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Racial Disparities in the Association between Alcohol Use Disorders and Health In Black and White Women

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Abstract

The burden of adverse health attributed to Alcohol Use Disorders (AUD) is higher among black compared to white women. We investigated whether socioeconomic status (education and income); healthcare factors (insurance, alcoholism treatment); psychosocial stressors (stressful life events, racial discrimination, alcoholism stigma) could account for black-white disparities in the association between AUD and physical and functional health among current drinker women aged 25 years and older (N = 8,877) in the National Epidemiological Survey on Alcohol and Related Conditions (NESARC). We used generalized linear regression model to test the interaction between race and 12-month DSM-IV AUD in Wave 1 (2001-2002) associated with health in Wave 2 (2004-2005), adjusted for covariates (age group, smoking, alcohol consumption, cardiovascular disease, diabetes, body mass index, and arthritis). Black women with AUD had poorer health compared to white women with AUD ($\beta = -3.18$, $SE = 1.28$, $p < .05$), an association that partially attenuated after adjusting for education and income ($\beta = -2.71$, $SE = 1.27$, $p < .05$), and attenuating further after adjusting for health care and psychosocial factors ($\beta = -2.64$, $SE = 1.27$, $p < .05$). In race-specific analysis, AUD was associated with poorer health for black but not white women. Accounting for black-white differences in AUD and physical and functional health among women requires investigation beyond traditional mechanisms.

Background

Alcohol use disorders (AUD) are psychiatric conditions diagnosed in the context of compulsive and excessive drinking that cause harm to oneself or another (Peterson, Nisenholz, and Robinson 2003, Dawson 2011). AUD is a major international public health problem. Four and a half percent of the global burden of disease and injury has been attributed to AUD (World Health Organization 2011). In the United States (US), at least 30 percent of individuals meet an AUD diagnosis in their lifetime (Hasin et al. 2007). Furthermore, AUD is the third leading lifestyle-related causes of preventable death in the US, corresponding to an estimated 88,000 deaths annually (National Institute on Alcohol

Abuse and Alcoholism 2016). US healthcare expenditures for AUD are high, estimated at \$223.5 billion in a given year (Bouchery et al. 2011).

Excessive alcohol use, an implicit criterion of an AUD diagnosis (Dawson 2000), damages the central nervous and digestive systems and aggravates inflammatory markers (Agarwal and Seitz 2001) that are causally associated with poorer physical and functional health (Friedman, Christ, and Mroczek 2015). Physical and functional health, an important metric of population health (Burdine et al. 2000), is depicted by indicators including physical functioning, role limitations resulting from physical health problems, self-rated general health, and bodily pain (Ware Jr, Kosinski, and Keller 1996). These physical and functional limitations are costly to society. For example, one study estimated health care expenditures for people with physical and functional limitations and disabilities at \$220 billion, or approximately 9.3 percent of total health care expenditures (O'Shaughnessy 2014).

Women compared to men suffer a greater number and severity of health consequences attributed to AUD (Streissguth 2012, Wilsnack et al. 2000, Hommer et al. 2001, United States Department of Health and Human Services 2008), despite women's lower alcohol consumption and 12-month and lifetime AUD risk (Grant et al. 2011). Biological differences in the body's ability to process alcohol partly explain women's worse alcohol-attributed health sequelae relative to men (Baraona et al. 2001, Holmila and Raitasalo 2005). The association between AUD and poorer health among women has also been attributed to women being less likely to self-identify as having a drinking problem before the evidence is clinically obvious (Jarque-Lopez et al. 2001).

There is strong evidence that race plays a modifying role in the association between AUD and health, particularly among black and white women (Griffin et al. 2000, Chartier, Hesselbrock, and Hesselbrock 2013, The National Center on Addiction and Substance Abuse at Columbia University 2006). For instance, nationally representative data indicate that black women have a lower lifetime risk of alcohol abuse than white women (9.1% vs. 13.3%) and a lower lifetime risk of alcohol dependence than white women (4.8% vs. 7.9%) (Zemore et al. 2014). Despite their lower AUD risk than white women, black women suffer a greater health burden attributed to AUD (Jackson et al. 2015, Chartier, Hesselbrock, and Hesselbrock 2013, Centers for Disease Control and Prevention 2011). For example, Fuchs et al. (2004, 471) showed that the Hazard ratio for incident coronary heart disease among former drinking black women was 1.33 but 0.91 among white women (Fuchs et al. 2004). More recently, Jackson et al. (2015, e7) found that among current drinkers who consumed two or greater number of drinks three to seven days per week, black women had a mortality rate of 141.2 per 100,000 persons years compared to 79.7 among white women (Jackson et al. 2015). Although several studies demonstrate a pattern of more adverse health at similar levels of alcohol misuse (Jones-Webb et al. 1997, Zemore et al. 2014, Chartier, Hesselbrock, and Hesselbrock 2013, Pacek, Malcolm, and Martins 2012, Mulia et al. 2008), explanations for this paradoxical association among black and white women remain unclear given that the state of evidence on this topic is limited (Zapolski et al. 2014).

