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HIV in people reincarcerated in Connecticut prisons and jails: an observational cohort study

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Summary

Background—Reincarceration in prison or jail correlates with non-sustained HIV viral suppression, but HIV treatment outcomes in released prisoners who are reincarcerated have not recently been systematically assessed despite advances in antiretroviral treatment (ART) potency, simplicity, and tolerability.

Methods—In a retrospective cohort of reincarcerated inmates with HIV in Connecticut (2005–12), we used longitudinally linked demographic, pharmacy, and laboratory databases to examine correlates of viral suppression. The primary outcome was viral suppression on reincarceration, defined as viral load lower than 400 RNA copies per mL.

Findings—Of 497 prisoners and jail detainees with HIV, with 934 reincarcerations, individuals were mostly unmarried, uninsured, and black men prescribed a protease-inhibitor-based ART regimen. During the median 329 days (IQR 179–621) between prison release and reincarceration, the proportion of incarceration periods with viral suppression decreased significantly from 52% to 31% (mean HIV-RNA increased by 0·4 $\log_{10}$; p<0·0001), lower than Connecticut's HIV-infected prison population and those prescribed ART nationally. 158 (51%) of 307 individuals with viral suppression on release had viral suppression on reincarceration. Viral suppression on reincarceration was associated with increasing age (adjusted odds ratio [aOR] 1·04, 95% CI 1·01–1·07), being prescribed non-nucleoside reverse transcriptase inhibitor-based regimens (1·63, 1·14–2·34), and having higher levels of medical or psychiatric comorbidity (1·16, 1·03–1·30).

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Declaration of interests
We declare no competing interests.

Contributors
JPM obtained funding for the project and designed the study, with guidance from FLA and SAS. JC conducted all data analyses with data interpretation by JPM, JC, SAS, and FLA. JPM drafted primary versions of the manuscript, with input from JC, JW, RLT, SAS, and FLA. All authors have contributed significantly to the work and reviewed and approved the final version for submission.

Interpretation—Identification of individuals most at risk for recidivism and loss of viral suppression might mitigate the risk that repeated reincarceration poses to systems of public health and safety.

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Introduction

Recidivism, defined as rearrest, reconviction, or return to jail or prison after release, is a crucial concern for intersecting systems of public safety and health. The 3 year recidivism rate in inmates released from US prisons in 2004 was 43·3%.[1] Recidivism rates in Connecticut are among the highest in the USA, with released prisoners being reincarcerated for either a new offense or a technical violation of supervision terms.[1,2] Findings from an internal study[3] by the Connecticut Department of Correction (CTDOC) showed that 56% of sentenced male prisoners released in 2008 were arrested again by 2011. Similarly, 56% of HIV-infected opioid-dependent prisoners and jail detainees that were released to the community and enrolled in a randomised controlled trial of extended-release naltrexone (XR-NTX) in Connecticut were reincarcerated after a mean of 93 days during the 12 month study follow-up (unpublished data). From a systems perspective, recidivism is an extraordinarily inefficient and costly use of services that disrupts continuity of care generally and especially for people with chronic illnesses,[4] and disproportionately affects those without housing, insurance, or treatment for psychiatric and substance use disorders.[5] With clear reductions in state appropriations for criminal justice,[6] reduction of recidivism has become a top national priority[1]—the Pew Center estimates that a 10% reduction in recidivism would save the USA US$470 million annually.[1,7]

Recidivism is costly in terms of individual health. Its disruption of social networks independently increases risk of HIV transmission,[8] and, for people living with HIV who are prescribed antiretroviral therapy (ART), reincarceration is associated with interruptions in medication adherence and persistence (duration of time from inititation to discontinuation of therapy).[9–12] Although we reported that 70% of inmates with HIV in Connecticut achieved viral suppression during incarceration,[13] we expected on the basis of historical data in this setting[14] and elsewhere[15–18] that viral suppression would not persist after release despite simpler, more potent, and better tolerated ART regimens.

The effect of correctional recidivism on HIV treatment has not been systematically assessed for more than a decade, although in this time period ART has changed substantially. Moreover, previous studies have not accounted for both prisoners and jail detainees (all inmates) who are reincarcerated nor compared them with inmates who are not reincarcerated over the same observation period. Such comparisons could help to align public safety and public health, especially for people living with HIV, whose care contributes substantially to costs for criminal justice settings and society.

