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Correlates of Antiretroviral Therapy Adherence among HIV-Infected Older Adults

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Abstract

Background—Despite the success of antiretroviral therapy (ART), HIV-infected older African Americans experience higher mortality rates compared to their white counterparts. This disparity may be partly attributable to the differences in ART adherence by different racial and gender groups. The purpose of this study was to describe demographic, psychosocial, and HIV disease-related factors that influence ART adherence and to determine whether race and gender impact ART adherence among HIV-infected adults aged 50 years and older.

Methods—This descriptive study involved a secondary analysis of baseline data from 426 participants in “PRIME,” a telephone-based ART adherence and quality-of-life intervention trial. Logistic regression was used to examine the association between independent variables and ART adherence.

Results—Higher annual income and increased self-efficacy were associated with being 95% ART adherent. Race and gender were not associated with ART adherence.

Conclusion—These findings indicated that improvements in self-efficacy for taking ART may be an effective strategy to improve adherence regardless of race or gender.

Keywords

adherence; African Americans; antiretroviral therapy; HIV; older adults

Introduction

Over the course of the last 30 years, the face of HIV has changed.^{1,2} In the early years of the epidemic, HIV was considered to be a disease that primarily affected young, homosexual

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Declaration of Conflicting Interests

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males.³ However, with each passing decade, the prevalence of HIV infection among adults aged 50 and older (from here on referred to as “older adults”) has continually increased to the extent that by 2004, the prevalence of HIV infection in older adults had exceeded the rates previously found in those younger than age 50.^{1,4} In fact, between 2007 and 2009, the highest increase in HIV prevalence occurred among 80- to 84-year-old individuals.⁵ In 2011, older adults accounted for approximately 17% of the individuals newly diagnosed with HIV, 19% of the people living with HIV (PLWH),⁶ 24% of the AIDS diagnoses, and over 50% of the deaths among PLWH.^{5,6} By the year 2020, approximately 70% of the PLWH in the United States will be older than the age of 50.⁷

In the United States, African Americans have been disproportionately affected by the HIV pandemic.⁸ African Americans represented 46% of the new HIV diagnoses in 2010, despite the fact that they comprised only 12% of the US population.⁸ Moreover, in 2013, it was reported that HIV-infected older African Americans were 11 times more likely to be diagnosed with HIV, and they were 7 times more likely than their white counterparts to die from the disease.⁵ The disparity in the HIV prevalence rates may be related to the high proportion of African Americans living in environments where stigma, discrimination, and poverty contribute to the conditions conducive to the spread of HIV.^{9,10}

Antiretroviral therapy (ART) has been shown to be vital to increase the life expectancy and decrease mortality among PLWH.¹¹ When ART adherence is maintained at or above 90% to 95% of the prescribed regimen, it has been shown to be effective in preventing virologic failure and virologic resistance.^{11,12} Despite these benefits and the ready availability of ART in the United States,¹³ some groups continue to experience adverse outcomes. Older Americans have higher HIV/AIDS-related morbidity and mortality compared to their HIV-infected younger American counterparts,¹² and women have been shown, albeit inconsistently, to have suboptimal ART adherence.^{14,15} It has also been reported that being of African-American race predicted suboptimal levels of ART adherence among HIV-infected older adults, although some studies do not support this finding.¹⁶⁻¹⁹ Thus, it is not certain whether particular populations are at greater risk of poor adherence.

In addition to demographic characteristics, the virus and its symptoms may also influence ART adherence. HIV-related symptoms commonly occur among adults aging with HIV.²⁰ The symptoms reported most often include pain, fatigue, depression, difficulty sleeping, and memory impairments.^{20,21} Studies examining the symptom experiences of HIV-infected individuals have shown that HIV symptomatology increases with age,²² women often experience more HIV-related symptoms than men,²⁰ and the number of symptoms reported ranged between 9 and 21 symptoms.^{20,21} Therefore, as people are living longer with HIV, they will likely experience an increase in the number of HIV symptoms and increased symptom severity.²² Subsequently, these symptoms have the potential to negatively impact overall ART adherence among individuals aging with HIV.^{23,24}

