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Suitability of the PROMIS Alcohol Use Short Form for Screening in a HIV Clinical Care Setting*

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Abstract

Background—At-risk alcohol use is important to identify in clinical settings to facilitate interventions. The Patient-Reported Outcomes Measurement Information System (PROMIS) Alcohol Use Short Form was developed through an item response theory process, but its utility as a screening instrument in clinical care has not been reported.

Objective—To determine the ability of the PROMIS Alcohol Use Short Form to identify people with current or future at-risk alcohol use defined by the Alcohol Use Disorders Identification Test consumption (AUDIT-C) instrument.

Methods—Observational study of people living with HIV (PLWH) in clinical care at four sites across the US. Patients completed a tablet-based clinical assessment prior to seeing their providers at clinic appointments. We used 3 definitions of clinically-relevant at-risk alcohol use and determined the proportion of PLWH with current or future at-risk drinking identified by the PROMIS instrument.

Results—Of 2,497 PLWH who endorsed 1 drink in the prior 12 months, 1,500 PLWH (60%) endorsed “never” for all PROMIS items. In that group, 26% had clinically-relevant at-risk alcohol use defined by one or more AUDIT-C definitions. At follow-up (N=1,608), high baseline PROMIS scores had 55% sensitivity for at-risk drinking among those with at-risk drinking at baseline, and 22% sensitivity among those without baseline risk.

Conclusions—The PROMIS Alcohol Use Short Form cannot be used alone to identify PLWH with clinically-relevant at-risk alcohol use. Optimal assessment of problem drinking behavior is not clear, but there does not seem to be an important role for the PROMIS instrument in this clinical setting.

Keywords

At-risk alcohol use; HIV; clinical care; patient-reported outcomes; screening

1. BACKGROUND

At-risk alcohol use is associated with adverse clinical outcomes, including suboptimal adherence to recommended medical interventions, cognitive problems, mood disorders, a number of cancers, hypertension, liver disease, injuries and violence (Boden and Fergusson, 2011; Corrao et al., 2004; Zahr et al., 2011). Among persons living with HIV (PLWH), at-risk alcohol use is prevalent and associated with delayed initiation of and decreased adherence to antiretroviral therapy (ART) and decreased viral suppression (Braithwaite et al., 2005; Chander et al., 2006; Cook et al., 2001; Galvan et al., 2002; Samet et al., 2004). These considerations have led to the recommendation to assess alcohol use in routine clinical care for PLWH (Conigliaro et al., 2003) and also for adults in primary care in the general population (Moyer and Preventive Services Task, 2013; U. S. Preventive Services Task Force, 2004).

Although it is clear that it is important to assess alcohol use, the optimal measure to identify clinically-relevant at-risk alcohol use in routine clinical care settings is not as clear. One well-known option is the Alcohol Use Disorders Identification Test consumption questions (AUDIT-C; Bradley et al., 2003; Bush et al., 1998), a brief instrument that measures the frequency and amount of alcohol consumed including binge drinking. The AUDIT-C has been studied in a variety of settings (Bell and Britton, 2015; Blank et al., 2015). Criteria for clinically-relevant at-risk alcohol use based on AUDIT-C responses have been established (Bradley et al., 2007; Gual et al., 2002). There is extensive literature supporting the clinical relevance of providing brief interventions for patients whose screen results suggest at-risk alcohol use (Beich et al., 2003; Moyer et al., 2002; Moyer and Preventive Services Task, 2013; Whitlock et al., 2004).

Other instruments developed to assess alcohol use include PROMIS Alcohol Use, whose initial description and analyses (Pilkonis et al., 2013) detail the development of several Alcohol-related domains, including the “Alcohol Use” domain, from exploratory factor analyses of data from a substance use treatment sample and a general population sample, with subsequent development based on psychometric considerations. The authors co-calibrated the 10-item AUDIT to the PROMIS Alcohol Use and Alcohol Negative

Consequences domains, and found that the PROMIS Alcohol Use domain had better measurement precision of Alcohol Use as defined by the PROMIS items than did the AUDIT (see Figures 6 and 7 from Pilkonis et al., 2013) and associated discussion).

