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## HIV+ Caregivers and HIV+Non-Caregivers: Differences in Sociodemographics, Immune Functioning and Quality-of-Life

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### Introduction

In the United States, estimates suggest that 52 million informal and family caregivers provide care to someone who is incapacitated and/or needs assistance related to their health (1, 2). Traditionally in Africa, Asia and Latin America women are the principal informal caregivers to ailing family members with AIDS (3–8). However, statistics on the population of informal HIV+ caregivers is not readily available, and research examining the impact of caregiving burden on persons living with HIV/AIDS has mostly compared the health status of seropositive to seronegative caregivers (9–15).

Recent estimates suggest there are currently 33.2 million persons living with HIV/AIDS (PLWHA) throughout the world, with the greatest number living in sub-Saharan Africa (16). Since 1996 the benefit of HAART to the survival of PLWHA has been quite remarkable, transforming HIV into a “manageable chronic disease”(17). The “AIDS cocktail” has essentially improved the average life expectancy for someone diagnosed with HIV at 20 years of age, from 16 years to 29 years (18). Thus, today PLWHA are as likely to engage in an ongoing manner with family, professional and social activities as their seronegative counterparts. In fact, some PLWHA are also healthy enough to initiate and maintain significant responsibilities towards family and loved ones, including taking on a caregiving role.

Since the introduction of HAART has presumably expanded the global population of HIV+ informal caregivers (19), caregiver studies should now preferably compare seropositive cohorts, including caregivers and non-caregivers, arising from the same source population. Results from these investigations may help to determine whether significant differences in health outcomes exist between these groups, which may help to justify the design of interventions targeting the “care of caregivers” for the growing population of PLWHA worldwide. Thus far, empirical evidence from caregiver studies predominantly shows the impact of caregiving burden comparing seropositive to seronegative informal caregivers.

## Literature Review on Caregiving Burden in PLWHA

Folkman and colleagues (10) examined *caregiver burden* in a longitudinal study including 82 HIV seropositive and 162 seronegative partners of men with AIDS. Burden was conceptualized as care-related disruptions to family life, finances, and relationships, along subjective dimensions of embarrassment, overload and resentment. Results showed that HIV + caregivers did report more burden, compared to HIV- caregivers, however most differences were related to HIV serostatus rather than factors associated with caregiving (10).

In contrast, LeBlanc and colleagues (20) examined the impact of caregiving burden on the *physical health* of informal caregivers providing support to persons living with HIV/AIDS, in a cross-sectional study that isolated the kinds of stressors that most strongly influenced the physical health of caregivers (n=642). Findings revealed that the physical health status of seropositive caregivers appeared to be largely independent of the actual demands and stressors associated with caregiving. In addition, for both seropositive and seronegative caregivers, the proximal and stronger correlates of health status included depression and prior physical health.

A study conducted by Irving and colleagues (11) focused more on *psychological distress* experienced by the caregiver when providing care and support to a lover/partner with AIDS. Study findings suggested that providing care may have adverse effects on the caregiver's psychological health; however, study authors did not organize results to allow comparison differences by HIV serostatus and sample size was small (n=38), limiting generalizability.

Wight (15) examined *depression* amongst AIDS caregivers in a longitudinal study including 376 HIV seronegative and seropositive (HIV asymptomatic and symptomatic) dyads. Results showed that seropositive caregivers reported depression associated with their persistently poor or deteriorating health, with increased feelings of AIDS-related alienation/stigma, increased social constriction, and AIDS-related bereavements. In contrast, seronegative caregivers reported depression associated with their unemployment and perceptions of constricting social activity. Additional analyses on the subset of seropositive HIV symptomatic caregivers showed they had significantly lower CD4 cells than their asymptomatic counterparts, and had lost almost twice as many close friends than their seronegative counterparts.

