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Education and race-ethnicity differences in the lifetime risk of alcohol dependence

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Abstract

Objectives: While lower socioeconomic status (SES) is related to higher risk for alcohol dependence, minority race-ethnicity is often associated with lower risk. This study attempts to clarify the nature and extent of social inequalities in alcohol dependence by investigating the effects of SES and race-ethnicity on the development of alcohol dependence following first alcohol use.

Design: Cross-sectional analysis of data from the National Epidemiologic Survey on Alcohol and Related Conditions (n = 43 093). Survival analysis was used to model alcohol dependence onset according to education, race-ethnicity and their interaction.

Setting: United States, 2001–2.

Results: Compared with non-Hispanic white people, age-adjusted and sex-adjusted risks of alcohol dependence were lower among black people (odds ratio (OR) = 0.70, 95% confidence interval (CI) = 0.63 to 0.78), Asians (OR = 0.65, CI = 0.49 to 0.86) and Hispanics (OR = 0.68, CI = 0.58 to 0.79) and higher among American Indians (OR = 1.37, CI = 1.09 to 1.73). Individuals without a college degree had higher risks of alcohol dependence than individuals with a college degree or more; however, the magnitude of risk varied significantly by race-ethnicity (χ^2 for the interaction between education and race-ethnicity = 19.7, df = 10, p = 0.03); odds ratios for less than a college degree were 1.12, 1.46, 2.24, 2.35 and 10.99 among Hispanics, white people, black people, Asians, and American Indians, respectively. There was no association between education and alcohol dependence among Hispanics.

Conclusions: Race-ethnicity differences in the magnitude of the association between education and alcohol dependence suggest that aspects of racial-ethnic group membership mitigate or exacerbate the effects of social adversity.

Reducing health disparities is a major objective of United States health policy.¹ For the majority of health problems, low socioeconomic status (SES) and minority race/ethnicity are associated with higher risk, suggesting that factors common across types of social disadvantage (for

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example, psychological stress) have a broad negative impact on health. However, this convergence does not exist with respect to alcohol use disorders. Although individuals of lower SES are at greater risk for alcohol dependence, there is evidence that members of some disadvantaged minority race-ethnic groups are at lower lifetime risk.²⁻⁶ These apparently discrepant findings suggest that factors that vary by race-ethnicity and are independent of SES influence risk for alcohol dependence and raise questions about whether SES differences vary in magnitude across race-ethnic groups. Clarifying the nature and extent of social inequalities in alcohol dependence is therefore necessary for reducing disparities.

Results of previous studies of alcohol dependence indicate significant differences in risk according to SES and race-ethnicity, although they are unclear about a possible interaction between the two.^{2,5} In the National Comorbidity Survey, respondents with <12 years of education had an odds of alcohol dependence over their lifetimes 1.53 times those for respondents with 16 years or more of education.² In the National Longitudinal Alcohol Epidemiology Study, the risk of alcohol dependence among participants with <12 years of education was significantly higher (odds ratio = 1.24) than among participants with 16 years or more.⁵ However, in both of these studies, non-Hispanic black people had a lower risk of alcohol dependence than majority non-Hispanic white people, adjusting for SES.²⁻⁷ There was no difference in risk for alcohol dependence between Hispanics and non-Hispanic white people in the National Comorbidity Survey.² Risk for alcohol dependence among other race-ethnic groups, including American Indians and Asians, has not been assessed as reliably on a national level, although a large body of research suggests that the risk of dependence is extremely high in some American Indian communities.⁸

Data from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) suggest higher risks for dependence among white people compared to black people, Asians and Hispanics; however, race-ethnic differences were not directly tested in previous reports from the NESARC, nor were SES differences.⁹⁻¹¹ The current study extends previous analyses of SES and race-ethnic differences in alcohol dependence in the NESARC by focusing specifically on the development of dependence among alcohol users. The NESARC enrolled a large household sample of adults with sufficient socioeconomic and race-ethnic diversity to examine patterns of risk for alcohol dependence according to both SES and race-ethnicity.

