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Adherence to HIV treatment and care among previously homeless jail detainees

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Abstract

HIV-infected persons entering the criminal justice system (CJS) often experience suboptimal healthcare system engagement and social instability, including homelessness. We evaluated surveys from a multisite study of 743 HIV-infected jail detainees prescribed or eligible for antiretroviral therapy (ART) to understand correlates of healthcare engagement prior to incarceration, focusing on differences by housing status. Dependent variables of healthcare engagement were: 1) having an HIV provider, 2) taking ART, and 3) being adherent (>95% of prescribed doses) to ART during the week before incarceration. Homeless subjects, compared to their housed counterparts, were significantly less likely to be engaged in healthcare using any measure. Despite Ryan White funding availability, insurance coverage remains insufficient among those entering jails, and having health insurance was the most significant factor correlated with having an HIV provider and taking ART. Individuals interfacing with the CJS, especially those unstably housed, need innovative interventions to facilitate healthcare access and retention.

Keywords

HIV; AIDS; Homelessness; jail; incarceration; substance abuse; alcohol; insurance; Adherence; healthcare access

Introduction

The United States has the highest incarceration rate of any industrialized country with an average daily census of over 760,000 jail detainees and more than 13 million adult admissions to jails annually (1, 2). The overwhelming majority of jail detainees return to the community, and 50% of jail detainees are released within 48 hours (3). After incarceration, the transition to the community is a vulnerable period, as former inmates often have difficulty obtaining housing, finding employment, and accessing health care (4–6). Little is known, however, about the vulnerability of individuals in the period just before incarceration.

Moreover, the post-release transitional period is better described for HIV-infected prisoners than for jail detainees. Compared to prisons, jails generally house inmates who are either unsentenced or sentenced to shorter terms (less than 12 to 24 months). Among HIV-infected former prisoners, the benefits of antiretroviral therapy (ART) seen during imprisonment (increased CD4 cell count and high rates of viral suppression) are frequently lost after release to the community (7, 8). The reasons for these poor outcomes are complex and not fully understood (9). For example, despite medication assistance programs that guarantee

free antiretroviral medications after release, only 5% of Texas prisoners obtained their HIV medications within 10 days of release – when their discharge supply of medications would have been exhausted (10). Additionally, relapse to drug or alcohol use immediately post-release, may contribute to poor outcomes. HIV-infected prisoners meeting criteria for opioid dependence who initiated buprenorphine at the time of prison-release, maintained their viral suppression during the vulnerable post-release period, confirming that effective substance abuse treatment improves previously described post-release outcomes (11). Reasons for disrupted prescription refills and poor adherence to HIV care following prison release are therefore multifactorial and may include relapse to substance use, untreated mental health issues, social instability including homelessness, and lack of medical insurance (4–6, 12–15).

Approximately 23–68% of homeless individuals have a history of incarceration (16, 17). Homelessness increases incarceration risk through common risk behaviors, such as substance abuse and transactional sex, and the criminalization of homelessness (5, 16–19). Incarceration also increases risk of homelessness through loss of employment, loss of housing, and disruption of social support or medical or social benefits (5, 17). Among non-incarcerated people living with HIV/AIDS (PLWHA), homelessness and unstable housing have been associated with suboptimal HIV outcomes including poor adherence to HIV medications, fewer primary care visits, and increased risk of death (4, 20, 21). Therefore, homelessness and incarceration may synergistically exacerbate the risk for poor HIV treatment outcomes.

Approximately one in six PLWHA pass through the criminal justice system (CJS) annually (22), suggesting that the CJS is an opportune setting to identify new HIV diagnoses, initiate HIV treatment, and retain persons in care (23). Although some inmates are only adherent to medications while incarcerated, even intermittent ART has been demonstrated to provide immunological and virologic benefit compared to those who never received ART (24). Thus, jail settings may represent a unique point for public health interventions among these HIV-infected individuals.

Linking HIV-infected inmates to HIV primary care services upon release from correctional settings is essential to improving health outcomes among the recently incarcerated. The transition to the community is a highly vulnerable time for former inmates, and the additional complication of social instability and homelessness may exacerbate their risk of poor HIV outcomes. Individuals who experience homelessness prior to incarceration may experience additional challenges to maintaining adherence to medications or having a regular HIV provider. In recognition that the time of incarceration provides a unique window to retrospectively assess the relationship of PLWHA to healthcare access and utilization, the objectives of these analyses were to compare homeless and non-homeless individuals prior to incarceration and (1) describe their differences in demographic profile, substance use, and mental health history; (2) examine factors associated with having an HIV treatment provider; and (3) understand the factors associated with HIV medication adherence. A more in-depth understanding of the interaction between homelessness and healthcare engagement, especially since homelessness, substance abuse, and mental illness are associated with reincarceration, would inform individual and public health post-release interventions from jails.

