Title
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Journal
Journal of Studies on Alcohol and Drugs, 77(1)

ISSN
1937-1888

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Publication Date
2016

DOI
10.15288/jsad.2016.77.51

Peer reviewed

Summer Versus School-Year Alcohol Use Among Mandated College Students

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ABSTRACT. Objective: Longitudinal research examining college students' alcohol use during the summer months, especially in at-risk individuals, is limited. The current study evaluated changes in mandated college students' alcohol use and related consequences over the summer. **Method:** Participants (n = 305, 67% male) who had violated campus alcohol policy and were subsequently mandated to treatment completed follow-up assessments at 3, 6, and 9 months. For the majority of students, one of these follow-up assessments occurred over the summer. Hierarchical linear modeling was used to examine changes in alcohol use and related consequences during the school year and summer. **Results:** Participants reported consuming significantly fewer drinks per occasion, reaching lower peak blood alcohol concentrations, and experiencing fewer alcohol-related consequences during the summer months. All outcomes were mediated by summer housing, indicating that summer influenced alcohol use indirectly through participants' tendency to live at home. **Conclusions:** Despite small but significant decreases in alcohol consumption and related consequences when living with a parent/guardian, mandated college students continue to exhibit risky drinking and consequences during the summer months. Given these findings, summer may be an appropriate time to implement prevention and intervention strategies with mandated and other at-risk populations. (*J. Stud. Alcohol Drugs, 77,* 51–57, 2016)

ALCOHOL MISUSE IS A PROBLEM ON college campuses, where 60% of students younger than age 21 years report alcohol consumption in the past 30 days and more than 40% of students report heavy episodic drinking (five or more drinks in one sitting) in the past 2 weeks (Core Institute, 2014). Drug and liquor law violations on college campuses have also been increasing since 2001, with a 14% increase in liquor law violations in 2012 (National Center for Education Statistics, 2014). Although the prevalence of college alcohol misuse has led to empirical investigations of effective intervention and prevention strategies, the majority of research has focused primarily on drinking during the school year. Therefore, it is unclear if college students continue to drink in a problematic manner when separated from the college environment over the summer.

The campus environment seems to have a powerful influence on alcohol use among young adults (Jackson et al., 2005). Matriculation to campus tends to generate increases in rates of high-risk drinking among first-year students, with increases attributed primarily to elevated levels of alcohol use among those who were non–heavy drinkers in high school (Borsari et al., 2007; Sher & Rutledge, 2007). Once on campus, however, the majority of college students seem to adapt their drinking to fit the contingencies of the academic setting. Although a minority of students drink heavily despite academic requirements (Greenbaum et al., 2005; Hoeppner et al., 2012), most students confine drinking to weekends, decrease drinking when academic demands are high (e.g., during final exams), and increase drinking over holidays (e.g., July 4th, New Years) (Del Boca et al., 2004; Neighbors et al., 2011; Skidmore & Murphy, 2011). However, it has yet to be determined whether students maintain their levels of alcohol use when responsibilities and expectations change over the summer.

Parental influences may also affect high-risk drinking over the summer, when on-campus housing is generally not available and many students return home. Parental involvement and monitoring have been found to serve as protective factors against the progression of drinking among both adolescents (Simons-Morton & Chen, 2005; van der Vorst et al., 2006) and college students (Fairlie et al., 2012; Patock-Peckham et al., 2011). Specifically among college students, high parental permissiveness toward drinking has been positively associated with heavy alcohol use (Fairlie et al., 2012), and low parental monitoring has been linked to more alcohol-related consequences (Patock-Peckham et al., 2011). Moreover, students who live at home with parents are less likely than those living either on campus or off campus with-

Received: December 31, 2014. Revision: August 4, 2015.

Jennifer Merrill's contribution to this manuscript was supported by National Institute on Alcohol Abuse and Alcoholism (NIAAA) Grant K01AA022938. Ali Yurasek's contribution to this manuscript was supported by National Institute on Drug Abuse (NIDA) Grant T32 DA016184. Nadine Mastroleo's contribution to this manuscript was supported by NIAAA Grant T32 AA07459. Brian Borsari's contribution to this manuscript was supported by NIAAA Grants R01-AA015518 and 01-AA017874 and Department of Veterans Affairs VISN1 Career Development Award V1CDA2012-18. The contents of this article do not represent the views of the NIAAA, NIDA, the Department of Veterans Affairs, or the United States government.

