. Scores on the MSC range from 0-81; an individual who scores among the lowest percentiles for the MCS is considered to have "frequent psychological distress, social and role disability due to emotional problems" (30). The SF-36 has been shown to have good reliability and validity among individuals with diagnoses meeting *Diagnostic and Statistical Manual* (DSM)-III-R criteria, including major depression and schizophrenia, but it should be noted that discriminant validity between psychiatric illnesses is poor (28, 31, 32).

The Addiction Severity Index (ASI) was developed as a tool for individuals with drug addiction and is widely used as a measure to assess changes between treatment initiation and follow-up (33, 34). The ASI incorporates seven domains, including drugs, alcohol, employment, family/social, legal, medical, and psychiatric. Composite scores are calculated assess the severity of self-reported problems within the past 30 days for each domain. Although the ASI has been widely used in subpopulations of substance users, there is no standardized scoring system to allow comparison to the general population. However, in a study comparing the ASI medical and psychiatric composite scores to SF-36 scores among a cohort of substance users, a cut-point of 0.22 on the ASI psychiatric composite score was found to have 90% sensitivity and 71% specificity for scoring below the 25th percentile on the SF-36 MCS, which is indicative of serious mental impairment (35).

The ASI has been also commonly used in populations with a high prevalence of comorbid mental illness and substance use (36, 37), although the utility of the ASI in populations with severe or serious mental illness has been debated (37, 38). Most of these

debates focus on the limitations of the drug composite score for individuals with comorbid disorders and the biases of the severity ratings (37). The psychiatric composite score has been found to have good internal reliability (Cronbach's alpha=0.77) in populations with severe mental illnesses meeting DSM-III-R criteria (37), and good concurrent validity for measuring mental illness in populations with substance abuse. In another study in which the psychiatric composite score was used among mental hospital patients, it was found to still have adequate to good reliability and validity (38). The ASI psychiatric composite score ranges continuously between 0 and 1, with higher scores indicating greater severity of problems.

Serious Mental Impairment: Associations with Serious or Severe Mental Illness

Serious mental impairment, as defined above, has been significantly associated with the presence of mental illness (25, 39). In one study, the odds of having serious mental impairment among women who screened positive for post-traumatic stress disorder (PTSD) were 8.64 the odds among women who did not screen positive (95% confidence interval: 4.80-15.57) (25). Additionally, it may be possible that serious mental impairment, in the presence of a diagnosed mental disorder, can serve as an indicator of serious and severe mental illness. Although the definitions of serious and severe mental illness in the literature may vary, the terms are usually applied using similar criteria, particularly with regard to the presence of serious mental impairment.

"Serious mental illness" is a federally defined condition. Public Law No. 102-321, the Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA) Reorganization Act of 1992, created a block grant to provide community mental health services to those with

serious mental illness (40), and required that the Substance Abuse and Mental Health Services Administration (SAMHSA) develop a definition for serious mental illness. The resultant definition includes the following criteria for adults over 18 years of age: a current diagnosis or diagnosis within the previous year of an emotional or behavioral condition meeting current *Diagnostic and Statistical Manual* (DSM) criteria (40).

"Severe mental illness" often refers to the definition Shinnar et al. first described prior to the development of the SAMHSA definition (41). The authors operationalized 17 commonly-used American definitions for severe mental illness in a cohort of 222 patients and determined that most comprehensive definition included the presence of one of a range of major mental illnesses (including major depression, schizophrenia, and bipolar disorder) that persists over an extensive period of time and causes severe ongoing impaired function (41). For the purposes of this literature review, severe and serious mental illness will be differentiated where appropriate.

Mental Illness: Potential HIV Mechanisms and Implications for HIV Treatment

Proposed biologic mechanisms for the relationship between HIV and general mental illness are not clearly understood, and evidence for theoretical mechanisms is often inconclusive (42). In terms of sociocontextual associations between mental illness and HIV, not only does mental illness increase an individual's engagement in risky sexual behaviors and substance use, thus increasing the risk for acquiring HIV, but HIV may also increases an individual's risk for mental illness over his or her lifetime due to stigma, stress, and anxiety (43).

Onset of serious mental illness typically occurs in the late teens or early twenties (44). In most cases of a dual diagnosis of HIV and serious mental illness, the mental illness preceded HIV acquisition, although there have been reports of psychotic symptoms with initial onset occurring during late-stage HIV infection (44-46). It is uncertain in these cases whether HIV involvement in the central nervous system contributed to psychosis or developed separately (45).

Psychiatric comorbidity in HIV-infected individuals can cause difficulties in HIV medication adherence and access to adequate HIV primary care (47-49). In the general population, treatment of depression in HIV-infected individuals has been associated with significant improvements in adherence (50, 51). In a small community-based study of individuals with a dual diagnosis of severe mental illness and HIV in California, the authors found that highly-active antiretroviral therapy (HAART) adherence among individuals with severe mental illness was comparable to those without a comorbid diagnosis, and suggested that severe mental illness should not preclude an individual from being eligible for HAART (52).

Although there are few studies documenting HIV outcomes for incarcerated individuals with mental health disorders, and even fewer studies regarding the effects of severe mental illness on medication adherence (7), we would think since incarcerated persons have high rates of substance use and addiction disorders, mental health treatment and drug rehabilitation should aid in antiretroviral therapy adherence in this population as well. It is generally acknowledged, however, that there are limitations to providing acute treatment for serious or severe mental illness in the jail setting, due to the extent of the need for continuous and ongoing support (7, 53). As a result, treatment is often outsourced to the community only

after release through care linkages (53). Furthermore, mental care linkage is often secondary to HIV care linkage (53).

Mental Illness and Substance Abuse: Co-occurring disorders

It is estimated that 42.3% of individuals in the general population with substance use disorders also have a mental illness (40). The nature of a causal relationship between mental illness and substance use is unclear but appears to be dependent on the intertwined effects of several factors, including homelessness, gender, and age (54-56). For individuals with genetic predisposition to certain disorders, such as schizophrenia, drug use can trigger disease onset earlier in life (57).

