# Prevention of Relapse in Women Who Quit Smoking During Pregnancy

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ABSTRACT

*Objectives.* This study is an evaluation of relapse prevention interventions for smokers who quit during pregnancy.

*Methods.* Pregnant smokers at 2 managed care organizations were randomized to receive a self-help booklet only, prepartum relapse prevention, or prepartum and postpartum relapse prevention. Follow-up surveys were conducted at 28 weeks of pregnancy and at 8 weeks, 6 months, and 12 months postpartum.

*Results.* The pre/post intervention delayed but did not prevent postpartum relapse to smoking. Prevalent abstinence was significantly greater for the pre/post intervention group than for the other groups at 8 weeks (booklet group, 30%[a]; prepartum group, 35%[b]; pre/post group, 39%[b]; $P = .02$ [different superscripts denote differences at $P < .05$]) and at 6 months (booklet group, 26%[a]; prepartum group, 24%[a]; pre/post group, 33%[b]; $P = .04$) postpartum. A nonsignificant reduction in relapse among the pre/post group contributed to differences in prevalent abstinence. There was no difference between the groups in prevalent abstinence at 12 months postpartum.

*Conclusions.* Relapse prevention interventions may need to be increased in duration and potency to prevent postpartum relapse. (*Am J Public Health.* 1999;89:706–711)

Smoking cessation during pregnancy significantly reduces the risks of fetal death, low birthweight, and other complications of pregnancy.[1] Continued abstinence postpartum also reduces children's exposure to environmental tobacco smoke and its associated health risks.[2] Moreover, sustained abstinence postpartum reduces women's lifetime risk for smoking-related diseases.[3]

It is encouraging that approximately 30% of women who smoke at the start of pregnancy quit smoking for the duration of the pregnancy.[1,4] Unfortunately, up to 60% of these women will return to smoking within the first 6 months postpartum, and 80% to 90% will have experienced a relapse by 12 months postpartum.[4,5] In contrast to nonpregnant smokers' steep relapse curves in the initial days and weeks after cessation,[6–8] postpartum relapse is more gradual, with the greatest drop in abstinence occurring between 4 and 6 months postpartum.[5,8]

Social and psychological changes such as decreased motivation and social pressure to maintain abstinence, the stress of caring for a newborn, exposure to high-risk situations that may have been avoided during pregnancy, and cessation of breast-feeding may contribute to the disappointingly high relapse rates seen among postpartum women.[8] Thus, interventions that address these factors during and immediately after pregnancy may reduce postpartum relapse rates.

With few exceptions,[9] relapse prevention components of cessation interventions for pregnant smokers have been minimal and targeted to the prenatal period.[10–12] By contrast, the Healthy Options for Pregnancy and Parenting project was a 5-year randomized trial conducted with pregnant smokers in which postpartum relapse prevention was the primary objective. This 3-group randomized controlled trial addressed 2 primary questions: (1) Does a relapse prevention intervention during pregnancy result in decreased postpartum relapse rates compared with a standard self-help intervention? and (2) Does a relapse prevention intervention extended into the early postpartum period further decrease postpartum relapse rates?

## Methods

### *Setting*

The clinical sites for the trial were Group Health Cooperative of Puget Sound (Seattle) and Park-Nicollet of Minnesota. Group Health Cooperative is a health maintenance organization that serves over 450 000 enrollees in western Washington State. Park-Nicollet is a multispecialty group practice with a patient base that is 60% health maintenance organization and 40% traditional fee-for-service.

### *Identification of a Population-Based Sample of Pregnant Smokers*

Pregnant women who scheduled their first prenatal visit were identified from clinic appointment logs at each site. In Seattle, the

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women received a letter introducing a study of women's health during pregnancy and a number to call to decline participation. In Minnesota, new prenatal patients received a letter from Park-Nicollet informing them that their names would be provided to the University of Minnesota for a study unless they declined participation by calling or returning a postcard. At both sites, women who did not decline to participate were called to complete a baseline health behavior survey that assessed their smoking status and eligibility for the trial. All participants gave verbal consent for participation in the study before answering the telephone survey questions.

