Adolescent Substance Use Following Participation in a Universal Drug Prevention Program: Examining Relationships with Program Recall and Baseline Use Status

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Abstract

Background—We examined whether adolescents receiving a universal, school-based, drug-prevention program in grade 7 varied, by student profile, in substance use behaviors post-program implementation. Profiles were a function of recall of program receipt and substance use at baseline.

Methods—We analyzed data from the Adolescent Substance Abuse Prevention Study, a large, geographically diverse, longitudinal school-based cluster-randomized controlled trial of the *Take Charge of Your Life* drug-prevention program. Profiles were created using self-reported substance use (pre-intervention) and program recall (post-intervention) at Grade 7. We first examined characteristics of each of the four profiles of treatment students who varied by program recall and baseline substance use. Using multilevel logistic regression analyses, we examined differences in the odds of substance use (alcohol, tobacco, and marijuana) among student profiles at the six additional study waves (Time 2 (Grade 7) through Time 7 (Grade 11)).

Results—Pearson's chi-square tests showed sample characteristics varied by student profile. Multilevel logistic regression results were consistent across all examined substance use behaviors at all time points. Namely, as compared to students who had no baseline substance use and had program recall (No Use, Recall), each of the remaining three profiles (No Use, No Recall; Use, Recall; Use, No Recall) were more likely to engage in substance use. Post-hoc analyses showed

that for the two sub-profiles of baseline substance users, there were only two observed, and inconsistent, differences in the odds of subsequent substance use by recall status.

Conclusions—Findings suggest that for students who were not baseline substance users, program recall significantly decreased the likelihood of subsequent substance use. For students who were baseline substance users, program recall did not generally influence subsequent substance use. Implications for school-based drug prevention programs are discussed.

Keywords

adolescents; substance use; program recall

INTRODUCTION

Substance use in the adolescent population remains a critical public health problem. According to results from the 2013 *Monitoring the Future* study, the percentage of grade eight students who engaged in past-30 day use of alcohol, marijuana, and cigarettes was 10.2%, 7.0%, and 4.5%, respectively.[1] For grade 12 students, these percentages increase to 39.2%, 22.7%, and 16.3%, respectively.[1] These prevalence estimates are cause for concern because early initiation of substance use is associated with future problematic substance use,[2] early initiation of sexual activity,[3] and adverse effects on neurodevelopment,[4,5] academics,[5,6] and relationships;[5] early intervention is, therefore, critical. Given the funding provided to a large percentage of school districts via the Safe and Drug-Free Schools program,[7] as well as the fact that schools serve a large number of youth in a concentrated setting, schools are an ideal setting for delivering substance use prevention programming to youth.[8] Due to the variation with which school-based prevention programs have succeeded in delaying the initiation of substance use, the goal of our study was to understand the influence of one universal, school-based, drug prevention program on students who received the program early in adolescence (grade 7) but varied by recall of program receipt and baseline substance use.

School-Based Drug Prevention Programs

School-based drug prevention programs, with strategies that range from didactically providing drug information to interactively developing psychosocial skills, have varied in their ability to prevent, reduce, and/or delay adolescent drug use. [e.g., 8–15] In a meta-analysis of 207 universal school-based drug prevention programs implemented from 1990–1998, Tobler et al.[12] calculated a weighted mean effect size of 0.05 for non-interactive and 0.15 for interactive programs. In a meta-analysis of 11 Project D.A.R.E. studies taking place from 1991 to 2002, West and O'Neal[14] reported effect sizes ranging from negative to positive, and the weighted mean effect size of 0.01 was non-significant. Lastly, in their systematic review of drug prevention programs targeting youth and young adults that had been evaluated since 1980, Werch and Owen[13] retrieved 17 studies that reported iatrogenic effects (e.g., increased substance use); 13 of these evaluated prevention programs were school-based.

Program Moderators

Given the range of effect sizes observed for school-based substance use prevention programs, it is important to explore variables that may moderate subsequent substance use by students who receive prevention programming; doing so may guide future program development as well as evaluation efforts. Two potential variables whose interaction has, to our knowledge, yet to be examined are program recall (referred to as "recall" from this point forward) and baseline substance use. This paper examines whether students receiving a school-based drug prevention program early in adolescence (i.e., grade 7) who differed in their recall and baseline use status had different odds of substance use at multiple follow-ups throughout adolescence.