The seminal Self Medication Hypothesis posited by Khantzian in 1985 points towards mental illness as the cause of substance use, suggesting that individuals with mental illness seek out drugs or alcohol to alleviate their psychiatric symptoms (58). However, the Self Medication Hypothesis is criticized for its lack of longitudinal evidence as well as for advocating the idea that persons with mental disorders seek out drugs preferentially according to their illness (59-61). One proposed revision to the Self Medication Hypothesis to improve its validity is to shift the focus from alleviation of psychiatric symptoms to alleviation of difficult emotional feelings (62). In a cohort of homeless persons with a dual diagnosis of mental health and substance use disorders, more than half of participants' self-reported reasons for seeking substance use were related to assuaging painful emotions; few of the self-reported reasons for seeking substance use were related specifically to symptom alleviation (62). In two studies that used randomization of genetic markers related to substance use, the authors of both papers concluded that there was no evidence of the causal

effect of substance use on mental illness (63, 64). Rather, both sets of results were more consistent with the Self Medication Hypothesis (65).

Prevalence of Mental Illness among the General Population and Incarcerated Persons

In the population-based 2011 National Survey on Drug Use and Health (NSDUH), the prevalence of any mental illness (defined as currently or at any time in the past year having had a diagnosable mental, behavioral, or emotional disorder, excluding developmental and substance use disorders) was 19.6% among U.S. adults (40). Mental illness was more prevalence among women and among persons between the ages 18 and 25 years (40).

Similarly, serious or severe mental illness prevalence in the general population is higher among women and Native American populations, and often coincides with homelessness and poverty (40, 66). In 2011, 5% of adults aged >18 years met the criteria for serious mental illness (40). Women were nearly twice as likely to have serious mental illness as men (6.4% compared with 3.4%, respectively) (40). However, women with serious mental illness in the general population face different circumstances than men with serious mental illness: they are more likely to be older at onset (thus more likely to have independence), are more likely to seek treatment and support, and are less likely to be homeless (67, 68).

Alaskan and American Natives and multiracial individuals had the highest percentages of serious mental illness among racial and ethnic categories (12.4% and 8.1%, respectively) (40). Non-Hispanic whites reported higher prevalence of serious mental illness in comparison to non-Hispanic blacks and Hispanics (5.5% compared with 3.5% and 3.7%,

respectively) (40). Serious mental illness was also elevated in unemployed individuals (7.6%) and individuals living below the poverty line (9.1%) (40).

Rates of mental illness in jail settings are high; at mid-year 2005, over 450,000 individuals in jails reported a mental health problem, accounting for over half of the jail population at that time (69). Rates of serious mental illness in the jail setting are similarly elevated in comparison to the general population, particularly among incarcerated women. In a cohort of 822 recently-admitted jail inmates at five jails in Maryland and New York, prevalence of severe illness among men was 14.5%; among female jail inmates, estimated prevalence rose as high as 31.0% (70). In addition, serious mental illness is often found concurrently with substance use disorders in jail detainees (71).

Sexual Risk Behaviors

HIV Acquisition and Definitions

In 2011, the majority of reported incident HIV cases among men were acquired through male-to-male sexual contact; among women, heterosexual contact was the primary transmission route (72). Sexual risk behaviors include unprotected sex, multiple sex partners, sex with an injection drug user, sex with an HIV-positive partner, and sex in exchange for money or drugs (1).

Prevalence of Sexual Risk Taking Behaviors among the General Population, Incarcerated Persons, and Individuals with Mental Illness

In a national population-based survey, the National Survey of Family Growth (NSFG) 2006-2010, 7.2% of men and 3.9% of women aged 15-44 years reported at least one sexual HIV risk behavior in the last 12 months, a decrease from 10.2% and 7.6% reported in 2002

for men and women, respectively (1). HIV sexual risk behaviors were defined in the survey as sex with more than 5 partners in the last 12 months, sex with an injection drug user, sex with an HIV-positive partner, sex in exchange for money or drugs, and/or recent treatment for a sexually transmitted disease (STD). Although men reported higher overall engagement in HIV sexual risk behaviors, condom use during last sexual encounter among women reporting at least one sexual risk behavior was half that of condom use among men (24.9% versus 50.0%, respectively) (1). Additionally, non-Hispanic black men reported higher percentages of at least one HIV sexual risk behaviors than Hispanic men, non-Hispanic white men, and Asian/Pacific Islander men (13.9%, compared to 7.5%, 6.0%, and 3.8%, respectively) (1).

Despite some evidence that serious or severe mental illness may impair engagement in sexual activity (3), studies have found that most individuals with severe mental illness have been sexually active within the last year (between 54% and 74%) (2, 73). Increased engagement in HIV sexual risk behaviors in individuals with severe or serious mental illness has been found to be associated with risk factors similar to those found among the general population, including lack of information, lack of safer sex skills, and lack of self-efficacy in reducing sexual behaviors (3, 74, 75), although these factors may be augmented in individuals with serious or severe mental illness. In addition, increased sexual risk engagement among individuals with serious or severe mental illness may also be related to psychiatric symptoms; impairment in planning, evaluating risk, and communication skills resulting from their illness; and inability to afford condoms or other protection methods (76-78).

In a literature review of 52 U.S. and international studies of HIV risk behavior among individuals with severe mental illness, the prevalence of several HIV sexual risk behaviors was higher than the prevalence reported in the NSFG discussed above (2). Many individuals (45.7%) had not used a condom at any point within the past 12 months, and 43.2% also reported multiple (2 or more) sex partners in the past year (2). A smaller number of individuals reported transactional sex and having an STD in the past year (13.7% and 8.0%, respectively), although these percentages are several-fold times higher than percentages among the general population (2).

In a more recent study of 96 women with severe mental illness, a majority of individuals reported no condom use and sex with multiple partners in the past 3 months (60% and 67.7%, respectively) (79). Many women also reported having transactional sex within the past 3 months and having received treatment for an STD within the past year (39.6% and 32.6%, respectively) (79). A study conducted among 152 men and women with serious or severe mental illness found no significant differences in sexual risk behaviors between genders; however, many sexually-active individuals reported unprotected sex (72.6%), multiple partners (44.9%), and transactional sex (21.4%) within the past year (3). In contrast, a study of data from a national population-based survey suggested that female sex modifies the effect of mental illness, particularly major depression, on sexual risk behaviors (80).

Recently released jail detainees, who demonstrate high rates of drug addiction, housing instability, and mental illness, also engage in sexual risk behaviors more frequently than among the non-incarcerated population (66). In the NSFG 2006-2010, men who reported a recent incarceration at a correctional facility within the last 12 months were more likely than men who never had been incarcerated to have reported at least one HIV sexual

risk behavior (15.5% compared to 5%, respectively) (1). Data were too sparse to obtain comparable estimates for women.