Similarly, Land and colleagues (12) reported on the difference in *depressive symptomatology* by serostatus, using cross-sectional data from a sample of gay (n=388) and bisexual (n=28) men. Results showed that seropositive caregivers (n=164), compared to their seronegative counterparts (n=252), had statistically higher mean levels of depressive symptomatology, lower self-esteem, and higher levels of secondary stress due to financial concerns.

Finally, Pirraglia and colleagues (14) investigated the relationship between *depression* and *caregiver burden* among informal caregivers of seropositive individuals. The data were from a cross-sectional study design, using baseline information from 176 dyads of HIV+ patients and their caregivers, enrolled in an ongoing randomized trial of a supportive telephone intervention. Major study findings showed that high caregiver burden was strongly associated with depression amongst informal caregivers, which suggested a need of both mental health services and assistance in caregiving.

Hence, findings from the literature support the notion that caregiver burden is associated (directly and indirectly) with poorer psychological health for all caregivers; and most differences observed between seropositive and seronegative caregivers is related to the HIV

serostatus and prior physical health of the caregiver, rather than the actual demands (and tasks) associated with caregiving (21). However, no previous studies have examined the health status of HIV+ caregivers compared to HIV+ non-caregivers arising from the same source population. This study examines whether differences exist across caregiver status in terms of three categories of indicators: (a) sociodemographics; (b) biological determinants of immune functioning (i.e., HIV log<sub>10</sub> RNA, CD4 cells/μl, age, baseline exposure to ART, duration of exposure to ART, AIDS-defining event and number of HIV illness years prior to study enrollment); and (c) HIV-related quality-of-life (i.e., symptom distress, mental and physical quality-of-life).

## Methods

### Data Source

This is a secondary data analysis of a cross-sectional subset of the Collaborations HIV Outcomes Research US Cohort (CHORUS), which is a population-based observational study designed to follow the clinical and epidemiological outcomes of adults with HIV infection in the United States (22). Through the use of an electronic medical record (EMR), the project received real time data collected during routine medical visits. Beginning in August 1997 through 2005, participating physicians offered the opportunity to participate in the project to all of their HIV positive patients who were 18 years of age and older. Patients enrolled in the study at seven clinic sites: Pacific Oaks Medical Group, Los Angeles, CA; Pacific Horizon Medical Group, San Francisco, CA; Comprehensive Care Center, Nashville, TN; Liberty Medical Group, New York, NY; Orlando Immunology Center, Orlando, FL; Treasure Coast Infectious Disease, Vero Beach, FL and ID Consultants, Charlotte, NC.

### Data Collection

Captured through the EMR at every clinic visit was medical history, physical assessment and plan, medications, laboratory results, procedures, and demographics, which has been described in detail elsewhere (22). Patients were characterized at consent through a questionnaire that includes demographic information (e.g., age, educational attainment, gender, income, occupation, race/ethnicity), family history of chronic illness and HIV risk factors. In addition, information regarding chronic illnesses that were diagnosed prior to consent and HIV-related information from the beginning of HIV care (e.g., AIDS diagnoses at, or prior to, baseline) were collected. Exposure to alcohol, recreational drug and tobacco use, occurrence of pregnancy, and birth control practices were captured annually. Quality-of-life (Short-Form 12 and Short-Form 36 (23, 24)), and the AIDS Clinical Trial Group (ACTG) HIV Symptoms Distress Module (25), were captured through patient-completed questionnaires every six months. Caregiver status was captured as a dichotomous variable [yes/no].

### Study Inclusion Criteria

As of September 2005, a total of 9,197 patients had consented to participate in CHORUS. Amongst this population, a total of 5,521 participants met the criteria for inclusion into this study. Inclusion criteria required that subjects have measures of quality of life. This included: (a) study participants with a valid baseline ACTG HIV Symptom Distress Module completed, with (b) an SF-12 or SF-36 completed on the same day as the SDM. A valid ACTG HIV Symptom Distress Module was defined as one with all the items endorsed, or an instrument with only positive answers (response = 1 to 4) indicated. For those with only positive answers, all unendorsed items were set to 0="I do not have this symptom". A valid SF-12 was defined as one with at least half of the questions answered to be scored. For patients with an SF-36 only the subset of SF-12 questions were used for the analysis, and were scored according to the algorithm for SF-12 (23, 24).

