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Validating a Hazardous Drinking Index in a Sample of Sexual Minority Women: Reliability, Validity and Predictive Accuracy

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Abstract

Background—Although sexual minority women (SMW) are at increased risk of hazardous drinking (HD), efforts to validate HD measures have yet to focus on this population.

Objectives—Validation of a 13-item Hazardous Drinking Index (HDI) in a large sample of SMW.

Methods—Data were from 700 adult SMW (age 18–82) enrolled in the Chicago Health and Life Experiences of Women study. Criterion measures included counts of depressive symptoms and post-traumatic stress disorder (PTSD) symptoms, average daily and 30-day ethanol consumption, risky sexual behavior, and *Diagnostic and Statistical Manual (DSM-IV)* measures of alcohol abuse/dependence. Analyses included assessment of internal consistency, construction of receiver operating characteristic (ROC) curves to predict alcohol abuse/dependence, and correlations between HDI and criterion measures. We compared the psychometric properties (diagnostic accuracy and correlates of hazardous drinking) of the HDI to the commonly used CAGE instrument.

Results—KR-20 reliability for the HDI was 0.80, compared to 0.74 for the CAGE. Predictive accuracy, as measured by the area under the receiver operating characteristic curve for alcohol abuse/dependence, was HDI: 0.89; CAGE: 0.84. The HDI evidenced the best predictive efficacy and tradeoff between sensitivity and specificity. Results supported the concurrent validity of the HDI measure.

Conclusions—The Hazardous Drinking Index is a reliable and valid measure of hazardous drinking for sexual minority women.

Keywords

hazardous drinking; sexual minority women; alcohol abuse; alcohol dependence

Research with sexual minority women (SMW) has consistently demonstrated an increased risk for hazardous drinking (HD) compared to heterosexual women. In a U.S. national

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sample, SMW were 11 times as likely to meet criteria for alcohol dependence and 8 times as likely to seek help for alcohol problems as were heterosexual women (Drabble, Midanik, & Trocki, 2005). In the Drabble et al. study the prevalence of alcohol dependence was 11.5% for lesbians and 16.7% for bisexual women, compared to 2.3% for heterosexual women. In another study comparing SMW and heterosexual women (S. C. Wilsnack et al., 2008), the prevalence of heavy drinking (i.e., two or more drinkers per day or 14 or more drinks per week) was 4.4% for exclusively heterosexual women, 13.7% for exclusively lesbian, 8.4% for mostly lesbian, and 6.7% for bisexual women. Researchers have also found that SMW are more likely than heterosexual women to seek treatment for substance use problems (Grella, Greenwell, Mays, & Cochran, 2009; McCabe, West, Hughes, & Boyd, 2013).

There is considerable evidence that among SMW, HD is correlated with risky sexual behavior (Matthews et al., 2013; Patel et al., 2013; Shuper, Joharchi, Irving, & Rehm, 2009), smoking, (Lehavot & Simoni, 2011), history of sexual assault and associated post-traumatic stress disorder (PTSD) symptoms (D'Augelli, Grossman, & Starks, 2006; Han et al., 2013), and depression (Hughes, Johnson, Wilsnack, & Szalacha, 2007; Johnson et al., 2013; Lehavot & Simoni, 2011; Rosario, Schrimshaw, & Hunter, 2009). Although these relationships have also been observed in the general population, HD may be more strongly associated with negative outcomes among SMW (Drabble et al., 2005; Marshal et al., 2012; Needham, 2012; Ortiz-Hernandez, Tello, & Valdes, 2009; Ziyadeh et al., 2007).

