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Adolescents, alcohol, and marijuana: Context characteristics and problems associated with simultaneous use

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Abstract

We investigated contexts of simultaneous use of alcohol and marijuana and the impact of simultaneous use on problems among adolescents. Ecological momentary assessment data were obtained over two weekends from 150 adolescents in California (47% female, M age = 16.36 years), using smartphone surveys administered early and late in the evening and again the following morning. We assessed whether, in what context, and with whom adolescents drank alcohol and used other substances over 3 evening hours. We assessed problems they experienced each evening on the following morning. Results showed that greater adult supervision in every context was associated with a 55% lower risk of simultaneous use ($RRR=0.45$, $p=.05$). Contexts with no other underage drinkers were associated with 99% lower risk of simultaneous use ($RRR=0.01$, $p=.005$). Each occasion of simultaneous use was related to 110% increase in the number of problems ($IRR=2.10$, $p=.005$), with 83%, 221% and 311% greater odds of violence ($OR=1.83$, $p=.05$), driving under the influence or riding with a drunk driver ($OR=3.21$, $p=.05$), or being drunk ($OR=4.11$, $p=.005$). Additional analyses showed that these problems may be attributed largely to the alcohol consumed in each context. Results demonstrate that it is essential to consider situational and social characteristics of substance use contexts to better understand adolescent simultaneous use of alcohol and drugs and problems.

Keywords

Substance use contexts; Alcohol; Marijuana; Simultaneous use; Adolescents

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1. Introduction

Alcohol and marijuana are the most commonly used drugs by adolescents in the U.S. (Miech et al., 2016). Although simultaneous use (i.e., use of more than one substance within a few hours) is common among young substance users (Pape et al., 2009; Schepis et al., 2016; Subbaraman and Kerr, 2015), we know very little about contexts and risks associated with simultaneous use of alcohol and marijuana. We know that risks for underage drinking vary from one context to another and that drinking contexts, independently of how much a person drinks, are related to specific problems (Bersamin et al., 2016; Lipperman-Kreda et al., 2015; Mair et al., 2015), but we do not know if contexts of simultaneous alcohol and marijuana use are unique or whether simultaneous use leads to greater problems.

A small but growing body of research has investigated risks associated with concurrent substance use (i.e., use of multiple substances but not necessarily at the same time). Concurrent substance use appears to be associated with more frequent use (Conway et al., 2013; Dierker et al., 2007), dependence (Moss et al., 2014), mental and physical health problems (Brooks-Russell et al., 2015), sexual risk taking (Connell et al., 2009), violence (Parker and Bradshaw, 2015), and high school non-completion (D'Amico et al., 2016). The small literature that has addressed adolescent simultaneous use suggests that simultaneous use of alcohol and marijuana is associated with unsafe driving (Terry-McElrath et al., 2014) and other substance-related problems (e.g., legal, academic, relational; Briere et al., 2011). However, this limited cross-sectional research has relied on retrospective data and has not compared impacts of simultaneous use with alcohol use only and marijuana use only to gain an understanding of how problems are uniquely related to these specific substance use patterns.

Furthermore, no studies have investigated contexts of adolescents' simultaneous substance use. Substance use context is defined as the location, and situational and social characteristics of a specific substance use event (Freisthler et al., 2014). Limited research has found that situational (e.g., lack of adult supervision, alcohol availability, and lack of enforcement) and social (e.g., group size) context characteristics contribute to increased adolescent alcohol use (Bersamin et al., 2016; Grune et al., 2017; Jackson et al., 2016; Lipperman-Kreda et al., 2015). Characteristics of drinking or substance use contexts may influence alcohol or substance use and problems through increased access and opportunities to engage in risky behaviors (Flewelling et al., 2013; Ryan et al., 2010) or through social modeling, social pressure, or social norms (Chan et al., 2017; Handren et al., 2016). If we understand the situational and social contexts in which young people are likely to use substances simultaneously and experience problems, we can develop interventions that target use and risks within these contexts.