Theoretical/Conceptual Framework of Current Study

The Behavioral Model for Vulnerable Populations guided this analysis (25, 26). This model of healthcare utilization asserts that there are predisposing, enabling, and need factors that impact the utilization of health services. Figure 1 presents this model, adapted from Gelberg,

et al, with the factors impacting linkage to care that are most relevant to homelessness and incarceration (26). Predisposing factors are demographic and social structure characteristics intrinsic to the individual that impact healthcare utilization. In this population of jail detainees, we included current housing status and history of mental and substance use disorders (SUDs) as additional predisposing factors. Enabling resources are personal and community resources that facilitate linkage to care. In this vulnerable population, we regard food security, anticipated housing situation, health insurance, stable living situation, and history of drug or psychiatric treatment as enabling resources that positively affect linkage to care. Need factors are determined by an individual's perceived health needs or priorities, severity of disease and their actual health status. Need factors typically take into account medical co-morbidities and severity of illness, and in our study they included having active medical problems, psychiatric, or substance use disorders.

In this manuscript, we provide a snapshot of the degree to which HIV-infected persons are engaged in HIV care as they migrate into jail, primarily focusing on the differences between previously homeless and non-homeless individuals. The Health Resources and Services Administration (HRSA) describes a spectrum of engagement in HIV care ranging from those who are unaware of their infection and not receiving any HIV care to those that are fully engaged in HIV care (27). Gardner, et al further defined levels of engagement in care as those who are retained in HIV care, those who need and receive ART, and finally those who are adherent and achieve complete viral suppression (28). Compatible with this spectrum of engagement, we analyzed the following step-wise progression of engagement in care: (1) having an HIV provider, (2) taking prescribed ART in the seven days prior to incarceration, (3) and among those who report taking ART, the level of adherence to ART (figure 1). We used the period immediately prior to incarceration as a window into previous healthcare use, recognizing that the period of incarceration is a disruptive time in the lives of PLWHA.

Methods

We performed a cross-sectional analysis from a mid-term review of data from the baseline interviews of HIV-infected jail detainees enrolled in the Enhancing Linkages to HIV Primary Care and Services in Jail Settings Initiative.

Study setting

Enhancing Linkages to HIV Primary Care and Services in Jail Settings Initiative is a HRSA-funded Special Projects of National Significance (SPNS). This initiative funds ten sites in nine states (CT, GA, IL, MA, NY, OH, PA, SC, RI) to design, implement, and evaluate new methods for linking PLWHA who are recently released from jails to primary HIV medical care and ancillary services (29, 30). Although eligibility criteria differed slightly between sites, all sites recruited HIV-infected jail detainees aged ≥ 18 years. New York City excluded subjects with serious mental illness and Chicago included only women. Data were retrieved for the first 871 subjects enrolled from September 2007 to October 8, 2010. Since we were interested in engagement in HIV care prior to incarceration, we excluded individuals newly diagnosed with HIV during the current incarceration and those who did not meet criteria for ART (no history of antiretroviral therapy and CD4 count greater than 350 cells/mL) (n=126) (31). Of the remaining 745 individuals, only two did not have data regarding having an HIV provider and they were excluded from the analysis leaving a total study sample of 743 individuals, of which 312 (42%) were homeless and 431 (58%) were non-homeless persons.

The multisite study was approved by Rollins School of Public Health of Emory University and Abt Associates Institutional Review Board, and was approved and overseen by the

individual institutional IRBs as appropriate to the level of involvement at each site. A certificate of confidentiality was also obtained for the study.

Study Instruments

Dependent Variables of Interest—To assess the degree to which subjects were engaged in care just prior to incarceration, we chose three dependent variables based on HRSA guidance: (1) having an HIV provider at the time of incarceration, (2) having taken any ART in the seven days prior to incarceration, and (3) among those who reported taking ART prior to incarceration, having >95% self-reported adherence to the medications in the past seven days (32, 33).

Independent Variables of Interest—In accordance with the Behavioral Model for Healthcare Utilization, we analyzed the predisposing factors, enabling resources and need factors depicted in figure 1. The primary covariate of interest was housing status, which was classified as homeless versus non-homeless. Homelessness was defined by self-report, and individuals were also considered homeless if they reported sleeping in a shelter, streets or parks, empty building, bus station, or some other public place in the 30 days before incarceration. Demographic variables included gender, age, race/ethnicity, education level, marital status, and employment status. History of substance use and mental disorder were by self-report. Specifically, participants were asked about recent (30 days before incarceration) and lifetime substance use for each of the following substances: alcohol, heroin or other non-prescribed opioids, methadone, buprenorphine, barbiturates, other non-prescribed sedatives, cocaine, benzodiazepines, amphetamines, cannabis, hallucinogens, inhalants, and multiple drug use (more than one substance on any given day). Health beliefs regarding healthcare was not available for subjects.

Enabling resources of interest included health insurance status at time of incarceration, food security, anticipated housing status after release, and history of psychiatric or drug treatment, which were all determined by self-report. Food insecurity was defined as going without food for two or more days in the 30 days prior to incarceration. Information on social support was not available. Study site was also included as available resources differed by location.