Measurement of Hazardous Drinking

The problems associated with HD among SMW highlight the need for prevention and early intervention, and accurate monitoring of HD can play an important role in the responsive delivery of these services. In addition, it is important to assess HD as it may affect the treatment of other conditions, such as HIV (Cook et al., 2001). Several measures of problematic alcohol use are available, including the Alcohol Use Disorders Identification Test (AUDIT; Bohn, Babor, & Kranzler, 1995), the CAGE (Mayfield, McLeod, & Hall, 1974), and the Fast Alcohol Screening Test (FAST; Hodgson, Alwyn, John, Thom, & Smith, 2002). However, very few studies have examined the psychometric properties of these instruments in SMW samples (Johnson & Hughes, 2005; Winters, Remafedi, & Chan, 1996). Johnson and Hughes (2005) examined the CAGE's reliability and concurrent validity in a sample of 63 lesbians and 57 demographically similar heterosexual women. Comparable to results for heterosexual women, the CAGE was found to have an acceptable level of internal consistency in a sample of SMW (lifetime CAGE score: 0.66; past-year CAGE score: 0.72). The CAGE significantly distinguished between SMW who ever wondered vs. never wondered if they had a drinking problem.

Although informative, these findings merit cautious interpretation given the studies' small sample sizes. To our knowledge, there have been no systematic studies of HD measures in samples of SMW. Thus, the purpose of this study was to investigate the reliability and validity of the Hazardous Drinking Index (HDI) in a large sample of SMW. Questions included in the HDI were derived from an earlier 20-year longitudinal survey of women's drinking in the general population (R. W. Wilsnack, S. C. Wilsnack, & Klassen, 1984; R. W. Wilsnack, S. C. Wilsnack, Klassen & Harris, 1997). The purpose of developing the HDI was

to enable the retrospective and prospective monitoring of hazardous drinking among SMW. To assess the performance of the HDI in a sample of SMW, we compared the psychometric properties, including diagnostic accuracy and correlates of HD, of the HDI to the CAGE.

MATERIAL AND METHODS

Recruitment and Sample

The Chicago Health and Life Experiences of Women (CHLEW) study is a 15-year, three-wave longitudinal and multi-cohort investigation of risk and protective factors for HD among SMW. Data collection began in 2000–2001 (Wave I) with 447 women. We used multiple recruitment strategies including posting advertisement in local newspapers, on Internet lusters, and on flyers posted in churches and bookstores, and by distributing information about the study to individuals and organizations via formal and informal social events and networks. Women were eligible for the study if they self-identified as lesbian, were 18 years old or older and were fluent in spoken English. We conducted follow-up assessments of the original sample in 2004–2005 (Wave II) and 2010–2012 (Wave III). In Wave III we added a new cohort of younger women (age 18–25), bisexual women, and women of color (n=253). We recruited these participants using a modified version of Respondent Driven Sampling (Heckathorn, 1997). Analyses for the current paper include data from 700 women interviewed in Wave III.

Instruments

The CHLEW interview questionnaire was adapted from the National Study of Health and Life Experiences of Women (NSHLEW), a 20-year longitudinal study of drinking among women in the U.S. general population (R. W. Wilsnack, Kristjanson, Wilsnack, & Crosby, 2006; S. C Wilsnack, Klassen, Schur, & Wilsnack, 1991), with questions added about sexual orientation and other sexual-minority-related variables (e.g., internalized homophobia, sexual orientation disclosure). The survey questionnaire was administered in face-to-face interviews by trained female interviewers. Additional information about study design and methods can be found elsewhere (Bostwick, Everett & Hughes, 2015; Hughes et al., 2006, 2014; Wilsnack et al., 2008).

All measures included in the study were assessed at Wave III, unless otherwise specified.

Hazardous Drinking Index—We created an index of responses from 13 questions that assessed heavy drinking, problem drinking consequences, and symptoms of potential alcohol dependence. For each question, interviewers first asked participants whether this had “ever” happened. If the participant answered affirmatively, the interviewer then asked if this had happened in the past 12 months. We defined heavy episodic drinking (HED) as consumption of six or more drinks in a day. Intoxication was defined as drinking that “noticeably affected your thinking, talking, and behavior.” Preliminary analyses of the relationships of frequency of HED and intoxication to DSM-IV (American Psychiatric Association, 2000) criteria for alcohol abuse or dependence (AAD) revealed that one or more occasions of HED in the past 12 months and four or more intoxication episodes in the past 12 months provided optimal prediction. We used six items to assess adverse consequences of alcohol use (e.g., getting

into fights with one's partner, getting into fights with non-family members, being told by partner to cut down on drinking), and five items to assess symptoms of potential alcohol dependence (e.g., drinking in the morning, memory loss, rapid drinking). We summed the responses to produce an unweighted index with a range of 0–13.