We postulated that reincarceration would be associated with a loss of viral suppression and a decrease in CD4 cell count. To explore this hypothesis, we assessed the effect of reincarceration on viral suppression and CD4 cell counts in a cohort of all prisoners and jail

detainees with HIV in Connecticut by use of longitudinally linked demographic, custody, pharmacy, and laboratory databases.

Methods

Study design and population

The USA has the highest incarceration rate worldwide,[19] and Connecticut ranks 28th (376 incarcerations per 100 000 residents) among the 50 states.[20] The mean daily CTDOC census is 16 347 inmates, mainly black men, housed in 16 facilities (15 facilities for men and one facility for women).[21] Unlike most US states, the CTDOC is an integrated system that includes both jail detainees and sentenced prisoners, enabling an accurate comprehensive assessment of recidivism, defined as re-incarceration for any reason.

We included individuals from the parent cohort, which has been described previously,[13] if they were incarcerated in any CTDOC facility (jail or prison) between March 1, 2005, and June 29, 2012, had at least two (admission and pre-release) sets of laboratory data available during the incarceration period, and were prescribed ART with pharmacy data available during at least one incarceration. We further defined a recidivist subsample as those meeting all eligibility criteria and who were reincarcerated for any duration after having spent at least 90 days in the community between incarceration periods (figure 1); we restricted this period to 90 days to exclude repeated bond releases over short durations and because this interval is guideline recommended for laboratory monitoring. Connecticut prisoners are rarely reincarcerated outside the CTDOC. Yale's institutional review board and the CTDOC Research Advisory Committee approved all procedures.

Data sources

Using unique identifiers, we created the longitudinal cohort by merging three comprehensive databases: a statewide correctional database system with all demographic and custody information; a laboratory database with all HIV-1 viral load and CD4 lymphocyte values; and a pharmacy database with all information about medication prescription (figure 1). Community or offence-specific data were unavailable. We removed all unique personal identifiers to protect participant identity and we then stored and analysed the data on triple password-protected computers.

Measures

The primary outcome was viral suppression on reincarceration, defined as viral load lower than 400 copies per mL. The secondary outcomes were maximum viral suppression, defined as viral load lower than 50 copies per mL, CD4 cell count (cells per μL), and viral load (copies per mL). We examined viral load and CD4 cell count continuously, using the most conservative estimates of viral suppression.

We used the last laboratory values before release (median 35 days before release) and the first values on reincarceration (median 4 days after readmission intake); the incarceration period was the unit of analysis so that individuals could contribute more than one observation. Drug resistance profiles were unavailable. Demographic information included

age, sex, race or ethnic origin, marital status, number of dependent children, highest educational level, and medical insurance status. We derived inmate classification scores (from 1 to 5), used by the CTDOC to classify criminal offences and medical or mental health needs, from intake assessments.[22] We dichotomised the maximum score as high or low based on its relationship to the mean and median for every category and for every individual over all incarceration periods. Custody information included dates and types of intakes and discharges.

Pharmacy data were censored for medications prescribed at the time of release. All ART regimens included two nucleoside reverse transcriptase inhibitors (NRTIs) and were defined by an additional component with derived categories being mutually exclusive, as described previously.[13] We analysed ART regimens in terms of drug administration (defined by whether ART was prescribed as directly observed therapy at the time of release or ever during an observed incarceration), dosing frequency (once-daily *vs* twice-daily), and total calculated daily ART pill burden at the time of release, expressed as a continuous variable. We categorised documented prescription of psychiatric drugs and other medications for every disorder, and coded every category dichotomously. We generated a comorbidity score for every individual, representing the sum total number of potential medical and psychiatric comorbidities that required pharmacological treatment during any incarceration period. We deemed categories mutually exclusive and analysed the score as a continuous variable.