## Study Population

The median age of respondents (N=5,521) was 43 years (SD  $\pm$  8.7), and median values for baseline immune parameters are 429 CD4 cells/ $\mu$ l and 2.6 for HIV log<sub>10</sub> RNA copies/ml. The population is predominantly male (88.6%), with primary route of HIV acquisition reported as homosexual/bisexual exposure (75.5%). Participants are ethnically diverse with representation among non-Hispanic White (70.7%), African American (17.6%) and Hispanic (7.8%) populations. There is also variation reported across educational attainment: less than high school (N=303; 5.8%); high school (N=1055; 20.2%); some college (N=1521; 29.2%); college (N=1561; 29.9%); post-college (N=776; 14.9%).

## Ethics

The CHORUS Project received Independent Review Board approval at Vanderbilt University (Nashville, TN), the Mount Sinai School of Medicine (New York, NY), and Copernicus Group IRB (Cary, NC). Interested patients during primary data collection were provided an IRB approved informed consent document that described the project's purpose, procedures, potential risks and benefits, confidentiality, and the project's voluntary nature. Patients received no incentive for participation beyond their contribution to medical research. This secondary analysis was approved by the Institutional Review Board of the Weill Medical College of Cornell University.

## Measures

**Biological Measures and Determinants of Immune Functioning—CHORUS** contains biological measures for HIV-1 viral load and CD4 lymphocyte counts, as well as information on antiretroviral therapy (ART) and history of an AIDS-defining event at time of study entry. *Baseline exposure to ART* for study participants was defined as a nominal categorical variable including three response choices: naïve to ART, ART-experienced and currently on therapy, or ART-experienced but not currently on therapy. *Duration of exposure to ART* prior to study enrollment is defined as exposure prior to baseline enrollment into CHORUS, which is calculated in months (naïve patients have zero months) and is continuous type data. *HIV-1 RNA viral load* was collected from study participants closest to baseline enrollment into CHORUS, and is defined as 0–90 days prior to baseline log transformed, and is continuous type data. *CD4 lymphocyte counts* were ascertained closest to baseline enrollment defined as 0–90 days prior to baseline (cells/ $\mu$ l), and is continuous type data. Finally, there is a variable for *AIDS-defining event* (clinical diagnosis) that was captured at baseline, coded as a dichotomous variable (0 = no, 1 = yes).

Several adjusted analyses have included the first year of HIV or AIDS diagnosis prior to baseline assessment [*HIV diagnosis year* or *AIDS diagnosis year*], to control for the number of illness years related to HIV/AIDS disease prior to being enrolled into the CHORUS project. This was a computed variable, and referred to as *number of illness years prior to baseline enrollment*. If there was missing data for either *HIV diagnosis year* or *AIDS diagnosis year*, or if the *AIDS diagnosis year* was more recent than the *HIV diagnosis year*, a computerized replacement routine generated a 'diagnosis year' that more accurately estimates the number of illness years related to HIV/AIDS disease prior to baseline assessment. The algorithm for the replacement is as follows: (1) if the AIDS diagnosis year was more recent than the HIV diagnosis year, then the AIDS diagnosis year have been used; (2) if the HIV diagnosis year was missing data then the AIDS diagnosis year will be used; (3) if both the HIV and AIDS diagnosis year were missing then the year at time of baseline assessment will be used; (4) if the AIDS diagnosis year was more recent than the year of baseline assessment, then the year of baseline assessment will be used. This is based on the assumption that HIV was detected at, or prior to enrollment, and the development of an AIDS-defining event.