CAGE—The CAGE is a four-item instrument that can be interviewer-administered or self-administered. Several studies have found that the CAGE is accurate in predicting *DSM* diagnoses for alcohol abuse and dependence (Bradley, Kivlahan, Bush, McDonell, & Fihn, 2001; Chan, Pristach, & Welte, 1994). The CAGE was designed to assess whether respondents *ever* exhibited signs of heavy alcohol use or alcohol-related problems. In the present study, however, we administered the CAGE by asking if participants had the experiences during the past 12 months. This enabled us to compare the CAGE and the HDI using the same timeframe; it is also consistent with guidelines for alcohol screening (Bradley et al., 2001; National Institute on Alcohol Abuse and Alcoholism, 1995).

Quantity/Frequency of Drinking—Interviewers asked participants about (1) the number of days they drank alcohol in the previous 30 days, and (2) the typical number of drinks they consumed on days when they drank. These two values were multiplied to provide an estimate of the number of drinks consumed during the previous 30 days.

Employing procedures from the NSHLEW (R. W. Wilsnack, Wilsnack, & Klassen, 1984), mean ethanol consumption was calculated using estimates of ethanol content for three beverage types and drink sizes: a standard drink of beer (12 oz.), wine (5 oz.), or liquor (1.5 oz. of 80-proof spirits), each containing approximately 0.5 ounces of ethanol. We combined information about the number, typical size, and ethanol content of drinks in the past 30 days, adjusting this estimate to take into account the frequency of heavy episodic drinking in the past 12 months.

DSM-IV Diagnostic Criteria for Alcohol Abuse or Dependence—Two dichotomous variables based on DSM-IV criteria represented past-year alcohol abuse and past-year alcohol dependence. We classified participants as meeting criteria for alcohol abuse if they endorsed one or more of four symptoms of abuse and did not meet diagnostic criteria for alcohol dependence. To meet criteria for alcohol dependence, participants needed to endorse three or more of seven symptoms. In keeping with current (DSM-5) criteria (American Psychiatric Association, 2013), we decided to combine alcohol abuse and alcohol dependence into a single variable. Our rationale for collapsing abuse and dependence classifications is that the HDI is intended as a global measure of alcohol-related problems and not as a tool for diagnosing alcohol abuse or dependence.

Depressive Symptoms—We used seven questions that assessed depressive symptoms the participant's lifetime: (1) appetite or weight change, (2) insomnia or hypersomnia, (3) psychomotor agitation, (4) fatigue or loss of energy, (5) feelings of worthlessness or guilt, (6) diminished concentration or decisiveness, and (7) suicidal ideation or previous attempts. The KR-20 reliability coefficient for the seven items was 0.81.

Post-Traumatic Stress Disorder (PTSD) Symptoms—We developed a scale consisting of seven symptoms associated with PTSD: (1) avoidance of reminders of the traumatizing experience by staying away from certain places, (2) loss of interest in enjoyable activities, (3) feeling isolated or more distant from others, (4) finding it more difficult to have love or affection for others, (5) feeling there is no point making plans for the future, (6) difficulty falling asleep, and (7) becoming jumpy or easily startled by ordinary noises and movements The timeframe for these questions are participant specific and based on when the criterion traumatic event (specified by the participant) occurred. For example, if the participant reported that she was raped five years ago and she chose this as the criterion event for which the PTSD symptom questions referred to, the timeframe for this measure would be five years. The KR-20 coefficient for this scale was 0.79.