Need factors included active medical problems and psychiatric or substance use severity, which were all determined by self-report. Individuals were considered as having “active medical problems” if they experienced a medical problem other than HIV in the 30 days before incarceration. Substance use severity was determined by the Addiction Severity Index (ASI) fifth edition (34, 35). ASI drug and alcohol composite scores (CS) were calculated with each ranging from zero to one with one indicating more severe disease (34–36). Severity of mental illness was ascertained from the ASI psychiatric component CS and was analyzed as both a linear and a dichotomous variable with cutoff at 0.22 since this has threshold has demonstrated 90% sensitivity and 71% specificity in identifying mental illness (34, 35, 37).

Statistical Analysis

All analyses were stratified by housing status to ensure assessing the relationship between any cofactor (e.g. substance abuse) with homelessness. Comparison of baseline characteristics was performed using Chi-square test for dichotomous variables and Student's t-test for continuous variables, specifying significance level of $\alpha=0.05$. For analysis of all three dependent variables, we performed univariate analysis using logistic regression examining all predisposing factors, enabling resources, and need factors as described above. Covariates with a $p<0.10$ on univariate analysis were included in the multivariate logistic

regression. Variance inflation factor analysis did not reveal any significant collinear variables. Effect modification was assessed for all the selected factors. Model comparison was done by likelihood ratio testing, using Akaike's information criterion (AIC) to assess model fit. All statistical analyses were performed using STATA 10.0 (College Station, TX).

Results

Table 1 compares the demographic, substance use, and medical and psychiatric profile between homeless (n=312) and non-homeless (n=431) HIV-infected jail detainees. The predominant profile for an enrolled jail detainee in this analysis was an unmarried, African-American man in his 40's who had never completed high school, was not regularly employed, had used illegal drugs in the past (with cocaine being the most common), and who had an HIV provider and was taking ART in the week prior to incarceration, but was less than 95% adherent with ART.

Stratification by housing status, however, identified some notable differences. Homeless individuals were more likely to report recent substance use (especially with alcohol, benzodiazepine, cocaine, any drug, or multiple concurrent drug use) and have co-morbid and more severe psychiatric illnesses than non-homeless individuals. Homeless individuals were also less likely to report having medical insurance, having an HIV provider, taking ART or being adherent to it.

Table 2 examines the independent correlates of having an HIV provider prior to incarceration among both the homeless and non-homeless jail detainees. Having health insurance was the most significant factor (AOR=4.5, 95% CI 2.2–9.2 among the non-homeless; AOR 4.7, 95% CI 2.5–9.0 among the homeless) associated with having an HIV provider prior to incarceration

Alcohol use influenced the likelihood of having a HIV provider differently among homeless and non-homeless jail detainees. For non-homeless detainees, any alcohol use during the 30 days prior to incarceration was associated with increased likelihood (AOR=2.3, 95% CI 1.2–4.6) of having an HIV provider, whereas for homeless detainees, increasing severity of alcohol use on the ASI was associated with decreased likelihood (AOR=0.20; 95% CI 0.04–0.90) of having an HIV provider. Among the homeless, expected homelessness or uncertainty about housing upon release was also associated with decreased likelihood of having an HIV provider (AOR=0.44; 95% CI 0.25–0.78).

In Table 3, homeless (n=271) and non-homeless (n=382) subjects were stratified to examine factors associated with ART use among those who reported whether or not they were taking ART in the seven days prior to incarceration. For all jail detainees, irrespective of housing status, having health insurance was the most significant factor associated with taking ART.

Among those reporting not being homeless, any drug use in the 30 days before jail was associated with a decreased likelihood of taking ART. On univariate analysis, recent cocaine use was also associated with decreased likelihood of taking ART, but the association was no longer significant on multivariate analysis nor did it improve the final model validity (data not shown).

Correlates of taking ART among the homeless were different. Having an active non-HIV-related medical problem was associated with an increased likelihood of taking ART, recent cocaine use decreased this likelihood. Moreover, unlike that found among the non-homeless group, food insecurity was associated with a more than 50% decreased likelihood of taking ART. Having health insurance, however, modified the effect of food insecurity among the homeless; homeless individuals who experienced hunger but who also had health insurance

had a 3.05 adjusted odds ratio (95% CI 1.24, 7.49) of taking their ART in the seven days prior to incarceration, compared to those who experienced hunger but had no health insurance (data not shown).

We examined factors associated with optimal adherence, defined as taking 95% of prescribed ART doses among the homeless (n=119) and non-homeless (n=236) who were on ART in the week prior to incarceration (Table 4). Sixty-two percent (n=147) of the non-homeless reported optimal adherence compared to 51% (n=61) of homeless individuals (p=0.05). Among the non-homeless, optimal adherence was associated with being single and not having active medical problems. There was a trend towards decreased adherence with alcohol use, cocaine use, and drug severity, although these were not statistically significant after adjustment for other covariates.

