AIDS and Behavior (2023) 27:3916–3926
https://doi.org/10.1007/s10461-023-04106-z

ORIGINAL PAPER

Examining Pre-Release Interventions on HIV Outcomes 12 Months After Release from Louisiana State Corrections

Olivia K. Sugarman[1] · Deborah A. Wendell[2,4] · Ashley B. Wennerstrom[2,3] · Marcus A. Bachhuber[3] · William T. Robinson[2,4]

Accepted: 2 June 2023 / Published online: 12 June 2023

Abstract
Louisiana has the highest proportion of people living with HIV (PLWH) in state prison custody. Linkage to care programs minimize odds of HIV care drop-off after release. Louisiana has two pre-release linkage to HIV care programs, one implemented through Louisiana Medicaid and another through the Office of Public Health. We conducted a retrospective cohort study of PLWH released from Louisiana corrections from January 1, 2017 to December 31, 2019. We compared HIV care continuum outcomes within 12 months after release between intervention groups (received any vs. no intervention) using two proportion z-tests and multivariable logistic regression. Of 681 people, 389 (57.1%) were not released from a state prison facility and thus not eligible to receive interventions, 252 (37%) received any intervention, and 228 (33.5%) achieved viral suppression. Linkage to care within 30 days was significantly higher in people who received any intervention (v. no intervention, p = .0142). Receiving any intervention was associated with higher odds of attaining all continuum steps, though only significantly for linkage to care (AOR = 1.592, p = .0083). We also found differences in outcomes by sex, race, age, urbanicity of the return parish (county), and Medicaid enrollment between intervention groups. Receiving any intervention increased the odds of achieving HIV care outcomes, and was significantly impactful at improving care linkage. Interventions must be improved to enhance long-term post-release HIV care continuity and eliminate disparities in care outcomes.

Keywords HIV · Prison · Incarceration · Medicaid · Ryan White

Introduction

Louisiana has the highest incarceration rate in the country, and its disproportionately high HIV prevalence [1, 2] is magnified among incarcerated people. In 2020, 3.1% of people in Louisiana state prison custody were living with HIV, nearly three times that of all PLWH in state prison custody in the US (1.2%) [3]. Intersecting disparities in HIV incidence and incarceration by sex, race and ethnicity, drug use, and social determinants of health (SDOH) factors further magnify HIV prevalence in carceral facilities. For instance, 33% of all people in Louisiana are Black or African American [4], but make up approximately 67% of people in Louisiana state or federal prison custody. In 2019, the rate of new HIV diagnoses was two to nine times higher among people in all other racial and ethnic groups compared to White and Asian people [1]. Black women made up 55% of all new HIV diagnoses among women in 2019, but make up only 13% of the US female population [1]. 45% of people who inject drugs living with HIV in 2019 were Black, 28% were Hispanic Latinx, and 22% were White [1].

✉ Olivia K. Sugarman
okacsits@gmail.com

1 Department of Health Policy and Management, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD 21205, USA

2 School of Public Health, LSU Health Sciences Center – New Orleans, New Orleans, LA, USA

3 School of Medicine, Section of Community and Population Medicine, LSU Health Sciences Center – New Orleans, New Orleans, LA, USA

4 STD/HIV/Hepatitis Program, Louisiana Office of Public Health, New Orleans, LA, USA

HIV Treatment and Incarceration

Under the ruling of *Estelle v Gamble* [5], prison facilities are required to provide HIV care. As such, HIV treatment initiation, adherence, and viral load are generally improved during incarceration given continuity of care and proximity to receiving medications that may otherwise be difficult to access in the community [6, 7]. However, there is substantial drop-off in HIV care engagement and retention after release [8–12]. Because most incarcerated people will be released [13], post-release linkage to HIV care and care continuity are a challenge most formerly incarcerated PLWH will encounter.

In addition to comorbid medical and mental health conditions, social determinants of health (SDOH) needs, difficulty navigating the healthcare system, and stigma are common barriers to HIV care engagement and retention after release from prison [7, 9, 14–19]. For SDOH needs, medical care is a secondary priority to immediate needs like housing, food, and employment [9, 14, 16]. For navigating the healthcare system, some PLWH lack the required knowledge or skills to enroll in health benefits or arrange HIV care, especially if incarcerated for long periods [14, 16]. Finally, stigma from structural policies, physicians and care providers, neighbors, friends, and family is a ubiquitous barrier to HIV treatment, both as a PWLH and a formerly incarcerated person [14, 16, 18, 20]. Altogether, these barriers seriously jeopardize previous gains in HIV treatment adherence and viral suppression while incarcerated.

Characteristics and facilitators associated with successful post-release care engagement and retention include strong individual motivation to focus on one's HIV care, social support [14, 16, 18], older age, having health insurance, receiving HIV treatment while incarcerated, receiving care management services during follow-up, and early linkage to care after release [10]. State-run linkage to care programs are emerging to provide tailored, more intensive opportunities for post-release HIV care engagement and retention. These programs are typically characterized by the presence of a case manager (or coordinator, patient navigator, or other similar role) who provides varying degrees of intervention for people approaching release via needs assessments, appointment scheduling, and other community supports. Such programs have been proven and recognized as an essential factor in facilitating post-release HIV care continuity [8, 9, 11, 15, 17, 21, 22], but effectiveness differs by model [17].

Linkage to Care Programs

To promote post-release HIV care engagement, the Louisiana Offices of Public Health [23, 24] and Medicaid [25] each offer a separate pre-release HIV care linkage and/or case management program. The Louisiana Office of Public Health, STD/HIV/Hepatitis Program initiated the Ryan White HIV/AIDS-funded pre-release linkage to care program (hereafter referred to as the Ryan White Pre-release Program) in the early 2000s with the goal of linking people to HIV care immediately before release [23]. People are eligible to receive support from the Ryan White Pre-release Program if they are living with HIV, housed in one of the eight Louisiana state prison facilities, and elect to enroll. Program activities include six in-person visits within the 180 days before release by an Office of Public Health-based corrections specialist for the state. The staff member assesses prior experience with HIV care, conducts other needs assessments, identifies an HIV care provider in the person's planned return community, makes an appointment for them, and provides other paperwork, medical records, and information necessary to attend appointments [23, 24]. The Ryan White pre-release intervention is specifically focused on linkage to care but does not offer follow-up or longer-term care management services. More details about Ryan White Pre-release program activities are documented elsewhere [23, 24, 26].

