HEALTH EDUCATION RESEARCH
Theory & Practice

Vol.10 no.3 1995
Pages 297–307

Diffusion of an effective tobacco prevention program. Part II: evaluation of the adoption phase

Guy S.Parcel, Nancy M.O'Hara-Tompkins, Ronald B.Harrist[1], Karen M.Basen-Engquist, Laura K.McCormick, Nell H.Gottlieb and Michael P.Eriksen[2]

Abstract

This paper presents the results of theory-based intervention strategies to increase the adoption of a tobacco prevention program. The adoption intervention followed a series of dissemination intervention strategies targeted at 128 school districts in Texas. Informed by Social Cognitive Theory, the intervention provided opportunities for districts to learn about and model themselves after 'successful' school districts that had adopted the program, and to see the potential for social reinforcement through the knowledge that the program had the potential to have an important influence on students' lives. The proportion of districts in the Intervention condition that adopted the program was significantly greater than in the Comparison condition ($P < 0.001$). Stepwise logistic regression indicated that the variables most closely related to adoption among intervention districts were teacher attitudes toward the innovation and organizational considerations of administrators. Recommendations for the development of effective strategies for the diffusion of innovations are presented.

Introduction

The Smart Choices Diffusion Study was a 4 year study designed to expand our knowledge base of intervention programs to increase the diffusion of effective health promotion programs. The purpose of the research was to study the diffusion of an innovative tobacco prevention program to school districts and to evaluate the effectiveness of theory-based intervention strategies aimed at influencing the diffusion process.

The project was divided into four phases: dissemination, adoption, implementation and maintenance. Each phase included a series of intervention strategies and evaluation procedures to determine the impact of the interventions. The purpose of this paper is to report findings from the adoption phase of the project. Two major questions are addressed in this phase of the study:

(1) How effective were the intervention strategies in influencing school districts to adopt the innovative tobacco prevention program?
(2) For those districts exposed to the interventions, what school organizational, administrator and teacher characteristics are associated with program adoption?

For a description of the overall project research design, intervention methods and theoretical foundations, see Parcel *et al.* (1989a,b).

Adoption intervention strategies

The process of adopting an innovation requires an awareness of the characteristics of the innovation and a decision to make a trial effort to use the innovation. Within complex organizations such as school districts it may not always be clear who needs to be made aware and who will make the decision to adopt the innovative program. Therefore, we designed a series of intervention strategies that targeted both potential program users

Center for Health Promotion Research and Development, and [1]Biometry Department, School of Public Health, Houston, TX 77225-9960 and [2]Centers for Disease Control, Office on Smoking and Health, Atlanta, GA 30333, USA

(middle school teachers) and potential adoption decision makers (school and district level administrators). In order to facilitate the diffusion process, intervention strategies were developed for two phases: (1) the dissemination phase, which was designed to increase awareness about the Smart Choices program, and (2) the adoption phase, which focused on the decision to adopt the program.

The dissemination intervention development, implementation and evaluation are discussed in the previous article (Brink *et al.*, 1995). The evaluation of the dissemination phase revealed no differences between intervention and comparison districts in readiness to adopt a tobacco prevention program. Possible explanations for these results included: (1) incomplete implementation of the dissemination strategies leading to low exposure, (2) lack of effectiveness of the dissemination strategies and (3) high levels of favorable views toward tobacco prevention at baseline. The following section describes the intervention strategies that were used during the Adoption phase of the Smart Choices study.

Adoption phase

The target outcome of the adoption phase was to influence school districts to adopt the Smart Choices program. Teachers and administrators of districts in the intervention condition were mailed a newsletter about the Smart Choices program in March 1989. At the same time, a brochure about the Smart Choices program was mailed to superintendents in districts in the comparison condition.

Smart Choices newsletter. The conceptualization for the newsletter was derived from Diffusion Theory (Rogers, 1983) and Social Cognitive Theory (Bandura, 1986). The newsletter was designed to (1) provide modeling of program adoption, (2) discuss positive attributes of the innovation and (3) offer incentives for program adoption.

Modeling. Both Rogers (1983) and Bandura (1986) discuss modeling as a powerful inducement to encourage adoption of an innovation or behavior. Adoptive behavior is often influenced by seeing what others are doing. The front page of the newsletter featured photographs and stories about several early adopters (the first school districts to adopt the Smart Choices program) to provide modeling of program adoption and vicarious reinforcement for those contemplating adoption. The photographs and stories were obtained from interviews with school district personnel involved in the adoption decision. Wherever possible, quotes from school district personnel about value expectancies ('teaching tobacco use prevention is important') and anticipated benefits or outcome expectations of program adoption ('this program will prevent our students from using tobacco') were cited.

