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Event Specific Drinking Among College Students

Clayton Neighbors[1], **David C. Atkins**[2], **Melissa A. Lewis**[2], **Christine M. Lee**[2], **Debra Kaysen**[2], **Angela Mittmann**[2], **Nicole Fossos**[1], and **Lindsey M. Rodriguez**[1]

[1] University of Houston

[2] University of Washington

Abstract

College represents a period of risk for heavy drinking and experiencing unwanted consequences associated with drinking. Previous research has identified specific events including holidays (e.g., New Years), school breaks (e.g., Spring Break) and personally relevant events (e.g., 21st birthdays) that are associated with elevated risk of heavy drinking and negative alcohol-related consequences. The systematic evaluation of relative risk offers insights into event specific drinking and an empirical basis upon which to consider allocation of limited prevention resources. Thus, the purpose of the present study was to provide a comparative index of drinking across a wide range of holidays and compare holiday drinking to 21st birthday drinking. Participants were 1,124 students (55% female) who had turned 21 within the previous three weeks in 2008 and provided 90-day retrospective reports of their drinking using the Timeline Follow-back. Results based on a hurdle mixed model for blood alcohol content (BAC) revealed several holidays that stand out for elevated drinking, including New Year's Eve and July 4th, whereas other holidays appear more similar to weekend drinking, such as Spring Break (approximately last week of March) and graduation (mid-June). Drinking on holidays or special days was substantially lower than drinking on 21st birthdays. Results are discussed in terms of practical applications for targeted intervention efforts on college campuses toward specific events where elevated drinking is known to occur.

Keywords

event-specific drinking; 21st birthday drinking; timeline follow-back

Twenty-first birthdays have been highlighted in recent research as a specific event associated with extreme drinking (Brister, Wetherill, & Fromme, 2010; Neighbors, Oster-Aaland, Bergstrom, & Lewis, 2006; Rutlege, Park, & Sher, 2008) and related negative consequences (Lewis, Lindgren, Fossos, Neighbors, & Oster-Aaland, 2009; Wetherill & Fromme, 2009). The purpose of the present research was to extend previous examinations of event-specific drinking by evaluating the prevalence and quantity of drinking on specific holidays in comparison to 21st birthdays and non-holidays in a large sample of college students. In combination with others' efforts (e.g., Beets et al., 2009; Del Boca, Darkes, Greenbaum, & Goldman, 2004; Greenbaum, Del Boca, Darkes, Wang, & Goldman, 2005),

Correspondence should be sent to Clayton Neighbors, University of Houston, Department of Psychology, 126 Heyne Bldg, Houston, TX 77204-5022. Phone: 713-743-2616, Fax: 713-743-8588, cneighbors@uh.edu.

this work may facilitate a system of priortization for Event-Specific Prevention (ESP) efforts on college campuses (Neighbors et al., 2007), where campus health professionals currently have little empirical data upon which to base resource allocation decisions regarding targeted prevention efforts for specific events. A central assumption underlying ESP is that knowing when and/or where a negative event will occur should provide distinct advantages for preventing the negative event (Neighbors et al., 2007), but knowing which events are of greatest risk and merit proportionally greater resource allocation is currently unclear. As detailed below, several events have been associated with heavy drinking among college students including 21st birthdays, Spring Break, sporting events, and holidays.

Over 80% of students report drinking during their 21st birthday celebration (Rutlege et al., 2008; Neighbors et al., 2006). Rutlege et al. (2008) found that half of 21st birthday drinkers drank more on this occasion than any other previous occasion, and college students consume more alcohol than they anticipate during 21st birthday celebrations (Brister et al., 2010). In a recent study, students most likely to experience greater amounts of consequences were those who drank heavily the week of their birthday, but were not typically heavy drinkers (Lewis et al., 2009). Of concern, research has shown that 40% of students report blacking out (Wetherill & Fromme, 2009) and over 30% of students report not remembering part of the previous evening due to 21st birthday drinking (Lewis et al., 2009). Although research has shown 21st birthday celebrations to be associated with extreme drinking and experiencing consequences, research has yet to evaluate how 21st birthday drinking relates to drinking during other specific holidays or occasions.

