

# The Relationship between Alcohol Consumption and Past-Year Smoking Initiation in a Sample of Undergraduates

**Mark B. Reed, Ph.D.**

*School of Social Work, San Diego State University, San Diego, California, USA, and Center for Alcohol and other Drug Studies, San Diego State University, San Diego, California, USA*

**Cameron McCabe, B.A.**

*Center for Alcohol and other Drug Studies, San Diego State University, San Diego, California, USA*

**James E. Lange, Ph.D.**

*AOD Initiatives Research, San Diego State University, San Diego, California, USA*

**John D. Clapp, Ph.D. and Audrey M. Shillington, Ph.D.**

*School of Social Work, San Diego State University, San Diego, California, USA, Center for Alcohol and other Drug Studies, San Diego State University, San Diego, California, USA*

**Background:** Although most young people begin smoking before the age of 18, the results of a growing number of recent studies have shown a sizable minority of college students initiate smoking while in college. Moreover, the use of alcohol by college students has been linked to smoking initiation in some studies in the literature. **Objectives:** The purpose of this study was to examine the association between past-year drinking frequency and past-year smoking initiation among a sample of college students. **Methods:** A total of 1,523 undergraduate students attending a large urban university in the southwestern United States were invited to participate in an Internet study examining college student lifestyles and behaviors. **Results:** The results of a logistic regression analysis indicated a significant association between past-year alcohol consumption and the likelihood of past-year smoking initiation after controlling for respondent race, the past-year use of marijuana, illicit drug use, and prescription drug use. **Conclusions and Scientific Significance:** These results suggest alcohol consumption may serve as an influence on smoking initiation among some college students. These results provide additional support to a growing literature linking alcohol use to smoking initiation in college student populations. Additional research is needed to determine the mechanisms that explain this relationship.

**Keywords:** Alcohol, initiation, smoking

Address correspondence to Mark B. Reed, Ph.D., School of Social Work, San Diego State University, San Diego, CA 92182-4419 USA. Fax: 1-619-594-5991. E-mail: mreed@mail.sdsu.edu

## INTRODUCTION

Although most young people smoke their first cigarette before the age of 18 (1), the results of several studies show a sizable minority of college students in the United States start smoking while in college (2). For example, several recent studies examining the smoking behavior of young adults found that between 8% and 25% of college students report initiating cigarette smoking while in college (3–5). Furthermore, among daily smoking college students, nearly 20% report smoking for the first time after the age of 19 (6).

The increase in smoking prevalence observed in the college student population during the past decade (7–9) coupled with the sizable number of students who report starting smoking in college could be attributed to the increased experimentation observed with substances such as tobacco, alcohol, and other drugs in this population (10). A number of recent studies have documented a strong association between alcohol use and cigarette smoking in college student populations (3, 11, 12); and generally, the results of these studies show students with less smoking experience tend to drink less alcohol (i.e., measures of both quantity and frequency) than students who smoke more frequently. These findings are qualified, however, by empirical investigations demonstrating heavy alcohol use in samples of non-daily college smokers (13, 14).

Emerging evidence also suggests a link between alcohol use and smoking initiation among samples of students who entered college as non-smokers (3, 5, 6). For example, using cross-sectional survey data, Reed and colleagues (3) found that among students who reported not smoking 12 months prior to study

participation, the likelihood of starting to smoke during the past year increased significantly as a function of heavy past-year alcohol consumption. One significant limitation to the results obtained in this study, however, centers on the fact that the actual age of smoking initiation as well as drinking initiation was not known in this study because these questions were not asked of participants. Thus, it is possible students who reported not smoking at all 12 months ago had actually initiated smoking at an earlier age and quit, but relapsed back to smoking within the past year. It is also possible these students tried a cigarette once or twice at a younger age and then started experimenting with smoking again once reaching college, or that participants started smoking before initiating alcohol use.

The results of the studies supporting a link between alcohol consumption and smoking initiation are contrasted with a recent study that failed to find a significant association between alcohol consumption and cigarette initiation (15) in a mid-western college student sample. Thus, the results linking alcohol use to smoking initiation in college students are somewhat equivocal. The potential public health implications associated with increases in college student smoking initiation as well as the equivocal results of studies examining the relationship between alcohol and smoking onset in this population underscore the importance of conducting additional research on this topic.

