Enabling Parents Who Smoke to Prevent Their Children From Initiating Smoking

Results From a 3-Year Intervention Evaluation

Christine Jackson, PhD; Denise Dickinson, MPH

Objective: To evaluate effects of a home-based anti-smoking socialization program on the initiation of smoking among children whose parents smoke.

Design: Three-year randomized controlled trial.

Participants: Parents who were current smokers and had a child in the third grade who had not tried smoking were eligible; 873 parents-offspring pairs met these criteria, completed baseline interviews, and were randomly assigned to the intervention or control condition; 776 children (89%) completed an interview 3 years after baseline and were included in the study.

Intervention: During 3 months, the intervention group (n=371) received 5 printed activity guides, parenting tip sheets, child newsletters, and incentives; this group also received a booster activity guide 1 year later. The control group (n=405) received fact sheets about smoking.

Results: Initiation of smoking (first instance of puffing on a cigarette) was reported by 12% vs 19% of children in the intervention vs control groups. Logistic regression analysis indicated that children in the control condition had twice the odds of reporting initiation of smoking as children in the intervention condition (adjusted odds ratio, 2.16; P<.001), after adjusting for child sex, parent sex, parent race, parent educational achievement, child’s best friends’ smoking, parent smoking rate at baseline, and parent cessation status.

Conclusion: Children in the preinitiation phase of smoking who receive antismoking socialization from their parents are less likely to initiate smoking, even if their parents smoke.

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Although the upper limit of the age range used to define early initiation of smoking has varied across studies,1-6 there is consensus that youth who first try smoking by age 12 years are early initiators. A comparison of prevalence estimates across studies3-6 indicates that about 10% of 8-year-old (third grade) children, 18% to 24% of 10-year-old (fifth-grade) children, and 35% to 40% of 12-year-old (seventh-grade) children have tried smoking.

Studies1-3,7-11 have found strong positive associations between the initiation of smoking during childhood and habitual smoking later in life. These studies measured the age at initiation by asking adolescents3,7-9 or young adults1,10,11 to recall their age at first use. Despite the limitations of a retrospective assessment, the strength and consistency of the findings from these studies support the assertion that those who initiate smoking in childhood are significantly more likely to report advanced stages of smoking by late adolescence. Prospective evidence of an association between initiation during childhood and later use was obtained in a cohort study12 of subjects who were surveyed at ages 8 through 10 years, and again at age 17 years; early cigarette use was a significant predictor of progression to advanced stages of smoking. These prospective data corroborate the results of earlier retrospective investigations of the early onset of smoking.1-3,7-11 Together, these studies implicate the initiation of smoking in childhood as a primary risk factor for lifetime smoking.

ANTISMOKING SOCIALIZATION

Antismoking socialization is defined as parent-child interactions that influence the development of children’s cognitive and behavioral norms against smoking.13-15 Using communication, rule setting, monitoring, guided experience, and other methods of child socialization, parents can...
influence children’s perceptions of the prevalence of smoking, the acceptability of smoking, and the personal and social consequences of smoking. Antismoking socialization is substantially more than telling children that they should not smoke. From the child’s perspective, antismoking socialization involves internalization of attitudinal and behavioral norms against initiation of smoking, acceptance of parental monitoring of access to cigarettes and affiliation with peers who have tried smoking, expectations of negative consequences for trying smoking, and expectations of positive consequences for not smoking. Antismoking socialization is a broader concept than parental attitude about smoking, which has been studied extensively.17-19

Few parents engage in antismoking socialization; in fact, prosmoking socialization is not uncommon.14-16 Moreover, parental complacency is not devoid of a socializing effect; children commonly interpret parental nonresponse as tacit approval or lack of disapproval.20 At best, the absence of antismoking socialization leaves children to perceive experimentation with smoking as an activity that lies outside the realm of overt parental concern and active parental influence.

It is reasonable to assert that parents who smoke can do little to dissuade their children from smoking. The present study, however, rested on the opposite assumption. Although smokers model smoking behavior, we reasoned that being a smoker does not preclude a parent from eliminating a child’s exposure to passive smoke, talking to a child about smoking, making cigarettes inaccessible, monitoring the smoking behavior of children and their friends, and making clear the disciplinary consequences of smoking. In the present study, we evaluated whether exposure to an intervention that is designed to promote these antismoking socialization activities by parents who smoke could reduce children’s likelihood of initiating smoking.