Further validation of the PROMIS alcohol use scales was conducted in an outpatient substance use treatment setting (Pilkonis et al., 2016), and considered the AUDIT-C, which is of critical relevance in considering the use of the PROMIS instrument in routine clinical care. They found a correlation of 0.70 between a PROMIS alcohol use and AUDIT-C scores. The AUDIT-C focuses specifically on the consumption or use items of the AUDIT and as described above is commonly used for screening in clinical care due to both its brevity and its ability to identify those with at-risk alcohol use who may benefit from intervention. Even if the PROMIS scale measures the domain defined by its items with more precision than the AUDIT-C does, if it does not identify substantial proportions of people with at-risk alcohol use it may not be suitable as a stand-alone instrument to screen for that clinically relevant behavior.

We conducted this study to better understand the measurement of clinically-relevant at-risk alcohol use by the PROMIS Alcohol Use instrument as compared with the established AUDIT-C in clinical care. We administered both instruments as part of one assessment at routine clinical care visits in four clinics caring for PLWH across the U.S., specifically focusing on the identification of clinically-relevant at-risk alcohol use.

2. METHODS

2.1 Overview

We used a web-based platform to collect patient-reported data via touch-screen tablets immediately before scheduled routine clinical care visits at clinics across the Centers for AIDS Research Network of Integrated Clinical Systems (CNICS). Here we examined data from AUDIT-C and the PROMIS Alcohol Use Short Form administered at 4 CNICS sites to PLWH who reported drinking alcohol in the previous 12 months. We used psychometric approaches to evaluate the dimensionality (i.e., are the 2 instruments measuring the same construct) and measurement properties of the AUDIT-C and the PROMIS Alcohol Use Short Form. We used three different definitions of clinically-relevant at-risk alcohol use based on AUDIT-C responses, and determined the proportion with clinically-relevant at-risk alcohol use identified by the PROMIS Alcohol Use Short Form. We analyzed AUDIT-C data available from follow-up visits at least 30 days after the baseline visit at which both the PROMIS Alcohol Use Short Form and the AUDIT-C were collected together. With these data, we evaluated the ability of the PROMIS Alcohol Use Short Form to predict future at-risk alcohol use based on AUDIT-C responses among those who did not have at-risk alcohol use at the baseline visit, and among those who did have at-risk alcohol use at the baseline visit.

2.2 Participants

This observational cohort study was conducted among patients from the CNICS cohort. CNICS is a longitudinal observational study of PLWH from 8 clinical sites receiving

primary care from 1/1/1995 to the present (Kitahata et al., 2008). Informed consent was obtained in accordance with the Declaration of Helsinki.

2.3 The CNICS Assessment

Patients used touch-screen tablets to complete the CNICS assessment every 4–6 months. The assessment included alcohol use as measured by the AUDIT-C (Crane et al., 2007; Fredericksen et al., 2012) as well as a number of other domains important for clinical care and research. As previously described (Crane et al., 2007; Fredericksen et al., 2012), we used web-based survey software developed specifically for measuring patient reported measures and outcomes (PROs). Patients who are medically unstable at the time of a visit, appear intoxicated, have a cognitive impairment, or do not speak English or Spanish are not asked to complete the assessment.

For this project, the PROMIS Alcohol Use domain was selected after reviewing the possible clinical relevance of each of the four PROMIS alcohol scales. PROMIS Alcohol Use items were administered as part of the clinical assessment at four CNICS sites: the Madison HIV Clinic at the University of Washington in Seattle, the 1917 HIV Clinic at the University of Alabama at Birmingham, the Fenway Clinic in Boston, and the HIV Clinic at the University of California at San Diego. Data were collected between January, 2012 and April, 2015.

