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Mental and physical quality of life by age groups in persons with HIV

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Abstract

Aim—The aim of this study was to assess the relationship between quality of life (QOL), age and other demographic and clinical factors in persons with HIV (PWH).

Background—Patient-centered outcomes such as QOL are increasingly relevant for PWH with their advancing age. QOL by age group and other predictors have not been fully explored.

Design—This study was conducted using a cross-sectional study design.

Methods—Overall, 614 Kaiser Permanente Northern California members with HIV completed baseline questionnaires from May 2013 - May 2015 at enrollment in an alcohol treatment study (n=310 for PWH <50 years of age and n=304 for PWH ≥50 years of age). QOL was assessed by the 12-item Short Form Survey (SF-12), which includes physical and mental QOL domains. Linear regression models were used to evaluate the association of age and other predictors of mental and physical QOL.

Results—PWH <50 years of age reported poorer mental QOL but better physical QOL compared with PWH ≥50 years of age. Other factors associated with worse mental QOL included substance use, depression, and anxiety. Other factors associated with worse physical QOL included injection drug use and depression.

Conclusions—In this primary care-based sample of PWH, we identified age group differences in QOL. Addressing substance use and depression in PWH can also improve mental and physical QOL. These findings can be used by healthcare providers to guide patient-centered care.

Keywords

alcohol; depression; HIV; mental health; quality of life; HIV/AIDS

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Declaration of interest statement

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Persons living with HIV (PLWH) are living longer due to effective combination antiretroviral therapy (ART). As a result, PLWH and their providers have been faced with long-term management of co-morbidities associated with aging, and ongoing care for multiple chronic conditions (High et al., 2012; Valcour, Paul, Neuhaus, & Shikuma, 2010). It has, therefore, become increasingly important to examine the burden of HIV and co-morbid conditions on quality of life (QoL), to inform the delivery of high-quality, integrated, patient-centered care (Balderson et al., 2013). The Institute of Medicine and the National Institutes of Health have recognized QoL as a global priority for tracking health trends and measuring health outcomes (High et al., 2012). In HIV care settings, poor QoL has been associated with increased HIV transmission risk due to unprotected sex, poor medication adherence, and detectable HIV RNA levels (de Oliveira e Silva, Reis, Nogueira, & Gir, 2014). In addition, poor QOL is recognized as an independent predictor of increases in HIV-related morbidity and mortality and associated higher health system costs (High et al., 2012).

It is unclear to what extent HIV clinical factors (CD4+ T cell count, HIV RNA levels), substance use characteristics (hazardous alcohol use, marijuana use, other substance use), and mental health symptoms (depression, anxiety) are independently associated with QoL in PLWH. Furthermore, few studies have separately examined physical QoL, which corresponds to functional ability or the ability to perform activities of daily living, and mental QoL, which corresponds to the degree of patient satisfaction with his or her psychological health and cognitive function (de Oliveira e Silva et al., 2014; Vance, McGuinness, Musgrove, Orel, & Fazeli, 2011). Differences by age are important to consider, because older PLWH experience different physical and mental co-morbidities than younger PLWH (Moore et al., 2014; Vance et al., 2011).

Our aims in this study were to: (a) evaluate the independent effect of age on QoL; and (b) identify other factors associated with QoL (demographics, HIV clinical characteristics, substance use, and mental health symptoms) in PLWH. We hypothesized that QoL would differ by age and that older PLWH would report poorer mental and physical QoL compared to younger PLWH. We further hypothesized that the association between mental and physical QoL and other factors would differ by age. Understanding the association of age and other factors with mental and physical QoL has the potential to enhance patient-centered care for PLWH.

Methods

Study Setting, Design, and Participants

Our cross-sectional analysis was conducted at Kaiser Permanente Northern California (KPNC), a large, private, non-profit, integrated health system of 4 million members, where more than 8,500 members with HIV receive care (Satre et al., 2016). Study subjects were recruited with purposive sampling and included 614 PLWH from KPNC recruited for a randomized clinical trial evaluating an alcohol use behavioral intervention called the Health and Motivation study (Silverberg et al., 2018). At enrollment, participants completed a self-administered questionnaire that included baseline measures of QoL, demographic characteristics, HIV clinical factors, substance use, mental health symptoms, and QoL, the