Incentives. According to Bandura (1986), the issues of money, skills and accessory resources can function as incentives or disincentives in an adoption decision. The more resources an innovation requires, the lower the probability it will be adopted. For this reason, several incentives related to cost, resources and skills training were offered to school districts in the newsletter. Program costs were purposely quite low. The cost included copies of the videotapes and materials needed to implement the program. Free teacher training was offered to school districts that adopted by a certain date.

In addition to the above incentives, a social incentive for adoption was highlighted in the newsletter. Through focus groups with teachers and administrators we identified 'making a difference' in the lives of students as a very important social incentive for adopting a new school program. We used data from evaluations of the Minnesota Smoking Prevention Program (MSPP) in a story to demonstrate that teachers who use the Smart Choices program could make a difference in the lives of their students by reducing the number of students likely to become smokers.

Attributes of the innovation. Rogers and Shoemaker (1971) have identified several attributes of innovations that influence their adoptability including

relative advantage, compatibility and complexity. The newsletter discussed the Smart Choices program in the context of these variables.

Relative advantage refers to the benefits provided by an innovation. According to Rogers and Shoemaker (1971), people adopt innovations that are perceived to have an advantage over other innovations and even though these benefits cannot be experienced until the innovation is tried, people act on the basis of anticipated benefits. Smart Choices is an adaptation of the Minnesota Smoking Prevention Program (MSPP) (Perry *et al.*, 1987). MSPP has been field tested and evaluation results indicate that MSPP is effective in reducing the onset of smoking among seventh graders by as much as 60% (Perry *et al.*, 1987). These data were reported in the newsletter to demonstrate the relative advantage of the Smart Choices program. To address anticipated benefits, these data were interpreted in terms of what a district could achieve in reducing the onset of their students' smoking behavior if Smart Choices were adopted and implemented.

Compatibility refers to the fit of an innovation with prevailing norms. In the newsletter, Smart Choices was demonstrated to be compatible by linking it to the state education agency's mandate to provide tobacco prevention education at the middle school level.

Complexity refers to ease of comprehension and use of an innovation. Smart Choices was described as a finely tuned, complete program that except for teacher training, required no outside resources or extra preparation to implement.

An order form for the program was inserted into each newsletter. The order form requested that a central level administrator (e.g. superintendent, curriculum director) sign the form to signify the district's willingness to adopt the program.

Smart Choices brochure. The brochure about the Smart Choices program that was mailed to superintendents in comparison school districts was developed with a clearinghouse prototype in mind. Basic information about the curriculum contents and ordering information was presented. An order form for the program was attached. Teacher training was not mentioned, nor were any persuasive messages about adoption.

Methods

The study population consisted of all school districts in Texas Education Service Center Regions III, V and VII (n = 166). School districts in the intervention condition (n = 128) received the intervention while the remaining school districts (n = 38) served as a comparison condition. The proportion of districts adopting the Smart Choices program in the intervention condition and in the comparison condition are compared using school district as the unit of analysis. In addition, the independent effects of the intervention and organization, teacher and administrator variables on the likelihood of adoption are assessed. All districts were followed for 2 years after enrolment in the study. Since the districts were assigned to treatment conditions by region, this is not a randomized study design and the interpretation of the results must take this into account. A randomized design for this type of study was not seen as feasible since the diffusion process may be geographically determined, i.e. school districts close to each other may influence one another to adopt the program regardless of assignment to treatment condition.

Measures

Survey questions related to the adoption of innovations by individuals and by organizations were identified and included in the Readiness to Adopt Survey. Separate versions of the survey were written for teachers and administrators. After pilot testing these surveys, two final surveys with similar but not identical items were constructed. The items were sorted by the investigators into categories derived from Social Cognitive Theory and Diffusion Theory as follows: relative advantage of the innovation, compatibility of the innovation, complexity of the innovation, respondent innovativeness, attitudes toward tobacco prevention, attitudes toward tobacco policies, respondent self-efficacy for using a tobacco prevention program,

outcome expectations for using a tobacco prevention program, attitudes toward tobacco prevention and decentralized decision making. The teacher survey included items relating to all the above variables except innovation complexity, and the administrator survey included items relating to all the above variables except outcome expectations and respondent innovativeness. The α reliability coefficients for scales constructed for each category ranged from 0.56 to 0.82. See the previous paper for details of scale construction.