Statistical analysis

After first comparing between recidivist and non-recidivist individuals, subsequent analyses used each incarceration period as the unit of analysis for the dependent variables, defined as the time between admission to any correctional facility and release, defined as conditional (probation or parole), unconditional, or death. We used descriptive statistics to characterise both individuals and incarceration periods, and we compared recidivists with non-recidivists (ie, only one incarceration during the observation period) by use of *t* tests for continuous variables and χ^2 tests for categorical variables with robust standard errors. We did not compare HIV treatment outcomes between recidivists and non-recidivists because non-recidivists did not, by definition, have viral load data measured on reincarceration. For recidivists, we compared mean changes in viral load and CD4 counts from release to reincarceration by use of unpaired *t* tests. We used logistic regression with generalised estimating equations (GEE) to examine independent correlates of the primary outcome, viral sup pression on reincarceration. We generated a multivariable model using backwards elimination that included viral load on previous release and variables significant ($p<0{\cdot}10$) on bivariate analysis. To account for correlated outcomes, we calculated odds ratios (ORs) and adjusted ORs with GEE. We did all analyses using SAS, version 9.3 (SAS Institute, Cary, NC, 2010).

Role of the funding source

The funder had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all study data and final responsibility for the decision to submit for publication.

Results

Of the previously described 882 HIV-infected inmates on ART,[13] 497 (56%) individuals met recidivist criteria, contributing 934 reincarcerations (1431 incarceration periods in total; median 118 days [IQR 36–281] with a median 329 days (179–621) in the community between incarcerations (table 1). Time-to-reincarceration did not differ significantly by sex, race or ethnic origin, or educational level; although older individuals (oldest quartile age ≥48·6 years) remained in the community significantly longer than younger ones. Nearly half of individuals were reincarcerated once during the observation period, and the modal participant was an unmarried black man without medical insurance. Comorbid medical and psychiatric severity was high. During the 1167 (82%) incarceration periods in which recidivists were prescribed ART, the most commonly prescribed ART regimen was protease inhibitor (PI)-based, followed by non-nucleoside reverse-transcriptase inhibitor (NNRTI)-based, and the most commonly prescribed NNRTI-based regimen involved a single-tablet regimen (table 2). ART was given as directly observed therapy throughout a third of incarceration periods.

Compared with 362 non-recidivists, the 497 recidivists were more likely to be women, have medical insurance, and to have not completed high school (table 1). Among recidivists, 112 (23%) met criteria for crisis-level psychiatric disorders on intake requiring 24 h supervision, compared with zero non-recidivists. Despite having significantly higher mean intake medical and psychiatric severity scores (and similar median scores) and similar overall mean comorbidity scores, recidivists were significantly less likely than non-recidivists to receive treatment for each of several psychiatric and medical (eg, hypertension, diabetes, dyslipidaemia, and neuropathy) comorbidities. Overall, ART regimen did not differ significantly between recidivists and non-recidivists, although recidivists were nearly twice as likely as non-recidivists to ever receive ART as directly observed therapy.

Although half of reincarceration periods resulted in viral suppression on release, only a third of reincarceration periods (292 of 934) began with viral suppression (figure 2); 158 (51%) of 307 individuals achieving viral suppression on previous release had sustained viral suppression on rein carceration. Similarly, 149 (16%) of 934 reincarceration periods resulted in maximum viral suppression, but only 62 (7%) of 934 had sustained maximum viral suppression on reincarceration, suggesting loss of treatment benefit within the community. From a transmissibility perspective, for 509 (54%) of 934 reincarcerations, individuals had a viral load higher than 1500 copies per mL on entry to the CTDOC from the community. Between the time of release and reincarceration, recidivists showed a significant mean loss of 50·8 CD4 cells per μL (from 400·9 cells per μL to 350·1 cells per μL) and a mean rebound of 0·4 $\log_{10}$ viral load (from $\log_{10}$ 3·2 to $\log_{10}$ 3·5).

After controlling for viral load on last release, viral suppression on reincarceration was significantly correlated with several key modifiable and non-modifiable factors (table 3). Increasing age, a non-modifiable factor, was associated with a 4% increased relative odds of having viral suppression on reincarceration. Being prescribed a pre-release NNRTI-based regimen and each incremental comorbid condition were significantly correlated with sustained viral suppression on reincarceration, both of which are potentially modifiable

factors. Reincarceration viral suppression was not significantly associated with other factors such as sex, number of dependants in care, and others (table 3).