To address these gaps in the existing research literature, the current study investigates situational and social contexts of simultaneous use of alcohol and marijuana and subsequent risks for problems among adolescents. We used longitudinal Ecological Momentary Assessment (EMA) data collected from adolescents over two weekends assessing alcohol and marijuana use within a few hours of one another, situational and social characteristics of simultaneous use events, and subsequent problems. We compared context characteristics and

problems associated with simultaneous use with those for alcohol use only, marijuana use only, and no substance use in order to gain an understanding of how contexts and problems are uniquely related to different substance use patterns. We tested the following hypotheses:

1. Situational characteristics including lack adult supervision, less perceived enforcement, and greater perceived availability of alcohol will be positively related to adolescents' simultaneous use of alcohol and marijuana.
2. Social characteristics including greater number of people, having a party, and presence of other underage drinkers will be positively related to adolescents' simultaneous use of alcohol and marijuana.
3. Simultaneous use of alcohol and marijuana will have a greater impact on the number of problems as well as the risks for specific problems than the use of either of these substances alone.

2. Materials and Methods

2.1 Sample

2.1.1 Sample of Cities and Adolescents—Data for the current study were collected from adolescents in 12 midsized California cities that were randomly assigned to control condition for a randomized trial, conducted in 24 midsized California cities, to evaluate effects of environmental strategies to reduce community alcohol problems. A total of 1,217 adolescents (15 to 18 years old) participated in a baseline survey and the estimated response rate was 42%. The selection of cities and sample recruitment have been described elsewhere (Bersamin et al., 2016).

2.1.2 Recruitment of EMA Sample—Using the baseline data, we created a list of 252 potential participants in the 12 control sites for the EMA study. Specifically, we considered all participants who self-reported past month drinking ($N=126$) and matched them with non-past month drinking participants by age, gender, race (non-White versus White) and ethnicity (non-Hispanic versus Hispanic). Potential participants were invited to take part in a study about alcohol and young people using personal smartphones. They were told that the study involved 12 brief text prompted online surveys across two weekends and that they could receive up to \$80 for participating. An invitation postcard was mailed to households, followed by a telephone contact to obtain parental consent and youth assent. Institutional review board approval was obtained prior to implementation of the study.

2.1.3 EMA Sample—We recruited 154 adolescents (51% past month drinkers) to participate in the EMA study (61% cooperation rate). Participants represented all 12 control sites and the number of participants per community ranged from 5 to 19. The EMA sample included 46% ($N=71$) females, 17% ($N=26$) Hispanics and 77% ($N=119$) Whites. The average age at baseline was 16.4 years ($SD=.92$).

2.2 EMA Methods

2.2.1 Timing of EMA Surveys—We restricted EMA data collection to the weekends to minimize respondent burden, but capture the maximum number of drinking events, which

typically occur on weekends (Kauer et al., 2009). Surveys were conducted Friday evening through Sunday morning over two weekends. Participants received text messages with links to the surveys each day at 8pm, 11pm, and the next morning at 11am for a total of 6 surveys per weekend. Participants received two reminders to complete the surveys and responses were only accepted within a 6-hour window. On average, participants completed the surveys within 35 minutes after receiving the first reminder. Each survey took approximately five minutes to complete. EMA data collection continued for 10 months with 7-8 adolescents participating every 2 weekends.

2.2.2 Incentives—Participants received a visa card, which initially had no value. Incentives were electronically wired to the participants' cards on the Monday morning after each weekend. Participants received \$5 for each completed survey and a \$10 bonus if all 6 surveys were completed each weekend. On average, participants responded to 9.94 of the 12 assessments (83%). The number of completed surveys per participant ranged from 2 to 12, providing a total of 1,531 data points.

2.3 Outcome Measures

2.3.1 Alcohol and Marijuana Use—In each survey we asked adolescents whether they drank alcohol or used other substances over the past 3 hours (i.e., an occasion). The timeframe for each survey was specified (e.g., between 8-11pm), and response options were yes or no. Other substances included (a) cigarettes or other tobacco products, (b) marijuana, and (c) other drugs. Of a total of 1,531 data points, 33 (2.1%) involved use of various other drugs (e.g., Cocaine, Ecstasy, Xanax) and 15 (1%) had missing data for these items. In addition, 26 (1.7%) involved tobacco use only, 14 (1%) use of alcohol and tobacco, 16 (1%) use of tobacco and marijuana, and 21 (1.4%) use of alcohol, tobacco and marijuana. We excluded these 125 assessments for the current study and focused on use of alcohol and marijuana. This resulted in the elimination of 4 respondents, leaving us with a sample of 150 adolescents and 1,406 assessments for the current investigation. For the analyses, we used a multinomial outcome measure with no substance use as the reference category (0), alcohol use only (1), marijuana use only (2), and simultaneous use of alcohol and marijuana (3).