Louisiana Medicaid expansion went into effect July 1, 2016 [27]. To connect people who were newly eligible to Medicaid coverage, Louisiana Medicaid created the Justice-Involved Pre-release Enrollment Program [25]. Goals of this program are to help people enroll in Medicaid insurance with one of the five Medicaid managed care organizations (MCOs) so that their benefits are active upon release, and to offer more intensive, longer-term post-release case management through the MCOs for people designated as having 'high needs' [25]. Like the Ryan White Pre-release Program, people must be released from one of the eight state prison facilities to participate in the Medicaid pre-release program [25]. In addition, PLWH must also be eligible for Medicaid, be designated as high needs, and consent to enroll in case management [25]. Details of the pre-release program are published elsewhere [25].

Notably, most people in Louisiana state prison custody do not serve their sentences in one of the state's eight prison facilities [28]. Prisons are state or federally-run entities and house people serving sentences of greater than one year [29]. Jails are city or county-run facilities that house people awaiting trial, sentencing, both, or are sentenced to terms less than one year [29]. Parish prisons (hereafter referred to as parish jails), the Louisiana equivalent of county jails, often house people in state prison custody in exchange for a

per diem rate per person, and there is no documented protocol for selecting who serves their sentence in a prison facility or a parish jail [28, 30]. As such, PLWH in Louisiana state prison custody may be mandated to serve their sentence in either one of the eight state prison facilities or in a parish jail. If PLWH serve their sentence in a parish jail, they are inherently ineligible to receive either pre-release program. Thus, it is important to understand (a) what proportion of PLWH in state prison custody are eligible, (b) among those who are, what proportion elect to receive a pre-release intervention, and (c) the impact of receiving a pre-release intervention on post-release HIV care outcomes.

While both programs have been researched previously, gaps remain. Previous research about the Ryan White program did not include long-term HIV care outcomes and used data from 2013 to 2016 [23]. The Medicaid pre-release program has been evaluated recently, but the evaluation did not examine disease-specific outcomes [31, 32]. Previous research of HIV and incarceration suggests that there is significant drop-off in HIV care engagement after release from prison custody, but existing studies are becoming dated, use data from other older studies, or are focused in other states [8, 12, 14, 16, 19].

The purpose of this study is to (1) investigate the effectiveness of receiving any or no case management or linkage to care intervention on HIV care outcomes within 12 months after release among people released from Louisiana state prison custody, and (2) identify ways to tailor current interventions by assessing HIV outcomes of PLWH returning home from incarceration along the HIV continuum [33]. Our study aims to (1) construct and compare proportions of HIV care continua among people who receive any and no intervention, and (2) use multivariate logistic regression models to assess the comparative likelihood of achieving HIV care continuum outcomes within 12 months of release by (a) intervention group and (b) demographic factors.

We hypothesized that (1) continuum proportions would be higher for people who received any versus no intervention and (2) people enrolled in any intervention would be more likely to achieve or maintain HIV care continuum outcomes, with specific interest in viral suppression, within the 12 months after release from Louisiana state prison custody versus people who receive neither intervention.

Methods

Study Design

This retrospective cohort study aimed to evaluate the impacts of the Medicaid and Louisiana Ryan White pre-release programs on HIV care engagement within the 12-month period after release from Louisiana state prison custody. We compared those who received a pre-release intervention with those who did not receive a pre-release intervention in two ways: first by constructing a cross-sectional HIV care continua for 2020 using proportions by intervention group (any versus no intervention), and second by an adjusted longitudinal analysis of HIV care outcomes within 12 months after release that controlled for differences in key covariates using logistic regression models. Study data were analyzed between December 2021 and March 2022.

Study Population

The inclusion criteria for the two analyses were slightly different due to the nature of the analyses. For both analyses, inclusion criteria were: (1) age 18 years or older, (2) a lifetime positive HIV test (confirmed by the Louisiana Office of Public Health), and (3) released from Louisiana state prison custody between January 1, 2017 and December 31, 2019. Individuals were excluded if they were released out of state. If a person was incarcerated and released more than once within the study period, only the most recent record based on release date was kept. For the 2020 cross-sectional HIV care continuum analysis, to follow CDC surveillance methods [34], we excluded those individuals who died before year-end 2020. For the adjusted longitudinal analysis of HIV care outcomes, we only excluded those individuals who died within 12 months of release.

Data Sources

Data used for this study were compiled from Louisiana's Enhanced HIV/AIDS Reporting System (eHARS; lifetime HIV diagnosis, demographics), Louisiana STD HIV/Hepatitis Program laboratory results database (linkage to care, care receipt, care retention, and viral suppression), Louisiana Ryan White pre-release intervention program data (exposure to Ryan White pre-release intervention), and Louisiana Medicaid claims data (exposure to Medicaid pre-release intervention, Medicaid enrollment). Corrections-related data used to calculate variables in the dataset (e.g. age at release, time from release to HIV outcomes, parish released to) were available within the four data sources identified. Data were matched via deterministic matching using first name, last name, and date of birth using the SAS application LinkKing© [35]. All identifiable information was permanently removed from the dataset before sending to the study team.

Measures

Exposure

Our main exposure was receipt of an HIV pre-release intervention. We divided individuals into two groups, those who received "any intervention" and those who received "no intervention." Those who received "any intervention" group received either or both the Ryan White and Medicaid pre-release interventions. People allocated to the "no intervention" group did not receive or declined to participate in either pre-release intervention. Participation in the Ryan White pre-release intervention was defined as both being eligible and accepting program services, as indicated in program tracking data. People who elected to receive the Medicaid pre-release intervention were designated as "high needs" in Medicaid claims data.