Discussion

To our knowledge, this study represents the largest longitudinal analysis of HIV treatment outcomes in people living with HIV reincarcerated during the current HIV treatment era and within an integrated health-care delivery system in which recidivism can be accurately measured (panel). Recidivism, in this population of people living with HIV, is strikingly higher than that reported for the overall inmate population in Connecticut and nationally. Although about a third of recidivist inmates maintained viral suppression on reincarceration, similar to the proportion of all people living with HIV both nationally[25] and within Connecticut,[26] this sample of recidivists were all prescribed ART. The proportion of recidivist inmates achieving viral suppression both before release (52%) and on reincarceration (31%) contrasts with that proportion for people living with HIV prescribed ART nationally,[23] within Connecticut,[23,24] and among all Connecticut inmates (all ≥70%).[13] Viral suppression levels did not improve with each successive reincarceration. Thus, substantial health disparities persist for recidivist HIV-infected inmates, making them an important target population for intervention.

Panel: Research in Context

Systematic review

We searched PubMed for original research articles published in English between Jan 1, 2000, and Sept 1, 2014, using the keywords “prison” or “jail” AND “recidivism” or “reincarceration” combined with “HIV”, “treatment”, or “outcomes.” We identified four cohort studies[5,14–16] in which HIV treatment outcomes were reported in terms of biological markers of disease progression (ie, CD4 cell count and HIV viral load). Of these, the first study[14] reported an absence of sustained benefit of antiretroviral therapy (ART) after release from prison and on reincarceration for the 27% of the sample who were reincarcerated during the observational period, with an increase in HIV viral load of 1·14 $\log_{10}$. These findings were replicated in a highly selective retrospective cohort study of 122 inmates with HIV in Texas[16] and in a cohort of 15 reincarcerated prisoners with HIV in North Carolina.[15] In a multisite prospective linkage-to-care demonstration project of 798 people living with HIV and transitioning from jail, HIV viral suppression on index incarceration was not significantly associated with 6 month risk of reincarceration.[5]

Interpretation

Previous research has thus shown that, on an individual level, HIV treatment outcomes worsen during a period of interim community exposure for people with repeated reincarcerations. These findings must be interpreted in light of the highly selective nature of these studies, either because biological markers were not consistently measured for all participants, only jail detainees or prisoners were included, or because there was no comparator group of non-recidivists. Previously published studies have also been unable to account for contemporary ART regimens that have relatively higher efficacy, durability, and tolerability. Our study, by contrast, includes both recidivists and non-

recidivists within an integrated correctional health system and in the context of current ART options. Recidivists and non-recidivists fundamentally differed on key demographic and comorbidity variables. Recidivists experienced a significant worsening in HIV treatment outcomes after release, with the proportion maintaining viral suppression remaining far lower than the state's prison population with HIV and those prescribed ART nationally. Future research should attempt to pre-emptively identify individuals most at risk of repeated reincarcerations and loss of viral suppression to intervene on modifiable characteristics such as psychiatric and substance-use disorders.

In parallel to reductions in the proportion with viral suppression between community release and reincarceration, the mean viral load rebound was 0·4 $\log_{10}$ post-release, suggesting ART non-persistence or suboptimum ART adherence. ART non-persistence might be partly attributable to low insurance coverage; however, recidivists were more likely than non-recidivists to have medical insurance on entry, perhaps because discharge planning occurred during previous incarcerations, but the insured proportion was low in both groups. People living with HIV who cycle through criminal justice settings do have highly improved rates of viral suppression during incarceration.[13,14] For recidivists, half of incarceration periods resulted in viral suppression after a median of 118 days, close to the guideline-recommended 12 week interval. Viral suppression might have been achieved, however, because ART was prescribed during most (82%), but not all incarceration periods. Without effective and accessible community-based resources, treatment benefits are not sustained. As evidence, of the individuals achieving viral suppression before release, only 51% maintained viral suppression from release to reincarceration. From a public health perspective, HIV risk behaviours are high after release,[27] and HIV can be transmitted effectively to sexual partners in the absence of condoms for 54·5% with a viral load greater than 1500 copies per mL.[28]

