Published in final edited form as:

Psychol Public Policy Law. 2013 August 1; 19(3): 380–394.

Endorsement of a Personal Responsibility to Adhere to the Minimum Drinking Age Law Predicts Consumption, Risky Behaviors, and Alcohol-Related Harms

Valerie F. Reyna, Katherine Croom, Lisa Staiano-Coico, Martin L. Lesser, Deborah Lewis, Jeremy Frank, and Timothy Marchell

Departments of Human Development and Psychology, Center for Behavioral Economics and Decision Research and Cornell Magnetic Resonance Imaging Facility, Cornell University; Health Promotion, Gannett Health Services, Cornell University; Lisa Staiano-Coico, Office of the President, City College of New York; Biostatistics Unit, Feinstein Institute for Medical Research; Health Promotion, Gannett Health Services, Cornell University, Tuttleman Counseling Services, Temple University; Timothy Marchell, Health Promotion, Gannett Health Services, Cornell University

Abstract

Despite minimum drinking age laws, underage college students engage in high levels of risky drinking and reach peak lifetime levels of alcohol dependence. A group of presidents of universities and colleges has argued that these laws promote disrespect for laws in general, and do not prevent drinking or related negative consequences. However, no study has investigated the policy-relevant question of whether students who endorse a personal responsibility to obey drinking laws, regardless of their opinions about the laws, are less likely to drink or to experience negative consequences. Therefore, we compared endorsers to non-endorsers, controlling for race, gender, and baseline outcomes, at two universities (Ns = 2007 and 2027). Neither sample yielded a majority (49% and 38% endorsement), but for both universities, all 17 outcome measures were significantly associated with endorsement across all types of analyses. Endorsers were less likely to drink, drank less, engaged in less high-risk behavior (e.g., heavy/binge drinking), and experienced fewer harms (e.g., physical injury), even when controlling for covariates. Racial/ethnic minority groups were more likely to endorse, compared to White students. By isolating a small window of time between high school and college that produces large changes in drinking behavior, and controlling for covariates, we can begin to hone in on factors that might explain relations among laws, risky behaviors, and harms. Internalization of a social norm to adhere to drinking laws could offer benefits to students and society, but subsequent research is needed to pin down causation and causal mechanisms.

Keywords

Risky decision making; adolescent risk taking; social norms; alcohol-related harms; minimum legal drinking age; underage drinking

Underage drinking is a major problem that is estimated to cost more than \$53 billion annually, including \$19 billion from traffic accidents, \$29 billion from violent crime, and inestimable losses in human potential (Bonnie & O'Donnell, 2004; Spear & Varlinskaya, 2005; Tapert, Theilmann, Schweinsburg, Yafai, & Frank, 2003). To mitigate these consequences, lawmakers have set minimum ages at which alcohol can be purchased or possessed, referred to as a minimum legal drinking age (Martinez, Muñoz García, & Sher, 2009). The modern history of these laws dates back to the 1933 repeal of the 21st amendment to the U.S. Constitution (known as “Prohibition”), when most states established a minimum drinking age of 21 years (Wechsler & Nelson, 2010). This age standard generally prevailed until the 1970s.

During the Vietnam War period, the argument was made that those old enough to serve in the military should be granted the right to drink alcohol, among other rights (e.g., the 26th amendment, adopted in 1971, lowered the minimum voting age to 18). Thus, many states lowered the drinking age to 18. However, this change was followed by increases in alcohol consumption and corresponding increases in alcohol-related traffic fatalities, as well as other negative consequences, particularly among young adults.

In 1984, Congress passed the National Minimum Drinking Age Act, which is the focus of this study. The Act imposed a penalty of 10% of a state's federal highway appropriation on any state setting its drinking age lower than 21 years; all 50 states complied with the provisions of the Act by 1988. Although alcohol consumption remains the leading cause of death among adolescents and young adults, consumption has declined appreciably among 18- to 20-year-olds since the 1980's (Masten, et al., 2008; Wechsler & Nelson, 2010). Studies have documented a relation between minimum drinking age laws and reductions in alcohol-related adverse outcomes, such as reductions in underage drinking drivers involved in fatal crashes (Fell et al., 2008; Wagenaar & Toomey, 2002).

Nevertheless, the lifetime prevalence of alcohol dependence is highest between the ages of 18 and 20 years, peaking before the legal drinking age of 21 years in the U.S. (“dependence” as defined according to the criteria of the American Psychiatric Association; Masten et al., 2008). The transition from high school to college, which we study here, is especially problematic. In the first few months of college, students are at heightened risk for hazardous drinking (White, Kraus, & Swartzwelder, 2006). Moreover, college students are more likely to engage in heavy drinking than same-aged peers who do not attend college (e.g., Hingson, Zha, & Weitzman, 2009). Among college students, the magnitude of alcohol-related negative consequences is high: Annual estimates are 599,000 unintentionally injured, 696,000 physically assaulted by another drinking student, and 97,000 sexually assaulted, according to national surveys (Hingson et al., 2009).

Despite the prevalence of heavy drinking and associated negative consequences among college students, a group of presidents of colleges and universities launched the Amethyst Initiative in 2008 to reconsider the National Minimum Drinking Age Act. By 2011, 135 college leaders had signed a pledge to encourage public debate about reducing the minimum drinking age to 18 years (Amethyst Initiative, 2011). These college leaders, and an allied

organization, Choose Responsibility, suggest that the current drinking age of 21 years is not effective in preventing underage students from using alcohol and experiencing the negative consequences of drinking (Martinez, Muñoz García, & Sher, 2009). They contend that the current policy promotes disrespect for the law and encourages “a culture of dangerous, clandestine `binge drinking,” and that changing this policy will help students make healthy decisions about alcohol (Amethyst Initiative, 2011).

The Amethyst Initiative and similar efforts are predicated on assumptions about attitudes towards the law and their effects on alcohol use and abuse (Wechsler & Nelson, 2010). For example, some college presidents have argued that young adults learn to drink more responsibly in European countries where the minimum legal drinking age is lower. However, the data do not support this contention. On the contrary, many European countries have higher rates of frequent binge drinking in adolescents than the U.S. and early exposure to alcohol is a risk factor rather than a protective factor (e.g., Reyna & Farley, 2006).

The high rate of underage drinking, however, raises questions about the endorsement of the minimum drinking age and the effect of endorsement on drinking, especially in college populations in which underage students live in close proximity to students who can legally drink (Martinez et al., 2009). Few studies have examined how attitudes toward the minimum drinking age law--rather than toward alcohol generally--might be related to drinking and its negative consequences in college students (but, see below). Although enforcement strategies and additional state laws (about 245 laws as of 2005) reduce access to alcohol, surveys suggest that availability of alcohol is widespread on college campuses (Lipperman-Kreda, Grube, & Paschall, 2010). Because access to alcohol cannot be prevented entirely through legal prohibition and enforcement, the decision-making and self-regulation processes of adolescents and young adults come into play in adherence to laws, such as the minimum drinking age Act (e.g., Fischhoff, 2008; Masten, Fadden, Zucker, & Spear, 2008; Reyna & Rivers, 2008).

More generally, developing effective legal policies that reduce rates of underage drinking requires identifying the mechanisms that contribute to alcohol-related attitudes and behaviors. We adopted a multicomponent theoretical framework that synthesizes biological, social, cognitive, and developmental factors in decision making (e.g., Reyna, Chapman, Dougherty, & Confrey, 2012). Thus, we assume that general alcohol-related attitudes are shaped by social influences (e.g., from peers and family; Bourgeois & Bowen, 2001; Read, Wood, Davidoff, McLacken, & Campbell; 2002) as well as by specific aspects of personality, such as conscientiousness, that are empirically related to alcohol use (Kashdan, Vetter, & Collins, 2005). For example, studies suggest that people high in conscientiousness are more likely to be law abiding, obedient, disciplined, and careful compared to people low in conscientiousness (and to have fewer alcohol-related problems; Ozer & Benet-Martinez, 2006). We control for many of these pre-existing factors in our analyses by controlling for baseline measures of our outcomes (by entering them as covariates in regression analyses; see below).

We also build on prior theory and evidence concerning adolescents' and young adults' views of laws and social conventions (Smetana & Villalobos, 2009). Social cognition, including

reasoning regarding adherence to laws and social norms, is undergoing change as adolescents enter higher stages of thought. Of relevance to our focus, many young adults in this study are likely to have progressed beyond mindless adherence to laws or rules, internalizing their rationale. At the same time, the peer context is becoming much more influential, as young adults gain greater freedom and are less subject to parental monitoring (Smetana, Campione-Barr, & Metzger, 2006). Thus, we phrased our key question about legal age to drink in terms of personal responsibility: “I have a responsibility to myself to wait until I am legal to drink.” The phrase “to myself” was added to distinguish personal endorsement of internalized values and principles from mere compliance with others' values and principles.¹

Specifically, because our focus is on the transition between high school and college, we control for many aspects of personality and social cognition that are influential immediately prior to college by covarying out baseline measures (obtained in the summer prior to college) of each of our 17 outcome variables. For example, the heaviest-drinking college students are more likely to have been heavy drinkers in high school (Wechsler & Nelson, 2010); we add heavy drinking at baseline as a covariate in our analysis of heavy drinking in college. That is, we conducted separate regression analyses for each of our 17 outcome variables and statistically controlled for baseline values on each variable (e.g., measures of quantity and frequency of drinking; negative consequences associated with drinking).

Together with standard demographic variables, we relate endorsement of a personal responsibility to obey minimum age drinking laws to 17 outcomes, all of which were identified a priori as important outcomes. The outcome measures were based on prior theoretical research, national surveys (e.g., Monitoring the Future, National College Health Assessment survey, and Youth Risk Behavior Surveillance survey), and on clinical experience with college students (see Measures and Procedure below). Naturally, clinical experience by itself is not sufficient to demonstrate the validity of any outcome item; instead, empirical research also supported the use of all of the outcome measures in this study. Most of the outcome items were drawn from similar national surveys that have been extensively validated using large, representative samples (e.g., Centers for Disease Control, 2012; Matthews & Miller, 1979; Schiller, Lucas, Ward, & Peregoy, 2012). Thus, we selected outcome measures from among those used in previous empirical studies, and then *tested* whether they were related to endorsement of the legal item.

Although there are a number of ways to organize these 17 self-reported outcome measures, we grouped them into three conceptually related categories for the sake of exposition: four items that query the amount and frequency of alcohol consumption; six items that are related to higher levels of consumption and problem drinking (e.g., heavy/binge drinking and drinking games); and seven items that assess the experience of negative consequences of

¹Consistent with this distinction, endorsement of the responsibility “to myself” (as assessed by the legal item) differ from feeling a responsibility to comply with others' values and principles (e.g., friends and family, “I have a responsibility to my parents/family...”). Correlations between the legal item and such items concerning other people's values and principles have been found to be low (ranging from .13 to .23); in contrast, correlations between the latter items concerning other people was .60 in one sample and .61 in another sample. Thus, perceptions of (and concerns about complying with) other people's values and principles did not correlate highly with the legal item, although they did correlate with one another.

consumption (e.g., drinking-related physical injuries) (Hingson et al., 2009; Wechsler & Nelson, 2010). These categories in no way affect our analyses; they are merely ways of discussing the natural progression of problem drinking from use, to high-risk use, to experiencing more frequent harms associated with high-risk use (Vaillant, 1995; 2003). Note that these outcomes are not assumed to be independent of one another. On the contrary, as examples, heavy/binge drinking and playing drinking games would be expected to correlate with measures of the amount and frequency of alcohol consumption.

