Accessing Antiretroviral Therapy Following Release From Prison

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Accessing Antiretroviral Therapy Following Release From Prison

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Context Interruption of antiretroviral therapy (ART) during the first weeks after release from prison may increase risk for adverse clinical outcomes, transmission of human immunodeficiency virus (HIV), and drug-resistant HIV reservoirs in the community. The extent to which HIV-infected inmates experience ART interruption following release from prison is unknown.

Objectives To determine the proportion of inmates who filled an ART prescription within 60 days after release from prison and to examine predictors of this outcome.

Design, Setting, and Participants Retrospective cohort study of all 2115 HIV-infected inmates released from the Texas Department of Criminal Justice prison system between January 2004 and December 2007 and who were receiving ART before release.

Main Outcome Measure Proportion of inmates who filled an ART prescription within 10, 30, and 60 days of release from prison.

Results Among the entire study cohort (N=2115), an initial prescription for ART was filled by 115 (5.4%) inmates within 10 days of release (95% confidence interval [CI], 4.5%-6.5%), by 375 (17.7%) within 30 days (95% CI, 16.2%-19.4%), and by 634 (30.0%) within 60 days (95% CI, 28.1%-32.0%). In a multivariate analysis of predictors (including sex, age, race/ethnicity, viral load, duration of ART, year of discharge, duration of incarceration, parole, and AIDS Drug Assistance Program application assistance), Hispanic and African American inmates were less likely to fill a prescription within 10 days (adjusted estimated risk ratio [RR], 0.4 [95% CI, 0.2-0.8] and 0.4 [95% CI, 0.3-0.7], respectively) and 30 days (adjusted estimated RR, 0.7 [95% CI, 0.5-0.9] and 0.7 [95% CI, 0.5-0.9]). Inmates with an undetectable viral load were more likely to fill a prescription within 10 days (adjusted estimated RR, 1.8 [95% CI, 1.2-2.7]), 30 days (1.5 [95% CI, 1.2-1.8]), and 60 days (1.3 [95% CI, 1.1-1.5]). Inmates released on parole were more likely to fill a prescription within 30 days (adjusted estimated RR, 1.3 [95% CI, 1.1-1.6]) and 60 days (1.5 [95% CI, 1.4-1.7]). Inmates who received assistance completing a Texas AIDS Drug Assistance Program application were more likely to fill a prescription within 10 days (adjusted estimated RR, 3.1 [95% CI, 2.0-4.9]), 30 days (1.8 [95% CI, 1.4-2.2]), and 60 days (1.3 [95% CI, 1.1-1.4]).

Conclusion Only a small percentage of Texas prison inmates receiving ART while incarcerated filled an initial ART prescription within 60 days of their release.

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THE US PRISON SYSTEM HAS BECOME an important front in the effort to treat and control the spread of human immunodeficiency virus (HIV) infection, serving as the principal screening and treatment venue for thousands of individuals with or at high risk for HIV infection who have limited access to community-based health care.[1,2] Many inmates are offered HIV testing for the first time while incarcerated,[3] and three-quarters of inmates with HIV infection initiate treatment during incarceration.[4] Although the majority of HIV-infected inmates respond well to antiretroviral therapy (ART) and demonstrate high levels of adherence to complex antiretroviral drug regimens during incarceration,[5] many discontinue their treatment following release from prison.[5-7]

During the transition back to their home communities, released inmates frequently encounter multiple social and economic challenges, such as securing housing and employment, reestablishing connections with family, managing finances, and often coping with substance use and mental health disorders.[8,9] Because the majority of former inmates are without private or public health insurance for the first several months after release,[8] accessing ART in a timely fashion represents a formidable challenge. Unfortunately, these treatment barriers occur precisely at a time when judicious continuation of ART is most critical. In the weeks following release from prison, former inmates are particularly vulnerable to

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resuming sexual and substance abuse–related behaviors with new and former contacts.[10-12] Those who discontinue ART at this time are at increased risk of developing a higher viral burden, resulting in greater infectiousness and higher levels of drug resistance, potentially creating reservoirs of drug-resistant HIV in the general community.[11,13,14]

In view of this, understanding the extent to which prisoners experience interruptions in ART after their release is important from a public health perspective. Because little published information is available on this topic, we conducted a study in the nation's largest state prison system[15] to determine the proportion of HIV-infected inmates who filled a prescription for ART medication within 60 days following their release. We also examined demographic, clinical, and correctional predictors of this outcome.

METHODS

Study Population and Design

This retrospective cohort study included all 2115 HIV-infected inmates released from the Texas Department of Criminal Justice (TDCJ) prison system between January 1, 2004, and December 31, 2007, and receiving ART at the time of release. All health care for TDCJ inmates is provided by the University of Texas Medical Branch or Texas Tech University Health Sciences Center and is based on a managed care model.[16] The study was conducted at the University of Texas Medical Branch between August 2007 and September 2008. All data were collected between January and March 2008 and analyzed between March and December 2008. Our study was designed to determine the percentage of the cohort that filled at least 1 prescription for ART medication from the Texas AIDS Drug Assistance Program (ADAP) within 10, 30, and 60 days after release from prison.

This study was reviewed by and received approval from institutional review boards at the University of Texas Medical Branch, Baylor College of Medicine, and the Texas Department of State Health Services and was reviewed and approved by the Office for Human Research Protections, US Department of Health and Human Services. Because the study was confined to an analysis of retrospective electronic data, all institutional review boards waived the requirement to obtain subject authorization for use and disclosure of personal health information as well as prior consent of the individual affected. After the initial linkage, all data were completely deidentified and maintained in a password-protected format. All institutional review boards approved publication of study results in aggregate form to ensure that no individual was at risk of being identified.

Medical Evaluation and HIV Screening

During intake into the prison system, all TDCJ inmates undergo medical and psychiatric examinations. This intake assessment takes place over approximately 60 minutes and includes a detailed medical history, mental health screening, physical examination, and laboratory tests. During the study period, all incoming inmates were offered serological screening for HIV infection at intake; approximately 10% refused. Additionally, HIV screening was available to all inmates throughout their incarceration (up to 2 times per year at the inmate's request and whenever medically indicated).

In September 2005, the TDCJ instituted a policy of mandatory HIV screening at release. A small number (approximately 3-5 per month) of inmates diagnosed in the 30 days prior to release are not prescribed ART within the TDCJ and thus are not included in the study cohort. However, they are given a list of clinicians in their home community who provide care to patients with HIV infection and a copy of their recent HIV laboratory test results.

