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The Socio-Environmental Context of Simultaneous Alcohol and Marijuana Use Among Young Adults: Examining Day-Level Associations

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Abstract

Introduction and Aims: Simultaneous alcohol and marijuana (SAM) use is reported by roughly 30% of young adult drinkers. Among SAM users, SAM use days have more negative substance-related consequences than single-substance days. Little information is available about contextual factors contributing to the likelihood of SAM use on a particular day. This study compared days on which individuals reported SAM use relative to days on which they reported alcohol but not marijuana use in terms of physical location, engagement in risky activities, and social context of use.

Design and Method: Participants were 148 young adults (57% female) reporting past-month SAM use and past two-week binge drinking. Participants completed up to 14 daily surveys assessing substance use behaviour and socio-environmental characteristics of use.

Results: For those <21 years, only using at home was associated with greater odds of SAM use. For those 21+, using at a friend's house and outdoors were associated with increased odds of use; using at a bar/club was associated with lower odds. Using alone was associated with lower odds of use for those 21+. Engagement in risky activities (pre-gaming and drinking games) was not associated with SAM use.

Discussion and Conclusions: SAM days are linked with use in private settings and social situations. Despite experiencing more harms on SAM days, SAM use is not more likely than alcohol use alone to occur in certain environments and situations traditionally found to be linked with increased risk. Findings may provide key insight for developing context-informed interventions focused on SAM use.

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Keywords

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Simultaneous alcohol and marijuana (SAM) use – or the use of alcohol and marijuana such that the effects overlap – is reported by approximately 30% of US young adult drinkers and appears to be on the rise in this age group [1]. Relative to individuals who only use alcohol or who use both substances but not at the same time, individuals who engage in SAM use are at increased risk for heavy substance use and negative consequences such as physical health problems, driving under the influence, academic and occupational problems, and social consequences [2–4]. Recent daily diary work conducted in the US has extended our knowledge beyond person-level differences that distinguish individuals who engage in SAM use from individuals who engage in only alcohol use by instead contrasting behavioural outcomes on days when they reported SAM use relative to days the same individual reported only alcohol use [e.g., 5, 6]. Though findings are mixed, one study supported that SAM use is linked with heavier alcohol use [6] and another study showed that SAM use is linked with negative consequences on the same day – most commonly blacking out, embarrassing one’s self, and negative physical effects even after controlling for number of drinks consumed, demonstrating the potential unique risks of SAM use on experiencing harms [5]. These findings not only suggest that individuals reporting SAM use are a population at increased risk of heavy use and harms, but also that within the same individual, SAM use days may be associated with acute negative consequences.

While there is emerging evidence that among SAM users, SAM use days are riskier than single-substance use days, there is little information about contextual factors that contribute to the likelihood of engaging in SAM use on a particular day. Similar to comparing whether harms are more likely on SAM use days relative to alcohol use days, comparing characteristics about a day can also elucidate whether a unique set of risk factors exists for predicting the odds of an individual engaging in SAM use relative to only alcohol use on that day. Teasing apart risk factors associated with an individual engaging in certain behaviours in general (e.g., the frequency of which an individual attends parties) and those associated with engaging in certain behaviours on specific days (e.g., an individual only attends parties on days they engage in SAM use) can help identify potential drivers of SAM use and ultimately inform interventions targeting problematic use.

Broadly applied to substance use, social learning theory [7–9] suggests that the environmental and social contexts in which individuals engage in substance use are critical determinants of use and the resulting sequelae. Applications of social learning theory have been used to identify key situational factors that may increase risk for heavy drinking and experience of negative alcohol-related consequences. Some of the most commonly studied contextual influences of substance use include an individual’s physical location, social setting, and engagement in particularly risky activities [10]. Attributes of an individual’s immediate physical environment – such as whether they are engaging in substance use in a public vs. private location, whether the setting is a party, availability of alcohol, lighting,

and presence of live entertainment – can all influence the amount of alcohol consumed (see [9]). For example, drinking in environments such as at a bar/club or at parties has been found to be associated with heavier alcohol use and engagement in risky behaviour [11–13]. Social learning theory also holds that substance use behaviours are dramatically influenced by social influence and selection processes including observing others' substance use, imitating others' use, and selecting peers who have similar substance use behaviours as our own [7–9]. Unsurprisingly, social context such as using around others, group size, and how much others are using is consistently associated with an individual's own alcohol use [e.g., 14–16]. Lastly – in the same vein as social setting – engagement in certain activities such as pre-gaming or drinking/using substances before the main event and playing drinking games with others has been consistently tied to problematic alcohol use [17].

Numerous diary studies have been conducted to parse out the effect of between-person processes (e.g., people who drink in bars more often also tend to drink heavily) and within-person processes (e.g., individuals tend to drink more heavily when they drink in a bar versus drink in other locations) on single-substance use occasions. Generally, findings have revealed that at the daily level, high-intensity drinking (drinking at more than twice the “binge” threshold) is more likely to occur on days when individuals engage in pre-gaming or drinking games [18]. Also, young adult college students tend to report greater alcohol intake and/or alcohol-related negative consequences on days they drink with others relative to days they drink alone [14], when they spend more time socializing [19], when they perceive others around them drinking heavily [20], and when they drink in large groups relative to smaller groups [21]. Further, greater frequency of drinking in social contexts is longitudinally associated with more negative alcohol-related consequences [22]. Identification of key situational characteristics has the potential to inform context-based, real-time interventions to reduce heavy use [23].

Recent, albeit limited work suggests that social learning theory principles also apply to SAM use, but the risk factors may be unique from those predicting single-substance use days [e.g., 24]. Individuals intentionally combine alcohol and marijuana for specific reasons, namely to achieve a better high or to get “cross-faded” [25, 26]. Also, drawing upon well-established alcohol literature [e.g., 14, 27], SAM users may select friends who also engage in SAM use, which could further reinforce their own SAM use behaviour. Moreover, individuals residing in states where recreational marijuana is illegal are limited in terms of where they can use both substances; thus, there may be a different set of day-level predictors for SAM use relative to alcohol use. Though limited information is known, recent work assessing characteristics of young adults' most recent substance use event found that in comparison to alcohol-only events, SAM use events were less likely to occur in bars and restaurants [28]. These data also suggest that SAM use events are more likely to occur in social settings where more than half of other individuals were intoxicated. Consistent findings were observed among adolescents ages 15 to 18 years old, such that SAM use days were more likely to occur in groups that were not necessarily larger, but were comprised of a higher percentage of people using alcohol [29]. These event-level studies highlight the importance of identifying predictors at the day-level, as between-person studies of SAM users and alcohol-only users can reveal opposite findings. For example, whereas SAM use at the event-level is associated with *lower* odds of using in bars [28], SAM use at the

individual-level is linked with *higher* odds of using in bar and party contexts [4, 30, 31]. Thus, SAM use at the day-level may occur under unique conditions that are best assessed using within-person studies.