Among recent entrants to a jail, a cohort of female jail detainees in Chicago, commonly reported sexual risk behaviors in the past year included four or more sexual partners (26.5%) and never using protection (32%) (11). Ten percent of non-Hispanic white women reported 100 or more sexual partners within the previous 12 months, nearly 2.5-fold higher than Hispanic women and 10-fold higher than non-Hispanic black women (11). Among women who reported having anal sex within the past year (5.2%), 74.4% reported never using protection (11). Additional studies have found significant associations between incarceration and sexual risk behaviors (4, 12).

CHAPTER 2: MANUSCRIPT

INTRODUCTION

Sexual risk behaviors among persons with serious mental impairment is an understudied but important area of research for individuals infected with human immunodeficiency virus (HIV) in correctional facilities. In 2006, one in six of the estimated 1.1 million persons living with HIV/AIDS in the United States was incarcerated (5, 16). In comparison to the general population, HIV seroprevalence is four times higher among correctional populations (0.4% versus 1.7%) and more than 7.5 times higher among severely mentally ill persons (2, 5, 81). Because risk behaviors that lead to HIV and behaviors associated with untreated mental illness intersect with each other and with common reasons for incarceration, correctional settings are disproportionately burdened with individuals who have both HIV and serious mental impairment (2, 70).

Mental illness and history of incarceration have been linked separately to increased engagement in unsafe sexual behaviors, including multiple concurrent partners and sex without a condom (1-4). These associations have important public health implications for HIV-infected individuals detained in jails. Jails differ from other correctional settings such as prisons in that they are often city- or county-run facilities and have a much higher turnover rate. In 2006, U.S. jails released 8.6 million inmates, approximately 95% of all releases from correctional facilities that year (5). HIV-positive individuals incarcerated in jail are at risk for interruptions in HIV care and adherence due to housing instability and recidivism post-release, leading to increased likelihood of elevated HIV viral load (6-8). Because these individuals are also vulnerable to relapses in previous sexual risk behaviors, those with unsuppressed HIV viral load are at risk of transmitting the virus to others upon release.

Although sexual risk behaviors among HIV-positive inmates pre- and post-release have been examined (9-12), there is a paucity of data regarding the impact of mental impairment on sexual risk behaviors among this population. We examined whether serious mental impairment, defined as extremely poor mental health and social functioning, was associated with unsafe sex in HIV-positive jail detainees using a cross-sectional secondary analysis of baseline data from the Enhancing Linkages to HIV Primary Care and Services in Jail (EnhanceLink) demonstration project, a cohort of HIV-positive jail detainees enrolled at 20 jail systems across the United States. We selected three unsafe sex behaviors for analysis: intercourse under the influence of alcohol or drugs, concurrent sex partners, and failure to use a condom during last sexual intercourse. We hypothesized that serious mental impairment is associated with higher odds of engaging in unsafe sexual risk behaviors prior to incarceration among HIV-positive jail detainees.

METHODS

Study population, design, and data collection

Data for this secondary analysis were drawn from the Enhancing Linkages to HIV Primary Care and Services in Jail Setting (EnhanceLink) Initiative, a Special Project of National Significance funded by the Health Resources Services Administration (HRSA). The 10-site demonstration project implemented and evaluated the feasibility and effectiveness of interventions for successful HIV linkage to standard care services post-release in the jail setting. Grantee sites were located in nine states (CT, GA, IL, MA, NY, OH, PA, RI, SC) (82).

Between January 2008 and October 2011, EnhanceLink staff collected data on 1270 male and female HIV-infected jail detainees who enrolled in an observational 6-month

longitudinal cohort study. There was some heterogeneity among sites with regard to eligibility criteria for enrollment (e.g., some sites considered new diagnoses ineligible), but in general, HIV-positive individuals were considered eligible if they were at least 18 years of age. For the present analysis, we excluded individuals who were newly diagnosed with HIV during index incarceration (n=58) and limited our study sample to those individuals who provided information on an optional risk behavior module at baseline (n=373). We also excluded 23 detainees who were missing a baseline Addiction Severity Index (ASI) psychiatric composite score. After exclusions, our sample included 350 individuals (Figure 1).

Data included in this cross-sectional baseline analysis were drawn from (1) a baseline interview conducted during index incarceration or within 7 days of release and (2) a medical chart abstraction performed post-release of clinical data documented during participants' index incarceration. Information from a follow-up medical chart abstraction performed approximately 6 months post-release was used to supplement any missing data from the baseline chart review. Baseline interview data included sociodemographic characteristics, employment and criminal history, housing stability, and HIV treatment and care experiences. The ASI, fifth edition, was administered to participants at baseline to assess severity of problems with employment, physical health, drug and alcohol use, and psychiatric illness (83). Mental and physical well-being were examined using the 12-item Short Form Health Survey (SF-12) (84). The optional risk behavior module administered at the conclusion of the baseline interview asked study participants to describe their sexual activity and substance use in the 30 days prior to incarceration. Questions for the risk behavior module were adapted from a variety of sources, including the CDC-funded Project START instruments and an

assessment in development prior to the EnhanceLink study by the CDC HIV-STD Behavioral Surveillance Working Group (85).

The HRSA-funded EnhanceLink multisite study was approved by both central and site-specific Institutional Review Boards.

Variables

Outcome variables

The outcome of interest for this study was unsafe sex in the 30 days prior to incarceration (referred to as the "reporting period"), defined as three separate outcomes: (1) having vaginal or anal sex under the influence of drugs or alcohol during last vaginal or anal sexual intercourse, (2) concurrency (having two or more vaginal or anal sexual partners), and (3) lack of condom use during last vaginal or anal sexual intercourse. Condom use at last sexual intercourse was used to approximate regular habits of condom use and has been found to be acceptable measure in the general population (86). Each outcome was treated dichotomously in three separate models. A fourth outcome was used in an exploratory model to investigate factors associated with reporting two or more unsafe sexual behaviors versus reporting only one or none at all.

Predictor variables

Our primary exposure of interest was serious mental impairment, operationalized using the ASI psychiatric composite score from each participant's baseline interview to assess severity of mental impairment within the reporting period (30 days prior to incarceration). Psychiatric composite score was dichotomized at a cut-point of 0.22, which

has been used in similar studies (34, 35). A score above 0.22 indicated serious mental impairment.

We also considered two additional predictors for analyzing condom use: uncontrolled HIV viremia and HIV serostatus of partner(s). Uncontrolled viremia was defined as having an HIV viral load >400 copies/mL on a test taken during or closest to the 30 days prior to incarceration. Partner serostatus was divided into two separate predictors: (1) any sexual intercourse with an HIV-negative main or non-main partner and (2) any sexual intercourse with a main or non-main partner of unknown HIV serostatus. Main versus non-main partner status was not defined in the risk behavior module (e.g., by frequency of sexual contact or exclusiveness); participants were simply asked if they considered themselves to have partners in each category.