Compared with an earlier (1997–2003) HIV-infected prisoner cohort in Connecticut,[14] this contemporary cohort spent more time in the community (median 329 *vs* 127 days), and, although treatment benefits after release were not sustained during both periods, these benefits are better than those previously described, perhaps related to interventions that effectively addressed social instability and psychiatric and substance use disorders.[4] Such transitional programmes designed to maintain people living with HIV in the community longer must simultaneously retain them in continuous HIV treatment. Although not measured here, several recently implemented jail-diversion programmes in Connecticut target high-cost individuals with co-occurring psychiatric and substance use disorders by providing alternatives to incarceration and providing post-release medication-assisted therapies (eg, methadone or buprenorphine) to reduce costs and recidivism. For example, released HIV-infected inmates in Connecticut retained on buprenorphine are significantly more likely to maintain maximum viral suppression than are their opioid-dependent counterparts not retained on buprenorphine.[29] Such linkages to evidence-based psychiatric and drug treatment, along with HIV care, are poised to reduce recidivism while improving or maintaining individual health and, from a public health perspective, to reduce the risk of transmitting HIV to sex and drug-using partners.[30]

We found both modifiable and non-modifiable predictors of viral suppression. Among potentially modifiable predictors, by contrast with an earlier study where ART regimen type

did not influence viral suppression,[31] we noted that individuals prescribed a pre-release NNRTI-based regimen were twice as likely to maintain viral suppression on reincarceration than those receiving other categories of pre-release regimens. Most NNRTI-based regimens were single-tablet regimens. Although we did not find an independent effect of single-tablet regimens on viral suppression, it was difficult to disentangle this from the effect of NNRTIs overall. Our findings echo those from a recent meta-analysis that showed the beneficial effect of single-tablet regimens on health outcomes for any disease.[32] Although results from a recent meta-analysis showed increased rates of viral suppression and adherence were associated with lower pill burden and once-daily dosing,[33] those findings were not replicated here, perhaps because of other adherence support strategies available in criminal justice settings. One might expect newer, more potent ART regimens to result in high rates of viral suppression over time, but the significant effect of ART regimen persisted in the multivariate model, even after controlling for year of incarceration. The comparative efficacy of NNRTI-based regimens was echoed in a recent meta-analysis of viral suppression in treatment-naive patients.[34] This finding is counterintuitive since NNRTIs have quite low barriers to genotypic resistance that are problematic when patients are not fully adherent[35] or persistent.[36] These downsides might be balanced by a long half-life compared with PIs. Alternative explanations for increased viral suppression in those prescribed NNRTIs include patients being prescribed their first ART regimen with NNRTIs, often prescribed as first-line treatment, or the role of prescribing clinicians who intentionally selected other regimens for those perceived to be at highest risk for ART non-adherence or non-persistence. Future research on ART regimen choice, including new single-tablet regimens that do not include NNRTIs, might guide providers to best select between the first-line recommended regimens.

Recidivists with other treated comorbidities were significantly more likely to have viral suppression on reincarceration than were those without. Comorbid conditions are modifiable only when they are diagnosed and treated; other studies have confirmed incongruous findings between screening and diagnosis for several conditions in criminal justice settings.[37,38] One explanation of the association between treated co-morbidities and viral suppression on reincarceration is that non-HIV and perhaps more symptomatic conditions required ancillary support that facilitated engagement in care. The condition contributing most to the calculated comorbidity score was depression, with nearly a quarter of the study sample requiring antidepressant medication during incarceration. This finding has important implications for the screening and treatment of depression in inmates, a modifiable comorbidity associated with increased HIV risk-taking[39] and sub-optimum ART adherence.[40] Psychiatric disorders are highly prevalent in US inmates, especially in people living with HIV.[38,41,42] Depression is often severe, as evidenced by 23% of recidivists in our sample meeting criteria for crisis-level psychiatric disorders including acute suicidality on intake, finding replicated in other studies.[43] Treatment of depression and engagement in psychiatric care, however, has been associated with having a consistent HIV provider among HIV-infected jail detainees transitioning to the community.[44] These findings imply that the benefits of diagnosing and treating psychiatric disorders extend beyond mood stabilisation and amelioration of depressive symptoms, to secondary optimisation of HIV treatment with achievement of viral suppression.

As a retrospective study that used large databases maintained by the CTDOC, analyses were necessarily limited by available data. Some measures, including severity scores, were not recorded for the purposes of diagnosis or treatment and did not involve externally validated instruments. Other information, including genotypic resistance, and presence of comorbid HCV infection or substance use disorders might have been important confounders, but they were possibly underestimated because of the low proportion of inmates receiving treatment.[45] Viral load measurements changed over the 7 year observation period, limiting capability to detect viral suppression at lower thresholds. We used the most conservative estimates of viral load as a continuous variable, but this method might have limited our ability to account for low-level viraemia. Finally, differentiating incarcerations in jails versus prisons was not possible because inmates might cycle through both during any given incarceration period.

