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Places and social contexts associated with simultaneous use of alcohol, tobacco and marijuana among young adults

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Abstract

Introduction and Aims—Little is known about social-ecological correlates of simultaneous use of alcohol with other substances. This study examined places and social contexts associated with simultaneous use of alcohol, tobacco and marijuana among young adults.

Design and Methods—We used survey data obtained from 1538 young adult recent alcohol drinkers (49% male; 18–30 years old) in 24 non-contiguous cities in California. Event-level measures included alcohol, tobacco and marijuana use, drinking places and social characteristics of the event. Individual-level measures included alcohol expectancies, depression and demographics.

Results—Bars and restaurants had significantly less alcohol and marijuana use (odds ratio = 0.34; 95% confidence interval 0.18, 0.62; $P < 0.001$) and alcohol, marijuana and tobacco use (odds ratio = 0.27; 95% confidence interval 0.14, 0.54; $P < 0.001$) compared with alcohol use only. Perceived percent of intoxicated people at an event was associated with greater likelihood of using alcohol with tobacco and marijuana at the event. At the individual level, greater age was generally associated with increased odds of simultaneous use. Participants who were male, less educated, more depressed and had positive alcohol expectancies were more likely to simultaneously co-use alcohol with tobacco and marijuana. Those with negative expectancies were less likely to simultaneously use these substances.

Discussion and Conclusions—Social events in private settings with a high percentage of people who are intoxicated had increased likelihood of simultaneous use of alcohol, tobacco and marijuana. Prevention efforts in these settings may reduce simultaneous use of these substances and related harms.

Keywords

Young adults; Alcohol; Tobacco; Marijuana; Simultaneous use; Contexts

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Introduction

Co-use or concurrent substance use results in increased risk for short and long term negative outcomes such as physical aggression, drinking and driving, initiation of new substance use, and difficulties quitting drug use [1–4]. Research has shown that alcohol use is strongly associated with tobacco and marijuana use in the general population and among young people [3,5–8]. For example, results of the 2013 US National Household Survey on Drug Use and Health indicated that among past-month heavy drinkers aged 12 or older, 33.7% were past month illegal drug users, with marijuana as the most commonly used illegal drug in this population. Similarly, among past-month heavy alcohol users aged 12 and older, 43.1% also smoked cigarettes in the past-month [9]. A few studies identified specific risks associated with simultaneous use of alcohol with tobacco or marijuana, including initiation of new substance use [4], increased risks of drunk driving, social consequences and harms to oneself associated with simultaneous alcohol and marijuana use [10], and increased subjective feelings of alcohol intoxication associated with simultaneous alcohol and cigarette use [11].

In this study we examine places and social contexts associated with simultaneous use of alcohol, tobacco and marijuana among young adults (18–30 years old) in California, USA. Social contexts are the attributes of people and their relationships in a specific event involving substance use (e.g. number of people, age composition) [12]. The identification of places and social contexts in which alcohol is used with other substances is an essential first step toward the development of targeted preventive interventions to reduce the risks associated with simultaneous use of alcohol and other substances among young people.

To date, much of the research on the co-use of alcohol, tobacco and other drugs among young people has focused on examining substance use trajectories such as the gateway or reverse gateway models [13–15]. Other studies have focused on global associations between alcohol, tobacco and marijuana, its prevalence, and correlates of comorbidity [7,16,17], ignoring simultaneous use [18,19]. Moreover, our current state of knowledge is limited with respect to environmental and social characteristics that may be associated with simultaneous use of alcohol and other substances in this young population. The type of setting (e.g. own home, friends' home, bar or restaurant, outdoor setting) and characteristics of a social gathering (e.g. number of people attending who are intoxicated, whether alcohol beverage service is managed) could affect the likelihood of simultaneous use of alcohol and other substances, though prior studies have only investigated associations between such factors and levels of alcohol use [e.g. 1,20–22]. Questions then remain about where and what social contexts are associated with simultaneous use of alcohol and other substances, and whether such contextual characteristics differ from those that predict alcohol use only.

To this end, we investigated the relationships of places and social contexts with young adult simultaneous use of alcohol with tobacco and marijuana. Moreover, we compared events of simultaneous use with events of alcohol use only in order to gain an understanding of how different places or social contexts are related to different combinations of substances used. We controlled for individual characteristics including alcohol use expectancies, depression, religiosity, age, gender, and ethnicity, which were found to be associated with alcohol and

other substance use and co-use in previous research [e.g. 13,18,21,23,24]. The inclusion of these individual characteristics allows us to identify the unique relationships between places and social contexts and simultaneous use of alcohol, tobacco and marijuana, beyond that attributable to individual demographic and psychosocial characteristics.