Although almost all of the outcome measures are descriptive (rather than explanatory) and drawn from previous surveys, two of the 17 outcome measures were modeled on items used to express the “gist” of social values in other domains of risk taking, based on fuzzy-trace theory (Mills, Reyna, & Estrada, 2008; Reyna, Estrada et al., 2011). Briefly, research indicates that people extract simple mental representations of the gist (essential meaning) of their decision options, in parallel with verbatim representations of exact words or numbers. They then retrieve simple *valenced* (i.e. what is good or bad, better or worse) principles from long-term memory (e.g., “Getting some money is better than getting no money”; “No risk is better than some risk”) that are applied to the gist representations to produce choices (Rivers, Reyna, & Mills, 2008). These conclusions about mental representations and gist principles have been supported by the results of hypothesis-driven experiments and of mathematical models that test specific processing predictions (see Clark & Clark, 1977; Reyna, 2008; 2012; Reyna & Brainerd, 2011).

In this study, we asked experts on alcohol dependence to nominate examples of gist principles based on the empirical literature (e.g., Baer, 2002; Bellis et al., 2010; Brown et al., 2008; Cacioppo, Hawkley, & Berntson, 2003). This literature documents relations between such variables as boredom and loneliness, on the one hand, and alcohol consumption and negative alcohol-related consequences, on the other hand, especially in the context of drinking to “get drunk.” Boredom can be explained as a precursor to high-risk drinking in theories of biological arousal; according to these theories, risk taking (including substance use) satisfies a need for stimulation (or sensation seeking; Zuckerman, 1994). Consistent with this view, high-risk drinking has been associated with feelings of boredom in college students (Orcutt, 1984; see also Bellis et al., 2010). In addition, drinking can be used to satisfy a need for affiliation (e.g., to avoid loneliness, fit in with friends, or maintain relationships). In the latter connection, gist principles that tap a need for affiliation, such as “Having sex is better than losing a relationship” and “Having a relationship is better than not taking a risk,” have been shown to predict sexual risk taking among adolescents and college students (e.g., Mills et al., 2008; Reyna, Estrada et al., 2011). Therefore, two items capturing gist principles related to boredom and loneliness were added, “Getting drunk is better than being bored” and “Getting drunk is better than being alone,” which were evaluated in the present research for their relation to endorsement of the legal item.

The main question we ask is whether endorsing a personal responsibility to obey the minimum legal age predicts unique variance (beyond baseline variables) in alcohol behavior and alcohol-related consequences in the initial, vulnerable months of college in which hazardous drinking increases sharply. Consistent with social domain theory, fuzzy-trace theory, and other frameworks, we expect endorsement to predict alcohol-related outcomes in

regression analyses (Jambon & Smetana, 2012; Reyna & Brainerd, 2011). However, this result is not a foregone conclusion. There are a number of theoretical reasons why endorsing personal responsibility to obey drinking laws might not predict college drinking (and related outcomes). For example, the brain undergoes substantial development through adolescence into the early twenties, with associated developments in variables such as sensation seeking and self-regulation that predict risky behavior (e.g., Casey, Getz, & Galvan, 2008; Quinn & Fromme, 2010; Reyna et al., 2012; Reyna, Estrada, et al., 2011; Steinberg, 2008). Although social reasoning might be advanced, self-regulation remains less reliable for younger compared to somewhat older adults (e.g., Reyna, Chapman et al., 2012). In other words, a young adult might endorse a value or social norm that they cannot act on reliably in social contexts involving tempting rewards and social benefits. Therefore, because of a lower ability to self-regulate among young adults, endorsement of this law might not be significantly related (or might be only weakly related) to self-reported alcohol behaviors or alcohol-related consequences in college students.

Another reason why we might not observe a relation between endorsement and alcohol-related outcomes is that, as supporters of the Amethyst Initiative and others argue, college students might not endorse a personal responsibility to obey what many view as an unfair law (e.g., Jambon & Smetana, 2012; Martinez et al., 2009). Prior research has addressed whether college students think that the minimum drinking age law is unfair and whether they have favorable attitudes toward 18–20 year olds drinking (e.g., Bourgeois & Bowen, 2001; Martinez et al., 2009). For example, Martinez et al. showed that heavier drinkers were more likely to think the law was unfair. While important, this research does not directly address the issue of whether students intend to comply with the law regardless of their attitudes toward it—and how that perceived responsibility might relate to the public policy goal of reducing negative consequences. In short, the hypothesis that endorsement (of a responsibility to obey minimum drinking age laws) predicts alcohol behavior or consequences, beyond baseline or demographic variables, is an empirical question—a question that is directly relevant to one of the most legally regulated problems of public health, underage drinking.

Method

Participants

The participants for both studies were incoming first-year college students (transfer and international students were excluded). University A is a large, urban, public research university in Philadelphia, Pennsylvania. The population of undergraduate first-year students was 57% female and 31% minority students (Temple University, 2012). The sample of first-year students at University A was 62% female, mean age 17.91 years ($SD = 0.55$), and at least 28% minority students (African American 13%, Asian 11%, Hispanic 4%, White 66%, Other 4%, and Refused 2%).

University B is a mid-sized, rural, highly competitive, private university in Ithaca, New York. The undergraduate population of first-year students was 48% females and 28% minorities (Cornell University, 2012). The University B sample participants were 50% female, mean age 17.86 years ($SD = 0.61$), and at least 34% minority students (African

American 4%, Asian 23%, Hispanic 7%, White 60%, Other 3%, and Refused 3%). Both samples were representative (i.e., they did not differ demographically from the larger populations from which they were sampled). At both University A and B, the majority lived on campus or in a residence hall (82% and 95%, respectively).

Sampling Procedure and Participant Flow

Although the studies were run separately at two campuses, the sampling procedure was identical: In July, all incoming first-year students listed with the registrar were randomly assigned to either a control or educational intervention group as part of a larger study of an online alcohol prevention program (reported elsewhere). (Results here for all outcomes were significant for the control groups, analyzed separately from the intervention groups.) After adjusting for students who withdrew enrollment after randomization and those who did not complete both baseline and follow-up surveys, 982 remained in the control group and 1,025 in the intervention group at University A, whereas 952 remained in the control group and 1,075 in the intervention group at University B. Although the response rate for control and intervention groups were similar within each campus, University A had an overall response rate of 49%, while University B's response rate was 68%.

Measures and Procedure

Participants completed a baseline survey during the initial (summer) phase of the study. After completing the baseline survey, students in the intervention group completed a commonly used alcohol education program (Alcohol-Wise®). One month after arrival on campus, participants who had completed the summer phase of the study were sent email reminders to complete the follow-up survey. Over a two-week period, several email reminders were sent.

The questions on the baseline and follow-up surveys were identical: The only difference was that the baseline survey was completed before participants arrived on campus, whereas the follow-up survey was completed 4–6 weeks into the fall semester. Participants were asked to indicate whether they agreed or disagreed with the statement, “I have a responsibility to myself to wait until I am legal to drink.”² All 17 outcome measures were identified in advance. Outcome variables were self-reported and included: four drinking patterns and frequencies items (some items were used to estimate blood alcohol content); six risky drinking behavior items; and seven items assessing experience of harms associated with drinking (see Table 1 for items).

Drinking measures implemented two types of alcohol-use calendars. For the first type of calendar, students indicated the number of drinks they consumed for each day of the week for a typical drinking week in the past month (beer, wine, and liquor were recorded separately and then combined for a total drink sum). Then, at a later point in the survey,

²The results are reported in detail in the Results section, but readers might wonder about the reliability of the legal item. An unreliable measure (i.e., one that varies randomly) cannot correlate with outcome variables because such variation is unreliable (by definition). With this simple single item, we predicted (in the regression sense) close to 100% of the outcome measures, and not just on one occasion (which is usually not achievable with a single item, per the Spearman-Brown formula), but on multiple tests (baseline and follow-up) and with multiple samples (University A and B), which is surprising for a single item. Thus, the results (demonstrating successful prediction) are evidence for at least sufficient reliability.

participants indicated daily drinking totals on a 14-day calendar. A third measure of drinking did not use a calendar; students recalled the occasion when they drank the most (and estimated number of drinks). For each question, instructions specified approximate drink equivalents for beer, wine, and liquor drinks. The calendar (i.e., timeline) method for assessing alcohol consumption has been assessed to be a reliable measure among college students (Sobell, Sobell, Klajner, Pavan, & Basian, 1986). The Alcohol-Wise® program also contains a personalized feedback program, which has standard questions used to estimate blood alcohol concentration: gender, weight, and the time spent drinking and amount of alcohol drank during a typical drinking week (Matthews & Miller, 1979; see National Institute on Alcohol Abuse and Alcoholism, 2007).

In addition to standard measures of high-risk drinking (see Table 1), high-risk measures included two theoretically motivated “gist-based” outcomes questions: “Getting drunk is better than being bored” and “Getting drunk is better than being alone.” Similar items were part of a gist-principles scale that has demonstrated scale reliability (Cronbach's alphas of .82 and .74; Mills et al., 2008; Reyna, Estrada et al., 2011). The two high-risk measures of playing drinking games and skipping a meal to get drunk faster were also added to standard measures of high-risk drinking. High-risk measures of heavy-drinking (Heavy-1 and Heavy-3) were calculated from the self-report drinking calendars, using the established consumption standard of 5 or more drinks according to heavy and/or binge drinking criteria (e.g., Schiller, Lucas, Ward, & Peregoy, 2012).

The seven harm-outcomes questions are similar to those on national surveys (e.g., Hingson et al., 2009) and drawn from the National College Health Assessment survey (American College Health Association, 2007; 2009). Response options were dichotomous (yes or no). These items are designed to capture descriptive data regarding health-related outcomes. The prior literature regarding reliability and validity of these surveys is too voluminous to recapitulate here, but it should be noted that analyses used multiple national databases (e.g., the National College Health Risk Behavior Survey of the Centers for Disease Control) and a variety of statistical procedures to accomplish the evaluations. This evidence supports their reliability and descriptive validity (e.g., American College Health Association, 2007; 2009; see also Centers for Disease Control, 2012).

Results

Preliminary Analyses

Analyses showed that the two groups (control and intervention groups) in each study were comparable at baseline, as expected given that they were randomly assigned. Specifically, baseline measurement of the intervention and control groups did not significantly differ on gender, race, or measures of alcohol consumption, risky drinking behaviors, or harms experienced due to alcohol use. Nevertheless, full regression models adjusted for study group as well as gender, race, and baseline behaviors/harms for all outcome variables to ensure that differences in agreement with the legal age item accounted for unique variance in alcohol-related outcomes. (All outcomes were also significant for the control groups analyzed separately.)

