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Age of Drinking Onset and Injuries, Motor Vehicle Crashes, and Physical Fights After Drinking and When Not Drinking

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Abstract

Background—Earlier age of drinking onset has been associated with greater odds of involvement in motor vehicle crashes, unintentional injuries, and physical fights after drinking. This study explores whether early drinkers take more risks even when sober by comparing potential associations between age of drinking onset and these outcomes after drinking relative to when respondents have not been drinking.

Method—From a national sample, 4,021 ever-drinkers ages 18 to 39 were asked age of drinking onset, not counting tastes or sips. They were also asked if they were ever in motor vehicle crashes, unintentionally injured, or in physical fights after drinking and when not drinking. GEE logistic regression models for repeated measures dichotomous outcomes compared whether odds ratios between age of onset and these adverse outcomes significantly differed when they occurred after drinking vs. when not drinking, controlling for respondents' demographic characteristics, cigarette and marijuana use, family history of alcoholism, ever experiencing alcohol dependence, and frequency of binge drinking.

Results—Compared with persons who started drinking at age 21+, those who started at ages <14, 14–15, 16–17, and 18–20 had, after drinking, respectively greater odds: 6.3 (2.6, 15.3), 5.2 (2.2, 12.3), 3.3 (1.5, 7.3), and 2.2 (0.9, 5.1) of having been in a motor vehicle crash; 6.0 (3.4, 10.5), 4.9 (3.0, 8.6), 3.7 (2.4, 5.6), and 1.9 (1.2, 2.9) of ever being in a fight; and 4.6 (2.4, 8.7), 4.7 (2.6, 8.6), 3.2 (1.9, 5.6), and 2.3 (1.3, 4.0) of ever being accidentally injured. The odds of experiencing motor vehicle accidents or injuries when not drinking were not significantly elevated among early onset drinkers. The odds of earlier onset drinkers being in fights were also significantly greater when respondents had been drinking than not drinking.

Conclusion—Starting to drink at an earlier age is associated with greater odds of experiencing motor vehicle crash involvement, unintentional injuries, and physical fights when respondents were drinking, but less so when respondents had not been drinking. These findings reinforce the need for programs and policies to delay drinking onset.

Keywords

drinking onset; injuries; fights; traffic crashes; alcohol dependence

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INTRODUCTION

Excessive alcohol consumption is the third leading contributor to preventable death in the United States. Of the 75,000 alcohol-attributable deaths annually in the United States, over 40,000 are acute, primarily injury deaths, which include: 13,600 traffic deaths; 12,474 other unintentional injury deaths; 7,600 homicides; and nearly 7,000 suicide deaths (Midanik, 2004). Injuries are the leading cause of death in the United States for persons ages 1–44 (Web-Based Injury Statistics Query and Reporting System, 2008), and alcohol is the leading contributor to those deaths. Because alcohol-attributable injury deaths typically affect young people, these deaths account for twice the number of preventable years of life lost than alcohol-attributable chronic disease deaths (Midanik, 2004).

According to the Centers for Disease Control and Prevention's 2007 Youth Risk Behavior Survey (YRBS), a national probability self-administered survey of high school seniors, 24% of high school students begin to drink before the age of 13. Those who initiate drinking at that age are, by the time they are age 17, 3.3 times more likely than their peers to report that they consume 5 or more drinks on an occasion at least 6 times per month (Youth Risk Behavior Survey: Youth Online, 2008). The National Institute on Alcohol Abuse and Alcoholism (NIAAA) has defined binge drinking as the consumption of 5 or more drinks over a 2 hour period by a male and 4 or more drinks in the same time period by a female (2004/2005), an amount that would result in an average male or female adult reaching a blood alcohol level of 0.08%, the legal level of intoxication in every state. Projecting responses from the 2007 YRBS to the U.S. population of high school students indicates one million high school students engage in a pattern of binge drinking or drinking to intoxication 6 or more times per month.

High school students who are frequent binge drinkers are much more likely than other students to engage in a variety of behaviors that pose risk of injury to themselves and others. They are more likely to drive after drinking and ride with drinking drivers, thereby enhancing their risk of motor vehicle crash involvement. They much more often report never wearing seat belts, thereby increasing the likelihood of getting injured in a crash. They more often report involvement in physical fights, carrying weapons, and, in the past year, being injured in physical fights and suicide attempts. (National Institute on Alcohol Abuse and Alcoholism, 2004/2005; Youth Risk Behavior Survey: Youth Online, 2008.)