**HIV Symptom Distress Scale**—The HIV Symptom Distress Scale is a summative rating scale for the 20-Item ACTG HIV Symptom Distress Module (25, 26), the latter of which was originally designed and validated to identify *individual* HIV-related symptoms that reflect underlying HIV clinical phenomenon. Now that the 20-Item ACTG Module has been widely incorporated as part of the battery of tools used to identify *individual* HIV bothersome symptoms in clinical studies (25), the instrument has been transformed into a 100-point summative rating scale allowing for greater interpretation and use in statistical models, with a higher score indicating greater HIV symptom distress. Information on the psychometric properties of the HIV Symptom Distress Scale has been previously reported on showing a reliability of  $\alpha=0.92$  (26).

**SF-12**—The SF-12 is considered one of the leading health status instruments in human immunodeficiency virus (HIV) research, which has been administered to over 20,000 persons in descriptive studies and clinical trials. Its construction was based on a pool of items developed as part of the Medical Outcomes Study (MOS) (27), and there is substantial evidence from nine countries for its reliability, validity and responsiveness (24). The scale is scored on a 0-100 scale (a higher score indicates better health), with physical and mental health subscale scores available within the CHORUS dataset. The physical subscale consists of six items – *general health perception, moderate activity, stair climbing, physical health (accomplishing less), physical health limiting kind of work and pain*. The mental subscale consists of six items – *emotional problems (accomplished less), emotional problems (not careful), feeling calm and peaceful, feeling a lot of energy, feeling downhearted and blue, and health interfered with social activities*.

**Sociodemographic Variables**—Educational level was categorized as a six-level ordinal variable: unknown (value=0); less than high school (1); high school (2); some college (3), college graduate (4), post-graduate (5) or missing (6). Race/ethnicity was categorized as a four-level nominal categorical variable: White (1), Black (2), Hispanic (3) and Other (4).

**Statistical Analysis**—Between-group comparisons were performed using two tailed t-tests for continuous variables and chi-square was used for tests of proportions. Linear regression was used for crude and adjusted multivariate analyses involving continuous outcomes, with alpha-level of 0.05 indicating significance. Software programs used include STATA version 9, SPSS version 10 and Microsoft EXCEL.

## Results

### Sociodemographics

Amongst the 5,521 HIV+ study participants, results showed that 431 were caregivers and 4,541 were non-caregivers (Table 1). A test for trend showed there were significant differences in educational attainment across these groups ( $p=0.02$ ), suggesting that caregivers (CGs) have achieved lower educational milestones than non-caregivers (NCGs). Otherwise, there were no significant differences across caregiver status for age, gender, work, race/ethnicity or mode of transmission.

### Biological Determinants of Immune Functioning

Bivariate analyses examined whether CGs compared to NCGs had greater severity of HIV disease measured at baseline. Using the Student's t-test, findings showed there were no significant differences across caregiver status for baseline *CD4 lymphocyte counts, log HIV-1 RNA viral load, duration of exposure to ART* or the *number of illness years prior to enrollment* (Table 1). Using chi-square analyses we examined if there were differences across caregiver status, in the proportion of persons reporting *baseline exposure to ART*.

Findings were marginally significant ( $\chi^2=5.25$ ;  $p=0.07$ ) with a slightly higher proportion of NCGs reporting they were naïve to ART at baseline, and more CGs reporting they were ART-experienced but not currently on therapy. Finally, there were no reported differences across caregiver status for *AIDS-defining event* at baseline.

### HIV Symptom Distress, Mental and Physical Quality of Life

Using three regression models, we investigated whether CGs, compared to NCGs, experienced greater HIV-related bothersome symptoms or poorer quality of life. The first model was an unadjusted simple linear regression including the main effect variables. The second was an adjusted multivariate model including the main effect variables and biological determinants of immune functioning (i.e., HIV  $\log_{10}$  RNA, CD4 cells/ $\mu$ l, age, baseline exposure to ART, duration of exposure to ART, AIDS-defining event and number of HIV illness years prior to study enrollment). The final saturated model included main effect variables and biological determinants of immune functioning, and demographic variables (age, gender, race/ethnicity, education, mode of transmission).

