Predicting the Effects of Underage Drinking on Concomitant Alcohol Use Disorder and Poor Educational Attainment

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Abstract

This study examined whether and how underage drinking (UD) relates with concomitant alcohol use disorder and poor educational attainment (CAUDAPEA). A total of 39,860 participants (25-75 years old), roughly 59% of the 2010 National Survey of Drug Use and Health (NSDUH) sample, were drawn for the study. Correlation and regression analyses were used to address the research question. Demographic characteristics of respondents were analyzed using t-test or Chi-square statistics. Alpha was set at .05 to determine statistical significance. Underage drinking alone was a strong and statistically significant predictor of CAUDAPEA. The simple binary logistic regression model identified was statistically significant: (chi-square = 24.19, df =1, $p <$ .05), (Cox and Snell $R^2 = 0.001$), and (Nagelkerke $R^2 = 0.015$), which suggests that using the Nagelkerke R^2, the model explains roughly 1.5% of the variation in CAUDAPEA. The regression coefficient and the Wald statistic show that the effect of having underage drinking history (UDHISTORY) on CAUDAPEA is highly significant (Wald $F = 14.44$, $df = 1$, $p < .05$) with odds ratio = 4.86 indicating that currently legal age drinkers with UDHISTORY were about five times more likely to experience CAUDAPEA than their counterparts without UDHISTORY. When demographic variables (age, gender, race/ethnicity) were added to the model, the identified final multiple logistic regression model was statistically significant, (chi-square = 132.33, $df = 10$, $p < .05$), (Cox and Snell $R^2 = 0.008$), and (Nagelkerke $R^2 = 0.079$) which suggests that using the Nagelkerke R^2, the model explains roughly 7.9% of the variance in CAUDAPEA, an improvement over the model with UDHISTORY alone. Results suggest different ways of looking at relationships between underage drinking, alcohol use disorder, and educational attainment. Implications for rehabilitation and prevention are discussed.

Keywords: underage drinking, alcohol use disorder, poor educational attainment, concomitance

Underage drinking occurs when persons under 21 (the legal drinking age in the United States) drink alcoholic beverages (Alcohol Policy Information System [APIS], 2010). Decades of efforts to prevent underage drinking in the country have not yielded desired results (Johnston, O'Malley, Bachman, & Schulenberg, 2011). Heavy and hazardous drinking by youths have continued, with initiation age getting younger each decade (Johnston, O'Malley, Bachman, & Schulenberg, 2013; Yeide, 2009). Alcohol use disorder (AUD) in this study was defined based on DSM-5 criteria for diagnosis and treatment of alcohol-related disorders (American Psychiatric Association [APA], 2013). An AUD diagnosis meant that the individual met certain diagnostic criteria, including loss of ability to stop drinking or control quantity drank, high tolerance for alcohol, intoxication-driven risky behaviors, or the development of withdrawal symptoms (APA, 2013; Gustin & Simons, 2008; Substance Abuse and Mental Health Services Administration [SAMSHA], 2012). Alcohol use disorder can be mild, moderate, or severe depending on the number of the diagnostic criteria the individual met. The National Institute on Alcohol Abuse and Alcoholism ([NIAAA], 2006) reported that underage drinking (UD) was no longer limited to college students in fraternity houses and at football games, but starts much earlier as children start to experiment with alcohol at much younger ages since the past couple of decades. The purpose of this study was to determine whether and in what way(s) underage drinking predicts concomitant alcohol use disorder and poor educational attainment. The study was guided by the research question: *Do currently legal aged drinkers with a history of underage drinking have a higher probability of concomitant alcohol use disorder and poor educational attainment than their counterparts without a history of underage drinking?* Demographic (age, gender, race/ethnicity) differences were also investigated and discussed.

Prevalence and Consequence of Underage Drinking in the United States

The Surgeon General in 2007, issued a *Call to Action To Prevent and Reduce Underage Drinking* stating that "... new, disturbing research which indicates that the developing adolescent brain may be particularly susceptible to long-term negative consequences from alcohol use" had emerged (pp. V-VI). Nearly a decade later, the Center for Behavioral Health Statistics and Quality (2015) reported that close to nine million youths between the ages of 12 and 20 confirmed drinking in the past month. Johnston, O'Malley, Miech, Bachman, and Schulenberg (2016, 2017) found that 46% of 12th graders had been drunk at least once. Of the 189,060 drug-related emergency room visits in 2010, close to half (45.2%) was by youths who had been drinking (SAMHSA, 2012).

