



Women Who Quit Smoking During Pregnancy

Background

Quitting smoking may be one of the most important steps pregnant women can take toward achieving a healthy birth outcome. When a woman stops smoking during pregnancy and remains smoke-free, she minimizes her risk of numerous prenatal complications and adverse birth outcomes, including preterm delivery, low birth weight (less than 5lbs, 8ozs), and Sudden Infant Death Syndrome (SIDS).¹⁻¹¹

Due to the effects of smoking on fetal growth (resulting from decreased amount of blood, oxygen, and nutrients flowing to the developing fetus²), it has been estimated that if smoking during pregnancy was eliminated, the incidence of low birth weight could be reduced by as much as 25%.^{1,2,6} In addition to the health benefits derived from quitting smoking during pregnancy for the woman and baby, women who maintain abstinence from tobacco use after delivery remain at decreased risk for high blood pressure, stroke, heart attacks, and lung cancer.³

Despite the highly addictive nature of nicotine, spontaneous and assisted smoking cessation occurs at higher rates (18% to 40%)^{2,7} during pregnancy than at other times in a woman's life.¹² Reviews of prenatal smoking cessation programs indicate that success is more likely to occur when health care providers are thoroughly trained in smoking cessation. Interventions, including cognitive behavioral strategies, when integrated into routine clinical practice, also improve quit rates.^{2,13} Recent guidelines from the Agency for Health Care Policy and Research recommend that health care systems be modified to routinely identify and intervene with all tobacco users at every visit.¹⁴

Cigarette smoking before, during, and after pregnancy remains a serious public health threat and is worthy of continued efforts to study the means by which pregnant smokers may be encouraged and assisted to quit. This study examines the characteristics of Oklahoma women who quit smoking cigarettes during pregnancy and those who remain abstinent after delivery. It is hoped that by profiling

women who were successful at quitting, lessons can be learned to assist health care professionals in providing smoking cessation interventions for all women who smoke before and during their pregnancy.

Methods

Smoking status in the three months prior to pregnancy, the three months before delivery and at the time of response (four to six months post-partum) were measured on the PRAMS questionnaire by self-

In Oklahoma

- Nearly one-third (31.9%) of women report smoking in the three months prior to pregnancy, 22% report smoking in the last three months of pregnancy, and 28.4% report smoking after pregnancy.
- Only one-third (32.2%) of women who smoke before pregnancy quit in the prenatal period.
- Among those who quit, nearly one-half (44.2%) abstain from smoking for at least four to six months postpartum.
- Women with at least some college education who smoke prior to pregnancy are nearly 2 times more likely to quit smoking during pregnancy than women with less than a high school education.
- Women who quit smoking during pregnancy are 2.5 times less likely to deliver a low birth weight infant than women who continue to smoke throughout pregnancy.
- Women who smoke less than 10 cigarettes per day are 13.7 times more likely to quit smoking during pregnancy than women who smoke 20 or more cigarettes per day.
- Women in their thirties who quit smoking during pregnancy are 1.7 times more likely than women less than 20 to remain abstinent from smoking for at least four to six months after they have their baby.

reported number of cigarettes smoked per day during these periods. Women who *quit* smoking during pregnancy were those who reported smoking three months prior to pregnancy but not in the three months before delivery. Women who remained abstinent from smoking four to six months after delivery were considered *long-term quitters* while those who resumed smoking by the time they responded to the survey were *short-term quitters*.

Along with demographic and socioeconomic characteristics, the overall prevalence and trends of women smoking before, during, and after pregnancy were examined. These same characteristics were also used to examine women who quit smoking during pregnancy, and those who were and were not able to remain abstinent after delivery. In addition, the level of smoking prior to pregnancy, inquiries about prenatal smoking status, and receipt of advice about effects of smoking during pregnancy were examined. The prevalence of low birth weight (<2,500 grams) is presented by smoking status. The amount of cigarettes smoked impacts this measure of birth outcome. Point estimates are presented, with comparison of proportions done using 95% confidence intervals (95% CI). A logistic regression model was used to examine factors related to a woman's likelihood to quit smoking. Adjusted odds ratios and 95% CI are presented. All data cited are self-reported and represent resident women in Oklahoma who have recently had a live birth.