Relations among predictor variables were examined for multicollinearity. The Variance Inflation Factor (VIF) was calculated for all predictors in each regression model, which is an indicator of multicollinearity. A VIF value of 10 or higher is traditionally interpreted as indicating multicollinearity, although some use a more stringent lower limit of 4 (O'Brien, 2007). At University A, VIF values ranged from 1.0 to 1.3, and at University B from 1.0 to 1.2, all well below the conservative cutoff value.

Correlations provide a rough idea of how outcomes were related (but see below for more sophisticated analyses). As expected, outcome measures of alcohol consumption were correlated significantly: Among the four “drinking” measures, correlations ranged from .66 to .89 at baseline and from .65 to .90 at follow-up for University A. The corresponding correlations for University B ranged from .63 to .91 at baseline and from .71 to .90 at follow-up. Among the high-risk measures, the two heavy/binge drinking measures correlated with each other (.57 at baseline and .68 at follow-up for University A and .52 and .63, respectively, for University B) and with playing drinking games (.57 and .37 at baseline and .54 and .43 at follow-up for University A; .53 and .34 at baseline and .58 and .46 at follow-up for University B). Correlations between any measure and skipping meals to get drunk did not exceed .40 for either sample (perhaps a restriction-of-range issue due to the low base rate of this activity; see Table 2). The “alone” and “bored” measures correlated with each other (.54 at baseline and .57 at follow-up for University A; .52 at baseline and .55 at follow-up for University B). Although the latter items correlated significantly with other measures, the correlations did not exceed .40 for either sample.

Naturally, the four drinking measures (amount and frequency of drinking) were also correlated with heavy/binge drinking; correlations ranged from .46 to .76 at baseline and from .53 to .79 at follow-up for University A and from .41 to .73 at baseline and from .55 to .80 at follow-up for University B. The four drinking measures, plus the two heavy/binge drinking measures, all correlated with playing drinking games (correlations ranged from .37 to .70 at baseline and from .43 to .68 at follow-up at University A and from .34 to .70 at baseline and from .46 to .71 at follow-up at University B).

Among the harms, the “regret” (did something that was later regretted) and “forgot” (i.e., experienced a blackout) items correlated with one another: .47 at baseline and .45 at follow-up for University A and .42 and .45, respectively, for University B). Regret also correlated with the four drinking items, the two heavy/binge drinking items, and the playing drinking games item: correlations ranged from .27 to .45 at baseline and from .32 to .40 at follow-up for University A and from .31 to .44 at baseline and from .36 to .45 at follow-up for University B. All other correlations for the regret item did not exceed .40.

For the forgot item, correlations with the four drinking items, the two heavy/binge drinking items, and the playing drinking games item ranged from .28 to .48 at baseline and from .39 to .48 at follow-up for University A, and from .21 to .40 at baseline and from .38 to .46 at follow-up for University B. The only other correlation with the forgot item that exceeded .40 was with “injured self” for University A at follow-up (.43; the corresponding correlation was .40 for University B).

Among the two sexual and three physical injury/fighting items, none of the remaining correlations exceeded .40 for University A (although many were significant). The injured-self item correlated .41 with total number of drinks in the past two weeks and .44 with injury to others for University B at baseline; the corresponding correlations for University B at follow-up were .38 and .43. The correlation between injury to others and fighting was .45 at baseline and .41 at follow-up for University B.

For all correlations involving the two heavy/binge drinking measures, the low correlation in the reported ranges of correlations (reported above) was associated with the more extreme outcome (heavy-3), probably due to its lower base rate (and, thus, restriction of range). Similarly, with the exception of the correlations noted above, the two sexual and three physical injury/fighting items had low base rates, and thus correlations above .40 were also relatively rare. Overall, consumption measures were related to one another, with higher levels of consumption correlated with heavy drinking (or bingeing), playing drinking games, and forgetting (blacking out). The alone and bored items were related, as were regrets and forgetting; physical-injury/fighting items were occasionally correlated with each other and with forgetting. As outcome measures became more severe (e.g., physical injury), they were reported more rarely and were less likely to be correlated above .40. For each campus, these results also demonstrated that the outcome measures, while correlated, were not so highly correlated that the measures were redundant (John & Soto, 2007).

Exploratory factor analyses (EFA) with and without orthogonal rotation were performed on the 17 outcome measures (and with age at baseline to distinguish effects of age), separately for baseline and follow-up measures. Results were similar across analyses, so only the rotated solutions for the follow-up measures are reported in detail. At both University A and B, the EFA yielded three factors which accounted for 54% and 56% of the variance, respectively. (Age loaded separately, as a fourth factor, for both samples.) At University A, the three factors had the following pattern (factor loadings of .4 or higher are reported in parentheses): The four measures of drinking patterns and frequency loaded on the first factor (.86 for total drinks, .85 for typical week, .90 for drank most, and .83 for BAC), as well as three of the higher risk items (.69 for drinking games, .83 for heavy-1, and .78 for heavy-3). Forgetting also loaded .46. The seven harms items loaded on the second factor: regrets (.50), forgetting (.44), unsafe sex (.56), forced sex (.53), injury to self (.58), injury to others (.67), and fighting (.64). The third factor contained the two gist-principles items: being drunk is better than being alone (.88) and being bored (.79). Skipping a meal to get drunk faster did not load above .4 on any of the factors.

At University B, the pattern was similar to that of University A, with the exception that two harms measures (regret as well as forgetting) loaded on Factor 1. Thus, Factor 1 contained the four measures of drinking pattern and frequency items (.88 for total drinks, .90 for typical week, .92 for drank most, and .87 for BAC), as well as three of the higher risk items (.73 for drinking games, .83 for heavy-1, and .76 for heavy-3). Lower loadings were obtained for regrets (.51) and forgetting (.50). Factor 2 contained the two sexual harm measures, unsafe sex (.58) and forced sex (.68), and the three physical harm measures of injury to self (.55), injury to others (.73), and fighting (.69). In addition, skipping a meal to

get drunk faster loaded on the second factor (.47). Factor 3 contained the two gist-principles items: being drunk is better than being alone (.88) and being bored (.81).

Descriptive Results for the Legal Item

A sizeable proportion of students endorsed the statement that they had a responsibility to wait until they were of legal age to drink: Among University A students, 49% initially endorsed a responsibility to wait; among University B students, 38% endorsed such a responsibility. These proportions remained reasonably stable. The phi coefficient was .54 for the association between baseline survey endorsement of the legal age item and follow-up survey endorsement in the University A sample ($p < .001$); 77% of responses remained stable. The comparable phi coefficient was .57 for the University B sample ($p < .001$); 80% of responses remained stable. In both samples, responses were similarly likely to shift from “Yes” to “No” as from “No” to “Yes” (11.46% from “Yes” to “No” and 11.61% from “No” to “Yes” in the University A sample; 11.94% from “Yes” to “No” and 8.24% from “No” to “Yes” in the University B sample).

Summary of Analyses of Outcome Measures

Initial analyses simply compared the means, medians, or frequencies (e.g., number of drinks) for each outcome variable for those who endorsed versus did not endorse the legal item. The choice of means versus medians for analyses followed standard conventions. These initial results provide descriptive statistics for each outcome (but see logistic and multiple regression analyses below).

Due to the high proportion of “zeros” values in the outcomes measures (those who reported not drinking; i.e., zero drinks), which violate assumptions of parametric tests, analyses of all outcome variables (dichotomous and continuous) were also performed using chi-square tests to determine whether the distribution of zeros (as opposed to non-zero responses) differed for students who did or did not endorse the legal age item. These results are not reported in detail because they did not differ substantively from results for parametric tests.

Then, logistic regression analyses were performed for *dichotomous* outcome variables, first, using only the legal age item as a predictor, and, subsequently, adding the remaining predictors of gender, race, group, and baseline behaviors/harms as predictors. The latter analysis is aimed at the question of whether the endorsement of the legal item has unique variance associated with it that statistically predicts outcome measures, once all other predictors are controlled for.

Finally, multiple regression analyses were conducted on the outcome measures that were *continuous*, again, with the legal age item first entered as a sole predictor, and, subsequently, accompanied by the other predictors of gender, race, group, and baseline behaviors/harms. For both logistic and multiple regression analyses, the baseline endorsement of the legal age item was used as a predictor of follow-up behaviors/harms, and then the same analyses were performed using the endorsement of the legal age item at follow-up. Results were considered statistically significant if $p < .05$.

Results for Outcome Measures

For both universities, outcome measures were significantly associated with endorsement of the legal drinking age. Tables 2 (University A) and 3 (University B) display the means, medians, or frequencies (e.g., number of drinks) broken down for those who endorsed versus did not endorse the legal items. Specifically, for University A, all 17 outcome measures (for each outcome analyzed separately) were significantly associated with endorsement at baseline and were also significantly associated with endorsement at follow-up (Table 2). For University B, 16 of these 17 measures were significantly associated with endorsement of the legal drinking age at baseline and significantly associated at follow-up (Table 3).

According to chi-square analyses, the distribution of zero (“no” or “none”) responses for outcome measures also differed significantly for students who endorsed versus did not endorse the legal age item. Therefore, the same results were obtained when nonparametric and parametric tests were performed.

The corresponding logistic regression analyses for each outcome measure were also significant. (These logistic regressions with a single predictor, the legal age item, were conducted for comparison to results of entering multiple predictors, a nested models approach): Tables 4 and 5 display results for the 11 dichotomous items. The odds ratios for endorsement of the legal age item as sole predictor were consistently lower than 1, which reflects risk reduction. For example, University A students who endorsed the legal age item at baseline had an odds ratio of .18 and thus were 82% less likely to injure themselves as a result of drinking (Table 4); the corresponding risk reduction for University B students was 81% (Table 5). Overall, for University A students, endorsement of the legal age item at baseline was associated with an average reduction of 85% in the risk of drinking, of 81% in engaging in risky behaviors (such as heavy drinking/bingeing), and of 77% in experiencing harms (e.g., physical injury or unsafe sex; Table 4). Overall, for University B students, the average risk reductions were 83%, 69%, and 74%, respectively (Table 5).

Once the other predictors were entered into the model, the unique contribution of endorsement of the legal age item at baseline for the University A sample remained significant for all outcomes but one (the forced sex item; Table 4). It should be noted that there was a low number of “Yes” responses to this dichotomous item, making it more difficult to detect differences (Table 2). In the University B sample, endorsement became non-significant when other predictors were added for the forced sex item and two additional measures; being drunk is better than being alone, $p = .0609$ and being involved in a fight, $p = .1160$ (Table 5). However, significant differences were obtained at follow-up for these two outcome measures for both University A students (Table 4) and for University B students (Table 5). Overall, therefore, for 16 out of 17 outcome measures, risk was significantly reduced in both samples for students who endorsed the legal age item, after adjustment for all other predictors.