METHODS

Study population

The NESARC is a nationally representative household survey conducted in 2001 and 2002 by the National Institute on Alcohol Abuse and Alcoholism. The final response rate was 81.2%, resulting in a sample size of 43 093 participants aged 18 and over. The sample analysed in the current study included NESARC participants who ever used alcohol in their lifetimes and who provided complete data on SES and alcohol dependence. Details of the NESARC design and population weighting are reported by Grant *et al.*¹²

Measures

Alcohol dependence was assessed using the Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV (AUDADIS-IV).¹³ The AUDADIS-IV is a structured interview administered by trained non-clinician interviewers that yields diagnoses of alcohol dependence according to the *Diagnostic and Statistical Manual*, fourth edition (DSM-IV).¹⁴ Alcohol dependence according to DSM-IV is characterised by maladaptive alcohol use resulting in “clinically significant impairment or distress” and at least three of seven symptoms of dependence occurring during a 12-month period (p 197).¹⁴ DSM-IV symptoms of dependence include both physiological indicators of addiction such as developing tolerance to alcohol and

experiencing withdrawal symptoms, and adverse effects of alcohol on social or occupational functioning. Age at dependence onset was defined as the age at which symptoms began to occur “around the same time.” The reliability of the AUDADIS lifetime diagnosis of alcohol dependence has been assessed in several test-retest studies, with reliability coefficients (kappa) of the order of 0.7.¹⁵ The concordance of AUDADIS diagnoses of alcohol dependence with that of other established measures has also been investigated; kappa indicating the concordance of AUDADIS alcohol dependence with the Schedules for Clinical Assessment in Neuropsychiatry (SCAN) was 0.62, and 0.67 against the Composite International Diagnostic Interview (CIDI).¹⁶

Various measures such as education, occupation, income and wealth reflect different aspects of SES. We measured SES by educational attainment because an individual's education is generally established before occupation and income and is less subject to endogeneity or “reverse causation” (the effect of alcohol dependence on SES). We used information on the age at school completion to establish the timing of schooling with respect to the onset of alcohol dependence. Educational attainment was categorised as student, high school degree or less, graduate equivalency degree (GED), some college and 4-year college degree or higher. Race-ethnicity was categorised by the NESARC as white, non-Hispanic; black, non-Hispanic; American Indian/Alaskan Native, non-Hispanic; Asian/Native Hawaiian/other Pacific Islander, non-Hispanic; and Hispanic, any race.

Statistical analysis

Risk of alcohol dependence according to education and race-ethnicity was modelled using discrete-time survival analysis¹⁷ of person-years from the year of first alcohol use through the year of dependence onset (for cases) or age at interview (for non-cases). Educational attainment was included in the survival analyses as a time-varying covariate, and was coded as “student” for all person-years before the age at which the participant completed his or her education. This coding isolates years before finishing school from the effects of completed education on the risk of alcohol dependence.

We estimated models for education and race-ethnicity separately, as well as models that included education and race-ethnicity together with demographic covariates (sex, age at interview, age at first alcohol use and birthplace). Sampling weights account for selection and response probabilities and calibrate the sample to be representative of the US population according to the 2000 census.¹² Analyses were conducted using SUDAAN.¹⁸ Design-based percentages, means, odds ratios and confidence intervals are presented in the text and tables; sample sizes correspond to the actual number of participants.

RESULTS

Demographic characteristics of participants in the NESARC sample (n = 43 093), participants who ever used alcohol (n = 34 827) and alcohol users with complete data (n = 33 240; 96.1% of alcohol users) are presented in table 1. The analysis sample, in the third column, is 74.6% white, 10.2% Hispanic, 9.9% black, 3.1% Asian and 2.1% American Indian. The educational qualifications of the sample were: 25.2% college degree, 27.3% some college, 36.6% high school or less, 3.8% GED and 7.0% currently in school. The prevalence of DSM-IV alcohol dependence in the analysis sample is 15.4% (median age at onset 21 years). As reported previously, the lifetime prevalence of alcohol dependence in the full NESARC sample is 12.5% (median age at onset = 21 years).^{9 19}

Associations of SES and race-ethnicity with alcohol dependence

Results of survival analyses of alcohol dependence are shown in table 2. Odds ratios and corresponding 95% confidence intervals for each covariate reflect the risk of alcohol dependence accounting for the number of person-years at risk (that is, after initiation of use). After adjustment for age at interview, age at first alcohol use and sex, risk of dependence was significantly higher among respondents with less than a college degree, lower among black people, Hispanics, and Asians compared to white people, and higher among American Indians. In the final model, lower levels of education were significantly associated with a higher risk of alcohol dependence. With respect to race-ethnicity, the lower risks of alcohol dependence among Asians and Hispanics relative to white people that were observed in the models without education were no longer significant. Risk of alcohol dependence remained higher among American Indian and lower among black respondents compared with white respondents.

