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# Prenatal and Postpartum Smoking Abstinence

## A Partner-Assisted Approach

Colleen M. McBride, PhD, Donald H. Baucom, PhD, Bercedis L. Peterson, PhD, Kathryn I. Pollak, PhD, Carleton Palmer, PhD, Eric Westman, MD, Pauline Lyna, MPH

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- Background:** A partner's provision of support and smoking status has been consistently associated with women's likelihood of smoking cessation during pregnancy and relapse in postpartum.
- Design:** A three-group randomized controlled intervention trial was conducted in 1996 to 2001, with 583 women and their partners randomized to usual care (UC), woman-only (WO), or partner-assisted (PA) intervention. Follow-ups occurred at 28 weeks of pregnancy, and 2-, 6-, and 12-months postpartum.
- Setting:** Womack Army Medical Center (WAMC) at Fort Bragg in Fayetteville, North Carolina.
- Intervention:** Women in the UC condition received provider advice to quit and a self-help guide. The WO condition received UC components plus a late-pregnancy relapse prevention kit (booklet and gift items) and six counseling calls (three in pregnancy and three postpartum) initiated by a health advisor. Women in the PA condition received the WO intervention, and their partners received telephone counseling and a support guide emphasizing skills to help the woman build and maintain her confidence to quit smoking. Partners who smoked also received cessation aids and related counseling.
- Main Outcome Measure:** Seven-day self-reported abstinence from smoking at each follow-up.
- Results:** Intent-to-treat analyses showed no significant differences by condition in women's reports of abstinence at any follow-up. In late pregnancy, more partners were abstinent in the PA condition (15%) than in the UC condition (5%),  $p = 0.02$ .
- Conclusions:** Partner-assisted smoking-cessation interventions need further refinement. Influencing young couples' support patterns may require more intensive and conjoint intervention. Partners who smoke could benefit from support for their cessation efforts.  
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## Introduction

Despite the considerable attention given to promoting smoking cessation among new mothers, half or more of women smokers continue to smoke for the duration of pregnancy,<sup>1</sup> and the majority

who quit relapse within 12 months postpartum.<sup>1-3</sup> Self-directed interventions that include a prenatal provider's advice to quit smoking, printed self-help guides, and follow-up often via telephone counseling consistently have indicated modest improvements in short-term abstinence in pregnancy and postpartum.<sup>4-11</sup> However, when compared to usual care, treatment effects have not always been significant<sup>10,11</sup> and generally fade post-intervention, suggesting that interventions have delayed rather than prevented relapse.<sup>7,9,12</sup> However, the low cost<sup>13</sup> and portability of these approaches justifies continued evaluation of techniques to further improve their efficacy.

Involvement of intimate partners could be a promising direction for these improvements.<sup>7,12,14,15</sup> Pregnancy most often occurs in the context of an intimate relationship shown to influence women's smoking behaviors. For example, prenatal cessation is particularly unlikely and postpartum relapse most common among those whose intimate partner smokes.<sup>16</sup> Across studies

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From the Social and Behavioral Research Branch, National Human Genome Research Institute/National Institutes of Health, Department of Health and Human Services (McBride), Bethesda, Maryland; Department of Psychology, University of North Carolina (Baucom, Palmer), Chapel Hill, North Carolina; Department of Biostatistics and Bioinformatics (Peterson) and Cancer Prevention, Detection and Control Research Program (Pollak, Lyna), Duke Comprehensive Cancer Center, Durham, North Carolina; and Department of Psychiatry, Duke University Medical Center (Westman), Durham, North Carolina

At the time this manuscript was written, Dr. McBride was a faculty member at Duke University Medical Center and the Comprehensive Cancer Center in Durham, North Carolina.