In this study, we aim to add new evidence about black-white differences in the AUD-health association among women. We also endeavor to foster an understanding of these differences

by investigating a range of factors that have been put forth to explain racial and ethnic disparities generally, and particularly among women (Dressler, Oths, and Gravlee 2005, Godette, Headen, and Ford 2006, Williams and Jackson 2005, Nolen-Hoeksema 2004). Specifically, we examine socioeconomic status, healthcare access and utilization, and psychosocial stressors.

METHODS

Data and Sample

We drew a nationally representative sample of women who were current drinkers (defined as self-reported alcohol use in the past 12 months) from the National Epidemiologic Survey on Alcohol Related Conditions, Wave 1 (2001-2002) and Wave 2 (2004-2005). NESARC is a multi-state stratified population-based survey that utilized computer-assisted personal interviews to capture health outcomes, behavioral factors, and psychiatric disorders among civilian non-institutionalized adults in the US (National Institutes of Health and National Institute on Alcohol Abuse and Alcoholism 2010). NESARC oversampled non-Hispanic blacks, Hispanics, and persons aged 18-24. The data were weighted to adjust for the probabilities of selecting households, selecting one person per household, oversampling, and non-response. Further details of NESARC sampling methodology have been published (Grant and Dawson 2006, Ruan et al. 2008). Wave 1 consisted of 43,093 respondents with an overall response rate of 81%. From Wave 1, 39,959 individuals remained eligible at Wave 2, and 34,653 total respondent interviews were completed at Wave 2 for an overall response rate of 86.7% (National Institutes of Health and National Institute on Alcohol Abuse and Alcoholism 2010). NESARC contained a sample of 8,877 current drinkers among non-Hispanic black and white women aged 25 years and older.

Measures

Alcohol use disorders—AUD is the main exposure variable, defined as meeting diagnostic criteria for alcohol abuse and/or alcohol dependence (Grant et al. 2004) outlined in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) (American Psychiatric Association (APA) 2000). AUD was assessed with questions from the Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS-IV). We used 12-month AUD from Wave 1 (year 2001-2002). Test-retest reliabilities for AUD using AUDADIS-IV were robust for both the general population ($k = .76$, $SE = 0.05$) and clinical samples ($k = .74$, $SE = 0.04$) (Grant et al. 1995, Hasin et al. 1997). The reliability, validity, and efficacy of identifying AUD among blacks based on the AUDADIS instrument is good (Volk et al. 1997).

Race—Self-reported race is the second exposure variable, coded as non-Hispanic black and non-Hispanic white (hereafter, black and white).

Physical and Functional Health—The study outcome is physical and functional health in Wave 2, which is captured by the Short Form 12 Health Survey (SF-12). The measure assesses self-reported limitations in physical and role functioning such as climbing stairs. The measure also captures bodily pain and general health (Ware Jr, Kosinski, and Gandek

2002, Ware Jr, Kosinski, and Keller 1996). This measure has exhibited strong reliability and validity in household surveys (Ware Jr, Kosinski, and Keller 1996) and it has also been validated in the African American population (Larson et al. 2008). The measure is a norm-based physical component summary score, standardized with a range of 0 to 100 and a mean of 50; higher scores indicate better physical and functional health (Ware Jr, Kosinski, and Gandek 2002).

Mechanisms—We examined the following mechanisms: socioeconomic status, health care access, stressful life events, racial discrimination, and alcoholism stigma, at Wave 2. We operationalize socioeconomic status as highest education completed (less than high school, high school, some college or higher) and personal income (\$0-\$19,999, \$20,000 to \$34,999, \$35,000 and greater), however, these were analyzed continuously to examine linear effects on health. We operationalize health care factors as insurance status (private, public, or no insurance) and alcohol treatment utilization, which corresponded to whether a respondent utilized any form of treatment targeted to alcohol use (e.g., Alcoholics Anonymous, detoxification treatment, psychological counseling) within the past 12 months (Keyes et al. 2008).