outcome variable for this study, from May 2013 to May 2015. We used baseline assessment data for our study. Participants in the trial met the following inclusion criteria: (a) inclusion in the KPNC HIV registry, which has maintained a list of all PLWH in KPNC since the 1980s; (b) ages 18 years and older receiving HIV services at KPNC San Francisco medical center; and (c) exceeded low-risk alcohol use limits (≥ 3 drinks in a day for women, ≥ 4 drinks in a day for men) in any 24-hour period during the prior year, a time frame consistent with other hazardous drinking studies (Satre, Chi, Eisendrath, & Weisner, 2011). Additional enrollment information and details of inclusion criteria for the study can be found in the baseline paper (Silverberg et al., 2018). The study received IRB approval from KPNC and the University of California, San Francisco, and informed consent was obtained from each participant.

Measures

Quality of Life (QoL)—QoL, the primary outcome variable, was assessed using the 12-item Short Form Survey (SF-12). The SF-12 includes two domains: physical QoL and mental QoL, both scored from 0 to100, with higher scores representing better QoL (Ware, Kosinscki, & Keller, 1996). High validity and reliability have been established with this tool in PLWH, including PLWH who use substances and across ages older than 18 years (Aden et al., 2015; Wu, Revicki, Jacobson, & Malitz, 1997).

Demographic characteristics and HIV clinical factors—Age, gender, race/ethnicity, marital status, education, and employment status were obtained from surveys, and HIV exposure risk groups (i.e., men who have sex with men [MSM] or bisexual, injection drug use, heterosexual, and unknown/other), CD4+ T cell count, and HIV RNA levels (viral load) were obtained from the KPNC HIV registry. The median age at baseline for our sample was 49 years (interquartile range: 43, 57). Age groups were categorized as (a) 50 years and older and (b) younger than 50 years. This age group categorization was consistent with other studies (Monteiro, Canavarro, & Pereira, 2016; Moore et al., 2014).

Substance use characteristics—Substance use was measured using self-report questions about hazardous alcohol use in the previous 30 days, and any tobacco, marijuana, or other substance use, in the previous 30 days. Other substance use (which was grouped together for analysis) included prescription drug use other than as prescribed, tranquilizers, stimulants, cocaine, painkillers, heroin, hallucinogens, and ecstasy in the previous 30 days. For the analyses, hazardous alcohol use was defined as four or more drinks per day more than four times in the past 30 days for women and five or more drinks per day more than four times in the past 30 days for men.

Mental health symptoms—Depression symptoms were measured using the Patient Health Questionnaire (PHQ-9), a 9-item instrument based on DSM-IV depression criteria (Kroenke, Spitzer, & Williams, 2001). The PHQ-9 is a valid and reliable measure of depression severity and has been found to make criteria-based diagnoses of depressive disorders; the conciseness of the PHQ-9 makes it a useful clinical and research tool (Kroenke et al., 2001). Scores range from 0 to 27, with higher scores indicating more symptoms (Dum, Pickren, Sobell, & Sobell, 2008). For our analyses, PHQ-9 scores were

dichotomized, with scores 0–9 indicating *no/mild depression* and 10–27 indicating *moderate/severe depression*. Anxiety was measured using the Generalized Anxiety Disorder-7 (GAD-7), a valid and reliable measure of symptoms of anxiety (Shacham, Morgan, Önen, Taniguchi, & Overton, 2012). This test has good internal and test-retest reliability, as well as construct, convergent, and factorial validity to diagnose generalized anxiety disorder (Spitzer, Kroenke, Williams, & Löwe, 2006). Scores range from 0 to 21, with higher scores indicating more symptoms. GAD-7 was dichotomized with scores 0–9 rated as *no/mild anxiety* and 10–21 as *moderate/severe anxiety*.

Statistical Analyses

Summary statistics, including percentages, for patient characteristics were reported for the total sample ($N = 614$) and by age group (< 50 years, ≥ 50 years). Chi-square tests compared categorical variables and Student's *t*-tests compared continuous variables between age groups, given that normality assumptions were not violated.

For our first objective, linear regression models were constructed to evaluate the association of age on the two primary outcomes of mental and physical QoL. To assess the influence of confounding factors, models were adjusted sequentially for the following variables: (a) age group; (b) additional demographic characteristics (gender, race/ethnicity with White as the control group; marital status, education, employment, and HIV exposure risk factor with MSM as the control group); (c) HIV clinical characteristics (CD4+ T cell count, HIV RNA levels); and (d) alcohol and substance use (tobacco, other substances) and mental health symptoms (depression, anxiety).

