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Predictors of Linkage to HIV Care upon Release from Incarceration

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BS, BGS, University of Kansas, 2021

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An abstract of

A thesis submitted to the faculty of the
Rollins School of Public Health of Emory University

in partial fulfillment of the requirements for the degree of
Master of Public Health
in Epidemiology

2023

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Abstract

HIV infected individuals recently released from incarceration experience lack of access or falling out of care at higher rates than the general population. This study performed secondary analyses of STTR-CJ cohort data to determine predicting factors of retention of care, as well as successful interventions aimed at improving connection to care for Persons Living with HIV. Bivariate analysis was performed on all predictor variables and their strength in determining care retention was determined. Complete case management (OR=19.10), peer navigation (OR=1.96), opiate therapy (OR 1.44), and previous treatment for depression or mental health (OR=2.82) were all positive predictors of completing a full HIV care regimen, while Black individuals (OR=0.52) and individuals not receiving treatment for depressive symptoms (OR=0.60) were more likely to fall out of care at some point. When adjusted for age and education levels, similar odds ratios were found. These predictors can be utilized to tailor intervention approaches towards this population to ensure the largest chances for connection to care.

Background

Human Immunodeficiency Virus (HIV) poses a major public health burden, specifically for individuals recently released from incarceration. In the United States, nearly 2% of the incarcerated population is infected with HIV (BJS, 2021). The difference in cases between incarcerated individuals and the general population is 5 to 7-fold (BJS, 2021). Treatment options for those in jails or prisons, and those recently released, are scarce and challenging to follow. The major treatment problem for Persons Living with HIV (PLWH) who were recently incarcerated is linkage to and retention of care. Only 36% of individuals have access to HIV care after release from incarceration, and only 30% of individuals retain that care for full treatment regimens (Iroh, 2015). Given the severity of these drop-offs compared to the general population, the question to ask is what factors can be associated with an uptake in HIV care for individuals recently released from incarceration? Previous, traditional attempts at linking PLWH and Persons at High Risk of Seroconversion (PHRS) to care have been unsuccessful. Rigorous analysis of these strategies such as peer navigation, case management, introduction of long-acting ART, and stronger analyses of and interventions focused on trends of the root causes of incarceration have seen varying levels of success and could prove to be successful methods. Further investigation coupled with an analysis of predictors to linkage to care, can result in a clear picture of how to ensure at risk individuals are able to access necessary treatment to help their conditions.

Current evaluations of linkage to care (LTC) for incarcerated individuals consistently show drop-offs in coverage after release. Multiple factors contribute to this drop-off, including inadequate health insurance and poor transitional case management. Confounders such as age, race, sex, and income may further affect access. (Loeliger, 2018). Existing strategies often rely heavily on the initiative of PLWH, placing a high burden on the client. A lack of communication between the jail system, HIV clinics, and individuals is a frequent occurrence (Pluznik, 2018). Social services prove to be effective in assisting recently released individuals in other sectors of

their lives, such as connection to primary care, employment opportunities, and housing; however, researchers still struggle at bridging this connection to HIV care. The causes for the lack of connection to care are complex and interwoven, and only comprehensive responses that address both the needs of the individual and the systems that cause drop off in care will be successful in maintaining care coverage.

The Seek, Test, Treat, and Retain United States Criminal Justice cohort (STTR-CJ) series of studies analyzed a cohort of PLWH and their access to HIV care over the course of multiple years with a goal of determining effective methods at retaining care for these individuals (Chandler et al, 2017). Enrolling over 11,000 individuals, primarily with HIV, the STTR-CJ investigated methods of case management, drug regimens, peer navigation, and a holistic analysis of the treatment cascade for PLWH upon release from jail. The study found that access to care does drop off for all cohort post-release, but there exist several qualifying factors to predict the severity of drop-off, and the likelihood of an individual being able to access care. These factors include where an individual was incarcerated, screening capabilities both within and outside of the carceral system, insurance coverage, as mentioned above, as well as other demographic factors such as age, sexual orientation, race, sex, and education levels. All of these contribute to whether an individual will be able to receive care for HIV after being released from jail or prison, and all should be considered when developing treatment systems for such individuals. A key finding from the STTR-CJ was the rate of ART adherence among those individuals who were released from jail compared to the general population on ART. Measuring viral load is an important aspect of understanding ART adherence and efficacy, and in populations of individuals in the STTR-CJ cohort maintaining a stable ART regimen resulted in consistent viral loads compared to the general population; However, access to viral load counts were significantly less frequent, and therefore treatment plans are more difficult to create (Cunningham, 2019).