We operationalize psychosocial stressors at Wave 2 with three indicators. Stressful life events are the number of reported stressful life events from a selected list of 11 that respondents could have experienced in the prior 12 months (e.g., death of someone close, major financial crisis, self or family member's trouble with the police) (Dawson, Grant, and Ruan 2005). Second is experiences of racial discrimination (Krieger et al. 2005) categorized by frequency using a 5-item Likert-type scale (0 = never to 4 = very often) (Ruan et al. 2008). The third is alcoholism stigma, which measured perceived discrimination and devaluation wherein higher summed scores represented higher alcohol-related stigma (Glass, Kristjansson, and Bucholz 2013).

Other covariates—Sociodemographic covariates included categorical age (25 to 29, 30 to 64, and 65 and older). Covariates related to physical and functional health included cardiovascular diseases (indicated by a doctor-confirmed diagnosis of chest pain or angina, rapid heartbeat, heart attack, or any other form of heart disease); diabetes in Wave 2; and arthritis in Wave 1 (Fleishman and Lawrence 2003). Health status and lifestyle covariates include current smoking (yes/no); alcohol consumption corresponding to exceeding daily drinking limits (light = 0/0.2568 ounces, moderate = 0.257/1.2 ounces, and heavy=>1.2 ounces)(National Institutes of Health and National Institute on Alcohol Abuse and Alcoholism 2010) in Wave 2. Current self-reported height and weight were used to derive a body mass index (BMI), which was log-transformed to normalize a skewed distribution, and physical inactivity (no-, moderate-, and vigorous- physical activity).

Analyses

We restricted the analyses to current drinkers, which is consistent with previous research that examined the association between AUD and health and social outcomes (Mulia, Ye et al. 2009). We further restricted the sample to age 25 years and older because the majority of physical health consequences related to alcoholism begin to manifest after that age, and

racial differences in onset of alcohol dependence emerge (Godette, Headen, and Ford 2006, Alvanzo et al. 2011).

We first examined bivariate associations of race on AUD, physical and functional health, and the factors hypothesized to account for race differences in health. For categorical variables, we reported unweighted sample sizes with weighted column percent and used the Rao-Scott chi-square test to assess statistical differences between black and white women. For continuous variables, we report weighted survey means and linearized standard errors and used the Wald test to assess the significance of race-differences in means.

The multivariable sample included individuals with no missing values on AUD, physical and functional health or the covariates, which yielded analytic sample size of ($N = 8,603$), about 97 percent of the original sample ($N = 8,877$) of current drinking non-Hispanic black and white women. We used multivariable generalized linear regression models to compute separately, the main effects of race, and AUD, in association with physical and functional health adjusting for age group, cardiovascular disease, diabetes, arthritis, current smoking, alcohol consumption, BMI, and physical inactivity (hereafter, covariates) (Model 1). The covariates were included in all subsequent models.

We then computed and tested the interaction for race and AUD in association with physical and functional health in a separate step (Model 2). The interaction variable had two levels (white with AUD and black with AUD), which is estimated in the same equation with the main effects of AUD and race. The reference group is white with AUD, but the interaction coefficient from factorial interactions represents the differences in effects (slopes) of AUD on health between white and black persons. We used the Wald test of contrast to examine the statistical significance of the interaction term. We sequentially added socioeconomic status (Model 3); healthcare access factors (Model 4); and psychosocial stressors (Model 5) to see whether any of these factors accounted for the interaction between race and AUD associated with physical and functional health. The order of entering these factors was informed by a framework for studying the role of race in health (Williams 1997). We also calculated the percent reduction in the race*AUD interaction coefficient from Model 2 to Model 5, which included all the mechanisms, using the following formula $((\text{Model 2} - \text{Model 5}) / \text{Model 2}) * 100$ (Stringhini et al. 2010)

We conducted all analyses in STATA 13.0 using the “svy” and “subpop” commands as appropriate (StataCorp 2014) to restrict the analyses to women and current drinkers. Those commands also account for the complex survey design of NESARC, which includes obtaining correct standard errors (Heeringa, West, and Berglund 2010).

RESULTS

Those included in the multivariable analysis did significantly differ from the excluded sample on age group (older) race (higher proportion of white women), diabetes (yes), stressful life events (higher mean), racial discrimination (lower mean). The sample did not differ on AUD prevalence or physical and functional health (Supplement Table 1).

