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Alcohol Consumption Milestones: Comparing First- Versus Last- Reported Age of Onset

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Abstract

Multiple assessments of age of onset of alcohol use milestones may produce inconsistent reports, yielding potentially different results, depending on the report utilized. Using data from a prospective study of 1,023 middle-school students, we modeled risk of onset of four drinking milestones as a function of multiple correlates of alcohol use and compared models using first versus last reported age for each milestone. . While forward telescoping was evident, no significant differences were obtained for any models examined. Substantive conclusions about associations of correlates of early drinking are not greatly impacted by misreporting age of first use.

Keywords

drinking onset; adolescents; alcohol; telescoping

INTRODUCTION

A robust literature demonstrates significant associations between age of first substance use and various short- and long-term outcomes. Early drinking in particular is predictive of subsequent alcohol and other substance use problems and use disorders (e.g., Dawson et al., 2007; McGue et al., 2001), risky sexual behaviors (Stueve & O'Donnell, 2005), unintentional injury (Hingson et al., 2000), and deficits in neurodevelopment (Jacobus & Tapert, 2013). Based on this literature, age of first drink has been proposed as an important construct in alcohol research (Kuntsche, Rossow, Engels, & Kuntsche, 2015). However, several issues have been noted with regard to this variable, including inconsistent definitions of first use of alcohol (e.g., first sip; first use beyond a sip or a few sips/tastes; first time consuming “most or all” of a drink of alcohol; first intoxication; first time drinking alcohol on a regular basis). In addition, the reliability of self-reported age of first drink has been questioned, in part because of biases associated with retrospective report. Prospective studies which assess age of first use repeatedly on multiple occasions can minimize retrospective bias by assessing age of first use as it occurs.

It is not uncommon for repeated assessments of age of onset of alcohol use milestones to yield different reports, however. Agreement between two reports is often poor; for example correlations as low as $r=.22$ and $r=.23$ over a two-year period (Prause, Dooley, Ham-Rowbottom, & Emptage, 2007; Shillington et al., 2012, respectively) and $r=.32$ over a three-year period (Golub, Labouvie, & Johnson, 2000). Across several studies, few participants gave identical ages (5%, Engels, Knibbe, & Drop, 1997; 32%, Parra, O'Neill, & Sher, 2003), with low consistency even allowing for a one-year differential between ages (54%, Johnson & Mott, 2001; 64%, Sartor et al., 2011; 48%, Shillington & Clapp, 2012). Disagreement tends to occur in the form of forward telescoping, whereby individuals report events as occurring more recently (e.g., Golub et al., 2000; Parra, et al., 2003; Prause et al., 2007; Sartor et al., 2011). Indeed, in some studies forward telescoping accounts in the majority of cases (e.g., Engels et al., 1997; Parra et al., 2003; Shillington et al., 2012), with a mean differential in age for forward telescoping typically greater than one year (e.g., Golub et al., 2000; Johnson & Mott, 2001) and as high as 3 and one-half years (Shillington et al., 2012).

Memory, self-presentation biases, social pressures, and redefinition of use have been suggested as possible explanations for why forward telescoping occurs (Engels et al., 1997; Johnson & Mott, 2001; Shillington et al., 2012), especially among adolescents. Although reasons for why inconsistency occurs in reporting age of onset of substance use have been posited, little guidance has been offered to indicate which report to use in analyses. One rule of thumb is to use the first assessment of age of onset, as it is assumed to be the most accurate given that as time passes, the ability to recall details about the event diminishes (Johnson, Gerstein, & Rasinski, 1997); indeed, there is evidence that the prevalence of forward telescoping increases with greater elapsed time since first use (Bright & Soulakova, 2014; Shillington et al., 2012). Yet, the earliest report may not be the most reliable indicator of first use, as there may be an improvement in accuracy over time due age-related increases in maturity (Engels et al. 1997; Kaestle, 2015; Wellman & O'Loughlin, 2015). Given that the choice of age has important implications for public policy efforts and design of prevention programs, it is critical that the accuracy of self-reports about the precise age of first use be explored more fully.

