

# Cumulative Effects of Prevention Education on Substance Use Among 11th Grade Students in Ohio

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**ABSTRACT:** *This article examines participation in school-based prevention education activities from a statewide sample of 11th grade students in Ohio. About 42% of subjects indicated they had never been involved in a prevention education activity. Differences existed in mean number of activities by both gender and White/nonWhite status. Popular prevention education activities included participation in D.A.R.E. (Drug Abuse Resistance Education) at elementary, junior high, and senior high levels; "Just Say No Clubs"; Quest; and Red Ribbon Week. Only a small proportion of youth participated exclusively in any one of these activities. An association existed between student participation in prevention education and level of drug involvement. Students in each activity had lower mean scores for drug involvement when compared to students who had never participated in a prevention education activity. Also, the lowest mean scores occurred among students who had participated in multiple prevention activities. (J Sch Health. 1998;68(4):151-158)*

Alcohol and drug prevention education activities continue to proliferate in schools. Recent concerns over a rise in adolescent substance use will encourage development of new activities and a critical analysis of current efforts.<sup>1</sup>

A recurring theme in the research literature on school-based prevention efforts is that programs rarely achieve their stated goals.<sup>2,4</sup> Programs that have been criticized in particular are early ones, which emphasized only knowledge about the adverse consequences of substance use, and affective ones, which focused only on changing personal beliefs.<sup>2,5</sup> Later school-based programs added more dimensions to their programming, including teaching peer resistance and life skills. However, effectiveness of these programs has also been questioned.<sup>6,7</sup> Part of the new concern involves how educational activities are reinforced by the school environment and by families and peers. In addition, there is growing concern about the attrition of effects of prevention education.<sup>8,9</sup>

Increasingly, research on school-based prevention education focuses on long-term effects. While continuing to employ pre- and post-test designs, a number of studies have followed cohorts for several years after program implementation,<sup>8,9</sup> and some have attempted longer term assessments.<sup>10,11</sup> Despite these efforts, most research continues to assess school-based prevention soon after implementation, and a sizeable number of studies focus on alcohol and tobacco use only among elementary school students.<sup>8,12</sup>

One challenge for long-term research assessments involves contamination of control group subjects. Several factors affect the problem. First, school-based prevention education activities have been adopted by many U.S. schools, so finding control groups in schools without some form of prevention education is increasingly difficult. Second, because the population is highly mobile, students currently in schools that do not sponsor prevention educa-

tion could have previously attended a school that did. This presents difficulties to sampling frames that select controls based on school sponsorship. Third, school policies create magnet or alternative schools, school consolidation, annually revised busing plans, and other actions that continually shuffle the student population. As noted by Ennett et al<sup>12,13</sup> "... it is important to bear in mind that program effectiveness is determined on a comparative, rather than absolute basis."

This article reports findings from a statewide survey of 11th grade students in Ohio. A self-report survey, it measured previous participation in prevention programs as well as actual substance use. By research design, the survey was cross-sectional and did not attempt to test for a causal relationship between participation in prevention education activities and substance use. However, the survey did provide an opportunity to examine a possible association between participation in multiple prevention education activities and current use. In addition, it focused on youth in late adolescence, a group relatively neglected in research literature on school-based prevention education.

## METHODS

Information for the study comes from a statewide survey of 3,190 11th grade students in Ohio. The survey was administered during Spring 1995. One reason that 11th grade students were targeted was that they have ample opportunity to participate in prevention education activities, and at various levels during their elementary-school, middle-school, and senior high-school years.

## Procedures

Thirty-six public high schools were randomly selected throughout Ohio for the survey. These schools were stratified into 12 each from rural, satellite or suburban, and urban school districts based on a classification of all public and private schools provided by the Ohio Department of Education. Stratification by location was important, given the demographic and geographic features of the state. Ohio is a large urban state, with a sizeable suburban population. In addition, its rural population is among the largest in the nation, with agricultural concerns specializing in crop and livestock production.