Covariates

Initial covariates were selected for analysis according to the theoretical model proposed by Meade and Sikkema (2) to represent five domains influencing sexual risk behavior: (1) psychiatric illness, (2) substance use, (3) cognitive-behavioral factors, (4) social relationships, and (5) demographics. Covariates included demographics (age, gender, race, Hispanic ethnicity, sexual orientation, relationship status, and education), employment and criminal history, homelessness, time since HIV diagnosis, and previous HIV care linkage. Substance use as a covariate was not included in the analysis, as the literature has suggested that it may be on the causal path between mental illness and all four outcomes of interest (58, 62, 65).

Self-reported race on the baseline interview was classified as white, black, or other. Hispanic ethnicity was also by self-report and was considered separately from race. Homelessness was defined as self-reported homelessness at any point during the 30 days prior to incarceration. Prior HIV care linkage was also by self-report and defined as having an HIV care provider during the 30 days prior to incarceration. Time since HIV diagnosis was drawn from jail medical chart review and was categorized dichotomously as less than two years versus more than two years. Recidivism was examined using two dichotomous self-reported measures: recent incarceration in the 30 days prior to index incarceration and having spent more than 2 years in a correctional facility.

Statistical Analysis

Analysis was performed using SAS software, version 9.3 (SAS Institute, Inc.; Carey, NC). Differences in baseline characteristics for participants with and without serious mental impairment were explored using a chi-square test of independence (or Fisher's Exact for sparse data) for categorical variables and the Wilcoxon two-sample test for continuous variables, using an alpha = 0.10. Univariate logistic regression was then used to explore the unadjusted associations between independent variables of interest and the outcomes. Serious mental impairment, demographic variables (age, gender, race/ethnicity, and relationship status), and additional covariates and predictors significant at $P < 0.10$ for each outcome were included in subsequent regression models. Separate multiple logistic regressions were then conducted using backwards elimination for each of the three models after assessing for collinearity, and adjusted odds ratios and 95% confidence intervals were calculated. Interaction terms were tested in each model for serious mental impairment with gender.

RESULTS

Demographics

In our study, 185 participants indicated that they were sexually active during the reporting period and were included in the analysis (Figure 1). In comparison to sexually-inactive detainees who completed the risk behavior module (n=165), sexually-active individuals were more likely to have not completed high school (0.081), be married or in a committed relationship ($p<0.001$), have bipolar disorder ($p<0.001$), and to be women ($p<0.001$) and ≤40 years old ($p<0.001$).

Demographic data and characteristics for participants are shown in Table 1. Severe mental impairment was common among study participants, with141 (76.2%) having an ASI psychiatric composite score ≥0.22. The average age of participants was 38.3 years (SD=9.0). The majority of individuals were black (68.5%), had been mostly unemployed during the past 3 years (75.7%), and were heterosexual (77.3%). Women made up 51.6% of the sample, and 82 participants (44.8%) were married or in a committed relationship. Over half of the study participants (60.9%) had never received their high school diploma or GED. Demographic characteristics were not statistically different between individuals with and without serious mental impairment, with the exception of sexual orientation ($p < 0.001$) and education ($p = 0.021$) (Table 1).

Recidivism was common in our sample, as was homelessness. Homelessness was significantly higher among individuals with serious impairment compared with those without impairment (51.8% versus 29.6%, respectively; p=0.010). Individuals with serious mental impairment also had a significantly higher frequency of incarceration during 30 days prior to index incarceration (28.4% versus 4.8%; p=0.002).

More than half of individuals (51.4%) had a recorded diagnosis of bipolar disorder, schizophrenia, major depression, or post-traumatic stress disorder (PTSD). Only one individual with a mood disorder and six individuals with major depression listed on their jail medical charts did not have an ASI psychiatric composite score above the 0.22 cutoff. Frequencies of schizophrenia of was higher among individuals without serious mental impairment (9.5% versus 5.2%, respectively), but was not significantly different (p=0.293). Over a third of participants (39.5%) reported use of prescribed medications for emotional problems. More than half (57.1%) of participants reported that their drug problems bothered them moderately to extremely during the 30 days prior to incarceration; 17.2% of participants were bothered moderately to extremely by alcohol problems. Moderate to extreme distress for drug and alcohol problems occurred more commonly among individuals with serious mental impairment ($p<0.001$ and $p=0.012$, respectively).

Unsafe sexual risk behaviors during the reporting period

Among our study sample, 42.7% reported concurrency during the 30 days prior to incarceration. The mean number of sexual partners during the reporting period was 5.1 (SD=14.0); the median number of partners was 1.0. More than a third of participants (38.5%) did not use a condom during the last anal or vaginal sexual intercourse prior to incarceration, and 53% were under the influence of alcohol or drugs during last sexual intercourse. Having an HIV-negative partner or a partner of unknown status was common (41.5% and 42.5%, respectively). The results for each analysis of the four unsafe sex outcomes are described below.

1. Under the influence of alcohol or drugs during last sexual intercourse among sexually active participants

Table 3 shows the results for unadjusted and adjusted logistic regressions among sexually-active participants (n=185) being under the influence of alcohol or drugs during last sexual intercourse. In unadjusted analyses, serious mental impairment was a significant predictor of the outcome ($p<0.001$) (Table 3). In addition, bisexual orientation ($p=0.049$) and homelessness ($p<0.001$) were significantly associated with increased odds of being under the influence of alcohol or drugs during, whereas marriage or being in a committed relationship was significantly associated with lowered odds ($p=0.053$).

In the adjusted model, serious mental impairment was significantly associated with increased odds of having had sex under the influence of alcohol or drugs (aOR: 3.90, 95% CI: 1.64-9.27). Homelessness was likewise linked to increase odds of the outcome (aOR: 3.66, 95% CI: 1.78-7.51). Although sexual orientation and being married or in a committed relationship were significant in univariate analyses, they were not significantly linked to higher odds of the outcome in an adjusted model.

2. Concurrency (two or more sexual partners during the reporting period)

In unadjusted analyses, variables that were significantly associated with having increased odds or two or more partners included serious mental impairment ($p=0.097$) and homelessness ($p<0.001$); being married or in a committed relationship was significantly associated with decreased odds of concurrency ($p<0.001$) (Table 4). In the adjusted model, individuals with serious mental impairment had significantly higher odds of having had two or more sexual partners (aOR: 2.56, 95% CI: 1.08-6.08), as was homelessness (aOR: 2.72

95% CI: 1.35-5.48). Being married or in a committed relationship was significantly associated with decreased odds of concurrency (aOR: 0.27, 95% CI: 0.13-0.55), as was being of a non-black or non-white race (aOR: 0.21, 95% CI: 0.05-0.84) (Table 4).

