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Psychosocial Stressors and Alcohol Use, Severity, and Treatment Receipt across HIV Status in a Nationally Representative Sample of U.S. Residents

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Abstract

Background—Human Immunodeficiency Virus (HIV) is stigmatized and disproportionately impacts vulnerable populations. Thus people living with HIV (PLWH) may have greater exposure to psychosocial stressors than those without HIV. Exposure to psychosocial stressors may increase alcohol use and serve as barriers to alcohol treatment receipt. We evaluate whether psychosocial stressors, and alcohol use, symptom severity, and treatment receipt vary across HIV status in a general population sample of U.S. residents, and assess whether psychosocial stressors mediate identified associations.

Methods—Data from Wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) were used to assess associations between HIV status and psychosocial stressors (perceived stress, alcohol-related stigma, and perceived discrimination based on race/ethnicity, sexual orientation, or sex) and alcohol-related outcomes (any use, heavy drinking, severity, and treatment receipt). For each outcome, regression models were fit and iteratively adjusted for sociodemographic characteristics and comorbidities. Indirect effects of HIV on alcohol-related outcomes through stressors were estimated to assess mediation when main effects were significant.

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Authorship:

Drs. Glass and Williams conceptualized and designed the study and oversaw all aspects of study design, analysis, interpretation, and presentation. Dr. Williams led data presentation and manuscript writing, and Dr. Glass guided data analysis and conducted mediation analyses. Ms. Joo completed all non-mediation analyses, and Ms. Lipira contributed to literature searches and manuscript preparation. All authors contributed to data interpretation and have approved the final manuscript.

Results—Among 34,653 NESARC Wave 2 respondents, 161 were PLWH. PLWH were more likely than those without HIV to experience discrimination and had higher levels of perceived stress than those without HIV (p values <0.05), but did not differ regarding alcohol-related stigma. PLWH were less likely to use alcohol and had similar rates of heavy drinking relative to participants without HIV, but alcohol symptom severity and treatment receipt were greater among PLWH. Perceived stress but not discrimination mediated associations.

Conclusions—Findings from this first study of variation in psychosocial stressors, and alcohol use, severity, and treatment receipt across HIV status further highlight PLWH as a population that is particularly vulnerable to experiences of psychosocial stress and certain adverse alcohol-related outcomes. Future longitudinal research is needed in a larger sample of PLWH to identify intervention targets.

Keywords

HIV; AIDS; alcohol; stress; discrimination; stigma

INTRODUCTION

Alcohol use is common among, and particularly risky for, persons living with HIV (PLWH)¹ due to its associations with decreased access to,^{2,3} engagement with,⁴ and adherence to⁵ care at each step of the HIV treatment cascade,⁶ as well as its associations with comorbid conditions that are increasingly common among PLWH.⁷ Alcohol use is also a known risk factor for transmission of new infections.⁸ Therefore, understanding pathways via which alcohol use and severity may be influenced and/or intervened upon may inform HIV treatment and prevention efforts.

It is unclear whether PLWH in the U.S. general population differ regarding alcohol use and treatment receipt from those without HIV, though studies have assessed related questions in populations of PLWH receiving healthcare.^{9–12} It is possible that alcohol use, severity and treatment seeking patterns among PLWH differ from those among people without HIV due to either direct effects of HIV on alcohol-related outcomes (e.g., knowledge of the harmful influence of alcohol use on the health of PLWH) or indirect effects via stigma, reduced self-efficacy, or psychosocial stress mechanisms.^{13–16}

HIV is a stigmatized condition that can result in a marginalized identity.¹³ Moreover, HIV is disproportionately represented within several vulnerable subgroups of the U.S. population, including people living in poverty, racial/ethnic minorities, and sexual minorities (in particular, men who have sex with men).^{17–24} Intersectionality theory posits that processes operating at the intersections of multiple identities may synergistically work to magnify health risks.²⁵ For instance, because PLWH may already be socially discredited due to their HIV status, they may be subjected to more discrimination due to one's race, ethnicity, or sex. Similarly, PLWH may have increased exposure to other psychosocial stressors, such as general experiences of stress or alcohol-related stigma. Social reactions to alcohol use among individuals with privileged statuses (e.g., white men) differ from those to individuals with marginalized identities (e.g., women), such that those with marginalized identities are more shunned for their alcohol use,²⁶ and, like people with HIV, people with alcohol use

