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April 21, 2014

Predictors of Emergency Department Use Among Jail Releasees Living With HIV/AIDS

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2009

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An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
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ABSTRACT

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The socioeconomic and public health relevance of HIV/AIDS remains a global health issue in the 21st century. People incarcerated constitute a significant proportion of individuals living with HIV/AIDS. Incarceration disrupts optimal access to and utilization of health care services. This observational study aims to evaluate the predictors of emergency department use among jail releases living with HIV/AIDS. To understand this relationship, a prospective cohort of 1,078 individuals living with HIV was evaluated in a ten-site demonstration using data from the EnhanceLink project. The study cohort was tracked from time of incarceration to six months post-incarceration. The effect of potential predictors of emergency department use among this population was analyzed. Linkage to care upon release, age at index incarceration, homelessness, pre-incarceration use of the emergency department, lack of medical insurance and mental instability were significantly associated with emergency department use. A holistic perspective involving primary health care provision, mental and socioeconomic rehabilitation is needed to ensure a sustained improvement on the health outcomes of released individuals living with HIV/AIDS. This would lead to a reduction in the transmission of HIV/AIDS and less use of the emergency department.

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INTRODUCTION

Human Immunodeficiency Virus (HIV), a retrovirus that primarily targets the immune system of humans, remains an unsolved global public health problem. This retrovirus in its advanced stage is called Acquired Immunodeficiency Syndrome (AIDS). In 2012, the World Health Organization (WHO) estimated that about 35 million people were living with HIV.[1] With over 40,000 reported new cases of the virus annually in the U.S, HIV/AIDS is reported to have claimed over 36 million lives globally, since it became known to the world in the early 1980s.[1, 2] Though there is still no cure for the disease, early diagnosis and treatment have been shown to afford HIV positive individuals with normal, healthy and productive lives. In addition, emphasis on judicious adherence to highly active antiretroviral drugs has shown much promise in life sustenance among HIV positive individuals.[2-4]

Many people living with HIV/AIDS spend time in some form of correctional facility such as a jail or a prison.[5] In the United States, one out of every six persons diagnosed with HIV/AIDS go through either a jail or prison annually.[6] Prisons house individuals convicted of a crime. On the other hand, jails are predominantly for people awaiting trial.[7] A large proportion of people that go through some form of correctional institution pass through the jail system only.[8] Jails by nature have a higher turnover rate than prisons.[9] Persons that go to prisons often have passed through a jail, either as previous offenders or while awaiting trial.[10] Hence, the jail population accounts for a significant portion of the HIV/AIDS epidemic.

The United States ranks first among the worlds' most developed countries in rates of incarceration.[11] Reports show that there are over 2 million Americans incarcerated.[12]

About 3% of adult residents in the United States went through some form of correction in 2012.[13] About 1.4% of people incarcerated in the United States are living with HIV/AIDS.[14] In addition, figures from the Center of Disease Control (CDC) show that the prevalence of HIV/AIDS in jails and prisons is about 3 times the corresponding prevalence in the general population.[14] The United States jail system accounts for about 13 million admissions and releases from jails, translating to approximately 10 million unique individuals annually.[4] As a result of the high human traffic in correctional facilities,[15] and the fact that people are easy to reach when incarcerated, jails present the health care system with a peculiar opportunity to diagnose and treat HIV positive individuals optimally.[3, 9] As many as 28% of HIV positive inmates were previously undiagnosed in a blinded serosurvey done in New York.[16] Unsurprisingly, in recent years, efforts have been made in the United States to improve HIV detection and treatment in jails and prisons.[17] Linkage to care after incarceration has been advocated as a sustainable means of reducing the incidence of HIV/AIDS in our community.[18] People incarcerated are more vulnerable to HIV owing to their socioeconomic and medical instabilities.[18] Incarcerated individuals present with undiagnosed mental problems, housing instability and alcohol/drug addiction.[18] They also engage in high-risk behaviors-- commercial sex work and injection drug use-- which are common reasons for incarceration. Such factors put incarcerated individuals at higher risk of acquiring and transmitting the HIV.[19, 20] Reports in the U.S. estimate that the prevalence of HIV/AIDS among the incarcerated population is about thrice the prevalence of the disease in the general populace.[18] Incarcerated persons with HIV are at risk for poor viral suppression post-release. Release from a correctional facility without follow up has been shown to worsen the health of individuals

with HIV.[6] New releasees have difficulty in getting health insurance.[3] Medical and social entitlements that would allow the receive HIV care routinely are lost when incarcerated. These benefits are not readily available upon release from the correctional facility.[21] Consequently, there is poor access to HIV care in the community which translates to poor health prognosis in this population. Upon release, they leave a well-structured institution where they receive their antiretroviral drugs judiciously, to a world of uncertainty.[22] The situation to which the releasee goes out to after incarceration is very important. Going back to being homeless or to a setting where drug and alcohol abuse are prevalent increases the likelihood of poor viral control and increased transmission of the disease.[22] The time gap between release and re-entry into the community is critical in controlling their viral load. Linkage to care aims to bridge that time gap ensuring that viral load is controlled and the risk of disease transmission minimal.[6] The goal for incarcerated people living with HIV is receiving well-structured treatment while incarcerated and continuing this upon release from incarceration. Integration of the correctional, community and primary health care systems would be vital in achieving this goal.[23]

People living with HIV/AIDS are more likely to require care in emergency rooms as compared to those without the disease. Striking is the fact that people with HIV/AIDS are not more likely to be hospitalized after an emergency room visit when compared to those without HIV/AIDS.[24] Being incarcerated diminishes the likelihood of being linked to HIV care and therefore may increase the frequency of visits to the emergency department. Determinants ranging from homelessness, substance and alcohol abuse have been known to disrupt proper linkage to care upon release.[24-26] Reasons given for more frequent emergency department visits among

people living with HIV include social and psychiatric instability-- both of which are more likely to be experienced by people incarcerated. Emergency care visits by releasees constitute an unnecessary economic burden to health institutions, the state, and ultimately the tax payers.[22]

Most of the emergency care visits by people newly released from incarceration can be handled by primary care givers and at cheaper costs. Lack of linkage to HIV care among those recently leaving jail translates to them having minimal access to basic medical care. They may rely primarily on the use of emergency departments for health complaints that could have otherwise been treated for by a primary health care provider.[27] Additionally, the health education benefits of having primary health care providers are lost among this already vulnerable population. As such, many individuals recently incarcerated are not able to advocate for their health as they would if they were being routinely evaluated by a primary health care provider upon release.