The purpose of the present study is twofold: 1) to provide additional support linking alcohol consumption to smoking initiation in the college student population, and 2) replicate the results of our earlier study (3) using data collected over a period of 4 academic semesters that included age of onset items for smoking and drinking behaviors. We hypothesized that increased past-year alcohol consumption would be associated with the increased likelihood of smoking initiation for participants who had never smoked a cigarette prior to the 12-month period preceding his or her participation in the study.

## METHOD

### Procedure and Study Sample

Undergraduate students attending a large university in the southwestern United States were invited via e-mail to participate in a cross-sectional Internet-based study examining college student achievement and lifestyles each academic semester between fall 2005 and spring 2007. The data for the present study were combined across all four semesters of data collection. Details of the general study procedures are described elsewhere (3). Because smokers younger than 25 are more likely to be in the early stages of smoking experimentation (16), and given our interest in young adult smokers who initiated smoking within the past year, we limited the sample for the present analysis to participants between the ages of 18 and 24 who reported not smoking 12 months prior to participating in the study.

Of the 15,520 students invited to participate in the study, a convenience sample of 4,172 students completed the questionnaire across the four academic semesters (27% response rate),

yielding sample of 1,667 18–24 year old participants (40%) who were not smoking 1 year prior to participation for inclusion in our study analysis. In a recent meta-analysis on the response rates of Internet-based surveys, Shih and Fan (17) found a mean response rate of 34%; thus, our response was slightly lower than what has been observed in the literature. It is also important to note that 133 (8%) respondents (representing 144 observations) completed the questionnaire in one or more of the survey administration semesters. For the present study we only included a participants' first survey submission for analysis. Thus, the final sample was comprised of 1,523 participants. After completing the online questionnaire, all participants were entered into a sweepstakes-style lottery with prizes ranging from \$25 to \$250.

### Study Measures

The study questionnaire was comprised of core a set of demographic questions as well as items concerning past and current alcohol, tobacco, and other drug use behaviors. Demographic items included questions about the respondent's gender, age, race/ethnicity, and fraternity/sorority membership. All respondents were asked if they had ever smoked a cigarette. Those who ever smoked a cigarette were then asked the age at which they smoked their first cigarette. Never smokers were defined as participants who had never smoked a cigarette in his or her lifetime. Participants who reported starting smoking in the past year were defined as past year initiators (i.e., if chronological age minus age of initiation was  $\leq 1$ ). Thus, the final sample used for the present analysis was comprised of never smokers and past-year initiators.

Participants were also asked several questions concerning their past year drinking frequency and age of first drink. In the fall 2005 and spring 2007 questionnaires, participants were asked about the number of past year drinking occasions with the following response options: 1 = never, 2 = 1–2 occasions, 3 = 3–5 occasions, 4 = 6–9 occasions, 5 = 10–19 occasions, 6 = 20–39 occasions, 7 = 40 or more occasions. One-half of the participants in spring 2006 and all the participants in fall 2006 were asked an open-ended version of the past-year drinking occasion question (i.e., in the past year, how many alcoholic drinks did you consume?). Responses were recoded into the response option categories used for the closed-ended question.

Participants were also asked about their past-year use (1 = never, 2 = 1–2 occasions, 3 = 3–5 occasions, 4 = 6–9 occasions, 5 = 10–19 occasions, 6 = 20–39 occasions, and 7 = 40 or more occasions) of illegal drugs such as marijuana, cocaine, and ecstasy as well as their use of prescription drugs such as Ritalin/Adderall, Soma, and OxyContin. The items measuring past-year use of cocaine and ecstasy and the items measuring prescription drug use were combined into two separate items measuring: 1) illegal drug use and 2) prescription drug use. Response options for the use of marijuana, illegal drugs, and prescription drug were collapsed into 'past-year use' and 'no

use.' Participant race/ethnicity was also recoded into a new variable with the categories of 'white' and 'non-white.'

### Data Analysis

We tested the relationship between past-year alcohol consumption and smoking initiation (relative to never smoking) using logistic regression. We excluded respondents who initiated smoking and drinking within the past year ( $n = 9$ ) because the temporal sequence of initiation could not be discerned. Our model included the same covariates (gender, age, race, fraternity/sorority membership, the past-year use of marijuana, illegal drugs, and prescription drugs) that were included in our earlier study (3). The main independent variable of interest for this analysis was past-year drinking frequency. Model covariates with significant bivariate relationships to past year smoking initiation (see Table 2) were included in the final logistic regression model. Cases with missing values were deleted list-wise from the analysis ( $n = 225$ ), resulting in 1,298 participants included in both the bivariate and logistic regression analyses.