Importantly, our knowledge on comparisons of context across multiple SAM use days is currently based solely on adolescent substance use. Findings concerning the location and social context of adolescent SAM use may not necessarily apply to older age groups such as college-aged young adults, as substance use is less normative among adolescents [32]. SAM use appears to be on the rise among young adults [1] and rates of daily marijuana use are at an all-time high among early- and middle-young adults [33]; thus, it is critical to identify contexts associated with SAM use among young adults. Moreover, as some young adults are underage (18 to 20 years), they may be less likely to drink and engage in SAM use in public places. Consequently, when examining socio-environmental predictors of SAM use among young adults it may be important to consider whether they are of legal drinking age.

Current Study

The current study examined 14-day daily diary data from a sample of young adults, comparing days on which individuals reported SAM use (“SAM days”) relative to days on which they reported alcohol but not marijuana use (“alcohol days”) on physical contexts, risky activity engagement, and social contexts of use. Specifically, Aim 1 was to compare SAM days to alcohol days on the physical context where they reported substance use, including use at home, work, a friend’s house, a restaurant, a bar or club, a car, or outdoors. Aim 2 was to compare SAM days to alcohol days on engagement in risky activities, namely to compare whether SAM days were more likely to involve pre-gaming and/or playing drinking games relative to alcohol days. Aim 3 was to compare the social context of SAM days relative to alcohol days, including whether participants used substances with others (versus alone), the number of people present during use, and the perceived level of others’ intoxication. As substance use context may vary in part based on whether individuals are able to legally consume alcohol, we conducted all analyses separately for those under the age of 21 years and 21+ years.

Methods

Participants and Procedure

Participants were recruited from a Northeastern region of the U.S. adjacent to a large, public university using flyers and a university research website. Individuals were eligible for participation if they were between the ages of 18 and 25, reported binge drinking (4+/5+ drinks in one day for women/men) at least once in the past two weeks, and reported SAM use at least once in the past month. Eligible participants completed a 15-20 minute baseline survey online followed by a series of daily online assessments for 14 consecutive days, which could be completed on any personal device. Every morning at 9:00 AM, participants were sent e-mail and text message reminders to complete a survey on their behaviour the previous day, with an additional reminder sent at approximately 11:30 AM. Each daily survey took an average of 3.75 minutes to complete. Participants received up to \$48 in compensation: \$10 for completion of the baseline survey, \$2 for each completed daily

survey, and a \$10 bonus if they completed 12 or more daily surveys. All study procedures were approved by the Institutional Review Board at the university where the study took place, and all participants provided informed consent prior to study participation. Data collection occurred during October 2018 and March 2019 in a state where recreational marijuana use was not legalized.

Of the $n = 161$ participants who were eligible to participate, $n = 148$ (57.4% female) reported at least one SAM or alcohol use day and were included in the analytic sample. The average age of the analytic sample was 20.3 ($SD = 1.45$) years old with 41.2% 21+ years old. Most participants were Non-Hispanic/Latinx (NHL)-White (73.6%). Most participants were currently attending college (87.8%); of current students, 13.5% were first-year, 24.8% were second-year, 28.6% were third-year, and 32.3% were fourth-or later-year students. Most (63%) reported living in a house/apartment/room that was not affiliated with the local university. Additional sample details are provided in the parent study [5].

Of our analytic sample, participants completed between 2 to 14 daily surveys with an average of 13.29 ($SD = 1.39$) daily surveys per person, yielding 1,976 daily surveys. Of 1,976 daily surveys completed, there were 377 alcohol days and 217 SAM days (594 days total) from 148 participants. Participants reported between 1 ($n = 18$) and 13 ($n = 2$) alcohol days and an average of 4.43 ($SD = 2.56$) alcohol days per person. Most participants reported 1+ SAM day ($n = 83$; 56.1%); among these participants, they reported between 1 ($n = 31$) and 8 ($n = 2$) SAM days. Participants reported an average of 1.47 ($SD = 1.89$) SAM days per person. Further, of the 83 participants reporting 1+ SAM day, 79.5% ($n = 66$) indicated 1+ alcohol day. This information was fairly consistent between age groups (52.9% of participants under age 21 reported 1+ SAM day relative to 60.7% of participants aged 21+).

Daily Measures

Alcohol and marijuana use.—Each day, participants reported whether they used alcohol and/or marijuana the day prior. If they reported using both alcohol and marijuana, they were provided a follow-up question asking whether they used them at the same time such that their effects overlapped. Days when participants reported using alcohol but not marijuana were classified as *alcohol days*, and days when participants reported using both alcohol and marijuana at the same time such that their effects overlapped were classified as *SAM days*.¹

Location.—If participants indicated any substance use, they were asked where they used substances the prior day. Participants could select multiple locations, including at home (parent's or relative's home, college dorm/residence hall, house/apartment/room [not college-affiliated], fraternity/sorority house), work, friend's house, restaurant, bar/club, car, and outdoors. Each location was coded as 1 = used in this location, 0 = did not use in this location.²

¹Days ($n = 57$) on which alcohol and marijuana were used but did not overlap (non-simultaneous use days) were omitted from study analyses.

²Although most days (51.4%) involved substance use in only one location, many days involved use in multiple locations in one day. Thus, the reference group ("did not use in this location") may involve one or more locations.

Risky drinking activities.—Each day, participants indicated whether they engaged in pre-gaming (drinking before the main event) the previous day (1 = yes, 0 = no). Participants were also separately asked whether they played drinking games the previous day (1 = yes, 0 = no).

Social context.—On days participants reported alcohol or other substance use, participants were asked, “Did you drink or use other substances around other people yesterday?” with *yes* and *no* response options. This information was coded to reflect whether they engaged in substance use alone (1) or with others (0) the previous day. If they used around others, they were provided two follow-up questions: “How many people were you with?” with a drop-down menu of (0-10+ people) and, “How drunk/high were other people?” on a scale from 0 (not at all) to 100 (very drunk/high).