Current Smoker—We used a single item that asked participants whether they currently smoke cigarettes.

Risky Sexual Behavior—Two measures were used to reflect risky sexual behavior: (1) number of sexual partners since the time of the last interview (i.e., approximately six years), and (2) neglecting to use birth control or safe sex practices while drinking during the past year. Each of these variables has been identified as a correlate of HD among SMW (Matthews et al., 2013).

Data Analysis

Dimensionality—We assessed the dimensional structure of the HDI by performing confirmatory factor analysis (CFA) using the mean- and variance-adjusted weighted least squares (WLSMV) estimator. WLSMV is a robust estimator designed specifically for ordinal observed variables and provides less biased and more accurate factor loadings relative to comparable maximum likelihood procedures (Li, 2015). We conceptualized a one-factor measurement model with uncorrelated error terms. Criteria for model fit included: (1) p values associated with model-fit chi-square > .05; (2) comparative fit index (CFI; Bentler, 1980) > 0.95; (3) root mean-square error of approximation (RMSEA) < .05, and (4) weighted root-mean-square residual (WRMR; Muthen & Muthen, 1998–2001) < 1.00 (Yu, 2002). The CFI is based on the model chi-square, with values ranging between zero and one. The RMSEA (Browne & Cukek, 1993) provides a measure of discrepancy per model degree of freedom. The RMSEA approaches zero as model fit improves. We performed all CFA analyses using MPlus version 7.2 (Muthen & Muthen, 2014).

Reliability—We assessed internal consistency by calculating the Kuder-Richardson 20 (KR-20) coefficient.

Concurrent Validity—We employed two methods for assessing concurrent validity. First, we performed receiver operating characteristic (ROC) curve analyses using scores on the HDI and CAGE to predict whether participants met DSM-IV criteria for AAD. An ROC curve is a plot of the percentage of true positives (i.e., the percentage of persons classified as having AAD based on their HDI or CAGE score, who have the disorder, referred to as *sensitivity*) versus the percentage of false positive (the percentage of persons classified as

meeting AAD criteria based on their HDI or CAGE score who do not have the disorder). This percentage, referred to as *specificity*, is 1- the percentage of true negatives. Sensitivity and 1-specificity are plotted for various cutpoints along the measure. The total possible area under the ROC curve is 1.0 (i.e., 0 to 1.0 for sensitivity by 0 to 1.0 for 1-specificity). Therefore, the area under the ROC curve ranges from zero to one, with higher values representing better predictive accuracy. To compare the predictive efficacy of the HDI measures, area under the ROC curve (AUC) for the HDI and the CAGE were compared using a non-parametric procedure (Hanley & McNeil, 1983). Our evaluation of the performance of the HDI relative to the CAGE involved comparison of sensitivity, specificity, and positive predictive value (PPV) indices.

Subsequent to the ROC analyses, we examined the sensitivity and specificity of the HDI and CAGE at specific cutpoints to determine which cutpoint(s) were optimal. Specifically, we established cutpoints for the HDI and CAGE to provide > 90% sensitivity while maximizing specificity. Such cutpoints would be useful in identifying individuals at risk for hazardous drinking, requiring additional assessment and/or treatment.

We examined correlations between the HDI and CAGE scores and measures of the quantity of alcohol consumed as well as with variables previously identified as behavioral or psychological correlates of HD including (1) depressive symptoms, (2) PTSD symptoms, (3) smoking, and (4) risky sexual behavior. We used Stata, version 12.0 (Stata Corp.) to perform all statistical analyses.

RESULTS

Participants

Table 1 summarizes characteristics of the SMW sample (N=700). The average age of the sample was 40.01 years (*SD*=14.11, range = 18 to 82 years). The majority of women in the sample identified as exclusively lesbian (56.9%), 17.0% as mostly lesbian, and 26.1% as bisexual. There was near equal representation of White and African American women (37.4% and 36.0%, respectively) in the sample, whereas a smaller percentage of the sample was Hispanic/Latina (23.1%). Relatively few women (6.3%) reported daily alcohol use; about twice as many (13.3%) reported drinking several times a week.

