Age at Drinking Onset, Age at First Intoxication, and Delay to First Intoxication: Assessing the Concurrent Validity of Measures of Drinking Initiation with Alcohol Use and Related Problems

Meghan E. Morean[a,b,*], **Alexa L'Insalata**[a], **Ellyn R. Butler**[a], **Avalon McKee**[a], and **Suchitra Krishnan-Sarin**[b]

[a]Oberlin College, Department of Psychology, 120 West Lorain Street Oberlin, OH 44074, USA

[b]Yale School of Medicine, Department of Psychiatry, 34 Park St. New Haven, CT 06519, USA

Abstract

Introduction—Drinking at an early age (AO) and quickly progressing to drinking to intoxication (Delay = Age of Intoxication[AI]-AO) confer risk for alcohol use and alcohol-related problems. However, inconsistencies exist in the literature, which may reflect the use of different definitions of AO and AI. We evaluated whether 1) defining AO as age at first sip of alcohol (AO sip) versus age at which at least one standard drink was consumed (AO drink); and 2) defining AI as age at first "drunk" (AI drunk) versus age at first binge episode (5 standard drinks consumed; AI binge) resulted in different self-reported ages or differentially predicted drinking outcomes.

Methods—248 high school students (53.6% male; 16.50[1.19] years; 71.4% White) completed anonymous surveys assessing alcohol use.

Results—Participants reported a younger AO (sip) than AO (drink) and a younger AI (drunk) than AI (binge), resulting in significantly different Delay values for the four AO-AI pairings. Univariate general linear models indicated that AO-Delay pairings accounted for more variance in maximum drinks and alcohol-related problems than did the individual AO and AI variables. Pairings comprising AO (drink) and Delay (drink-binge) and AO (sip) and Delay (sip-binge), respectively, uniquely accounted for variance in both maximum drinks and problems.

Conclusions—Clearly defining AO and AI using objective definitions that reflect specific amounts of alcohol (e.g., first sip; first standard drink; first binge) appears to outperform subjective definitions of alcohol use (e.g., first drunk).

Keywords

age of onset; delay to intoxication; adolescents; alcohol; underage drinking

1.0 Introduction

Underage alcohol use poses serious public health problems at the level of the individual, the family, and society (SAMHSA, 2012). While rates of youth alcohol use have decreased over the past decade (Miech et al., 2015), continued efforts to curb underage drinking are warranted. Developing more effective prevention and intervention efforts inextricably is linked an improved understanding of alcohol-related risk factors among youth.

Age at drinking onset (AO) is an established risk factor for heavy alcohol use and alcohol-related problems, with most studies indicating that an earlier AO confers risk for heavier drinking and alcohol-related problems (e.g., Dawson et al., 2008; Hingson and Zha, 2009; Hingson et al., 2006). Research also indicates that drinking to intoxication at an early age (AI) confers similar risk (e.g., Hingson et al., 2006; Henry et al., 2011; Warner and White, 2003; Warner et al., 2007). Recent research suggests that deconstructing AI into its constituent components - AO and the lag time to first intoxication (i.e., Delay) – may be a more informative way of examining early intoxication; studying AO and Delay as joint alcohol-related risk factors accounts for additional variance in drinking outcomes relative to examining either AO or AI independently (Morean et al. 2012; Morean et al., 2014). Specifically, an earlier AO coupled with a shorter Delay predicts heavy drinking in high school students (Morean et al., 2014) and heavy drinking and alcohol-related problems in college students (Morean et al., 2012).

While the field is making strides in understanding the links between early drinking and negative alcohol-related consequences in youth, inconsistent research findings have been noted, especially with respect to the relationship between AO and negative alcohol outcomes. Several studies, including a systematic review of prospective cohort studies, have either found little to no evidence for associations between early drinking and negative drinking outcomes or have suggested that more complex, non-linear relationships exist (Afitska et al., 2008; Chou and Pickering, 1992; DeWit et al., 2000; Maimaris and McCambridge, 2014).

