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## ORIGINAL RESEARCH

# Smoking behaviors and abstinence in low-income pregnant women

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## ABSTRACT

**Background:** Despite efforts to educate individuals about the hazards of smoking, pregnant women continue to smoke. In the literature, there is less evidence about successful abstinence strategies for low-income women. The purpose of this pilot study was to assess smoking behaviors and factors that support smoking abstinence in low-income pregnant women.

**Methods:** Using a longitudinal design, quantitative and qualitative data were collected from pregnant women at a low-income community prenatal clinic. Based on the Transtheoretical model, all subjects received information about the harmful effects of smoking and secondhand exposure, while current smokers were given a “quit kit” and contacted up to one year post-delivery to evaluate smoking behaviors.

**Results:** All subjects (N = 135) ranged in age from 18 to 41; 75% were not married; 78% had household incomes < \$30,000; and the majority were African American (40%). Fifty-five (40.7%) never smoked while 77(57%) had a smoking history, of these 18(23%) were spontaneous quitters. Data indicated that 36% reported smoking during pregnancy, with the majority in pre-contemplation. After one year, 18% of current smokers quit.

**Conclusions:** Without a specific plan, the majority were unable to successfully abstain. Rate of abstinence may have been further influenced because subjects began smoking at an early age and were unsuccessful at previous quit attempts. Providers must continue to educate pregnant women but also evaluate strategies that require few provider visits, are cost effective, focus on relapse prevention, and can successfully influence smoking abstinence in low-income pregnant women.

**Key Words:** Smoking abstinence, Pregnant women, Low-income, Transtheoretical model

## 1. INTRODUCTION

Smoking tobacco remains the leading cause of preventable morbidity and mortality in the United States (U.S.).<sup>[1]</sup> Tobacco smoking poses significant avoidable health risks such as cancer, cardiovascular disease, and chronic respiratory conditions for smokers and those exposed to environmental tobacco smoke. Between 2005 and 2014 approximately 480,000 individuals each year died prematurely in the U.S. because of smoking or exposure to secondhand tobacco

smoke.<sup>[1]</sup> The majority of tobacco smokers continue the habit for many years and typically cycle through multiple periods of remission and relapse.<sup>[2]</sup> Nearly two-thirds of smokers reported quitting or attempting to quit smoking during the last year.<sup>[3]</sup>

Despite efforts to warn individuals about the hazards of smoking, pregnant women continue to smoke. Currently, approximately 10% of women living in the U.S. smoke during last three months of pregnancy.<sup>[4]</sup> The harmful effects of smok-

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ing on the pregnant woman and fetus are well documented in the literature.<sup>[4,5]</sup> Tobacco smoke contains carbon monoxide and chemicals that may have a negative effect on fetal development.<sup>[6]</sup> In addition, evidence demonstrates that smoking during pregnancy contributes to low birth weight, premature delivery,<sup>[5-7]</sup> and fetuses small for gestational age.<sup>[5]</sup> Smoking during the postpartum period also can result in health concerns for the baby that include behavioral problems, acute lower and upper respiratory illnesses, middle ear infections, reduced lung function, and asthma.<sup>[8]</sup>

### 1.1 Significance of the study

Pregnancy provides a unique motivation to quit smoking. Pregnant women are more likely to quit because of an increased concern for the health of their baby and themselves.<sup>[8,9]</sup> Ideally, smoking abstinence strategies should be implemented prior to conception; however, if a woman persists in smoking, abstinence must continue to be a health care goal. More than 45% of women quit smoking during pregnancy; unfortunately, just over 50% these women resumed smoking by six months postpartum,<sup>[10]</sup> with 50%<sup>[10]</sup> to 80%<sup>[11]</sup> by one year.

There is ample literature on smoking abstinence for all pregnant women; however, there is less evidence available for low-income women. It is important to note that low-income pregnant women are more likely to be smokers prior to pregnancy and less likely to abstain during pregnancy.<sup>[7,10]</sup> The literature also reports increased smoking rates among rural, low income pregnant women compared to their urban counterparts.<sup>[12,13]</sup> The identification of factors that best assist low-income women to achieve abstinence is essential. In one study which used a longitudinal design to interview low-income pregnant women, a substantial number quit smoking due to an aversion of the taste and smell.<sup>[14]</sup> Regrettably, 73% returned to smoking during the postpartum period. In another study of low-income women during the postpartum period, only 13% were smoke free at 18-months.<sup>[15]</sup> Social support was linked to quitting among low-income women, though these results were not significant and not sustained at three months postpartum.<sup>[16]</sup> Another efficacious factor in the literature was the use of low-cost self-help books.<sup>[17]</sup> However, in another study self-help books were effective only for the short term because the effect was lost between four and 12-months post-partum.<sup>[18]</sup> Thus, the literature for low-income pregnant women does not describe consistent factors associated with sustained abstinence.