Several determinants of emergency care visits among HIV infected persons (especially those recently released from incarceration) have been discussed in previous literature. They include linkage to care, mental illness, availability of insurance, homelessness, demographics, alcohol and drug abuse. However, there is a gap in the literature with regards to research that compared emergency department visits and care among new releasees with HIV/AIDS before and after incarceration. The aim of this observational study is to identify the risk factors associated with emergency department visits among incarcerated persons with HIV/AIDS. I hypothesize that linkage to HIV care upon release causes less use of the emergency department among newly released individuals living with HIV/AIDS.

LITERATURE REVIEW

Introduction

Correctional facilities serve as an important institution in detecting and treating people with HIV, many of whom are diagnosed for the first time while incarcerated.[28] Having HIV has been shown to be associated with imprisonment (OR 1.69, 95% C.I. 1.07, 2.64).[20] Available literature shows that HIV/AIDS is highly prevalent in correctional facilities and people of color are at greater risk of the disease as compared to whites.[29, 30] In addition, people living with HIV are at greater need of general health services as compared to the general public.[31] This section focuses on showing findings from various sources on general health care utilization by people living with HIV, those incarcerated and individuals living with HIV that are newly released from a correctional facility. It then tries to highlight significant determinants of emergency department use. The importance of these determinants is then viewed from different perspectives-- people living with HIV, people incarcerated and emergency department use.

Health care Utilization and Emergency Department Use

A 2004 study to examine medical service utilization on 190 adults living with HIV showed increased use of the emergency department. The study reported that 75% of the adults were treated in the emergency department at some point throughout the study period. It also revealed that 64% of the study population was hospitalized at some point and 93% of them were treated in ambulatory care clinics.[25] Another study that evaluated life-time utilization of

health service among incarcerated women showed that they had been seen and treated at the emergency department about 14 times on the average. The women had also been hospitalized about 5 times after initially presenting at the emergency department.[32]

The emergency department is visited more frequently by individuals living with HIV virus.[24, 33] A cross-sectional study involving 14 HIV clinics showed that 32% of the respondents had at least one visit to the emergency department in the 6 months preceding the study interview.

The study further revealed that of the people who reported going to the emergency department at least once, 39% were hospitalized at least once during the same period.[31]

People incarcerated are a vulnerable group at increased risk of using the emergency department upon release.[24] A retrospective cohort study on emergency department utilization among recently released prisoners showed that about a quarter of the entire population had at least one visit to the emergency department. It also revealed that about 4 visits per person on the average, was made to the emergency department within the one year study period post release. More than 30% of them had been to the emergency department 3 or more times and more than 7% of these ex-prisoners had greater than 10 visits to the emergency department within the study period.[27]

There is an increased likelihood of emergency care visits among people living with HIV who are newly out of incarceration. Studies conducted on incarcerated individuals living with HIV showed increased use of emergency departments upon release from a correctional facility. An observational longitudinal study, evaluating the quantity and type of emergency department visits by released prisoners with HIV, showed that 56% of the total cohort made at least one

visit to the emergency department. At the 12 months follow up period, the study revealed that 15% of these individuals went to the emergency department more than twice per person-year.[33] A novel multi-morbidity index study examining frequent emergency department use among released prisoners with HIV was carried out in 2013. Frequent emergency department use, defined as going to the emergency department more than twice, accounted for greater than 80% of all the emergency department visits. More than a quarter of the 151 released prisoners in the study were classified as frequent emergency department users.[33]

Emergency department visit by individuals newly released from a correctional institution is influenced by several factors. They include being linked to care upon release, housing status, gender, psychiatric status, availability of insurance, alcohol, drug abuse and the demographics of the population in question. HIV positive women seem to be at even higher risk of emergency care utilization than men. A multicenter study reported that women living with HIV upon release from incarceration are at higher risk of adverse medical co-morbidities and HIV treatment results. They would hence be more likely to use the emergency department as compared to their male counterparts.[34] In 2007, a study on emergency department use among marginalized people-- of color, with substance/alcohol addiction, homeless or with some form of mental illness-- living with HIV also showed that emergency care is affected by a cascade of factors. Using adjusted odds ratio, the paper noted that homelessness (aOR 2.23, 95% C.I. 1.36, 3.67), duration of HIV infection (aOR 2.02, 1.11, 3.67), regressing medical state (aOR 2.02, 95% C.I. 1.53, 2.67), availability of insurance (aOR 1.74, 95% C.I. 1.10, 2.77), and psychiatric status (aOR 1.47, 95% C.I. 1.18, 1.84) were all associated with emergency care visits.[35]

Linkage to HIV Care

Ensuring that the basic necessities including food, shelter, clothing and medico-social services are available for these individuals upon release from incarceration is the primary goal of linkage to care.[36] Linkage to care promotes good health and longevity for people living with HIV. It helps to suppress the viral load of individuals with HIV.[3] A report released in 2012, showed that individuals who met with a HIV care provider within the first month post-release had better viral load suppression (OR 2.13, 95% Wald C.I. 1.42, 3.19). It also showed that individuals who attended the scheduled initial meeting with a case manager post-release had better viral suppression (OR 1.94, 95% Wald C.I. 1.40, 2.69).[6]

The importance of linkage to care in favoring viral suppression[37] in people living with HIV is also highlighted in a community-based, prospective cohort study done from 1998 to 2011 among HIV infected injection drug users. The study showed that of the 790 individuals involved in the study, about 94% of them were linked to HIV care. Furthermore, approximately 85% of those confirmed to have received antiretroviral drugs during their clinical meeting achieved viral suppression. Noteworthy, only 30% of individuals enrolled in the study were continuously retained in HIV care throughout the study period of about 8 years. This translated to poor sustained viral suppression (10%) in this cohort.[37] Additionally, the study showed that suboptimal linkage to care was associated with substance abuse. Injection of any drug was seen to negatively affect access to medical care (aOR 1.25, 95% C.I. 1.06, 1.49) and viral suppression (aOR 1.28, 95 C.I. 1.02, 1.61) respectively in the study population.

The concentration of individuals with HIV in jails makes it easy to identify and engage them in HIV treatment when incarcerated and upon release. A multisite evaluation that collected data on HIV across 20 unique jails revealed that 82% of the incarcerated population in the study accepted health services linking them with HIV care upon release. Data from the study revealed that 99% of those that accepted linkage services, did so while still in incarceration.[8] Linkage to HIV care ensures that the health benefits enjoyed by the individual during incarceration such as optimal availability and adherence to highly active antiretroviral treatment (HAART) are not lost upon release.