2.3.2 Problems—In the morning surveys we asked adolescents whether any of the following happened to them the previous night: (a) getting into a verbal argument or a physical fight, (b) getting hurt or injured, (c) getting into trouble with the police, (d) getting into trouble with parents or other adults, (e) having unprotected vaginal sex (e.g., sex without a condom), (f) having vaginal sex or oral sex with someone they had met yesterday, (g) driving after drinking alcohol, (h) riding with a driver who had been drinking alcohol, and (i) getting drunk. Similar questions were asked about problems that happened to other people who were with them that night. Response options for all these items were yes or no. We created the following problem measures by summing the reports of own and other's problems: (a) total number of problems that night, (b) verbal argument, physical fight or injury (i.e., any violence), (c) trouble with police, parents or other adults (i.e., any trouble), (d) risky sex, (e) driving under the influence of alcohol or riding with a drunk driver (i.e., any DUI/RDD), and (f) being drunk.

2.4 Independent Measures

2.4.1 Situational Context Characteristics—In each survey we asked respondents whether there was any adult supervision at the place where they were (yes or no) and how unlikely or likely they thought it was that someone their age would get caught by parents, adults or police for drinking at that place (a 4-point scale from very unlikely to very likely). We also asked them how easy it was for someone their age to get alcohol at that place (a 4-point scale from very easy to very difficult). We reverse-coded response values of this item so that a higher value represented greater perceived access.

2.4.2 Social Context Characteristics—In each survey we also asked respondents to indicate whether they were at a party (yes or no), how many people were with them (number), and how many people their age drank alcohol at that place (with two dummy variables of “some of them” and “none of them” with “most of them” as a reference category).

2.4.3 Number of Occasions of Alcohol and Marijuana Use—For each night, we summed the number of occasions (i.e., a 3-hour period) in which adolescents reported alcohol use only, marijuana use only, and simultaneous use of alcohol and marijuana. With 3 surveys that assessed substance use each night, this variable ranged from 0-3 occasions. We treated these measures as three dummy variables with no substance use as the reference category.

2.4.4 Demographics—Youths reported their gender, age in years, race (White versus non-White) and ethnicity (non-Hispanic versus Hispanic) in the baseline survey.

2.5 Data Analysis

We conducted two sets of analyses using Stata v.14 (StataCorp, 2015). To account for the clustering of assessments within adolescents we used cluster robust standard errors in all analyses. We also controlled for adolescents' demographics (i.e., age at baseline, gender, Hispanic, White). To test hypotheses 1 and 2, we used multinomial logistic regression analysis to examine associations of situational and social context characteristics and simultaneous use of alcohol and marijuana (3), marijuana use only (2), and alcohol use only (1) compared with no substance use (0). All predictors were entered simultaneously.

To test hypothesis 3, we investigated associations of the number of alcohol use only, marijuana use only, and simultaneous use of alcohol and marijuana occasions that occurred the previous night (with no substance use as reference category) with (a) total number of problems, (b) any violence, (c) any trouble with police, parents or other adults, (d) any risky sex, (e) any alcohol DUI/RDD, and (f) being drunk. To account for the overdispersion of the number of problems measure we used a negative binomial model. The Vuong closeness test indicated a standard negative binomial model was a better fit than a zero-inflated negative binomial model. For the specific problem outcomes, we used logit models. Hausman specification tests indicated that the random-effects models were appropriate. We then used these models and controlled for adolescents' demographics. Because of low percent of risky sex occasions in our sample, the model to predict “any risky sex” did not converge and we

therefore cannot report results of this outcome. In additional analyses, we included the number of occasions participants used any of these substances in the previous night as an offset variable to determine whether alcohol, marijuana, or simultaneous use contributed to the number of problems or specific risks independently of any substance use per se.

