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MAJOR ARTICLE

Reduced Sexual Risk Behaviors Among Persons With HIV After Release From the Criminal Justice System

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Background. HIV prevalence is 3 times greater for those in the criminal justice system than the general population, with an assumed increase in sexual risk behaviors (SRBs) postrelease. HIV viral suppression impacts HIV transmission; however, studies of SRBs among persons with HIV leaving the criminal justice system are limited, and no studies have examined viral suppression in relation to SRBs in persons leaving the criminal justice system.

Methods. Data were examined from 2 double-blind placebo-controlled trials of extended-release naltrexone among persons with HIV and alcohol use or opioid use disorder. Participants self-reported sexual activity, including number of sexual partners, sex type, and condom use. HIV viral suppression was evaluated prerelease and at 6 months.

Results. Thirty days before incarceration, 60% reported having sex compared with 41% and 46%, respectively, at months 1 and 6 postrelease. The number of sex partners and sexual intercourse events decreased from pre-incarceration to months 1 and 6 postrelease. Condom use increased but was not statistically significant. Of the 11 (9.7%) who reported having sex without a condom 1 month postrelease, only 2 did not have viral suppression (VS; HIV VL <200 copies/mL), whereas the 7 (6.5%) who reported SRBs at 6 months all had VS.

Conclusions. After release, SRBs decreased, and among those who reported SRBs, most were virally suppressed, and thus risk of transmitting HIV was low.

Keywords. alcohol use disorder; criminal justice system; HIV; opioid use disorder; sexual risk behaviors; viral suppression.

HIV prevalence is estimated to be 3 times greater among those involved in the criminal justice system (CJS) compared with the general population [1]. Although CJS-involved people with HIV (PWH) can achieve viral suppression (VS) before release, VS is often lost within 3 months after release to the community [2–4]. This occurs even when discharge planning, case management, and other social services are in place [5].

Viral suppression is critical to reduce HIV transmission. Several randomized controlled trials (HIV Prevention Trials Network and PARTNER Studies) showed no linked transmission of HIV in both same- and opposite-sex serodiscordant couples when the person with HIV is virally suppressed [6–9]. As CJS-involved persons have been shown to often lose viral suppression after release, achieving and maintaining VS among this group remains critical to reducing the transmission of HIV [3, 4].

Among CJS-involved populations, there is an assumed increase in sexual risk behaviors (SRBs) after release to the community [2, 10, 11]. Although some studies have shown a reduction in certain SRBs [12, 13], there was little reported change in other behaviors, such as condom use [14]. Over 60% of the US prison population meets criteria for a substance use disorder (SUD) [15], and drug use is associated with unprotected sex, exchanging sex for drugs, and sharing injection equipment [16]. Although treating SUDs can help reduce SRBs related to drug use, other risk factors also affect SRBs, including intimate partner violence, homelessness, and mental health disorders [17].

Studies of SRBs among CJS-involved persons with HIV are limited in that many assess baseline SRBs [10, 11, 18] or assess an intervention tailored to reduce SRBs [19–21]. There are 2 studies that examined risk behaviors pre-incarceration and postrelease; in 1 only 2% were PWH, and the prevalence of specific SUDs was unknown [22], and in another all participants were living with HIV, but the prevalence of SUDs was not reported [23]. Further, pre-incarceration and postrelease risk behaviors were analyzed separately [23].

No prior studies have addressed comorbid SUDs, nor have they assessed SRBs among CJS-involved persons with HIV in

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relation to HIV viral suppression, an important factor to consider given the results of the PARTNER studies [7, 8] and the potential impact on HIV incidence.

We evaluated SRBs among prisoners and jail detainees in Connecticut with HIV and opioid and/or alcohol use disorder who were enrolled in 1 of 2 randomized trials examining treatment with extended-release naltrexone (XR-NTX) [24–28]. Both studies found that treatment with XR-NTX improved or maintained VS 6 months postrelease [26, 27]. We report on SRBs during incarceration, changes in risk behaviors from pre-incarceration to after release to the community, and, among those who reported SRBs, their HIV VS status.

METHODS

Data were examined from 2 double-blind placebo-controlled trials of XR-NTX among prisoners with HIV and alcohol use disorder (n = 100) or opioid use disorder (n = 93) transitioning from correctional to community settings [24–28]. In each study, participants were randomly allocated 2:1 to receive 380 mg of XR-NTX or placebo with the first injection administered before release to the community. These studies were powered to detect changes in VS at 6 months between the randomized groups in an intention-to-treat analysis with SRBs as a secondary outcome. Descriptions of the trials' methods, eligibility criteria, primary outcomes, and ethical oversight have been previously published [24–28].