We report sample characteristics in Table 1. The 12-month prevalence of AUD in Wave 1, among current drinking women age 25 years and older was 6.9 percent among black women, and 6.7 percent among white women and the black-white difference was not statistically significant. The mean physical and functional health score was 52.3 for black women and 51.2 for white women, and the black-white difference was statistically significant. Black women were significantly less likely to have a college degree, and more likely to be uninsured than white women. Black women also had a higher mean number of stressful life events, experiences of racial discrimination, and alcoholism stigma than white women.

In Table 2, we report the main effects of race and AUD, as well as the interaction between race and AUD associated with physical and functional health, among current drinking women age 25 years and older. When race was considered as a main effect, black women had almost two points lower health score than white women, adjusting for covariates ($\beta = -2.02$, $SE = 0.31$, $p < .001$) (Model 1). AUD was not associated with lower health adjusting for covariates (Model 1). However, there was a significant interaction between race and AUD associated with physical and functional health. Black women with AUD had three points lower physical and functional health score than their white counterparts ($\beta = -3.18$, $SE = 1.28$, $p < .05$) (Model 2), Wald test for interaction ($df=1$, 65), $F = 5.73$, $p = .02$). Figure 1 graphically displays the results of this interaction.

Beginning with Model 3, we assessed whether adding the identified factors accounted for the interaction between race and AUD associated with physical and functional health. The addition of socioeconomic status slightly attenuated the coefficient for the race*AUD interaction ($\beta = -2.71$, $SE = 1.27$, $p < .05$) (Model 3). Sequential adjustment for insurance status and alcoholism treatment utilization appeared to suppress the association that socioeconomic status had on health. Specifically, after the health care factors were added, the interaction coefficient widened from the previous model, ($\beta = -2.77$, $SE = 1.28$, $p < .05$) (Model 4). Adding psychosocial stressors did attenuate magnitude of the race*AUD interaction ($\beta = -2.64$, $SE = 1.27$, $p < .05$) (Model 5). The percent reduction of the interaction coefficient for black-white effect of AUD on health from the interaction model to a fully adjusting for all mechanisms was 20% (i.e., $3.18 - 2.64 / 2.64 * 100$).

To better understand these black-white differences in the association between AUD and health, we conducted race-specific analyses (Table 3). We found that for white women, AUD was related to better physical and functional health but not statistically significant, adjusting for covariates and all the explanatory mechanisms ($\beta = 0.19$, $SE = 0.48$, $p > .05$). In contrast, for black women, AUD was statistically associated with poorer physical and functional health ($\beta = -2.30$, $SE = 1.10$, $p < .05$).

Among the covariates, for white women, moderate drinking, and vigorous physical activity had a positive association with physical and functional health, which was not found among black women. Higher BMI, CVD, and diabetes had a stronger negative association with physical and functional health for black women compared to white women. Education and income had a stronger positive association with health for black compared to white women. Stressful life events had a similar magnitude of poor health association across both groups

but was only statistically significant among whites. High racial discrimination had a significant negative association with health among black but not white women.

DISCUSSION

In this sample of current drinker non-Hispanic black and white women ages 25 years and older, there was no significant race differences in 12-month prevalence of DSM-IV AUD. Previous studies that investigated black-white differences in the association between alcohol and health vary with respect to indicators used to characterize excessive drinking (i.e., some used non-diagnostic measures). This methodological difference precludes a direct comparison of prevalence estimates to other studies based on these data. Nevertheless, our findings are consistent with one other study showing that among current drinker women (age 18 years and older), there were no significant differences in the 12-month prevalence of alcohol abuse and dependence criteria between black and white women (Witbrodt, Mulia et al., 2014).

We found that despite no differences in prevalence, black women with AUD had poorer health than white women with AUD. Our findings that at similar levels of alcohol consumption, blacks women fare worse is consistent with patterns found in prior research (Mulia, Ye et al., 2009). For example, Chartier et al (2013) showed that among alcohol-dependent women, at the same mean years of heavy drinking, black women had 0.85 points poorer chronic and physical health consequences, while the association was 0.11 points lower for white women (Chartier, Hesselbrock, and Hesselbrock 2013).

Racial disparities in the association between AUD and health persisted beyond health status and lifestyle controls, which included heavy alcohol consumption, physical inactivity, and high body mass index. Our estimates of black-white disparities may be underestimated given that those excluded from the multivariable analysis were more likely to be black, have higher stress, and lower discrimination.