Emphasis should remain on the ultimate goal of linking incarcerated individuals living with HIV to HIV care upon release. The relevance of the method used to achieve linkage to care is still unclear. A random, uncontrolled clinical trial evaluated two methods used to ensure individuals incarcerated had access to HIV care post-release and found no significant difference between both approaches. It noted that an intensive case management started 3 months prior to release from prison and continued 6 months post-release was not more effective than a simple, less costly, less intensive and comprehensive discharge planning program.[38] There was no significant difference between the two approaches on a scheduled clinical visit-- 1 month post release ($p = 0.30$, $TS = 1.07$), 12 months post release ($p = 0.20$, $TS = 1.62$) and 24 months post release ($p > 0.50$, $TS = 0.8$). In addition, the study found no significant difference between the two approaches in emergency department use and rates of hospitalization.[38]

Linkage to care has been reported to be associated with emergency department use. A study examined case managers meeting newly released individuals at the gate. It found no significant association with reducing emergency department utilization among these individuals post-

release (aOR 0.91, 95% C.I. 0.23, 3.57), but showed that being met at the gate by a case manager significantly increased the likelihood of seeking substance abuse treatment ($p < 0.01$) and not engaging in commercial sex ($p < 0.05$).[39] Using a Poisson regression model, a study showed that individuals without a pre-release discharge plan were more than 3 times likely to use the emergency department as compared to those with a pre-release discharge plan (OR 3.16 $p < 0.05$).[33] Also a lower probability of more than one emergency room visit per 6 months (OR 0.75, 95% C.I. 0.59, 0.95) was seen in women receiving antiretroviral treatment-- an important component of being linked to care-- as compared to women without treatment.[40] Noteworthy, a study examined case managers meeting newly released individuals at the gate. It found no significant association with reducing emergency department utilization among these individuals post-release (aOR 0.91, 95% C.I. 0.23, 3.57), but showed that being met at the gate by a case manager significantly increased the likelihood of seeking substance abuse treatment ($p < 0.01$) and not engaging in commercial sex ($p < 0.05$).[39]

Substance Abuse

Substance abuse problems are commonly seen in people living with HIV. About 3 million people living with HIV/AIDS are injection drug users.[1] Many people incarcerated also have a history of substance abuse. A study examining substance abuse and incarcerated women, revealed that the most (90%) commonly encountered health problem among these women was drug abuse. Eighty-five percent of women in the study reported drug use on multiple occasions a month prior to incarceration.[32]

Living with HIV while incarcerated, increases the likelihood for emergency care use. A study done on HIV positive individuals with a substance abuse problem revealed that of the factors thought to affect emergency department use, homelessness and alcohol abuse were the only variables significantly associated with emergency department use ($p < 0.01$).[25] Another study done in Vancouver, focused on injection drug users and frequent emergency department visits. It showed that along with having primary care and been physically abused, frequent crystal methamphetamine injection (aOR 2.40, 95% C.I. 1.00, 5.60), non-fatal drug overdose (aOR 2.10, 95% C.I. 1.40, 3.30) and HIV positive status (aOR 1.5, 95% C.I. 1.1–2.1) were independently significantly associated with more than usual emergency department use.[41] Similarly, a retrospective cohort study on ex-prisoners determined that after controlling for patient and community-level factors, substance-use related illnesses (OR 1.93, 95% C.I. 1.77, 2.11) was the most likely reason for visits to the emergency department by this study group.[27]

A recent study highlighted the need for substance-use treatment post-incarceration in a bid to reduce substance abuse related illness that could potentially translate to emergency department visits. It showed that frequent alcohol (aOR 2.03, 95% C.I. 0.95, 4.34) and drug use (aOR 11.79%, 95% C.I. 5.70, 24.36) were both associated with increased cocaine use six months post-release from incarceration. The study also showed that the risk of opioid use 6 months post-release was substantially higher if there was a history of pre-incarceration opioid abuse (aOR 25.06, 95% C.I. 8.02, 78.34) and drug abuse (aOR 31.86) respectively.[42] An earlier study that evaluated substance abuse treatment and emergency care visits among people with alcohol problems living with HIV, found results that suggest that substance abuse affects health care utilization. While noting that the dynamics between substance abuse and emergency care

visits among HIV positive individuals needed more evaluation, the study showed that consistent and optimal treatment for substance abuse was favorably associated with emergency department visits. It determined the odds of going to the emergency department among HIV positive individuals with at least an alcohol problem. The odds of going to the emergency department in individuals that had substance abuse treatment were 50% (95% C.I. 0.30, 0.90) less than the corresponding odds of those without any substance abuse treatment.[19] A similar study among 151 HIV positive inmates, showed that 1 year post-release from incarceration, about 20% of emergency department visits were attributable to substance abuse. Furthermore, this observational longitudinal study showed that alcohol addiction (IRR = 0.21) and housing status (IRR = 0.54) were correlated with emergency department use among this study population.[24]

Housing/Homelessness

On the part of the health care systems, ensuring that there is continuity of health services upon release of prisoners is a tasking job. It is important that the health care provider outside the prisons/jails have access to all the health information of the newly released. Sharing of information is sometimes difficult because these newly released individuals, may not have identified their post-release HIV community clinic.[3] This is so because newly released are also faced with the issue of housing post-release.[3] Lack of housing in the community can lead to them relocating or going back to old habits-injection drug use, alcohol abuse, commercial sex work that could prevent them from been linked to care. Irrespective of the location,

incarcerated people are more than 10 times more likely to be homeless prior to incarceration as compared to the general population.[43] Substance abuse and psychiatric issues were the most predictive variables of homelessness in a multivariate analysis ($p < 0.05$) of a 2002 local jails survey.[43] The same study showed that among incarcerated individuals, being married (OR 0.56, 95% C.I. 0.43, 0.71), finishing high school (OR 0.84, 95% C.I. 0.72, 0.99) and being of a younger age group-- 17-21 years (OR 0.58, 95% C.I. 0.47, 0.73) -- were protective against being homeless. In addition, it reported that race was associated with homelessness (OR 1.42, 95% C.I. 1.13, 1.79).[43]

Incarcerated individuals who are homeless are at increased risk of living on the streets and going back to poor health-seeking behaviors like drug use that could potentially cause re-incarceration; increase the likelihood of transmitting HIV and requiring emergency care. Lim et al showed that among incarcerated individuals, those with a history of homelessness had a three-fold risk of drug-related mortality (RR 3.40, 95% C.I. 2.10, 5.50) and twice the risk of suicide as compared to those with stable housing (RR 2.10, 95% C.I. 1.20, 3.40).[44] The relationship between homelessness and incarceration is “symbiotic”. Homelessness promotes incarceration by increasing the propensity to engage in risky behaviors like drug use and get arrested. Being in a correctional facility on the other hand can lead to homelessness by causing disruption in normal family life and loss of job.[20]