The seroprevalence of HIV in the TDCJ during the 4-year study period was 1.5% (2004), 1.5% (2005), 1.7% (2006), and 1.6% (2007). Consistent with most US state prison systems, HIV clinical care in TDCJ is based on US Department of Health and Human Services guidelines.[17] Care is directed by HIV specialists and includes standard laboratory and clinical monitoring at least 3 times per year, initiation of ART when the CD4 cell count is 350 cells/μL or less, and treatment for opportunistic diseases. Our cohort (N = 2115) included all released inmates receiving ART and represented 55% of the total population of HIV-infected inmates released during the study period; the remainder of the population was not receiving ART at the time of release.

HIV Discharge Planning

The TDCJ Field Services division, which oversees discharge planning for HIV-infected inmates, identifies all inmates diagnosed with HIV infection within 30 days of their scheduled release from prison. On the day of their release, all inmates receiving ART are instructed by a field services employee to contact a Texas ADAP caseworker via a toll-free telephone number to obtain an initial 30-day supply of ART drugs. In addition, the inmates are provided with a package containing (1) a 10-day supply of ART medication, (2) a list of clinicians in the inmate's home community who provide care to HIV-infected patients, (3) a copy of their recent HIV laboratory test results, (4) an ADAP application form, and (5) an ADAP medication certification form signed by a physician.

Formal Assistance With ADAP Application

In addition to standard discharge planning, some members of the study population received formal assistance from a discharge planning coordinator in completing and submitting their application to ADAP for the initial 30-day supply of ART medication. Because this program was implemented with limited resources across a broad geographic region at 110 prison units, program administrators were able to provide this service to only 55% of the TDCJ population diagnosed with HIV infection during the study period. How-

ever, as the HIV discharge planning infrastructure developed, the proportion of inmates receiving such assistance increased in a stepwise fashion over time (see Results).

Texas ADAP

All eligible inmates who choose to continue ART after their release can obtain their first 30-day supply of medication from ADAP. Funded through the Ryan White HIV/AIDS Treatment Modernization Act Part B (formerly Ryan White CARE Act Title 2), the Texas ADAP supplies eligible persons with ART agents approved by the US Food and Drug Administration as well as other medications used in HIV care. To qualify for ADAP, a patient must meet financial criteria and lack other payor sources. Based on our assessment of a random sample (n=500) of inmates released during the 4-year study period, we estimate that 100% of HIV-infected TDCJ inmates who received ART during their incarceration qualified for ADAP assistance after release.

The ADAP program is administered through a central office in the Texas Department of State Health Services, located in Austin. Medications are distributed through a network of participating pharmacies, local health departments, and public health clinics. To have an initial ADAP prescription filled, the inmate must complete, sign, and submit a 4-page ADAP application. In addition, a 1-page medication certification form detailing recent laboratory values must be completed and signed by a clinician. Both the application and form must be submitted to the central ADAP office by mail or fax. Subsequently, an applicant must contact an ADAP caseworker via a toll-free telephone number. At this time, the caseworker assigns the former inmate to the ADAP-approved pharmacy closest to his or her current address. The ADAP-approved pharmacy then contacts the TDCJ pharmacy to have the former inmate's prescription for ART drugs transferred. ADAP personnel ship the medication to the clinic or pharmacy within 5 days after receiving the application and the approved TDCJ prescription order. With few exceptions, the ART package is received by the pharmacy within 1 business day of its shipment. The entire ADAP process, from application submission to receipt of medication, typically takes between 5 and 10 days. Inmates who receive ADAP application assistance generally file their application 2 to 3 weeks before their release date. Those who do not receive ADAP application assistance may file their application on the day of their release or any time after that. For this investigation, the prescription fill date was defined as the date the package was shipped.

For persons who live in remote rural areas, medications can be obtained via a mail-order pharmacy. Although ADAP-approved pharmacies may charge a $5 co-payment per prescription, they cannot refuse to fill a prescription because of a client's inability to pay. Subsequent 30-day supplies of ART drugs can also be obtained from ADAP, provided the released inmate continues to meet the financial criteria and does not have another payor source such as Medicaid, Medicare, or private insurance. Although an estimated 20% of HIV-infected inmates in the Texas prison system qualify for Medicaid and 5% qualify for Medicare within 1 year of release, the activation of these benefits generally takes between 4 and 6 months. Therefore, for newly released inmates to continue ART without a significant treatment interruption, their initial prescription for a 30-day supply of medication must be filled by ADAP shortly after their release.

Duration of Incarceration

Federal disability benefits, including supplemental security income and Social Security disability insurance, are almost always interrupted when a person is incarcerated. These benefits are typically linked with health care coverage via Medicaid or Medicare. The duration of incarceration may affect the time required to reinstate these benefits after release.[18] As an example, when an individual receiving supplemental security income benefits is incarcerated for less than 12 consecutive months, the Social Security Administration suspends the benefits but usually will resume payments shortly after release, provided the individual still meets financial criteria. However, when the incarceration period exceeds 12 continuous months, the inmate must file a new application for supplemental security income benefits, including verification of continuing disability as well as financial need, which may take several months. No published information is available on how time to reinstatement of Medicaid and other public health insurance benefits varies according to duration of incarceration. To examine the effect of duration of incarceration on the study outcomes, we examined inmates incarcerated for less than 12 months vs all others.

Metropolitan Status

To assess whether the inmate's home county was classified as metropolitan vs nonmetropolitan, we relied on a classification scheme developed by the US Office of Management and Budget and based on the key elements of population size (at least 50 000 residents in the core urbanized area), density (a core area within the urbanized area of at least 1000 persons per square mile), and economic integration (measured primarily by commuting flows).

Data Sources

The primary data sources for this study were the TDCJ electronic medical record database and the Texas ADAP database. The TDCJ electronic medical record database contains demographic characteristics (ie, sex, age, and race/ethnicity) and medical records of all TDCJ inmates. Race/ethnicity classification (African American, non-Hispanic white, or Hispanic) was defined by TDCJ and was self-reported via a multiple-choice item on the prison intake questionnaire. Because HIV treatment outcomes may vary substan-

tially by race/ethnicity, we included this variable in our analyses. The database maintained by the Texas Department of State Health Services contains information on all ADAP prescription orders filled from 2003 to the present.

Statistical Analysis

The distribution of demographic, correctional, and clinical characteristics were summarized for the overall study population and by sex. To address concerns about selection bias among inmates who received ADAP application assistance, we examined the association of this intervention with each of the other study covariates using the Mantel-Haenszel χ^2 statistic. Additionally, we used the Mantel-Haenszel χ^2 test of trend to examine whether the percentage of inmates who received ADAP application assistance increased in linear fashion over time. We also assessed the proportion of inmates who filled a second ADAP prescription. This variable is an indicator of having completed the first 30-day ART regimen and, because the former inmate must obtain the second ADAP prescription from a clinician in the community, it provides evidence that community-based HIV treatment was initiated.