Table 3 is adopted from Wagner et al 2023 and depicts the bivariate analysis results of a cohort of individuals at risk of seroconversion and their adherence to PrEP regimens. Race proved to be the largest indicator of PrEP adherence, with Black individuals being 0.29 times as likely to adhere to PrEP than non-Black individuals ($p = 0.033$). Additionally, education was shown to be a statistically significant indicator in this analysis. Individuals with high school educations or higher were 2.18 times as likely to connect to PrEP than individuals with less than a high school education ($p<0.001$). Lastly, age was an indicator of PrEP adherence, with older individuals being more likely to complete a full PrEP regimen. Depression was not a statistically significant factor for PrEP uptake, as individuals were measured as having symptoms or not, with the status of treatment not being measured ($p >0.12$). Peer navigation, case management, and other intervention possibilities used in the STTR-CJ cohort were not measured as predictors of PrEP adherence.

Table 3: Odds Ratios of Predictors for PrEP (Adopted from Wagner et al, 2023)

Variable	Odds Ratio of Adhering to PrEP	Confidence Interval	P-value
Race (Black vs. Non-	0.29	[0.13, 0.66]	.0033

Black)			
Education (Greater than high school vs. High school or lower)	2.18	[1.36,3.50]	0.0013
Age (5-year changes)	1.15	[1.04,1.27]	0.005
Depression (Symptoms vs no symptoms)	0.66	[0.38,1.13]	0.1265

A secondary analysis of STTR-CJ data allows for further investigation into the questions posed by the initial studies. Understanding why individuals fall out of care, and factors that are contributing to retention in care, is an important first step in designing intervention strategies. Additionally, determining whether a potential intervention will be successful for diverse groups of people allows for strategies to be created to tailor treatment plans to an individual, and ensure that care connection is successful. This paper engages in analysis of three STTR-CJ studies to determine potential predicting factors for linkage to care for individuals recently released from incarceration, including demographic traits, individual actions, and intervention strategies

Methods

Data for this review were collected from the Seek Test Treat and Retain Criminal Justice cohort through the University of Michigan archives, specifically from the LINK-LA, SUCCESS, and NEW HOPE studies (Cunningham, 2018; Spaulding, 2018; Springer, 2015). All three studies enrolled only PLWH.

Study Settings and Participant Selection

The sites for all studies utilized, as well as post-release treatment plans are described in the original study documentation. Study designs included randomized trials and prospective cohort studies of eligible individuals. Participants were deemed eligible for recruitment if they were HIV positive, at least 18 years of age, incarcerated in the county or state jail of the respective study counties, and eligible to receive antiretroviral therapy treatment. All arms of the LINK-LA NEW HOPE studies were used, and the intervention arm of the SUCCESS study were used. The control arm of the SUCCESS study was not utilized in this analysis the intervention arm of All individuals signed written consent forms for their participation in the respective studies. Upon release from jail, individuals in the intervention arms of the studies were connected to either case managers, peer navigators, and opiate providers, or a combination of the interventions, as described in original study documentation. Individuals in control arms of studies received care-as-usual for HIV-infected individuals released from jail. Upon release from jail, individuals were followed up regularly for 6 months to determine levels of intervention success at maintaining connections to care. Individuals reincarcerated during the 6-month follow-up period were excluded from further study investigations.