Among the homeless, non-Hispanic blacks and Hispanics were more likely to report 95% adherence to ART compared to non-Hispanic whites. Suboptimal adherence (<95%) was associated with experiencing food insecurity. None of the drug use or addiction severity variables were associated with medication adherence.

Discussion

In this multisite study of jail detainees with previously-diagnosed HIV, we confirmed that nearly half (42%) were homeless when they entered jail. The complicated interactions between homelessness and incarceration pose seemingly insurmountable challenges for engagement in HIV care. In this sample, homeless jail detainees were more likely to have a higher prevalence and increased severity of substance use, medical and psychiatric disorders than the non-homeless, suggesting the need for initiating or continuing treatment for both conditions during and after release from jail. Both psychiatric and substance use disorders are associated with decreased health care access and utilization, including adherence to antiretroviral therapy, among non-incarcerated populations (38). Substance use, specifically alcohol and cocaine use, significantly decreased likelihood of accessing HIV care (having an HIV provider and taking ART in the seven days prior to incarceration) among homeless individuals. Along every step of the continuum of engagement in HIV care (28), homeless individuals were less likely to be engaged in care when compared to non-homeless jail detainees, suggesting the need for interventions that incorporate special provisions to address homelessness in both community and jail-release interventions.

Guided by the Behavioral Model for Vulnerable populations (Figure 1), we focus our discussion primarily on the modifiable factors critical to jail detainees, with an independent assessment of the contribution of homelessness on HIV health outcomes. Importantly, for all jail detainees irrespective of their housing status, having health insurance prior to arrest was the most important factor associated with having an HIV provider and taking ART in the week before incarceration. Multiple factors may contribute to an inability to obtain health insurance. Private insurance is typically prohibitive to this patient population secondary to high costs and exclusion for HIV as a pre-existing condition. Employee-based insurance may be equally unreliable in this often-migratory population, as they cycle between communities and the criminal justice system. Acquiring public assistance, such as Medicaid, involves meeting strict poverty requirements (with limited eligibility for men) and qualification for Medicare disability requires a debilitating sickness, which does not include properly-managed HIV (39). Having acquired public assistance in the form of health insurance may, therefore, be an indication of illness severity in some settings where these entitlements are constrained. The Ryan White HIV/AIDS Treatment Modernization Act is the safety net and provider of last resort for PLHWA that theoretically allows all HIV-infected individuals to receive some modicum of medical care (40), but waiting lists, limited

providers, flat to decreased funding, and lack of awareness of the program by both patients and non-HIV providers remain as significant barriers. Ryan White is not an insurance plan. Having public entitlements such as health insurance require that an individual is socially organized enough to comply with the complicated and strict application processes, which is challenging for a population with such a high prevalence of active substance use and mental disorders. While it seems prudent and self-evident that the period of incarceration provides an opportunity to either establish health insurance or to ensure its continuity, federal disability benefits including Social Security disability insurance along with Medicaid or Medicare coverage during incarceration are unfortunately discontinued (rather than suspended) in most states upon incarceration (10) and may require several months before reinstatement (10, 41, 42). Efforts to address this enabling resource either through the advent of affordable healthcare coverage with the proposed healthcare reform or through suspension rather than disenrollment of inmates from public entitlements, may contribute greatly to HIV outcomes, especially when integrated with effective treatment of substance use and psychiatric disorders.

Among homeless individuals, other important enabling factors are those involving the competing needs for survival. In accordance with Maslow's Hierarchy of Needs, individuals have pressing needs for survival and sustenance, and they must address these basic needs (food, shelter, safety) before they can address secondary needs (i.e., healthcare engagement) (43). Struggles with food insecurity or finding adequate housing can often interfere with ability to maintain linkages to HIV care or proper medication adherence (4, 21, 44). Among homeless jail detainees, unstable or unknown housing status upon release and food insecurity decreased likelihood of having an HIV provider and taking ART, respectively. Food insecurity, in our homeless sample, was associated with suboptimal adherence to ART, similar to findings in sub-Saharan Africa (45–47), suggesting that there are incredible pockets of poverty and healthcare inequity even within resource rich countries. We noted, however, that having health insurance modified the effect of food insecurity, as food insecurity decreased the likelihood of having a HIV provider only among those without health insurance. Having health insurance may indicate an existing linkage to care and thus, access to other resources that may have attenuated access to food. Addressing the needs of housing among jail detainees at risk for homelessness upon release is essential to improving their adherence to HIV care and medications. Ensuring that there is no gap in health insurance coverage may also attenuate some of the effects of food insecurity on medication adherence.

Need factors relevant to this vulnerable population include the presence of active psychiatric illnesses. HIV-infected inmates are more likely to have psychiatric disorders compared to their uninfected counterparts, and inmates with mental illness often have a history of homelessness (48, 49). The high prevalence of severe depression or anxiety in our study is of concern because depression has been associated with decreased adherence (50, 51). Fortunately, depression is treatable using relatively safe and inexpensive medications with little known drug interactions with HIV therapeutics (52). Treatment of mental illness has been shown to improve HIV outcomes among depressed, HIV-infected homeless and drug-using individuals (51, 53). Receiving outpatient psychiatric treatment increased the likelihood of having an HIV provider, suggesting that treatment of psychiatric disorders facilitates access to HIV primary care services or alternatively, having HIV primary care is associated with screening and treatment for psychiatric disorders. Irrespective of the direction, there is a need to ensure access to coordinated healthcare services for this population.