Weekend.—Weekends (1) were coded as Thursday through Saturday, and weekdays (0) were coded as Sunday through Wednesday [e.g., 34]. Weekends were included as a covariate in analyses given that substance use is generally higher on weekends [35] and social drinking and other contexts often differ as a function of weekday versus weekend drinking [e.g., 36, 37].

Data Analytic Plan

Three sets of multilevel models were used to examine (1) physical location, (2) engagement in risky activities, and (3) social context as within-person predictors of whether an individual reported SAM use on a given day (“SAM days”; coded as 1) relative to alcohol use on a given day (“alcohol days”; coded as 0). All analyses were restricted to examining only SAM days or alcohol days ($n = 594$ person-days). The first set of models used logistic multilevel models to examine the day-level effects of drinking in a particular location (home, work, friend’s house, restaurant, bar/club, car, and outdoors) as a within-person predictor of SAM use. As the list of locations was not mutually exclusive (participants were able to select multiple locations each day), seven separate models were conducted for each location. For each model, level 1 (day-level) predictors included whether an individual used in a particular location (e.g., home) or did not use in that location (e.g., not at home) and weekend (0 = weekday, 1 = weekend). Level 2 (person-level) predictors included sex (0 = female, 1 = male) and the proportion of days an individual used in a given context (e.g., of SAM and alcohol days, proportion of days used at home). Individual-level proportions were calculated by dividing the number of days an individual reported using in a given context (e.g., home) across SAM days and alcohol days divided by the total number of SAM days and alcohol days they recorded throughout the 14-day study period.

The second set of models used logistic multilevel models to examine pre-gaming and drinking games as individual predictors of SAM use, conducted in two separate models. Similar to the first set of models, level 1 predictors included an indicator of whether an individual engaged in a particular behaviour (e.g., pre-gamed) or did not engage in that behaviour (e.g., did not pre-game) and an indicator of weekend. Level 2 predictors included sex and the proportion of days an individual used in a given context (e.g., of SAM days and alcohol days, proportion of days engaged in pre-gaming).

The third set of models assessed whether they drank alone, the number of people participants were with, and others' level of intoxication as predictors of SAM use in three separate models. The model assessing whether they used alone included a level 1 indicator of whether an individual used alone or used with at least one other person on that day. Level 2 predictors included sex and the proportion of days used alone. For the models examining number of people and others' level of intoxication, analyses were restricted to days involving use around at least one person ($n = 463$ days).

All analyses were conducted using SAS statistical software (SAS 9.4; SAS Institute, Cary, NC, USA). Descriptive statistics were calculated in PROC FREQ and multilevel models were conducted using PROC GLIMMIX. Intercepts were specified as random in all multilevel models. Random slopes (e.g., whether the slope for using at home as a predictor of SAM use varies between people) were initially specified for each predictor but were not included in final models given that each model either had convergence problems or the random effects were non-significant. In all models, predictors at level 1 were group-mean centered and predictors at level 2 were grand-mean centered to separate between- and within-person clustering effects. All three sets of analyses were conducted for the total sample and separately for individuals under the age of 21 and for individuals 21+ years. Models were conducted separately by age given that participants under the age of 21 are not legally allowed to drink and thus reported lower endorsement of using substances in public venues such as restaurants and bars/clubs (see Table 1); as many participants under the age of 21 always endorsed "0" for these variables (i.e., did not use in this location), combining responses between the two age groups on these variables may obscure results.

Results

Descriptive Statistics

A breakdown of substance use location, risky drinking activity participation, and social context for both SAM and alcohol days for participants under 21 years old and 21 years old and older are provided in Table 1. Descriptively, SAM days most commonly occurred at home, followed by at a friend's house, in a bar or club, and outdoors. Few SAM days involved substance use in a car, in a restaurant, or at work.

Physical Context and SAM Use

Table 2 shows the results from a series of multilevel models predicting SAM use from drinking location, separated by age, after controlling for the effect of weekend, proportion of days in each relevant context, and sex. For those <21, only substance use at home was significantly associated with odds of engaging in SAM use relative to alcohol use. Using at work, at a friend's house, in a restaurant, in a bar/club, in a car, or outdoors were unassociated with odds of SAM use. For those 21+, substance use at a friend's house and outdoors were associated with increased odds for engaging in SAM use relative to alcohol use. Conversely, among participants 21+, using in a bar or club was associated with decreased odds of engaging in SAM use. Use in a car was unassociated with odds of SAM use among those 21+. There were too few days involving substance use at work to examine this location as a predictor for those 21+; this model did not converge.

Engagement in Risky Activities and SAM Use

As shown in Table 3, after controlling for the effect of weekend, proportion of days engaged in each activity, and sex, engagement in pre-gaming was not associated with odds of SAM use for those <21 and for those 21+. Similarly, playing drinking games was not associated with odds of reporting SAM use for both age groups.

Social Context and SAM Use

Findings concerning social context (whether used alone, number of people with whom used, others' level of intoxication) as individual predictors of SAM use are shown in Table 3. For those 21+, using alone was significantly associated with decreased odds of engaging in SAM use on a particular day but was not significantly associated with SAM use for those <21. For both age groups, number of people they were with and others' level of intoxication did not predict SAM use.

Discussion

The current study examined daily diary data and compared SAM days and alcohol days on key predictors of physical context, engagement in risky activities, and social contextual characteristics. Our findings revealed differential contextual patterns between those under 21 years and those 21+. For young adults under 21 years old, SAM days were more likely to occur on days in which they used at home. Among adults aged 21+, relative to alcohol days, SAM use was more likely to occur on days in which individuals reported substance use at a friend's house or outdoors. SAM use was less likely on days in which they used at a bar/club. As data were collected in a state where recreational marijuana use was illegal, it is unsurprising that SAM days were less likely to involve use in a public venue such as at a bar or a club. Given that roughly one-quarter of SAM days involved using at a bar or club, however, SAM use itself may not have occurred in this environment but they may have used substances in multiple locations throughout a SAM use day. Ecological momentary assessment (EMA) surveys assessing alcohol, marijuana, and simultaneous use would be helpful in identifying use patterns throughout the day. Our diary findings highlighting that SAM days are associated with use in private settings (home or friend's house) and outdoors are consistent with other event-level work examining situational characteristics of young adults' most recent alcohol and SAM use event [28].