Interaction between SES and race-ethnicity

The interaction between educational attainment and race-ethnicity, when added to the final model in table 2, was statistically significant ($\chi^2 = 19.7$, $df = 10$, $p = 0.03$), indicating that the association between education and alcohol dependence varies by race-ethnicity. To illustrate this variation, we estimated a separate model for each race-ethnic group (table 3). Several findings are noteworthy. Firstly, the pattern of significantly higher risks among respondents with lower levels of education was observed for white people, American Indians, and black people, but not for Asians and Hispanics. Odds ratios among Asians (1.88 to 2.72) were comparable to those observed among white and black people, but were not statistically significant. Odds ratios among Hispanics were similar and close to 1 (1.02 to 1.46). Secondly, odds ratios were largest for American Indians. Thirdly, alcohol dependence did not increase linearly with decreasing levels of education. Rather, the largest education effects were differences in risk between individuals with and without a college degree. Except among white people ($\chi^2 = 18.0$, $df = 3$, $p = 0.0004$), where there was a strong effect of GED, the coefficients for student, \leq high school, GED and some college were not significantly different from one another.

We conducted two additional analyses to evaluate the robustness of our findings with respect to race-ethnic differences: one in the full analysis sample and the second set in the sample of participants born in the United States. In each of these analyses, we collapsed the \leq high school, GED and some college categories. We also excluded person-years before school completion, thereby eliminating the “student” category of education along with 2064 of the 4649 cases of alcohol dependence from the analyses that occurred while participants were still students. Results from these analyses, shown in table 4, reveal one major difference from those shown in table 3: a significant association between educational attainment (less than college degree versus college degree or more) and alcohol dependence among Asians born in the United States (odds ratio: 4.09; 95% confidence interval: 1.56 to 10.77).

DISCUSSION

This study advances the epidemiology of alcohol dependence by describing the joint effects of educational attainment and race-ethnicity on the risk of alcohol dependence in a large national sample of adults. Progression from alcohol use to dependence was significantly more likely among individuals without a college degree compared to those with a college degree. The risk of dependence did not increase across all levels of education; rather, attainment of a college degree appeared to be a threshold between low and high levels of risk. A similar association between education and current-year alcohol abuse or dependence was observed in the National Comorbidity Survey.²⁰

This association could be attributable to the protective effects of schooling, particularly obtaining a college degree, on the development of alcohol dependence. It may also operate through a broader set of SES pathways including income and occupational status. Our measure of education reflects the individual's socioeconomic background, insofar as opportunities for schooling are influenced by parental resources. As parental SES was not assessed in the NESARC, it was not possible to separate the effects of (exogenous) parental SES from the participants' own (partly endogenous) educational attainment.

A separate component of the association between education and alcohol dependence may operate in the opposite direction: dependence onset before school completion may adversely impact an individual's final educational attainment.²¹ In the current study, we attempted to isolate the effect of education on subsequent alcohol dependence by modelling education as a time-varying covariate and creating a separate education category (student) for all person-years before school completion. In addition, we conducted analyses which eliminated cases of dependence that occurred while participants were in school. While the contrast between student status and college degree could be contaminated by the reverse effect of alcohol dependence on education, the contrasts between the remaining education categories (\leq high school, GED, some college) and college degree reflect the association between completed education and subsequent risk of dependence onset.