The largest proportion of the sample reported drinking several times per month (39.7%). Less than one-fifth (18%) of participants met our criteria for 12-month AAD. Average scores on both the HDI and CAGE were relatively low (HDI: M = 1.67, range 0–13; CAGE: M = 0.52, range 0–4). The distribution of scores on both measures exhibited positive skewness. Participants reported an average of 3.09 sexual partners (*SD*=3.60, range 0 to 25) in the previous 12 months, and endorsed an average of 3.80 depression symptoms (*SD*=2.34) and 2.69 PTSD symptoms (*SD*=2.25).

Dimensionality

Confirmatory factor analyses (CFA) were performed using the 13 HDI items. Results revealed generally good fit to the hypothesized one-dimensional structure (CFI = .992; RMSEA = 0.025; WRMR = 0.93), though the model fit chi-square was significant [χ^2

(65)=92.37, p = 0.014; χ^2/df=1.42]. Factor loadings ranged from 0.11 (Drove while drunk) to 0.89 (Could not stop drinking). Though the factor loading for Drove while Drunk was relatively low, its corresponding item discrimination of 0.61 suggested that it provided useful information. We therefore we chose to retain this item.

KR-20 reliability was 0.80 for the HDI and 0.74 for the CAGE. Table 2 presents the level of symptom endorsement and item-total correlations for the 13 HDI items. Item endorsement ranged from 0.9% ("You felt that your drinking caused problems between you and your children.") to 38.7% ("[During the past 12 months] Did you ever have six or more drinks of wine, beer, or liquor in a single day?"). Item-total correlations ranged from 0.22 ("You felt that your drinking caused problems between you and your children.") to 0.71 ("At times, you could not remember some of the things you had said or done while drinking.").

Predictive Accuracy

We performed a series of receiver operating characteristic (ROC) curve analyses to predict *DSM-IV* diagnosis of AAD based on self-reported symptom counts, using the HDI and the CAGE (see Figure 1). The area under the ROC curve (*AUC*) was 0.84 for the CAGE and 0.89 for the HDI, with the latter evidencing significantly greater predictive accuracy: $\chi^2(1) = 4.65$, $p < .04$.

Table 3 presents correct classification rate, sensitivity, specificity, and positive predictive value (PPV) for various cutpoints on the HDI and the CAGE. To achieve ≥ 90% sensitivity with maximum specificity would require a cutpoint of ≥ 2 on the HDI with a specificity of 74.14%. Sensitivity was never ≥ 90% on the CAGE. Employing a cutoff ≥ 1, sensitivity was 81.45% and specificity was 81.09%. Using a cutpoint of ≥ 2 on the HDI vs. a cutpoint of ≥ 1 on the CAGE, the CAGE evidenced a slightly higher PPV (49.74%) compared to the HDI (43.92%).

Concurrent Validity

We examined the relationship of HDI and CAGE scores with daily and 30-day consumption and hazardous drinking correlates (see Table 4). Average correlations were 0.32 for the HDI and 0.23 for the CAGE. Correlations ranged from 0.20 to 0.56 for the HDI and 0.13 to 0.40 for the CAGE. Not surprisingly, 30-day alcohol consumption and typical number of drinks had the highest correlation with both the HDI and CAGE measures. Number of sexual partners, use of birth control and safe sex practices, depressive symptoms and PTSD symptoms evidenced the weakest correlations with the HDI, whereas use of safe sex practices, smoking, depression symptoms and the number of sexual partners had the weakest correlations with the CAGE.