INTERVENTION PROGRAM

Focus groups, a pilot study, and consultations with children, parents, and third-grade teachers were used to develop a home-based program called Smoke-free Kids. The program comprised 6 printed activity guides to meet the intervention objectives. Five guides were delivered in sequence after baseline data collection; the sixth guide was a booster, delivered 1 year after baseline. Examples of the intervention guides and activities can be viewed at the project’s Web site (http://www.familyhealthresearch.org). The intervention also included a series of tip sheets focused on parenting skills and a series of newsletters for children. Incentives (eg, children’s cameras and backpacks) were donated by local merchants and were given as prizes in program contests.

PROGRAM EVALUATION

An earlier evaluation of the Smoke-free Kids intervention21 showed that the intervention increased parental engagement in antismoking socialization 3 months after intervention and reduced child susceptibility to smoking 2 years after baseline. The database used for this earlier evaluation included only families for whom we had parent and child data at the 3-month and 24-month follow-ups (N=671). The database used for the present report included all children in the intervention or control condition with outcome data at 36 months (N=776). The present study used these data to test the primary hypothesis of the Smoke-free Kids intervention, namely, that children exposed to a program of antismoking socialization by parents who smoke will be significantly less likely than control subjects to initiate smoking by the sixth grade.

METHODS

PARTICIPANT RECRUITMENT

A volunteer sample was recruited. Administrators of 28 school districts allowed project staff to request that school principals disseminate institutional review board–approved recruitment materials. These districts were located in North Carolina, South Carolina, and Colorado, with 15, 3, and 10 districts per state, respectively. The role of these districts was limited to disseminating recruitment materials. Materials were mailed to elementary school principals with a letter that documented district cooperation. Principals were asked to distribute the materials to third-grade teachers, with the request that they send the materials home with students. Interested parents could enroll in the study with a child by mailing a signed consent form to the project office.

This voluntary recruitment method precluded obtaining an estimate of the response rate among eligible persons (ie, the self-enrolled number divided by the total number eligible). Obtaining a valid estimate of the denominator would have required a separate probability-based survey that measured the rate of smoking among parents of third-grade students in districts where recruitment occurred.

Parents who reported current smoking at baseline and who had a child in the third grade (ages 7-8 years) who had not tried smoking were eligible. The eligibility of those submitting consent forms (n=1147) was checked during telephone calls to complete the baseline interviews before randomization. During this procedure, 135 households could not be reached by telephone, and 125 (12%) of 1012 households that were reached did not meet the eligibility criteria (41 parents were nonsmokers, 2 children were not in the third grade, and 82 children reported having tried smoking), leaving 887 parents and children who completed baseline assessments and were randomized to a condition. During follow-up data collection, 14 children were found to have logic errors in their self-reported smoking status (eg, reporting abstinence at baseline and later reporting that a first puff occurred in the second grade or earlier). Because the reliability of their smoking status report was in question, these 14 children were reassigned as not eligible, leaving 873 children eligible. Of these, 776 (89%) completed a 3-year postbaseline interview and were included in the present study.

INTERVENTION PROTOCOL

During the baseline year, participants in the intervention condition received the 5 core activity guides mailed to their homes at approximately 2-week intervals. Delivery of newsletters, tip
sheets, and incentives was timed as appropriate to complement or reinforce each program guide.

Participants in the control condition received brief fact sheets with content that pertained to macrolevel variables relevant to youth smoking but not targeted by the intervention program (e.g., cost of cigarettes and sales to minors). Five fact sheets were mailed to controls, one each time an activity guide was sent to participants in the intervention condition.

SURVEY PROTOCOL

Telephone interview data were obtained from parents and children at baseline and from the children only at follow-up. At baseline, children were interviewed before their parents to avoid the possibility that the parent interview would influence parental behavior about smoking and thereby influence children’s responses. Interviewers were blinded to the study condition of participants.

Child Interview

The children’s interviews were administered by staff who had at least 2 years of experience working with children and had completed 30 hours of training. The training covered ethical treatment of human subjects, reading the assent transcript, standardizing the pace of reading, and reading with a voice that did not give any hint of agreement or disagreement with responses.

Parents provided verbal consent before interviewers spoke with their children (this was in addition to the signed parental consent). This procedure included requesting that the parent “Ask your child to go sit somewhere that’s quiet, let your child know that it’s okay with you if he/she answers our questions about smoking, and let your child know that he/she won’t have to discuss any answers after the interview ends. Please tell your child that it is okay with you if he/she sits and answers our questions privately.” After providing nonbinding verbal assent, children were asked by the interviewer to move to a place that was private, comfortable, and without obvious distractions. The actual interview took about 20 minutes to complete.