Although pre-gaming and drinking games were fairly common on both types of substance use days, engaging in these behaviours did not significantly predict SAM use relative to alcohol use. Findings were consistent across underage young adults and young adults aged 21+. The association between engagement in pre-gaming/drinking games and SAM use had not been examined previously. Findings suggest that while participating in these activities may not be a risk factor for SAM use that day, its prevalence among SAM users across different types of substance use days is worth considering in developing prevention and intervention work tailored toward this subgroup given documented associations between pre-gaming/drinking games and risk for heavy use and harms [17, 18]. In other words, although pre-gaming and drinking games do not predict one's odds of engaging in SAM use relative to alcohol use on a given day, our diary analyses across a 14-day period do

suggest that pre-gaming and drinking game prevalence is fairly high within our sample. As prevention and intervention programming tailored to meet the needs of young adults engaging in SAM use is developed and refined, it may be useful for interventionists to bring awareness not only to which factors specifically predict SAM use on a given day, but also the general behaviours that SAM users may exhibit that could be contributing to their risk.

Lastly, for those 21+ years old, SAM use was significantly more likely to occur on days when they used substances with others. Interestingly, although SAM days were more social in nature, odds of SAM use relative to alcohol use was unassociated with number of people with whom they used and perceptions of others' level of intoxication. The social nature of SAM use has been documented in prior event-level work [29, 30], but findings concerning the impact of group size and others' substance use on SAM use are mixed. Among young adults, the perceived percentage of intoxicated people at an event – but not the number of people at the event – is associated with SAM use [28]. Among adolescents, the presence of other underage drinkers specifically is associated with SAM use whereas group size is not [29]. Moreover, recent diary work among young adult SAM users found that SAM use was more likely to occur on days when individuals reported greater enhancement motives (i.e., using alcohol and/or marijuana to increase positive affect) and conformity motives (i.e., using alcohol and/or marijuana to fit in with others) but not necessarily social motives (i.e., using alcohol/marijuana to be social) [38]. As perceptions of others' level of alcohol, marijuana [2], and SAM use [39] are associated with young adults' own SAM use, together these findings highlight the need for future work to disentangle the association between one's social environment and odds of SAM use. Specifically, there may be undetected aspects of the quality of social relationships, level of pressure perceived from others to use, or merely increased availability beyond how much others are using that may be contributing to one's likelihood of engaging in SAM use.

Our findings may have important implications for interventions focused on alcohol and marijuana co-use. To date, while there are established intervention programs for reducing heavy alcohol use (e.g., Brief Alcohol Screening and Intervention for College Students [40]), efforts to reduce dual use of alcohol and marijuana generally have been unsuccessful. For example, a brief intervention designed for alcohol and marijuana co-users also did not reduce co-use days relative to the control condition [41]. Our diary findings revealed that among SAM users, SAM use may be driven by risk factors that are not conventionally linked to risky alcohol use. In other words, using in a bar or club, while pre-gaming, and using in large groups are linked with risky alcohol use [13, 18, 21] but are not associated with SAM use. Further, whereas conformity motives are less frequently reported and are typically unrelated to alcohol use [42], conformity motives are associated with SAM use [38]. While more work is needed to parse out predictors of high-risk and low-risk SAM use episodes, mounting evidence suggests there are unique circumstances under which SAM use occurs. Thus, intervention content may need to be tailored to meet the specific needs of SAM users, while accounting for whether they are of legal drinking age. Context-based real-time interventions that aim to reduce substance use and/or related harms may benefit from a comprehensive view of one's substance use behaviours. In other words, while addressing public settings with large groups may be relevant for reducing alcohol use and harms, private and outdoor social settings may be more relevant for addressing

SAM use. Real-time, personalized interventions that involve GPS tracking or machine learning could use information about one's context to assess whether the participant is in an environment that may be associated with SAM-related risk (e.g., while tailgating for a football game outdoors). Subsequent intervention content via text messaging, for example, could be automatically pushed to the participants while in certain contexts to help reduce their potential for experiencing harm. Further, the relative effectiveness of real-time message pushes could be evaluated across contexts, thus informing contexts that present better opportunities for interventions. It should be noted, however, that only the context of being 'at home' was associated with SAM use for individuals under the age of 21, whereas a variety of other contexts (e.g., outdoors, friend's house) was associated with use for individuals aged 21 and older. Thus, context-specific messaging may hold greater promise for affecting behavior of individuals who are of legal drinking age. As we continue to learn information about predictors that are most associated with risky SAM use behaviour (e.g., motives, mood states, stress) and for whom SAM use is particularly tied to risk (e.g., by sex, mental health outcomes), this information could also be incorporated into context-based, personalized interventions.

Limitations and Future Directions

There are several limitations and future directions that should be noted. First, our findings are based on self-reports of participants' behaviour from the day prior, which may have been impacted by participants' social desirability or memory recall. Future work building from these findings may benefit from the use of EMA data or transdermal alcohol sensors and GPS tracking to assess use and behaviour in real time.

Second, given the nature of diary study, each morning participants reported on behaviours that occurred across the entire day prior. Participants were allowed to check all locations where they used substances. Across SAM days and alcohol days, most (51.4%) days involved using substances in only one location but some days did involve use in two (31.8%) or three (12.1%) locations. Less than 5% of days involved using in 4 or more locations. Similarly, on days participants reported substance use, they were asked whether they had used around others or whether they used alone. Although our variables were coded as "used in this location" vs. "did not use in this location" and our analyses were conducted separately to allow for the possibility of use in multiple environments, findings should be interpreted with caveats. In particular, on days where multiple locations were selected, it is unknown whether SAM/alcohol use occurred in each specific location. Similarly, it is possible that participants were engaged in multiple social contexts throughout the day, which may not be captured using the current study design. For these reasons, an important future direction is to use real-time intensive longitudinal methods (e.g., EMA) to assess shorter time windows that reduce recall failures and allow for reporting on multiple contexts throughout the day. For example, participants could indicate which substance(s) they used over the last three-hour period and, during this period, where they used, whether they pre-gamed, and with whom they used. Subsequent analyses could better capture the possibility of multiple SAM use episodes within a given day and the extent to which locations, behaviours, and social settings co-vary with SAM use episodes. It also would allow for capturing whether days with non-SAM use have a unique set of predictors and

consequences. Although the current study has limitations, it represents an important step toward understanding whether SAM days as a whole differ from non-SAM days on socio-environmental contexts. Recent work by Lipperman-Kreda et al. [29] successfully used an EMA design to study SAM use and context in adolescents; this design could be adapted and replicated in a sample of young adults.