Women were eligible for the intervention trial if they completed the baseline survey, were fewer than 20 weeks pregnant, and reported being a current smoker or a recent quitter (had been a smoker in the 30 days before pregnancy but had quit by the time of the baseline survey).

### *Intervention*

Eligible women were stratified by baseline smoking status and randomized to 1 of 3 intervention groups: self-help booklet only (booklet-only group), booklet plus prepartum intervention (prepartum group), or booklet plus prepartum and postpartum intervention (pre/post group). The intervention was delivered via mail and telephone without involving prenatal health care providers. The specific components are described below.

*Self-help booklet.* All participants were mailed a self-help booklet designed specifically for pregnant women titled *Stop Now for Your Baby.* The booklet was written at a fifth-grade reading level. For current smokers, the booklet included information about the health effects of smoking during pregnancy, as well as specific suggestions for quitting smoking (setting a quit date, enlisting support, etc.). For recent quitters, the booklet offered stress reduction techniques, suggestions for handling high-risk situations, and pregnancy-appropriate behavioral alternatives to smoking. Women in the booklet-only group received no other intervention materials.

*Personalized letter.* Women in the prepartum and pre/post groups received a personalized letter to introduce the self-help booklet, adapted from our previous evaluations of self-help interventions.[13,14] The computer-generated letter acknowledged the woman's baseline stage of readiness for change,[15] her personal health concerns, and her intrinsic motivation to quit and compared her with other pregnant women who had successfully quit smoking.

*Relapse prevention kit.* Within 2 weeks after completing the 28th-week follow-up survey, women in the prepartum and pre/post groups were mailed a relapse prevention kit. The kit included a relapse prevention booklet, *Balancing Act*, that discussed the transition between pregnancy and the postpartum period and related factors that influence smoking cessation and relapse. Drawing on the Relapse Prevention Model,[16] the guide included practical tips for dealing with high-risk situations, strategies for avoiding self-defeating reactions to slips, and personal anecdotes from women who quit smoking or remained abstinent after pregnancy. Women who were still smoking in late pregnancy received the kit with an introductory letter that referred them back to the *Stop Now* booklet for further assistance with cessation.

*Prepartum telephone counseling.* The prepartum and pre/post groups received 3 prepartum counseling calls. The first call occurred approximately 2 weeks after the *Stop Now* booklet was mailed, and calls 2 and 3 followed at 1-month intervals. Counseling calls were initiated by smoking cessation counselors, one at each site, who received about 40 hours of training. While the format for the calls was open-ended, counselors used a standardized protocol based on motivational interviewing techniques[17] and followed stage-based objectives for each call.[15] The counselors were not involved in any follow-up survey activities.

The overall objective for continuing smokers was to identify personal motivators and to encourage women to use the self-help materials for quitting smoking. Women who had quit smoking were provided with support and encouragement to remain abstinent. Prepartum calls lasted an average of 8.5 (SD = 6.3) minutes.

*Postpartum telephone counseling.* Women in the pre/post group received 3 counseling calls within the first 4 months postpartum. The calls reinforced themes from the *Balancing Act* booklet relating to the transition from pregnancy to parenting and the continued importance of smoking cessation. The first call was scheduled to occur within the first 4 weeks after delivery; the second and third calls were timed to occur at approximately 4- to 6-week intervals. Postpartum calls lasted an average of 7.7 (SD = 6.5) minutes.

*Postpartum newsletters.* Women in the pre/post group were mailed 3 newsletters that included feature articles about the health effects of environmental tobacco smoke, and emphasized the importance of being a nonsmoking parent. The newsletters were mailed at approximately 2, 6, and 12 weeks postpartum.

### *Measures*

*Baseline questionnaire.* The baseline telephone survey provided data on demographics, pregnancy history, characteristics of the current pregnancy, smoking history, type and level of motivation, and perceived stress. The computer-assisted telephone surveys were implemented by trained interviewers who had no role in intervention activities.

*Follow-up.* Smoking status and patterns of smoking were assessed by telephone surveys at 28 weeks of pregnancy and at 8 weeks, 6 months, and 12 months postpartum. Participation in specific intervention components was assessed at the nearest appropriate follow-up (e.g., use of the self-help guide was assessed at the 28-week follow-up; use of the relapse prevention kit and participation in the prepartum telephone counseling sessions were assessed at the 8-week postpartum follow-up). All follow-up surveys were conducted from the University of Minnesota.