Recall—Relatively unexamined in the school-based substance use prevention literature, recall (i.e., self-reported exposure) has a demonstrated association with adolescent substance use in media literature. Using data from the nationally representative Partnership Attitude Tracking Survey, Block et al.[16] found recall of anti-drug advertising to be associated with lower probability of marijuana and cocaine/crack use by adolescents. Evaluation of the National Youth Anti-Drug Media Campaign, a four-wave panel study, suggested an iatrogenic effect as increased recall of advertisement exposure at time three was associated with greater marijuana initiation at time four; [17,18] however, methodological limitations of the evaluation have been noted.[18] A more recent study combined Monitoring the Future substance use data and Nielson Media Research data for 12–17 year old viewers from 1995 to 2006; among middle school students, recall of anti-drug ads was associated with total anti-drug advertising exposure, which was significantly associated with marijuana use disapproval and marginally inversely associated with odds of marijuana use.[19] Therefore, it is possible that recall of substance use prevention messages provided in school-based programming could moderate the relationship with subsequent substance use (e.g., by influencing attitudes, beliefs, and self-efficacy, which are proximal to the behavior). As such, inclusion of recall status in evaluations of school-based drug prevention programming is warranted.

Baseline Substance Use Status—To date, literature on school-based drug prevention programs has examined the role of baseline use status on program effects in studies with experimental designs. As discussed by Gottfredson and Wilson[20] in their meta-analysis of school-based prevention programs, the mean effect size for the five cognitive-behavior programs targeting high-risk youth (e.g., youth with prior substance use) was greater than the mean effect size for the 39 similarly focused programs targeting the general population (i.e., effect sizes of 0.20 and 0.05, respectively). Although these results suggest the utility of targeted interventions, one randomized controlled trial of a substance use program delivered specifically to high-risk youth (i.e., Project SUCCESS) found no difference in substance use at one-year follow-up between treatment and control students.[21] In the European Drug Abuse Prevention study, a randomized controlled trial examining the impact of a universal school-based substance use prevention program, students in the intervention classified as baseline nonusers of alcohol were less likely to engage in frequent alcohol use at the 18-month follow-up, as compared to similar students in the control group.[22] Research on the role of baseline use status on the subsequent substance use of students *within* the treatment

condition, however, is more limited and, therefore, warrants further examination. This is particularly true as funding limitations may hinder the ability to evaluate programs using experimental design.

Purpose

We aimed to determine whether students receiving a universal and school-based drug prevention program in grade 7 who vary as a function of recall *and* baseline substance use differ on their subsequent substance use behaviors. Data come from the Adolescent Substance Abuse Prevention Study (ASAPS), which evaluated the school-based substance use prevention program, *Take Charge of Your Life* (*TCYL*). The ASAPS was a five-year, cluster-randomized, geographically diverse trial that followed students from grades 7 to 11.[23,24] To date, the interactive roles of recall *and* baseline substance use on outcomes in the ASAPS have not been examined.

For a program such as *TCYL*, examining the interaction of program recall and baseline substance use could be particularly insightful. This is because the *TCYL* program was designed to influence mediators of behavior, including attitudes towards a behavior, normative beliefs, and refusal skills.[25] According to theories such as the Theory of Planned Behavior, [26] influencing these beliefs should influence behavioral intentions, which should influence behavior. For students who have not yet engaged in substance use, recall of the *TCYL* program should be associated with lower subsequent substance use because students with recall should be more likely to develop these aforementioned attitudes and beliefs (e.g., because they may be more engaged in the program and its content). These intended impacts on attitudes and beliefs should result in decreased intentions to engage in substance use, and, therefore, less actual substance use. Contrarily, students who have already initiated substance use prior to program receipt may have established attitudes and beliefs that contradict messages delivered in the *TCYL* program; these students may benefit more from an early intervention program capable of altering pre-existing attitudes and beliefs, as opposed to a prevention program such as *TCYL*. Examining the interactive nature of recall and baseline substance is, therefore, a contribution to the field as findings may provide additional information on mechanisms of prevention program impact.

We focus on profiles of students in the treatment group defined by recall and baseline use status, and examine differences in substance use at follow-up by student profiles. In light of the aforementioned research, [e.g., 16, 22, 25, 26] we hypothesized the lowest likelihood of substance use at follow-up would be amongst the group of students who had program recall and no history of substance use at baseline.