Analyses of national surveys revealed that the younger respondents were when they first began to drink, the greater the likelihood that they would experience alcohol dependence at some point in their lives (Grant and Dawson, 1997), and that the earlier in age that respondents began to drink, the greater the likelihood that they will develop alcohol dependence and dependence more rapidly, thus becoming dependent before age 25 (Hingson et al., 2006). They are also more likely to develop chronic relapsing dependence characterized by longer episodes of dependence, having multiple episodes, and meeting more of the diagnostic criteria for dependence (Hingson et al., 2006). The association between early drinking onset and the development of alcohol dependence has also been observed in longitudinal studies (Grant et al., 2001; Warner and White, 2003) and in a study of monozygotic twins discordant on age of first drinking (Grant et al., 2005), even though earlier work suggested that early age at first drink may be a marker for family or genetic liability to develop alcohol dependence rather than reflecting a causal relationship (Prescott and Kendler, 1999).

Persons who start drinking at earlier ages are also much more likely to experience unintentional injuries after drinking (Hingson et al., 2000), drive after drinking (Hingson et al., 2002; Lynskey et al., 2007; Zakrajsek and Shope, 2006), and experience motor vehicle

crashes and physical fights after drinking (Hingson et al., 2002; Hingson et al., 2001). For example, relative to persons who wait until age 21 or older to begin drinking, those who start at age 14 or younger are, after drinking, 11 times more likely to have been unintentionally injured (Hingson et al., 2000), 7 times more likely to have been in a motor vehicle crash (Hingson et al., 2002), and 12 times more likely to have been in a physical fight (Hingson et al., 2001). These associations have been observed ever during a respondent's life and during the year preceding the survey, when the average respondent age was 44, and remained statistically significant after statistically controlling for a variety of personal characteristics associated with early drinking onset, including age, gender, race/ethnicity, marital status, education, history of smoking and drug use, childhood depression, and family history of alcoholism. While the relationship between early drinking onset and the development of alcohol dependence accounts for part of the associations, it does not fully explain why early drinkers are more likely to experience unintentional injuries, motor vehicle crashes, and physical fights after drinking.

Early drinking onset has also been linked to violent behavior (Blitstein et al., 2005; Ellickson et al., 2003), dating violence victimization (Ramisetty-Mikler et al., 2006; Eaton et al., 2007; Swahn et al., 2008; Swahn and Bossartre, 2007), criminal behavior (Allan et al., 2001; Ellickson et al., 2003), and predatory violence (Ellickson et al., 2003). Heavy drinking at age 16 has been prospectively linked to drink driving offenses and violent offenses at ages 16–20 and 21–25 (Wells et al., 2004).

One hypothesis consistent with problem behavior theory has been that early onset drinkers are greater risk takers in general (Jessor et al., 1991; DuRant et al., 1999) and hence would be more likely, even if they had not been drinking, to experience diverse outcomes such as injuries, motor vehicle crashes, and physical fights.

Previously unexplored and the focus of this analysis is whether, compared with persons who wait until they are age 21 or older to begin drinking, those who start at an earlier age are more likely to experience unintentional injuries, to be drivers in motor vehicle crashes, and to be in physical fights both when they had been drinking and when they had not been drinking. This study will also examine the relative odds of experiencing these outcomes both after drinking and when respondents had not been drinking.

METHODS

In 2006, we conducted a survey of current or former drinkers aged 18 to 39. This study was approved by the Boston Medical Center Institutional Review Board. The aims of our survey focused on associations between age of drinking onset and alcohol-related problems in adolescence and adulthood. We restricted our target population to ever-drinkers between the ages of 18 to 39 to minimize recall issues around drinking onset. Most alcohol-related traffic crashes, fights, and injuries occur in this age group. Also, the legal purchase age became 21 years nationwide in 1984, and so these respondents began drinking under the same legal environment. The study sample was comprised of two groups that completed the same questionnaire: a random sample from a pre-recruited Internet panel who participated by Internet and a non-response follow-up sample of individuals who were selected for but declined membership in the same Internet panel who participated by telephone.

The standing Internet panel was established using list-assisted, random digit dial (RDD) telephone techniques. Telephone numbers from phone banks with higher concentrations of black people and Hispanics were slightly over-sampled. The households with phone numbers that could be matched to residential addresses (65%) received an advanced mailing about the Internet panel. Both address-matched and unmatched phone numbers were called.