A total of 117 (61%) month 1 and 110 month 6 (57%) structured interviews were completed, and 85 participants (44%) completed both the month 1 and 6 interviews. In the month 6 interview questions, participants were asked how many of the past 30 days they spent in the community (not in jail/prison, drug/alcohol treatment, medical treatment, or transitional housing). We expected that those not in the community would be less likely to report having sex, and therefore not representative of persons in the community. The Fisher's exact test was used to assess the proportion of participants who reported having any sex among those in the community every day for the past 30 days compared with those who spent any time not in the community. The Kruskal-Wallis test was used to assess differences in SRBs by community status.

Participants self-reported SRBs through structured interview questions about the number of sexual partners, type of sexual intercourse (vaginal, anal receptive, and anal insertive), number of times they used a condom, and the HIV status of each sexual partner (unknown, negative, or positive). Participants received the same definition of each type of sexual intercourse to ensure that they understood the questions about sexual practices. Assessment time points that were analyzed included 30 days pre-incarceration for both studies (baseline); the previous 30 days of incarceration before release (OUD study) and the entire incarceration period (AUD study); and 1 and 6 months postrelease for both studies.

Changes in SRBs were analyzed for the following time periods to have power to detect changes in risk behaviors: (1) baseline to 1 month postrelease; (2) baseline to 6 months postrelease. Calculations of the total number of times participants reported having sex (any sex, stratified by vaginal, anal insertive, or anal receptive sex), the number of total sex partners, vaginal sex partners, anal insertive sex partners, anal receptive sex partners, and condom use (defined as percent condom use at each time point) were compared from baseline to months 1 and 6 postrelease using nonparametric tests (data were skewed). The Wilcoxon signed rank test was used to compare differences pre- and postrelease for SRBs and was chosen because it accounts for the sign of the changes (negative or positive) and magnitude of the differences.

As both studies' primary outcome was VS, HIV viral load was obtained prerelease and at 6 months. For this analysis, VS was defined as an HIV viral load <200 copies/mL, which is consistent with current research showing that VS at this level is associated with no HIV transmission [6, 9]. SRBs were categorized as (1) low risk (no sexual intercourse or consistent condom use) or (2) risky behavior (not using a condom at least once). McNemar's test was used to test for changes in SRBs from baseline to months 1 and 6 and stratified by HIV VS.

Bivariate analyses were done to assess if treatment with XR-NTX, the specific study participants were enrolled in, drug use, gender, age, and other baseline characteristics were associated with SRBs at months 1 and 6; all analyses were nonsignificant ($P > .20$), therefore, we determined that regression modeling would not be appropriate. Data were analyzed using SAS, version 9.4.

RESULTS

Baseline Characteristics

As depicted in Table 1, participants were mostly male (79%) and black (46%) or Hispanic (41%), with a mean age (SD) of 45 (8.3) years. Baseline VS (<200 copies/mL) at the time of release from prison/jail was 61% among all participants.

Retention

There was no difference in retention by treatment arm and no statistically significant differences in demographic characteristics including sex/gender for those who completed month 6 interviews compared with those who did not. Further, there were no differences in SRBs pre-incarceration for those retained vs not retained in the study at month 6.

Sexual Risk Behaviors: Baseline and During Incarceration

In the 30 days before incarceration, 60% (114/191) reported having any sexual intercourse, with 55% reporting vaginal sex, 8% anal insertive sex, and 6% anal receptive sex. During

Table 1. Baseline Characteristics

Variable Study	n = 193	(%)
Recruited participants with alcohol use disorder	100	(51.8)
Recruited participants with opioid use disorder	93	(48.2)
Randomization arm		
XR-NTX	133	(68.9)
Placebo	60	(31.1)
Gender		
Male	153	(79.3)
Female	38	(19.7)
Transgender	2	(1.0)
Race/ethnicity		
White	25	(13)
Black	88	(45.6)
Hispanic	80	(41.5)
Age, mean (SD), y	45.4	(8.3)
Completed GED or high school	99	(51.3)
Homeless or unstably housed (n = 192)	122	(63.2)
Length of incarceration, mean (SD), mo	12.4	(24.6)
Currently prescribed ART	168	(87.1)
Prescribed ART regimen (n = 167)		
Protease inhibitor	74	(38.3)
Non-nucleoside reverse transcriptase inhibitor	60	(31.1)
Integrase inhibitor	19	(9.8)
Combination	14	(7.3)
No. of XR-NTX injections received		
0	45	(23.3)
1	41	(21.2)
2	22	(11.4)
3	20	(10.4)
4	22	(11.4)
5	16	(8.3)
6	27	(14)
MINI (n = 185)		
Major depressive disorder	38	(19.7)
Bipolar disorder	27	(14)
PTSD	23	(11.9)
Generalized anxiety disorder	19	(9.8)
Substance use disorder via the MINI		
Cannabis	34	(17.6)
Cocaine	121	(62.7)
Opioid	92	(47.7)
Alcohol	106	(54.9)
HIV-RNA VL <200 copies/mL	117	(60.6)
HIV-RNA VL <50 copies/mL	99	(51.3)
HIV viral load, mean (SD), copies/ mL	10 725.1	(52 925.7)
CD4 count, mean (SD), cells/mL	502.0	(287.5)