Although PRAMS data provide the most comprehensive population-based state-specific information on women smoking during pregnancy in Oklahoma, they are subject to limitations. Assessment of the actual number of cigarettes smoked before, during, and after pregnancy by an individual is difficult to determine by self-report. Even in the context of a mail or phone questionnaire such as PRAMS, women may have perceptions of how they should behave during pregnancy; these perceptions may influence their answers to the survey questions. In addition, the women are responding to the PRAMS survey four to six months after they have had their baby; this time lag may also influence their recall of actual events (i.e., number of cigarettes smoked).

Prevalence of Smoking Before, During and After Pregnancy

Over the seven-year period beginning with April 1988 and ending March 1995, 31.9% of women re-

ported smoking in the three months prior to pregnancy, 22% reported smoking in the last three months of pregnancy, and 28.4% reported smoking after pregnancy (data not shown).

The percentage of women smoking prior to and after pregnancy has shown some variation over time with an upward trend since April 1992 (Figure 1). The proportion of women who report smoking in the last three months of pregnancy has remained consistent over time with prevalence ranging from 20.3% to 24.2%.

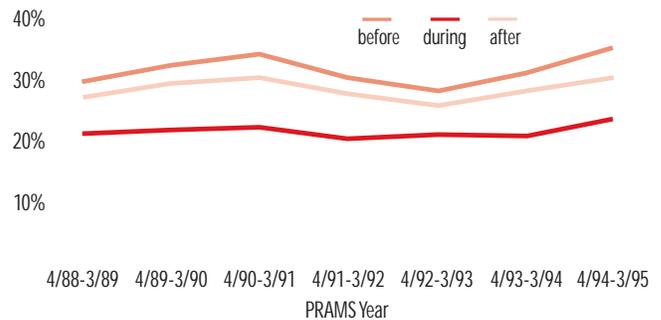


Figure 1 Trend of Women Smoking Before, During, and After Pregnancy

Demographic and socioeconomic factors that may increase the likelihood of a woman smoking before, during or after pregnancy are presented in Table 1. In all three periods, the women most likely to report smoking were less than 20 years old, had not graduated from high school, were not married when they became pregnant, or lived below 100% of the Federal Poverty Level (FPL). Although Native American women were more likely to smoke before and after pregnancy compared to white and African American women, during pregnancy they were equally as likely as white women and twice as likely as African American women to smoke. The prevalence of these factors has not changed substantially since 1991.¹⁵

PRAMS is a population-based survey of Oklahoma women with a recent delivery. A stratified sampling approach is used to select approximately 200 new mothers each month from the state's live birth registry. Data for this report reflect live births occurring between April 1988 and March 1995; the overall response rate was 71%. Up to three mailed questionnaires are used to solicit a response. Telephone interviews are attempted for non-respondents. Analysis weights were applied to adjust for selection probability and non-response. The total number of women in the sample was 11,750. The sample sizes for the various sub-populations analyzed were: women who smoked before pregnancy (3,674); who smoked during pregnancy (2,528); who quit smoking during pregnancy (1,114); who smoked after pregnancy (3,321); quitters who remained abstinent after delivery (long-term quitters) (472); and women who resumed smoking after delivery (short-term quitters) (630). To compare low birth weight, only women with singleton births over 36 weeks gestation were included. All data represent state estimates of women residing in Oklahoma with a recent live birth.