Additional research has shown drinking and related risks are elevated during Spring Break (Beets et al., 2009; Del Boca et al., 2004), especially for students who go on trips (Grekin, Sher, & Krull, 2007; Lee, Maggs, & Rankin, 2006; Lee, Lewis, & Neighbors, 2009). One reason why drinking and consequeces may be elevated during Spring Break trips is because students intend to engage in heavy drinking during Spring Break trips (Smeaton, Josiam, & Dietrich, 1998). As found with 21st birthday drinking, research has shown typically lighter drinkers who drank during Spring Break were more likely to report consequences (Lee, Lewis, & Neighbors, 2009).

Sporting events have been associated with heavy alcohol use among college students (e.g., Glassman, Dodd, Sheu, Rienzo, & Wagenaar, 2010; Neal & Fromme, 2007; Neighbors et al., 2006). Glassman et al. (2010) found that students who typically drank on football game days consumed an average of 7.20 drinks (*SD*=5.15) and experienced hangovers, driving after drinking, blacking out, vomiting, and injuries associated with game day drinking. College football games have lead to increased alcohol-related arrests, showing a 13% increase in arrests for drunk driving, a 41% increase in arrests for disorderly conduct, and a 76% increase in arrests for liquor law violations (Rees & Schnepel, 2009). However, additional research has found no evidence of an association between football games and drinking (Beets et al., 2009).

In a similar vein, research examining event-specific drinking among first-year college students has found that holidays were among the highest binge days, with Halloween, Thanksgiving, and New Year's Eve in particular being associated with binge drinking (Beets et al., 2009; Greenbaum et al., 2005; Del Boca et al., 2004). Several studies have compared specific holidays/events or weeks including holidays/events in comparsion to weeks that do not contain specific holidays or events (Beets et al., 2009; Del Boca et al., 2004; Greenbaum et al., 2005; Woodyard & Hallam, 2010). These studies provide a strong foundation for beginning to consider differences among specific holidays and events in comparison to typical weeks, typical weekends, and/or typical days. With the exception of one study by Beets et al. (*N* = 827), the samples have been relatively small and have focused largely on

weekly drinking with a limited number of specific events evaluated, and none including 21st birthdays. Of the four studies, only Woodyard and Hallam (2010) did not find support for specific events exceeding typical drinking.

The purpose of the present study was to evaluate the prevalence and quantity of alcohol consumed on a range of holidays and one's 21st birthday in comparison to a typical Saturday. The research was intended to provide a comparative index of risk which might be used in setting priorities for targeted prevention efforts and to provide an empirical basis from which to begin to consider why some events are associated with greater risk than others.

Method

Participants and Procedures

Participants included 1,124 registered undergraduate students who turned 21 during three academic quarters at a large public northwestern university (February 2008-August 2008). Demographic characteristics included 55.1% women and 61.8% White, 25.9% Asian, 6.2% multi-racial, and 6.1% other. Students (N = 2,113) were mailed and emailed an invitation to participate in a confidential 45-minute online survey about 21st birthday celebrations four days after their 21st birthday in exchange for $30. Approximately 53% of students provided informed consent and completed the online survey (n = 1,124). All procedures were approved by the university's IRB and a federal certificate of confidentiality was obtained.

Measures

Past 90-day alcohol use—Daily BAC estimates were derived from a modification of the Widmark formula (National Highway Traffic Safety Administration, 1994). The number of drinks consumed (if any) and the number of hours the drinks were consumed were assessed for each of the past 90-days using a Timeline Follow-back calendar (TLFB; Sobell & Sobell, 2000; Tonigan et al., 1997). The validity of the TLFB has been favorably evaluated in different formats (Sobell & Sobell, 2000) and found to be consistent over 30, 90, and 366 day formats (Searles et al., 2002). Important campus events, federal and state holidays (e.g., Thanksgiving), and popular secular holidays or other events (e.g., Halloween, 21st birthday) were labeled on the calendar. Participants could personalize their calendar further by selecting other categories to be included in the calendar (e.g., religious observances) or by listing up to 10 individual memorable events and corresponding dates (e.g., sister's wedding). Following the instructions, students were presented with the 90-day calendar and asked to report the number of standard drinks consumed on each day over the previous 90 days. Specific events included in the present analysis are detailed in Figure 2. Each day was coded to indicate the day of week, as well as whether it was one of 13 specific events selected for analysis. Specific events occurring within the prior 90 days were assessed, although all events were not completed by all participants because of the rolling recruitment nature of the study (i.e., participants surveyed just after their 21st birthday).

