Community and School Drug Prevention Strategy Prevalence: Differential Effects by Setting and Substance

Curtis J. VanderWaal,[1,4] **Lisa M. Powell,**[2] **Yvonne M. Terry-McElrath,**[3] **Yanjun Bao,**[2] **and Brian R. Flay**[2]

This study used key informant interviews and student survey data in 508 U.S. communities to examine relationships between the prevalence of community and non-classroom-based school substance prevention strategies and teen substance use rates. After controlling for covariates, analyses indicated that: (1) adult-supervised after-school activities were significantly related to lower past 30-day cigarette smoking and both past 30-day alcohol use and binge drinking; (2) un-supervised after-school recreational facilities were significantly associated with both lower past 30-day cigarette smoking and current daily smoking; (3) community activities to reduce substance use were significantly related to lower binge drinking; and (4) student organizations to prevent alcohol abuse were significantly related to lower binge drinking. Communities need a broad spectrum of strategies to address variation in substance use among youth.

Editors' Strategic Implications: Policymakers at the school, community, state, and federal levels will benefit from knowing that after-school activities for teens typically result in reliable (though often modest) reductions in substance use in this large national sample. This is a strategy that works, but the effects are likely to vary by setting, level of supervision, substance, and program implementation.

KEY WORDS: youth substance use; drug prevention; community; school.

[1]Institute for Prevention of Addictions, Andrews University.
[2]University of Illinois at Chicago.
[3]The University of Michigan.
[4]Address correspondence to Curtis VanderWaal, Institute for Prevention of Addictions, Andrews University, Berrien Springs, Michigan, 49104-0211; e-mail: vanderwa@andrews.edu.

INTRODUCTION

Communities and schools utilize a wide variety of approaches in their attempts to reduce or prevent youth substance use. Most of these approaches are designed to be universal, meaning that they are targeted toward all students, regardless of individual risk for substance use (Mrazek & Haggerty, 1994). Universal approaches also target all drugs, including those that are illegal for all age groups (marijuana, cocaine, etc.) as well as cigarettes and alcohol that become legal when youth reach the relevant ages specified by their state. Such universal interventions are based on the belief that early intervention delays initiation of all substance use and reduces problematic future use (Brounstein & Zweig, 1999).

The Center for Substance Abuse Prevention (CSAP) has identified six universal prevention strategies that focus on the risk and protective factors most associated with youth substance use: information dissemination, prevention education, alternative drug-free activities, problem identification and referral, community-based interventions, and environmental approaches (Brounstein & Zweig, 1999). While a significant body of research has focused on prevention education (especially within school settings), and information dissemination (e.g., research on substance-related media campaigns), less is known about the relative effects of the other CSAP-identified strategies. The current study examined the differential effectiveness of two of these lesser-researched strategies—community-based interventions and alternative drug-free activities—in reducing alcohol, tobacco, and marijuana use among youth.

Drug prevention approaches can be either general or substance-focused. General approaches do not directly target reductions in substance use but instead offer youth opportunities to engage in activities that occupy their unstructured time, develop pro-social skills or knowledge, or involve them in the community in some way. Such general strategies consider drug prevention to be only one of many possible benefits to youth, and include alternative drug-free activities such as after-school programs or community service programs, as well as available recreational facilities. Substance-focused approaches are intentionally designed to reduce substance use among youth. Such strategies include various community activities to reduce substance use (such as free rides home to avoid driving while intoxicated), school-based non-class prevention activities (such as Red Ribbon Week), and student organizations to prevent substance use. Some strategies go even farther by targeting specific substances in their prevention effort. In this study we focused on community-based prevention strategies (adult-supervised after-school activities, unsupervised after-school recreational facilities, and community activities to reduce substance use) and school-based prevention strategies (school-based non-class drug prevention activities and student-led organizations to prevent substance use). While most research has examined the effectiveness of one specific prevention program across one or more substances, this study is unique in that our goal was to explore the association between broader

prevention strategy prevalence and the three substances most commonly used by adolescents—tobacco, alcohol, and marijuana.

LITERATURE REVIEW

Community-Based Prevention Strategies

Communities have developed and implemented a wide variety of drug-reduction strategies, including media campaigns (Flynn et al., 1994; Vartiainen, Paavola, McAlister, & Puska, 1998), community task forces, and parent interventions (Biglan, Ary, Smolkowski, Duncan, & Black, 2000; Stevens, Mott, & Youells, 1996). There is some evidence to suggest that adding community components to existing classroom-based school programs enhances overall reductions in substance-using behaviors (Donaldson et al., 1996; Ellickson, 1999; Flay, 2000). Such conclusions may be premature, however, since most studies fail to separate out the differential effects of curricula, school-wide environmental change, parent training, mass media, or community interventions (Flay, 2000).

Many communities have also realized the importance of both providing environments that are less conducive to substance-using activities and also increasing youth involvement in alternative drug-free activities. These activities may occur in either adult-supervised or unsupervised locations, with supervision defined as an adult who is present to coordinate or monitor the activity. A number of studies (see U.S. Department of Education, 1998) have determined that the largest proportion of youth drug use, sexual activity, and delinquency occurs between the after-school hours of 3:00 p.m. and 6:00 p.m. Several studies (e.g., Jenkins, 1996; Schinke, Orlandi, & Cole 1992; Yin, Katims, & Zapata, 1996) have found substance use to be lower among students who were involved in after-school activities. For example, a U.S. Department of Health and Human Services report (Zill, Nord, & Loomis, 1995) found that students who spent no time in extracurricular activities (e.g., after-school involvement in sports, clubs, music lessons, etc.) were 49% more likely to have used illicit drugs and 35% more likely to have smoked cigarettes than students who spent one to four hours per week in extracurricular activities (time in extracurricular activities was not related to underage drinking). A meta-analysis has also shown that alternative after-school activities can be an effective approach to preventing substance use (Tobler & Stratton, 1997). In contrast, several other studies (Carlini-Cotrim & de Carvalho, 1993; U.S. Department of Education, 2003) find no relationship or even an increased relationship between drug use and other delinquent behaviors and after-school programming.