Several organizational variables were obtained from records of the Texas Education Agency. These variables were size (number of seventh graders), expenditure per pupil (instructional expenditures per pupil), percent of students who are college bound and percent of students who are minority.

The decision to adopt the Smart Choices program by a school district was assessed by the return of an adoption form, as well as a purchase order for the program ($20/unit). This form was included in the adoption newsletter and could be signed by the superintendent or curriculum director and mailed to the research project office. Adoption by school districts in the comparison condition was also assessed by the return of an adoption form and purchase order for the program.

Procedures

Surveys designed to assess readiness to adopt a school tobacco prevention program were mailed to a data collection coordinator in each school district, who then distributed the surveys to the specified district and school administrators and to seventh grade science and health teachers. The surveys were mailed in January 1988 and January 1989. The second set of surveys was used for this analysis, since these surveys were completed just prior to the initiation of the adoption phase, and more accurately assess attitudes that may be related to the adoption decision.

Methods of analysis

To investigate the degree of similarity of the Intervention districts and the Comparison districts, each of several different baseline variables were compared. In addition to the intervention variable, three different groups of explanatory covariates were considered: the *organizational* covariates (size, expenditure per pupil, percent college bound, percent minority), the *administration* covariates (relative advantage, compatibility, complexity, characteristics of the social system, attitudes toward tobacco policies, decentralized decision making, self-efficacy for using tobacco prevention, attitudes toward tobacco prevention) and the *teacher* covariates (relative advantage, compatibility, characteristics of the social system, decentralized decision making, self-efficacy for using tobacco prevention, attitudes toward tobacco prevention, outcome expectations, attitudes toward tobacco policies, respondent innovativeness). A description and discussion of these variables can be found in the measures section.

Summary statistics, including means and standard deviations, and also minimum, first quartile, median, third quartile and maximum, were calculated separately for each of these variables in the Intervention and Comparison districts. Several of the covariates had skewed or otherwise apparently non-normal distributions. For this reason, the medians of the covariates in the Intervention and Comparison districts were compared with Mann–Whitney tests to determine if there were major differences in the distributions between the two treatment conditions. The effect of conducting multiple tests was taken into account in interpreting the results.

The decision of each district to adopt or not adopt the curriculum was considered the principal outcome variable. In the primary analysis, a χ^2 test was used to compare the proportions of districts adopting in the Intervention and Comparison conditions.

A secondary analysis used stepwise logistic regression to take into account any imbalances in the covariates between the Intervention and Comparison districts. The BMDP LR stepwise logistic regression procedure (Dixon, 1988) was used to determine the relationship of the intervention to adoption of the tobacco prevention program by the school districts while adjusting for the

effects of the covariates. This was done by first determining which of the covariates entered into the logistic model in the absence of the intervention variable, then refitting the model including the intervention variable while retaining those covariates already selected. Any additional explanatory power of the intervention variable may then be attributed to the intervention. The odds ratio of adoption by districts receiving the intervention compared with those not was then calculated, along with appropriate confidence intervals.

The odds ratio for adoption is the ratio of the odds of adoption when intervention has occurred to the odds of adoption when intervention has not occurred and the confidence interval gives a measure of the variability in estimate of this ratio. In the case of a continuous covariate, the odds ratio is the increase in the relative probability of adoption associated with a one-unit increase in that covariate, and again a confidence interval reports the variability in this estimated ratio.

Since logistic regression procedures require measurements on each of the covariates for each district, a fairly large proportion of the districts could not be used in this part of the analysis. To determine if the districts for which data were complete differed in important ways from districts whose records were incomplete, the medians of the covariates available were compared in the 'Complete' and 'Incomplete' groups.

To further investigate the possible influence of the various covariates upon adoption of the Smart