The association between being homeless and using the emergency care has been documented. A randomized trial by Masson et al with 190 participants revealed that homelessness was associated with an increased use of the emergency department.[25] People who were homeless were in the emergency department over 90% times more than those who had some form of

housing.[25] Another study involving 610 people living with HIV, by Cunningham et al showed similar results. Individuals living with HIV were more likely to visit the emergency department more than once as compared to a corresponding group of HIV patients with stable housing (OR 2.23, 95% C.I. 1.36, 3.67).[35] Furthermore, Cunningham et al showed that health care utilization was associated with having insurance (aOR 1.74, 95% C.I. 1.10, 2.77).[35]

Medical Insurance

The excessive cost incurred from excessive utilization of the emergency department has led to health policies that focus on emergency care.[45] One major intervention would be in ensuring that medical insurance is available to newly released individuals living with HIV. Medical insurance enable incarcerated individuals to access medical care post-release. Access to health care has been reported to be associated with having medical insurance.[46] Absence of medical insurance post-release is a barrier to proper linkage to care. This has necessitated some states to temporarily withhold insurance coverage while in incarceration as against totally removing insurance coverage.[21] A bivariate analysis reported in 2010 showed that emergency department use among people living with HIV and having Medicaid insurance was about 3 times as much as the corresponding use among those without any insurance (OR 2.89, 95% C.I. 1.78, 4.70).[31] A similar result was shown by a study that examined the characteristics of frequent emergency department use. It reported that frequent use of the emergency department was more likely reported by individuals who were uninsured as compared to those who had medical insurance (OR 2.38, 95% C.I. 0.99, 5.74).[47]

Mental Status

Many individuals who frequently visit the emergency department are psychosocially unstable.[48] Among 1,434 ex-prisoners enrolled in a study, psychiatric disorders (OR 1.43, 95% C.I. 1.27, 1.61) was of three reported reasons for visit to the emergency department.[27] A similar result was seen in an observational longitudinal study. HIV-infected released prisoners suffering from moderate to severe depression were approximately twice at risk of using the emergency department as compared to those without any form of depression (IRR 1.80, 95% C.I. 1.35, 2.40).[24] Hunt et al in a paper examining the characteristics of frequent emergency department users, showed that mental disorders (OR 1.70; 95% CI 1.42 to 2.02) were independently associated with the frequency of emergency department use.[47] Ensuring that newly released individuals living with HIV are properly cared for upon release necessitates that adequate provision for mental health treatment is factored in.[3]

Sexual orientation of individuals with HIV has been reported to affect public perception and affect the psychology of infected individuals. Addressing mental health disorders is important if optimum linkage to care is to be achieved among people incarcerated living with HIV.[33, 49] Transgenders, men having sex with men (MSM) and females are at increased risk of sexual harassment by fellow inmates and guards,[50] while incarcerated, which places them at greater stress upon release.[32] Stigma emanating from being incarcerated to being HIV positive by the public can affect one's self belief, willingness to disclose HIV status and readiness to seek care.[51]

Conclusion

Having infectious diseases like HIV/AIDS is common among inmates and puts them at even higher risk of using the emergency department.[52] Literature reviewed shows that there is a higher risk of emergency department use among people living with HIV and people newly released from incarceration. Additionally, it reveals that people with HIV newly released from a correctional institution are at greater risk of having health complaints necessitating emergency care visits. Previous studies done have also shown that a cascade of determinants are associated with emergency department use among people newly out of incarceration.

Linkage to care is important in these individuals as they place the entire community at risk if not treated and monitored routinely. Risks of returning to old habits like drug/alcohol abuse, commercial sex work are also addressed at some level with proper linkage. HIV infected people with substance abuse problems usually have several health complications and are hence more likely to need emergency care treatment.[42] Housing status has been shown to be associated with emergency care use. Homelessness was shown to be associated with an increased likelihood of emergency care visit. Having some form of medical insurance among newly released individuals with HIV ensures that their basic medical needs are covered by a primary health care provider. This has been shown to be associated with less emergency department utilization. Finally, psychosocial issues including mental illness and personal perception of HIV are addressed with linkage to care, reducing the risk of going back to poor health behaviors that lead to incarceration. In the end, a study that aims to evaluate factors associated with emergency department use among newly released individuals with HIV would go a long way in addressing the transmission of HIV in correctional facilities and the community at large. It can

also identify interventions that can save tax payers, the community and government a lot of unnecessary health cost in the form of avoidable emergency department visit by this target population.

INTRODUCTION TO MANUSCRIPT

Incarcerated individuals living with HIV/AIDS are at greater risk of poor health outcomes upon release if not linked to HIV care upon release. Having a worse disease prognosis and resuming poor health behaviors if not linked to care in these population, translates to emergency care visits that could have otherwise been avoided. The gap in literature in understanding the association between linkage to health care upon release from a correctional facility and emergency care utilization post-incarceration necessitates the need for more research on the subject matter. Previous literature identified several determinants of emergency department utilization in this target population. They include linkage to care, substance abuse, housing status, medical insurance and mental status.

Hypothesis

This study aims to address the following hypothesis:

1. Jail releasees living with HIV, are more likely to use the emergency department if they are not linked to health care upon release as compared to those linked to health care upon release.

METHODS

Sample and Study Design

The study population was from the EnhanceLink project as previously published in 2011 by Draine *et al.*[9] EnhanceLink is an HRSA-funded project that was part of the Special Projects of National Significance (SPNS) initiative to design, implement and evaluate innovative methods for linking newly released individuals living with HIV/AIDS to optimal health care services such as HIV medical care, substance abuse treatment and other supplementary health services.

Grantees were AIDS care organizations, health departments or universities partnering with one or more local jails. The project studied a cohort of individuals living with HIV who were incarcerated and tracked them from incarceration to release with the aim of evaluating the effectiveness of in jail interventions that encouraged early linkage to health care services upon release.

A total of ten jail demonstration sites were grantees for this initiative. These demonstration sites were located across the United States—Atlanta, GA; Chicago, IL; Cleveland, OH; Chester, PA; Columbia, SC; New Haven, CT; New York, NY; Philadelphia, PA; Springfield, MA; and Providence, RI. Inmates living with HIV were identified either through routine HIV testing or previous diagnosis with HIV.[42] Each demonstration site developed site-specific interventions and post-release protocols for their clients site.