Examining results for the Symptom Distress score across caregiver status, findings show that CGs have a significantly higher score than NCGs ( $\beta=32.0$ ;  $p=0.002$ ; 95% CI [1.2 to 5.3]), suggesting that CGs experienced greater HIV-related bothersome symptoms (Table 2). This remained statistically significant in a multivariate model ( $\beta=24.7$ ;  $p=0.003$ ; 95% CI [1.3 to 6.2]), controlling for the biological determinants of immune functioning.

Closely examining the saturated model, CGs continued to have a significantly higher Symptom Distress score than NCGs ( $\beta=28.4$ ;  $p=0.007$ ; 95% CI [0.9 to 5.8]). Higher symptom distress scores were also reported by study participants if they had the demographic profile of being female, White race, lower educational attainment or intravenous drug users; or had greater severity of disease measured by lower CD4 counts, higher HIV viral load or an AIDS-defining event at baseline. In contrast, study participants who were naïve to ART at baseline reported a significantly lower symptom distress score.

Findings from the main effects model for the mental health subscale of the SF-12 show no differences in scores between CGs and NCGs ( $\beta=44.6$ ;  $p=0.673$ ; 95% CI [-1.4 to -0.9]) (Table 3). This remained unchanged in a multivariate model controlling for the biological determinants of immune functioning, and in the saturated model including demographic variables. However, results from the main effects model for the physical health subscale of the SF-12 show that CGs have a significantly lower score than NCGs ( $\beta=45.6$ ;  $p<0.001$ ; 95% CI [-3.0 to -0.9]), suggesting that CGs experienced poorer physical quality of life (Table 4). This remained statistically significant in a multivariate model ( $\beta=49.1$ ;  $p<0.001$ ; 95% CI [-3.5 to -0.9]), controlling for the biological determinants of immune functioning.

In the saturated model, CGs continued to have significantly lower physical quality of life scores than NCGs ( $\beta=52.1$ ;  $p<0.001$ ; 95% CI [-3.4 to -0.9]). In addition, lower physical quality of life scores were also reported by study participants if they had the demographic profile of being female, having lower educational attainment or were exposed to the HIV virus through heterosexual transmission, intravenous drug use or blood products. Study participants with greater severity of disease measured by lower CD4 counts, higher HIV viral load or an AIDS-defining event at baseline also reported lower physical quality of life scores. In contrast, study participants who were naïve to ART at baseline reported significantly higher physical quality of life scores.

### Limitations

The “caregiver” measure in the CHORUS data set is only a dichotomous variable, which does not allow a sense of the type of care being provided, or the amount of burden

associated with caretaking activity. During the data collection period no additional information was obtained on the type of “caregiving” activities the caregivers engaged in; therefore any specific questions pertaining to the caregivers are not addressable. Also, the CHORUS sample over-represents men who have sex with men, persons of White race, and participants with higher educational status, than the general HIV infected population in the US. This limits generalizability to some degree, and to a larger degree in relation to the broader global epidemic where women are infected at rates as high or higher than men, and are more typically care providers. This is unfortunate as the findings herein may have the most relevance in international settings.

Further, no information on regimen switching, pre- or post-study enrollment is available in this cross-sectional subset. Causal relationships cannot be determined with the cross-sectional design, and study authors cannot comment on baseline or pre-caregiving health status of the participants. Finally, it is unknown whether these caregivers are simultaneously being provided informal care by others.

## Discussion

This study investigates whether differences exist in the health status of HIV+ caregivers compared to HIV+ non-caregivers, using data from a population-based cohort in the US.

First, study findings show that HIV+ caregivers, compared to their non-caregiver counterparts, have achieved lower educational milestones. This is pertinent because the literature shows that HIV+ persons with lower educational attainment have less confidence in their ability to adhere to antiretroviral therapy (28). In addition, persons with lower educational attainment trend towards poorer virological response to antiretroviral treatment, resulting in faster regimen failure (29). Second, although no difference across caregiver status were observed for biological determinants of immune functioning or mental quality-of-life in this study population, results showed that HIV+ caregivers, compared to their non-caregiver counterparts, were more likely to experience greater HIV bothersome symptoms and poorer physical quality-of-life. This is important as the literature shows that optimization of quality-of-life is necessary for achieving good antiretroviral adherence (30).

