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Disparities in Antiretroviral Treatment: A Comparison of Behaviorally-HIV-Infected Youth and Adults in the HIV Research Network

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Abstract

Objectives—Increasing numbers of youth are becoming HIV-infected and need highly active antiretroviral therapy (HAART). We hypothesized that behaviorally HIV-infected youth (BIY) ages 18–24 are less likely than adults (≥ 25 years) to receive HAART and once initiated, more likely to discontinue their first HAART regimen.

Methods—Longitudinal analysis of treatment-naïve patients (age ≥ 18) meeting criteria for HAART and followed at HIVRN sites (2002–2008). Time from meeting criteria to HAART initiation and duration on first regimen were assessed using Cox proportional hazards regression.

Results—3,127 (268 youth, 2,859 adult) treatment-naïve, HIV-infected patients met criteria. BIY were more likely to be Black (66.8% vs. 51.1%; $p < .01$) and less likely to identify injection drug use (IDU) HIV risk (1.1% vs. 8.8%; $p < .01$) than adults ≥ 25 years. Nearly 69% of BIY started HAART, versus 79% of adults; $p < .001$. Adults 25–29 (Adjusted Hazards Ratio (AHR) 1.39 [95%

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CI: 1.12–1.73]) and ≥ 50 (AHR 1.24 [95% CI 1.00–1.54]), but not 30–49 years (AHR 1.19 [95% CI 0.99–1.44]) were more likely to initiate HAART than BIY. Attending ≥ 4 HIV provider visits within one year of meeting criteria was associated with HAART initiation (AHR 1.91 [1.70–2.14]). CD4 200–350 vs. <200 cells/mm³ (AHR 0.57 (95% CI 0.52–0.63]) and IDU (AHR 0.80 [95% CI 0.69–0.92]) were associated with a lower likelihood of HAART initiation. There were no age-related differences in duration of first regimen.

Conclusion—BIY are less likely to start HAART when meeting treatment criteria. Addressing factors associated with this disparity is critical to improving care for youth.

Keywords

HIV; youth; adolescent; HAART; disparities

Introduction

Youth between the ages of 18 and 24 years are acquiring HIV through risk behaviors, primarily sexual activity, at alarming rates¹. This is being driven by a disproportionate increase in HIV incidence among young minority men who have sex with men (MSM)^{1–4}. In 2006, individuals between the ages of 18 and 24 accounted for 15% of incident HIV/AIDS cases from the 38 states with confidential name-based reporting¹, a 21% increase since 2000. Furthermore, significant numbers of behaviorally-infected youth (BIY) meet criteria for treatment with highly active antiretroviral therapy (HAART), despite a relatively short duration of infection⁵. It is unknown whether the percentage of treatment-eligible youth who receive HAART differs from that of adults.

Youth may be at particularly high risk for not receiving HAART for several reasons. First, prior studies have shown that a substantial proportion of individuals in the 18–24 age group exhibit concrete thinking and difficulty in perceiving risks or consequences^{2,6–8}; and these age-appropriate characteristics may impact youth's decisions to initiate HAART. Second, many HIV-infected youth have unstructured lifestyles, with minimal familial support, and participation in high risk activities^{2,8}. Third, HIV-infected youth often have difficulty engaging in care and adhering to appointments and/or medications^{6,9–11}; providers may delay therapy due to concerns regarding adherence. Also, youth often have little experience with the medical system and a limited ability to advocate for themselves¹². Finally, persons of minority race/ethnicity, who have been reported to be less likely to receive HAART compared with whites^{13,14}, account for an even greater proportion of HIV-infected youth compared to HIV-infected adults^{4,15}.

The primary objective of this study was to evaluate and compare HAART initiation rates in HAART-naïve youth and adult patients meeting treatment criteria followed in a large multi-site, multi-state cohort. We hypothesized that youth meeting treatment criteria would be less likely than their adult counterparts to initiate HAART and that this disparity would persist after taking into account demographic, clinical and health care utilization characteristics.

