

A Randomized Controlled Trial of the Middle and Junior High School D.A.R.E. and D.A.R.E. Plus Programs

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Objective: To evaluate the effect of the middle and junior high school Drug Abuse Resistance Education (D.A.R.E.) and D.A.R.E. Plus programs on drug use and violence.

Design: Randomized controlled trial of 24 schools, with 3 conditions: D.A.R.E. only, D.A.R.E. Plus, and delayed program control.

Setting: Schools and neighborhoods, primarily in Minneapolis–St Paul.

Participants: All seventh-grade students in 24 schools in the academic year 1999–2000 (N=6237 at baseline, 67.3% were white, and there was 84.0% retention at final follow-up).

Interventions: The middle and junior high school D.A.R.E. curriculum in the 16 schools that received D.A.R.E. only and D.A.R.E. Plus. In the 8 schools that received D.A.R.E. Plus, additional components included a peer-led parental involvement classroom program called “On the VERGE,” youth-led extracurricular activities, community adult action teams, and postcard mailings to parents. The interventions were imple-

mented during 2 school years, when the cohort was in the seventh and eighth grades.

Main Outcome Measures: Self-reported tobacco, alcohol, and marijuana use; multidrug use; violence; and victimization, assessed at the beginning and end of seventh grade and at the end of eighth grade. Growth curve analytic methods were used to assess changes over time by condition.

Results: There were no significant differences between D.A.R.E. only and the controls; significant differences among boys between D.A.R.E. Plus and controls for tobacco, alcohol, and multidrug use and victimization; significant differences among boys between D.A.R.E. Plus and D.A.R.E. only in tobacco use and violence; and no significant behavioral differences among girls.

Conclusion: D.A.R.E. Plus significantly enhanced the effectiveness of the D.A.R.E. curriculum among boys and was more effective than the delayed program controls, underscoring the potential for multiyear, multicomponent prevention programs and demonstrating sex differences in response to intervention programs.

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THE MOST promising drug use and violence prevention programs to date have been multicomponent, theory-driven programs.¹⁻⁸ The federal government's Center for Substance Abuse Prevention, Rockville, Md, rates prevention programs on their effectiveness in reducing alcohol and other drug use and violence. There are 32 model programs that have met stringent evaluation criteria.⁹

Drug Abuse Resistance Education (D.A.R.E.) is the most widely used drug use prevention program in the United States.^{10,11} Most students participate in the elementary school D.A.R.E. curriculum.¹⁰ Several evaluations have reported short-term changes in cigarette smoking

among participants that have been modest in size and substantially less than those associated with other programs recommended by the Center for Substance Abuse Prevention.¹²⁻¹⁵

Middle, junior, and high school D.A.R.E. programs have also been developed, but there have not been any independent evaluations to date of these curricula, to our knowledge. Given the widespread dissemination of D.A.R.E., one objective of the present study was to evaluate the effect of the middle and junior high school D.A.R.E. curriculum. However, because the most effective prevention programs have had multiple components over multiple years,^{5,16} a second objective was to develop and evaluate supplemental com-

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ponents to the D.A.R.E. curriculum. If these components improve the efficacy of the D.A.R.E. curriculum, they might be disseminated and increase the overall effect of D.A.R.E.

METHODS

STUDY DESIGN

The Minnesota D.A.R.E. Plus Project was developed to evaluate whether the middle and junior high school D.A.R.E. curriculum and an expanded D.A.R.E. Plus at the middle and junior high school level would reduce tobacco, alcohol, and marijuana use and violent behavior among seventh- and eighth-grade students. The study design involved 24 middle and junior high schools in Minnesota that were matched on socioeconomic measures, drug use, and size and randomly assigned to 1 of 3 conditions. Eight schools received D.A.R.E. only, the middle and junior high school curriculum taught by trained police officers, during the 1999 to 2001 school years. Eight schools received the D.A.R.E. curriculum and the D.A.R.E. Plus program during the 1999 to 2001 school years. Eight schools served as "delayed program" control schools and had the opportunity to receive the D.A.R.E. Plus programs in 2001-2002, after the final follow-up. Surveys were conducted among all seventh-grade students in the 24 schools in fall 1999 (baseline) and spring 2000 (first follow-up), and among eighth-grade students in the same schools in spring 2001 (final follow-up). The intervention took place after baseline data collection in September and October 1999, and ended before the final follow-up in April and May 2001. All study methods were reviewed and approved by the institutional review board at the University of Minnesota. **Table 1** summarizes the study design.