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out parents to drink heavily (Jackson et al., 2005). Therefore, students who move back home for the summer may modify their alcohol use in response to parental influences.

The extent to which changes in drinking patterns may differ between young men and women is unclear. A number of studies have found that women are more responsive to alcohol interventions than men (Larimer & Cronce, 2007) and may be more likely than men to reduce alcohol consumption in the absence of a targeted alcohol intervention (Carey et al., 2011). Conversely, recent research suggests that men who are lower in readiness to change may respond more favorably than women to an intensive intervention (Grossbard et al., 2016). However, naturalistic changes in drinking patterns do not seem to differ by gender; rather, individuals who drink heavily in general tend to continue drinking more than their peers on weekends and holidays (Del Boca et al., 2004; Neighbors et al., 2011). Based on the inconsistencies in these findings, continued exploration of the moderating effect of gender on changes in alcohol use patterns is warranted.

Given the wealth of resources invested in the intervention and prevention of college alcohol misuse, it is important to implement interventions in ways that maximize effectiveness. Several interventions tailored to college alcohol misuse have been associated with decreased alcohol consumption and related consequences (see Carey et al., 2007; Cronce & Larimer, 2011; Foxcroft et al., 2014). These reductions have been observed in the general college student population as well as in students who have violated campus alcohol policy and have been mandated to receive alcohol interventions (e.g., Borsari & Carey, 2005). However, most of this research has focused on alcohol use and consequences reported during the school year. Thus, the extent and consequences of enrolled college students' drinking over the summer remains unknown.

The current study evaluated changes in mandated college students' alcohol use and related behaviors over the summer months. It was hypothesized that drinks consumed per day, peak estimated blood alcohol concentrations (BACs), and alcohol-related consequences would decrease over the summer, when students are more likely to be exposed to parental influences that may be related to decreases in drinking (Fairlie et al., 2012; Jackson et al., 2005; Patock-Peckham et al., 2011). Moreover, it was expected that living with a parent or guardian would mediate the relationship between summer and decreased drinking outcomes. Exploratory analyses were conducted to determine if changes in summer and school-year alcohol use and consequences differ across male and female students.

Method

Participants and procedure

Undergraduate students at a 4-year liberal arts university in the Northeast were recruited to participate in the study as part of a larger research project (see Borsari et al., 2012). Students caught violating campus alcohol policies were presented with the option of either participating in the research study or engaging in a 15- to 30-minute individual discussion of their incident and alcohol use. After providing informed consent and completing baseline questionnaires, those who chose to participate (N = 598) completed a 15-minute brief advice session with a fellow college student in which they were encouraged to reduce high-risk alcohol use. Six weeks later, they were emailed a link to a web-based assessment, which they completed online from remote locations. The intervention strategy for those who denied high-risk drinking [defined as four or more heavy drinking episodes (four/five drinks on one occasion for females/males) and/or five or more alcohol-related consequences] at the 6-week follow-up was "stepped down" in such a way that those denying high-risk drinking were assessed at subsequent follow-ups without additional treatment. Those who continued to report high-risk drinking at the 6-week follow-up were randomized to either a 60-minute brief motivational intervention or an assessment-only control condition. To examine naturalistic changes in drinking that were not confounded by intervention effects, only participants in the assessment-only and step-down conditions (n = 311) were included in the current analyses. Participants completed follow-up web assessments at 3, 6, and 9 months. They received $15 for the baseline assessment; $40 for the 6-week assessment; and $25, $35, and $60 for the 3-, 6-, and 9-month assessments, respectively. All procedures were approved by the university's institutional review board.

Measures

Demographic information. Participants provided information regarding their gender, age, weight, year in school, race/ethnicity, and current residence (on campus, at home with parent/guardian, in an off-campus house/apartment, or other location). In final analyses, the residence variable was dichotomized as living with parent/guardian or not.