Principals were contacted and asked for their respective school's cooperation in the study. Objectives of the study

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and procedures for assuring anonymity of respondents was fully explained. Principals were given a copy of the survey and a sample letter of notification to parents so that they could review study procedures with school board members and other school officials from their districts. Confidentiality and anonymity applied to both the participating schools and respondents. Schools were provided with letters to parents notifying them of their child's involvement in the study. Each principal of participating schools was sent a confidential report of the survey, which summarized results for his/her school and gave a comparison to the statewide average from other schools in the study.

Three schools declined to participate in the study. Principals of two schools indicated a similar student survey on substance use had already been conducted in the school year. The third school declined after a special committee on human subjects reviewed the survey instrument and found it unacceptable, despite assurances that the same instrument had been reviewed by the human subjects committee at The Ohio State University. These three declining schools, one from each strata, were not replaced because the number of participating schools remained equal for each strata.

#### Instrumentation

The survey selected for the study, the American Drug and Alcohol Survey™ (ADAS), is a commercial product of the Rocky Mountain Behavioral Science Institute, Inc., Ft. Collins, Colorado. Extensively field-tested, it has been used in over 1,000 elementary and secondary schools across the country.

One advantage of ADAS is that it includes 35 ways of cross-checking for inconsistent and exaggerated responses. In this statewide survey, 2.5% of respondents failed three or more such tests and were excluded from analysis. The usual range of exclusions is between 2% and 6% of students who complete the survey.

A second advantage of ADAS is its similarity, in estimates of substance use, with two other national epidemiologies: the Monitoring the Future Study, (specifically, its prevalence rates for high school seniors), and the National Adolescent Student Health Survey.<sup>13</sup> ADAS has been administered to students from a variety of backgrounds. Previous analyses of scales for measures of substance use within ADAS have found high reliability (range from .79 to .94) across different sociodemographic groups,<sup>13</sup> and similar reliability coefficients were found for this study.

In regard to 30-day and past-year use of various substances, the statewide survey of 11th graders and the nationwide Monitoring the Future Study of 12th and 10th graders of 1995 showed very similar results.<sup>1</sup> For example, in this study, 49.2% of 11th graders had consumed alcohol in the previous 30 days, compared to 51.3% of 12th graders and 38.8% of 10th graders in the nationwide study. During the previous 30 days, 29.6% of 11th graders had been drunk, compared to 33.2% of 12th graders and 20.8% of 10th graders in the nationwide study.

Similar percentages on 30-day and past-year use of inhalants, nitrites, LSD, and cocaine also were found. Eleventh graders from this study generally fell between the 12th grade and 10th grade percentages from the Monitoring the Future Study, although the percentages were much closer to older than younger peers. The only exception to this pattern was marijuana use. In this study,

36.8% and 21.4% of 11th graders reported previous year and 30-day use, respectively. In the Monitoring the Future Study, annual use was 34.7% for 12th graders and 28.7% for 10th graders. Thirty day use was 21.2% for 12th graders and 17.2% for 10th graders.

For the purposes of this study, the ADAS 34-group and three-group drug involvement scales were used. The 34-group scale is based on responses to a series of 100-plus questions about consumption of 15 specific substances (Figure 1). Questions were asked about lifetime, past year, and past 30-day use. Scores ranged from total abstinence (0) to drug dependence (34). The 34-group drug involvement scale can be reduced to a three-group substance use scale: high-risk users, moderate-risk users, and low-risk users. The high-risk group includes subjects who frequently get drunk