The link between motivation and smoking was cited in the literature for low-income pregnant women. In a study of women who quit smoking just prior to or during pregnancy, data revealed that the motivation to stop smoking was the

only significant variable for cessation.<sup>[19]</sup> The potential harmful effect of smoking on breast milk was motivation to quit smoking in another sample of low-income women.<sup>[20]</sup> Even if women were not able to quit, women may cut back on smoking to reduce harm to the fetus.<sup>[9]</sup> As an intervention strategy, motivational interviewing (MI) was used during home visits with low-income pregnant women to promote abstinence.<sup>[21]</sup> At three months post-intervention, 39% achieved cessation, and 44% reduced smoking by 60%. In another sample, MI prevented relapse more effectively than usual care but was found to be more costly than other strategies.<sup>[22]</sup> Using a motivational problem solving approach, continuous absence was 23% at 26 weeks postpartum for low-income, spontaneous quitters.<sup>[23]</sup> Therefore, the literature supports focusing on factors related to motivation to quit smoking.

Education has been reported in the literature as a strategy to promote abstinence. A brief informational intervention statistically improved smoking abstinence for low-income pregnant women; however, this effect was lost at three and six months postpartum.<sup>[24]</sup> In a secondary analysis of these data, those who continued smoking were more likely to be older, receive Medicaid coverage, indicate a greater addiction, have a partner who smoked, and/or be a part of the control group.<sup>[25]</sup> The researchers also found spontaneous quitters were more likely to maintain abstinence during postpartum.<sup>[25]</sup> Spontaneous quitters are defined as those women who quit on their own after finding out they are pregnant.<sup>[26]</sup>

While factors related to continued smoking and abstinence have been examined in the literature, there is inconsistent evidence to demonstrate successful approaches for low-income pregnant women. Focusing on finding strategies for low-income women is important because of their increased rate of smoking compared to all pregnant women. In fact, there are disparities in smoking prevalence which are linked to socio-economic status.<sup>[12]</sup> For women who fall below the federal poverty level, it is reported that 25.8% are smokers; however, this rate may be even higher.<sup>[11]</sup> Thus exploring effective strategies to promote smoking abstinence for low-income women over time is important.

### 1.2 Theoretical framework

The Transtheoretical model (TTM) of behavioral change was developed from smoking cessation research.<sup>[27]</sup> The TTM proposes six stages of change: (1) precontemplation, not intending to quit in the next six months, (2) contemplation intending to make change in the next six months, (3) preparation intending to act within the next month, (4) action having made a behavioral change and it has persisted for 6 months, (5) maintenance having abstained for five years, and (6) ter-

mination having zero temptation to smoke.<sup>[28]</sup> This model is an integration and synthesis of multiple psychotherapy and behavior change theories. Most persons will decide that the pros of changing unhealthy behaviors outweigh the cons before taking action to modify a behavior.<sup>[29]</sup>

### 1.3 Aim of the study

Exploring smoking abstinence strategies for low-income pregnant women continues to be a need in the health care system. Thus, the purposes of this pilot study were to: (a) acquire an understanding of factors that influence the desire to quit and maintain smoking abstinence during pregnancy and the postpartum period and (b) determine the feasibility of replicating the method for an expanded study.

## 2. METHOD

### 2.1 Design and sample

A longitudinal, non-experimental one-group design was based on the TTM. Following IRB approval, a convenience sample was recruited at a single, community health clinic in Indiana for those with low-income (family taxable income not exceeding 150% of federal poverty level) over nine months. Inclusion criteria included: (a) 18 or older, (b) current smoker, (c) prenatal patient at the clinic, (d) ability to read and communicate in English, and (e) ability to give informed consent. Data were collected at the time of informed consent and 6 weeks, 6 months, and 12 months following delivery.