Once HAART is initiated, a subsequent goal is to maintain treatment for durable virologic suppression and immunologic improvement. The aforementioned challenges that complicate treatment in this population may result in youth having lower tolerance for medication side effects with resultant lower adherence to regimens and self-discontinuation. Alternatively, providers may be more inclined to modify or discontinue HAART for this population. We, therefore, hypothesized that youth would be more likely to undergo discontinuation or modification of their first HAART regimen than their adult counterparts. A second objective of this study was to evaluate and compare duration of first HAART regimen in BIY vs. their adult counterparts and to examine factors associated with discontinuation or modification.

Methods

This was a retrospective study comparing HAART initiation in behaviorally HIV-infected youth (BIY) between the ages of 18 and 24 and adults (≥ 25 years old) at entry into the dataset. Patients were enrolled and followed between January 1, 2002 and December 31, 2008 in the HIV Research Network (HIVRN), a consortium of 17 U.S. clinic sites that provide primary and subspecialty care to HIV-infected patients¹⁶. The study was approved by the Johns Hopkins University School of Medicine Institutional review board (IRB) and the IRBs of each participating institution. The HIVRN has been described previously¹⁶. In brief, sites abstract specified data elements from patients' medical records, including demographic data, service utilization, medications, and laboratory tests; abstracted data are assembled into a single database after quality assurance review^{13;16;17}.

Patients were included in analyses if they were at least 18 years old, enrolled into care between 2002 and 2008, acquired HIV through risk behaviors, were HAART-naïve, actively receiving HIV care (defined as having at least one CD4 count and one outpatient HIV provider visit within a calendar year), and met Department of Health and Human Services' (DHHS) HAART eligibility criteria at some point between enrollment and December 31, 2008¹¹. Patients had to have at least two CD4 measurements below 350 cells/mm³, the CD4 threshold for HAART initiation since 2002, to be included in the analysis. In order to compare patients with similar modes of acquisition in the two age groups, patients were excluded if they acquired infection perinatally or through blood transfusion.

Data Collection and Measures

Demographic and clinical data were collected from the HIVRN clinical database. Self-identified race/ethnic group was classified as non-Hispanic White, non-Hispanic Black, Hispanic, or "other", which included American Indian or Alaskan Native, Asian or Pacific Islander. Patients acquired HIV through sexual exposure (either heterosexual or men who have sex with men [MSM]), IDU, or a combination of risk factors [e.g., MSM and IDU]. The date of the second CD4 measurement less than 350 cells/mm³ was used as the date of eligibility for treatment. The age when each patient met criteria for HAART initiation was calculated from abstracted month and year of birth and the date of the qualifying CD4.

HAART was defined as concomitant use of ≥ 3 antiretroviral drugs either from ≥ 2 classes (nucleoside/nucleotide reverse transcriptase inhibitors [NRTIs], non-nucleoside reverse transcriptase inhibitors, protease inhibitors, and entry inhibitors) or 3 NRTIs. The relevant guidelines for HAART initiation for a given year were used¹⁸. Clinical indications for HAART (i.e., provider clinical decision-making, prior opportunistic infections (OIs) were not used in determining treatment eligibility).

The number of outpatient HIV provider visits during the 365 days after the patient met the CD4 threshold was calculated. This variable was then dichotomized as <4 or ≥ 4 visits for analysis as the DHHS recommends quarterly clinical follow-up (four visits per year with an HIV provider) for HIV-infected patients¹¹. Only visits to HIV primary care providers were counted towards the total visits. Non-HIV provider outpatient clinic visits (i.e., social worker, psychiatry, administrative visits) were not included in the count of visits.

Statistical Analysis

The primary outcome of interest was time to HAART initiation. A secondary outcome was duration of first HAART regimen. Time to HAART initiation was defined as elapsed time (in days) from the date of eligibility, based on CD4 test results, to the date of initiation of the HAART regimen or the censoring date (last recorded primary HIV provider visit). Duration of HAART was determined as the elapsed time (in days) between initiation and

discontinuation of the first HAART regimen. Discontinuation of first HAART regimen included any change to the first HAART regimen, including modification and discontinuation of any or all components of the regimen. We then looked at the subsequent year to evaluate if patients who discontinued were subsequently on HAART.