Table I. *Medians for covariates by treatment condition*

		Comparison group					Intervention group				
	D	*N*	MED	MIN	MAX	IQR	*N*	MED	MIN	MAX	IQR
ORGANIZATION											
Size		38	72	4	1134	104.3	128	74	6	1723	130.0
Expenditure per pupil	**	38	2052	1750	4050	480.3	128	1875	1306	4148	351.8
Percent college bound	*	38	65.7	0.0	94.7	28.1	128	52.5	0.0	92.9	19.1
Percent minority	**	38	44.4	0.0	73.4	29.5	128	16.6	0.0	72.1	23.4
ADMINISTRATORS											
Relative advantage	*	29	6.3	4.0	8.0	1.5	90	6.8	3.8	10.0	1.4
Compatibility		29	19.2	15.0	22.0	2.5	90	18.9	14.6	24.0	2.7
Complexity		29	7.0	5.0	10.0	2.0	90	7.0	4.3	10.0	1.6
Character of social system		29	45.54	38.3	55.0	5.0	90	45.6	36.0	55.5	6.6
Attitudes toward policy		29	16.00	10.5	20.0	2.5	90	16.0	9.0	20.0	3.0
Decentralized decision making		29	23.50	19.9	28.5	3.3	90	23.0	18.0	27.5	3.2
Self-efficacy		29	6.5	4.0	9.0	1.7	90	6.0	3.3	10.0	1.7
Attitudes toward prevention		29	18.20	15.7	19.5	1.1	90	18.6	15.0	20.0	1.2
TEACHERS											
Relative advantage		22	9.4	6.0	13.5	3.0	86	10.0	5.0	15.0	2.0
Compatibility		22	23.0	19.0	30.0	3.5	84	22.8	14.3	30.0	3.8
Character of social system		22	30.7	26.0	40.0	6.9	85	31.5	18.0	40.0	4.5
Decentralized decision making		22	20.5	16.0	28.0	4.0	85	20.6	12.0	27.0	4.1
Self-efficacy		21	8.0	7.0	9.5	2.0	86	8.0	5.0	10.0	1.1
Outcome expectations		22	17.0	13.0	19.5	2.4	85	17.0	13.0	22.0	2.4
Attitudes toward prevention		22	14.3	11.0	15.0	1.8	86	14.0	10.0	15.0	2.0
Attitudes toward policy		22	11.0	8.3	13.0	1.6	86	11.0	4.0	15.0	2.8
Respondent innovativeness		22	13.9	9.0	17.0	2.3	83	13.0	7.0	16.5	2.0

D = medians of Intervention and Comparison Groups differ by Mann–Whitney test (*$P < 0.05$; **$P < 0.01$); *N* = number of districts for which data were obtained; MED = median; MIN = minimum; MAX = maximum; IQR = interquartile range.

Choices program, a stepwise logistic regression analysis was carried out within the Intervention condition alone. This procedure eliminated the effect of the intervention and allowed an assessment of the predictive power of the variables other than intervention for districts in this condition.

Results

This study included a total of 166 school districts. Complete data on the organizational covariates were obtained for all 166 districts, 119 had complete data on the administration covariates, 105 had complete data on the teacher covariates and 101 had complete data on all covariates.

Median, minimum, maximum and interquartile range of each of the covariates within the Intervention and Comparison districts are reported in Table I. Mann–Whitney tests were used to compare the medians of each covariate between the Intervention and Comparison districts. The results suggest that the Intervention and Comparison districts are fairly similar with regard to the covariates measured with the exception of expenditure per pupil and ethnic composition. The Intervention districts tended to have a higher percentage of minority students and had a higher expenditure per pupil than the Comparison districts. Minority groups were primarily African-American and Hispanic. Since 21 comparisons were made, the two differences discovered are compatible with the pattern which might be seen due to sampling variation.

In the Intervention condition, 72 of 128 districts adopted the Smart Choices program (56.25%) while in the Comparison condition, four of 38 adopted Smart Choices (10.53%). A χ^2 test of the equality of these proportions confirms that they differ significantly ($P < 0.001$).

The covariates (other than intervention) most closely related to adoption were determined by a stepwise logistic regression procedure. This analysis requires complete data for each district on all variables considered, thus of 166 districts, only 101 (56 adopting, 45 not adopting) could be used. Table II(A) displays the covariates in the order entered, the estimated odds ratio of adoption associated with a one-unit increase in that covariate and

Table II. *Results of stepwise logistic regression procedures*

	Variable	OR	SE	*t*	*P*	95% CI
A. Intervention variable excluded (101 districts)	1. Relative advantage[a]	2.10	0.972	1.61	0.111	(0.84, 5.27)
	2. Attitudes toward policy[t]	1.99	0.814	1.68	0.095	(0.88, 4.48)
	3. Percent minority[o]	0.71	0.093	−2.59	0.011	(0.55, 0.92)
	4. Attitudes toward prevention[t]	5.53	3.98	2.38	0.019	(1.33, 2.30)
	5. Relative advantage[t]	2.33	0.921	2.13	0.036	(1.06, 5.11)
B. Intervention variable included (101 districts)	1. Relative advantage[a]	1.91	0.949	1.31	0.195	(0.71, 5.12)
	2. Attitudes toward policy[t]	2.11	0.927	1.71	0.091	(0.89, 5.05)
	3. Percent minority[t]	0.85	0.127	−1.06	0.290	(0.64, 1.15)
	4. Attitudes toward prevention[t]	5.98	4.51	2.37	0.020	(1.33, 2.68)
	5. Relative advantage[t]	1.96	0.818	1.61	0.110	(0.86, 4.49)
	6. Intervention	9.46	7.13	2.98	0.004	(2.12, 4.23)
C. Intervention group only (80 districts)	1. Attitudes toward prevention[t]	9.39	7.82	2.69	0.009	(1.79, 4.94)
	2. Decentralized decision making[a]	9.29	8.48	2.44	0.017	(1.51, 5.73)
	3. Attitudes toward policy[t]	2.72	1.29	2.10	0.039	(1.05, 7.02)
	4. Relative advantage[t]	2.40	1.07	1.98	0.051	(0.99, 5.81)

