

Mobilizing Positive Reinforcement in Communities to Reduce Youth Access to Tobacco¹

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A community intervention to mobilize positive reinforcement for not selling tobacco to young people was evaluated. The intervention had five components: (a) mobilization of community support, (b) merchant education, (c) changing consequences to clerks for selling or not selling to those under 18, (d) publicity about clerks' refusals to sell, and (e) feedback to store owners or managers about the extent of their sales to adolescents. A multiple baseline design experiment was conducted, in which two small Oregon communities received the intervention, while two others continued in baseline. Outlets' willingness to sell was assessed repeatedly by teenage volunteers. The intervention significantly reduced the proportion of stores willing to sell. Mobilizing social and material reinforcement for stores not selling tobacco to young people is a viable means of reducing such sales. It may be especially valuable in communities where laws against sales to minors go unenforced.

KEY WORDS: access to tobacco; tobacco sales to minors; prevention of adolescent tobacco use.

This paper reports an evaluation of a community-wide program to reduce illegal sales of tobacco to young people. The program involves the mobilization of positive reinforcement for clerks not selling tobacco to young people. In an initial evaluation of the program in four communities, the program led to a significant reduction in the proportion of stores that sold tobacco to youth (Biglan et al., 1995). The present study reports the ex-

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perimental evaluation of the program in an additional four communities and summarizes the effects of the program across all eight communities in which it has been evaluated.

Preventing adolescent tobacco use is a significant priority for public health because smoking contributes to approximately 400,000 deaths per year (U.S. Department of Health and Human Services, 1990), and most smokers begin when they are under 18 (U.S. Department of Health and Human Services, 1994).

Reducing illegal sales of tobacco to young people is an important component of community efforts to reduce adolescent tobacco use. Adolescent smokers obtain much of their tobacco from their own purchases or the purchases of friends (Forster, Klepp, & Jeffery, 1989). Young people succeed in purchasing tobacco from 53 to 100% of the time (Altman, Rasenick-Douss, Foster, & Tye, 1991; Erickson, Woodruff, Wildey, & Kenney, 1993; Forster, Hourigan, & McGovern, 1992; Jason, Ji, Anes, & Birkhead, 1991; Keay, Woodruff, Wildey, & Kenney, 1993).

There is suggestive evidence that reducing these sales can contribute to the reduction in the prevalence of adolescent smoking. Jason et al. (1991) found that after 2 years of greatly reduced sales of tobacco to young people in Woodridge, IL, the proportion of 7th and 8th graders who identified themselves as smokers went from 16 to 5%. Hinds (1992) reported that tobacco use among 10th-grade girls dropped from 26.4 to 11.5% after a local ordinance was enacted and enforced. Similarly, DiFranza, Carlson, and Caisse (1992) reported significant reductions in tobacco use among 12- to 13-year-olds and 16- to 17-year-olds after a period of enforcement of the law on illegal sales.

Until recently laws against the sale of tobacco to young people were seldom enforced. Where enforcement has been implemented and evaluated, it has been found to reduce such sales significantly more than publicity and merchant education by themselves (Feighery, Altman, & Shaffer, 1991; Jason et al., 1991). In our experience, however, many law enforcement officers feel that there are more important crimes to deal with and that judges will be annoyed if such cases are brought before them. In addition, if the value of reducing such sales has not been adequately publicized, there is a risk that enforcement will produce a backlash against tobacco control efforts. Clearly, positive alternative strategies for reducing illegal sales of tobacco could be useful.

A theoretical analysis of the consequences for selling tobacco to minors prompted us to develop one such alternative. To reduce the frequency of a behavior such as selling tobacco to young people, one can increase

the benefit-to-cost ratio for not selling and/or decrease the benefit-to-cost ratio for making such sales. McDowell's (1988) review indicated that, where there is a choice between two behaviors such as selling or not selling tobacco, one can achieve equivalent effects by increasing the reinforcement and decreasing the punishment for the desired behavior or decreasing the reinforcement and increasing the punishment for the problematic behavior. It should be possible, therefore, to reduce sales to young people by increasing reinforcement for not selling, even though the penalties and reinforcement for selling do not change.