Methods

Study sample and survey methods

Sample of cities—The current study included young adults (18–30 years old) who participated in a study in 24 non-contiguous midsized California cities. These cities were selected from a geographically diverse sample of 50 non-contiguous California cities (population range: 50,000 and 500,000) included in our previous research [22,25]. The subset of 24 cities had relatively higher levels of underage drinking, drinking and driving and alcohol-related motor vehicle crashes based on data from the California Healthy Kids Survey, an independent survey of over 8000 young adults conducted by the Prevention Research Center, and data from the California Statewide Integrated Traffic Reporting System. These cities were part of a randomized trial to evaluate the effects of environmental strategies to reduce community alcohol-related problems. Data used for the current study are based on the baseline survey.

Survey sample and methods—Households within each city were randomly sampled from purchased lists of landline and cell phone exchanges. The mixed-use (landline and cell phone) exchanges were intended to increase the representativeness of the study sample. For households sampled from the lists of landline exchange we had address information, and therefore an invitation letter describing the study and inviting participation was mailed to these households followed by a telephone contact. Households sampled from the lists of cell phone exchanges were contacted by cell phone only. Households and participants were screened for eligibility based on their city of residence and age. Of the total completed interviews, 21% were from random digit dialing cell phone samples. Informed consent was given for participation in the research and respondents received $20 as compensation for their participation in the study. Institutional review board approval was obtained prior to implementation of the study.

Study participants were surveyed through a computer-assisted telephone interview. The interviews were given in either English or Spanish at the respondent's request and lasted approximately 20 minutes. The survey took place in 2013–2014. The estimated response rate for this survey was 42%. The current study is based on data from 1538 young adult (49% male, M age = 23.63 years, SD =3.42) recent (past month/past three months) alcohol drinkers who: (i) reported alcohol use only; simultaneous use of alcohol and tobacco; simultaneous use of alcohol and marijuana; or simultaneous use of alcohol, tobacco and marijuana the last time they were in a social gathering at one of four places (i.e. their own home, someone else's home, bars/restaurants, or outdoor/public places like a park, beach, or camping area); and (ii) provided complete data for all study measures. Of the eligible 1553 respondents, 15 did not provide complete data for all study measures (0.9%). An average of

64 young adults (range: 54–84, *SD*=6.62) were interviewed in each city. Sample characteristics are provided in Table 1.

Measures

Alcohol use and drinking places—Survey respondents were asked, “In the last 12 months, about how often did you drink any kind of alcoholic beverage -- a glass of beer, wine, or a drink with hard liquor?” Possible response categories ranged from “Every day” to “Never had a drink of alcohol in my life.” Those who reported any past year alcohol use were asked about the number of days they drank alcohol, in the past month or past three months, in the four places (i.e. own home, someone else’s home, bar/restaurants and outdoor/public places) [22]. The time reference (past month or past 3 months) was determined based on previous survey items about alcohol use patterns. Respondents who reported alcohol use in any of these places in the past three months were asked specific questions about last time at that place.

Alcohol, tobacco and marijuana use at last event—Past month/past 3-month drinkers were asked about use of alcohol and other substances last time at each place. First, they were asked about number of alcohol drinks they had before, during or after the last time at each place. Then, they were asked if they had other types of substances at any time before, during or after the last time at the place including tobacco (cigarettes, cigars, pipe, chewing tobacco), marijuana or hashish (weed, pot, hash) and a few other substances not included in this analyses. Since the current study focuses on simultaneous use of alcohol with tobacco and marijuana, the outcome variable was a four-category multinomial variable with alcohol use only as the reference group (category 1), simultaneous use of alcohol and tobacco (category 2), simultaneous use of alcohol and marijuana (category 3), and simultaneous use of alcohol, tobacco and marijuana (category 4).

Social characteristics of last event—Measures related to social characteristics of last event at each place included: (i) total number of people at the event; (ii) estimated number of people who were intoxicated; (iii) whether the respondent had enough to feel drunk or intoxicated (yes/no); and (iv) whether drinks were refused to anyone who was intoxicated or impaired (yes/no). These measures are based on measures we used in previous studies [20, 21]. We computed the proportion of intoxicated people at the last event at the place and created dummy variables to represent the number of people at the event (10–19 people, 20+ people, and less than 10 people as reference group) and percent who were perceived to be intoxicated (20–50%, 51%+, and less than 20% as reference group).