OR = estimated odds ratio; SE = standard error of OR; *t* = *t*-statistic to test true OR = 1; *P* = two-tailed *P* value; 95% CI = approximate 95% confidence interval about true OR; o = organizational variable; a = administrator variable; t = teacher variable.

an approximate 95% confidence interval for the odds ratio.

When intervention was excluded as a predictor variable for adoption, the remaining covariates selected by the stepwise logistic regression procedure were, in order, relative advantage, teacher attitudes toward tobacco policies, ethnic composition, teacher attitudes toward tobacco prevention and teacher perception of relative advantage. The intervention variable was then included in the analysis while retaining the covariates selected at the initial step. This procedure is designed to take into account imbalances in the covariates between the two treatments so that an adjusted estimate of the odds ratio of adoption associated with the intervention may be determined. The ratio of the odds of adoption in the intervention districts as compared to the comparison districts was then estimated to be 9.46 (95% confidence interval: 2.12 to 42.3). This analysis is reported in Table II(B).

In order to determine which, if any, of the measured covariates were related to adoption among districts receiving the intervention, a stepwise logistic regression was carried out using only the 80 districts in the Intervention districts for which data were complete. As shown in Table II(C), the variables teacher attitudes toward tobacco prevention, decentralized decision making, teacher attitudes toward tobacco policies and teacher perception of relative advantage entered in that order.

The analysis described above takes into account imbalances in the measured covariates in the dis-

Table III. *Medians for predictor variables by Complete and Incomplete groups*

		'Complete' group					'Incomplete" group				
	D	*N*	MED	MIN	MAX	IQR	*N*	MED	MIN	MAX	IQR
ORGANIZATION											
Size	**	101	85	4	1723	139.0	65	65	4	479	103.0
Expenditure per pupil	*	101	1880	1306	3098	331.0	65	1995	1535	4148	512.0
Percent college bound		101	53.2	0.0	92.9	21.0	65	58.7	0.0	94.7	22.2
Percent minority		101	19.3	0.0	72.6	29.2	65	21.8	0.0	73.4	33.5
ADMINISTRATORS											
Relative advantage		101	6.8	3.8	10.0	1.4	18	6.3	4.7	8.3	0.8
Compatibility		101	19.0	14.6	24.0	2.6	18	18.3	15.0	22.0	2.7
Complexity		101	7.0	5.0	10.0	1.5	18	7.0	4.3	10.0	2.6
Character of social system		101	45.4	36.0	55.5	6.0	18	47.2	39.0	54.3	5.3
Attitudes toward policy		101	15.8	9.0	20.0	2.7	18	16.7	10.5	20.0	3.3
Decentralized decision making		101	23.0	18.0	28.5	3.4	18	23.0	20.2	27.5	2.9
Self-efficacy		101	6.2	3.3	10.0	1.5	18	6.8	4.0	9.3	2.9
Attitude toward prevention		101	18.5	15.3	20.0	1.2	18	18.5	15.0	19.5	0.9
TEACHERS											
Relative advantage		101	10.0	5.0	15.0	2.2	7	10.5	8.0	13.5	1.0
Compatibility		101	23.0	14.3	30.0	3.7	5	24.0	17.0	27.6	9.6
Character of social system		101	31.5	18.0	40.0	5.2	6	29.0	25.0	36.5	8.1
Decentralized decision making		101	20.7	12.0	28.0	4.0	6	18.0	16.0	23.5	4.1
Self-efficacy		101	8.0	5.0	10.0	1.4	6	8.0	6.0	8.5	1.4
Outcome expectations		101	17.0	13.0	22.0	2.6	6	17.0	3.0	18.0	12.3
Attitude toward prevention		101	14.0	10.0	15.0	1.9	7	14.0	1.0	15.0	4.0
Attitude toward policy		101	11.0	4.0	15.0	2.6	7	9.0	4.0	14.0	5.0
Respondent innovativeness		101	13.3	7.0	17.0	2.0	4	12.0	12.0	15.0	2.3