For the six outcome measures that involved numerical responses (four continuous and two five-point rating scales), rather than dichotomous responses, multiple regression analyses yielded similar results (Tables 6 and 7). Endorsement of the legal age item as a sole predictor was significant for all six numerical outcomes for both samples, University A and

University B, at both baseline and at follow-up. Once the other predictors were entered into the model, the contribution of endorsement of the legal age item remained significant for all but one outcome measure (skipping meals) for one sample (University B) at one time point (baseline endorsement) (Table 7). By comparison, the effect of the educational program (i.e., the intervention) was non-significant for all regression analyses for the University B sample (additional results reported elsewhere). Although intervention group was significant for seven of the multiple regression analyses for the University A sample, standardized beta weights were considerably smaller than those for endorsement of the legal age item.

Ancillary Analyses of Race/Ethnicity

Race/ethnicity was significantly related to endorsement of the legal item. At both Universities, racial/ethnic minority groups were significantly more likely than Whites to endorse the legal item. University A legal item endorsement was as follows: Blacks 68%, Asians 64%, Hispanics 55%, and Whites 42% ($\chi^2=87.90, p<.0001$). A similar pattern of endorsement was observed at University B; Blacks 42%, Asians 48%, Hispanics 43%, and Whites 33% ($\chi^2=38.27, p<.0001$).

Once all other covariates were entered into logistic and multiple regressions, including endorsement of the legal item, racial/ethnic minority groups had significantly lower levels of consumption (lower amounts and frequency of drinking, less heavy/binge drinking and lower participation in drinking games), but were more likely to have regrets or forgetting. This pattern was obtained at both time points and for both universities, and extended to the alone and bored items for University A (i.e., minority groups were less likely to agree with these gist principles).

We then further examined whether the study results differed by ethnic groups by repeating the analyses separately for Whites, Blacks, Hispanics, and Asians. A post-hoc analysis by racial and ethnic categories revealed very similar results to the main analysis, particularly for the continuous drinking outcome variables (e.g. total number of drinks in the past two weeks, typical drinking week, and occasion when drank the most). In some cases, low base rates of the dichotomous outcome variables prevented model estimation (e.g., unsafe sex and forced sex). At University A, the baseline and follow-up regression models that included covariates for the outcome “Drinking Games” were not significant for Blacks, Hispanics, and Asians, although they were still significant for Whites. At University B, the comparable “Drinking Games” models were significant for all groups.

Summary of Main Results

In sum, students who affirmed the statement that they had a personal responsibility to wait until they were of legal age to drink were less likely to drink, drank less, engaged in less high-risk behavior, and experienced fewer harms of all types. Affirming this responsibility at baseline, prior to entering college, predicted later college drinking, risky behaviors, and harms (as did endorsement at follow-up, when students were in college, controlling for baseline outcome measures). Racial/ethnic minority groups were more likely to endorse the legal item than Whites (and minority groups drank less even after controlling for endorsement). Differences between those who did and did not endorse were large, with non-

endorsers drinking about four times more alcohol and being about four times more likely to engage in high-risk behaviors or experience harms. Effects of endorsement generally remained significant when all other factors were entered as predictors, and exceeded the often non-significant effects of other predictors.

Discussion

The present study builds on prior work on attitudes toward underage drinking, but it goes beyond that work in assessing whether underage college students agree that they should adhere to drinking laws—regardless of whether they support those laws or think that the laws are fair—and whether that agreement is related to important public health and legal outcomes (e.g., underage drinking, sexual assault, and physical assault). The issue of adherence is directly relevant to the goals of public policy in reducing negative consequences of underage drinking, and to a widespread view that underage drinking laws should be repealed as counterproductive with respect to reducing these consequences (Fitzpatrick et al., 2012). Underage drinking laws, and the motivation of underage drinkers to adhere to those laws, continue to be hotly debated and the subject of new legislation (e.g., a new law in Pennsylvania raises fines for underage drinking and a proposed law would allow municipalities that include a university or college to impose a fee for alcohol-related offenses to help finance local prevention programs).

Given the study design, endorsement could simply be a correlate of protective factors, such as religiosity or conscientiousness, which reduce consumption. However, it is unlikely that those correlates are entirely responsible for our results. In this connection, it is vital to remember that we controlled for baseline variation in the outcome variables—removing effects of factors correlated with endorsement only 4 to 6 weeks earlier—and endorsement still had a large effect on outcomes. Thus, without the laws, some students would drink less than others, but they may drink even less with the laws in place, using the existence of underage drinking laws to reinforce their disinclination to drink (or to drink irresponsibly). The unexpectedly large proportion of college students who endorsed adherence to underage-drinking laws, along with the large magnitude of effects on outcomes, have major implications for public policy if these results hold up, even in part, in causal studies. If underage drinking laws only reinforce disinclinations to drink, this is a highly desirable public-policy outcome during a period of peak risk, which supports retaining the underage drinking laws (and is consistent with federal courts' arguments regarding the rational basis, and, hence, constitutionality of these laws; Wagenaar & Toomey, 2002).

Beyond the policy relevance of our results, there are a number of additional implications for understanding the relation between drinking laws and risky behaviors. Because of the more advanced social reasoning of young adults relative to younger adolescents, the specific question about adherence asked whether respondents agreed that they had a personal responsibility to adhere to the law. Given the greater freedoms of the college environment and the ready availability of alcohol, our expectation was that internalized attitudes (i.e., personal responsibility) about adherence to the law would be more predictive of alcohol-related behaviors and harms than mere acknowledgement of rules (i.e., that one should obey

rules). This expectation is consistent with contemporary developmental theories (e.g., Smetana & Villalobos, 2009; see Reyna & Rivers, 2008, for an overview).

Surprisingly, a sizeable proportion of college students at two differing universities endorsed the norm that they had a responsibility to themselves to wait until they were of legal age to drink. However, neither sample yielded a clear majority in favor of such a responsibility. Therefore, there was neither an overwhelming majority for nor against this social norm, with one sample evenly split. Although this split is not a ringing endorsement of the minimum legal age among underage students, it does not support wholesale dismissal of the minimum legal age among students as argued by the Amethyst Initiative. This division among students is a reminder that the effects of laws need not be uniform across groups. The proponents of the Amethyst Initiative could be right that such laws promote disrespect, but they might do so mainly among those who would engage in risky drinking anyway. Among those who endorse respect for the law, in contrast, those same laws and associated policies (e.g., university policies) could provide motivation to refrain from (or moderate) drinking.

The roughly even division of the samples into endorsers and non-endorsers provides good measurement conditions for comparing their outcomes. Endorsement of a personal responsibility to obey the legal age drinking law was significantly related to all self-reported outcomes, including amount and frequency of drinking; troubling high-risk behaviors, such as heavy drinking/bingeing; and experience of serious harms, such as physical injury. Therefore, endorsement was not simply empty rhetoric (e.g., because of failures to self-regulate), but, rather, was associated with differences in self-reported outcomes, namely, drinking behaviors and their consequences. Endorsers also differed from non-endorsers in their disagreement with “gist principles” that promote risky behavior, a construct derived from fuzzy-trace theory (e.g., endorsers rejected the principles that getting drunk is better than being alone or being bored) (e.g., Reyna, Estrada et al., 2011).

Negative consequences could have been underreported (due to social disapproval, e.g., participants might be reluctant to admit that fights or sexual assaults occurred when drinking), but such underreporting works against our hypotheses about group differences. That is, in spite of any tendency to underreport negative outcomes, large differences emerged between those who did and did not endorse obeying the law. It is plausible that both endorsers and non-endorsers had similar access to alcohol, but endorsers did not take advantage of this access to the extent that non-endorsers did, and therefore suffered fewer negative consequences. Having identified large differences in outcomes between endorsers and non-endorsers, future research should examine the specific causal mechanisms behind these differences.

Our findings cannot be used to infer causality, but they should provoke inquiry about potential causal mechanisms, especially in the context of prior research and theory (for reviews, see Masten et al., 2008; Reyna & Farley, 2006). Although correlation does not imply causation, causation implies correlation. Thus, epidemiological research (correlational research) typically precedes randomized control trials (causal experiments). If some critics of drinking laws were correct that the law had no effect on self-regulated behavior, we would not have observed the pervasive relations between attitudes toward adherence and

outcomes. Moreover, these differences were obtained within a small window of time that produces large differences in drinking behavior, narrowing down potential causes. We isolated a period of transition from high school to college, controlled for baseline levels of outcomes within this small window, (e.g., heavy drinking before entering college), and controlled for such factors as gender and race. Endorsing a personal responsibility to obey the law accounted for unique variance beyond gender, race, and baseline outcomes.

However, racial/ethnic groups differed considerably in endorsement of personal responsibility to obey underage drinking laws, pointing to sociocultural factors among minority groups that are protective against risky drinking and alcohol-related harms during this time of life (Jackson, Knight, & Rafferty, 2010). That is, racial/ethnic minority groups were more likely to endorse this social value of adherence to minimum drinking age laws (and those who did so were less likely to experience alcohol-related harms).

As Bourgeois and Bowen's (2001) research indicates (and consistent with dynamic social impact theory), members of groups who interact (e.g., those who live on the same floor in dorms) socially influence one another, in this instance reinforcing and amplifying group norms that discourage alcohol use. Based on prior research, racial/ethnic differences in alcohol consumption seem to be a complex function of such social norms, but also of differences in positive versus negative motivation (e.g., coping with stress among African Americans), and time of life. For example, although African Americans are (on average) poorer and subject to specific stressors, they drink less and experience fewer alcohol-related harms in adolescence and young adulthood relative to non-Hispanic Whites. However, this pattern diminishes or reverses after young adulthood, which has been linked to coping with negative emotions (Cooper et al., 2008). When endorsement of the legal item was controlled for (as a covariate), minority groups in this study still reported lower levels of consumption and of risky drinking, consistent with prior studies, although they were less likely (rather than more likely as Cooper et al. observed after young adulthood) in one sample to endorse using alcohol to cope with loneliness or boredom.

Although such factors as coping, conscientiousness, social reasoning, self-regulation of impulses, lack of parental monitoring, and proximal social influences are likely to play a role in adhering to the drinking law, it is not clear how these factors combine with one another and with cultural differences to lower risk in the presence versus absence of the law. Subsequent research should measure these factors for populations in different legal contexts, and examine their relations to drinking, risky behaviors, and alcohol-related harms.

Causal hypotheses can be examined experimentally and effective prevention programs can be facilitated through public policies (e.g., Reyna & Farley, 2006). Although some observers assume that social norms cannot be inculcated through instruction and that this instruction does not affect behavior, these assumptions are demonstrably false (e.g., Fischhoff, 2008; for a review of experimental evidence on these points, see Reyna & Farley, 2006; Reyna & Rivers, 2008). Efforts to inculcate adherence to drinking laws can communicate the reduced harms associated with adherence as reported in this study and elsewhere. Indeed, the dose-response relation between alcohol exposure (i.e., consumption) and negative consequences has been well documented, including improvements in health outcomes during prohibition

(despite popular myths to the contrary, Okrent, 2010; Owens, 2011). Research suggests that effective instruction should incorporate a multi-component approach, addressing such factors as self-efficacy (perceived ability to implement social values or norms), mental representations of risky options (so that the relevance of social norms is recognized in superficially different contexts), and practice retrieving social norms (so that they are implemented automatically, even under emotional stress) (Reyna & Rivers, 2008).