We conducted a longitudinal analysis of patients enrolling in care during the calendar years 2002–2008, who were previously treatment-naïve and eligible for treatment. Age group differences in demographic and clinical variables were assessed using the Chi-squared test for categorical variables and Wilcoxon rank sum tests for continuous variables. Univariate and multivariate Cox proportional hazards regression analyses were used to assess variables associated with time to HAART initiation as well as time to discontinuation/modification of the first HAART regimen. The final multivariate models included age (categorized as (18–24 years) vs. (25–29, 30–49, and ≥ 50 years), gender, race/ethnicity, HIV risk factor, CD4 cell count category when meeting treatment criteria (<200 vs. 200–350), number of outpatient visits made in the 365 days after meeting treatment criteria, the calendar year the patient met treatment criteria, insurance during the year the patient met treatment criteria, and clinical site. We also examined interactions between key variables to identify any potentially significant interaction terms. No significant interactions were detected. Kaplan-Meier methodology was used for univariate estimation of survival curves, with the log rank test used to compare the survival curves. Cox models were used for multivariate analyses of time to event. The proportionality assumption was assessed graphically and found to be appropriate. Data were analyzed using STATA 10.0 (STATA Corp., College Station, TX).

Results

Demographic and Clinical Comparisons between Youth and Adults

A total of 9,474 patients (527 BIY, 8,947 adults) enrolling into care between 2002 and 2008 were eligible to receive HAART. 6,104 (243 BIY and 5,861 adults) had received treatment previously and an additional 243 (16 BIY 227 adults) were excluded due to missing key data for the analyses (data not shown). The final analytic sample of 3,127 treatment-naïve patients included 268 (8.6%) BIY and 2,859 (91.4%) adults (Table 1). The median age of the BIY was 22 (IQR 20–23). Youth were more likely to be Black and more likely to have an HIV risk factor of MSM compared to adults. Adults had lower CD4 count when they met treatment criteria (Table 1). Most youth (82.5%) were cared for at adult clinical sites. A smaller proportion of treatment-eligible BIY (68.7%) than adults (79.2%) initiated HAART during follow up ($p < 0.001$).

Patient Characteristics Associated with Time to HAART Initiation

The 3,127 patients had a total follow-up time of 22,839 patient-months, with 2,615 patient-months for BIY and 20,158 patient-months for adult patients. The median time from meeting treatment criteria to HAART initiation for BIY was 204 days [IQR: 48–977] vs. 125 days [IQR: 35–490] for 25–29 year olds; 153 (41–565) for 30–49 year olds, and 145 (44–449) for those ≥ 50 years, $p = 0.0043$ (Figure 1). In univariate models (Table 2), adults ≥ 25 had a greater hazard of initiating HAART than BIY (hazard ratio (HR) 1.39 (95% CI 1.12–1.73); 1.24 (1.03–1.49), and 1.32 (1.07–1.63) for 25–29, 30–49, and ≥ 50 year olds). Attendance at ≥ 4 outpatient HIV provider visits within a year of meeting treatment criteria (HR 1.88 [1.68–2.10]) was associated with a shorter time to initiating HAART. Conversely, having a CD4 count between 200 – 350 cells/mm³ vs. <200 cells/mm³ (HR 0.60 [0.54–0.66]) and IDU (HR 0.81 (0.70–0.93) were associated with a longer time to starting HAART.

In multivariate analyses (Table 2), adults ≥ 25 years were more likely to initiate HAART than BIY (adjusted hazard ratio (AHR) 1.39 (1.12–1.73) and 1.24 (1.00–1.54) for 25–29 and ≥ 50 year olds, respectively, but not for 30–49 year olds (AHR 1.19 [95% CI 0.99–1.44]). Attendance at ≥ 4 outpatient HIV provider visits remained associated with a shorter time to starting HAART (AHR 1.91 [95% CI 1.70–2.14]), while IDU risk behavior (AHR 0.80 [0.69–0.92]), and CD4 cell count of 200–350 cells/mm³ (AHR 0.57 (0.52–0.63) remained independently associated with a longer time to HAART initiation.