### RESULTS

Table 1 presents the demographics and substance-use descriptive statistics for the study sample. A total of 113 (9%) participants reported initiating smoking within the past year. Table 2 presents the percentage of respondents who initiated smoking in the past year as a function of participant demographics and past-year drug and alcohol use. As observed in the first three columns of Table 2, results of the bivariate analysis showed that participant race, age, marijuana use, illegal drug use, prescription drug use, and past-year drinking frequency were all significantly related to initiating smoking during the past year. Participant gender and membership in a fraternity or sorority was not associated with past-year smoking initiation.

Results of the logistic regression analysis are shown in the last three columns of Table 2. Participant age, past year marijuana use, and drinking frequency were all significantly associated with past-year smoking initiation in the multivariate model. Specifically, every one-year increase in participant age was associated with a 24% decrease in the odds of reporting smoking initiation in the past year. Participants who reported using marijuana in the past-year were more than 3 times more likely to report smoking their first cigarette in the past year relative to non-marijuana users. Lastly, relative to past year alcohol abstainers, participants who reported drinking alcohol on 3–5 as well as on 10 or more occasions during the past year were significantly more likely to report past year smoking initiation. The significant bivariate associations found for participant race as well as for illegal and prescription drug use were not significant in the logistic regression model. The results of the Hosmer and Lemeshow goodness-of-fit test (18) indicated the present model fit the data well ( $\chi^2(8) = 6.08, p = .64$ ).

TABLE 1.  
Sample characteristics.

Characteristic	Percent	N
Gender		
Male	30.1	459
Female	69.9	1064
Race		
Non-white (including Hispanic/Latino)	46.5	693
White	53.5	799
Age		
Mean (SD)	20.4 (1.8)	1523
Fraternity/Sorority membership		
No	91.0	1381
Yes	9.0	136
Past-year drinking frequency		
Never	21.9	298
1–2 occasions	11.8	160
3–5 occasions	10.7	145
6–9 occasions	10.9	148
10–19 occasions	12.0	163
20–39 occasions	14.3	194
40 or more occasions	18.4	250
Marijuana use (past year)		
No	76.0	1138
Yes	24.0	359
Illegal drug use (past year)		
No	97.4	1472
Yes	2.6	39
Prescription drug use (past year)		
No	90.5	1366
Yes	9.5	144

### DISCUSSION

Among the respondents who reported initiating smoking within the past year, our results suggest past-year drinking frequency is an important variable associated with starting to smoke even after controlling for other factors. These findings also replicate the results obtained by Reed and colleagues (3). In contrast to this previous study, however, the present study utilized a much larger sample, and the actual age of first cigarette and age of first drink was known. Thus, the present investigation offers stronger evidence for an association between drinking frequency and smoking initiation than what was obtained in our earlier study and contributes to a growing body of evidence in this area of research.

The results of this study suggest that alcohol may play an important role in the initiation of cigarette smoking among a population of college students who were able to resist smoking

TABLE 2.  
Predictors of past-year smoking initiation.

Variable	Past-Year Smoking Initiation	$\chi^2$		AOR	95% CI		Wald Chi-Square	
Gender								
Male	9.0%			..	..		..	
Female	8.6%	.05	ns	..	..		..	
Race								
Non-white (including Hispanic)	6.0%			ref				
White	11.1%	10.6	**	1.17	.74–1.83	ns	.44	ns
Age								
Mean (SD)	19.7(1.4)	$t = 3.58$	***	.76	.66–.88	***	13.98	***
Fraternity/Sorority membership								
No	10.9%			..	..		..	
Yes	8.5%	.39	ns	..	..		..	
Marijuana use (12 mos.)								
No	4.1%			ref				
Yes	23.5%	110.70	***	3.17	1.96–5.12	***	22.35	***
Illegal drug use (12 mos.)								
No	8.2%			ref				
Yes	26.5%	13.86	***	1.39	.58–3.33	ns	.54	ns
Prescription drug use (12 mos.)								
No	7.9%			ref				
Yes	17.2%	11.68	***	1.07	.58–1.97	ns	.04	ns
Drinking frequency (12 mos.)								
Zero occasions	1.0%			ref				
1–2 occasions	3.9%			3.53	.86–14.47	ns		
3–5 occasions	4.4%			4.50	1.09–18.52	*		
6–9 occasions	4.3%			3.28	.79–13.61	ns		
10–19 occasions	12.3%			9.07	2.53–32.51	***		
20–39 occasions	18.6%			12.57	3.58–44.14	***		
40 or more occasions	16.4%	75.45	***	9.96	2.80–35.46	***	24.16	***