In an initial study, we examined whether a program designed to increase reinforcement for not selling tobacco would affect sales (Biglan et al., 1995). The program includes five components: (a) mobilization of community support for not selling, (b) merchant education, (c) changing consequences for clerks selling or refusing to sell tobacco, (d) publicity about clerks' refusals to sell, and (e) feedback to store owners or managers about the extent of their sales to adolescents. The changes in consequences involved increasing social and material reinforcement for clerks who refused to sell to young people and mild disapproval, in the form of a reminder about the law, to clerks who did sell to young people. The program is described in a manual that is available from the authors (Henderson et al., 1995).

The effects of the program were evaluated in multiple baseline design experiments (Biglan et al., 1995). Repeated assessments of the proportion of stores willing to sell tobacco were obtained in two small Oregon communities. The program was implemented in one community, while baseline assessments were continued in the second community. Implementation of the program led to a significant lowering of sales. This experiment was repeated in two additional communities with similar reductions in sales.

The present paper reports the replication of the program in an additional four communities and provides a summary of its effects across all eight communities. Although replication is often accorded an important role in discussions of science, attempts to replicate are not reported as often as they might be. The multiple baseline experimental design across communities provides a much more efficient way of assessing the effects of a community intervention than does a group design. However, the generalizability of the effects of the intervention cannot be gauged as well as in a group design unless the effects are replicated across numerous communities. Thus, a natural next step in this line of research

was a test of the replicability of the intervention in a further four communities.

METHOD

Communities

The study was conducted as part of Project SixTeen, an experimental evaluation of a community-wide program to reduce the prevalence of tobacco and other substance use among youth. Eight pairs of small Oregon communities (population 1,700 to 13,500) are participating in the project. One member of each pair is assigned at random to receive a school-based tobacco and other substance use prevention program in Grades 6 through 12 (Biglan, James, LaChance, Zoref, & Joffe, 1988). The other member receives a community intervention in addition to the school-based program. The community intervention is composed of modules designed to assist community members in influencing adolescents not to use tobacco or other substances.

Table I presents demographic data about the four communities that participated in the present experimental evaluation. Willamina and Sutherlin are primarily logging communities. The chief economic activities of Prineville are tourism, commercial activity associated with ranching, and tire manufacturing. Creswell is a farming community near Eugene, OR that is increasingly a bedroom community for Eugene.

Identification of Tobacco Outlets

Lists of businesses were obtained from the Chamber of Commerce or city government. Businesses thought likely to sell tobacco were visited to determine if they did. Table I indicates the number of places in each community that sold tobacco products at the outset of work in that community. Each of the communities was surveyed prior to the start of data collection to ensure that, in keeping with Oregon law, no vending machines were accessible to youth.

Design

The study consisted of a multiple baseline experiment in which the proportion of outlets willing to sell tobacco was repeatedly assessed and the intervention was introduced in two of the communities (Willamina and Sutherlin), while baseline assessments were continued in the other two

Table I. Demographic Data About the Participating Communities

Community	Population ^a	Median household income ^a	% Below poverty level ^a	% HS graduates in population ^a	Middle school enrollment ^b	% Black ^b	% Hisp. ^b	% Asian/Pacific ^b	% Amer. Indian ^b	Economic activities
Willamina	1,717	20,426	18.4	62.6	228	0.0	0.8	0.8	15.7	Timber
Sutherlin	5,020	20,593	19.8	69.0	254 ^c	1.1	2.2	0.0	0.0	Timber
Prineville	5,355	22,127	12.9	67.5	646 ^d	0.0	4.0	0.4	2.4	Agriculture, timber
Creswell	2,431	21,027	16.3	72.3	271	0.7	2.2	3.3	0.7	Agriculture

^a1990 Census.

^b1991-1992 Organization, Students, and Staff in Oregon Public Schools, Oregon Dept. of Education, 12/91.

^cGrades 7 and 8 only; 6th grade is in elementary school.

^dGrades K-8.

communities (Prineville and Creswell). Tobacco outlets were assessed every 3 weeks.