Depression is one of the most commonly occurring psychological symptoms reported by HIV-infected older adults²⁵ and is 3 times more likely to occur in HIV-infected individuals compared to the general population.²⁵ Moreover, HIV-infected older women have reported twice the rate of major depression compared to HIV-infected older men.²⁵ It has also been

shown that approximately 20% to 50% of HIV-infected older participants have depression symptoms.^{26,27} High levels of depression negatively impact ART adherence, engagement in care, symptom management, and quality of life.²⁸ However, whether depression's effect on ART adherence differs by race/gender groups remains inconclusive.²⁹

Medication adherence self-efficacy (the confidence in one's ability to take one's ART as prescribed, even under difficult circumstances) is an important psychosocial factor that has been shown to improve ART adherence among HIV-infected individuals and that treatment adherence self-efficacy has a direct influence on ART adherence, clinical outcomes, and health-care costs.^{30–32} Few studies have evaluated the role of ART adherence self-efficacy among older adults, although it has been shown to be an important indicator of adherence behaviors among younger persons living with HIV/AIDS.³³ Similar to depression, self-efficacy may have a direct impact on medication adherence behaviors³⁴; as more persons living with HIV/AIDS move into older age, its effect on adherence among older adults warrants greater study.

Given that HIV is now considered to be a chronic health condition, it is important to understand the factors that pose a risk for poor ART adherence among older persons living with HIV. The purpose of this study was to examine, among older persons living with HIV/AIDS, the common challenges of ART adherence and to test whether race and gender contribute to lower medication adherence rates when other challenges were also considered.

Methods

Participants

Participants were recruited as part of PRIME, a study to test a telephone-delivered ART adherence and quality-of-life intervention for HIV-infected persons aged 50 and older.²⁴

Recruitment for PRIME occurred from 2007 to 2012 in 10 different community-based AIDS Service Organizations from 9 states across the United States (Arizona, California, Illinois, Massachusetts, Michigan, Pennsylvania, Texas, Washington, and Wisconsin) through posters, flyers, and direct mailings. PRIME study participants were eligible if they met the following inclusion criteria: (1) aged 50 years or older, (2) HIV-positive serostatus, (3) currently prescribed ART, (4) non-adherent to ART in the past 30 days, (5) <95% adherence in the past 30 days. Exclusion criteria for PRIME were (1) hearing problems, (2) suspected dementia (3 errors on a brief cognitive assessment,³⁵ and (3) acute psychosis. The institutional review board of Group Health Research Institute approved this study, and each study participant provided written informed consent prior to participating in the research activities.

Measures

Demographic information—Participants' age, ethnicity, gender, sexual identity, relationship status, educational level, employment status, disability status, and annual income were assessed through self-report.

Substance use history—The 3-item Alcohol Use Disorders Identification Test³⁶ was used to evaluate the recent history of alcohol use. Scores ranged from 0 to 12, with higher scores indicating more alcohol use. In addition, history of intravenous drug use (IVDU) was assessed by asking participants two questions: “Have you ever injected any drug on your own, without medical supervision?” and “Have you injected any drug in the past 3 months?” These questions were answered as either yes or no.

Depression—Depression was measured using the Patient Health Questionnaire (PHQ-8), an 8-item modified version of the PHQ-9 depression scale³⁷ that omits 1 suicidal ideation item. The 8-item PHQ measures the frequency with which major depression symptoms were experienced over a 2-week period.³⁸ The scale ranged from 0 to 24, and clinical depression was defined as a score of 10 or more on the PHQ-8.³⁸

Treatment adherence self-efficacy—Participants were asked to indicate their level of confidence to take their HIV medications under various circumstances on a scale from 0 (you think you cannot do it at all) to 10 (you are certain you can do it).³⁰ Example questions include sticking to their treatment when daily routines changed, when they were busy, or when they were experiencing side effects.³⁰ This variable was analyzed as a continuous variable representing the sum of the 13 items on the treatment adherence self-efficacy scale. The scores ranged from 0 to 130.

HIV-related medical information—Relevant HIV disease-related medical information included duration of HIV disease, perceived HIV symptom severity, if they had ever had a diagnosis of AIDS, and length of time on antiretroviral treatment. Perceived HIV symptom severity was evaluated using a 23-item checklist of current HIV symptoms.³⁹ Participants rated each symptom on a 5-point scale from 1 (*not present*) to 5 (*very severe*), which produced a symptom severity score (range 23–115). Higher scores indicated higher perceived HIV symptom severity.