Duration of First HAART Regimen

Of the 2,449 patients (78.3%) who initiated HAART, 61.4% (1,505) discontinued or modified their first HAART regimen, including 61.7% (1,398) of adults and 58.1% (107) of BIY ($p=0.34$ for difference between the two groups). Of patients discontinuing/modifying their first regimen, 720/812 (88.7%) overall (47/58 (81%) BIY; 673/754 (93.5%) adults) started another regimen within the year after ($p=.06$ for difference between the groups), suggestive of brief interruption or modification for side effects; while 92 (11 BIY; 81 adults) were in care but not on HAART. Four hundred forty-two patients (28 BIY; 414 adults) are known to have fallen out of care and not be on HAART in the year following HAART discontinuation. For 251 patients (21 BIY; 230 adults) who stopped their HAART in 2008, we do not have data from the subsequent year (2009) in the dataset.

There was no significant difference in duration of the first HAART regimen between BIY and adults (Table 3). Having a CD4 of 200–350 cells/mm³ vs. <200 cells/mm³ (AHR 0.86 [95% CI 0.73–0.94]), attending ≥ 4 outpatient HIV provider visits within a year of meeting criteria (AHR 0.83 [95% CI 0.73–0.94]), and Hispanic ethnicity (AHR 0.82 [95% CI 0.70–0.95]) were independently associated with a longer time to discontinuing the first HAART regimen. Conversely, public insurance (Medicare/Medicaid) (AHR 1.20 [95% CI 1.06–1.37]) was associated with a shorter time to discontinuing one's first HAART regimen than being uninsured or having Ryan White support.

Discussion

In this large multi-site clinical cohort of patients eligible for HAART, youth were less likely than adults to initiate HAART. Furthermore, the time to initiation of HAART was longer among BIY than among their adult counterparts, even after adjusting for demographic, clinical and utilization characteristics. There was no association between age and duration of the first HAART regimen.

Studies examining the influence of age on HAART initiation and response have not focused on younger populations^{19–23}. In most studies, older age (>50) has been shown to be associated with later presentation to care, but better access and adherence to HAART therapies^{24,25}. In those analyses, the median ages were approximately 40 years and the limited numbers of youth were typically aggregated with individuals less than ages 35 years designated as a “young” comparator group, precluding specific assessment of treatment patterns in the population examined in the current analysis. This approach potentially ignores the differences in cognitive development, attitudes, and risk-taking that may potentially impact outcomes in youth. Though the developmental and psychological aspects of youth were not specifically examined in our study, by considering youth separately, our study extends the previous literature to demonstrate that youth are at greater risk of not receiving HAART compared with patients over 25 years of age.

Consistent with previous studies, better clinic attendance was associated with a shorter time to HAART initiation^{13,26}. This variable was also highly associated with a longer duration of the first HAART regimen. In addition to offering a greater number of opportunities for

providers to initiate or modify treatment in response to clinical parameters, it is possible that clinic attendance may be a marker of patient characteristics not measured in this analysis, such as improved self-efficacy, outcome expectancy, and motivation which have been associated with better medication adherence, but may also potentially further increase the likelihood of HAART initiation²⁷.

Discontinuation of the first regimen may be related to pill intolerance or side effects^{10;28}, issues that this study was not designed to evaluate. However, better clinic attendance increases the opportunities to address medication issues, potentially decreasing the likelihood of discontinuation. Future research should evaluate interventions to improve engagement into care, including novel mechanisms of delivering care for all patients, such as employing multidisciplinary teams (e.g. providers, case managers, social work, nurses, outreach workers), and using novel technologies (e.g. text reminders)²⁹, and approaches (e.g. directly observed therapy),^{30–33} in order to enhance adherence to appointments, and thereby affect ultimate HAART initiation and potential sustainability of HAART.