Address correspondence to: Colleen M. McBride, PhD, Social and Behavioral Research Branch, National Human Genome Research Institute/National Institutes of Health, Department of Health and Human Services, 50 South Drive, Building 50, Room 5351, Bethesda MD 20892-8000. E-mail: cmcbride@mail.nih.gov.

of pregnant smokers, 50% or more of partners also are current smokers.<sup>2,6,7,16–18</sup> Moreover, nonsmoking partners may be unduly negative in ways that are counterproductive to pregnant women's cessation efforts.<sup>8</sup>

The role of social support in smoking cessation has been studied extensively.<sup>19–21</sup> Related smoking interventions largely have been unsuccessful in shifting patterns of support from cessation "buddies." Previous interventions have not targeted couples and considered marital theory and empirical research showing how marital relationships might affect provision of support for smoking cessation.<sup>22</sup> Efficacious couple-based interventions have been intensive, typically involving 8 to 26 face-to-face sessions, and may be difficult to integrate into prenatal care settings. However, the focus of these interventions on building skills to increase reinforcing partner behaviors and decrease punishing partner behaviors, and on handling high-risk situations have improved adaptive behavior changes for disease-related outcomes such as osteoarthritis.<sup>23,24</sup>

Whether the above approaches can be effective when incorporated into brief and self-directed, smoking-cessation interventions is unclear. Results of the only partner-support intervention evaluated in a self-directed cessation program for pregnant smokers<sup>15</sup> were promising and showed a significant delayed benefit for postpartum abstinence (52% vs 42% at 12 months postpartum,  $p=0.05$ ).<sup>15</sup> However, partners did not receive support-skills training or assistance with smoking cessation themselves, nor were they surveyed regarding their experiences with the intervention.

This report describes results of a randomized intervention trial to evaluate whether relative to usual care (UC) and a previously evaluated woman-only (WO) intervention,<sup>7</sup> training in optimal support behaviors and giving support to partners increased abstinence rates among pregnant women during and after pregnancy. Secondary aims were to decrease postpartum relapse and increase rates of smoking cessation among partners.

## Methods

### Study Setting

The study site was Womack Army Medical Center (WAMC) at Fort Bragg in Fayetteville, North Carolina. The study was conducted in 1996 to 2001. The majority of women who received prenatal care at WAMC were married, and their smoking rates were estimated at 28% when the study began.

### Study Sample

Eligible women were  $\leq 20$  weeks pregnant, aged  $\geq 18$  years, current smokers or recent quitters (i.e., were smokers in the 30 days prior to pregnancy but not smoking at intake), living with an intimate partner, and willing to have the partner contacted for participation in the study. Recent quitters were

included in the study because they were at risk for prenatal and postpartum relapse.

## Study Design and Recruitment

Introductory letters describing the study were sent on behalf of WAMC to all women identified from automated appointment logs with a scheduled first prenatal visit. Women who did not call the study's toll-free number within 10 days to decline contact were called to complete the screening survey. Verbal consent was obtained from eligible women to complete the survey and to contact the partner. Eligible women who agreed to participate were stratified by smoking status (continuing smoker or recent quitter), their partner's smoking status (smoker or nonsmoker), and partner's level of willingness (not at all vs somewhat or very) to be involved in the woman's cessation efforts, and randomized to one of three conditions: usual care (UC), woman only (WO), or partner assisted (PA). Women and partners completed telephone surveys at baseline (about 11 weeks of pregnancy), at 28 weeks of pregnancy, and at 2-, 6-, and 12-months postpartum. All methods were approved by the Internal Review Boards at the Duke University Medical Center and WAMC.

## Intervention Conditions

**Usual care.** Women received provider advice to quit smoking at the first prenatal visit and were mailed the American Cancer Society's self-help guide, "Make Yours a Fresh Start Family," written at the fifth-grade reading level and designed for pregnant women.

**Woman-only.** Women received UC components plus a late-pregnancy relapse-prevention kit (a booklet and gift items) and six counseling calls (three in pregnancy and three in postpartum) initiated by a health advisor, who used a standardized protocol based on motivational interviewing techniques.<sup>26</sup> The WO intervention has been shown to significantly increase short-term postpartum point-prevalent abstinence.<sup>7</sup> Briefly, all intervention contacts were completed by 4 months postpartum. Prenatal calls were timed to occur in each trimester and emphasized using self-help materials to take stage-appropriate steps towards cessation or to develop skills for remaining abstinent.<sup>27</sup> Postpartum calls were timed to occur at monthly intervals and emphasized skills for remaining abstinent in the transition from pregnancy to parenting. Health advisors had master's-level counseling training, and received 40 hours of training for the study and ongoing supervision.