Adult supervision of such after-school activities appears to be very important in reducing delinquent behaviors among youth, including substance use (see Gottfredson et al., 2001). For example, a recent nationally representative survey of 14–17 year-old teens found that, compared to teens supervised every day of the

school week, those who were unsupervised one or more days were more likely to use alcohol, cigarettes, and marijuana (YMCA of USA, 2001). Richardson et al. (1989) found that eighth-graders who cared for themselves for eleven or more hours a week without an adult present were twice as likely to use drugs as those children who were always supervised.

Research is not as clear on the association between substance use and unsupervised after-school activities. Larson, Csikszentmihalyi, and Freeman (1984) found that alcohol and marijuana consumption were related to social context, with alcohol more associated with social bonding activities such as parties and marijuana more likely to be consumed with one or two friends. Agnew and Petersen (1989) found that hanging out and social activities were positively associated with delinquency, leading them to conclude that unsupervised peer relationships may increase the likelihood of delinquency due to higher levels of association with deviant others. Similarly, Caldwell and Darling (1999) found that adolescents who spent time in unsupervised social settings were likely to spend more time using alcohol and other drugs, particularly if the friends with whom they associated were perceived to value such behaviors and were substance users.

School-Based Prevention Strategies

A national study of school-based prevention programs (Gottfredson & Gottfredson, 2001) found that the typical school had 14 different prevention activities underway at any given time, with a range of zero to 66 activities across schools. Each year, schools spend millions of dollars on such programs, although research indicates that many such interventions result in little or no change in student substance use (White & Pitts, 1998), particularly long-term change.

Schools generally utilize classroom-based programs that fall under the CSAP-designated category of prevention education, and significant research currently exists or is underway to evaluate various program methodologies (for example, see Botvin, 2000; Ellickson, Bell, & McGuigan, 1993; Gottfredson & Wilson, 2003; Tobler et al., 2000). One issue of relevance for the present study is that interactive programs (emphasizing opportunities for youth to exchange ideas and role-play drug refusal skills) appear to show more promise than noninteractive programs (didactic programs teaching youth about the dangers of substance use and developing insight into personal feelings and behaviors) (Tobler et al., 2000). Peer-led programs generally fall into the category of interactive approaches. These prevention education programs are delivered to students by other students who are the same age or slightly older. Such approaches are based on the belief that peers have a greater influence on a youth's drug-related attitudes and behaviors than do adults who are presenting the same drug prevention information. The content of these programs may include drug information, peer resistance and refusal skills, self-improvement, and decision-making skills. Some of these programs generically

focus on all legal and illegal substances, while others target specific substances. Examples of the latter category include Students Against Destructive Decisions (SADD) (http://www.saddonline.com) and Students Working Against Tobacco (SWAT) (http://www.getswat.com). Research on these programs is relatively small but generally shows positive effects (Cuijpers, 2002; Gottfredson & Wilson, 2003; Josendal, Aaro, & Bergh, 1998; Tobler et al., 2000).

Schools also provide a wide variety of complementary non-classroom, substance-focused prevention education activities. These activities are often designed to reinforce curriculum-based instruction and are usually short-term in nature. Examples include Red Ribbon Week, anti-drug school assemblies, public commitments or pledges to remain drug-free, or contests relating to substance use prevention. Since these non-classroom interventions tend to be used in conjunction with other universal prevention programs, including classroom-based interventions, it is difficult to separate out the effects of non-classroom and classroom prevention interventions that are being conducted within the same school.

METHOD

This study used key informant interviews from the 1999–2001 ImpacTeen Project (www.impacteen.org) and national survey research findings from both the Youth, Education, and Society study and the Monitoring the Future study (www.monitoringthefuture.org) to compare the relative associations between the prevalence of community and school prevention strategies and past 30-day student use of tobacco, alcohol, and marijuana (both any use and higher risk use). Specifically, we focused on the relationships between the aforementioned substance use outcomes (aggregated to the school level) and the following five prevention strategies: (1) adult-supervised after-school activities, (2) unsupervised after-school recreational facilities, (3) community activities to reduce substance use, (4) school-based non-class drug prevention activities, and (5) student-led organizations to prevent substance use.

Sample and Data Collection

Data used in our analyses included 1) youth self-reported substance use measures and other individual data, 2) school administrator data on school activities, and 3) key informant data on community resources and activities at the community level related to youth substance use prevention. The sampling and data collection methods for each data type are described below.

Youth self-reported substance use data from 1999–2001 were obtained from the Monitoring the Future (MTF) study, an ongoing nationwide study of youth conducted under a series of research grants from the National Institute on Drug Abuse. Data were collected each year from separate and non-overlapping school

samples of 8th, 10th, and 12th grade classes drawn so as to be representative of all students in the specified grade for the 48 contiguous states (Bachman, Johnston, & O'Malley, 2001). Each school participated in the MTF study for two consecutive years. Response rates from 1999 to 2001 averaged 89% for 8th, 86% for 10th, and 83% for 12th grade surveys. Non-responses were almost entirely accounted for by absenteeism. This paper utilizes student data aggregated to the school level from public schools in their second year of participation in the MTF study. Magnet and private schools were excluded from this study due to the relative difficulty of determining school catchment area boundaries, a critical step in obtaining key informant data. Exclusion of private and magnet schools removed approximately 20% of the original MTF sample. The resulting sample included approximately (summing over the three years) 35,000 8th graders in 180 schools; 38,000 10th graders in 160 schools; and 33,000 12th grade students in 168 schools.