### 2.2 Data collection tools

Self-report questionnaires written at the 5th grade reading level were used to collect demographic and smoking behavior. Questionnaires were evaluated for face and content validity by two advanced practice nurses experienced with the underserved and smoking abstinence. The questionnaires were pilot tested with four patients from the community center to determine readability and time needed for completion. The baseline questionnaire included 38 items (quantitative and descriptive/qualitative) to assess: (a) pregnancy history, (b) secondary smoke exposure, (c) smoking patterns, and (d) the desire to quit. The TTM stages of change were measured on a Cantril ladder, a vertical self-anchoring scale with 10 rungs.<sup>[30]</sup> The scale was adapted from the Contemplation Ladder to measure smoking cessation readiness.<sup>[31]</sup> Rungs on the ladder range from the precontemplation stage: 0 = "I do not think smoking is a problem and have no intention to stop smoking" to the preparation stage: 10 = "I have decided to stop smoking and have a quit date."

The follow-up questionnaire was mailed to current smokers to reassess smoking history and perceptions about smoking

behaviors. If subjects reported they no longer smoked, questions were asked about motivation factors contributing to abstinence. If subjects were smoking, additional questions assessed current smoking patterns and future intentions to quit.

### 2.3 Procedures

Research assistants approached all prenatal patients during the once-per-week, prenatal clinic day over a 16 month period. Subjects completed the questionnaires in less than 15 minutes. The participation rate was 94%. Since standard care included assessment of smoking behaviors and verbal encouragement to stop smoking based on the 5 A's,<sup>[32]</sup> additional materials reflective of the TTM stages of change were provided. All subjects (N = 135), regardless of smoking behavior, received self-help booklets on the harmful effects of smoking and secondhand smoke exposure as a primary prevention strategy. Previous smokers in maintenance or termination (n = 77) were commended for their successful behavioral change efforts, given information on secondhand smoke exposure and smoking abstinence, and no further data were collected. To increase replicability, materials were low-cost, readily available, and could be incorporated into routine prenatal care at low-income clinics.

Self-identified current smokers (n = 28) received additional information to promote movement along the stages of change. Subjects in the pre-contemplation or preparation stage were given self-help booklets on quitting, information on local smoking abstinence classes, and how to contact the Tobacco Quitline 1-800-QUIT-NOW ([www.smokefreeindiana.org](http://www.smokefreeindiana.org)). The Quitline, available daily, offered free information and one-on-one counseling with a "Quit Coach". Contemplators were given the above materials and a smoking "quit kit". This kit contained a self-help abstinence guide, stress ball and twisty tie, "oral gratification" straws, cinnamon chewing gum, and a tobacco free picture frame.

All current smokers received a mailed survey to assess changes in behavior at 6 weeks, 6 months, and 12 months post-delivery. Each mailing contained informed consent, questions regarding smoking and intentions, and a stamped envelope. Return of the questionnaires indicated consent to participate. Since contact with low-income populations over time is difficult, each received a \$10 gift card for participation during follow-up assessments. Cash and vouchers as incentives are widely used to encourage smokers to quit.<sup>[33]</sup>

Data were entered into SPSS-Version 20. Normality of data was examined. Descriptive and inferential statistics were computed. Qualitative responses were examined verbatim and coded for common themes.

### 3. RESULTS

#### 3.1 Baseline data

Demographic characteristics (N = 135) were consistent with the total population seeking care at this health center. Ages ranged from 18 to 41 (M = 24.68, SD = 5.06) and most completed high school (M = 12.52, SD = 1.76). Subjects were African American (40%), White (38%), Hispanic (16%), and other (6%). Weeks of gestation ranged from 4-40 weeks (M = 26.9, SD = 8.7), and 64% had a previous pregnancy (M = 1.99, SD = .48). The majority were not married (75%) with household incomes < \$30,000/year (78%). Nearly 64% of the women had an average of 1.39 (SD = 1.52) children living at home. Thirty-six percent were exposed to smoke at home and 20% at work. While 41% (n = 55) indicated they never smoked during their lifetime, 57% (n = 77) indicated smoking at some point, and 75% (n = 58) previously attempted to quit, making an average of three (SD = 3.2) attempts. Top reasons for quitting included: “not healthy” (n = 33), “pregnant” (n = 16), “didn’t like smoking” (n = 12), and “cost” (n = 2).

