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## Mass Media and School Interventions for Cigarette Smoking Prevention: Effects 2 Years after Completion

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### ABSTRACT

The long-term cigarette smoking prevention effects of mass media and school interventions were assessed. Adolescents in two communities received both mass media and school interventions; those in two matching communities received only school interventions. Surveys of 5458 students were conducted at baseline in grades 4 through 6 and 2 years after the 4-year interventions were completed, when students were in grades 10 through 12. Students exposed to the media-plus-school interventions were found to be at lower risk for weekly smoking (odds ratio = 0.62, 95% confidence interval = 0.49, 0.78) than those receiving school interventions only, indicating that the effects of the combined interventions persisted 2 years after the interventions' completion. (*Am J Public Health*. 1994;84:1148-1150)

### Introduction

We previously reported on significant reductions in adolescent cigarette smoking achieved by mass media interventions combined with school programs.<sup>1,2</sup> Since other smoking prevention studies have shown that effects were lost over time, we conducted additional surveys 2 years after these interventions ended.<sup>3,4</sup>

### Methods

Baseline surveys were administered to 5458 students in grades 4 through 6 from four communities in the United States. Those in two communities received mass media and school interventions for 4 years; those in two matched communities received only the school interventions. Interventions were focused on cigarette smoking prevention.<sup>1,2</sup> When these students were in grades 10 to 12, we attempted to follow up all cohort members.

### Study Samples

Within the four study communities, equivalence of treatment groups was increased by selecting schools in census tracts having characteristics indicating higher risk for cigarette smoking. In media-plus-school tracts, 68% of adults

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were high school graduates, and median household income was \$14 186. In school-program-only tracts, 74% were graduates and household income was \$14 994.

The full-exposure sample consisted of cohort members participating in all six school surveys; this sample was assumed to have received the complete intervention. The complete-follow-up sample included all cohort members assessed in grades 10 to 12 regardless of survey participation during intervening years; these students received varying intervention exposure because some moved away or left school after the baseline survey.

#### Data Collection and Measurement

All school surveys were conducted by the University of Vermont. For cohort members who were not present for the follow-up school survey, telephone interviews were conducted by the University of Minnesota.<sup>5</sup> The primary outcome measure assessed cigarettes smoked in the past week; responses greater than zero were classified as weekly smokers. Two additional smoking measures, daily smoking and self-selected smoking category, were included to examine consistency of results.<sup>6,7</sup> Saliva samples were obtained during school surveys as a bogus pipeline procedure to encourage more accurate self-reports.<sup>8</sup> Self-reports of alcohol use were measured to assess substance use behaviors not targeted by the interventions.

#### Statistical Analyses

The study design was based on the individual as the unit of analysis. For analyses based on this perspective, stepwise logistic regression was used to assess treatment effects while adjusting for potential confounding variables. For analyses concerned with the complete-follow-up sample, additional predictors were included for type of follow-up survey and years of intervention exposure. Inclusion of variables was based on significance of the *F*-to-enter ( $P < .05$ ) and improvement in model fit (Hosmer-Lemeshow test).

Consistency between units of allocation to treatment and units of analysis has been emphasized in the recent program evaluation literature.<sup>9</sup> Because study communities were assigned to treatment groups, analyses of variance based on this perspective are presented. These analyses have low statistical power because of the small number of community units available. Community was considered a random factor nested within treatment; school, a random factor nested within

**TABLE 1—Follow-Up Survey Participation Status of Baseline Cohort**

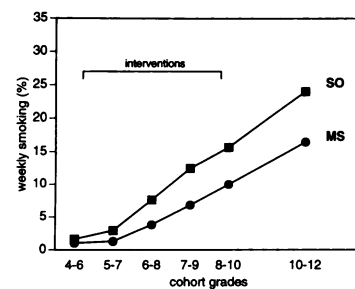
	No. (n = 5458)	%
Follow-up successful	4670	86
School survey	2863	
Telephone survey	1807	
Follow-up not successful	788	14
Refused in school	86	
Refused over telephone	63	
Incomplete telephone interview	4	
Not reached by telephone	122	
Not located by telephone	238	
School had no tracking data	237	
Excluded by school (special education students)	29	
Deceased	9	

community; and individual, a random factor nested within school. Significance associated with treatment differences was determined using community within treatment as the error term.<sup>10</sup>

#### Results

Of the 5458 students participating in baseline surveys, 38% ( $n = 2086$ ) participated in the five subsequent school surveys and constituted the full-exposure sample; 86% ( $n = 4670$ ) participated in surveys of grades 10 to 12 and constituted the complete-follow-up sample (Table 1). In the full-exposure sample, the media-plus-school group had a larger proportion of females, a group at higher risk for becoming smokers, than the school-program-only group. In the complete-follow-up sample, the media-plus-school group also were more likely to report sibling smokers.