DISCUSSION

To our knowledge, this is the first study to focus on the validation of a hazardous drinking measure in a sample of SMW. Overall, findings support the unidimensionality, reliability and validity of the HDI, which evidenced good internal consistency and accuracy in identifying SMW who met criteria for alcohol abuse or dependence. With respect to the latter, the HDI significantly outperformed the CAGE, an established instrument for assessing

heavy drinking. This may in part be because the HDI has more than three times as many items as the CAGE, making the HDI unsuitable for brief screening. Though the original purpose of the HDI was not as a diagnostic screening tool, future research aimed at developing shorter versions of the HDI is warranted. Concurrent validity was also stronger for the HDI compared to the CAGE, suggesting that the HDI may be a better tool for examining relationships between hazardous drinking and its consequences.

Decisions regarding the selection of an optimal cutpoint on a measure depends on the relative costs associated with false positive and false negative errors. Our criteria for cutpoint selection reflects the position that the cost of a false negative (i.e., failing to identify an individual who meets criteria for alcohol abuse or dependence) outweighs the cost of a false positive (identifying an individual as having abuse or dependence who in fact does not have the condition). In the present study, we chose cutpoints to obtain 90% or higher sensitivity with the highest specificity. This resulted in selecting a cutpoint of > 2 for the HDI.

The HDI evidenced significant correlations with measures of daily drinking quantity, and estimated number of drinks during the past 30 days, risky sexual behaviors, PTSD symptoms, depressive symptoms, and smoking. Mean correlation for the HDI (0.32) exceeded that for the CAGE (0.23). As might be expected, both the HDI and the CAGE evidenced the strongest relationships with estimated daily alcohol consumption and number of drinks in past 30 days, supporting the construct validity of both instruments. The HDI, however, had a markedly stronger relationship with neglect of safe sex practices (r=0.25) relative to the CAGE (r=0.13). The correlation between the HDI and number of sexual partners exceeds that reported in a study of gay and SMW participants by Hequembourg, Livingston and Parks (2013), who examined correlations between the AUDIT and number of male and female sexual partners. Though the associations between HDI measures and depression symptoms and PTSD symptoms were modest, they were consistent with previous findings with SMW samples (Han et al., 2013; Hughes et al., 2007; Rosario et al., 2009) and in one instance exceeded correlations found in a large SMW sample (Lehavot & Simoni, 2011). The correlation between the HDI and smoking status (r = 0.29) exceeded the correlation between smoking status and the CAGE (r=0.16), as well as the correlation between alcohol use and smoking (r=0.14) reported by Lehavot and Simoni (2011). Although these correlations are small to moderate in size, they suggest that the HDI performed as well as or better than the CAGE and other drinking measures employed in this population. Compared to the studies above, our sample was older (M=40.01 years) whereas the average age range of participants in the studies referenced above was (18.3 to 33.6 years). It is not clear to what extent this age difference may have affected the results of the present study.

The relative performance of the HDI and other measures of hazardous drinking in this population warrants further research.

Strengths and Limitations

Strengths of the study include the use of a large and diverse sample of SMW, and comparison with an established screening measure for heavy alcohol use and related problems. One limitation is the fact that alcohol abuse and dependence were assessed based

on self-report. Assessment of the clinical utility of the HDI will require testing it against AAD status assessed by trained clinicians. A further limitation is that our measures of AAD employed criteria from *DSM-IV* rather than the current *DSM-5* (American Psychiatric Association, 2013) criteria. Unlike *DSM-IV*, the latter guidelines include the criterion alcohol craving, a measure not included in the Wave III of the CHLEW study. A final limitation of the study concerns the use of DSM criteria as the gold standard. Prevailing diagnostic criteria (i.e., DSM-IV, DSM-5) evidence a lack of sensitivity to milder forms of AAD and consequently tend to under-estimate AAD in middle-aged and older populations (Atkinson, 1990; Kuerbis, Hagman, & Sacco, 2013). Given that approximately 18% of our sample was 50 years old or older, our findings may reflect differential sensitivity of *DSM* criteria by age. We therefore recommend additional research concerning the accuracy of *DSM* criteria in older cohorts of SMW.

CONCLUSIONS

Our findings suggest that the HDI is a reliable and valid measure of hazardous drinking among SMW, and that it performs as well as or better than the CAGE in this population group.