2.4 Alcohol use items

The AUDIT-C asks three questions about alcohol use during the past year; 1) how often a patient had a drink containing alcohol, 2) the usual quantity of drinks consumed, and 3) the frequency of drinking a large number of drinks at one time. If a patient's response to the first question is never, then the other questions are skipped. Consistent with prior studies, we modified question 3 to ask about the frequency of consuming 5 or more drinks for men and 4 or more for women (Dawson et al., 2005). The original item, which asked about the frequency of 6 or more drinks, was initially tested in Australia where the standard drink size is smaller than in the United States (Dawson et al., 2005). The modified version more accurately captures the level of intake assessed in the original instrument (Dawson et al., 2005). Each item receives a score of 0 to 4. The clinically-relevant at-risk definitions for the Audit-C are given in Section 2.6.

The PROMIS Alcohol Use Short Form includes 7 items that all refer to the past 30 days. Response options for each item are on a 5-point ordinal scale, ranging from 0 ("Never") to 4 ("Always"). The 7 items were:

- I had trouble controlling my drinking
- It was difficult to get the thought of drinking out of my mind
- It was difficult for me to stop drinking after one or two drinks
- I spent too much time drinking
- I drank more than I planned
- I drank too much

- I drank heavily at a single sitting

2.5 Item administration

Item 1 from the AUDIT-C was used as a screening item. People who endorsed “Never” (0 points) did not receive other alcohol use items and were excluded from these analyses. People who endorsed item 1 were administered the other 2 AUDIT-C items and all 7 PROMIS Alcohol Use Short Form items in fixed format (i.e., all items were administered to all such people). Test-retest reliability for the PROMIS Alcohol Use Short Form in this sample is in Supplemental Methods 1¹.

2.6 Definitions of at-risk alcohol use

We defined clinically at-risk alcohol use based on sex and responses to AUDIT-C items exactly as specified in Gual et al (2002) and Bradley et al (2007). Item scores for the three items were summed, and two sex-specific thresholds were defined based on this sum score: a higher level of at-risk alcohol use was defined as an AUDIT-C total score of at least 5 points for men and 4 for women (Gual et al., 2002), and a lower level was defined as at least 4 points for men and 3 for women (Bradley et al., 2007). In secondary analyses, we excluded people from an at-risk category if the responses were based only on the first item, frequency of drinking, as is recommended by the Substance Abuse and Mental Health Services Administration (Web reference 1). Separately, clinically-relevant at-risk alcohol use was defined based on responses to item 3, where reports of monthly or more frequent consumption of large amounts of alcohol were used to define binge drinking.

We fixed PROMIS Alcohol Use Short Form items to item parameters from Pilkonis *et al* (2013), which created scores with a mean of 0 and a standard deviation of 1 based on the sample evaluated in that study. For many PROMIS domains, scores >1 standard deviation above the norm are defined as clinically relevant (Cella et al., 2014); this was the threshold we also used for the PROMIS Alcohol Use Short Form scores.

2.7 Analytic procedure

We used the tools of psychometrics to determine if the AUDIT-C and PROMIS Alcohol Use Short Form measured the same construct (unidimensionality), and to compare their range and measurement precision (see Supplemental Methods 1²). A PROMIS score of -1.1 corresponded to responding “Never” for all items. We grouped the remaining scores into four groups, -0.5 to < 0, 0 to < 0.5, 0.5 to < 1, and 1 – 2.7, to compare them with at-risk alcohol use as defined by the AUDIT-C. It is possible that differential timeframes could be responsible for discrepancies in findings between the AUDIT-C, which characterizes drinking frequency over the past 12 months, and the PROMIS Alcohol Use Short Form, which uses a timeframe of the past 30 days. To increase the likelihood of appropriate overlap, we repeated these comparisons among people who endorsed drinking alcohol at least “two to four times per month” (2 or more for Item 1 on the AUDIT-C). Finally, we

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examined the distribution of PROMIS scores for people who were judged to have at-risk drinking according to the AUDIT-C.

We then analyzed follow-up AUDIT-C data using the next visit that was at least 30 days following the baseline visit. We stratified analyses on the basis of whether the person had at-risk alcohol use as defined by the higher AUDIT-C threshold or the binge threshold at the baseline visit, and determined the sensitivity, specificity, and positive and negative predictive values of the PROMIS Alcohol Use Short Form scores >1 to identify the initiation of (among people without clinically-relevant at-risk drinking defined by the AUDIT-C) or continuing (among people with at-risk drinking defined by the AUDIT-C) at-risk drinking defined by the AUDIT-C.