Approximately 5,000 youths die each year in the United States due to alcohol-related motor vehicle accidents, homicide, alcohol poisoning, fall, burn, drowning, and suicide (APIS, n.d.). Youths who start drinking before their 15th birthday are up to seven times more likely to develop alcohol use disorder than those who start drinking after the legal age of 21(National Consortium on Alcohol and NeuroDevelopment in Adolescence [NCANDA], 2015; SAMHSA, 2013). Furthermore, youths who regularly and excessively drink often experience, and subject others to negative life-changing outcomes including disabling physical injuries, mental and psychological impairments, neurological damages and

disorders, a host of undesirable socio-behavioral outcomes, and death (Centers for Disease Control and Prevention [CDC], 2010; International Center for Alcohol Policies [ICAP], 2012; National Institute of Mental Health [NIMH], 2011). Initiation of other substances of abuse is another risk of underage drinking (Kirby & Barry, 2012; OJJDP, 2012).

Underage Drinking, Mental Health Impairment, and Educational Attainment

Underage drinking could progress to levels that meet the DSM-5 criteria for alcohol use disorder diagnosis, as well as lead to use and abuse of other substances immediately or later in life (APA, 2013; Crews, He, & Hodge, 2007; Marshall, 2014; Masten, et al., 2009; Meda, et al., 2017; Silveri, 2012). Alcohol use disorder has been found to correlate with other mental health conditions such as major depressive episodes, suicidal ideation, serious mental illness, and psychological distress (Allen, Rivier & Lee, 2011; Dawson, Grant, & Li, 2007; Horsman, 2014; NIAAA, 2009, Windle, & Windle, 2017). Mental and neurological impairments could interrupt normal developmental process for the yet growing adolescent brain, and hinder educational attainment, hence human capital acquisition (Crosnoe, Brenner, & Schneider, 2012; NIMH, 2011). Emotional and psychological ramifications of alcohol-induced sexual violence have been linked to social dysfunction later in life (SAMHSA, 2010). Balodis, Potenza, and Olmstead (2009) discussed sexual harassment as a social consequence of binge drinking among college students. The National Institute of Health, NIAAA (2015) reported an estimated 700,000 physical assaults and 97,000 reported rape every year.

Neurological and cognitive impairments resulting from underage drinking interfere with academic performance and overall educational outcome (American Medical Association [AMA], 2010; Marshall, 2014; Silveri, 2012). High blood alcohol level in youths may result in neurological deficits including visual impairment, loss of motor coordination, and slowed reflexes (CDC, 2010; ICAP, 2012; SAMHSA, 2012). Cognitive deficits – memory loss, poor judgment, lack of inhibition, and psychological deficiencies (confusion, anxiety, and nervousness) were also reported as resulting from high BAL. Wernicke-Korsakoff Syndrome is another example of health outcomes of prolonged alcohol consumption (National Institute of Neurological Disorders and Stroke, 2018). Wernicke's encephalopathy results in damage to the thalamus and hypothalamus (Galvin et al., 2010; McCormick, Buchanan, Onwuameze, Pierson, & Paradiso, 2011). Symptoms might include mental disorientation, paralyzed eye nerves, and inability to walk and Korsakoff Syndrome might persist beyond treatment of Wernicke's encephalopathy (Thomson, Guerrini, & Marshall, 2009).

Educational attainment or human capital acquisition (HCA) in this study refers to academic and/or vocational training in preparation for future employment (Martínez & Fernández, 2010; van der Merwe, 2010; Olaniyan & Okemakinde, 2008). In today's industrialized, technology driven world, preparation for adulthood careers starts in adolescence and youth. Interruption to the youth's cognitive development could bankrupt educational and skills attainment (Tootoonchi & Tootoonchi, 2018). White and Hingson (2014) found class attendance problems and poor grades among a long list of consequences of college students' drinking. White and Hingson (2014) concluded that despite some gains in

the reduction of injury and death resulting from underage drinking since the Surgeon General's 2007 Call to Action, further studies are needed in the areas of alcohol's effect on the developing brain, policies, societal and family intervention strategies.

