FACTORS ASSOCIATED WITH TOBACCO USE AMONG RURAL AND URBAN PREGNANT WOMEN

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ABSTRACT OF DISSERTATION

Whitney Jeanne Katirai

The Graduate School
University of Kentucky
2011
FACTORS ASSOCIATED WITH TOBACCO USE AMONG RURAL AND URBAN PREGNANT WOMEN

ABSTRACT OF DISSERTATION

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Education in the College of Education at the University of Kentucky

By
Whitney Jeanne Katirai
Louisville, KY

Director: Dr. Melody Noland, Professor of Kinesiology and Health Promotion
Lexington, KY
2011
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ABSTRACT OF DISSERTATION

FACTORS ASSOCIATED WITH TOBACCO USE AMONG RURAL AND URBAN PREGNANT WOMEN

The purpose of this study was to investigate the influences of smoking on rural and urban pregnant women. More specifically, the variables of the knowledge of health effects, health provider recommendations, subscores from the Health Belief Model (HBM), and social support were explored in relation to the smoking behavior of pregnant women. A secondary purpose was to investigate the accuracy of self-reported smoking during pregnancy using biochemical validation. Pregnant women (N=71) completed an anonymous questionnaire, designed by the researcher, to identify variables that predicted smoking for urban and rural women. Participants also gave a saliva sample for cotinine testing.

Approximately 47% of rural participants and 49% of urban participants were classified as smokers. The overall smoking deception rate for the current study was 5.6%. The deception rate for rural and urban participants in this study was 2.8% and 8.6%, respectively. Variables were entered into a standard multiple regression analysis to predict smoking status of the pregnant women. Participants reporting barriers (a component of the HBM) to stopping smoking during pregnancy were significantly less likely to be smokers.

Through t-test and chi-square analyses, other variables related to smoking status during pregnancy included: Marital status, financial source for the pregnancy, living with husband or boyfriend, mean scores of the participants’ knowledge of the health effects of smoking during pregnancy, susceptibility and benefits (constructs of the HBM). Many healthcare providers performed 1A, 2A, and 3A; however, few completed the last step of 4A and none completed 5A.
Implications for health promotion specialists include an increase in the education of pregnant women about the health risks of maternal smoking. Additional training for pre-natal healthcare providers is necessary in order to increase the number of healthcare providers that implement all of the 5A’s. It is important to include the husband/boyfriend in any smoking cessation interventions since they have daily influence on the smoking status of the pregnant woman. Money used to conduct biochemical verification of maternal smoking status could be better spent on patient education of the health risks of smoking during pregnancy and physician education in implementing all 5A’s in daily practice.

KEYWORDS: Smoking, Pregnancy, Urban, Rural, Smoking Deception

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This dissertation is dedicated to my loving family.
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Chapter 1

Introduction

Tobacco use is the leading preventable cause of disease and premature death in the United States, resulting in an estimated 438,000 premature deaths annually, or nearly one of every five deaths each year (Centers for Disease Control and Prevention, 2005). Tobacco use causes more deaths each year than alcohol use, car crashes, suicide, Acquired Immunodeficiency Syndrome (AIDS), homicide, and illegal drug use combined (CDC, 2005; McGinnis & Foege, 1993). Additionally, smoking accounts for $167 billion annually in health care expenditures and productivity losses (CDC, 2005). Kentucky leads the United States in the percentage of adults who smoke. In Kentucky, 28% of adults smoke, compared to 21% nationally (CDC, 2008). Kentucky has the highest rates of lung cancer among men and women (133.2 and 75.5 per 100,000 persons), the third highest rate of laryngeal cancers among men (9.7 per 100,000) and the highest rate of laryngeal cancer among women (2.6 per 100,000) (CDC, 2008).