Parent Interview

Computer-assisted telephone interviews were administered to parents by a contracted survey research unit. The interviewers were jointly trained and supervised by us and by the coordinator of the research unit.

MEASURES

Eligibility Status at Baseline

Parents were considered eligible smokers if they had smoked at least 100 cigarettes in their lifetime and they had smoked at least 1 cigarette per week in the presence of their child (parents who said that they tried to hide their smoking from their child were not enrolled in the study). Children were considered eligible never smokers if they had never puffed on a cigarette. This widely used measure of initiation was selected based on a reliability study of elementary school children’s self-reported initiation of smoking. Children’s consistency was evaluated by looking for logic errors between baseline and the 1-year follow-up. Almost all children (98%) provided reliable reports of “ever smoking, even one puff” during 1 year. The results of these and other analyses reported in that study corroborate the results of another reliability study, which found that youth are highly consistent over time in their reporting of smoking behavior.

Dependent Variable

Initiation of smoking was defined as having ever puffed on a cigarette. Although puffing on a cigarette does not indicate regular smoking, it is the first instance of lifetime smoking. As such, it marks an important transition in children’s risk of progression toward habitual smoking. Initiation of smoking at the 36-month follow-up was measured using the same method as for the assessment of initiation status at baseline.

Covariates

Attributes of the child and of the parent smoker who enrolled the child were measured. These included child sex, relationship of the parent smoker to the child (the category of “mothers” comprised biological mothers, stepmothers, and other female guardians; and likewise for the category of “fathers”), parent race (white or nonwhite), parent educational achievement (high school or less or ≥1 year of college), smoking by the child’s best friends (no friends initiated or ≥1 friend initiated), and parent smoking rate (<1 pack/d or ≥1 pack/d).

STATISTICAL ANALYSIS

χ2 Analyses were used to test for attrition bias by comparing participants retained during 3 years (N=776) with participants who were lost to follow-up (n=97) and to evaluate the equivalence of the intervention and control groups based on demographic and smoking-specific variables. Logistic regression analyses were used to test whether the program affected initiation of smoking by the sixth grade. To develop the multivariate models, preliminary analyses were performed to determine which interaction terms should be included. We evaluated whether any of the covariates moderated the effect of program exposure on the initiation of smoking. None of these interaction terms was significant. Therefore, in the multivariate model used to estimate the intervention effect, the initiation of smoking was regressed at step 1 on the covariates and at step 2 on a dichotomous indicator of study condition. With intervention as the referent, the odds ratios (ORs) indicate the odds of initiation of smoking among control children relative to intervention children.

RESULTS

STUDY SAMPLE

Of the 776 children retained through follow-up, 53% were girls and all were in the second half of their sixth-grade year when the outcome data were collected (Table 1). Most parents (80%) who enrolled were mothers or other maternal figures, and the mean age was 36.6 years. Distributions by parent race, parent educational achievement, smoking by the child’s best friends, parental smoking rate at baseline, and parental cessation status at follow-up are also given in the table.

ATRITION ANALYSIS

Attrition analyses compared the 97 participants lost to follow-up with the 776 participants retained during 3 years. There was no association between attrition status...
and demographic attributes. The attrition rate (11.1% overall) varied only slightly (from 10.3% to 11.7%) across the categories of child sex, parent relationship to the child, parent race, and parent educational achievement. Similarly, attrition was equally likely within subgroups defined by smoking by 1 or more of the child’s best friends, parent smoking rate, and parent cessation status at follow-up. The only deviation from this pattern occurred for study condition; the loss to follow-up was higher in the intervention group (12.9%) than in the control group (9.4%), although this difference was not significant ($\chi^2 = 2.16, P = .12$).

### GROUP EQUVALENCE ANALYSIS

A preliminary analysis of data from children in the study sample ($N = 776$) tested whether the intervention ($n = 371$) and control ($n = 405$) groups differed in ways that could account for differences in the study outcome. The results (Table 1) indicated that control group children were significantly more likely than intervention group children to have parents who had attended college (68% vs 60%; $\chi^2 = 4.68, P = .03$). Given the expected inverse association between parent educational achievement and child smoking, this difference would exert a conservative effect on the assessment of intervention effect on the initiation of smoking. For all other comparisons, there were no significant differences between the intervention and control groups.