The magnitude of association between the predictor variables and each of the 3 dichotomous outcomes (ie, filling an ART prescription within 10, 30, and 60 days) was summarized as the unadjusted odds ratio (OR) with 95% confidence intervals (CIs). Next, to assess the independent effects of multiple covariates in predicting the binary outcomes, adjusted ORs were calculated using unconditional logistic regression analysis.[19]

Our final model retained all 3 demographic variables and 6 additional covariates. Variables were included in the final model based on whether or not they yielded an unadjusted OR that was statistically significant ($P=.05$) for at least 1 of the 3 outcomes. Our purpose in removing 4 covariates (major psychiatric disorder, CD4 cell count, criminal offense classification, and county population size) from the final model was to reduce the likelihood of collinearity and to generate a more parsimonious model.[19] Two-sided significance tests were reported for all adjusted ORs.

We examined selected first-order interaction terms for a number of variables based on a priori hypotheses, but none were statistically significant. Only 2 of the study variables had missing values: CD4 cell count had 4 missing values, and HIV viral load had 7 missing values. All 7 members of the cohort with missing values for HIV viral load were excluded from the multivariate analysis. Because ORs can sometimes exaggerate risk ratios (RRs), we converted all ORs and associated 95% CIs to RR estimates using previously validated methods by Zhang and Yu.[20] Statistical analyses were conducted using SAS version 8 (SAS Institute, Cary, North Carolina).

Power Calculations

Power calculations for the binary outcomes of filling an ART prescription by 10, 30, and 60 days were conducted using SAS and based on the approach proposed by Hsieh et al[21] for simple unconditional logistic regression models. Given the study cohort size of 2115 for a binary covariate that has a prevalence of 50%, the logistic regression test of $\beta=0$ ($\alpha=.05$, 2-sided) had more than 80% power to detect a difference in ART prescription fill rates of 22% vs 17% (RR, 1.24). Likewise, for a binary covariate that has a prevalence of 20%, this analytic approach had more than 80% power to detect a difference in ART prescription fill rates of 20% vs 14% (RR, 1.43).

RESULTS

All HIV-infected inmates (N=2115) released from the TDCJ between January 1, 2004, and December 31, 2007, and receiving ART at the time of release were included in the analyses. TABLE 1 shows the distribution of the study population's demographic, clinical, and correctional characteristics overall and according to sex. The vast majority were men (83.3%) and between 30 and 49 years of age (76.4%). African Americans comprised 60.3% of the study population, followed by non-Hispanic whites (26.7%) and Hispanics (13.0%). In terms of clinical characteristics, 17.5% of the cohort had at least 1 major psychiatric disorder, 45.4% had final CD4 cell counts greater than 350 cells/μL, and 55.2% had an undetectable viral load at the time of release. Additionally, 46.5% of the cohort had received ART for at least 1 year during the current period of incarceration. Assessment of correctional characteristics showed that 53.2% of inmates were incarcerated for at least 1 year, 50.5% were released on parole, and 58.4% were incarcerated for at least 1 drug-related charge. Overall, 94.6% of the inmates were released to home counties defined as metropolitan, and 54.7% received formal assistance with completing and submitting ADAP forms.

Because ADAP application assistance was provided to only 55% of the study population, we examined the receipt of such assistance according to each of the study covariates. The proportion of released inmates who were provided ADAP application assistance increased in a linear fashion according to calendar year (χ^2, 356.24; $P<.001$). Inmates incarcerated for more than 1 year (unadjusted estimated RR, 0.8 [95% CI, 0.7-0.9]; $P=.009$) and those released on parole (unadjusted estimated RR, 0.8 [95% CI, 0.7-0.9]; $P=.006$) were also more likely to have received ADAP application assistance. None of the other study variables, however, were associated with having received ADAP assistance.

Among the entire study cohort (N=2115), an initial prescription for ART medication was filled by 115 (5.4%) of the former inmates within 10 days of release, by 375 (17.7%) within 30 days, and by 634 (30.0%) within 60 days (TABLE 2). Assessment of unadjusted estimated RRs and 95% CIs revealed several associations between the study factors with each of the 3 binary outcomes. The rate of having an ART

prescription filled within 10 days was lower among African Americans (4.2%) and Hispanics (4.0%) than among non-Hispanic whites (9.0%); higher among inmates with CD4 cell counts greater than 350 cells/μL (7.0%) compared with those with counts less than 200 cells/μL (3.9%); higher among inmates with an undetectable viral load (7.0%) compared with those with a detectable viral load (3.6%); higher among inmates receiving ART for at least 1 year (6.9%) than among those receiving ART for less than 1 year (4.2%); higher among inmates incarcerated for at least 1 year (6.8%) than among those incarcerated for less than 1 year (3.8%); higher among inmates released on parole (6.6%) than among those with a standard, unsupervised release (4.3%); and higher among those who received formal ADAP application assistance (7.9%) compared with those who did not (2.5%).

Table 1. Baseline Characteristics of Texas Department of Criminal Justice Prison Inmates Receiving ART and Released Between January 1, 2004, and December 31, 2007

Characteristic	No. (%)		
	Total (N = 2115)	Male (n = 1762)	Female (n = 353)
Age, y			
16-29	171 (8.1)	128 (7.3)	43 (12.2)
30-49	1615 (76.4)	1335 (75.8)	280 (79.3)
≥50	329 (15.5)	299 (17.0)	30 (8.5)
Race/ethnicity			
Non-Hispanic white	565 (26.7)	467 (26.5)	98 (27.8)
Hispanic	274 (13.0)	242 (13.7)	32 (9.1)
African American	1276 (60.3)	1053 (59.8)	223 (63.2)
Major psychiatric disorder			
No	1745 (82.5)	1486 (84.3)	259 (73.4)
Yes	370 (17.5)	276 (15.7)	94 (26.6)
CD4 cell count, cells/μL			
<200	622 (29.5)	525 (29.9)	97 (27.6)
200-350	528 (25.1)	416 (23.7)	112 (31.8)
>350	957 (45.4)	814 (46.4)	143 (40.6)
Viral load			
Detectable	944 (44.8)	776 (44.2)	168 (47.7)
Undetectable	1163 (55.2)	979 (55.8)	184 (52.3)
Duration of ART, y			
<1	1131 (53.5)	860 (48.8)	271 (76.8)
≥1	984 (46.5)	902 (51.2)	82 (23.2)
Calendar year of discharge			
2004	430 (20.3)	357 (20.3)	73 (20.7)
2005	454 (21.5)	372 (21.1)	82 (23.2)
2006	562 (26.6)	481 (27.3)	81 (23.0)
2007	669 (31.6)	552 (31.3)	117 (33.1)
Duration of incarceration, y			
<1	990 (46.8)	745 (42.3)	245 (69.4)
≥1	1125 (53.2)	1017 (57.7)	108 (30.6)
Drug-related criminal offense			
No	879 (41.6)	775 (44.0)	104 (29.5)
Yes	1236 (58.4)	987 (56.0)	249 (70.5)
Released on parole			
No	1046 (49.5)	814 (46.2)	232 (65.7)
Yes	1069 (50.5)	948 (53.8)	121 (34.3)
County population size			
Nonmetropolitan	115 (5.4)	96 (5.5)	19 (5.4)
Metropolitan	2000 (94.6)	1666 (94.6)	334 (94.6)
ADAP application assistance			
No	959 (45.3)	790 (44.8)	169 (47.9)
Yes	1156 (54.7)	972 (55.2)	184 (52.1)