Changes in weekly smoking for the full-exposure sample are shown in Figure 1. When 1991 weekly smoking was regressed on potential explanatory variables, five predictors met the inclusion criteria (Table 2). The odds ratio for being a smoker in the media-plus-school group was 0.62, indicating reduced risk. Similar models were obtained for the alternative smoking measures. Analyses



**FIGURE 1—Weekly smoking among those participating in all six school surveys (full-exposure sample) in the media-plus-school (MS) and the school-program-only (SO) treatment groups ( $n = 2086$ ).**

of variance based on community as the analytic unit showed significant differences between treatment groups both before adjusting for covariates ( $F_{1,2} = 24.6$ ;  $P = .04$ ) and after adjustments ( $F_{1,2} = 92.0$ ;  $P = .01$ ).

When 1991 weekly smoking was regressed on potential explanatory variables in the complete-follow-up sample, five predictors again met the inclusion criteria (Table 2). In this model, the odds ratio for being a smoker in the media-plus-school group was 0.79. For analyses based on community as the unit, this difference was not statistically significant ( $F_{1,2} = 4.38$ ;  $P = .17$ ).

Self-reports of alcohol use were examined using similar logistic regression models. No treatment effects were observed.

#### Discussion

These results extend earlier findings of the smoking prevention efficacy of media and school interventions in two ways: (1) effects persisted 2 years after interventions ended; and (2) effects were observed among a more diverse sample of the original cohort.

The treatment groups had reasonably equivalent baseline characteristics but tended to show the media-plus-school group to be at higher risk for smoking; census tracts from which this group were drawn also showed higher population risks for smoking. Intervention effects were specific to cigarette smoking and did

TABLE 2—Logistic Regression Results Assessing Risk of Smoking among Cohort Members

Predictor	Outcome Measures									
	Weekly Smoking			Smoking Category			Daily Smoking			
	Entry Order	Odds Ratio	95% Confidence Interval	Entry Order	Odds Ratio	95% Confidence Interval	Entry Order	Odds Ratio	95% Confidence Interval	
<b>Full-exposure sample</b>										
	(n = 1939; P = .77) <sup>a</sup>			(n = 1988; P = .40)			(n = 1925; P = .99)			
Media-plus-school	1	0.62	0.49, 0.78	2	0.61	0.47, 0.77	2	0.60	0.46, 0.78	
Baseline smoker	2	3.38	1.47, 7.74	3	3.20	1.40, 7.31	4	2.96	1.20, 7.30	
Female gender	3	1.49	1.18, 1.87	4	1.46	1.14, 1.87	5	1.36	1.04, 1.79	
Parental smoking	4	1.39	1.10, 1.75	1	1.56	1.21, 2.00	1	1.80	1.35, 2.35	
Sibling smoking	5	1.50	1.01, 2.22	5	1.75	1.18, 2.59	3	1.86	1.22, 2.84	
<b>Complete-follow-up sample</b>										
	(n = 4307; P = .76)			(n = 4392; P = .60)			(n = 4304; P = .77)			
Telephone survey	1	2.02	1.76, 2.32	1	2.34	2.03, 2.69	1	2.40	2.06, 2.78	
Baseline smoker	2	3.29	2.24, 4.84	3	3.45	2.35, 5.08	3	3.11	2.11, 4.58	
Parental smoking	3	1.51	1.30, 1.74	2	1.73	1.49, 2.01	2	1.91	1.63, 2.25	
Media-plus-school	4	0.79	0.69, 0.91	5	0.78	0.68, 0.90	4	0.78	0.67, 0.90	
Sibling smoking	5	1.39	1.12, 1.73	4	1.50	1.21, 1.86	5	1.46	1.16, 1.83	

<sup>a</sup>P values represent significance of Hosmer-Lemeshow goodness-of-fit test.

not reflect a general proneness toward less substance use in the media-plus-school group. These findings confirm that sample differences were unlikely explanations for observed effects.<sup>1</sup> Confidence in the findings was increased by the consistency of results across different smoking measures.

For the full-exposure sample, both individual and community-based analytic approaches provided evidence of significant treatment effects. For the complete-follow-up sample, the primary analysis showed significant effects while the more conservative approach did not. The strength and specificity of the effects, their consistency, and their agreement with earlier results, however, support a conclusion that treatment differences were observed in the latter sample.

These results should be generalizable despite demographic differences between study areas and the US population. Census data indicate that the cohort represented a lower-income sector of the US adolescent population. High levels of cohort recruitment and retention provided an unusually complete picture of long-term effects within this group.

Other studies have evaluated multifaceted smoking prevention approaches.<sup>7,11-14</sup> This group of studies suggests that school smoking prevention programs can have substantial effects when supported by efforts outside of

schools to influence perceptions of peer and community norms. The present study shows that sustained smoking prevention effects can be achieved efficiently through schools and mass media, two of the most powerful influences on young people. □

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