3. Lack of condom use during last sexual intercourse among sexually active participants

In unadjusted analyses limited to sexually active individuals (n=185), serious mental impairment, uncontrolled HIV viremia, and sexual intercourse with a partner of unknown HIV serostatus were not significant predictors (Table 4), although having an HIV-negative partner was significantly associated with condom use (p=0.002). Covariates significantly associated with increased odds of failure to use a condom included including age ≤40 years (p=0.007) and being married or in a committed relationship (p<0.001). Homelessness (p=0.065), Hispanic ethnicity (p=0.089), and having spent more than 2 years in a correctional facility (p=0.047) were all significantly associated with decreased odds of failure to use a condom (Table 4).

In the final adjusted model, having an HIV-negative partner was significantly associated with condom use (aOR: 0.22, 95% CI: 0.10-0.50). Age ≤40 years was associated with higher odds of no condom use (aOR: 3.04, 95% CI: 1.40-6.62), as was being married or in a committed relationship (aOR: 4.04, 95% CI: 1.90-9.02).

4. Exploratory model: Two or more unsafe sexual behaviors

In analyzing factors associated with two or more sexual risk behaviors, we found that only 7.7% of participants engaged in all three behaviors. The greatest overlap in unsafe sexual behaviors occurred among individuals who had concurrent partners and sex under the influence of alcohol or drugs (24.8%), while fewer participants who failed to use a condom

had concurrent partners (3.9%) or reported having sex under the influence of alcohol or drugs (11.6%). Serious mental impairment was significantly associated with having two or more unsafe sexual behaviors both on unadjusted (crude OR: 5.73; 95% CI: 2.49-13.22) and adjusted analyses (aOR: 7.42; 95% CI: 2.78-19.80).

DISCUSSION

In comparison to incarcerated populations in general and the U.S. population, participants in our jail study experienced a higher prevalence of mental illnesses such as major depression and bipolar disorder (40, 69). Serious mental impairment was extremely common among participants, with more than three-fourths of participants reporting seriously impaired mental functioning and mental health distress in the 30 days prior to interview. Among those with a high ASI psychiatric composite score in this cross-sectional study, there was a greater likelihood of unsafe sex compared with individuals who had a low psychiatric composite score.

In our analysis, we found evidence that serious mental impairment was significantly associated with higher odds of having sexual intercourse under the influence of drugs or alcohol. This is an important finding because alcohol and drug use may affect typical serosorting behaviors, leading to increased likelihood of intercourse with partners of unknown HIV serostatus (87). Additionally, we found evidence that serious mental impairment was significantly associated with increased odds of having 2 or more sexual partners. Both of these findings support our initial hypothesis and reflects what has previously been found in studies conducted among non-incarcerated populations with serious mental impairment (2, 3).

We did not find evidence that serious mental impairment was associated with lack of condom use during last sexual intercourse. This conflicts with what has been found in other studies of mental illness, particularly serious or severe mental illness, in which serious mental impairment been linked to decreased self-efficacy for condom use in the general population (2, 3). It is possible that the participants in our study with serious mental impairment had different levels of condom self-efficacy depending on how mental impairment interacted with their underlying mental illness. Further, although condom use during last sexual intercourse has been found to be a good indicator of general condom use practices (1), condom use may have a much higher associated social desirability bias associated with it among HIV-positive individuals in comparison to the general population.

We did not obtain a significant result for the association of lack of condom use with partner of unknown HIV status; however, having an HIV-negative partner was significantly associated with lowered odds of lack of condom use on both unadjusted analysis and in the final model. Although studies among HIV-positive jail releasees have found a high prevalence of unprotected sexual intercourse with HIV-negative partners (9), our results suggest that among the HIV-positive individuals in our study, individuals had good self-efficacy when the status of a partner is known to be HIV-negative. We also did not obtain significant results for the association of uncontrolled HIV viremia with lack of condom use; however, this is similar to what has been found among HIV-infected individuals in the general population (88). Nearly a third of participants in our study were missing data on HIV viremia. Thus, results from our study for this predictor should be interpreted with caution.

Considering the evidence for the association between serious mental impairment and sexual intercourse under the influence of drugs or alcohol, it may appear that our results are

conflicting, as sexual intercourse under the influence of alcohol or drugs is often assumed to be associated with decreased condom use. However, current practices of sexual intercourse under the influence of alcohol had no association with condom non-use in studies conducted among the general population (89) or among HIV-serodiscordant couples (90). On the other hand, sexual intercourse under the influence of drugs or alcohol may carry less perceived stigma for HIV-positive individuals than lack of condom use, which may have masked the true associations for predictors of failing to use a condom.

Limitations

There are several additional limitations to our study. The cross-sectional design of our study does not allow causality to be established between serious mental impairment and unsafe sexual risk behaviors, and there is controversy regarding the directionality of the associations of several covariates, including homelessness and recidivism, with mental impairment.

The clinical use of the ASI in many subpopulations is debated, including individuals with serious mental illness (35), and the ASI psychiatric composite score cut-point does not differentiate between types of mental illness (31). As was noted for the SF-36, on which the ASI cut-point is based, while individuals with unipolar illness consistently within the impaired range, individuals with more complex illnesses, such as schizophrenia, had overall higher functioning abilities (22). Despite this, for the purposes of our study, it was a useful measure to gauge current impairment (potentially resulting from untreated, undiagnosed illness or poor psychiatric medication adherence), and the cut-point was significantly

correlated in our study sample with participants' mental component scores on the SF-12, which is closely related to the SF-36.

Finally, missing data was an important concern in our study, and selection bias may have influenced our results. No individuals were given the option to answer the risk behavior module at five of the 10 study sites; at three sites, all participants answered the module; and at the final two sites, the module was optional. Thus, selection bias was due to EnhanceLink study design as well as due to individual self-selection resulting from the sensitive nature of the questionnaires. Most notably, one of the five sites included in this study was a female-only facility, and women in our study represented over half (53.5%) of the 185 individuals who were sexually active. Although incarcerated women are twice as likely to test positive for HIV as incarcerated men, this number is still disproportionate, considering the comparably small number of women who pass through jails each year (13, 21).

