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Racial and Socioeconomic Disparities in the Symptom Profile of Persons Living with HIV

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Abstract

Persons living with HIV (PLWH) today can survive decades with the disease, making the symptom experience much more relevant to their lifestyle and health outcomes. The goal of the research reported here was to assess the symptom reporting of PLWH in the United States (US) in the combined antiretroviral therapy (cART) age of the epidemic. We conducted an anonymous online survey of symptomatic PLWH in the US and asked participants to report the frequency and intensity of 28 frequently occurring symptoms in the past 30 days. The relationship between symptom reporting and demographic factors was investigated using the adaptive least absolute shrinkage and selection operator (LASSO) method. Fatigue was the most frequently reported symptom in our study population. Those with the lowest income were more likely to report more burdensome symptoms. In comparison to other racial and ethnic groups, Black non-Hispanic participants were significantly more likely to report a lower symptom burden score for fatigue, depression, muscle aches, anxiety, difficulties with memory and concentration. There were no racial/ethnic differences in the burden of the symptoms related to sleep or neuropathy. Findings from this study present new evidence on the symptom reporting of PLWH in the US. Neuropathy continues to be a pervasive neurological symptom with no difference noted between racial/ethnic groups.

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Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from all individual participants included in the study.

Keywords

Symptoms; HIV; HANA conditions; online survey; racial disparities

Introduction

Persons living with chronic diseases often have a high burden of symptoms, which can affect their quality of life, physical functioning and overall health.(1–5) In contrast to the high mortality rate in the early days of the HIV epidemic, persons living with HIV (PLWH) today can, with current combination antiretroviral therapy (cART), survive decades with the disease, making the symptom experience of the disease much more relevant to their lifestyle and health outcomes. The symptom experience of PLWH was well-studied in the early years of the epidemic. Symptoms experienced by PLWH were associated with a negative impact on quality of life,(7–11) poorer health and functioning,(9, 12–16) and poorer adherence to ART.(17, 18) In fact, research has shown that quality of life and productivity decrease as the number and severity of HIV-related symptoms increase.(19, 20)

Even though HIV has evolved from a life-threatening acute illness to a chronic condition, PLWH often experience re-occurring symptoms from the disease, its treatment, and co-morbid conditions. (21).(22) Consequently, Much of the research on the symptom experience among PLWH is dated,(23–31) restricted to single site studies,(32–35) and based on old symptom indexes.(28, 29, 33, 34, 36–40) Therefore, it is clear that the symptom experience of PLWH today needs to be understood in the context of cART, including once a day regimens, long-term adherence to ART medications, and age-related comorbidities as opposed to illness progression and toxicity associated with early ART regimens.(21)

Another area in need of further understanding relates to racial, ethnic and socioeconomic differences in symptom burden. Past research has shown that those from low socioeconomic groups are more likely to report higher symptom burden.(41, 42) In contrast, racial and ethnic differences in symptom burden are inconclusive with some studies finding symptom burden to differ between racial/ethnic groups,(33, 36, 40, 43) and others finding no significant differences between groups.(28, 37, 44) Overall, the literature on HIV self-reported data is very sparse and has mainly focused on self-reported CD4 counts and health service utilization among marginalized populations living with HIV.(45, 46) Given the mixed findings and the dearth of existing evidence, our study examines racial, ethnic and socioeconomic differences in symptom reporting in PLWH.

Methods

After securing approval from the Columbia University Medical Center Institutional Review Board, we conducted an anonymous online survey of PLWH in the US from February to August 2016. Study participants were recruited through banner ads placed on the following sites: Facebook, Craigslist, POZ, BGCLive, and the Well Project. Participants were eligible for the study if they were HIV+, 18 years or older, able to read and respond in English, resided within the US, reported having experienced symptoms in the past 4 weeks, and were willing to participate in an online survey.

Participants who clicked on the study banner advertisements (see Figure 1) were automatically directed to a study landing page that screened potential participants. The screening survey, administered through Qualtrics, included questions related to the eligibility criteria described above. If they qualified for the study, then participants were directed to complete the consent form. Study participants were asked: 1) “In the past 30 days, which of the following 28 symptoms made it difficult to carry out your daily activities? (Check all that apply)” (Table 2). Participants were then asked to rate on a 4 point scale: 2) “how often they experienced the symptom and how much the symptom interfered with their day to day activities in the past 30 days?” In addition, study participants were asked to complete demographic questions and identify self-care strategies they had used to ameliorate their symptoms. These results are reported elsewhere.(47) Participants were also asked whether they had any of the following HANA conditions: asthma, bronchitis, cardiovascular disease, COPD, diabetes, liver disease, osteoporosis, renal failure, and arthritis.