Abbreviations: ART, antiretroviral therapy; GED, general education development; MINI, Mini-international neuropsychiatric interview; PTSD, post-traumatic stress disorder; XR-NTX, extended-release naltrexone.

incarceration, 4% (7/158) reported having any sexual intercourse (1 from the AUD study, 6 from the OUD study), with a gender distribution of 5 males and 2 females. The number of sex partners ranged from 1 to 2. Four participants reported vaginal sex, 2 reported anal insertive sex, and 1 reported both types. Four participants reported any condom use, whereas 3 reported no condom use when they had sex during incarceration.

Sexual Risk Behaviors: Changes From Pre-incarceration to Months 1 and 6 Postrelease

Data were available for 116 participants from pre-incarceration to 1 month postrelease. During month 1, 41% (47/116) reported having any sex, 37% vaginal sex, 3% anal insertive sex, and 3% anal receptive sex. The total number of sex partners and vaginal sex partners decreased from pre-incarceration to month

Table 2. Month 6 Community Status and Sexual Risk Behaviors

Location in the 30 Days Before Month 6 Interview	No.	Days not in Community, Mean (SD)	Median Days (IQR)	% who Reported Having Sex[a]	No. of Times Had Sex, Mean (SD)[a]	No. of Vaginal Sex Partners, Mean (SD)[a]	No. of Anal Receptive Sex Partners, Mean (SD)	No. of Anal Insertive Sex Partners, Mean (SD)
In community	72	NA	NA	46	3.74 (6.36)	0.56 (0.84)	0.08 (0.33)	0.02 (0.13)
Not in community	37	23.8 (9.96)	30 (31–30)	24	1.47 (3.69)[b]	0.36 (0.93)	0.02 (0.17)	0.03 (0.17)
Reincarceration (jail or prison)	23	23.5 (10.37)	30 (14–30)	26	1.82 (4.40)[b]	0.39 (1.08)	0.09 (0.29)	0.05 (0.21)
Alcohol or drug treatment	9	21.9 (11.26)	30 (19–30)	22	0.89 (2.32)	0.22 (0.44)	0.00 (0.00)	0.00 (0.00)
Other (shelter, halfway house, medical treatment)	5	28.6 (3.13)	30 (30–30)	20	1.00 (2.24)	0.40 (0.89)	0.00 (0.00)	0.00 (0.00)

Abbreviation: IQR, interquartile range.

[a]*P* values comparing in community vs not in community: % who reported sex $P = .038$ (Fisher exact test); No. of times had sex $P = .021$; and No. of vaginal sex partners $P = .068$ (Kruskal Wallis test).

[b]Excludes 1 statistical outlier who reported having sex 50 times, if included (mean = 3.91).

1 ($P = .002$ and $P < .001$, respectively). The number of times participants reported sexual intercourse with partners with either negative or unknown HIV status decreased from baseline to month 1 ($P < .001$ and $P = .034$) (Table 3).

Data were available for 109 participants from preincarceration to 6 months postrelease. At month 6, 66% (72/109) of the participants reported being in the community every day for the past 30 days. Of the remaining 37 participants, 23 reported being incarcerated, 9 were in alcohol or drug treatment inpatient programs, and 5 were in other medical treatment or transitionary housing/halfway housing programs. The average number of days spent not in the community (SD) was 23.8 (10.0), and 62% spent 30 days not in the community (Table 2). Those in the community were more likely to report having sexual intercourse compared with those not in the community (46% vs 24%; $P = .038$). Therefore, month 6 analyses were restricted to only those participants who reported being in the community every day for the past 30 days.