For enrolled households, all household members were enumerated and invited to be on the panel. Subjects agreeing to participate who did not have Internet access were given free access to WebTV and the Internet. Subjects remain on the panel for approximately 3 years, with new panel members recruited over time to replace those retiring or dropping out. Panel members receive e-mail invitations to participate in surveys 3 to 4 times a month and usually completed about 2 surveys per month.

We randomly selected one adult between the ages of 18 and 39 from households that had joined the Internet panel within the last two years. A screening e-mail was sent to 6,200 panel members inviting them to participate in a study of alcohol-related behavior and experiences. Those who did not respond to the invitation after a month were offered a short version of the survey. The 5,778 (93%) members who responded to the screening e-mail were asked if they were current drinkers (i.e. had at least 12 drinks over the past year) or former drinkers (i.e. ever had 12 drinks in a 12-month period). Of all respondents, 4,012 were eligible for the survey. Of these eligible respondents, 603 were randomly selected for a sub-study on mode of administration effects and were not included in this analysis. The other 3,409 completed survey online. All those who responded to the screening e-mail received panel reward points that they could use to enter prize drawings or to redeem for cash ($10 value).

Using a sample from a standing panel may introduce selection bias if those who agree to participate in a panel are somehow different from those who refuse participation. To minimize this potential bias, we supplemented our Internet panel sample with a second sample of non-panel members drawn from the same RDD sample that generated the Internet panel. The sample was drawn from 3 distinct pools of panel non-members: (1) respondents from the RDD sample who were never contacted or were contacted by phone but refused to participate (n = 338); (2) respondents who had agreed to participate but did not completed the initial online survey (n = 143); and (3) respondents who had joined the panel but had dropped out prior to the sampling for this survey (n = 131). These respondents completed the survey over the telephone.

Both the telephone sample (n=612) and the Internet sample (n=3,409) were drawn from the same underlying RDD national sample, and the combined sample (n=4,021) was weighted to reflect sampling probabilities and the national population by age, sex and race/ethnicity. By the American Association for Public Opinion Research (AAPOR) definitions, there was a 93% cooperation rate for the Internet survey sample and an overall population response rate of 37%. A previous manuscript (Heeren et al., 2008) compares the Internet and telephone sample with the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). This analysis shows the combined weighted sample represented the national age, gender, race/ethnicity, education, and family history of alcohol problems of 18–39 year old ever drinkers, and the distribution of current frequency and quantity of drinking. While rates of current high risk drinking (exceeding NIAAA recommended levels for both daily and weekly drinking) were similar in our sample and NESARC (16% and 17%), our sample showed a higher rate of high risk drinking during the lifetime heaviest drinking period (41% and 32%) and a higher rate of lifetime dependence (36% vs. 24%). There were no significant differences between our sample and NESARC on the associations between lifetime alcohol dependence and gender, education, family history of alcohol problems, age of drinking onset, or risky drinking by the NIAAA guidelines, although our sample failed to show the increased risk of lifetime dependence for those aged 18–25 vs. 36–39 found in NESARC.

Survey Instrument

The same survey instrument, which was designed to take about 30 minutes to complete, was used for both the online and telephone surveys. Questions measured demographic characteristics, the amount of alcohol consumption during the past year and during the respondent's time of heaviest drinking, alcohol dependence, and the age that respondents first began drinking (not counting tastes or sips). Demographic data on Internet panel members were available on file, so questions about demographics were only asked of the sample of non-panel members.

Demographic Variables

Age (categorized as 18 to 25 years, 26 to 35 years, and 36 to 39 years), sex, race/ethnicity (white non-Hispanic, black non-Hispanic, Hispanic, and other), and education (not a high school graduate, high school graduate, some college, college graduate) were examined.

Alcohol Consumption

Questions about alcohol consumption and age of drinking onset were drawn from NESARC. Respondents were asked about how often they consumed 5 or more drinks (if men) or 4 or more drinks (if women) in a single day during the past 12 months and during their period of heaviest drinking, if this period was not the last 12 months. Respondents were also asked "About how old were you when you first started to drink, not counting small tastes or sips of alcohol." We compared persons who started drinking at ages less than 14, 14–15, 16–17, and 18–20 with those who started at age 21 or higher. Numerous studies have used less than age 14 as the initial category for age of drinking onset (Grant and Dawson, 1997; Hingson et al., 2000; Hingson et al., 2001; Hingson et al., 2002; Hingson et al., 2006; Heeren et al., 2008).