Concomitant Alcohol Use Disorder and Poor Educational Attainment

There is a dart of literature on concomitant alcohol use disorder and poor educational attainment. There is however, some characterization of poor educational attainment as failure in school – low grades or minimal educational attainment and as related with teenage alcohol use (Office of Juvenile Justice and Delinquency Prevention [OJJDP], 2012; White & Hingson, 2014). Renna (2007) found associations between heavy alcohol use in adolescence and lower enrolment in educational activities beyond high school, reduced earnings, and heightened job instability in young adulthood. However, as Staff, Patrick, Loken, & Maggs (2008) noted, viewpoints differ on the nature of the relationship between heavy alcohol use and poor educational activities of youths. From the human capital theory perspective, educational attainment is directly and negatively affected by underage alcohol use as predicted by Crosnoe, Benner, and Schneider (2012).

Method

Data Set

Underage-drinking data was obtained from the 2010 National Survey on Drug Use and Health (NSDUH) data set ICPSR 32722-0001. According to SAMHSA (2012) the 2010 study population represented approximately 98% of this population. From the 57,873 final sample size for the 2010 NSDUH, the current study's sample of 19,240 (approximately 33%) was drawn based on the study criteria, which included individuals 25 to 75 years old. (See Table 1)

Data Analysis

Predictor and criterion variables were extracted from the dataset. Other variables were derived from key concepts of the study, recoded and operationalized concepts such as underage drinking history, length of period of underage drinking, recent alcohol consumption, and core demographic variables. The research question was addressed using correlation and regression analyses. Depending on the variables involved, t-test for independent groups or Chi-square statistics were used to study demographic outcomes. In light of Coolidge's (2012) less technical definition of statistical significance as the probability that an effect is not likely due to chance alone, the effect of underage drinking on alcohol use disorder was suspected to be statistically significant if evidence from the survey data showed that age at onset of drinking was a statistically significant predictor of alcohol used disorder and, as such, the prediction was not merely a result of chance.

Underage Drinking (UD), a conceptual variable, is the main predictor available in the survey data set as ALCTRY (Age at Onset of Drinking) and is represented by the construct variable UDHISTORY (Underage Drinking History). UDHISTORY is constructed as a dichotomous version of ALCTRY and is coded as UDHISTORY (1, 0) with the value 1= Yes if ALCTRY < 21, and 0 = No if ALCTRY ≥ 21.

Demographic predictor variables included in the study are:

Age category, AGECAT. This variable was previously labeled CATAG7 in the original dataset and for the purposes of this study was renamed AGECAT for convenience and clarity.

AGE is the non-categorical version of AGECAT and was computed as the difference between survey year and the respondent's date of birth. The variables CUD and CLAD were also established from the AGE based on study criteria. These two variables are coded as:

Currently underage drinking, CUD (0,1) where 1 = Yes if AGE < 21, 0 = No if AGE ≥ 21;

Currently legal age drinking, CLAD (0,1) where 1= Yes if AGE ≥ 21, 0 = No if AGE < 21). Clearly, the variable CLAD is the direct opposite of the variable CUD.

Gender (0,1) with 0 = Female, 1 = Male, is the variable IRSEX, a dichotomous nominal variable previously coded 1 for Male and 2 for Female in the original dataset.

Race/ethnicity, RACE is a categorical nominal variable with seven categories, and was represented in the dataset as NEWRACE2.

The dependent variable *Mental Health Impairment* (MHI) in terms of alcohol use disorder was operationalized as follows:

Alcohol use disorder AUD (0, 1) with 0 = no, 1 = yes. The original variable was DEPENDALC, which was also dichotomous and nominal. DEPENDALC was renamed AUD to conform to the terminology of this study.

Poor human capital acquisition (PHCA) or poor educational attainment (PEA) were operationalized as follows:

PEA (0, 1). The variable EDUCCAT2 was the precursor to the dependent variable for PHCA in terms of overall level of educational attainment, and was recoded into a categorical antecedent variable PEA with two categories in terms of poor educational attainment as: (1 = Yes, Less than High School Education, 0 = No, High School or more).