For our second objective, we again used linear regression to identify a final model for other factors associated with mental and physical QoL. Other factors possibly associated with mental and physical QoL included demographic variables, HIV clinical characteristics, alcohol and substance use, and mental health symptoms. The final model was determined by backward selection, which involved iteratively removing the least significant variable that did not meet $p < .10$ levels. Once the variable was removed, it remained excluded. This process was repeated until all remaining variables were below the $p < .10$ levels. Final models in strata defined by age were also constructed using backward selection. Beta coefficients with 95% confidence intervals (CIs) are presented, with statistical significance defined as $p < .05$. All analyses were conducted using SAS Version 9.3 (SAS Inc., Cary, NC).

Results

A total of 614 PLWH met study qualifications and completed study questionnaires to be included in the sample. The mean age of participants was 48.9 years ($SD = 11.0$). Participants were predominantly male (97.1%), non-Hispanic White (62.7%), and included PLWH 50 years of age and older ($n = 304$) and PLWH younger than 50 years of age ($n = 310$). Table 1 shows group differences based on age. PLWH 50 years of age and older were more likely to be employed ($p < .001$); were less likely to report recent hazardous alcohol use ($p < .001$), tobacco use ($p < .001$), and other substance use ($p < .05$); and reported less anxiety ($p < .05$) than PLWH younger than 50 years of age (see Table 1). The mean mental

QOL score was lower in PLWH younger than 50 years of age compared to PLWH 50 years of age and older ($M = 42.7$, $SD = 11.7$ and $M = 46.1$, $SD = 11.6$, respectively; $p < .001$). The mean physical QoL score was higher in PLWH younger than 50 years of age compared to PLWH 50 years of age and older ($M = 51.6$, $SD = 8.4$ and $M = 47.7$, SD 10.1, respectively; $p < .001$).

In bivariate models, PLWH younger than 50 years of age had a better mental QoL score compared to PLWH 50 years of age and older (difference = 3.4, 95% CI: 1.6, 5.2; $p < .001$). PLWH younger than 50 years of age had a poorer physical QoL score compared to PLWH 50 years of age and older (difference = −4.0, 95% CI: −5.4, −2.5; $p < .001$; see Table 2). Age group remained significant after sequentially including all other factors. In the multivariable model, adjusting for other demographic variables, HIV clinical characteristics, substance and alcohol use, and mental health symptoms, age remained significant for both mental QoL (difference = 2.4, 95% CI: 0.8, 4.0; $p = .005$) and physical QoL (difference = −3.1, 95% CI: −4.6, −1.6; $p < .001$; see Table 2).

Mental and Physical QoL for Total Sample

We identified the final model with strongest independent factors associated with mental QoL in PLWH. PLWH 50 years of age and older had a 2.6-unit greater mental QoL compared to PLWH younger than 50 years of age (difference = 2.6, 95% CI: 1.0, 4.2; $p < .01$). Hispanic race/ethnicity compared to White race/ethnicity was significantly associated with better mental QoL (difference = 3.8, 95% CI: 1.5, 6.1; $p < .01$). Other substance use (difference = −3.6, 95% CI: −5.3, −1.8; $p < .001$), having moderate to severe depression symptoms (difference = −8.4, 95% CI: −11.0, −5.8; $p < .001$), and having moderate to severe anxiety symptoms (difference = −10.3, 95% CI: −13.0, −7.5; $p < .001$) were significantly associated with poorer mental QoL in our sample.

Next, we identified the final model for physical QoL in PLWH (Table 3). Having a college education compared to lacking a high school diploma or equivalent (difference = 2.4, 95% CI: 0.6, 4.2; $p < .01$) and employment (difference = 5.4, 95% CI: 3.8, 7.0; $p < .001$) were associated with better physical QoL. PLWH 50 years of age and older compared to ages younger than 50 years (difference = −3.2, 95% CI: −4.6, −1.7; $p < .001$), HIV exposure risk group of using injection drugs compared to bisexual or MSM (difference = −3.8, 95% CI: −6.7, −0.9; $p < .05$), and moderate to severe depression symptoms (difference = −4.6, 95% CI: −6.6, −2.7; $p < .001$) were associated with poorer physical QoL.