Outcome Measures

For all individuals, outcomes of interest were linkage to care within 30 days of release from Louisiana state prison custody, receipt of care, retention in care, and viral suppression within the study period (primary outcome). For the unadjusted HIV continua analysis, we also assessed viral suppression among people who received care.

HIV continuum definitions were adapted from CDC surveillance standards [35, see Supplemental Table 1]. HIV linkage to care was defined as receiving one CD4 or viral load test within 30 days after release from state prison custody (yes, no). Receiving care was defined as having one or more CD4 or viral load tests (yes, no) within 12 months after release. Retention in care was defined as having two or more CD4 or VL tests 90 days apart of each other (yes, no) within 12 months after release. Viral suppression was defined as having < 200 copies/mL on the most recent VL test within 12 months post-release (yes, no).

Covariates

Covariates of interest in logistic regression models were age at the time of release in years (19–29, 30–39, 40–49, 50–59, 60+), sex (male, female), race/ethnicity (Black/African American, White, another race), urbanicity of the return parish (urban, rural), and post-release Medicaid enrollment (yes, no). Covariates were selected given demonstrated significance in previous literature, contextual importance, and data availability. For race/ethnicity, due to low frequencies, people whose race or ethnicity were classified as Hispanic/Latinx, American Indian/Alaskan Native, and/or Multiracial were recoded as "another race". Parish urbanicity was determined using the 2013 National Center for Health Statistics urban-rural classification scheme for counties with large central metros, large fringe metros, medium metros, and small metros categorized as urban parishes [36]. Post-release Medicaid enrollment was defined as enrollment in Medicaid at any point any time after release from state prison custody. Supplementary Table 1 summarizes all variables, definitions, and values.

Analysis

For the cross-sectional HIV care continua, we first obtained the counts of people by intervention group who met criteria for each HIV care continuum step. Proportions for each step were calculated using counts of "yes" as successes by intervention group (any intervention versus no intervention). Percentages were calculated using "yes" counts as the numerator and the total number of people with diagnoses as the denominator. To calculate the proportion of virally suppressed people among those in care, the numerator was the "yes" count of people who were both virally suppressed and received care, and the denominator was the number of people who received care. Then, we calculated z-scores and risk to test for equality of care continuum proportions between intervention groups. Two-sided p-values were used to assess significance.

For the adjusted longitudinal analysis, we constructed logistic regression models. First, we used chi-square tests to compare differences in counts and averages between intervention groups for all demographic characteristics and HIV care outcomes. Second, we conducted 24 separate parameterized logistic regressions using each continuum step as the outcome variable and individual covariates as the predictor variable. We then completed four separate multivariable logistic regressions of each HIV continuum step controlling for all covariates with intervention group as the predictor variable of interest. All statistical analyses were conducted using SAS 9.4 software for Windows (SAS Institute, Cary, NC).

This study was reviewed and determined to be not human subjects research by institutional review boards at LSU Health Sciences Center – New Orleans and the Louisiana Department of Health.

Results

Cross-Sectional HIV Care Continua

Of 718 PLWH released from prison between January 1, 2017 and December 31, 2019, 650 (91%) met eligibility criteria for the cross-sectional HIV care continua analysis (see Fig. 1a). Among this group, 245 (n = 245/650, 37.7%,)

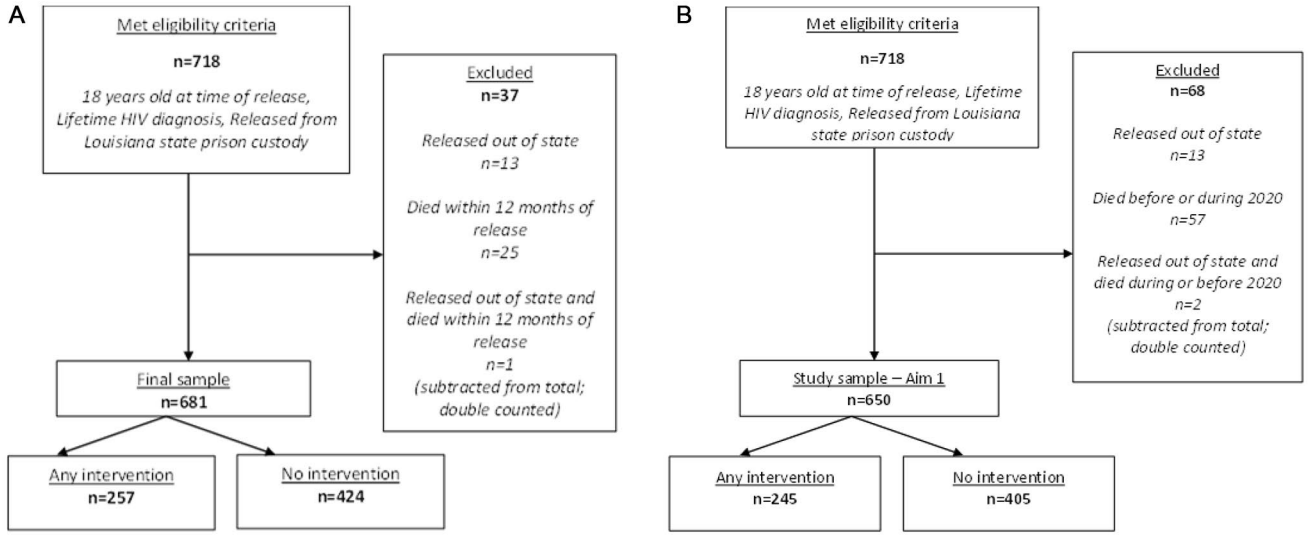

Fig. 1 Population flow charts, overall population (**a**) and continuum subcohort (**b**)