METHODS

The ASAPS study was funded by the Robert Wood Johnson Foundation and monitored by the University of Akron's Institutional Review Board (the Principal Investigator's institution during the study). The de-identified dataset was made available for public use by the Inter-University Consortium for Political and Social Research.[24] Cluster and demographic data not available in the public dataset were provided by the ASAPS Principal Investigator. A

detailed discussion of the *TCYL* curriculum and study methods are presented elsewhere. [e.g., 23, 25]

The Intervention

The *TCYL* program focused on correcting adolescents' substance use normative beliefs, discussing the harms related to substance use, and assisting youth in developing the social skills needed to resist drug use.[23,27] The program curriculum was interactive in nature, delivered by *TCYL*-trained Drug Abuse Resistance Education police officers, and consisted of 10 developmentally-appropriate lessons in grade seven and a booster of seven lessons in grade nine.[23] Each lesson was approximately 35 to 40 minutes, and all lessons were generally delivered over a two-week period (Z. Sloboda, personal communication, January 24, 2013). Attendance records showed students in treatment schools were present on days when the *TCYL* lessons were administered. [28]

Participants

As reported previously, [23] students participating in the ASAPS attended one of 83 school clusters (high schools and their feeder middle schools) located in six large cities (i.e., Detroit, Houston, Los Angeles, Newark, New Orleans, and St. Louis). School clusters were randomly assigned to treatment or control (i.e., "business-as-usual") status. Parental consent was provided for 11,314 treatment students; at the grade 11 follow-up, the number of participating treatment students was 5,756. At baseline (grade 7), 10,028 treatment students completed self-report surveys. The demographic breakdown for the baseline sample was as follows: 44.5% male; 32.8% White, 12.6% African American, 27.8% Hispanic, and had a mean age of 12.4 years.

Procedures

Students completed surveys starting in grade 7 of the 2001/2002 academic year through grade 11 of the 2005/2006 academic year. Data were collected at the following time points: Grade 7 (Time 1 (T1), baseline), Grade 7 (T2, 30–60 days following the Grade 7 *TCYL* intervention), Grade 8 (T3, one year following the Grade 7 *TCYL* intervention), Grade 9 (T4, prior to the *TCYL* booster intervention), Grade 9 (T5, 30–60 days following the Grade 9 *TCYL* booster intervention), Grade 10 (T6, one year following the Grade 9 *TCYL* intervention), and Grade 11 (T7, two years following the Grade 9 *TCYL* intervention). All surveys were administered by university staff without school personnel present.[23]

Current Study

Allocation of funding towards drug prevention made available by the Safe and Drug-Free Schools program[7] severely limits the ability to have a "pure" control group. [e.g., 7,9,12,28] In exploring this issue further in the ASAPS via follow-up interviews, Sloboda and colleagues[28] learned that even if a control school did not implement a drug-prevention program in its entirety during the study period, a large percentage of schools engaged in prevention-related activities (e.g., health education, assemblies, peer programs). As such, the control group in the ASAPS study could not be considered a "pure" control group. With respect to the recall variable in the control group, if a control student did/did not have recall,

the program they did/did not recall is <u>not</u> the *TCYL* program; moreover, the program a control student did/did not recall would vary by control school. Given that our aim was to understand the influence of the *TCYL* program on substance use by student profiles, we examine substance use outcomes for students in the treatment group only.

In the ASAPS, the transition from the middle-school to high-school years was accompanied by exposure to new *TCYL* program material. Given our interest in early intervention, our primary research question related to whether substance use behaviors varied by student profile after implementation of the grade 7 program. For the purposes of this study, therefore, we present results from the T2 to T4 follow-ups as the main analyses, and results from T5 to T7 follow-ups as supplemental analyses.

Measures

Recall, a binary measure (0 = No recall; 1 = Recall) was created using two items. In the Grade 7 post-test survey (T2), students were asked if they had received drug education in the past year. Students were also asked who delivered the drug education. Students indicating that they received drug education in the past year (corresponding with the year *TCYL* was delivered) and that the instructor of their drug education program was a police officer were categorized as having program recall. The variable was created in this manner as it was discovered many treatment schools engaged in prevention-related activities in addition to *TCYL*.[28]

Students were asked whether they had engaged in past 30-day use of alcohol, tobacco, and marijuana, and past two-week high-risk alcohol use. Students who reported engaging in any of these four forms of substance use at T1 were categorized as baseline substance users (0=No use; 1=Use).

Student *profiles* were created based on recall and baseline substance use status. The four profiles possible were: (1) no baseline substance use/program recall (No Use, Recall); (2) No Use, No Recall; (3) Use, Recall; and (4) Use, No Recall. Profiles were assigned to 7,149 students.