Negative and positive alcohol expectancies—Respondents were asked questions regarding perceived likelihood that different things would happen to them personally if they were to drink 3 or 4 whole drinks of an alcoholic beverage - beer, wine, wine cooler, flavored malt beverage, or liquor [26]. Questions about negative outcomes included: (i) get hangover; (ii) do something you would regret; (iii) feel sick to your stomach; (iv) get into a trouble with your parents; (v) feel out of control; (vi) get into fist fights or shoving matches; and (vii) feel clumsy. Questions about positive outcomes included: (i) feel more confident or sure of yourself; (ii) have an easier time expressing your feelings; (iii) feel less shy; (iv) feel

more cheerful; (v) feel more friendly; and (vi) feel braver about talking to people. Possible response options for all items were, “Very likely (1),” “Somewhat likely (2),” “Somewhat likely (3),” and “Very unlikely (4).” We reverse coded response values and computed mean scores for each participant representing negative and positive expectancies, with a higher score indicating greater perceived negative or positive expectancies. Cronbach’s α was 0.81 for the seven-item negative expectancies scale and 0.84 for the six-item positive expectancies scale.

Depression symptoms—We used the short version of the Center for Epidemiologic Studies Depression Scale [27] to measure depression symptoms. Respondents were asked “In the last 2 weeks, how often have you been bothered by any of the following problems?” including: (i) little interest or pleasure in doing things; (ii) feeling down, depressed, or hopeless; (iii) trouble falling or staying asleep, or sleeping too much; (iv) feeling tired or having little energy; (v) poor appetite or overeating; (vi) feeling bad about yourself – or that you are a failure or have let yourself or your family down; (vii) trouble concentrating on things, such as reading the newspaper or watching television; (viii) moving or speaking so slowly that other people could have noticed or the opposite – being so fidgety or restless that you have been moving around a lot more than usual; and (ix) thoughts that you would be better off dead or of hurting yourself in some way. A mean score was computed, with a higher score indicating greater depression symptoms. Cronbach’s α for the nine-item scale was 0.83.

Young adult demographics—Respondents reported their gender, age, race, and ethnicity. Race and ethnicity were treated as dichotomous variables (i.e. White versus non-White; Hispanic versus non-Hispanic). Respondents were also asked “How religious are you?” with possible response options (values) of “Very (1),” “Somewhat (2),” “A little (3),” and “Not at all (4),” with higher values representing more secularity. Finally, they reported the highest level of education they have finished from less than high school (1) to graduate school, medical school or other post graduate education (5), with higher values representing higher education.

Data analysis

First, we examined prevalence of simultaneous use of alcohol with tobacco and marijuana by places. A chi-square was used to analyze the prevalence rates. Then, to account for the nested design of our study, we conducted multilevel multinomial logistic regression analyses of event-level data, with simultaneous use measured as: (i) alcohol use only; compared with (ii) simultaneous use of alcohol and tobacco; (iii) simultaneous use of alcohol and marijuana; and (iv) simultaneous use of alcohol, tobacco and marijuana. Allowing for random effects, the three-level model takes into account the variability in these outcome measures that is between individuals (i.e. events nested within individuals) and between cities (i.e. individuals nested within cities). We examined associations between places and event social characteristics and simultaneous use of alcohol with tobacco and marijuana relative to alcohol use only. The models included individual characteristics (i.e. past-month drinker, age, gender, education, secularity, race and ethnicity), alcohol expectancies, and depression score. We used Stata v.14 for all analyses.

Results

Table 2 presents the prevalence of simultaneous use of alcohol with tobacco and marijuana by places. Across all places, most events (71.16%) were alcohol use only followed by simultaneous use of alcohol and tobacco (12.46%), simultaneous use of alcohol and marijuana (9.59%) and simultaneous use of alcohol, tobacco and marijuana (6.79%). Results of chi-square tests show that simultaneous use of alcohol and marijuana was significantly lower in bars or restaurants, χ^2 (3, N=3315) =24.64, P <0.001. Similarly, simultaneous use of alcohol, tobacco and marijuana was significantly lower in bars or restaurants, χ^2 (3, N=3315) =18.80, P <0.001. No relation was found between simultaneous use of alcohol and tobacco and places, χ^2 (3, N=3315) =6.43, P = 0.09. Focusing on legal age status, only 8% of underage drinkers (<21 years) reported alcohol or simultaneous use in bars or restaurants compared to 29% legal age drinkers.