Alcohol Dependence

Survey questions relating to alcohol dependence were based on the NIAAA Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-IV Version (AUDADIS-IV), a structured, diagnostic interview designed for use by nonclinician lay interviewers that was used in NESARC. The good to excellent reliability and validity of the AUDADIS-IV alcohol abuse and dependence criteria have been well documented (Grant et al., 2004). DSM-IV alcohol dependence was defined by 7 diagnostic criteria, including 1) tolerance, 2) the withdrawal syndrome or drinking to relieve or avoid withdrawal symptoms, 3) drinking larger amounts or for a longer period than intended, 4) persistent desire or unsuccessful attempts to cut down on drinking, 5) spending a great deal of time obtaining alcohol, drinking, or recovering from effects of drinking, 6) giving up important social, occupational, or recreational activities in favor of drinking, and 7) continued drinking despite physical or psychological problems caused by drinking. Withdrawal criteria required at least 2 positive symptoms of withdrawal as defined by DSM-IV alcohol withdrawal diagnosis, and diagnosis of alcohol dependence required meeting at least 3 of the 7 DSM-IV criteria for dependence during the same time period.

Injury Outcome Variables

Respondents were asked: 1) "Did you ever have a car, motorcycle, or truck accident when you were the driver? If yes, how many of these accidents happened after you had been drinking? All, some, or none?" 2) "Did you ever get into a physical fight? If yes, how many of these fights happened after you had been drinking? All, some or none?" and 3) "Did you ever accidentally injure yourself, like have a bad fall, cut yourself badly, or get hurt in a traffic accident? If yes, how many of these accidental injuries happened after you had ever been drinking alcohol? All, some, or none?"

Data Analysis

Analyses were conducted using SUDAAN (Shah et al., 1996), a statistical software program that uses Taylor series linearization to adjust for survey design and weighting both in calculating parameter estimates and standard errors. Chi-square tests were used to evaluate unadjusted associations between the outcomes and demographic factors, and the outcomes and drinking behaviors. Generalized Estimating Equation (GEE) logistic regression models for repeated measures dichotomous outcomes were used to estimate and compare odds ratios describing the association between early drinking onset and having motor vehicle accidents, fights, and injuries after drinking with odds ratios describing this association for these events while not drinking. Regression models first controlled for age, gender, race/ethnicity, and education, and then for those demographics plus cigarette and marijuana use, family history of alcoholism, whether respondents ever met alcohol dependence diagnostic criteria, and frequency of binge drinking (i.e. 5+ drinks for men and 4+ drinks for women in a two hour period) in the past year and during the period of respondents' heaviest drinking period. Each respondent contributed two observations to this analysis, one for ever/never experiencing the outcome event after drinking and the other for ever/never experiencing the outcome event while not drinking. Differential effects of age of onset were modeled through interaction terms between event condition (after drinking vs. while not drinking) and age of drinking onset, which was represented through a set of indicator variables.

RESULTS

Respondent demographic characteristics and substance use are presented in Table 1. Among respondents who ever drank, 38% had ever been a driver in a motor vehicle crash, and 14% of those drivers were in accidents that occurred after they had been drinking; 34% reported ever being in a physical fight, and 64% of them were in fights that occurred after drinking; and 27% were ever accidentally injured, and 50% of them were injured after drinking.

Table 1 presents whether, after drinking and when not drinking, respondents were ever a driver in an automobile crash, in a physical fight, or unintentionally injured according to respondent demographic characteristics and substance use patterns. Table 2 presents the odds of involvement in a motor vehicle accident, physical fight, and unintentional injury after drinking and when not drinking by age of drinking onset, controlling for respondent age, sex, race/ethnicity, and education. Table 3 presents the odds of experiencing these outcomes after further controlling for cigarette and marijuana use, family history of alcoholism, ever being alcohol dependent, and exceeding drinking limits (5+ drinks for men and 4+ drinks for women in a two hour period) during the current and heaviest drinking period.

Logistic regression analyses (Table 3) revealed that, compared with persons who started drinking at age 21 or older, those who started drinking at earlier ages were more likely after drinking to have been a driver in a motor vehicle crash, to have been injured, and to have been in a physical fight. The younger the age group of respondents when they began to drink, the greater the odds that they would have experienced these outcomes after drinking. Compared with persons who waited until age 21 or older to start drinking, those who started drinking at age 14 had 6.3 (95% confidence interval, 2.6, 15.3) greater odds of having been in a motor vehicle crash after drinking, 4.6 (2.4, 8.7) greater odds of having been in a physical fight after drinking, and 5.2 (2.7, 10.2) greater odds of having been accidentally injured after drinking. The odds of experiencing each of these outcomes after drinking were also significantly higher for persons who began drinking at ages 14–15 and 16–17 relative to persons who began drinking at age 21 or older (Table 3), as were the odds of ever being in a fight or accidentally injured for those who started drinking at ages 18–20.