School administrator data collection was supported by the Robert Wood Johnson Foundation through the Youth, Education, and Society (YES) study. Self-report questionnaires were mailed to an administrator (usually the principal) in each participating MTF school, and included items on school characteristics, policies, and student anti-drug use activities (Johnston, O'Malley, Bachman, Schulenberg, & Kumar, 2001). A $250 incentive payable to either the administrator or the school was provided upon receipt of the completed questionnaire.

Community key informant data were collected through the efforts of ImpacTeen, a policy research collaborative supported by the Robert Wood Johnson Foundation. Community boundaries were defined as the area from which each relevant MTF school drew at least 80% of its student population. Following the definition of community boundaries, a list was developed identifying relevant health and police departments. Computer-assisted telephone interviews were then conducted by trained telephone interviewers to identify informants from each office that were the most knowledgeable about youth substance use issues in the relevant communities. During the interviews, each respondent was also asked to provide a referral to individuals representing substance abuse coalitions operating within the community(ies). Both health and police contacts were asked to provide referrals for coalition respondents as follows: "Is there a coalition in your community whose purpose is to reduce youth alcohol, tobacco or drug use?" If respondents said yes, they were then asked, "What is the name of this coalition?" and "Are you the person who can tell us about this coalition's activities?" If the respondent indicated he or she was not able to discuss the coalition's activities, they were asked for the name, title and telephone number of a contact person at the relevant coalition and the data were recorded verbatim. Interviews were then conducted with the identified coalition referral. All identified respondents (from either the original listings of health/police departments or referred coalition representatives) were asked to self-refer as appropriate study participants: "Are you the person most knowledgeable about your agency's programs or activities

related to youth alcohol, tobacco, and illicit drug use?" If the respondent did not self-identify as the appropriate respondent, he or she was asked for the name, title, and telephone number of the appropriate person. Similarly, each respondent was asked if his or her agency had jurisdiction over the community area(s) involved. Thus, each referral self-identified as both knowledgeable about youth substance-related issues as well as representing the respective department/agency/coalition and defined community(ies). This recruitment process resulted in a varied profile of key informants; however, this variation likely appropriately represents the extant variation across communities in the types of individuals involved in coalition activities. Using the described resulting snowball sampling recruitment methodology, a total of 4,308 key informant interviews were completed for the sample of 508 communities with non-missing aggregated student and school administrator data. To assess potential concerns regarding inter-rater reliability among multiple respondents within a community, we examined the degree of agreement among the key informants for sites that had multiple respondents. Our calculations revealed that mean levels of agreement across all scale items with multiple respondents ranged from 0.73 to 0.99.

Dependent Substance Use Measures

The substance use outcome variables used in this study were school-level aggregate MTF measures of (a) any past 30-day use prevalence for tobacco, alcohol, and marijuana; and (b) higher risk use prevalence for tobacco, alcohol, and marijuana. Thus, each outcome was a continuous measure of the proportion of students per school who reported the relevant substance use behavior. In accordance with the definitions applied in the Monitoring the Future Study (Johnston, O'Malley, & Bachman, 2003), higher risk use prevalence measures were defined as follows: higher risk cigarette use was defined as current daily smoking (past 30 days); higher risk alcohol use was defined as binge drinking (5+ drinks on one occasion in the past two weeks); and, higher risk marijuana use was defined as current almost-daily use (20+ occasions in the past 30 days). Table I reports the mean 30-day prevalence rates for any use (and higher risk use) for smoking, alcohol, and marijuana to be 23% (14%), 37% (23%), and 17% (4%), respectively.

Independent Community- and School-Based Measures

As mentioned previously, we examined five prevention strategies to reduce youth substance use. The community-based measures included two general prevention strategies (adult-supervised after-school activities and unsupervised after-school recreational facilities) and one substance-focused prevention strategy (community activities to reduce substance use). The two school-based measures

Table I. Summary Statistics

		N	Mean	Std. Dev.	Range
Substance use		508	0.2314	0.1219	0–0.8085
Cigarette smoking					
Any smoking (past 30 days)					
Current daily smoking (past 30 days)		508	0.1379	0.0997	0–0.7660
Alcohol consumption		508	0.3669	0.1527	0–0.8000
Any drinking (past 30 days)					
Binge drinking (5+ drinks on one occasion in past two weeks)		508	0.2296	0.1144	0–0.6667
Marijuana use		508	0.1696	0.0939	0–0.7727
Any use (past 30 days)					
Current almost-daily use (20+ occasions in past 30 days)		508	0.0364	0.0351	0–0.6364
Substance prevention strategies					
General community prevention strategies	(Scale: 0–11)	357	10.5661	0.6060	7–11
Adult-supervised after-school activities					
Adult-supervised after-school activities	(Any/none)	357	0.7137	0.4527	0–1
Unsupervised after-school recreational facilities	(Scale: 0–9)	357	7.1908	1.4720	2.5–9
Substance-focused prevention strategies	(Scale: 0–4)	508	2.2750	0.8253	0–4
Community activities to reduce substance use					
School-based non-class drug prevention activities	(Scale: 0–9)	388	5.0251	1.9402	0–9
Student organizations to prevent tobacco use	(Any/none)	501	0.4971	0.3258	0–1
Student organizations to prevent alcohol abuse	(Any/none)	506	0.8034	0.2878	0–1
Student organizations to prevent drug abuse	(Any/none)	503	0.6311	0.3073	0–1
Control Variables					
Year					
1999		508	0.3255	0.4690	0–1
2000		508	0.3150	0.4650	0–1
2001		508	0.3595	0.4803	0–1
Grade		508	0.3692	0.4831	0–1
8th					
10th		508	0.3321	0.4714	0–1
12th		508	0.2987	0.4581	0–1
Race/ethnicity		508	0.1287	0.2117	0–1
African American					
Asian American		508	0.0355	0.0731	0–0.7074
White		508	0.6387	0.2986	0–1
Hispanic		508	0.1233	0.1900	0–0.9333
Other		508	0.0738	0.0715	0–1
Presence of father in the household		508	0.7694	0.1152	0.3–1
Median household income		508	$46,399	$18,047	$16,128 – $134,857