D = medians of Complete and Incomplete Groups differ by Mann–Whitney test (*$P < 0.05$; **$P < 0.01$); *N* = number of districts for which data were obtained; MED = median; MIN = minimum; MAX = maximum; IQR = interquartile range.

tricts having complete data. The requirement that the data be complete may itself result in a selection bias which is not addressed by this analytic procedure. Assessment of the similarity of the 'Complete' districts and the 'Incomplete' districts is limited by the same missing data. However, a comparison of the 101 'Complete' and 65 'Incomplete' districts was carried out using the Mann–Whitney procedure, and is reported in Table III. This analysis shows that median student enrolment (size) is larger ($P < 0.001$) in the 'Complete' districts (median 85) than in the 'Incomplete' districts (median 65), and median instructional expenditure per pupil (expenditure per pupil) is smaller ($P < 0.05$) in the 'Complete' districts (median $1880) than in the 'Incomplete' districts (median $1995). No significant differences were found in the remaining covariates.

Discussion

Adoption is defined as 'a decision to make full use of an innovation as the best course of action available' (Rogers, 1983). The purpose of the adoption intervention was to increase the likelihood that school districts would decide to adopt the Smart Choices program. The proportion of districts in the Intervention condition that adopted the program is significantly greater than in the Comparison condition. In fact, only 10% of the districts that did not receive the dissemination and adoption interventions ordered the Smart Choices program. 'Adoption' was measured by the return of the curriculum order form which required a small payment and confirmation of adoption by a district-level administrator. While this is a very simple indicator, it represents an interest in the innovation and an investment (though small) of resources in the innovation. The efforts of the intervention to promote and encourage adoption clearly had an effect among those districts that received the intervention.

One explanation of the higher adoption rates among intervention districts might have been the influence of the earlier dissemination intervention on the exposed districts. Unfortunately, the research design and analysis do not enable us to determine which of the two diffusion interventions (initial dissemination strategies or the adoption newsletter) were effective in influencing adoption, so the adoption decision should be viewed as the result of combined intervention strategies.

A potential weakness of the study was the lack of a true, randomized experimental design. Not only was the geographic proximity of school districts a consideration, the structure and practice of the education service area regions in Texas were important potential problems. Because of the massive area and number of school districts in Texas, the state is divided into 20 area education service centers, and the service center personnel serve as 'linking agents' between the state department of education and local school districts. It is highly likely that service center personnel could have contaminated the study by influencing districts in a single region to adopt the Smart Choices program, regardless of randomization to a treatment status.

Informed by Social Cognitive Theory, the dissemination and adoption interventions provided opportunities for districts to learn about and model themselves after 'successful' school districts that had adopted the Smart Choices program, and to see the potential for social reinforcement through the knowledge that the program had the potential to have an important influence on students' lives. Social Cognitive Theory further guided the use of incentives such as free teacher training and low program cost. Although Social Cognitive Theory has been used as the basis for curriculum development (Parcel *et al.*, 1987; Perry and Kelder, 1992) to influence attitudes and behaviors at the student level, the results of this study show that it also provides a strong foundation for interventions targeting school teachers and administrators at a district level for program adoption.

The stepwise regression model indicated that teachers' perceptions of the relative advantage of the Smart Choices program as compared to their current practices, their attitudes toward the innovation, and their attitudes toward tobacco policies were each predictive of adoption. The administrators' perceptions of the relative advantage of

the innovation and the ethnic composition of the district were also predictive of adoption. The analysis was conducted in the absence of the intervention, since the intervention effects were so highly significant. When the intervention was forced into the previously defined model as the sixth variable, it still remained highly significant.

A second objective of the adoption phase of the diffusion study was to determine which organizational, administrative and teacher characteristics were associated with the adoption decision. Logistic regression was used to determine the variables most closely related to adoption, while adjusting for the effects of the covariables. Of the five variables found to be predictive of adoption, three were 'teacher' variables (relative advantage, attitudes toward tobacco prevention, and attitudes toward tobacco policies) and only one was an 'administrator' variable (relative advantage). Teachers' perceptions of the relative advantage of the Smart Choices program as compared to their current practices, their attitudes toward the innovation and their evaluations of tobacco policies were each predictive of adoption. The administrators' perceptions of the relative advantage of the innovation and the ethnic composition of the district were also predictive of adoption. One interpretation of this prediction model is that the attitudes of teachers are more influential than the attitudes of administrators in influencing adoption. There are not sufficient data from this study to support a statement of this magnitude, however. In fact, earlier studies have suggested the decision to adopt an innovation is generally made by upper level administrators or even a single administrator, and teachers have little influence until later in the diffusion process (Rogers, 1983; Huberman and Miles, 1984; Crandall, 1989). Our results suggest that efforts to influence the adoption decision-making process should include those responsible for administration and implementation of programs, rather than focusing only on school district administrators.