School districts in Minnesota that had middle and junior high schools with a seventh-grade population of at least 200 were targeted for sufficient statistical power. If a school was interested in participating, the appropriate police department was contacted. This process resulted in the recruitment of 24 schools, comprising about 7000 seventh-grade students. These schools came from urban, suburban, and rural areas of Minnesota, with most from the Minneapolis-St Paul metropolitan area.¹⁷

STUDY SAMPLE

The primary study sample comprised students in the 24 schools who were in the seventh grade in the 1999-2000 school year or in the eighth grade in the 2000-2001 school year. There were 6728 students eligible for the survey at baseline. Of these students, 6237 (92.7%) were surveyed at baseline—2226 comprised the D.A.R.E. only condition; 2221, the D.A.R.E. Plus condition; and 1790, the control group condition. At the final follow-up, 84.0% of the baseline sample were surveyed. Reasons for loss to follow-up included students relocating (10.8%), absenteeism (1.4%), parental refusal or nondeliverable consent form (2.3%), student refusal (1.0%), and home schooling, limited English, or special education (0.5%). Loss to follow-up rates did not differ by study condition.

The main outcomes of the study were analyzed using growth curve analyses. This analytic method permits retention of subjects who do not have complete data.^{18,19} Of the 7353 students who completed at least 1 survey during the trial, 92 students relocated between study conditions during the 2 years of data collection and were dropped from the analyses. Students who had 3 or more responses in a survey that were inconsistent with each other were dropped from that data point only for that survey (about 2.3% each year). Of the 7261 remaining students, 4687 (64.6%) had all 3 data points, 1360 (18.7%) had 2 data points, and 1214

Table 1. Minnesota Drug Abuse Resistance Education (D.A.R.E.) Plus Project Study Design

Condition	Fall 1999 (Baseline) Seventh Grade	Spring 2000 (First Follow-up) Seventh Grade	Spring 2001 (Final Follow-up) Eighth Grade
D.A.R.E. only (8 schools)	O ₁ X ₁	O ₂ X ₁	O ₃
D.A.R.E. Plus (8 schools)	O ₁ X ₁ X ₂	O ₂ X ₁ X ₂	O ₃
Control (8 schools)	O ₁	O ₂	O ₃

Abbreviations: O, baseline survey; O₂, first follow-up survey; O₃, final follow-up survey; X₁, middle and junior high school D.A.R.E. curriculum (taught in seventh or eighth grade); X₂, D.A.R.E. Plus programs ("On the VERGE," peer-led extracurricular activities, adult action teams, parent postcards).

(16.7%) had 1 data point. Students who had higher levels of drug use and violent behavior at the beginning of the seventh grade were more likely to complete fewer surveys. However, there was no differential attrition between study conditions with regard to the main dependent variables in the analyses. Of the 7261 students, 51.6% were male; 67.3% were white, 7.5% were African American, 12.7% were Asian American, 3.6% were Hispanic, 4.0% were American Indian, and 4.9% were mixed or other racial/ethnic groups.

INTERVENTION COMPONENTS

The D.A.R.E. middle and junior high school 10-session curriculum provided skills in resisting influences to use drugs and in handling violent situations. It also focused on character building and citizenship skills. The police officers who taught the middle and junior high school D.A.R.E. program had received training in the elementary school D.A.R.E. curriculum, had taught at least 2 semesters of D.A.R.E., and had received training in the middle and junior high school curriculum, according to the D.A.R.E. protocol. In addition, officers who were teaching D.A.R.E. in the D.A.R.E. Plus condition were provided an extra 2-hour training by the research team on interactive teaching methods.

The first component of D.A.R.E. Plus was a classroom-based, peer-led, parental involvement program entitled "On the VERGE." VERGE is a 4-session program implemented by trained teachers once a week for 4 weeks. The program was designed as a teen magazine, and the classroom activities focused on influences and skills related to peers, social groups, media, and role models. The narrator of the magazines was a "very cool" bear, named "Buddy DaBear." The 2 classroom activities each session were primarily led by elected and trained peer leaders.

The last part of the magazine included "home team" activities for the students to complete with their parents related to these same themes.²⁰ Students also participated in a theater production in their classrooms and received 3 postcards through the mail that focused on the tobacco industry's targeting of youth. As a follow-up to VERGE, 10 additional postcards were mailed to the parents about every 6 to 8 weeks, with short and relevant behavioral messages.

The second component of D.A.R.E. Plus involved extracurricular activities for students. Youth action teams were organized during the 1999 to 2001 school years at each of the 8 schools that received D.A.R.E. Plus. The teams involved the students in determining the types of extracurricular activities that would be created and in their planning and implementation. Eight community organizers were hired to create and facilitate the teams and extracurricular programs.