Hence, these results raise awareness that HIV+ caregivers may require different supportive services than their non-caregiving counterparts, with specific attention focused on identifying predictors of antiretroviral adherence. The challenge however is that many global national HIV/AIDS plans lack a program component for the “care of caregivers”(4), despite the fact that the overwhelming majority of people living with HIV/AIDS live in developing countries where informal and family caregiving may predominate (31, 32).

While the proportion of men and women living with HIV/AIDS is almost equal globally, young women make up over 60% of the 15–24 year old age group (31, 32); and within this paradigm women are the primary informal care providers (3–8). This is germane because there may be a high proportion of young HIV+ females with the burden of caring for a seropositive infant and/or sexual partner. International trends on marriage (and first births) confirm this concern, as the median age of women at first births is below 25 years in most developing nations (33). In these settings, women often have minimal coping skills and limited access to healthcare. Home-based care is less than optimal in the quality of services provided, and family members are overwhelmed with responsibilities (34–37).

We trust these findings highlight the importance of the role of caregiving on the well-being of persons living with HIV/AIDS worldwide, and advance discussions for the development of tailored programs as part of global national HIV/AIDS plans. Program components might consider:

- a. Conducting baseline screening of adherence predictors amongst HIV+ caregivers, to develop focused interventions that address modifiable factors in resource-poor settings;
- b. Tailoring supportive services for the needs of HIV+ caregivers in international settings, based on country conditions and level of international AIDS funding; and
- c. Designing special programs for HIV+ women and their families, towards their adaptation to life with HIV/AIDS in resource poor settings (38).

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**Table 1**

Baseline Characteristics by Caregiver Status

	Caregivers (n=431)	Non-Care Givers (n=4541)	
<b>Number of Subjects (N)</b>			<b>p-value</b>
<b>Demographics</b>			
Mean Age in Years (±SD)	42.6 (±7.7)	43.3 (±8.8)	0.13 <sup>†</sup>
Female	60 (13.9%)	504 (11.1%)	0.08 <sup>‡</sup>
Education			0.02 <sup>§</sup>
<High School	12.4%	5.3%	
High School	7.3%	19.9%	
Some College	22.6%	29.2%	
College	28.7%	30.3%	
Post Graduate	28.9%	15.2%	
Work Status			0.51 <sup>‡</sup>
Full-time	55.6%	58.9%	
Part-time	8.4%	6.9%	
Not Employed	30.0%	28.2%	
Retired	6.5%	6.0%	
<b>Race/Ethnicity</b>			
White	305 (70.8%)	3,207 (70.6%)	0.23 <sup>‡</sup>
Black	66 (15.3%)	809 (17.8%)	
Hispanic	43 (10.0%)	344 (7.6%)	
Other	17 (4.0%)	181 (4.0%)	
<b>Mode of Transmission</b>			
Homosexual/Bisexual	323 (75.5%)	3,476 (78.0%)	0.55 <sup>‡</sup>
Heterosexual	78 (18.2%)	706 (15.8%)	
Occupational	2 (0.5%)	37 (0.8%)	
Injection Drug Use	17 (4.0%)	177 (4.0%)	
Blood Products	8 (1.9%)	61 (1.4%)	
<b>Biological Determinants of Immune Functioning</b>			
CD4	467.2 (±280.1)	471.8 (±274.1)	0.77 <sup>†</sup>
Log HIV Viral Load	3.0 (±1.3)	2.9 (±1.2)	0.43 <sup>†</sup>
Duration of Antiretroviral (ART) Exposure in months	53.9 (±42.0)	53.8 (±44.2)	0.95 <sup>†</sup>
Exposure to Antiretroviral Therapy (ART)			
Naïve to ART	18 (4.8%)	320 (7.0%)	0.07 <sup>‡</sup>
ART Experienced- Currently on Therapy	335 (77.7%)	3,454 (76.1%)	
ART Experienced- Not currently on Therapy	78 (18.1%)	767 (16.9%)	
AIDS-defining Event at Baseline	184 (42.7%)	2,012 (44.31%)	0.52 <sup>‡</sup>
Years of Illness prior to Baseline Enrollment	8.0 (±5.6)	8.3 (±5.5)	0.29 <sup>†</sup>