Study Instruments

Various instruments were implemented as part of the STTR cohort studies. All studies utilized Audio-Computer Assisted Self- Interview (ACASI) in their data collection, and gathered demographic information, risk behaviors, health-related information, and baseline access to care details. All individuals answered survey questions from the Center for Epidemiologic Studies Depression Scale instrument (CES-D) or the Mini International Neuropsychiatric Interview (MINI), as well as the National Institutes of Health Alcohol Use Disorder and Associated Disabilities Scale (AUDIDS)

Statistical Analysis

All data was analyzed using SAS and Stata. Prior to analysis, datasets from all relevant studies were merged based on STTR-CJ classification. To determine what independent variables could be predictors for impacts on dependent variables, logistic regression was performed on each variable, adjusting for known confounders such as race, education level, and age. The dependent variable in question was consistent connection to HIV care. An individual was considered to have completed linkage to care if they remained in their respective studies for the entire follow up period and missed fewer than five HIV care appointments during the 6-month follow-up period. Study participants that did not meet these criteria, either by loss to follow-up or excessive missed appointments were determined to have not been successfully connected to care.

Demographic information was analyzed for each participant, including age, race, education level, health insurance level, and mental illness, using demographic survey instruments within each study. Additionally, access to case management, peer navigation, and opiate use were measured as independent variables to determine the effect of interventions as predictors to care connection. Case management was broken into a three-tiered variable, with levels of complete case management, which was defined as participants connecting with case managers while still incarcerated, continuing through release into external care. Incomplete case management was defined as connection to case managers during incarceration, but not continuing through the length of imprisonment, release, and care connection. Access to peer navigation was defined as any individual with one or more contacts with study sanctioned peer navigators, people employed by the studies with lived experience in incarceration and with HIV.

Bivariate analysis was performed on each independent variable to determine its effect on dependent variables, and respective odds ratios, 95% confidence intervals and p-values were reported for each factor. Variables deemed statistically significant were identified as potential predictors for care connection, and alphas of 0.05 were used as a cutoff for statistical significance. Multicollinearity was evaluated for all relevant variables, and the model was adjusted for potential confounders and effect modifiers, specifically race and education level.

Results

Demographic information for all participants is described in Table 1. The mean age of all participants was 40.71 years. Across all studies, 260 (44.98%) individuals received some form of case management while in jail, with 121 (20.93%) receiving complete case management programs after release, and 139 (24.05%) not receiving a full program. Two hundred twenty-six

(41.09%) individuals had access to some form of peer navigation, both while incarcerated and upon release. Three hundred nine (62.22%) individuals enrolled in the respective studies identified as Black, with 309 (65.19%) enrolled individuals having educational backgrounds of completing high school or less, compared to those continuing education. Of 224 (54.16%) individuals experiencing depressive symptoms, as indicated by MINI or CES-D instruments, 150 (66.96%) received some form of psychiatric care or therapy services. There were 279 (48.26%) individuals enrolled in the studies who had some form of health insurance, with 175 individuals having private insurance plans and 104 individuals on some form of Medicaid or Medicare.

Table 1: Demographic characteristics of individuals enrolled in STTR-CJ studies used for secondary analysis, 2015-2018

	Overall	**Continued Care**	**Not linked/not continued care**
N	578	285	239
Age, mean (SD)	40.71 (10.36)	39.54 (10.36)	41.80 (10.37)
Case Management in jail			
Received (Complete)	121	109	12
Received (Incomplete)	139	74	65
Not Received	318	102	216
Peer Navigation			
Received (complete)	226	135	91
Not Received	324	150	198
Race			
White	97	80	17
Black	359	220	139
Other	122	85	37
Education Level			
High school or lower	309	123	174
Greater than High School	165	62	101
Mental Illness			
No Mental Illness	190	103	87

Mental Illness-No Treatment	150	62	88
Mental Illness-Received Treatment	74	57	17
Health Insurance			
Private	175	102	73
Medicaid/Medicare	104	61	43
Other/None	299	176	123