We implemented a number of precautionary measures to prevent fraud in our study. including: no incentive payments, trap questions and a reCAPTCHA code.

Data Management and Analysis

Data were downloaded from Qualtrics to Excel. Data were first examined to ensure that there were no duplicate responses (eg. multiple entries by the same person). Descriptive statistics were used to analyze the demographic characteristics of the study participants. We developed a symptom score which incorporated the frequency and bothersomeness of each symptom. If frequency is “No” then score=0; If frequency is not “No” and bothersome is “A little” then score=1; If frequency is not “No” and bothersome is “somewhat” then score=2; If frequency is not “No” and bothersome is “quite a bit” then score=3; If frequency is not “No” and bothersome is “very much” then score=4. This scoring was based on the Memorial Symptom Assessment Scale, an index that combines frequency and bothersomeness to capture symptom burden in oncology and AIDS patients.(48)

Once we developed a symptom score for each participant, we estimated the mean and corresponding S.E. of each score. For multivariable analyses, we focused on the 9 most frequently reported symptoms. Our initial multiple regression model included following independent variables: age, sex, race, ethnicity, sexual orientation, number of HANA conditions, AIDS diagnosis, income and employment. We used the adaptive LASSO (least absolute shrinkage and selection operator) method to select the final model since it produces better prediction accuracy and interpretability of the statistical models than the commonly used stepwise selection and backward elimination methods when there are a large number of possible predictive variables and many of these variables are correlated.(49) To illustrate, we first dichotomized dummy variables for categorical variables are automatically created, then predictors are selected based on LASSO. There is no traditional significance test with the LASSO method and so the final model typically excludes some dichotomized variables that were initially categories within a categorical variable.

Results

Study Sample

1,373 completed the entire survey and are included in our sample. Demographics of the study sample are included in Table 1. We had respondents from all 50 states with the most respondents in California (N= 231) and the fewest number in West Virginia (N =1).

A symptom score was calculated based on frequency and bothersomeness with daily activities and was based on Memorial Symptom Assessment Scale. The mean (S.E.) and frequency of the symptom burden score in order of severity is reported in Table 2. Fatigue is the most frequently reported symptom in our study population, followed by depression, muscle aches, and difficulty falling asleep. Pain or discomfort during sex is the least frequently reported symptom.

Symptom Clustering

We identified symptoms that were highly correlated by identifying groups of highly related symptoms based on the percent of variance explained in disjoint symptoms clusters. Five symptoms clusters were identified from the 28 symptoms (Figure 2): 1) Fatigue, nausea, diarrhea, and depression; 2) constipation, thirst, and dry eyes; 3) cough, fever, shortness of breath, heartburn; 4) speech, difficulty concentrating and memory; and 5) urination, erection problems, painful sex, and decreased sex drive. The total percent of variance explained by the 5 clusters is 40% (0.3996).

The results of our multi-regression analysis of the 9 most frequently reported symptoms are reported in Table 3. Among almost all of the symptoms, those with the lowest income (less than \$20,000/year) as compared to those with higher incomes were more likely to report more burdensome symptoms for the top nine symptoms. Having fewer HANA conditions was predictive of less burdensome symptom reporting for all of the 9 most frequently reported symptoms except depression and difficulty falling asleep. Women reported significantly greater symptom burden for muscle aches only. Those working full-time reported significantly lower symptom burden for neuropathy. Those diagnosed with AIDS had significantly greater symptom burden for fatigue, difficulty with memory, and neuropathy, though those with a recent low CD4 count (<200) had a significantly lower symptom score for difficulty with memory, adjusting for AIDS diagnosis. In comparison to other racial and ethnic groups, including white non-Hispanics, Hispanics and others, black non-Hispanic participants were significantly more likely to report a lower symptom burden score for fatigue, depression, muscle aches, anxiety, difficulties with memory and concentration. There were no racial/ethnic differences in the burden of the symptoms related to sleep or neuropathy.