In an attempt to identify potential sources of the aforementioned inconsistencies across studies, we reviewed the AO literature. Of note, we found considerable variability in the types of questions that have been used to assess AO (for sample questions see Table 1). Some questions are non-specific with regard to the amount of alcohol consumed at the AO event (e.g., "How old were you when you started to drink alcohol?" [Eliasen et al., 2009]; "At what age did you start using alcohol?" [Pitkänen et al., 2005]) while others assess the onset of more regular drinking (e.g., "How old were you when you first started drinking? For example, having two or more drinks a week?" [Muthen, 2000]). Further complicating the

research landscape, some questions refer to alcohol use occurring specifically outside of family or religious contexts (e.g., Warner et al., 2007), as drinking characterized by consuming more than just a few sips (e.g., Morean et al., 2014), or as drinking characterized by consuming a specific number of drinks (e.g., "a whole drink;" Kuperman, 2005). Of concern, in a number of cases, researchers have not reported explicitly what question they used to assess AO (e.g., Baltieri, 2014; Handley et al., 2013; Hayatbakhsh et al., 2014). Assessing AO using different questions may contribute to the inconsistencies in findings about the risk conferred by an early AO. Questions that assess specific quantities of alcohol consumed at AO (e.g., "How old were you when you drank at least one glass of alcohol for the first time [Monshouwer, 2003]) may produce more reliable results than questions that do not specify the amount of alcohol consumed (e.g., "At what age did you start using alcohol?" [Pitkänen, 2005]). The latter case may be associated with an earlier AO for some individuals who interpret the question to mean the first time they tried a sip of alcohol but may be associated with a later self-reported AO for individuals who interpreted the question to assess the onset of more regular alcohol use (e.g., monthly use). Differences in AO based on question type may translate to meaningful differences in study results. However, no study of which we are aware has evaluated this possibility.

Given the diversity in the questions used to assess AO, we also reviewed the questions that have been used to assess AI. All studies conceptualized intoxication subjectively (e.g., feeling drunk; See Table 1). The subjectivity of the term "drunk" may result in widely varying responses. For example, some individuals may conceptualize the effects of drinking one or two drinks as constituting intoxication, especially during early drinking episodes, and subsequently report an AI corresponding to the first time they ever consumed one or two drinks. However, others may conceptualize intoxication as occurring at higher doses of alcohol, potentially resulting in an older self-reported AI. Thus, the field may benefit from assessing AI by specifying an objectively intoxicating amount of alcohol (i.e., a binge episode).

In the current study we evaluated the impact of defining AO as 1) the age at which an individual had his or her first sip of alcohol (AO sip) versus 2) the age at which an individual consumed at least one standard drink (AO drink). We also evaluated the impact of defining age of first intoxication as 1) the age at which an individual first experienced subjective intoxication (i.e., "got drunk"; AI drunk) versus 2) the age at which an individual first consumed at least five standard drinks on a single occasion (AI binge). We hypothesized that, on average, individuals would report an earlier AO (sip) than AO (drink) as well as an earlier AI (drunk) than AI (binge). We also examined whether the different operational definitions of AO and AI, considered independently and in concert with Delay, would relate differently to markers of problem drinking (i.e., maximum drinks consumed on a single occasion and the experience of alcohol-related problems). We anticipated that both the individual AO and AI variables and the AO-Delay pairings that were based on questions assessing a specific amount of alcohol (i.e., a sip, one standard drink, and/or five or more drinks [a binge episode]) would account for more variance in drinking outcomes than models containing subjectively defined "first drunk."

2.0 Materials and Methods

2.1 Participants

Two hundred forty eight students from a high school in Connecticut completed a survey assessing alcohol use (53.6% male; mean age 16.50 [1.19] years; 17.5% 9th grade, 19.5% 10th grade, 38.2% 11th grade, 24.8% 12th grade; 71.4% White).

2.2 Procedures

The survey was approved by the Institutional Review Board of Yale University. During their lunch period, interested students completed a brief screener that was distributed by study staff. Students who responded "yes" to the question "Have you ever had a drink of alcohol?" were invited to complete the full survey in the library immediately after school. Prior to completing the survey, students were informed that participation was voluntary and anonymous, and that their data were confidential. Participants were compensated $5.