Figure 1  
34 Group and 3 Group  
Drug Involvement Scales

34 Group	3 Group
1. Never Tried Drugs or Alcohol	
2. Tried Alcohol	
3. Used Alcohol	
4. Very Light Alcohol	
5. Light Alcohol	1. Low
6. Tried Marijuana	
7. Tried One Drug	
8. Tried More Than One Drug	
9. Light Marijuana	
10. Light Marijuana and Alcohol	
11. Occasional Other Drug	
12. Occasional Uppers	2. Moderate
13. Occasional Downers	
14. Occasional Inhalant	
15. Occasional Drug Only	
16. Light Marijuana and Occasional Drug	
17. Marijuana and Occasional Drug	
18. Heavy Alcohol Only	
19. Heavy Alcohol and Marijuana	
20. Heavy Alcohol, Occasional Drug	
21. Alcohol Dependent or Predependent	
22. Heavy Marijuana Only	
23. Heavy Marijuana and Heavy Alcohol	
24. Heavy Marijuana and Other Drugs	
25. Marijuana and Uppers	
26. Marijuana and Cocaine	
27. Uppers and Hallucinogens	
28. Heavy Uppers	3. High
29. Young Polydrug	
30. Marijuana and Downers	
31. Uppers and Downers	
32. Heavy Downers	
33. Polydrug	
34. Drug Dependent	

(nearly every week) and/or use drugs frequently. The moderate-risk group consists of occasional marijuana users and occasional drug users; that is, their use is less than weekly and/or is not regular. The low-risk group includes previous marijuana users, those who have experimented with other drugs, light alcohol users, and abstainers.

#### Prevention Activities

The ADAS survey included a special prevention-program insert that asked subjects to indicate their prior involvement in various prevention education activities. The list was developed from the most widely mentioned prevention education activities based on a statewide survey of educators on this subject.<sup>14</sup> Activities included in the insert were the following:

1. **BABES (Beginning Alcohol/Addictions Basic Education).** BABES is a set of curricula designed for preschool through 12th grade levels that emphasizes self-image and personal feelings; decision-making and peer pressure; coping skills, alcohol and other drug information; and getting help for chemical dependency.

2. **Children are People.** This is a set of seven age-appropriate school curricula on alcohol, tobacco, and other drug use for kindergarten through the sixth grade.

3. **D.A.R.E. (Drug Abuse Resistance Education).** D.A.R.E. is designed for the elementary, middle school, and senior school levels. The elementary D.A.R.E. curriculum includes 17 hours of instruction on the mental and behavioral effects of drugs; managing stress; the influence of media on drug use and violence; peer resistance skills; and development of positive behaviors. The middle school program covers the same topics through 10 hours of instruction. The senior level program includes five hours of instruction. The program is a cooperative venture between a law enforcement agency and the sponsoring school. Specially screened and trained officers present the curriculum and supervise role-playing and other activities of D.A.R.E. However, the teacher stays in the classroom and assists the officers. (Most other curricula included in the study were teacher or peer taught.)

4. **Here's Looking at You 2000.** This kindergarten through 12th grade curriculum offers a comprehensive approach to health behavior, including alcohol, tobacco and other drug use; nutrition and hygiene; and consumer skills. The curriculum also includes lessons on refusal skills, peer pressure, and stress management.

5. **"Just Say No" Clubs.** These clubs are usually sponsored by a school as an extracurricular activity.

6. **Project Charlie (Chemical Abuse Resolution Lies in Education).** A set of two curricula for kindergarten through 3rd grade and fourth through 6th grade, this is designed to be a partnership between the school and the family. It focuses on skills, knowledge, and attitudes necessary for young people to make healthy choices.

7. **Quest Skills for Adolescence.** A set of three curricula for kindergarten through fifth grade, sixth through eighth grade, and ninth through 12th grade, this includes eight educational lessons, each containing a variety of specific lessons for learning about the dangers of substance use and about refusal skills. *Quest* encourages peer teaching.

8. **The Red Ribbon Campaign.** This annual event, sponsored by schools and community organizations in October, includes information on the dangers of substances

and encourages healthy choices. Participants are encouraged to tie red ribbons on the antennas of their motor vehicles and other places as a community-based symbolic gesture about drug awareness.