**Partner assisted.** Women received the WO intervention plus a PA adjunct,<sup>23</sup> in which the smoker described how her partner could be a coach to build and maintain the confidence she needed to quit smoking. Intervention objectives were to (1) encourage couple communication about helpful and unhelpful support behaviors, (2) assist partners in developing alternatives to negative behaviors, (3) prompt couples to make plans for handling high-risk situations, and (4) when appropriate, encourage and assist partner smoking cessation. An "It Takes Two" booklet and companion video were developed to guide couples in discussing support behaviors related to the woman's smoking. These skills were reinforced during counseling calls.

Partners received six separate calls (three in pregnancy and three postpartum) from the woman's health advisor. These calls were made separately to the two individuals (pregnant woman and partner) and guided by a motivational interviewing protocol similar to that used for counseling the women. The second and fourth calls to the couple focused on developing a written agreement regarding helpful partner support behaviors. Partners who smoked were given self-help cessation guides, free nicotine patches if needed, and stage-appropriate counseling.

## Measures

**Specific support.** Smoking-specific support was assessed at baseline and each follow-up. Women and men independently completed a ten-item version of the Partner Interaction Questionnaire to assess positive and negative perceived and provided support for cessation.<sup>8,19</sup> Women reported the frequency with which their partners performed certain smoking-specific support behaviors (e.g., compliments for not smoking) in the past 30 days (1=never to 5=very often). Men were asked the frequency with which they performed those behaviors (provided support). (Internal consistency of scales for positive support was  $\alpha=0.83$  [women] and  $\alpha=0.77$  [men], and for negative support,  $\alpha=0.74$  [women] and  $\alpha=0.77$  [men]).

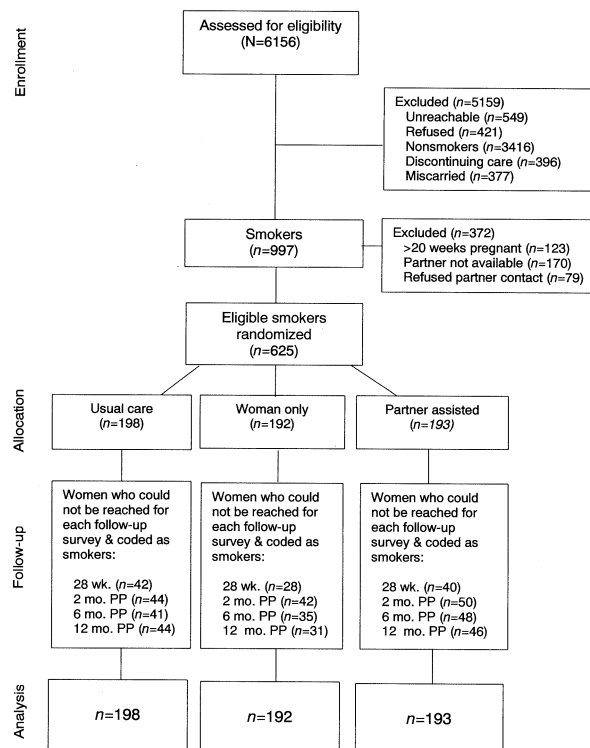
**General support.** Only women reported the frequency of emotional (three items, e.g., showing he cares) and instrumental (three items, e.g., help with chores) support behaviors at baseline and each follow-up. These questions were adapted from longer interpersonal support scales<sup>28–31</sup> (emotional support  $\alpha=0.84$ ; instrumental support  $\alpha=0.69$ ).

**Outcomes.** Self-reported smoking status was assessed at each follow-up with the question, "Have you smoked any cigarettes in the past 7 days?"

## Statistical Analyses

The five main outcome measures in this study were sustained abstinence (no smoking across all four follow-up times) and prevalent abstinence (no smoking in the prior 7 days) at each of the four follow-up times. Logistic regression was used to compare the two experimental conditions (WO and PA) to the control condition (UC) on each of these outcome measures, controlling for baseline smoking-specific support variables and predictors known to be associated with smoking cessation. An intent-to-treat approach was used, in which the missing values on follow-up smoking status were imputed to be "smoker." Twenty-eight to 50 patients were imputed to be smokers within any given condition at any given follow-up.