In multilevel models (Table 3), bars and restaurants (compared to outdoor places) were associated with 66% decrease in the likelihood of simultaneous use of alcohol and marijuana (odds ratio [OR] = 0.34; 95% confidence interval [CI] 0.18, 0.62) and a 73% decrease in the likelihood of alcohol, tobacco and marijuana use compared with alcohol use only (OR = 0.27; 95% CI 0.14, 0.54). Additional multilevel models examined places associated with simultaneous use, alternating the reference group for place (Table 4). Results show that bars or restaurants were associated with about a 70% decrease in the likelihood of simultaneous use of alcohol, tobacco and marijuana compared to all places. Also, compared with bars or restaurants, the likelihood of using alcohol with tobacco was 70% higher at own home. Focusing on social contexts, where more people at an event were perceived to be intoxicated, the likelihood of simultaneous alcohol and other substance use increased. For example, events in which 51% or more people were perceived to be intoxicated were associated with 7-fold increased odds of use of alcohol with tobacco (OR = 7.23; 95% CI 4.25, 12.32); 7-fold increased odds of alcohol and marijuana use (OR = 7.11; 95% CI 4.13, 12.24); and 13-fold increased odds of simultaneous alcohol, tobacco and marijuana use (OR = 12.86; 95% CI 7.13, 23.18).

At the individual level, an additional year of age was associated with 16% increase of the likelihood of simultaneous use of alcohol and tobacco (OR = 1.16; 95% CI 1.07, 1.27) and 10% increase of use of alcohol, tobacco and marijuana (OR = 1.10; 95% CI 1.00, 1.20). Participants who were male and less educated were more likely to simultaneously use alcohol, tobacco and marijuana. An additional unit increase in secularity was associated with about 40% decrease in the likelihood of use of alcohol with marijuana. Being White was associated with a 70% increase in the odds of simultaneous use of alcohol with tobacco and marijuana, and being Hispanic was associated with a 54% lower likelihood of use of alcohol with tobacco. Focusing on alcohol expectancies, positive expectancies were associated with an increased likelihood of simultaneous use of alcohol and tobacco (OR = 1.67; 95% CI 1.09, 2.57) and alcohol, tobacco and marijuana (OR = 1.72; 95% CI 1.08, 2.74). Negative expectancies were associated with reduced odds of use of alcohol with tobacco (OR = 0.28; 95% CI 0.17, 0.47), alcohol and marijuana (OR = 0.38; 95% CI 0.22, 0.63), and use of all these substances at the same event (OR = 0.32; 95% CI 0.18, 0.55). Finally, although high levels of depression symptoms were associated with all three types of simultaneous use, the

relative associations were higher for simultaneous use of alcohol, tobacco and marijuana (OR = 11.78; 95% CI 6.24, 22.24).

Discussion

Results of this study identified places and social characteristics that are uniquely associated with simultaneous use of alcohol, tobacco and marijuana in a large sample of young adults. This study goes beyond previous studies in that it is the first study to examine places and social contexts associated with simultaneous use of alcohol, tobacco and marijuana among young adults. Also, we controlled for various demographic and psycho-social characteristics that strengthen the conclusions of the study by helping to rule out possible self-selection effects. Finally, by comparing simultaneous use events to alcohol use only events, the current study provided a distinct perspective about how these behaviors differ from alcohol use only with respect to social-ecological contexts and therefore allowed a better understanding of the nature of these events and types of simultaneous substance use.

Previous research suggests that co-use and concurrent substance use may result in increased risk for short and long term negative outcomes. In this study we identified characteristics at which prevention efforts might be directed. Simultaneous use of alcohol and marijuana or alcohol, tobacco and marijuana were less likely to occur in bars or restaurants with presumably greater control relative to alcohol use only in other settings. Also, controlling for the different settings, a greater percentage of intoxicated people increased the likelihood of simultaneous use of alcohol with tobacco and marijuana. Further research could tell us what gives rise to social settings with higher percentages of intoxicated guests or patrons, whether the higher percentage “cues” individuals to join in or whether the occasion is understood to include a higher prevalence of intoxication in advance, and whether simultaneous use is largely “driven” by alcohol use or not.