In an attempt to gauge consequences of potential unreliability of reports of age of alcohol use onset, we modeled the risk of onset of drinking as a function of a variety of known correlates of adolescent alcohol use. We compare models using first versus last reported age at first sip, first full drink, first heavy drinking episode, and first time felt drunk. We examine an array of risk factors, protective factors, and peer influence to assess whether patterns persist across different types of correlates.

METHODS

Participants and Procedure

The sample was taken from a prospective study on alcohol initiation and progression among early adolescents, a group who largely have not yet initiated alcohol use but who are expected to show developmental progression through increasingly severe alcohol involvement. Participants were 1,023 students in six Rhode Island middle schools (one urban, two rural, three suburban), with data collected using web-based surveys over a three-

year period, with five semi-annual surveys over the first two years (alternating fall and spring) and a follow-up survey one year later. The first survey was completed in person on laptops as part of an orientation session; web-based follow-up surveys could be completed from any location with Internet access. Response rates at each wave were high, ranging from 82.7%–91.6%. For detailed information on sample participants and recruitment see Jackson et al. (2014). The Brown University Institutional Review Board approved all study procedures. Students provided assent and their parent/guardian provided consent for the student to participate.

Measures

Milestones

At all assessments, students were asked about their alcohol involvement. A set of three questions assessed whether they had ever had a sip of alcohol, ever had a full drink of alcohol, or ever felt drunk, and then their age when each milestone occurred. Students were also asked to report the maximum number of drinks ever consumed in one sitting. For responses of three or greater (i.e., heavy episodic drinking; HED), students were asked how old they were when this occurred (“We are specifically interested in finding out about when you drank three or more drinks of alcohol on an occasion. How old were you when you did this?”).

Predictors

A number of predictors were examined, including risk factors, protective factors, and peer influence. All predictors were assessed at every wave, except where noted.

The Problem Behavior Frequency Scale (PBFS) is a 20-item measure assessing past 30 day aggression and delinquency (Farrell, Danish, & Howard, 1992). Three sub-scales were derived and used in the analyses: delinquency (6 items, $\alpha=0.80$), physical aggression (7 items, $\alpha=0.85$), and non-physical aggression (7 items, $\alpha=0.85$).

School engagement is a composite of 12 items ($\alpha=0.80$) assessing enjoyment and perceived importance of schoolwork and school (Bachman et al., 2005). The parental monitoring scale (Kerr & Stattin, 2000) is an eight-item measure assessing parents’ knowledge of children’s activities, whereabouts, and friends ($\alpha=0.88$).

The version of the Positive and Negative Affect Scale (PANAS) used in this study consists of ten traits of the PANAS-C, developed by Laurent and colleagues (1999). The five-item positive affect subscale has a Cronbach’s α of 0.89, while the five-item negative affect subscale has an α of 0.81.

The Multidimensional Anxiety Scale for Children (MASC; March, Parker, Sullivan, Stallings, & Conners, 1997) consists of seven items measuring social anxiety in children and adolescents ($\alpha=0.85$).

Peer factors include perceived normative drinking, peer passive social influence, and extreme peer orientation scale. Perceived normative drinking was assessed with the item, “During the school year, how often do you think that the typical {same GRADE/SEX as

student } drinks alcohol?" Peer passive social influence (Wood et al., 2004) is constructed as the sum of responses to two items: 1) "How do most of your close friends feel about kids your age drinking alcohol?" and 2) "How do most of your close friends feels about kids your age getting drunk?" Response options ranged from "Strongly Disapprove" (0) to "Strongly Approve" (4). The extreme peer orientation scale (Fuligni and Eccles, 1993) is the mean of responses to four items, each with a 7-point Likert scale assessing how students feel about things like letting homework slip to be popular and acting dumber to make someone like them ($\alpha=0.70$).

Perceived availability assesses students' perceptions of their ability to obtain alcohol: "If you wanted to get some beer, wine, or hard liquor, could you get some?" (Arthur et al., 2000). Alcohol expectancies assesses students' expectations of "How likely is it that the following things would happen to people your age if they had one or more drinks of alcohol?" Items included potentially positive (e.g., have fun) and negative outcomes (e.g., get a hangover). The means of the nine positive ($\alpha=0.87$) and the 13 negative ($\alpha=0.96$) items were computed.