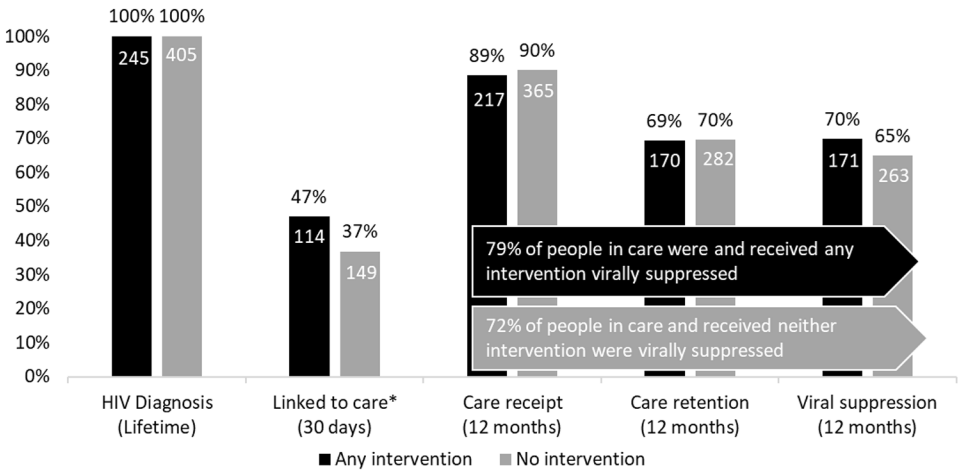

Fig. 2 HIV care continuum of PLWH released from Louisiana state prison custody by year-end 2020, by intervention group (n = 650) *p < .05

received any intervention and 405 (n = 405/650, 62.3%) received no intervention. The proportion of linkage to care within 30 days after release was significantly higher among people who received any intervention (n = 114/245, 47%) than those who received no intervention (37%, n = 149/405; p = .0142; see Fig. 2 and Supplemental Table 2). Comparisons of remaining continuum steps between intervention groups (see Fig. 2 and Supplemental Table 2) showed that there were not significant proportional differences between groups in receiving care, care retention, and viral suppression.

Adjusted Longitudinal Analysis

Of 718 PLWH released from prison between January 1, 2017 and December 31, 2019, 681 (95%) met eligibility criteria for the adjusted longitudinal analysis of HIV care outcomes (see Fig. 1b). In contrast to the cross-sectional HIV care continua, an additional 31 individuals could be included because, while they died prior to year-end 2020, they were alive for at least 12 months after they were released. Of those 718, 257 (37.7% of 681) received any intervention and 424 (62.3% of 681) received no intervention.

Within this group, the largest proportion were 30 to 39 years old at release (n = 233, 34.2%, see Table 1), Black/African American (n = 525, 77.1%), enrolled in Medicaid after release (n = 618, 90.8%), male (n = 558, 81.9%), released to an urban parish (n = 613, 90%), and not released from a state prison facility (n = 389, 57.1%; see Table 1). Most members of the study population were not linked to care within 30 days of release (n = 405, 59.5%).

Age at release ($X^2 = 18.56$, p = .001), Medicaid enrollment ($X^2 = 51.2$, p < .0001), sex ($X^2 = 8.78$, p = .003), and release from a state prison facility ($X^2 = 549.9$, p < .0001), were significantly different between intervention groups. Of all HIV care outcomes, chi-squared analyses showed that

Table 1 Characteristics and weighted proportions of the overall study population, by intervention group (n = 681)

Variables	*Total (n = 681)*	*Any intervention (n = 257)*	*No intervention (n = 424)*	X^2	*p*
	n (%)	n (%)	n (%)		
Age at release***				**18.56**	**0.001**
19 to 29	100 (14.7)	22 (8.6)	78 (18.4)		
30 to 39	233 (34.2)	80 (31.1)	153 (36.1)		
40 to 49	192 (28.2)	85 (33.1)	107 (25.2)		
50 to 59	89 (13.1)	40 (15.6)	49 (11.6)		
60+	67 (9.8)	30 (11.7)	37 (8.7)		
Race				2.74	0.2541
Black/African American	525 (77.1)	205 (79.8)	320 (75.5)		
White	138 (20.26)	44 (17.1)	94 (22.2)		
Another race	18 (2.6)	8 (3.11)	10 (1.5)		
Medicaid enrollment**				**51.2**	< 0.0001
Yes	618 (90.8)	207 (80.5)	411 (96.9)		
No	63 (9.3)	50 (19.5)	13 (3.1)		
Sex*				**8.78**	**0.003**
Female	123 (18.1)	32 (12.5)	91 (21.5)		
Male	558 (81.9)	225 (87.6)	333 (78.5)		
Parish urbanicity				0.0305	0.8614
Rural	68 (10.0)	25 (9.7)	43 (10.1)		
Urban	613 (90.0)	232 (90.3)	381 (89.9)		
Released from DPSC Facility**				**549.9**	**< 0.0001**
Yes	292 (42.9)	257 (100.0)	35 (8.3)		
No	389 (57.1)	0	389 (91.8)		

*p < .05, ** p < .01, ***p < .001

only linkage to care within 30 days ($X^2 = 9.2046$, p = .0024) was significantly different between intervention groups.

Within 12 months after release, most received care (n = 611, 89.7%), were retained in care (n = 476, 69.9%) and were virally suppressed within 12 months post-release (n = 453, 66.5%; see Table 2). Unadjusted odds ratios for all outcomes and covariates are in Supplemental Table 3.