*Saliva cotinine.* Women who reported abstaining from cigarettes for the previous 7 days were asked to provide a saliva sample at the 28th-week follow-up and at the 6- and 12-month postpartum follow-ups. The women were sent a packet with detailed instructions for collecting and returning the samples by mail. These methods have been shown to yield specimens consistent with in-person collection methods.[18] All samples were analyzed for cotinine at the American Health Foundation laboratory. A cutpoint of 20 ng/mL was used to confirm 7 days' abstinence from smoking.

### *Statistical Analysis*

Baseline characteristics of the study participants were compared by study site and intervention group by means of $\chi^2$ tests for binary variables and F tests for continuous and ordinal variables. Because randomization was stratified by site and baseline smoking status (current smoker vs recent quitter), the outcome analyses, including the "unadjusted" analyses, were controlled for these variables. All analyses were done twice: first, "unadjusted," controlling only for the 2 stratification variables, and second, adjusted for additional baseline covariates. Covariates used in the adjusted analyses were site, baseline smoking status, education, employment status, marital status, age, race, intention to be pregnant, prior pregnancy, illness during pregnancy, gestational age, cigarettes smoked per day prior to pregnancy, length of longest previous quit attempt, and number of cigarettes per day at baseline (current smokers only). Logistic regression was used for the main binary outcome measures: (1) prepartum 7-day prevalent abstinence (defined below) and (2) relapse,

cessation, and 7-day prevalent abstinence at each postpartum follow-up.

For prepartum 7-day prevalent abstinence, the prepartum and pre/post groups were combined, because both groups received the same intervention, and compared with the booklet-only group (a 1 *df* test). For postpartum relapse and 7-day prevalent abstinence outcomes, if the *P* value for the overall between-group $\chi^2$ test (2 *df*) was less than or equal to .05, pairwise comparisons were run with dummy variables. Logistic regressions (both adjusted and unadjusted) were used to test for a site × treatment interaction to determine whether the effect of the intervention differed between sites.

The unadjusted and adjusted intervention effects were very similar. Thus, we report only the unadjusted proportions, together with the overall unadjusted and adjusted *P* values, to compare the 3 groups. For pairwise comparisons between groups, unadjusted *P* values are also given when the overall test was significant.

Consistent with an intent-to-treat approach, when smoking status was missing for a participant because of nonresponse, either to a follow-up survey or to that item, the participant was included in the analysis as a smoker. The results did not differ from those of outcome analyses including only those participants who provided follow-up data (data not shown).

### *Study Outcomes*

The primary prepartum outcome was *7-day prevalent abstinence*, that is, the proportion of women who reported not having smoked in the previous 7 days at the 28-week follow-up. Three postpartum outcomes were assessed: *postpartum relapse*, the proportion of women who were abstinent at 28 weeks but had returned to smoking; *postpartum cessation*, the proportion who had been smoking at the 28-week follow-up but had not smoked any cigarettes in the 7 days preceding the postpartum follow-up; and *postpartum 7-day prevalent abstinence*, the proportion of all women randomized who had not smoked any cigarettes in the 7 days preceding the postpartum follow-up.

The planned and achieved sample size of 900 (450 at each site) yielded 80% power to detect a 16% difference in postpartum relapse rates at the 12-month follow-up.

## *Results*

### *Recruitment*

Of the 9152 new prenatal patients identified, 714 (8%) were ineligible owing to miscarriage, termination of the pregnancy, or inability to speak English; 697 (8%) refused to participate; and 262 (3%) could not be reached by telephone after repeated attempts. A total of 7479 (82% of those eligible) completed the survey. Refusal rates did not differ by site.

Of those who completed the baseline survey, 1007 (Seattle n = 539; Minnesota n = 468) were current smokers or recent quitters and were randomized to a study group. However, 88 of these women (Seattle n = 60; Minnesota n = 28) subsequently miscarried between baseline and the 28-week follow-up. These women were excluded from the randomized trial. In addition, 22 women in Seattle were mailed the wrong intervention materials; they were also excluded. The results described here are based on the remaining 897 women (Seattle n = 457; Minnesota n = 440).