Conclusion

Individuals who are detained in the jail setting represent a substantial reservoir of HIV infection in the United States (5, 20). Because sexual intercourse is the most common route of HIV transmission (72), it is important to understand current trends in sexual risk behaviors among HIV-positive jail detainees so that appropriate interventions can be targeted to the groups at highest risk both during incarceration and post-release in the community. We believe our results suggest that HIV-positive jail detainees with serious mental impairment are more likely to engage in concurrent sexual relationships and sexual intercourse under the influence of alcohol or drugs than HIV-positive detainees without impairment, making them an important demographic group for interventions. Future areas of research may include

further investigation into factors associated with serosorting in this population and whether certain types of mental illness are more likely to engage in unsafe sex.

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TABLES AND FIGURES

Table 1. Baseline characteristics of participants, stratified on mental impairment status (N=185)

	Total (N=185)		Serious mental impairment (N=141)		No serious mental impairment (N=44)		*p*-value[1]	
	N	(%)	N	(%)	N	(%)		Missing
Demographics								
Age in years (Mean [SD])	(38.3 [9.0])		(38.6 [8.7])		(37.5 [9.9])		0.478	2
Sex							0.217	1
Male	84	(45.7)	59	(42.1)	25	(56.8)		
Female	95	(51.6)	77	(55.0)	18	(40.9)		
Transgender	5	(2.7)	4	(2.8)	1	(2.3)		
Race							0.339	1
White	32	(17.4)	26	(18.6)	16	(13.6)		
Black	126	(68.5)	92	(65.7)	72	(77.3)		
Other	26	(14.1)	22	(15.7)	6	(9.1)		
Hispanic ethnicity	17	(9.6)	14	(10.3)	3	(7.1)	0.766	7
Married or in a committed relationship	82	(44.8)	63	(45.0)	19	(44.2)	0.925	2
Sexual orientation							0.008	--
Heterosexual	143	(77.3)	110	(78.0)	33	(75.0)		
Homosexual	22	(11.9)	19	(8.5)	1	(22.7)		
Bisexual	20	(10.8)	12	(13.5)	10	(2.3)		
Education							0.021	1
Some high school or less	112	(60.9)	93	(66.4)	19	(43.2)		
High school diploma/GED	45	(24.5)	30	(21.4)	15	(34.1)		
College or beyond	27	(14.7)	17	(12.1)	10	(22.7)		
Unemployed for most of the previous 3 years	140	(75.7)	110	(78.0)	30	(68.2)	0.186	--
Legal and housing status								
Spent >2 years locked in a correctional facility in lifetime	119	(64.7)	92	(65.7)	27	(61.4)	0.598	1
Number of times arrested, lifetime (Mean [SD])	(23.9 [33.6])		(23.5 [25.9])		(25.2 [50.8])		0.032	19
Spent time in a jail, prison, or hospital, 30 days prior to index incarceration	40	(22.7)	38	(28.4)	2	(4.8)	0.002	9
Homeless, 30 days prior to incarceration	86	(46.5)	73	(51.8)	13	(29.6)	0.010	--
HIV-related health								
Uncontrolled HIV viremia (>400 copies/mL)	75	(58.6)	57	(57.6)	18	(62.1)	0.666	57

Had health insurance at baseline	110	(59.8)	86	(61.4)	24	(54.6)	0.417	1
HIV care provider, 30 days prior to incarceration	123	(69.5)	94	(69.6)	29	(69.1)	0.943	8
Less than 2 years since HIV diagnosis	20	(15.4)	18	(17.8)	2	(6.9)	0.242	55
Mental health								
Diagnosed with a major mental illness[2]	91	(51.4)	81	(60.0)	10	(23.8)	<0.001	8
Bipolar disorder	44	(25.0)	43	(31.9)	1	(2.4)	<0.001	9
Major depression	47	(26.7)	41	(30.4)	6	(14.6)	0.046	9
Schizophrenia	11	(6.2)	7	(5.2)	4	(9.5)	0.293	8
PTSD	8	(4.6)	8	(5.9)	0	(0.0)	0.201	9
Prescribed medication for emotional problem[3]	73	(39.5)	67	(47.5)	6	(13.6)	<0.001	--
Substance use								
Moderately to extremely bothered by drug problems, 30 days prior to incarceration[4]	104	(57.1)	92	(66.7)	12	(27.3)	<0.001	3
Moderately to extremely bothered by alcohol problems, 30 days prior to incarceration[4]	31	(17.2)	29	(21.2)	2	(4.7)	0.012	5

ASI: Addiction Severity Index; PTSD: Post-traumatic stress disorder.

[1] A chi-square test (or Fischer's Exact for sparse data) was used for categorical variables. The Wilcoxon Rank Sum Rank t-test was used to test age and overall lifetime number of arrests. Alpha=0.05.

[2] As recorded on participants' medical charts from index incarceration. Pre-existing diagnoses prior to incarceration were not differentiated from new diagnoses.

[3] Based on self-report during baseline interview for 30 days prior to incarceration.

[4] Participants were asked to self-report how bothered they were. Answer options were: Not at all, Slightly, Moderately, Considerable, and Extremely.

Table 2. Select sexual behaviors during 30 days prior to incarceration among study participants (N=185)

	N	(%)	Missing
Had 2 or more vaginal or anal sex partners	79	(42.7)	--
Number of vaginal or anal sex partners (Mean [SD])	(5.1	[14.0])	--
Did not use condom during last vaginal or anal intercourse	70	(38.5)	3
Under influence of alcohol/drugs during last intercourse	96	(53.0)	4
MSM (among sexually active men, N=84)	21	(25.0)	--
WSM (among sexually active women, N=95)	81	(85.3)	--
Sex with an HIV serodiscordant partner	73	(40.3)	4
Sex with a partner of unknown HIV status	80	(44.2)	4

SD: Standard deviation; MSM: Men who have sex with men; WSM: Women who have sex with men.

Table 3. Factors associated with having last anal or vaginal sexual intercourse under the influence of drugs or alcohol prior to incarceration among sexually active study participants (N=185).