Similar results were obtained at both universities and response rates exceeded those of some earlier studies of students in transition from high school to college (Read et al., 2002). However, the current samples are not nationally representative (they were representative of the populations of entering students at each university). Also, these results may not apply to underage non-college youth, who exhibit different alcohol use than college students of the same age (Blanco et al., 2008).

In sum, if only a fraction of the effect of endorsement observed here holds up in subsequent causal research, the policy impact would be substantial because of the high prevalence of alcohol-related negative consequences. Underage drinking laws may reinforce predisposing factors that reduce consumption, which supports their use as a major public-policy instrument and complements policies to limit access to alcohol in underage populations. These results are consistent with causal mechanisms linking internalized social norms to lower levels of risky behavior and, therefore, reduced harms—but research is needed to test these causal hypotheses (e.g., Fishbein, 2008; Mills et al., 2008). The degree to which adherence to social norms deters drinking relative to effects of laws that deter “risk opportunity” (access to alcohol) is unknown (Brown et al., 2008). The strong association between endorsement and outcomes observed in this study, however, suggests that subsequent studies should investigate whether adherence to these norms can be increased in vulnerable populations and whether this results in reductions in adverse outcomes.

Acknowledgments

Funding for this research was provided by Gannett Health Services at Cornell University and The Office of the Provost at Temple University. Preparation of this article was supported in part by grants to the first author from the National Institutes of Health (RO1MH-061211 and RO1NR014368-01). The authors would also like to thank Katie P. D'Angelo, Stephanie Gillin, and Stephanie B. Ives of Temple University, and Richard Bonnie of the University of Virginia School of Law.

References

- American College Health Association. American College Health Association-National College Health Assessment: Reference Group Data Report Fall 2006. Baltimore, MD: 2007.
- American College Health Association. American College Health Association-National College Health Assessment: Spring 2008 Reference Group Data Report (Abridged). *Journal of American College Health*. 2009; 57(5):477–488. [PubMed: 19254888]
- Amethyst Initiative. [Accessed January 13, 2011] 2011. Web Site. <http://www.amethystinitiative.org/statement/>.
- Baer JS. Student factors: Understanding individual variation in college drinking. *Journal of Studies on Alcohol* (Supplement). 2002; 14:40–53. [PubMed: 12022729]
- Bellis MA, Morleo M, Hughes K, Downing J, Wood S, Smallthwaite L, Cook PA. A cross-sectional survey of compliance with national guidance for alcohol consumption by children: measuring risk

- factors, protective factors and social norms for excessive and unsupervised drinking. *BMC Public Health*. 2010; 10:547. doi:10.1186/1471-2458-10-547. [PubMed: 20831810]
- Blanco C, Okuda M, Wright C, Hasin DS, Grant BF, Liu SM, Olfson M. Mental health of college students and their non-college-attending peers. *Archives of General Psychiatry*. 2008; 65(12):1429–1437. [PubMed: 19047530]
- Bonnie, RJ.; O'Connell, ME., editors. *Reducing underage drinking: A collective responsibility*. National Academies Press; Washington, DC: 2004.
- Brown SA, McGue M, Maggs J, Schulenberg J, Hingson R, Swartzwelder S, Martin C, Chung T, Tapert SF, Sher K, Winters KC, Lowman C, Murphy S. A developmental perspective on alcohol and youths 16 to 20 years of age. *Pediatrics*. 2008; 121(4):S290–310. [PubMed: 18381495]
- Brown, SA.; Tapert, S. Health consequences of adolescent alcohol involvement. In: Bonnie, RJ.; O'Connell, ME., editors. *Reducing underage drinking: A collective responsibility*. National Academies Press; Washington, DC: 2004. p. 383-401.
- Bourgeois MJ, Bowen A. Self-organization of alcohol-related attitudes and beliefs in a campus housing complex: An initial investigation. *Health Psychology*. 2001; 20(6):434–437. doi: 10.1037//0278-6133.20.6.434. [PubMed: 11714185]
- Cacioppo JT, Hawkley LC, Berntson GG. The anatomy of loneliness. *Current Directions in Psychological Science*. 2003; 12:71–74.
- Casey BJ, Getz S, Galvan A. The adolescent brain. *Developmental Review*. 2008; 28:42–77. doi: 10.1016/j.dr.2007.08.003.
- Centers for Disease Control and Prevention. Youth Risk Behavior Surveillance, United States, 2011. *Morbidity and Mortality Weekly Report*. 2012; 61(4):1–166. Available at: www.cdc.gov/yrb. Retrieved from <http://www.cdc.gov/mmwr/pdf/ss/ss6104.pdf>.
- [Accessed January 13, 2011] Choose Responsibility. 2011. Web Site. <http://www.chooseresponsibility.org/home/>.
- Clark, HH.; Clark, EV. *Psychology and Language*. Harcourt Brace Jovanovich; New York, NY: 1977.
- Cooper ML, Krull JL, Agocha VB, Flanagan M, Grabe SA, Orcutt HK, Jackson M, Dermen KH. Motivational pathways to alcohol use and abuse among Black and White adolescents. *Journal of Abnormal Psychology*. 2008; 117:485–501. [PubMed: 18729604]
- Cornell University. [Accessed July 25, 2012] Common Data Set 2007–8. 2012. Web Site. <http://dpb.cornell.edu/documents/1000395.pdf>.
- Fell JC, Fisher DA, Voas RB, Blackman K, Tippetts AS. The relationship of underage drinking laws to reductions in drinking drivers in fatal crashes in the United States. *Accident Analysis and Prevention*. 2008; 40:1430–1440. doi:10.1016/j.aap.2008.03.006. [PubMed: 18606277]
- Fitzpatrick BG, Scribner R, Ackleh AS, Rasul J, Jacquez G, Simonsen N, Rommel R. Forecasting the effect of the amethyst initiative on college drinking. *Alcoholism: Clinical and Experimental Research*. 2012; 36:1608–1613. doi: 10.1111/j.1530-0277.2012.01765.x.
- Fischhoff B. Assessing adolescent decision-making competence. *Developmental Review*. 2008; 28:12–28. doi: 10.1016/j.dr.2007.08.001.
- Fishbein M. A reasoned-action approach to health promotion. *Medical Decision Making*. 2008; 28:834–844. doi: 10.1177/0272989X09326092. [PubMed: 19015289]
- Hingson R, Heeren T, Winter M, Wechsler H. Magnitude of alcohol-related mortality and morbidity among US College students ages 18–24: Changes from 1998 –2001. *Annual Review of Public Health*. 2005; 26:259–279. doi: 10.1146/annurev.publhealth.26.021304.144652.
- Hingson RW, Zha W, Weitzman ER. Magnitude of and trends in alcohol-related mortality and morbidity among US college students ages 18–24, 1998–2005. *Journal of Studies on Alcohol and Drugs Supplement*. 2009; 16:12–20. [PubMed: 19538908]
- Jackson JS, Knight KM, Rafferty JA. Race and unhealthy behaviors: Chronic stress, the HPA axis, and physical and mental health disparities over the life course. *American Journal of Public Health*. 2010; 100:933–939. [PubMed: 19846689]
- Jambon MM, Smetana JG. College students' moral evaluations of illegal music downloading. *Journal of Applied Developmental Psychology*. 2012; 33(1):31–39. doi: 10.1016/j.appdev.2011.09.001.

- John, OP.; Soto, CJ. The importance of being valid: Reliability and the process of construct validation. In: Robbins, RW.; Fraley, RC.; Krueger, RF., editors. *Handbook of research methods in personality psychology*. The Guilford Press; New York, NY: 2007. p. 461-494.
- Kashdan TB, Vetter CJ, Collins RL. Substance use in young adults: Associations with personality and gender. *Addictive Behaviors*. 2005; 30:259–269. doi:10.1016/j.addbeh.2004.05.014. [PubMed: 15621397]
- Lipperman-Kreda S, Grube JW, Paschall MJ. Community norms, enforcement of minimum legal drinking age laws, personal beliefs and underage drinking: An explanatory model. *Journal of Community Health*. 2010; 35:249–257. doi: 10.1007/s10900-010-9229-6. [PubMed: 20135210]
- Matthews DB, Miller WR. Estimating blood alcohol concentration: Two computer programs and their applications in therapy and research. *Addictive Behaviors*. 1979; 4(1):55–60. [PubMed: 420046]
- Martínez JA, Muñoz García MA, Sher KJ. A new minimum legal drinking age (MLDA)? Some findings to inform the debate. *Addictive Behaviors*. 2009; 34:407–410. doi:10.1016/j.addbeh.2008.12.001. [PubMed: 19135311]
- Masten AS, Faden VB, Zucker RA, Spear LP. Underage drinking: A developmental framework. *Pediatrics*. 2008; 121(Suppl. 4):s235–s251. doi: 10.1542/peds.2007-2243A. [PubMed: 18381492]
- Mills BA, Reyna VF, Estrada S. Explaining contradictory relations between risk perception and risk taking. *Psychological Science*. 2008; 5:429–433. [PubMed: 18466401]
- O'Brien RM. A caution regarding rules of thumb for variance inflation factors. *Quality & Quantity*. 2007; 41:673–690. doi: 10.1007/s11135-006-9018-6.
- Orcutt JD. Contrasting effects of two kinds of boredom on alcohol use. *Journal of Drug Issues*. 1984; 14:161–173.
- Okrent, Daniel. *Last call: The rise and fall of prohibition*. Scribner; New York, NY: 2010.
- Owens EG. Are underground markets really more violent? Evidence from early 20th century America. *The American Law and Economics Review*. 2011; 13(1):1–44. doi: 10.1093/aler/ahq017.
- Ozer DJ, Benet-Martínez. Personality and the prediction of consequential outcomes. *Annual Review of Psychology*. 2006; 57:401–421.
- Quinn PD, Fromme K. Self-regulation as a protective factor against risky drinking and sexual behavior. *Psychology of Addictive Behaviors*. 2010; 24:376–385. doi: 10.1037/a0018547. [PubMed: 20853922]
- Read JP, Wood MD, Davidoff OJ, McLacken J, Campbell JF. Making the transition from high school to college: The role of alcohol-related social influence factors in students' drinking. *Substance Abuse*. 2002; 23(1):53–65. [PubMed: 12444360]
- Reyna VF. A theory of medical decision making and health: Fuzzy-trace theory. *Medical Decision Making*. 2008; 28(6):850–865. doi:10.1177/0272989X08327066. [PubMed: 19015287]
- Reyna VF. A new intuitionism: Meaning, memory, and development in fuzzy-trace theory. *Judgment and Decision Making*. 2012; 7(3):332–359.
- Reyna VF. A new intuitionism: Meaning, memory, and development in fuzzy-trace theory. *Judgment and Decision Making*. 2012; 7(3):332–359.
- Reyna VF, Brainerd CJ. Dual processes in decision making and developmental neuroscience: A fuzzy-trace model. *Developmental Review*. 2011; 31:180–206. doi:10.1016/j.dr.2011.07.004. [PubMed: 22096268]
- Reyna, VF.; Chapman, S.; Dougherty, M.; Confrey, J. *The adolescent brain; Learning, reasoning, and decision making*. American Psychological Association; Washington, DC: 2012.
- Reyna VF, Estrada SM, DeMarinis JA, Myers RM, Stanis JM, Mills BA. Neurobiological and memory models of risky decision making in adolescents versus young adults. *Journal of Experimental Psychology: Learning, Memory, and Cognition*. 2011; 37(5):1125–1142. doi: 10.1037/a0023943.
- Reyna VF, Farley F. Risk and rationality in adolescent decision-making: Implications for theory, practice, and public policy. *Psychological Science in the Public Interest*. 2006; 7(1):1–44.
- Reyna VF, Rivers SE. Current theories of risk and rational decision making. *Developmental Review*. 2008; 28(1):1–11. doi: 10.1016/j.dr.2008.01.002. [PubMed: 19255598]