Response rates were 92% at 28 weeks, 91% at 8 weeks postpartum, 89% at 6 months postpartum, and 87% at 12 months postpartum. Response rates did not differ by intervention group or site. Overall, 80% of those randomized provided data at all 4 follow-ups.

### *Participant Characteristics*

Women in the trial were predominantly White and married or living as married, with an average age of 28 years; fewer than 20% had a college education, and 71% had been pregnant before (Table 1). At the time of randomization, the women were, on average, in their first trimester of pregnancy. Participants reported smoking an average of 15 cigarettes per day in the 30 days before pregnancy. Three quarters of the women had tried to quit smoking in the past; the average number of previous quit attempts was 5. At baseline, 44% of the women reported that they had not smoked any cigarettes in the previous 7 days. The 56% who did smoke reported an average of 5 cigarettes per day and were moderately confident that they could quit smoking during the current pregnancy (the mean score was 6 on an 11-point confidence scale).

Participants in the booklet-only group were significantly more likely than women in the other 2 groups to report that the current pregnancy was planned (*P* = .03). Compared with the women recruited in Minnesota, those in Seattle were younger (mean age: Minnesota = 28.3 years, Seattle = 27.1 years); less likely to be college educated (Minnesota = 22%, Seattle = 12%); less likely to have household incomes of at least $30 000 (Minnesota = 77%, Seattle = 56%); less likely to be White (Minnesota = 95%, Seattle = 81%); recruited earlier in pregnancy (means: Minnesota = 11 weeks, Seattle = 8 weeks); and less likely to have intended to become pregnant (Minnesota = 62%, Seattle = 54%). Seattle participants had also made fewer previous quit attempts (means: Minnesota = 6.4, Seattle = 3.4). Site was included as a covariate in all subsequent analyses and site × treatment interactions were tested for all primary study outcomes.

### *Participation in Intervention*

More women in the prepartum and pre/post groups than in the booklet-only group recalled receiving the self-help booklet (96% vs 81%; $P < .05$). Just over half of the women (56% of those in the prepartum and pre/post groups and 57% of those in the booklet-only group) reported reading the booklet, and of those, more than half said they had followed some of its suggestions. Twenty-two percent of those in the prepartum and pre/post groups and 14% of those in the booklet-only group used the booklet during the postpartum period as well ($\beta < .05$).

The majority (91%) of the women in the prepartum and pre/post groups recalled receiving the relapse prevention kit. Almost half (46%) reported reading most or all of the relapse guide, and of those, 58% reported following suggestions in the guide. Participation in the counseling calls was also high among women in these groups; 92% accepted the first prepartum call, 86% the second, and 78% the third. Of the women in the pre/post group, 82% accepted at least one postpartum call. The majority (93%) recalled receiving the postpartum newsletters; 57% reported reading all or most of them, and 60% of these women reported following some of their suggestions.

### *Biochemical Validation of Outcomes*

The proportion of women who reported 7-day abstinence and who returned saliva samples did not differ significantly by intervention group or site; percentages ranged from 64% to 78% over the follow-ups. Confirmation rates—the proportion of returned samples multiplied by the proportion of samples with a cotinine level of less than 20 ng/mL—did not differ significantly by group at any follow-up. Thus, since there were no between-group differences in the proportion of saliva samples returned or the proportion confirmed, the primary trial outcomes were based on self-reported smoking status.

### *Prepartum Outcomes*

Prepartum 7-day prevalent abstinence did not differ between the booklet-only group and the combined prepartum and pre/post