We performed all statistical analyses with Mplus 7.11 (Muthén and Muthén, 2012), PARSCALE 4.1 (Muraki and Bock, 2003) and Stata version 14.1 (StataCorp, 2015).

3. RESULTS

3.1 Demographic characteristics

Across the 4 CNICS sites, AUDIT-C and PROMIS Alcohol Use Short Form items were administered to 2,497 PLWH who reported at least 1 drink in the past 12 months. Participant demographics, PHQ9 depression scores (Nine-item Patient Health Questionnaire; Spitzer et al., 1999), substance use, and HIV risk factor and medication use are in Table 1, broken down by alcohol risk according to the AUDIT-C and to the PROMIS Alcohol Use Short Form.

3.2 Psychometric findings

We found that the PROMIS Alcohol Use Short Form and AUDIT-C items were sufficiently unidimensional to use item response theory (IRT) methods (Supplementary Methods 1³); the AUDIT-C items could be considered to be indicators of the domain defined by the PROMIS Alcohol Use Short Form items. The correlation between the PROMIS Alcohol Use Short Form and the AUDIT-C was 0.62. We plotted standard errors of measurement against observed scores on the PROMIS metric for the two scales (Figure 1). In our dataset the AUDIT-C has a range that extends below the range addressed by the PROMIS Alcohol Use Short Form Items, indicating less of a floor effect for the AUDIT-C. For PROMIS Alcohol Use Short Form scores above the floor, the PROMIS Alcohol Use Short Form had better measurement precision than did the AUDIT-C.

3.3 Clinically relevant at-risk alcohol use defined by the AUDIT-C, and comparisons with PROMIS scores

Among this sample who reported drinking some alcohol in the prior 12 months, there were 1,136 people with clinically-relevant at-risk alcohol use defined by the lower AUDIT-C threshold (45%) of whom 731 also met the higher AUDIT-C threshold (29%) and 21% met the binge criterion based on responses to AUDIT-C item 3. In all, 1,145 people (46%) met

³Supplementary material can be found by accessing the online version of this paper at <http://dx.doi.org> and by entering doi:...

either the lower threshold or binge criterion, and 763 (31%) met either the higher threshold or binge criterion.

People who met at-risk alcohol use thresholds were found at every level of PROMIS Alcohol Use Short Form scores (Figure 2 and Table 2). Sixty percent of the PLWH endorsed the very lowest category (“never”) for all of the PROMIS Alcohol Use Short Form items and thus had a score at the floor. Of these, 26% had at-risk problem drinking by at least one definition on the AUDIT-C (Table 2).

In secondary analyses, only two people had AUDIT-C scores of at least 5 for men or at least 4 for women that were based only on the frequency of their drinking (item 1 of the AUDIT-C), so our findings for the higher AUDIT-C threshold are the same under the secondary definition. Sixty-five people with AUDIT-C scores of at least 4 for men and at least 3 for women were not at risk using the secondary definition. This reduced the proportion of people who met either the lower threshold or binge criterion from 46% to 43%, and the proportion of people who endorsed “never” for all of the PROMIS Items but had at-risk problem drinking by at least one of the secondary definitions on the AUDIT-C from 26% to 17%.

To address the possibility that timeframe differences were responsible for this finding, we repeated the primary analyses with the subset of 1,596 people who endorsed “two to four times per month” or more frequent alcohol use (2 or more points on AUDIT-C Item 1). In that group, 756 people (47%) endorsed “never” for all of the PROMIS Items; of those, 360 (48%) were identified as having at-risk levels of alcohol use by at least one definition of the AUDIT-C.

It may be possible to consider PROMIS Alcohol Use Short Form items as assessing level of concern about drinking among people with alcohol use and also the level of consequences they have experienced. Among people with at least one definition of at-risk alcohol use according to the AUDIT-C, a small minority of people with at-risk alcohol use had the very highest levels of concern about their drinking (Figure 3).