Among those in the community at month 6, 46% (33/72) reported having any sexual intercourse, 42% vaginal sex, 1% anal insertive sex, and 7% anal receptive sex. The total number of vaginal sex partners decreased from baseline to month 6 ($P = .017$) (Table 3). The number of times participants reported sexual intercourse with partners with unknown HIV status decreased from baseline to month 6 ($P < .001$). Condom use increased slightly, but changes were not statistically significant at either time point (Table 3).

Changes in Risk Behaviors and HIV Viral Suppression

From baseline to 1 and 6 months postrelease, more participants changed their sexual behavior from high to low risk, and few changed from low- to high-risk behavior (McNemar's, both time points, $P < .001$) (Table 4). At month 1, 2% were engaging in high-risk behaviors and not virally suppressed, whereas at month 6, 0% were.

DISCUSSION

This is one of few published studies that has assessed changes in sexual risk behaviors before and after a period of incarceration. Study participants were all living with HIV and had at least 1 substance use disorder. To our knowledge, this is the first study

Table 3. Changes in Sex Risk Behaviors From Baseline to 1 and 6 Months Postrelease

	Baseline to 1 Month Postrelease (n = 116)			Baseline to 6 Months Postrelease (n = 72), in Community		
Measure	Baseline Mean	Mean Change	*P* (Sign Rank)	Baseline Mean	Mean Change	*P* (Sign Rank)
Total sex partners (OUD study only)	2.09	–1.33	.002	1.37	–0.74	.189
No. of vaginal sex partners	1.36	–0.80	<.001	1.25	–0.61	.017
No. of anal receptive partners	0.28	–0.25	.160	0.08	0.00	1.000
No. of anal insertive partners	0.28	–0.23	.041	0.56	–0.55	.063
No. of times had sex	10.34	–7.27	<.001	7.17	–3.37	.066
No. of times had sex w/ partners with unknown HIV status	2.92	–2.62	<.001	1.93	–1.48	<.001
No. of times had sex w/ partners with negative HIV status	5.91	–3.95	.034	4.25	–1.75	.701
No. of times had sex w/ partners with positive HIV status	1.51	–0.70	.124	0.89	–0.10	.586
% times used condom	62.19	+10.8	.195	74.69	+7.92	.461

Abbreviation: OUD, opioid use disorder.

Table 4. Changes in Risk Behaviors and HIV Viral Suppression

Time Points	High to Low Risk, No. (%)	Low to High Risk, No. (%)	High Risk Total at Follow-up, No. (%)	High Risk, not VS, No. (%)	Mcnemar's Test for Changes in Risk Behavior, *P*
Baseline to month 1 (n = 114)	19 (17)	3 (3)	11 (10)	2 (2)	<.001
Baseline to month 6 (n = 107)	22 (21)	3 (3)	7 (7)	0 (0)	<.001

Abbreviation: VS, viral suppression.

to assess changes in SRBs from pre-incarceration to postrelease among this population, and the first to do so in conjunction with HIV viral suppression. Most participants maintained or achieved VS postrelease; therefore, the risk of transmitting HIV to an HIV-negative sexual partner decreased. Among participants who reported SRBs postrelease, most were virally suppressed, and those who were not reported condom use. Hence, the risk of HIV transmission among this group was determined to be low [7, 8].

After release, participants reported a decrease in the number of sexual partners and events compared with pre-incarceration, which is similar to Adams et al.'s findings of decreased cumulative risk of HIV risk behaviors from pre-incarceration to postrelease [22]. It is possible that relationships ended during the incarceration period and no new sexual partners were found postrelease or that relationships continued and offered stability. Khan et al. suggest that a primary intimate relationship offers stability to incarcerated persons with HIV and protects against risky sexual behaviors [29].

Condom use increased from pre-incarceration to both 1 and 6 months postrelease; however, most participants reported high condom use before incarceration (62%), which may explain the small changes that were not statistically significant. This is consistent with other studies that have shown increases in condom use after release from the criminal justice system [22, 23].

Few participants reported having sexual intercourse during incarceration, with few sexual partners. Condom use varied during incarceration: 3 participants reported using condoms at every sexual event, 1 reported some condom use, and 3 reported no condom use. We do not have information on the sex partners (eg, consensual or forced sexual intercourse with other inmates; spouse/partner during conjugal visit), but we posit that this may explain differences in condom use. Studies typically do not ask about sexual activity during incarceration, likely due to potential legal ramifications and reporting requirements; however, some studies have noted a high prevalence of sexual encounters among those who are incarcerated, with higher rates among those who identify as gay or bisexual [30–32]. There were differences in reporting periods for the alcohol use disorder (entire incarceration) and opioid use disorder studies (past 30 days of incarceration) for the number of times participants reported having sex. We expected more reports from the alcohol use disorder study, where the reporting time frame was longer; however, all but one of those reporting having sex while incarcerated were from the opioid use disorder study. Given the differences in reporting time and the small number of participants who reported having sex, it would have been inappropriate to conduct analyses on this variable.