Stages of change for those with a history of smoking (n = 77) are reported in Table 1. Twenty-nine subjects were non-smokers who quit prior to pregnancy and were in the TTM maintenance stage; 18 quit when they found out they were pregnant (spontaneous quitters) and were in the action stage. Verbatim descriptive responses from the spontaneous quitters were coded and clustered to form common themes. Two themes emerged: the decision to ‘quit because of the pregnancy’ and smoking was seen as a ‘bad habit’. One-half (n = 9) of the women connected quitting with being pregnant and made statements such as “I tried to stop smoking because I was pregnant” or “because I got pregnant.” Another common theme surrounded the notion of smoking as a ‘bad habit’ that was not healthy. One woman responded: “I can’t understand the point of putting something in your mouth puffing on smoke; I see no purpose for it”. “I don’t [like] smoking. It’s not good for you and the baby and it smells bad.” Other comments were: “It’s gross” and “it’s not healthy”. Thus, intention and motivation to quit were linked to learning of their pregnancy and/or the desire to change an unhealthy habit.

Current smokers (n = 28) ranged in age from 18 to 36 (M = 24.1, SD = 3.9), were predominately white (64%), and completed high school (M = 12.11, SD = 1.75). The majority were not married (82%) with household income < \$30,000 per year (89%). Except for race, current smokers were similar on all demographics to those in the recruited sample. Five current smokers planned to quit (preparation); 15 intended to make a change (contemplation); and six were not intend-

ing to quit (precontemplation). Current smokers described a variety of related behaviors (see Table 2).

**Table 1.** TTM stages of change for subjects with a history of smoking (n = 77)

| History of Smoking                    | n  | %     |
|---------------------------------------|----|-------|
| <b>Current Non-smokers</b>            |    |       |
| Maintenance (quit prior to pregnancy) | 29 | 37.6  |
| Action (quit during pregnancy)        | 18 | 23.4  |
| <b>Current Smokers</b>                |    |       |
| Precontemplation                      | 6  | 7.8   |
| Contemplation                         | 15 | 19.5  |
| Preparation                           | 5  | 6.5   |
| Missing                               | 2  | 2.6   |
| <b>Missing</b>                        | 2  | 2.6   |
| <b>Total</b>                          | 77 | 100.0 |

**Table 2.** Smoking behaviors of current smokers (n = 28)

| Behaviours                              | n  | %    |
|---|----|------|
| <b>First cigarette of the day</b>       |    |      |
| First wake up                           | 9  | 32.1 |
| Within 1 <sup>st</sup> hour             | 7  | 25.0 |
| After breakfast, before lunch           | 6  | 21.4 |
| After lunch                             | 4  | 14.3 |
| After dinner                            | 1  | 3.6  |
| Missing                                 | 1  | 3.6  |
| <b>Factors associated with smoking</b>  |    |      |
| Relieves tension                        | 21 | 75.0 |
| Relaxing                                | 16 | 57.1 |
| <b>Factors associated with quitting</b> |    |      |
| Others believe I should stop            | 25 | 89.3 |
| My smoking bothers others               | 20 | 71.4 |
| I am unhappy when smoking               | 16 | 57.1 |
| I enjoy it too much to quit             | 11 | 39.3 |
| <b>Difficult to not smoke</b>           |    |      |
| Very hard                               | 1  | 3.6  |
| Hard                                    | 1  | 3.6  |
| Somewhat hard                           | 9  | 32.1 |
| Not hard at all                         | 15 | 53.6 |
| Missing                                 | 2  | 7.1  |

#### 3.2 Longitudinal data

During the post-delivery period 79% (n = 22) of current smokers responded at least once; only one reported at all data collection points. Over the full 12 months, four subjects (18%) reported quitting; one was in maintenance, and three were in action. Descriptive responses for reasons related to abstinence were coded and clustered for those (n = 4) who

reported quitting. Two themes emerged: 'use of abstinence behaviors' and the 'mental commitment to quit'. The most commonly identified abstinence behavior by all the quitters was oral gratification and/or hand activity such as chewing gum or as one woman stated, "If I get the urge I put a pen or something like that in my hand or mouth." The other theme was the mental commitment to quit. For example one woman described it as, "I just have it in my mind that I don't want to smoke" and I "just lost interest" in smoking. A few other behaviors reported by individual women included not wanting to smoke around their children or the concern about being seen smoking in public while pregnant. No one reported using 1-800-QUIT-NOW to support smoking abstinence.

Smoking patterns were analyzed for subjects ( $n = 18$ ) who continued to smoke. At the initial assessment, subjects smoked an average of 8.5 (SD = 7.9) cigarettes per day. There was a slight decline in cigarettes smoked ( $M = 7.5$  cigarettes/day, SD = 3.8) at six weeks post-partum. But by six months, consumption surpassed the baseline smoking rate ( $M = 10$ , SD = 3.5). At one year, consumption increased to 10.6 (SD = 5.0) cigarettes per day.