There were 1,608 individuals with a subsequent visit at least 30 days following the baseline visit. We categorized people on the basis of at-risk baseline AUDIT-C scores (defined using the higher total score threshold OR the binge threshold) and at-risk baseline PROMIS scores (defined as a score > 1 SD above the national norms) (Table 3). In the group of people who were not at-risk by the AUDIT-C alone, 1,057 were not at-risk according to PROMIS and 100 were at-risk according to PROMIS. We then examined whether there was predictive value to adding PROMIS information in this group, on the basis of subsequent at-risk AUDIT-C scores. The sensitivity of PROMIS for identifying the 108 people who would develop at-risk alcohol use at follow-up was only 0.22. The specificity was somewhat better at 0.93, but the positive predictive value was only 0.24. These data do not suggest great value in adding the PROMIS to people who did not have at-risk drinking according to the AUDIT-C, as over three-fourths of those who went on to have at-risk AUDIT-C scores would not be identified by PROMIS (low sensitivity), and three-fourths of the people

identified by PROMIS would not go on to have at-risk AUDIT-C scores (low positive predictive value).

We then considered the group of people who were at-risk by the AUDIT-C alone, of whom 236 were not at-risk according to PROMIS and 215 were at-risk according to PROMIS (Table 3). We examined whether there was predictive value to adding PROMIS information in this group, on the basis of subsequent at-risk AUDIT-C scores. In that group, the sensitivity of PROMIS for identifying people who would continue to have at-risk alcohol use at follow-up was 0.55. The specificity was only 0.66. The predictive power of a positive test was 0.74, and the predictive power of a negative test was only 0.46.

4. DISCUSSION

We administered AUDIT-C and PROMIS Alcohol Use Short Form items in 4 HIV clinics across the U.S. We found that the PROMIS Alcohol Use items were insufficiently sensitive to identify people with clinically-relevant at-risk alcohol use as defined by the AUDIT-C. Indeed, 60% of all PLWH who endorsed any drinking over the past year endorsed “never” for all of the PROMIS items, and of these, 17%–26% had at-risk drinking as defined by the two ways of classifying AUDIT-C responses. We also evaluated the ability of the PROMIS score to identify people who would initiate or continue at-risk drinking at follow-up. The sensitivity was very low (0.24) to identify people who would initiate at-risk drinking, and was also low (0.55) among those who would continue at-risk drinking.

As noted in Pilkonis et al. (2016), based on item content, the AUDIT-C assesses quantities of alcohol use, regardless of how the individual feels about that quantity, while the PROMIS Alcohol Use Short Form items assess respondent attitude about their alcohol use. While the PROMIS Alcohol Item Bank includes items that capture consumption itself, those items are not included on the Alcohol Use Short Form. Our results suggest that despite a correlation of 0.62 between the two scores, a substantial proportion of people whose quantity or pattern of alcohol consumption as reported on the AUDIT-C places them in an at-risk category do not self-identify their drinking as a problem. This does not mean that the PROMIS Alcohol Use Short Form is not a valid measure of its underlying construct; rather what we find is that it does not work for one specific purpose, which is identifying clinically-relevant at-risk alcohol use among PLWH.

It should be noted that we used responses of 2 or higher on item 3 of the AUDIT-C as one of our criteria for identifying people with binge alcohol use. It would also have been reasonable to use 1 or higher on this question as a definition of binge alcohol use, given that this is the cut-off recommended by NIAAA in their publication called *Helping Patients who Drink Too Much: A Clinician’s Guide* (Web reference 2). An even lower threshold on that item would have identified even more PLWH with at-risk alcohol use whose scores were at the floor of the PROMIS scale.