Note: Substance prevention strategies measured at the community level. Substance use measures and control variables aggregated to the school level. The following three substance prevention strategies are available for 2000 and 2001 only: adult-supervised after-school activities, unsupervised after-school recreational facilities, and school-based non-class drug prevention activities.

were both substance-focused prevention strategies (school-based non-class drug prevention activities and student organizations to prevent substance use).

Community-Based Prevention Strategies

We generated two scale measures based on community availability of adult-supervised after-school activities and unsupervised after-school recreational facilities. These general prevention strategy measures were constructed by summing individual items across the average of responses from the key informants interviewed in each community within our sample. The adult-supervised after-school activity and unsupervised after-school recreational facility scales were based on the availability of 11 and 9 activities or facilities, respectively, in the community (see Table II for a listing of the activities and facilities included). The summary statistics presented in Table I show that, on average, most communities had a very high percentage of available supervised after-school activities (the mean of the 11-item scale was 10.6, with a range of 7–11). Communities had an average of 7.2 unsupervised recreational facilities available out of the 9-item scale (range 2.5–9). Due to changes in instrumentation, these scales were only available for 2000 and 2001.[5]

The community-based substance-focused prevention strategy was measured using a 4-item scale of activities to reduce substance abuse within a given community. This scale was constructed as a summation across the four items shown in Table II based on the average of responses obtained from the key informants in the community. As Table I shows, the mean value for this scale was 2.2, with a range of 0–4.

School-based Prevention Strategies

Drawing on school administrator data, we constructed a 9-item scale reflecting the existence of non-class prevention activities in each school (see Table II for a listing of individual scale components). On average, schools had about five non-class prevention activities available to students out of the 9-item scale (range 0–9). We also examined whether substance-related student-led organizations were present in schools. Specifically, we defined separate dichotomous substance-focused measures (based on the community-average responses from our key informants) for the existence of any organization in the community in which students had joined together to prevent tobacco use (such as Students Together Against Tobacco), alcohol abuse (such as Students Against Drunk Driving), or drug abuse. Table I shows substantial variance in the percentage of communities that had student-led organizations aimed at preventing tobacco (50%), alcohol (80%), and drug abuse (63%).

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[5]Due to noted instrumentation changes, analyses have not been conducted that would indicate the degree of inter-correlation, if any, among scales.

Table II. Components of Community- and School-Level Prevention Strategy Scales

Adult-supervised after-school activities	Unsupervised after-school recreational facilities	Community activities to reduce substance use	School-based non-class drug prevention activities
1. 4-H, Girl/boy scouts, or other special interest clubs	1. Coffee houses/shops	1. Free rides home from events to avoid drunk driving	1. Assemblies
2. 12 Step programs (Ala-Teen or Narcotics Anonymous)	2. Game arcades	2. Night clubs with a designated teen night	2. Clubs
3. Athletic opportunities not associated with the school	3. Ice or roller skating rinks	3. Noise abatement laws to close drug houses	3. Contests
4. Mentoring programs	4. Indoor/outdoor shopping malls	4. Removal of buildings that serve as centers for illicit drug activities	4. Non-alcohol prom
5. Music, theater, art or dance programs	5. Movie theaters		5. Parent involved activities
6. Part-time employment	6. Night-lit ball parks		6. Public commitments
7. Religious clubs	7. Recreational centers (YMCA/YWCA/indoor sports facilities)		7. Red ribbon week
8. School-based athletics	8. Teen centers		8. Special days
9. Teen programs at places of worship	9. Any other place where teens may hang out		9. Other anti-drug activities
10. Tutoring or other academic enrichment programs			
11. Volunteer opportunities			
(Cronbach's $\alpha = 0.62$)	(Cronbach's $\alpha = 0.78$)	(Cronbach's $\alpha = 0.51$)	(Cronbach's $\alpha = 0.60$)

Control Variables

The control variables used in our analyses included aggregate student data from the MTF surveys on grade, race/ethnicity, and the presence of a father in the household. Community median household income data were drawn from the 2000 U.S. Census and were merged with the ImpacTeen community-level data based on census block groups in identified communities. Finally, year of study was also included in all analyses to control for social trends in substance use outcomes.

ANALYSIS

This paper used ordinary least squares (OLS) regression analyses to examine the impact of various community- and school-based general and substance-focused prevention strategies on youth substance use. Specifically, we estimated separate ordinary least squares regressions to examine relationships between aggregated 30-day prevalence rates for any use and higher risk use of tobacco, alcohol, and marijuana and the presence of (1) adult-supervised after-school activities for youth (11-item scale); (2) unsupervised after-school recreational facilities (9-item scale); (3) community activities to reduce substance use (4-item scale); (4) school-based non-class prevention activities (9-item scale); and (5) student-led anti-substance tobacco, alcohol, and drug organizations. All regression models included the controls listed earlier. Weights were included in all analyses based on the probability of each school participating in the MTF sample.

