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The Influence of Psychological Variables on Health Related Quality of Life among HIV Positive Individuals with a History of Intravenous Drug Use

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Abstract

Objective—Intravenous drug use (IDU) remains a prominent pathway of HIV transmission in the United States, though little is know about modifiable factors influencing quality of life among IDUs. The goal of this study was to evaluate the influence of psychological variables (e.g., depression and anxiety) on health related quality of life among HIV-positive individuals with a history of IDU who were enrolled in outpatient treatment for opioid dependence.

Method—108 HIV-positive individuals with a history of IDU and participating in current outpatient treatment for opiate dependence who were screened for participation in a depression and adherence study reported sociodemographic data, depressive and anxiety symptoms and health-related quality of life (HRQoL; Multidimensional Health Assessment using the ACTG-SF 21).

Results—Multiple regression models controlling for disease stage and background characteristics identified significant negative relationships between General Health Perception and Functioning without Pain for anxiety and depression, and between Role Functioning and Physical Functioning for anxiety. CD4 cell count was significantly related to Physical Functioning only.

Conclusions—Results indicate that distress (both depression and anxiety) contribute significantly to variation in HRQoL over and above the effects of disease variables. Effective depression and anxiety treatment may result in improved overall functioning.

Keywords

HIV; Depression; Anxiety; Health-related quality of life; intravenous drug use

INTRODUCTION

Advances in antiretroviral therapy have allowed many individuals living with HIV/AIDS to manage what was once considered a terminal disease as a chronic medical condition. However, individuals living with HIV/AIDS may be required to manage short-term and long-term side effects of antiretroviral therapy (e.g., nausea, diarrhea, peripheral neuropathy, and lipodystrophy), comorbid medical conditions (e.g., Hepatitis C), and comorbid mental health disorders (e.g., depression, anxiety, and substance abuse). Accordingly, commonly used endpoints in HIV research like CD4 cell count and HIV plasma viral load are no longer

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considered adequate to fully capture the complexity of treatment outcomes (Casado 2005). Thus, while increased survival is an important outcome for individuals living with HIV/AIDS, it has also become important to understand factors that influence the quality of life (QOL) for this population, as well as how quality of life is conceptualized. A meta-analysis investigating how individuals with HIV define QOL showed that mental health was more important than physical functioning when rating QOL, thereby suggesting that HIV-positive patients view health status and QOL as distinct constructs (Smith, Avis & Assmann 1999). Health-related quality of life (HRQoL) can be of particular interest within the context of ART treatment outcomes; such data can provide a more dynamic appraisal of how treatment impacts an individual's physical, social, and psychological well-being, as well as how these factors influence an individual's ability to function in their day-to-day life (Phung et al. 2009).

HIV-positive individuals report poorer HRQoL than persons with other chronic illnesses, including diabetes, multiple sclerosis, and clinical depression (Hays et al. 2000; Korthuis et al. 2008). While previous research suggests that certain biological variables, such as disease stage, are associated with HRQoL in HIV-positive individuals (Lubeck & Fries 1997; Burgoyne & Saunders 2001; Wig et al. 2006), it is unlikely that biological variables alone account for this discrepancy, particularly among those who are responding well to treatment and thus do not have active symptoms of advanced disease. Psychological factors may represent another pathway to decreased HRQoL among individuals living with HIV/AIDS, who generally experience higher rates of psychological distress relative to the general population, and in some cases, relative to other chronic illness populations (Pence et al. 2006; Ciesla & Roberts 2001; Ruiz Perez et al. 2005). Substance use disorders, unipolar mood disorders, and various anxiety disorders, including post-traumatic stress disorder, generalized anxiety disorder, and panic disorder, are among the most prevalent forms of psychopathology diagnosed in HIV-positive populations (Bing et al. 2001; Pence et al. 2006; Sherbourne et al. 2000; Cruess et al. 2003; Dew et al. 1997; Atkinson & Grant 1994; Israelski et al. 2007; Kelly et al. 1998; Maj et al. 1994; Morrison et al. 2002; Orlando et al. 2002; Rabkin et al. 1997; Smith et al. 2002; Tsao, Dobalian & Naliboff 2004; Kimberling et al. 1999). For example, individuals living with HIV/AIDS are estimated to have rates of major depression that are two times higher than the general population (Ciesla & Roberts 2001). Prevalence rates of post-traumatic stress disorder range from 3.2% to 60% among HIV-positive individuals (Kelly et al. 1998; Kimberling et al. 1999; Israelski et al. 2007; Morrison et al. 2002; Pence et al. 2006; Smith et al. 2002) and it is estimated that between 8.74% and 22.4% of injection drug users in the United States are HIV-positive (Mathers et al. 2008).