The dependent variables encompassed different substance use behaviors. *Alcohol use* was assessed with, "How many times have you had alcoholic beverages to drink during the last 30 days?"; *marijuana use* was assessed with, "How many times have you used marijuana or hashish during the last 30 days?"; and *cigarette use* was assessed with, "How frequently have you smoked cigarettes during the past 30 days?" *High-risk alcohol use* was assessed with, "How many times have you had five or more drinks in a row in the last two weeks?"; the high-risk alcohol use measure allows for us to determine whether students are experiencing intoxication from alcohol, which is to be expected from consuming five or more drinks in a row. Early age intoxication, in turn, is associated with a multitude of negative personal and social outcomes.[e.g. 2–3] Each outcome was categorized as "use" versus "no use".

Control variables included *gender* (1 = male, 0 = female) and *race/ethnicity* (1=White; 2 = Hispanic; 3 = Black; 4 = Other (With "Other" encompassing Asian, American Indian, and Other)).

Analysis

Our *preliminary analyses* used Pearson's χ^2 to test the null hypotheses that race, gender, and substance use at each follow-up would not vary among the four student profiles.

Our *primary analyses* involved multilevel (students within schools) logistic regression analyses at each follow-up for each of the four substance use outcomes (i.e., a total of 12 main (T2–T4) and 12 supplemental (T5–T7) analyses). Controlling for gender and race/ethnicity, these models compared the probability of each student profile engaging in the various forms of substance use at follow-up. Our primary models used the No Use, Recall profile as the reference group. Post-hoc analyses compared the two groups of baseline users who varied on recall status (i.e., Use, No Recall; Use, Recall); analyses focused on these two sub-groups so that differences by recall status could be further examined. The regression analyses were conducted using Mplus version 7.0; with respect to missing data, each two-level model was estimated using maximum likelihood estimators and used all of the available data. Each model was specified such that the profiles had fixed variances within schools and the covariates (i.e., gender and race) were correlated. Correlating the exogenous variables in Mplus allows for full information maximum likelihood estimation, with estimates in general found to be more accurate and less biased than listwise deletion methods of estimation.[29]

RESULTS

Profile Distributions and Description

Student profiles were distributed as follows: 70.18% (n=5,017) of students were in the no baseline substance use and recall (No Use, Recall) profile, 12.41% (n=887) of students were in the No Use, No Recall profile, 13.67% (n=977) of students were in the Use, Recall profile, and 3.75% (n=268) of students were in the Use, No Recall profile. Results from our preliminary χ^2 analyses refuted the null hypotheses (Table 1). Namely, there were statistically significant relationships between student profile and gender, race/ethnicity, and each substance use outcome.

Multilevel Analyses

Results from the multilevel logistic regression analyses, presented in Table 2, were consistent across the four substance use behaviors. In the main analyses (i.e.,T2–T4), the four forms of substance use were all least likely among the No Use/Recall reference group, as compared to the No Use/No Recall, Use/Recall, and Use/No Recall student profiles. The only outcome in the main analyses for which there was no difference between the two groups of students who did not engage in substance use at baseline (No Use, Recall; No Use, No Recall) was Grade 8 marijuana use.

Results from the supplemental analyses were similar to results from the main analyses. In the supplemental analyses (i.e., T5–T7) for alcohol use, the behavior was most likely in the Use, Recall and Use, No Recall profiles, as compared to the No Use, Recall profile; there was no difference in use between the two No Use sub-profiles who varied by recall status. For all remaining substance use behaviors (i.e., high-risk alcohol, marijuana, and cigarette use), the No Use/Recall reference group was least likely to engage in each behavior, as compared to the three remaining student profiles.

Past 30-Day Alcohol Use—As compared to the No Use, Recall profile, each of the three additional student profiles had a higher probability of engaging in alcohol use at the T2 (Grade 7), T3 (Grade 8), and T4 (Grade 9) post-tests. For example, at the Grade 7 post-test, the No Use, No Recall profile (Odds Ratio [OR] = 1.38, p<0.05), Use, Recall profile (OR = 12.42, p<0.01), and Use, No Recall profile (OR = 10.71, p<0.01), each were more likely to engage in alcohol use as compared to the No Use, Recall profile. Post-hoc analyses (results not shown) showed no significant difference in the odds of alcohol use between the Use, Recall and Use, No Recall profiles at the T2 and T4 post-tests. However, at the Grade 8 post-test, students in the Use, No Recall profile were less likely to engage in alcohol use as compared to students in the Use, Recall profile (OR = 0.64, p<0.01).