The final component of D.A.R.E. Plus involved neighborhood action teams, which were formed to address neighborhood and school-wide issues related to drug use and violent behavior. The same community leaders organized these action teams. The organizers were extensively trained in direct action community organizing methods, as used in prior research.²¹

EVALUATION METHODS

The major outcome measures for the study—the use of cigarettes, alcohol, and marijuana; multidrug use; and violent behaviors among the students—were measured by a self-administered questionnaire, based on prior surveys (S. Kelder, PhD, and B. Flay, DPhil, unpublished data, 1995 and 1994, respectively).²²⁻²⁶ The alcohol use items measured occasions of use in the past year and in the past month (7 response categories each) and occasions of having gotten drunk (6 response categories). Cigarette use was measured by the amount of current use (10 response categories). In addition, scales were formed that measured behavior and intentions related to the use of alcohol (9 items; scale range, 9-49; $\alpha = .88$); tobacco (6 items; scale range, 6-27; $\alpha = .88$); marijuana (6 items; scale range, 6-26; $\alpha = .91$); and multiple drugs (21 items; scale range, 21-102; $\alpha = .93$); and violent behavior and intentions (5 items; scale range, 5-23; $\alpha = .85$) and physical victimization (2 items; scale range, 2-10; $\alpha = .71$). Psychosocial constructs related to multidrug use and violence were also measured and included demographic characteristics; normative estimates and expectations concerning multidrug use (20 items; scale range, 20-100; $\alpha = .87$) and violence (16 items; scale range, 16-80; $\alpha = .80$); perceived access and offers of multiple drugs (19 items; scale range, 19-63; $\alpha = .88$) and weapons (8 items; scale range, 8-26; $\alpha = .77$); parental rules and communication about drugs (9 items; scale range, 9-27; $\alpha = .83$) and violence (6 items; scale range, 6-18; $\alpha = .76$); and outcome expectations concerning tobacco use (17 items; scale range, 17-51; $\alpha = .87$) and violence (15 items; scale range, 15-45; $\alpha = .86$). We also assessed general social skills (20 items; scale range, 20-60; $\alpha = .81$) and social support (24 items; scale range, 24-120; $\alpha = .90$). Greater detail on the reliability and validity of the scales used in the D.A.R.E. Plus Project is published elsewhere.²⁷

DATA ANALYSIS METHODS

Differences between the D.A.R.E. only, D.A.R.E. Plus, and delayed program control conditions were tested using a 3-level, linear, random-coefficients model. This analytic approach is recommended for group-randomized trials with 3 or more repeated observations on the same individuals or groups, because these models maintain an appropriate type I error rate.²⁸ Instead of defining intervention effectiveness as the difference between group means at one point in time (via a mixed-model analysis of covariance, for example), a random coefficients model tests for differences in group slopes over an extended period. In doing so, it allows an assessment of the degree to which an intervention is able to positively alter the normative growth or trajectory of behavior over time.²⁹ One of the strengths of this approach is its ability to appropriately model the structure of data arising from a cluster sampling scheme (such as students in schools) and missing data. It models the process of change not only for the population but also for individuals, and thus is useful when there are multiple levels, such as are found in school and community trials. More detailed explanations of random coefficients models (growth curve analyses and hierarchical linear models) can be found elsewhere.^{18,30}

These models were used to evaluate the intervention's effect on relevant behavioral and psychosocial factors. Analyses were

first conducted with all students and, because substantial interactions with sex were noted, were then conducted separately for boys and girls. Models were not adjusted for ethnicity, because baseline data showed equivalency between study conditions. All of the models were estimated using maximum likelihood procedures with the multilevel module in LISREL 8.50.^{31,32}

RESULTS

The behavioral outcomes of the D.A.R.E. Plus Project are given for boys and girls in **Table 2**. The table shows the baseline scores and increase per year for each measure and the associated *P* values. At baseline, there were no significant differences between the 3 conditions. Comparing outcomes for students in D.A.R.E. only vs control schools, there were no significant outcomes for use of tobacco, alcohol, or marijuana or for violence, for all students, among boys or girls.

Among boys, those in the D.A.R.E. Plus schools were less likely than those in the control schools to show increases in alcohol use behavior and intentions, past year or past month alcohol use, tobacco use behavior and intentions, current smoking, multidrug use behavior and intentions, and victimization. Differences in increases between D.A.R.E. Plus and control schools also were marginal for violent behavior and intentions ($P \leq .06$).

Also among boys, those in the D.A.R.E. Plus schools were significantly less likely than those in the D.A.R.E. only schools to show increases in tobacco use behavior and intentions and in violent behavior and intentions. Boys in the D.A.R.E. Plus schools were marginally less likely than boys in the D.A.R.E. only schools to increase current smoking ($P \leq .08$) and victimization ($P \leq .10$).

