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**BEER AND BONGS: DIFFERENTIAL  
PROBLEMS EXPERIENCED BY OLDER  
ADOLESCENTS USING ALCOHOL ONLY  
COMPARED TO COMBINED ALCOHOL  
AND MARIJUANA USE**

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**ABSTRACT**

Alcohol and other drug problems experienced by adolescents who use only alcohol compared to those who use both alcohol and marijuana (A + M) is studied. Using the national longitudinal survey of youth 1994 data, forward multiple regression analyses revealed that impulsivity, A + M use (compared to alcohol-only use), age, sex, religiosity, frequency of substance use were associated with a higher number of behavioral problems. Youth with more alcohol problems were found to be binge drinkers, impulsive, more frequent alcohol users, and nonHispanic. Implications and future research needs are discussed.

*Key Words:* Adolescence; Alcohol and drug problems; Marijuana use; Alcohol use; Co-morbid substance use

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## BACKGROUND

Alcohol and marijuana (A + M) continue to be important public health problems in this country. Use of alcohol and other drugs (AOD) has a negative impact on adolescents on multiple levels including their motivation, cognitive abilities, affective problems, health, and legal difficulties (1). To date, there have been numerous epidemiological and explanatory studies, examining adolescent AOD use. There are few studies, however, examining the co-morbid use of substances and how such use relates to AOD problems. A recent study by Shillington and Clapp (2) reported that among college students, the combined use of the two of the most-widely used drugs—A + M—was a strong risk factor for a number of AOD problems. Alcohol and marijuana users experienced significantly more problems than their single-substance-using counterparts. The authors suggested that preventive efforts should target this subsection of high-risk users. This study examines the issue of combined A + M use among a national sample of adolescents. The study adds to the dearth of literature examining A + M use among adolescents and should have utility for AOD prevention specialists.

### The Epidemiology of Adolescent Substance Use

There have been several studies conducted, documenting the epidemiology of marijuana use among high-school students. Using a longitudinal national sample, Johnston et al. (3) reported that the lifetime prevalence rate for marijuana is 49.7% among high-school seniors. The annual prevalence rate is somewhat lower at 37.8% for high-school seniors, while the 30-day rate is 23.1%. For seniors, the annual prevalence rate for marijuana use increased steadily during the 1990s, and leveled off during the last three years of the 1990s.

Alcohol use is more prevalent than marijuana use. The 1999 Monitoring the Future data indicate that the lifetime prevalence of alcohol use is 80% for seniors with over 62% of seniors reporting drunkenness. The annual prevalence rate for alcohol use among seniors dropped slightly to about 74%, while the annual prevalence rate of drunkenness in the past year was 53.2%. Similarly, the National Household Survey on Drug Abuse reported that in 1998, 15.6% of 12–17 year olds reported binge drinking during the past 30 days and 31.7% of 17–25 year olds reported binge drinking (five or more drinks at a single setting) at least once in the past 30 days (NHSDA, 1998). However, such epidemiological studies do not report the rates of combined use of such substances.

Demographic variables associated with adolescent alcohol use include gender, age, and race/ethnicity. Alcohol use has been found to increase with age,

and males drank more than females (4). In terms of ethnicity, white adolescents drank more than African Americans and Hispanics (4–6). Concerning heavy drinking, Johnston and associates (3) reported more male high-school seniors drank heavily (38%) than did their female counterparts (24%) and the number of occasions of heavy drinking increased with age.

Age of onset for alcohol use is an important predictor of current alcohol use (7–9) and represents a pathway into heavier drinking and other risk behaviors (7). Merrill et al. (10) reported that adolescents who used alcohol before age 13 were four and one-half times more likely to report marijuana use compared to those who begin use later.

Psychological variables associated with AOD use include positive alcohol expectancies (11), unconventionality, poor coping skills (12), rebelliousness, nontraditional values (13,14), self-deviancy (15), risk-taking, depression (16), and self-esteem (6). These variables were found to be positively associated with increased adolescent AOD use. Similarly, Beck and Treiman (17) reported that a combination of social context and peer drinking norms discriminated between problem drinkers and nonproblem drinkers. Iannotti et al. (18) found that adolescents' perceptions of friends' substance use was more important in predicting substance use than the actual use by friends.