Factors Associated with Mental Quality of Life, by Age Group

In PLWH younger than 50 years ($n = 310$), Hispanic race/ethnicity compared to White race/ethnicity (difference = 4.2, 95% CI: 1.3, 7.2; $p < .01$), being married (difference = 2.5, 95% CI: 0.3, 4.8; $p < .05$), and being employed (difference = 3.6, 95% CI: 0.7, 6.5; $p < .05$) were associated with better mental QoL (Table 4). Moderate to severe depression symptoms (difference = −9.2, 95% CI: −12.7, −5.7; $p < .001$) and moderate to severe anxiety symptoms (difference = −8.0, 95% CI: −11.6, −4.3; $p < .001$) were associated with poorer mental QoL for PLWH younger than 50 years of age (Table 4).

For PLWH 50 years of age and older (n = 304), Hispanic race/ethnicity (difference = 3.9, 95% CI: 0.1, 7.8; p < .05) was associated with better mental QoL compared to White participants. Other substance use in the prior 30 days (difference = −4.0, 95% CI: −6.6, −1.3; p < .01), moderate to severe depression symptoms (difference = −8.5, 95% CI: −11.6, −3.9; p < .001), and moderate to severe anxiety symptoms (difference = −13.7, 95% CI: −18.0, −9.4; p < .001) were associated with poorer mental QoL.

Factors Associated with Physical Quality of Life by Age Group

In PLWH younger than 50 years of age (n = 310), college (difference = 2.5, 95% CI: 0.1, 4.8; p < .05) or graduate school education (difference = 2.9, 95% CI: 0.2, 5.6; p < .05) compared to less than high school or equivalent education, employment (difference = 3.8, 95% CI: 1.4, 6.2; p < .01), and other substance use (difference = 2.0, 95% CI: 0.04, 3.9; p < .05) were associated with better physical QoL (Table 5). Black race/ethnicity compared to White (difference = −4.5, 95% CI: −8.1, −1.0; p < .05), HIV exposure risk factor of injection drug use compared to MSM or bisexual exposure (difference = −4.4, 95% CI: −7.7, −1.1; p < .05), and having moderate to severe depression (difference = −3.5, 95% CI: −5.8, −1.2; p < .01) were associated with poorer physical QoL.

In PLWH 50 years of age and older (n = 304), employment (difference = 6.3, 95% CI: 4.1, 8.5; p < .001) compared to unemployment was associated with better physical QoL. Hazardous alcohol use (difference = −3.6, 95% CI: −6.6, −0.6; p < .05) and moderate to severe depression (difference = −5.8, 95% CI: −8.9, −2.7; p < .001) were associated with poorer physical QoL.

Discussion

In a large, primary-care based sample of PLWH from an integrated health system, we found that PLWH younger than 50 years of age had significantly poorer mental QoL and better physical QoL than older PLWH, even after controlling for demographic, HIV clinical characteristics, substance use, depression, and anxiety factors. In addition to age, key factors associated with poorer mental QoL included other substance use, moderate to severe depression, and moderate to severe anxiety. Finally, in addition to age, key factors associated with poorer physical QoL included injection drug use and moderate to severe depression. Of note, HIV clinical characteristics, including CD4+ T cell levels and HIV RNA levels, were not associated with QoL.

Our finding of poorer mental QoL but better physical QoL for younger PLWH was consistent with some, but not all, prior research. Previous studies suggested that PLWH report poorer QoL based on age (Chen & Barbour, 2017). Although one study in China found that older PLWH reported worse mental and physical QoL and more depression compared to younger PLWH (Liu et al., 2014), our results were consistent with findings from other studies indicating that older PLWH reported poorer physical QoL compared to their younger counterparts (Liu et al., 2014; Monteiro et al., 2016). Older PLWH reported more physical symptoms compared to younger PLWH, such as more co-morbidities and declines in activities of daily living, which related to poor physical QoL (Monteiro et al., 2016). As people age, more symptoms associated with co-morbid conditions negatively

affect physical health, which can relate to poor physical QoL (Liu et al., 2014; Monteiro et al., 2016).