Each year, cigarette smoking kills an estimated 178,000 women in the United States (CDC, 2008). It can be linked to numerous causes of morbidity and mortality in women, including lung, bladder, and reproductive cancers, as well as severe adverse effects on menstrual function and reproductive outcomes (U.S. Department of Health and Human Services, 2004). More than 34% of women of reproductive age in Kentucky currently smoke, which is the highest rate for American women in that classification (CDC, 2008). Women of reproductive age (18-44 years) who smoke risk not only adverse pregnancy outcomes but adverse health consequences as well (CDC, 2008). They are also exposing their children
to secondhand smoke and modeling behavior that will increase the likelihood that
their children will become smokers. Moreover, women in Kentucky of
childbearing age made the fewest attempts to quit (43.4%) compared to female
smokers in Delaware (67.7%) and Puerto Rico (66.6%), for example, who had
the highest rates of quit attempts (CDC, 2008).

**Smoking and Pregnancy**

The Surgeon General’s Report on Smoking and Health (U.S. Department
of Health and Human Services, 2004) provided compelling evidence of the harm
of smoking and the benefits of quitting during pregnancy, and established
smoking during pregnancy as the most important modifiable cause of poor
pregnancy outcomes among women in the United States. The target number of
maternal smokers nationwide was established by *Healthy People 2010* (DHHS,
2000) which sets the goal of reducing the prevalence of maternal smokers to no
more than 2% nationwide. Since 1990, progress has been made in promoting
and achieving smoke-free pregnancies. Nationwide, Kentucky continues to have
the highest rates of maternal smoking in the United States where the maternal
smoking rate is estimated to be about 26-27%. Healthy Kentuckians 2010
objectives (KY CHFS, 2000) set the goal of reducing cigarette smoking among
pregnant women in Kentucky to less than 17%, which is a significant reduction
from the current 26%.
Numerous studies have shown that smoking and exposure to secondhand smoke among pregnant women is a major cause of spontaneous abortions, low birth weight, stillbirths, and Sudden Infant Death Syndrome (SIDS) (Shiverick & Salafia, 1999). According to a meta-analysis of published studies, each year tobacco use is responsible for anywhere from 19,000 to 141,000 spontaneous abortions; 1,900 to 4,800 infant deaths due to perinatal or pre-birth disorders; and 1,200 to 2,200 SIDS cases (DiFranzia & Lew, 1995). The number of low birth weight babies that were born in Kentucky has increased from 7.6% in 1996 to 9% in 2002 (CDC, 2008).

The fact that cigarettes adversely affect fetal health, growth, and development has been well established. The nicotine inhaled by the mother crosses the placenta and is found in amounts 15 times higher than in maternal blood levels. Exposure to deadly levels of carbon monoxide interferes with tissue
development and drastically increases the risk of fetal death. Buka, Shenassa, and Niaura (2003) reported that children whose mothers reported smoking a pack of cigarettes (20 cigarettes) during the course of their entire pregnancy were significantly more likely to have an elevated risk of tobacco dependence. It is important to be able to understand the behaviors and decision making of a pregnant woman who smokes, in order to help them quit.

The Health Belief Model (HBM) (Rosenstock, 1960) provides the theoretical framework for describing pregnant women’s behaviors in this study. The HBM is a “value expectancy” model that is used to describe behavior or decision making under conditions of uncertainty. The HBM posits that individuals will take action to ward off, screen for, or control an ill-health condition if they regard themselves as susceptible to the condition, they believe it to have potentially serious consequences, they believe that a course of action available to them would be beneficial in reducing either their susceptibility to or the severity of the condition, and they believe that the anticipated barriers to (or costs of) taking the action are outweighed by its benefits (Stretcher & Rosenstock, 1997). An additional construct of the HBM, self-efficacy is defined as the “conviction that one can successfully execute the behavior required to produce the outcomes” (Bandura, 1977). Tiedje, Kingry, and Stommel (1992) developed an instrument using the four main HBM constructs to assess women’s health beliefs during pregnancy and found that the HBM was an effective framework for understanding smoking-related behaviors and beliefs during pregnancy.
Because of the severe maternal and fetal health effects of smoking during pregnancy, it is important to encourage pregnant women to quit. Researchers have explored a number of factors that contribute to smoking during pregnancy. One variable that researchers have found to consistently affect smoking status during pregnancy is social support.