disorders are blamed for their illness.^{27–29} Alcohol-related stigma is associated with a persistent course of alcohol use disorder³⁰ and may serve as a barrier to seeking treatment for alcohol use.³¹ Thus, alcohol-related outcomes may be influenced by multiple forms of psychosocial stress, including general stress encumbered by an individual's HIV status, as well as stress from stigma or discrimination associated with other marginalized identities that are disproportionately represented among PLWH.

While both HIV status^{32–37} and alcohol use^{38,39} are associated with stress, no previous study to our knowledge has assessed associations between HIV status, psychosocial stressors, and alcohol-related outcomes. The present study was designed to begin to investigate associations between HIV status, psychosocial stressors, and alcohol-related outcomes using a nationally representative sample of people in the U.S. with and without HIV from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). Specifically, we: 1) describe and compare psychosocial stressors across HIV status; 2) assess associations between HIV status and alcohol use, severity, and treatment receipt; and 3) assess whether psychosocial stressors mediate identified associations between HIV status and alcohol-related outcomes.

METHODS

Data Source and Study Sample

This study utilized data from Wave 2 (W2) of NESARC. NESARC used a complex survey design to yield population-representative estimates of U.S. adults living in non-institutionalized settings in 2000. Wave 2 interviews were conducted 2004–2005 and included 34,653 respondents, reflecting an 86.7% follow-up rate among participants from Wave 1 who were eligible for re-interview (i.e., those who remained alive and non-institutionalized). Previous comparison of weighted Wave 2 respondents with the target population (respondents and eligible non-respondents) has identified no significant differences in age, race/ethnicity, sex, socioeconomic status, or lifetime alcohol use disorders.⁴⁰ NESARC methodology and participants have previously been described.^{40,41} The present study was approved by the IRB at the University of Wisconsin-Madison and by the Research & Development Committee at VA Puget Sound.

Measures

HIV Status—Participants were considered to be living with HIV if they reported either testing positive for HIV or having AIDS in the past 12 months. This approach is consistent with that used by the Veterans Aging Cohort Study—the largest epidemiologic study of HIV + patients in care in the U.S.—in which HIV and AIDS diagnostic codes are combined to identify PLWH.^{42,43}

Alcohol-related outcomes—Four alcohol-related outcomes were assessed. *Any alcohol use* was measured based on a yes response to the question, “During the last 12 months, that is, since (*month one year* ago) did you have at least 1 drink of any kind of alcohol?” A dichotomous measure of *any heavy drinking* was measured using the 3rd question of the derived Alcohol Use Disorders Identification Test (AUDIT) included in NESARC, which

assesses the frequency of drinking 5 or more drinks in a single day in the past year.⁴⁴ Past year *alcohol symptom severity* was assessed with the Alcohol Use Disorders (AUD) and Associated Disabilities Interview Schedule (AUDADIS-IV)^{45–47} and defined as the number of AUD criteria met (range 0 – 11), consistent with Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)⁴⁸. *Receipt of alcohol treatment* was measured based on any report of receipt of treatment for alcohol use from specialty substance use disorder treatment sources, general medical sources, or informal sources, such as 12-step meetings or getting help with drinking from a religious counselor, in the past year.⁴⁹

Psychosocial Stressors—Three psychosocial stressors were assessed. Consistent with previous NESARC studies,^{50,51} *perceived discrimination* was measured dichotomously based on any report of discrimination on the Experiences of Discrimination scale,^{47,52} which assesses past-year experiences of discrimination in relation to the participants' race/ethnicity, sex, and/or sexual orientation in various situations (e.g., while obtaining healthcare and during interpersonal violence). *Perceived stress* was measured continuously with the Perceived Stress Scale,^{47,53} which assesses the extent to which respondents believed that their life felt uncontrollable in the past year using a five-point Likert-type scale (e.g., “How often have you felt difficulties were piling up so high that you could not overcome them?”). Higher scores indicate more perceived stress. *Perceived alcohol stigma*, or the perception of being socially discredited based on alcohol use, was measured with the validated alcohol-adapted Perceived Devaluation-Discrimination scale.^{47,54} This scale uses 7 items to assess perceived discrimination (e.g., “most people in my community would treat a former alcoholic just as they would treat anyone else”) and 5 items to assess perceived devaluation (e.g., “most people feel that entering alcohol treatment is a sign of personal failure”).⁵⁵ Scores range from 12 – 72 (U.S. general population mean 37.8, SD=8.47);⁵⁶ higher scores indicate greater levels of perceived alcohol stigma.⁵⁵ Following prior work,^{30,31} responses for cases that had missing data on 2 or fewer items were imputed.