Intravenous drug use (IDU) remains a prominent pathway of HIV transmission in the United States, with approximately 8% of new cases in 2010 directly attributed to intravenous drug use either (Centers for Disease Control and Prevention December 2012). HIV-positive individuals with a history of IDU may be especially vulnerable to low levels of HRQoL as they often experience increased barriers to treatment relative to HIV-positive individuals without a history of IDU, such as increased levels of stigma, greater social marginalization, and lower socio-economic class (Carballo et al. 2004; Korthuis et al. 2008; Krusi et al. 2010; Lorenz et al. 2001; Ruiz Perez et al. 2005; Wood et al. 2008). However, it is less clear how psychological variables influence HRQoL among HIV-positive individuals in general, particularly among those with a history of IDU.

Prior research has found that symptoms of depression, a diagnosis of one or more psychiatric disorders, and current drug use are all associated with poorer HRQoL (Holmes et al. 1997; Mrus et al. 2005; Ruiz Perez et al. 2005; Sherbourne et al. 2000). Ruiz Perez and colleagues examined cross-sectional data from 320 adults living with HIV in Spain and

found that higher HRQoL was associated with certain demographic and HIV-related variables, including female sex, younger age, employment status, and higher CD4 counts. In addition, the absence of a psychological morbidity, current psychiatric treatment, and either current or former IDU were also associated with better HRQoL (Ruiz Perez et al. 2005). However, the sample was predominantly male (73%), and less than half of the participants (47%) had a history of IDU. A more recent study of HIV-positive men who have sex with men (MSM) examined the relationship between psychological factors, namely symptoms of depression and post-traumatic stress, and HRQoL (O'Cleirigh et al. 2009). The authors found that after controlling for demographic variables, disease stage, and use of antiretroviral medications, symptoms of post-traumatic stress and depression were significant predictors of poorer HRQoL, and more specifically, worse overall health estimates and impairment due to pain, role impairment, and work-related impairment.

This work suggests that psychopathology may play an important role in determining HRQoL among individuals living with HIV/AIDS. However, there remains a dearth of research exploring the psychological factors that may contribute to HRQoL, especially among HIV-positive individuals with a history of IDU. The importance of identifying these factors is significant, as they provide another vector on which to intervene in order to potentially increase HRQoL and reduce functional impairment. In addition to a limited scope of HRQoL research conducted among HIV-positive individuals with a history of IDU, previous studies investigating HRQoL within this population did not consistently utilize well-validated measures and frequently failed to adequately represent women and ethnic minorities within study samples. The current study seeks to add to existing literature by evaluating the influence of psychological factors (e.g., depression and anxiety) of HRQoL among HIV-positive individuals with a history of IDU who are currently in outpatient treatment for opioid dependence. It was hypothesized that depression and anxiety would account for significant variance across all domains of HRQoL above and beyond demographic variables such as age and education, and over and above disease factors such as CD4 count, viral load, and adherence to antiretrovirals.