A second interpretation of the prediction model is that the adoption intervention was better received in districts with an organizational climate where teachers' attitudes and opinions were valued. In other words, districts with more favorable teacher attitudes may have provided a better 'fit' for the innovation than districts with less favorable teacher attitudes (Roberts-Gray and Scheirer, 1988). Previous studies have shown that differences in teachers' use and attitudes about new programs appear to be directly attributable to principal commitment and support (Bentzen, 1974; Hall and Loucks, 1977, 1978; Berman and McLaughlin, 1978). The support of administrators may be a necessary but not sufficient factor in innovation adoption.

The variables most closely related to adoption among the intervention districts were teacher attitudes toward the innovation, and decentralized decision making of administrators. Whether the teachers liked, or felt favorably about the program, played an important role in program adoption. Their perceptions of the advantage of using the Smart Choices program, as compared to current tobacco prevention teaching strategies, and their attitudes toward current school district tobacco policies were also predictors (although less strong) of adoption. These findings provide further support for the earlier recommendation that teachers should be included in program adoption decisions. The prediction model also supports the suggestion that districts with more favorable organizational climates or better 'fits' were more likely to adopt the innovation. Although there was no direct assessment of the fit between the program and district policies and procedures, adoption of the program did require some latitude and flexibility in decision making within the district; resources had to be allocated (time, staff and financial) and a new program introduced. Districts that could be more adaptable to new practices, or could see how the program could be integrated into current practices, were more likely to adopt.

Based on our findings and experience with the Smart Choices project, we are confident in concluding that the addition of Social Cognitive Theory to Diffusion Theory substantially improved our ability to design interventions that would lead to program adoption. Diffusion Theory was especially useful in providing a general framework

for the diffusion process including emphasis to be placed on the characteristics of the innovation and the potential adopters. However, Diffusion Theory by itself provided insufficient guidance for how to design specific interventions to influence the diffusion process. Our initial goal was to inform the school districts about the availability of an effective tobacco prevention program and to obtain adoption of the program. To enhance the probability that adoption of the program would occur, we decided to focus on interventions that would address potential cognitive determinants of individuals who would be either making the adoption decision or could influence the decision to adopt the innovative program.

The primary method used in the Smart Choices dissemination and adoption interventions was modeling. Our conceptualization of modeling was based on Bandura's Social Cognitive Theory (Bandura, 1986) which provides extensive detail on the conditions and processes under which learning occurs as a result of observing models. To translate the method of modeling into intervention strategies, we used both mediated and interpersonal channels to model teachers and administrators making the decision to adopt or successfully using the innovative program. The challenge for using modeling as a method for influencing the adoption of innovative school-based health promotion programs is to design strategies that enable teachers and administrators to observe the successful adoption and use of the program by other school districts.

Messages included in modeling strategies should address the most salient factors potential adopters are likely to use as a basis for making the decision. In a large diffusion study conducted in schools in the Netherlands, the most salient factors associated with program adoption were related to the practical aspects of teachers' ability to effectively implement the innovative programs (Paulussen *et al.*, 1995). Knowing more about the key factors that will be used by potential adopters in making the adoption decision can be used to strengthen and focus the messages used in the modeling strategies. In retrospect, we may have been able to strengthen our interventions by tailoring messages more directly to the predictors of adoption and given less effort to those factors that were already very favorable toward the innovation and not associated with program adoption.

As reported in the evaluation of the dissemination intervention (see previous paper), there were incomplete and low to moderate levels of implementation of the various intervention strategies. However, the results reported show a high level of program adoption. We attribute a good adoption rate for the tobacco prevention program to the use of multiple strategies. Bandura (1986, p. 147) emphasizes that there is no single pattern of social diffusion.

> Dispersion patterns can .... vary widely depending on the nature of the innovation and the skills and resources it requires, the associational networks that exist for spreading the innovation, and the social constraints and incentives that impinge upon the activity. Within these various patterns of social diffusion, the media can serve as originating, as well as reinforcing, influences.