Among girls, those in the D.A.R.E. Plus schools were less likely to report increases in ever having been drunk, compared with girls in the D.A.R.E. only schools. There were no other differences between conditions among girls.

The psychosocial outcomes support the behavioral outcomes and are given for boys in **Table 3**. Comparing boys in D.A.R.E. only schools with boys in the control schools, there were no significant psychosocial outcomes, including changes in normative expectations, access or offers, parental rules, or outcome expectations. Boys in the D.A.R.E. Plus schools, compared with boys in the control schools, were less likely to report an increase in normative estimates and expectations of drug use, violence, and access or offers of drugs, and less likely to report a decrease in negative outcome expectations surrounding tobacco use and violence. Boys in the D.A.R.E. Plus schools, compared with boys in the D.A.R.E. only schools, were less likely to increase positive normative estimates and expectations surrounding drugs and violence, less likely to have increased access to multiple drugs, and less likely to report decreases in parental rules about drugs.

Girls in the D.A.R.E. only schools, compared with girls in the control schools, were less likely to report a decrease in parental rules against violence (-0.10 vs -0.22 , $P < .01$; data not shown). There were no other significant differences between conditions among girls' psychosocial outcomes.

Table 2. Growth Curve Analyses of Alcohol, Tobacco, and Drug Use and Violent Behavior, From Baseline (Fall 1999) to Final Follow-up (Spring 2001) in the Drug Abuse Resistance Education (D.A.R.E.) Plus Project by Treatment Group and Sex*

Measure	Control	D.A.R.E.	D.A.R.E. Plus	P Value		
				D.A.R.E. vs Control	D.A.R.E. Plus vs Control	D.A.R.E. Plus vs D.A.R.E.
Boys						
Alcohol	(n = 1093)	(n = 1269)	(n = 1381)			
Behavior and intentions						
Baseline score	11.17 (0.20)	11.16 (0.19)	11.03 (0.19)	.48	.31	.32
Growth rate	1.64 (0.18)	1.35 (0.18)	1.19 (0.17)	.13	.04	.27
Past year						
Baseline score	1.31 (0.04)	1.31 (0.03)	1.29 (0.03)	.47	.40	.36
Growth rate	0.26 (0.03)	0.21 (0.03)	0.19 (0.03)	.12	.04	.30
Past month						
Baseline score	1.11 (0.02)	1.10 (0.02)	1.09 (0.02)	.43	.29	.36
Growth rate	0.14 (0.02)	0.11 (0.02)	0.08 (0.02)	.12	.01	.12
Ever drunk						
Baseline score	1.09 (0.02)	1.10 (0.02)	1.07 (0.02)	.41	.18	.12
Growth rate	0.15 (0.02)	0.11 (0.02)	0.11 (0.02)	.07	.07	.49
Tobacco						
Behavior and intentions						
Baseline score	7.66 (0.22)	7.65 (0.22)	7.72 (0.21)	.49	.43	.42
Growth rate	0.96 (0.12)	0.95 (0.11)	0.68 (0.11)	.49	.04	.04
Current smoker						
Baseline score	1.29 (0.06)	1.30 (0.06)	1.31 (0.06)	.48	.42	.44
Growth rate	0.31 (0.05)	0.28 (0.05)	0.18 (0.05)	.28	.02	.08
Marijuana behavior and intentions						
Baseline score	6.47 (0.08)	6.53 (0.08)	6.49 (0.08)	.28	.42	.35
Growth rate	0.98 (0.14)	0.90 (0.13)	0.76 (0.13)	.35	.11	.20
Drug behavior and intentions						
Baseline score	25.34 (0.47)	25.35 (0.46)	25.22 (0.46)	.50	.43	.42
Growth rate	3.58 (0.38)	3.19 (0.38)	2.66 (0.37)	.24	.05	.16
Violent behavior and intentions						
Baseline score	7.92 (0.17)	7.67 (0.17)	7.82 (0.16)	.15	.35	.26
Growth rate	0.54 (0.09)	0.57 (0.09)	0.35 (0.08)	.41	.06	.04
Physical victimization						
Baseline score	4.19 (0.15)	4.13 (0.15)	4.16 (0.15)	.39	.46	.44
Growth rate	0.03 (0.05)	-0.03 (0.04)	-0.10 (0.04)	.18	.02	.10
Girls						
Alcohol	(n = 1015)	(n = 1249)	(n = 1254)			
Behavior and intentions						
Baseline score	10.66 (0.22)	10.82 (0.21)	10.67 (0.22)	.30	.48	.31
Growth rate	1.49 (0.24)	1.61 (0.23)	1.32 (0.23)	.37	.30	.19
Past year						
Baseline score	1.23 (0.03)	1.27 (0.03)	1.25 (0.03)	.19	.37	.29
Growth rate	0.25 (0.04)	0.27 (0.04)	0.23 (0.04)	.35	.36	.22
Past month						
Baseline score	1.08 (0.02)	1.08 (0.02)	1.08 (0.02)	.49	.37	.38
Growth rate	0.12 (0.03)	0.13 (0.02)	0.08 (0.03)	.40	.15	.10
Ever drunk						
Baseline score	1.07 (0.02)	1.07 (0.02)	1.07 (0.02)	.42	.41	.49
Growth rate	0.12 (0.02)	0.13 (0.02)	0.07 (0.02)	.33	.11	.04
Tobacco						
Behavior and intentions						
Baseline score	7.71 (0.25)	7.82 (0.25)	8.07 (0.25)	.39	.16	.24
Growth rate	1.01 (0.19)	0.93 (0.18)	0.79 (0.18)	.39	.20	.29
Current smoker						
Baseline score	1.31 (0.07)	1.35 (0.06)	1.43 (0.06)	.33	.11	.21
Growth rate	0.28 (0.07)	0.25 (0.07)	0.22 (0.07)	.38	.25	.35
Marijuana behavior and intentions						
Baseline score	6.32 (0.10)	6.38 (0.09)	6.43 (0.09)	.29	.20	.39
Growth rate	0.73 (0.15)	0.84 (0.15)	0.61 (0.15)	.33	.29	.16
Drug behavior and intentions						
Baseline score	24.69 (0.53)	25.03 (0.52)	25.19 (0.52)	.33	.25	.41
Growth rate	3.22 (0.54)	3.38 (0.53)	2.75 (0.53)	.42	.27	.20
Violent behavior and intentions						
Baseline score	6.66 (0.16)	6.75 (0.15)	6.67 (0.15)	.34	.49	.35
Growth rate	0.30 (0.07)	0.26 (0.07)	0.23 (0.07)	.34	.24	.38
Physical victimization						
Baseline score	3.44 (0.10)	3.51 (0.10)	3.37 (0.10)	.30	.33	.16
Growth rate	0.00 (0.04)	0.01 (0.04)	0.00 (0.04)	.44	.45	.38