These limitations notwithstanding, findings suggest that HIV-infected recidivist inmates are a key population for targeted intervention. Moreover, the structure provided by criminal justice settings, if organised and funded adequately, improves HIV-treatment outcomes; however, the loss of structure, including potential loss of assured housing,[44,46] scarcity of medications for HIV or psychiatric disorders, and relapse to alcohol and drug use, results in worse HIV treatment outcomes on release to the community. To effectively increase the proportion of viral suppression in people living with HIV requires adequate housing and effective treatment for psychiatric and substance use disorders expanded into community settings.

Viral suppression is often not sustained between prison release and reincarceration, particularly in individuals who are younger, require more complicated ART regimens, and have fewer diagnosed comorbid conditions requiring health-care engagement. The identification of those individuals most at risk of recidivism and loss of HIV viral suppression might mitigate the risk repeated reincarceration poses to systems of public health and safety.

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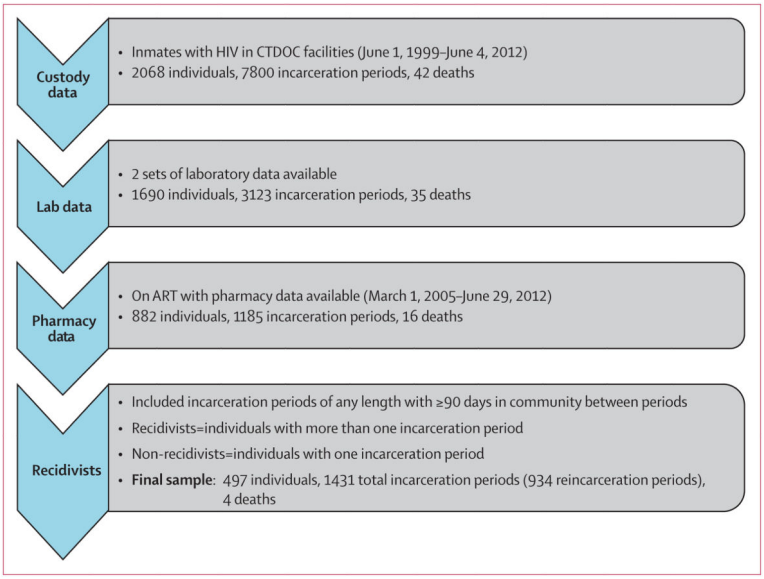

Figure 1.

Disposition of participants and data sources

CTDOC=Connecticut Department of Correction. ART=antiretroviral therapy.