METHODS

Participants

Participants were drawn from a sample of HIV-positive adults (N=154) who completed a baseline evaluation in order to determine eligibility for participation in a randomized controlled trial of cognitive behavioral therapy for treatment of depression and HIV medication adherence. Participants in these analyses were limited to those who had data for the variables of interest (N=108, 60 male and 48 female). There were limited cases of missing data on measures of depression, anxiety, and HRQoL. If a participant completed 75% of items on a given measure, missing values were imputed using the mean value of the completed items in order to maximize the sample size. Inclusion criteria for the randomized controlled trial included: (1) HIV-infection; (2) a prescribed regimen of antiretroviral medication for a minimum of three months; (3) a history of injection drug abuse or dependence; (4) enrollment in a substance abuse treatment program (pharmacological treatment programs such as methadone or suboxone, or group or individual substance abuse counseling); (5) age 18 to 65; and (6) completion of a baseline diagnostic assessment, a clinician-administered interview, and two-week medication monitoring period with an electronic pill cap (MEMS). The diagnostic interview and clinician-administered assessments were completed by a clinical psychologist, psychology pre or postdoctoral fellow, or a Masters level psychologist with extensive training and supervision in psychodiagnostics. This study was reviewed and approved by the institutional review boards for Massachusetts General Hospital and Rhode Island Hospital.

Recruitment

Participants were recruited in person by study staff or clinic staff at methadone treatment centers, other substance abuse treatment centers, and HIV clinics for participation in a randomized controlled trial of cognitive behavioral therapy for treatment of depression and HIV medication adherence, as noted above. Because of the high prevalence of depression among HIV positive individuals and the fact that depression may be undiagnosed, all HIV positive clients at the methadone clinics were referred for study eligibility screening, and all HIV positive patients seeking treatment at the HIV clinics who had documented methadone use or a history of IDU were referred for study eligibility screening, regardless of documented depression. Participants were also recruited through advertisements at these clinics and through newspaper ads in Massachusetts and Rhode Island. Individuals who reported being on current antiretroviral therapy, having a history of IDU, and willingness to participate in a year long research study were invited to complete a baseline evaluation.

Measures

Lab measures—During the baseline evaluation, participants who did not have an HIV plasma RNA or CD4+ lymphocyte testing in the prior month available through clinic chart review had blood drawn to assess both their viral load and CD4 count.

Adherence assessment—We used an electronic pill-cap (Medication Event Monitoring System, MEMS; AARDEX), recording the date and time of each instance of bottle opening, to monitor the antiretroviral medication that was judged to be the most difficult to remember or most difficult to take. If participants reported that his or her medications were equally difficult to remember or take, the participants used the cap for the pill that they took most frequently. To account for doses that participants may have taken without opening the pill cap (e.g., took out afternoon doses when they opened it in the morning), we counted a dose as taken if participants could recall specific instances when they took their medications but did not use the pill cap. This procedure is consistent with recent studies comparing multiple measures of adherence with HIV outcomes, and recommending use of composite adherence scores (e.g., Liu et al., 2001, 2006; Llabre et al., 2006), and our prior work (Safren et al., 2009). Medication adherence scores were calculated by dividing the number of doses taken by the number of prescribed doses. A dose was considered missed if it was not taken or if it was taken more than two hours before or after the designated time. For the outcome used in these analyses, the measure of medication adherence was percentage adherence based upon corrected, on-time adherence for the two weeks prior to the study visit.

Clinician-administered psychological measures—Participants completed a psychiatric diagnostic interview (the MINI Neuropsychiatric Interview; MINI; Sheehan et al. 1998) to determine study eligibility status. A study therapist administered a variety of measures assessing diagnostic criteria for psychiatric disorders, and level of symptom distress.

Self-reported measures—In addition to the clinician-administered measures, participants completed a series of self-report measures at the baseline visit, as described below.

Multidimensional Health Assessment (ACTG-SF 21): A modified 10-item version of the of SF-21, the QOL measure used in Adult AIDS Clinical Trial Group (AACTG) clinical trials, was chosen to assess role impairment and HRQoL because it has been shown to have specific application, reliability and construct validity in the assessment of QOL in HIV-positive populations (Wu, Revicki et al. 1997). Composite scores for each of these HRQoL outcomes (i.e., General Health Perceptions, Functioning without Pain, Role Functioning,