Antiretroviral therapy adherence—Adherence to ART was assessed using Golin Self-Report of Medication Non-Adherence questionnaire.⁴⁰ Participants were asked to estimate the amount of HIV medications that they had missed in the 30 days prior to the baseline interview by answering the following questions: “What is your best guess about how much of your prescribed HIV medication you have taken in the last month? We would be surprised if this were 100% for most people. For example, 0% means you have taken no medication; 50% means you have taken half your medication; 100% means you have taken every single dose of your medication (percentage of medication taken).” This adherence estimate was then dichotomized at >95% for analysis.

Statistical Analysis

Descriptive statistics were used to determine the distributions of each of the study variables. Due to low responses in some categories, during the analyses, several independent variables (sexual orientation [lesbian, gay, bisexual, and transgender or heterosexual], relationship status [married/partnered or single], educational level [less than high school or equal or greater than high school education], and employment status [unemployed/disabled or

working]) were dichotomized in order to have adequate cell sizes. Spearman correlation analysis was used to test the relationship of the dichotomously measured 95% adherence and the independent variables. Only those independent variables significantly associated with ART adherence at a $P < .10$ were entered into the logistic regression model. Race and gender, as well as their interaction, were also included as independent variables. All analyses were conducted using the SPSS for Windows version 21.

Results

Sociodemographic Characteristics of the Study Population

A total of 426 participants completed the PRIME baseline study procedures and were included in the present study. Approximately 60% were African American, 27% were female, and 55% self-identified as being heterosexual. Participant racial and gender groups included African-American women ($n = 87$), white women ($n = 30$), white men ($n = 141$) and African-American men ($n = 168$). Participants ranged in age from 50 to 75, and the mean age was 54 years. The majority of participants graduated from high school, 88% considered themselves disabled, and 83% earned less than US\$20,000 per year. On average, the overall scores on the psychosocial measures indicated low depression (PHQ-9; mean = 7) and relatively high treatment adherence self-efficacy (mean = 108). The mean time since HIV diagnosis was 15 years, and participants had been taking ART for an average of 12 years. The overall mean level of ART adherence was 88%.

There were no significant differences in their age ($P = .21$), employment status ($P = .90$), or past history of IVDU ($P = .10$) between the 4 racial/gender groups. Nor were there any statistically significant group differences in reported levels of depression ($P = .17$), HIV symptom severity ($P = .39$), or 95% ART adherence ($P = .27$). The characteristics of the study participants are presented in Table 1.

Correlations of Study Variables With 95% ART Adherence

Significant Spearman correlations ($P < .10$) were noted between several of the independent variables and 95% ART adherence for the past 30 days. Race ($r = -.088$, $p = .07$), education level ($r = .089$, $p < .06$), employment status ($r = .084$, $p = .08$), annual income ($r = .165$, $p < .001$), depression ($r = -.297$, $p < .0001$), treatment adherence self-efficacy ($r = .450$, $p < .0001$), the age diagnosed with HIV ($r = .110$, $p = .02$), HIV symptom severity ($r = -.272$, $p < .0001$), and the duration of ART ($r = -.084$, $p = .08$) were each significantly correlated with 95% ART adherence. Table 2 details the correlations of independent variables with ART adherence.

Logistic Regression Analysis of Factors Associated With ART Adherence

Logistic regression was utilized to determine whether the statistically significant variables identified in correlational analyses were associated with >95% ART adherence. Regression results indicated that the overall model was statistically reliable in predicting >95% ART adherence, $\chi^2(11, N = 408) = 108.766$, $P < .0001$ (Table 3).

Demographic factors—Annual income ($P = .019$) was the only demographic factor that was significantly associated with >95% ART adherence. No statistically significant associations were noted between race ($P = .61$), gender ($P = .74$), or education ($P = .07$) and 95% ART adherence.

Psychosocial factors—Higher treatment adherence self-efficacy was positively and significantly associated with >95% adherence ($P < .0001$). For every unit increase in self-efficacy, there was about a 4% increase in the odds of being >95% ART adherent. Depression ($P = .14$) was not significantly associated with >95% ART adherence.