Analytic Strategy

Among students who reported a milestone at two or more assessments, the correlation of the first reported age and the last reported age was computed. To examine the overall rates of telescoping in the sample, we computed a three-level measure of telescoping comparing the first to the last reported age. Forward telescoping was coded if the last reported age was older than the first, backward telescoping was coded if the last reported age was younger than the first, and no telescoping was coded if the ages matched. We also computed this measure allowing for a one-year difference to be accepted as the same reported age.

Cox proportional hazards regression was used to examine onset of alcohol consumption milestones as a function of psychosocial and other risk factors, comparing models predicting the first age reported to models predicting the last age reported. As risk factors were assessed at each wave, we used the baseline report for all models.¹ All models adjust for gender and age at the time of the baseline survey. To identify significant differences between each pair of models, we converted the parameter estimates into Z-scores, which were then converted to pairs of correlated correlation coefficients. Using Lee's CCORR macro, we test for significant differences between the two coefficients (Lee, 1994), obtaining Z (the standard normal deviation of the two coefficients) and P (the two-sided probability of Z).

RESULTS

The study sample is comprised of approximately equal numbers of 6th, 7th, and 8th graders (33%; 32%; 35%, respectively), with a mean age of 12.2 ($SD=1.0$, Range=10–15).

Approximately half are female (52%), 24% are non-White (5% Black, 3% Asian, 2% American Indian, 8% mixed race, 6% other), and 12% are Hispanic.

¹We explored alternative ways of measuring the set of student-reported risk factors. In addition to using the baseline report, we also examined 1) the wave at which each milestone was first reported, 2) the average of all reports for each student, 3) the wave at which the last age for each milestone was reported, 4) the last report, and 5) the wave at which the oldest age for each milestone was reported. All results were similar and no statistically significant differences were identified.

Two-thirds of the students ($n=677$, 66.2%) reported ever having a sip of alcohol and two-thirds of these students ($n=450$, 66.5%) reported ever having a sip at two or more assessments. There were significantly fewer students endorsing ever having a full drink ($n=291$, 28.4%; see Table 1), ever having three or more drinks ($n=166$, 16.2%), and ever being drunk ($n=153$, 15.0%). The proportion of students with two or more reports for each of these milestones decreased as the severity of the milestone increased. The frequency of differential reporting decreased with increasing severity of milestones: 40% reported different ages for the milestone of first sip, compared to 23% for full drink and 11% for HED and drunk. For all four milestones, there was evidence of telescoping, as the mean of first-reported ages was different than the mean of the last-reported ages. The correlation of ages was moderate to high for all (range of r : 0.36–0.63), and was strongest for the milestone of ever being drunk and weakest for the milestone of heavy drinking.

Forward and/or backward telescoping were prevalent for all five adjacent wave comparisons (see Table 2). Defining telescoping as any difference in first and last reported age (see upper section of Table 2), more than half of the students reported older ages at the last report than at the first report for each milestone. Backward telescoping was also prevalent, but typically at lower rates. Some researchers define consistent reporting as no more than a one year age difference between the two reports (e.g., Sartor et al. 2011, Shillington & Clapp 2000). Even with allowing this one year difference, we still find significant levels of forward telescoping for all four milestones, although 49–71% of students would then be considered consistent reporters (see bottom section of Table 2).

Results of the Cox regression models are presented in Tables 3, 4, 5, and 6. Overall, there were virtually no differences found when comparing models predicting age of onset of the four milestones. The absolute differences in hazard ratios were minor, with none exceeding 0.22 and most ranging between zero and 0.06. In all models, the same conclusion would be made, regardless of which age of onset was used.

To quantify the differences in hazard ratios, we converted the non-transformed parameter estimates into Z-scores. These pairs of Z-scores are correlated correlation coefficients. Using Lee's CCORR macro (Lee, 1994), which tests for differences between two correlated correlation coefficients, we have a test to indicate whether the difference between the two coefficients is statistically significant or not. None of the risk factors examined had a significant p -value, and in fact, the smallest p -value was 0.16.