CAUDAPEA (0, 1) was constructed from AUD and PEA to represent the presence of concomitant MHI and PHCA. CAUDAPEA is a dichotomous nominal variable with values 1 = Yes, if both AUD and PEA are yes, and 0 = No, if b oth AUD and PEA are negative.

Addressing the Research Question

Alpha was set at .05. A correlation analysis was a necessary first step leading to the regression analyses used to address the research question. Data was screened for outliers before calculating a correlation coefficient, and for evidence of a relationship. Where the relationship between two variables was non-linear, Pearson's *r* coefficient was not used. For variables with ordered categories, Spearman's rho or Kendall's tau-b were used. Phi, Chi-squares and log of odds-ratio statistics were used for measuring association in dichotomous nominal variables.

Relationships among variables were tested using logistic regression analysis. Hosmer and Lemeshow's (2000) model building approach along with a hierarchical procedure that examines the incremental variance accounted for by a set of predictor variables after sharing out the effects of previously entered independent variables was adopted. Thus, the predictor variable or sets of variables were entered into the logistic regression analysis model in a predetermined order according to the logic or theory behind the hypothesized relations.

High inter-correlations as well as determination of excluded variables from the logistic regression model were obtained from the assessment between each criterion variable and each of the independent variables. Furthermore, individual cross-tabulations between each criterion variable and the remaining predictor variables were run. The direction of the relationships was inspected through evaluation of the β coefficient for each independent variable,

and statistics were evaluated for measures of association.

Analysis Performed

Correlation and logistic regression analyses were conducted in order to answer the research question, obtain regression equations to analyze effects of the main predictor variable UDHISTORY and examine whether there are significant differences in the demographic variables (Current Age, Gender, Race/Ethnicity) in the prediction process. In the model building, the criterion variable CAUDAPEA was entered and then the predictor variable and demographic covariates followed hierarchically in the regression procedure.

In the hierarchical manner, UDHISTORY was entered first and its effect alone was recorded and then the demographic variables were entered singly and in sets to ascertain both their mean and interaction effects when present. Then, the odds ratio exp(B) was used to provide an estimate of the ability of UDHISTORY to predict the probability of an individual having CAUDAPEA as described above. Similarly, the odds ratio exp(B) for each demographic variable was used to provide an estimate of the ability of the demographic variable to influence the predictor.

Furthermore, odds ratios were used to ascertain whether or not there are demographic differences among currently legal age drinkers in this research question. For example the odds ratio indicated whether the incidence of having CAUDAPEA is influenced by gender, whether and by how much the odds of having CAUDAPEA are higher or lower for males than for females. This would mean that there is a greater or lesser chance of male drinkers having CAUDAPEA than female drinkers or vice versa. The odds ratio also indicated whether incidence of having CAUDAPEA went up or down with Current Age and Race/Ethnicity.

Results

The NSDUH 2010 survey dataset contained a final sample size of 57,873 respondents. Among these, some 27,516 (70% of valid cases) were currently legal age drinkers (CLADs) as at the survey period. Respondents considered in this study were 19,100 CLADs aged 25-75, about 69% of all CLADs in the overall sample. About 47% of these respondents were male 52% were female. Most (84%) of the respondents in the study had underage drinking history (UDHISTORY). Among those with underage drinking history, 42% (11,566) were males and 11,909 were females. The average length of period of underage drinking (ALOPUD) was 5.3 years. Males had longer periods of underage drinking (5.6years) than females (5 years). About 4.3% (815) of respondents in the study had alcohol use disorder (AUD). Males had higher prevalence of AUD 2.6% (496) than females 1.7% (319). Majority of respondents in the study (88% or 16,808) completed high school and 12% (2,292) did not complete high school. The 12% who did not complete high school fall under the poor educational attainment (PEA) classification. Among those with PEA, 55% (1,264) were males and 1103 were females. About 1.0% (153) of the respondents experienced CAUDAPEA and among them 93 were male while 60 were female, but there was missing data (2876, 5% of sample) for this variable.