Table 1 Smoking Before, During and After Pregnancy

Characteristics	Smoked Before Pregnancy		Smoked During Pregnancy		Smoked After Pregnancy	
	%	95% CI	%	95% CI	%	95% CI
Age						
<20	40.0	35.9-44.1	23.9	20.4-27.4	35.8	31.9-39.7
20-29	31.8	30.0-33.6	22.0	20.4-23.6	28.6	26.8-30.4
30+	27.0	24.5-29.5	20.8	18.4-23.2	22.9	20.4-25.4
Education¹						
< 12 yrs	57.6	53.3-61.9	45.4	40.9-49.9	54.6	50.3-58.9
12 yrs	35.7	33.3-38.1	25.2	23.0-27.4	31.7	29.3-34.1
13+ yrs	17.4	15.6-19.1	11.0	9.4-12.6	14.7	12.9-16.5
Race						
White	32.9	31.3-34.5	23.3	21.9-24.7	29.3	27.7-30.9
African-Amer.	17.5	13.0-22.0	11.9	8.2-15.6	16.5	12.2-20.8
Native Amer.	40.7	35.6-45.8	22.6	18.3-26.9	34.1	29.2-39.0
Marital Status²						
Unmarried	44.2	41.5-46.9	29.4	26.9-31.9	39.6	36.9-42.3
Married	25.5	23.9-27.1	18.1	16.7-19.5	22.5	20.9-24.1
FPL						
< 100% FPL	43.3	40.2-46.4	32.0	29.1-34.9	40.2	37.3-43.1
100-184% FPL	34.2	31.3-37.1	23.9	21.2-26.6	30.1	27.2-33.0
185+% FPL	21.3	19.1-23.5	13.3	11.5-15.1	17.8	15.8-19.8

¹ Excludes women less than 19 years old.

² Marital status at conception.

Women Who Quit Smoking During Pregnancy

As shown in Figure 2, almost one-third (32.2%) of women smoking before pregnancy quit in the prenatal period. Among those who quit, over one-half (55.8%) began smoking again after giving birth to their baby (short-term quitters), while 44.2% remained abstinent from smoking for at least four to six months postpartum (long-term quitters).

Socioeconomic, demographic, prenatal, and lifestyle factors that may influence a woman's likelihood to quit smoking during pregnancy are included in Table 2. Women less than 20 years old were 1.7¹ times more likely than women in their thirties, and 1.3¹ times more likely than women in their twenties, to quit smoking during pregnancy. Other women more likely to quit smoking during pregnancy had some college education, were Native American, or lived above 185% Federal Poverty Level (FPL).

Smokers entering prenatal care in the first trimester were slightly more likely to report quitting (32.8% vs. 29.8%) than those entering care late. In addition, women with an unwanted pregnancy were less likely than those with an intended or mistimed pregnancy to quit smoking (25.2% vs. 32.8% and 37.0%¹, respectively).