9. **TWYSAA (Talking with Your Students about Alcohol).** TWYSAA includes a set of curricula taught at three levels: fifth or sixth grade, seventh or eighth grade, and ninth or 10th grade, plus a refresher for the 11th and 12th grades. TWYSAA focuses specifically on alcohol use but includes information on other substances.

10. **Other prevention education activities.** Two questions in the survey asked students to indicate if they had participated in other activities, as both in-class and extra-curricular activities.

#### RESULTS

The sample of 11th graders matched well with statewide totals provided by the Ohio Department of Education. Nearly 83% of the sample was White, and slightly over 10% was Black, compared to statewide totals of 85% and 12%, respectively, for 11th graders. Forty-six percent of respondents were male, compared to a state total of 50%. Estimates by rural, suburban, and urban status for 11th graders were not available. However, 21% of the sample attended schools that had been classified by the Ohio Department of Education as rural. Census of population estimates of the proportionate rural population in 1990 (all age groups) was 25%.

About 42% of the junior class of 1995 indicated they had never participated in a school-based prevention education activity (Table 1). Nearly one-third had participated in multiple activities. The mean number of prevention education activities was 1.10. Significant differences existed in mean scores by the gender, race, and location of subjects. Female students, White students, and urban students each had higher mean scores.

The most popular activity was membership in "Just Say No" Clubs (28.7%), followed by participation in the D.A.R.E. elementary level program (27.4%) and Red Ribbon Week (19.5%). Also popular was participation in *Quest* and the D.A.R.E. program at the middle and senior school levels. Other prevention education activities were mentioned by less than one percent of the subjects and are not included in Table 2 or in any additional analysis. Only a few students had participated exclusively in each of the six most popular programs. Exclusive participation in only one prevention education activity ranged from 37.6% of those involved in *Quest* to 16% of subjects in the D.A.R.E. middle school program.

Common combinations of prevention activities are shown in Table 2. No single combination was dominant. Participation in *Red Ribbon Week* and "Just Say No" Clubs was the most common combination, but this represented the experience of only 7.0% of all subjects who participated in a prevention education activity and only 4.1% of all 3,190 subjects. However, the common theme running through every combination but the first was the presence of a D.A.R.E. program. This response reflected the wide diffusion of the D.A.R.E. program in the state, especially the elementary level curriculum.

Results in Table 3 include the analysis of variance for total number of prevention activities, gender, race, location and the 34-group drug involvement scale. Mean drug

Table 1  
Participation in School-Based Prevention Education Activities

	None	One	Two	Three	Four or more	$\chi^2$
<b>Gender<sup>b</sup></b>						
Male (1,486)	47.3%	24.0%	17.6%	7.5%	3.6%	.98
Female (1,678)	36.7%	28.4%	19.8%	9.6%	5.5%	1.22
<b>Race<sup>c</sup></b>						
White (2,578)	40.1%	27.0%	19.4%	8.8%	4.7%	1.13
Other (612)	49.0%	23.7%	15.7%	7.5%	4.1%	.96
<b>Location<sup>d</sup></b>						
Rural (683)	44.1%	25.9%	18.4%	8.5%	2.9%	1.01
Suburban (1,271)	49.0%	25.0%	15.7%	5.7%	4.5%	.95
Urban (1,235)	33.2%	28.0%	21.7%	11.5%	5.6%	1.30
Total (3,190)	41.8%	26.4%	18.7%	8.6%	4.6%	1.10

<sup>a</sup> Mean scores and ANOVAs were based on a frequency distribution for prevention education activities with a range of 0 to 7.