Verbatim descriptive responses for those subjects who continued to smoke were analyzed. Data were coded and clustered to form common themes to capture the meaning of the data. The first predominant theme was the 'lack of strength to quit'. Common statements were: "I believe I should stop but just can't seem to quit" and "I am hoping . . . I will be able to have the physical and mental strength to quit." Even concern for the baby was identified as a desire to quit: "I am still trying to stop but it is hard for me. I have to cut back since I had my baby." The second theme was how they will 'quit in the future'. Common statements were: "I plan on smoking less cigarettes a day until I eventually quit altogether"; "I will quit cold turkey. The only problem will be when I am at work"; and "I want to quit but in time by using the patches and cutting 'done' on them." The women had an intention to quit but were unable to articulate a specific action plan.

#### 4. DISCUSSION

Any increase in smoking abstinence during pregnancy provides benefits to the health of women and their babies.<sup>[21,34]</sup> Low-income women are more likely to be smokers prior to pregnancy and less likely to quit during pregnancy.<sup>[7,19]</sup> Findings from this pilot study indicated that 36% reported smoking during pregnancy which was consistent with the literature on low-income women.<sup>[1,35]</sup> However, this rate of smoking is nearly three times higher than the current rate of 10% for all pregnant women in the U.S.,<sup>[4]</sup> and in Indiana, approximately 15.7% of pregnant women smoked.<sup>[36]</sup> The mean age of the women in this pilot, 24, corresponds with

the higher rate of smoking among pregnant women between the ages of 18 and 24.<sup>[5]</sup>

Various strategies have been hypothesized to lead to smoking abstinence; however, most women continue to smoke during pregnancy,<sup>[37]</sup> and extensive smoking abstinence strategies are not always made available to pregnant women.<sup>[9,11]</sup> Pregnancy can be viewed as a stressful or critical time with additional life worries.<sup>[37,38]</sup> Since smoking is seen as a stress reliever during the perinatal period,<sup>[39]</sup> the view that smoking is used to help women cope may contribute to the difficulties with quitting.

A successful finding in this pilot was that 18% of the current smokers eventually abstained during the post-delivery period. This finding was similar to a 13% quit rate in the literature.<sup>[15]</sup> Another positive change was the decrease in the total number of cigarettes smoked per day. Pregnant women are more likely to decrease the total number of cigarettes rather than quit entirely,<sup>[21]</sup> and women may choose to cut back on smoking in an attempt to reduce harm to the fetus.<sup>[9]</sup> According to the literature, most low-income pregnant women either fail to quit or return to smoking during the post-partum period.<sup>[10,14,24]</sup> In this pilot, the majority intended to quit according to the TTM stages of change; however, without a specific plan, they were unable to successfully abstain. The lower rate of abstinence may have been further influenced because subjects began smoking at an early age ( $M = 16$  years) and were unsuccessful at previous attempts to quit. Over 50% of the subjects reported smoking their first cigarette within an hour of waking up. These women also reported not having the strength to quit even knowing they should stop.

#### 4.1 Implications

Typically, women who successfully abstain from smoking during pregnancy quit shortly after learning of their pregnancy and before receiving advice or interventions from health care providers (HCPs).<sup>[40]</sup> In this pilot, 23% quit spontaneously after finding out they were pregnant, which was consistent with the literature.<sup>[23,38]</sup> Unfortunately, most spontaneous quitters return to smoking during post-partum.<sup>[16,23,26,41]</sup> The majority resume smoking within six months,<sup>[10,25]</sup> and this increases to as much as 80% within one year after delivery.<sup>[11]</sup> The rate of smoking relapse for low-income women is higher than all pregnant women.<sup>[10]</sup> Therefore, HCPs should be alert to the characteristics of spontaneous quitters who are typically primiparas, have a non-smoking partner, have more than a high school education, and do not perceive multiple stressors in their life.<sup>[38,40]</sup> While not implemented in this pilot, spontaneous quitters need continued monitoring and tailored support to transi-

tion from TTM action to maintenance during the postpartum period. Any relapse terminates the action phase causing a cyclical movement back through earlier stages of change.<sup>[29]</sup>

Maintaining contact with low-income women is difficult, and significant attrition was encountered in this pilot. Suggestions to maintain contact could include the use of text messaging, Twitter, and email since most were found to have access to technology. The use of incentives in the form of vouchers or cash tend to boost cessation rates as long as they are in place,<sup>[30]</sup> but incentives could be considered as part of an overall plan for abstinence.