	Unadjusted					Adjusted[1]				
	OR	**(95% CI)**		***p*-value**		**OR**	**(95% CI)**		***p*-value**	
Serious mental impairment (psychiatric ASI ≥0.22)	4.23	(2.00,	8.92)	<0.001	*	3.90	(1.64,	9.27)	0.002	**
Demographics										
Age ≤40 years	0.90	(0.49,	1.63)	0.717		0.87	(0.43,	1.75)	0.689	
Female	1.29	(0.72,	2.33)	0.392		0.91	(0.43,	1.95)	0.813	
Race										
White	1.00	--				1.00	--			
Black	0.91	(0.42,	2.00)	0.822		0.85	(0.32,	2.11)	0.727	
Other	0.61	(0.21,	1.75)	0.360		0.38	(0.10,	1.42)	0.149	
Hispanic ethnicity	1.16	(0.41,	3.27)	0.777		1.66	(0.39,	7.51)	0.497	
Married or in a committed relationship	0.56	(0.31,	1.01)	0.053	*	0.64	(0.31,	1.29)	0.212	
Sexual orientation										
Heterosexual	1.00	--				1.00	--			
Homosexual	0.88	(0.35,	2.21)	0.791		1.37	(0.39,	4.84)	0.624	
Bisexual	2.92	(1.01,	8.46)	0.049	*	1.78	(0.50,	6.27)	0.372	
Education										
Some high school or less	1.14	(0.48,	2.68)	0.843						
High school diploma/ GED	1.14	(0.44,	3.01)	0.851						
College or beyond	1.00	--								
Unemployed for most of the previous 3 years	1.41	(0.72,	2.76)	0.324						
Other covariates										
Homeless, 30 days prior to incarceration	4.43	(2.36,	8.31)	<0.001	*	3.66	(1.78,	7.51)	<0.001	**
Spent time in a jail, prison, or hospital, 30 days prior to index incarceration	1.59	(0.77,	3.29)	0.208						
Spent >2 years locked in a correctional facility in lifetime	1.17	(0.64,	2.13)	0.606						
Health insurance	0.87	(0.48,	1.59)	0.655						
Less than 2 years since HIV diagnosis	1.42	(0.52,	3.89)	0.491						
HIV care provider, 30 days prior to incarceration	0.71	(0.37,	1.36)	0.303						

ASI: Addiction Severity Index; OR: Odds ratio.

*Indicates significance at alpha=0.10 for univariate analysis.

**Indicates significance at alpha=0.05 for multivariate analysis.

[1] Serious mental impairment, sex with an HIV-negative partner, demographic confounders (age, sex, relationship status, race, and ethnicity), and significant covariates from univariate analysis were included in the subsequent multivariate logistic regressions.

Table 4. Factors associated with having anal or vaginal sexual intercourse with more than 2 partners within 30 days prior to incarceration (N=185)

	Unadjusted					Adjusted[1]				
	OR	**(95% CI)**		***p*-value**		**OR**	**(95% CI)**		***p*-value**	
Serious mental impairment (psychiatric ASI ≥0.22)	1.83	(0.90,	3.75)	0.097	*	2.56	(1.08,	6.08)	0.033	**
Demographics										
Age ≤40 years	1.23	(0.68,	2.23)	0.498		1.34	(0.66,	2.73)	0.415	
Female	1.11	(0.62,	2.00)	0.718		0.92	(0.44,	1.92)	0.828	
Race										
White	1.00	--				1.00	--			
Black	1.10	(0.50,	2.40)	0.817		0.9	(0.36,	2.21)	0.811	
Other	0.47	(0.16,	1.44)	0.188		0.21	(0.05,	0.84)	0.027	**
Hispanic ethnicity	0.75	(0.26,	2.12)	0.582		1.29	(0.31,	5.33)	0.724	
Married or in a committed relationship	0.27	(0.14,	0.50)	<0.001	*	0.27	(0.13,	0.55)	<0.001	**
Sexual orientation										
Heterosexual	1.00	--								
Homosexual	0.99	(0.40,	2.45)	0.975						
Bisexual	1.74	(0.68,	4.46)	0.249						
Education										
Some high school or less	1.09	(0.46,	2.56)	0.971						
High school diploma/GED	1.16	(0.44,	3.06)	0.771						
College or beyond	1.00	--								
Unemployed for most of the previous 3 years	1.48	(0.74,	2.97)	0.267						
Other covariates										
Homeless, 30 days prior to incarceration	3.05	(1.66,	5.58)	<0.001	*	2.72	(1.35,	5.48)	0.005	**
Spent time in a jail, prison, or hospital, 30 days prior to index incarceration	0.64	(0.31,	1.34)	0.237						
Spent >2 years locked in a correctional facility in lifetime										
Had health insurance at baseline	0.86	(0.47,	1.56)	0.620						

Less than 2 years since HIV diagnosis	1.02	(0.39,	2.65)	0.970
HIV care provider, 30 days prior to incarceration	0.86	(0.45,	1.63)	0.638

ASI: Addiction Severity Index; OR: Odds ratio.

*Indicates significance at alpha=0.10 for univariate analysis.

**Indicates significance at alpha=0.05 for multivariate analysis.

[1] Serious mental impairment, demographic confounders (age, sex, relationship status, race, and ethnicity), and significant covariates from univariate analysis were included in the multivariate regression.

Table 5. Factors associated with not using a condom during last anal or vaginal sexual intercourse during 30 days prior to incarceration among study participants (N=185).

	Unadjusted			Adjusted[1]		
	OR	**(95% CI)**	***p*-value**	**OR**	**(95% CI)**	***p*-value**
Serious mental impairment (psychiatric ASI ≥0.22)	1.28	(0.63, 2.61)	0.494	1.15	(0.47, 2.81)	0.760
Uncontrolled HIV viremia (>400 copies/ mL)	1.03	(0.49, 2.17)	0.935			
Sex with an HIV-negative partner	0.35	(0.18, 0.68)	0.002 *	0.22	(0.10, 0.50)	<0.001 **
Sex with a partner of unknown HIV status	0.92	(0.50, 1.67)	0.773			
Demographics						
Age ≤40 years	2.41	(1.27, 4.56)	0.007 *	3.04	(1.40, 6.62)	0.005 **
Female	1.49	(0.82, 2.73)	0.194	1.26	(0.57, 2.77)	0.567
Race						
White	1.00	--		1.00	--	
Black	0.86	(0.39, 1.88)	0.700	0.84	(0.33, 2.15)	0.710
Other	0.41	(0.13, 1.29)	0.126	0.58	(0.13, 2.62)	0.481
Hispanic ethnicity	0.33	(0.09, 1.19)	0.089 *	0.59	(0.10, 3.58)	0.568
Married or in a committed relationship	3.35	(1.79, 6.28)	<0.001 *	4.14	(1.90, 9.02)	<0.001 **
Sexual orientation						
Heterosexual	1.00	--				
Homosexual	0.99	(0.39, 2.55)	0.986			
Bisexual	1.08	(0.41, 2.80)	0.883			
Education						
Some high school or less	1.07	(0.44, 2.57)	0.584			
High school diploma/ GED	0.80	(0.29, 2.18)	0.510			
College or beyond	1.00	--				
Unemployed for most of the previous 3 years	0.72	(0.36, 1.42)	0.343			
Other covariates						
Homeless, 30 days prior to incarceration	0.56	(0.31, 1.04)	0.065 *	0.57	(0.27, 1.21)	0.143
Spent time in a jail, prison, or hospital, 30 days prior to index incarceration	1.20	(0.59, 2.47)	0.614			
Spent >2 years locked in a correctional facility in lifetime	0.53	(0.29, 0.99)	0.047 *	0.87	(0.40, 1.90)	0.726