Past 30-Day Marijuana Use—At the Grade 7 post-test (T2), each profile, as compared to the No Use, Recall profile, had a higher odds of engaging in marijuana use (No Use, No Recall OR = 2.18, p<0.01; Use, Recall = 12.87, p<0.01; Use, No Recall OR = 16.17, p<0.01); these results parallel the T4 post-test. At the Grade 8 (T3) post-test, the difference between the two student profiles with no baseline substance use who differed in recall status was attenuated and reduced to non-significance. At each follow-up, post-hoc analyses showed no significant difference in the odds of marijuana use between the Use, No Recall and the Use, Recall profiles.

Past 30-Day Cigarette Use—The No Use, No Recall (OR = 2.26, p<0.01), Use, Recall (OR = 12.01, p<0.01), and Use, No Recall (OR = 13.27, p<0.01) profiles all had higher odds of engaging in cigarette use at the Grade 7 (T2) post-test, as compared to the No Use, Recall profile; post-hoc analyses showed no significant difference in the odds of cigarette use between the Use, Recall and Use, No Recall profiles. These results were consistent across the Grade 8 (T3) and 9 (T4) post-tests.

Past Two-Weeks High-Risk Drinking—At the Grade 7 (T2) post-test, all profiles, as compared to the No Use, Recall profile, were more likely to engage in high-risk drinking; post-hoc analysis did not reveal significant differences in the odds of high-risk drinking between the Use, Recall and Use, No Recall profiles. Findings from the Grade 8 (T3) and 9 (T4) post-tests paralleled what was observed at T2; for the Grade 9 (T4) post-hoc analysis, however, amongst the two sub-profiles of baseline users, students without recall were more likely to engage in high-risk drinking as compared to students with recall.

DISCUSSION

The purpose of our study was to explore whether program recall and baseline substance use interact to influence subsequent substance use among students who received a universal drug prevention program in early adolescence (Grade 7). Even though all students in our analytic sample received the drug prevention program during Grade 7, [28] four profiles characterized by recall and baseline use status emerged. Not only did these four profiles differ in their demographic representations, but they also differed with respect to subsequent substance use behaviors.

As hypothesized, the lowest risk group was the profile of students who had no history of substance use and who recalled receipt of the *TCYL* program (i.e., the No Use, Recall profile); this result was consistent for all outcomes in supplemental analyses with older adolescents. Even amongst the two profiles of students who had no baseline substance use, in all but one model (grade 8 marijuana use), the probability of subsequent substance use at follow-up was significantly lower among those students who also had program recall; these results were consistent in the supplemental analysis with older adolescents for all outcomes except alcohol use. The importance of recall in this study parallels findings from consumer-based research demonstrating the importance of recall on substance use outcomes. [e.g., 16]

That findings were consistent across time suggests students with greater recall may have had their attitudes, normative beliefs, and refusal skills influenced in the manner intended by the *TCYL* program. As would be proposed by the Theory of Planned Behavior,[26] these students with recall who have not yet engaged in substance use appear to, in turn, have less intention to engage in the various substance use behaviors, as demonstrated by their lower actual substance use.

Results also suggest program recall did not influence subsequent substance use among students already engaging in these behaviors. For two outcomes only (i.e., grade 8 (T3) alcohol use and grade 9 (T4) high-risk alcohol use), substance use differed among baseline users who varied by recall status; these findings were contradictory suggesting that overall, students engaging in substance use at baseline did not benefit from the universal program irrespective of recall status. This finding for the universal *TCYL* program parallels findings for similar programs reported by Gottfreson and colleagues. [20] One plausible reason for this observed relationship, as discussed by Dishion and colleagues,[30] is that programs like *TCYL* that put a great deal of focus on correcting normative beliefs may not be developmentally appropriate for students who are already engaging in high-risk behaviors. Taken together, these results suggest that the program may be beneficial for students who have not yet initiated substance use if they have program recall, but that a need exists for tailored programs, as opposed to a universal program, for high-risk students already engaging in substance use. Programs for these high-risk students may require focusing less on delivering substance use prevention messages, and instead focusing on developing social-emotional and character skills known to be associated with substance use and related mental, emotional, and behavioral problems (e.g., self-control).[31] Moreover, students with substance use experience may benefit from intervention approaches such as Motivational Interviewing

(MI), which has shown promise amongst heavy drinking youth;[32] as opposed to a directive approach, in MI, practitioners meet students where they are in the change process.