3. Results

3.1 Descriptive Statistics

Of the 1,406 occasions in this study, most occasions did not include any substance use (83.5%), 7.6% occasions included marijuana use only, 5.6% included alcohol use only, and 3.3% included simultaneous alcohol and marijuana use. Table 1 shows the percent of problems reported in the morning surveys ($N=471$). On average, youths reported that fewer than one problem occurred each previous night (Mean=0.4, $SD=0.9$). The youths reported that incidents of violence, being drunk, trouble with parents or police, risky sex, and driving after drinking alcohol or riding with a drunken driver occurred the previous night on 15%, 8%, 4%, 4% and 3%, respectively, of the 471 morning assessments. Sample characteristics and descriptive statistics for the context characteristics are in Table 1. Of the 150 adolescents in this study, 25% used marijuana in the past two weeks and 36% used alcohol in the past two-weeks.

3.2 Context Characteristics and Simultaneous Use of Alcohol and Marijuana

3.2.1 Test of Hypothesis 1—Results of the multinomial logistic regression analysis are in Table 2. Focusing on situational context characteristics associated with the different substance use patterns, the presence of adult supervision was associated with 50% and 65% reduced risks of marijuana use ($RRR=0.50$, $CI=0.25, 0.97$) and simultaneous alcohol and marijuana use ($RRR=0.45$, $CI=0.21, 0.98$). The association between adult supervision and alcohol use was only marginally significant ($RRR=0.44$, $CI=0.18, 1.05$, $p=0.06$). Perceived risk of getting caught by parents or police was associated with a 30% reduction in the risk of marijuana use only and perceived alcohol availability was associated with 2% increase in the risk of alcohol use only. None of these situational characteristics were significantly associated with simultaneous use.

3.2.2 Test of Hypothesis 2—Focusing on social context characteristics associated with these substance use patterns, while an additional person at the context was associated with 1% increased risks of alcohol use only ($RRR=1.01$, $CI=1.01, 1.01$), it was associated with 4% decrease in the risk of marijuana use only ($RRR=0.96$, $CI=0.93, 0.99$). No significant association was found between number of people and simultaneous use. Compared to contexts in which most other underage youths were drinking alcohol, contexts without underage drinkers were associated with a 99% reduction in the risk of simultaneous alcohol and marijuana use ($RRR=0.01$, $CI=0.00, 0.02$). Similarly, contexts with some underage drinkers (versus most underage drinkers) were associated with an 80% decrease in the risk of simultaneous use. The presence of underage drinkers was also associated with increased risks of use of alcohol only and marijuana only (see Table 2). Being at a party was not significantly associated with alcohol, marijuana or simultaneous use.

3.3 Simultaneous Alcohol and Marijuana Use and Problems

3.3.1 Test of Hypothesis 3—Results of a negative binomial regression analysis to examine associations between the number of alcohol only, the number of marijuana only, and the number of simultaneous alcohol and marijuana use occasions and the number of problems reported by participants in the morning are in Table 3. Compared with no substance use occasions during the previous night, each additional occasion of alcohol use only was associated with 281% increase in the number of problems reported by the youths in the next morning (IRR=3.81, CI=2.95, 4.91). An additional occasion of marijuana use only was associated with 74% increase in the number of reported problems (IRR=1.74, CI=1.35, 2.25). Each additional simultaneous use occasion was associated with a 110% increase in problems reported the following morning (IRR=2.10, CI=1.53, 2.87).

Including the number of occasions participants used any of these substances in the previous night as an offset variable, results showed alcohol use only continued to be associated with a 40% increase in problems (IRR=1.40, CI=1.09, 1.81) and marijuana use with a 36% decrease problems (IRR=0.64, CI=0.50, 0.82). Simultaneous use was not significantly associated with problems reported the following morning (IRR=0.77, CI=0.57, 1.06).