We also identified individual characteristics associated with the different simultaneous use outcomes. Compared to alcohol use only events, the odds of simultaneous use was greater among males than females. Although previous research often shows decrease in substance use as participants reach their late twenties [28,29], in our study older young adults were more likely than younger to simultaneously use alcohol, tobacco and marijuana. Our results, however, are similar to those of the study in Brazil, in which males aged 25 and over were more likely to be engaged in simultaneous use of alcohol and marijuana than females [18].

Compared to alcohol use only, positive alcohol expectancies were positively associated with all simultaneous use. Also, negative alcohol expectancies were negatively associated with all simultaneous use outcomes, compared with alcohol use only. As suggested by another study [24], measuring simultaneous use expectancies may provide important information not available when measuring alcohol expectancies only. Finally, depression was positively associated will all simultaneous use outcomes compared to alcohol use only. However, the relative associations of depression symptoms with simultaneous substance use were much greater for use of alcohol with tobacco and marijuana than the other outcomes. Although our cross-sectional study cannot determine the direction of these relationships, recent results

from a longitudinal study suggest bidirectional relationships between substance use and depression in a non-clinical sample [30].

Several limitations of this study should be noted. First, young adults in our sample may not be representative of all young adults in the 24 California cities. Second, our data are drawn from midsized California cities, so study results are not necessarily representative of young adults from rural or larger urban areas or other geographic areas, although the cities themselves are diverse and in both rural and urban regions. Therefore, findings of this study may not generalize beyond the study sample. Third, based on our previous alcohol studies, our analyses considered simultaneous substance use in only a few predetermined places and limited number of contextual characteristics. These places represent many different types of settings (e.g. outdoor/public places) which may precipitate different sets of situations and behaviors that were not captured in this study [31]. Finally, the self-report survey measures may have been limited by recall biases especially with regard to characteristics of specific events. Other research methods, such as ecological momentary assessment, may allow us to better capture event characteristics and simultaneous substance use behaviors and contexts across places.

Nevertheless, findings of this study suggest that less restrictive social events in private settings with a high percentage of people who are intoxicated may increase the likelihood of simultaneous use of alcohol and other substances. Importantly, these settings may be more amenable to change than the relevant individual-level factors. The identification of contexts in which alcohol is used with other substances is an essential first step toward the development of targeted preventive interventions to reduce comorbid use and problems associated with this behavior among young people.

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References

1. Clapp JD, Shillington AM, Segars LB. Deconstructing contexts of binge drinking among college students. Am J Drug Alcohol Abuse. 2000; 26:139–54. [PubMed: 10718169]
2. Peters EN, Budney AJ, Carroll KM. Clinical correlates of co-occurring cannabis and tobacco use: a systematic review. Addiction (Abingdon, England). 2012; 107:1404–17.
3. Moss HB, Chen CM, Yi HY. Early adolescent patterns of alcohol, cigarettes, and marijuana polysubstance use and young adult substance use outcomes in a nationally representative sample. Drug Alcohol Depend. 2014; 136:51–62. [PubMed: 24434016]
4. Olthuis JV, Darredeau C, Barrett SP. Substance use initiation: the role of simultaneous polysubstance use. Drug Alcohol Rev. 2013; 32:67–71. [PubMed: 22612987]
5. Anthony JC, Echegaray-Wagner F. Epidemiologic analysis of alcohol and tobacco use: Patterns of co-occurring consumption and dependence in the United States. Alcohol Res Health. 2000; 24:201–8. [PubMed: 15986714]