Health insurance covers some or all HIV care	0.76 (0.42, 1.40)	0.386
Less than 2 years since HIV diagnosis	1.92 (0.72, 5.11)	0.194
HIV care provider, 30 days prior to index incarceration	1.40 (0.71, 2.77)	0.332

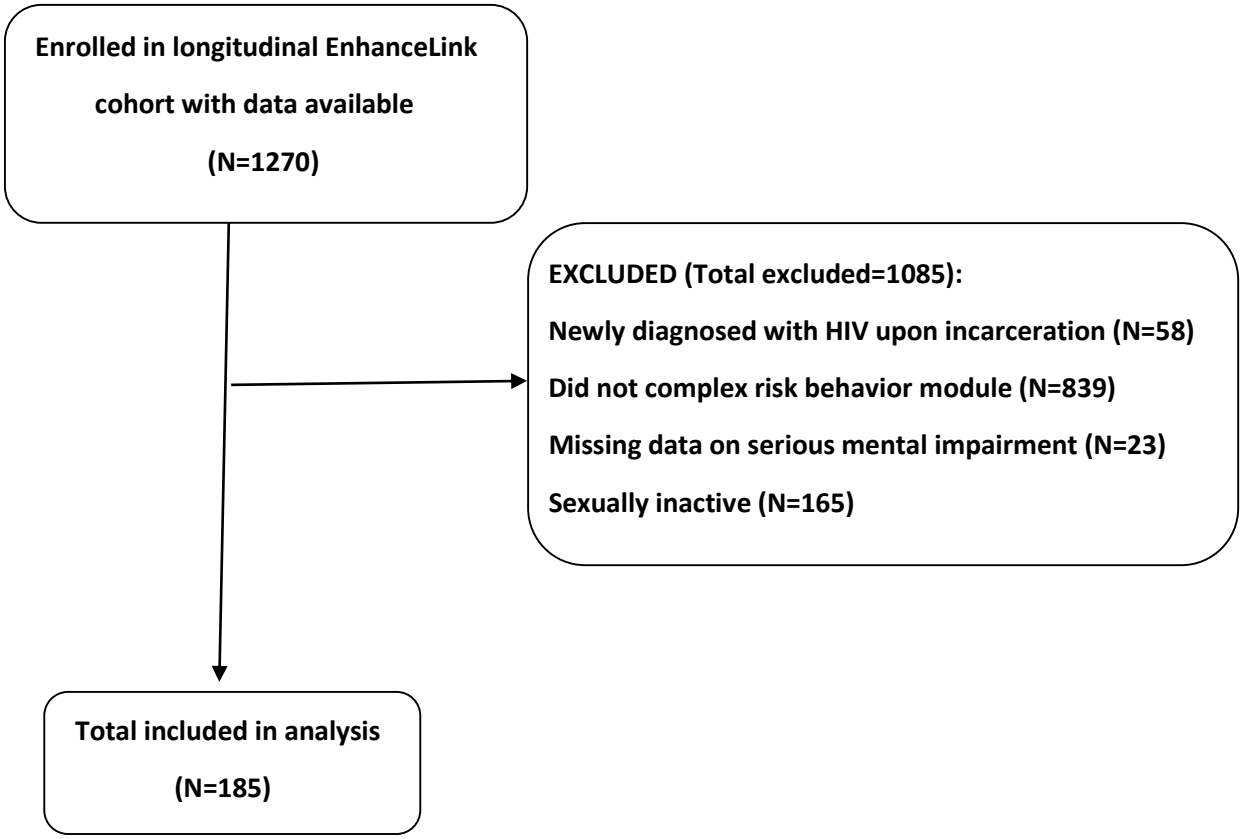
ASI: Addiction Severity Index; OR: Odds ratio.

*Indicates significance at alpha=0.10 for univariate analysis.

**Indicates significance at alpha=0.05 in final multivariate model.

[1] Serious mental impairment, sex with an HIV-negative partner, demographic confounders (age, sex, relationship status, race, and ethnicity), and significant covariates from univariate analysis were included in the subsequent multivariate logistic regressions.

Figure 1. Inclusion and exclusion criteria for study participants.



APPENDIX

EMORY UNIVERSITY

Institutional Review Board

TO: Anne Spaulding, MD, MPH
Principal Investigator
Epidemiology

DATE: August 8, 2013

RE: **Continuing Review Expedited Approval**

CR5_IRB00009279

IRB00009279
Enhancing Linkages to HIV Primary Care and Services in Jail Settings Initiative

Thank you for submitting a renewal application for this protocol. The Emory IRB reviewed it by the expedited process on 08/08/2013, per 45 CFR 46.110, the Federal Register expeditable categories F(7), Subpart C section 46.306(a)(1) and (a)(2)(iv). This re-approval is effective from **08/08/2013** through **08/07/2014**. Thereafter, continuation of human subjects research activities requires the submission of another renewal application, which must be reviewed and approved by the IRB prior to the expiration date noted above.

Any reportable events (e.g., unanticipated problems involving risk to subjects or others, noncompliance, breaches of confidentiality, HIPAA violations, protocol deviations) must be reported to the IRB according to our Policies & Procedures at www.irb.emory.edu, immediately, promptly, or periodically. Be sure to check the reporting guidance and contact us if you have questions. Terms and conditions of sponsors, if any, also apply to reporting.

Before implementing any change to this protocol (including but not limited to sample size, informed consent, and study design), you must submit an amendment request and secure IRB approval.

In future correspondence about this matter, please refer to the IRB file ID, name of the Principal Investigator, and study title. Thank you.

Sincerely,

Carol Corkran, MPH, CIP
Interim Team Lead
This letter has been digitally signed

CC:	Bowden	Chava	Epidemiology
	Frew	Paula	MedInfect
	Jacob Arriola	Kimberly	Behavioral Science

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