Similarly, having stable housing improves mental health, which was confirmed by the Housing and Health study in which homeless or unstably-housed, HIV-infected individuals

who received housing-assistance services had greater improvement in their mental health scores compared to those who received standard case management services (21). It remains unclear, however, whether addressing the housing needs using a “Housing First” model or addressing the psychiatric disorder would have a greater impact on health outcomes in this population. Either approach, however, would need to address evidence-based treatment for substance use disorders, particularly those with the triple diagnoses (homelessness, mental illness, and drug dependence), because there is often an intertwined and revolving cycle between homelessness and the criminal justice system in the context of active drug or alcohol use in the U.S. (48, 49, 54–56)

Overall, the prevalence of active drug use and increased severity was higher among the homeless than non-homeless, and although drug use was not associated with having an HIV provider, it was associated with decreased likelihood of taking ART and with suboptimal adherence. In the total U.S. jail population, over two thirds of inmates admit to regular substance use, and in this HIV-infected cohort, 79% reported using any drug within 30 days of incarceration (57). Among non-incarcerated PLWHA, ART adherence is decreased among active drug users compared to former drug users or non-users (58, 59). Interventions such as provision of directly administered antiretroviral therapy (DAART) to PLWHA with substance use disorders significantly improve adherence and virologic outcomes (60–64). Unfortunately, this is a resource-intensive strategy, and improvements are time-limited and regress to the mean after the intervention has ended (65). Medication-assisted treatment (MAT) for opioid dependence has been shown effective in decreasing substance use as well as decreasing HIV risk behavior and improving HIV treatment outcomes (11, 66–71). Treatment with MAT, particularly for longer time periods, is associated with improved HIV treatment outcomes (72, 73). Currently, inmates are rarely started or even continued on opioid agonist treatment (buprenorphine or methadone) when incarcerated although MAT started prior to or upon release from prison has proven feasible and effective in this high-risk population (11, 74). Cocaine use, prevalent among this study population and among jail detainees in general, negatively contributes to HIV treatment outcomes. MAT targeting cocaine use is currently not available and even the promise of an effective cocaine vaccine (75) may not be effective in persons with compromised immune systems. The high prevalence of drug use and its negative association with taking ART and on ART adherence highlight the importance of incorporating effective drug treatment strategies as part of effective interventions among this population.

Alcohol use disorders (AUDs) remain a major problem among incarcerated persons as 66% of U.S. inmates admit to regular alcohol use and 33% were under the influence of alcohol at the time of offense (57). Alcohol use disorders negatively impact HIV treatment outcomes (76). Among homeless HIV-infected jail detainees increasing severity of alcohol use decreases likelihood of having a HIV provider among the homeless, but not among their housed counterparts. In addition, alcohol use in the month prior to incarceration was associated with a lower prevalence of suboptimal adherence among the non-homeless and because of the small sample size, only a trend of suboptimal adherence and alcohol use among the homeless. This is consistent with previous studies that have found recent alcohol use also associated with poor adherence to ART (76–78). Paradoxically, recent alcohol use among non-homeless individuals was associated with an increased likelihood of having an HIV provider. Recent alcohol use may be a marker, however, for more moderate alcohol use and not with the more chaotic use and destabilizing lifestyles associated with those with alcohol dependence and abuse or even hazardous drinking (76). The differential effect of alcohol on healthcare utilization is likely secondary to the heterogeneous definitions used for describing alcohol use disorders in research studies (76). In this analysis the definition of alcohol use was any use in the last 30 days, and therefore this broad definition does not necessarily constitute an alcohol use disorder (76). The alcohol section of the ASI, however,

does indicate severity of alcohol use, and there is overwhelming evidence that alcohol use is associated with worse virologic outcomes and poor adherence to ART (76–78). It is therefore crucial to consider the use of contemporary and effective MAT for AUDs, including use of extended release naltrexone, especially for those transitioning through the CJS (79).

There are several limitations to this analysis. This study is limited by its cross-sectional nature and relying on self-report for our health care utilization measures. In addition, there are several predisposing and need factors and enabling resources that were not measurable with the data available that may have independently contributed to outcomes. For example, personal health beliefs, the concurrent use of MAT to treat SUDs and the degree to which social support was available were not included in our analysis. Variation in pill burden and side effects of various ART regimens, known variables affecting adherence, were also not available to be included in our analysis. Though we limited the assessment period of medication adherence to seven days prior to incarceration to reduce recall bias (80), this period may reflect social instability for a number of reasons, including homelessness, drug use and/or unbridled mental illness. Irrespective of other concomitant contributions to the preincarceration instability, however, it nonetheless results in poor healthcare utilization and poor ART adherence that may complicate HIV treatment outcomes. Also, though self-report is a well-validated tool to assess a number of our dependent and independent variables, the timing between incarceration and the survey varied by site, potentially introducing recall bias. Notwithstanding these limitations, this serves as the largest study to date examining HIV treatment outcomes among those who enter through jail and provides a glimpse of the care (or lack thereof) that was afforded to these homeless and non-homeless individuals while in community settings. It provides considerable insight into the need to develop and implement evidence-based community and jail-release interventions for this particularly vulnerable and understudied population.