In addition to providing education on smoking cessation during HCP visits, it is essential to use educational materials that promote abstinence for women once they leave the health care environment. Two successful strategies used in this pilot were self-help booklets and substitutional activities. Self-help information is an essential component of any abstinence intervention<sup>[42]</sup> and has demonstrated positive effects compared with usual care.<sup>[43]</sup> In this pilot, self-help booklets may have provided some success in supporting abstinence which was consistent with the literature specifically for low-income pregnant women.<sup>[17]</sup> These booklets can be inexpensive or free, readily available from organizations that promote smoking abstinence, and do not require direct contact with HCPs. The women in this pilot commonly identified the need to substitute oral gratification and/or hand activities such as stress balls to stay in the maintenance stage. Preventing cigarette cravings for postpartum women can include hard peppermint candy, ice, and gum.<sup>[44]</sup> Instructing women on the use of these strategies is important. Not only can these strategies be used in a variety of settings, they are inexpensive, do not require a prescription, and can be individualized based on preference. Providing these additional measures in the form of a “quit kit” as part of routine care can be an inexpensive strategy distributed during visits to assist women in adopting these behaviors

Since low-income women have a high rate of failure to attend intervention sessions and HCP visits,<sup>[45]</sup> counseling interventions must require few interactions with HCPs. While not effective in this sample, a phone based counseling intervention or “quit line” adds flexibility and provides access to evidence-based strategies which could support smoking abstinence.<sup>[46]</sup> Assessment of the barriers for using a Quitline and more frequent reminders to use the Quitline would be recommended in the future.

In this pilot, the majority of smokers were in the precontemplation stage. According to Prochaska and DiClemente,<sup>[27]</sup> precontemplators use the change processes significantly less than individuals in other stages. Thus, HCPs need to continue

to explore evidenced-based strategies for low-income pregnant women interested in smoking abstinence but need support to make the behavioral change. One strategy discussed in the literature is the use of nicotine replacement therapy (NRT).<sup>[11,26,37]</sup> NRT increases the likelihood of successful quitting by 50%-70%.<sup>[47]</sup> In addition, Medicaid coverage for NRT ensures this as an affordable option for low-income women.<sup>[11]</sup> Since predictors of smoking during the perinatal period include living with a partner who smokes,<sup>[25,37]</sup> it is recommended that HCPs educate women about strategies that focus on a smoke free home environment. While not used in this study, these strategies reduce second hand smoke exposure for mother and baby and support smoking abstinence for the family.<sup>[48]</sup>

#### 4.2 Limitations

Findings should be interpreted in relationship to its limitations. The sample was small and from one prenatal clinic providing care to low-income women; however, women were from both rural and urban areas. While the sample reflected the community, it may not represent all low-income pregnant women. Smoking behaviors were identified and monitored by self-report. Although behaviors are typically measured by self-report, cotinine measurement shows self-reported smoking status is underestimated by much as 25%.<sup>[5]</sup> Thus, smoking and change in smoking behaviors may be inaccurate. All women at the clinic received continual advice on smoking abstinence as part of routine care. However, in this pilot, spontaneous quitters were not specifically targeted or reevaluated to determine their rate of abstinence or relapse. While the number of women who quit smoking was consistent with the literature and some women reported the use of abstinence interventions were helpful, it is not certain if these women would have quit on their own without additional interventions.

#### 5. CONCLUSION AND RECOMMENDATIONS

As seen in this pilot study, the preponderance of at-risk populations is not prepared for action and without planned interventions will remain stagnated in the early stages of change or even regress.<sup>[49]</sup> It is recommended that HCPs continue to review the evidence on strategies that promote smoking abstinence in low-income pregnant women. Abstinence interventions should begin prior to pregnancy, be based on the TTM stages of change, require few provider visits, be cost effective, and focus on relapse prevention. Additionally, increased contact by HCPs with the use of text messaging, Twitter, and email should be added since most individuals in this pilot were found to have access to these types of technology. The next research step is to repeat this design in a larger sample using the same low-cost, strategies but in-

clude tailored interventions with added emphasis during the post-delivery period for relapse prevention of spontaneous quitters.

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## CONFLICTS OF INTEREST DISCLOSURE

The authors declare that there is no conflict of interest.

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