The PROMIS Alcohol Use Short Form had one advantage compared to the AUDIT-C, which is that its measurement precision is better in the region of scores above the floor of the instrument. It may play a role in assessing which patients with at-risk drinking have a

moderate-severe alcohol use disorder and thus need more intensive treatment or medication, rather than a brief intervention. It may also be more sensitive to change over time for patients with more severe at-risk alcohol use, whether they are being managed in primary care or specialty addiction treatment settings. However, because of the PROMIS Alcohol Use Short Form's insensitivity to identifying at-risk use, it cannot be substituted for the AUDIT-C for use in clinical care settings to identify at-risk alcohol use. Furthermore, in our analyses of follow-up AUDIT-C data, PROMIS Alcohol Use Short Form scores did not reliably identify sufficiently large proportions of people who would continue to have at-risk alcohol use (sensitivity = 0.55) and especially people who would develop at-risk alcohol use at the subsequent visit (sensitivity = 0.24). We do not have data to comment on the ability of the PROMIS Alcohol Use Short Form scores to track progress of alcohol treatment programs or to identify people especially like to enroll in treatment. While it may be especially valuable in these settings, we are not aware of evidence to support the clinical utility of using PROMIS in these ways.

Several limitations are worth noting. We only evaluated PLWH; generalizability to other settings is uncertain. Nevertheless, alcohol use is common among PLWH, making this a particularly relevant group to study, and we have no evidence that results from PLWH do not apply in other settings. While the CNICS assessment has been expanded to include additional languages such as Amharic, this study included only English and Spanish-speaking PLWH. We suspect results would be similar in other languages but do not have data. Alcohol use was patient-reported as part of the clinical assessment, which could lead to underestimates of risk behavior. However, electronic PRO collection may reduce social desirability bias relative to a face-to-face interview with a provider (Fairley et al., 2010). We were concerned that timeframe differences between the AUDIT-C and the PROMIS Alcohol Use Short Form could impact our findings, but sensitivity analyses among people who indicated that they drank two or more times per month produced similar results. Follow-up data were available for a sizable proportion of our cohort, but some people did not have a follow-up visit in the timeframe we considered here. It is unlikely but possible that additional follow-up data would have changed our conclusions regarding the ability of the PROMIS Alcohol Use Short Form to identify people who would continue to have or who would develop at-risk alcohol use at their next clinical visit.

At-risk alcohol use as defined by the AUDIT-C has been well established as a clinically relevant threshold. Since such a high proportion of PLWH with clinically-relevant at-risk alcohol use are not detected with the PROMIS Alcohol Use Short Form, we cannot advocate that it should replace the AUDIT-C in clinical settings. Furthermore, the PROMIS Alcohol Use Short Form does not reliably identify large proportions of people who will continue to have at-risk alcohol use, and especially does not identify large proportions of individuals who will develop at-risk alcohol use at their next clinical visit. Further study is needed to determine the best use of the PROMIS Alcohol Use Short Form in primary care and addiction treatment settings.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- The PROMIS Alcohol Use Short Form (PROMIS) was administered in HIV clinics
- Of current drinkers, 60% endorsed “never” for all PROMIS items.
- Of the 60%, 26% had at-risk alcohol use as defined by the AUDIT-C.
- PROMIS insufficiently identified at-risk alcohol use in people living with HIV.

Figure 1.

Standard errors of measurement plotted against observed scores on the PROMIS metric for the AUDIT-C (gray dots) and the PROMIS Alcohol Use Short Form (black dots)

- As noted, 60% of respondents endorsed the lowest category (“never”) for all of the PROMIS Alcohol Use Short Form items; these individuals are shown with the black dot at $(-1, 0.6)$. The value of 0.6 is not meaningful, as the only reason these people have a finite score is that we used expectation a posteriori (EAP) scoring, where a prior $(0,1)$ distribution is applied to item responses. The value of 0.6 for the standard error of measurement shown for these people is the value expected for people whose score is precisely -1 . That score is as valid as picking some other score, such as -1.5 or -2 ; those scores would have a much larger standard error of measurement than the one for -1 that is plotted in the figure.

Figure 2.
The proportion of PLWH who met at-risk alcohol use thresholds by AUDIT-C-based criteria in different regions defined by PROMIS Alcohol Use Short Form scores

Figure 3.
Distribution of PROMIS Alcohol Use scores for people with at-risk alcohol use according to at least one definition based on AUDIT-C criteria

Table 1

Participant description by alcohol risk according to the AUDIT-C and to the PROMIS Alcohol Use Short Form, where we used the higher AUDIT-C threshold or binge drinking for the AUDIT-C and a score > 60 for PROMIS (see section 2.6).