Conclusion

Among HIV-infected individuals, the interconnected web of homelessness and incarceration is often complicated by substance use and mental illness, all of which can impact engagement in HIV care. Despite the safety net provided by Ryan White coverage for medical care, having health insurance still remains an important component to optimal HIV treatment outcomes. In addition, addressing the fundamental needs of housing and food is an essential factor in ensuring adherence to care among homeless jail detainees. The Enhancing Linkages Initiative will allow us to explore the effectiveness of enhanced case management services in addressing these needs and the impact this has on HIV care.

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Figure 1.

Conceptual model of health behaviors among the HIV-infected persons during the pre-incarceration period

Abbreviations: *ART* Antiretroviral therapy

Table 1

Demographic and risk behavior profiles of HIV infected jail detainees, stratified by pre-incarceration housing status

	Not homeless N=431 (%)	Homeless N=312 (%)	p-value
Demographics			
Male	298 (69.1%)	194 (62.4%)	0.07
Transgender	6 (1.4%)	7 (2.3%)	0.14
Mean age, years (SD)	44.7 (8.6)	43.3 (8.2)	0.02
Never completed high school	213 (49.6%)	165 (53.2%)	0.35
Not in a relationship	272 (63.4%)	233 (74.7%)	0.001
Non-Hispanic White (referent)	62 (14.4%)	45 (14.4%)	
Non-Hispanic Black	259 (60.1%)	186 (59.6%)	0.95
Hispanic	110 (25.5%)	81 (26.0%)	0.95
Sexual orientation: Heterosexual	340 (79.1%)	242 (77.8%)	0.73
Hunger: Went for 2 days without food	92 (21.5%)	188 (60.7%)	<0.001
Anticipated housing on release: homeless/unknown	105 (24.5%)	132 (42.7%)	<0.001
Age <18 years at first arrest	172(42.4%)	152 (50.0%)	0.05
Regular employment (full or part time) over the last 3 years	75 (17.6%)	37 (12.0%)	0.04
Substance Use			
Drug use, ever:			
Heroin/opioids	187 (43.4%)	141 (45.2%)	0.63
Benzodiazepines	39 (9.3%)	45 (14.5%)	0.03
Cocaine	338 (79.3%)	263 (84.8%)	0.06
Any illegal drug	417 (96.8%)	304 (97.4%)	0.59
Multiple drugs	249 (61.6%)	214 (72.3)	0.003
Drug use, recent (30 days prior to incarceration):			
Heroin/opiate	118 (27.4%)	95 (30.5%)	0.36
Benzodiazepine	19 (4.5%)	38 (12.3%)	<0.001
Cocaine	195 (46.0%)	197 (63.8%)	<0.001
Any illegal drug	324 (75.2%)	259 (83.0%)	0.01
Multiple drugs	167 (41.1%)	168 (57.0%)	<0.001
Alcohol use, recent (30 days prior to incarceration)	179 (42.0%)	161 (51.9%)	0.009
Ever experienced Delirium tremens	42 (9.9%)	45 (14.6%)	0.05
Ever been in Alcohol treatment	108 (25.5%)	90 (30.2%)	0.16
Ever been in Drug treatment	301(71.0%)	227 (73.7%)	0.39
Addiction Severity, mean (SD) ASI score-Drugs	0.19 (0.15)	0.26 (0.16)	<0.001
Addiction Severity, mean (SD) ASI score-Alcohol	0.20 (0.21)	0.26 (0.24)	<0.001
Medical and Psychiatric Co-morbidities			
Tuberculosis	10 (2.3%)	9 (2.8%)	0.63
Hepatitis B	32 (7.4%)	29 (9.3%)	0.35
Hepatitis C	148 (34.3%)	131 (42.0%)	0.03