HIV disease-related factors—A potential trend was found for higher HIV symptom severity to be associated with lower ART adherence; however, the effect did not meet our statistically significant cutoff ($P = .08$). Neither the age at diagnosis ($P = .51$) nor the duration of ART ($P = .14$) were associated with >95% adherence.

Discussion

The current study examined the association of demographic, psychosocial, and HIV disease-related factors with ART adherence and whether race or gender influenced ART adherence in a regionally diverse sample of HIV-infected older adults. The study participants were mainly African American, heterosexual, single, and in their mid-50s. The mean ART adherence levels reported across each racial/gender group were between 84% and 92% at baseline, and these levels of ART adherence were higher than the levels reported in other studies that included HIV-infected older African Americans.⁴¹ Some previous reports have indicated that within the subpopulation of HIV-infected older adults, African Americans and older women were less adherent to ART than their HIV-infected white male counterparts.¹³

However, among the participants in this study (more than a quarter of whom were women), we did not find any statistically significant differences in the mean level of ART adherence across the racial/gender groups within this study, nor did we find that race or gender was associated with ART adherence.

Annual income was associated with ART adherence. Similar trends between income and ART adherence have been found by others, but their results were not statistically significant.⁴² This is an important factor for HIV-infected older adults with limited incomes.

Depressive symptoms can negatively impact ART adherence among HIV-infected older adults.²⁸ Given that depression was initially associated with ART adherence in our bivariate analysis, it might be possible that other constructs, such as HIV symptom severity, impart similar weight on actual adherence behaviors and thus minimize the effects of each within multivariate regression models. Moreover, unlike other studies that attributed the suboptimal levels of ART adherence demonstrated by racial minorities^{41,43} and women⁴³ to differences in rates of depressive symptoms, the present study did not find that depressive symptoms differed by race or gender. However, the nature in which the participants were enrolled in the current study may have attracted persons who were “higher functioning” overall (ie, they

had the energy, motivation, and interest to engage in study activities), enabling the detection of subgroups who may be at greater risk for depression difficult.

Treatment adherence self-efficacy was the only psychosocial variable that emerged as being significantly associated with ART adherence in the regression model. This finding is consistent with other reports of a positive association between higher self-efficacy and higher ART adherence among HIV-infected older adults.³² Across each racial/gender group in the current study, the mean levels of self-efficacy for taking ART were relatively high with scores ranging from 105 to 111. Interestingly, African-American women and white American men reported the same mean treatment adherence self-efficacy levels (mean = 111). However, their self-reported levels of adherence were not significantly different from those of the other racial/gender groups. As greater numbers of these individuals age into their 70s and 80s, it will be important to monitor the nature of any self-efficacy changes.

As HIV-infected older adults are living longer, they will likely experience an increasing number of HIV-related symptoms and symptoms related to other comorbid conditions, which may impact their adherence to ART. While our unadjusted analysis showed that greater symptom severity was associated with lower ART adherence, its effect was no longer evident in the multivariate model. These results are inconsistent with other studies and may be due to a relatively low symptom burden reported by participants in this study.

Study Limitations

The study findings should be interpreted in light of its limitations. Participants were recruited as a convenience sample and thus were limited to individuals who were willing to volunteer for an intervention study focused on “living well with HIV as you age.” The majority of HIV-infected adults who participated in this study lived in the Northeastern, Southwestern, Midwestern, or Western United States. Therefore, these results may not be generalizable to older HIV-infected adults living in the Southeastern United States, the area with the highest prevalence of HIV-infected older adults. Another limitation of the study is that all of the data were collected as self-reported data. Although previous studies have shown high correlations between self-reported ART adherence and actual measured viral loads, self-reports are known to overestimate medication adherence.⁴⁴ In addition, self-reported adherence may be influenced by social desirability bias or recall bias.⁴⁵

Despite these limitations, the present study furthers our understanding about the influence of race and gender on ART adherence. The finding that there were no statistically significant differences in the demographic characteristics between the racial/gender groups, related to ART adherence, may suggest that older adults may be more homogenous in their ART adherence practices than first thought and that a different mechanism may be driving the higher mortality rates in older HIV-infected African Americans and older women.