The first HAART regimen initiated has the greatest likelihood of durable virologic suppression^{34;35}. Data suggest a correlation between switching components of the initial HAART regimen and virologic rebound³⁵, possibly due to increased complexity of subsequent regimens. Additionally, modifications may be a marker for poor tolerance and adherence. The median length of the first HAART regimen was not different for the BIY and adult groups in this current study. Given the data showing decreased likelihood of success (i.e., durable virologic suppression) with subsequent regimens, the limited duration of first HAART regimen in this cohort is concerning³⁵. Our findings did not reveal any statistically significant differences in the duration of the first HAART regimen by age. Importantly, once BIY initiated HAART they sustained their first HAART regimen as well as their adult counterparts, which may be important in addressing potential provider concerns regarding HAART initiation in this population.

In the current study, there was no association between having publicly-funded insurance (i.e., Medicaid, Medicare) and HAART initiation. However, publicly-funded insurance was independently associated with an increased likelihood of discontinuing one's first HAART regimen when compared to being uninsured or having Ryan White coverage. Others have reported varying comparisons and mixed associations between insurance and HAART utilization, with some studies showing greater likelihood of HAART in patients in publicly-funded vs. no insurance, and others reporting decreased likelihood of HAART when comparing publicly-insured patients to those patients with private or no insurance^{36–38}. It is unclear why publicly-funded insurance demonstrated such a strong association with discontinuing one's first HAART regimen; however, it is possible that the small prescription co-payments that may be associated with publicly-funded insurance programs, as compared to Ryan-White, may potentially serve as an impediment to HAART continuation. This finding is worthy of further study, as it may inform programs that fund HIV care.

The Institute of Medicine has highlighted HIV/AIDS as a disease where reducing racial/ethnic disparities in treatment is a priority³⁹. Interestingly, our study did not reveal any significant racial/ethnic differences in HAART initiation. However, when examining duration of first HAART regimen, our study findings show a lower likelihood of discontinuation of first HAART regimen among Hispanic patients. This finding may reflect cultural differences in provider-patient relationships (e.g., fear of challenging authority, less autonomy), or patient factors including greater self-efficacy, or outcome expectancy, which were not specifically examined in our study, but worthy of further research⁴⁰.

Our study findings should be interpreted in light of several potential limitations. Though this is a multi-site study, we are cautious about generalizing our findings to the entire U.S. HIV-infected population or to non-U.S. sites. In the absence of recent nationally representative data examining this issue, our results add pertinent information regarding care of this high risk population. In addition, we did not have information on *why* patients did not receive HAART, for example patient, provider, or mutual decision. Future studies will need to evaluate these reasons. Further, we can only observe that HAART was prescribed, but cannot specifically state that it was taken. Finally, we did not collect information about the characteristics of the providers caring for the patients, beyond the clinical site and whether the site is identified as a pediatric or adult site; there are no adolescent-specific sites in the HIVRN. Provider characteristics (e.g., infectious disease (ID)-trained vs. non-ID trained) likely contribute to decisions regarding HAART initiation and are fertile grounds for future research^{39;41}. Providers working in HIVRN clinic sites, however, are highly experienced as a group⁴². Our study was not designed to evaluate the provider characteristics and impact on initiation or discontinuation. While our analysis cannot account for the factors that impact providers' decisions, such as the greater awareness of negative consequences of unchecked inflammation in more recent years, adjusting for the year that an individual met treatment criteria likely allows us to address some of the differences. Data were not collected as to why antiretrovirals were discontinued. Further studies will be needed to elucidate causes of discontinuation in this population, specifically whether the decision was made by the patient, provider or both together. Lastly, we had limited numbers of BIY patients to examine the duration of first regimen, which may have limited our power to detect a difference.

Substantial numbers of BIY are becoming HIV infected and need HAART; however, many of these patients are not receiving this life saving therapy. The under-treatment of this population, combined with increasing rates of acquisition of the disease, may have significant implications for HIV transmission, disease trajectory, and short and long-term morbidity and mortality. As treatment guidelines move toward initiating HAART at higher CD4 counts to decrease resultant inflammation, immune activation, and resultant morbidity⁴³, disparities in HAART initiation between BIY and adults are likely to increase. Additional research is urgently needed to identify and overcome barriers contributing to treatment disparities in youth.