Individuals enrolled in the study opted to participate in the study voluntarily and were educated properly on the study process before signing informed consent forms. They were then interviewed twice—first at baseline which was during the period of the index incarceration

and then post-release, six months after release from the index incarceration. Additionally, case managers for each newly released inmate conducted a post-release interview one month post-release from jail. The EnhanceLink Project gathered data on 1,270 eligible participants (men and women) between January 2008 and March 2011. Enrollment criteria varied from site to site but mandated that participants be at least 18 years old, living with HIV/AIDS and incarcerated at the given time frame in one of the designated demonstration sites. For the purpose of this paper, participants were deemed ineligible if there was no information for their six-month interview post-release from incarceration. The most obvious reasons for lack of data in the clients post-release stemmed from physical unavailability post-release caused by death either during incarceration or upon release from jail, transfer to another, non-participatory correctional facility or court-ordered locked facility, relocation to a geographical area not serviced by the grantee organization, and deportation. (See Fig.1)

Detailed information on data collection was previously published by Draine *et al.*[9] Briefly, information was collected by project staff both at baseline and six-month follow-up period post-release. Data collected included demographic characteristics, family and social relationships, employment status, housing conditions, criminal justice history and pre-incarceration emergency department use. It also included questions to assess mental well-being, drug and alcohol use. Furthermore the survey had questions on access to HIV/AIDS care and treatment.

Figure 1 shows the inclusion/exclusion of participants for this present study. A total of 1,270 eligible participants consisting of men and women were enrolled in the overall project after providing informed consent. Of the total number enrolled, 1,255 participants completed the

baseline interview. Among those with completed baseline information, 471 individuals were excluded from further analysis because they were physically unavailable to provide follow-up data. About 61% of those excluded due to physical unavailability were because their release from jail was uncertain or they were transferred to a court-ordered in-patient facility. By the six-month post-release interview period, a further 201 individuals were lost to follow-up leaving only 583 individuals with both completed baseline and six-month follow up information for this paper.

Study variables

Dependent Variable of Interest

The outcome of interest was self-reported emergency department use (Yes or No) defined as a formerly incarcerated individual living with HIV/AIDS visiting the emergency department at least once, post-release from the index incarceration during the time frame of the study. The outcome variable was recorded at six months.

Independent variables of Interest

This paper uses the analytical approach guided by previous publications on The Behavioral Model For Vulnerable Populations, released by Andersen *et al.*[53, 54] In summary, the model gotten from such an approach suggests that utilization of health care services is influenced by certain factors. These factors can be categorized into predisposing factors, enabling resources and need factors. Predisposing factors constitute demographic and socioeconomic characteristics that are known to affect the utilization of health care services. Enabling

resources imply those variables that directly affect health care utilization such as availability of medical insurance. Need factors comprise of variables that underline the clients' health need.

The main exposure of interest was linkage to care which was defined as the client having a planning document indicating that appointment/arrangements were made with a community-based provider for either case management or continuity of health care services. The exposure variable comes from the Post-Release Summary report. Missing data on clients was treated as missing values as there was no certainty that these were clients that missed their appointments.

Control covariates were taken from baseline interview report; six-month post-release interview report and Follow-Up chart Clinical Review Summary. Data was collected on demographic characteristics (age, gender, race and ethnicity), socioeconomic variables (relationship status, sexual orientation, level of education, employment status in the past 30 days and housing status at baseline and at six-month post-release) and enabling resources (medical insurance at baseline and six-month follow-up period). Data on pre-incarceration emergency department utilization was also collected. Additionally information on re-incarceration within 30 days post-release and previously documented associates of incarceration-- mental stability, drug and alcohol abuse using a composite Addiction Severity Index scoring system {ASI}-- were also examined.[6] HIV/AIDS related information collected include HIV first diagnosed in a correctional facility, number of newly diagnosed, clients with viral load suppressed on most recent visit, first CD4 count in a clinic post-release and having a usual HIV care provider pre and post-incarceration.

Statistical Analysis

All data were analyzed using SAS Institute Inc. 2011. *SAS® 9.3 System Options: Reference, Second Edition*. Cary, NC: SAS Institute Inc. A descriptive analysis was carried out on the study population stratifying between those with complete information (baseline and six-month reports) and those with incomplete information (only baseline information). Test of significance was conducted using Chi-squared test (at $\alpha = 0.05$). Wilcoxon Two-Sample Test was used to compare the mean age between those with complete information and those without. Mantel-Haenszel Chi-square tests were conducted to compare categorical variables with multiple levels.

Univariate analysis was performed on clients with complete information to determine if there was a significant association (95% Wald Confidence Interval) between variables of interest and the likelihood of visiting the emergency department at least once upon release from incarceration.

Lastly, a multivariate analysis using logistic regression was employed to evaluate the effect of linkage to care on the likelihood of at least one emergency department visit post-incarceration.

All variables associated with the outcome of interest in the univariate analysis and all potential confounders were entered into the multivariate model. The variables left in the final model after assessment for interaction and confounding, are displayed in Table 3. To control for confounders, the variables of age stratified into decades, gender (male), race (white), level of education (less than high school), employment status, housing status 6 months post-incarceration, emergency visit pre-incarceration, medical insurance pre-incarceration and mental status (using the ASI composite scoring system) were included in the final model.

Backward stepwise elimination was employed to make the final model more parsimonious. All statistical testing was conducted at an alpha level of 0.05. The original multisite study as previously documented was approved by Emory Institutional Review Board (IRB). The ten individual sites also had their studies approved by their respective IRBs as appropriate.[6]

RESULTS

Only 583 participants were analyzed out of the total number of 1,270 enrollees for this study.

This is because they were the clients who had both a baseline and six-month information required for this study. The most common reason for exclusion was transfer to a court-ordered inpatient treatment facility.

Table 1 shows a descriptive analysis of the study population. It compares the characteristics of the clients among those with complete and those without complete six-month post-release information. In doing this comparison, similarities or differences between the two groups were statistically evaluated.

Comparison between those with complete and incomplete information, showed that at an alpha level of 0.05, age at incarceration (categorical) {p value = 0.0003}, being homeless pre-incarceration {p value = 0.003}, having medical insurance pre-incarceration {p value = 0.0001}, having a usual HIV care provider {p value = 0.0001} and having kids below 18 years of age under care {p value = 0.0402} varied significantly between the two groups. Of the 1,067 participants considered in this paper, 46.4% of them did not have six-month follow up data. Four hundred and fifty participants (41.7 %) had documentation that they visited the emergency department at least once pre-incarceration. Five hundred and sixty-two participants (52.1 %) had no record of both baseline and six-month emergency department visit. Only one hundred and six participants (9.8%) who visited the emergency department at baseline also visited the emergency department at the six-month follow-up period. A change in emergency department visit from baseline (pre-incarceration) to the six-month follow up period (post-incarceration) was explained by over a third of the participants (37.3 %).