Data analyses

The primary focus of the study was to examine how holiday drinking (represented by BAC) compares to two reference points: 21st birthday drinking and typical drinking (both weekend [i.e., Thursday-Saturday and coded 0] and weekday [i.e., Sunday-Wednesday and coded 1]). TLFB data is intensive, longitudinal data, and statistical models of it must account for the nesting of repeated measures within individuals. Moreover, the distribution of BAC is heavily skewed with a large number of zeroes (n = 45,668 zeroes, or 79.7% of total data points). To accurately model the data, we used a Bayesian mixed-effects hurdle model, a type of count regression technique appropriate when there are large numbers of zeroes

(Atkins & Gallop, 2007; Hilbe, 2007). Hurdle models are closely related to zero-inflated models, with one key difference. In zero-inflated models a count regression (i.e., Poisson, negative binomial) is combined with a model for excess zeroes, the zero-inflation part of the model. This means that zeroes are accounted for in both parts of the model, and zero-inflated models are one example of a mixture model (in which the predicted zeroes are a mixture of both parts of the model). Hurdle models fit all zeroes (vs. non-zeroes) in a logistic regression, and non-zero counts are modeled via a truncated count regression (truncated because it does not include zeroes). Although the overall fit between hurdle models and zero-inflated models is often similar, hurdle models are more straightforward to interpret as all zeroes are accounted for in the logistic regression sub-model, which is not true of zero-inflated models. For alcohol research, the hurdle model maps directly to two dependent variables of general interest: drinking days and BAC on drinking days.

The current analyses included a random-intercept in the logistic portion of the model (i.e., individuals were allowed to vary in their baseline probability of any drinking), and a random intercept and random slope for weekday (vs. weekend) in the truncated count regression (i.e., the model allowed individual variability in the amount drunk on weekdays vs. weekends). Because there was some evidence that students were more likely to respond to more recent days, the days since the present day was included as a. Finally, the truncated count regression was an over-dispersed Poisson model, including an observational level random-effect to account for any over-dispersion. The model was fit using Markov Chain Monte Carlo (MCMC) methods, with non-informative priors (i.e., inverse-Wishart priors for random-effects, and normal distribution priors for fixed-effects). Three separate MCMC chains were run. Convergence was determined using the Gelman-Rubin diagnostic that compares the variability within chains to that between chains. All analyses were done in R v2.12.1 (R Development Core Team, 2010) and made extensive use of the MCMCglmm package (Hadfield, 2009) for Bayesian generalized linear mixed models.

Results

Descriptive analyses indicated that participants drank on an average of 10.3 (*SD* = 12.0) days over the past 90 days and consumed an average of 4.4 (*SD* = 3.4) drinks on days when they consumed alcohol. Mean BAC in the sample on drinking days was 0.10 (*SD* = 0.09). The overall mean BAC on all days, including drinking and non-drinking days, was 0.02 (*SD* = 0.05). Figure 1 displays mean BAC with 50% confidence intervals for each day between December 25th 2007 and July 8th 2008. Holidays and special days are indicated in black. In the month of May, two weeks of data are expanded, so that the intraweek pattern of drinking can be seen more clearly. Several interesting patterns can be seen. There is a regular, weekly difference in drinking across weekends (Thursday-Saturday; *M* = 0.03, *SD* = 0.07) and weekdays (*M* = 0.01, *SD* = 0.05), which can also be seen in the inset graph of drinking during mid-May. Several holidays emerged for elevated drinking, including New Year's Eve and July 4th, whereas other holidays appear more similar to weekend drinking, such as Spring Break (approximately last week of March) and graduation (mid-June). However, estimated BACs on holidays or special occasions were considerably lower than on 21st birthdays (*M* = 0.14, *SD* = 0.14).