Measurement

The dependent variable was the proportion of tobacco outlets in the community that were willing to sell tobacco to young people. Data were also obtained on (a) whether the clerk asked for identification (ID) and (b) whether the clerk asked the assessor's age. However, these measures were so highly correlated with the willingness-to-sell measure, that they are not presented here

Youth Assessors. At each assessment, one boy and one girl were recruited to attempt to purchase tobacco in each community. Assessors were age 15 to 17, with one exception (a 14-year-old). In most cases, different assessors were used at each assessment to prevent clerks from detecting that the purchase attempt was an assessment. Our records indicate that a total of 206 youths were used in these assessments, although the total includes some youths who participated more than once across the 48-week duration of the study. The assessors were driven to stores by an adult. A boy-girl pair went into each outlet. They alternated attempts to purchase tobacco across stores. Boys attempted to purchase smokeless tobacco on half of the occasions and cigarettes on the other half. Girls attempted to purchase cigarettes. The products that they attempted to purchase were Marlboro or Camel cigarettes or Copenhagen or Kodiak smokeless tobacco. Assessors entered the store, got a food item, and got or asked for a tobacco product. If the clerk agreed to sell the tobacco, assessors indicated that they had insufficient money to pay for both items and declined to purchase the tobacco product. This approach was necessitated by the fact that underage possession of tobacco is illegal in Oregon. If assessors were asked for ID, they were instructed to say that they did not have it with them. If they were asked their age, they were instructed to answer honestly. Each assessor received a gift certificate, worth about \$5, for every hour of participation.

Measures. The following information was recorded for each outlet: (a) name of outlet, (b) type of outlet (variety, convenience/gas station, other), (c) gender of the clerk, (d) type (cigarettes or chew) and brand of tobacco product asked for, (e) whether the tobacco was behind the counter or accessible to customers, (f) whether ID was asked for, (g) whether the youth was asked his or her age, and (h) whether the clerk was willing to sell tobacco.

The Intervention

The groundwork for the overall community intervention was laid through extensive communication to civic leaders regarding the need to prevent adolescent tobacco use.

Mobilization of Community Support. Support for not selling tobacco to young people was initially organized by means of a widely disseminated public proclamation that declared that the community did not want such sales to occur. Organization and individual endorsement of the proclamation was sought from all sectors of the community including city government, the school district, health care providers, civic organizations, social welfare agencies, churches, major businesses, and all tobacco outlets. Initially a letter and a copy of a proposed proclamation were sent to organizations. The letter was signed by the project coordinator in that community and, in some communities, by other community leaders. It asked that community members and organizations lend their names to the proclamation supporting no sales to minors. The letter was followed by calls or visits from the community coordinator or other community members. The proclamation was published in the local paper and distributed to tobacco merchants. This process produced substantial support in each community. In Willamina, 84 individuals, civic organizations, or business organizations endorsed the proclamation. There were 78 in Prineville who signed the proclamation, 77 in Creswell, and 122 in Sutherlin. Identification of community members who would support the campaign began during baseline because it was necessary to have the proclamations ready at the outset of the intervention; it was believed that this activity, by itself, would not affect sales. As progress was made on the intervention, publicity for the success of the campaign was sought in order to maintain community support and encourage community members to give positive feedback to merchants.

Merchant Education. At the outset of the campaign, each tobacco outlet was visited. Merchant packets were given to owners or managers that contained a copy of the proclamation, a description of the law that could be passed on to clerks, and signs regarding the law. Retailers were told about the ongoing assessments of tobacco sales and about the plan, described below, to reward clerks for asking for ID and refusing to sell to young people.

Reward and Reminder Visits. In visits that were distinct from those used for assessment purposes, teenagers visited each tobacco outlet and attempted to purchase tobacco. If the clerk asked for ID or refused to sell the item, the young person gave the clerk an envelope containing a gift certificate and a letter thanking them for refusing to sell. Gift certificates were typically donated by local businesses. They were worth from \$2 to

\$10, and were good for food items or meals in local restaurants. Clerks who were willing to sell received reminder statements about the law and the level of community support for adherence to the law. These visits were made to each store once the intervention began. Frequency of intervention visits was curtailed as stores' willingness to sell declined.

Publicity About Clerks' Refusals to Sell. Newspaper articles, paid ads, and circulars were used to publicize clerks' refusals to sell tobacco. Clerks' pictures were published with the caption, "These clerks were caught in the act." The story went on to describe how the clerk had asked for ID and received a gift certificate. The publicity was also intended to benefit the outlet.

Feedback to Outlets. Tobacco outlet owners and managers received feedback about the extent of clerks' refusals to sell. Identities of clerks who had been willing to sell were not revealed. Publicity that stores had received for not selling was also shared with outlet representatives. If stores continued not selling, the frequency of feedback diminished. Stores that continued to sell continued to receive visits.