Alcohol use. The number of heavy drinking episodes, which was used to screen for eligibility, was obtained using a gender-specific question that asked women/men to report the number of times they consumed four/five or more drinks on one occasion in the past month (National Institute on Alcohol Abuse and Alcoholism, 2004). Past-month alcohol use outcome variables were obtained using the Alcohol and Drug Use Measure (Borsari & Carey, 2000, 2005). The typical number of drinks consumed per drinking day (DDD) was calculated based on participant's self-reported number of standard drinks consumed on each day of a typical week. This measure also recorded the maximum number of drinks consumed on one occasion in the past month, as well as the amount of time spent drinking during that episode. This information was used to calculate students' estimated peak

BAC using Matthews and Miller's (1979) equation and an average metabolism rate of 0.017 g/dl per hour.

Consequences. Alcohol-related consequences were assessed using the 24-item Brief Young Adult Alcohol Consequences Questionnaire (B-YAACQ; Kahler et al., 2005), a reliable and sensitive assessment of changes in alcohol-related consequences over time (Kahler et al., 2008). Dichotomous (yes/no) items were summed for a total number of consequences experienced in the past month. The B-YAACQ has demonstrated high internal consistency in research with college students (α = .89; Kahler et al., 2005) as well as in this sample (α = .91).

Data screening and analysis

To prepare the data, participants' assessments were coded to reflect the semester (spring, fall, or summer) during which they were completed. Taking into account the academic calendar of the university (classes ended May 20) as well as the 1-month recall period of the measures, assessments completed between June 20 and August 28 were coded as summer assessments.

Data were then screened for outliers, missing values, and violations of the assumptions of hierarchical linear modeling (HLM). Outliers for DDD and alcohol-related consequences variables were replaced with the value that was three standard deviations and one integer above the mean (Tabachnick & Fidell, 2007), and peak BAC estimates that would normally result in coma or death (>.40%) were recoded as .40. After we recoded outliers, the three outcome variables were normally distributed. Six of the final 311 participants did not complete any follow-up assessments and, therefore, were excluded from analyses. (In chi-square and independent samples *t*-test comparisons, those excluded from analyses did not differ significantly from those included with respect to gender, age, ethnicity, or any outcome variable at baseline.) The multilevel person-period data set comprised three observations nested within each participant, resulting in 915 survey points. Data were missing because of a failure to complete surveys on 52 of these 915 potential assessments (6%), and an additional six occasions of the consequence measure were missing. No imputation procedures were used for these missing data since HLM does not require complete data for each participant; therefore, sample sizes varied across analyses. In models where the homogeneity of the Level 1 variance assumption was violated, we relied on robust standard errors (Zeger et al., 1988).

Substantive statistical analyses were completed using HLM (Raudenbush et al., 2013) with full maximum likelihood estimation. In the analysis of longitudinal data characterized by repeated measurements nested within persons, HLM requires fewer assumptions than other approaches, including an ability to handle data in which spacing between observations and the number of observations differ from one participant to the next. HLM also allows examination of within-person associations (i.e., whether one's drinking differs from summer to school-year assessments) while providing natural controls for between-individual differences (e.g., gender; Raudenbush & Bryk, 2002). Therefore, HLM was an ideal approach for examining differences in alcohol use between school-year and summer assessments.

Fully unconditional HLM models (HLM 7.0 program; Raudenbush et al., 2013) were used to determine intraclass correlations for all three outcomes. This allowed a test of whether multilevel models were appropriate (i.e., whether there was between- and within-person variation in outcomes) (Raudenbush & Bryk, 2002). Level 1 (within-person) and Level 2 (between-person) variables were then added to models consistent with hypotheses (described below). In the HLM models, all intercept effects were specified as random to allow for individual differences in mean levels of outcomes. Slope effects were fixed, as this was necessary for model convergence and we did not expect variation in associations of interest. In all models predicting DDD, peak BAC, and consequences, Level 1 included a control for time (3, 6, or 9 months after baseline) and class year. These variables were controlled to account for potential changes in outcomes that may occur generally over time or as a function of developmental transitions from one academic year's class standing to the next. The Level 2 portion of the models included controls for gender and study condition (assessment only vs. step-down participants, who decreased drinking in response to brief advice to do so). We controlled for gender to account for the well-established gender differences in alcohol use among college students (Jackson et al., 2005) as well as the overrepresentation of men in the current sample, and we controlled for condition because those in the assessment-only condition inherently reported heavier drinking than those in the step-down condition. In addition, we regressed gender on the slope effect of summer on each outcome to evaluate whether the association between summer and outcomes was similar for men and women.