### INTERVENTION EFFECT

Before the multivariate analysis, the bivariate association between each covariate and the study outcome was assessed (Table 2). Consistent with previous findings of risk factors for youth smoking, the smoking status of the child’s best friends had the strongest association with initiation of smoking. Initiation was reported by 12% of children who reported that no best friends had tried smoking vs 29% of children who had 1 or more best friends who had tried smoking. The parent smoking rate at baseline also had a significant association with the initiation of smoking at follow-up.

The bivariate association between study condition and the study outcome showed that 12% vs 19% of children in the intervention vs control groups reported initiation of smoking at follow-up ($\chi^2 = 8.1, P < .001$).

The intervention effect was estimated using the intent-to-treat model. Initiation of smoking was regressed first on the study covariates (partial model) and then on the dichotomous indicator of study condition (full model) (Table 3). The adjusted OR for study condition (OR, 2.16 [95% confidence interval, 1.39-3.37]; $P < .001$) indicates that children in the control condition were twice as likely as children in the intervention condition to report initiation of smoking 3 years after baseline. A comparison of the partial and full presentation of the regression model shows a significant increase in $\chi^2$ value owing to study condition (omnibus test of model coefficients, $\chi^2 = 31.5, P < .001$ for the partial model; and $\chi^2 = 44.0, P < .001$ for the full model). In addition, this comparison shows that the ORs for the control variables changed only slightly when the study condition was added to the model, indicating that the effect of the study condition on the initiation of smoking was independent of these control variables. Overall, this analysis indicates that exposure to the intervention had a significant, independent, and protective effect on the odds of the initiation of smoking at follow-up.

### Table 1. Sample Description and Comparisons of the Intervention vs Control Groups at Baseline

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total Sample ($N = 776$)</th>
<th>Intervention Group ($n = 371$)</th>
<th>Control Group ($n = 405$)</th>
<th>$\chi^2$ Value</th>
<th>$P$ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>408 (52.6)</td>
<td>206 (55.5)</td>
<td>202 (49.9)</td>
<td>2.5</td>
<td>.12</td>
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<tr>
<td>Male</td>
<td>368 (47.4)</td>
<td>165 (44.5)</td>
<td>203 (50.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parent relationship to child</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Father</td>
<td>158 (20.4)</td>
<td>75 (20.2)</td>
<td>83 (20.5)</td>
<td>0.009</td>
<td>.92</td>
</tr>
<tr>
<td>Mother</td>
<td>618 (79.6)</td>
<td>296 (79.8)</td>
<td>322 (79.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parent race</td>
<td></td>
<td></td>
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<tr>
<td>White</td>
<td>572 (76.3)</td>
<td>265 (73.8)</td>
<td>307 (78.5)</td>
<td>2.3</td>
<td>.13</td>
</tr>
<tr>
<td>Nonwhite</td>
<td>178 (23.7)</td>
<td>94 (26.2)</td>
<td>84 (21.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parent educational achievement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ High school</td>
<td>273 (36.1)</td>
<td>145 (40.1)</td>
<td>128 (32.5)</td>
<td>4.7</td>
<td>.03</td>
</tr>
<tr>
<td>≥ 1 y of College</td>
<td>483 (63.9)</td>
<td>217 (59.9)</td>
<td>266 (67.5)</td>
<td></td>
<td></td>
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<tr>
<td>Smoking by ≥1 of child’s best friends</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>611 (79.6)</td>
<td>299 (81.3)</td>
<td>312 (78.0)</td>
<td>1.2</td>
<td>.27</td>
</tr>
<tr>
<td>Yes</td>
<td>157 (20.4)</td>
<td>69 (18.8)</td>
<td>88 (22.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parent smoking rate at baseline, pack/d</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1</td>
<td>426 (54.9)</td>
<td>208 (56.1)</td>
<td>218 (53.8)</td>
<td>0.4</td>
<td>.53</td>
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<tr>
<td>≥1</td>
<td>350 (45.1)</td>
<td>163 (43.9)</td>
<td>187 (46.2)</td>
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<tr>
<td>Parent cessation status at follow-up</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cessation reported</td>
<td>113 (15.1)</td>
<td>48 (13.3)</td>
<td>65 (16.7)</td>
<td>1.7</td>
<td>.15</td>
</tr>
<tr>
<td>No change reported</td>
<td>637 (84.9)</td>
<td>313 (86.7)</td>
<td>324 (83.3)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Data are given as number (percentage) unless otherwise indicated. The numbers of subjects are less than the total numbers of subjects for some variables because of missing data.
In a feasibility study, Ary et al recorded conversations about avoiding tobacco use among parent-daughter dyads and found that the conversations were perceived as nonaversive and helpful by most parents and daughters. These investigators concluded that the next important research question was whether such conversations with parents can discourage young people from using tobacco. In a prospective study of naturally occurring parental antismoking socialization, Chassin et al studied 182 mother-offspring pairs and found that offspring exposed to smoking-specific discussion and punishment were significantly less likely to initiate smoking. Based on this finding, Chassin et al recommended enlisting socialization by mothers as a smoking prevention strategy. The antismoking socialization program tested in the present study directly addressed the recommendations of Ary et al and Chassin et al, although the focus on parents who were smokers was unique to this investigation.