The results of the Bayesian mixed-effects hurdle model are presented in Figures 2 and 3[1]. Figure 2 includes the results for the truncated, over-dispersed Poisson regression. To aid with the interpretation, predicted marginal means are shown. That is, the intercept and where appropriate weekday coefficients are added to holiday coefficients to present estimated BAC on each holiday. The outcome was transformed by multiplying by 100, and thus the intercept value of 8.2, means that the average BAC on weekend (when there is drinking) is approximately a BAC of 0.08. The reference line is set at the intercept (i.e., typical weekend

drinking on drinking days), and 95% confidence intervals that do not cross the reference line are significant at $p < .05$[2]. Figure 3 presents the results of the logistic regression of any drinking versus no drinking. Similar to the count regression portion of the model, the figure presented marginal predicted means for the proportion of individuals drinking on the various days. As before, 95% CI that do not cross the reference line are significantly different at the $p < .05$ level. Although it is more common to report odds ratios for logistic regression, proportions were used here as the primary interest in the present analyses is to know what percentage of individuals were drinking on certain days.

Not surprisingly, 21st birthday drinking is notably more elevated relative to other holidays, with 90% of individuals reporting at least some drinking on their 21st birthday and with a predicted mean BAC of 0.186 (on original outcome scale), over two times the BAC for a typical weekend when there is drinking. Results revealed that certain holidays were associated with drinking and drinking notably more than usual (e.g., New Year's Eve, Spring Break, and July 4th), whereas other holidays showed a split between proportion of students drinking and the quantity consumed. For example, the proportion of individuals drinking on Cinco de Mayo was not significantly different from typical weekend drinking; however, of those who did drink on that holiday, their BACs were estimated to be somewhat higher than typical weekend drinking. In a similar vein, significantly fewer individuals drank on Super Bowl Sunday, Fat Tuesday, and President's Day relative to a typical weekend, but of those who were drinking, their estimated BAC was approximately similar to typical weekend drinking. Analyses were conducted to evaluate gender, baseline drinking, and greek status as moderators. Model comparisons reliably pointed to preference for the smaller model, without moderators. Results supported the conclusion that individuals who drink more generally (i.e., males, high baseline drinkers, and Greeks) also generally drink more on holidays. We did not find evidence of systematic variance in discrepancies between typical drinking and holiday drinking.

Discussion

The purpose of the present research was to extend previous examinations of event-specific drinking by evaluating drinking on specific holidays in comparison to 21st birthdays and non-holidays in a large sample of college students. The longitudinal design of the current research allowed for an in-depth examination of the variability of college student drinking, in addition to a direct comparison of specific events where celebration and risky drinking occur to a typical weekend day. The present findings indicate that increases in drinking occurred for the majority of the events but that the prevalence and quantity consumed varied by event.

With heavy drinking being associated with higher frequency and severity of negative consequences, it is of critical importance to determine the events with the largest risk of heavy drinking. Additionally, it is important to distinguish between events on which students who drink consume more than they typically drink, and events on which students

[1]We note that BAC would not a priori seem appropriate for a count regression model. That is, count regression assumes the outcome is a non-negative integer representing a count. However, peak BAC is a gender and weight adjusted estimate of drinking per some specified amount of time and as such represents a rate of drinking over time. Given the notable stack of zeroes and overall distribution of BAC, other typical statistical approaches (e.g., linear mixed models with or without a transformation) would be entirely inappropriate. Neal and Simons (2007) provide some justification and support for the use of count models with non-integer outcomes that otherwise fit the distributional assumptions of Poisson and/or negative binomial distributions. Moreover, the present Bayesian hurdle mixed model provided a good fit to the data. Specifically, the predicted distribution of drinking from the present model provides a good fit to the marginal distribution of BAC. One critical point for interpretation is that the BAC outcome was transformed by multiplying by 100 to take it to an approximate, integer-valued scaling.