Other demographic variables, including race/ethnicity, education, and employment were significantly associated with mental or physical QoL in our study. Contrary to the literature, Hispanic race/ethnicity was associated with better mental QoL compared to White PLWH in our sample. One explanation could be that in KPNC, given equal access to care, there are fewer racial/ethnic differences in response to ART and clinical outcomes (Silverberg, Leyden, Quesenberry, & Horberg, 2009). One group showed that higher education was associated with better physical QoL (Degroote, Vogelaers, & Vandijck, 2014), a trend also seen in our sample. Employment was also significantly related to better mental QoL, which was consistent with another study (Degroote et al., 2014). Employment constitutes a large part of daily life, even as people age, and can provide structure, role identity, meaning, and a social support network. It is important to highlight the roles of education, and employment in poor physical QoL, as declines in physical QoL have been associated with adverse physical symptoms (Degroote et al., 2014).

Contrary to another study (Armon & Lichtenstein, 2012), HIV clinical characteristics in our sample were not associated with QoL. One study found that lower CD4+ T cell count and more advanced stage of HIV disease were associated with poorer QOL (Degroote et al., 2014). Despite low HIV RNA levels (≤ 50 copies/mL) and fairly high CD4+ T cell count (≥ 350/mm^3), older PLWH reported poor physical QoL due to increased problems of mobility, daily function, and self-care, but reported improved mental QoL (McGowan et al., 2014). It is possible that we were not able to also observe this association because our sample was well treated and overall had high CD4+ T cell counts; in addition, a high proportion had undetectable HIV RNA levels.

HIV exposure risk group (injection drug use compared to MSM or bisexual) was associated with poorer physical QoL and other substance use was associated with poorer mental QoL, a finding consistent with the literature (Millar, Starks, Gurung, & Parsons, 2017). In our sample, other substance use (including prescription drug use other than as prescribed, tranquilizers, stimulants, cocaine, painkillers, heroin, hallucinogens, and ecstasy) was associated with poorer mental QoL. The relationship of recent substance use and history of injection drug use with QoL could be attributed to indirect causes, including exacerbation of mental health symptoms. Millar et al. (2017) found no relationship between substance use and QoL after adjusting for mental health issues (depression and anxiety), but we found that a history of injection drug use was strongly associated with poorer physical QoL and recent substance use was strongly associated with poorer mental QoL.

In our study, depression was a significant factor associated with both mental and physical QoL; anxiety was a significant factor associated with mental QoL. Depression can cause physical problems, including lack of sleep, poor appetite, and fatigue, and negatively affect physical QoL in PLWH (Degroote et al., 2014). Furthermore, depression has a direct effect on adherence to medications, which can directly impact a person’s physical health (Degroote et al., 2014). Anxiety was strongly associated with poor mental QoL in our study, a similar finding in PLWH in Uganda (Ezeamama et al., 2016). The study by Zimpel and Fleck

(2014) emphasized the need to assess and treat anxiety and depression in PLWH, because mental health symptoms directly affect HIV risk behavior and QoL. Overall, our findings supported findings that having moderate to severe depression and anxiety contributed to poor QoL in PLWH (Mays, Jones, Delany-Brumsey, Coles, & Cochran, 2017). Our results reinforce the importance of treating mental health symptoms to enhance overall QoL in PLWH.

Limitations

Several study limitations are noted. First, the sample was primarily male, and included patients who were insured and had well-controlled HIV disease. Thus, findings are not generalizable to women living with HIV or populations with publicly-funded health care. Nevertheless, the sample was highly generalizable to PLWH with insurance, as KPNC provides care to approximately 30% of all insured Californians (Gordon, 2011). In addition, due to the cross-sectional nature of the data, we cannot draw conclusions about the directionality of relationships between many clinical factors and QoL. Finally, we did not analyze other key factors that may impact QoL, such as common medical co-morbidities, and psychosocial variables such as social support.

Conclusion

In this large primary care-based sample, we found that QoL in PLWH with well-controlled HIV disease varied by age, with older patients reporting poorer physical but better mental QoL compared to younger patients. Thus, it is important to develop effective treatment planning and age-appropriate interventions to improve QoL across the lifespan. Other factors, including substance use and mental health symptoms, were also strongly associated with QoL, highlighting the potential impact of effective screening and treatment of these conditions in PLWH. Together, results suggest that measurement of broader functional outcomes such as QoL in clinical practice improves understanding of patient perspectives, which health care providers can use as a foundation for directing comprehensive, patient-centered care.