Table 2 Weighted proportions of outcomes among the overall study population, by intervention group (n = 681)

Variables	*Total (n = 681)*	*Any intervention (n = 257)*	*No intervention (n = 424)*	*p*
	n (%)	n (%)	n (%)	
Linked to care within 30 days of release*				**0.0024**
Yes	276 (40.5)	123 (47.9)	153 (36.1)	
No	405 (59.5)	134 (52.1)	271 (63.9)	
Received care				0.6803
Yes	611 (89.7)	229 (89.1)	382 (90.1)	
No	70 (10.3)	28 (10.9)	42 (9.9)	
Retained in care				0.8141
Yes	476 (69.9)	181 (70.4)	295 (69.6)	
No	205 (30.1)	76 (29.6)	129 (30.4)	
Viral suppression within 12 months after release				
Yes	453 (66.5)	181 (70.4)	272 (64.2)	0.0925
No	228 (33.5)	76 (29.6)	152 (35.9)	

*p < .05, ** p < .01, ***p < .001

Linkage to Care

Adjusted models showed those who received any intervention had 60% higher odds of linking to care within 30 days after release than those who received no intervention (AOR = 1.56, 95% CI = 1.13–2.25; see Table 3). Of demographic covariates, all age categories were significantly associated with higher odds of linkage to care compared to people age 19 to 29 years old at release. As age increased, the adjusted odds of linkage increased between 1.9 and 6.5 times that of the comparator age group (age 30 to 39: AOR = 1.89 [95% CI = 1.08, 3.30]; age 40 to 49: AOR 2.87 [95% CI = 1.63, 5.06]; age 50 to 59: AOR = 3.41 [95% CI = 1.79, 6.49]). Adjusted odds of post-release linkage within 30 days were significantly lower among Black/African American people compared to White people by nearly two thirds (AOR = 0.65, 95% CI = 0.43, 0.98), and for people who returned to rural parishes by nearly one third (vs. urban; AOR = 0.33, 95% CI = 0.18, 0.60).

Receipt of Care

There was no significant difference in adjusted odds of post-release care receipt between people who received any versus no intervention (AOR = 1.31 [95% CI = 0.72, 2.39], see Table 3). Adjusted odds of care receipt within 12 months of release were significantly higher for people in age group categories 40 to 49 years old and 60 + years old (vs. age 19 to 29; age 40 to 49: AOR = 2.33 [95% CI = 1.04, 5.23]; age 60+: AOR = 3.78 [95% CI = 1.00, 14.25]) and people

Table 3 Adjusted odds ratios of HIV care continuum outcomes 12 months after release, by demographic characteristics and intervention group

Variables	Linkage	Receipt	Retention	Viral Suppression
	AOR (95% CI)	**AOR(95% CI)**	**AOR(95% CI)**	**AOR(95% CI)**
Age (Reference = 19 to 29)				
30 to 39	**1.89 (1.08, 3.30)***	1.27 (0.63, 2.58)	**1.97 (1.19, 3.27)****	1.40 (0.85, 2.29)
40 to 49	**2.87 (1.63, 5.06)****	**2.331 (1.039, 5.23)***	**2.26 (1.33, 3.84)****	**1.81 (1.08 3.03)***
50 to 59	**3.41 (1.79, 6.49)****	1.89 (0.73, 4.90)	**2.29 (1.21, 4.32)***	**2.63 (1.38, 5.01)****
60+	**5.62 (2.79, 11.34)*****	**3.78 (1.00, 14.25)***	**2.96 (1.42, 6.18)****	**3.99 (1.83, 8.70)****
Race (Reference = White)				
Another race	0.68 (0.23, 1.99)	1.65 (0.19, 14.07)	1.23 (0.40, 3.81)	1.47 (0.44, 4.91)
Black/African American	**0.65 (0.43, 0.98)***	0.80 (0.40, 1.60)	0.87 (0.60, 1.35)	**0.60 (0.38, 0.93)***
Sex (Reference = Male)	1.23 (0.80, 1.89)	0.88 (0.45, 1.8)	**0.57 (0.37, 0.88)***	**0.51 (0.33, 0.78)****
Parish of return (Reference = Urban)	**0.36 (0.18, 0.60)****	0.66 (0.30, 1.44)	**0.54 (0.32, 0.93)***	**0.52 (0.31, 0.88)***
Medicaid enrollment (Reference = No)	1.38 (0.77, 2.47)	**6.77 (3.41, 13.44)*****	**2.90 (1.64, 5.10)****	1.49 (0.84, 2.65)
Intervention group (Reference = No intervention)[a]	**1.59 (1.13, 2.25)****	1.31 (0.72, 2.39)	1.09 (0.75, 1.59)	1.24 (0.86, 1.79)

AOR Adjusted Odds Ratio, CI Confidence Interval

*p < .05, ** p < .01, ***p < .001

[a] controlling for age, sex, race, urbanicity of return parish, Medicaid enrollment

enrolled in Medicaid (vs. not enrolled; AOR = 6.77, 95% CI = 3.41, 13.44).

Retention in Care

There was also no significant difference in the adjusted odds of care retention between people who received any versus no intervention (AOR = 1.09, 95% CI = 0.75, 1.59; see Table 3). Among demographic covariates, all age categories and Medicaid enrollment were associated with significantly higher odds of care retention. Compared to people ages 19 to 29, the adjusted odds of care retention increased with age and were between nearly two and three times higher (age 30 to 39: AOR = 1.97 [95% CI = 1.19, 3.27]; age 40 to 49: AOR = 2.26 [95% CI = 1.33, 3.84]; age 50 to 59: AOR = 2.29 [95% CI = 1.21, 4.32]; age 60+: AOR = 2.96 [95% CI = 1.42, 6.18]). Adjusted odds of care retention were nearly three times higher for people enrolled in Medicaid than people not enrolled in Medicaid (AOR = 2.89, 95% CI = 1.64, 5.09).

Viral Suppression

After controlling for all covariates, the adjusted odds of viral suppression within 12 months after release were not significantly different between people who received any vs. no intervention (AOR = 1.24, 95% CI = 0.86, 1.79). Adjusted odds of viral suppression were significantly higher for people ages 40 to 49, 50 to 59, and 60 + compared to people ages 19 to 29 years old (age 40 to 49: AOR = 1.81 [95% CI = 1.08, 3.03]; age 50 to 59: AOR = 2.63 [95% CI = 1.38, 5.01]; age 60 + AOR = 3.99 [95% CI = 1.83, 8.69]). Adjusted odds of viral suppression were significantly lower among people who were Black/African American (v. White, AOR = 0.60, 95% CI = 0.382, 0.926), female (v. male, AOR = 0.51, 95% CI = 0.33, 0.78), and returned to a rural parish (v. urban, AOR = 0.52, 95% CI = 0.31, 0.88).