Discussion

Despite advances in cART medications, adverse symptoms in PLWH continue to be common. As the demographic profile of PLWH continues to evolve, the symptom experience of PLWH may be further influenced by individual clinical and non-clinical characteristics. By means of an online survey, our national study aimed to capture symptom

reports from PLWH in the cART era. Specifically, we sought to reach a large sample of PLWH to characterize symptom reports by racial, ethnic, and socioeconomic differences. Online recruitment allowed us to reach a large, geographically, racially, ethnically and socioeconomically diverse group of PLWH and employed a quick medium to enroll participants.

Past research on symptoms among PLWH has focused on topics such as symptom experience and incidence,(23–26, 29, 30, 38, 50) as well as symptom management.(31, 36, 37, 44, 51, 52) Many of the prior studies on the symptom experience and incidence in PLWH were conducted at a single site(32–34) or were conducted before the age of cART. (23, 24, 53, 54) We did not use two frequently used HIV symptom indexes since these instruments were developed before the advent of advanced cART.(55, 56) Instead, the symptom data reported in this survey presents outputs from earlier work; We presented our study participants with a large array (N=28) of symptom choices that could best capture the full range of possible symptoms. Our selection of 28 symptoms was based on the number of symptoms from past surveys of PLWH, and the selection of specific symptoms was based on most frequently reported symptoms in past studies. For example, in a study in the Washington, D.C. area, PLWH experienced an average of 15.2 out of 39 listed symptoms (38.97%).(57) In another study in New York City, Baltimore, and Alabama, PLWH reported that they experienced an average of 10.9 (34.06%), 11.9 (37.19%), and 12.7 (39.69%) of 32 listed symptoms, respectively.(58) The 2000 iteration of the National HIV Costs and Services Utilization Survey indicated that at least 50% PLWHA in the United States report experiencing up to seven out of fourteen HIV/AIDS-related symptoms within a six-month period (50%) and less than 10% of PLWH report no symptoms.(59) Finally, a study of 504 PLWH in New York City who also had chronic conditions noted that this population experienced on average 16.7 out of 32 symptoms at the time that they received care from a physician.(60)

In three other studies, the symptom profiles of those living with HIV were similar to some of the findings in our study, with fatigue being the most frequently reported symptom.(61, 62). (33) Despite the changes in management of the disease and its treatment, fatigue persists as a burdensome symptom among PLWH. The etiology of fatigue is multifactorial and has been associated with various physiologic and psychological factors including being attributed to the long-term effects of inflammation from the virus,(63, 64) whose mechanism is still not well-understood.

Depression, muscle aches, anxiety and difficulty with sleep were among the top 10 most frequently reported symptoms across multi-site studies as well as in more recent single site studies. These findings are similar to the symptom frequencies that we identified in our large national study. In contrast to earlier studies, thirst and diarrhea were infrequently reported in our study sample and were also not reported as being very burdensome (Table 2). The improvement in diarrhea in our current study population is to be expected given improvements in protease inhibitors.(65, 66)

Similar to past research, our study found that neuropathy is the most common neurological complication in HIV. Past studies estimate that approximately 30–60% of PLWH report

symptoms of neuropathy.(55, 56, 67) We found that just under 30% of our participants reported symptoms of neuropathy. Past research also suggests that neuropathy is associated with taking ART. The lower incidence of neuropathy in our study sample may be contributed to improvements in ART, as many of those studies are dated. It may also be a result of selection bias in some of the smaller studies that focus only on PLWH with neuropathy symptoms, since people report a high burden associated with this symptom and therefore may be more likely to seek help and participate in studies related to their symptom burden(68–70).

Past studies on symptoms among PLWH have focused on identifying symptom clusters,(33, 43) as symptoms often have moderating and mediating effects on one another.(54, 71) For example, the symptom cluster of weight loss, polydipsia, polyuria and polyphagia is often associated with the diagnosis of diabetes.(33) Of the five symptom clusters represented in our survey data, four can be easily understood. For instance, constipation, thirst, and dry eyes are often associated with dehydration; speech, difficulty concentrating and remembering are associated with neurological deficit; cough, fever, shortness of breath and heartburn are often represented by a compromised respiratory system; and urination, difficulty with erection, decreased sex drive and painful sex are all related to the genitourinary system. The first symptom cluster, fatigue, nausea, diarrhea, and depression, cannot be as easily explained and has not been reported previously in the literature as being highly related.