Comparison of the experimental conditions to the control condition on dichotomous secondary outcomes, such as postpartum relapse and partners' prevalent abstinence, were made with logistic regression. The proportional hazards model was used to compare conditions on time to relapse, where time to relapse was defined (among nonsmokers at 28 weeks of pregnancy) as the number of days between the woman's delivery date and the date she resumed smoking. Differences by condition for changes in women's and partner's smoking-specific support (positive and negative) and



**Figure 1.** Study flow diagram. PP, postpartum.

general support (emotional and instrumental) across time were tested with mixed linear-model repeated measures analysis. In the analysis of each main and each secondary outcome measure, a two-tailed alpha of 0.05 was maintained by using an alpha of 0.025 for each of the two-way comparisons.

## Recruitment

Of the 6156 introductory letters mailed to prenatal patients, 5159 (84%) initially were screened out because they were either unreachable (549, 9%), declined to be surveyed (421, 7%), classified as nonsmokers (3416, 55%), did not plan to continue care at the clinical site (396, 6%), or were no longer pregnant (377, 6%) (Figure 1). The remaining 997 women were identified as pregnant smokers and underwent further eligibility screening. Over a third of these women (372, 37%) were excluded because they were either >20 weeks pregnant (123, 12%), their partner was not available for participation (170, 17%), or the woman declined to allow partner contact (79, 8%). A total of 625 women (63% of 997) met all study criteria, consented to participate, and were randomized. Following randomization, 42 women miscarried (7% of randomized sample), resulting in a final sample of 583, of whom 267 (46%) were continuing smokers and 316 (54%) were recent quitters. Baseline surveys were completed with 488 (84%) of the partners; 14 partners refused, 22 could not be reached within the call window, and 17 partners reported their wife was a nonsmoker.

Among women, follow-up rates did not differ statistically by condition (across conditions: 81%, 77%, 79%, and 76% at 28 weeks of pregnancy, 2-, 6-, and 12 months postpartum follow-ups, respectively). Compared to those retained in the study, women lost to follow-up had significantly lower education and

**Table 1.** Baseline characteristics of women in sample (mean or percent)

Baseline characteristic	Totals (N = 583)	Usual care (n = 198)	Woman only (n = 192)	Partner assisted (n = 193)
Age, mean (SD)	24 (4.7)	24 (4.8)	24 (4.9)	24 (4.8)
Household income $\geq$ 20,000	44	42	49	42
More than high school	52	50	54	53
Married	96	96	95	98
White	77	78	77	77
Employed (full or parttime)	50	48	53	50
Length of relationship in years, mean (SD)	2 (2.9)	2 (2.4)	3 (3.3)	2 (2.9)
Planned pregnancy	61	55	65	63
Weeks pregnant, mean (SD)	11 (3.8)	11 (3.7)	11 (3.7)	11 (3.8)
Previously pregnant	69	68	68	70
Partner smokes	52	51	52	51
<b>Smoking patterns before pregnancy</b>				
Number of cigarettes/day, mean (SD)	13 (7.9)	12 (7.4)	13 (8.4)	13 (8.8)
Smoked within 30 minutes of waking	33	31	36	32
Have tried to quit	77	79	76	77
Quit in previous pregnancy	68	69	70	65
Number of prior attempts, mean (SD)	3 (3.1)	3 (3.4)	2 (2.6)	3 (3.1)
<b>Smoking patterns during pregnancy</b>				
Continuing smoker	46	46	45	46
Current cigarettes/day, mean (SD)	6 (5.0)	5 (4.3)	6 (6.1)	5 (4.5)
Confidence can quit, mean (SD)	8 (1.9)	8 (1.9)	8 (2.1)	7 (1.8)

SD, standard deviation.

income, and reported shorter duration of prior quit attempts. Among the partners, follow-up rates also did not differ statistically by condition (across conditions: 64%, 62%, 64%, and 60% at 28 weeks of pregnancy, and 2-, 6-, and 12-month postpartum follow-ups, respectively).

## Results

### Sample Characteristics

Women participants were relatively young (mean age=24; standard deviation [SD]=4.7 years), 77% were white, and half had more than a high school education. Most (96%) were married to the baby's father; 61% indicated that the pregnancy was planned, and most had been pregnant previously (Table 1). Before pregnancy, women reported having smoked an average of 13 cigarettes per day, and one third had smoked within 30 minutes of waking. Continuing smokers reported currently smoking an average of six cigarettes per day and were very confident in their ability to quit during the current pregnancy (mean=8, SD=1.9 on a 0 to 10 scale). Male partners' mean age was 25, 77% were white, and 54% were current smokers.