Socioeconomic status influenced but did not entirely attenuate the race effect of AUD on physical and functional health. Higher socioeconomic status is associated with better physical and functional health (Matthews and Gallo 2011) and better access to resources (Link and Phelan 1996) such as alcohol treatment utilization (Saunders, Zygowicz, and D'Angelo 2006). Prior studies have also showed that race effects in some major fatal chronic disease are not eliminated after socioeconomic status is adjusted (Hayward et al. 2000).

It still remains unclear, however, whether the reason that socioeconomic status did not attenuate race-differences in alcohol and health is because the race effect could be due to residual confounding between high socioeconomic status and good health practices (Williams 2012). For instance, there is some evidence of a positive association between AUD and physical activity, however, that protective association diminishes with more severe forms of AUD (e.g., dependence) (Lisha, Sussman, and Leventhal 2013), which in-turn may limit physical and functional health. One national study showed that compared to white women, black women had almost 3-fold higher risk of meeting 3+ DSM-IV dependence criteria adjusting for heavy episodic drinking, among current drinkers, (Witbrodt et al.

2014). While there were no differences in AUD prevalence or physical activity in our study, the wider body of evidence suggests that further research into lifestyle factors could be useful to understand racial disparities in AUD and health.

Also, empirical evidence documented that alcohol abuse—one component of AUD is biased towards those with higher socioeconomic status (Keyes and Hasin 2008). Our results, however, indicate little support for the hypothesis of better health being related to higher socioeconomic status among white women. In fact, we find that in race-specific models, socioeconomic status had a larger magnitude of association with better health among black compared to white women. We only examined education and income in this study. However, other socioeconomic measures such as occupational status and wealth also has profound impacts on health (Williams et al. 2010). Investigating other markers of socioeconomic status is one direction for future research on this topic.

Racial disparities in the association between AUD and health remained, and slightly widened after additional adjustments for healthcare access and alcohol treatment utilization. This finding may reflect the extremely low levels of alcohol treatment in this sample. For instance, one study estimated that 15% of persons in the US population with AUD received some alcohol treatment (Cohen et al. 2007). In this study, less than two percent of the sample reported any treatment for AUD, and this low percent was similar for both black and white women.

In the pooled data, additionally adjusting for stressful life events, racial discrimination, and alcoholism stigma further attenuated racial disparities, which may indicate, as suggested in other research, that psychosocial factors are modest predictors of health disparities (Schnittker 2004). In race-specific models, however, racial discrimination was a significant determinant of poor health among black but not white women. This finding could be plausibly explained by racial differences in the relationship between discrimination and alcohol use. For instance, one large national multiethnic study found that higher racial/ethnic discrimination was statistically associated with higher odds of heavy drinking among blacks but lower non-significant odds among whites (Borrell et al. 2010). We also found that AUD in Wave 1 was significantly associated with poorer health in Wave 2 among black women, and the association was reversed, although not significant among whites. Some research suggests that blacks engage in unhealthy behaviors such as alcohol used to cope with stress, which can buffer mental health in the short-term, but ultimately contribute to poorer physical and chronic health conditions in the long-run (Jackson and Knight 2006, Jackson, Knight, and Rafferty 2010).

This study has some limitations. The NESARC sample is based on households; hence, our study is not applicable to clinical or institutional samples. Evidence suggests that in clinical samples, AUD prevalence is higher among blacks, and that black-white disparities in alcohol and health are pronounced (Williams et al. 2016, Williams et al. 2012). However, NESARC is the largest probability survey on alcohol, psychiatric, and psychosocial mechanisms in the US. Thus, findings from this research are potentially generalizable to the wider US population of current drinker black and white women age 25 years and older. Both AUD and

physical and functional health were assessed via self-report. Therefore the extent to which social desirability bias could have affected our estimates is unknown.

Next, the minimum score to detect clinically important difference between the SF-12 and chronic disease outcomes is not well known, and in some cases the SF-12 fail to detect disease differences in diabetes compared to other physical and functional health measures (Johnson and Maddigan 2004), which is partially a function of limitations with the SF-12 weighting procedures used for the multiple subscales of the measure (Busija et al. 2011). These limitations may thwart the ability to suggest clinical interventions based on this study without additional research linking physical and functional health to other chronic disease outcomes, and biomarker indicators of health. Nevertheless, the SF-12 is not disease-specific and can be used when a broad range of health emphasis is needed (Busija et al. 2011) and this property makes it a strong measure to compare across groups, especially since the psychometric properties have been shown to be strong for African Americans (Larson et al. 2008).