	Not homeless N=431 (%)	Homeless N=312 (%)	p-value
Active other medical problems	154 (36.4%)	148 (48.7%)	0.001
Had insurance at time of incarceration	352 (81.9%)	210 (67.3%)	<0.001
Type of Insurance at time of incarceration			
Medicaid	279 (64.7%)	169 (54.2%)	0.004
AIDS Drug Assistance Program	48 (11.1%)	33 (10.6%)	0.81
Medicare	23 (5.3%)	20 (6.4%)	0.54
Private/Other/Don't know	79 (18.3%)	39 (12.5%)	0.032
Inpatient treatment for psychiatric problems	125 (29.3%)	132 (43.3%)	<0.001
Outpatient treatment for psychiatric problems	107 (24.8%)	108 (34.6%)	0.004
Prescribed psychiatric medications: 30 days prior to jail	101 (23.4%)	90 (29.2%)	0.09
Experienced severe depression/anxiety: 30 days prior to jail	225 (52.1%)	202 (64.7%)	0.001
Addiction Severity, mean (SD) ASI score-Psychiatric	0.15 (0.20)	0.20 (0.31)	0.006
Severe psychiatric illness (ASI>0.22)	123 (28.5%)	122 (39.1%)	0.003
Engagement in HIV Care			
Had an HIV provider 30 days prior to incarceration	355 (82.4%)	202 (64.7%)	<0.001
Took HIV medication in 7 days prior to incarceration	238 (62.3%)	123 (45.4%)	<0.001
High antiretroviral adherence (≥95%) in 7 days prior to jail	N=236 147 (62.3%)	N=119 61(51.3%)	0.05

Abbreviations: *SD*= standard deviation; *ASI*=Addiction Severity Index

Table 2

Factors associated with having an HIV provider among homeless and non-homeless jail detainees *

	Non-homeless, n=431		Homeless, n=312	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Gender				
Male	Referent	Referent	Referent	Referent
Female	0.66 (0.39, 1.12)	1.14(0.52, 2.49)	1.03 (0.63, 1.67)	0.89 (0.47, 1.66)
Age (years), continuous	1.04 (1.01, 1.07)	1.02 (0.99, 1.06)	1.01 (0.98, 1.04)	1.02 (0.98, 1.06)
Anticipated Housing Upon Release				
Has place to live	Referent	--	Referent	Referent
Homeless/unknown	0.69 (0.40, 1.20)		0.69 (0.43, 1.10)	0.44 (0.25, 0.78)
Heroin/opiate use: ever				
No	Referent	Referent	Referent	--
Yes	2.30 (1.33, 3.96)	1.71 (0.85, 3.44)	1.10 (0.69, 1.76)	
Multiple drug use: more than one illicit substance, past 30 days				
No	Referent	Referent	Referent	Referent
Yes	0.66 (0.40, 1.09)	0.53 (0.26, 1.05)	0.60 (0.37, 0.99)	0.58 (0.32, 1.06)
Alcohol use: any use, past 30 days				
No	Referent	Referent	Referent	Referent
Yes	1.47 (0.88, 2.47)	2.31 (1.15, 4.64)	0.79 (0.49, 1.26)	1.99 (0.93, 4.24)
ASI-Alcohol Composite Score	2.42 (0.64, 9.15)	2.37 (0.33, 17.04)	0.40 (0.16, 1.02)	0.20 (0.04, 0.90)
Health Insurance Prior to Jail				
No	Referent	Referent	Referent	Referent
Yes	6.19 (3.57, 10.76)	4.45 (2.15, 9.21)	4.89 (2.94, 8.13)	4.69 (2.46, 8.95)
Outpatient Psychiatric Treatment				
No	Referent	Referent	Referent	Referent
Yes	2.66 (1.32, 5.38)	2.45 (1.08, 5.54)	1.79, (1.08, 2.96)	2.54 (1.29, 4.99)

* also controlled for site

* univariate analysis also performed for education level, marital status, race/ethnicity, food insecurity, recent drug use (cocaine, benzodiazepines, marijuana, amphetamines, opiates, multiple drugs, or any drug use), ASI-drugs, history of drug or alcohol treatment, history of psychiatric hospitalization, ASI-psychiatric both dichotomous and continuous, outpatient psychiatric treatment, psychiatric medication use, hepatitis C co-infection, active medical problems, but none of these were significant either on univariate analysis or in the final model when incorporated if $p < 0.10$ in the univariate analysis.

Abbreviations: ASI=Addiction Severity Index

Table 3

Factors associated with taking antiretroviral therapy in the 7 days prior to incarceration