2.3 Measures

2.3.1 Demographic Information—Participants reported on their biological sex, race/ethnicity, age, and grade in school.

2.3.2 Age of Onset of Alcohol Use—Participants reported how old they were 1) "the very first time [they] had a sip of alcohol, counting even a very small sip" (i.e., AO sip) and 2) "the very first time [they] had at least 1 standard alcoholic drink [NOT counting small sips or small amounts consumed during religious activities]" (i.e., AO Drink). A standard drink was defined within the survey as a 12 ounce bottle or can of beer, a 5 ounce glass of wine, or a shot of hard liquor like vodka, rum, whiskey, or tequila, and pictures accompanied the description.

2.3.3 Age of First Intoxication—Participants reported how old they were 1) "the very first time [they] drank enough to feel drunk" (i.e., AI drunk) and 2) "the very first time [they] drank five or more drinks in one sitting" (i.e., AI binge).

2.3.4 Maximum Drinks—Participants reported on the maximum number of drinks they had ever consumed on a single occasion, which is an endophenotype related to alcohol dependence (Saccone et al., 2000).

2.3.5 Alcohol-Related Problems—(The Rutgers Alcohol Problem Index; RAPI; White & Labouvie, 1989). Using the response options "never, 1–2 times, 3–5 times, 6–10 times, >10 times," participants rated how frequently over the past 3 months they experienced 23 negative consequences of alcohol use (e.g., neglected responsibilities; not able to study for a test).

2.4 Data Analytic Plan

We first examined mean scores for maximum drinks consumed on a single occasion and alcohol-related problems. We also calculated the four Delay variables: 1) Delay (sip-drunk); 2) Delay (sip-binge); 3) Delay (drink-drunk); and 4) Delay (drink-binge).

We then conducted paired-samples t-tests to evaluate whether AO (sip), AO (drink), AI (drunk), and AI (binge) differed significantly from one another. We similarly evaluated whether the four Delay variables differed significantly from one another.

Next, we ran four Univariate General Linear Models to evaluate whether AO (sip), AO (drink), AI (drunk), or AI (binge), respectively, predicted the maximum drinks and/or alcohol-related problems. Model covariates included sex, race, and grade in school (which allowed us to control for participant age and potential cohort effects within a grade simultaneously). The total number of drinks consumed in the past month also was included as a covariate in the models predicting alcohol-related problems. The four models were then rerun with each of the four pairings of AO and Delay included as the independent variables.

3.0 Results

On average, participants reported consuming a maximum of 9.12 [5.71] drinks on a single occasion (range 1–20). Given the scale of the RAPI ("never, 1–2 times, 3–5 times, 6–10 times, >10 times), it is difficult to interpret a mean score. For ease of interpretation, we report here a simple count of the number of alcohol-related problems experienced (8.80 [7.98] problems).

Paired samples t-tests indicated that self-reported AO (sip), AO (drink), AI (drunk), and AI (binge) all differed significantly from one another, p-values < .001, as did each of the Delay variables, p-values < .001 (See Table 2).

The univariate GLM models indicated that starting to drink at an earlier age and drinking to intoxication at an earlier age, irrespective of operational definition, were associated with consuming a larger number of maximum drinks on a single occasion (see Table 3). Only binge drinking at an earlier age was associated with experiencing more alcohol-related problems (See Table 3).

With regard to the AO-Delay pairings, consuming a greater number of drinks was associated with an earlier AO and a shorter Delay across all models, with the exception of Delay (drink-drunk) which was not a significant predictor of maximum drinks when it was included alongside AO (drink) (see Table 4). Experiencing more alcohol-related problems was associated with an earlier AO only in the two models that also contained Delay to first binge (see Table 4). Experiencing more alcohol-related problems was associated with a shorter Delay across all models, with the exception of the model in which AO (drink) and Delay (drink-drunk) were entered together.