Discussion

The purpose of this study was to understand the impact of and identify opportunities to tailor two pre-release interventions on HIV continuum outcomes within 12 months of release from Louisiana state prison custody. We found that linkage to care was the only outcome significantly associated with receiving any pre-release intervention and that care receipt, retention in care, and viral suppression were not significantly different between those who received an intervention and those who received no intervention.

Cross-sectional HIV continua comparisons by intervention group contradicted initial hypotheses as linkage to care was the only continuum step in which the proportion of people who received any intervention was significantly higher than people who received no intervention (47% vs. 37%). Adjusted longitudinal analysis regression models also showed that receiving any intervention was significantly associated with higher odds of linkage to care within 30 days after release, which indicates that programs are meeting their goals of connecting intervention participants with care post-release. Our findings are consistent with previous studies that also found longer-term post-release HIV care engagement and clinical outcomes were limited, and more or different interventions were needed to enhance care continuity [10–12].

Findings may be explained by the focus of interventions on care linkage, intervention eligibility requirements, and study population makeup. The Ryan White pre-release intervention is specifically focused on linkage to care with little to no continued contact after release. Similarly, the Medicaid pre-release intervention uses a case manager approach, but engagement with participants is concentrated shortly before and after release. Further, only people released from Louisiana state prison facilities are eligible to receive interventions from either Ryan White or Medicaid pre-release interventions, yet only 43% of PLWH released from state prison custody were housed in one of the eight state prison facilities. Additionally, some people released from state prison facilities may have been eligible for intervention but missed due to a moving release date or early parole. Moving release dates refer to changed sentence length and may occur when a prison sentence is shortened by a commuted sentence, or earned credit toward their sentence for satisfactory behavior, for example [37].

Notably, disparities in HIV care outcomes were detected by race/ethnicity, sex, and parish urbanicity. For race/ethnicity, compared with White people, Black/African American people were about half as likely to link to care within 30 days after release or achieve viral suppression within 12 months after release. Disparate outcomes by race may reflect and be compounded by ubiquitous race-based inequities in social determinants of health, incarceration as a health determinant, healthcare access, and health outcomes present in return communities. This finding is especially concerning given disproportionately high incarceration and HIV diagnosis and prevalence rates of Black Americans.

For sex, people who were female had significantly lower, nearly half, the adjusted odds of care retention and viral suppression than males. Though not all significant, the adjusted odds of success for females decreased as continuum steps progressed - adjusted odds of linkage to care, though not significant, were higher for females, 20% lower than males for care receipt, then more than 50% lower for care retention and receipt. This finding may be the result of disparate access to health care, employment opportunities, transportation, and social services in the return community, and may be intensified by sex and gender-based discrimination and barriers to receiving and retaining care.

For parish urbanicity, returning to a rural parish was significantly and negatively associated with linkage to care, retention in care, and viral suppression; odds of outcomes were between 50% and 70% lower than people who returned to urban parishes. HIV services and physicians who serve PLWH and accept Medicaid may be unavailable in rural return communities. Proximity to physicians and lack of adequate transportation may hinder care access as people who return to rural parishes may need to travel to urban areas for care. Other state and local factors like community reentry services, transportation access, housing, employment, and substance use program (in)availability may not sufficiently meet participants needs.

Finally, Medicaid enrollment was significantly associated with post-release care receipt and retention. This indicates that efforts to enroll people both before and shortly after release are effective at successfully enrolling people in Medicaid and having insurance encourages people to seek and remain in care.

Limitations

This study has several limitations. First, results may not be generalizable to formerly incarcerated populations outside of Louisiana. However, other states may use this study's findings to inform their programs and policies for PLWH after incarceration. Second, because of the COVID-19 pandemic, there may be limits on laboratory data given interruptions in care access and laboratory capacity from March 2020 to December 2020. Third, intervention impacts between the Medicaid and Ryan White pre-release interventions may vary given differences in intervention longevity, fidelity, and delivery between the eight state prison facilities, and in the case of Medicaid, between the five MCOs. The Medicaid Pre-release intervention has been in place since January 1, 2017, while the Ryan White intervention has been in place since 2015. Medicaid pre-release intervention uptake and execution may have been less efficient or consistent in its first year. Fourth, this study does not ascertain individual impacts by intervention type (i.e., received Ryan White only, Medicaid only, both interventions, or neither). An attempt was made to complete individual intervention analyses and revealed insufficient sample sizes by intervention type to complete robust analyses (received Ryan White only: n = 198; Medicaid case management only: n = 21; both interventions: n = 38; neither intervention: n = 424). Fifth, voluntary enrollment into interventions may introduce selection bias – people who enrolled in an intervention may be more motivated to engage in HIV treatment after incarceration. Alternatively, people who enrolled in an intervention may have anticipated experiencing more barriers to successful treatment upon release and thus may have been interested in enrolling in an intervention to help overcome those barriers. Study data did not include details about whether participants did not have the opportunity to enroll or if they declined participation. Sixth, HIV viral load is assessed dichotomously and does not illustrate improvements in viral load between release and 12-months after release that may occur at > 200 copies/mL. Seventh, people who returned to rural areas may be underrepresented, as some parishes classified as urban contain census tracts that

are more characteristic of rural communities. Finally, we did not have data on other possible covariates like social determinants of health (e.g. homelessness, education), interpersonal factors (e.g. stigma, community connectedness, peer support) [7, 9, 10, 14–19, 23], comorbidities (e.g. severe mental illness, substance use disorder, Hepatitis C), length of incarceration, or connection to HIV care prior to incarceration [23], all of which have been shown to influence post-incarceration HIV outcomes.