The association of peer substance use with individual adolescent use has been a consistent finding for 20 years (13). Donohew et al. (19) reported that in a two-year follow-up study, levels of peer sensation seeking had a direct effect on an adolescent's own use of A + M, two years later. However, it was also found that the adolescent's own level of sensation seeking had only an indirect effect on substance use, two years later.

### **Alcohol and Other Drug Problems**

Interestingly, there is little agreement among researchers concerning the definition of alcohol problems for adolescents (33). Alcohol consumption itself has been conceptualized as a problem for adolescents in several studies, often with the rationale that alcohol consumption is illegal for adolescents (33). Consistent with studies of young adult populations (20–22), some adolescent studies have conceptualized alcohol-related problems as social, educational, and legal consequences resulting from alcohol use (23). Hays and Ellickson (33) noted that there is a great deal of variation in measures both within adolescent alcohol studies and between adult and adolescent alcohol studies. As they noted (p. 297): "Drinking levels that may cause little or no problem for adults may be dangerous for adolescents, who typically have lower body weight, less drinking experience and less well-defined judgment."

Marijuana use also has been found to be independently associated with problem behaviors among adolescents. Brook et al. (24) found that early onset of marijuana use among adolescents was associated with not graduating from high school, delinquency, having multiple sex partners, perceiving drugs as not harmful, associating with more peers with deviant behaviors. Any lifetime use of marijuana has been found to be associated with both experimental and regular alcohol use for both male and female adolescents (25).

Marijuana has been found to be an illicit substance that is used consistently over time (26) and also has been a gateway drug to the use of other illicit substances (27). Marijuana users who begin use before age 14 were found to be over seven times more likely to report using other drugs compared to those who use at a later age (10). While, religiosity has been found to be negatively associated with alcohol use (13,28), its association with marijuana use has not been studied.

Surprisingly, no research was found that examined the combined effects of A + M, as they relate to AOD problems experienced by the adolescents. In a study comprising college students, Shillington and Clapp (2) found that the combined use of A + M as compared to alcohol-only (AO) use resulted in an increased risk for a number of negative consequences. Given the association of alcohol drinking and marijuana use noted elsewhere (10,13,18,27), an examination of the relationship between reported problems and poly-drug use seems warranted. The present study contributes to literature by further examining this issue. Specifically, the authors address the following research questions:

- (1) Are there differences in behavior problems reported by adolescents who use AO and those who use both A + M?
- (2) Are there differences in alcohol-related problems reported by adolescents who use AO compared to those using both A + M?
- (3) If there are differences, how much variance in problem behaviors is accounted for by A + M use when controlling for other risk and protective variables.

## METHODS

### Sample

The data for this study are obtained from the national longitudinal survey of youth (NLSY), conducted in the United States, which used a multistage stratified random sampling technique. The original sample interviewed 5828 females and 5578 males, aged 14–21, with an over-sampling of Blacks and Hispanics. These youth have been interviewed annually since 1979 with a retention rate at 12-year follow-up of 90.5% (34). Beginning in 1986, the study protocol was expanded to

include the children of the female respondents. These children, however, were born to young mothers and therefore are not a national representative sample of children.

Since 1986, children aged 10 and older were interviewed and age-eligible children have completed this instrument every two years. In 1994, a new child supplement was added to the protocol. Youth aged 15 and older responded to the survey entitled the young adult survey (YAS). The YAS asks questions regarding alcohol and other substance use, sexual activity, delinquent activities, and friend affiliations. The sample for this study consists of adolescents aged 15 and older by 1996. The authors limited this sample to older adolescents aged 15–21 due to the legal issues involved in obtaining and using alcohol. The alcohol question queries use during the past year, thus those aged 21 could have used before the legal age limit.