<sup>b</sup>  $F=28.87$  ( $df=3,162$ ),  $p<.001$

<sup>c</sup>  $F=9.34$  ( $df=3,188$ ),  $p<.010$

<sup>d</sup>  $F=29.96$  ( $df=3,186$ ),  $p<.001$

Table 2  
Participation in Prevention Education by Type of Activity

Prevention Activity	Participating In:		Only Program:	
	Frequency	Percent	Frequency	Percent of Row Total
	(n=3,190)			
D.A.R.E. Elementary Level	873	27.4%	237	27.1%
D.A.R.E. Middle School Level	450	14.1%	73	16.2%
D.A.R.E. Senior School Level	392	12.3%	77	19.6%
Just Say No Club	916	28.6%	246	26.9%
Red Ribbon Week	623	19.6%	130	20.9%
Quest	178	5.6%	67	37.6%

Participation in Multiple Activities (Most Common)

Combination of Activities	Frequency	Percent
		(n=1,857)
Red Ribbon Week and Just Say No Club	130	7.0%
Elementary D.A.R.E. and Just Say No Club	108	5.8%
D.A.R.E. Elementary and Middle School Levels	88	4.7%
D.A.R.E. Elementary and Senior School Levels	69	3.7%
D.A.R.E. Elementary Level, Red Ribbon Week, and Just Say No Club	62	3.3%
D.A.R.E. Elementary and Middle School Levels and Just Say No Club	50	2.7%
D.A.R.E. Middle School Levels and Just Say No Club	49	2.5%
D.A.R.E. Elementary, Middle, and Senior School Levels, Red Ribbon Week, and Just Say No Club	35	1.9%
D.A.R.E. Elementary Level and Red Ribbon Week	31	1.7%
D.A.R.E. Elementary and Middle School Levels, Red Ribbon Week, and Just Say No Club	28	1.5%

Table 3  
Summary of Drug Involvement, One Way, and Multiple Analysis of Variance

Variable	Cell Means*	One Way F-Value	P-Value	Multiple F-Value	P-Value
<b>Number of Activities</b>					
None	9.50				
1 activity	8.25				
2 activities	7.21				
3 activities	6.35				
4 activities and more	5.36				
Total	8.28	19.1	.000	19.8	.000
<b>Gender</b>					
Male	9.17				
Female	7.42				
Total	8.24	37.1	.000	28.1	.000
<b>Race</b>					
White	8.05				
Other	9.25				
Total	8.28	10.7	.001	4.9	.034
<b>Location</b>					
Rural	7.83				
Suburban	8.54				
Urban	8.26				
Total	8.28	1.7	.183	2.0	.137

\* Cell Means from one-way ANOVA of each independent variable with the 34 group drug involvement scale.

involvement scores decreased with number of prevention activities. This analysis of variance also was computed controlling for gender, race, and location. However, results did not change. Females had lower drug involvement scores than males. Although White subjects had lower scores than non-White subjects, the significance level was reduced when controlling for the influence of gender and location. Differences in drug involvement by location were not significant.

Eleventh grade students who participated in two or more prevention education activities were most likely to be in the low-risk group (Table 4). This pattern held for each demographic group. Involvement in multiple prevention education activities was slightly more beneficial for males than females, for non-Whites than Whites, and for urban than suburban and rural students.

Table 5 shows the mean scores for the 34-group drug involvement scale in four different ways. On the far left (a) are mean scores for all participants in each of the six most popular prevention education activities. Each mean score in Table 5 is lower than the average for subjects who indicated no participation in prevention education (Table 3). Variations occurred in mean scores among the six programs, but comparisons should be made with caution

because most participants in any one of these prevention education activities were also involved in some other activity. Mean scores were different when calculated for subjects who had participated only in that activity (b). In every case, mean scores increased. They went up least for *Quest* and one elementary *D.A.R.E.* program. When mean scores were calculated among subjects who had participated in a particular prevention education activity plus one additional activity (c), the mean scores were consistently lower. The single exception was the *D.A.R.E.* elementary level program. Finally, mean scores for subjects who had participated in a particular prevention education activity plus two additional activities (d) were even lower, although the decrease for *Red Ribbon Week* was small.