### Intervention Outcomes for Women

**Biochemical confirmation of self-reported abstinence.** Saliva samples were collected by mail at 28 weeks of pregnancy and at 12 months postpartum from women and partners who reported not smoking in the previous

7 days.<sup>32</sup> Saliva return rates did not differ by condition at either follow-up (28-week or 12-month follow-ups: UC, 61% and 64%; WO, 56% and 54%; PA, 58% and 66% [ $p=0.77$  and  $0.34$ , respectively]). Intervention outcomes were based on self-reported abstinence.

**Prevalent and sustained abstinence:** There were no differences by condition in the proportion of subjects reporting sustained abstinence or in the proportion reporting point-prevalent abstinence at each of the four follow-ups (Table 2).

**Postpartum relapse.** Among the 267 women who were continuing smokers at enrollment, an additional 34% reported having quit smoking by the 28th week of pregnancy follow-up; this did not differ by condition. At the 28th week of pregnancy, 349 women were abstinent and served as the denominator for postpartum relapse proportion and the survival analysis of time to relapse (Table 2). There were no significant differences among conditions in the proportion relapsed at any postpartum follow-up (Table 2). Survival analysis of time to relapse indicated no significant ( $\chi^2=2.86$ ,  $p=0.09$ ) differences by condition in time to relapse, although a divergence in rates of abstinence between UC and PA occurred after 90 days postpartum. Specifically, at 90 days postpartum, UC and PA abstinence rates were comparable at 69% and 70%, respectively, whereas by 140 days postpartum abstinence rates were 57% and 66%, respectively, and at 240 days postpartum, 49% and 59%, respectively. Median days between delivery and relapse were 246 and 357 for UC and PA, respectively.



**Table 2.** Women's self-report of prevalent and sustained abstinence by experimental condition<sup>a</sup>

Condition	Usual care (%)	Woman only (%)	Partner assisted (%)
<b>Prevalent abstinence<sup>b</sup></b>	<i>n</i> = 198	<i>n</i> = 192	<i>n</i> = 193
28-week pregnancy	60	59	61
2 months postpartum	38	37	42
6 months postpartum	33	36	37
12 months postpartum	29	32	35
Sustained abstinence <sup>c</sup>	15	20	21
<b>Among baseline continuing smokers</b>	<i>n</i> = 91	<i>n</i> = 87	<i>n</i> = 89
Proportion abstinent at 28 weeks of pregnancy	36	29	37
<b>Among baseline recent quitters</b>	<i>n</i> = 107	<i>n</i> = 105	<i>n</i> = 104
Proportion abstinent at 28 weeks of pregnancy	79	85	81
<b>Among those abstinent at 28 weeks of pregnancy, proportion remaining abstinent postpartum (N = 349)</b>	<i>n</i> = 118	<i>n</i> = 114	<i>n</i> = 117
2 months postpartum	55	54	60
6 months postpartum	47	52	52
12 months postpartum	40	43	48

<sup>a</sup>None of the comparisons by condition significant at  $p = 0.025$ .

<sup>b</sup>Analyses control for age (years), income (<20,000; ≥20,000), education (≤ high school vs > high school), race/ethnicity (minority vs white), working outside the home (no vs yes), weeks pregnant, planned pregnancy (no vs yes), previous pregnancy (no vs yes), cigarettes/day prior to pregnancy (≤10 vs >10), smoked within 30 minutes of waking prior to pregnancy (no vs yes), length of relationship (in years), length of longest prior quit attempt (≤60 days vs >60 days) and partner's smoking status (nonsmoker vs current smokers), woman's positive and negative smoking-specific support (mean scores on Partner Interaction Questionnaire).

<sup>c</sup>Not smoking at all four follow-ups.

SD, standard deviation.

## Intervention Impact on Support

**Changes in smoking-specific and general support.** Women in all conditions consistently reported a decline in positive partner support from baseline to 12-month postpartum ( $F=81.43$ ,  $df=1322$ ,  $p<0.001$ ) (Table 3). A similar linear decline across time was observed for women's report of instrumental ( $F=20.11$ ,  $df=1322$ ,  $p<0.0001$ ) and emotional partner support ( $F=33.19$ ,  $df=1322$ ,  $p<0.0001$ ). In contrast, a U-shaped quadratic function was observed for women's report of negative smoking-specific support ( $F=34.15$ ,  $df=1322$ ,  $p<0.001$ ), such that negative support decreased through pregnancy, but increased postpartum. There was no time by condition interaction for perceived or provided support for any of the measures of smoking-specific or general support.