4.0 Discussion

The current study expands our understanding of AO, AI, and Delay to first intoxication as risk factors for consuming a greater number of maximum drinks on a single occasion and the experience of alcohol-related problems in high school students. Of central importance, using different operational definitions of AO and AI translated to statistically significant differences in results, suggesting that the use of different operational definitions of these constructs may contribute, at least in part, to the discrepancies observed in prior research

findings. As hypothesized, adolescents reported a younger AO (sip) relative to AO (drink) and a younger AI (drunk) relative to AI (binge). Further, when AO (sip), AO (drink), AI (drunk), and AI (binge) were examined as independent predictors of maximum drinks consumed on a single occasion, an earlier AO and an earlier AI were associated with drinking a larger number of maximum drinks irrespective of how these variables were defined. However, only an early AI (binge) was associated with experiencing more alcohol-related problems.

Consistent with prior research indicating that examining AO and Delay in concert represents a more informative way of conceptualizing early intoxication (Morean et al., 2012; Morean et al., 2014), each of the pairings of AO and Delay accounted for more variance in maximum drinks than did AO (sip), AO (drink), AI (drunk), and AI (binge), respectively. However, only the pairings comprising the clearly defined versions of AO (i.e., first sip and first drink) and Delay (drink-binge) accounted for significant variance in both maximum drinks and alcohol-related problems.

The novel study findings should be considered in light of several limitations. First, study results were based on participant self-report. In addition, the generalizability of the study results may be limited by the fact that data were collected within a single high school in Connecticut and by the fact that the analytic sample comprised high-risk adolescents who endorsed underage drinking. Furthermore, the study was cross-sectional. As such, it is not possible to state, for example, that an earlier AO and a shorter Delay cause heavy drinking or alcohol-related problems although prior longitudinal research has indicated such directionality (Morean et al., 2012). Of note, the current study did not test a truly ambiguous AO variable (e.g., when did you first start drinking), so the results are limited to the questions that were asked. In addition, the definition of binge drinking used in the current study (i.e., 5 or more drinks on a single occasion) may have resulted in a later AI (first binge) reported by females in the study than might have been the case if the standard definition of binge drinking was used (e.g., drinking 4 or more drinks in 2 hours for females or 5 or more drinks in two hours for males). Finally, although the current study suggests that different definitions of AO and AI are differentially associated with alcohol use outcomes, a meta-analysis comparing the predictive power of different AO and AI questions across studies would provide more definitive evidence. However, given the lack of consistency in the questions used to assess AO and AI in the extant literature and the variability in study samples (e.g., adults, adolescents, Americans, Europeans), conducting a meta-analysis was not possible. In the future, a meta-analysis should be conducted as additional research is conducted using standardized questions.

In spite of the limitations, the findings indicate that the way researchers and clinicians choose to operationalize age at drinking onset and first intoxication matters. Although additional research on this topic is warranted to determine the extent to which the current pattern of results can be replicated, asking participants or clients questions that clearly define the amount of alcohol consumed at AO (i.e., one sip or 1 standard drink) or AI (i.e., 5 or more standard drinks in a single occasion) appears to be a more informative approach for capturing risk associated with problematic drinking than asking questions that do not specify a specific amount of alcohol (e.g., first drunk).

Acknowledgments

References

Afitska N, Plant MA, Weir I, Miller P, Plant ML. The relationship between teenage binge drinking, age of first alcohol consumption and intoxication. Journal Substance Use. 2008; 13:205–218.

Baltieri DA. Order of onset of drug use and criminal activities in a sample of drug-abusing women convicted of violent crimes. Drug alcohol review. 2014; 33(2):202–10. [PubMed: 24382095]

Clark TT, Doyle O, Clincy A. Age of First Cigarette, Alcohol, and Marijuana Use Among U.S. Biracial/Ethnic Youth: A Population-Based Study. Addictive Behaviors. 2013; 38(9):2450–2454. [PubMed: 23688908]

Chou SP, Pickering RP. Early onset of drinking as a risk factor for life-time alcohol-related problems. British Journal of Addiction to Alcohol & Other Drugs. 1992; 87:1199–1204.

Dawson DA, Goldstein RB, Chou P, Ruan WJ, Grant BF. Age of first drink and the first incidence of adult-onset DSM-IV alcohol use disorders. Alcoholism: Clinical and Experimental Research. 2008; 31:2149–2160.