\* $p < .05$  \*\* $p < .01$ , \*\*\* $p < .001$ ,  $N = 1,298$ .

AOR = Adjusted Odds Ratio.

95% CI = 95% Confidence Interval.

a cigarette during early adolescence, particularly when considering the specific social environment in which these behaviors occur. The high prevalence of social smoking (i.e., smoking cigarettes only within social settings in the presence of other people) that occurs within the college environment (19) and the fact alcohol and cigarettes are often used concurrently by college students (3, 20, 21) suggest alcohol consumption among college students occurs within a contextual environment which is supportive of experimenting and/or initiating cigarette smoking (6). This explanation is well suited to models of reduced

cognitive capacity (e.g., Alcohol Myopia Theory) resulting from alcohol intoxication (22, 23). These models propose the likelihood of engaging in risky behaviors, that is, smoking is increased when one is intoxicated because alcohol consumption focuses one's attention on the most salient cues in a given situation. For example, in a college party environment, the contextual cues promoting smoking such as the presence of others smoking may be more salient to the intoxicated non-smoker than cues inhibiting smoking such as beliefs about the health risks of smoking. Therefore, in this example, an intoxicated non-smoker

may experiment with cigarettes in a social environment where alcohol-related smoking is ubiquitous.

The results of several recent laboratory-based studies testing the relationship between alcohol intoxication and smoking behavior among non-daily (occasional) smokers support predictions advanced by alcohol myopia theory. Specifically, participants administered alcohol reported significantly increased urges to smoke a cigarette relative to participants given a masked placebo (24, 25). According to alcohol myopia theory, these findings demonstrate how intoxication may cause a non-daily or occasional smoker to attend to the most salient cues—which in this case may be the conditioned response to smoke—in his or her environment (26). Given these studies were conducted in a laboratory setting, additional research is needed to test the predictions of alcohol myopia theory in natural environments (i.e., college parties), where smoking and drinking behavior is taking place.

In addition to the influence of alcohol on smoking initiation, we also found that the past-year use of marijuana was associated with past-year smoking onset, highlighting the importance drug use may play in relation to smoking initiation in the college student population (27). More generally, this finding also underscores the notion that the college years are a time where experimentation of both legal and illegal drugs is common for many students (10). It is important to note, however, the temporal ordering of marijuana use, and smoking initiation is not clear because we did not ask participants the age when they initiated marijuana use. Future research should focus on the role marijuana may play in the initiation of smoking in the college population.

Although these results suggest a strong association between alcohol consumption and smoking initiation, several limitations should be acknowledged. First, the cross-sectional design of this study precludes making causal statements about the link between alcohol consumption and smoking initiation. However, because all past-year smoking initiators in this study started drinking more than one year prior to the survey, a temporal relationship between drinking and smoking onset can be established. An additional limitation concerns the fact that approximately 9% of our sample did not provide responses to the past-year drinking frequency question; thus it is possible the results we observed for this study could be attributed to a bias in our sample. Because the results of the present study replicate our earlier findings, this explanation is not likely. A second limitation related to the past-year drinking frequency item concerns the introduction of method variance as a result of using open ended response options in the spring and fall of 2006, while close-ended categorical response options were used in the earlier questionnaires. The use of a convenience sample also limits the generalizability of our findings; however, this limitation is somewhat mitigated by the results of other studies using different college samples demonstrating a similar relationship between alcohol and smoking initiation (5, 6). Lastly, the present study did not empirically test possible mechanisms that account

for the relationship between alcohol consumption and smoking initiation. Thus, future studies will need to examine these mechanisms in order to design interventions focusing on the prevention of smoking initiation in college student populations.

### Declaration of Interest

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