Partners reported little change in positive and negative smoking-specific support that they gave in the same time frame. Moreover, there were no differences by condition in partner reports of negative support related to pressuring the woman to quit; for all conditions, pressuring was greater during pregnancy than after. Couples generally agreed on their reported levels of positive and negative support being provided; no differences by condition were found.

**Partner cessation.** Over half of the partners (54%) were current smokers at baseline. At 28 weeks of pregnancy under the intent-to-treat assumption and a two-sided alpha of 0.025, self-reported quit rates by condition adjusting for partner age, education, and race/ethnicity were significantly higher for partners in

**Table 3.** Women-reported perceptions of smoking-specific and general support over time<sup>a</sup>

Survey	Smoking-specific support (PIQ <sup>b</sup> )		General support scales <sup>c</sup>	
	Positive M (SE)	Negative M (SE)	Emotional support M (SE)	Instrumental support M (SE)
Baseline	13.4 (0.24)	12.4 (0.24)	14.0 (0.11)	11.8 (0.11)
28-week of pregnancy	12.9 (0.26)	10.6 (0.26)	13.3 (0.12)	11.5 (0.13)
2-months postpartum	11.7 (0.27)	10.6 (0.28)	13.0 (0.13)	11.4 (0.13)
6-months postpartum	11.1 (0.25)	10.0 (0.24)	13.0 (0.13)	10.9 (0.14)
12-months postpartum	10.5 (0.25)	10.7 (0.27)	12.6 (0.15)	10.8 (0.15)

<sup>a</sup>Sample numbers is vary at each follow-up in keeping with response rates.

<sup>b</sup>The Partner Interaction Questionnaire (PIQ) included a positive and negative support scale. Each scale included five items from 1 (Never do the behavior) to 5 (Very often do the behavior). Scores ranged from 5 to 25.

<sup>c</sup>Emotional and instrumental support scales included three items, each with a scale from 1 (Low support) to 5 (High support). Scores ranged from 3 to 15.

M, mean; SE, standard error.

**Table 4.** Partners smart point/prevalent abstinence by experimental condition

Condition	Usual care (%)	Woman only (%)	Partner-assisted (%)
Prevalent abstinence ( $n = 257$ ) <sup>a</sup>	$n = 85$	$n = 88$	$n = 84$
28 weeks of pregnancy <sup>b</sup>	5	9	15
2 months postpartum	11	9	17
6 months postpartum	13	10	20
12 months postpartum	8	10	12

<sup>a</sup>Self-reported of not smoking in previous 7 days; partners with missing follow-up data were coded as smokers. Analysis controlled for age (years), education ( $\leq$  high school vs  $>$  high school), and race/ethnicity (minority vs white).

<sup>b</sup>Usual care vs partner assisted,  $p = 0.02$ .

M, mean; SE, standard error.

the PA condition compared to UC (15% vs 5%, respectively;  $\chi^2 = 5.11$ ,  $p = 0.02$ ) (Table 4).

**Participation in intervention.** Logistic regression analyses were used to test whether the recorded number of counseling calls received by women in the WO and PA conditions was associated with abstinence at 6 months postpartum, the first follow-up after intervention completion. For both the WO and PA conditions (interaction of condition by calls was not significant), the recorded number of calls received was significantly and positively associated ( $\chi^2 = 8.57$ ,  $p = 0.003$ ) with abstinence at 6 months postpartum. The experimental condition did not predict abstinence after controlling for number of calls, even though women in the PA condition received fewer calls than women in the WO condition (mean number of calls of four and five, respectively;  $p = 0.03$ ).

## Discussion

The PA intervention did not increase women's abstinence rates in pregnancy or postpartum, or reports of smoking-specific or general support above that of the WO intervention or UC. That patterns of support were not influenced by the PA intervention may reflect a manipulation failure. Indeed, telephone counselors' impressions were that men had difficulty thinking relationally (i.e., considering how their actions might affect the relationship) and were not easily engaged in problem solving to assist the woman in smoking cessation. Relational thinking may be especially challenging for this sample of young men with low socioeconomic status in relatively new relationships. Future couple-based interventions for young pregnant couples might give greater focus to building relational thinking skills.