### Measures

In order to study the association between past-year problems reported by the adolescents and the two patterns of substance use, single and combined use variables were created. All youth who reported alcohol or marijuana use during the past year were included. Those who reported the use of both substances were categorized as A + M users (coded 1) and those who were alcohol only users were the second group (coded 0). Each individual's self-reported problem behavior is listed in Table 2.

Other variables included in these analyses include sex (males coded 1), ethnicity including Black, Hispanic, non-Black, and non-Hispanic. Two religiosity variables were included—religious attendance (never, less than once a month, and more than once a month) and importance of religion (four-point scale of not at all important to very important). Satisfaction with school as coded at very or somewhat dissatisfied (coded 0) and somewhat to very satisfied (coded 1).

Several variables were included for this study driven by the findings in the literature. The first was a measure of self-esteem. Youth were asked 10 questions making up a short scale for the Rosenberg self-esteem scale, to which the youth could strongly agree, agree, disagree, or strongly disagree. Item reversals were conducted wherever necessary and a summary score was created. The scale has proven to have strong internal consistency with reliability coefficients ranging from 0.87 (29) to 0.94 (30).

The Perlin Mastery Scale was used which measures self-concept and perceptions of self, being in control of forces that impact their lives (NLS Users Guide, 1999). The seven-item scale was developed by Perlin et al. (31) in which youth responded to a statement as to whether they strongly agree, agree, disagree,

or strongly disagree to a statement as it relates to them. This scale was reverse coded as necessary and then the summative scale was created.

The impulsivity scale was created by summing the number of agreements to six questions, which included: often does things without thinking, planning takes the fun out of things, uses self-control to keep out of trouble, enjoys taking risks, enjoys new/exciting experiences, believes life without danger is dull.

Substance-use variables included lifetime frequency of marijuana use with coding ranging from 1–7 where 1 was for 100 times or more, 2 for 50–99 times, 3 for 11–49 times, 4 for 6–10 times, 5 for 3–5 times, 6 for 1–2 times, and 7 for never used marijuana. This was reverse coded such that an increasing score will reflect increasing problems. The frequency of alcohol use was for the past year and was coded 9 for daily use, 8 for 3–6 days/week, 7 for 1–2 days/week, 6 for several times/month, 5 for 1–2 times/month, 4 for every other month or so, 3 for 3–5 days past year, 2 for 1–2 days past year, and 1 for no alcohol use in the past year. The age at onset of use for both substances was the actual age of first use. The number of friends, the youth “hangs-out” with those who drink alcohol was coded 0 for none, 1 for a few, 2 for half of the friends, 3 for most of the friends, and 4 for all of the friends.

A summary variable of the youths’ social environment was included, which asked the youth for their impressions on a number of characteristics of their neighborhood. This summative variable reflected youths’ perceptions of whether: (1) whether people in their neighborhood do not respect the law, (2) whether crime and violence is a problem, (3) whether the neighborhood is run down, (4) whether there are enough police, (5) whether there is enough public transportation, (6) whether children are supervised, (7) whether people do not care about others, and (8) whether neighbors cannot find a job. Each item was coded as 1 for a big problem, 2 for somewhat, and 3 for not a problem. A scale was created summing the neighborhood items.

Youth were queried regarding various problem behaviors they have been involved in during the past year. One set of problems queried 17 (see Table 2 for list of all problem behaviors) general behavioral problems with a possible range of 0–17. The second set of problem behaviors examined, were those that happened while drinking alcohol, which ranged from 0–14. In the bivariate analyses, these problems were examined individually and cross-tabulated with the poly-substance-use variable with Chi-square values reported. For each problem behavior, not reporting the behavior was coded 0 and reporting the behavior was coded 1.

Continuous variables included age, family income, age at onset of alcohol use and age at onset for marijuana use, frequency of use for alcohol and marijuana, and number of peers who drink alcohol. A summary variable was created for the behavior problems and the alcohol-related problems with the variable adding one for each positive response to each set of questions. Analysis of variance (ANOVA) was conducted to test if there were significant differences

between the AO users and the A + M users on the continuous problem variables. The Chronbach's coefficient alpha for behavior problems was 0.84 and the alpha for the alcohol-related problems variable was 0.85.