Results of random-effects logit models to examine associations between the number of different substance use occasions in the previous night and specific problems are in Table 5. Each additional occasion of alcohol use only was associated with increases in the odds of youth reporting any violence (OR = 7.28, CI=3.53, 15.01), any trouble with parents or police (OR = 7.25, CI=2.60, 20.20), any alcohol DUI/RDD (OR = 2.92, CI=1.51, 5.62), and being drunk (OR = 9.99, CI=4.76, 20.98), the previous night. Each additional occasion of marijuana use only was associated with increase in the odds of youth reporting any violence (OR=1.65, CI=1.08, 2.54) and any alcohol DUI/RDD (OR=2.10, CI=1.31, 3.36) the previous night. Finally, each additional occasion of simultaneous alcohol and marijuana use was associated with increases in the odds of youth reporting any violence (OR=1.83, CI=1.02, 3.26), any alcohol DUI/RDD (OR=3.21, CI=1.39, 7.44), and being drunk (OR=4.11, CI=1.79, 9.44). Adjusting for overall substance use in the previous night as an offset variable, results showed that each additional occasion of alcohol use only was associated with increases in the odds of youth reporting any violence (OR=2.67, CI=1.29, 5.52) and being drunk (OR=3.67, CI=1.75, 7.72) that night. For marijuana use only the direction of the associations changed. Specifically, each additional occasion of marijuana use only was associated with decreases in the odds of youth reporting any violence (OR = 0.61, CI=0.40, 0.93) or any trouble with parents or police (OR = 0.29, CI=0.12, 0.66) the previous night. The number of simultaneous alcohol and marijuana use occasions were not uniquely associated with any problem reported in the following morning.

4. Discussion

Studying simultaneous substance use is important because such use represents the experiences of many young substance users (Schepis et al., 2016; Subbaraman and Kerr, 2015). We identified situational and social characteristics associated with simultaneous use of alcohol and marijuana. Results showed that social events with greater numbers of other underage drinkers, but not larger numbers of people more generally, was associated with

increased risks of simultaneous alcohol and marijuana use. In a study of young adults we similarly found that the perceived percent of intoxicated people at an event, but not the overall number of people at that event, was associated with greater risks of using alcohol with marijuana (Lippman-Kreda et al., 2017). Results of the current investigation also showed that the presence of relatively large number of underage drinkers was positively associated with use of alcohol and marijuana exclusively, suggesting that the presence of other underage drinkers may provide normative cues about the acceptability of using other substances as well as using alcohol with other substances simultaneously.

Adult supervision was identified as an important situational characteristic associated with reduced risks of simultaneous alcohol and marijuana use. Prevention efforts to reduce simultaneous alcohol and marijuana use should target unsupervised social settings with higher number of underage drinkers (e.g., social host laws). In addition, family programs educating parents about the importance of adult supervision and the risks associated with events with large number of underage drinkers may be useful (Bersamin et al., 2016; Foxcroft and Tsertsvadze, 2011).

Interestingly, social contexts with larger numbers of people were associated with increased risks of alcohol use only and contexts with fewer people were associated with increased risks of marijuana only. We found no association between the general number of people (not necessarily underage drinkers or drinkers) and simultaneous use. These findings are consistent with results of an exploratory qualitative study we conducted revealing that adolescents make decisions about substance use and simultaneous use based on their perceptions of how the substance's effects fit within the social context. Whereas alcohol was described as best for “party-like” atmospheres, marijuana was described as best for “kickbacks” or gatherings of small groups of intimate friends (Price-Wolf et al., 2016). Results of the current study suggest that situational and social characteristics of substance use contexts are differentially related to alcohol use only, marijuana use only, and simultaneous alcohol and marijuana use. To increase our understanding of these differences and inform prevention, future research should continue to investigate contexts uniquely associated with simultaneous use of alcohol and marijuana including specific locations (e.g., own home, outdoor settings) and other situational or social characteristics (e.g., gender or age distribution).

We also found that all three substance use patterns (i.e., alcohol use only, marijuana use only, and simultaneous use) were associated with greater numbers of problems reported the following morning. The strongest associations were observed for alcohol use only, somewhat weaker associations for simultaneous use, and the weakest associations for marijuana use only. It is possible that marijuana use increases the likelihood of alcohol use, which then could increase problems. Importantly, this analysis allowed us to distinguish alcohol, marijuana and simultaneous use in a time ordered design that suggests these may be causal effects. After adjusting for differential exposure to any of these substances in the previous night, risks specifically related to alcohol alone remained high and those related to simultaneous use the same as those due to overall exposures to either substance. This suggests that the increase in number of problems should be primarily attributed to alcohol use, whether or not used with marijuana simultaneously. Prevention efforts to reduce

problems related to simultaneous use should emphasize the importance of modifying and controlling opportunities for underage drinking.