Deutsch AR, Slutske WS, Heath AC, Madden PAF, Martin NG. Substance Use and Sexual Intercourse Onsets in Adolescence: A Genetically Informative Discordant Twin Design. Journal of Adolescent Health. 2014; 54:114–116. [PubMed: 23992762]

Deutsch AR, Slutske WS, Richmond-Rakerd LS, Chernyavskiy P, Heath AC, Martin NG. Causal Influence of Age at First Drink on Alcohol Involvement in Adulthood and Its Moderation by Familial Context. Journal of Studies on Alcohol and Drugs. 2013; 74:703–713. [PubMed: 23948529]

DeWit DJ, Adlaf EM, Offord DR, Ogborne AC. Age at first alcohol use: a risk factor for the development of alcohol disorders. American Journal of Psychiatry. 2000; 157:745–750. [PubMed: 10784467]

Eliasen M, Kjaer SK, Munk C, Nyga M, Sparén P, Tryggvadottir L, Liaw K, Grønbæk M. The relationship between age at drinking onset and subsequent binge drinking among women. European Journal of Public Health. 2009; 19(4):378–382. [PubMed: 19321715]

Handley ED, Chassin L. Alcohol-Specific Parenting as a Mechanism of Parental Drinking and Alcohol Use Disorder Risk on Adolescent Alcohol Use Onset. Journal of Studies on Alcohol and Drugs. 2013; 74(5):684–693. [PubMed: 23948527]

Hayatbakhsh R, Clavarino A, Williams GM, Najman JM. Maternal and personal religious engagement as predictors of early onset and frequent substance use. American Journal on Addictions. 2014; 23(4):363–70. [PubMed: 24629070]

Henry K, McDonald JN, Oetting ER, Silk Walker P, Walker RD, Beauvais F. Age of onset of first alcohol intoxication and subsequent alcohol use among urban American Indian adolescents. Psychology of Addictive Behaviors. 2011; 25:48–56. [PubMed: 21244122]

Hingson RW, Heeren T, Winter MR. Age at drinking onset and alcohol dependence: age at onset, duration, and severity. Archives of Pediatrics and Adolescent Medicine. 2006; 160:739–746. [PubMed: 16818840]

Hingson RW, Zha W. Age of drinking onset, alcohol use disorders, frequent heavy drinking, and unintentionally injuring oneself and others after drinking. Pediatrics. 2009; 123:1477–1484. [PubMed: 19482757]

Maimaris WM, McCambridge J. Age of first drinking and adult alcohol problems: systematic review of prospective cohort studies. Journal of Epidemiology and Community Health. 2014; 68:268–274. [PubMed: 24249000]

Miech, RA., Johnston, LD., O'Malley, PM., Bachman, JG., Schulenberg, JE. Monitoring the Future national survey results on drug use, 1975–2014: Volume I, Secondary school students. Ann Arbor:

Institute for Social Research, The University of Michigan; 2015. Available at http://monitoringthefuture.org/pubs.html#monographs

Monshouwer K, Smit F, De Zwart WM, Spruit I, Van Ameijden EJC. Progress from a first drink to first intoxication: age of onset, time-windows and risk factors in a Dutch national sample of secondary school students. Journal of Substance Use. 2003; 8:155–163.

Morean ME, Corbin WR, Fromme K. Age of first use and delay to first intoxication in relation to trajectories of heavy drinking and alcohol- related problems during emerging adulthood. Alcoholism: Clinical and Experimental Research. 2012; 36:1991–1999.

Morean ME, Kong G, Camenga DR, Cavallo DA, Connell C, Krishnan-Sarin S. First Drink to First Drunk: Age of Onset and Delay to Intoxication Are Associated with Adolescent Alcohol Use and Binge Drinking. Alcoholism: Clinical and Experimental Research. 2014; 38:2615–2621.

National Institute of Alcohol Abuse and Alcoholism. NIAAA council approves definition of binge drinking. NIAAA Newsletter. 2004; 3:3. [Accessed June 1, 2015] Available at: http://pubs.niaaa.nih.gov/publications/Newsletter/winter2004/Newsletter_Number3.pdf.