The regression analysis (Tables 2a and 2b) shows that UDHISTORY alone is a statistically significant predictor of CAUDAPEA. The simple binary logistic regression model identified was statistically significant: (chi-square = 24.19, df =1, $p <$ .05), (Cox and Snell R^2 = 0.001), and (Nagelkerke R^2 = 0.015) which suggests that using the Nagelkerke R^2, the model explains

roughly 1.5% of the variation in CAUDAPEA. Table 2c provides the regression coefficient (B), the Wald statistic and the Odds Ratio represented by Exp(B), and shows that the effect of UDHISTORY on CAUDAPEA is highly significant (Wald $F = 14.44$, $df = 1$, $p < .05$) with odds ratio = 4.86 indicating that currently legal age drinkers with underage drinking history were about five times more likely to have concomitant alcohol use disorder and poor educational attainment than currently legal age drinkers without underage drinking history.

The investigation into demographic differences among individuals specified in the research question revealed that when CAUDAPEA was regressed on UDHISTORY with AGE as a categorical covariate

Table 1 – Response Rate and Sample Size for the 2010 NSDU by Relevant Demographic Characteristics

Source: Adapted from SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2009 and 2010.

Demographic Characteristic	Selected Persons	Completed Interviews	Weighted Response Rate
TOTAL	85,668	68,487	74.66%
AGE IN YEARS			
12-17	26,157	22,246	84.79%
18-25	28,447	23,322	81.39%
26 or Older	31,064	22,919	72.21%
GENDER			
Male	42,116	33,164	73.20%
Female	43,552	35,323	76.03%
RACE/ETHNICITY			
Hispanic	13,003	10,715	78.29%
White	55,890	44,005	73.65%
Black	9,990	8,507	80.25%
All Other Races	6,785	5,260	67.14%

Table 2 – Results of Binary Logistic Regressions of CAUDAPEA on UDHISTORY using SPSS 10.0 for Windows

2a. Omnibus Tests of Model Coefficients

		χ^2	*df*	*p*
Step 1	Step	24.191	1	.000
	Block	24.191	1	.000
	Model	12.191	1	.000

2b. Model Summary

-2 Log likelihood	1727.106		
Cox & Snell		.001	
Nagelkerke		.015	

2c. Variables in the Equation

		β	*SE* β	Wald	*df*	*p*	e^{β}	95% CI for e^{β} Lower	Upper
Step 1	UDHSTORY(1)	1.582	.416	14.443	1	.000	4.853	2.151	10.993
	Constant	-6.122	.408	225.292	1	.000	.002		

(reference category = 35 years or older), the logistic regression model was statistically significant. Table 3a shows that odds ratio of AGECAT (21-25) was 2.3, and that of AGECAT (26-34) was 1.72 indicating that, taking into account the effect of UDHISTORY, currently legal age drinkers in both age categories were about two times more likely to experience CAUDAPEA than their older counterparts. Furthermore, when CAUDAPEA was regressed on UDHISTORY with GENDER as a covariate (reference category = female), the resulting model (Table 3b) was statistically significant and taking into account the effect of UDHISTORY, the odds ratio for gender was 1.7. This indicated that currently legal age male drinkers were about 2 times more likely to experience concomitant alcohol use disorder and poor educational attainment than their female counterparts.

When CAUDAPEA was regressed on UDHISTORY with RACE as a covariate predictor (reference group = non-Hispanic White), the results in Table 3c show that it was overall significant (Wald = 97.31, df = 6, $p < 0.000$). But looking at the regression coefficient B of the individual categories, only three categories (Black, Hispanic, Islander) were statistically significant. The Hispanic group had the highest odds ratio (11.04) indicating that, after taking into account the effect of UDHISTORY, Hispanic currently legal age drinkers were about 11 times more likely to experience CAUDAPEA than their non-Hispanic White counterparts. The Islander group had the second highest odds ratio (4.29) indicating that, controlling for the effect of underage drinking history, non-Hispanic Islander currently legal age drinkers were about four times more likely to have CAUDAPEA than their non-Hispanic White counterparts. The non-Hispanic Black group had odds ratio = 3.63 indicating that, after taking into account the effect of underage drinking history, they were about four times more likely to have CAUDAPEA than their non-Hispanic White counterparts (see Table 3c). The identified final multiple logistic regression model was statistically significant, (chi-square = 132.33, df =10, $p < .05$) (see Table 4a), (Cox and Snell $R^2 = 0.008$), and (Nagelkerke $R^2 = 0.079$) which suggests that using the Nagelkerke R^2, the model explains roughly 7.9% of the variation in CAUDAPEA, an improvement of 6.4% over the model without the demographic variables (see Table 4b).