Strengths and Limitations

This study is not without limitations. Although the ASAPS included a control group, we excluded the control group from these analyses due to issues previously discussed.[28] As a result, in our analyses, the "control" group was within the treatment condition. As the aim of the paper was to understand the influence of the *TCYL* program on substance use by student profiles, the aim was still achieved. We also examined substance use behaviors from Time 2 (Grade 7) to Time 7 (Grade 11); the longer-term follow-ups (i.e., T5 to T7) occurred after the booster *TCYL* session in grade 9. As such, it is possible that findings in the supplemental analyses were confounded by the booster sessions. With respect to study measures, the high-risk drinking measure was not sex-specific and so is conservative in nature. Additionally, we examined overall program recall, as opposed to recall of specific lesson plans. With respect to the analytic plan, as these analyses were exploratory in nature, we did not control for other factors that have a demonstrated influence on the impact of drug prevention programs, such as fidelity of implementation.[33]

In spite of these limitations, the study has several strengths worthy of highlighting. First, the study addresses a current gap in the prevention literature by simultaneously incorporating the interaction of program recall and baseline substance use into one analysis examining a school-based substance use prevention program. As our hypotheses were, in part, driven by advertising research, results demonstrate the importance of applying findings from related fields to school-based drug prevention studies. Strengths of the ASAPS dataset that we were able to employ include its large sample size and many school clusters. The sample was also geographically diverse. Findings from these analyses, therefore, have greater generalizability as compared to single-site studies. An additional strength of our study relates to how the recall variable was created. Rather than relying on a single item, the recall variable was created to ensure that students were recalling the *TCYL* program. In reviewing the additional programming provided to treatment students during the ASAPS study, it was discovered that in grade 7 and 8, one and two treatment schools, respectively, implemented a gang-prevention program delivered by police officers. Since this program did not focus on substance use, we are confident that the students we classified as "recallers" were indeed recalling the *TCYL* program.

Findings from our study provide multiple directions for future research. First, the findings have implications for program development and evaluation. Namely, researchers should aim to determine how to best maximize student recall, as doing so may lead to greater development of targeted mediators (e.g., beliefs, attitudes, and behaviors). Similarly, understanding why some students lack recall should prove beneficial. For example, examining the association between fidelity of implementation and program recall would be worthwhile. For program evaluators, developing multi-item recall measures (i.e., recall of specific lessons as opposed to general recall) may help in determining strengths and weakness of a multi-component program. Adjusting for recall in outcomes analyses may also provide more accurate representations of whether a program achieved its aims.

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TABLE 1

Sample characteristics by student profiles observed in the Adolescent Substance Abuse Prevention Study.

	Student Profiles (Baseline Substance Use & Program Recall Combinations)			
	No Use, Recall	*No Use, No Recall*	*Use, Recall*	*Use, No Recall*
Variables *(Results from Chi-Squared Test)*	N (%)			
Gender(**)				
Female	2,739 (71.31%)	392 (10.21%)	603 (15.70%)	107 (2.79%)
Male	1,965 (69.83%)	394 (14.00%)	319 (11.34%)	136 (4.83%)
Race/Ethnicity(**)				
White	2,143 (75.83%)	238 (8.42%)	379 (13.41%)	66 (2.34%)
Hispanic	869 (65.14%)	218 (16.34)	183 (13.72%)	64 (4.80%)
Black	365 (64.15%)	92 (16.17%)	89 (15.64%)	23 (4.04%)
Other	734 (72.46%)	133 (13.13%)	119 (11.75%)	27 (2.67%)
Past 30-day Alcohol Use				
Time 2-Grade 7(**)				
No Use	4,581 (77.26%)	760 (12.82%)	457 (7.71%)	131 (2.21%)
Use	354 (34.01%)	81 (7.78%)	492 (47.26%)	114 (10.95%)
Time 3-Grade 8(**)				
No Use	3,272 (78.43%)	523 (12.54%)	284 (6.81%)	93 (2.23%)
Use	865 (53.20%)	174 (10.70%)	495 (30.44%)	92 (5.66%)
Time 4-Grade 9(**)				
No Use	2,524 (78.90%)	388 (12.13%)	237 (7.41%)	50 (36.76%)
Use	921 (59.52%)	171 (11.13%)	359 (23.36%)	86 (5.60%)
Time 5-Grade 9(**)				
No Use	2,141 (78.77%)	347 (12.77%)	175 (6.44%)	55 (2.02%)
Use	1,209 (63.97%)	198 (10.48%)	401 (21.22%)	82 (4.34%)
Time 6-Grade 10(**)				
No Use	2,128 (78.99%)	318 (11.80%)	199 (7.39%)	49 (1.82%)
Use	1,299 (66.48%)	208 (10.64%)	361 (18.47%)	86 (4.40%)
Time 7-Grade 11(**)				
No Use	1,659 (81.89%)	220 (10.86%)	116 (5.73%)	31 (1.53%)
Use	1,364 (69.49%(	208 (10.60%)	327 (16.66%)	64 (3.26%)
Past 30-day Marijuana Use				
Time 2-Grade 7(**)				
No Use	4,850 (73.73%)	810 (12.31%)	738 (11.22%)	180 (2.74%)
Use	100 (23.64%)	39 (9.22%)	215 (50.83%)	69 (16.31%)
Time 3-Grade 8(**)				
No Use	3,877 (74.50%)	631 (12.13%)	560 (10.76%)	136 (2.61%)
Use	265 (45.53%)	58 (9.97%)	211 (36.25%)	48 (8.25%)
Time 4-Grade 9(**)				