Socioeconomic differences in the symptom experience have been noted in previous studies. There is strong evidence across studies that PLWH with higher annual income and who are employed have lower symptom scores.(25, 29, 36) Similarly, in our study, across symptoms there was a significantly higher symptom score reported among PLWH with the lowest level of income (<\$20,000 per year) as compared to other income levels. We also found PLWH working full-time reported a lower symptom score for neuropathy.

In past studies, there have been mixed findings on racial/ethnic disparities in symptom reporting in PLWH. One study found that being of black race was associated with reporting a greater number of symptoms and greater level of symptom bothersomeness,(25) in contrast to findings of another study that being of white or black race, compared to Hispanic, was negatively related to symptom intensity.(36) In another study, compared to Blacks and Hispanics, whites reported higher prevalence of: fatigue, sadness, poor sleep, nervousness/anxiousness, and memory loss.(33) The inconclusive evidence across these studies made our analysis highly relevant.

In our study, Hispanic descent was not a significant predictor for symptom reporting across all symptoms. However, being Black/non-Hispanic, compared to any other racial group, was a significant predictor for reporting the following symptoms as being less burdensome: fatigue, depression, muscle aches, anxiety, difficulties with memory and concentration. The key finding that black non-Hispanics report fewer symptoms in several categories is noteworthy especially in light of past research. A limitation to this findings is that it is difficult to tell whether this difference is due to black non-Hispanics being less likely to report the symptoms or to them truly having fewer symptoms. Research on differences in

self-reported symptoms by race/ethnicity is not concrete. Past studies with similar findings have suggested that this difference may be due to genetic differences or differences in social support and self-care strategies.(72, 73)

Moreover, there were no racial differences in symptom burden of sleep difficulties or neuropathy. As discussed earlier, the physiologic basis for symptoms related to neuropathy may be different than the other symptoms that we explored. The uniformity of the symptom reporting across racial/ethnic groups may suggest that there is a unique mechanism that underlies this symptom in PLWH.

Limitations

There are a number of limitations to our study. First, there is a possibility for self-selection bias, as participants who are willing to participate in a health-related survey may be more likely to be experiencing health-related issues. The inclusion criteria of needing to report having experienced symptoms in the past 4 weeks has the potential to introduce bias in understanding symptom differences and may not be representative of the general population of PLWH. Second, all information collected as part of our survey was self-reported and may include over or underreporting of symptom burden. While a validated scale was used to score symptoms, symptom validity remains a challenging concept to define and manage and often requires a multi-method approach, involving both individual and clinical reports, specifically in the context of mental health.(74) However, in other clinical contexts, such as cancer, symptom validity measures have demonstrated high agreement between patient and clinician reports.(75) Third, online research has typically reported lower completion and retention rates than offline research as there are fewer social constraints compared to in-person interviewing.(31) Since study participants were not paid for completing this survey, there may have been less motivation to complete the survey unless it was of relevance to their own health.(71) Finally, past research has suggested that there is a digital divide and this would likely influence our sampling strategy, yet current estimates suggest that 88% of Americans use the Internet with no differences in racial and ethnic groups and the largest differences in use are by income and age groups, with older and lower-income Americans being less likely to use the Internet.(76) At the same time, our study sample mirrored the current national estimates of the age and income of PLWH, demonstrating the generalizability of our findings.(77, 78) Given the widespread use of the Internet across racial, ethnic, socioeconomic groups(79) and the widespread distribution across these groups in our study sample, it is unlikely that this sampling bias affected our survey data.(80)

Conclusion

Findings from this study present new evidence on the symptom reporting of a national sample of PLWH in the US. Fatigue continues to be the most prevalent symptom in PLWH even as the controllability of the disease and its treatment have progressed. The decreases in reporting of diarrhea and thirst are notable as well and likely attributable to advancements in treatment. In comparison to other racial and ethnic groups, including white non-Hispanics, Hispanics and others, black non-Hispanic participants were significantly more likely to

report fewer symptoms except in the case of neuropathy, which continues to be a pervasive neurological symptom with no difference noted between racial/ethnic groups.

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Figure 1.
Sample Study Banner Ad

Figure 2.
Phylogram showing Symptom Clusters.