Abbreviations: ADAP, AIDS Drug Assistance Program; ART, antiretroviral therapy.

Our assessment of the proportion of inmates who filled an ART prescription within 30 days of release yielded similar findings. The rate of filling a prescription within this period was higher among inmates aged 30 through 49 years (18.4%) compared with those aged 16 through 29 years (11.1%); lower among African Americans (16.8%) and Hispanics (14.6%) compared with non-Hispanic whites (21.4%); higher among inmates with CD4 cell counts greater than 350 cells/μL (20.6%) compared with those with counts less than 200 cells/μL (14.6%); higher among those with an undetectable viral load (21.2%) compared with those with a detectable viral load (13.2%); higher among inmates receiving ART for at least 1 year (21.9%) than among those receiving ART for less than 1 year (14.2%); higher among inmates incarcerated for at least 1 year (21.2%) than among those incarcerated for less than 1 year (13.8%); higher among those released on parole (21.1%) than among those with a standard, unsupervised release (14.2%); and higher among those who received formal ADAP application assistance (22.8%) compared with those who did not (11.6%).

The rate of filling a prescription within 60 days was higher among inmates aged 30 through 49 years (30.7%) and 50 years or older (31.9%) compared with inmates aged 16 through 29 years (19.3%); higher among inmates with CD4 cell counts greater than 350 cells/μL (34.6%) compared with those with counts less than 200 cells/μL (24.8%); higher among those with an undetectable viral load (34.7%) compared with those with a detectable viral load (24.1%); higher among inmates receiving ART for at least 1 year (36.7%) than among those receiving ART for less than 1 year (24.1%); higher among inmates incarcerated for at least 1 year (35.6%) than among those incarcerated for less than 1 year (23.6%); higher among those released on parole (37.6%) than among those with a

standard, unsupervised release (22.2%); and higher among those who received formal ADAP application assistance (33.6%) compared with those who did not (25.7%).

Adjusted RR estimates were calculated using logistic regression to assess whether these associations persisted after adjustment for potential confounding variables (TABLE 3). Our findings show that Hispanic and African American inmates were less likely to fill a prescription within 10 days (adjusted estimated RR, 0.4 [95% CI, 0.2-0.8] and 0.4 [95% CI, 0.3-0.7], respec-

Table 2. Unadjusted Predictors of Having an ART Prescription Filled Among Texas Department of Criminal Justice Prison Inmates Receiving ART and Released Between January 1, 2004, and December 31, 2007

	≤10 d After Release		≤30 d After Release		≤60 d After Release	
Characteristic	No. (%)	Unadjusted Estimated RR (95% CI)[a]	No. (%)	Unadjusted Estimated RR (95% CI)[a]	No. (%)	Unadjusted Estimated RR (95% CI)[a]
Overall (N = 2115)	115 (5.4)		375 (17.7)		634 (30.0)	
Sex						
Male	97 (5.5)	1 [Reference]	322 (18.3)	1 [Reference]	552 (31.3)	1 [Reference]
Female	18 (5.1)	0.9 (0.5-1.5)	53 (15.0)	0.8 (0.6-1.1)	82 (23.2)	0.8 (0.6-1.0)
Age, y						
16-29	5 (2.9)	1 [Reference]	19 (11.1)	1 [Reference]	33 (19.3)	1 [Reference]
30-49	95 (5.9)	2.0 (0.8-4.6)	297 (18.4)	1.7 (1.1-2.5)	496 (30.7)	1.6 (1.2-2.0)
≥50	15 (4.6)	1.6 (0.6-4.0)	59 (17.9)	1.6 (1.0-2.5)	105 (31.9)	1.7 (1.2-2.2)
Race/ethnicity						
Non-Hispanic white	51 (9.0)	1 [Reference]	121 (21.4)	1 [Reference]	183 (32.4)	1 [Reference]
Hispanic	11 (4.0)	0.4 (0.2-0.8)	40 (14.6)	0.7 (0.5-0.9)	77 (28.1)	0.9 (0.7-1.1)
African American	53 (4.2)	0.4 (0.3-0.6)	214 (16.8)	0.7 (0.6-0.9)	374 (29.3)	0.9 (0.8-1.1)
Major psychiatric disorder						
No	97 (5.6)	1 [Reference]	311 (17.8)	1 [Reference]	537 (30.8)	1 [Reference]
Yes	18 (4.9)	0.9 (0.5-1.5)	64 (17.3)	1.0 (0.7-1.2)	97 (26.2)	0.9 (0.7-1.0)
CD4 cell count, cells/μL[b]						
<200	24 (3.9)	1 [Reference]	91 (14.6)	1 [Reference]	154 (24.8)	1 [Reference]
200-350	24 (4.6)	1.2 (0.7-2.0)	84 (15.9)	1.1 (0.8-1.4)	145 (27.5)	1.1 (0.9-1.3)
>350	67 (7.0)	1.8 (1.2-2.8)	197 (20.6)	1.4 (1.2-1.7)	331 (34.6)	1.4 (1.2-1.6)
Viral load[c]						
Detectable	34 (3.6)	1 [Reference]	125 (13.2)	1 [Reference]	227 (24.1)	1 [Reference]
Undetectable	81 (7.0)	1.9 (1.3-2.8)	247 (21.2)	1.6 (1.3-1.9)	403 (34.7)	1.5 (1.3-1.6)
Duration of ART, y						
<1	47 (4.2)	1 [Reference]	160 (14.2)	1 [Reference]	227 (24.1)	1 [Reference]
≥1	68 (6.9)	1.7 (1.2-2.4)	215 (21.9)	1.5 (1.3-1.8)	361 (36.7)	1.5 (1.3-1.7)
Calendar year of discharge						
2004	10 (2.3)	1 [Reference]	40 (9.3)	1 [Reference]	96 (22.3)	1 [Reference]
2005	20 (4.4)	1.9 (1.0-3.9)	63 (13.9)	1.5 (1.0-2.1)	123 (27.1)	1.2 (1.0-1.5)
2006	45 (8.0)	3.5 (1.8-6.4)	123 (21.9)	2.3 (1.8-3.1)	186 (33.1)	1.5 (1.2-1.8)
2007	40 (6.0)	2.6 (1.3-4.9)	149 (22.3)	2.4 (1.8-3.2)	229 (34.2)	1.5 (1.3-1.8)
Duration of incarceration, y						
<1	38 (3.8)	1 [Reference]	137 (13.8)	1 [Reference]	234 (23.6)	1 [Reference]
≥1	77 (6.8)	1.7 (1.2-2.4)	238 (21.2)	1.6 (1.2-1.8)	400 (35.6)	1.5 (1.3-1.7)
Drug-related criminal offense						
No	55 (6.3)	1 [Reference]	152 (17.3)	1 [Reference]	269 (30.6)	1 [Reference]
Yes	60 (4.9)	0.8 (0.5-1.1)	223 (18.0)	1.1 (0.8-1.2)	365 (29.5)	0.9 (0.8-1.1)
Released on parole						
No	45 (4.3)	1 [Reference]	149 (14.2)	1 [Reference]	232 (22.2)	1 [Reference]
Yes	70 (6.6)	1.5 (1.1-2.1)	226 (21.1)	1.5 (1.2-1.8)	402 (37.6)	1.7 (1.5-1.9)
County population size						
Nonmetropolitan	7 (6.1)	1 [Reference]	14 (12.2)	1 [Reference]	35 (30.4)	1 [Reference]
Metropolitan	108 (5.4)	0.9 (0.4-1.8)	361 (18.1)	1.5 (0.9-2.3)	599 (30.0)	1.0 (0.7-1.3)
ADAP application assistance						
No	24 (2.5)	1 [Reference]	111 (11.6)	1 [Reference]	246 (25.7)	1 [Reference]
Yes	91 (7.9)	3.1 (2.0-4.8)	264 (22.8)	2.0 (1.6-2.4)	388 (33.6)	1.3 (1.1-1.5)