| Variables (Results from Chi-Squared Test) | Student Profiles (Baseline Substance Use & Program Recall Combinations) | | | |
	No Use, Recall	No Use, No Recall	Use, Recall	Use, No Recall
	N (%)			
No Use	3,214 (75.91%)	482 (11.38%)	444 (10.49%)	94 (2.22%)
Use	251 (48.08%)	74 (14.18%)	150 (28.74%)	47 (9.00%)
Time 5-Grade 9[**]				
No Use	2,919 (75.80%)	453 (11.76%)	393 (10.21%)	86 (2.23%)
Use	434 (56.88%)	90 (11.80%)	186 (24.38%)	53 (6.95%)
Time 6-Grade 10[**]				
No Use	2,940 (76.64%)	409 (10.66%)	403 (10.51%)	84 (2.10%)
Use	472 (59.60%)	115 (14.52%)	156 (19.70%)	49 (6.19%)
Time 7-Grade 11[**]				
No Use	2,577 (78.90%)	333 (10.20%)	286 (8.76%)	70 (2.14%)
Use	445 (62.32%)	92 (12.89%)	151 (21.15%)	26 (3.64%)
Past 30-day Cigarette Use				
Time 2-Grade 7[**]				
No Use	4,841 (74.12%)	825 (12.63%)	683 (10.46%)	182 (2.79%)
Use	151 (26.26%)	54 (9.39%)	290 (50.43%)	80 (13.91%)
Time 3-Grade 8[**]				
No Use	3,859 (74.58%)	623 (12.04%)	555 (10.73%)	137 (2.65%)
Use	313 (46.30%)	78 (11.54%)	233 (34.47%)	52 (7.69%)
Time 4-Grade 9a[**]				
No Use	3,162 (75.94%)	478 (11.48%)	424 (10.18%)	100 (2.40%)
Use	346 (52.27%)	89 (13.44%)	182 (27.49%)	45 (31.03%)
Time 5-Grade 9b[**]				
No Use	2,968 (75.66%)	460 (11.73%)	402 (10.27%)	92 (2.35%)
Use	398 (56.29%)	85 (12.02%)	180 (25.46%)	44 (6.22%)
Time 6-Grade 10[**]				
No Use	2,899 (76.75%)	424 (11.23%)	370 (9.80%)	84 (2.22%)
Use	558 (60.92%)	106 (11.57%)	198 (21.62%)	54 (5.90%)
Time 7-Grade 11[**]				
No Use	2,466 (78.91%)	332 (10.62%)	272 (8.70%)	55 (1.76%)
Use	579 (64.55%)	100 (11.15%)	174 (19.40%)	44 (4.91%)
Past Two-Week				
High-Risk Alcohol Use				
Past 30-day Alcohol Use				
Time 2-Grade 7[**]				
No Use	4,760 (75.30%)	798 (12.62%)	608 (9.62%)	155 (2.45%)
Use	242 (30.29%)	81 (10.14%)	365 (45.68%)	111 (13.89%)
Time 3-Grade 8[**]				
No Use	3,699 (75.94%)	585 (12.01%)	477 (9.79%)	110 (2.26%)