Nigg CR, Anderson JK, Troumbley R, Alam MM, Keller S. Recent Trends in Adolescent Alcohol Use in Hawai'i: 2005–2011. Hawaii Journal of Medicine & Public Health. 2013; 72(3):92–98. [PubMed: 23520567]

Pilatti A, Caneto F, Garimaldi JA, del Valle Vera B, Pautassi M. Contribution of Time of Drinking Onset and Family History of Alcohol Problems in Alcohol and Drug Use Behaviors in Argentinean College Students. Alcohol and Alcoholism. 2014; 49:128–137. [PubMed: 24322673]

Saccone NL, Kwon JM, Corbett J, Goate A, Rochberg N, Edenberg HJ, … Rice JP. A genome screen of maximum number of drinks as an alcoholism phenotype. American Journal of Medical Genetics. 2000; 96:632–637. [PubMed: 11054770]

Substance Abuse and Mental Health Services Administration. [Accessed June 1, 2015] Report to Congress on the prevention and reduction of underage drinking. 2012. Available at: http://store.samhsa.gov/product/PEP12-RTCUAD

Substance Abuse and Mental Health Services Administration. Results from the 2013 National Survey on Drug Use and Health: Summary of National Findings. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2014. NSDUH Series H-48, HHS Publication No. (SMA) 14-4863

Warner LA, White HR. Longitudinal effects of age at onset and first drinking situations on problem drinking. Substance Use & Misuse. 2003; 38:1983–2016. [PubMed: 14677779]

Warner LA, White HR, Johnson VL. Alcohol initiation experiences and family history of alcoholism as predictors of problem drinking trajectories. Journal of Studies on Alcohol and Drugs. 2007; 68:56–65. [PubMed: 17149518]

White HR, Labouvie EW. Towards the assessment of adolescent problem drinking. Journal of Studies on Alcohol and Drugs. 1989; 50:30–37.

Zhang L, Wierczorek WF, Welte JW. The link between early onset drinking and early onset alcohol-impaired driving in young males. American Journal of Drug and Alcohol Abuse. 2014; 40(3):251–257. [PubMed: 24766089]

Highlights

- Starting to drink at an early age confers risk for negative drinking consequences.

- Quickly progressing to drinking to intoxication also confers alcohol-related risk.

- Many different questions have been used to assess these constructs across studies.

- Objectively defined age of onset and intoxication outperform subjective questions.

Table 1

A Sampling of Questions Used to Assess Age of Onset and Age of Intoxication

Age of Onset			
First Author	**Year**	**Country**	**Question**
Afistska	2008	UK	When (if ever) did you first drink at least one glass of beer, wine, spirits?
Clark	2013	USA	How old were you when you first had an alcoholic drink?"
Deutsch	2013a,b	Australia	How old were you the first time you had more than just a sip of beer, wine, or spirits?
DeWit	2000	Canada	Not counting sips, how old were you the very first time you had a drink of beer, wine, or liquor?
Eliasen	2009	Denmark, Iceland, Norway, Sweden	How old were you when you started to drink alcohol?
Grant	1997, 1998	USA	Not counting sips, how old were you the very first time you had a drink of beer, wine, or liquor?
Grant	2001	USA	How old were you when you first started drinking? For example, having two or more drinks a week?
Grant	2005	USA	At what age did you begin drinking regularly (consuming alcohol at least once a month for 6 months?
Hingson	2000a,b 2002, 2006, 2008, 2009	USA	About how old were you when you first started to drink, not counting small sips or tastes?
Kraus	2000	Germany	At what age did you begin drinking regularly (consuming alcohol at least once a month)?
Kuperman	2005	USA	How old were you when you had your very first whole drink?
Livingston	2008	Australia	How old were you when you had your very first whole drink?
McGue	2001	USA	How old were you the first time you used alcohol (on your own; more than your parents allowed you to)?
Monshouwer	2003	Netherlands	How old were you when you drank at least one glass of alcohol for the first time?
Muthen	2000	USA	How old were you when you first started drinking? For example, having two or more drinks a week?
Morean	2012	USA	Not including drinking as part of religious ceremonies, at what age did you take your first drink on your own rather than just a sip from an adult's glass?
Morean	2014	USA	How old were you the first time you tried alcohol (more than just a few sips and not including drinking as part of religious activities)?
Nigg	2013	USA	How old were you when you had your first drink of alcohol other than a few sips?
Pilatti	2014	Argentina	How old were you the first time you drank a glass or more of any alcoholic beverage?
Pitkänen	2005a,b	Finland	At what age did you start using alcohol?