TABLE 1

Participant characteristics (N=1,373)

Gender, n (%)	
Male	957 (69.7)
Female	385 (28.0)
Other	14 (1.0)
Missing	17 (1.2)
Sexual orientation, n (%)	
Homosexual	816 (59.4)
Bisexual	141 (10.3)
Heterosexual	399 (29.1)
Missing	17 (1.2)
Race, n (%)	
White, non-Hispanic	721 (52.5)
Black, non-Hispanic	369 (26.8)
Hispanic	163 (11.9)
Other	91 (6.6)
Unknown	29 (2.1)
Education, n (%)	
Less than high school	54 (3.9)
High school and some college	733 (53.4)
College degree or higher	554 (40.3)
Unknown	32 (2.3)
Income, n (%)	
Less than \$20,000	506 (36.9)
\$20,000 to \$59,999	461 (33.6)
\$60,000 and above	286 (20.8)
Missing	120 (8.7)
Ever had an AIDS diagnosis, n (%)	
Yes	479 (34.9)
No	821 (59.8)
Unknown	73 (5.3)
Number of HANA conditions, n (%)	
0	563 (41.0)
1	486 (35.4)
2	193 (14.1)
3+	131 (9.5)

TABLE 2

Symptom Scores N = 1,373

	Symptom Burden Score		Frequency of persons reporting the symptom (%)
	Mean	SE	
Overall low energy or fatigue	1.374	0.037	57.8
Depression	1.011	0.037	41.7
Muscle aches or pain	1.005	0.036	42.0
Difficulty falling asleep	0.914	0.037	35.5
Anxiety or fear	0.833	0.035	35.4
Difficulty staying asleep	0.829	0.034	34.9
Difficulty remembering	0.629	0.031	27.6
Neuropathy	0.609	0.031	26.9
Difficulty concentrating	0.594	0.031	24.2
Decreased sex drive	0.543	0.028	28.3
Diarrhea	0.484	0.026	24.3
Problems achieving or maintaining erection	0.467	0.027	23.1
Shortness of breath	0.424	0.025	20.8
Constipation, gas, or bloating	0.397	0.024	20.2
Thirst or dry mouth	0.342	0.022	20.0
Clumsiness or difficulty with balance	0.338	0.023	16.5
Unplanned changes in weight	0.315	0.023	15.7
Lightheadedness or dizziness	0.312	0.021	17.3
Heartburn	0.282	0.020	16.1
Dry eyes	0.265	0.020	15.2
Changes in appetite	0.244	0.020	12.4
Ringing in ears or noise intolerance	0.240	0.018	14.6
Cough	0.239	0.019	12.7
Nausea or vomiting	0.208	0.018	11.0
Fever, night sweats, or chills	0.195	0.018	10.1
Difficulty with urination	0.177	0.017	9.5
Speech difficulties	0.131	0.015	6.4
Pain or discomfort during sex	0.057	0.011	2.8

Table 3

Factors Associated with Symptom Reporting, using Logistic Regression with LASSO Regularization