	Neither		AUDIT-C only		PROMIS only		Both		Total		p-value*
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Age	44.4	11.0	41.8	10.8	45.5	10.2	42.0	10.7	43.7	10.9	<0.001
PHQ9 Depression score	5.1	5.9	5.3	6.2	8.0	6.3	7.8	6.5	5.7	6.2	<0.001
	N	%	N	%	N	%	N	%	N	%	
Male	1376	87	330	86	143	93	350	93	2199	88	0.002
Race/ethnicity											0.291
White, non-Hispanic	871	55	199	52	78	51	206	54	1354	54	
Black, non-Hispanic	464	29	118	31	45	29	97	26	724	29	
Hispanic	172	11	51	13	25	16	58	15	306	12	
Other/unknown	73	5	17	4	6	4	17	4	113	5	
Suicidal (PHQ9 item)	135	9	34	9	29	19	81	21	279	11	<0.001
Amphetamines, past 3 months	119	8	35	9	19	12	47	12	220	9	0.007
Marijuana, past 3 months	523	34	174	46	57	38	202	55	956	40	<0.001
Cocaine, past 3 months	61	4	28	7	16	10	65	17	170	7	<0.001
Opiates, past 3 months	16	1	6	2	8	5	13	3	43	2	<0.001
HIV risk factor											0.054
MSM only	1122	71	257	67	115	75	265	70	1759	70	
Any IDU	151	10	37	10	16	10	44	12	248	10	
Heterosexual	279	18	84	22	19	12	55	15	437	18	
Other/Unknown	28	2	7	2	4	3	14	4	53	2	
Taking anti-HIV medications	1416	90	317	82	136	88	302	80	2171	87	<0.001
Total	1580	100	385	100	154	100	378	100	2497	100	

* ANOVA for age and depression score, χ^2 for race/ethnicity and HIV risk factor, Fisher's exact for the rest.

MSM=Men who have sex with men. IDU=Injection drug user. PHQ9=Nine-item Patient Health Questionnaire.

Table 2

Proportion of PLWH who met at-risk alcohol use thresholds by AUDIT-C-based criteria in different regions defined by PROMIS Alcohol Use Short Form scores

AUDIT-C	Floor	PROMIS				Total
		-0.5 to 0.0	0.0 to 0.5	0.5 to 1.0	>1.0	
None, no binge	1,103 (74%)	165 (35%)	68 (23%)	14 (9%)	2 (2%)	1,352
Lower threshold, no binge	189 (13%)	123 (26%)	54 (18%)	14 (9%)	2 (2%)	382
Higher threshold, no binge	91 (6%)	75 (16%)	50 (17%)	25 (17%)	5 (6%)	246
Binge only	6 (0%)	3 (1%)	0 (0%)	0 (0%)	0 (0%)	9
Lower threshold, binge	13 (1%)	5 (1%)	3 (1%)	2 (1%)	0 (0%)	23
Higher threshold, binge	98 (7%)	94 (20%)	126 (42%)	94 (63%)	73 (89%)	485
Total	1,500	465	301	149	82	2,497

Table 3

Ability of the baseline PROMIS Alcohol Use Short Form to identify people who would initiate (left half) or continue (right half) at-risk drinking as defined by the AUDIT-C*

At-risk by PROMIS	Not at risk by AUDIT-C at baseline		At risk by AUDIT-C at baseline	
	Not At-risk at follow-up	At-risk at follow-up	Not at -risk at follow-up	At-risk at follow-up
No	973	84	108	128
Yes	76	24	56	159
Total	1,049	108	164	287
				451

* For this table, at-risk drinking was defined as meeting either the higher AUDIT-C threshold or the binge threshold. Included are the 1,608 people who had at least one follow-up visit at least 30 days after their baseline visit where both the AUDIT-C and the PROMIS Alcohol Use Short Form were collected.