Age of Onset			
First Author	**Year**	**Country**	**Question**
Prescott	1999	USA	How old were you when you first had a drink, other than as part of a religious ceremony?
Schuckit	1983	USA	At what age did you first take a drink on your own, rather than just a sip from an adult's glass, not including religious ceremonies?
Stallings	1999	USA	At what age did you first drink alcohol -- first time ever?
Ta	2010	USA	How old were you when you had your first drink of alcohol other than a few sips?
Warner	2003, 2007	USA	At what age did you try (more than a few sips) beer, wine, and hard liquor for the first time? At what age did you first try each type of alcohol outside a family gathering?
York	2004	USA	How old were you when you had your first drink of any beverage containing alcohol, other than a taste?
Zhang	2014	USA	About how old were you when you began drinking alcoholic beverages, not counting small tastes?
Age of Intoxication			
Adam	2011	Switzerland	Have you ever been intoxicated due to alcohol? If so, at what age?
Afistska	2008	UK	When (if ever) did you first get drunk on alcohol?
Deutsch	2013	Australia	How old were you the first time you got drunk?
Ehlers	2006	USA	What was the age the rst time you got drunk, that is, your speech was slurred or you were unsteady on your feet?
Fromme	1983	USA	What was your age at the time of first intoxication?
Hingson	2003	USA	How old were you when you first got drunk (unsteady, dizzy, or sick to your stomach)?
Hingson	2004	USA	How old were you when you first got drunk?
Monshouwer	2003	Netherlands	How old were you when you got drunk for the first time?
Morean	2012	USA	How old were you when you first got drunk after drinking alcohol?
Morean	2014	USA	How old were you the first time you got drunk?
Stallings	1999	USA	At what age did you first become intoxicated?

Table 2

Age of Onset, Age of Intoxication, and Delay Variables differ significantly from one another based on question type

Variable	Mean (years)	Std. Dev.
Age at First Sip	11.32	3.28
Age at First Standard Drink	14.04	1.73
Age at First Drunk	14.53	1.35
Age at First Binge	14.85	1.36
Delay First Sip to First Drunk	3.32	2.99
Delay First Sip to First Binge	3.71	3.22
Delay First Drink to First Drunk	0.58	1.07
Delay First Drink to First Binge	0.85	1.22

Note. All age of onset values differed from one another at $p < .001$. All delay variables differed from one another at $p < .001$.

Table 3

Age of Onset and Age of Intoxication Variables Predict Maximum Number of Drinks Consumed (Lifetime) and Alcohol-Related Problems

Variable	Maximum # Drinks			Alcohol-Related Problems		
	df	F	η_{p}^{2}	df	F	η_{p}^{2}
Corrected Model	(6, 228)	9.12	.20***	(7, 227)	9.76	.24***
Sex	1	32.86	.13***	1	36.94	.14***
Grade	3	5.28	.07**	3	5.93	.08**
Race	1	0.32	.00	1	0.05	.00
Total Monthly Drinks	--	--	--	1	6.66	.03**
Age at First Sip	1	6.86	.03**	1	3.92	.01
Corrected Model	(6, 228)	10.18	.22***	(7, 227)	8.83	.22***
Sex	1	24.88	.10***	1	34.97	.14***
Grade	3	7.36	.09***	3	4.74	.06*
Race	1	0.82	.00	1	0.15	.00
Total Monthly Drinks	--	--	--	1	5.69	.03*
Age at First Drink	1	11.41	.05**	1	0.43	.00
Corrected Model	(6, 194)	7.78	.20***	(7, 193)	7.33	.22***
Sex	1	19.31	.09***	1	26.98	.13***
Grade	3	4.85	.07**	3	3.23	.05*
Race	1	0.01	.00	1	0.42	.00
Total Monthly Drinks	--	--	--	1	3.69	.02*
Age at First Drunk	1	8.41	.04**	1	1.53	.01
Corrected Model	(6, 185)	7.35	.20***	(7, 184)	8.24	.25***
Sex	1	14.75	.08***	1	21.98	.11***
Grade	3	4.71	.07**	3	4.43	.07**
Race	1	0.18	.00	1	1.60	.01