Socio-demographic characteristics—Self-reported measures of socio-demographic characteristics at the time of the Wave 2 survey were included as covariates. *Sex* was measured dichotomously as male or female. *Age* was grouped into 20–34, 35–49, 50–64, or 65 years consistent with previous NESARC studies.³¹ *Race/ethnicity* was categorized first based on report of Hispanic ethnicity; non-Hispanic individuals were hierarchically coded in the following order: 1) black, 2) Native American, 3) Asian, and 4) white.⁵⁷ *Marital status* was categorized as never married, previously married, and currently married or living as if married. *Sexual minority status* was assessed based on self-report of being best described as gay, lesbian, or bisexual. A dichotomous measure of *poverty status* was derived based on annual family income using the official 2004 poverty threshold by the Bureau of the Census as the cutoff, accounting for variation based on family size, the number of children under 18 years in the household, and the number of people 65 years in a one or two person household. *Health insurance status* was derived based on self-report of no insurance, public health insurance (e.g., Medicare, Medicaid, military/VA) without private health insurance, or private health insurance (e.g., employer, self-paid) with or without public health insurance.

Other substance use and psychiatric conditions—Other substance use and psychiatric conditions were assessed using the validated AUDADIS-IV^{45–47} and defined consistent with DSM-IV criteria. They included *lifetime antisocial or conduct disorder* (diagnosis of antisocial personality or conduct disorder), *past-year internalizing disorder* (presence of DSM-IV panic, social phobia, specific phobia, generalized anxiety, depressive, manic, dysthymic, hypomanic, or posttraumatic stress disorder), and *past-year drug use disorder* (DSM-IV sedative, tranquilizer, opioid, amphetamine, cannabis, hallucinogen, cocaine, inhalant/solvent, heroin, or other drug use disorder). Antisocial and conduct disorders were lifetime diagnoses consistent with DSM-IV, given their longstanding pattern (for antisocial) and early time of onset (for conduct).⁴⁸

Statistical Analyses

Socio-demographic characteristics, other substance use, and psychiatric conditions of the sample were described overall and compared across HIV status using survey-adjusted Wald Chi-square statistics with robust standard errors. Measures of psychosocial stressors were similarly described and compared across HIV status.

To assess the association between HIV status and alcohol-related outcomes, five sets of regression models were fit with HIV status as the predictor of interest and the four alcohol-related outcomes as the dependent variables of interest. Logistic regression was used to model dichotomous outcomes (any alcohol use, heavy drinking, and treatment receipt); negative binomial regression was used to model alcohol symptom severity due to over-dispersion of zero values. Models were first unadjusted and then iteratively adjusted for age and race/ethnicity (Model 1), additionally for sex and sexual minority status (Model 2), additionally for poverty and insurance status (Model 3), and additionally for other substance use and psychiatric disorders (Model 4). This iterative approach to modeling was conducted for two reasons: 1) to account for known associations between socio-demographic and clinical characteristics and both alcohol use and HIV, and 2) to avoid statistical over-control in initial models because factors such as poverty, insurance status, substance use, and psychiatric disorders could be provoked by HIV and thus could be in the pathway.⁵⁸ Due to the second concern, findings from Model 2 for each outcome are considered primary. Post estimation techniques were used to estimate the adjusted prevalence and 95% confidence intervals of each dichotomous alcohol-related outcome (alcohol use, heavy drinking, and treatment receipt) and the adjusted mean and standard error for alcohol symptom severity for those with and without HIV.