Recommendations

Direct applications of this study's findings point to three primary areas of improvement programs and policies to enhance post-release HIV care and health outcomes. First, more comprehensive and longer-term interventions are needed to ensure continued engagement in care. States may leverage existing multi-agency resources within the state and Medicaid agency resources and personnel to enhance longer-term case management efforts. For example, community health workers, peer navigator, or similar services may improve outcomes [38] and Medicaid reimbursement of these services can promote financial sustainability. While some states currently reimburse for community health worker services, some do not, or reimburse only in specific contexts or for specific services. Second, partnerships between state agencies and community-based organizations in returnees' locales are needed to directly address reentry, HIV, co-morbidities, and/or social determinants of health needs. Partnerships with community-based organizations in returnees' communities may reduce barriers to finding and making timely appointments with physicians, promote trust with returnees, and help eliminate disparities in post-release HIV care outcomes.

More research is also needed to identify modifiable barriers and facilitators to long-term HIV care engagement and retention. Future research should examine the impacts of factors at multiple levels such as time from release to care engagement, social determinants of health, comorbidities, and interpersonal relationships on post-release HIV care outcomes. Qualitative research may be helpful to clarify results found in this study by examining characteristics of people who decline linkage to care interventions and why they decline to participate, motivations to seek care after incarceration among PLWH, health care navigation experiences as a PLWH after release, and social supports and community resources in identifying and maintaining care. Collectively, this study and the proposed future studies can inform existing pre-release interventions and an adapted, incarceration-specific HIV care continuum. An adapted HIV care continuum will serve as an evidence-based framework to inform policies, programs, and future research that best serves people leaving incarceration and the communities they return to.

Conclusion

Our study of PLWH released from Louisiana state prison custody examined the impact of the Louisiana Ryan White and Medicaid HIV pre-release programs on HIV care outcomes within 12 months of release after incarceration. We compared proportional differences in and odds of achieving HIV care outcomes within 12 months of release by intervention group and demographic characteristics. Altogether, we found that receiving any intervention was significantly associated with increased odds of linkage to care within 30 days after release. Our study provides evidence that existing pre-release programs are associated with improved linkage to care but that additional longer-term interventions are needed to enhance post-release HIV care continuity. Interventions must be tailored to individuals to eliminate disparities in care outcomes. Existing or new interventions may be improved by creating collaborations that leverage mutual strengths, like Medicaid-reimbursed or health system sponsored services by a community health worker or peer navigator. Future studies should evaluate longitudinal time to care, social determinants of health, comorbidities, interpersonal relationships, and multi-level differences in HIV outcomes.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s10461-023-04106-z.

Acknowledgements The authors received no external funding to support this research and have no conflicts of interest to disclose. This study was conducted as part of Dr. Sugarman's dissertation during her time as a student at Louisiana State University Health Sciences Center – New Orleans School of Public Health. Results were previously presented as Dr. Sugarman's dissertation, and elements were presented at the American Public Health Association 2022 Annual Meeting. The authors would like to acknowledge Dr. DeAnn Gruber for her support in completing this project.

Authors' Contributions OKS led study conceptualization, design, completed analyses, and manuscript writing.

Funding The authors received no funding to support this research.

Data Availability Not applicable.

Code Availability Analytic codes are available by request to the corresponding author.

Declarations

Competing interests The authors have no conflicts of interest to disclose.

Ethics approval This study was reviewed and determined non-human subjects research by Institutional Review Boards at LSU Health Sciences Center ? New Orleans and the Louisiana Department of Health.