When examining results from the zero-order correlation matrixes for multicollinearity, it was found that no variable had a correlation above 0.50. Variables with a correlation with the summative behavior problem variable between 0.30 and 0.38 were positive correlations indicating an association with higher impulsivity, A + M use, higher frequency of alcohol use, and binge drinking. Similarly, the zero-order correlations were examined for the summative alcohol problems variable with only frequency of alcohol use having a positive correlation above 0.30.

On the basis of the bivariate analyses, ordinary least squares multiple regression analyses were conducted using the A + M user data to determine the linear combination of predictor variables that best explains the variance in the summative self-report problem indexes.

## RESULTS

The descriptive, individual, and substance-use variables are presented in Table 1. This was a sample of approximately equal proportions of males and females, which was ethnically diverse with 43% being Black and 22% being Hispanic. The sample had a mean age of 17.06 years; a mean family income of \$34,220 and the adolescents had a mean education of about a second year in high school (9.81 years).

Two religiosity and one school variable were included in the analyses. It was found that over half of the adolescents were very or somewhat satisfied with school and for about a third, satisfaction with school was not applicable. Thirty-five percent of the adolescents attended religious services at least once a month and just over 16% reported that religion was fairly unimportant or not important at all to them.

Table 1 also reports the substance-use variables for this sample. Forty-two percent of the sample reported they had used alcohol during the past 12 months and nearly 22% reported using marijuana during the past year. When the A + M-use variable was created, it was found that of those adolescents who reported using either alcohol or marijuana or both, 56.5% reported using alcohol only (AO) and 43.5% reported using A + M during the past 12 months.

### Bivariate Analyses

The following analyses were limited to the 676 adolescents who reported using alcohol and/or marijuana during the prior 12 months. Table 2 reports the

*Table 1.* Descriptive Data for the Children of the National Longitudinal Survey of Young Adults 15 Years and Above (*N* = 1612)

	<i>N</i>	Percent (%)
<b>Gender</b>		
Females	832	51.6
Males	780	48.4
<b>Race</b>		
Hispanics	350	21.7
Blacks	697	43.2
Nonblack, nonhispanic	565	35.1
<b>Religious service attendance</b>		
More than once a month	571	35.5
Less than once a month	666	41.4
Never	371	23.1
<b>Importance of religion</b>		
Very important	717	44.6
Fairly important	629	39.2
Fairly unimportant	132	8.2
Not important at all	128	8.0
<b>Satisfaction with school</b>		
Very or somewhat satisfied	961	59.6
Very or somewhat dissatisfied	162	10.1
N/A	489	30.3
<b>Child substance use behaviors</b>		
Past year alcohol use	676	42.0
Past year marijuana use	346	21.5
AO	382	56.5
A + M	294	43.5
<b>Variable</b>		
	Mean (SD)	
Age	17.06 (1.79)	
Education	9.81 (1.62)	
Family income 1996	\$34,220	
No. of behavioral problems	2.62 (3.03) Range 0–17	
No. of alcohol-related problems	1.15 (2.32) Range 0–14	

Chi-square results from the cross-tabulations of the A + M-use variable with sex, ethnicity, and the alcohol-related problems experienced and the behavioral problems experienced during the past 12 months. For the problem variables, in addition to the Chi-square values, odds ratios and 95% confidence intervals are

also presented. As can be seen in this table, the A + M users were more likely to be nonBlack, nonHispanic, followed by Black and then Hispanic youth. No significant differences were found between male and female adolescents for alcohol use compared to A + M use.

The next part of Table 2 presents the reported problems of the past year experienced as a result of alcohol use. Alcohol and marijuana-using youth were significantly more likely to report alcohol-related problem than were the AO using youth. Youth who used A + M were over two-and-a-half times more likely to report being late or missing school, having grades suffer, driving a car while drinking, and not doing necessary things than were the AO users. The variables that had lower, but significant odds ratios included getting into a fight or argument, missing school or work, having problems with family or friends, legal problems, drinking more than intended, finding it hard to stop drinking, hurting self or others, and missing or being late for work. For each of these, the A + M users were about two times more likely to report each of these problems compared to the AO users.