Limitations

The current study used existing data, which was not collected in response to the research question and as such, might have missed critical and interesting variables and subpopulations (Cheng & Phillips, 2014). Furthermore, the study omitted individuals 21 – 24 years of age, an age category that includes newly legal age drinkers who would have been informative to the study. The final limitation to the study was the data collection method, which involved self-reports. Self-reported data can introduce bias into the study in the forms of false and/or misleading information (Sedgwick, 2014).

Discussion

The purpose of this study, which was to examine whether and how underage drinking relates with concomitant alcohol use disorder and poor educational attainment, was achieved. Correlation and regression analyses indicated positive associations between the two variables, and predicted concomitant alcohol use disorder and poor educational attainment. Findings of this study suggest that underage drinking can lead to concomitant alcohol use disorder and poor educational attainment, among other negative consequences (economic, civil, social, mental and physical health impairments), which also interrupt the normal lives of individuals engaged in the behavior.

Table 3 – Results of Logistic Regressions of CAUDAPEA on UDHISTORY and demographic variables separately using SPSS 10.0 for Windows

3a. Variables in the Equation

		β	*SE* β	Wald	*df*	*p*	e^{β}	95% CI for e^{β}	
								Lower	Upper
Step 1	UDHSTORY(1)	1.561	.416	14.068	1	.000	4.764	2.107	10.770
	AGECAT			17.224	2	.000			
	AGECAT(1)	.829	.221	14.058	1	.000	2.291	1.485	3.535
	AGECAT(2)	.539	.182	8.731	1	.003	1.714	1.199	2.451
	Constant	-6.386	.416	235.839	1	.000	.002		

3b. Variables in the Equation

		β	*SE* β	Wald	*df*	*p*	e^{β}	95% CI for e^{β}	
								Lower	
Step 1	UDHSTORY(1)	1.508	.417	13.088	1	.000	4.516	1.995	10.222
	GENDER(1)	.541	.166	10.657	1	.001	1.718	1.241	2.378
	Constant	-6.342	.415	233.185	1	.000	.002		

3c. Variables in the Equation

		β	*SE* β	Wald	*df*	*p*	e^{β}	95% CI for e^{β}	
								Lower	Upper
Step 1	UDHSTORY(1)	1.748	.418	17.524	1	.000	5.746	2.534	13.028
	RACE			97.309	6	.000			
BLACK	RACE(1)	1.290	.221	34.153	1	.000	3.631	2.356	5.596
HISPANIC	RACE(2)	2.401	.322	55.707	1	.000	11.039	5.876	20.740
ASIAN	RACE(3)	1.114	1.016	1.201	1	.273	3.046	.415	22.335
MIXED	RACE(4)	-.281	.719	.152	1	.696	.755	.185	3.090
NATIVE	RACE(5)	.694	.517	1.801	1	.180	2.002	.726	5.517
ISLANDER	RACE(6)	1.457	.209	48.475	1	.000	4.292	2.848	6.469
	Constant	-6.793	.424	256.778	1	.000	.001		

Note: For equations 6a, 6b, and 6c, variable(s) entered in step 1 = AGECAT, GENDER, and RACE, respectively. All statistics reported herein use 3 decimal places in order to maintain statistical precision.

Table 4 – Results of Logistic Regressions of CAUDAPEA on UDHISTORY and demographic variables jointly using SPSS 10.0 for Windows

4a. Omnibus Tests of Model Coefficients

		χ^2	*df*	*p*
Step 1	Step	108.134	9	.000
	Block	108.134	9	.000
	Model	132.325	10	.000