With respect to specific problems, we found that an additional occasion of simultaneous use increased the odds of youth reporting violence, DUI/RDD, and being drunk. Whereas the effect of alcohol use only on violence is three times greater than the effects of marijuana only or simultaneous alcohol and marijuana use, the effects are similar regarding DUI/RDD. This finding are supported by previous results showing that simultaneous alcohol and marijuana use was associated with adolescents' engaging in unsafe driving (Terry-McElrath et al., 2014). As before, the pattern of these effects changed after adjusting for differential exposure to any of these substances; alcohol use alone remained uniquely associated with increased odds of specific problems and marijuana use was related to decreased odds of problems, suggesting that problems associated with simultaneous use may be attributed largely to alcohol. Future studies should continue investigating problems associated with simultaneous use, including the impact of contexts on specific problems, independent of substance use behaviors.

5. Conclusions

Our results show that alcohol use, whether or not used with marijuana simultaneously, is an important contributor to problems. However, alcohol only and simultaneous alcohol and marijuana use are associated with context characteristics that can be modified to reduce these behaviors and related risks. Our findings suggest that prevention efforts to reduce alcohol only and simultaneous alcohol and marijuana use and related problems should target unsupervised social settings with larger numbers of underage drinkers. Contexts with greater alcohol availability and number of people should also be considered. Effective strategies to target these risky settings may include social host laws that prohibit the hosting of underage drinking parties or messages to educate parents or youths about risks associated with these settings. Our findings also suggest the importance of considering specific risks associated with simultaneous use, including violence, DUI/RDD, and heavy drinking with specific attention to the role of alcohol use behaviors in these adverse outcomes. Identifying contexts and problems associated with alcohol only and simultaneous alcohol and marijuana use is an essential first step to develop prevention interventions to target contexts that contribute to these behaviors and to specific risks.

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Highlights

- Situational and social context characteristics increase risks for simultaneous use.
- Larger numbers of underage drinkers increase risks for simultaneous use.
- Lack of adult supervision increases risks for simultaneous use.
- Simultaneous use is associated with increased subsequent risks.
- Alcohol may be the primary contributor to risks associated with simultaneous use.

Table 1
Sample characteristics and descriptive statistics of context characteristic variables and problems ($n=1,406$ occasions, 150 adolescents)

	Percent (%)	Mean (SD)	Range
Age at baseline	---	16.4 (0.9)	15-18
Female	46.9	---	---
Hispanic	14.9	---	---
White	79.0	---	---
Alcohol use, past two weeks	36	---	---
Marijuana use, past two weeks	25	---	---
Adult supervision	65.3	---	---
Perceived enforcement	---	2.5 (1.1)	1-4
Perceived alcohol availability	---	2.4 (1.1)	1-4
Number of people	---	171.2 (5357.8)	0-200,000
Presence of underage drinkers	---	---	---
Most youth were drinking	10.3	---	---
Some underage drinkers	8.2	---	---
No underage drinkers	81.5	---	---
Being at a party	8.9	---	---
Problems the previous night ¹			
Number of problems, last night		0.4 (0.9)	0-7
Any violence	15		
Any trouble with parents, other adults, or police	4		
Any alcohol DUI/RDD	3		
Being drunk	8		
Any risky sex	4		

¹ Assessed only in the morning surveys (N=471 occasions)

Table 2
Associations (Relative Risk Ratio, 95% CIs) between context characteristics and simultaneous alcohol and marijuana use, multinomial logistic regression analyses with cluster robust standard errors