Consent for publication Not applicable

Consent to participate Not applicable

References

1. Centers for Disease Control and Prevention, Surveillance Report HIV. 2019. 2021 May.
2. Centers for Disease Control and Prevention. HIV Surveillance Report 2020 [Internet]. 2020 May p. 143. Report No.: 33. Available from: https://www.cdc.gov/hiv/pdf/library/reports/surveillance/cdc-hiv-surveillance-report-2020-updated-vol-33.pdf.
3. Maruschak LM. HIV in prisons, 2020-Statistical tables. Bureau of Justice Statistics; 2022 May.
4. United States Census Bureau. QuickFacts: Louisiana [Internet]. census.gov. 2019 [cited 2021 Apr 17]. Available from: https://www.census.gov/quickfacts/LA.
5. Supreme Court of the United States. *Estelle v. Gamble*, 429 U.S. 97. Library of Congress; 1976.
6. Meyer JP, Cepeda J, Wu J, Trestman RL, Altice FL, Springer SA. Optimization of human immunodeficiency virus treatment during incarceration: viral suppression at the prison gate. JAMA Intern Med American Medical Association. 2014;174:721–9.
7. Strick LB, Budak JZ. HIV and Corrections [Internet]. University of Washington, National HIV. Curriculum; 2020 Aug. Available from: https://www.hiv.uw.edu/go/key-populations/hiv-corrections/core-concept/all.
8. Iroh PA, Mayo H, Nijhawan AE. The HIV Care Cascade before, during, and after incarceration: a systematic review and data synthesis. Am J Public Health. 2015;105:e5–16.
9. Centers for Disease Control and Prevention. HIV Testing Implementation Guidance for Correctional Settings [Internet]. Centers for Disease Prevention and Control. ; 2009 p. 1–38. Available from: http://www.cdc.gov/hiv/topics/testing/resources/guidelines/correctional-settings.
10. Loeliger KB, Meyer JP, Desai MM, Ciarleglio MM, Gallagher C, Altice FL. Retention in HIV care during the 3 years following release from incarceration: A cohort study. Tsai AC, editor. PLOS Med. Public Library of Science; 2018;15:e1002667.
11. Ibañez GE, Zhou Z, Algarin AB, Disler ·, Ayala V, Spencer EC, et al. Incarceration history and HIV Care among individuals living with HIV in Florida, 2014–2018. AIDS Behav. 2021;25:3137–44.
12. Baillargeon J, Giordano TP, Rich JD, Wu ZH, Wells K, Pollock BH, et al. Accessing antiretroviral therapy following release from prison. JAMA - J Am Med Assoc NIH Public Access. 2009;301:848–57.
13. Hughes T, Wilson DJ. Reentry Trends in the United States [Internet]. Bureau of Justice Statistics; 2004. Available from: https://www.bjs.gov/content/reentry/reentry.cfm.
14. Dennis AC, Barrington C, Hino S, Gould M, Wohl D, Golin CE. You're in a world of Chaos": experiences accessing HIV Care and adhering to Medications after Incarceration. J Assoc Nurses AIDS Care. 2015;26:542–55.
15. Fuller SM, Koester KA, Maiorana A, Steward WT, Broaddus MR, Lass K, et al. I don't have to do this all by myself": Systems navigation to ensure continuity of HIV care for persons leaving prison. Volume 23. New York LLC: AIDS Behav. Springer; 2019. pp. 14–24.
16. Haley DF, Golin CE, Farel CE, Wohl DA, Scheyett AM, Garrett JJ, et al. Multilevel challenges to engagement in HIV care after prison release: a theory-informed qualitative study comparing prisoners' perspectives before and after community reentry. BMC Public Health BioMed Central. 2014;14:1253.
17. Woznica DM, Fernando NB, Bonomo EJ, Owczarzak J, Zack B, Hoffmann CJ. Interventions to improve HIV Care Continuum Outcomes among individuals released from prison or Jail. Syst Literature Rev JAIDS NLM (Medline). 2021;86:271–85.
18. Yanes-Lane M, Dussault C, Linthwaite B, Cox J, Klein MB, Sebastiani G, et al. Using the barriers and facilitators to linkage to HIV care to inform hepatitis C virus (HCV) linkage to care strategies for people released from prison: findings from a systematic review. J Viral Hepat. 2020;27:205–20.
19. Rowell-Cunsolo TL, Hu G. Barriers to optimal antiretroviral therapy adherence among HIV-infected formerly incarcerated individuals in New York City. PLoS ONE [Internet]. Public Library of Science; 2020. [cited 2021 Apr 18];15. Available from: /pmc/articles/PMC7263611/.
20. Kemnitz R, Kuehl TC, Hochstatter KR, Barker E, Corey A, Jacobs EA, et al. Manifestations of HIV stigma and their impact on retention in care for people transitioning from prisons to communities. Health Justice. 2017;5:7.
21. United Nations Office on Drugs and Crime, Organization WH. UNAIDS. HIV testing and counselling in prisons and other closed settings [Internet]. Vienna, Austria: United Nations, World Health Organization; 2009. Available from: www.unodc.org.
22. United Nations Office on Drugs and Crime, Organization WH. UNAIDS. A Framework for an Effective National Response. Vienna, Austria: United Nations Office of Drugs and Crime; 2006 Oct.
23. Brantley AD, Page KM, Zack B, Friedrich KR, Wendell D, Robinson WT, et al. Making the connection: using videoconferencing to increase linkage to care for incarcerated persons living with HIV post-release. AIDS Behav. 2019;23:32–40.
24. Louisiana Department of Health and Hospitals Office of Public Health STD/HIV Program. Video Conference Manual. New Orleans, LA: Louisiana Department of Health and Hospitals; 2015 Aug.
25. Louisiana Department of Health Bureau of Health Services Financing. Justice-Involved Pre-Release Enrollment Program Manual. Baton Rouge, LA: Louisiana Department of Health; 2017 Oct. p. 16.
26. Health Resources & Services Administration. Improving Health Outcomes: Moving Patients Along the HIV Care Continuum and Beyond Video Conferencing Intervention. 2017.
27. Edwards JB. Executive order no. JBE 16 – 01 Medicaid expansion. Baton Rouge, Louisiana: Governor; 2016.
28. Louisiana Department of Public Safety and Corrections. Information for & about people in prison [Internet]. 2022 [cited 2022 Mar 27]. Available from: https://doc.louisiana.gov/imprisoned-person-programs-resources/offender-information/.
29. Bureau of Justice Statistics. Correctional Institutions [Internet]. Bur. Justice Stat. [cited 2022 Oct 28]. Available from: https://bjs.ojp.gov/topics/corrections/correctional-institutions.
30. O'Donoghue J. As prison population drops, Louisiana sheriffs ask for more money. Times-Picayune [Internet]. 2020 Jan 31 [cited 2022 Mar 27]; Available from: https://www.nola.com/news/article_ce3f6329-d9fe-55f4-a295-97db50afe4ff.html.
31. Wennerstrom A, Sugarman OK, Page KM, Whittington A, Martin D, Reilly B, et al. Mixed method evaluation of Louisiana's Prerelease Medicaid Enrollment Program, 2017–2019. Med Care. 2022;60:512–8.
32. Sugarman OK, Bachhuber M, Page KM, Wennerstrom A. Evaluation of the Louisiana pre-release Medicaid Enrollment Program.

New Orleans, LA: LSU Health Sciences Center - New Orleans Center for Healthcare Value and Equity; 2019.
33. Centers for Disease Control and Prevention. Understanding the HIV Care Continuum. Centers for Disease Control and Prevention; 2019.
34. Centers for Disease Control and Prevention. Monitoring selected national HIV prevention and care objectives by using HIV surveillance data—United States and 6 dependent areas, 2019 [Internet]. HIV Surveill. Suppl. Rep. 2021 May. Available from: https://www.cdc.gov/hiv/pdf/library/reports/surveillance/cdc-hiv-surveillance-supplemental-report-vol-27-3.pdf.
35. Campbell KM. Rule your data with the Link King © (a SAS/AF® application for record linkage and unduplication).
36. National Center for Health Statistics. 2013 NCHS Urban-Rural Classification Scheme for Counties Series 2, Number 166. National Center for Health Statistics; 2014 Apr.
37. 18 U.S. Code. § 3624 - Release of a prisoner [Internet]. US, 3624. Available from: https://www.law.cornell.edu/uscode/text/18/3624.
38. Hammack AY, Bickham JN, Gilliard I, Robinson WT. A Community Health Worker Approach for ending the HIV Epidemic. Am J Prev Med Elsevier. 2021;61:26–31.