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Key Considerations

- Clinicians should consider tailoring interventions to improve physical QoL in older PLWH, because older PLWH report lower physical QoL scores compared to their younger counterparts.
- Addressing mental health and substance use in PLWH is important, as both are associated with mental and physical QOL.
- The nursing profession can contribute to improved QoL for PLWH across the lifespan by addressing mental and physical QoL by age groups.
- It is important to treat mental health symptoms, specifically depression and anxiety, in all ages, because they affect QoL and health in PLWH.

Table 1

Baseline Characteristics of Study Sample Living With HIV, Total and by Age

Characteristic	Total	< 50 years of age	≥ 50 years of age	*p*-value[a]
	***N* = 614**	***n* = 310**	***n* = 304**	
Gender (Male), %	96.7	95.8	97.7	0.19
Race/ Ethnicity, %				< .001
White	62.7	53.2	72.4	
Hispanic	14.0	7.7	8.9	
Black	9.1	20	10.5	
Unknown/Other[b]	14.2	19.0	8.2	
Married, %	43.8	41.3	46.4	0.20
Education, %				0.69
< HS/GED	25.4	26.1	24.7	
AA/AS	17.1	17.7	16.5	
College	35.2	35.8	34.5	
≥ Graduate School	22.3	20.3	24.3	
Employed, %	72.5	82.3	62.5	< .001
HIV exposure risk factor, %				0.26
MSM or bisexual	73.1	70.3	76.0	
Injection Drug Use	6.4	8.1	4.6	
Heterosexual	4.2	4.2	4.3	
Unknown/Other[c]	16.3	17.4	15.1	
CD4+ T cell count (≥ 500 cells/mm^3), %	71.8	76.1	67.4	0.05
HIV RNA levels < 75 copies/mL, %	93.5	91.9	95.1	0.12
Hazardous alcohol use[d]	23.1	31.9	14.1	< .001
Tobacco use[e]	24.4	30.7	18.1	< .001
Marijuana use[e]	49.8	51.0	48.7	0.57
Other substance use[e,f]	27.4	31.3	23.4	0.03
Moderate/Severe Depression[g]**, %**	16.1	18.7	13.5	0.079
Moderate/Severe Anxiety[h]**, %**	13.8	17.1	10.5	0.018

Note. HS/GED = High school/General Education Development; AA/AS = Associates in Arts/Associates in Science; MSM = men who have sex with men.

[a] Based on Pearson Chi-square test comparing < 50 years old to ≥ 50 years old

[b] Includes Asian, American Indian, Other, and Unknown

[c] Includes Transfusion/Other/Unknown

[d] Defined as 4 drinks for women and 5 drinks for men in a day for 4+ days in the past 30 days

[e] Use in the past 30 days

[f] Other substances include prescription drug use other than as prescribed, tranquilizers, stimulants, cocaine, painkillers, heroin, hallucinogens, and ecstasy

[g] Patient Health Questionnaire (PHQ)-9 score

[h] Generalized Anxiety Disorder (GAD)-7 score

Table 2

Associations of Mental and Physical Quality of Life by Age

Mental Quality of Life			
Factors in Model	**Age difference[a]**	**95% CI**	***p*-value**
Age only[b]			
Age ≥ 50 years (< 50 years reference)	3.4	(1.6, 5.2)	< .001
Age, Demographics[c]			
Age ≥ 50 years (< 50 years reference)	4.1	(2.2, 6.0)	< .001
Age, Demographic, HIV Clinical[d]			
Age ≥ 50 years (< 50 years reference)	4.0	(2.0, 5.9)	< .001
Age, Demographic, HIV Clinical, Substance use, Mental Health Characteristics[e]			
Age ≥ 50 years (< 50 years reference)	2.4	(0.8, 4.0)	.0047
Physical Quality of Life			
Factors in Model	**Age difference[a]**	**95% CI**	***p*-value**
Age only[b]			
Age ≥ 50 years (< 50 years reference)	−4.0	(−5.4, −2.5)	< .001
Age, Demographics[c]			
Age ≥ 50 years (< 50 years reference)	−3.0	(−4.5, −1.5)	< .001
Age, Demographic, HIV Clinical[d]			
Age ≥ 50 years (< 50 years reference)	−3.0	(−4.4, −1.4)	< .001
Age, Demographic, HIV Clinical, Substance use, Mental Health Characteristics[e]			
Age ≥ 50 years (< 50 years reference)	−3.1	(−4.6, −1.6)	< .001

Note. CI = confidence interval.