Our findings of lower lifetime rates of alcohol dependence among black, Hispanic and API participants are consistent with previous epidemiological studies,^{20,22,23} including the National Comorbidity Survey² and the National Longitudinal Alcohol Epidemiologic Study.²⁴ There is less consistency across previous studies with respect to race-ethnicity differences in current, or 12-month, prevalence of alcohol use disorders. Caetano et al reported higher rates of 12-month dependence symptoms among black people than among white people,^{25,26} whereas Grant *et al* and Kandel *et al* reported no such differences.^{27,28} It is therefore important to distinguish between risks for initial dependence onset and those for the chronicity of dependence. This also implies disaggregating 12-month prevalence into the components that are the result of lifetime risk and those that are the result of the persistence of dependence among lifetime cases.²⁹

One plausible explanation for lower rates of lifetime alcohol dependence among minority race-ethnicity groups is that members of these groups are more likely to be involved in activities that shield individuals from initial exposure to alcohol.³⁰ Heath *et al* observed higher levels of religious involvement among black people, which predicted lower levels of alcohol use.³¹ Similarly, Chen *et al* observed that adolescents with higher levels of religious participation reported less exposure to alcohol and higher levels of lifetime abstinence.³⁰ Our findings suggest there are protective factors associated with race-ethnic minority status that reduce the risk of dependence *after* initiation of alcohol use. These factors may or may not differ from those that reduce the likelihood of first alcohol use or of levels of use.

The association between education and alcohol dependence was statistically significant, but of varying magnitude, among white people, American Indians, black people and US-born Asians. The relation between education and alcohol dependence was not significant among Hispanics. Variability in the relation between SES and alcohol dependence across race-ethnic groups suggests that factors that vary by race-ethnicity modify the effect of social adversity on risk for alcohol dependence.¹¹ Previous evidence for variation in the relation between SES and pathological alcohol use across race-ethnic groups is mixed. For example, some studies have shown inverse SES gradients in alcohol abuse or dependence that do not vary across race-ethnic groups,^{32,33} while others have shown that SES differences in alcohol consumption and problem drinking are stronger among black people compared to white people.³⁴⁻³⁶ Analogously to our study, Jones-Webb *et al* reported that SES, as indicated by neighbourhood

poverty, was more strongly related to alcohol problems among black people than among white people, and had no relation to alcohol problems among Hispanics.³⁷

The mixed evidence from previous studies is due partly to different outcomes used, which range from levels of alcohol consumption, problem drinking and alcohol abuse, to alcohol dependence. Our analyses focused on the development of dependence following first alcohol use by excluding lifetime abstainers from the analysis sample and by restricting the person-years at risk for dependence to those beginning with age at first drink.

The pathways leading to alcohol dependence among users need to be further disaggregated in order to clarify the reasons for SES and race-ethnicity differences in lifetime dependence rates. Before first use, group differences in social norms regarding drinking have been shown to predict lifetime abstinence rates^{35 38}; the same norms influencing abstinence rates have also been hypothesised to influence levels of alcohol consumption.³⁹ For example, group differences in drinking contexts⁴⁰ may influence both the level of consumption and the frequency of heavy drinking, which contribute independently to the risk of alcohol dependence.⁴¹ In addition, while higher levels of consumption are related to increasing risk of alcohol dependence,⁴² converging evidence from several studies suggests that the relation between consumption and dependence also varies by race-ethnicity, with higher levels of consumption predicting steeper increases in risk for dependence among white people than among black people.^{38 43 44}

What is already known on this subject

- ▶ Risk of alcohol dependence is higher among individuals of lower socioeconomic status, but appears from several studies to be lower among some minority ethnic groups.
- ▶ The pattern of disparities in alcohol dependence contradicts that of other health conditions, in which social disadvantage and minority race-ethnicity are associated with elevated risk.

What this study adds

- ▶ The association between educational attainment, an indicator of socioeconomic status, and alcohol dependence varied across race-ethnic groups.
- ▶ Lower education was associated with a higher risk of alcohol dependence among white people, black people, Asians and American Indians, but not among Hispanics.
- ▶ Aspects of minority racial-ethnic group membership might mitigate or exacerbate the effects of socioeconomic status on alcohol dependence.