Third, our sample of recent SAM users comprised heavy drinkers (reported binge drinking in the past two weeks) who were primarily college students. SAM users are heterogeneous in their substance use patterns [3]; thus, results from our study may not necessarily generalize to SAM users who engage in lighter drinking or to young adults who do not currently attend college. Relatedly, participants were recruited from a single northeastern US state in which recreational marijuana was illegal at the time. Marijuana use and co-use patterns may differ by geographic region, particularly US states in which recreational marijuana is legal. Relatedly, while some work has focused on SAM use or other polysubstance use behavior in countries outside the US (e.g., 43–45), the vast majority of work has focused on SAM use in the US. Given international differences – particularly in policies for recreational marijuana use – it would be beneficial to examine whether findings generalize to young adults outside the US.

Conclusions

Overall, our daily diary findings indicate that SAM days, relative to alcohol use days, are linked with use in certain private settings (e.g., home, friend’s house), outdoors, and in social situations, though primarily for those aged 21 and older. Despite experiencing more substance-related negative consequences on SAM days, SAM use is not more likely to occur than alcohol use alone in certain environments and situations traditionally found to be linked with increased risk, such as engagement in pre-gaming/drinking games or using in bars/clubs. Our findings underscore the potentially unique contexts in which SAM use occurs (e.g., outdoors) and suggest that prevention and intervention content may be most effective in reducing harms associated with SAM use if tailored to those contexts.

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References

- [1]. Terry-McElrath YM, Patrick ME. Simultaneous alcohol and marijuana use among young adult drinkers: Age-specific changes in prevalence from 1977 to 2016. *Alcohol: Clin Exp Res*. 2018;42:2224–33. [PubMed: 30277588]
- [2]. Linden-Carmichael AN, Stamatos AL, Lau-Barraco C. Simultaneous use of alcohol and marijuana: patterns and individual differences. *Subst Use Misuse*. 2019;54:2156–66. [PubMed: 31304834]
- [3]. Patrick ME, Kloska DD, Terry-McElrath YM, Lee CM, O’Malley PM, Johnston LD. Patterns of simultaneous and concurrent alcohol and marijuana use among adolescents. *Am J Drug Alcohol Abuse*. 2018;44:441–51. [PubMed: 29261344]
- [4]. Subbaraman MS, Kerr WC. Simultaneous versus concurrent use of alcohol and cannabis in the National Alcohol Survey. *Alcohol: Clin Exp Res*. 2015;39:872–9. [PubMed: 25872596]

- [5]. Linden-Carmichael AN, Van Doren N, Masters LD, Lanza ST. Simultaneous alcohol and marijuana use in daily life: Implications for level of use, subjective intoxication, and positive and negative consequences. *Psychol Addict Behav.* 2020;34:447–53. [PubMed: 31971426]
- [6]. Lee CM, Patrick ME, Fleming CB, Cadigan JM, Abdallah DA, Fairlie AM, Larimer ME. Daily study comparing alcohol-related positive and negative consequences for days with only alcohol use versus days with simultaneous alcohol and marijuana use in a community sample of young adults. *Alcohol Clin Exp Res* 2020;44:689–96. [PubMed: 32022945]
- [7]. Bandura A Principles of behavior modification. New York: Holt, Rinehart & Winston, 1969.
- [8]. Bandura A Social learning theory. Englewood Cliffs, NJ: Prentice Hall, 1977.
- [9]. Maisto SA, Carey KB, Bradizza CM. Social learning theory. In: Blane HT, Leonard KE, eds. *Psychological theories of drinking and alcoholism*. New York: Guilford Press, 1999:106–63.
- [10]. Stansby O, Labhart F, Dietze P, Wright CJ, Kuntsche E. The contexts of heavy drinking: A systemic review of the combinations of context-related factors associated with heavy drinking occasions. *PLoS One.* 2019;14:e0218465. [PubMed: 31291261]
- [11]. Demers A, Kairouz S, Adlaf E, Gliksmann L, Newton-Taylor B, Marchand A. Multilevel analysis of situational drinking among Canadian undergraduates. *Soc Sci Med.* 2002;55:415–24. [PubMed: 12144149]
- [12]. Nyaronga D, Greenfield TK, McDaniel PA. Drinking context and drinking problems among Black, White, and Hispanic men and women in the 1984, 1995, and 2005 US National Alcohol Surveys. *J Stud Alcohol Drugs.* 2009;70:16–26. [PubMed: 19118387]
- [13]. Patrick ME, Crouce JM, Fairlie AM, Atkins DC, Lee CM. Day-to-day variations in high-intensity drinking, expectancies, and positive and negative alcohol-related consequences. *Addict Behav.* 2016;58:110–6. [PubMed: 26922158]
- [14]. Abar CC, Maggs JL. Social influence and selection processes as predictors of normative perceptions and alcohol use across the transition to college. *J Coll Stud Dev.* 2010;51:496–508. [PubMed: 21072330]
- [15]. Senchak M, Leonard KE, Greene BW. Alcohol use among college students as a function of their typical social drinking context. *Psychol Addict Behav.* 1998;12:62–70.
- [16]. Clapp JD, Shillington AM. Environmental predictors of heavy episodic drinking. *Am J Drug Alcohol Abuse.* 2001;27:301–13 [PubMed: 11417941]
- [17]. LaBrie JW, Hummer J, Kenney S, Lac A, Pedersen E. Identifying factors that increase the likelihood for alcohol-induced blackouts in the prepartying context. *Subst Use Misuse.* 2011;46:992–1002. [PubMed: 21222521]
- [18]. Fairlie AM, Maggs JL, Lanza ST. Prepartying, drinking games, and extreme drinking among college students: A daily-level investigation. *Addict Behav.* 2015;42:91–5. [PubMed: 25437263]
- [19]. Finlay AK, Ram N, Maggs JL, Caldwell LL. Leisure activities, the social weekend, and alcohol use: Evidence from a daily study of first-year college students. *J Stud Alcohol Drugs.* 2012;73:250–9. [PubMed: 22333332]
- [20]. O’Grady MA, Cullum J, Tennen H, Armeli S. Daily relationship between event-specific drinking norms and alcohol use: A four-year longitudinal study. *J Stud Alcohol Drugs.* 2011;72:633–41. [PubMed: 21683045]
- [21]. Cullum J, O’Grady M, Armeli S, Tennen H. The role of context-specific norms and group size in alcohol consumption and compliance drinking during natural drinking events. *Basic Appl Soc Psych.* 2012;34:304–12. [PubMed: 27536009]
- [22]. Beck KH, Caldeira KM, Vincent KB, Arria AM. Social contexts of drinking and subsequent alcohol use disorder among college students. *Am J Drug Alcohol Abuse.* 2013;39:38–43. [PubMed: 22746152]
- [23]. Beckjord E, Shiffman S. Background for real-time monitoring and intervention related to alcohol use. *Alcohol Res.* 2014;36:9. [PubMed: 26258996]
- [24]. Patrick ME, Fairlie AM, Cadigan JM, Abdallah DA, Larimer ME, Lee CM. Daily motives for alcohol and marijuana use as predictors of simultaneous use among young adults. *J Stud Alcohol Drugs.* 2019;80:454–61. [PubMed: 31495383]
- [25]. Patrick ME, Lee CM. Cross-faded: Young adults’ language of being simultaneously drunk and high. *Cannabis.* 2018;1:60–5. [PubMed: 30643908]