6. Falk DE, Yi HY, Hiller-Sturmhofel S. An epidemiologic analysis of co-occurring alcohol and tobacco use and disorders: findings from the National Epidemiologic Survey on Alcohol and Related Conditions. Alcohol Res Health. 2006; 29:162–71. [PubMed: 17373404]
7. Hedden SL, Martins SS, Malcolm RJ, Floyd L, Cavanaugh CE, Latimer WW. Patterns of illegal drug use among an adult alcohol dependent population: results from the National Survey on Drug Use and Health. Drug Alcohol Depend. 2010; 106:119–25. [PubMed: 19758770]
8. Stinson FS, Grant BF, Dawson DA, Ruan WJ, Huang B, Saha T. Comorbidity between DSM-IV alcohol and specific drug use disorders in the United States: results from the National Epidemiologic Survey on Alcohol and Related Conditions. Drug Alcohol Depend. 2005; 80:105–16. [PubMed: 16157233]
9. Substance Abuse and Mental Health Services Administration. Results from the 2013 National Survey on Drug Use and Health: Summary of National Findings. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2014.
10. 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]
11. Piasecki TM, Jahng S, Wood PK, et al. The subjective effects of alcohol-tobacco co-use: an ecological momentary assessment investigation. J Abnorm Psychol. 2011; 120:557–71. [PubMed: 21443289]
12. Freisthler B, Lipperman-Kreda S, Bersamin M, Gruenewald PJ. Tracking the when, where, and with whom of alcohol use: integrating ecological momentary assessment and geospatial data to examine risk for alcohol-related problems. Alcohol Res. 2014; 36:29–38. [PubMed: 26258998]
13. Nelson SE, Van Ryzin MJ, Dishion TJ. Alcohol, marijuana, and tobacco use trajectories from age 12 to 24 years: Demographic correlates and young adult substance use problems. Dev Psychopathol. 2015; 27:253–77. [PubMed: 25017089]
14. Agrawal A, Budney AJ, Lynskey MT. The co-occurring use and misuse of cannabis and tobacco: a review. Addiction (Abingdon, England). 2012; 107:1221–33.
15. Badiani A, Boden JM, De Pirro S, Fergusson DM, Horwood LJ, Harold GT. Tobacco smoking and cannabis use in a longitudinal birth cohort: evidence of reciprocal causal relationships. Drug Alcohol Depend. 2015; 150:69–76. [PubMed: 25759089]
16. Chun TH, Spirito A, Hernandez L, Fairlie AM, Sindelar-Manning H, Eaton CA, et al. The significance of marijuana use among alcohol-using adolescent emergency department patients. Acad Emerg Med. 2010; 17:63–71. [PubMed: 20078438]
17. Palmer RH, Young SE, Hopfer CJ, et al. Developmental epidemiology of drug use and abuse in adolescence and young adulthood: evidence of generalized risk. Drug Alcohol Depend. 2009; 102:78–87. [PubMed: 19250776]
18. Oliveira LG, Alberghini DG, Santos B, Andrade AG. Polydrug use among college students in Brazil: a nationwide survey. Rev Bras Psiquiatr. 2013; 35:221–30. [PubMed: 24068301]
19. Earleywine M, Newcomb MD. Concurrent versus simultaneous polydrug use: prevalence, correlates, discriminant validity, and prospective effects on health outcomes. Exp Clin Psychopharmacol. 1997; 5:353–64. [PubMed: 9386962]
20. Marzell M, Bavarian N, Paschall MJ, Mair C, Saltz RF. Party characteristics, drinking settings, and college students' risk of intoxication: a multi-campus study. J Prim Prev. 2015; 36:247–58. [PubMed: 25976418]
21. Paschall MJ, Saltz RF. Relationships between college settings and student alcohol use before, during and after events: a multi-level study. Drug Alcohol Rev. 2007; 26:635–44. [PubMed: 17943524]
22. Lipperman-Kreda S, Mair CF, Bersamin M, Gruenewald PJ, Grube JW. Who drinks where: youth selection of drinking contexts. Alcohol Clin Exp Res. 2015; 39:716–23. [PubMed: 25778102]
23. Kelly AB, Chan GC, White A, Saunders JB, Baker PJ, Connor JP. Is there any evidence of changes in patterns of concurrent drug use among young Australians 18–29 years between 2007 and 2010? Addict Behav. 2014; 39:1249–52. [PubMed: 24813551]
24. Barnwell SS, Earleywine M. Simultaneous alcohol and cannabis expectancies predict simultaneous use. Subst Abuse Treat Prev Policy. 2006; 1:29. [PubMed: 17034634]

25. Paschall MJ, Lipperman-Kreda S, Grube JW, Thomas S. Relationships between social host laws and underage drinking: findings from a study of 50 California cities. J Stud Alcohol Drugs. 2014; 75:901–7. [PubMed: 25343646]

26. Brown SA, Christiansen BA, Goldman MS. The Alcohol Expectancy Questionnaire: an instrument for the assessment of adolescent and adult alcohol expectancies. J Stud Alcohol. 1987; 48:483–91. [PubMed: 3669677]

27. Radloff LS. The CES-D Scale: A self-report depression scale for research in the general population. Applied Psychological Measurement. 1977; 1:385–401.