The patterns of risk for alcohol dependence—as well as other substance and psychiatric disorders²⁹—are unique in social epidemiology in that minority race-ethnic groups have generally lower lifetime risks when estimated from nationally representative household samples. Therefore, theoretical frameworks based on adversity-stress models are not fully adequate for understanding social group differences in the risk of alcohol dependence. These models posit higher levels of psychological exposures in the context of social disadvantage. Farmer and Ferraro described two such models: one in which the effects of poverty on health are stronger among minorities because of the uniquely toxic effects of disadvantage among minorities; the other in which minorities benefit less from educational achievements.⁴⁵ Black-white differences in educational returns^{46 47} are the result of a combination of factors including discrimination⁴⁸ and school quality.⁴⁹ Previous empirical support for these types of models as applied to pathological alcohol use suggests stronger effects of SES on the level of alcohol

consumption among minorities, but not necessarily on problem use or dependence.³⁵ Our results are consistent with stronger effects of lower education on alcohol dependence among black people, Asians and American-Indians than among white people (or, in other words, reduced benefits of schooling among minorities).

Despite the large size of the NESARC and the use of measures of alcohol dependence according to diagnostic criteria, several limitations are notable. The NESARC is a cross-sectional study; therefore, our analyses relied on retrospective reports of the age at highest educational qualification and at alcohol dependence onset. Inaccuracy in these reports may have attenuated associations between education and risk for alcohol dependence. While we are unaware of evidence that the accuracy age of onset reports varies by SES or race-ethnicity, this possibility cannot be ruled out. Secondly, the current analyses did not distinguish individuals of the same ethnicity who have different backgrounds or different nativities—for example, Puerto Ricans versus Mexican Americans, nor did they identify other ethnic minority groups.¹¹ Finally, our findings may not apply to all alcohol-exposed individuals, given that the NESARC was a household survey and therefore did not include people at high risk for alcohol dependence who were outside of the study's sampling frame, such as institutionalised individuals.

An important next step in this line of inquiry is to investigate SES differences in the course of alcohol dependence as evidenced by remission, recovery and relapse. Investigating patterns of current-year dependence also falls within the rubric of persistence insofar as alcohol dependence in the past year (among cases with onset before the year of interview) indicates the continuation of previously established disorder.³²⁹ The role of treatment in attenuating or exacerbating SES and race-ethnic differences is also of interest. Planned follow-up interviews of participants in the NESARC will be critical for investigating the course of disorders prospectively.

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Table 1

Characteristics of participants in the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC, 2001–2002), subset of alcohol users, and sample included in the current study

	Full NESARC sample (n = 43 093)			Lifetime alcohol users* (34 827)			Sample included in the current study† (33 240)		
	Number	% in sample	% alcohol dependence	Number	% in sample	% alcohol dependence	Number	% in sample	% alcohol dependence
Education									
Student	2758	7.2	18.0	2153	6.8	22.7	2115	7.0	23.0
≤High school	18137	39.5	10.3	13545	37.1	13.3	12721	36.6	13.6
GED	1578	3.7	20.0	1325	3.9	23.4	1263	3.8	24.0
Some college	11072	25.9	14.0	9495	27.2	16.1	9123	27.3	16.4
≥4-year college	9548	23.7	11.6	8309	25.0	13.3	8018	25.2	13.4
Race-ethnicity									
Black	8245	11.1	8.4	6195	10.1	11.1	5826	9.9	11.3
Hispanic	8308	11.6	9.5	6121	10.4	12.8	5796	10.2	13.1
API	1332	4.4	6.0	831	3.2	9.9	776	3.1	10.5
American Indian	701	2.1	20.1	587	2.1	24.2	564	2.1	24.5
White	24507	70.9	13.8	21093	74.2	15.9	20278	74.6	16.2
Age (years) at interview									
18–29	8666	21.8	17.3	6920	21.5	21.2	6751	21.9	21.5
30–39	8942	20.1	15.9	7563	20.9	18.5	7358	21.2	18.7
40–49	8458	20.8	14.4	7231	21.8	16.6	6948	21.9	16.8
50–59	6454	15.7	10.4	5418	16.1	12.2	5160	16.1	12.2
≥60	10573	21.6	4.2	7695	19.7	5.5	7023	19.0	5.6
Age (years) at first alcohol use									
≤12				1048	3.0	35.4	1011	3.0	34.9
13–17				9716	30.4	27.4	9539	30.4	27.4
18–29				21172	61.5	9.4	20795	61.6	9.4
30–39				1282	3.4	5.2	1247	3.3	5.4
≥40				673	1.7	1.9	648	1.7	1.9
Sex									
Male	18518	47.9	17.4	16274	48.8	19.6	15551	51.3	19.9