In contrast, the odds of having been a driver in a motor vehicle crash or ever being accidentally injured when respondents had not been drinking did not significantly vary according to age of drinking onset. Also, the odds of being in a fight when not drinking increased only modestly with earlier ages of drinking onset. Compared with respondents who started drinking at age 21, those who started drinking at <14 years and 15–16 years had, respectively, 2.2 (1.3, 3.8) and 1.8 (1.2, 2.8) greater odds of being in a physical fight when they had not been drinking (Table 3).

Interaction models showed the associations between age of drinking onset and adverse outcomes after drinking to be significantly stronger than the associations between age of drinking onset and adverse outcomes when not drinking (Table 3). For example, compared to those who started drinking at age 21+, those who started drinking by age 14 had 6.3 times the odds of ever being in an auto accident after drinking, but only 0.9 times the odds of having been in an auto accident when not drinking, p<.01.

DISCUSSION

This article replicates prior research indicating associations between early drinking and experiencing unintentional injuries, motor vehicle crashes, and physical fights after drinking (Hingson et al., 2000; Hingson et al., 2001; Hingson et al., 2002). New findings are that earlier drinking is significantly more likely to be associated with these outcomes after respondents had been drinking than when they had not been drinking. This suggests that the associations arise not only because early drinkers are greater risk-takers in general. Rather, the associations result in part from early drinkers being more likely later in life to be heavier drinkers and to experience alcohol dependence and more and longer episodes of dependence (Hingson et al., 2006), and are therefore more likely to experience unintentional injuries, motor vehicle crashes, and physical fights after drinking. Because these associations, although less strong, remain significant after controlling for lifetime history of dependence and frequency of heavy drinking, other factors may also be at work. Early drinkers may be more likely to engage in risky behavior like speeding after drinking than when sober. Independent of frequency and quantity of drinking, early onset drinkers may consume alcohol in contexts (e.g. in bars or when driving) that put them at greater risks for these events. Research is needed to further identify the factors that contribute to higher injury experience after drinking for early drinkers. Is it because of increases in time spent under the influence of alcohol, more impaired judgment and risk-taking after drinking, or greater impaired response and slower reaction time to dangerous situations?

Several issues should be considered in interpreting these results. First, this cross-sectional survey required some respondents to recall age of drinking onset many years earlier. We included current age as a covariate in our regression analyses and found that the patterns of relationships were not altered when respondent age was taken into account. The patterns were the same for respondents with both shorter and longer recall periods. Nonetheless, longitudinal studies that begin during childhood before drinking onset and that follow adolescents into adult life could shorten recall periods and may offer additional insights into the mechanisms at work.

Second, social desirability biases may foster underreporting of alcohol use and associated problems. On the other hand, persons willing to report early drinking at ages when it is illegal may be less hesitant to report adverse drinking consequences like motor vehicle crashes, physical fights, or unintentional injuries after drinking.

Third, potential confounding factors, genetic factors, disinhibitory behavior patterns, and other psychiatric disorders may have contributed to the observed associations. Personality

characteristics such as childhood conduct disorder and depression have been linked to early drinking onset and may also be associated with study outcomes both after drinking and when not drinking. Such factors were not included in our survey. Also, our questionnaire also did not seek to measure the quantity of use of psychoactive substances other than alcohol and marijuana that could influence study outcomes. Adverse childhood experiences such as physical or psychological abuse, growing up in single parent households or with parents with psychiatric disorders, etc. have also been linked to early drinking onset and could relate to study outcomes (Rothman et al., 2008). We repeated our regression analyses with number of adverse childhood experiences included as a covariate, and the impact on the pattern and significance of the results was negligible (data available upon request).

Fourth, the fighting variable did not identify the context in which violence occurred (e.g. date with a peer, situation involving an intimate partner, the street, a bar, etc.). Relations between age of drinking onset and fighting in these various situations may vary.