*Totals may differ due to missing values

Across the three studies of interest, over half of all individuals, 285 (54.39%) were connected to complete HIV care regimens. Table 2 shows the results of bivariate analysis performed on each relevant independent variable. Odds ratios are provided, along with corresponding confidence intervals and p-values describing the significance of the relationship. Adjusted odds ratios for relevant variables, controlling for age and education levels, are also recorded. Complete case management programs had the largest effect on linkage to care, with individuals completing case management being 19.10 times more likely to connect to care than individuals with no case management ($p < 0.001$). Incomplete case management was an effective predictor of linkage to care (OR 2.41, $p < 0.001$), however the relationship was significantly weaker than those who completed full case management regimens. Peer navigation, the intervention combined with case management in the Link-LA study, also showed positive indication of predicting care linkage (OR 1.96. $p < 0.001$). The final intervention analyzed was the use of extended-release injectable naltrexone as a method of opiate abuse treatment. Opiate therapy appeared to be a positive predictor of linkage to care. Nonetheless, it was not statistically significant ($p=0.25$), consistent with original study findings.

Table 2: Odds Ratios of Predictors to Continued Care Among Individuals in STTR-CJ Cohorts, 2015-2018

Variable	**Odds Ratio of Continuing Care**	**Adjusted Odds Ratio of Continuing Care***	**Confidence Interval**	**p-Value**
Case Management (complete)	19.10	18.76	[10.31,37.74]	<0.001
Case Management (incomplete)	2.41	2.35	[1.60,3.63]	<0.001

Peer Navigation	1.96	1.85	[1.39,2.75]	<0.001
Extended-release Naltrexone	1.44	1.35	[0.50, 4.7]	0.248
Race (Black vs non-Black)	0.52	0.68	[0.36,0.75]	<0.001
Education (High school vs no high school)	1.15	--	[0.7785,1.708]	0.4826
Depression (No treatment)	0.60	0.65	[0.39,0.92]	0.009
Depression (Receiving treatment)	2.82	1.01	[1.55,5.31]	<0.001
Health Insurance (Private vs. None)	0.98	1.0	[0.67, 1.43]	0.45
Health Insurance (Medicaid/Medi care vs none)	0.99	1.0	[0.63,1.57]	0.48

*Adjusted on age and education levels

Several non-intervention variables were analyzed as potential factors affecting the care cascade. Most notable were individuals having depressive symptoms, as indicated by CES-D survey instrument questionnaires. Individual's experiencing depressive symptoms that had received treatment from a psychiatrist, therapist, or other mental health professional were 2.82 times more likely to be connected to care programs than individuals with no depressive symptoms ($p < 0.001$). This contrasts with individuals with depressive symptoms that had not received any treatment, who were about half as likely (OR=0.60) to be fully connected to care ($p = 0.009$). Participants' race showed to be a statistically significant variable, with Black individuals being 0.52 times as likely to complete HIV care than non-Black individuals ($p < 0.001$).

The education level of individuals was found to be a statistically insignificant factor for predicting whether someone would connect to care ($p > 0.48$). Education was used as a potential confounder for other variables. Nonetheless, adjusting other indicators for education did not meaningfully change the relationship between connection to care and the variables of interest. Health insurance was measured as a potential indicator; however, it was not deemed to be statistically significant, regardless of type of coverage or insurance plan ($p = 0.45,0.48$ respectively).

For individuals receiving PrEP, Race proved to be the largest indicator of PrEP adherence, with Black individuals being 0.29 times as likely to adhere to PrEP than non-Black individuals ($p = 0.033$). Additionally, education was shown to be a statistically significant indicator in this analysis. Individuals with high school educations or higher were 2.18 times as

likely to connect to PrEP than individuals with less than a high school education ($p<0.001$). Lastly, age was an indicator of PrEP adherence, with older individuals being more likely to complete a full PrEP regimen. Depression was not a statistically significant factor for PrEP uptake, as individuals were measured as having symptoms or not, with the status of treatment not being measured ($p >0.12$). Peer navigation, case management, and other intervention possibilities used in the STTR-CJ cohort were not measured as predictors of PrEP adherence.