Finally, we also flipped the models, predicting the last reported risk factor as a function of the reported milestone ages (analyses available upon request). Again, no significant differences were found for any model examined.

DISCUSSION

The present study showed quite a bit of inconsistency in self-reported age of several early drinking milestones, with evidence of both forward and backward telescoping. Less than half of the sample reported an age that was within one year of their first report for the earliest drinking milestone of first sip, and only two in three participants were consistent

within one year for the other three milestones. This replicates prior work cited above that found similar rates of consistency (between 48% and 64%). It may be that later milestones such as getting drunk are more salient and thus easier to recall than a sip of alcohol, the meaning of which may change as an adolescent ages. Also consistent with the literature, forward telescoping was far more likely than backward telescoping; in fact, when comparing exact ages, more than half of the sample exhibited forward telescoping for all measures of drinking.

Yet, the choice of whether to use first or last reported age of onset in models of onset of alcohol consumption milestones need not necessarily be a difficult one. Kaestle (2015) suggested that reporting instability will introduce error into retrospective studies that determine factors that predict the timing of onset. However, results of the Cox regression models, calculation of the absolute difference in hazard ratios, and tests for differences between the correlated correlation coefficients suggest that this is not necessarily true: across a wide variety of predictors, there was no meaningful difference as a function of whether the first or the last reported age was used for analyses examining onset of alcohol consumption milestones among adolescents. Thus, for this group of individuals, at least, there was no bias in estimates due to choice of report.

Strengths and Limitations

The present study was comprised of repeated assessments of students in early-to-mid adolescence, just beginning to engage in underage drinking, which permitted a precise investigation of early use. Multiple known correlates of alcohol consumption uptake factors were available to examine, including risk factors, protective factors, and peer influence. Our approach permitted us to directly compare parameter estimates for each pair of models. We also conducted ancillary analyses that included correlates measured at various time points to allow us to be reasonably confident that our findings were robust to time of assessment.

One limitation is that the study only covered three years of adolescence, and there was right-censoring where at-risk participants had not yet reached a given drinking milestone. It is entirely possible that with longer spans of time between first and last reported ages, different results may be obtained. Our sample was on the younger side and there is evidence that telescoping is greatest for earlier ages of onset (Parra et al., 2003). Additionally, few students had two or more reports of onset for the more severe consumption milestones (ever having three or more drinks in one sitting, ever being drunk). However, these milestones may also be more salient to adolescents and less susceptible to telescoping.

An additional limitation that is shared by other studies examining the reliability of age of onset is the lack of a gold standard. Ideally it would be possible to validate self-reported age of onset. However, absent this, researchers must take care to understand findings with respect to the data and to acknowledge potential for misclassification (Wellman & O'Loughlin, 2015). Fortunately, it appears from present study findings that conclusions about substantive associations about correlates of early drinking are not greatly impacted by misreporting of age of first use.

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Table 1.

Milestone onset descriptives, N=1023

Milestone	Proportion Reporting Ever Use N (%)	# with 2+ reports	# of reports Mean (SD)	% with different ages reported	First		Last	
					Reported Age of Onset Mean (SD)	Reported Age of Onset Mean (SD)	r (SE)	
Sip	677 (66.2%)	450	3.5 (1.4)	40.2%	10.2 (3.0)	11.2 (3.3)	0.53 (0.04)	
Full drink	291 (28.4%)	128	2.8 (1.0)	23.4%	12.7 (1.8)	13.5 (1.8)	0.49 (0.08)	
Heavy episodic drinking	166 (16.2%)	55	2.6 (0.9)	10.9%	13.1 (1.4)	14.3 (1.5)	0.36 (0.14)	
Drunk	153 (15.0%)	48	2.7 (0.9)	12.5%	13.3 (1.3)	13.9 (2.0)	0.63 (0.18)	

Table 2.