[a] Differences by age from linear regression models and interpreted as mean quality of life summary scores for persons living with HIV ≥ 50 years of age minus scores for persons living with HIV < 50 years of age.

[b] Bi-variate model including only age group.

[c] Demographic variables included in model: gender, race/ethnicity, marital status, education, employment status, and HIV risk group.

[d] HIV clinical characteristics included in model: CD4+ T cell counts and HIV RNA levels.

[e] Substance use and psychosocial variables included in the model: Alcohol use defined as 4 drinks for women and 5 drinks for men in a day for 4+ days in the past 30 days, Marijuana and Tobacco use in past 30 days, and other substance use (prescription drug use other than as prescribed, tranquilizers, stimulants, cocaine, painkillers, heroin, hallucinogens, and ecstasy); Mental Health Characteristics include depression as assessed by the Patient Health Questionnaire (PHQ)-9 score and anxiety as assessed by the Generalized Anxiety Disorder (GAD)-7 score

Table 3

*Demographics, HIV Clinical Characteristics, Alcohol/Substance Dependence, and Psychosocial Factors Associated With Mental and Physical Quality of Life (*n *= 614)*

Variables[a]	Mental Quality of Life			Physical Quality of Life		
	Difference	95% CI	*p*-value	Difference	95% CI	*p*-value
Age ≥ 50 years (< 50 years reference)	2.6	(1.0, 4.2)	0.0013	−3.2	(−4.6, −1.7)	<.001
Race/Ethnicity						
Hispanic	3.8	(1.5, 6.1)	0.0011			
Black	2.1	(−0.6, 4.8)	0.10			
Unknown/Other[b]	0.3	(−2.0, 2.6)	0.79			
White (reference)	0.0					
Married	1.5	(−0.004, 3.1)	0.05			
Education						
< HS/GED (reference)				0.0		
AA/AS				0.9	(−1.3, 3.1)	0.42
College				2.4	(0.6, 4.2)	0.0094
≥ Graduate School				1.7	(−0.3, 3.7)	0.10
Employed	1.7	(−0.03, 3.5)	0.05	5.4	(3.8, 7.0)	< .001
HIV exposure risk factor, %						
MSM or bisexual				0.0		
Injection Drug Use				−3.8	(−6.7, −0.9)	0.01
Heterosexual				−0.3	(−3.8, 3.1)	0.85
Unknown/Other[c]				−0.6	(−2.4, 1.3)	0.56
Other substance use[d]	−3.6	(−5.3, −1.8)	< .001	1.5	(−0.1, 3.1)	0.06
Moderate to Severe Depression[e]	−8.4	(−11.0, −5.8)	< .001	−4.6	(−6.6, −2.7)	< .001

Variables[a]	Mental Quality of Life			Physical Quality of Life		
	Difference	95% CI	*p*-value	Difference	95% CI	*p*-value
Moderate to Severe Anxiety[f]	−10.3	(−13.0, −7.5)	< .001			

Note. CI = confidence interval; HS/GED = High school/General Education Development; AA/AS = Associates in Arts/Associates in Science; MSM = men who have sex with men.

[a.] Linear regression models using backward selection for final model selection. Variables without results were excluded based on $p > .10$ criterion.

[b.] Includes Asian, American Indian, Other, and Unknown

[c.] Includes Transfusion/Other/Unknown

[d.] Use in the past 30 days and includes prescription drug use other than as prescribed, tranquilizers, stimulants, cocaine, painkillers, heroin, hallucinogens, and ecstasy

[e.] None to mild depression is the reference group, from Patient Health Questionnaire (PHQ)-9 score

[f.] None to mild anxiety is the reference group, from Generalized Anxiety Disorder (GAD)-7 score

Table 4

Demographics, HIV Clinical Characteristics, Alcohol/Substance Dependence, and Psychosocial Factors Associated With Mental Quality of Life by Age Groups