Discussion

The results show a number of factors exist to predict the likelihood of linking and retaining individuals to HIV care. Compared to those who do not engage in peer navigation, individuals in the respective studies had significantly higher rates of retention, indicating the potential success of the intervention at improving access to care. Complete case management was more successful than partial programs, which further supports the promotion of full case management regimens. Beginning while the participant is still incarcerated, communication with case managers dedicated to individual participants and supporting them through the care process proves to be a potential factor in ensuring said care is maintained. Other successful intervention strategies based on the analysis included comprehensive peer navigation strategies. Participants who were able to connect to individuals with lived experiences like theirs were almost two times as likely to continue care than those without access to peer navigation. The individuals receiving peer navigation were a part of the LINK-LA study and received case management, and there exists a synergistic relationship between the use of case management and peer navigation as partnered strategies aimed at improving linkage to care for incarcerated individuals. The final intervention measured was the use of extended-release Naltrexone as a treatment for opioid abuse. This strategy was not proven to be significantly successful at increasing linkage to care as defined by this analysis, however, could be combined with either of the interventions included in this study as an additional measure to improve retention. Further research will be needed to confirm, but it is possible that combination use of case management, peer navigation, along with substitution opiate therapy for individuals who abuse injection drugs will be successful in maximizing efficiency and connections to care.

Demographic factors are shown to be strong predictors of linkage to care. An individual's race specifically played a significant role in predicting their connection to care. Black individuals in the studies were half as likely to continue care than their non-Black counterparts. The literature points to this being explained by various competing factors, including distrust in healthcare systems, stigmas regarding HIV, individual apprehension, and larger cultural trends against receiving care. Future studies aimed at increasing connections to care could be racially specific and interventions implemented should be designed with the goal of improving connections specifically for Black individuals. Treated and untreated depression also proved to be strong indicators of care connection. Individuals with depressive symptoms were much less likely to retain HIV care if they had not received treatment for their depression, but significantly more likely to continue care if they had received psychiatric treatment of some kind. We speculate that for these individuals, the routine of going to a doctor's appointment, taking medication, and talking to professionals about personal matters, such as sexual history or drug use, is built into their schedules, and the additional appointment dates and treatment regimens are

not entirely foreign to them, and the transition into a care plan is eased by improved social support systems. This contrasts with individuals with untreated depression, who dropped out of care at higher rates. Lack of motivation, inability to manage appointment schedules, fear of disclosing personal information, and a disconnect from care providers all contributed to these individuals dropping out, and all exist as potential contributing factors to depression being an accurate predictor of retention of care.

Adjusting for age and education levels, separately and together, did not significantly change the odds of connecting to care for all predicting variables. There was shown to be a slight decrease in the odds ratios when adjusting for age, which indicates that increases in age contribute slightly to connection to care. Some variables originally predicted to be factors contributing to care connection did not result in meaningful differences in retention. Participants were asked about their health insurance status, and individuals without health insurance were connected to care at almost identical rates to those with both private insurance providers and public providers such as Medicare or Medicaid. This can be explained by HIV clinics in the counties of interest across all studies providing Ryan White programs, which allow care regardless of insurance status. This safety net alleviates a primary point of stress for individuals receiving care.

This study is an important secondary analysis of the STTR-CJ cohort studies. The use of harmonized data allows for aggregate and cross-study comparisons to be made, specifically in this context. Determining predicting factors for HIV care retention allows for future studies to build interventions around the factors contributing to an individual falling out of care. For example, case management and peer navigation strategies, when partnered, appeared to succeed at connecting vulnerable individuals to care providers. Additionally, this furthers the original goal of the harmonization efforts of STTR-CJ, analysis of studies in tandem to advance the initial results and continue further research into the HIV care cascade.