No differences in SRBs were identified in those treated with placebo compared with XR-NTX at 6 months when controlling for status in the community (data not shown). Neither parent study was powered to detect changes in SRBs based on randomized treatment group. However, both parent studies whose primary outcome was VS at 6 months found improved rates of VS among those treated with XR-NTX as compared with placebo [26, 27].

Those not in the community (ie, in jail/prison or drug/alcohol treatment) at 6 months were less likely to report having sexual intercourse and reported fewer sexual events than those in the community, with availability of sexual partners being a likely contributing factor. This poses a major methodological challenge when studying outcomes in CJS-involved and other transient populations, and if not accounted for, it may lead to misconceptions about behaviors and how they change over time. We chose to exclude those not in the community from our analyses, which affected the power to detect changes over time but provided an unbiased estimate of changes in SRBs.

Several interventional studies aimed at reducing risk behaviors among CJS-involved populations have been conducted. In both Positive Transitions (POST) and the ecosystem-based intervention by Reznick et al., participants reduced SRBs pre- incarceration to postrelease; however, in each study, there were no differences in SRBs between the intervention and control groups [19, 21]. Providing directed interventions to reduce SRBs was unlikely to change or decrease risk behaviors. These findings, in conjunction with the results of our analysis, indicate that interventions should ensure that those living with HIV who are leaving the CJS transition immediately to HIV medical care and SUD treatment. This will help to ensure that these individuals have continual access to antiretroviral therapy (ART) and SUD treatment and receive the necessary support to remain in care, adhere to their medications, and remain virally suppressed.

Medication treatment of opioid and alcohol use disorder has been shown to improve HIV VS [33], as was found in the parent studies [26, 27], and thus reduce HIV transmission, which could have a considerable public health and economic impact. HIV is

a costly disease, and there are large economic benefits associated with reducing HIV incidence. Shackman et al. estimated that the direct medical cost saved by avoiding 1 HIV infection is $229 800 [34]. In the recent outbreaks of HIV in Northeastern Massachusetts and Seattle, Washington, a large proportion of those with new HIV infection were women who reported exchanging sex for injection drugs [35, 36]. Reducing SRBs, testing for HIV, increasing PrEP utilization, and increasing access to substance use treatment are crucial, as there are communities that use drugs who are at risk for HIV through both sharing needles and sex [37]. SUD treatments that increase rates of VS among persons with HIV could have a large impact on HIV transmission and incidence.

This analysis has some limitations; first, it is focused on secondary outcomes from 2 randomized trials of XR-NTX that were not powered to detect changes in SRBs. This population is difficult to retain in health care and research, resulting in incomplete data for the follow-up time points; however, the retention rate of 56% is consistent with other studies of people leaving the CJS with SUDs and with SUD treatment studies [14, 38–40]. It is possible that those who were lost to follow-up were more likely to engage in risky sexual behaviors and less likely to be virally suppressed. Few participants reported anal insertive or receptive sex, especially at the follow-up time points analyzed, and thus changes in this type of sexual behavior were not detected. It is possible that among this group there was increased knowledge about reducing HIV transmission, which could explain why few engaged in risky sexual behaviors. Despite these limitations, findings from these analyses do suggest a reduction in SRBs, increased viral suppression, and thus decreased risk of HIV transmission.

CONCLUSIONS

These findings, in combination with the 2 original studies' primary outcomes, suggest that after release to the community, CJS-involved persons with HIV and co-occurring SUDs reduce their sexual risk behaviors and have improved HIV viral suppression. Thus, the initiation and maintenance of medication treatment for opioid and alcohol use disorders in conjunction with ART can improve HIV viral suppression and reduce risk of HIV transmission. We recommend that the criminal justice system increase capacity to screen for opioid and alcohol use disorders and initiate Food and Drug Administration–approved medication treatments before release with community linkage. Such a continuum of care for the treatment of opioid and alcohol use disorders could improve individual health via reducing relapse and, among those with HIV, improve viral suppression. Additionally, this will help improve public health through reduced HIV transmission to the uninfected among those who engage in high-risk behaviors.

Supplementary Data

Supplementary materials are available at *Open Forum Infectious Diseases* online. Consisting of data provided by the authors to benefit the reader, the posted materials are not copyedited and are the sole responsibility of the authors, so questions or comments should be addressed to the corresponding author.

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