When significant differences in psychosocial stress variables were identified across HIV status, mediation by stressors was assessed by estimating indirect effects of HIV on alcohol-related outcomes through each stress variable.⁵⁹ Conceptually, the indirect effect represented the extent that the association between HIV and psychosocial stress accounted for differences in alcohol-related outcomes. In these models, alcohol-related outcomes were regressed on the psychosocial stressor, HIV, and covariates, and the stressor was regressed on HIV and covariates. Sobel-Goodman mediation tests were used to evaluate the statistical significance of indirect effects.⁶⁰ Models with dichotomous outcomes (any alcohol use, heavy drinking, and alcohol treatment receipt) were modeled with probit regression, and

alcohol symptom severity was modeled with negative binomial regression. As per the main effects analyses, Model 2 was considered the primary model, and mediation models were only adjusted for age, race/ethnicity, sex, and sexual minority status.⁵⁸

Consistent with previous research,⁶¹ all analyses adjusted for the complex sample design of NESARC. For sample descriptive statistics, we calculated weighted percentages for categorical variables and means for continuous variables. Analyses were conducted in Stata Version 13 and Mplus.^{62,63}

RESULTS

Sample Characteristics

The 34,653 NESARC Wave 2 respondents are described in Table 1, and were fairly evenly distributed across age groups, with 80% being less than 65 years. The majority of participants were white, most were currently married, and a very small proportion (~2%) reported sexual minority status. Approximately 12% of the population was living below the poverty line, and the majority had private health insurance. Antisocial or conduct disorders, as well as drug use disorders, were uncommon, but slightly more than one-fifth met criteria for an internalizing disorder.

Among all respondents, 161 (<1%) were PLWH. All socio-demographic characteristics significantly differed across HIV status (Table 1). PLWH were more likely than those without HIV to be male, younger, from a racial/ethnic and/or sexual minority group, never married, to live in poverty, and to have no source of health insurance. PLWH were also more likely than those without HIV to have a past-year internalizing disorders and past-year drug use disorders. No differences in prevalence of antisocial or conduct disorder were observed across HIV status.

Psychosocial Stressors

About one-sixth of the population reported experiences of discrimination, and overall mean stress and stigma scores were consistent with general population averages⁵⁵ (Table 2). A greater proportion of PLWH than those without HIV reported experiences of discrimination, and PLWH reported higher levels of perceived stress than those without HIV (Table 2; p-values both <0.05). Perceived alcohol stigma did not differ across HIV status.

Alcohol Use, Severity, and Treatment

In unadjusted and the primary adjusted model (Model 2), differences across HIV status were identified in alcohol use, alcohol symptom severity, and alcohol treatment receipt, while the prevalence of heavy drinking did not differ across groups (Table 3). PLWH were less likely to report any alcohol use than those without HIV (Model 2 results: 52% versus 66%, $p<0.01$), and PLWH had greater alcohol symptom severity (i.e., a greater number of AUD criteria) than those without HIV (Model 2 results: Mean symptoms 0.68 versus 0.43). A greater proportion of PLWH received alcohol-related treatment than those without HIV (Model 2 estimate: 4% versus 1%; Table 3). All observed differences were attenuated and, with the exception of alcohol treatment receipt, were no longer statistically significant with

further adjustment for poverty and insurance status and other substance use and psychiatric disorders (Table 3). No significant differences in treatment receipt were observed after adjustment for other substance use and psychiatric disorders (Table 3).

Mediation Analysis

Table 4 displays the indirect effects for each outcome examined in the mediation analyses (conducted only when main effects were significant). Perceived stress mediated the association between HIV status and alcohol outcomes, while experience of discrimination did not. The coefficient for the indirect effect of perceived stress was negative for any alcohol use but was positive for alcohol symptom severity and treatment receipt (Table 4). The association between HIV and heavy drinking was not mediated by either psychosocial stressor (Table 4).