[2]Days since present day was included as a covariate and was positively associated with BAC (rate ratio = 0.99, $p = .03$). Thus the further back in time participants were recalling, the less drinking they reported. Estimated BACs are adjusted for this effect.

who do not typically drink consume heavy amounts of alcohol. The present research used a typical non-holiday weekend (i.e., Thursday–Saturday) as the point of reference to which all holidays and one's 21st birthday were compared. Risk was defined as the product of the proportional increase in drinking prevalence and the proportional increase in number of drinks consumed. Our results suggest that particular events are differentially associated with high-risk drinking: some holidays are only associated with slightly elevated drinking, while others are associated with high levels of drinking. Compared to a typical non-holiday weekend, more students consumed alcohol and reached higher BAC's on 21st birthdays, New Year's Eve, New Year's Day, July 4th, Spring Break, and Graduation. Other events were associated with either a greater proportion of drinkers (i.e., Valentine's Day) or higher BAC (i.e., Cinco De Mayo) but not both. Twenty-first birthday drinking was associated with the highest proportion of drinkers and highest BAC. Previous research has shown that 21st birthday drinking is associated with extreme and potentially dangerous levels of drinking (Lewis et al., 2009; Wetherill & Fromme, 2009), and results from the current study suggest 21st birthday drinking is in fact the riskiest event. This research provides an important perspective into the direct comparison of holidays where students engage in high risk drinking, and the findings have equally important implications for alcohol preventative interventions.

The majority of existing alcohol interventions on college campuses target typical heavy drinking rather than heavy episodic drinking associated with specific events or dates. Previous research has demonstrated that students who are not typically heavy drinkers, but drink heavily on specific events, are at increased risk for experiencing negative consequences (Lewis et al., 2009). Thus, interventions targeting typically heavy drinking students may miss an important population of students who increase their drinking on special occasions and are at greater risk for experiencing consequences. Our results suggest that we can identify specific events that are most associated with riskier drinking. Clinicians may want to inquire not only about plans for those occasions but also about expectancies about drinking related to those events. These results also suggest that clinicians may want to be mindful about the timing of interventions. Designing interventions around specific, predictable events provides campuses with an opportunity to reduce drinking and risk of consequences around these events. Targeting specific events in terms of timing and content of the interventions may provide a cost-effective approach to preventing alcohol-related harms associated with these events. It may be beneficial to time prevention programs to occur prior to special occasions that occur on regular and easily anticipated schedules like New Year's Eve to most effectively reduce negative consequences for students.

A primary limitation of the present study is that data were taken from a single large public university utilizing a sample of students who had recently turned 21. It is unclear whether a similar pattern of results for drinking over specific events would emerge among students younger or older than 21 or at other universities. We might expect population specific differences in relative risk of specific events. For example, Cinco de Mayo might be more strongly celebrated in Hispanic student populations. Another limitation is the use of a self-report retrospective measure of alcohol use. Research has supported the validity of self-report measures of alcohol use among college students and adolescents (Johnston & O'Malley, 1985) and has demonstrated the reliability of the TLFB with other drinking measures (Sobell & Sobell, 2000) Nevertheless, it is not clear how accurately participants recall drinking on specific days several weeks afterwards. An additional limitation is the absence of data regarding alcohol-related consequences for each event. Subsequent systematic evaluation of event-specific consequences would be useful.

The current research provides an extension to the literature that suggests college student drinking varies considerably over time and is contingent upon particular events. This

research provides a direct comparison of many major secular and personal events where students engage in high-risk drinking to drinking on their 21st birthday and a typical weekend day and provides an important foundation for future research aimed at understanding which events are likely to be associated with the greatest risk and why.

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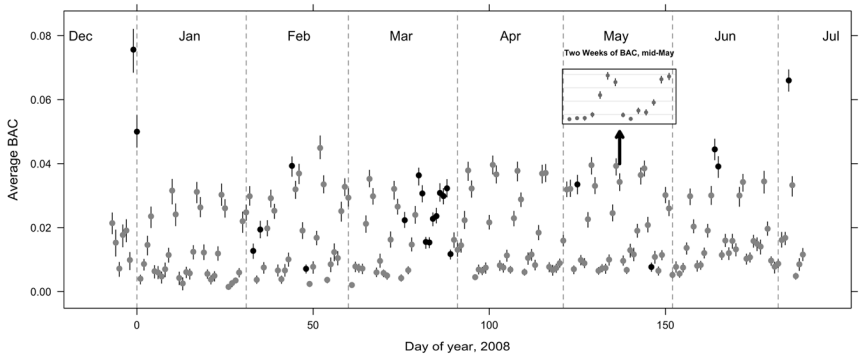

Note. Holidays = Black, Non-holidays = Grey.