*Data are given as mean (SE) unless otherwise indicated. Growth curve analyses based on 3-level, linear random-coefficients model, unadjusted, 1-tailed. Higher scores indicate more risk.

Table 3. Growth Curve Analyses of Scales of Psychosocial Factors for Tobacco, Alcohol, and Marijuana Use and Violence, From Baseline (Fall 1999) to Final Follow-up (Spring 2001) in the Drug Abuse Resistance Education (D.A.R.E.) Plus Project by Treatment Group*

Boys	Control (n = 1093)	D.A.R.E. (n = 1269)	D.A.R.E. Plus (n = 1381)	P Value		
				D.A.R.E. vs Control	D.A.R.E. Plus vs Control	D.A.R.E. Plus vs D.A.R.E.
Normative expectations†						
Drugs						
Baseline score	35.94 (1.15)	34.96 (1.14)	36.02 (1.14)	.27	.49	.26
Growth rate	4.56 (0.55)	5.07 (0.54)	3.28 (0.54)	.26	.05	.01
Violence†						
Baseline score	35.32 (0.77)	34.85 (0.75)	34.49 (0.75)	.33	.22	.37
Growth rate	2.07 (0.33)	1.95 (0.32)	1.11 (0.31)	.39	.02	.03
Access and offers‡						
Drugs						
Baseline score	26.25 (0.45)	25.97 (0.44)	26.26 (0.44)	.34	.49	.33
Growth rate	2.48 (0.27)	2.54 (0.27)	1.71 (0.26)	.44	.02	.02
Weapons‡						
Baseline score	10.10 (0.18)	9.72 (0.18)	9.76 (0.18)	.13	.20	.83
Growth rate	0.16 (0.06)	0.19 (0.06)	0.09 (0.05)	.70	.43	.22
Parent rules‡						
Drugs						
Baseline score	25.99 (0.20)	25.93 (0.20)	25.64 (0.20)	.40	.11	.17
Growth rate	-0.31 (0.08)	-0.33 (0.08)	-0.14 (0.07)	.47	.07	.05
Violence						
Baseline score	16.23 (0.18)	16.21 (0.18)	16.24 (0.18)	.47	.49	.46
Growth rate	-0.23 (0.06)	-0.17 (0.06)	-0.10 (0.06)	.23	.07	.23
Outcome expectations‡						
Tobacco						
Baseline score	43.82 (0.53)	44.39 (0.53)	43.78 (0.52)	.23	.48	.21
Growth rate	-2.04 (0.26)	-2.20 (0.26)	-1.30 (0.25)	.33	.02	.01
Violence‡						
Baseline score	32.90 (0.39)	33.21 (0.38)	33.62 (0.37)	.29	.09	.22
Growth rate	-1.78 (0.20)	-1.62 (0.20)	-1.30 (0.19)	.28	.04	.12