	Non-homeless, n=382		Homeless, n=271	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Gender				
Male	Referent	Referent	Referent	Referent
Female	0.47 (0.30, 0.75)	0.51 (0.29, 0.90)	0.54 (0.32, 0.90)	0.36 (0.17, 0.75)
Age, continuous	1.05 (1.02, 1.08)	1.04 (1.01, 1.07)	1.02 (0.99, 1.06)	1.01 (0.97, 1.06)
Completed high school or equivalent				
Yes	Referent	--	Referent	Referent
No	0.78 (0.52, 1.18)		0.62 (0.38, 1.01)	0.55 (0.29, 1.04)
Lived with a drug user: past 30 days				
No	Referent	--	Referent	Referent
Yes	1.06 (0.64, 1.76)		0.67 (0.41, 1.09)	0.75 (0.41, 1.40)
Food insecurity				
Did not experience hunger	Referent	--	Referent	Referent
Experienced hunger	0.67 (0.41, 1.12)		0.52 (0.32, 0.85)	0.49 (0.25, 0.95)
Health Insurance Prior to Jail				
No	Referent	Referent	Referent	Referent
Yes	2.99 (1.68, 5.31)	4.56 (2.16, 9.61)	4.29 (2.38, 7.71)	4.71 (2.21, 10.0)
Active medical problems				
No	Referent	--	Referent	Referent
Yes	0.73 (0.48, 1.13)		1.84 (1.13, 3.01)	2.65 (1.39, 5.06)
Cocaine use: past 30 days				
No	Referent	--	Referent	Referent
Yes	0.47 (0.30, 0.71)		0.30 (0.18, 0.50)	0.33 (0.15, 0.75)
Any substance use: past 30 days				
No	Referent	Referent	Referent	Referent
Yes	0.47 (0.28, 0.79)	0.45 (0.22, 0.88)	0.39 (0.20, 0.76)	0.99 (0.36, 2.74)
ASI-Drugs Composite Score	0.13 (0.03, 0.54)	0.50 (0.08, 3.21)	0.10 (0.02, 0.51)	2.01 (0.16, 25.6)
ASI-Alcohol Composite Score	0.37 (0.14, 0.96)	0.59 (0.20, 1.76)	0.61 (0.23, 1.66)	0.85 (0.23, 3.15)

* also controlled for site

* univariate analysis also performed for marital status, race/ethnicity, recent drug use (benzodiazepines, marijuana, amphetamines, opiates, multiple drug use), history of drug or alcohol treatment, recent alcohol use, history of psychiatric hospitalization, ASI-psychiatric both dichotomous and continuous, outpatient/inpatient psychiatric treatment, psychiatric medication use, hepatitis C co-infection, but none of these were significant either on univariate analysis or in the final model checking when incorporated if $p < 0.10$ in the univariate analysis.

Abbreviations: ASI=Addiction Severity Index

Table 4

Factors associated with optimal medication adherence (>95%) among non-homeless and homeless jail detainees who were taking medications 7 days prior to incarceration

	Non-homeless (N=236)		Homeless (N=119)	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Gender				
Male	Referent	Referent	Referent	Referent
Female	0.81 (0.43, 1.52)	1.17 (0.56, 2.24)	0.93 (0.41, 2.10)	0.91 (0.38, 2.19)
Age, continuous	1.00 (0.97, 1.03)	0.98 (0.95, 1.02)	1.02 (0.97, 1.07)	1.02 (0.97, 1.07)
Race/Ethnicity				
Non-Hispanic White	Referent		Referent	Referent
Non-Hispanic Black	0.72 (0.34, 1.56)	--	4.18 (1.25, 14.0)	5.12 (1.41, 18.5)
Hispanic	0.73 (0.31, 1.69)	--	5.38 (1.45, 20.0)	5.03 (1.30, 19.5)
Marital Status				
Married/committed	Referent	Referent	Referent	
Single/not in a relationship	1.79 (1.04, 3.06)	1.83 (1.04, 3.19)	0.59 (0.26, 1.34)	--
Food insecurity				
Did not experience hunger	Referent		Referent	Referent
Experienced hunger	1.03 (0.52, 2.03)	--	0.44 (0.21, 0.91)	0.41 (0.19, 0.89)
Active medical problems				
No	Referent	Referent	Referent	
Yes	0.47 (0.27, 0.83)	0.55 (0.31, 0.97)	0.51 (0.24, 1.06)	--
Had health Insurance				
No	Referent		Referent	
Yes	0.76 (0.30, 1.94)	--	2.01 (0.73, 5.53)	--
Any Cocaine use: past 30 days				
No	Referent	Referent	Referent	
Yes	0.48 (0.28, 0.83)	0.68 (0.35, 1.35)	0.56 (0.27, 1.17)	--
Any opiate use: past 30 days				
No	Referent		Referent	Referent
Yes	0.92 (0.51, 1.67)	--	0.30 (0.10, 0.91)	2.02 (0.78, 5.19)
Any Alcohol use: past 30 days				
No	Referent	Referent	Referent	
Yes	0.46 (0.27, 0.80)	0.56 (0.31, 0.99)	0.60 (0.29, 1.25)	--
ASI-Alcohol Composite	0.56 (0.15, 2.12)	--	0.90 (0.40, 2.03)	--
ASI-Drug Composite	0.15 (0.02, 0.98)	0.34 (0.03, 3.34)	2.86 (0.34, 23.9)	--
ASI-Psychiatric Composite	0.53 (0.10, 2.90)	--	0.59 (0.19, 1.80)	--

Univariate analysis also performed for education level, anticipated housing status upon release, recent drug use (benzodiazepines, amphetamines, multiple drug use, and any drug use), history of drug or alcohol treatment, outpatient/inpatient psychiatric treatment, psychiatric medication use, report of recent severe depression/anxiety, and hepatitis C co-infection, but none of these were significant either on univariate analyses or in the final model checking when incorporated if $p < 0.10$ in the univariate analysis.

Abbreviations: *ASI*=Addiction Severity Index