The longitudinal analysis of these data allowed us to strengthen the causal claims of race-differences in the effect of AUD on physical and functional health, something which previous studies lacked. We found strong evidence that the long-term impacts on health attributed to AUD is worse for black than white women. Because NESARC has a large sample size, our analyses avoided some of the problems such as low precision, which have plagued racial disparities research (Griffith, Neighbors, and Johnson 2009) (Griffith, Neighbors et al., 2009). Importantly, we moved beyond the basic documenting of black-white differences in AUD and health by systematically investigating factors traditionally accounts for racial disparities, but which have not been systematically examined in prior research on this topic.

Conclusion

Reducing adverse health outcomes attributed to excessive alcohol use and eliminating racial disparities in health attributed to alcohol are Healthy People 2020 objectives (United States Department of Health and Human Services 2015). Based on the findings from this one study, we found about a 20% reduction race effects in the association between AUD and physical and functional health among black and white women current drinkers age 25 years and older. We suggest future research examine additional mechanisms beyond socioeconomic status and psychosocial factors, particularly among women. Specifically, we suggest investigating contextual level factors such as racial residential segregation and alcohol exposure/availability in the community, and income inequality (Williams and Collins 2001, Theall et al. 2011, Elgar et al. 2005). Future research should also examine black-white differences in AUD and biological markers of health such as Interleukin-6 (IL-6), which drivers poor health through pathways of inflammation caused by heavy alcohol use (Agarwal and Seitz 2001). Research using biological markers of health can provide a deeper insight into the physiological pathways through which alcohol interacts with the organ systems to produce disparities in other health conditions that include hypertension and cardiovascular diseases, which remain top causes of mortality among blacks in the US.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Figure 1.

Marginal predicted scores for physical and functional health based on regression model adjusted for covariates age group, cardiovascular disease, diabetes, arthritis, current smoking, alcohol consumption, BMI, and physical inactivity.

TABLE 1

Sample Characteristics of Black and White Current Drinker Women Age 25 Years and Older in the National Epidemiologic Survey of Alcohol and Related Conditions, USA (N=8877)

	Non-Hispanic White (N=7034)	Non-Hispanic Black (N=1843)	p-value
Sociodemographic			
<i>Age Group (in years), n (%)</i>			0.000
25 to 29	663 (9.99)	217 (15.34)	
30 to 64 (reference)	5081 (72.54)	1485 (78.40)	
65 and older	1290 (17.47)	141 (6.26)	
Health Status and Lifestyle			
<i>Current smoker, yes, n (%)</i>	1696 (23.69)	505 (27.13)	0.021
<i>Alcohol consumption, n (%)</i>			0.005
Light (0/0.256 ounces of alcohol)(reference)	5087 (72.65)	1379 (74.55)	
Moderate (0.257/1.2 ounces of alcohol)	1567 (22.31)	328 (18.46)	
Heavy (>1.2 ounces of alcohol)	365 (5.04)	132 (6.99)	
Body Mass Index, range (23.6-30.9) Mean, (SE)	28.35 (0.25)	30.66 (0.34)	0.000
<i>Physical Activity, n (%)</i>			0.841
No physical activity (reference)	6265 (89.04)	1626 (88.61)	
Moderate physical activity	104 (1.60)	34 (1.55)	
Vigorous physical activity	665 (9.36)	183 (9.84)	
Diabetes, n (%)	335 (4.87)	156 (8.11)	0.000
Cardiovascular Disease, n (%)	619 (8.65)	148 (7.04)	0.033
Arthritis, n (%)	1357 (18.99)	293 (15.25)	0.003
Socioeconomic Status			
<i>Education, n (%)</i>			0.000
Less than high school	408 (5.83)	234 (12.49)	
Completed high school	4192 (60.24)	1199 (65.81)	
Some college or higher	2434 (33.94)	410 (21.70)	
<i>Personal Income, n (%)</i>			0.001
\$0-\$19,999	2960 (44.42)	800 (43.39)	
\$20,000-\$34,999	1695 (23.37)	512 (28.70)	
\$35,000 and greater	2379 (32.22)	531 (27.91)	
Health Care Access and Utilization			
<i>Insurance status, n (%)</i>			0.000
No insurance	470 (6.60)	244 (15.23)	
Public	4679 (66.83)	962 (52.32)	
Private	1885 (26.57)	637 (32.44)	
<i>Alcohol treatment utilized, yes, n (%)</i>	65 (0.94)	29 (1.66)	0.047
Psychosocial Stressors			
<i>Stressful life events, range (0-14) Mean, SE</i>	1.41 (0.03)	2.30 (0.07)	0.000
<i>Alcoholism stigma, range (31-43) Mean, (SE)</i>	35.55 (0.14)	37.85 (0.33)	0.000