The behavioral problems reported for the past year for the two substance-using groups, the odds ratios, and Chi-square values are reported in the second part of Table 2. All of the behavior problems were found to be significantly higher among the A + M-using group compared to the AO group with the exception of having tried to con someone where the AO users were twice as likely to have done this than the A + M users. Alcohol and marijuana users were found to be at or more than three times more likely to report eight of the 17 behavior problems. The strongest of these eight problems was having sold or held stolen goods where the A + M group was nearly seven times more likely to report this compared to the AO group. The other seven problems included damaging property, stolen from a store, stolen something less than and something more than \$50, used force to get money or things, attacked someone to seriously hurt them, and broken into a building. The remaining eight behavior problems were also significantly more likely to be reported by A + M users than alcohol users and their odds ratios ranged from 1.82 to 2.70.

The results from the ANOVA between the A + M-use variable and the continuous variables are reported in Table 3, which includes means, *F* values, and significance levels. Two of the individual level variables were found to be significantly different for the three substance using groups. The A + M-using group was found to attend religious services less often, report that religion is less important to them, and are more impulsive compared to the AO using group. No significant differences were found for mean age, income, self-esteem, satisfaction level with school, impulsivity, or their perception of neighborhood problems.

The second part of Table 3 presents the substance-use variables in which it was found that the A + M-using youth reported a lower mean age at onset for alcohol use. The A + M-using group had a higher frequency of lifetime marijuana

**Table 2.** Chi-Square Results of the Alcohol Only/Alcohol Plus Marijuana-Use Variable and Problems Reported by the Young Adults of the National Longitudinal Survey of Youth 15 Years and Older ( $N = 676$ )

Descriptive variables	Alcohol Only		Alcohol + Marijuana		Odds Ratio (95% C.I.)	Chi-Square Value
	$N$ (%) ( $N = 382$ )	$N$ (%) ( $N = 294$ )	$N$ (%) ( $N = 294$ )	$N$ (%) ( $N = 382$ )		
Male sex	182 (47.64)	157 (53.40)				ns
Ethnicity						
Hispanic	83 (21.73)	92 (31.29)				7.99*
African American	137 (35.86)	95 (32.31)				
Other	162 (42.41)	107 (36.39)				
Alcohol problems—past year						
Fight or argument	89 (23.80)	114 (39.18)			2.06 (1.45–2.92)	18.25***
Missed school/work	52 (13.98)	75 (25.86)			2.15 (1.42–3.24)	14.84***
Problems with teacher	32 (08.63)	39 (13.45)				ns
Problems with family/friends	81 (21.72)	100 (34.48)			1.90 (1.32–2.72)	13.40***
Problems with police	33 (08.85)	52 (17.81)			2.23 (1.37–3.65)	10.80***
Drank more than intended	138 (36.90)	152 (52.78)			1.91 (1.38–2.65)	16.67***
Hard to stop drinking	55 (14.71)	69 (23.71)			1.80 (1.19–2.72)	8.75***
Could hurt self or others	46 (12.30)	70 (24.05)			2.26 (1.47–3.47)	15.71***
Missed/late for school	24 (06.43)	48 (16.49)			2.87 (1.66–4.97)	17.11***
Grades suffered	15 (04.03)	34 (11.68)			3.15 (1.62–6.19)	14.00***
Drove a car while drinking	27 (07.22)	49 (16.90)			2.61 (1.55–4.43)	15.09***
Missed/late for work	24 (06.43)	32 (11.03)			1.80 (1.01–3.25)	4.46*
Did not do necessary things	44 (11.76)	82 (28.18)			2.94 (1.92–4.50)	28.71***