Social support can be defined as the actual supportive acts that are exchanged between individuals (Uchino, 2004). It appears as though social support is an important determinant of continued smoking status throughout pregnancy. Support from family/friends and partners has often been shown to be an important factor in achieving long-term cessation in the general population (Thompson et al., 2004) and research with pregnant smokers has indicated similar findings. Pregnant smokers themselves often acknowledge their partners as having an important influence over their smoking behavior (Thompson et al., 2004). In 2004, Thompson et al., found that pregnant women perceived the support from their partners to be greater than that of family and friends. Still, Dunn, Pirie, and Hellerstedt (2003) suggest that close female friends and relatives may be important sources of influence during pregnancy, especially for low-income women. In this study, close female friends were seen as the most valued advice-givers because of their first-hand experience with pregnancy in the context of reduced economic circumstances (Dunn, Pirie, & Hellerstedt, 2003). Advice and guidance from one’s husband or partner or close friends and family may help to shape and modify smoking-related risk factors (Dunn, Pirie, & Hellerstedt, 2003). The influence of social support is suggested in studies
demonstrating an increased likelihood of smoking cessation among women who have few or no smokers in their social network compared with those who socialize or live with a smoker (Aaronson, 1989; McBride & Pirie, 1990).

In addition to the supportiveness of one’s social network, recommendations that women receive from their health care provider regarding smoking is another factor that appears to play a role in whether or not they smoke during pregnancy. Pregnancy is one of the few times in a woman’s life that she has regular contact with a health care provider who can give smoking cessation recommendations and counseling. Smoking cessation intervention by prenatal care providers can decrease the number of pregnant women who smoke by 30-70%, and the intensity of the intervention directly affects the probability of cessation (Melvin & Gaffney, 2004; Dolan-Mullen, Ramirez, & Groff, 1994). Although, studies suggest that information alone may lead to greater levels of anxiety, stress, and guilt in patients (Maclaine & Macleod-Clark, 1991; Price et al., 1991). In one study of low-income pregnant smokers, healthcare professionals were perceived as providing unrealistic ‘textbook’ knowledge, oriented to an ideal set of conditions (Dunn, Pirie, & Hellerstedt, 2003). In another study, it was shown that brief interaction with health professionals by pregnant smokers may be completely dismissed by socially disadvantaged women because these exchanges are perceived as impersonal and do not explain the effects of smoking within the context of the realities of pregnancy (Dunn, Pirie, & Hellerstedt, 2003). Nichter et al., (2007) found that smoking cessation messages from providers were general and were not followed by
specific advice about how to quit. Several women in this study also stated that they had been told by their doctor that stress was equally bad for the fetus as smoking, a message that the women interpreted to mean that it was alright to smoke – as long as they didn’t smoke too much.