*Data are given as mean (SE) unless otherwise indicated. Growth curve analyses based on 3-level, linear random coefficients model, unadjusted, 1-sided. Drug use includes tobacco, alcohol, and marijuana use. Data for girls are reported in the text.

†A higher score on this scale indicates more risk.

‡A higher score on this scale indicates less risk.

COMMENT

The D.A.R.E. Plus Project was well received by the schools and communities in the study, and high participation rates were noted. The project's strengths included its randomized design, equivalence at baseline on all drug use and violence measures, extraordinary support on the part of the school districts and police departments to conform to the research needs, reliable psychosocial scales, and representation of urban, multiethnic students. The outcomes of the study underscore the benefits of multiyear, multicomponent interventions, as well as the potential sex differences in how interventions affect young adolescents.

The D.A.R.E. curriculum alone did not demonstrate any significant behavioral effect. The reasons for this lack of effect might include an ineffective curriculum that was not able to make changes in the key predictive factors of drug use and violence, a population in which more than 94% had already been exposed to the D.A.R.E. curriculum in the fifth or sixth grade, and the curricula in the control schools, which included programs that have been shown to be effective.³³ Recently, D.A.R.E. has begun a revision of the middle and junior high school program with an extensive evaluation³⁴; the results of the present study

support the need to develop a more effective D.A.R.E. curriculum for young adolescents.

The D.A.R.E. Plus components significantly enhanced the effect of the D.A.R.E. curriculum for boys. The D.A.R.E. Plus intervention was significantly more effective than the control intervention in reducing increases in tobacco, alcohol, and multidrug use and victimization among boys. D.A.R.E. Plus was significantly more effective than D.A.R.E. only in reducing the increase in tobacco use and violence. Therefore, D.A.R.E. Plus was particularly effective among boys, in whom psychosocial factors that were predictive of alcohol, tobacco, and marijuana use and violence were modified by the intervention. It may be that the main male role model in VERGE appealed to boys more than girls, or that the interactive and competitive tobacco use theater production (staged like a game show) was more involving for boys than girls. In addition, 13 (72.2%) of the 18 D.A.R.E. officers were men and may have been positive role models for the boys. Compared with girls, boys had significantly higher rates of alcohol use, marijuana use, and violence at baseline, and therefore were at higher risk at the beginning of the project, so the D.A.R.E. Plus intervention may have been more salient to them, and there may

What This Study Adds

D.A.R.E. is the most widely implemented drug use prevention program in the United States. Although evaluations of the elementary school D.A.R.E. curriculum have been undertaken, to our knowledge, there have not been any independent evaluations of the middle and junior high school curriculum. Also, there has not been a study to examine the potential of enhancing D.A.R.E. with additional peer, parental, and community components.

The D.A.R.E. Plus Project research outcomes suggest that the middle and junior high school D.A.R.E. program does not affect drug use and violent behaviors among young adolescents. These results should be useful as D.A.R.E. undertakes revisions of its curricula and should provide an impetus to thoroughly evaluate the new programs. The project also demonstrates that peer, parental, and community components significantly enhance the effect of the D.A.R.E. curriculum for boys, who are at higher risk of drug use and violence. These added components help to create a multicomponent safety net for young adolescents that may be important in making prevention programs more comprehensive and effective.

have been more statistical power to detect changes in these behaviors. Boys at baseline also reported significantly fewer parental rules concerning drugs and violence, fewer decision-making skills, involvement in fewer extracurricular activities, and less social support than girls and thus may have begun with fewer protective factors that may have been enhanced or provided by the intervention. Although prior prevention studies³⁵⁻³⁷ have not shown such marked differences in outcomes by sex, other prevention programs have also been more effective with boys.³⁸⁻⁴⁰ More work, including mediation analyses and qualitative research, needs to be done to understand why D.A.R.E. Plus was primarily effective with boys.