and Physical Functioning) were constructed based on two to four survey items and were scored according to the ACTG QOL 601–602 Health Survey Manual (Wu, Hays et al. 1997; Bozzette et al. 1995). Scores ranged from 0–100, with 0 indicating worst possible quality of life and 100 indicating best possible quality of life. As the modified 10-item version of the SF-21 did not include one of the three survey items that comprise the General Health Perceptions scale (QOL0601), an average of the respondent's score on completed items QOL0602-8a and QOL0602-8b was substituted for the missing value per the Health Survey Manual instructions Bozzette et al. (1995). Accordingly, all scores were transformed to a 0 to 100 scale in order to create an overall HRQoL score, with higher scores reflective of higher functioning and lower scores reflective of greater functional impairment. The General Health Perception subscale assessed an individual's view of his or her overall health, the Functioning without Pain subscale assessed how much pain was present and how much it interfered with activities of daily living, the Role Functioning subscale assessed the impact of health on functioning at home, work, or school, and the Physical Functioning subscale assessed how much health impacted a variety of vigorous, moderate, and low level physical activities.

Beck Depression Inventory - Short Form (BDI-SF) (Beck et al. 1961): The BDI-SF uses a subset of the items from the full-scale BDI form and correlates .95 with the full scale scores. The BDI-SF has been shown to be a better assessment for individuals with HIV because it focuses on the cognitive symptoms of depression rather than physiological symptoms and therefore may help reduce the confounding of depressive symptoms with those related to HIV or medication side effects (Zea et al. 2005).

Beck Anxiety Inventory (BAI) (Beck et al. 1988): The BAI is a 21-item scale and has a strong history of psychometric reliability and validity, and specifically, differentiates depression from anxiety symptoms, despite their general overlap. It has demonstrated high internal consistency ($\alpha = .92$) and test-retest reliability over the course of one week, r (81) = .75 (Beck et al. 1988).

Statistical Analyses

Descriptive statistics were calculated for all variables and correlations were produced for all independent and dependent variables. The distributions of the four dependent variables were examined for normality and all we normally distributed; no outliers were identified beyond 2.5 standard deviations from the mean and there was no evidence of kurtosis. Hierarchical multiple regression models were used to examine the relationships between anxiety, depression and all four HRQoL outcomes while controlling for demographics and HIV disease related variables. Four separate regression models (one for each HRQoL outcome) were created. The regression models predicting the HRQoL outcome were created sequentially, whereby age and education were entered at the first step, followed by HIV related variables (CD4 cell count, HIV plasma log viral load, and adherence), followed by anxiety, and finally, depression. The significance of the standardized beta weights in the final step was used to determine the significance of the relationships of interest. Psychological variables were added to the model in separate steps in order to assess the predictive value of these variables while accounting for the demographic and disease related variables. The addition of substance abuse variables (use of alcohol to intoxication, heroin, cocaine, and marijuana over the past 30 days) to the model did not alter the pattern of results.

RESULTS

Demographic and Descriptive Data

Descriptive data on the sample are presented in Table 1. The mean age of the sample was 47.08 years (SD = 6.70), and 48.1% of participants identified as white, 31.5% identified as African-American, and 28.7% as Hispanic or Latino. Participants received an average of 11.13 (SD = 2.85) years of education. Seventy-three percent of patients were on disability. The mean CD4 cell count was 431.69.45 cells/mm^3 (SD = 253.45; minimum = 3.00 and maximum = 1296.00). The mean viral load was 3120.97 copies/ml (SD = 12220.75; minimum = 0.00 and maximum = 100000.00); 68.5% of participants had achieved undetectable viral loads with an average adherence of 67.55% (SD=27.99).

The average number of Axis I diagnoses for the sample was 2.30 (SD = 1.34), with 54.6% (n = 59) of the sample meeting diagnostic criteria for a primary unipolar depressive disorder and 43.5% (n = 47) for a comorbid anxiety disorder. The mean BDI score was 10.81 (SD = 6.97) and the mean BAI score was 17.39 (SD = 12.59; see Table 2). The majority of the sample (74.1%) reported prescribed methadone use in the past 30 days. With regard to substance use within the past 30 days, 5.6% reported alcohol use to intoxication, 30.6% reported cocaine use, 21% reported heroin use, and 19% reported marijuana use. Mean scores on the HRQoL were as follows: General Health Perception (M = 38.19, SD = 25.96); Pain (M = 53.29, SD = 25.54); Role Functioning (M = 57.53, SD = 28.01); and Physical Functioning (M = 56.69, SD = 23.32; see Table 2).