Abbreviations: ADAP, AIDS Drug Assistance Program; ART, antiretroviral therapy; CI, confidence interval; RR, risk ratio.
[a] Odds ratios were converted to RR estimates using methods by Zhang and Yu.[20]
[b] Missing data for 4 inmates.
[c] Missing data for 7 inmates.

tively) and 30 days (adjusted estimated RR, 0.7 [95% CI, 0.5-0.9] and 0.7 [95% CI, 0.5-0.9]), compared with non-Hispanic whites. Inmates with an undetectable viral load were more likely to fill a prescription within 10 days (adjusted estimated RR, 1.8 [95% CI, 1.2-2.7]), 30 days (adjusted estimated RR, 1.5 [95% CI, 1.2-1.8]), and 60 days (adjusted estimated RR, 1.3 [95% CI, 1.1-1.5]) than inmates with a detectable viral load at release. Inmates released on parole were more likely to fill a prescription within 30 days (adjusted estimated RR, 1.3 [95% CI, 1.1-1.6]) and 60 days (adjusted estimated RR, 1.5 [95% CI, 1.4-1.7]) than inmates with a standard, unsupervised release. Inmates who received formal assistance in completing an ADAP application were more likely to fill a prescription within 10 days (adjusted estimated RR, 3.1 [95% CI, 2.0-4.9]), 30 days (adjusted estimated RR, 1.8 [95% CI, 1.4-2.2]), and 60 days (adjusted estimated RR, 1.3 [95% CI, 1.1-1.4]) than inmates who received no such assistance.

The percentage of inmates who filled a second ADAP prescription is presented according to the duration of treatment interruption. Of the entire study cohort (N=2115), 634 (29.9%) filled their first ADAP prescription within 60 days of release. Of the 2115 total inmates, 39 (1.8%) filled their second prescription in time to avoid treatment interruption; 254 (12.0%) experienced a treatment interruption ranging between 1 and 30 days, 221 (10.4%) between 31 and 90 days, and 59 (2.8%) between 91 days and 1 year; and 61 (2.9%) did not refill an ADAP prescription. Restricting this analysis to the subgroup of former inmates who filled their first ADAP prescription within 60 days of release (n=634) showed that 39 (6.2%) experienced no treatment interruption; 254 (40.0%) had a treatment interruption ranging between 1 and 30 days, 221 (34.8%) between 31 and 90 days, and 59 (9.3%) between 91 days and 1 year; and 61 (9.6%) did not refill an ADAP prescrip-

Table 3. Adjusted Predictors of Having an ART Prescription Filled Among Texas Department of Criminal Justice Prison Inmates Receiving ART and Released Between January 1, 2004, and December 31, 2007