Implications for Future Research

Over the next few years, the number of older adults who are either aging with previously diagnosed HIV or newly infected will continue to increase.⁶ It has been estimated that by the year 2020, approximately 70% of the people infected with HIV will be older than 50.⁶ Therefore, it is of vital importance that further research is conducted to identify and address

factors influencing mortality in HIV-infected older adults from various racial backgrounds and gender groups. These investigations should also consider the complexity surrounding the synergistic effects of multimorbid conditions, the longevity of ART use, and the normal aging process on mortality rates in older adults living longer with HIV. Moreover, findings from this study specifically suggest that future research should be focused on developing effective ways to improve treatment adherence self-efficacy among older adults living with HIV.

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Table 1
Descriptive Characteristics of the Sample Population by Race/Gender Group at Baseline.^a

Variables	African American Women, n = 87 (20%)	White Women, n = 30 (7%)	White Men, n = 141 (33%)	African American Men, n = 168 (39%)
<i>Age, years</i>				
50–54	53 (60.9)	20 (66.7)	72 (51.1)	103 (61.3)
55–59	26 (29.9)	6 (20.0)	42 (29.8)	47 (28.0)
60	8 (9.2)	4 (13.3)	27 (19.1)	18 (10.7)
<i>Sexual identity</i>				
Heterosexual	81 (93.1)	26 (86.7)	34 (24.1)	94 (56.0)
Homosexual	2 (2.3)	0	92 (65.2)	53 (31.5)
Bisexual	2 (2.3)	2 (6.7)	14 (9.9)	18 (10.7)
Transgendered	1 (1.1)	2 (6.7)	0	1 (0.6)
<i>Relationship status</i>				
Married/partnered	18 (20.7)	7 (23.3)	35 (24.8)	36 (21.4)
Separated/divorced	19 (21.8)	12 (40.0)	25 (17.7)	34 (20.2)
Single	35 (40.2)	10 (33.3)	74 (52.5)	86 (51.2)
Widowed	15 (17.2)	1 (3.3)	7 (5.0)	12 (7.1)
<i>Education level</i>				
<High school graduate	29 (33.3)	4 (13.3)	8 (5.7)	36 (21.4)
High school graduate	29 (33.3)	11 (36.7)	29 (20.6)	64 (38.1)
Some college	24 (27.6)	8 (26.7)	48 (34.0)	42 (25.0)
College graduate or higher	5 (5.7)	7 (23.3)	56 (39.7)	26 (15.5)
<i>Employment status</i>				
Employed	10 (11.5)	1 (3.8)	18 (13.3)	19 (11.6)
Unemployed	6 (6.9)	2 (7.7)	7 (5.2)	10 (6.1)
Disabled	71 (81.6)	23 (88.5)	110 (81.5)	135 (82.3)
<i>Annual income</i>				
\$0–\$10 000	50 (58.8)	18 (62.1)	44 (31.7)	106 (64.2)
\$10 001–\$20 000	20 (23.5)	11 (37.9)	59 (42.4)	39 (23.6)
>\$20 000	15 (17.6)	0	36 (25.9)	20 (12.1)
<i>History of IVDU</i>				

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Variables	African American Women, n = 87 (20%)	White Women, n = 30 (7%)	White Men, n = 141 (33%)	African American Men, n = 168 (39%)
Yes	31 (35.6)	17 (56.7)	46 (32.6)	59 (35.1)
No	56 (64.4)	13 (43.3)	95 (67.4)	109 (64.9)
History of AIDS				
Yes	40 (47.1)	21 (70.0)	84 (59.6)	80 (47.6)
No	45 (52.9)	9 (30.0)	57 (40.4)	88 (52.4)
Age, years	M (SD)	M (SD)	M (SD)	M (SD)
	54 (3.7)	55 (5.1)	56 (4.9)	54 (3.9)
	Range	Range	Range	Range
	49–66	50–70	50–75	50–69
Alcohol use	1 (2.2)	1 (2.1)	2 (2.3)	2 (2.8)
Depression severity	6 (5.0)	9 (4.9)	8 (6.0)	7 (5.9)
Self-efficacy	111 (19.9)	110 (17.3)	111 (18.3)	105 (21.8)
Years since HIV diagnosis	13 (5.3)	13 (6.3)	17 (6.5)	14 (6.2)
Duration of ART, years	11 (4.7)	11 (5.4)	13 (5.6)	11 (5.7)
HIV symptom severity	7 (8.1)	10 (9.6)	7 (8.1)	7 (9.4)
ART adherence (> 95%)	88.52 (17.24)	88.93 (15.18)	91.81 (14.79)	84.97 (19.11)
	20–100	50–100	0–100	0–100
				84.97 (19.11)
				10–100

Abbreviations: IVDU, intravenous drug use; ART, antiretroviral therapy.