**TABLE 1—Baseline Characteristics of Pregnant Smokers in the Healthy Options for Pregnancy and Parenting Project, by Intervention Group**

| | Total Sample (n = 897) | Booklet-Only (n = 297) | Prepartum (n = 294) | Pre/Post (n = 306) | Significance[a] |
|---|---|---|---|---|---|
| Age, y, mean (SE) | 27.7 (0.2) | 27.8 (0.3) | 27.5 (0.3) | 27.7 (0.3) | .77 |
| Household income ≥ $30 000, % | 67 | 68 | 65 | 68 | .72 |
| College graduate, % | 17 | 18 | 14 | 19 | .34 |
| White, % | 88 | 87 | 87 | 89 | .66 |
| Married/living as married, % | 82 | 83 | 82 | 82 | .97 |
| Employed full-time, % | 64 | 62 | 66 | 64 | .62 |
| Planned pregnancy, % | 58 | 64 | 56 | 54 | .03 |
| Sick during this pregnancy, % | 64 | 66 | 60 | 66 | .16 |
| Previously pregnant, % | 71 | 69 | 74 | 71 | .48 |
| Weeks gestation, mean (SE) | 9.4 (0.1) | 9.5 (0.2) | 9.5 (0.2) | 9.2 (0.2) | .30 |
| Smoking pattern before pregnancy | | | | | |
| No. of cigarettes/d, mean (SE) | 14.9 (0.3) | 15.4 (0.5) | 14.3 (0.5) | 14.9 (0.5) | .40 |
| Smoked within 30 min of waking, % | 37 | 37 | 38 | 37 | .99 |
| Tried to quit, % | 79 | 81 | 76 | 80 | .20 |
| No. of quit attempts, mean (SE) | 4.9 (0.4) | 5.0 (0.7) | 4.9 (0.7) | 5.0 (0.7) | .99 |
| Quit in previous pregnancy,[b] % | 42 | 45 | 36 | 45 | .07 |
| Continuing smoker,[c] % | 56 | 54 | 60 | 54 | .28 |
| Current no. of cigarettes/d,[d] mean (SE) | 4.8 (0.2) | 4.8 (0.4) | 4.7 (0.4) | 4.9 (0.4) | .92 |
| Confidence score for ability to quit,[e] mean (SE) | 6.0 (0.1) | 5.9 (0.2) | 6.3 (0.2) | 5.8 (0.2) | .30 |

[a]*P* value comparing 3 groups was based on $\chi^2$ test (2 *df*) or F test.
[b]Quit for 3 months or more during a previous pregnancy.
[c]Smoked in month before pregnancy and still smoking at baseline survey.
[d]Among continuing smokers.
[e]Confidence about ability to quit was measured on an 11-point scale.

groups (47% vs 50%; $P < .17$). Although continued abstinence was not a primary outcome, compared with those in the booklet-only group, significantly more women in the combined prepartum and pre/post groups who were not smoking at baseline remained abstinent at 28 weeks of pregnancy (87% vs 80%, $P = .02$; data not shown). However, among women who were smoking at baseline, 7-day prevalent abstinence at the 28-week follow-up did not differ by intervention group (prepartum and pre/post, 21%, vs booklet-only, 19%; $P = .90$; data not shown) or by site.

### *Postpartum Outcomes*

For the 438 women who reported 7-day abstinence at the 28-week follow-up, we compared the proportion who had relapsed at each follow-up by intervention group (Table 2). At 8 weeks postpartum, the proportion who had relapsed was lower, though not significantly ($P = .09$), in the pre/post (33%) and prepartum (35%) groups than in the booklet-only group (44%). At 6 months postpartum, the proportion who had relapsed remained lower ($P = .09$) in the pre/post group (43%) than in the prepartum (53%) and booklet-only (55%) groups. By the 12-month follow-up, there was little difference (1 percentage point) in relapse rates across intervention groups; more than 50% of those who were abstinent in late pregnancy had returned to smoking. There were no significant interactions between relapse rates and baseline smoking status or site at any postpartum follow-up.

Relatively few of the women who were smoking in late pregnancy (n = 459) quit smoking after the 28th week of pregnancy (range, 4%–8%), and there were no differences by group (Table 2).

Overall comparisons showed significant differences between the 3 intervention groups in 7-day prevalent abstinence at 8 weeks and 6 months postpartum (Table 2). In pairwise comparisons, both the prepartum and the pre/post groups had significantly higher rates of prevalent abstinence than women in the booklet-only group. At the 6-month follow-up, rates of prevalent abstinence remained significantly higher for the pre/post group than for the other 2 groups. By the 12-month follow-up, abstinence rates were virtually identical across the 3 groups.