Table 2 shows the factors associated with emergency department visit at the end of the six-month post-incarceration using univariate analysis. Not setting an appointment for continuity of health service was predictive of visiting the emergency department at least once post release from jail. Also, not attending the first scheduled appointment with a grant-funded case manager or a HIV primary care provider in the 30 days post-release was significantly associated with at least one emergency department visit post-incarceration. As expected, other predictors of emergency department visit from the univariate analysis included homeless pre and post-incarceration, availability of medical insurance pre-incarceration, prior emergency department use before index incarceration and mental status of the client determined by ASI composite scores. Interestingly, neither drug or alcohol abuse had any significant association with at least one emergency department visit. Furthermore, the CD4 count and viral load of the participants (OR 1.13, 95% C.I. 0.79, 1.63) were not predictive of at least one emergency department visit post-incarceration.

Results of the multivariate analysis, showing factors associated with at least one emergency department visit at the six month post-incarceration period are illustrated in Table 3. There was no significant interaction between the main exposure variable and other independent variables. The adjusted model shown in Table 3 reveals that among the participants, being linked to HIV care post-incarceration was significantly protective of visiting the emergency department as compared to those who were not linked to HIV care post-incarceration (aOR 0.63, 95% C.I. 0.41, 0.97).

Considering the demographic determinants, while the sex of the individual was not associated with emergency department visit, individuals within the age range of 40-49 years were shown

to be less likely to use the emergency department upon release as compared to those less than 30 years (aOR 0.47, 95% C.I. 0.21, 1.00). Of the socioeconomic parameters, only housing status was shown to be associated with emergency department visit. Individuals that reported being homeless anytime within six month post-incarceration were about three times more likely to use the emergency department as compared to those who reported not being homeless post-incarceration (aOR 2.58, 95% C.I. 1.57, 4.25).

In addition, not having medical insurance was significantly predictive of visiting the emergency department. Newly released participants without any form of health insurance were more likely to present to the emergency department as compared to those with some form of health insurance (aOR 1.86, 95% C.I. 1.10, 3.13). Unsurprisingly, individuals who had visited the emergency department prior to the index incarceration considered in this paper were more likely to visit the emergency department upon release (aOR 4.16, 95% C.I. 2.68, 6.44). Finally, participants classified as having severe mental instability (using ASI score cut-off > 0.22) were associated with an increased likelihood of emergency department visit post-incarceration (aOR 1.60, 95% C.I. 1.02, 2.51).

DISCUSSION

This study adds to existing knowledge on the predictors of emergency department use among jail releasees. The study shows that emergency department use among the target population is predicted by linkage to health care upon release from a correctional facility. It also agrees with previous studies that show that socioeconomic parameters as well as mental instability of newly released individuals are predictive of emergency department use.[24] The previous literature has shown that the period of transition from a correctional facility to the community is a very important period in determining the health of people living with HIV/AIDS.[24, 26] A study in 2013 showed that many individuals living with HIV/AIDS visit the emergency department at least once within the first month post-incarceration.[33] Linkage to care ensures that HIV medications are continued by individuals living with HIV upon release and that primary care is sustained in this population.[55] The results from this study show that linkage to care upon release correctly predicted the likelihood to use the emergency department among HIV-positive jail releases enrolled in the EnhanceLink initiative. Among a subset of 583 participants with both baseline and six months follow-up information, visiting the emergency department at least once post-incarceration was more likely if the individual was linked to care.

The effect of linkage to care as seen in this adds to a recent study done by Spaulding *et al* that evaluated the effects of linkage to care on viral suppression. They showed that linkage to care was associated with an increased likelihood for viral suppression among newly released individuals with HIV/AIDS.[6] It can be deduced that individuals who were linked to health care upon release from incarceration, continued on their HIV medications and achieved viral

suppression. These individuals would be less likely to suffer from complications arising from poorly managed HIV/AIDS. They are more immunocompetent than those not on HIV medications and less susceptible to opportunistic infections culminating in a reduced need for the emergency department. This reduced use of the emergency department would go a long way in reducing the steady rising emergency care cost accrued by the government annually. Considering the demographic parameters, an age bracket of 40-49 years was seen to be significantly protective of going to the emergency department. This could be because most people within that age group are more mature and hence less irresponsible as compared to those below 40 years. They were most likely the group of people with children under their care and in committed relationships. This is supported by the fact that in the analyzed cohort for this study, individuals in committed relationships and those with kids below 18 years were accounted for by 50.2% and 50% of individuals between 40-49 years respectively. They are also young enough to avoid medical co-morbidities associated with advanced years that could worsen the immune state of an individual as would be obtainable in individuals above 50 years. There was no significant association between the sex of individual and emergency department visit. This contradicts findings on a recent study by Meyer *et al* that showed that women with HIV were more likely than their male counterparts to use the emergency department post-incarceration.[34] However, univariate analysis in this study showed that women were associated with emergency department use. Overuse of emergency department by women can also be because women are more likely burdened with greater illnesses and stress post-incarceration compared to men.[33] More research on this subject matter would be beneficial.

Availability of medical insurance was significantly associated with emergency department visit. Results from this study were similar to a study done by Hunt et al in 2006. In both studies, individuals without any form of medical insurance were about two times more likely to visit the emergency department as compared to those with some form of insurance.[47] Individuals who were mentally unstable as determined by the ASI composite scoring system were more likely to visit the emergency department. Similar results were seen in recent literature.[24, 33] Prior use of the emergency department was a huge predictor of future use among this study cohort. An explanation could be that these same individuals upon release go back to the same poor health seeking behaviors that necessitated the emergency visit initially causing a vicious cycle; hence the need to ensure optimal linkage to care as the need to continually monitor them cannot be over-emphasized.

Study Strengths and Limitations

A major strength of this study is the large study size which confers study power, and its representation for the heterogeneous population of incarcerated individuals living with HIV/AIDS. Previous studies among incarcerated individuals living with HIV/AIDS have examined cohorts of fewer than 300 unique individuals. The EnhanceLink initiative is the largest study conducted in the United States on incarcerated people living with HIV with the aim of evaluating linkage to care.