Characteristic	≤10 d After Release		≤30 d After Release		≤60 d After Release	
	Adjusted Estimated RR (95% CI)[a]	*P* Value	Adjusted Estimated RR (95% CI)[a]	*P* Value	Adjusted Estimated RR (95% CI)[a]	*P* Value
Sex						
Male	1 [Reference]		1 [Reference]		1 [Reference]	
Female	1.2 (0.7-1.3)	.55	1.0 (0.7-1.2)	.80	0.9 (0.7-1.1)	.20
Age, y						
16-29	1 [Reference]		1 [Reference]		1 [Reference]	
30-49	1.8 (0.7-4.2)	.22	1.5 (1.0-2.3)	.07	1.4 (1.1-1.8)	.03
≥50	1.4 (0.5-3.7)	.57	1.4 (0.8-2.3)	.18	1.4 (0.9-1.9)	.09
Race/ethnicity						
Non-Hispanic white	1 [Reference]		1 [Reference]		1 [Reference]	
Hispanic	0.4 (0.2-0.8)	.008	0.7 (0.5-0.9)	.01	0.9 (0.7-1.1)	.15
African American	0.4 (0.3-0.7)	<.001	0.7 (0.5-0.9)	.007	0.9 (0.8-1.1)	.13
Viral load[b]						
Detectable	1 [Reference]		1 [Reference]		1 [Reference]	
Undetectable	1.8 (1.2-2.7)	.004	1.5 (1.2-1.8)	<.001	1.3 (1.1-1.5)	<.001
Duration of ART, y						
<1	1 [Reference]		1 [Reference]		1 [Reference]	
≥1	1.0 (0.5-1.8)	.98	1.2 (0.8-1.7)	.27	1.1 (0.9-1.5)	.20
Calendar year of discharge						
2004	1 [Reference]		1 [Reference]		1 [Reference]	
2005	1.9 (0.9-3.8)	.12	1.4 (1.0-2.1)	.06	1.2 (0.9-1.5)	.12
2006	2.1 (1.1-4.7)	.03	1.9 (1.3-2.6)	<.001	1.3 (1.1-1.7)	.008
2007	1.5 (0.7-3.0)	.26	1.9 (1.3-2.6)	<.001	1.4 (1.1-1.7)	.003
Duration of incarceration, y						
<1	1 [Reference]		1 [Reference]		1 [Reference]	
≥1	1.6 (0.9-2.8)	.11	1.2 (0.8-1.6)	.29	1.1 (0.9-1.5)	.30
Released on parole						
No	1 [Reference]		1 [Reference]		1 [Reference]	
Yes	1.3 (0.9-1.9)	.18	1.3 (1.1-1.6)	.009	1.5 (1.4-1.7)	<.001
ADAP application assistance						
No	1 [Reference]		1 [Reference]		1 [Reference]	
Yes	3.1 (2.0-4.9)	<.001	1.8 (1.4-2.2)	<.001	1.3 (1.1-1.4)	.003

Abbreviations: ADAP, AIDS Drug Assistance Program; ART, antiretroviral therapy; CI, confidence interval; RR, risk ratio.
[a] Odds ratios converted to RR estimates using methods by Zhang and Yu.[20]
[b] Missing data for 7 inmates.

tion. Of the total 1090 former inmates ever filling a first ADAP prescription for ART, 964 (88.4%) ever filled a second ADAP prescription for ART (this number includes inmates who did not fill their first ADAP prescription until after the 60-day cut point).

COMMENT

In this 4-year study of HIV-infected inmates released from the nation's largest state prison system, we found that only 5% of released inmates filled a prescription for ART medications soon enough (ie, within 10 days after release) to avoid treatment interruption. Furthermore, only 18% of inmates filled a prescription for ART medications within 30 days of release, and 30% did so within 60 days. While other studies have documented loss of both immune function and viral suppression among recidivist populations,[5,7] to our knowledge this is the first study to assess continuity of HIV pharmacotherapy among released inmates. In all of the subgroups we examined, at least 90% of the former inmates experienced a treatment interruption; more than 70% had an interruption that lasted at least 30 days, and more than 60% had an interruption that lasted at least 60 days.

The Strategies for Management of Antiretroviral Therapy (SMART) study demonstrated that even a small number of treatment interruptions leads to poorer clinical outcomes, independent of baseline CD4 cell count.[22] Previous studies suggest that a large proportion of HIV-infected inmates discontinue their ART regimen, while often resuming high-risk behaviors such as injection drug use and prostitution.[11,14,23] In combination, these behaviors may result in poor health outcomes for former inmates and the creation of reservoirs of drug-resistant HIV in the general community.[11,13,14] Moreover, because a higher viral burden also predicts greater infectiousness, former inmates who fail or discontinue ART may be more likely to infect their contacts.[24,25] In view of these risks, a careful examination of policies and procedures related to the release of HIV-infected inmates is warranted. In particular, greater coordination between state and local agencies, health care institutions, and community-based organizations is needed to reduce this high rate of treatment interruption among newly released inmates.

Our study provides some evidence for improving this low rate of linkage to community-based ART after release from prison. We found that HIV-infected inmates who received formal assistance with the completion and submission of ADAP applications had significantly higher rates of filling an ART prescription on release compared with inmates who did not receive this service. An inmate's release from prison represents a move from a highly structured environment in which clinical care and administration of medications can be carefully supervised to a setting in which multiple socioeconomic and psychological factors can adversely affect treatment adherence and access to care.[7] Released prisoners, as they transition back to their home communities, are faced immediately and simultaneously with a multitude of social and economic challenges.[8] It is not surprising that those who received formal assistance accessing the community-based medication system exhibited better outcomes. Because this intervention can be implemented at relatively low cost and with little infrastructure, it has potential broad applicability across US prison systems.

We also found that inmates released on parole had higher rates of filling an ART prescription at 30 and 60 days than those with a standard, unsupervised release. It is possible that parolees' mandatory recurring visits with parole officers and participation in substance abuse or mental health treatment programs are associated with higher rates of adherence to medical treatment such as ART. Because of legal and ethical considerations, however, participation in or adherence to treatment for HIV or any other physical health condition cannot be imposed as a condition of parole. Nonetheless, in view of the higher risks of treatment interruption among released inmates not placed on parole, targeted case management programs for this group may be warranted. However, it is acknowledged that being released on parole may not always be helpful if individuals do not keep their appointments with their officer and because of limited resources available in this regard.

Our finding that inmates with undetectable viral loads had higher rates of ART initiation may indicate that this subgroup demonstrated favorable medication adherence during incarceration and continued this behavior following release. It is important to consider that educational interventions designed to improve HIV knowledge and treatment adherence during incarceration may ultimately lead to improved continuity of ART following release.

African Americans and Hispanics were less likely to have filled an ART prescription at 10 and 30 days after release compared with non-Hispanic whites. This finding is consistent with previous community-based research indicating that minority populations may experience more socioeconomic barriers to health care than their nonminority counterparts.[26-28] It is noteworthy that we found no significant difference across the 3 racial/ethnic groups in the proportion of inmates who received ADAP application assistance. Future investigations that examine the specific health care barriers faced by African Americans as well as Hispanics following release from prison may be warranted. It is noted that none of the study participants were Mexican nationals, who would thus potentially be able to obtain antiretroviral medications in Mexico.

Our finding that inmates 30 years and older were more likely than their younger counterparts to obtain a prescription by 60 days is consistent with several community-based studies that reported that older HIV-infected patients demonstrated better adherence to ART[29,30] and better linkage to and re-

tention in HIV care[31,32] than younger patients. Each of these demographic disparities highlights the importance of developing targeted interventions for specific subgroups who may be at increased risk for treatment interruption.