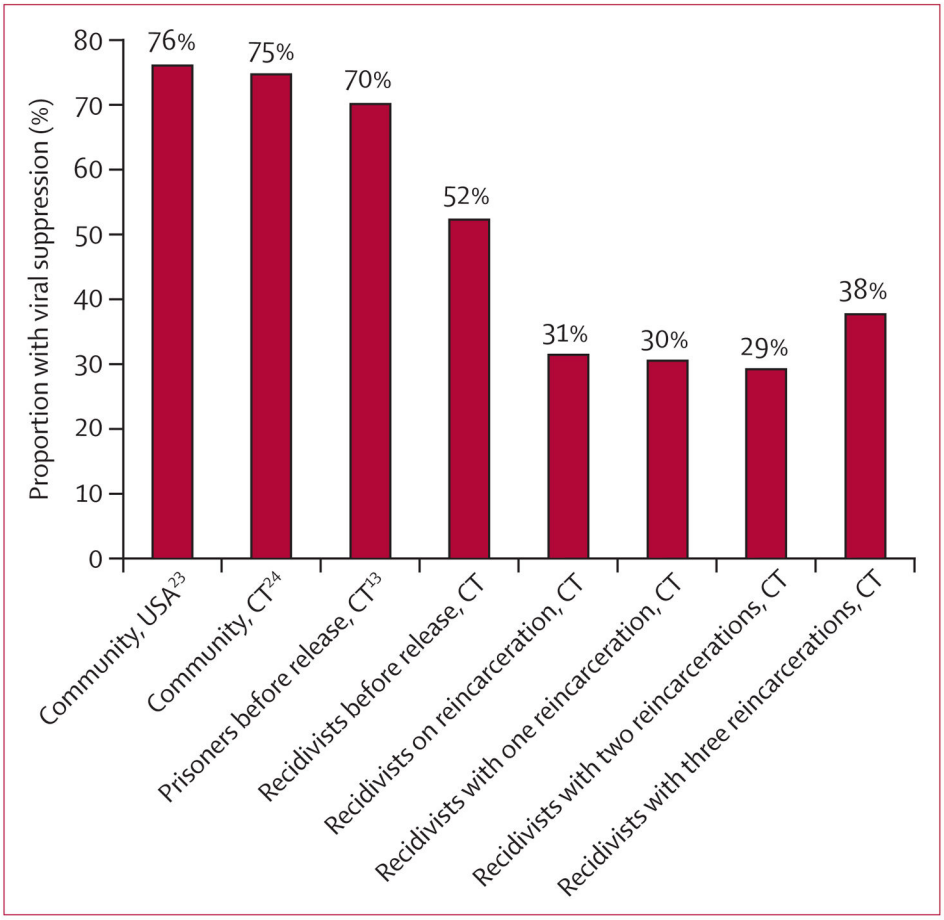

Figure 2.

Relative proportion of people living with HIV/AIDS and achieving viral suppression

For recidivists, n=497 individuals, 934 reincarceration periods. CT=Connecticut.

Table 1

Comparison of recidivists and non-recidivists in the study sample

	Recidivists	Non-recidivists	p value
Mean (SD) age, years	43·2 (8·2)	42·9 (8·8)	0·54
Men	43·9 (8·4)	43·0 (9·1)	··
Women	40·7 (6·9)	41·7 (6·2)	··
Sex			0·0003
Male	382 (77%)	314 (87%)	··
Female	115 (23%)	48 (13%)	··
Ethnic origin			0·76
Non-Hispanic white	101 (20%)	67 (19%)	··
Non-Hispanic black	240 (48%)	170 (47%)	··
Hispanic	155 (31%)	121 (33%)	··
Married	68 (14%)	62 (17%)	0·16
Mean (SD) number of dependents	1·6 (1·8)	1·7 (1·8)	0·26
Highest education level attained			0·02
Less than high school	242 (49%)	148 (41%)	··
High school or greater	255 (51%)	214 (59%)	··
Medical insurance on entry	95 (19%)	44 (12%)	0·01
Offence severity			0·29
Mean maximum score (SD)	2·6 (1·0)	2·5 (1·1)	··
Intake medical severity			<0·0001
Mean maximum score (SD)	3·6 (0·8)	3·3 (0·8)	··
Intake psychiatric severity			<0·0001
Mean maximum score (SD)	3·1 (1·2)	2·6 (1·2)	··
Mean duration of incarceration period, days (SD)	225·6 (298·0)	757·22 (741·8)	<0·0001
Median duration of incarceration period, days (IQR)	118 (36–281)	512 (272–936)	··
Median time spent in community between incarceration periods, days (IQR)	329 (179–621)	··	··
Mean number of reincarceration periods per individual (SD)	1·9 (1·2)	··	··
Median number of reincarceration periods per individual (IQR, range)	2 (1–3,1–8)	··	··
Number of reincarcerations by individual		··	··
1	245 (49%)	··	··
2	147 (30%)	··	··
≥3	105 (21%)	··	··

	Recidivists	Non-recidivists	p value
Incarceration periods by intake year			<0·0001
2005–07	725 (50·7)	242 (66·9)	··
2008–10	547 (38·2)	97 (26·8)	··
2011–12	159 (11·1)	23 (6·4)	··
Incarceration periods by discharge status			<0·0001
Conditional release	267 (28·6)	211 (58·3)	··
Release	663 (71·0)	140 (38·7)	··
Death	4 (0·4)	11 (3·0)	··

Data are n (%) unless otherwise stated.