Fifth, our survey's 37% response rate was low, raising questions about internal validity and generalizability. It should be noted, however, that a study exploring these questions by comparing respondent characteristics and associations between age of drinking onset and the development of alcohol dependence in this survey with respondents in the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) has been published (Heeren et al., 2008). The NESARC was conducted by the U.S. Census Bureau under contract with the NIAAA in 2001–2002 by means of face-to-face interviews with 43,093 adults age 18 years and older identified through a national multi-stage probability sample. The response rate was 81%. Respondents in this survey were similar to NESARC ever drinkers ages 18 to 39 on gender, education, and race/ethnicity, although those ages 18 to 25 were underrepresented in our survey. Compared with respondents in NESARC, respondents in our survey reported higher rates of moderate risk drinking over the past 12 months, lifetime high risk drinking, and lifetime (ever) alcohol dependence; however, estimates of associations between age of drinking onset, alcohol dependence, risky drinking, and family history of alcoholism did not differ between the two surveys.

The lower percentage of younger panel members ages 18–25 may be in part related to the use of random digit dialing (RDD) panel recruitment methods for the standing Internet panel from which our sample originated. More adults in this age range may rely on cell phones than land lines and may be less likely to be reached by RDD methods. Higher reporting of drinking in our survey may be related to the more anonymous nature of Internet interviews than the face-to-face approach used in the NESARC. The standing Internet panel was initially recruited to participate in a variety of surveys on non-alcohol related topics. Persons who declined to participate in studies that focus primarily on alcohol use, such as NESARC, may be more reluctant to discuss their drinking habits. All these factors point to the need to interpret our results with caution. Research obtaining a higher response rate and testing potential associations with multiple modes of data collection is needed.

Sixth, in an effort to increase the representativeness of our sample, we studied both participants in the standing Internet panel and a second sample of respondents who were drawn from the RDD sample that generated the panel but were not in the panel at the time of our study. In the combined sample, the pattern of results did not significantly differ between the two sub-samples. Logistic regression analyses of the Internet survey respondents only revealed a similar pattern of results as the combined sample (data available upon request).

These methodological limitations notwithstanding, the findings in this study reinforce the need to implement interventions to delay drinking onset and reduce underage drinking. Recent clinical trials indicate that motivational counseling interventions can result in

decreases in drinking and alcohol-related negative consequences among adolescents and college students (Larimer and Cronce, 2007). Also, raising the legal drinking age to 21 years reduced drinking, alcohol-related traffic deaths, and deaths from other unintentional injuries among persons younger than 21 years (Shults et al., 2001; Wagenaar and Toomey, 2002). A national analysis found that the law also reduced drinking among persons when they became 21 to 25 years of age (O'Malley and Wagenaar, 1991). Other environmental interventions, such as lowering the legal blood alcohol limits for adolescent and adult drivers, increasing the price of alcohol, lowering outlet density, etc. have been associated with reducing alcohol-related injuries (Toomey et al., 2007). A series of comprehensive community interventions with multi-faceted education, law enforcement, and expansion of alcohol screening and brief intervention and treatment have also reduced alcohol-related injuries (Hingson et al., 2005) and may be helpful in weakening the associations between early drinking onset and a greater propensity to be injured under the influence of alcohol.

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Table 1

Percent of respondents who were ever in an automobile accident, physical fight, or accidentally injured after drinking and not drinking by demographics and substance use history

	Percent Ever in Auto Accident		Percent Ever in Fight		Percent Ever Accidentally Injured	
	After Drinking (n=213)	When Not Drinking(n=1394)	After Drinking (n=764)	When Not Drinking (n=1044)	After Drinking (n=469)	When Not Drinking(n=957)
Age						
18–25 (n=1225)	3.5	26.4	21.1	28.7	13.3	23.9
26–35 (n=1793)	6.2	40.9	23.9	30.4	14.6	26.2
36–39 (n=787)	7.4	42.8	22.2	29.1	13.4	25.5
	p=.02	p<.01	p=.56	p=.76	p=.73	p=.63
Sex						
Male (n=1946)	7.6	43.2	28.6	38.8	16.7	31.2
Female (n=1859)	3.5	19.7	16.0	20.0	11.1	19.1
	p<.01	p<.01	p<.01	p<.01	p<.01	p<.01
Race						
White non-Hispanic (n=2506)	6.1	41.1	22.0	28.8	14.5	27.6
Black non-Hispanic (n=413)	3.0	22.4	24.7	34.8	12.9	18.1
Hispanic (n=619)	6.3	29.2	25.2	29.7	13.6	22.1
Other (n=265)	3.7	34.4	16.7	28.0	10.7	20.9
	p=.08	p<.01	p=.17	p=.49	p=.56	p<.01
Education						
Not a H.S. Graduate (n=405)	6.7	24.0	29.3	30.9	18.5	25.4
H.S. Graduate (n=1112)	5.8	30.6	25.9	32.3	13.0	23.7
Some College (n=1326)	6.1	39.0	22.5	32.3	14.0	27.0
College + (n=962)	4.2	45.7	15.5	22.2	13.1	24.8
	p=.30	p<.01	p<.01	p<.01	p=.50	p=.61
Cigarette Use						
Current Regular (n=1268)	9.8	38.1	35.2	43.0	22.5	33.2