<sup>‡</sup> Student's t-test;

<sup>‡</sup> Chi-square analyses;

<sup>§</sup> Logistic regression, Test for Trend

**Table 2**

HIV Symptom Distress Scale

	Model 1	L-95%	U-95%	Model 2	p-value	L-95%	U-95%	Model 3	p-value	L-95%	U-95%
	$\beta$			$\beta$				$\beta$			
Caregiver	3.26	0.002	1.18	5.34	0.003	1.29	6.24	3.38	0.007	0.92	5.84
Constant	28.74			20.94				25.04			
CD4	-0.01	0.001	-0.01	0.00	0.002	-0.01	0.00	0.00	0.002	-0.01	0.00
Log HIV Viral Load	2.41	<0.001	1.71	3.12	0.000	1.51	2.92				
Exposure to Antiretroviral Therapy (ART)											
Naive to ART	-5.71	<0.001	-8.88	-2.55	0.001	-8.32	-2.02				
ART Experienced- Not currently on Therapy	-1.17	0.300	-3.37	1.04	0.441	-3.06	1.33				
ART Experienced- Currently on Therapy	1.00	Reference			Reference						
AIDS-defining Event at Baseline	6.53	<0.001	4.99	8.08	0.000	4.87	7.96				
Years of Illness prior to Baseline Enrollment	0.00	0.938	-0.12	0.13	0.990	-0.12	0.13				
Age	0.09	0.044	0.00	0.18	0.000	0.00	0.18				
Female Gender	7.13	0.000	3.90	10.36							
Race/Ethnicity											
Black	-4.26	0.000	-6.40	-2.12							
Hispanic	0.09	0.948	-2.54	2.72							
White	1.00	Reference			Reference						
Education	-2.25	0.000	-2.96	-1.54							
Mode of Transmission											
Homosexual/Bisexual	1.00	Reference			Reference						
Heterosexual	-3.75	0.016	-6.80	-0.69							
Occupational	-2.31	0.639	-11.96	7.34							
Injection Drug Use	8.27	0.000	4.49	12.04							
Blood Products	3.17	0.327	-3.17	9.50							

**Table 3**

SF-12 Mental Health Subscale

	Model 1	L-95%	U-95%	Model 2	L-95%	U-95%	Model 3	L-95%	U-95%	p-value	L-95%	U-95%
	$\beta$		$\beta$		$\beta$		$\beta$					
Caregiver	-0.25	0.673	-1.40	0.90	-0.73	0.319	-0.47	-2.17	0.71	0.522	-1.91	0.97
Constant	44.85			48.02			41.68					
CD4				0.00	0.670	0.00	0.00	0.00	0.00	0.846	0.00	0.00
Log HIV Viral Load				0.00	0.000	-1.33	-0.78	-1.33	-0.51	0.000	-1.19	-0.37
Exposure to Antiretroviral Therapy (ART)												
Naive to ART				0.05	0.958	-1.79	-0.04	-1.79	1.89	0.969	-1.88	1.81
ART Experienced- Not currently on Therapy				-0.22	0.740	-1.50	-0.26	-1.50	1.06	0.697	-1.54	1.03
ART Experienced- Currently on Therapy				1.00	Reference		1.00	Reference		Reference		
AIDS-defining Event at Baseline				-1.59	0.001	-2.49	-1.40	-2.49	-0.69	0.003	-2.30	-0.49
Years of Illness prior to Baseline Enrollment				-0.48	0.86	-0.08	-0.01	-0.08	0.07	0.774	-0.084	0.06
Age							0.07	0.012		0.012	0.02	0.12
Female Gender							-3.27	0.001		0.001	-5.17	-1.38
Race/Ethnicity												
Black							3.10	0.000		0.000	1.85	4.35
Hispanic							0.52	0.508		0.508	-1.02	2.06
White							1.00	Reference		Reference		
Education							0.74	0.000		0.000	0.33	1.15
Mode of Transmission												
Homosexual/Bisexual							1.00	Reference		Reference		
Heterosexual							2.4	0.009		0.009	0.61	4.19
Occupational							2.72	0.345		0.345	-2.93	8.37
Injection Drug Use							-2.97	0.009		0.009	-5.18	-0.76
Blood Products							2.74	0.148		0.148	-0.97	6.44