	Non-Hispanic White (N=7034)	Non-Hispanic Black (N=1843)	p-value
<i>Racial/ethnic discrimination</i> , range (1-5) Mean, (SE)	1.03 (0.00)	1.23 (0.01)	0.000
12-month Alcohol Use Disorders , n (%)	512 (6.67)	119 (6.87)	0.812
Physical and Functional Health , Mean, (SE)	52.29 (0.15)	51.20 (0.29)	0.001

Note: Column percent is weighted, n's are unweighted. SE-Standard Linearized Error

Table 2

Multivariable Results of Race and 12-month DSM-IV AUD in Wave 1 Associated with Current Physical and Functional Health Status (Wave 2) Among Current Drinker Women Age 25 Years and Older in the National Epidemiologic Survey of Alcohol and Related Conditions, USA (N=8,603)

	Model 1		Model 2		Model 3		Model 4		Model 5	
	<i>b</i>	SE	<i>b</i>	SE	<i>b</i>	SE	<i>b</i>	SE	<i>b</i>	SE
Non-Hispanic black	-2.02***	0.31	-1.81***	0.31	-1.51***	0.30	-1.52***	0.30	-1.10**	0.33
DSM-IV Alcohol use disorder (AUD)	-0.18	0.44	0.14	0.48	0.06	0.47	0.03	0.47	0.16	0.48
Black * AUD			-3.18*	1.28	-2.71*	1.27	-2.77*	1.28	-2.64*	1.27
Age group										
25 to 29	1.82***	0.28	1.82***	0.28	2.11***	0.28	2.11***	0.28	2.36***	0.29
30 to 64 (reference)	1		1		1		1		1	
65 and older	-3.16***	0.37	-3.15***	0.37	-2.41***	0.37	-2.36***	0.38	-2.66***	0.38
Current smoker vs. (no=reference)	-2.28***	0.31	-2.28***	0.31	-1.58***	0.30	-1.60***	0.30	-1.52***	0.30
Alcohol consumption										
Light (0/0.256 ounces) (reference)	1		1		1		1		1	
Moderate (0.0257/1.2 ounces)	1.10***	0.27	1.11***	0.27	0.77**	0.27	0.76**	0.27	0.72*	0.27
Heavy (>1.2 ounces)	0.95*	0.42	0.95*	0.42	0.73	0.40	0.67	0.41	0.68	0.41
Body mass index ^a	-0.04***	0.01	-0.04***	0.01	-0.04***	0.01	-0.04***	0.01	-0.04***	0.01
Physical activity										
None (reference)	1		1		1		1		1	
Moderate	0.14	0.88	0.14	0.88	0.54	0.88	0.59	0.87	0.53	0.89
Vigorous	0.55	0.38	0.55	0.38	0.66	0.38	0.68	0.38	0.77*	0.38
Cardiovascular disease	-6.54***	0.58	-6.54***	0.58	-6.31***	0.56	-6.31***	0.56	-6.20***	0.55
Diabetes vs (no=reference)	-5.30***	0.66	-5.31***	0.66	-5.09***	0.66	-5.06***	0.66	-5.03***	0.67
Arthritis										
Yes vs. (no=reference)	-7.01***	0.43	-7.02***	0.43	-6.83***	0.55	-6.84***	0.41	-6.73***	0.41
Unknown vs. (no=reference)	-0.10	0.83	-0.09	0.83	0.05	0.80	0.06	0.80	0.15	0.81
Education ^a					1.36***	0.21	1.36***	0.22	1.32***	0.21
Income ^a					1.09***	0.13	1.11***	0.13	1.09***	0.13