RESULTS

Figure 1 shows the proportion of stores willing to sell tobacco at each assessment in each of the four communities. As can be seen, the introduction of the intervention was associated with a distinct reduction in the proportion of stores willing to sell in three of the four communities. In Creswell, where there was no evidence of an effect, the mean baseline level of sales was only 35%, which was lower than in any of the other seven communities in which the intervention was evaluated.

An interrupted time-series analysis of the effects of the intervention in each community was conducted (Crosbie, 1993). The analysis corrects for the effects of autocorrelations among the data points in the time series. However, the statistical power of the analysis is limited if there are fewer than five data points in any phase of the study and there were only four data points for the baseline phase in Willamina and Sutherlin. The analysis tests for differences between phases in both the intercept (i.e., mean level) and the slope. A reduction in intercept from baseline to intervention would indicate that the mean level of sales was lower in the intervention phase. A change in slope would indicate that the rate of increase or decrease in sales across baseline data points differed from the rate across intervention data points. For example, one might find that the rate of sales was increasing over baseline but decreasing across the period of the intervention. In the present case, one would hope that the mean level of sales was signifi-

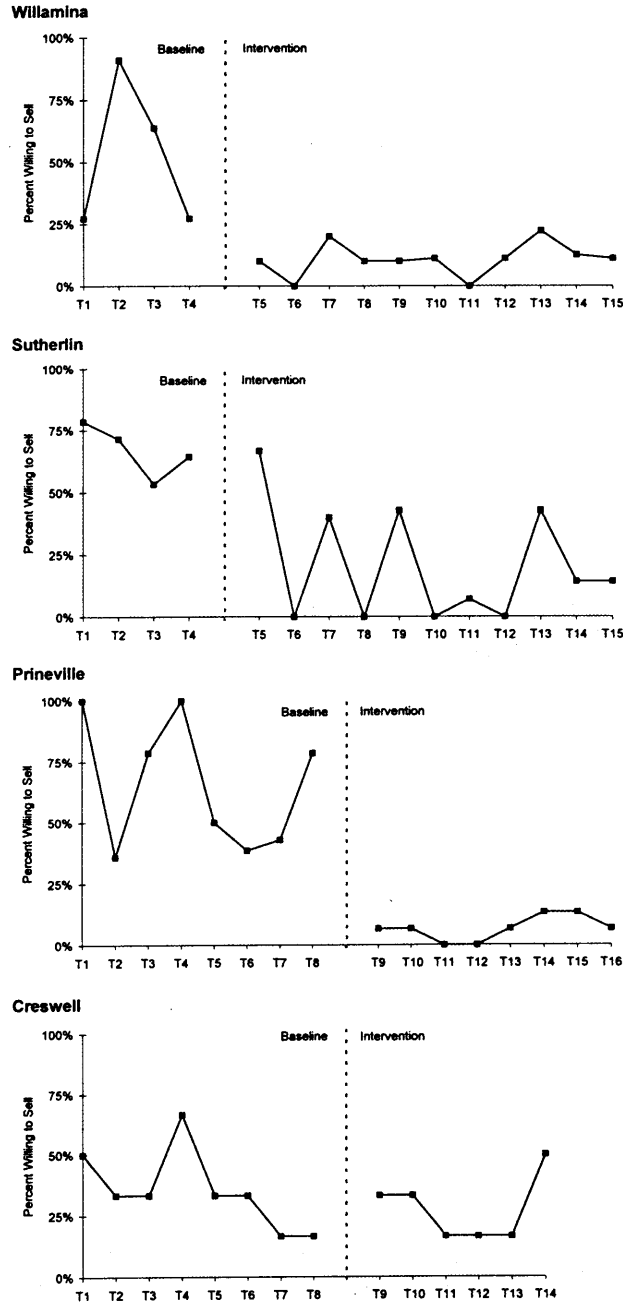


Fig. 1. Proportion of stores willing to sell tobacco to minors at each assessment in each of the four communities.

cantly lower in the intervention phase and that there was no evidence that the slope in the intervention phase was significantly more positive than it was in baseline. (Such a slope difference would imply that sales were increasing over the course of the intervention.)

For Willamina, the changes in intercept and slope were statistically significant, $t(10) = -7.389$, $p < .001$, for the intercept, and $t(10) = 6.35$, $p < .001$, for the slope. The slope was negative during baseline in Willamina, but was essentially zero during intervention. For Sutherlin, despite the fact that only one intervention phase data point was as high as any of the baseline data points, neither the change in intercept nor the change in slope was statistically significant. For Prineville, the change in intercept was significant, $t(11) = -2.62$, $p = .024$. Neither the change in intercept nor the change in slope were significant for Creswell.