Influence of Anxiety and Depression on Health-related Quality of Life

Results from the regression models are presented in Table 3. Unadjusted estimates of the relationships among anxiety, depression, and functional health outcomes are provided in Table 4.

General Health Perception—The results of the regression model predicting General Health Perception revealed a significant negative relationship with depression (β =−.42, t (100) = −4.04, p = .00), which was entered in the final step, and uniquely accounted for 11.8% of the variance, (F_{change} (1,100) = 16.29, p = .00); no other covariates in the final step were significant. Although anxiety was not significantly associated with General Health Perception in the final step (β = −.16, t (100) = −1.52, p = .13), the relationship was significant in the previous step (β = −.38, t (101) = −4.05, p = .00) which included covariates (sociodemographic and disease variables) but not depression. The common variance shared by depression and anxiety (see Table 4 for correlations) likely accounted for the reduction in the magnitude of the standardized beta weight that was associated with anxiety in the final step.

Functioning without Pain—The results of the regression model predicting scores on the Functioning without Pain subscale indicated that anxiety (β =−.31, t (100) = −2.97, p = .00) and depression (β =−.26, t (100) = −2.43, p = .02) were significantly and negatively associated with those scores in the final step. Anxiety accounted for 18.7% of variance in the Functioning without Pain subscale score when it was entered into the model in step three (F_{change} (1,101) = 24.31, p = .00). When depression was added to the model in step 4, it uniquely contributed an additional 4.3% of the variance (F_{change} (1,100) = 5.93, p = .02). No other covariates in the final step were significant.

Role Functioning—The results of the regression model predicting scores on the Role Functioning subscale indicated that anxiety was significantly and negatively associated with role functioning scores (β =−.37, t (100) = −3.30, p = .00). Anxiety accounted for 13.6% of

variance in the Role Functioning subscale score when it was entered into the model in step three (F_{change} (1,101) = 16.36, p = .00). No other covariates in the final step were significant.

Physical Functioning—The results of the regression model predicting scores on the Physical Functioning subscale revealed a significant, positive association between CD4 cell count (β =.31, t (100) = 3.32, p = .00) and significant negative associations between age (β = −.19, t (100) = −2.08, p = .04), anxiety (β =−.21, t (100) = −2.00, p = .05), and Physical Functioning scores. When anxiety was added to the model in step three, it accounted for 7.2% of the variance (F_{change} (1,101) = 9.33, p = .00). No additional covariates in the final step were significant.

DISCUSSION

As purely biological measures are inadequate to capture the complexity of HIV treatment outcomes (Casado 2005), HRQoL represents a relevant and patient centered indicator of treatment progress in HIV positive individuals. Currently, there is a paucity of research on the factors associated with HRQoL among HIV-positive individuals with a history of IDU, despite the fact that IV drug users continue to make up a significant portion of new infections annually (Jia et al. 2010; Solomon et al. 2010). More research, particularly into modifiable factors predicting HRQoL, is needed.

This study contributes to a growing body of literature documenting the significant role of psychological symptoms in functional impairment among HIV-positive individuals and fills an important gap regarding HIV-positive individuals with a history of IDU. Depression and anxiety were implicated in all models in some capacity, and were significantly correlated with all HRQoL outcomes (see Table 4). Results indicate that depressive symptoms contribute significantly to variation in general health perception, that both anxiety and depression contribute to variation in functioning without pain, and that anxiety contributes significantly to variance in role functioning – over and above HIV related disease variables – among this sample of HIV-positive individuals with a history of IDU use. This relationship is similar to the one found by O'Cleirigh and colleagues (2009), whereby post-traumatic stress and depressive symptoms accounted for significant variation in general health estimates, pain, and role functioning among a primary care sample of MSM (O'Cleirigh et al. 2009). The current study expands upon this work by examining anxiety and depressive symptoms in a different, significant, and with respect to HRQoL, understudied subpopulation of the HIV epidemic in the United States—HIV-positive individuals with a history of IDU. Findings provide evidence of the significance of these relationships at higher levels of functional impairment than were reported previously (O'Cleirigh et al., 2009). While there are data to suggest that trauma and post-traumatic stress disorder predict poorer HRQoL in HIV-positive individuals (Leserman 2008), it is possible that more general symptoms of anxiety and depression can, in part, account for this relationship as well. Continued investigation into these relationships is important, particularly given the high levels of depression and anxiety among HIV-positive populations (Asch et al. 2003; Bing et al. 2001; Ciesla & Roberts 2001; Pence et al. 2006). Even in this sample of HIV-positive individuals with relatively well-controlled HIV disease progression (i.e., high CD4 counts and many with undetectable viral loads), significant impairment in HRQoL remains, and this impairment appears to be partially explained by symptoms of depression and/or anxiety.