	Percent Ever in Auto Accident		Percent Ever in Fight		Percent Ever Accidentally Injured	
	After Drinking (n=213)	When Not Drinking(n=1394)	After Drinking (n=764)	When Not Drinking (n=1044)	After Drinking (n=469)	When Not Drinking(n=957)
Former Regular (n=439)	6.7	44.5	34.4	35.3	19.7	28.3
Not Regular (n=972)	4.9	36.7	17.1	26.2	10.3	23.7
Non-Smoker (n=1100)	1.0	31.5	8.0	15.4	4.9	16.2
	p<.01	p<.01	p<.01	p<.01	p<.01	p<.01
Marijuana Use						
Current Regular (n=446)	16.0	42.5	42.0	46.0	32.4	38.4
Former Regular (n=436)	11.0	45.9	44.6	50.4	23.0	36.6
Not Regular (n=1082)	5.5	38.3	25.2	32.3	15.4	28.3
Non-User (n=1795)	1.8	32.4	10.9	19.1	6.2	17.3
	p<.01	p<.01	p<.01	p<.01	p<.01	p<.01

	Percent Ever in Auto Accident		Percent Ever Fight		Percent Ever in Accidentally Injured	
	After Drinking (n=211)	When Not Drinking (n=1519)	After Drinking (n=764)	When Not Drinking (n=1044)	After Drinking (n=469)	When Not Drinking (n=957)
Age of Drinking Onset						
< 14 (n=250)	11.6	37.8	45.3	48.2	24.5	31.9
14–15 (n=482)	11.0	44.8	41.3	43.0	25.8	34.2
16–17 (n=961)	6.7	38.3	30.4	38.4	17.8	30.6
18–20 (n=1224)	4.2	33.8	15.3	23.5	10.4	22.0
21+ (n=861)	1.8	34.7	7.4	16.6	4.2	16.6
	p<.01	p=0.04	p<.01	p<.01	p<.01	p<.01
Family History of Alcohol Problems						
Yes (n=2027)	7.4	39.5	28.3	33.8	18.5	29.9
No (n=1527)	3.9	35.9	16.4	25.3	8.6	20.1
	p<.01	p=.10	p<.01	p<.01	p<.01	p<.01
Frequency of Binge Drinking in Past 12 Months						

	Percent Ever in Auto Accident		Percent Ever Fight		Percent Ever in Accidentally Injured	
	After Drinking (n=211)	When Not Drinking (n=1519)	After Drinking (n=764)	When Not Drinking (n=1044)	After Drinking (n=469)	When Not Drinking (n=957)
At Least Once a Week (n=485)	14.3	33.7	45.4	41.5	31.4	35.4
At Least Once a Month (n=588)	5.3	37.8	27.0	33.1	17.1	29.2
At Least Once a Year (n=1127)	5.0	42.1	18.6	28.6	12.5	25.2
Never (n=1601)	5.3	33.3	16.6	25.5	8.5	20.8
	p<.01	p<.01	p<.01	p<.01	p<.01	p<.01
Frequency of Binge Drinking in Heaviest Drinking Period						
At Least Once a Week (n=1478)	11.0	37.8	40.3	39.8	25.3	32.8
At Least Once a Month (n=703)	2.6	42.7	16.1	28.6	8.4	24.7
At Least Once a Year (n=809)	2.6	36.7	10.0	23.7	7.1	20.6
Never (n=812)	1.6	29.1	8.3	18.1	4.9	17.0
	p<.01	p<.01	p<.01	p<.01	p<.01	p<.01
Ever Alcohol Dependent						
Yes (n=1449)	11.7	46.5	40.9	42.0	26.6	37.2
No (n=2356)	1.9	30.5	11.2	22.0	6.2	17.9
	p<.01	p<.01	p<.01	p<.01	p<.01	p<.01

P-values compare percent with event across categories of demographics and substance use history. Ns are weighted to reflect sampling probabilities and national distribution of age, sex, and race.