DISCUSSION

In this nationally representative sample, PLWH were more likely than those without HIV to experience discrimination based on their race/ethnicity, sex, or sexual orientation and to have higher levels of perceived stress than those without HIV. However, alcohol-related stigma did not differ across HIV status. While PLWH were less likely to report any alcohol use than those without HIV and had similar rates of heavy drinking, alcohol symptom severity and receipt of alcohol treatment were greater among PLWH. Of the mediators evaluated, perceived stress appeared to be a mechanism through which HIV status may be associated with alcohol-related outcomes.

We initially hypothesized that psychosocial stressors would be greater among PLWH than those without HIV, both as a result of the stigmatizing and marginalizing experience of living with HIV, as well as the disproportionate representation of other vulnerable populations (e.g., racial/ethnic and sexual minorities) among PLWH.^{23,24,38,39,64} Moreover, we hypothesized that exposure to psychosocial stressors may increase alcohol use and serve as barriers to treatment receipt among PLWH.⁶⁵ Our findings from this cross-sectional study both counter and support these hypotheses.

Because alcohol use is associated with HIV acquisition,⁶⁶ and because some psychosocial stressors that may increase alcohol use were more prevalent among PLWH in this sample, we did not expect PLWH to be less likely to report any alcohol use than those without HIV. Similarly, we did not expect to observe no differences in heavy drinking across groups. Though longitudinal studies would be needed, it is possible that the lower prevalence of drinking and the similar prevalence of heavy drinking among PLWH may be due in part to those who stop or reduce drinking because they become aware of how HIV increases the adverse effects of alcohol on health⁶⁷ and/or how alcohol complicates HIV treatment or reduces its efficacy.^{5,66,68,69}

Findings related to both alcohol-related stigma and alcohol treatment receipt were also unexpected. We hypothesized that perceived alcohol stigma would be greater among PLWH than those without HIV, and that treatment receipt would be lower among PLWH due in part to elevated stigma.³¹ However, alcohol-related stigma did not differ across HIV status in this

sample, and treatment receipt was actually more common among PLWH, suggesting that stigma may not enhance barriers to treatment any more than usual⁷⁰ among this population. Even so, PLWH had increased exposure to other psychosocial stressors, such as discrimination and perceived stress, which we hypothesized may also serve as barriers to treatment receipt. In contrast, HIV was associated, by mediation through perceived stress, with greater treatment receipt. These results suggest the possibility that PLWH relative to those without HIV may receive treatment as a response to increased perceived stress. Differences in treatment receipt may also be due to other factors. For instance, greater treatment receipt could also have resulted from disproportionate representation of other substance use and psychiatric comorbidity among PLWH relative to those without—indeed, differences in treatment receipt were attenuated after adjustment for these factors. In addition, there may have been greater need for treatment among PLWH than those without HIV. Though associations were attenuated after adjustment for factors that may be in the causal pathway between HIV status and alcohol symptom severity, PLWH had greater alcohol symptom severity than those without HIV in primary analyses. Increased alcohol-related symptoms are associated with increased readiness to change⁷¹ and often serve as a catalyst for change among people with alcohol use disorders.⁷² Moreover, PLWH may be more vulnerable than those without HIV to the consequences of alcohol use^{73,74} and may feel greater need to seek treatment, relative to people without HIV, due to the specific risks of alcohol use for PLWH.^{6,75} Finally, while there are still many PLWH in need of medical care who do not receive it,⁷⁶ PLWH may access healthcare more often than those without HIV and, thus be more likely to be aware of options for, and/or receive facilitated referrals to, alcohol-related treatment. Investigation of mechanisms underlying treatment receipt among PLWH is needed in bigger samples.

Consistent with our hypotheses, HIV was positively associated, by way of mediation through perceived stress, with increased alcohol symptom severity. According to the tension reduction hypothesis, alcohol use is a common coping response to stress that is associated with uncontrollable events.⁷⁷ Among PLWH, stress may be encumbered simply through receiving an HIV diagnosis, and may be exacerbated by the complex sequelae resulting from living with HIV (e.g., costly treatment regimens, potential for stigmatization).^{78,79} However, our mediation analyses also indicated that the indirect effect was negative when examining the outcome of any alcohol use. These findings suggest the possibility that increases in stress due to HIV may influence some persons to stop drinking, but this hypothesis would need to be tested using longitudinal data. HIV-associated stress may have complex effects on alcohol use: some may choose to stop drinking in response to stress, but those who continue drinking may experience elevated problems and thus seek treatment. Indeed, whereas the literature on alcohol and stress suggests a largely consistent positive association between stress and heavy drinking, the association between stress and any alcohol use is less consistent,^{36,80} and certain types of stress, such as stress due to having a physical health condition, are prospectively associated with abstinence from drinking.³⁶