28. Flora DB, Chassin L. Changes in drug use during young adulthood: the effects of parent alcoholism and transition into marriage. Psychol Addict Behav. 2005; 19:352–62. [PubMed: 16366807]

29. Chen K, Kandel DB. The natural history of drug use from adolescence to the mid-thirties in a general population sample. Am J Public Health. 1995; 85:41–7. [PubMed: 7832260]

30. Wilkinson AL, Halpern CT, Herring AH. Directions of the relationship between substance use and depressive symptoms from adolescence to young adulthood. Addict Behav. 2016; 60:64–70. [PubMed: 27100470]

31. Rauthmann JF, Sherman RA, Funder DC. Principles of situation research: towards a better understanding of psychological situations. Eur J Pers. 2015; 29:363–81.

Table 1

Descriptive statistics, past month/past 3 month alcohol drinkers (*N*=1538)

	%	Mean (SD)	Range
Past month drinkers[1]	50		
Age	---	23.63 (3.43)	18.00–30.00
Legal age (≥ 21 years)	75		
Male	49	---	---
Education[2]	---	3.34 (.92)	1.00–5.00
Religiosity[3]	---	2.17 (1.10)	1.00–4.00
White	65	---	---
Hispanic	17	---	---
Positive expectancies	---	2.98 (.65)	1.00–4.00
Negative expectancies	---	1.87 (.60)	1.00–4.00
Depression	---	1.49 (.48)	1.00–3.67

[1]50% of the sample drank in the past month, while 50% drank in the past three months but not in the past month.

[2]From less than high school (1) to graduate school, medical school or other post graduate education (5).

[3]From very (1) to not at all (4).

Table 2

Simultaneous use of alcohol, tobacco and marijuana by place, last occasion (%)

	Overall (n=3,315)	Own home (n=695)	Friend's home (n=1,085)	Bar or restaurant (n=841)	Outdoor or public (n=420)
Alcohol only	71.16	69.97	70.60	76.22	65.25
Alcohol and tobacco	12.46	12.38	10.78	14.63	12.62
Alcohol and marijuana	9.59	10.11	11.06	5.47	12.86
Alcohol, tobacco and marijuana	6.79	7.53	7.56	3.69	9.29

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Table 3

Results of multilevel multinomial logistic regression analyses to examine places, social contexts and individual characteristics associated with alcohol simultaneous use, OR (CI)

	Alcohol and tobacco[1]		Alcohol and marijuana[1]		Alcohol, tobacco and marijuana[1]	
	OR (95% CI)	**P**	**OR (95% CI)**	**P**	**OR (95% CI)**	**P**
Event level						
Home[2]	1.41 (0.81, 2.48)	0.22	1.13 (0.65, 1.98)	0.67	1.38 (0.75, 2.55)	0.30
Someone else's home[2]	1.09 (0.63, 1.88)	0.75	1.07 (0.63, 1.83)	0.80	1.03 (0.57, 1.86)	0.92
Bar or restaurant[2]	0.83 (0.47, 1.46)	0.52	0.34 (0.18, 0.62)	<0.001	0.27 (0.14, 0.54)	<0.001
Number of people[3]						
10–19 people	1.25 (0.79, 1.99)	0.34	1.10 (0.69, 1.77)	0.69	1.18 (0.70, 1.99)	0.54
20+ people	0.85 (0.53, 1.35)	0.49	0.68 (0.42, 1.14)	0.13	1.04 (0.62, 1.76)	0.88
% of drunk people[4]						
20–50% were drunk	1.90 (1.18, 3.05)	0.008	1.82 (1.11, 2.97)	0.02	1.65 (0.93, 2.94)	0.09
51%+ were drunk	7.23 (4.25, 12.32)	<0.001	7.11 (4.13, 12.24)	<0.001	12.86 (7.13, 23.18)	<0.001
Drinks refused[5]	1.00 (0.95, 1.06)	0.97	0.81 (0.52, 1.27)	0.36	1.01 (0.95, 1.07)	0.76
Being drunk[5]	1.04 (0.79, 1.38)	0.77	1.17 (0.90, 1.52)	0.25	1.18 (0.89, 1.57)	0.24
Individual level						
Age	1.16 (1.07, 1.27)	<0.001	1.03 (0.94, 1.13)	0.54	1.10 (1.00, 1.20)	0.05
Male	5.05 (2.83, 8.99)	<0.001	3.50 (1.95, 6.30)	<0.001	7.00 (3.75, 13.04)	<0.001
Education	0.30 (0.21, 0.44)	<0.001	0.34 (0.23, 0.49)	<0.001	0.27 (0.18, 0.39)	<0.001
Secularity	1.00 (0.79, 1.28)	0.94	0.63 (0.49, 0.81)	<0.001	0.81 (0.63, 1.06)	0.13
White	1.47 (0.89, 2.41)	0.13	1.43 (0.91, 2.24)	0.12	1.66 (1.07, 2.58)	0.03
Hispanic	0.46 (0.25, 0.84)	0.01	0.77 (0.47, 1.26)	0.29	0.89 (0.56, 1.43)	0.63
Positive expectancies	1.67 (1.09, 2.57)	0.02	1.53 (0.99, 2.38)	0.06	1.72 (1.08, 2.74)	0.02
Negative expectancies	0.28 (0.17, 0.47)	<0.001	0.38 (0.22, 0.63)	<0.001	0.32 (0.18, 0.55)	<0.001
Depression	6.94 (3.75, 12.85)	<0.001	6.47 (3.47, 12.10)	<0.001	11.86 (6.28, 22.39)	<0.001
Past month alcohol use	2.06 (1.15, 3.70)	0.02	2.26 (1.25, 4.10)	0.007	2.51 (1.34, 4.69)	0.004