	Model 1		Model 2		Model 3		Model 4		Model 5	
	<i>b</i>	SE	<i>b</i>	SE	<i>b</i>	SE	<i>b</i>	SE	<i>b</i>	SE
Insurance										
None							0.45	0.46	0.65	0.45
Private							-0.26	0.26	-0.25	0.26
Public (reference)							1		1	
Alcohol treatment utilization, yes							0.96	1.13	1.55	1.10
Stressful life events ^a									-0.26 ^{**}	0.08
Racial discrimination									-0.77	0.48
High (> 1.5)									-1.04 [*]	0.52
Alcoholism stigma ^a									-0.03 [*]	0.01
Constant ^b (Mean, SE)	55.4 ^{***}	(0.3)	55.4 ^{***}	(0.3)	51.0 ^{***}	(0.6)	51.0 ^{***}	(0.6)	52.5 ^{***}	(0.7)
Significance of race * AUD interaction			F(1, 65) = 5.73 P = .020		F(1, 65) = 4.54 P = .040		F(1, 65) = 4.66 P = .034		F(1, 65) = 4.28 P = .043	
Variance Explained			R ² = 22.86		R ² = 24.67		R ² = 24.71		R ² = 25.04	

Note: All models were adjusted for age group, current smoker, alcohol consumption, body mass index, physical activity, diabetes, cardiovascular disease, and arthritis.

^aModeled as a continuous variable.

^bThe constant refers to the outcome of physical and functional health status.

Model 1: Main effects

Model 2: Interaction of Race * AUD

Model 3: Model 2 + socioeconomic status

Model 4: Model 3 + healthcare access and alcohol treatment utilization

Model 5: Model 4 + psychosocial stressors

* P < .05,

** P < .01,

*** P < .001

Table 3

Race-specific Association of 12-month DSM-IV AUD in Wave 1 and Current Physical and Functional Health (Wave 2) Among Current Drinker Women Age 25 Years and Older, in the National Epidemiologic Survey of Alcohol and Related Conditions, USA (N=8,603)

	Non-Hispanic white		Non-Hispanic black	
	<i>b</i>	SE	<i>b</i>	SE
DSM-IV Alcohol use disorder (AUD)	0.19	0.48	-2.30 [*]	1.10
Age group				
25 to 29	2.18 ^{***}	0.31	3.93 ^{***}	0.66
30 to 64 (reference)	1		1	
65 and older	-2.76 ^{***}	0.40	-1.86 [*]	0.91
Current smoker vs. (no=reference)	-1.77 ^{***}	0.33	0.69	0.70
Alcohol consumption				
Light (0/0.256 ounces) (reference)	1		1	
Moderate (0.0257/1.2 ounces)	0.80 ^{**}	0.28	-0.01	0.68
Heavy (>1.2 ounces)	0.81	0.45	0.24	1.18
Body mass index ^a	-0.04 ^{***}	0.01	-0.05 ^{**}	0.01
Physical activity				
None (reference)	1		1	
Moderate	0.29	0.95	2.45	1.60
Vigorous	0.89 [*]	0.42	0.10	0.84
Cardiovascular disease	-6.12 ^{***}	0.59	-7.11 ^{***}	1.06
Diabetes vs (no=reference)	-4.96 ^{***}	0.73	-5.12 ^{***}	1.29
Arthritis				
Yes vs. (no=reference)	-6.77 ^{***}	0.44	-6.23 ^{***}	0.98
Unknown vs. (no=reference)	-0.16	0.91	1.42	1.25
Education ^a	1.25 ^{***}	0.23	1.49 ^{**}	0.52
Income ^a	0.98 ^{***}	0.14	2.41 ^{***}	0.36
Insurance				
None	0.78	0.47	0.54	1.00
Private	-0.30	0.27	0.36	0.63
Public (reference)	1		1	
Alcohol treatment utilization, yes	1.74	1.23	0.59	2.22
Stressful life events ^a	-0.25 ^{**}	0.09	-0.25	0.14
Racial discrimination				
Medium (1.2 to 1.5)	-1.22	0.63	0.09	0.85
High (> 1.5)	-0.73	0.77	-1.40 [*]	0.63
Alcoholism stigma ^a	-0.03 [*]	0.01	-0.02	0.03
Constant ^b (Mean, SE)	52.86 ^{***}	0.77	49.03 ^{***}	1.68

Note: All models were adjusted for age group, current smoker, alcohol consumption, body mass index, physical activity, diabetes, cardiovascular disease, arthritis, and mechanisms: socioeconomic status, healthcare access and alcohol treatment utilization, and psychosocial stressors

^a Modeled as a continuous variable.

^b The constant refers to the outcome of physical and functional health status.

* $P < .05$,

** $P < .01$,

*** $P < .001$