The experience of discrimination did not mediate associations between HIV status and alcohol-related outcomes. While discrimination is a well-known risk-factor for adverse alcohol-related outcomes,⁸¹ it may be less tied to HIV status than hypothesized, or it could be that certain forms of psychosocial stress, such as discrimination, may be less central to

the relationship between HIV and alcohol outcomes. Further, no stressor mediated the association between HIV status and heavy drinking. It may be that experiencing psychosocial stressors may not be relevant for specific outcomes such as heavy drinking. Future research using large and diverse samples is needed to further examine these issues.

This study has several limitations. First, this cross-sectional study cannot address the causal link between HIV status, psychosocial stressors, and alcohol-related outcomes. In addition, because we could not temporally sequence HIV and alcohol use with these data, the extent to which non-drinkers stopped drinking subsequent to HIV diagnosis is unknown. Similarly, mediators were assessed over the same time period as HIV status and drinking outcomes. Mediation analyses should be replicated and expanded upon using longitudinal data. Second, NESARC was not designed to compare PLWH to persons without HIV. Thus, there are low numbers of PLWH in comparison to those without HIV, consistent with the population prevalence in the U.S. Furthermore, due to low numbers of PLWH, we did not examine lifetime abstainers separate from those who stopped drinking, which could have provided additional insight into differential drinking patterns. Third, HIV diagnoses were self-reported which may have resulted in misclassification because 18% of PLWH go undiagnosed.⁸² Fourth, while we assessed three different dimensions of psychosocial stress, assessments of stressors did not specifically tie them to the experience of living with HIV. Therefore, future research is needed to assess whether HIV-specific stressors (e.g., HIV-associated stigma and discrimination) mediate alcohol-related outcomes among PLWH. Finally, though from the largest epidemiologic study of alcohol use in the U.S., the data are over 10 years old, and it is possible that these relationships would differ due to period effects.

Despite these limitations, this study was the first to assess whether experiences of psychosocial stressors, and alcohol use, severity, and treatment receipt, vary across HIV status in a large national sample. We found that PLWH had higher prevalence of experiences of discrimination, higher levels of perceived stress, and greater alcohol symptom severity than those without HIV. Conversely, PLWH had greater receipt of alcohol treatment than those without HIV. Perceived stress appeared to be a mechanism through which HIV status may be associated with alcohol-related outcomes. Because of the small sample of PLWH and the cross-sectional nature of the data, results can best be considered hypothesis-generating. However, if replicated, results further highlight PLWH as a population that is particularly vulnerable to experiences of stress, which could be targeted in programs focused on the prevention or treatment of adverse alcohol-related outcomes among PLWH.