- [26]. Patrick ME, Fleming CB, Fairlie AM, Lee CM. Cross-fading motives for simultaneous alcohol and marijuana use: Associations with young adults' use and consequences across days. *Drug Alcohol Depend.* 2020;213:108077 [PubMed: 32492600]
- [27]. Osgood DW, Ragan DT, Wallace L, Gest SD, Feinberg ME, Moody J. Peers and the emergence of alcohol use: Influence and selection processes in adolescent friendship networks. *J Res Adolesc.* 2013;23:500–12.
- [28]. Lipperman-Kreda S, Paschall MJ, Robert F S, Morrison CN. Places and social contexts associated with simultaneous use of alcohol, tobacco and marijuana among young adults. *Drug Alcohol Rev.* 2018;37:188–95. [PubMed: 28422352]
- [29]. Lipperman-Kreda S, Gruenewald PJ, Grube JW, Bersamin M. Adolescents, alcohol, and marijuana: Context characteristics and problems associated with simultaneous use. *Drug Alcohol Depend.* 2017;179:55–60. [PubMed: 28755540]
- [30]. Pakula B, Macdonald S, Stockwell T. Settings and functions related to simultaneous use of alcohol with marijuana or cocaine among clients in treatment for substance abuse. *Subst Use Misuse.* 2009;44:212–26. [PubMed: 19142822]
- [31]. Terry-McElrath YM, O'Malley PM, Johnston LD. Simultaneous alcohol and marijuana use among US high school seniors from 1976 to 2011: Trends, reasons, and situations. *Drug Alcohol Depend.* 2013;133:71–9. [PubMed: 23806871]
- [32]. Substance Abuse and Mental Health Services Administration. Key substance use and mental health indicators in the United States: Results from the 2017 National Survey on Drug Use and Health Rockville, MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration; 2018. HHS Publication No. SMA 18-5068, NSDUH Series H-53).
- [33]. Schulenberg JE, Johnston LD, O'Malley PM, Bachman JG, Miech RA, Patrick ME. Monitoring the Future national survey results on drug use, 1975–2017: Volume II, College students and adults ages 19–55. Ann Arbor: Institute for Social Research, The University of Michigan, 2018.
- [34]. Del Boca FK, Darkes J, Greenbaum PE, Goldman MS. Up close and personal: Temporal variability in the drinking of individual college students during their first year. *J Consult Clin Psychol.* 2004;72:155–64. [PubMed: 15065951]
- [35]. Goldman MS, Greenbaum PE, Darkes J, Brandon KO, Del Boca FK. How many versus how much: 52 weeks of alcohol consumption in emerging adults. *Psychol Addict Behav.* 2011;25:16–27. [PubMed: 21219038]
- [36]. Finlay AK, Ram N, Maggs JL, Caldwell LL. Leisure activities, the social weekend, and alcohol use: Evidence from a daily study of first-year college students. *J Stud Alcohol Drugs.* 2012;73:250–9. [PubMed: 22333332]
- [37]. Lau-Barraco C, Braitman AL, Linden-Carmichael AN, Stamates AL. Differences in weekday versus weekend drinking among nonstudent emerging adults. *Exp Clin Psychopharmacol.* 2016;24:100–9. [PubMed: 26901592]
- [38]. Patrick ME, Fairlie AM, Cadigan JM, Abdallah DA, Larimer ME, Lee CM. Daily motives for alcohol and marijuana use as predictors of simultaneous use among young adults. *J Stud Alcohol Drugs.* 2019;80:454–61. [PubMed: 31495383]
- [39]. White HR, Kilmer JR, Fossos-Wong N, Hayes K, Sokolovsky AW, Jackson KM. Simultaneous alcohol and marijuana use among college students: patterns, correlates, norms, and consequences. *Alcohol: Clin Exp Res.* 2019;43:1545–55. [PubMed: 31135972]
- [40]. Dimeff LA, Baer JS, Kivlahan DR, Marlatt GA. Brief Alcohol Screening and Intervention for College Students (BASICS): A harm reduction approach. The Guilford Press, 1999.
- [41]. Stein MD, Caviness CM, Morse EF, Grimone KR, Audet D, Herman DS, Moitra E, Anderson BJ. A developmental-based motivational intervention to reduce alcohol and marijuana use among non-treatment-seeking young adults: a randomized controlled trial. *Addiction.* 2018;113:440–53. [PubMed: 28865169]
- [42]. Arbeau KJ, Kuiken D, Wild TC. Drinking to enhance and to cope: A daily process study of motive specificity. *Addict Behav.* 2011;36:1174–83. [PubMed: 21864984]

- [43]. Ramalho Mostardinha A, Pereira A. Drinking, smoking and Type A polydrug behaviors: Psychosocial factors among Portuguese university students. *Psychol Community Health*. 2020;8:158–75.
- [44]. Pakula B, Macdonald S, Stockwell T. Settings and functions related to simultaneous use of alcohol with marijuana or cocaine among clients in treatment for substance abuse. *Subst Use Misuse*. 2009;44:212–26. [PubMed: 19142822]
- [45]. Fernández-Calderón F, Vidal-Giné C, Rojas-Tejada AJ, Lozano-Rojas O. Patterns of simultaneous polysubstance use among partygoers: Correlates and differences in adverse acute effects experienced. *J Psychoactive Drugs*. 2020;52:344–56. [PubMed: 32321381]