As such, it is important to consider why depressive and anxiety symptoms would play a role in HRQoL. Depressive symptoms may contribute to fatigue, difficulty concentrating, appetite problems, and sleep disruption, which may be important determinants of health

perceptions. Depressive cognitions and hopelessness may also play a role in poorer perceived general health, as individuals with depression might not expect their health to improve, or may focus on the negative aspects of their health and ignore positive aspects. Anxiety sensitivity or general anxiety may impact vigilance to bodily symptoms in numerous ways. For example, anxiety may contribute to poorer role functioning or physical functioning through a pathway of hypervigilance to bodily processes and more catastrophic interpretation of both physical symptoms and other threats, such that individuals with higher levels of anxiety may perceive themselves as less able to function. With respect to physical functioning, the role of biological variables must also be considered. While age was negatively associated and CD4 count was positively associated with physical functioning in the current study, it was to a lesser extent than we might expect, suggesting anxiety still plays an important role.

Although the current study extends previous research of psychological predictors of HRQoL in HIV-positive individuals to an under-studied population of individuals with a history of IDU, there are also limitations. Many participants were enrolled in outpatient care for opiate dependence and were seeking participation in a treatment study for depression and adherence; results may vary for a non-treatment seeking sample or across a more general sample of HIV-infected IDU. A small number of participants reported some substance use in the past month, and this too may negatively impact HRQOL. The data are self-report and cross-sectional, and the sample size is smaller than some other studies in this area. Future research should include multiple sources of information beyond self-report, such as clinician-rated symptoms. Whenever possible, future studies should also include a prospective design to determine how psychological symptoms predict HRQoL over time, as the current study was unable to determine the temporal relationship between psychological symptoms and HRQoL. Additionally, larger sample sizes will afford greater power to determine the intricacies of the relationships between psychological symptoms and HRQoL in this unique population.

Another direction for future research lies in the clinical implications of this work. Depression and anxiety are highly treatable (Butler et al. 2006; Hofmann & Smits 2008). Given that depressive and anxiety symptoms are potentially modifiable, successful treatment for these symptoms may result in improved mental health, as well as improved functioning. This is an empirical question that can be answered with well-executed, randomized, controlled trials that examine HRQoL at baseline and then again after treating depressive and anxiety symptoms in this population. Some of this research is ongoing, though mainly focused on depression versus anxiety, and may provide further insight into the role of psychological functioning in HRQoL in HIV-positive individuals, as well as how treatment can improve symptoms, overall functioning, and HRQoL, all of which have significance for public health.

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Table 1

Sociodemographic Characteristics of Participants[a]

Variable		
	N	**%**
Gender		
Female	48	44.4
Male	60	55.6
Race		
African American/Black	34	31.5
White	52	48.1
Asian	0	0
Native Hawaiian/Pacific Islander	1	0.9
Native American	3	2.8
Other	24	22.2
Ethnicity		
Hispanic or Latino	31	28.7
Sexual Orientation		
Exclusively Heterosexual	87	80.6
Bisexual	5	4.6
Exclusively Homosexual	3	2.8
Other	8	7.5
Employment		
Full-time Work or School	2	1.9
Part-time Work or School	8	7.4
Neither Work or School	23	21.3
On Disability	79	73.1
Other	5	4.6
	Mean	SD
Age	47.08	6.70
Years of Education	11.13	2.86

[a]Note: Percentages do not always add up to 100 due to overlap and some participants reporting more than one demographic variable.