One major limitation of this analysis is that of missing data in the six month follow-up period. Some of the participants could have been incarcerated in the 30 days before the follow up

interview and hence would be physically unavailable. However, comparing the demographics and socioeconomic characteristics of those with complete and incomplete information showed little differences between the two groups. Fortunately, pre-incarceration emergency department use which was the strongest predictor of emergency department use post-incarceration was not significantly different among the two groups. Having in mind that those missing were most likely to be homeless and uninsured while also recognizing that both parameters are associated with an even greater likelihood of emergency department visit, this paper most probably *underestimates* the effect of linkage to care and emergency department visit in this study cohort. Results from this study are conservative, and would be more pronounced if there was better follow-up of participants.

Another limitation in this paper is recall bias especially on reporting behaviors such as drug, alcohol and health care use. Measurements of behavior were taken periodically and at a specific time, which considering the time lag, could cause this bias. Still self-report has proven to be a valuable tool in data collection, especially with incarcerated populations, hence it is hoped that bias if at all introduced would not be sufficient to significantly affect the results of the study.

Conclusion

Individuals newly released from jail who are infected with HIV pose a continuous dilemma for health care planners. Firstly, in terms of integrating them into the society and from a health perspective, ensuring that they do not go back to poor health behaviors that increase the

likelihood of continued transmission of the HIV. Linkage to health care upon release bridges that gap as it ensures that their viral load is controlled and they are afforded the basic health needs. Doing this also allows them to live healthy lives and be less at risk to themselves (necessitating emergency department visits) and to the community at large. Frequent emergency department use by this target population resulting from poorly managed viral load amounts to avoidable cost to the health care system and invariably the tax payer. Linkage to care post release from jail is an important component of the strategy of using treatment as prevention as it prevents excessive use of limited resources on emergency care.

Future directions

This study demonstrates the importance of gaining insight into the determinants of emergency department use. Although linkage to care should be the basic minimum for newly released individuals living with HIV/AIDS, efforts should be made to ensure that these individuals are treated holistically. Efforts to ensure that housing, substance treatment, mental rehabilitation and socioeconomic support are made available post-incarceration would cause sustained improvements in this marginalized population. There should be increased priority in ensuring that newly released individuals that present to the emergency department be followed up afterwards and linked to a primary health care provider. This would go a long way in filling up the vacuum left by the great proportion lost to follow up for one reason or another. More research on programs aimed at improving linkage to care would help to reduce emergency department use and minimize transmission of the disease.

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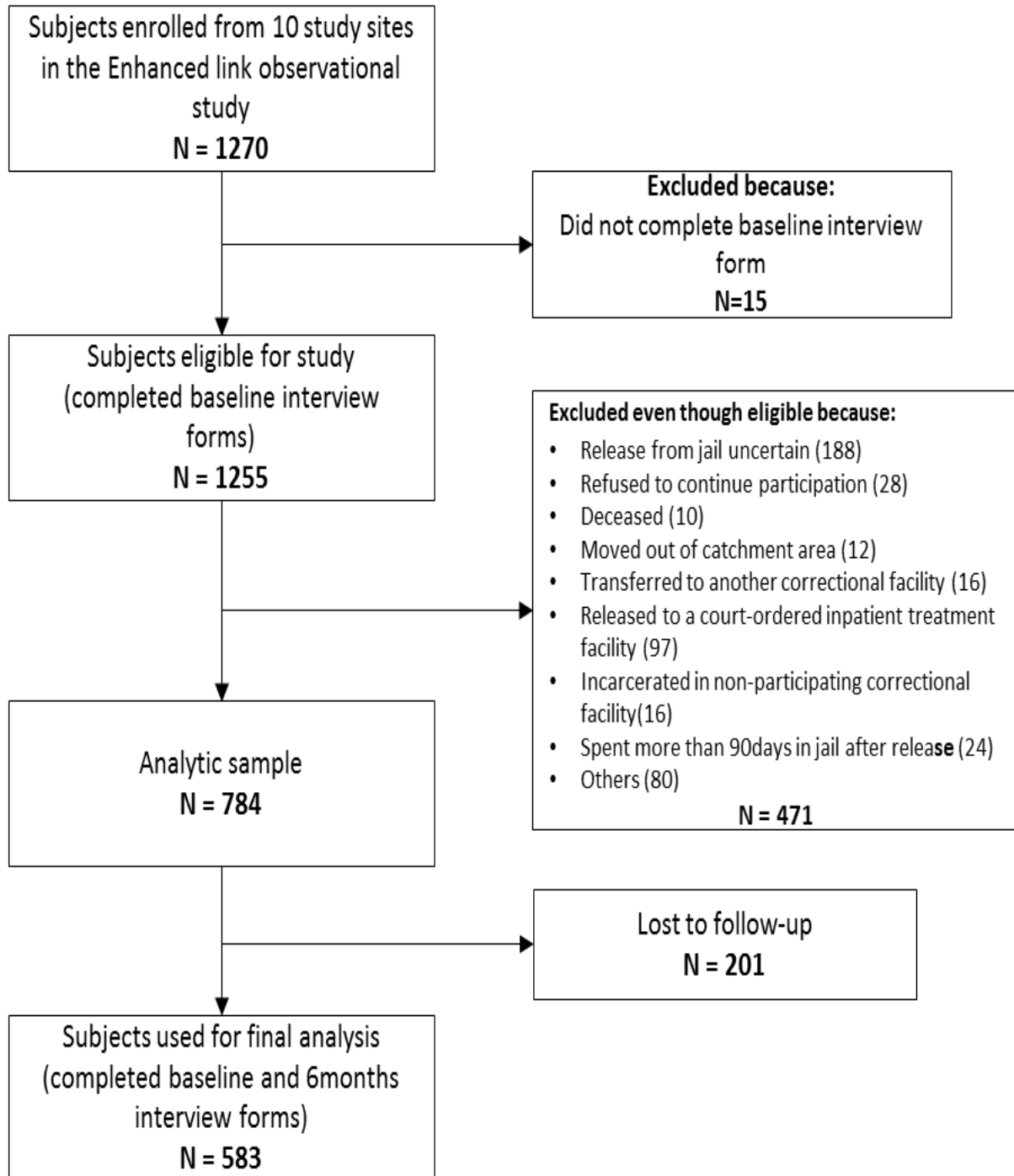


Fig.1 Participants in the EnhanceLink initiative used for the analysis of predictors of emergency department use six-month post-incarceration.