[1]Compared with alcohol use only events.

[2] Reference group, outdoor areas.

[3] Reference group, fewer than 10 people.

[4] Reference group, fewer than 20% were drunk.

[5] no/yes.

CI, confidence interval; OR, odds ratio.

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Table 4

Results of multilevel multinomial logistic regression analyses to examine places associated with alcohol simultaneous use, using different reference groups, OR (CI)

Substance use	Alcohol and tobacco		Alcohol and marijuana		Alcohol, tobacco and marijuana	
	OR (95% CI)	***P***	**OR (95% CI)**	***P***	**OR (95% CI)**	***P***
Model 1[1]						
Own home	1.41 (0.81, 2.48)	0.22	1.13 (0.65, 1.98)	0.67	1.38 (0.75, 2.55)	0.30
Someone else's home	1.09 (0.63, 1.88)	0.75	1.07 (0.63, 1.83)	0.80	1.03 (0.57, 1.86)	0.92
Bar or restaurant	0.83 (0.47, 1.46)	0.52	0.34 (0.18, 0.62)	<0.001	0.27 (0.14, 0.54)	<0.001
Outdoor place	Reference group		Reference group		Reference group	
Model 2[1]						
Own home	1.70 (1.02, 2.85)	0.04	3.36 (1.89, 5.94)	<0.001	5.04 (2.66, 9.57)	<0.001
Someone else's home	1.31 (0.81, 2.12)	0.27	3.18 (1.86, 5.43)	<0.001	3.76 (2.05, 6.87)	<0.001
Bar or restaurant	Reference group		Reference group		Reference group	
Outdoor place	1.19 (0.68, 2.11)	0.53	2.97 (1.61, 5.45)	<0.001	3.65 (1.85, 7.19)	<0.001
Model 3[1]						
Own home	1.30 (0.85, 1.99)	0.23	1.06 (0.69, 1.63)	0.80	1.34 (0.83, 2.17)	0.23
Someone else's home	Reference group		Reference group		Reference group	
Bar or restaurant	0.76 (0.47, 1.23)	0.27	0.31 (0.18, 0.54)	<0.001	0.27 (0.15, 0.49)	<0.001
Outdoor Place	0.91 (0.53, 1.58)	0.74	0.93 (0.54, 1.60)	0.80	0.97 (0.54, 1.75)	0.91
Model 4[1]						
Own home	Reference group		Reference group		Reference group	
Someone else's home	0.77 (0.50, 1.18)	0.23	0.95 (0.62, 1.45)	0.80	0.75 (0.46, 1.20)	0.23
Bar or restaurant	0.76 (0.47, 1.23)	0.27	0.31 (0.18, 0.54)	<0.001	0.27 (0.15, 0.49)	<0.001
Outdoor place	0.91 (0.53, 1.58)	0.74	0.93 (0.54, 1.60)	0.80	0.97 (0.54, 1.75)	0.91

[1]All analyses included individual- and evet-level characteristics. CI, confidence interval; OR, odds ratio.