Within schools and school districts, there is great diversity in how decisions about the adoption of new programs are made (Goodman *et al.*, 1992). We view the use of multiple intervention strategies that reached both teachers and administrators at multiple levels as an essential component contributing to the observed rate of program adoption in our study.

The findings from the Smart Choices study are highly applicable to future intervention efforts. Combined dissemination and adoption methods, with a strong theoretical background including the use of modeling and interpersonal and mediated messages that address the characteristics of the innovation, are effective in encouraging and influencing school districts to adopt health promotion programs.

Acknowledgements

Supported by NCI Grant #5 R01 CA45970

References

Bandura, A. (1986) *Social Foundations of Thought and Action: A Social Cognitive Theory.* Prentice-Hall, Englewood Cliffs, NJ.

Bentzen, M. (1974) *Changing Organizations: The Magic Feather Principal.* McGraw-Hill, New York.

Berman, P. and McLaughlin, M. W. (1978) *Federal Programs Supporting Educational Change. Vol. 8: Implementing and Sustaining Innovations.* Rand, Santa Monica, CA.

Brink, S. G., Basen-Engquist, K. M., O'Hara-Tompkins, N. M., Parcel, G. S., Gottlieb, N. H. and Lovato, C. Y. (1995) Diffusion of an effective tobacco prevention program. Part I: evaluation of the dissemination phase. *Health Education Research*, **10**, 283–295.

Crandall, D. P. (1989) Implementation aspects of dissemination. *Knowledge, Creation, Diffusion, Utilization,* **11**, 79–106.

Dixon, W. J. (1988) *BMDP Statistical Software Manual,* Vol. 2. University of California Press, Berkeley, CA

Goodman, R. M., Tenney, M., Smith., D. W. and Steckler, A. (1992) The adoption process for health curriculum innovations in schools: a case study. *Journal of Health Education,* **23**, 215–220.

Hall, G. and Loucks, S. (1977) A developmental model for determining whether the treatment is actually implemented. *American Educational Research Journal,* **14**, 263–276.

Hall, G. and Loucks, S. (1978) Teacher concerns as a basis for facilitating and personalizing staff development. *Teachers College Record,* **80**, 36–53.

Huberman, A. M. and Miles, M. B. (1984) *Innovation Up Close: How School Improvement Works.* Plenum Press, New York.

Parcel, G. S., Simons-Morton, B. G, O'Hara, N. M., Baranowski, T., Kolbe, L. J. and Bee, D. E. (1987) School promotion of healthful diet and exercise behavior: an integration of organizational change and Social Learning Theory interventions. *Journal of School Health,* 57, 150–156.

Parcel, G. S., Eriksen, M. P., Lovato, C. Y., Gottlieb, N. H., Brink, S. G. and Green, L. W. (1989a) The diffusion of school-based tobacco-use prevention programs: program description and baseline data. *Health Education Research,* **4**, 111–124.

Parcel, G. S., Taylor, W. C., Brink, S. G., Gottlieb, N. H., Engquist, K., O'Hara, N. M. and Eriksen, M. P. (1989b) Translating theory into practice: intervention strategies for the diffusion of a health promotion innovation. *Family and Community Health,* **12**, 1–13.

Paulussen, T., Kok, G., Schaalma, H. and Parcel, G. S. (1995) Diffusion of AIDS curricula among Dutch secondary teachers. *Health Education Quarterly,* in press.

Perry, C. L., Murray, D. M. and Klepp, K. I. (1987) Predictors of adolescent smoking and implications for prevention. *Mortality and Morbidity Weekly Report,* **36**, 415–455.

Perry, C. L., Luepker, R. V., Murray, D. M., Kurth, C., Mullis, R., Crockett, S. and Jacobs, D. R. (1988) Parent involvement with children's health promotion: the Minnesota home team. *American Journal of Public Health,* **78**, 1156–1160.

Perry, C. L. and Kelder, S. H. (1992) Models for effective prevention. *Journal of Adolescent Health,* **13**, 355–363.

Roberts-Gray, C. and Scheirer, M. A. (1988) Checking the congruence between a program and its organizational environment. *New Directions for Program Evaluation,* **40**, 63–82.

Rogers, E. M. (1983) *Diffusion of Innovations,* 3rd edn. Free Press, New York.

Rogers, E. M. and Shoemaker, F. F. (1971) *Communication of Innovations: A Cross-Cultural Approach.* Free Press, New York.

Received on June 1, 1993; accepted on December 11, 1994