Comparison of first age to last age reported

	Backward Telescoping	No Telescoping	Forward Telescoping
Any difference between first and last for:			
Sip	99 (22.0%)	107 (23.8%)	244 (54.2%)
Drink	17 (13.3%)	39 (30.5%)	72 (56.3%)
HED	5 (9.1%)	13 (23.6%)	37 (67.3%)
Drunk	4 (8.3%)	18 (37.5%)	26 (54.2%)
One year or less between first and last for:			
Sip	59 (13.1%)	219 (48.7%)	172 (38.2%)
Drink	8 (6.3%)	84 (65.6%)	36 (28.1%)
HED	1 (1.8%)	34 (61.8%)	20 (36.4%)
Drunk	2 (4.2%)	34 (70.8%)	12 (25.0%)

Table 3.

Models of age at first sip, comparing first age to last age reported

Risk factor	First age reported			Last age reported			abs diff in HRs	Z	P
	Hazard Ratio	LCL	UCL	Hazard Ratio	LCL	UCL			
PBFS: Delinquency	1.05	1.02	1.08	1.06	1.03	1.09	0.02	1.20	0.23
PBFS: Non-physical aggression	1.05	1.03	1.06	1.06	1.04	1.07	0.01	0.96	0.34
PBFS: Physical aggression	1.04	1.02	1.06	1.04	1.02	1.06	0.00	0.41	0.68
Parental monitoring	0.84	0.76	0.93	0.80	0.72	0.89	0.04	-0.94	0.35
School engagement	0.61	0.51	0.72	0.55	0.46	0.65	0.06	-1.01	0.31
PANAS: Negative affect	1.15	1.03	1.29	1.21	1.08	1.35	0.06	0.81	0.42
PANAS: Positive affect	0.89	0.81	0.98	0.87	0.80	0.96	0.02	-0.38	0.70
MASC: Social anxiety	1.01	0.99	1.03	1.01	0.99	1.03	0.00	0.00	1.00
Perceived normative drinking	1.07	1.00	1.13	1.07	1.01	1.13	0.00	0.20	0.84
Peer passive social influence	1.19	1.13	1.25	1.24	1.18	1.30	0.05	1.41	0.16
Extreme peer orientation scale	1.23	1.14	1.33	1.27	1.17	1.38	0.04	0.64	0.52
Perceived availability	2.23	1.82	2.74	2.36	1.93	2.89	0.13	0.61	0.54
Alcohol expectancies: Negative	1.14	1.01	1.29	1.15	1.02	1.29	0.01	0.13	0.89
Alcohol expectancies: Positive	1.30	1.15	1.47	1.34	1.19	1.52	0.04	0.59	0.55

Note: All models control for gender and baseline age.

Table 4.

Models of age at first full drink, comparing first age to last age reported

Risk factor	First age reported			Last age reported			abs diff in HRs	Z	P
	Hazard Ratio	LCL	UCL	Hazard Ratio	LCL	UCL			
PBFS: Delinquency	1.11	1.08	1.15	1.13	1.09	1.17	0.01	0.59	0.56
PBFS: Non-physical aggression	1.09	1.06	1.11	1.10	1.07	1.13	0.01	0.75	0.45
PBFS: Physical aggression	1.08	1.06	1.11	1.09	1.06	1.12	0.01	0.42	0.68
Parental monitoring	0.61	0.52	0.73	0.60	0.50	0.72	0.01	-0.29	0.77
School engagement	0.45	0.33	0.60	0.39	0.28	0.53	0.06	-0.62	0.53
PANAS: Negative affect	1.33	1.10	1.61	1.38	1.14	1.66	0.04	0.31	0.76
PANAS: Positive affect	0.79	0.67	0.94	0.77	0.65	0.92	0.02	-0.22	0.83
MASC: Social anxiety	0.99	0.96	1.03	0.99	0.96	1.02	0.00	-0.18	0.86
Perceived normative drinking	1.15	1.05	1.27	1.15	1.05	1.26	0.00	0.01	0.99
Peer passive social influence	1.44	1.33	1.55	1.48	1.37	1.60	0.04	0.66	0.51
Extreme peer orientation scale	1.37	1.20	1.56	1.43	1.25	1.64	0.06	0.45	0.65
Perceived availability	3.93	2.71	5.69	4.15	2.87	5.99	0.22	0.30	0.76
Alcohol expectancies: Negative	0.85	0.69	1.05	0.83	0.67	1.01	0.03	-0.31	0.76
Alcohol expectancies: Positive	1.57	1.23	2.00	1.59	1.25	2.04	0.03	0.15	0.88

Note: All models control for gender and baseline age.