This study found that the Smoke-free Kids intervention reduced the likelihood that children of parents who smoke would initiate smoking by the sixth grade. Whereas 19% of children in the control condition had tried smoking by sixth grade, 12% of children in the intervention condition had done so. The 2.16 adjusted OR associated with this effect indicated that the control group was twice as likely to report having tried smoking. This effect was adjusted for sex of the parent who modeled smoking, child’s best friends’ smoking, parent smoking rate, parent cessation of smoking, and other predictors of youth smoking behavior.

That parents who smoke can be effective agents of antismoking socialization might seem counterintuitive. Indeed, one could question whether this finding is simply a research anomaly. Multiple studies of antismoking socialization interventions for parents who smoke are needed before the replicability and generalizability of this effect are known. Other research studies that support the notion that parents who smoke can exert a protective antismoking effect on offspring are highlighted herein.

Investigators for nonintervention studies of antismoking socialization have reported inverse associations between antismoking socialization and the risk of smoking among offspring. Some of these studies found inverse associations even if the parents were smokers. In 1 study, adolescents in the experimental phase of smoking who perceived strong parental disapproval of their smoking were less than half as likely to progress to established smoking as peers who did not hold that perception; the effects of parental disapproval were as strong for parents who smoked as for parents who did not smoke. More recently, an analysis of a population-based cohort of 3555 high school seniors showed that parental antismoking actions, such as restrictive rules in the home, had significant inverse associations with adolescents’ odds of daily smoking, even if the parents were smokers. In brief, the results of nonintervention studies of antismoking socialization have reported inverse associations between antismoking socialization and the risk of smoking among offspring. Some of these studies found inverse associations even if the parents were smokers. In 1 study, adolescents in the experimental phase of smoking who perceived strong parental disapproval of their smoking were less than half as likely to progress to established smoking as peers who did not hold that perception; the effects of parental disapproval were as strong for parents who smoked as for parents who did not smoke. More recently, an analysis of a population-based cohort of 3555 high school seniors showed that parental antismoking actions, such as restrictive rules in the home, had significant inverse associations with adolescents’ odds of daily smoking, even if the parents were smokers.

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socialization during the elementary school years bolster the effect of middle school prevention programs, which have not had sustained effects on youth smoking.32-34 Another issue is how to persuade parents who smoke to get involved in antismoking socialization. From our research, we know that parents who smoke are difficult to recruit. This is likely because of several factors, including low self-efficacy driven by concerns about hypocrisy and a desire to avoid experiences that could heighten feelings of guilt and worry about one's smoking. Research is needed to identify audience segments within the population of parents who smoke and to test messages designed to persuade parents in these segments that antismoking socialization is feasible for them and potentially beneficial for their children.

Limitations of the study are its design and method, which limit the external validity of the findings. By using a volunteer sample, the findings are generalizable only to adult smokers who are receptive to the opportunity to engage in antismoking socialization. From our research, we know that parents who smoke are difficult to recruit. This is likely because of several factors, including low self-efficacy driven by concerns about hypocrisy and a desire to avoid experiences that could heighten feelings of guilt and worry about one's smoking. Research is needed to identify audience segments within the population of parents who smoke and to test messages designed to persuade parents in these segments that antismoking socialization is feasible for them and potentially beneficial for their children.

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CONCLUSIONS

Children in the preinitiation phase of smoking who are exposed to antismoking socialization from their parents are less likely to try smoking, even if their parents smoke. The Smoke-free Kids intervention is a tool that parents who smoke can use to increase the range, intensity, and specificity of antismoking socialization activities to which their children are exposed.

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Correspondence: Christine Jackson, PhD, Pacific Institute for Research and Evaluation, Chapel Hill Center, 1516 E Franklin St, Suite 200, Chapel Hill, NC 27514 (cjackson@pire.org).
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**Convulsions, infantile:** alcohol has remarkable power in arresting convulsions of teeth-
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—From *Materia Medica Pharmacy and Therapeutics*, 1906