Symptom	Predictor	Beta	95% Confidence Interval	
Fatigue	<i>Number of HANA Conditions</i>			
	0	−0.490	−0.670	−0.310
	1	−0.348	−0.528	−0.168
	Female	0.151	−0.008	0.310
	Black Non-Hispanic	−0.457	−0.618	−0.296
	Education unknown or not answered	−0.631	−1.101	−0.161
	Income <\$20,000	0.486	0.341	0.631
	No AIDS Diagnosis	−0.454	−0.599	−0.309
Reference groups: Number of HANA Conditions (2+); Female (male, other, missing); Black non-Hispanic (white non-Hispanic, Hispanic, other, missing); Education unknown or not answered (some high school or less, high school/GED/some college/associates degree/technical school, 4-year college graduate or higher); Income <\$20,000 (\$20,000–\$60,000, >=\$60,000, missing); No AIDS Diagnosis (yes, don't know)				
Depression	Black Non-Hispanic	−0.365	−0.528	−0.202
	Income <\$20,000	0.617	0.470	0.764
Reference groups: Black non-Hispanic (white non-Hispanic, Hispanic, other, missing); Income <\$20,000 (\$20,000–\$60,000, >=\$60,000, missing)				
Muscle Aches	<i>Number of HANA Conditions</i>			
	0	−0.979	−1.151	−0.807
	1	−0.644	−0.820	−0.468
	Female	0.415	0.254	0.576
	<i>Age</i>			
	Unknown	0.391	0.222	0.560
	45–54	0.298	0.139	0.457
	Black Non-Hispanic	−0.220	−0.379	−0.061
	Income <\$20,000	0.396	0.257	0.535
	Reference groups: Number of HANA Conditions (2+); Female (male, other, missing); Age (18–44, 55–64, 65+); Black non-Hispanic (white non-Hispanic, Hispanic, other, missing); Income <\$20,000 (\$20,000–\$60,000, >=\$60,000, missing)			
Difficulty Falling Asleep	Female	0.134	−0.027	0.295
	Income <\$20,000	0.489	0.340	0.638
Reference groups: Female (male, other, missing); Income <\$20,000 (\$20,000–\$60,000, >=\$60,000, missing)				
Anxiety	0 HANA Conditions	−0.250	−0.387	−0.113
	Age 18–44	0.223	0.062	0.384
	Black Non-Hispanic	−0.423	−0.578	−0.268
	Income <\$20,000	0.485	0.348	0.622
Reference groups: Number of HANA Conditions (1+); Age (45–54, 55–64, 65+, missing); Black non-Hispanic (white non-Hispanic, Hispanic, other, missing); Income <\$20,000 (\$20,000–\$60,000, >=\$60,000, missing)				

Symptom	Predictor	Beta	95% Confidence Interval	
Difficulty Staying Asleep	0 HANA Conditions	-0.252	-0.387	-0.117
	Female	0.141	-0.010	0.292
	Income <\$20,000	0.254	0.113	0.395
Reference groups: Number of HANA Conditions (1+); Female (male, other, missing); Income <\$20,000 (\$20,000–\$60,000, >=\$60,000, missing)				
Difficulty with Memory	0 HANA Conditions	-0.184	-0.307	-0.061
	Black Non-Hispanic	-0.184	-0.323	-0.045
	Income <\$20,000	0.292	0.167	0.417
	CD4 count <200	-0.211	-0.376	-0.046
	No AIDS Diagnosis	-0.258	-0.383	-0.133
Reference groups: Number of HANA Conditions (1+); Black non-Hispanic (white non-Hispanic, Hispanic, other, missing); Income <\$20,000 (\$20,000–\$60,000, >=\$60,000, missing); CD4 count <200 (200–349, 350–499, 500+); No AIDS Diagnosis (yes, don't know)				
Neuropathy	<i>Number of HANA Conditions</i>			
	0	-0.602	-0.753	-0.451
	1	-0.423	-0.574	-0.272
	Age 18–44	-0.221	-0.360	-0.082
	Fulltime Job	-0.235	-0.372	-0.098
	Income <\$20,000	0.232	0.097	0.367
	No AIDS Diagnosis	-0.270	-0.393	-0.147
Reference groups: Number of HANA Conditions (2+); Age (45–54, 55–64, 65+, missing); Fulltime Job (part time, other/no full time job/no part time job); Income <\$20,000 (\$20,000–\$60,000, >=\$60,000, missing)				
Difficulty with Concentration	0 HANA Conditions	-0.230	-0.352	-0.108
	Black Non-Hispanic	-0.370	-0.507	-0.233
	Income <\$20,000	0.316	0.191	0.441
Reference groups: Number of HANA Conditions (1+); Female (male, other, missing); Black non-Hispanic (white non-Hispanic, Hispanic, other, missing); Income <\$20,000 (\$20,000–\$60,000, >=\$60,000, missing)				

NOTE, candidate variables included in model selection: HANA (HIV-Associated non-AIDS) Conditions (0, 1, 2+); sex (male, female, other, missing); age (18–44, 45–54, 55–64, 65+, missing); sexual orientation (bisexual, heterosexual, homosexual, missing); race (Black non-Hispanic, white non-Hispanic, Hispanic, other, missing); education (some high school or less, high school/GED/some college/associates degree/technical school, 4-year college graduate or higher, missing); employment (full time, part time, other/no full time job/no part time job); income (<\$20,000, \$20,000–\$60,000, >=\$60,000, missing); CD4 count (<200, 200–349, 350–499, 500+); AIDS diagnosis (yes, no, don't know)