- Rivers SE, Reyna VF, Mills BA. Risk taking under the influence: A fuzzy-trace theory of emotion in adolescence. *Developmental Review*. 2008; 28(1):107–144. doi:10.1016/j.dr.2007.11.002. [PubMed: 19255597]
- Schiller, JS.; Lucas, JW.; Ward, BW.; Peregoy, JA. Vital Health Statistics. Vol. 10. National Center for Health Statistics; 2012. Summary health statistics for U. S. adults: National Health Interview Survey, 2010. Retrieved from Centers for Disease Control and Prevention website: http://www.cdc.gov/nchs/data/series/sr_10/sr10_252.pdf
- Smetana JG, Campione-Barr N, Metzger A. Adolescent development in interpersonal and societal contexts. *Annual Review of Psychology*. 2006; 57:255–284. doi: 10.1146/annurev.psych.57.102904.190124.
- Smetana, JG.; Villalobos, M. Social-cognitive development during adolescence. In: Lerner, RL.; Steinberg, L., editors. *Handbook of adolescent psychology*. 3rd Ed.. Vol. 1. Wiley; New York, NY: 2009. p. 187-208.
- Spear LP, Varlinskaya EI. Adolescence. Alcohol sensitivity, tolerance, and intake. *Recent Developments in Alcoholism*. 2005; 17:143–59. [PubMed: 15789864]
- Sobell MB, Sobell LC, Klajner F, Pavan D, Basian E. The reliability of a timeline method for assessing normal drinker college students' recent drinking history: Utility for alcohol research. *Addictive Behaviors*. 1986; 11(2):149–161. [PubMed: 3739800]
- Steinberg L. A social neuroscience perspective on adolescent risk-taking. *Developmental Review*. 2008; 28:78–106. doi: 10.1016/j.dr.2007.08.002. [PubMed: 18509515]
- Tapert SF, Theilmann RJ, Schweinsburg AD, Yafai S, Frank LR. Reduced fractional anisotropy in the splenium of adolescents with alcohol use disorder. *Proceedings of the International Society for Magnetic Resonance Medicine*. 2003; 11:2241.
- Temple University. [Accessed July 25, 2012] Temple Common Data Set 2007–48. 2012. Web Site. http://www.temple.edu/ir/factbook/documents/Common_Data_Set_2007–2008.pdf
- Vaillant, GE. *The natural history of alcoholism revisited*. Harvard University Press; Cambridge, Massachusetts: 1995.
- Vaillant GE. A 60-year follow-up of alcoholic men. *Addiction*. 2003; 98:1043–1051. [PubMed: 12873238]
- Wagenaar AC, Toomey TL. Effects of minimum drinking age laws: Review and analyses of the literature from 1960 to 2000. *Journal of Studies on Alcohol and Drugs*. 2002; 14(Suppl.):206–225.
- Wechsler H, Nelson TF. Will increasing alcohol availability by lowering the minimum legal drinking age decrease drinking and related consequences among youths? *American Journal of Public Health*. 2010; 100(6):986–992. doi: 10.2105/AJPH.2009.178004. [PubMed: 20395573]
- White AM, Kraus CL, Swartzwelder HS. Many college freshmen drink at levels far beyond the binge threshold. *Alcoholism: Clinical and Experimental Research*. 2006; 30(6):1006–1010. doi: 10.1111/j.1530-0277.2006.00122x.
- Zuckerman, M. *Behavioral expression and biosocial bases of sensation seeking*. Cambridge University Press; New York: 1994.

Table1**Outcome Measures**

Outcome Measures by Type	Response Format	Abbreviation
Drinking		
On the calendar below, please indicate the total number of alcoholic drinks you drank each day for the past two weeks. One standard drink=10–12oz beer=5ozs wine=1 shot or mixed drink. [Below these instructions appeared 2 rows of 7 boxes, labeled with the days of the week. The numbers of each day's drinks were summed.]	Continuous	Total Drinks
For the past month, please describe a typical drinking week. For each day, fill in the number of standard drinks of each type of alcohol you consumed and the number of hours you drank on that day. [Below these instructions appeared 4 rows of 7 boxes labeled with the days of the week. The rows were marked “beer”, “wine”, liquor”, and “hours”. The numbers of beer, wine, and liquor drinks were summed.]	Continuous	Typical Week
Think of the one occasion during the past month where you drank the most. Fill in the number of standard drinks of each type you consumed and the number of hours you drank that day. [Below these instructions appeared 4 boxes marked “beer”, “wine”, “liquor”, and “hours”. The numbers of beer, wine, and liquor drinks were summed.]	Continuous	Drank Most
Blood Alcohol Content was calculated from the number of drinks and the number of hours reported in Drank Most question, in addition to self-reported weight and gender using the Matthews and Miller's (1979) formula.	Continuous	BAC
High Risk		
Your drinking behavior. The following statements reflect values or principles that may guide students' choices when drinking alcohol. Even if you never drink, which of the following values or principles would apply if you were to drink? (Select all that apply). [Participants were then presented with a list of items that had a checkbox to the left of the item. Included in that list of items are the two outcomes below; “Alone” and “Bored”.]		
Getting drunk is better than being alone.	Yes/No	Alone
Getting drunk is better than being bored.	Yes/No	Bored
Heavy-1 was calculated as “Yes” if a person reported more than 5 drinks in one day of the 2 week drink calendar (Total Drinks).	Yes/No	Heavy-1
Heavy-3 was calculated as “Yes” if a person reported at least 3 days on the Total Drinks calendar as having more than 5 drinks in one day.	Yes/No	Heavy-3
Within the past 30 days, if you drank, how often did you play drinking games? [Below the question 5 choices marked “Always”, “Usually”, “Sometimes”, “Rarely”, and “Never”.]	5-point scale	Drinking Games
Within the past 30 days, if you drank, how often did you skip a meal to get drunk faster? [Below the question 5 choices marked “Always”, “Usually”, “Sometimes”, “Rarely”, and “Never”.]	5-point scale	Skip Meal
Harms		
If you drink alcohol, within the last year, have you experienced any of the following as a consequence of your drinking?[Two check-boxes appeared after each listed item below, marked “Yes” and “No”]		
Did something you later regretted?	Yes/No	Regret
Forgot where you were or what you did?	Yes/No	Forgot
Had unprotected sex?	Yes/No	Unsafe Sex
Had someone use force or threat of force to have sex with you?	Yes/No	Forced Sex
Physically injured yourself?	Yes/No	Injured Self
Physically injured another person?	Yes/No	Injured Other
Been involved in a fight?	Yes/No	Fight

Table 2

Mean, Median, and Frequency of Outcome Measures by Baseline and Follow-up Endorsement of Legal Item at University A

Outcome Measures		Baseline		<i>p</i>	Follow-up		<i>p</i>
		“Yes” Legal Item (49%, <i>n</i> = 993)	“No” Legal Item (51%, <i>n</i> = 1014)		“Yes” Legal Item (50%, <i>n</i> = 996)	“No” Legal Item (50%, <i>n</i> = 1011)	
Drinking							
	Total Drinks mean (<i>SD</i>), median (<i>n</i>)	3.07 (10.15), 0 (993)	12.07 (17.89), 5 (1014)	<.0001 ^a	2.46 (7.72), 0 (996)	12.70 (28.76), 5 (1011)	<.0001 ^a
	Typical Week, mean (<i>SD</i>), median (<i>n</i>)	2.27 (6.96), 0 (993)	8.80 (12.23), 4 (1014)	<.0001 ^a	2.00 (6.28), 0 (996)	9.09 (12.45), 5 (1011)	<.0001 ^a
	Drank Most, mean (<i>SD</i>), median (<i>n</i>)	1.49 (3.44), 0 (992)	5.37 (5.47), 5 (1006)	<.0001 ^a	1.45 (3.36), 0 (995)	5.42 (5.50), 5 (1003)	<.0001 ^a
	BAC, mean (<i>SD</i>), median (<i>n</i>)	0.03 (0.07), 0 (988)	0.10 (0.11), .07 (988)	<.0001 ^a	0.11 (0.07), 0 (989)	0.29 (0.11), .08 (987)	<.0001 ^a
High Risk							
	Alone, % (<i>n</i>)	2.52 (25)	10.85 (110)	<.0001 ^b	3.41 (34)	9.99 (101)	<.0001 ^b
	Bored, % (<i>n</i>)	4.53 (45)	21.79 (221)	<.0001 ^b	5.32 (53)	21.07 (213)	<.0001 ^b
	Heavy-1, % (<i>n</i>)	8.46 (84)	35.70 (362)	<.0001 ^b	7.03 (70)	37.19 (376)	<.0001 ^b
	Heavy-3, % (<i>n</i>)	4.23 (42)	19.33 (196)	<.0001 ^b	2.51 (25)	21.07 (213)	<.0001 ^b
	Drinking Games, % (<i>n</i>)						
	Never	78.65 (781)	33.53 (340)	<.0001 ^b	77.71 (774)	34.32 (347)	<.0001 ^b
	Rarely	4.33 (43)	11.14 (113)		5.22 (52)	10.29 (104)	
	Sometimes	10.27 (102)	30.08 (305)		10.54 (105)	29.87 (302)	
	Usually	4.13 (41)	19.72 (200)		4.22 (42)	19.68 (199)	
	Always	2.62 (26)	5.52 (56)		2.31 (23)	5.84 (59)	
	Skip Meal, % (<i>n</i>)						
	Never	94.76 (941)	83.43 (846)	<.0001 ^b	95.78 (954)	82.39 (833)	<.0001 ^b
	Rarely	3.93 (39)	10.65 (108)		3.01 (30)	11.57 (117)	
	Sometimes	1.01 (10)	4.24 (43)		0.90 (9)	4.35 (44)	
	Usually	0.10 (1)	1.18 (12)		0.30 (3)	0.99 (10)	
	Always	0.20 (2)	0.49 (5)		0.00 (0)	0.69 (7)	
Harms							
	Regret, % (<i>n</i>)	5.94 (59)	24.46 (248)	<.0001 ^b	5.42 (54)	25.02 (253)	<.0001 ^b
	Forgot, % (<i>n</i>)	5.34 (53)	24.75 (251)	<.0001 ^b	5.72 (57)	24.43 (247)	<.0001 ^b
	Unsafe Sex, % (<i>n</i>)	1.71 (17)	8.28 (84)	<.0001 ^b	1.51 (15)	8.51 (86)	<.0001 ^b
	Forced Sex, % (<i>n</i>)	0.50 (5)	1.48 (15)	.0278 ^b	0.50 (5)	1.48 (15)	.0268 ^b
	Injured Self, % (<i>n</i>)	2.42 (24)	12.43 (126)	<.0001 ^b	2.61 (26)	12.27 (124)	<.0001 ^b
	Injured Others, % (<i>n</i>)	0.60 (6)	3.06 (31)	<.0001 ^b	0.90 (9)	2.77 (28)	.0019 ^b

Outcome Measures	Baseline		<i>p</i>	Follow-up		<i>p</i>
	“Yes” Legal Item (49%, <i>n</i> = 993)	“No” Legal Item (51%, <i>n</i> = 1014)		“Yes” Legal Item (50%, <i>n</i> = 996)	“No” Legal Item (50%, <i>n</i> = 1011)	
Fight, % (<i>n</i>)	1.41 (14)	4.34 (44)	<.0001 ^{<i>b</i>}	1.51 (15)	4.25 (43)	.0002 ^{<i>b</i>}

Note.