The intervention dose also may have been inadequate to prompt changes in entrenched patterns of couple support. While the dose of intervention (i.e., 12 counseling calls to the household) was formidable for a minimal intervention, partners' participation in coun-

## What This Study Adds . . .

This manuscript describes results of one of the first randomized controlled trials to evaluate whether a couple-based support intervention to assist women's smoking cessation during pregnancy increased women's abstinence rates during and after pregnancy compared to usual care and a previously evaluated woman-only intervention.

Although the couple intervention did not significantly improve abstinence rates over usual care, the results suggest the feasibility of couple-based interventions and new directions for further refinement of these approaches.

selling calls decreased steadily throughout the trial. However, the strong and positive ( $r = 0.61$ ) correlation between number of calls received by women and partners suggests that greater involvement from the partner did not undermine involvement by the woman. Individual contacts rather than conjoint sessions also may have reduced the intervention impact. The challenge for future couple approaches is to provide a potent but parsimonious intervention. This may require capitalizing on clinic visits or developing, via formative research, other innovative approaches for conjoint intervention sessions.

It is noteworthy that significantly more of the partners in the PA condition reported short-term cessation during their wives' pregnancy compared to the UC and WO conditions. Smoking-cessation adjuncts for expectant fathers have the dual advantage of capitalizing on fathers' heightened receptivity to consider quitting, and wives may view these efforts as supportive. Future couple-based interventions should emphasize partner smoking as a tangible support strategy for encouraging pregnant women to quit.

Several caveats should be considered. Smoking status was self-reported. By only including women who agreed to involve their partners, couples who were inclined to support each other and attenuated treatment effects may have been over-represented. Inclusion of early pregnancy quitters who have been shown to report higher levels of perceived partner support also may have over-represented optimal patterns of support and attenuated intervention effects. Numerous survey contacts to those in UC also may have attenuated effects. Additionally, the Partner Interaction Questionnaire, used widely to assess support behaviors, has been critiqued because it may confound levels of support with the individual's smoking status.<sup>21</sup>

The public health benefit of conjoint smoking cessation among expectant couples warrants further refinement of intervention approaches. More formative work is needed to characterize appropriate format and dose for couple-based interventions.