	Student Profiles (Baseline Substance Use & Program Recall Combinations)			
	No Use, Recall	*No Use, No Recall*	*Use, Recall*	*Use, No Recall*
Variables *(Results from Chi-Squared Test)*	N (%)			
Use	468 (48.50%)	112 (11.61%)	307 (31.81%)	78 (8.08%)
Time 4-Grade 9[**]				
No Use	2,990 (77.00%)	447 (11.51%)	376 (9.68%)	70 (1.80%)
Use	490 (54.20%)	113 (12.50%)	227 (25.11%)	74 (8.19%)
Time 5-Grade 9[**]				
No Use	2,781 (76.61%)	433 (11.93%)	342 (9.42%)	74 (2.04%)
Use	574 (57.92%)	111 (11.20%)	241 (24.32%)	65 (6.56%)
Time 6-Grade 10[**]				
No Use	2,685 (77.44%)	387 (11.16%)	322 (9.29%)	73 (2.11%)
Use	744 (21.70%)	139 (11.68%)	242 (20.34%)	65 (5.46%)
Time 7-Grade 11[**]				
No Use	2,224 (79.89%)	287 (10.31%)	227 (8.15%)	46 (1.65%)
Use	819 (66.37%)	146 (11.83%)	216 (17.50%)	53 (4.29%)

Results from Pearson's Chi-Squared Test:

[*]
$p < .05$;

[**]
$p < .01$

TABLE 2

Adjusted[+] multilevel (students within schools) logistic regression results for the longitudinal follow-up periods; Adolescent Substance Abuse Prevention Study.

| | Post-Test Periods | | | | | |
| | Main Analyses | | | Supplemental Analyses | | |
Post-Test Period:	Time 2 Grade 7	Time 3 Grade 8	Time 4 Grade 9a	Time 5 Grade 9b	Time 6 Grade 10	Time 7 Grade 11
Student Profiles [a]	logistic-coefficient (Standard Error)[b]					
Alcohol (Past-30 Days)						
No Use, Recall (Reference Group)	Reference	Reference	Reference	Reference	Reference	Reference
No Use, No Recall	0.32 (0.13)*	0.27 (0.10)**	0.25 (0.10)*	0.08 (0.10)	0.17 (0.10)	0.17 (0.11)
Use, Recall	2.52 (0.09)**	1.86 (0.09)**	1.37 (0.10)**	1.35 (0.10)**	1.11 (0.10)**	1.26 (0.12)**
Use, No Recall	2.37 (0.14)**	1.36 (0.16)**	1.58 (0.19)**	1.00 (0.18)**	1.15 (0.19)**	0.97 (0.23)**
High-Risk Alcohol Use (Past-Two Weeks)						
No Use, Recall (Reference Group)	Reference	Reference	Reference	Reference	Reference	Reference
No Use, No Recall	0.66 (0.13)**	0.41 (0.12)**	0.46 (0.12)**	0.26 (0.12)*	0.30 (0.11)**	0.34 (0.11)**
Use, Recall	2.33 (0.10)**	1.57 (0.09)**	1.29 (0.10)**	1.18 (0.10)**	1.06 (0.10)**	0.98 (0.11)**
Use, No Recall	2.51 (0.14)**	1.70 (0.16)**	1.90 (0.18)**	1.51 (0.19)**	1.17 (0.18)**	1.17 (0.21)**
Marijuana (Past 30-Days)						
No Use, Recall (Reference Group)	Reference	Reference	Reference	Reference	Reference	Reference
No Use, No Recall	0.78 (0.19)**	0.25 (0.15)	0.65 (0.14)**	0.25 (0.13)	0.59 (0.12)**	0.47 (0.13)**
Use, Recall	2.56 (0.13)**	1.67 (0.11)**	1.50 (0.12)**	1.16 (0.11)**	0.92 (0.11)**	1.23 (0.12)**
Use, No Recall	2.78 (0.18)**	1.62 (0.19)**	1.88 (0.20)**	1.38 (0.19)**	1.31 (0.19)**	0.77 (0.24)**
Cigarettes (Past-30 Days)						
No Use, Recall (Reference Group)	Reference	Reference	Reference	Reference	Reference	Reference
No Use, No Recall	0.82 (0.16)**	0.50 (0.14)**	0.57 (0.13)**	0.37 (0.13)**	0.35 (0.12)**	0.24 (0.13)**
Use, Recall	2.49 (0.11)**	1.59 (0.10)**	1.33 (0.11)**	1.20 (0.11)**	1.04 (0.11)**	1.07 (0.11)**
Use, No Recall	2.59 (0.16)**	1.56 (0.18)**	1.38 (0.19)**	1.27 (0.20)**	1.30 (0.19)**	1.33 (0.22)**

[+] Results control for gender and race/ethnicity; Estimator = Maximum Likelihood

[a] : Student profiles were a function of baseline substance use (No Use, Use) and recall of TCYL program receipt at Grade 7 (Recall, No Recall)

[b] : Odds Ratios = e logistic coefficient

[*] $p < .05;$

[**] $p < .01$

Note: A positive relationship corresponds to greater substance use.