Table 1. Descriptive Characteristics for study population among those with complete and incomplete information (N=1078).			
Demographics	Complete (N=583)	Incomplete (N=495)	p-value*
	N (%)	N (%)	
Age at incarceration			0.000 *
≤ 29 years	41 (7.0)	71 (14.5)	
30 - 39 years	121 (20.8)	117 (23.9)	
40 - 49 years	285 (48.9)	210 (43.0)	
≥ 50 years	136 (23.3)	91 (18.6)	
Sex			0.222
Male	414 (71.2)	320 (65.1)	
Female	159 (27.4)	160 (32.5)	
Transgender**	8 (1.4)	12 (2.4)	
Race			0.953
White	120 (21.8)	101 (26.7)	
Black	348 (63.4)	293 (62.8)	
Other	81 (14.8)	72 (15.5)	
Ethnicity			0.348
Hispanic	150 (26.3)	114 (23.8)	
Non-hispanic	421 (73.7)	366 (76.2)	
In a relationship pre-incarceration: yes	197 (33.8)	144 (29.1)	0.098
Sexual Orientation:			0.860
Heterosexual	460 (79.7)	374 (78.1)	
MSM	53 (9.2)	47 (9.8)	
WSW	10 (1.7)	7 (1.5)	
Bisexual	54 (9.4)	51 (10.6)	
Level of Education: High school and above	294 (50.9)	235 (48.0)	0.344
Employment Status: Unemployed	485 (86.2)	422 (88.1)	0.349
Housing Status: homeless			
Status pre-incarceration	188 (32.4)	203 (41.1)	0.003 *
Status post-incarceration (N=583)	111 (19.2)		
Medical Insurance: Yes			
Pre-incarceration	467 (80.7)	343 (69.9)	0.000 *
Post-incarceration (N=583)	505 (88.1)		
Had emergency department visit pre-incarceration			
For those with at least one visit	240 (41.5)	210 (42.8)	0.663
For those with at least two visits	146 (25.2)	122 (24.9)	0.890
Re-incarcerated after index release (N=583)	175 (30.4)		
Mental instability: yes (using ASI score > 0.22)	287 (49.2)	256 (51.7)	0.415
Alcohol abuse: yes (using ASI score > 0.17)	196 (33.6)	173 (35.0)	0.646
Drug abuse: yes (using ASI score > 0.16)	305 (52.3)	277 (56.0)	0.232
Diagnosed for the first time in a Correctional facility	250 (43.9)	229 (47.0)	0.303
Had a usual HIV care provider			
6 months before index incarceration	448 (81.2)	321 (68.4)	0.000 *
6 months after index incarceration (N=583)	513 (88.8)		
With children under 18 years under care: yes			
Pre-incarceration	80 (13.8)	48 (9.8)	0.040 *
Post-incarceration (N=583)	63 (11.0)		
*denotes values of statistical significance at $\alpha = 0.05$			
**includes man-to-woman and woman-to-man transgenders			

Table 2. Univariate analysis: factors associated with emergency department visit at the end of the six-month post-incarceration (N=583)

Covariables	Univariate Analysis		
	OR	95% Wald C.I.	
Age at index incarceration (categorical)			
≤ 29 years (referent)	1.00		
30 - 39 years	0.45	0.22	0.92 *
40 - 49 years	0.37	0.19	0.72 *
≥ 50 years	0.35	0.17	0.72 *
Sex			
Male (referent)	1.00		
Female	1.52	1.02	2.25 *
Transgender	0.96	0.19	4.81
Race			
White (referent)	1.00		
Black	0.72	0.46	1.13
Other	0.79	0.43	1.47
Ethnicity: Non-hispanic	1.39	0.90	2.14
Relationship Status: In a relationship	1.14	0.78	1.67
Sexual Orientation:			
Heterosexual (referent)	1.00		
Bisexual	1.47	0.81	2.67
MSM≤	1.28	0.69	2.36
WSW	1.16	0.30	4.56
Level of Education: Less than High school	1.16	0.81	1.67
Employment Status past 30days: Unemployed	0.92	0.55	1.56
Housing Status			
6 months pre-incarceration: homeless	2.39	1.64	3.48 *
6 months post-incarceration: homeless	2.80	1.82	4.30 *
Had no medical Insurance			
6 months pre-incarceration	1.91	1.24	2.95 *
6 months post-incarceration	1.26	0.73	2.17
Had emergency visit 6 months pre-incarceration	3.83	2.62	5.61 *
Re-incarcerated post index incarceration: yes	1.20	0.81	1.76
Mental instability: yes (using ASI score > 0.22)	2.40	1.65	3.49 *
Alcohol abuse: yes (using ASI score > 0.17)	1.25	0.85	1.82
Drug abuse: yes (using ASI score > 0.16)	1.08	0.75	1.55
HIV diagnosed for the first time in a Correctional facility	0.95	0.66	1.38
Newly dagnosed HIV individuals**	0.92	0.39	2.16
Had viral load suppressed on most recent post-release viral load test	1.13	0.79	1.63
First CD4 count (T-Cells/mm ³) in clinic after jail release			
Above 500 cells/μL (referent)	1.00		
351 - 500 cells/μL	1.39	0.77	2.48
201 - 350 cells/μL	1.05	0.61	1.80
≤ 200 cells/μL	1.37	0.79	2.36
Linkage to HIV Care			
Individual wanted continuity of care services	1.36	0.94	1.97
Appointment was made for continuity of health service (no/unknown)	1.98	1.37	2.85 *
Did not attended first scheduled appointment with the grant-funded case manager in the 30-day period after release	1.65	1.09	2.50 *
Client did not go to his/her first scheduled appointment with a HIV primary care provider in the 30-day period after release	1.60	1.03	2.49 *
Had no usual HIV care provider			
6 months before index incarceration	1.33	0.84	2.12
6 months after index incarceration	0.89	0.50	1.60
With children under 18years under care: yes	1.36	0.82	2.24
*denotes association of statistical significance at an α = 0.05			
**diagnosed during index incarceration and excludes New York testing site			

Table 3. Multivariate analysis: factors associated with emergency department visit at the end of the six-month post-incarceration (N=583)				
Covariables	Multivariate analysis			
	aOR	95% Wald C.I.		
Age at index incarceration (categorical)				
≤ 29 years	1.00			
30 - 39 years	0.51	0.21	1.21	
40 - 49 years	0.47	0.21	1.00	*
≥ 50 years	0.62	0.26	1.49	
Level of Education: at least High school	1.16	0.75	1.78	
Homeless at 6 months post-incarceration	2.58	1.57	4.25	*
Had emergency visit 6 months pre-incarceration	4.16	2.68	6.44	*
Had no medical Insurance 6months pre-incarceration	1.86	1.10	3.13	*
Mental instability: yes (using ASI score > 0.22)	1.60	1.02	2.51	*
Was linked to care upon post-release	0.63	0.41	0.97	*
*denotes association of statistical significance at an $\alpha = 0.05$				