Kaplan-Meier survival analyses were used to compare the temporal patterns of postpartum relapse for the 3 intervention groups. Women who reported being abstinent at the 28th week of pregnancy and who had not relapsed before their delivery date (n = 340; booklet-only = 109, prepartum = 108, pre/post = 123) were included in the analyses. At each postpartum follow-up, time to relapse was computed by subtracting the woman's delivery date from the reported date of the first cigarette smoked. Nonrespondents to any postpartum follow-up survey (n = 22; booklet-only = 7, prepartum = 6, pre/post = 9) were excluded because relapse dates were missing.

The postpartum survival curves were very similar for the booklet-only and prepartum groups (Figure 1). The pre/post group had a slower pattern of relapse through 7 months postpartum. Relapse leveled off by 7 months for the booklet-only and prepartum groups, while the pre/post group's relapse pattern was steady up to 12 months postpartum.

## *Discussion*

Interventions for pregnant smokers that include relapse prevention assistance in the early postpartum period may delay, but not prevent, a postpartum return to smoking. In our study, women who received postpartum assistance were significantly less likely to be smoking at 8 weeks and 6 months after delivery than those who received only prepartum assistance. By contrast, in the prepartum intervention groups, relapse patterns at the 6-month follow-up were consistent with those reported by others.[5,8,9,19]

**TABLE 2—Postpartum Outcomes (%) for Pregnant Smokers in the Healthy Options for Pregnancy and Parenting Project, by Intervention Group**

| | Booklet-Only (n = 297) | Prepartum (n = 294) | Pre/Post (n = 306) | Significance | |
|---|---|---|---|---|---|
| | | | | Unadjusted[a] | Adjusted[b] |
| Relapse[c] | | | | | |
| Week 8 | 44 | 35 | 33 | .09 | .07 |
| Month 6 | 55 | 53 | 43 | .09 | .07 |
| Month 12 | 58 | 58 | 57 | .99 | .99 |
| Cessation[d] | | | | | |
| Week 8 | 6 | 8 | 8 | .75 | .75 |
| Month 6 | 8 | 4 | 7 | .25 | .19 |
| Month 12 | 8 | 8 | 5 | .76 | .79 |
| Prevalent abstinence[e] | | | | | |
| Week 8 | 30* | 35** | 39*** | .02 | .04 |
| Month 6 | 26* | 24* | 33** | .04 | .05 |
| Month 12 | 24 | 23 | 25 | .93 | .96 |

*Note.* Smoking status was self-reported; nonrespondents were coded as smoking. (Number of missing values was recoded to smoking: for relapse, 29 at week 8, 38 at month 6, 66 at month 12; for cessation, values were recoded to 54, 65, and 66, respectively, and for prevalent abstinence to 83, 103, and 112). Within rows, items denoted by different numbers of asterisks are significantly different from each other at the $P < .05$ level.

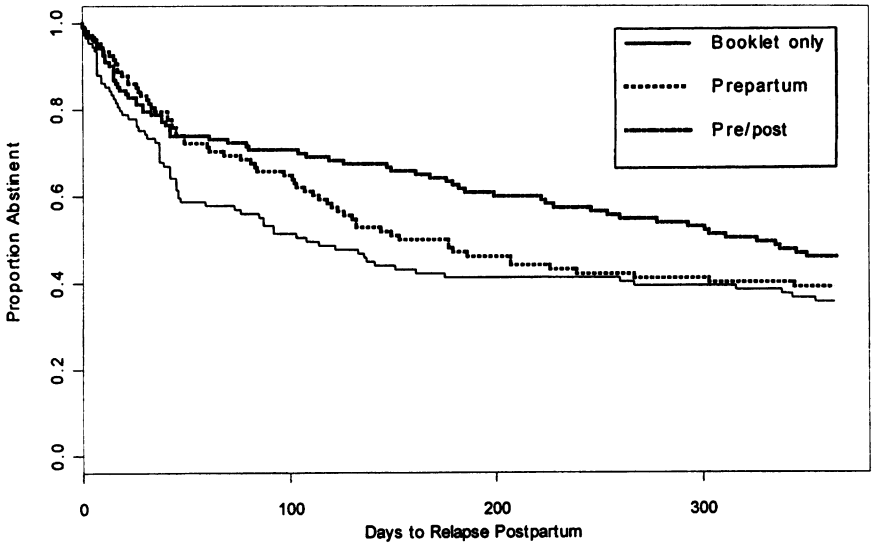
[a]Unadjusted analysis controlled for site and baseline smoking, using logistic regression.