Health care providers play an important role in making cessation recommendations and counseling, but also in the education of their patients about the dangers of smoking during pregnancy. A woman’s knowledge of the effects of smoking on herself and her baby affect consideration when encouraging cessation. In a study of the general population, Brownson et al. (1992) found individuals with lower educational levels, women, older respondents, and current smokers to be the least knowledgeable about the effects of smoking on health. In 2001, Arnold et al. (2001) found that pregnant women with the lowest reading levels were the least knowledgeable about the health effects of smoking and were the least concerned about the health effects of smoking on their baby. Hotham, Atkinson, & Glibert (2002) found that pregnant smokers in Australia had significant skepticism about smoking-related harm to the fetus. In an ethnographic study of 53 low income pregnant smokers, Nichter et al., (2007) reported that the risk of having a low-birth weight baby was not a major concern to women in their sample, and statements such as “smoking is bad for the baby” and “baby will be low birth weight” did more to make women feel guilty about themselves, implying that they are knowledgeable about the health risks of smoking but are not motivated enough to stop smoking.
In order to assist women in smoking cessation during pregnancy, it is important to identify all women who are smoking during pregnancy, not just the women who self-report to be non-smokers. Recently, increased attention has been paid to smoking in the media, public places, and worksites, causing individuals to become sensitized to the socially desirable form of smoking behavior: non-smoking (Britton, Brinthaupt, Stehle & James, 2004). Therefore, smokers may be more likely to exaggerate the extent to which their behavior conforms to the perceived social norm of non-smoking. With increasing education regarding the hazards of smoking during pregnancy, patient denial of smoking may represent a socially desired response rather than true non-smoker status (Britton, Brinthaupt, Stehle, & James, 2004). A meta-analysis of 26 published studies of 51 comparisons in non-pregnant populations shows that self-reports of smoking have high levels of sensitivity and specificity (Patrick et al., 1994). Many recent studies have questioned the validity of self-reported smoking status in pregnant women and have reported significant misclassification rates, with sensitivity values from 62% to 92.6% (average value: 75.2%) (Albrecht et al., 1999; Boyd et al., 1998; Ford et al., 1997; Markovic et al., 2000; Walsh, Redman, & Adamson, 1996). As demonstrated by the aforementioned studies, the self-deception rate among pregnant women is higher than the general population, therefore, it is important to confirm smoking status with a biochemical marker in combination with self-report, when researching smoking behavior during pregnancy.
Given that pregnant women are concerned about fetal well-being, and that pregnant women also repeatedly visit prenatal care clinics during pregnancy, it has been suggested that pregnancy may be an ideal time for smoking intervention and cessation (Cnattingius, 2004). The benefits of helping pregnant women stop smoking are numerous, one of which is the economic cost. Smoking during pregnancy carries a heavy financial burden. Health care costs at delivery for problems caused by smoking during pregnancy totaled about $366 million in the United States (Adams et al., 2002). Nearly two-thirds of this amount—$228 million—was for babies born to mothers on Medicaid and about $54 million was for babies born to teenagers (MMWR, 2001). Maternal smoking has been shown to increase the relative risk of admission to the Neonatal Intensive Care Unit (NICU) by almost 20% (Adams et al., 2002). Every $1 spent on smoking cessation for pregnant women could save about $3 in reduced neonatal intensive care costs (Adams et al., 2002).

Many studies have examined the influence of social support on smoking during pregnancy, but few have investigated social support among rural populations. This researcher has not found any studies comparing the social support of urban versus rural pregnant smokers. There is insufficient research on the nature of healthcare provider recommendations for pregnant smokers in rural areas where smoking rates are high. It might be assumed that pregnant women have knowledge of the health effects of smoking during pregnancy because of non-smoking social norms, but this may not necessarily hold true, especially in a rural area. Very few studies look specifically at the knowledge that pregnant
women possess of the health effects of smoking during pregnancy. It is well-documented in the literature that self-reported smoking status among a pregnant population is an inadequate indicator of true smoking status; therefore, biochemical confirmation of smoking status is needed. No current studies have evaluated biochemically confirmed smoking status in combination with self-reporting in a comparison of urban and rural populations.

Therefore, the current study was undertaken in order to answer questions regarding health care provider recommendations, knowledge of the health risks of smoking during pregnancy, the efficacy of the HBM in predicting smoking behavior/beliefs, and bio-confirmed smoking status in urban and rural pregnant populations.

**Statement of Purpose**

The purpose of this study is to investigate the influences of smoking on rural and urban pregnant women. More specifically, the variables of the knowledge of the adverse effects of smoking on health, health care provider recommendations, and subscores from the HBM will be explored in relation to the smoking behavior of pregnant women. A secondary purpose is to investigate the accuracy of self-reported smoking during pregnancy using biochemical validation.

**Research Questions**

- What proportion of pregnant smokers are truthful about their current smoking status?
• What knowledge do pregnant women have about the health risks associated with smoking during pregnancy?

• What percentage of healthcare providers are making recommendations about smoking during pregnancy according to the 5A’s approach? Are these recommendations in compliance with current clinical guidelines?

• What social support member(s) are the most influential on smoking status for pregnant women?

• Can smoking status be predicted by a linear composite of the following variables: total knowledge score, subscores of the Health Belief Model and healthcare provider inquiry of smoking status?

Hypotheses

• Rural women will be more truthful than urban women about their current smoking status.

• Rural women will rely on different sources of social support than urban women.

• Rural women will have less knowledge about the health effects of smoking during pregnancy, than urban women.

• Rural health care providers will give fewer recommendations regarding smoking than urban health care providers.