Frequency of Physical Context, Risky Activity Engagement, and Social Context for SAM Days and Alcohol Days by <21 and 21+ Years

Table 1

	Total Sample			< 21 Years Old		21 Years and Older	
	SAM Days (n = 217)	Alcohol Days (n = 377)		SAM Days (n = 118)	Alcohol Days (n = 184)	SAM Days (n = 99)	Alcohol Days (n = 193)
Physical Context							
Home	76.5%	54.4%		75.4%	53.8%	77.8%	54.9%
Work	0.9%	3.2%		1.7%	3.8%	0.0%	2.6%
Friend's house	56.2%	39.5%		58.5%	57.6%	53.5%	22.3%
Restaurant	2.8%	6.4%		1.7%	1.6%	4.0%	10.9%
Bar/club	24.4%	37.7%		14.4%	13.0%	36.4%	61.1%
Car	4.2%	4.0%		1.7%	0.5%	7.1%	7.3%
Outdoors	20.7%	13.8%		11.9%	14.7%	31.3%	13.0%
Risky Activity Engagement							
Pre-game	41.0%	37.7%		44.1%	38.6%	37.4%	36.8%
Drinking games	20.3%	20.7%		21.2%	28.3%	19.2%	13.5%
Social Context							
Alone	13.4%	26.8%		14.4%	26.6%	12.1%	26.9%
	Among Days Using with 1+ Other Person						
	<i>M (SD)</i>						
Number of people	6.16 (3.31)	6.47 (3.55)		7.07 (3.28)	6.74 (3.48)	5.11 (3.04)	6.21 (3.61)
Others' level of intoxication (0-100) ^a	54.06 (23.08)	48.74 (27.32)		58.77 (22.12)	51.32 (25.72)	48.60 (23.10)	46.27 (28.64)

Note.

^aNumber of people and others' level of intoxication were only assessed on days when individuals reported using substances with at least one other person.

Table 2

Multilevel Models Assessing Physical Context of Substance Use Predicting Odds of SAM Use, by <21 and 21+ Years

			Total Sample (n = 594 days)	< 21 Years Old (n = 302 days)	21 Years and Older (n = 292 days)
Model 1	Level 1	Intercept	0.12 [0.05, 0.30]***	0.24 [0.07, 0.81]*	0.05 [0.01, 0.24]**
		Home	2.46 [1.37, 4.42]*	2.94 [1.29, 6.73]*	2.02 [0.86, 4.77]
		Weekend	1.05 [0.65, 1.69]	0.66 [0.33, 1.33]	1.61 [0.82, 3.18]
	Level 2	Prop. Home	2.53 [0.76, 8.44]	1.22 [0.24, 6.14]	6.88 [0.97, 48.55]
		Sex	1.56 [0.76, 3.20]	1.71 [0.65, 4.52]	1.40 [0.45, 4.38]
Model 2	Level 1	Intercept	0.42 [0.23, 0.75]**	0.58 [0.26, 1.30]	--
		Work	0.76 [0.09, 6.75]	0.63 [0.05, 7.64]	--
		Weekend	1.02 [0.64, 1.62]	0.64 [0.32, 1.26]	--
	Level 2	Prop. Work	0.02 [0.00, 4.73]	0.17 [0.00, 25.60]	--
		Sex	1.70 [0.83, 3.49]	1.86 [0.71, 4.87]	--
Model 3	Level 1	Intercept	0.25 [0.12, 0.52]***	0.50 [0.17, 1.46]	0.12 [0.04, 0.33]***
		Friend's House	1.90 [1.07, 3.39]*	1.60 [0.69, 3.71]	2.35 [1.06, 5.22]*
		Weekend	0.93 [0.58, 1.49]	0.59 [0.30, 1.19]	1.50 [0.76, 2.96]
	Level 2	Prop. Friend House	1.61 [0.52, 4.92]	0.83 [0.18, 3.87]	8.87 [1.29, 61.19]*
		Sex	1.56 [0.76, 3.19]	1.72 [0.66, 4.48]	1.22 [0.40, 3.70]
Model 4	Level 1	Intercept	0.44 [0.24, 0.81]**	0.55 [0.24, 1.26]	0.38 [0.14, 1.04]
		Restaurant	0.35 [0.11, 1.15]	1.24 [0.06, 27.10]	0.27 [0.07, 1.06]
		Weekend	0.99 [0.61, 1.58]	0.65 [0.33, 1.29]	1.53 [0.77, 3.01]
	Level 2	Prop. Restaurant	0.82 [0.04, 18.56]	1.12 [0.00, 804.11]	0.44 [0.01, 27.49]
		Sex	1.48 [0.72, 3.04]	1.72 [0.66, 4.52]	1.21 [0.37, 3.95]
Model 5	Level 1	Intercept	0.50 [0.26, 0.97]*	0.47 [0.20, 1.14]	0.91 [0.28, 2.96]
		Bar/Club	0.57 [0.30, 1.10]	0.84 [0.26, 2.73]	0.44 [0.20, 0.99]*
		Weekend	1.06 [0.66, 1.71]	0.65 [0.33, 1.28]	1.85 [0.93, 3.69]
	Level 2	Prop. Bar/Club	0.79 [0.24, 2.65]	2.82 [0.31, 25.26]	0.19 [0.03, 1.25]
		Sex	1.47 [0.72, 3.00]	1.91 [0.72, 5.08]	1.35 [0.43, 4.21]
Model 6	Level 1	Intercept	0.40 [0.22, 0.72]**	0.56 [0.25, 1.25]	0.30 [0.12, 0.77]*
		Car	2.08 [0.30, 14.42]	3.63 [0.14, 96.25]	1.33 [0.10, 16.92]
		Weekend	1.02 [0.64, 1.63]	0.64 [0.32, 1.26]	1.59 [0.81, 3.11]
	Level 2	Prop. Car	0.54 [0.02, 16.73]	2.04 [0.00, 2.68]	0.78 [0.01, 49.99]
		Sex	1.53 [0.75, 3.14]	1.68 [0.65, 4.37]	1.32 [0.41, 4.24]
Model 7	Level 1	Intercept	0.38 [0.21, 0.71]**	0.60 [0.26, 1.36]	0.19 [0.06, 0.53]**
		Outdoors	2.05 [1.00, 4.23]	1.32 [0.35, 4.98]	2.43 [1.01, 5.85]*