Last, we followed the recommendations of Krull and MacKinnon (2001) in testing mediation in multilevel models. This procedure followed similar conceptual steps as single-level, regression-based mediation models (Baron & Kenny, 1986) in that it involved (Step 1) testing the influence of the independent variable on the dependent variable (i.e., whether summer was associated with each of the three outcomes [DDD, peak BAC, consequences]); (Step 2) testing the influence of the independent variable on the mediator (i.e., whether summer was associated with a greater likelihood of living with a parent/guardian); (Step 3) testing the influence of the mediator on the dependent variable, above and beyond the influence of the independent variable (i.e., whether the effect of summer remained significant after controlling for whether one lived at home); and (Step 4) a test of the significance of the mediated ef-

Table 1. Descriptive statistics for outcomes across school-year and summer assessments

	School year			Summer		
Outcome	*n*	*M*	*SD*	*n*	*M*	*SD*
Drinks per drinking day						
3 month	203	6.61	3.50	89	5.74	3.26
6 month	222	6.32	3.46	58	5.71	3.76
9 month	225	6.36	3.48	66	6.05	3.01
Peak BAC (estimated)						
3 month	203	.17	.10	89	.15	.10
6 month	222	.16	.11	58	.13	.10
9 month	225	.16	.10	66	.14	.10
Alcohol consequences						
3 month	199	5.96	5.55	89	4.49	4.78
6 month	220	5.32	5.12	58	4.31	5.08
9 month	225	5.11	4.85	66	5.26	5.50

Note: BAC = blood alcohol concentration.

fect. The magnitude of mediated effects and asymmetric confidence intervals (CIs) were calculated using RMediation (Tofighi & MacKinnon, 2011) to determine whether mediated effects were significant. Given that living with a parent/guardian represented a dichotomous outcome, we used a Bernoulli (unit-specific) model for binary data, which uses a logit link function, to test the effect of summer on living with a parent/guardian.

Results

Sample characteristics

The final 305 undergraduate students (67% male, 94% White) were primarily freshmen (71%), with a mean age of 18.68 years (*SD* = 0.77). At the 3-month follow-up, 60 (21%) of the participants reported living with a parent/guardian, whereas 232 (79%) reported living in an on-campus dormitory, an off-campus house/apartment, or another location. At the 6-month follow-up, 77 (28%) reported living with a parent/guardian and 203 (73%) did not. At the 9-month follow-up, 74 (25%) reported living with parents/guardian whereas 218 (75%) did not. Overall, 213 participants (70%) completed at least one assessment during the summer months.

Outcomes as a function of summer assessment

Descriptive statistics for outcomes across summer and school-year assessments are depicted in Table 1. Intraclass correlations indicated that 67%, 63%, and 69% of the variance in DDD, peak BAC, and consequences, respectively, occurred between individuals (at Level 2), whereas the remaining variance in each outcome was due to differences within person across time (at Level 1). The results of full hypothesized models for each of the three outcomes are presented in Table 2 and described below.

Drinks per drinking day. In Step 1, inclusion in the step-down (as opposed to assessment-only) condition, female gender, and summer were associated with consumption of significantly fewer DDD, and the relationship between summer and drinking was not moderated by gender (Table 2). In Step 2, summer was also associated with a significantly higher likelihood of living with a parent/guardian (*B* = 1.90, *SE* = 0.17; odds ratio = 6.69; 95% CI [4.78, 9.38]). As such, we proceeded to test Step 3. As seen in Table 2, living with a parent/guardian was associated with significantly fewer DDD. Once living with a parent/guardian was controlled for, however, the effect of summer on DDD was no longer significant, suggesting that living with a parent/guardian fully mediated the relationship between summer and decreased alcohol consumption. In Step 4, the indirect effect of summer on DDD, through living with a parent/guardian, was significant (*B* = -1.42, *SE* = 0.50; 95% CI [-2.43, -0.46]).

Peak blood alcohol concentration. In Step 1, inclusion in the step-down condition, higher class year, and summer were associated with significantly lower peak BACs, and the effect of summer on peak BAC was not moderated by gender (Table 2). The significance of Step 2 did not change across analyses and, therefore, is not repeated here (see DDD outcomes above). In Step 3, when the significant effect of living with a parent/guardian on lower peak BACs was controlled for, the effect of summer on peak BAC was no longer significant, again suggesting that living with a parent/guardian mediates the relationship between summer and peak BAC. In Step 4, the indirect effect of summer on peak BAC, through living with a parent/guardian, was significant (*B* = -0.03, *SE* = .01, 95% CI [-0.06, -0.01]).