Since Willamina and Sutherlin had the same number of baseline (and intervention phase) data points, it seemed appropriate to aggregate the data across the two communities and conduct an additional time series on the aggregated data. The aggregation was accomplished by computing the total number of outlets that sold across communities at a given data point and dividing it by the number of outlets in the two communities. This analysis showed that there was a significantly lower mean level of sales after intervention, $t(11) = -2.207$, $p = .049$. Similarly, since Prineville and Creswell had the same number of baseline and intervention data points, their data were aggregated and an additional time-series analysis was conducted. It also showed that the mean level of sales was lower in the intervention phase, $t(10) = -2.573$, $p = .028$.

Figure 2 shows data from across all eight communities in which the intervention was introduced. Each data point represents the percentage of stores willing to sell in each community averaged across all communities assessed at that time point. If fewer than four communities conducted a particular assessment, the data were not included in the time-series analysis, though they are shown in Figure 2 for the sake of completeness.

Across these communities, the mean percentage of outlets willing to sell during baseline was 57%. For the intervention phase it was 22%. This represents a 62% reduction in sales. Time-series analyses of these data indicated that there was a significant change in intercept from baseline to intervention phases, $t(12) = -2.732$, $p = .018$. That is, there was a significant reduction in mean level of sales to minors.

Relationship of Assessors' Gender and Age to Rate of Sales. We examined whether the age or gender of assessors was related to sales rate. Neither variable was significantly related to whether clerks were willing to sell tobacco to the assessor. It should be noted, however, that variability in assessor age was small; all but one of the assessors was 15 to 17 years of age.

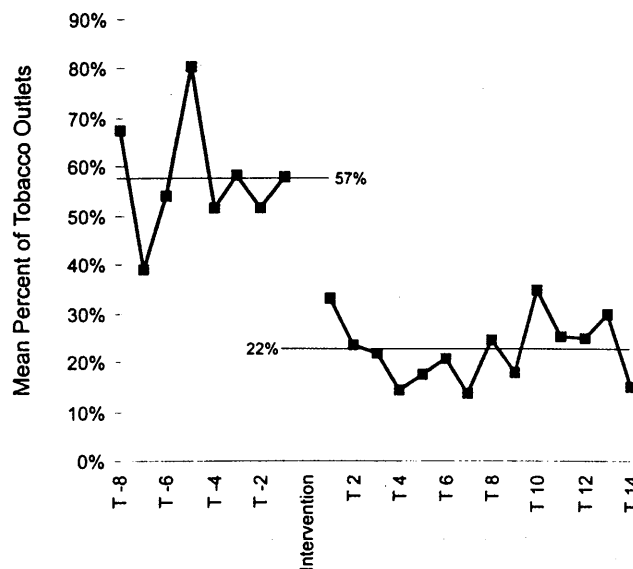


Fig. 2. Mean percentage of tobacco outlets in eight communities willing to sell tobacco to minors.

DISCUSSION

The results indicate that illegal sales of tobacco to young people can be reduced through the mobilization of a program featuring the positive reinforcement of clerks for not making such sales. The finding replicates the results obtained in the initial four communities in which the intervention was evaluated. In that study, illegal sales were reduced in each community and the mean level of sales was significantly lower after the intervention was introduced. Across all eight communities in which this program was tested, tobacco sales were reduced from 57 to 22%.

It should be noted that the present program has been evaluated only in small rural Oregon communities. The generalizability of the program to larger and more socioculturally diverse communities is unknown. It may be harder to obtain reductions in sales in larger and more impersonal communities.

The study did not analyze the effects of the individual components of the analysis. Thus, we can only speculate about the relative importance of each. Merchant education visits probably contributed to the effect. Altman et al. (1991) found that merchant education reduced sales from 76%

of outlets to 39%. However, sales returned to 59% one year following the program. Keay et al. (1993) found that merchant education reduced sales for 69.9% of outlets to 39% a month after the merchant education. However, in work that occurred in a community not included in the present study, we did not find that merchant education affected the proportion of outlets willing to sell.