Behavior problems—past year					
Skipped school	174 (46.15)	195 (67.47)	2.42 (1.71–3.37)	30.10***	
Damaged property	47 (12.50)	96 (32.88)	3.43 (2.28–5.17)	40.56***	
Fight at school/work	93 (24.67)	120 (41.24)	2.14 (1.52–3.02)	20.76***	
Stole from a store	58 (15.34)	119 (40.75)	3.79 (2.59–5.56)	54.72***	
Stole something < \$50	32 (08.47)	68 (23.37)	3.30 (2.05–5.32)	28.72***	
Stole something > \$50	17 (04.50)	40 (13.70)	3.37 (1.81–6.03)	17.92***	
Used force to get money or things	13 (03.45)	28 (09.59)	2.97 (1.45–6.18)	10.78***	
Hit or threatened to hit someone	100 (26.53)	140(47.95)	2.55 (1.82–3.58)	32.82***	
Attacked someone to serious hurt	28 (07.41)	61 (20.89)	3.30 (2.00–5.47)	25.99***	
Tried to con someone	68 (18.04)	91 (31.27)	2.07 (1.42–3.02)	15.86***	
Stole a vehicle	17 (04.51)	33 (11.30)	2.70 (1.42–5.17)	10.98***	
Broke into a building	14 (03.70)	34 (11.64)	3.43 (1.73–6.86)	15.61***	
Sold/hold stolen goods	15 (03.97)	65 (22.26)	6.93 (3.74 –13.01)	52.42***	
Helped with gambling	13 (03.45)	20 (06.85)		ns	
Hurt someone enough to need a doctor	36 (09.55)	58 (20.00)	2.37 (1.48–3.80)	14.78***	
Lied about something important	103 (27.32)	145 (49.66)	2.62 (1.87–3.67)	35.79***	
Bring parents to school past year	78 (20.69)	93 (32.18)	1.82 (1.26–2.62)	11.32***	

ns = not statistically significant.

\* $p < 0.05$ .

\*\* $p < 0.01$ .

\*\*\* $p < 0.001$ .

**Table 3.** Represents the Analysis of Variance Test Results of the Alcohol Only/Alcohol Plus Marijuana-Use Variable and Problems Reported by the Young Adults of the National Longitudinal Survey of Youth 15 Years and Older ( $N = 676$ )

Variable	Alcohol Only ( $N = 382$ ) Mean (SD)	Alcohol + Marijuana (294) Mean (SD)	ANOVA Value
<b>Individual variables</b>			
Age	17.54 (01.84)	17.51 (01.84)	ns
Family income	35,783 (63,589)	40,982 (94,715)	ns
Frequency of religious attendance	4.04 (1.57)	4.36 (1.55)	7.28**
How important is religion	1.76 (0.82)	1.99 (1.99)	11.11***
Impulsivity scale	14.97 (3.06)	15.40 (2.78)	3.57*
Rosenberg Self-Esteem Scale	32.62 (4.28)	32.18 (4.46)	ns
Satisfaction with school	1.91 (0.78)	2.03 (0.84)	ns
Perceived problematic neighborhood	21.33 (5.24)	21.19 (5.12)	ns
<b>Substance use variables</b>			
Age at onset of alcohol use	14.05 (2.69)	13.47 (2.44)	8.00**
Age at onset of marijuana use	14.59 (2.67)	14.66 (2.04)	ns
Frequency of marijuana use (lifetime)	5.05 (1.46)	3.17 (1.76)	76.26***
Frequency of alcohol use (past year)	4.10 (1.89)	5.17 (1.99)	51.28***
Number of peers drink alcohol	2.26 (1.21)	2.77 (1.16)	29.43***
<b>Severity variables</b>			
Number of behavioral problems (severity)	2.40 (2.59)	4.79 (3.76)	92.63***
Number of alcohol-related problems (severity)	2.28 (3.78)	4.25 (4.98)	32.72***

ns = not statistically significant.

\* $p < 0.05$ .

\*\* $p < 0.01$ .

\*\*\* $p < 0.001$ .

use than the AO users. Since this is lifetime use, it is possible for AO users to have used marijuana but not to have used it during the past 12 months. On the basis of coding, the range of use—based upon the mean number—indicates that the AO users used marijuana 3–5 times in their lifetime and the A + M users used it between 11 and 49 times. The frequency of alcohol use during the past year was higher for the A + M users as well. On the basis of the coding, the means would indicate that the A + M users were using slightly more than a couple of times a month and the AO users were drinking alcohol every other month on an average. The last substance-use variable is the report on how many friends the respondents hangout who drink alcohol. The A + M users reported a higher mean, which from the coding, indicates that most of their friends drink compared to the AO users who indicated that about half of their friends drink alcohol.