		Total Sample	< 21 Years Old	21 Years and Older
		(n = 594 days)	(n = 302 days)	(n = 292 days)
	Weekend	0.97 [0.61, 1.56]	0.65 [0.33, 1.29]	1.45 [0.73, 2.87]
Level 2	Prop. Outdoors	0.74 [0.17, 3.27]	0.46 [0.06, 3.82]	5.12 [0.37, 71.64]
	Sex	1.55 [0.76, 3.17]	1.73 [0.67, 4.48]	1.62 [0.50, 5.20]

Note. Separate logistic multilevel models predict the odds of engaging in SAM use on a given day compared to days in which they used alcohol but not marijuana; results reflect odds ratios. Models were conducted separately for those under 21 years and 21+ years old. Weekends (Thursdays through Saturdays) were coded as 1 and weekdays (Sundays through Wednesdays) were coded as 0. The model for “work” for participants 21 years old and older did not converge due to low endorsement.

 $p < .001$;

**
 $p < .01$;

*
 $p < .05$

Table 3

Multilevel Models Assessing Engagement in Risky Activities Predicting Odds of SAM Use, by <21 and 21+ Years

			<u>Total Sample</u>	<u>< 21 Years Old</u>	<u>21 Years and Older</u>
			<i>(n = 594 days)</i>	<i>(n = 302 days)</i>	<i>(n = 292 days)</i>
Model 1	Level 1	Intercept	0.33 [0.16, 0.67]**	0.32 [0.12, 0.89]*	0.35 [0.12, 1.02]
		Pre-gaming	1.17 [0.68, 2.02]	1.16 [0.55, 2.44]	1.23 [0.54, 2.80]
		Weekend	0.99 [0.61, 1.59]	0.57 [0.28, 1.15]	1.59 [0.81, 3.11]
	Level 2	Prop. Pre-gaming	1.51 [0.45, 5.11]	3.53 [0.68, 18.23]	0.54 [0.07, 3.95]
		Sex	1.58 [0.77, 3.24]	1.99 [0.75, 5.27]	1.32 [0.42, 4.19]
Model 2	Level 1	Intercept	0.42 [0.23, 0.78]**	0.69 [0.30, 1.62]	0.26 [0.10, 0.69]**
		Drinking Games	0.93 [0.50, 1.74]	0.98 [0.44, 2.19]	0.82 [0.29, 2.29]
		Weekend	1.05 [0.65, 1.68]	0.66 [0.33, 1.31]	1.62 [0.82, 3.18]
	Level 2	Prop. Drinking Games	0.73 [0.15, 3.47]	0.31 [0.04, 2.21]	3.24 [0.16, 66.73]
		Sex	1.60 [0.78, 3.29]	2.09 [0.79, 5.49]	1.30 [0.41, 4.09]

Note. Separate logistic multilevel models predict the odds of engaging in SAM use on a given day compared to days in which they used alcohol but not marijuana; results reflect odds ratios. Models were conducted separately for those under 21 years and 21+ years old. Weekends (Thursdays through Saturdays) were coded as 1 and weekdays (Sundays through Wednesdays) were coded as 0.

**
 $p < .01$;

*
 $p < .05$

Table 4

Multilevel Models Assessing Social Context of Substance Use Predicting Odds of SAM Use, by <21 and 21+ Years

			<u>Total Sample</u>	<u>< 21 Years Old</u>	<u>21 Years and Older</u>
			<i>(n = 594 days)</i>	<i>(n = 302 days)</i>	<i>(n = 292 days)</i>
Model 1	Level 1	Intercept	0.54 [0.28, 1.03]	0.79 [0.32, 1.96]	0.41 [0.15, 1.13]
		Alone	0.38 [0.18, 0.79]	0.34 [0.10, 1.13]	0.38 [0.14, 0.99]*
		Weekend	0.99 [0.61, 1.59]	0.58 [0.29, 1.17]	1.59 [0.81, 3.13]
	Level 2	Prop. Alone	0.72 [0.18, 2.91]	0.83 [0.13, 5.49]	0.57 [0.05, 6.07]
		Sex	1.49 [0.73, 3.07]	1.60 [0.61, 4.19]	1.35 [0.42, 4.34]
			<u>Total Sample</u>	<u>< 21 Years Old</u>	<u>21 Years and Older</u>
			<i>(n = 463 days)</i>	<i>(n = 235 days)</i>	<i>(n = 228 days)</i>
Model 2	Level 1	Intercept	0.51 [0.27, 0.95]*	0.94 [0.39, 2.29]	0.22 [0.08, 0.63]
		Number of People	1.02 [0.93, 1.12]	1.07 [0.94, 1.21]	0.97 [0.84, 1.12]
		Weekend	1.06 [0.62, 1.82]	0.52 [0.24, 1.14]	2.22 [0.98, 5.06]
	Level 2	Average Number of People	0.89 [0.77, 1.04]	0.99 [0.81, 1.21]	0.74 [0.57, 0.98]
		Sex	1.32 [0.63, 2.74]	1.08 [0.41, 2.86]	2.10 [0.59, 7.51]
Model 3	Level 1	Intercept	0.53 [0.28, 1.00]*	0.89 [0.37, 2.17]	0.30 [0.11, 0.86]*
		Others' Level of Intoxication	1.01 [0.99, 1.02]	1.01 [0.99, 1.02]	1.01 [0.99, 1.03]
		Weekend	0.95 [0.55, 1.64]	0.48 [0.21, 1.07]	1.85 [0.82, 4.17]
	Level 2	Average Others' Intoxication	1.02 [1.00, 1.04]	1.03 [1.00, 1.06]	1.01 [0.97, 1.05]
		Sex	1.42 [0.68, 2.97]	1.25 [0.48, 3.24]	1.84 [0.50, 6.81]

Note. Separate logistic multilevel models predict the odds of engaging in SAM use on a given day compared to days in which they used alcohol but not marijuana; results reflect odds ratios. Models were conducted separately for those under 21 years and 21+ years old. Weekends (Thursdays through Saturdays) were coded as 1 and weekdays (Sundays through Wednesdays) were coded as 0. Number of people and others' level of intoxication refers to only days involving use with at least one other person.

* $p < .05$