To further assess the potential association between various prevention approaches and youth substance use, simulations based on our regression results were performed at different levels of prevention strategy prevalence (presented at the end of the Results section). Our simulations report predicted levels of youth substance use based on the estimated regression coefficients evaluated at both mean and various specified prevalence levels of our independent prevention measures.

RESULTS

Table III presents the OLS coefficient estimates of the community- and school-based strategy predictors on 30-day prevalence rates for any use and higher risk use for cigarettes, alcohol and marijuana (controlling for grade, race/ethnicity, presence of father in the household, community median household income, and year). Table IV presents the results for the full set of demographic control variables for our adult-supervised after-school activities regression model. For the sake of brevity, we do not report the full set of covariates for all models summarized in Table III as they generally perform in similar ways across all models.

Table III. Effects of Community- and School-Level Prevention Strategies on School Aggregate Past 30-Day and Two-Week (Binge Drinking) Substance Use Outcomes

Prevention strategy predictor	#Obs.	Cigarette smoking		Alcohol consumption		Marijuana use	
		Any smoking Coef. (SE)	Current daily Smoking Coef. (SE)	Any drinking Coef. (SE)	Binge drinking Coef. (SE)	Any use Coef. (SE)	Current almost-daily use Coef. (SE)
Adult-supervised after-school activities (11-item scale)	357	−0.0209*** (0.0078)	−0.0094 (0.0059)	−0.0177** (0.0082)	−0.0225*** (0.0075)	−0.0021 (0.0067)	0.0037 (0.0026)
Adult-supervised after-school activities (Any/none)	357	−0.0311*** (0.0102)	−0.0137* (0.0077)	−0.0264** (0.0107)	−0.0292*** (0.0098)	0.0033 (0.0088)	0.0085** (0.0047)
Unsupervised after-school recreational facilities (9-item scale)	357	−0.0087*** (0.0032)	−0.0054** (0.0024)	−0.0019 (0.0034)	−0.0050 (0.0031)	0.0035 (0.0027)	0.0002 (0.0011)
Community activities to reduce substance use (4-item scale)	508	−0.0112** (0.0052)	−0.0062 (0.0041)	−0.0020 (0.0055)	−0.0085* (0.0049)	−0.0016 (0.0043)	−0.0011 (0.0018)
School-based non-class drug prevention activities (9-item scale)	388	0.0017 (0.0023)	−0.0001 (0.0019)	0.0028 (0.0025)	0.0020 (0.0022)	0.0019 (0.0018)	−0.0004 (0.0008)
Student organization to prevent tobacco use (Any/none)	501	−0.0228* (0.0125)	−0.0030 (0.0099)				
Student organization to prevent alcohol abuse (Any/none)	506			−0.0207 (0.0143)	−0.0345** (0.0128)		
Student organization to prevent drug abuse (Any/none)	503					−0.0088 (0.0108)	−0.0056 (0.0044)

Note. Non-standardized regression coefficients presented (standard errors in parentheses). R-squared value ranges, by substance: cigarette smoking 0.4563–0.5843; alcohol consumption 0.2407–0.4795. R-squared value ranges based on regressions that include control variables only: cigarette smoking 0.4523–0.5843; alcohol consumption 0.4730–0.6860; marijuana use 0.2389–0.4771. All regression equations control for grade (8th, 10th, and 12th), race/ethnicity (White, Black, Hispanic, Asian American, Other), presence of father in the household, median household income, and year.
$* p < .10; ** p < .05; *** p < .01$.

Table IV. Effects of Adult-Supervised After-School Activities and Control Variables on School Aggregate Past 30-Day and Two-Week (Binge Drinking) Substance Use Outcomes