[b]Adjusted analysis controlled for site, baseline smoking status, and 12 other baseline covariates (see Statistical Analysis), using logistic regression.

[c]Relapse = any cigarettes in the previous 7 days. Denominator limited to those who reported not having smoked in the 7 days preceding the 28-week follow-up (n = 438; booklet-only = 141, prepartum = 137, pre/post = 160).

[d]Cessation = no cigarettes in the previous 7 days. Denominator limited to those who were smokers at the 28-week follow-up (n = 459; booklet-only = 156, prepartum = 157, pre/post = 146).

[e]Prevalent abstinence = no cigarettes in the previous 7 days. Denominator includes all participants (n = 897).




*Note.* Curves are based on data from women with complete smoking status data at 8-week, 6-month, and 12-month postpartum follow-ups.

**FIGURE 1—Cumulative survival curves of postpartum abstinence among women in the Healthy Options for Pregnancy and Parenting project who quit smoking during pregnancy, by intervention group.**

Relapse occurred more slowly among women in the postpartum group than in the prepartum groups throughout the time that they were receiving the postpartum intervention. However, by 12 months postpartum the proportion who were smoking was virtually the same in all 3 groups, although somewhat lower than was reported in the one other intervention study[9] that included comparable follow-up. Future interventions may need to be increased in duration, potency, or both to further extend the period of abstinence.

The primary component of the postpartum intervention was telephone counseling, which provided only temporary support for sustaining abstinence. Interventions that incorporate support into women's natural social networks may be needed to further extend abstinence.[20,21] Ongoing trials are evaluating promising approaches that include intimate partners in interventions for pregnant smokers.[22] Other potential sources of long-term support should also be evaluated.

System links between obstetrical and pediatric care could also extend available support to discourage postpartum relapse. Two studies have evaluated relapse prevention interventions provided as part of clinical care. Secker-Walker and colleagues found that face-to-face counseling during prenatal and early postpartum visits substantially reduced postpartum relapse rates.[9] Similarly, Wall and colleagues trained pediatricians to offer relapse prevention assistance to mothers as part of well-baby care. The intervention significantly reduced relapse rates among mothers who had quit smoking during pregnancy.[23] Managed care settings can provide a framework for linking these 2 intervention approaches to maximize the duration of the intervention and its cost-effectiveness. The mailed materials and telephone counseling used in our intervention could be incorporated into both prenatal and pediatric care. Health care systems could also provide nicotine replacement to encourage subsequent quit attempts among women who relapse in postpartum.

These results should be considered with several caveats. While the 2-site design provided good power for assessing postpartum prevalent abstinence outcomes (80% power to detect a 10% between-group difference), even this large sample had limited power for the relapse outcomes (80% power for a 16% difference). In addition, the study population was predominantly White, married, and relatively well-educated, thus limiting the generalizability of these results to other settings or to low-income and minority women. The poor cessation outcomes of a clinic-based intervention with low-income pregnant smokers suggest that such populations present different and potentially greater chal-

lenges for smoking cessation interventions.[11] It is notable, too, that our prepartum cessation rate, which was quite high, was comparable to some[5] but substantially higher than others reported for similar populations.[12]

The potential to reduce negative health outcomes for women and their children makes pregnancy and the postpartum period an ideal time to encourage permanent smoking cessation. Evaluation of interventions to extend prepartum cessation is essential if we are to capitalize on this important public health opportunity. □

## Contributors

C. M. McBride, S. J. Curry, H. A. Lando, P. L. Pirie, and L. C. Grothaus collaborated in the development of all study protocols, questionnaires, and intervention materials for the described trial. L. C. Grothaus and J. C. Nelson conducted data analyses. All authors contributed to writing the manuscript and can attest to the integrity of the research.

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