¹ Statistically significant at alpha=0.05

Table 2 Women Who Quit Smoking During Pregnancy

Characteristics	Non-Quitters		Quitters	
	%	95% CI	%	95% CI
Age				
<20 yrs	57.8	51.1-64.5	42.2	35.5-48.9
20-29 yrs	68.6	65.3-71.9	31.4	28.1-34.7
30+ yrs	75.2	70.3-80.1	24.8	19.9-29.7
Education¹				
< 12 yrs	79.2	74.4-83.8	20.8	16.1-25.5
12 yrs	68.8	64.9-72.7	31.2	27.3-35.1
13+ yrs	62.4	56.9-67.9	37.6	32.1-43.1
Race				
White	69.7	67.0-72.4	30.3	27.6-33.0
African-American	63.9	50.5-77.8	36.1	22.2-50.0
Native American	55.4	47.2-63.6	44.6	36.4-52.8
Marital Status²				
Married	67.9	65.0-70.8	32.1	29.2-35.0
Unmarried	67.5	62.8-72.2	32.5	27.8-37.2
Poverty				
< 100% FPL	72.8	68.5-77.1	27.1	22.9-31.5
100-184% FPL	68.8	63.7-73.9	31.2	26.1-36.3
185+% FPL	61.3	55.8-66.8	38.7	33.2-44.2
Prenatal Care Entry				
1st trimester	67.2	64.3-70.1	32.8	29.9-35.7
2nd/3rd trimester or no care	70.2	64.7-75.7	29.8	24.3-35.3
Intention of Pregnancy				
Intended	67.2	63.3-71.1	32.8	28.9-36.7
Mistimed	63.0	58.3-67.7	37.0	32.3-41.7
Unwanted	74.8	68.5-81.1	25.2	18.9-31.5
Previous Births				
None	56.3	51.8-60.8	43.7	39.2-48.2
1	73.3	69.0-77.6	26.7	22.4-31.0
2+	80.1	75.8-84.4	19.9	15.6-24.2
Violence³				
Yes	73.5	65.7-81.3	26.5	18.7-34.3
No	66.9	64.2-69.6	33.1	30.4-35.8
Pre-pregnancy Smoking Level				
< 10 cigarettes/day	31.0	24.9-37.1	69.0	62.9-75.1
10-19 cigarettes/day	61.4	55.9-66.9	38.6	33.1-44.1
20+ cigarettes/day	82.2	79.5-84.9	17.8	15.1-20.5
Prenatal Drinking⁴				
Yes	84.1	77.8-90.4	15.9	9.6-22.2
No	65.5	62.8-68.2	34.5	31.8-37.2
Asking About Smoking				
Yes	67.5	64.8-70.2	32.5	29.8-35.2
No	68.3	55.8-80.8	31.7	19.2-44.2
Advising About Smoking				
Yes	69.2	66.3-72.1	30.8	27.9-33.7
No	59.0	52.1-65.9	41.0	34.1-47.9

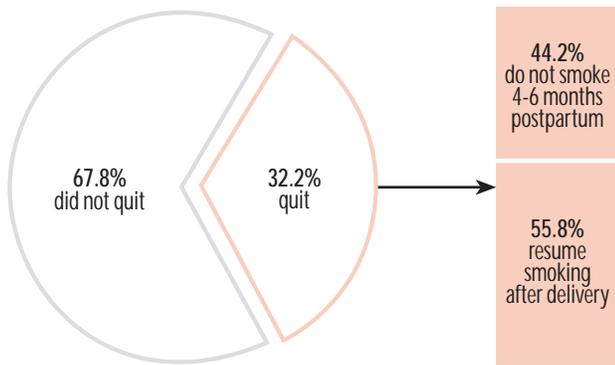
¹ Women less than 19 were excluded.

² Marital status at delivery.

³ Women who report being physically hurt by their husband or partner in the 12 months before delivery.

⁴ Women who report drinking alcohol in the last three months of pregnancy.

Figure 2 Women Who Quit Smoking During Pregnancy and Resume After Delivery



Life events and health-related behaviors also appear to influence a woman's likelihood of quitting smoking during pregnancy. Primiparous women were 2.2[†] times more likely than those with two or more children to quit. Light smokers (less than 10 cigarettes/day) in the three months prior to pregnancy were nearly 4.0[†] times as likely to quit smoking during pregnancy as those women who smoked 20 or more cigarettes per day in the preconception period. In addition, women who reported drinking alcohol in the last three months of pregnancy were twice[†] as likely as those who did not drink to continue smoking throughout pregnancy.

Women who were advised by a health care provider on the effects of smoking during pregnancy were less likely to quit smoking during pregnancy than those who were not advised (41.0% vs. 30.8%)[†].

Birth Outcome Among Quitters

Smoking during pregnancy increases a woman's risk for delivering a low birth weight baby (less than 5 and 1/2 lbs).^{7,12} Oklahoma women who quit smoking during pregnancy were 2.5 times less likely to deliver a low birth weight infant than women who continued to smoke throughout pregnancy. Women who did not smoke prior to or during pregnancy were nearly three times less likely than women who smoked during pregnancy to have a low birth-weight baby. After adjusting for other risk factors such as mother's age, mother's race and prenatal weight gain, quitting smoking during pregnancy was still found to reduce the risk of low birth weight by two times (data not shown).