	Alcohol only ^I	Marijuana only ^I	Alcohol and marijuana ^I
Occasions	<i>n</i> =1,128	<i>n</i> =1,128	<i>n</i> =1,128
<i>Situational characteristics</i>			
Adult supervision	0.44 (0.18, 1.05)	0.50 (0.25, 0.97) *	0.45 (0.21, 0.98) *
Perceived enforcement	0.84 (0.50, 1.42)	0.72 (0.54, 0.97) *	0.61 (0.34, 1.10)
Perceived alcohol availability	2.02 (1.27, 3.21) **	1.16 (0.89, 1.50)	1.02 (0.61, 1.71)
<i>Social characteristics</i>			
Number of people	1.01 (1.01, 1.01) **	0.96 (0.93, 0.99) *	0.99 (0.99, 1.00)
Presence of underage drinkers ²			
Some underage drinkers	0.11 (0.05, 0.25) **	0.24 (0.61, 0.94) *	0.20 (0.10, 0.52) **
No underage drinkers	0.01 (0.00, 0.04) **	0.20 (0.07, 0.61) **	0.01 (0.00, 0.02) **
Being at a party	2.02 (0.82, 4.98)	1.38 (0.57, 3.70)	0.70 (0.26, 1.92)
Individuals	<i>n</i> =143	<i>n</i> =143	<i>n</i> =143
Age at baseline	0.92 (0.54, 1.55)	0.94 (0.63, 1.40)	1.04 (0.60, 1.80)
Female	0.85 (0.35, 2.08)	0.94 (0.38, 2.31)	1.98 (0.64, 6.15)
Hispanic	1.10 (0.30, 4.06)	0.65 (0.17, 2.39)	0.50 (0.10, 3.30)
White	2.48 (0.59, 10.53)	1.02 (0.26, 4.03)	2.07 (0.40, 10.76)

^I Compared with no substance use occasions

² Reference group, most other underage were drinking alcohol

* *p* .05

** *p* .005

Table 3
Associations (Incidence Risk Ratio, 95% CIs) between number of problems and simultaneous alcohol and marijuana use, negative binomial regression with cluster robust standard errors

	Number of problems occurred last night
Occasions	<i>n</i> =467
Number of use occasions, last night^I	
Alcohol only	3.81 (2.95, 4.91) **
Marijuana only	1.74 (1.35, 2.25) **
Alcohol and marijuana	2.10 (1.53, 2.87) **
Individuals	<i>n</i> =145
Age at baseline	1.12 (0.87, 1.42)
Female	1.19 (0.78, 1.82)
Hispanic	0.63 (0.33, 1.23)
White	0.92 (0.51, 1.64)

^I Compared with no substance use occasions

*
p .05

**
p .005

Table 4
Associations (Odds Ratio, 95% CIs) of problems and simultaneous alcohol and marijuana use, random-effects logit models with cluster robust standard errors

	Any violence	Any trouble	Any DUI/RDD	Being drunk
Occasions	<i>n</i> =463	<i>n</i> =392	<i>n</i> =467	<i>n</i> =467
Number of use occasions, last night ¹				
Alcohol only	7.28 (3.53, 15.01) **	7.25 (2.60, 20.20) **	2.92 (1.51, 5.62) **	9.99 (4.76, 20.98) **
Marijuana only	1.65 (1.08, 2.54) *	0.76 (0.33, 1.81)	2.10 (1.31, 3.36) **	1.75 (0.89, 3.44)
Alcohol and marijuana	1.83 (1.02, 3.26) *	1.90 (0.51, 7.05)	3.21 (1.39, 7.44) *	4.11 (1.79, 9.44) **
Individuals	<i>n</i> =145	<i>n</i> =122	<i>n</i> =145	<i>n</i> =145
Age at baseline	1.31 (0.87, 1.98)	0.60 (0.27, 1.36)	0.85 (0.47, 1.56)	1.32 (0.74, 2.36)
Female	1.27 (0.62, 2.57)	0.96 (0.18, 5.02)	1.09 (0.40, 2.93)	1.40 (0.53, 3.66)
Hispanic	0.62 (0.18, 2.18)	--- ²	1.39 (0.49, 3.98)	0.28 (0.07, 1.15)
White	1.66 (0.49, 5.67)	0.45 (0.52, 3.84)	1.65 (0.56, 4.85)	1.31 (0.34, 5.03)

¹ Compared with no substance use occasions

² In this analysis being non-Hispanic predicted failure perfectly (i.e., when Hispanic is 0 any trouble is 1). Therefore the variable Hispanic was removed from the model (because it would have an infinite coefficient) and the 70 assessments that led to the problem were eliminated from analysis.

* p .05

** .005