**Table 4**

SF-12 Physical Health Subscale

	Model 1	L-95%	U-95%	Model 2	L-95%	U-95%	Model 3	L-95%	U-95%	p-value	L-95%	U-95%
	$\beta$											
Caregiver	-1.91	<0.001	-2.98	-0.86	-2.19	0.001	-2.12	-3.47	-0.92	0.001	-3.36	-0.87
Constant	47.56			49.07			54.26					
CD4	0.01	0.000	0.00	0.01	0.00	0.000	0.00	0.00	0.01	0.000	0.00	0.01
Log HIV Viral Load	-1.06	0.000	-1.42	-0.70	-1.08	0.000	-1.08	-1.42	-0.70	0.000	-1.44	-0.73
Exposure to Antiretroviral Therapy (ART)												
Naive to ART	3.03	0.000	1.40	4.66	2.38	0.003	2.38	1.40	4.66	0.003	0.79	3.97
ART Experienced- Not currently on Therapy	1.01	0.081	-0.12	2.15	0.93	0.100	0.93	-0.12	2.15	0.100	-0.18	2.04
ART Experienced- Currently on Therapy	1.00	Reference			1.00	Reference				Reference		
AIDS-defining Event at Baseline	-2.56	0.000	-3.36	-1.77	-2.76	0.000	-2.76	-3.36	-1.77	0.000	-3.54	-1.98
Years of Illness prior to Baseline Enrollment	0.03	0.44	-0.04	0.09	0.04	0.168	0.04	-0.04	0.09	0.168	-0.019	0.11
Age	-0.22	0.000	-0.27	-0.18	-0.22	0.000	-0.22	-0.27	-0.18	0.000	-0.27	-0.18
Female Gender	-1.70	0.041	-3.33	-0.07	-1.70	0.041	-1.70	-3.33	-0.07	0.041	-3.33	-0.07
Race/Ethnicity												
Black	0.60	0.275	-0.48	1.68	0.60	0.275	0.60	-0.48	1.68	0.275	-0.48	1.68
Hispanic	-0.03	0.961	-1.36	1.29	-0.03	0.961	-0.03	-1.36	1.29	0.961	-1.36	1.29
White	1.00	Reference			1.00	Reference				Reference		
Education	1.58	0.000	1.23	1.94	1.58	0.000	1.58	1.23	1.94	0.000	1.23	1.94
Mode of Transmission												
Homosexual/Bisexual	1.00	Reference			1.00	Reference				Reference		
Heterosexual	-0.74	0.344	-2.29	0.80	-0.74	0.344	-0.74	-2.29	0.80	0.344	-2.29	0.80
Occupational	-2.64	0.287	-7.51	2.23	-2.64	0.287	-2.64	-7.51	2.23	0.287	-7.51	2.23
Injection Drug Use	-4.10	0.000	-6.00	-2.19	-4.10	0.000	-4.10	-6.00	-2.19	0.000	-6.00	-2.19
Blood Products	-3.89	0.02	-7.08	-0.69	-3.89	0.02	-3.89	-7.08	-0.69	0.02	-7.08	-0.69