4b. Hosmer and Lemeshow Test

Step 1	7.910	7	.341

Model Summary

Step 1

-2 Log Likelihood	1618.972	
Cox & Snell		.008
Nagelkerke		.079

4c. Variables in the Equation

		β	*SE* β	Wald	*df*	*p*	e^{β}	95% CI for e^{β} Lower	Upper
	UDHSTORY(1)	1.625	.418	15.098	1	.000	5.081	2.238	11.534
	AGECAT			11.413	2	.003			
	AGECAT(1)	.715	.224	10.188	1	.001	2.045	1.318	3.172
	AGECAT(2)	.400	.185	4.659	1	.031	1.492	1.037	2,145
	GENDER(1)	.597	.167	12.779	1	.000	1.817	1.310	2,521
	RACE			91.683	6	.000			
BLACK	RACE(1)	1.259	.222	32.285	1	.000	3.522	2.281	5.437
HISPANIC	RACE(2)	2.419	.323	55.935	1	.000	11.238	5.961	21.185
ASIAN	RACE(3)	1.060	1.018	1.084	1	.298	2.885	.392	21.212
MIXED	RACE(4)	-.409	.719	.323	1	.570	.664	.162	2.722
NATIVE	RACE(5)	.614	.518	1.403	1	.236	1.847	.669	5.100
ISLANDER	RACE(6)	1.353	.212	40.736	1	.000	3.867	2.553	5.859
	Constant	-7.196	.437	271.434	1	.000	.001		

Note: Variable(s) entered on step 1: AGECAT, GENDER, RACE. All statistics reported herein use 3 decimal places in order to maintain statistical precision.

Statistically significant demographic differences were found especially in terms of gender and race/ethnicity. Taking into account the effect of underage drinking, currently legal age drinkers between 25 and 34 years old were about two times more likely to have concomitant alcohol use disorder and poor educational attainment than their older counterparts in the 35 years and older age group.

While underage drinking encompasses all ages of onset before 21, research has found that the effect of initiating drinking at an earlier age, for example at 12, can be remarkably different from initiating drinking at age 19 (Center on Alcohol Marketing and Youth at John Hopkins Bloomberg School of Public Health [CAMY], 2014). Recent research also shows a steady decrease in age at onset of drinking in the past two decades (CAMY, 2014). It is possible that participants in the lower age category may have started drinking earlier than their counterparts in the older age category. In that case, younger age of onset can be another plausible explanation for the difference observed in the age categories given that earlier age of onset of drinking would have an even greater impact on the youth's education.

In terms of gender, currently legal age male drinkers were about two times more likely to have concomitant alcohol use disorder and poor educational attainment than their female counterparts. Though some studies, (see for example Bönte & Jarosch, 2012; Gearing, McNeill, & Lozier, 2005; Schulte, Ramo, & Brown, 2009) suggest possible male contribution to fetal alcohol syndrome (FAS), it has been established that FAS is a consequence of female alcohol intake especially immediately before and during pregnancy (Schulte, Ramo, & Brown, 2009). Other areas of gender differences that could help explain the results obtained include psycho and physiological differences and personality (Bönte & Jarosch, 2012, Da Silva et al., 2018). Bönte and Jarosch (2012), Ronay and Kim (2006), and Da Silva et al. (2018) suggest that females avoid risky situations more so than males, and encourage further investigations of outcomes for females.

In terms of race/ethnicity, Hispanic currently legal age drinkers were about 11 times more likely to have CAUDAPEA than their non-Hispanic White counterparts, while the non-Hispanic Blacks were about 4 times more likely to have CAUDAPEA than their White counterparts. This result reflects a CAMY (2014) report that the prevalence of underage drinking initiation by race was 33.7%, 28.4%, and 28.2% of Latino, African American, and White youths respectively.
The same report indicated youths reported heavy drinking as follows: 21.4 percent for White, 17.2 percent for Latinos, and 10.3 percent for African Americans. Although the literature on concomitant alcohol use disorder and poor educational attainment for all individual groups is sparse, some hypotheses regarding race/ethnicity, substance use disorder, and poor educational attainment can be surmised. African American adolescents use alcohol more than they use other substances (Snyder, Milici, Slater, Sun, & Strizhakova, 2006; Wallace Jr., Brown, Bachman, & Laveist, 2003).

Conclusions and Recommendations

Results of this study indicated that underage drinking poses countless harms to the youth throughout his or her life, and especially to mental health and human capital acquisition. These findings are similar to those reported by earlier studies (see for example, AMA, 2010; Burns, 2016; Tombe, Burns, & Kalembo, 2017). The findings also suggest that relationships between underage drinking, alcohol use disorder, and educational attainment ought to be viewed from different perspectives.

Further investigation of the relationship between these variables, including specific look into influences of race/ethnicity and other demographic differences is recommended. Multidisciplinary approaches to interventions that address all areas of the youth's life are strongly recommended.

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