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Table 1

Characteristics of Wave 2 NESARC respondents: overall and by HIV status

	Weighted % (SE) or M (SE)		F (df)*	p-value
	Overall (n=34,653)	HIV affected 0.46% (n=161)	Not HIV affected 99.54% (n=34,492)	
Gender				
Female	52.08 (0.34)	40.40 (5.06)	52.12 (0.34)	5.22 (1) 0.026
Age				
<=34	25.43 (0.39)	24.44 (5.05)	25.44 (0.39)	7.34 (2.74) <0.001
35-49	31.12 (0.36)	50.58 (5.17)	31.05 (0.36)	
50-64	24.14 (0.29)	18.29 (3.22)	24.16 (0.29)	
65	19.31 (0.34)	6.69 (2.36)	19.36 (0.34)	
Race/ethnicity				
White	70.91 (1.54)	43.67 (5.07)	71.01 (1.55)	10.23 (3.17) <0.001
Black	11.05 (0.66)	33.94 (5.02)	10.97 (0.66)	
Native American	2.19 (0.18)	1.85 (1.36)	2.19 (0.18)	
Asian	4.27 (0.52)	2.89 (2.78)	4.28 (0.52)	
Hispanic	11.58 (1.19)	17.66 (4.33)	11.55 (1.19)	
Marital status				
Never married	17.35 (0.45)	37.05 (5.30)	17.28 (0.45)	13.37 (1.77) <0.001
Previously married	18.86 (0.26)	21.69 (3.68)	18.85 (0.26)	
Currently married or living with as if married	63.79 (0.48)	41.27 (6.07)	63.87 (0.48)	
Sexual minority[†]	1.93 (0.10)	26.30 (5.72)	1.84 (0.09)	193.42(1) <0.001
Poverty status (living below poverty line)	12.17 (0.37)	35.49 (4.60)	12.08 (0.37)	60.04 (1) <0.001
Health Insurance				
Public	12.77 (0.35)	38.54 (6.98)	12.70 (0.35)	29.07 (1.93) <0.001
Private	75.29 (0.55)	40.38 (7.59)	75.39 (0.55)	
None	11.93 (0.40)	21.08 (6.69)	11.91 (0.41)	
Substance use or psychiatric comorbidity				
Antisocial or conduct disorder	4.67 (0.18)	2.99 (1.54)	4.68 (0.18)	0.78 (1) 0.382
Past-year internalizing disorder	20.98 (0.37)	33.23 (4.55)	20.94 (0.37)	9.91 (1) 0.003
Past-year drug use disorder	2.39 (0.12)	11.94 (3.46)	2.36 (0.12)	33.94 (1) <0.001

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Note. SE = standard error, M = mean.

* Design-based F-test statistics are displayed with numerator degrees of freedom (df).
308 cases had missing data on sexual minority status.

Table 2

Psychosocial stressors overall and across HIV status among Wave 2 NESARC respondents

Stressor	Overall Sample			HIV +			HIV -		
	%	(SE)	%	(SE)	%	(SE)	%	(SE)	p-value
Discrimination	24.27	(0.43)	41.24	(5.75)	24.20	(0.43)	11.67 (1)	0.001	
	Mean	(SE)	Mean	(SE)	Mean	(SE)			
Perceived Stress	7.87	(0.03)	9.28	(0.34)	7.87	(0.03)	17.32(1)	0.001	
Perceived Alcohol Stigma	37.77	(0.10)	39.22	(1.01)	37.76	(0.10)	2.14(1)	0.148	

* Design-based F-test statistics are displayed with numerator degrees of freedom (df).

[†] 76 cases had missing data on perceived discrimination, 245 cases had missing data on perceived stress, and 1,080 cases had missing data on perceived alcohol stigma.

[‡] Discrimination indicates experiencing discrimination in any of racial/ethnic, sex, and sexual orientation.

Table 3

Alcohol Use, Severity, and Treatment Receipt across HIV Status among NESARC Wave 2 Respondents: Unadjusted and Then Iteratively Adjusted for Socio-demographic and Clinical Characteristics

	HIV+				HIV-			
Alcohol Use [†]								
Any Alcohol Use	%	95% CI	%	95% CI	p-value			
Unadjusted	53.84	(0.44, 0.64)	66.22	(0.65, 0.67)	0.012			
Model 1 (age & race)	54.85	(0.46, 0.64)	66.22	(0.65, 0.67)	0.012			
Model 2 (gender & sexual minority)	52.24	(0.43, 0.62)	66.41	(0.65, 0.68)	0.003			
Model 3 (poverty/insurance)	57.55	(0.47, 0.68)	66.39	(0.65, 0.68)	0.077			
Model 4 (other SUD/psych)	57.57	(0.48, 0.68)	66.39	(0.65, 0.68)	0.065			
Any Heavy Drinking	%	95% CI	%	95% CI	p-value			
Unadjusted	23.79	(0.15, 0.32)	23.94	(0.23, 0.25)	0.971			
Model 1 (age & race)	23.66	(0.16, 0.31)	23.94	(0.23, 0.25)	0.942			
Model 2 (gender & sexual minority)	19.47	(0.12, 0.27)	24.05	(0.23, 0.25)	0.239			
Model 3 (poverty/insurance)	19.86	(0.12, 0.27)	24.05	(0.23, 0.25)	0.282			
Model 4 (other SUD/psych)	17.70	(0.10, 0.25)	24.05	(0.23, 0.25)	0.117			
Alcohol Symptom Severity [‡]	Mean	95% CI	Mean	95% CI	p-value			
Unadjusted	1.03	(0.54, 1.51)	0.43	(0.41, 0.45)	0.000			
Model 1 (age & race)	0.95	(0.51, 1.40)	0.43	(0.41, 0.45)	0.001			
Model 2 (gender & sexual minority)	0.68	(0.38, 0.99)	0.43	(0.41, 0.45)	0.042			
Model 3 (poverty/insurance)	0.63	(0.36, 0.90)	0.43	(0.41, 0.45)	0.088			
Model 4 (other SUD/psych)	0.52	(0.30, 0.75)	0.44	(0.42, 0.47)	0.454			
Any Alcohol Treatment	%	95% CI	%	95% CI	p-value			
Unadjusted	6.07	(0.01, 0.11)	0.92	(0.01, 0.01)	0.000			