Table 5.

Models of age at first full drink, comparing first age to last age reported

Risk factor	First age reported			Last age reported			abs diff in HRs	Z	P
	Hazard Ratio	LCL	UCL	Hazard Ratio	LCL	UCL			
PBFS: Delinquency	1.15	1.10	1.19	1.17	1.12	1.22	0.02	0.50	0.62
PBFS: Non-physical aggression	1.11	1.07	1.15	1.12	1.08	1.16	0.01	0.40	0.69
PBFS: Physical aggression	1.11	1.07	1.14	1.11	1.08	1.15	0.01	0.25	0.80
Parental monitoring	0.49	0.38	0.63	0.47	0.37	0.61	0.02	-0.27	0.79
School engagement	0.28	0.18	0.42	0.21	0.13	0.33	0.07	-0.53	0.60
PANAS: Negative affect	1.42	1.06	1.88	1.47	1.10	1.96	0.05	0.19	0.85
PANAS: Positive affect	0.63	0.49	0.80	0.61	0.47	0.78	0.02	-0.23	0.82
MASC: Social anxiety	1.00	0.95	1.05	0.99	0.94	1.04	0.01	-0.13	0.89
Perceived normative drinking	1.28	1.14	1.43	1.26	1.13	1.41	0.02	-0.10	0.92
Peer passive social influence	1.54	1.38	1.73	1.55	1.39	1.73	0.01	0.26	0.80
Extreme peer orientation scale	1.49	1.24	1.79	1.60	1.32	1.93	0.11	0.41	0.68
Perceived availability	6.87	3.64	12.98	7.09	3.76	13.37	0.22	0.09	0.93
Alcohol expectancies: Negative	0.86	0.62	1.18	0.82	0.59	1.12	0.04	-0.29	0.77
Alcohol expectancies: Positive	1.72	1.17	2.52	1.75	1.19	2.56	0.03	0.07	0.94

Note: All models control for gender and baseline age.

Table 6.

Models of age at first full drink, comparing first age to last age reported

Risk factor	First age reported			Last age reported			abs diff in HRs	Z	P
	Hazard Ratio	LCL	UCL	Hazard Ratio	LCL	UCL			
PBFS: Delinquency	1.17	1.13	1.22	1.19	1.14	1.25	0.02	0.31	0.76
PBFS: Non-physical aggression	1.12	1.08	1.16	1.13	1.09	1.17	0.01	0.43	0.67
PBFS: Physical aggression	1.11	1.08	1.15	1.12	1.09	1.16	0.01	0.27	0.78
Parental monitoring	0.51	0.39	0.67	0.49	0.37	0.64	0.02	-0.31	0.76
School engagement	0.28	0.18	0.43	0.22	0.14	0.35	0.06	-0.53	0.60
PANAS: Negative affect	1.24	0.91	1.70	1.28	0.94	1.76	0.04	0.23	0.82
PANAS: Positive affect	0.68	0.52	0.89	0.67	0.51	0.88	0.01	-0.13	0.90
MASC: Social anxiety	0.97	0.91	1.02	0.96	0.91	1.02	0.00	-0.11	0.91
Perceived normative drinking	1.20	1.05	1.37	1.20	1.05	1.37	0.00	0.02	0.98
Peer passive social influence	1.65	1.47	1.86	1.66	1.48	1.86	0.00	0.26	0.79
Extreme peer orientation scale	1.54	1.27	1.86	1.66	1.35	2.03	0.12	0.45	0.65
Perceived availability	4.36	2.34	8.14	4.56	2.45	8.48	0.19	0.14	0.89
Alcohol expectancies: Negative	0.85	0.60	1.20	0.83	0.59	1.16	0.02	-0.20	0.85
Alcohol expectancies: Positive	1.89	1.25	2.87	1.90	1.26	2.88	0.01	0.04	0.97

Note: All models control for gender and baseline age.