	Cigarette smoking				Alcohol consumption				Marijuana use			
	Any smoking		Current daily Smoking		Any drinking		Binge drinking		Any use		Current almost-daily use	
Predictor	Coef. (SE)	β	Coef. (SE)	β	Coef. (SE)	β	Coef. (SE)	β	Coef. (SE)	β	Coef. (SE)	β
Supervised after-school activities	−0.0209*** (0.0078)	−0.1070	−0.0094 (0.0059)	−0.0615	−0.0177** (0.0082)	−0.0687	−0.0225*** (0.0075)	−0.1170	−0.0021 (0.0067)	−0.0133	0.0037 (0.0026)	0.0638
Grade												
10th grade	0.0747*** (0.0109)	0.2969	0.0540*** (0.0082)	0.2735	0.1818*** (0.0115)	0.5472	0.1194*** (0.0105)	0.4822	0.1093*** (0.0093)	0.5253	0.0263*** (0.0037)	0.3533
12th grade	0.1541*** (0.0118)	0.5964	0.1202*** (0.0090)	0.5931	0.2829*** (0.0124)	0.8296	0.1649*** (0.0114)	0.6490	0.1227*** (0.0101)	0.5747	0.0400*** (0.0040)	0.5228
Race/Ethnicity												
African American	−0.2080*** (0.0410)	−0.3576	−0.1719*** (0.0310)	−0.3759	−0.2089*** (0.0431)	−0.2713	−0.1984*** (0.0394)	−0.3458	−0.1490*** (0.0351)	−0.3091	−0.0613*** (0.0139)	−0.3552
Asian American	−0.2259*** (0.0573)	−0.1549	−0.1672*** (0.0434)	−0.1462	−0.3215*** (0.0606)	−0.1670	−0.3098*** (0.0551)	−0.2159	−0.1368*** (0.0491)	−0.1135	−0.0591*** (0.0194)	−0.1369
Hispanic	−0.1937*** (0.0269)	−0.3063	−0.1901*** (0.0204)	−0.3834	−0.0450 (0.0283)	−0.0539	−0.0365 (0.0258)	−0.0586	−0.0546** (0.0230)	−0.1044	−0.0372** (0.0091)	−0.1989
Other	−0.0325 (0.0616)	−0.0221	−0.0607 (0.0467)	−0.0526	0.0822 (0.0648)	0.0423	0.0744 (0.0592)	0.0514	0.3502*** (0.0528)	0.2879	0.0501** (0.0209)	0.1149
Father in household	−0.1009 (0.0811)	−0.0971	−0.1336** (0.0615)	−0.1639	−0.1305 (0.0854)	−0.0952	−0.0980 (0.0779)	−0.0959	−0.3166*** (0.0695)	−0.3686	−0.1209*** (0.0275)	−0.3929
Median household income	−0.0010*** (0.0003)	−0.1455	−0.0008*** (0.0002)	−0.1635	0.0007** (0.0003)	0.0756	0.00003 (0.0003)	0.0039	0.0007*** (0.0003)	0.1318	0.0001 (0.0001)	0.0419
Year 2001	−0.0198** (0.0091)	−0.0834	−0.0141 (0.0069)	−0.0758	−0.0056 (0.0096)	−0.0179	−0.0059 (0.0087)	−0.0252	−0.0029 (0.0078)	−0.0147	0.0017 (0.0031)	0.0248
Constant	0.5603*** (0.1035)		0.3783*** (0.0784)		0.5173*** (0.1089)		0.4896*** (0.0994)		0.3342*** (0.0886)		0.0756** (0.0351)	

Note: $N = 357$ for all models. Non-standardized regression coefficients (coef.) and standardized Beta coefficients (β) presented. Standardized errors presented in parentheses (SE). R-Squared ranges from 0.3616 to 0.6902.
* $p < .10$; ** $p < .05$; *** $p < .01$.

Community-Based Prevention Strategies

As noted previously, general community prevention strategies included the availability of both supervised activities and unsupervised facilities. The prevalence of supervised activities was significantly related to lower rates of past 30-day cigarette smoking, and both past 30-day alcohol use and past two-week binge drinking.[6] Regression results show that the presence of one additional prevention strategy was associated with lower prevalence rates of 2.1, 1.8, and 2.3 percentage points in tobacco use, alcohol use, and binge drinking, respectively. Based on the mean 30-day rates of any smoking, any alcohol use, and past two-week rates of binge drinking (23%, 37%, and 23% respectively), this reflects a 9% reduction in smoking, a 5% reduction in drinking, and a 10% reduction in binge drinking rates. While most communities had a high proportion of supervised activities, the development of such activities in those communities that have few or none may have substantial implications for the prevalence of smoking and drinking among teens.

The second general community prevention strategy, the availability of unsupervised after-school recreational facilities, was significantly associated with lower prevalence rates of both any past 30-day smoking and current daily smoking among youth but showed no significant relationships with alcohol or marijuana use. An additional unsupervised after-school recreational facility would significantly reduce any cigarette smoking and current daily smoking by approximately 0.9 and 0.5 percentage points, respectively. This reflects a 4% reduction for both any past 30-day smoking and current daily smoking rates.

Examining the results from the community-based substance reduction strategy, we found that communities with a higher number of activities aimed at reducing substance use or substance-related harm had a significant association with lower any cigarette smoking. An additional substance reduction strategy would significantly reduce any cigarette smoking by 1.1 percentage points, equivalent to a 5% overall reduction in any cigarette smoking rates.

School-Based Prevention Strategies

We found that the availability of school-based non-class activities had no significant relationships with any of the youth substance use outcomes. However, specific substance-related, student-led organizations to prevent alcohol abuse were found to be significantly associated with lower binge drinking. Our results showed

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[6]Given that the distribution of our 11-item supervised activity scale is highly skewed at the upper end, we also present estimates for this scale based on a dichotomous indicator of a score, on average, of 10.5 or greater. As seen from Table III, the results based on this dichotomous indicator for supervised activities confirm the findings based on our continuous scale measure and actually strengthen the results in several cases.

that the presence of student organizations to prevent alcohol use were associated with a 3.5 percentage point reduction, equivalent to a 15% overall reduction, in the prevalence of past two-week binge drinking rates.

Control Variables

As noted previously, the results from the demographic control variables are reported in Table IV for our adult-supervised after-school activities regression model. The table reports regression coefficients, standard errors, and standardized beta coefficients. The results revealed that students in higher grades were more likely to use all substances (both any use and higher risk use), while African American, Asian American, and Hispanic students were, on average, significantly less likely to use all substances than their White counterparts, with the exception of alcohol use and binge drinking among Hispanics. The presence of a father in the household was significantly associated with a lower prevalence of higher risk smoking, and both the use and higher risk use rates for marijuana. Our results showed that median household income had differential effects across substances. While students living in communities with higher median household income levels were likely to have significantly lower smoking and higher risk smoking prevalence rates, higher median household income was associated with higher drinking (any use) and higher marijuana use (any use). These control variable findings are generally consistent with the literature on adolescent substance use and lend reliability to the results found for our independent variables. As shown by the R-squared values reported in Table IV, the vast majority of the explained variance can be accounted for by grade and race/ethnicity. However, even after controlling for these important variables, we still find significant results for our community- and school-level prevention measures.