[†] Statistically significant at alpha=0.05

Regression Analysis on a Woman's Likelihood to Quit Smoking

Logistic regression was used to examine the influence of combined factors on a woman's likelihood to quit smoking during pregnancy. Sociodemographic and lifestyle variables were examined to determine those most influential in a woman's decision to quit. Lifestyle factors such as level of pre-pregnancy smoking, alcohol consumption during pregnancy, number of previous children, and receiving advice about the effects of smoking during pregnancy, remained as the best set of predictors for a woman's likelihood to quit.

Women who smoked less than ten cigarettes per day were 13.7 (8.7-21.7) times more likely to quit than those who smoked 20 or more cigarettes per day. Women who did not drink during pregnancy were 3.9 (1.9-7.8) times more likely to quit smoking in pregnancy than women who reported drinking in the last three months of pregnancy. Women who did not receive advice on the effects of smoking during pregnancy were 2.1 (1.4-3.4) times more likely to quit than women who received advice. Women with no previous children were 2.6 (1.7-3.9) times more likely to quit than women with two or more previous children at the time their new baby was born.

Table 3 Variables Influencing a Woman's Likelihood to Quit Smoking During Pregnancy

Variables	Adjusted Odds Ratio	95% CI
Level of Smoking Before Pregnancy ¹		
< 10 cigarettes/day	13.7	8.7-21.7
10-19 cigarettes/day	2.4	1.7-3.5
20+ cigarettes/day	1.0	1.0-1.0
Drinking During Pregnancy ²		
Yes	1.0	1.0-1.0
No	3.9	1.9-7.8
Number of Previous Children		
None	2.6	1.7-3.9
One	1.1	0.7-1.8
Three or More	1.0	1.0-1.0
Advice on Effects of Prenatal Smoking ³		
Yes	1.0	1.0-1.0
No	2.1	1.4-3.4

¹ Reported cigarette smoking in the three months prior to pregnancy.

² Reported drinking alcohol in the last three months of pregnancy.

³ Doctor or nurse talked to them when they went for prenatal care about the effects of smoking on their baby.

Resumption of Smoking After Delivery

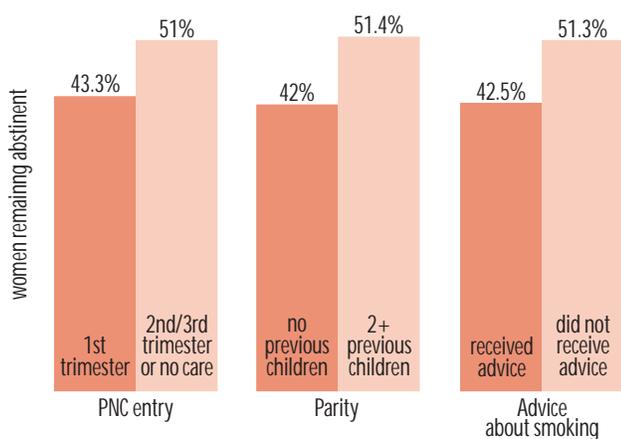
For those women who quit smoking during pregnancy, remaining “smoke-free” can reduce the risk for several health-related conditions for both herself and her baby. Those women who quit smoking during pregnancy were separated into short-term (resumed smoking after delivery) and long-term (did not resume smoking) quitters. For both of these groups, several characteristics were examined, including socio-demographic, prenatal, and lifestyle factors. After examining each of these characteristics, only a woman’s age was significantly associated with remaining abstinent four to six months after delivery (Table 4).