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## References

1. Fingerhut LA, Kleinman JC, Kendrick JS. Smoking before, during, and after pregnancy. *Am J Public Health* 1990;80:541-4.
2. McBride CM, Pirie PL, Curry SJ. Postpartum relapse to smoking: a prospective study. *Health Educ Res* 1992;7:381-90.
3. Mullen PD, Richardson MA, Quinn VP, Ershoff DH. Postpartum return to smoking: who is at risk and when? *Am J Health Promot* 1997;11:323-30.
4. U.S. Department of Health and Human Services. Clinical practice guideline, treating tobacco use and dependence. Washington DC: U.S. Department of Health and Human Services, 2000.
5. Ershoff DH, Quinn VP, Boyd NR, Stern J, Gregory M, Wirtschafter D. The Kaiser Permanente prenatal smoking-cessation trial: when more isn't better, what is enough? *Am J Prev Med* 1999;17:161-8.
6. Johnson JL, Ratner PA, Bottorff JL, Hall W, Dahinten S. Preventing smoking relapse in postpartum women. *Nurs Res* 2000;49:44-52.
7. McBride CM, Curry SJ, Lando HA, Pirie PL, Grothaus LC, Nelson JC. Prevention of relapse in women who quit smoking during pregnancy. *Am J Public Health* 1999;89:706-11.
8. McBride CM, Curry SJ, Grothaus LC, Nelson JC, Lando H, Pirie PL. Partner smoking status and pregnant smoker's perceptions of support for and likelihood of smoking cessation. *Health Psychol* 1998;17:63-9.
9. Petersen L, Handel J, Kotch J, Podedworny T, Rosen A. Smoking reduction during pregnancy by a program of self-help and clinical support. *Obstet Gynecol* 1992;79:924-30.
10. Secker-Walker RH, Solomon LJ, Flynn BS, Skelly JM, Mead PB. Smoking relapse prevention during pregnancy. A trial of coordinated advice from physicians and individual counseling. *Am J Prev Med* 1998;15:25-31.
11. Kendrick JS, Zahniser C, et al. Integrating smoking cessation into routine public prenatal care: the Smoking Cessation in Pregnancy Project. *Am J Public Health* 1995;85:217-22.
12. Ratner PA, Johnson JL, Bottorff JL, Dahinten S, Hall W. Twelve-month follow-up of a smoking relapse prevention intervention for postpartum women. *Addict Behav* 2000;25:81-92.
13. Adams EK, Miller VP, Ernst C, Nishimura BK, Melvin C, Merritt R. Neonatal health care costs related to smoking during pregnancy. *Health Econ* 2002;11:193-206.
14. Palmer CA, Baucom DH, McBride CM. Couple approaches to smoking cessation. In: Schmalin KB, Sher TG, eds. *The psychology of couples and illness: theory, research, and practice*. Washington DC: American Psychological Association, 2000.
15. Mullen PD, DiClemente CC, Carbonari J, et al. Project PANDA: maintenance of prenatal smoking abstinence six weeks postpartum. Paper presented at annual meetings of Society for Behavioral Medicine, Washington DC, 1996.
16. Ershoff DH, Quinn VP, Mullen PD. Relapse prevention among women who stop smoking early in pregnancy: a randomized clinical trial of a self-help intervention. *Am J Prev Med* 1995;11:178-84.
17. Haug K, Aaro LE, Fugelli P. Smoking habits in early pregnancy and attitudes towards smoking cessation among pregnant women and their partners. *Fam Pract* 1992;9:494-9.
18. Waterson EJ, Evans C, Murray-Lyon IM. Is pregnancy a time of changing drinking and smoking patterns for fathers as well as mothers? An initial investigation. *Br J Addict* 1990;85:389-96.
19. Mermelstein R, Lichtenstein E, McIntyre K. Partner support and relapse in smoking-cessation programs. *J Consult Clin Psychol* 1983;51:465-6.
20. Malott JM, Glasgow RE, O'Neill HK, Klesges RC. Co-worker social support in a worksite smoking control program. *J Appl Behav Anal* 1984;17:485-95.
21. May S, West R. Do social support interventions ("buddy systems") aid smoking cessation? A review. *Tob Control* 2000;9:415-22.
22. Doherty WJ, Whitehead DA. The social dynamics of cigarette smoking: a family systems perspective. *Fam Process* 1986;25:453-9.
23. Baucom DH, Shoham V, Mueser KT, Daiuto AD, Stickler TR. Empirically supported couple and family interventions for marital distress and adult mental health problems. *J Consult Clin Psychol* 1998;66:53-88.
24. Schilling EA, Baucom DH, Burnett CK, Allen EA, Ragland L. Altering the course of marriage: the effect of PREP communication skill acquisition on couples' risk of becoming maritally distressed. *J Fam Psychol* 2003;17:41-53.
25. Keefe FJ, Caldwell DS, Baucom DH, Salley A, Robinson E, Timmons K. Spouse-assisted coping skills training in the management of osteoarthritic knee pain. *Arthritis Care Res* 1996;9:279-91.
26. Miller W, Rollnick S. *Motivational interviewing: preparing people to change addictive behavior*. New York: Guilford Press, 1991.
27. Prochaska JO, DiClemente CC. Stages and processes of self-change of smoking: toward an integrative model of change. *J Consult Clin Psychol* 1983;51:390-5.
28. Barrera M, Ainlay SL. The structure of social support: a conceptual and empirical analysis. *J Community Psychol* 1983;11:133-43.
29. Collins NL, Dunkel-Schetter C, Lobel M, Scrimshaw SC. Social support in pregnancy: Psychosocial correlates of birth outcomes and postpartum depression. *J Pers Soc Psychol* 1993;65:1243-58.
30. McCormick IA, Siegert RJ, Walkey FH. Dimensions of social support: a factorial confirmation. *Am J Community Psychol* 1987;15:73-7.
31. Sarason IG, Levine HM, Basham RB, Sarason BR. Assessing social support: the Social Support Questionnaire. *J Pers Soc Psychol* 1983;44:127-39.
32. Murray D, McBride C, Lindquist R, Belcher J. Sensitivity and specificity of saliva thiocyanate and cotinine for cigarette smoking: a comparison of two collection models. *Addict Behav* 1991;16:161-6.