	Full NESARC sample (n = 43 093)			Lifetime alcohol users* (34 827)			Sample included in the current study [†] (33 240)		
	Number	% in sample	% alcohol dependence	Number	% in sample	% alcohol dependence	Number	% in sample	% alcohol dependence
Female	24575	52.1	8.0	18553	51.2	10.3	17689	48.8	10.6
Birthplace									
Foreign-born	7320	14.6	5.4	4862	11.7	8.2	4535	11.3	8.5
US-born	35622	85.4	13.7	29913	88.3	16.0	28705	88.7	16.2

OR, odds ratio; CI, confidence interval; GED, graduate equivalency degree; API, Asian, Pacific Islander, and Native Hawaiian.

* Age at first alcohol use available for 33 891 participants.

[†]The analysis sample for the current study includes 33 240 NESARC participants who used alcohol in their lifetimes and who provided complete data for all covariates.

Table 2

Characteristics of the analysis sample and results of survival analyses of *Diagnostic and Statistical Manual*, fourth edition alcohol dependence in the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), 2001–2002

	Survival analyses of alcohol dependence *		
	Unadjusted models OR (95% CI)	Age at interview, age at first alcohol use, and sex adjusted OR (95% CI)	Fully adjusted OR (95% CI)
Education			
Student	1.49 (1.28 to 1.74)	1.63 (1.40 to 1.89)	1.62 (1.40 to 1.88)
≤High school	1.21 (1.04 to 1.42)	1.36 (1.17 to 1.59)	1.43 (1.23 to 1.66)
GED	2.37 (1.91 to 2.94)	2.18 (1.77 to 2.69)	2.15 (1.75 to 2.65)
Some college	1.61 (1.39 to 1.87)	1.64 (1.41 to 1.89)	1.63 (1.41 to 1.89)
≥4-year college	1	1	1
χ^2 , df = 4 (p)	94.7 (<0.001)	86.9 (<0.001)	78.6 (<0.001)
Race-ethnicity			
Black	0.79 (0.71 to 0.87)	0.70 (0.63 to 0.78)	0.71 (0.64 to 0.78)
Hispanic	0.94 (0.81 to 1.09)	0.68 (0.58 to 0.79)	0.88 (0.76 to 1.02)
API	0.83 (0.64 to 1.08)	0.65 (0.49 to 0.86)	0.96 (0.73 to 1.26)
American Indian	1.49 (1.21 to 1.84)	1.37 (1.09 to 1.73)	1.34 (1.07 to 1.69)
White	1	1	1
χ^2 , df = 4 (p)	47.5 (<0.001)	94.0 (<0.001)	56.2 (<0.001)
Age (years) at interview			
18–29	8.76 (7.49 to 10.25)	8.80 (7.52 to 10.29)	9.52 (8.12 to 11.15)
30–39	4.85 (4.14 to 5.69)	4.72 (4.03 to 5.53)	5.00 (4.26 to 5.88)
40–49	3.54 (3.03 to 4.13)	3.49 (3.00 to 4.06)	3.59 (3.08 to 4.19)
50–59	2.4 (2.04 to 2.83)	2.45 (2.08 to 2.89)	2.49 (2.10 to 2.94)
≥60	1	1	1
χ^2 , df = 4 (p)	924.2 (<0.001)	921.0 (<0.001)	959.7 (<0.001)
Age (years) at first use			
≤12	1	1	1
13–17	1.03 (0.88 to 1.20)	0.88 (0.75 to 1.03)	0.84 (0.72 to 0.98)
18–29	0.49 (0.42 to 0.58)	0.49 (0.41 to 0.57)	0.48 (0.41 to 0.57)
30–39	0.78 (0.55 to 1.11)	0.97 (0.68 to 1.37)	1.01 (0.71 to 1.43)
≤40	0.83 (0.41 to 1.65)	1.06 (0.53 to 2.13)	1.06 (0.52 to 2.13)
χ^2 , df = 4 (p)	318.8 (<0.001)	208.8 (<0.001)	199.3 (<0.001)
Sex			
Male	1.65 (1.53 to 1.78)	1.69 (1.57 to 1.83)	1.76 (1.63 to 1.90)
Female	1	1	1
χ^2 , df = 1 (p)	173.2 (<0.001)	185.7 (<0.001)	213.7 (<0.001)
Birthplace			
Foreign-born	0.58 (0.50 to 0.68)	0.48 (0.41 to 0.56)	0.52 (0.44 to 0.61)
US-born	1	1	1
χ^2 , df = 1 (p)	50.0 (<0.001)	92.8 (<0.001)	66.5 (<0.001)