Table 2

Odds of Involvement in a Motor Vehicle Accident, Physical Fight, and Unintentional Injury After Drinking and When not Drinking, According to Age of Drinking Onset

	Ever in Auto Accident		
Age of Drinking Onset	**After Drinking AOR (95% CI)***	**After Not Drinking AOR (95% CI)**	**P-Value comparing AORs**
<14	9.3 (4.1, 21.2)	1.5 (0.9, 2.3)	<.01
14–15	7.7 (3.4, 17.4)	1.8 (1.3, 2.4)	<.01
16–17	4.3 (2.0, 9.1)	1.3 (1.0, 1.7)	<.01
18–20	2.5 (1.1, 5.7)	1.0 (0.8, 1.3)	.03
21+	1.0	1.0	---

	Ever in a Fight		
Age of Drinking Onset	**After Drinking AOR (95% CI)**	**After Not Drinking AOR (95% CI)**	**P-Value Comparing AORs**
<14	10.8 (6.3, 18.5)	4.7 (2.9, 7.7)	<.01
14–15	9.6 (6.2, 14.9)	4.0 (2.8, 5.8)	<.01
16–17	5.6 (3.8, 8.4)	3.2 (2.4, 4.4)	<.01
18–20	2.4 (1.6, 3.6)	1.6 (1.2, 2.2)	.04
21+	1.0	1.0	---

	Ever Accidental Injury		
Age of Drinking Onset	**After Drinking AOR (95% CI)**	**After Not Drinking AOR (95% CI)**	**P-Value Comparing AORs**
<14	7.9 (4.4, 14.2)	2.5 (1.5, 4.0)	<.01
14–15	8.1 (4.7, 14.0)	2.7 (1.9, 3.8)	<.01
16–17	4.9 (3.0, 8.0)	2.2 (1.6, 3.0)	<.01
18–20	2.7 (1.6, 4.5)	1.4 (1.1, 1.9)	.01
21+	1.0	1.0	---

Adjusted odds ratios (AOR) for general estimating equations logistic regression models controlling for current age, sex, race, and education

Table 3

Odds of Involvement in a Motor Vehicle Accident, Physical Fight, and Unintentional Injury After Drinking and When not Drinking, According to Age of Drinking Onset

	Ever in Auto Accident		
Age of Drinking Onset	**After Drinking AOR (95% CI)***	**When Not Drinking AOR (95% CI)**	**P-Value comparing AORs**
<14	6.3 (2.6, 15.3)	0.9 (0.5, 1.4)	<.01
14–15	5.2 (2.2, 12.3)	1.1 (0.8, 1.6)	<.01
16–17	3.3 (1.5, 7.3)	0.9 (0.7, 1.2)	<.01
18–20	2.2 (0.9, 5.1)	0.8 (0.6, 1.0)	.02
21+	1.0	1.0	---

	Ever in a Fight		
Age of Drinking Onset	**After Drinking AOR (95% CI)**	**When Not Drinking AOR (95% CI)**	**P-Value Comparing AORs**
<14	6.0 (3.4, 10.5)	2.2 (1.3, 3.8)	<.01
14–15	4.9 (3.0, 8.0)	1.8 (1.2, 2.8)	<.01
16–17	3.7 (2.4, 5.6)	1.9 (0.3, 2.7)	<.01
18–20	1.9 (1.2, 2.9)	1.1 (0.8, 1.6)	.01
21+	1.0	1.0	---

	Ever Accidental Injury		
Age of Drinking Onset	**AOR (95% CI)**	**When Not Drinking AOR (95% CI)**	**P-Value Comparing AORs**
<14	4.6 (2.4, 8.7)	1.3 (0.8, 2.3)	<.01
14–15	4.7 (2.6, 8.6)	1.3 (0.8, 1.9)	<.01
16–17	3.2 (1.9, 5.6)	1.4 (0.9, 2.0)	<.01
18–20	2.3 (1.3, 4.0)	1.0 (0.7, 1.4)	<.01
21+	1.0	1.0	---

*Adjusted odds ratios (AOR) for general estimating equations logistic regression models controlling for current age, sex, race, education, cigarette use, marijuana use, family history of alcohol problems, ever alcohol dependent, and exceeded recommended daily limits (5+ for men, 4+ for women) during current and heaviest drinking period