Variables[a]	< 50 years of age			≥ 50 years of age		
	Difference	**95% CI**	***p*-value**	**Difference**	**95% CI**	***p*-value**
Race/Ethnicity						
Hispanic	4.2	(1.3, 7.2)	< .01	3.9	(0.1, 7.8)	0.043
Black	3.1	(−1.1, 7.2)	0.15	2.5	(−1.0, 6.1)	0.16
Unknown/Other[b]	1.2	(−1.7, 4.1)	0.403	−1.2	(−5.1, 2.8)	0.0036
White (reference)	0.0					
Married	2.5	(0.3, 4.8)	0.027			
Education						
< HS/GED (reference)	0.0					
AA/AS	2.2	(−1.1, 5.6)	0.1857			
College	−0.4	(−3.2, 2.4)	0.78			
≥ Graduate School	−2.8	(−6.1, 0.5)	0.092			
Employed	3.6	(0.7, 6.5)	0.015			
Tobacco use[c]	−2.3	(−4.7, 0.04)	0.054			
Other substance use[d]				−4.0	(−6.6, −1.3)	0.0036
Moderate to Severe Depression[e]	−9.2	(−12.7, −5.7)	< .001	−8.5	(−11.6, −3.9)	< .001
Moderate to Severe Anxiety[f]	−8.0	(−11.6, −4.3)	< .001	−13.7	(−18.0, −9.4)	<. 001

Note. CI = confidence interval; HS/GED = High school/General Education Development; AA/AS = Associates in Arts/Associates in Science.

a. Linear regression models using backward selection for final model selection. Variables without results were excluded based on $p > .10$ criterion.

b. Includes Asian, American Indian, Other, and Unknown

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[c] Use in the past 30 days

[d] Use in the past 30 days and other substances include prescription drug use other than as prescribed, tranquilizers, stimulants, cocaine, painkillers, heroin, hallucinogens, and ecstasy

[e] None to mild depression is the reference group, from Patient Health Questionnaire (PHQ)-9 score

[f] None to mild anxiety is the reference group, from Generalized Anxiety Disorder (GAD)-7 score

Table 5

Demographics, HIV Clinical Characteristics, Alcohol/Substance Dependence, and Psychosocial Factors Associated With Physical Quality of Life by Age Groups

Variables[a]	< 50 years of age			≥ 50 years of age		
	Difference	95% CI	*p*-value	Difference	95% CI	*p*-value
Race/Ethnicity						
Hispanic	−2.0	(−4.4, −0.5)	0.11			
Black	−4.5	(−8.1, −1.0)	0.013			
Unknown/Other[b]	0.9	(−2.0, 3.8)	0.54			
White (reference)	0.0					
Education						
< HS/GED (reference)						
AA/AS	2.5	(−0.2, 5.3)	0.07			
College	2.5	(0.1, 4.8)	0.04			
≥ Graduate School	2.9	(0.2, 5.6)	0.033			
Employed	3.8	(1.4, 6.2)	< .01	6.3	(4.1, 8.5)	< .001
HIV risk exposure group						
Unknown/Other[c]	−1.5	(−4.6, 1.5)	0.32			
Injection Drug Use	−4.4	(−7.7, −1.1)	0.01			
Heterosexual	1.2	(−3.4, 5.8)	0.62			
MSM or bisexual (reference)	0.0					
Hazardous alcohol use[d]				−3.6	(−6.6, −0.6)	0.019
Other substance use[e]	2.0	(0.04, 3.9)	0.046			
Moderate to Severe Depression[f]	−3.5	(−5.8, −1.2)	0.0035	−5.8	(−8.9, −2.7)	< .001

Note. CI = confidence interval, HS/GED = High school/General Education Development; AA/AS = Associates in Arts/Associates in Science; MSM = men who have sex with men.

[a] Linear regression models using backward selection for final model selection. Variables without results were excluded based on $p > 0.10$ criterion.

[b] Includes Asian, American Indian, Other, and Unknown

[c] Includes Transfusion/Other/Unknown

[d] Defined as 4 drinks for women and 5 drinks for men in a day for 4+ days in the past 30 days

[e] Use in the past 30 days and other substances include prescription drug use other than as prescribed, tranquilizers, stimulants, cocaine, painkillers, heroin, hallucinogens, and ecstasy

[f] None to mild depression is the reference group, from Patient Health Questionnaire (PHQ)-9 score