Table 4 Woman’s Age and Abstinence from Smoking After Delivery

Age	Short Term Quitter		Long Term Quitter	
	%	95% CI	%	95% CI
<20 yrs	63.9	53.9-73.9	36.1	26.1-46.1
20-29 yrs	56.3	50.0-62.6	43.7	37.4-50.0
30+ yrs	40.3	28.9-50.7	59.7	48.3-71.1

In addition, there were several other characteristics which, though not statistically significant, were of interest (Figure 3). Women entering prenatal care after the first trimester were more likely than those entering care in the first 13 weeks gestation to be long-term quitters (51.0% vs. 43.3%). Having two or more previous children also increased a woman’s likelihood of remaining smoke-free four to six months after delivery compared to primiparous women (51.4% vs. 42.0%). In addition, women who did not receive advice on the effects of smoking during pregnancy were more likely to be long-term quitters than those who received advice (51.3% vs. 42.5%).

Figure 3 Factors Increasing Likelihood of Women Remaining Abstinent After Delivery



Discussion

The demographic and socioeconomic factors that increase a woman’s likelihood to quit smoking are similar to those that increase her chances of smoking before, during, and after pregnancy. In the course of logistic regression, these demographic and socioeconomic factors did not remain significantly associated with quitting smoking; instead, factors such as level of pre-pregnancy smoking, number of previous children, receipt of advice on the effects of smoking during pregnancy, and drinking during pregnancy were significant. These factors may reflect the level or intensity of a woman’s addiction to nicotine, her inclination to take care of her health, or her overall level of stress.

The finding that women who received advice from their health care provider regarding the effect of smoking on the health of the baby were less likely to quit smoking during pregnancy may reflect the content and effectiveness of prenatal smoking cessation interventions in Oklahoma. It may also reflect the fact that prenatal smoking is assessed only in the last trimester. The PRAMS survey does not define “advice” received from health care providers. It is possible that women who received only a brochure or a suggestion that they should stop smoking responded to this question in the same manner as those women who participated in a more intensive smoking cessation effort.

In addition, health care providers who address prenatal smoking cessation with their clients may be offering the same sort of “advice” to all women regardless of the clients stage of “readiness to change.” Stages of readiness to change are: precontemplation (unmotivated to quit), contemplation (considering quitting), preparation for quitting, action (the act of quitting itself), maintenance, and relapse.¹⁷ Determining the stage of readiness of the client to change is an important step in directing intervention efforts.

Success at quitting smoking during pregnancy was typically seen among women who were younger, were experiencing their first or second pregnancy, and entered care in the first trimester. Women who successfully remained abstinent after delivery, however, were in their thirties, had two or more children, and entered care after the first trimester. It may be that these women who manage to quit smoking during pregnancy have some characteristics that PRAMS is unable to measure, which enable them to maintain their abstinence after delivery. It is important to note that, given the relatively small sample

size (472 women), the findings regarding those characteristics not statistically significantly related to remaining abstinent (parity, prenatal care entry, and receiving advice about the effects of prenatal smoking), should be interpreted with caution.

In light of the growing body of evidence linking a variety of adverse health effects in children exposed to environmental tobacco smoke, it is encouraging to note that nearly half (44.2%) of Oklahoma women who quit smoking during pregnancy reported they remained smoke-free for at least the first four to six months after their child is born. The maintenance of this healthy behavior change reduces the risk of both smoking related health problems for the woman and the negative effects of environmental tobacco smoke on her child(ren). The identification of those factors that may contribute to a woman's abstinence are important in the development of appropriate program and policy decisions related to smoking cessation activities.

Recommendations

Reducing the incidence of maternal smoking is one of the most significant means by which Oklahoma could impact the Year 2000 goal of decreasing low birth weight to no more than 5% of all births.

- Increase the quality and effectiveness of current prenatal smoking cessation interventions by using the AHCPR Clinical Practice Guideline on Smoking Cessation, and the "stages of readiness to change."
- Increase opportunities for health and medical professionals to learn more effective means of assisting pregnant women to stop smoking.
- Partner with various tobacco use prevention organizations to implement a long-term plan of public education to encourage prevention of tobacco use and abstinence from smoking for all pregnant women and their families.
- Advocate for a more in-depth population-based survey of Oklahoma mothers regarding smoking during pregnancy and the factors which influenced them to continue smoking or to quit.

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