Our analysis of the group of released inmates who filled a second ADAP prescription showed that the vast majority did not fill their second prescription soon enough to avoid a substantial treatment interruption. This finding offers some insight into the difficulty released inmates experience in linking with HIV clinics in the general community. To receive a second 30-day supply of ART medication from ADAP, the former inmate must obtain a written prescription by completing a medical visit to a community-based HIV clinic. Our finding that only 6% of inmates who filled their initial ADAP prescription within 60 days accessed their second prescription without interruption suggests that in the months following release, inmates may need additional assistance in navigating the health care system and addressing behavioral and social barriers to treatment.

The results of this study may have been influenced by several limitations. It is possible that some released inmates may have received ART medications from a source other than ADAP. Within the first 30 days of release, however, this number would likely have been exceedingly small, given that the vast majority of inmates have no health benefits on release from prison. In their study of a representative sample of more than 800 newly released US prison inmates, Mallik-Kane and Visher[8] reported that 75% of former inmates had no public or private health insurance 2 to 3 months after community reentry, and 65% still had no insurance by 8 to 10 months.

All HIV-infected inmates released from prison in Texas and who do not have private insurance qualify for ADAP. Because almost all of these individuals are from disadvantaged socioeconomic backgrounds, it is unlikely that many released inmates would have accessed ART from other sources. Even inmates who eventually receive public health care benefits receive their initial 30-day supply of ART medications as well as a substantial portion of subsequent medication from ADAP. However, because 60 days may have been enough time for a small but significant proportion of released inmates to gain access to ART through other sources—including Medicare and Medicaid—our analyses focusing on the percentage of inmates who filled an ADAP prescription by 60 days should be interpreted with caution.

Another potential limitation is that it was difficult to determine the extent to which the higher rates of ART initiation among inmates who received ADAP application assistance might reflect an underlying selection bias. Although HIV discharge planning coordinators did not target specific clinical or demographic subgroups of inmates to receive ADAP application assistance, it is possible that unmeasured behavioral characteristics may have resulted in inmates either seeking or being selected for such assistance. However, our analyses of the study factors across the 2 subgroups showed that, with the exception of parole status and duration of incarceration, all demographic and clinical characteristics were relatively evenly distributed. In particular, we observed no statistically significant differences in CD4 cell count or viral load across the 2 ADAP application assistance subgroups.

Additionally, our use of multivariate modeling permitted simultaneous adjustment for several potential confounding factors. Nevertheless, the high likelihood of unmeasured confounding and selection bias associated with ADAP application assistance limits our ability to make strong inferences about this finding. A randomized trial is needed to more rigorously examine the role of this factor in accessing ART following release from prison.

The retrospective nature of this study limited our ability to assess a number of important social and behavioral characteristics. In particular, because information on injection drug use—which is prevalent among HIV-infected individuals and has long been associated with poor ART adherence[33,34]—was unavailable, we were unable to examine its effect on filling an ART prescription. Additionally, the inmate's potential fear of stigmatization associated with receiving HIV treatment following release represents an important barrier to ART adherence among community-based samples[35-37] that we were unable to assess. To fully characterize these and other important determinants of obtaining ART after release, in-depth qualitative studies are needed.

Despite these limitations, we believe that this study has important strengths. It represents the largest investigation of newly released prison inmates with HIV infection and is the first to examine continuity of ART for all inmates released statewide. Because this study was carried out in the nation's largest state prison system,[15] these findings have a high degree of statistical power. Moreover, given that the HIV screening and treatment policies of the TDCJ are comparable with those of most other state prisons,[38] these findings are likely generalizable to other US correctional systems. No published information is available on the extent to which US prison systems provide released inmates with assistance or information related to ADAP services. It is likely, however, that ADAP represents the optimal initial source of ART medications for the vast majority of released inmates in the United States. ADAP has long served as a bridge to services for impoverished HIV-positive persons and is the most expeditious pathway to obtaining ART drugs during the immediate postrelease period.[39]

In conclusion, we found that 90% or more of released inmates did not fill a prescription for ART medication soon enough to avoid a treatment interruption and that more than 80% did not fill a prescription within 30 days of release. These exceedingly high rates of treatment interruption suggest that

most inmates face significant administrative, socioeconomic, or personal barriers to accessing ART when they return to their communities. Future prospective and in-depth qualitative studies are needed to more rigorously examine these barriers. Adequately addressing a public health crisis of this scale and complexity will require carefully coordinated efforts between academic institutions, the criminal justice system, and public health agencies.

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Study concept and design: Baillargeon, Giordano, Wu, Wells, Paar.
Acquisition of data: Baillargeon, Paar.
Analysis and interpretation of data: Baillargeon, Rich, Wu, Wells, Pollock, Paar.
Drafting of the manuscript: Baillargeon, Giordano, Wu, Wells.
Critical revision of the manuscript for important intellectual content: Baillargeon, Giordano, Rich, Pollock, Paar.
Statistical analysis: Baillargeon, Giordano, Wu, Pollock.
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REFERENCES