Additional research questions were raised by the results of the D.A.R.E. Plus Project. One question concerns the independent effect of the D.A.R.E. Plus components. A fourth condition—the D.A.R.E. Plus components alone—would be useful in future studies to understand the effect of the added intervention components. It may be that the results for D.A.R.E. Plus resulted from the synergism of the D.A.R.E. curriculum and the D.A.R.E. Plus components. Alternatively, because the D.A.R.E. curriculum alone was not effective in changing drug use and violent behaviors, if a more effective curriculum^{35,41} had been supplemented with D.A.R.E. Plus, more robust outcomes or significant outcomes among girls may have been achieved. A second question concerns the duration of the intervention. The project might have been enhanced by a longer intervention and follow-up, as has been observed in other programs.⁴¹ Finally, the effect of the program on those who were lost to follow-up would be useful to examine the larger results of an intervention.

In summary, the D.A.R.E. Plus Project demonstrated that a multicomponent intervention significantly improved the D.A.R.E. middle and junior high school D.A.R.E. curriculum and became an effective intervention for reducing increases in alcohol, tobacco, and

multidrug use and victimization among adolescent boys. The sex differences in outcomes need greater exploration, because there was a clear intervention effect with multiple behaviors among boys, but no effect among girls. Because boys were at greater risk at baseline, these results suggest that the intervention was reaching an audience that was at high risk and that these efforts were warranted. Finally, the efficacy of broadening our prevention programs to develop healthy communities by including parents, peers, and other community members is underscored by the outcomes of this project.

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REFERENCES

1. US Department of Health and Human Services. *Preventing Tobacco Use Among Young People: A Report of the Surgeon General*. Atlanta, Ga: Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Public Health Service, US Dept of Health and Human Services; 1994.