• The majority of health care providers will verbally inquire about smoking status but few will perform the recommended 5A’s.
• The spouse/partner will be the social support member that is most influential to the smoking status of a pregnant woman.

• A linear composite of the following will predict smoking during pregnancy: knowledge of the health effects of smoking during pregnancy, social support, subscores of the HBM, and health care provider recommendations.
Chapter 2

This chapter is a review of the existing scientific literature dealing with the questions that this study attempts to investigate further, specifically the extent of women's knowledge of the health effects of smoking while pregnant, the role that social support plays in whether women choose to smoke or not smoke during their pregnancy, and the influence of their healthcare provider in this area. The literature related to smoking and pregnancy, biochemical validation of women's smoking status during pregnancy, the 5A’s and the Health Belief Model are also explored here.

The health consequences of smoking during pregnancy.

The problems associated with smoking while pregnant are well-documented, and the consequences are far-reaching. The U.S. Surgeon General found a causal relationship between cigarette smoke and fetal growth problems, low birthweight, pre-term delivery, SIDS, and other infant problems. (U.S. Department of Health and Human Services, 2004) In 2005, Mathews and MacDorman found that babies born to mothers who smoked had a substantially higher rate of infant mortality than babies born to mothers who did not smoke (10.69 per 1,000 and 5.96 per 1,000, respectively) (2008). Smoking during pregnancy can harm the health of both a woman and her unborn baby. At last count, 10 percent of women in the United States smoke during pregnancy, but in Kentucky the rate is 26 percent (Martin et al., 2006; KIDS Count, 2008). Rates of smoking during pregnancy in Kentucky vary significantly by race with 29 percent of white women reporting smoking during pregnancy compared to 19 percent of
black women and 3 percent of Hispanic women (CDC, 2008). The CDC found no improvement from 2004 to 2006 in the percent of births to mothers in Kentucky who reported smoking during pregnancy (CDC, 2008).

Cigarette smoke contains more than 2,500 chemicals. It is not known for certain which of these chemicals are harmful to the developing baby, but both nicotine and carbon monoxide play a role in causing adverse pregnancy outcomes. Chemicals including nicotine, cyanide, and carbon monoxide pass through the placenta into the fetal blood supply and constrict the oxygen flow to the growing infant’s body (Mathews & MacDorman, 2008). The risk of respiratory infections and allergic immune responses in infants also increases when a pregnant woman smokes (Mathews & MacDorman, 2008).

Maternal smoking has serious detrimental effects on the health of the fetus. The effects of maternal smoking on birth weight have been known for many years. Simpson reported in 1957 that infants born to mothers who smoked 10 cigarettes or more per day weighed on average 200g less than infants born to non-smokers. More recent studies have found that the smoking-related reduction in birth weight is due to fetal-growth restriction. Another indicator of fetal-growth restriction is inadequate weight gain during pregnancy. Smokers gain less weight during pregnancy compared with non-smokers (Spinillo et al., 1994; Wen et al., 1990). In 1994, Spinillo and colleagues found that even after adjustment for pregnancy weight gain, maternal smoking increased the risk of low birth weight births. Besides low birth weight caused by fetal-growth restriction, pre-term birth is one of the most common health effects of maternal smoking.
Pre-term birth is most commonly defined as a birth occurring at least 4 weeks before the estimated date of delivery and is the major cause of neonatal mortality and morbidity in developed countries (Cnattingius, 2004). The relative risk of pre-term birth among smokers, compared to non-smokers generally ranges from 1.2 to 1.6 (USDHHS, 2001). Smoking appears to increase the risk of having both very (less than 32 weeks) and moderately (32-36 weeks) pre-term infants (Kyrklund-Blomberg & Cnattingius, 1998). Smoking is reported to increase the risk of both spontaneous and elective pre-term delivery, but the association is stronger with spontaneous pre-term delivery (Kyrklund-Blomberg & Cnattingius, 1998).