Consequences. In Step 1, inclusion in the step-down condition and summer were associated with experiencing significantly fewer consequences, and the effect of summer was not moderated by gender (Table 2). In Step 3, once the significant effect of living with a parent/guardian on lower

TABLE 2. Summary of hierarchical linear models

	Step 1				Step 3			
Fixed effect	*B*	*SE*	*t*	*p*	*B*	*SE*	*t*	*p*
Drinks per drinking day								
Intercept	4.90	0.24	20.04	<.001	5.03	0.24	20.74	<.001
Condition (L2)	2.65	0.28	9.45	<.001	2.69	0.28	9.73	<.001
Gender (L2)	-2.18	0.27	-8.18	<.001	-2.18	0.26	-8.26	<.001
Time (L1)	0.05	0.09	0.53	.60	0.07	0.09	0.73	.47
Class Year (L1)	-0.25	0.15	-1.64	.10	-0.35	0.15	-2.37	.02
Summer (L1)	-0.46	0.19	-2.47	.01	-0.15	0.19	-0.77	.44
Gender × Summer	0.47	0.29	1.59	.11	0.47	0.30	1.58	.12
Residence (L1)	–	–	–	–	-0.74	0.25	-2.94	.003
Peak BAC (estimated)								
Intercept	0.12	0.01	13.95	<.001	0.13	0.01	14.21	<.001
Condition (L2)	0.08	0.01	8.35	<.001	0.08	0.01	8.48	<.001
Gender (L2)	0.01	0.01	0.90	.37	0.01	0.01	0.90	.37
Time (L1)	-0.002	0.003	-0.65	.52	-0.002	0.003	-0.53	.60
Class Year (L1)	-0.01	0.01	-2.02	.04	-0.01	0.01	-2.40	.02
Summer (L1)	-0.02	0.01	-3.14	.002	-0.01	0.01	-1.74	.08
Gender × Summer	0.001	0.01	0.07	.94	0.001	0.01	0.09	.93
Residence (L1)	–	–	–	–	-0.02	0.01	-2.39	.02
Alcohol consequences								
Intercept	2.79	0.29	9.66	<.001	2.95	0.29	10.29	<.001
Condition (L2)	4.62	0.41	11.36	<.001	4.67	0.41	11.52	<.001
Gender (L2)	-0.14	0.47	-0.30	.77	-0.14	0.47	-0.30	.76
Time (L1)	-0.13	0.15	-0.88	.38	-0.10	0.15	-0.70	.49
Class Year (L1)	-0.21	0.26	-0.80	.42	-0.34	0.26	-1.30	.19
Summer (L1)	-0.60	0.26	-2.27	.02	-0.21	0.29	-0.72	.48
Gender × Summer	-0.10	0.49	-0.20	.84	-0.09	0.49	-0.18	.89
Residence (L1)	–	–	–	–	-0.89	0.33	-2.70	.01

Notes: Step 2 (testing influence of summer on living with a parent/guardian) is described in the results section above. SE = standard error; L2 = Level 2 (between-person) variable; L1 = Level 1 (within-person) variable; intercept = grand mean when all predictors are 0; BAC = blood alcohol concentration; Condition 0 = step down, 1 = assessment only; Gender 0 = male, 1 = female; Time 0 = 3 month, 1 = 6 month, 2 = 9 month; Class year 0 = freshman, 1 = sophomore, 2 = junior, 3 = senior, 4 = upperclassmen; Summer 0 = spring/fall, 1 = summer; Residence 0 = not living with parent/guardian, 1 = living with parent/guardian.

consequences was controlled for, the effect of summer on consequences was reduced to nonsignificance, suggesting that living with a parent/guardian fully mediated the relationship between summer and alcohol-related consequences. In Step 4, the indirect effect of summer on consequences, through living with a parent/guardian, was significant (*B* = -1.69, *SE* = .65, 95% CI [-3.00, -0.46]).