#### DISCUSSION

Data presented in this article must be interpreted with caution. First, measures of drug involvement and participation in prevention education activities were based on self-reports by subjects. Previous researchers examined this issue and found self-report studies to produce valid information for research on substance use.<sup>11</sup> Furthermore, ADAS does include a number of internal consistency and exaggeration checks. Second, this research is a cross-sectional

Table 4  
**Cross-tabulation of Three Group Drug Involvement Scale  
 and Number of Prevention Programs by Gender, Race, and Location**

Characteristics and Risk Levels	0		Number of Programs 1		2 or more	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
<b>Total</b>	<b>1334</b>	<b>100%</b>	<b>841</b>	<b>100%</b>	<b>1015</b>	<b>100%</b>
Low	732	54.9%	527	62.7%	714	70.3%
Moderate	358	26.8%	195	23.2%	204	20.1%
High	244	18.3%	119	14.1%	97	9.6%
<b>Gender</b>						
<b>Male Total</b>	<b>703</b>	<b>100%</b>	<b>357</b>	<b>100%</b>	<b>426</b>	<b>100%</b>
Low Risk	346	49.2%	217	60.8%	291	68.3%
Moderate Risk	186	26.5%	84	23.5%	81	19.0%
High Risk	171	24.3%	56	15.7%	54	12.7%
<b>Female Total</b>	<b>616</b>	<b>100%</b>	<b>477</b>	<b>100%</b>	<b>585</b>	<b>100%</b>
Low Risk	375	60.9%	308	64.6%	423	72.3%
Moderate Risk	171	27.8%	109	22.9%	120	20.5%
High Risk	70	11.4%	60	12.6%	42	7.2%
<b>Race</b>						
<b>White Total</b>	<b>1034</b>	<b>100%</b>	<b>696</b>	<b>100%</b>	<b>848</b>	<b>100%</b>
Low Risk	586	56.7%	447	64.2%	605	71.3%
Moderate Risk	271	26.2%	151	21.7%	162	19.1%
High Risk	177	17.1%	98	14.1%	81	9.6%
<b>Non-White Total</b>	<b>300</b>	<b>100%</b>	<b>145</b>	<b>100%</b>	<b>167</b>	<b>100%</b>
Low Risk	146	48.7%	80	55.2%	109	65.3%
Moderate Risk	87	29.0%	44	30.3%	42	25.1%
High Risk	67	22.3%	21	14.5%	16	9.6%
<b>Location</b>						
<b>Rural Total</b>	<b>301</b>	<b>100%</b>	<b>177</b>	<b>100%</b>	<b>205</b>	<b>100%</b>
Low Risk	182	60.5%	119	67.2%	154	75.1%
Moderate Risk	64	21.3%	36	20.3%	32	15.6%
High Risk	55	18.3%	22	12.4%	19	9.3%
<b>Suburban Total</b>	<b>623</b>	<b>100%</b>	<b>318</b>	<b>100%</b>	<b>330</b>	<b>100%</b>
Low Risk	349	56.0%	186	58.5%	230	69.7%
Moderate Risk	163	26.2%	80	25.2%	71	21.5%
High Risk	111	17.8%	52	16.4%	29	8.8%
<b>Urban Total</b>	<b>410</b>	<b>100%</b>	<b>346</b>	<b>100%</b>	<b>479</b>	<b>100%</b>
Low Risk	201	49.0%	222	64.2%	330	68.9%
Moderate Risk	131	32.0%	79	22.8%	100	20.9%
High Risk	78	19.0%	45	13.0%	49	10.2%

study of 11th grade students. It cannot assess the association between participation in prevention education and substance use among those who have dropped out of school. It cannot definitively determine a cause-and-effect relationship between participation in prevention education and levels of substance use. It can only conclude that there was (or was not) an association, or a covariation, between participation and substance use. One possible interpretation of the data suggests that youth who do not use substances are more likely to participate in prevention education activ-

ities (ie, "preaching to the choir"). Yet it is also reasonable to conclude that 11th graders who previously participated in various prevention education activities have lower substance use.