SD = standard deviation; % = percentage; *n* = number of observations.

^{*a*} *t*-test;

^{*b*} Chi-square test.

Table 3

Mean, Median, and Frequency of Outcome Measures by Baseline and Follow-up Endorsement of Legal Item at University B

Outcome Measures		Baseline		<i>p</i>	Follow-up		<i>p</i>
		“Yes” Legal Item (38%, <i>n</i> = 774)	“No” Legal Item (62%, <i>n</i> = 1253)		“Yes” Legal Item (34%, <i>n</i> = 699)	“No” Legal Item (66%, <i>n</i> = 1328)	
Drinking							
	Total Drinks mean (<i>SD</i>), median (<i>n</i>)	3.00 (8.56), 0 (774)	10.55 (15.43), 5 (1253)	<.0001 ^a	1.80 (5.84), 0 (699)	10.76 (15.56), 6 (1328)	<.0001 ^a
	Typical Week, mean (<i>SD</i>), median (<i>n</i>)	1.96 (4.71), 0 (774)	6.92 (9.43), 4 (1253)	<.0001 ^a	1.18 (3.95), 0 (699)	7.05 (9.25), 4 (1328)	<.0001 ^a
	Drank Most, mean (<i>SD</i>), median (<i>n</i>)	1.61 (3.44), 0 (773)	4.77 (7.75), 4 (1249)	<.0001 ^a	1.01 (2.55), 0 (699)	4.91 (4.81), 4 (1323)	<.0001 ^a
	BAC, mean (<i>SD</i>), median (<i>n</i>)	0.04 (0.08), 0 (770)	0.10 (0.10), .07 (1239)	<.0001 ^a	0.02 (0.06), 0 (698)	0.10 (0.10), .08 (1311)	<.0001 ^a
High Risk							
	Alone, % (<i>n</i>)	4.78 (37)	9.02 (113)	<.0004 ^b	3.72 (26)	9.34 (124)	<.0001 ^b
	Bored, % (<i>n</i>)	5.94 (46)	15.64 (196)	<.0001 ^b	3.86 (27)	16.19 (215)	<.0001 ^b
	Heavy-1, % (<i>n</i>)	9.43 (73)	36.47 (457)	<.0001 ^b	4.86 (34)	37.35 (496)	<.0001 ^b
	Heavy-3, % (<i>n</i>)	4.26 (33)	17.48 (219)	<.0001 ^b	2.00 (14)	17.92 (238)	<.0001 ^b
	Drinking Games, % (<i>n</i>)						
	Never	76.10 (589)	37.91 (475)	<.0001 ^b	82.55 (577)	36.67 (487)	<.0001 ^b
	Rarely	6.98 (54)	10.30 (129)		6.01 (42)	10.62 (141)	
	Sometimes	8.14 (63)	25.14 (315)		6.58 (46)	25.00 (332)	
	Usually	5.94 (46)	20.03 (251)		3.00 (21)	20.78 (276)	
	Always	2.84 (22)	6.62 (83)		1.86 (13)	6.93 (92)	
	Skip Meal, % (<i>n</i>)						
	Never	95.48 (739)	89.86 (1126)	<.0001 ^b	96.85 (677)	89.46 (1188)	<.0001 ^b
	Rarely	2.58 (20)	6.94 (87)		2.15 (15)	6.93 (92)	
	Sometimes	1.16 (9)	1.76 (22)		0.57 (4)	2.03 (27)	
	Usually	0.00 (0)	0.64 (8)		1.29 (2)	0.045 (6)	
	Always	0.78 (6)	0.80 (10)		0.14 (1)	1.13 (15)	
Harms							
	Regret, % (<i>n</i>)	6.074 (47)	23.86 (299)	<.0001 ^b	3.43 (24)	24.25 (322)	<.0001 ^b
	Forgot, % (<i>n</i>)	5.04 (39)	16.12 (202)	<.0001 ^b	2.29 (16)	16.94 (225)	<.0001 ^b
	Unsafe Sex, % (<i>n</i>)	1.16 (9)	3.99 (50)	<.0002 ^b	0.72 (5)	4.07 (54)	<.0001 ^b
	Forced Sex, % (<i>n</i>)	0.26 (2)	0.96 (12)	.0648 ^b	0.29 (2)	0.90 (12)	.1106 ^b
	Injured Self, % (<i>n</i>)	1.94 (15)	9.26 (116)	<.0001 ^b	1.14 (8)	9.26 (123)	<.0001 ^b
	Injured Others, % (<i>n</i>)	0.52 (4)	2.31 (29)	<.0019 ^b	0.43 (3)	2.26 (30)	.0020 ^b

Outcome Measures	Baseline		<i>p</i>	Follow-up		<i>p</i>
	“Yes” Legal Item (38%, <i>n</i> = 774)	“No” Legal Item (62%, <i>n</i> = 1253)		“Yes” Legal Item (34%, <i>n</i> = 699)	“No” Legal Item (66%, <i>n</i> = 1328)	
Fight, % (<i>n</i>)	0.90 (7)	2.23 (28)	<.0255 ^{<i>b</i>}	0.57 (4)	2.33 (31)	.0038 ^{<i>b</i>}

Note.

SD = standard deviation; % = percentage; *n* = number of observations

^{*a*} *t*-test;

^{*b*} Chi-square test.

Table 4

Logistic Regression Results at University A (N = 2007)

Outcome Measures	Baseline Legal Item									
	Model = Legal Item Only					Model = Legal Item with Covariates ^a				
	<i>b</i>	<i>SE</i>	Wald χ^2	<i>OR</i> (95% <i>CI</i>)	<i>p</i>	<i>b</i>	<i>SE</i>	Wald χ^2	<i>OR</i> (95% <i>CI</i>)	<i>p</i>
High Risk										
Alone	-1.55	0.226	46.90	0.21 (0.14–0.33)	<.0001	-1.13	0.237	22.91	0.32 (0.20–0.51)	<.0001
Bored	-1.77	0.171	107.80	0.17 (0.12–0.24)	<.0001	-1.25	0.182	47.14	0.29 (0.20–0.41)	<.0001
Heavy-1	-1.79	0.132	185.84	0.17 (0.13–0.22)	<.0001	-1.13	0.145	60.78	0.32 (0.24–0.43)	<.0001
Heavy-3	-1.69	0.177	91.70	0.18 (0.13–0.26)	<.0001	-1.23	0.187	43.43	0.29 (0.20–0.42)	<.0001
Harms										
Regret	-1.63	0.153	114.33	0.20 (0.15–0.26)	<.0001	-0.10	0.168	35.16	0.37 (0.27–0.51)	<.0001
Forgot	-1.76	0.159	123.32	0.17 (0.13–0.23)	<.0001	-1.08	0.179	36.13	0.34 (0.24–0.48)	<.0001
Unsafe Sex	-1.65	0.270	37.20	0.19 (0.11–0.33)	<.0001	-1.22	0.286	18.15	0.30 (0.17–0.52)	<.0001
Forced Sex	-1.09	0.518	4.40	0.34 (0.12–0.93)	.0359	-0.95	0.541	3.08	0.39 (0.13–1.12)	.0793
Injured Self	-1.75	0.228	58.86	0.18 (0.11–0.27)	<.0001	-1.36	0.242	34.57	0.26 (0.16–0.41)	<.0001
Injured Others	-1.65	0.448	13.49	0.19 (0.08–0.46)	.0002	-1.43	0.457	9.81	0.24 (0.10–0.59)	.0017
Fight	-1.15	0.310	13.869	0.32 (0.17–0.58)	.0002	-0.81	0.330	5.95	0.45 (0.23–0.85)	.0147
Follow-up Legal Item										
Outcome Measures	Model = Legal Item Only					Model = Legal Item with Covariates ^a				
	<i>b</i>	<i>SE</i>	Wald χ^2	<i>OR</i> (95% <i>CI</i>)	<i>p</i>	<i>b</i>	<i>SE</i>	Wald χ^2	<i>OR</i> (95% <i>CI</i>)	<i>p</i>
	<i>b</i>	<i>SE</i>	Wald χ^2	<i>OR</i> (95% <i>CI</i>)	<i>p</i>	<i>b</i>	<i>SE</i>	Wald χ^2	<i>OR</i> (95% <i>CI</i>)	<i>p</i>
High Risk										
Alone	-1.14	0.204	31.59	0.32 (0.21–0.48)	<.0001	-0.77	0.214	13.08	0.46 (0.30–0.70)	.0003
Bored	-1.56	0.161	93.80	0.21 (0.15–0.29)	<.0001	-1.07	0.173	38.49	0.34 (0.25–0.48)	<.0001
Heavy-1	-2.06	0.140	216.16	0.13 (0.10–0.17)	<.0001	-1.59	0.152	109.05	0.20 (0.15–0.28)	<.0001
Heavy-3	-2.34	0.217	116.42	0.10 (0.06–0.15)	<.0001	-1.97	0.223	78.09	0.14 (0.09–0.22)	<.0001
Harms										
Regret	-1.76	0.158	124.89	0.17 (0.13–0.23)	<.0001	-1.37	0.172	63.37	0.26 (0.18–0.36)	<.0001
Forgot	-1.67	0.155	116.73	0.19 (0.14–0.25)	<.0001	-1.30	0.177	53.82	0.27 (0.19–0.39)	<.0001
Unsafe Sex	-1.81	0.284	40.53	0.16 (0.09–0.29)	<.0001	-1.44	0.298	23.24	0.24 (0.13–0.43)	<.0001

Outcome Measures	Follow-up Legal Item									
	Model = Legal Item Only					Model = Legal Item with Covariates ^a				
	<i>b</i>	<i>SE</i>	Wald χ^2	<i>OR</i> (95% <i>CI</i>)	<i>p</i>	<i>b</i>	<i>SE</i>	Wald χ^2	<i>OR</i> (95% <i>CI</i>)	<i>p</i>
Forced Sex	-1.09	0.518	4.45	0.34 (0.12–0.93)	.0349	-1.01	0.541	3.50	0.36 (0.13–1.05)	.0613
Injured Self	-1.65	0.221	56.03	0.19 (0.12–0.30)	<.0001	-1.39	0.237	34.56	0.25 (0.16–0.40)	<.0001
Injured Others	-1.14	0.386	8.71	0.32 (0.15–0.68)	.0032	-0.97	0.367	6.02	0.38 (0.17–0.82)	.0141
Fight	-1.07	0.303	12.37	0.34 (0.19–0.62)	.0004	-0.78	0.325	5.79	0.46 (0.24–0.87)	.0161

Note. Abbreviations: *b* = Unstandardized regression coefficient, *SE* = Standardized error, χ^2 = Chi-square, *OR* = Odds Ratio, 95% *CI* = 95% Confidence Intervals.