^aN = 426.

Table 2

Spearman Correlations Between Independent Variables and ART Adherence.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. ART adherence	—															
2. Age	.054	—														
3. Race	-.088 ^a	-.098 ^b	—													
4. Gender	-.004	-.065	.182 ^c	—												
5. Sexual orientation	-.019	-.027	.337 ^c	.453 ^c	—											
6. Relationship status	.047	.007	.040	.017	-.104 ^b	—										
7. Educational level	.089 ^a	.127 ^c	-.350 ^c	-.205 ^c	-.351 ^c	-.021	—									
8. Employment	.084 ^a	.045	-.071	-.029	-.043	-.017	.233 ^c	—								
9. Annual income	.165 ^c	.147 ^c	-.225 ^c	-.087 ^a	-.203 ^c	-.059	.331 ^c	.355 ^c	—							
10. Alcohol use	-.056	-.079	-.014	-.180 ^c	-.109 ^b	-.069	.012	-.047	-.070	—						
11. Depression	-.297 ^c	-.139 ^c	-.095 ^a	-.002	.016	-.095 ^a	-.100 ^b	-.199 ^c	-.159 ^c	.049	—					
12. Self-efficacy	.450 ^c	.128 ^c	-.092 ^a	.067	-.018	-.002	.083 ^a	.059	.103 ^b	-.016	-.428 ^c	—				
13. Age diagnosed	.110 ^b	.461 ^c	.078	.083 ^a	.151 ^c	.002	-.049	-.046	-.035	-.020	-.099 ^b	.167 ^c	—			
14. Duration of HIV	-.062	.070	-.188 ^c	-.158 ^c	-.242 ^c	.021	.153 ^c	.065	.158 ^c	-.031	.028	-.091 ^a	-.804 ^c	—		
15. Symptom severity	-.272 ^c	-.129 ^c	-.048	.028	.081 ^a	-.031	-.044	-.170 ^c	-.150 ^c	.100 ^b	.538 ^c	-.378 ^c	-.021	-.020	—	
16. History of AIDS	.010	.167 ^c	.137 ^c	.000	.122 ^b	-.022	-.067	.003	-.020	.046	-.122 ^b	.077	.223 ^c	-.159 ^c	-.195 ^c	—
17. Duration of ART	-.084 ^a	.114 ^b	-.179 ^c	-.103 ^b	-.134 ^c	.004	.044	.028	.144 ^c	-.033	-.001	-.096 ^a	-.537 ^c	.687 ^c	-.023	-.088 ^a

Abbreviation: ART, antiretroviral therapy.

^a *P* .10.

^b *P* .05.

^c *P* .01.

Table 3

Logistic Regression Analysis Predicting ART Adherence.^a

	β	SE	P	OR	95% CI
Race	.247	0.489	.613	1.281	0.492 3.337
Gender	.103	0.313	.742	1.109	0.600 2.049
Education	-.578	0.318	.069	0.561	0.301 1.047
Employment status	.125	0.307	.684	1.133	0.621 2.070
Annual income	.237	0.101	.019	1.267	1.039 1.545
Depression	-.037	0.025	.141	0.963	0.917 1.012
Treatment self-efficacy	.042	0.007	.000	1.042	1.028 1.058
Age diagnosed	.013	0.020	.512	1.013	0.975 1.053
HIV symptom severity	-.028	0.016	.082	0.972	0.941 1.004
Duration of ART	-.037	0.025	.148	0.964	0.917 1.013
Race \times gender	.072	0.565	.899	1.074	0.355 3.250
Constant	-4.350	1.303	.001	0.013	

Abbreviation: ART, antiretroviral therapy.

^a $\chi^2(11, N = 408) = 108.766, P < .0001$.