2. *Drug Strategies: Making the Grade: A Guide to School Prevention Programs*. Chicago, Ill: Spencer Foundation; 1996.
3. *Drug Strategies: Making the Grade: A Guide to School Prevention Programs*. Rev ed. Chicago, Ill: Spencer Foundation; 1999.
4. Dusenbury L, Falco M. Eleven components of effective drug abuse prevention curricula. *J Sch Health*. 1995;65:420-425.
5. National Institute on Drug Abuse. *Preventing Drug Use Among Children and Adolescents*. Bethesda, Md: National Institutes of Health; 1997.
6. Tobler NS. Meta-analysis of 143 adolescent drug prevention programs: quantitative outcome results of program participants compared to a control or comparison group. *J Drug Issues*. 1986;16:537-567.
7. Tobler NS, Roona MR, Ochshorn P, Marshall DG, Streke AV, Stackpole KM. School-based adolescent drug prevention programs: 1998 meta-analysis. *J Prim Prev*. 2000;20:275-335.
8. Tolan P, Guerra N. *What Works in Reducing Adolescent Violence: An Empirical Review of the Field*. Boulder: Center for the Study of Prevention of Violence, University of Colorado; 1994.
9. Center for Substance Abuse Prevention. *Promising and Proven Substance Abuse Prevention Programs*. Rockville, Md: US Dept of Health and Human Services; 2001. Publication (SMA) 01-3506.
10. Rogers EM. Diffusion and reinvention of Project D.A.R.E. In: Backer TE, Rogers EM, eds. *Organizational Aspects of Health Communication Campaigns*. Newbury Park, Calif: Sage Publications; 1993.
11. Wysong E, Aniskiewicz R, Wright D. Truth and D.A.R.E.: tracking drug education to graduation and as symbolic politics. *Soc Probl*. 1994;41:448-472.
12. Ennett ST, Tobler NS, Ringwalt CL, Flewelling RL. How effective is Drug Abuse Resistance Education? a meta-analysis of Project D.A.R.E. outcome evaluations. *Am J Public Health*. 1994;84:1394-1402.
13. DeJong WA. Short-term evaluation of Project D.A.R.E.: preliminary indications of effectiveness. *J Drug Educ*. 1987;17:279-294.
14. Hansen WB, McNeal RB. How D.A.R.E. works: an examination of program effects on mediating variables. *Health Educ Behav*. 1997;24:165-176.
15. Clayton RR, Cattarello AM, Johnstone BM. The effectiveness of Drug Abuse Resistance Education (Project D.A.R.E.): 5-year follow-up results. *Prev Med*. 1996; 25:307-318.
16. Perry CL. *Creating Health Behavior Change: How to Develop Community-Wide Programs for Youth*. Thousand Oaks, Calif: Sage Publications; 1999.
17. Perry CL, Komro KA, Veblen-Mortenson S, et al. The Minnesota D.A.R.E. Plus Project: creating community partnerships to prevent drug use and violence. *J Sch Health*. 2000;70:84-88.
18. Raudenbush SW, Bryk AS. *Hierarchical Linear Models: Applications and Data Analysis Methods*. 2nd ed. Thousand Oaks, Calif: Sage Publications; 2001.
19. Bryk AS, Raudenbush SW. *Hierarchical Linear Models: Applications and Data Analysis Methods*. Newbury Park, Calif: Sage Publications; 1992.
20. Perry CL, Luepker RV, Murray DM, et al. Parent involvement with children's health promotion: the Minnesota Home Team. *Am J Public Health*. 1988;78:1156-1160.
21. Perry CL, Williams CL, Komro KA, et al. Project Northland high school interventions: community action to reduce adolescent alcohol use. *Health Educ Behav*. 2000;27:29-49.
22. Johnston LD, O'Malley PM, Bachman JG. *Monitoring the Future Student Survey*, 1998. Ann Arbor: Institute for Social Research, University of Michigan; 1998.
23. *Minnesota Student Survey*. St Paul: Minnesota Dept of Children Families & Learning; 1998.
24. Williams CL, Toomey TL, McGovern P, Wagenaar AC, Perry CL. Development, reliability, and validity of self-report alcohol-use measures with young adolescents. *J Child Adolesc Subst Abuse*. 1995;4(3):7-40.
25. Gambrell ED, Richey CA. An assertion inventory for use in assessment and research. *Behav Ther*. 1975;6:550-561.
26. *Search Institute Profiles of Student Life*. Minneapolis, Minn: Search Institute; 1989.
27. Komro KA, Perry CL, Munson KA, Stigler MH, Farbakhs K. Reliability and validity of self-report measures to evaluate drug and violence prevention programs. *J Child Adolesc Subst Abuse*. In press.
28. Murray DM, Hannan PJ, Wolfinger RD, Baker WL, Dwyer JH. Analysis of data from group-randomized trials with repeat observations on the same groups. *Stat Med*. 1998;17:1581-1600.
29. Maggs JL, Schulenberg J, Hurrelmann K. Developmental transitions during adolescence: health promotion implications. In: Schulenberg J, Maggs JL, Hurrelmann K, eds. *Health Risks and Developmental Transitions During Adolescence*. New York, NY: Cambridge University Press; 1997:522-546.
30. Murray DM. Statistical models appropriate for designs often used in group-randomized trials. *Stat Med*. 2001;20:1373-1385.
31. Du Toit S, Du Toit M, Cudeck R. *Introduction to the Analysis of Multilevel Models With LISREL 8.30*. Lincolnwood, Ill: Scientific Software International; 1999.
32. Joreskog K, Sorbom D, Du Toit S, Du Toit M. *LISREL 8: New Statistical Features*. Lincolnwood, Ill: Scientific Software International; 1999.
33. Ellickson PL, Bell RM. Drug prevention in junior high: a multi-site longitudinal test. *Science*. 1990;247:299-1305.
34. Zernike K. Antidrug program says it will adopt a new strategy. *New York Times* [newspaper online]. Available at: <http://www.nytimes.com/2001/02/15/national/15D.A.R.E..html>. Accessed February 16, 2001.
35. Perry CL, Williams CL, Veblen-Mortenson S, et al. Project Northland: outcomes of a community-wide alcohol use prevention program during early adolescence. *Am J Public Health*. 1996;86:956-965.
36. Perry CL, Williams CL, Komro KA, et al. Project Northland: long-term outcomes of community action to reduce adolescent alcohol use. *Health Educ Res*. 2002; 17:117-132.
37. Perry CL, Kelder SH, Murray DM, Klepp KI. Communitywide smoking prevention: long-term outcomes of the Minnesota Heart Health Program and the Class of 1989 Study. *Am J Public Health*. 1992;82:1210-1216.
38. MacKinnon DP, Weber MD, Pentz MA. How do school-based drug prevention programs work and for whom? *Drugs Soc*. 1989;3(pt 1):125-143.
39. Dielman TE, Horvath WJ, Leech SL, Loregner AL. *Peer Pressure in Recruitment to Cigarette Smoking: Final Report*. Bethesda, Md: National Institute on Drug Abuse; 1984. Technical memo 84.1.
40. Flay BR, Burns JL, He Y, et al. The Aban Aya Youth Project: preventing violence among inner-city African American youth. Paper presented at: Society for Prevention Research Annual Meeting; May 31, 2000; Montreal, Quebec.
41. Botvin GJ, Baker E, Dusenbury L, Tortu S, Botvin EM. Preventing adolescent drug abuse through a multimodal cognitive-behavioral approach: results of a 3-year study. *J Consult Clin Psychol*. 1990;58:437-466.