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Fig 1. Kaplan-Meier Estimate of Time to Starting HAART in Youth vs. Adults Meeting Treatment Criteria

The median time from meeting treatment criteria to HAART initiation for youth was 204 days [IQR: 48–977] vs. 125 days [IQR: 35–490] for 25–29; 153 days [IQR: 42–574] for 30–49; and 145 days [43–518] for ≥ 50 year olds. $p=0.0043$ (*Log-rank test). Overall patient days at risk was 22,839 patient-months, 2,615 patient-months (BIY), 20,158 patient-months for adults (2,241 (25–29); 14,770 (30–49); and 3,211 (≥ 50)).

Table 1

Characteristics of Treatment-Naïve Youth and Adult Patients Enrolled in the HIVRN Cohort Meeting Treatment Criteria in or after 2002 through 2008

	Youth (18–24 years) N=268 (8.6%)	Adults (≥25 years) ¹ N=2,859 (91.4%)	Total N=3,127	p-value*
Male	196 (73.1)	2,070 (72.4)	2,266 (72.5)	0.798
Race				<.001
Black	179 (66.8)	1,462 (51.1)	1,641 (52.5)	
Hispanic	47 (17.5)	566 (19.8)	613 (19.6)	
White	35 (13.1)	740 (25.9)	775 (24.8)	
Other	9 (2.6)	90 (3.2)	99 (3.2)	
HIV acquisition risk^{1,2}				<.001
MSM	158 (59.0)	1,075 (37.6)	1,233 (39.4)	
IDU ³	3 (1.1)	252 (8.8)	255 (8.1)	
Hetero	94 (35.1)	1,128 (39.4)	1,222 (39.1)	
Hetero + IDU	3 (1.1)	152 (5.3)	155 (5.0)	
MSM + IDU	1 (0.4)	99 (3.5)	100 (3.2)	
Other	9 (0.0)	18 (0.6)	19 (0.6)	
Unknown	9 (3.4)	135 (4.7)	144 (4.6)	
CD4+ T cells when first meet criteria (cells/mm³)				<0.001
≤200	68 (25.4)	1,323 (46.3)	1,391 (44.5)	
200–350	200 (74.6)	1,536 (53.7)	1,736 (55.5)	
≥4 HIV provider visits within 365 days of meeting criteria	162 (60.4)	1,879 (65.7)	2,041 (65.3)	0.083
Insurance³				0.001
Uninsured/Ryan White/Other	158 (59.0)	1,327 (46.4)	1,485 (47.5)	
Private	23 (8.6)	347 (12.1)	370 (11.8)	
Public	83 (31.3)	1,137 (39.8)	1,221 (39.0)	
Unknown	3 (1.1)	48 (1.7)	51 (1.6)	
HAART Ever Started	184 (68.7)	2,265 (79.2)	2,449 (78.3)	<0.001

¹ Excludes vertical or blood transfusion-acquired.

² Categories mutually exclusive;

³ Insurance coverage included private insurance, public (Medicaid, Medicare, dual insurance with Medicaid/Medicare), and Uninsured/Ryan White/Other (e.g., Veteran's administration, county health program), and Unknown insurance coverage.

¹ Age distribution is as follows: 325 (25–29); 2,059 (30–49); and 475 (≥50) years of age.

* Chi-square test.

Table 2

Patient Characteristics Associated with HAART Initiation in Treatment-Naïve Patients Meeting Treatment Criteria*