Glossary

AAD	Alcohol abuse or dependence
Alcohol abuse	Alcohol abuse refers to any “harmful use” of alcohol. The Diagnostic and Statistical Manual of Mental Disorders IV describes alcohol abusers as those who drink despite recurrent social, interpersonal, and legal problems resulting from alcohol use
Alcohol dependence	A previous psychiatric diagnosis in which an individual is physically or psychologically dependent upon drinking alcohol. Recently (in 2013) reclassified as alcohol use disorder along with alcohol abuse in DSM-5
AUC	Area under the receiver operating characteristic curve
CHLEW	Chicago Health and Life Experiences of Women study
DSM	Diagnostic and Statistical Manual of Mental Disorders (?)
HD	Hazardous drinking
HDI	Hazardous Drinking Index
PPV	Positive predictive value
PTSD	Post-traumatic stress disorder
ROC curve	Receiver operating characteristic curve

Sensitivity	Sensitivity is the true positive rate, i.e., the proportion of actual positives (e.g., persons who in fact have a disease or condition) classified as such by the test
SMW	Sexual minority women
Specificity	Specificity is the true negative rate, i.e., the proportion of actual negatives (e.g., those who in fact do not have the disease or condition) classified as such by the test

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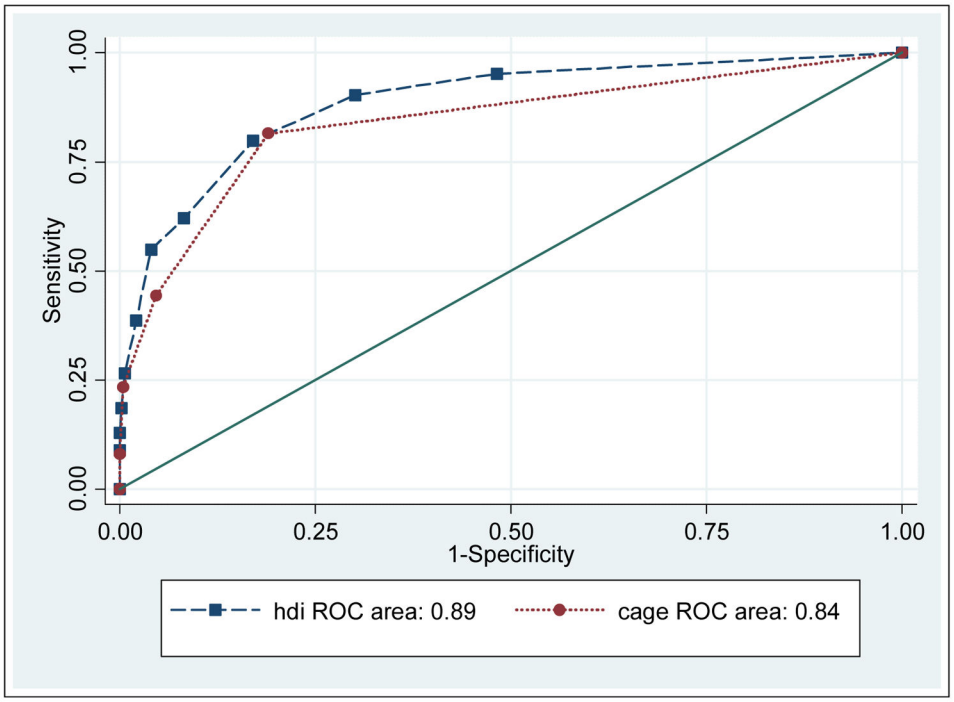

Figure 1.

ROC curves for the HDI and CAGE in Predicting DSM-IV Alcohol Abuse or Dependence (HDI: dashed line with square markers; CAGE: dotted line with circular markers).