Simulation Results

To help interpret this study's association between the various prevention approaches and youth substance use, simulations based on our regression results were performed at different levels of prevention strategy prevalence for our significant regression findings. Simulations of the relationships between the prevalence of any smoking and supervised after-school recreational activities showed that while smoking prevalence estimates might reach as high as 44% in communities with no such activities, similar estimates in communities with all 11 activities might be as low as 21%. Similarly, any drinking and binge drinking could vary from 55% to 36%, and 47% to 22%, respectively, based on the presence of no activities vs. all 11 activities. Simulations for the unsupervised after-school recreational facilities showed that the smoking rates associated with communities with none, half, or

all of the range of unsupervised activities available would relate to any smoking prevalence rates of 28%, 24%, and 20% and current daily smoking prevalence rates of 17%, 14%, and 12%, respectively. Simulation results for the student-led alcohol-prevention programs revealed that communities with such student-led organizations versus those without such organizations were associated with lower binge drinking risks (22% versus 26%). Communities with all four activities to reduce substance use versus those with no such activities were associated with a lower any cigarette smoking prevalence rate (21% versus 26%). When interpreting these findings, readers should bear in mind that the simulation results are based on linear empirical models that do not provide insight into potential threshold or saturation effects.

DISCUSSION

General Community-Based Prevention Strategies

While the findings from this analysis have a number of limitations (discussed below), they do provide insights into which universal prevention strategies may be associated with lower rates of use across various substances. General community prevention strategies were associated with modestly lower levels of any past 30-day smoking and drinking rates (any use and binge) among adolescents. Specifically, results showed that the availability of the full range or close to the full range (dichotomous scale value greater than or equal to 10.5) of adult-supervised after-school activities was related to the largest changes, showing a 3.1 percentage point difference in smoking rates and 2.6 and 2.9 percentage point differences, respectively, in any drinking and binge drinking rates. Given that an average of 23% of all adolescents had smoked in the past 30 days within sampled MTF schools, an average of 37% of all adolescents had drunk an alcoholic beverage in the past 30 days, and an average of 23% of all adolescents had engaged in binge drinking in the past two weeks, even modest reductions in smoking and drinking rates would be significant. As noted above, most of the sampled communities provided most of the activities listed in the survey. Given the highly skewed nature of the data, it is particularly striking to note that both smoking and drinking rates were estimated to increase by approximately 20 percentage points if communities did not have any supervised after-school activities in place for their youth. While it is not possible to clarify the roles that adults might be playing in these activities, a growing body of research suggests that the presence of caring adults such as teachers or clergy in the lives of adolescents is associated with lower substance use rates (National Institute on Drug Abuse, 2003; Resnick et al., 1997). Such adults may be playing a risk-protective role for some of the youth in these settings.

One potential implication of such findings is that communities with tight budgets should carefully consider the unintended consequences of reducing or

eliminating funding for after-school programs. For example, on the national level, the Bush Administration recently proposed a 40% reduction in its 21st Century Learning Centers Program, which largely funds after-school programming in some 6,800 rural and inner city schools (Fox, Silverman, Newman, & Miller, 2003). Based on the results of this and other studies, policymakers may wish to consider the potential for increased substance use, crime, and other deviant behaviors before making reductions in such programs.

Unsupervised after-school recreational facilities were associated with small but statistically lower rates of both any smoking and current daily smoking among adolescents. The availability of an additional unsupervised facility was associated with 0.87 and 0.54 percentage point differences in any smoking and current daily smoking rates, respectively. Lower smoking rates are perhaps to be expected since most unsupervised after-school facilities in our scale were located in public spaces such as game arcades, indoor sports facilities, coffee houses, or teen centers. Many of these facilities have 'no smoking' policies and may also have adults who manage the facility, thus making smoking much less likely in those settings. In addition, since youth smoking is a statistically non-normative behavior, the presence of more opportunities for social interaction with those who are non-smokers may serve to somewhat lower smoking behaviors in those communities. It is also possible that lower smoking rates could be obtained by examining a different mix of unsupervised recreational facilities. For example, while game arcades and roller rinks may not allow smoking on the premises, they may provide an opportunity for teens to 'hang out,' thus increasing smoking levels among certain peer groups. On the whole, however, the small change in smoking rates, coupled with the lack of significant reductions in alcohol and marijuana use rates, appears to indicate that the mere presence of social and recreational spaces is not likely to deter adolescent substance use in most instances. This finding is also consistent with the work of previous researchers (e.g., Caldwell & Darling, 1999).

Interestingly, current almost-daily marijuana use increased by 0.85 percentage points in the presence of adult-supervised after-school activities. While the increase in almost-daily use of marijuana is difficult to interpret, this may represent the presence of a peer culture or environment in which higher risk use is more acceptable.

Specific Community-Based Prevention Strategies

We analyzed only one specific community strategy using a scale that combined four different community prevention activities. The first two activities were related to community alcohol policies (night clubs with a designated teen night and free rides home from events to avoid drunk driving), while the second two activities related to illegal drug policies (laws enabling removal of buildings that serve as centers for illicit drug activities and noise abatement laws to close drug

houses). Of all outcome variables, only any cigarette smoking showed significantly lower rates of use, with reductions in binge drinking use approaching significance. Such community strategies have not been carefully studied, in part due to the complexity of co-occurring variables that exist in community-based interventions, including intensity and consistency of law enforcement, frequency and regularity of activities, and community budget priorities. Such strategies may also suffer from unintended consequences, such as an increase in drinking behaviors when teens congregate informally around designated teen night activities. It is also possible that our measure was not specific enough to pick up the variations and nuances of local ordinances and their enforcement. The indications of moderate effectiveness certainly merit further study.