	Maximum # Drinks		Alcohol-Related Problems		
Variable	df	F	η_p^2	df	F	η_p^2
Total Monthly Drinks	--	--	--	1	2.39	.01
Age at First Binge	1	11.71	.06 **	1	4.85	.03 *

Note:

*
$p < .05$

**
$p < .01$

***
$p < .001$

-- denotes that total monthly drinks was not included as a model covariate.

Reference groups are females, 9th grade students, and non -Whites. Abbreviations are df (degrees of freedom); η_p^2 (partial eta squared); Age at First Sip (age when participant consumed his/her first sip of alcohol); Age at First Drink (age when participant consumed his/her first standard drink); Age at First Drunk (age when participant first drank to the point of subjective intoxication); Age at First Binge (age at when participant first engaged in a binge drinking episode)

Table 4

Different Pairings of Age of Onset and Delay to Intoxication Variables Predict Maximum Number of Drinks Consumed (Lifetime) and Alcohol-Related Problems

Variable	Maximum # Drinks			Alcohol-Related Problems		
	df	F	η_p^2	df	F	η_p^2
Corrected Model	(7, 192)	6.55	.20***	(8, 191)	7.52	.25***
Sex	1	18.88	.09***	1	24.53	.12***
Grade	3	4.50	.07**	3	3.01	.05*
Race	1	0.00	.00	1	0.11	.01
Total Monthly Drinks	--	--	--	1	2.97	.02
Age at First Sip	1	8.69	.05**	1	1.67	.01
Delay Sip to Drunk	1	5.73	.03*	1	4.83	.03*
Corrected Model	(7, 182)	6.15	.20***	(8, 182)	8.50	.28***
Sex	1	14.19	.08***	1	21.87	.11***
Grade	3	0.15	.00	3	4.14	.07**
Race	1	4.59	.07**	1	1.30	.01
Total Monthly Drinks	--	--	--	1	1.91	.01
Age at First Sip	1	12.36	.07***	1	3.46	.02*
Delay Sip to Binge	1	9.28	.05**	1	7.65	.04**
Corrected Model	(7, 188)	6.18	.19***	(8, 187)	6.41	.22***
Sex	1	20.62	.10***	1	28.06	.14***
Grade	3	3.39	.05*	3	3.03	.05*
Race	1	0.19	.00	1	0.15	.00
Total Monthly Drinks	--	--	--	1	3.97	.02*
Age at First Drink	1	7.10	.04**	1	1.45	.01
Delay First Drink to First Drunk	1	2.63	.01	1	0.88	.01

Variable	Maximum # Drinks			Alcohol-Related Problems		
	df	**F**	**η_p^2**	**df**	**F**	**η_p^2**
Corrected Model	(7, 184)	6.42	.20 ***	(8, 183)	7.12	.25 ***
Sex	1	14.75	.08 ***	1	20.92	.11 ***
Grade	3	5.19	.08 **	3	3.83	.06 *
Race	1	0.27	.00	1	1.57	.01
Total Monthly Drinks	--	--	--	1	2.41	.01
Age at First Drink	1	12.78	.07 ***	1	4.94	.03 *
Delay First Drink to First Binge	1	5.70	.03 *	1	5.55	.03 *

Note:

*
$p < .05$

**
$p < .01$

***
$p < .001$

-- denotes that total monthly drinks was not included as a model covariate.

Reference groups are females, 9th grade students, and non –Whites. Abbreviations are df (degrees of freedom); η_p^2 (partial eta squared); Age at First Sip (age when participant consumed his/her first sip of alcohol); Age at First Drink (age when participant consumed his/her first standard drink); Delay to Drunk (delay between age of onset and first subjective experience of intoxication); Delay to Binge (delay between age of onset and first binge drinking episode)