	Univariate ¹ HR (95% CI)	Multivariate ² AHR (95% CI)
Age (years)		
18–24	1.0 (Ref)	1.0 (Ref)
25–29	1.39 (1.12–1.73)	1.39 (1.12–1.73)
30–49	1.24 (1.03–1.49)	1.19 (0.99–1.44)
≥50	1.32 (1.07–1.63)	1.24 (1.00–1.54)
Sex		
Female	1.01 (0.91–1.13)	1.03 (0.93–1.15)
Race		
Black	0.95 (0.85–1.05)	0.91 (0.81–1.03)
Hispanic	1.03 (0.92–1.16)	0.97 (0.84–1.11)
White	1.0 (Ref)	1.0 (Ref)
HIV acquisition risk		
IDU	0.81 (0.70–0.93)	0.80 (0.69–0.92)
CD4+ T cells when first meet criteria (cells/mm³)		
<200	1.0 (Ref)	1.0 (Ref)
200–350	0.60 (0.54–0.66)	0.57 (0.52–0.63)
Outpatient HIV provider visits in the year after meeting treatment criteria		
≥ 4 visits	1.88 (1.68–2.10)	1.91 (1.70–2.14)
< 4 visits	1.0 (Ref)	1.0 (Ref)
Insurance		
Uninsured/RW/Other	1.0 (Ref)	1.0 (Ref)
Private	0.98 (0.83–1.15)	0.97 (0.82–1.14)
Public	1.02 (0.92–1.13)	0.94 (0.84–1.06)
Year first meeting HAART treatment eligibility		
2002	1.0 (Ref)	1.0 (Ref)
2003	0.82 (0.66–1.02)	0.86 (0.70–1.07)
2004	0.83 (0.67–1.02)	0.90 (0.73–1.11)
2005	0.86 (0.70–1.05)	0.94 (0.76–1.16)
2006	0.91 (0.74–1.12)	1.02 (0.83–1.26)
2007	1.07 (0.86–1.33)	1.24 (1.00–1.55)
2008	0.90 (0.72–1.13)	1.27 (0.98–1.57)

* Cox proportional hazards regression model including age (categorical), sex, race/ethnicity, HIV acquisition risk, clinic utilization, insurance in the year treatment criteria met, CD4 category, year met criteria for HAART; adjusted for site to account for difference across treatment sites.

¹ Insurance coverage included private insurance, public (Medicaid, Medicare, Dual insurance with Medicaid/Medicare), and Other/Unknown insurance (e.g., Veteran's administration, county health program).

¹ Hazard Ratio.

² Adjusted hazard ratio. Significant result in bold font.

Table 3

Hazard of Discontinuing the First Prescribed HAART Regimen *

	Univariate HR (95% CI) ¹	Multivariate AHR 95% CI ²
Age (years)		
18–24	1.0 (Ref)	1.0 (Ref)
25–29	1.03(0.80–1.32)	0.94 (0.72–1.21)
30–49	1.10(0.89–1.36)	0.95 (0.77–1.18)
≥50	1.02 (0.80–1.30)	0.90 (0.70–1.15)
Sex		
Female	0.94 (0.83–1.05)	0.97 (0.86–1.10)
Race		
Black	0.97 (0.86–1.08)	0.88 (0.77–1.00)
Hispanic	0.86 (0.75–0.99)	0.82 (0.70–0.95)
White	1.0 (Ref)	1.0 (Ref)
HIV acquisition risk		
IDU	1.15 (0.99–1.33)	1.05 (0.91–1.22)
Non-IDU	1.0 (Ref)	1.0 (Ref)
CD4+ T cells when first meet criteria (cells/mm³)		
<200	1.0 (Ref)	1.0 (Ref)
200–350	0.82 (0.74–0.91)	0.86 (0.73–0.94)
Outpatient HIV visits in the year after meeting treatment criteria		
≥ 4 visits	0.90 (0.79–1.02)	0.83 (0.73–0.94)
< 4 visits	1.0 (Ref)	1.0 (Ref)
Insurance[⊥]		
Uninsured/RW/Other	1.0 (Ref)	1.0 (Ref)
Private	0.78 (0.65–0.95)	0.86 (0.71–1.05)
Public	1.13 (1.00–1.27)	1.20 (1.06–1.37)

* Cox proportional hazards regression model; adjusted for site and year meeting treatment criteria to account for difference across treatment sites and practice patterns over time.

¹ Hazard Ratio.

² Adjusted hazard ratio. Significant findings in bold font.

[⊥] Insurance coverage included private insurance, public (Medicaid, Medicare, Dual insurance with Medicaid/Medicare), and Other/Unknown insurance (e.g., Veteran's administration, county health program). RW=Ryan White Care Act insurance.

Duration of first HAART regimen overall was a median of 314 days (IQR 112–876); with 367 days (IQR 123–1070), 347 (IQR: 133–868), 302 (IQR 111–845), and 328 (102–947) for youth, 25–29, 30–49, and ≥50 year olds, respectively.