Specific School-Based Prevention Strategies

Our findings indicated that the school-based non-class drug prevention activities we included (such as the presence of anti-drug assemblies, contests or clubs as well as public commitment events, Red Ribbon Weeks and non-alcohol proms) had no significant effect on any of the substance use outcomes. Because such interventions are generally used in conjunction with other classroom-based interventions, it is difficult to separate out the effects of these initiatives from other prevention interventions that are being conducted within the same school. That said, however, it is not surprising that an occasional, non-targeted intervention would fail to demonstrate significantly lower adolescent substance use behaviors. While such initiatives may serve to enhance the effects of classroom-based interventions, they also take time and resources away from other programs or activities. For this reason, more studies are needed to separate out the differential effects of these potentially complementary activities.

In contrast, the presence of student-led organizations designed specifically to reduce the use of alcohol was associated with a significant decrease in binge drinking. Student-led organizations to reduce tobacco use were associated with a marginally significant reduction in any 30-day cigarette use. These findings are generally consistent with other research studies that find a positive relationship between peer-led interventions and reduced substance use rates. The relatively small but lower tobacco use rates may relate to comparatively small numbers of student-led anti-tobacco groups (present in 50% of schools, vs. 80% and 63% for alcohol and drug abuse prevention organizations, respectively). Unfortunately, we do not have data that detail the characteristics of these groups.

Limitations

This study has several limitations. First, we have no way of knowing what is in the 'black box' of different approaches to substance abuse prevention. The mere presence of a strategy tells us little about the content of the strategy and nothing

about how that strategy was implemented (including the availability of resources such as funding level, person hours, or program publicity). In addition, we have no way to assess the quality or consistency of the intervention's implementation or student access to the programming. It is likely that some strategies were promoted and implemented in a highly effective manner, while others may have been poorly implemented. Second, higher response rates and greater community sampling saturation for key informants in each community would contribute to improved study reliability. Third, we do not have detailed information on the specific roles played by the community key informants within their agencies. While the data we used are not likely to be strongly sensitive to whether or not the key informants worked directly with community members versus having primarily administrative roles, such variation may exist. Fourth, our substance use data do not include private or parochial school students. It is possible that public schools operate with different norm and value referents than private schools. Such differences make generalizations to that population difficult and possibly inappropriate. Fifth, as stated earlier, non-classroom interventions tend to be used in conjunction with other universal prevention programs, including classroom-based interventions, making it difficult to separate out the effects of non-classroom and classroom prevention interventions that are being conducted within the same school. Finally, all items in each scale were given the same weight. It is possible that some items have a larger impact on drug use rates than others and a more in-depth analysis of each item's independent effect would help researchers better understand the impact of the various strategy components.

Our study also contains several measurement limitations. The first issue relates to reliability in the form of relatively low inter-item correlations for some of the scales. Our study was not designed to comprehensively survey the entire range of school- or community-based prevention activities. There are certainly a wide variety of prevention approaches that are developed by different groups, for different purposes, and targeting different substances. Based on our own data limitations, we only included a handful of the possible prevention activities that communities and schools incorporate into their programming, so it is not surprising that we did not have stronger inter-item correlations. We suggest that future researchers develop a more comprehensive list of community- and school-based prevention programs and include a wider range of key informants and school administrators in order to better understand the range of prevention activities.

It is also possible that a larger or smaller number of variables, or the selection of different variables in each scale, would either positively or negatively affect the significance levels of these findings. Future researchers could take several steps to improve measurement validity. First, focus groups could be conducted with area teens to accurately capture the entire range of supervised and unsupervised activities or facilities that would generally be present within a community. Second, key informant interviews could be conducted with community recreation directors, school athletic directors or coaches, adult and youth teen leaders and others

with heavy youth involvement to identify typical supervised and unsupervised after-school activities and recreation areas. Finally, community-based site surveyors could physically observe and identify the number and type of after-school recreational facilities that are present in a community.

CONCLUSIONS

Based on our findings, communities wishing to reduce smoking and drinking rates among adolescents should continue to provide supervised after-school activities for their youth. To reduce smoking rates, they should also continue to maintain locations where children and teens can play and socialize, preferably supervised by adults in the immediate vicinity since smoking behaviors are more difficult to hide than alcohol consumption. Marijuana use appears to be the most difficult substance to reduce through the community-based strategies that we examined. Since marijuana is very unlikely to be used in public places, this finding is not particularly surprising.

Our study results appear to indicate that schools will find it difficult to reduce tobacco use through either non-classroom-based activities such as Red Ribbon Weeks or infrequent assemblies. It may well be that such activities provide a booster effect when used in combination with other evidence-based classroom prevention programs, but such conclusions need further research. A similar conclusion may be appropriate for the use of student organizations that attempt to reduce tobacco use among peers, but such determinations are more tentative since our findings were only approaching significance. In contrast, reductions in higher risk alcohol use seem to be influenced by school-based, peer-led organizations, leading us to encourage schools to promote such organizations as one way to moderate the higher risk use of that substance.

These findings add to the existing knowledge on non-classroom-based prevention programs. While effect sizes are relatively modest, statistically significant reductions in tobacco and alcohol were related to both general and substance-focused prevention strategies in both community and school settings. However, these effects vary by both strategy and substance, suggesting that communities need a broad spectrum of approaches to address the variation in youth substance use. While this broad-based national study provides some comparative insights into several community and school prevention strategies, we recommend that future research and data collection examine the relative effectiveness of specific strategies including questions related to program implementation.

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