Smoking is also related to an increased risk of perinatal mortality and preterm birth. Preterm birth has been defined as a live birth before 37 completed weeks of gestation (ACOG, 2005). Repeatedly, smoking has been found to be directly associated with stillbirth and neonatal mortality. A study conducted in Norway found that smoking had the strongest association with risk of unexplained stillbirth (Froen et al., 2001). Maternal smoking during pregnancy has also been primarily associated with increased risk of oral-facial clefts with the association being confirmed in a meta-analysis.

Premature and low-birth weight babies face an increased risk of serious health problems during the newborn period, chronic lifelong disabilities (such as cerebral palsy, mental retardation and learning problems) and even death. The more a pregnant woman smokes, the greater her risk of having a low-birth weight baby. However, if a woman stops smoking even by the end of her second
trimester of pregnancy, she is no more likely to have a low-birth weight baby than a woman who never smoked (ACOG, 2005).

Smoking not only causes serious health problems for the fetus, but can also cause pregnancy complications. Smoking cigarettes doubles a woman’s risk of developing placental problems which include placenta previa and placental abruption (US DHHS, 2001). The twofold risk of placental problems due to smoking has a dose-response increase with the amount of cigarettes smoked (US DHHS, 2001). In pregnancies complicated with placental abruption, smoking has been associated with increased risk of perinatal death (Kyrklund-Blomberg & Cnattingius, 1998). Placenta previa and placental abruption can result in very heavy bleeding during delivery which can endanger mother and baby (Cnattingius, 2004). There is also an elevated smoking-related risk of premature rupture of the membranes (PROM) or leakage of amniotic fluid occurring before 37 weeks gestation which commonly leads to a premature delivery (Cnattingius, 2004).

A woman’s fertility is also affected by smoking, and can cause reproductive problems even before a woman becomes pregnant. Studies have shown that women who smoke may have increased difficulty in conceiving compared to non-smokers (US DHHS, 2001). Interestingly, studies have also shown that fertility returns to normal after a woman stops smoking which shows a direct relationship between ability to conceive and smoking behavior (US DHHS, 2001).
In 2003, Law and colleagues found that babies of mothers who smoked during pregnancy undergo withdrawal-like symptoms similar to those seen in babies of mothers who use some illicit drugs. These babies appear to be more jittery and difficult to soothe than the babies of non-smokers. Studies have also consistently shown that babies whose mothers smoked during pregnancy are at an increased risk of dying from SIDS. The babies of women who smoked during pregnancy are up to three times as likely to die from SIDS as babies of non-smokers (CDC, 2005). Prenatal and postnatal smoking exposure has been established as a risk for SIDS (Anderson & Cook, 1997).

Smoking during pregnancy has many harmful effects during and after pregnancy. However, many pregnant women that smoke during pregnancy do not tell their healthcare provider that they are smoking. Self-reported smoking status has been widely used to assess the detrimental effects of smoking and to learn about effective cessation counseling and preventive interventions. Self reporting, however, can be unreliable if the subject is under pressure because of social or medical disapproval (Rebagliato, 2002). With increasing education regarding the hazards of smoking during pregnancy and increased societal disapproval of smoking, self-reported smoking status may represent a socially desired response rather than true non-smoking status. Therefore, an objective validation of smoking status is necessary. The preferred biochemical marker of smoking status validation is the measurement of cotinine in human fluids such as urine, blood, and saliva (Britton et al., 2004).
Biochemical validation of smoking status during pregnancy.