Table 1

Descriptive statistics: Key study variables (N=700)

	Statistic
Age – *M* (*SD*)	40.01 (14.11)
Sexual identity – n (%)	
Exclusively lesbian	398 (56.9)
Mostly lesbian	119 (17.0)
Bisexual	183 (26.1)
Race/Ethnicity – n (%)	
White	262 (37.4)
African American	252 (36.0)
Hispanic/Latina	162 (23.1)
Other	24 (3.4)
Alcohol Use – n (%)	
Not at all	97 (13.9)
Rarely	188 (26.9)
Several times/month	278 (39.7)
Several times/week	93 (13.3)
Daily	44 (6.3)
Hazardous Drinking Index – *M* (*SD*)	1.67 (2.33)
CAGE – *M* (*SD*)	0.52 (0.90)
Alcohol abuse/dependence – n (%)	126 (18.0)
Smoking – n (%)	211 (30.1)
No. of Sexual partners – *M* (*SD*)	3.09 (3.60)
Depression – *M* (*SD*)	3.80 (2.34)
PTSD – *M* (*SD*)	2.69 (2.25)

Table 2

Hazardous Drinking Index Item Statistics

	Endorsement of Symptom		
HDI Items	**Freq.**	**%**	**Item-Total *r***
Heavy Drinking			
How often in the past 12 months did you have 6 or more drinks of wine, beer, or liquor in a single day? Any heavy episodic use (6+ drinks/drinking day)	271	38.7	0.68
How often in the last 12 months did you drink enough to feel drunk—that is, where drinking noticeably affected your thinking, talking, and behavior? Intoxicated 4+ times/yr.	206	29.4	0.67
Problem Consequences of Drinking			
Have any of the following happened in the last 12 months?			
You drove a car when you felt drunk or high from drinking.	91	13.0	0.44
Drinking had an effect on your housework or chores around the house.	36	5.1	0.46
You started a fight with someone other than your partner or a family member when you had been drinking.	39	5.6	0.56
Your partner told you that you should cut down on your drinking.	63	9.0	0.60
You started an argument or fight with your partner when you had been drinking.	83	11.9	0.61
You felt that your drinking caused problems between you and your children.	6	0.9	0.22
Alcohol Dependence			
At times, you could not remember some of the things you had said or done while drinking.	121	17.3	0.71
You tossed down several drinks fast, to get a quicker effect from them.	97	13.9	0.67
You took a drink as soon as you got up in the morning	28	4.0	0.47
You could not stop drinking before becoming intoxicated.	48	6.9	0.64
You tried to cut down or quit drinking but were unable to do so.	43	6.3	0.55

Table 3

Performance of Hazardous Drinking Index (HDI) and CAGE in predicting DSM IV alcohol abuse or dependence

Instrument Cutpoint[a]	% Correct	Sensitivity	Specificity	PPV[b]
HDI				
Cut ≥ 1	65.29	95.16	58.59	34.01
Cut ≥ 2[b]	**77.10**	**90.32**	**74.14**	**43.92**
Cut ≥ 3	84.34	79.84	85.35	55.00
Cut ≥ 4	87.30	62.10	92.95	66.38
Cut ≥ 5	88.92	54.84	96.56	78.16
CAGE				
Cut ≥ 1	**81.17**	**81.45**	**81.09**	**49.74**
Cut ≥ 2	84.83	44.35	95.38	71.43

Note

[a]Bolded text represents optimal cutpoint, i.e., ≥ 90% sensitivity and highest possible specificity

[b]PPV=Positive predictive value

Table 4

Pearson correlations between the HDI and CAGE with drinking quantity and frequency, risky sexual behavior, psychosocial outcomes and smoking

	HDI	CAGE
Mean ounces ethanol consumed per day	0.56	0.40
Typical number of drinks last 30 days	0.46	0.27
Number of sexual partners	0.20	0.22
Neglected to use birth control, safe sex practices while drinking	0.25	0.13
PTSD symptoms	0.21	0.24
Depression symptoms	0.25	0.21
Current smoker	0.29	0.16
Average r	0.32	0.23

Note: All p values < .01.