Analyses of variance were conducted for the two severity variables. These were the two summative variables created by counting the number of problems reported by each youth. As can be seen, the A + M-using group reported a significantly higher mean number of behavior problems (4.79 vs. 2.4) and a higher mean number of alcohol-related problems (4.25 vs. 2.28).

### Multiple Linear Regression

Once it was clear that A + M users had higher reports of problems during the past 12 months while controlling for other significant variables. To this end, forward entry multiple ordinary least squares regression was used. The dependent variable for the first model was the summative variable for behavior problems and the second model had the summative alcohol problems variable as the dependent variable. Demographic variables were entered first (age, ethnicity variables dummy coded, gender) followed by the A + M-use variable, the two religiosity variables, impulsivity, and the substance-use variables (binge drinking, age of onset for marijuana and for alcohol use, frequency of use of each substance, and the number of peers who drink alcohol).

The diagnostic statistics for both models were examined for measures of model fit, multicollinearity, and autocorrelation. The diagnostic tests indicated that multicollinearity and autocorrelation were not present in either model. The Durbin–Watson D statistic was 1.9 for the alcohol-problems model and 2.1 for the behavior-problems model. The tolerance measure ranged from 0.66 to 0.83 and variance inflation measures were 1.1–1.5 for the alcohol-problems model. For the behavior-problems model, it was found that the tolerance measures ranged from 0.73 to 0.89 and the Variance Inflation measures ranged from 1.2 to 1.4.

The results for the regression model with behavior problems as the dependent variable are presented in Table 4. As can be seen, the adjusted  $R^2$  was good, at 0.42 and the overall model  $F$  value was 20.46 significant at  $p < 0.0001$ .

**Table 4.** Associations Between Problem Behaviors Using Multiple Linear Regression with Forward Entry of Demographic, Individual, and Substance Use Variables

Variable	$R^2$	$R^2$ Change	Standardized Beta	Unstandardized Beta
Impulsivity	0.17	0.17	0.26	0.36***
Alcohol and marijuana use	0.26	0.09	0.21	1.91***
Sex	0.32	0.06	-0.19	-1.38***
Younger age	0.37	0.05	-0.26	-0.49***
Importance of religion	0.41	0.03	-0.16	-0.62***
Frequency of marijuana use	0.43	0.02	0.12	0.24**
No. peers who drink	0.44	0.01	0.10	0.32*

Model  $F = 20.46$ ,  $p < 0.0001$ .

Adjusted  $R^2 = 0.42$ .

Probability of  $t$  value: \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

The greatest amount of variance was accounted for by the impulsivity variable (standardized beta = 0.26), followed by the A + M-use variable, which added 9% to the variance explained in the model. Other variables that remained in the model were younger age, sex, religiosity, frequency of marijuana use, and the number of friends who drink. The directionality of the betas indicate that youth reporting more behavior problems were those who were more impulsive, used A + M, were younger, male, and less religious.

The final model presented is the multiple-regression model predicting the number of alcohol problems reported by these youth and the results are presented in Table 5. The overall model  $F$  value was 11.84, significant at  $p < 0.0001$ , with

**Table 5.** Associations Between Alcohol-Related Problems Using Multiple Linear Regression with Forward Entry of Demographic, Individual, and Substance-Use Variables

Variable	$R^2$	$R^2$ Change	Standardized Beta	Unstandardized Beta
Binge drinking	0.13	0.13	0.20	0.01***
Frequency of alcohol use	0.17	0.04	0.14	0.21***
No. peers drinking	0.20	0.03	0.10	0.27**
Impulsivity	0.21	0.02	0.13	0.14*

Model  $F = 11.84$ ,  $p < 0.0001$ .

Adjusted  $R^2 = 0.23$ .