HIV+		HIV-			
Alcohol Use [†]					
	%	95% CI	%	95% CI	p-value
Model 1 (age & race)	5.68	(0.01, 0.10)	0.92	(0.01, 0.01)	0.000
Model 2 (gender & sexual minority)	3.53	(0.00, 0.07)	0.91	(0.01, 0.01)	0.006
Model 3 (poverty/insurance)	2.55	(0.00, 0.05)	0.91	(0.01, 0.01)	0.025
Model 4 (other SUD/psych)	1.93	(0.00, 0.04)	0.91	(0.01, 0.01)	0.092

Note: SUD = substance use disorders, CI = confidence interval.

[‡] 18 cases had missing data on alcohol symptom severity and 31 cases had missing data on alcohol treatment.

[‡] Number of alcohol use disorder criteria endorsed.

Table 4

Mediation analysis results: Is the association between HIV status and alcohol-related outcomes mediated by social stressors?

Variable	Dependent variable			
	Any alcohol use	Heavy drinking	Alcohol use disorder symptom count	Alcohol treatment
Coefficient (95% CI)				
<i>Path a: Independent variable -> Mediator</i>				
HIV -> Perceived discrimination	0.115 (-0.186, 0.415)	0.116 (-0.185, 0.416)	-0.156 (-0.338, 0.649)	0.104 (-0.196, 0.405)
HIV -> Perceived stress	1.038 (0.446, 1.630) **	1.038 (0.446, 1.630) **	0.770 (0.081, 1.459) *	0.932 (0.340, 1.524) **
<i>Path b: Mediator -> Dependent variable</i>				
Perceived discrimination -> Dependent variable	0.132 (0.102, 0.162) ***	0.101 (0.072, 0.129) ***	0.458 (0.382, 0.535) ***	0.115 (0.036, 0.193) **
Perceived stress -> Dependent variable	-0.040 (-0.047, -0.034) ***	-0.005 (-0.013, 0.002)	0.095 (0.082, 0.107) ***	0.084 (0.069, 0.099) ***
<i>Path c': Independent -> Dependent variable</i>				
HIV -> Dependent variable	-0.372 (-0.662, -0.121) **	-0.182 (-0.442, 0.078)	0.203 (-0.184, 0.590)	0.604 (0.143, 1.065) *
<i>Path a*b: Indirect effect</i>				
Perceived discrimination	0.015 (-0.025, 0.055)	0.012 (-0.018, 0.037)	0.071 (-0.152, 0.259)	0.012 (-0.023, 0.047)
Perceived stress	-0.042 (-0.067, -0.017) **	-0.005 (-0.014, 0.002)	0.073 (0.008, 0.127) *	0.078 (0.025, 0.132) **

Note. CI = confidence interval, OR = odds ratio. Covariates included age, sex, race, and sexual minority status. Probit coefficients are reported for any alcohol use, heavy drinking, and treatment utilization. Negative binomial regression coefficients are reported for alcohol use disorder symptom counts. Bolded values indicate a statistically significant association.

* P < 0.05,

** P < 0.01,

*** P < 0.001.