^a Covariates include gender, race, group, and baseline measurement of outcome measure.

Table 5

Logistic Regression Results at University B (N=2027)

		Baseline Legal Item									
		Model = Legal Item Only					Model = Legal Item with Covariates ^a				
Outcome Measures		<i>b</i>	<i>SE</i>	Wald χ^2	<i>OR</i> (95% <i>CI</i>)	<i>p</i>	<i>b</i>	<i>SE</i>	Wald χ^2	<i>OR</i> (95% <i>CI</i>)	<i>p</i>
High Risk											
Alone		-0.68	0.195	12.143	0.51 (0.35-0.74)	.0005	-0.39	0.206	3.51	0.68 (0.45-1.02)	.0609
Bored		-1.08	0.171	39.74	0.34 (0.24-0.48)	<.0001	-0.62	0.183	11.42	0.54 (0.38-0.77)	.0007
Heavy-1		-1.71	0.136	156.94	0.18 (0.14-0.24)	<.0001	-1.27	0.144	77.69	0.28 (0.21-0.37)	<.0001
Heavy-3		-1.56	0.193	65.39	0.21 (0.14-0.31)	<.0001	-1.27	0.198	41.34	0.28 (0.19-0.41)	<.0001
Harms											
Regret		-1.58	0.165	92.14	0.21 (0.15-0.29)	<.0001	-1.08	0.174	38.54	0.34 (0.24-0.48)	<.0001
Forgot		-1.29	0.181	50.35	0.28 (0.19-0.39)	<.0001	-0.77	0.193	15.86	0.46 (0.32-0.68)	<.0001
Unsafe Sex		-1.26	0.365	11.95	0.28 (0.14-0.58)	.0005	-0.82	0.388	4.50	0.44 (0.21-0.94)	.0338
Forced Sex		-1.32	0.765	2.96	0.27 (0.06-1.2)	.0852	-1.21	0.774	2.46	0.30 (0.07-1.36)	.1171
Injured Self		-1.64	0.278	34.77	0.19 (0.11-0.33)	<.0001	-1.24	0.289	18.32	0.29 (0.17-0.51)	<.0001
Injured Others		-1.52	0.535	8.04	0.22 (0.78-0.63)	.0046	-1.23	0.551	4.95	0.29 (0.10-0.86)	.0260
Fight		-0.92	0.425	4.66	0.40 (0.17-0.92)	.0308	-0.69	0.438	2.47	0.50 (0.21-1.19)	.1160
Follow-up Legal Item											
		Model = Legal Item Only					Model = Legal Item with Covariates ^a				
Outcome Measures		<i>b</i>	<i>SE</i>	Wald χ^2	<i>OR</i> (95% <i>CI</i>)	<i>p</i>	<i>b</i>	<i>SE</i>	Wald χ^2	<i>OR</i> (95% <i>CI</i>)	<i>p</i>
High Risk											
Alone		-0.98	0.221	19.68	0.38 (0.24-0.58)	<.0001	-0.70	0.230	9.112	0.50 (0.32-0.78)	.0025
Bored		-1.5	0.210	55.94	0.21 (0.14-0.31)	<.0001	-1.16	0.220	27.76	0.32 (0.21-0.48)	<.0001
Heavy-1		-2.46	0.185	176.74	0.09 (0.06-0.12)	<.0001	-2.13	0.192	122.95	0.12 (0.08-0.17)	<.0001
Heavy-3		-2.37	0.279	71.93	0.09 (0.05-0.16)	<.0001	-2.11	0.283	55.52	0.12 (0.07-0.21)	<.0001
Harms											
Regret		-2.20	0.217	102.20	0.11 (0.07-0.17)	<.0001	-1.83	0.225	65.90	0.16 (0.10-0.25)	<.0001
Forgot		-2.16	0.263	67.57	0.15 (0.07-0.19)	<.0001	-1.76	0.271	42.16	0.17 (0.10-0.29)	<.0001
Unsafe Sex		-1.77	0.470	14.23	0.17 (0.07-0.43)	.0002	-1.63	0.510	10.25	0.20 (0.07-0.53)	.0014

Outcome Measures	Follow-up Legal Item									
	Model = Legal Item Only					Model = Legal Item with Covariates ^a				
	<i>b</i>	<i>SE</i>	Wald χ^2	<i>OR</i> (95% <i>CI</i>)	<i>p</i>	<i>b</i>	<i>SE</i>	Wald χ^2	<i>OR</i> (95% <i>CI</i>)	<i>p</i>
Forced Sex	-1.16	0.765	2.28	0.32 (0.07–1.41)	.1308	-1.05	0.776	1.82	0.35 (0.08–1.61)	.1778
Injured Self	-2.18	0.368	34.98	0.11 (0.06–0.23)	<.0001	-1.90	0.379	25.20	0.15 (0.07–0.31)	<.0001
Injured Others	-1.68	0.607	7.65	0.19 (0.06–0.61)	.0057	-1.41	0.621	5.13	0.25 (0.07–0.83)	.0235
Fight	-1.42	0.533	7.13	0.24 (0.09–0.69)	.0076	-1.22	0.54	5.04	0.30 (0.10–0.86)	.0247

Note. Abbreviations: *b* = Unstandardized regression coefficient, *SE* = Standardized error, χ^2 = Chi-square, *OR* = Odds Ratio, 95% *CI* = 95% Confidence Intervals.

^aCovariates include gender, race, group, and baseline measurement of outcome measure.

Table 6

Multiple Regression Results at University A (N=2007)

Outcome Measures		Baseline Legal Item							
		Model = Legal Item Only				Model = Legal Item with Covariates ^a			
		<i>b</i>	β	<i>SE</i>	<i>p</i> value	<i>b</i>	β	<i>SE</i>	<i>p</i> value
Drinking									
	Total Drinks	-9.00	-0.29	0.651	<.0001	-2.95	-0.10	0.569	<.0001
	Typical Week	-6.53	-0.31	0.446	<.0001	-2.42	-0.12	0.382	<.0001
	Drank Most	-3.88	-0.39	0.205	<.0001	-1.05	-0.11	0.170	<.0001
	BAC	-0.07	-0.35	0.004	<.0001	-0.02	-0.12	0.004	<.0001
High Risk									
	Drinking Games	-1.05	-0.41	0.052	<.0001	-0.26	-0.10	0.047	<.0001
	Skip Meal	-0.18	-0.17	0.023	<.0001	-0.09	-0.08	0.021	<.0001

Outcome Measures		Follow-up Legal Item							
		Model = Legal Item Only				Model = Legal Item with Covariates ^a			
		<i>b</i>	β	<i>SE</i>	<i>p</i> value	<i>b</i>	β	<i>SE</i>	<i>p</i> value
Drinking									
	Total Drinks	-10.24	-0.34	0.642	<.0001	-4.98	-0.16	0.554	<.0001
	Typical Week	-7.09	-0.34	0.441	<.0001	-3.39	-0.16	0.374	<.0001
	Drank Most	-3.97	-0.40	0.204	<.0001	-1.57	-0.16	0.163	<.0001
	BAC	-0.08	-0.38	0.004	<.0001	-0.04	-0.19	0.004	<.0001
High Risk									
	Drinking Games	-1.04	-0.41	0.517	<.0001	-0.44	-0.17	0.043	<.0001
	Skip Meal	-0.20	-0.20	0.023	<.0001	-0.13	-0.13	0.021	<.0001

Note. Abbreviations: *b* = Unstandardized regression coefficient, β = Standardized regression coefficient, *SE* = Standardized error.

^a Covariates include gender, race, group, and baseline measurement of outcome measure.

Table 7

Multiple Regression Results at University B (N=2027)

		Baseline Legal Item							
		Model = Legal Item Only				Model = Legal Item with Covariates ^a			
Outcome Measures		<i>b</i>	β	<i>SE</i>	<i>p</i> value	<i>b</i>	β	<i>SE</i>	<i>p</i> value
Drinking									
	Total Drinks	-7.55	-0.27	0.605	<.0001	-3.43	-0.12	0.523	<.0001
	Typical Week	-4.96	-0.29	0.364	<.0001	-2.47	-0.14	0.332	<.0001
	Drank Most	-3.16	-0.34	0.197	<.0001	-1.13	-0.12	0.167	<.0001
	BAC	-0.06	-0.30	0.004	<.0001	-0.03	-0.15	0.004	<.0001
High Risk									
	Drinking Games	-0.95	-0.35	0.057	<.0001	-0.39	-0.14	0.051	<.0001
	Skip Meal	-0.08	-0.07	0.023	.0012	-0.04	-0.04	0.023	.0839
		Follow-up Legal Item							
		Model = Legal Item Only				Model = Legal Item with Covariates ^a			
Outcome Measures		<i>b</i>	β	<i>SE</i>	<i>p</i> value	<i>b</i>	β	<i>SE</i>	<i>p</i> value
Drinking									
	Total Drinks	-8.95	-0.31	0.610	<.0001	-5.29	-0.18	0.524	<.0001
	Typical Week	-5.87	-0.33	0.366	<.0001	-3.55	-0.20	0.334	<.0001
	Drank Most	-3.90	-0.40	0.195	<.0001	-2.02	-0.21	0.166	<.0001
	BAC	-0.08	-0.38	0.004	<.0001	-0.05	-0.24	0.004	<.0001
High Risk									
	Drinking Games	-1.15	-0.41	0.056	<.0001	-0.65	-0.23	0.050	<.0001
	Skip Meal	-0.12	-0.11	0.024	<.0001	-0.09	-0.08	0.023	.0001

Note. Abbreviations: *b* = Unstandardized regression coefficient, β = Standardized regression coefficient, *SE* = Standardized error.

^a Covariates include gender, race, group, and baseline measurement of outcome measure.