Probability of  $t$  value: \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

an adjusted  $R^2$  of 0.23. The variable that accounted for the most variance in this model was binge drinking which added 13% to the  $R^2$  and was followed by the frequency of alcohol use (standardized beta = 0.14) and the number of friends who drink (standardized beta = 0.10) and finally impulsivity (standardized beta = 0.13). The results would indicate that youth who report higher problems while drinking alcohol tend to be binge drinkers, with higher impulsivity, who use alcohol more frequently, and have many friends who drink.

### DISCUSSION

This study examined relationships among alcohol use, marijuana use, demographic variables, several other individual characteristics, and self-reported substance-use problems using data from the NLSY. More specifically, the study sought to determine how the combined use of A + M related to self-reported behavioral problems and alcohol problems. As noted earlier, the combined use of A + M has been rarely studied within the young adult and adolescent populations; however, preliminary evidence (2) suggests that this substance-use pattern is associated with an increased risk for a number of self-reported problems.

The results of this study suggest that A + M users are more likely to report behavioral problems than their single-substance using counterparts. Our multivariate analyses suggest that this relationship remains fairly strong, even after accounting for other demographic predictors, psychological attributes like impulsivity and binge-drinking behavior.

However, when examining drinking problems, A + M use did not contribute to the final model. This finding is in contrast to Ref. (2) wherein it was found that combined A + M use was a risk factor for alcohol-related problems among college students. Binge drinking was the strongest predictor of alcohol-related problems. As expected, frequency of marijuana use was positively associated with problem behaviors in the multivariate models.

Although interesting, the present findings must be viewed in light of some limitations. First, the present study's secondary analytic design precluded variables that could have added to our understanding such as availability of the substances. To this end, variables of interest were unavailable for analysis. For instance, availability (i.e., price, access) of alcoholic beverages would be important to understand. In addition, the study would have been benefited by inclusion of variables measuring more specific frequency of use measures and alcohol content of beverages consumed. Another limitation is related to the sampling. This dataset has an over-representation of both Black and Hispanic youth. The value of this was having a sufficient sampling of these ethnic groups for analysis. However this over-representation precludes the generalization of these findings to the general population.

### Future Research and Implications

Additional research is needed to understand better how A + M use contributes to substance-related problems. On the basis of our findings, there are differences between those who use AO compared to those who use A + M. This is particularly interesting when the dual substance-using group is found more likely to report behavioral problems but not alcohol-related problems. This points to the possibility that there are significant differences between youth who choose to use only one substance compared to those who choose to use A + M. Especially important, is that our data reveal that the alcohol users who also use marijuana are experiencing difficulties in their lives outside of the times they use alcohol. Further that problems experienced in conjunction with alcohol use are experiences by those who use AO point to different behavioral patterns of the two groups.

One possible approach would be to expand the classification of problems. In the present study, we used a summative index that included several acute problems and a few items that might reflect a more chronic substance-use problem (i.e., hard to stop drinking, problems with friends or family). Future studies might examine how A + M use relates to indicators of addiction.

As previously found, impulsivity was also related to both alcohol and behavior problems (16). Future studies might examine further the relationships between impulsivity, marijuana use, alcohol use, and problems using a causal-modeling approach. It is interesting to note that the age of onset for A + M use did not contribute to the multivariate models. Similarly, the quality of life for the neighborhood variable and the self-esteem scales did not contribute to the models. These findings are in contrast to earlier studies (6) and warrant further examination in future research.

The findings of this study suggest that behavioral problems and alcohol-related problems have different underlying predictors. Prevention efforts targeting these unique problems will likely require separate strategies. For instance, efforts to reduce behavior problems might best target younger males and focus on strategies to reduce impulsivity. Such efforts would benefit from addressing substance-use issues, but these issues appear to be ancillary to impulsivity. In contrast, prevention efforts with the goal of reducing alcohol-related problems should focus on binge drinking as well as impulsivity. For these problems, peer use and frequency of use are also important factors to be addressed. In addition, the results of the present study suggest that preventive efforts should be targeted at younger adolescents.

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