We believe that the mobilization of reinforcement for clerks not selling was essential to the effects in the present study. Reinforcement was provided to clerks through rewards for not selling as well as through publicity for clerks who did not sell. Further research could evaluate this assertion, by providing rewards to clerks without merchant education, proclamations, or feedback to stores.

The present intervention can be compared with other strategies for reducing illegal sales. The Altman et al. (1991) study indicated that merchant education alone is an insufficient means of bringing about lasting reductions in sales. Jason, Billows, Schnopp-Wyatt, and King (1995) argued that achieving substantial and long-lasting reductions in illegal sales of tobacco requires ongoing (e.g., quarterly) enforcement of the law. They may well be right. The longer term efficacy of the present strategy is yet to be evaluated.

However, even if the effects of this intervention diminish over time, the strategy may be valuable in communities where inducing law enforcement agencies to enforce the law proves difficult. Currently, many jurisdictions are unwilling to enforce laws regarding tobacco sales (e.g., Feighery et al., 1991). Mobilizing positive reinforcement for not selling may be the only viable strategy available to community groups that wish to reduce sales but cannot get the cooperation of law enforcement officials. Moreover, the implementation of this strategy may build support in the community for law enforcement. It may be possible to influence law enforcement to take action against recalcitrant stores, once it has been shown that all positive means of gaining compliance have failed. Of course, ultimately, an empirical test of this reasoning is needed. One could, for example, compare a strategy designed to increase law enforcement with the present strategy or could examine whether the willingness of communities to make and enforce laws regarding illegal sales increased as a result of evidence that outlets continued to sell, even after positive reinforcement had been tried.

Under a federal law written by the late Representative Mike Synar, each state is required to systematically assess and reduce the rate of illegal sales of tobacco to young people. Thus, there is a substantial nationwide effort underway to reduce illegal sales. The present results, coupled with the results of studies of enforcement (e.g., Jason et al., 1991, 1995) and education (e.g., Altman et al., 1991) indicate that there are now a variety

of empirically based procedures for reducing such sales. Community psychologists could play a significant role in helping communities make use of these approaches.

The intervention was designed to be replicable by volunteer community groups. A written module (Henderson et al., 1995)³ describes all of the procedures necessary to conduct the program. We estimate that, in a small community, a group of volunteers could conduct the entire program for about \$1,000. In our experience, most of that money could be obtained from donations. For example, all of the gift certificates used to reward clerks for not selling were donated by local businesses and much of the publicity came in the form of nonpaid newspaper coverage.

In theory, anything that increases the cost or difficulty of getting tobacco—such as having to go to many outlets and risk refusal or paying more for tobacco—should make it less likely that young people will become addicted to tobacco (U.S. Department of Health and Human Services, 1994). However, it should be stressed that the evidence linking reductions in sales to reductions in the prevalence of teenage smoking remain limited to demonstrations that the measured prevalence of tobacco use declined after enforcement of illegal sales laws (DiFranza et al., 1992; Hinds, 1992; Jason et al., 1991). To date, the effects on prevalence have not been demonstrated in true experimental designs, in which communities are randomized to receive or not receive an access reduction intervention.

One reason that reducing the proportion of outlets willing to sell could fail to result in reduced prevalence of teen smoking is that teens could continue to get tobacco from the few remaining outlets that are willing to sell. Unfortunately, this project did not have a method of assessing the volume of sales in outlets that continued to sell. Similarly, we cannot rule out the possibility that young people could continue to obtain tobacco from nearby communities. Future research needs to explore these possibilities.

The design of the present study is an example of the use of time-series experimentation in whole communities. Such single-case experimental designs are suitable whenever the dependent variable can be measured repeatedly over time (Biglan, 1995). Such designs enable community

³The tools Project SixTeen developed for its community intervention have been packaged in the form of three modules: Youth-Anti-Tobacco Activities, which focuses on how to involve teens in tobacco prevention activities (Hood et al., 1995{6876}); Family Communications about Tobacco, providing parents with guidelines for talking with their children about tobacco usage (James et al., {6877}); and Reducing Sales of Tobacco to Minors, providing methods of limiting youth access to tobacco (Henderson et al., 1995{6875}). Each is available for \$12. Send to Project SixTeen, 1715 Franklin Blvd., Eugene, OR 97403-1983. Up to \$36, shipping costs are \$4.00, after that 10% of total.

interventionists to evaluate programs in a smaller number of communities than would be required by a group design.

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