Discussion

To our knowledge, this is the first study to systematically compare mandated college students' alcohol use and related behaviors during the summer and school year. Mandated students reported small decreases in the amount and severity of alcohol use during the summer months. That being said, alcohol use remained high over the summer, with participants averaging more than five drinks per occasion and reaching estimated peak BACs (past-month) well over the legal limit. Although summer seems to affect alcohol use and related consequences indirectly through students' tendencies to live with a parent/guardian, findings indicate that mandated college students maintain potentially harmful drinking habits over the summer.

Although these data do not allow for examination of causal effects, it seems that living with a parent/guardian over the summer elicits small but significant reductions in drinking quantities, peak BACs, and alcohol-related consequences among both male and female mandated students. This pattern of findings is consistent with the idea that students adapt their drinking to fit the contingencies of their environment (Del Boca et al., 2004) and may decrease drinking in response to parental influences to do so (Fairlie et al., 2012; Patock-Peckham et al., 2011). Other environmental factors may also influence changes in high-risk drinking over the summer. For example, students who live at home over the summer may have more free time and opportunity to enjoy substance-free alternatives to drinking (e.g., family activities, going to the pool or the beach, summer athletics), which may serve as a protective factor among heavy drinkers (Murphy et al., 2005). Regardless, the discrepancy in outcomes based on residence seems to indicate that living with a parent or guardian is effective in eliciting changes in college student drinking.

Current findings may inform prevention and intervention efforts. First, it may be prudent for campuses to implement college drinking interventions during the summer months, before students return to an environment that they may as-

sociate with heavier drinking. Preliminary data suggest that phone interventions delivered by trained clinicians over the summer are effective in reducing alcohol-related consequences among college students (Borsari et al., 2014). Such interventions may circumvent the reciprocal relationship between normative perceptions of typical drinking on campus and actual drinking quantity (Wardell & Read, 2013) by reducing students' perceived norms before they return to an environment of heavy-drinking peers. Summer may also be an appropriate time to help parents intervene in their young adults' drinking patterns. Empirical support for parent-based interventions for college alcohol misuse has been inconsistent but promising (Ichiyama et al., 2009; Turrisi et al., 2001; Wood et al., 2010). Because parents' misperceptions of the appropriateness of certain drinking behaviors among college students (LaBrie et al., 2011) may prevent them from capitalizing on their abilities to influence their children's drinking, summer interventions may build incrementally on both parents' tendencies to discourage high-risk drinking and students' tendencies to decrease drinking over the summer. Because mandated students have clearly encountered some form of consequences as a result of drinking, such interventions may be particularly useful in reducing recidivism among this population.

The finding that high-risk drinking declines subtly but naturally among students living with a parent/guardian over the summer also has methodological implications. Specifically, it indicates a need for researchers to be aware of the outcomes being assessed when conducting follow-ups over the summer. In contrast to the increases in drinking that may confound follow-up assessments conducted over academic holidays (Del Boca et al., 2004; Hoeppner et al., 2012), slight decreases in consumption during the summer may artificially inflate intervention effects on alcohol use if follow-up assessments occur at that time.

The findings of the current study should be considered in the context of important limitations. First, participants in the current study were mandated college students from a single 4-year, liberal-arts college, and the large majority of them were freshmen and male. Therefore, the extent to which results generalize to more diverse samples of students is unknown. Second, participants' responsibilities and peer interactions over the summer were not assessed. It is possible that students decreased drinking, in part, because of summer employment or classes or affiliation with low-risk drinking peer groups, and that students without such influences do not decrease drinking over the summer. Third, all data were collected via self-report. Previous research has found that mandated students tend to underreport their alcohol use (Borsari & Muellerleile, 2009); therefore, current data may underestimate true drinking quantities within this sample. However, consistent underreporting should not influence conclusions regarding variations in summer and school-year drinking.

Conclusion

Research on college alcohol misuse has focused primarily on outcomes reported during the school year. Current findings suggest that mandated college students continue to engage in risky drinking practices over the summer months, despite small but significant decreases in alcohol consumption and peak BACs that are related to an increased likelihood of living with a parent/guardian. These findings, in combination with evidence that interventions delivered during the summer are effective in reducing alcohol-related consequences among college students (Borsari et al., 2014), indicate that summer may be an appropriate time to intervene in high-risk drinking among mandated students.

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