Through this analysis, comparisons between known predictors of care retention for PLWH and whether they can be utilized as predictors of PrEP coverage for PHRS can be made. The study done by Wagner et al. in 2023 identified potential predictors of PrEP uptake, and the results of this study can potentially be applied to the individuals in the Manheim cohort. Specifically, when evaluating the success of potential interventions aimed at increasing PrEP uptake and adherence, strategies of case management and peer navigation have been uninvestigated for individuals receiving PrEP. Demographic predictors are similar for both PrEP and ART, such as race as a predicting factor for adherence, and based on these predictors, similar conclusions can be drawn relating success of interventions and predictors for care between both ART and PrEP users. The one variable with meaningfully different odds of care connection was insurance status. Ryan White programs and other HIV care assistance programs largely do not cover PrEP coverage, and individuals are required to have sustainable insurance or pay out of pocket, which explains the difference in impact from ART to PrEP. Especially in states with limited Medicaid expansion, if similar programs to Ryan White programs were implemented for PrEP, the impact of insurance may decrease. Further studies would need to be performed to determine the true impact an intervention like case management or peer navigation could have on PrEP adherence for individuals released from jail.

This study obtained important findings on trends in HIV care connection but does have some limitations. The secondary analysis relied heavily on self-reports from individuals in the initial study populations, which may be subject to recall or bias. The largest limitation is the crossover between interventions. Not all individuals receiving case management had access to peer navigation, as is the case with extended-release Naltrexone opiate therapy. Additionally, linkage to care was defined differently across studies. A potential unifying measurement of care success could be viral suppression. To determine the success of each individual intervention, as well as interventions in collaboration with each other, further studies would need to be performed on similar cohorts with the intention of comparing the success of potential interventions. Additionally, understanding other predictive factors towards care retention such as depression levels or race can help interventions be tailored to the individual, and present the most successful methods at improving access to care for individuals released from incarceration.

Conclusions

Connection to HIV care for individuals recently released from incarceration continues to pose a significant challenge, with detrimental implications on the health of individuals and communities. This study engaged in secondary analyses of STTR-CJ data to identify predicting factors that contribute to an individual falling out or continuing care through full ART or PrEP regimens. A number of demographic factors help predict care retention, such as individuals' race, education levels, and mental health status. Black individuals, as well as individuals with depressive symptoms but no treatment have increased odds of falling out of care. Additionally, intervention strategies such as comprehensive case management, peer navigation, and Naltrexone opiate therapy all present potential successful methods at retaining care. Further research will need to be done to determine how successful an understanding of predicting factors and intervention possibility can be at retaining care, but the potential for tailored solutions aimed at increasing the care access for all individuals is promising.

What's Next

Research into HIV care options continues to develop, and interventions are being implemented with expectations of improving the care cascade for affected individuals. Further investigation into the potential of case management, peer navigation, and opiate therapy, specifically when combined as part of a larger intervention plan, is necessary to determine how effective and generalizable these strategies can be. Obtaining data regarding viral loads for individuals in the NEW HOPE study will allow for continued analysis on this topic, using a consistent outcome of viral suppression across all studies to create a harmonized depiction of intervention success and variables' predicting power. Larger scale studies enrolling individuals nationally will allow for a better understanding of intervention connections, limitations, and successes. This study made comparisons of interventions designed for PLWH to potential cohorts of PHRS and inferred potential crossovers to PrEP coverage. To determine the effect the interventions this study investigated can have on a cohort of individuals getting PrEP, a research team could implement peer navigation and case management strategies. Continued investigations should implement racially specific intervention strategies, as outlined in this study, to understand and control for the effect race has on an individuals' likelihood of falling out of care. A racially specific study may be able to address the aforementioned factors leading to lack of retention and promote successful care linkage for individuals of all races. Additionally, with the adoption of new ART and PrEP strategies, such as long-acting injectable PrEP, adherence strategies, care plans, and individual approaches may drastically change. Further investigation into new intervention plans could adopt one of multiple of these new classes of drugs, which could greatly improve the odds an individual remains in HIV care.

Future studies should utilize the findings of this investigation to develop approaches fitted around individual characteristics, predictors of care linkage, and known successful intervention strategies, all of which contribute to ensuring all individuals leaving incarceration are connected to HIV care. Combining these factors into comprehensive intervention strategies aimed at tailoring care plans to individuals could result in successful connections to HIV care for individuals both in the Atlanta Metropolitan area, as well as nationally across the United States. These approaches could greatly improve the access to care for individuals leaving incarceration and improve their chances of adhering to the treatment options they are given.

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