Figure 1.
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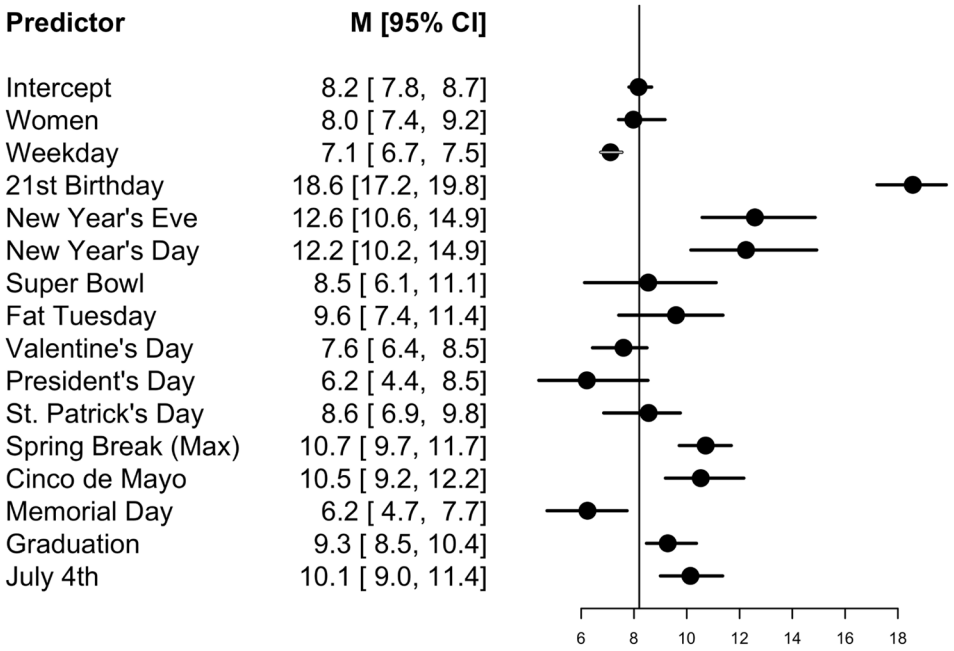

Figure 2.

Predicted mean BAC on drinking days based on hurdle mixed model. Confidence intervals that do not cross the reference line (set at the intercept) are significantly different at $p < .05$. (Note that BAC has been transformed by multiplying by 100.)

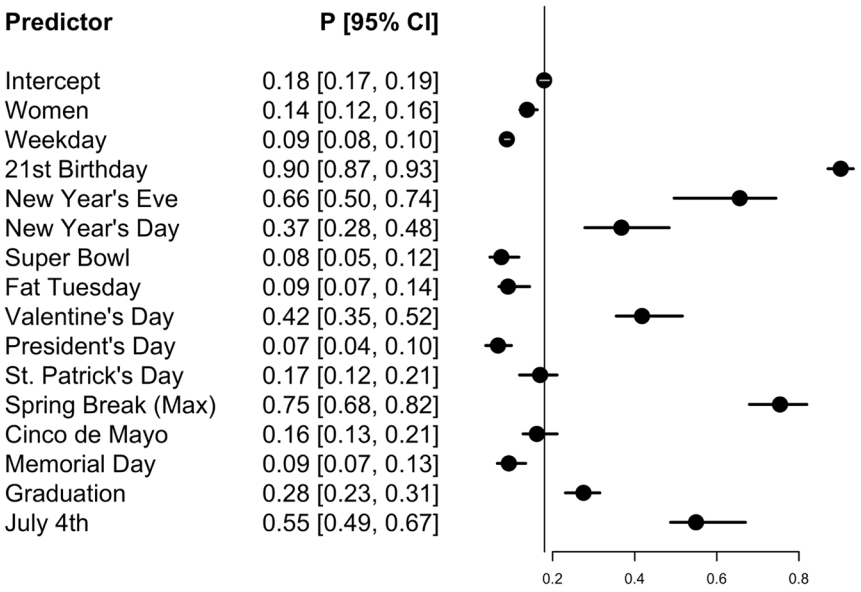

Figure 3.

Predicted proportion of individuals drinking based on hurdle mixed model. Confidence intervals that do not cross the reference line (set at the intercept) are significantly different at $p < .05$.