One argument for the former interpretation is that activities like *Red Ribbon Week* and "*Just Say No*" Clubs are voluntary, so students with lower substance use would more likely belong to these self-selective activities. However, both *Quest* and *D.A.R.E.* are in-class curricula and are self-selective only for the occasional parent or

Table 5  
Mean Scores for 34 Group Drug Involvement Scale by Type of Program

Program Name	a Total Participants		b Participation in Activity Only		c Participation in Activity and One Additional		d Participation in Activity and Two or More Additional Activities	
	Mean Score	N	Mean Score	N	Mean Score	N	Mean Score	N
Just Say No Club	7.03	916	8.54	246	6.87	331	6.09	339
Red Ribbon Week	5.88	623	7.18	130	5.71	213	5.40	280
Quest	6.83	178	7.25	67	6.79	48	6.40	63
D.A.R.E. Elementary	6.80	873	7.35	237	7.39	306	5.85	330
D.A.R.E. Middle School	8.01	450	10.04	73	9.04	161	6.56	216
D.A.R.E. Senior High	7.59	392	10.80	77	8.18	117	5.99	208

guardian who feels that prevention education is not appropriate for his/her child.

Several observations from the findings argue for the latter interpretation. First, the drug involvement scale is a combination of questions on previous lifetime, annual, and past-30-days use. Lower mean scores are indicative of subjects who may have experimented at a previous time, but not recently. Second, a clear lowering of mean drug involvement occurs for each additional level of involvement in a prevention education activity. Third, mean drug involvement scores for the three levels of the *D.A.R.E.* program in Table 5 show an interesting pattern: Mean scores among subjects who had participated only in a single activity (b) were higher for the *D.A.R.E.* middle school and *D.A.R.E.* senior programs than for the *D.A.R.E.* elementary level program. This finding suggests a prevention education curriculum like *D.A.R.E.* proves relatively more effective when it is not a "one shot" attempt at a time when experimental use has already begun among middle and senior high school students.

However, if subjects who had participated in the *D.A.R.E.* middle and senior school programs also participated in other prevention education activities (including the *D.A.R.E.* elementary program), then the mean scores were lower. In fact, differences in mean scores across all six prevention education activities for subjects who had been involved in two additional activities (Table 5, e) were relatively small. This finding suggests that these various programs reinforce each other, especially when they are spread over the developmental span of adolescence. If true, these results also suggest that arguments over the relative advantage of one activity versus another are misplaced and inappropriate. Finally, the findings from this study, which included subjects in the 11th grade, correspond to the results of an evaluation of the *D.A.R.E.* program in Colorado Springs. In this research, program effects such as participation in the elementary level *D.A.R.E.* program were not evident at a three-year follow-up (ninth grade

students), but some differences in substance use re-emerged at the six-year follow-up, such as lower use among twelfth grade males who had formerly participated in *D.A.R.E.*<sup>10,13</sup>

## CONCLUSION

Future research on the relative effectiveness of school-based prevention education activities should consider designs that can account for multiple exposures to different kinds of programs. This group of 11th grade students (from 1995) had been fifth graders in 1989, and fifth grade is a popular target level for *D.A.R.E.* and other prevention education curricula. Since 1989, more schools have adopted prevention education activities, including both in-class curricula and various extra-curricular activities. It is likely that a similar study of 11th grade students in 1998 will find fewer subjects than this study's 41.8% who had never participated in any kind of prevention education activity, and the 26.4% who had participated in only one activity.

Recent increases in drug use<sup>1</sup> have re-focused the nation's attention on the importance of prevention education. Various curricula and other prevention education activities compete with each other for adoption by schools. More established programs, like *D.A.R.E.*, have expanded to include multiple grade levels. As investments in prevention education once again grow, so too will questions about their effectiveness.

Untangling the connection between a specific curriculum or activity and substance use will be even more difficult. In addition, attempting to isolate effects may miss a more important research pursuit: measuring the cumulative influence of these experiences. ■

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