Table 2

Descriptive Statistics of Depression, Anxiety, and Health-related Quality of Life (HRQoL)

Measure	Mean (SD)	Range
Beck Depression Inventory (BDI)	10.80 (6.97)	0–29
Beck Anxiety Inventory (BAI)	17.39 (12.59)	0–50
General Health Perception	38.19 (25.96)	0–100
Functioning without Pain	53.29 (25.54)	0–100
Physical Functioning	56.69 (23.32)	12.50–100
Role Functioning	57.53 (28.01)	0–100

Table 3

Linear Regression Analyses Examining the Relationship between Depression, Anxiety, and Health-related Quality of Life (HRQoL) Outcomes

	General Health Perceptions				Functioning without Pain			
	B: Step 1	**B: Step 2**	**B: Step 3**	**B: Step 4**	**B: Step 1**	**B: Step 2**	**B: Step 3**	**B: Step 4**
Age	0.05	0.04	0.01	0.05	0.12	0.12	0.07	0.10
Education	−0.04	−0.03	−0.06	−0.16	−0.08	−0.08	−0.11	−0.17
CD4 Count		0.05	0.01	0.01		0.07	0.02	0.02
Viral Load (log)		−0.12	−0.18	−0.18		0.01	−0.05	−0.05
Adherence		−0.04	−0.06	−0.03		−0.14	−0.16	−0.15
Anxiety			−0.38**	−0.16			−0.44**	−0.31**
Depression				−0.42**				−0.26*
F_{change}	0.17	0.69	16.39**	16.29**	0.82	0.79	24.31**	5.93*
Df	2,105	3,102	1,101	1,100	2,105	3,102	1,101	1,100
R^2	0.00	0.02	0.16	0.28	0.02	0.04	0.23	0.27
R^2 Change	0.00	0.02	0.14	0.12	0.02	0.04	0.19	0.04

	Role Functioning				Physical Functioning			
	B: Step 1	**B: Step 2**	**B: Step 3**	**B: Step 4**	**B: Step 1**	**B: Step 2**	**B: Step 3**	**B: Step 4**
Age	0.07	0.08	0.04	0.05	−0.16	−0.18	−0.21*	−0.19*
Education	0.03	0.03	0.00	−0.01	0.17	0.19*	0.17	0.14
CD4 Count		−0.01	−0.05	−0.05		0.34**	0.31**	0.31**
Viral Load (log)		0.08	0.03	0.03		0.05	−0.01	−0.01
Adherence		−0.80	−0.10	−0.10		0.05	0.03	0.04
Anxiety			−0.38**	−0.37**			−0.27**	−0.21*
Depression				−0.02				−0.12
F_{change}	0.41	0.60	16.36**	0.04	2.11	4.50**	9.33**	1.22
Df	2,105	3,102	1,101	1,100	2,105	3,102	1,101	1,100
R^2	0.01	0.03	0.16	0.16	0.04	0.15	0.22	0.23
R^2 Change	0.01	0.02	0.14	0.00	0.04	0.11	0.07	0.01

*$p \leq 0.05$,

** $p \leq 0.01$

Table 4

Correlations between Depression, Anxiety, and Health-related Quality of Life (HRQoL) Outcomes

	BDI	BAI	General Health	Physical Functioning	Role Functioning	Pain	Age	Education	CD4 Count	Viral Load	Adherence
BDI	1.00										
BAI	−.53**	1.00									
General Health	−.46**	−.36**	1.00								
Physical Functioning	−.27**	−.29**	.38**	1.00							
Role Functioning	−.22*	−.38**	.38**	.31**	1.00						
Pain	−.39**	−.43**	.43**	.40**	.43**	1.00					
Age	−.01	−.12	.05	−.11	.08	.10	1.00				
Education	−.25**	−.10	−.02	.13	.05	−.05	.25**	1.00			
CD4 Count	−.03	−.07	.01	.31**	−.04	.06	.05	−.05	1.00		
Viral Load	−.07	−.09	−.13	−.07	.10	.03	−.05	−.01	−.32**	1.00	
Adherence			.00	.06	−.10	−.13	.02	−.03	.10	−.29	1.00

* $p < 0.05$

** $p < 0.01$