Survival analyses of alcohol dependence *

Unadjusted models OR (95% CI)	Age at interview, age at first alcohol use, and sex adjusted OR (95% CI)	Fully adjusted OR (95% CI)
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OR, odds ratio; CI, confidence interval; GED, graduate equivalency degree; API, Asian, Pacific Islander, and Native Hawaiian.

* Number of participants with alcohol dependence according to *Diagnostic and Statistical Manual*, fourth edition, criteria = 4649.

Table 3
Survival analyses of alcohol dependence stratified by race-ethnicity in the National Epidemiologic Survey on Alcohol and Related Conditions, 2001–2002*

	Student		≤High school		GED		Some college		≥College		χ^2 , df = 4(p)
	No	OR (95% CI)	No	OR (95% CI)	No	OR (95% CI)	No	OR (95% CI)	No	OR	
Black	404	2.32 (1.41 to 3.83)	2580	2.03 (1.29 to 3.19)	224	2.67 (1.36 to 5.26)	1654	2.51 (1.61 to 3.91)	964	1	18.9 (0.0008)
Hispanic	423	1.33 (0.80 to 2.21)	2836	1.02 (0.66 to 1.58)	241	1.46 (0.75 to 2.85)	1426	1.27 (0.77 to 2.09)	870	1	5.5 (0.24)
API	117	1.98 (0.92 to 4.26)	143	2.72 (0.89 to 8.28)	16	2.39 (0.29 to 20.0)	152	1.88 (0.67 to 5.24)	348	1	3.8 (0.43)
American Indian	36	7.24 (1.54 to 34.01)	227	10.37 (2.36 to 45.54)	42	4.17 (0.58 to 30.05)	162	13.41 (2.78 to 64.79)	97	1	13.5 (0.009)
White	1135	1.52 (1.29 to 1.80)	6935	1.34 (1.13 to 1.59)	740	2.18 (1.71 to 2.77)	5729	1.52 (1.28 to 1.79)	5739	1	56.7 (<0.001)

OR, odds ratio; CI, confidence interval; GED, graduate equivalency degree; API = Asian, Pacific Islander, and Native Hawaiian.

* Models estimated separately for each race-ethnic group, and include controls for age at interview, age at first alcohol use, sex and birthplace.

Association between less than college degree versus college degree or more and alcohol dependence following school completion among all participants and among the subset of US born participants in the National Epidemiologic Survey on Alcohol and Related Conditions, 2001–2002*

Table 4

	All participants (n = 29 519)			US-born participants (n = 25 376)		
	No	OR (95% CI)	χ^2 , df = 1 (p Value)	No	OR (95% CI)	χ^2 , df = 1 (p Value)
Black	5282	2.24 (1.45 to 3.45)	13.84 (0.0002)	4945	2.11 (1.36 to 3.27)	11.63 (0.001)
Hispanic	5185	1.12 (0.72 to 1.73)	0.25 (0.62)	2654	0.97 (0.57 to 1.64)	0.01 (0.91)
API	626	2.35 (0.95 to 5.78)	3.57 (0.059)	194	4.09 (1.56 to 10.77)	8.46 (0.004)
American Indian	491	10.99 (2.51 to 48.09)	10.51 (0.001)	477	10.99 (2.51 to 48.09)	10.51 (0.001)
White	17935	1.46 (1.25 to 1.71)	22.98 (<0.001)	17106	1.42 (1.22 to 1.67)	20.10 (<0.001)