1. Boutwell A, Rich JD. HIV infection behind bars. *Clin Infect Dis*. 2004;38(12):1761-1763.
2. Rich JD, Holmes L, Salas C, et al. Successful linkage of medical care and community services for HIV-positive offenders being released from prison. *J Urban Health*. 2001;78(2):279-289.
3. Dixon PS, Flanigan TP, DeBuono BA, et al. Infection with the human immunodeficiency virus in prisoners: meeting the health care challenge. *Am J Med*. 1993;95(6):629-635.
4. Altice FL, Mostashari F, Friedland GH. Trust and the acceptance of and adherence to antiretroviral therapy. *J Acquir Immune Defic Syndr*. 2001;28(1):47-58.
5. Springer SA, Pesanti E, Hodges J, Macura T, Doros G, Altice FL. Effectiveness of antiretroviral therapy among HIV-infected prisoners: reincarceration and the lack of sustained benefit after release to the community. *Clin Infect Dis*. 2004;38(12):1754-1760.
6. Palepu A, Tyndall MW, Chan K, Wood E, Montaner JS, Hogg RS. Initiating highly active antiretroviral therapy and continuity of HIV care: the impact of incarceration and prison release on adherence and HIV treatment outcomes. *Antivir Ther*. 2004;9(5):713-719.
7. Stephenson BL, Wohl DA, Golin CE, Tien HC, Stewart P, Kaplan AH. Effect of release from prison and re-incarceration on the viral loads of HIV-infected individuals. *Public Health Rep*. 2005;120(1):84-88.
8. Mallik-Kane K, Visher CA. *Health and Prisoner Reentry: How Physical, Mental, and Substance Abuse Conditions Shape the Process of Reintegration.* Washington, DC: Urban Institute; 2008.
9. Baillargeon J, Binswanger IA, Penn JV, Williams BA, Murray OJ. Psychiatric disorders and repeat incarcerations: the revolving prison door. *Am J Psychiatry*. 2009;166(1):103-109.
10. Binswanger IA, Stern MF, Deyo RA, et al. Release from prison—a high risk of death for former inmates. *N Engl J Med*. 2007;356(2):157-165.
11. MacGowan RJ, Margolis A, Gaiter J, et al; Project START Study Group. Predictors of risky sex of young men after release from prison. *Int J STD AIDS*. 2003;14(8):519-523.
12. Morrow KM, Eldridge G, Nealey-Moore J, Grinstead O; Project START Study Group. HIV, STD, and hepatitis risk in the week following release from prison: an event-level analysis. *J Correctional Health Care*. 2007;13(1):27-38.
13. Baillargeon J, Borucki MJ, Zepeda S, Jenson HB, Leach CT. Antiretroviral prescribing patterns in the Texas prison system. *Clin Infect Dis*. 2000;31(6):1476-1481.
14. Wohl DA, Shain L, Adamian M, et al. HIV transmission risk behaviors among HIV-infected individuals released from prison. In: Program and abstracts of the 10th Conference on Retroviruses and Opportunistic Infections; February 10-14, 2003; Boston, MA. Abstract 36.
15. One in 100: behind bars in America 2008. Pew Center on the States Web site. http://www.pewcenteronthestates.org/report_detail.aspx?id=35904. Accessed September 1, 2008.
16. Raimer BG, Stobo JD. Health care delivery in the Texas prison system: the role of academic medicine. *JAMA*. 2004;292(4):485-489.
17. Panel on Antiretroviral Guidelines for Adults and Adolescents. Guidelines for the use of antiretroviral agents in HIV-1 infected adults and adolescents. Department of Health and Human Services Web site. http://www.aidsinfo.nih.gov/ContentFiles/AdultandAdolescentGL.pdf. November 3, 2008. Accessed December 19, 2008.
18. An explanation of federal Medicaid and disability program rules. Council of State Governments Justice Center Web site. http://consensusproject.org/projects/benefits/federal-benefits. Accessed December 15, 2008.
19. Stokes M, Davis CS, Koch GG. *Categorical Data Analysis Using the SAS System.* 2nd ed. Cary, NC: SAS Publishing; 2000.
20. Zhang J, Yu KF. What's the relative risk? a method of correcting the odds ratio in cohort studies of common outcomes. *JAMA*. 1998;280(19):1690-1691.
21. Hsieh FY, Bloch DA, Larsen MD. A simple method of sample size calculation for linear and logistic regression. *Stat Med*. 1998;17(14):1623-1634.
22. El-Sadr WM, Lundgren JD, Neaton JD, et al; Strategies for Management of Antiretroviral Therapy (SMART) Study Group. CD4+ count-guided interruption of antiretroviral treatment. *N Engl J Med*. 2006;355(22):2283-2296.
23. Mumola CJ. *Substance Abuse and Treatment, State and Federal Prisoners, 1997.* Washington, DC: US Dept of Justice; 1999.
24. Pence BW, Miller WC, Gaynes BN, Eron JJ Jr. Psychiatric illness and virologic response in patients initiating highly active antiretroviral therapy. *J Acquir Immune Defic Syndr*. 2007;44(2):159-166.
25. Wainberg MA, Friedland G. Public health implications of antiretroviral therapy and HIV drug resistance. *JAMA*. 1998;279(24):1977-1983.
26. Kahn JG, Zhang X, Cross LT, Palacio H, Birkhead GS, Morin SF. Access to and use of HIV antiretroviral therapy: variation by race/ethnicity in two public insurance programs in the U.S. *Public Health Rep*. 2002;117(3):252-262.
27. Menke TJ, Giordano TP, Rabeneck L. Utilization of health care resources by HIV-infected white, African-American, and Hispanic men in the era before highly active antiretroviral therapy. *J Natl Med Assoc*. 2003;95(9):853-861.
28. Palacio H, Kahn JG, Richards TA, Morin SF. Effect of race and/or ethnicity in use of antiretrovirals and prophylaxis for opportunistic infection: a review of the literature. *Public Health Rep*. 2002;117(3):233-251.
29. Glass TR, De Geest S, Weber R, et al. Correlates of self-reported nonadherence to antiretroviral therapy in HIV-infected patients: the Swiss HIV Cohort Study. *J Acquir Immune Defic Syndr*. 2006;41(3):385-392.
30. Li X, Margolick JB, Conover CS, et al. Interruption and discontinuation of highly active antiretroviral therapy in the multicenter AIDS cohort study. *J Acquir Immune Defic Syndr*. 2005;38(3):320-328.
31. Giordano TP, Visnegarwala F, White AC Jr, et al. Patients referred to an urban HIV clinic frequently fail to establish care: factors predicting failure. *AIDS Care*. 2005;17(6):773-783.
32. Gardner LI, Metsch LR, Anderson-Mahoney P, et al; Antiretroviral Treatment and Access Study Study Group. Efficacy of a brief case management intervention to link recently diagnosed HIV-infected persons to care. *AIDS*. 2005;19(4):423-431.
33. Gordillo V, del Amo J, Soriano V, González-Lahoz J. Sociodemographic and psychological variables influencing adherence to antiretroviral therapy. *AIDS*. 1999;13(13):1763-1769.
34. Shannon K, Kerr T, Lai C, et al. Nonadherence to antiretroviral therapy among a community with endemic rates of injection drug use. *J Int Assoc Physicians AIDS Care*. 2005;4(3):66-72.
35. Derlega VJ, Winstead BA, Brokington JE Jr. AIDS stigma among inmates and staff in a USA state prison. *Int J STD AIDS*. 2008;19(4):259-263.
36. Rao D, Pryor JB, Gaddist BW, Mayer R. Stigma, secrecy, and discrimination: ethnic/racial differences in the concerns of people living with HIV/AIDS. *AIDS Behav*. 2008;12(2):265-271.
37. Rintamaki LS, Davis TC, Skripkauskas S, Bennett CL, Wolf MS. Social stigma concerns and HIV medication adherence. *AIDS Patient Care STDS*. 2006;20(5):359-368.
38. Maruschak LM. *HIV in Prisons, 2005*. Washington, DC: US Dept of Justice; 2007.
39. National ADAP Monitoring Project Annual Report, April 2008. Henry J. Kaiser Family Foundation, National Alliance of State and Territorial AIDS Directors. Kaiser Family Foundation Web site. http://www.kff.org/hivaids/hiv040808pkg.cfm. Released April 8, 2008. Accessed December 18, 2008.