Table 2

Medications prescribed on release, by incarceration periods

	Recidivists	Non-recidivists	p value
Antiretroviral regimen*			
Protease inhibitor-based	579 (50%)	163 (45%)	0·37
NNRTI-based	421 (36%)	132 (36%)	0·64
One-tablet regimen	252 (22%)	83 (23%)	1·00
NRTI only	97 (8%)	37 (10%)	0·28
INSTI-based	53 (5%)	24 (7%)	0·12
Other	5 (<1%)	6 (2%)	0·02
Type of medication administration†			0·001
SAT	740 (70%)	286 (79%)	··
DOT	318 (30%)	76 (21%)	··
Individuals ever prescribed DOT during incarceration	287 (60%)	133 (37%)	0·001
Dosing frequency‡			0·98
Once daily	563 (72%)	206 (73%)	··
Twice daily	223 (28%)	78 (27%)	··
Mean daily antiretroviral pill burden on release (SD)	3·3 (2·4)	3·3 (3·4)	0·93
Psychiatric medications			
Antipsychotic	120 (13%)	48 (13%)	0·003
Antidepressant	234 (25%)	118 (33%)	<0·0001
Medications prescribed for comorbid conditions§			
Hepatitis C virus	4 (<1%)	9 (2%)	0·0003
Hypertension	160 (17%)	112 (31%)	<0·0001
Diabetes	45 (5%)	43 (12%)	<0·0001
Dyslipidaemia	32 (3%)	47 (13%)	<0·0001
Seizure disorder	71 (8%)	41 (11%)	<0·0001
Herpes	85 (9%)	72 (20%)	<0·0001
Asthma	116 (12%)	58 (16%)	<0·0001
Neuropathy	11 (1%)	12 (3%)	0·0008
Opioid dependence	29 (3%)	9 (2%)	0·53
Pregnancy (prenatal vitamin)	7 (1%)	0	NA
Mean comorbidity score (SD)	1·7 (1·5)	1·6 (1·4)	0·33

Data are n (%) unless otherwise stated. NNRTI=non-nucleoside reverse transcriptase inhibitor. NRTI=nucleoside reverse transcriptase inhibitor. INSTI=integrase strand-transfer inhibitor. SAT=self-administered therapy. DOT=directly-observed therapy. NA=not applicable.

*For recidivists, 1167 incarceration periods during which antiretroviral medications were prescribed.

†For recidivists, for the 1058 incarceration periods in which type of medication administration was specified.

[‡] For the 786 incarceration periods (for recidivists) and 284 incarceration periods (for non-recidivists) in which medication dosing frequency was specified.

[§] For recidivists, for the 934 reincarceration periods.

Table 3

Correlates of viral suppression on reincarceration, by covariate

	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Age, years	1·04 (1·02–1·07)	1·04 (1·01–1·07)
Ethnic origin	··	··
Non-Hispanic white	1·0	··
Non-Hispanic black	0·97 (0·66–1·43)	··
Hispanic	0·84 (0·54–1·30)	··
Marital status		
Not married	1·0	··
Married	1·69 (1·06–2·72)	1·57 (0·91–2·72)
Intake year		
2005–07	1·0	1·0
2008–10	1·40 (1·06–1·87)	1·22 (0·80–1·87)
2011–12	1·58 (1·09–2·29)	1·31 (0·80–2·15)
Antiretroviral regimen at previous release		
Protease inhibitor-based	0·76 (0·54–1·06)	··
NNRTI-based	1·48 (1·04–2·11)	1·63 (1·14–2·34)
Fixed dose combination	1·20 (0·81–1·78)	··
NRTI only	0·81 (0·50–1·30)	··
INSTI-based	1·76 (0·67–4·63)	··
Comorbidity score	1·20 (1·07–1·34)	1·16 (1·03–1·30)

OR=odds ratio. DOT=directly observed therapy. PI=protease inhibitor.

NNRTI=non-nucleoside reverse transcriptase inhibitor. NRTI=nucleoside reverse transcriptase inhibitor. INSTI=integrase strand transfer inhibitor. Sex, number of dependants in care, educational attainment, medical insurance, maximum offence or medical and psychiatric severity, duration of incarceration, duration in the community, discharge status, number of reincarcerations, receipt of DOT, dosing frequency, mean daily antiretroviral pill burden, and receipt of psychiatric medications all had bivariate associations with the dependent outcome of p>0·1 and were thus not included in the final multivariate model.