Cotinine is a major metabolite of nicotine and is considered the best measure of nicotine consumption (Perez-Stable, Benowitz, & Marin, 1995). Cotinine is a metabolite of nicotine and has a half-life of about 20 hours in non-pregnant people, which makes it a stable indicator of tobacco exposure over the previous 2-3 days, and is not altered by environmental variables (Rebagliato, 2002). Many different cotinine cut-off levels have been used to differentiate smokers from non-smokers (14.2-30 ng/ml); however, these cut-off levels were established using men and non-pregnant populations (Haley, Axelrad, & Tilton, 1983). In 2002, researchers found that pregnant women have an accelerated cotinine metabolism compared to non-pregnant women (Dempsey, Jacob, & Benowitz, 2002). Rebagliatio et al., studied the difference in saliva cotinine during and after pregnancy in a sample of Spanish pregnant smokers and found that cotinine per cigarette ratio during pregnancy was significantly lower than the ratio in post-natal cotinine testing (1998). In 2007, a Danish study using saliva cotinine samples recommended that the optimum cut-off level to establish current smoking status in a pregnant population is 13 ng/ml (Hegaard et al., 2007). In 2002, the Society for Research on Nicotine and Tobacco’s (SRNT) Subcommittee on Biochemical Verification established the saliva cotinine cut-off level to distinguish smokers from non-smokers in pregnant women at 10ng/ml. For the purposes of this study, the cut-off level of 10 ng/ml established by SRNT will be used to biochemically determine if a pregnant participant is a smoker or non-smoker.
Biochemical validation methods have been recommended for bio-confirmation of smoking status in pregnant women because of the high rates of deception during prenatal care due to the social desirability of a non-smoking response (Windsor, Woodby, Miller et al., 2000). Two evaluation research studies of Medicaid-supported pregnant women that included self-report and cotinine analysis found overall smoking deception rates from 24% (Windsor et al., 2000) to 50% (Kendrick et al., 1995). A meta-analysis of 26 published reports of 51 comparisons in non-pregnant populations suggests that self-reports have high levels of sensitivity (probability of positive test results confirming self-reported smoking status) and specificity (probability of negative test results confirming self-reported non-smoking status) (Patrick et al., 1994). More recent studies have reported significant misclassification rates in pregnant populations with sensitivity values ranging from 86.2% to 86.5% and specificity values from 62% to 92.6% (Britton et al., 2004).

As evidenced by these studies, the self-deception rate among pregnant women is higher than the general population because of their desire to provide the socially desirable non-smoking response. The integrity of self-reported smoking status varies according to the population and social context in which the data are collected (Britton et al., 2004). In 2000, Shaffer and Lia-Hoagberg reported four factors that influence an individual’s responses to questions about smoking status: “characteristics of the individual respondents, the method and setting of the encounter, cognitive demands imposed by the question, and the motivation of the respondent as mediated by the social desirability of the subject.
of inquiry”. The social context in which data are collected is an important factor to consider when considering the self-deception rates of a pregnant, rural population. Britton et al., found that geographic and regional differences have an impact on the “social patterning of smoking behavior” and further establishes the unreliability of self-reported smoking status in the pregnant, rural population (2004).

International studies have shown that, with increased awareness of the risk of smoking, a pregnant woman who is unable to stop smoking may choose not to reveal that she is a smoker, or to report that she smokes less than she actually does to avoid harassment from her healthcare provider. Pregnancy is a unique opportunity for physician-recommended smoking cessation because of the frequency of healthcare provider and patient contact during pre-natal care. Smoking cessation intervention by prenatal care providers can decrease the number of pregnant women who smoke by 20-30%, and the intensity of the intervention directly affects the probability of cessation (Hartmann et al., 2007).

**Healthcare provider recommendation.**

Several decades of behavioral research have led to effective smoking cessation strategies and the development of evidence-based clinical guidelines for smoking cessation intervention including five key components, termed the 5A’s. The 5A’s are to be performed during a 5-15 minute counseling session performed by appropriately trained health-care providers. This method has been shown to be the most effective with pregnant women who smoke less than 20 cigarettes per day (Fiore et al., 2000). The 5A’s intervention is most appropriate
for use during routine prenatal office visits and includes five steps: Ask, Advise, Assess, Assist, and Arrange (ACOG, 2005). This intervention is adapted from the U.S. Public Health Service clinical practice guideline, “Treating Tobacco Use and Dependence” (Fiore et al., 2000). The 5A’s intervention is the recommended clinical practice standard for counseling pregnant women about smoking cessation established by the American College of Obstetricians and Gynecologists (ACOG) in 2005.

The first key component of the 5A’s is Ask. The healthcare provider should ASK about and document the smoking status of all patients at every visit. Providers should ask the patient to choose a statement that best describes her smoking status from a list of statements on smoking behavior. This multiple choice method is more likely to elicit an accurate response than asking a question that requires a simple “yes” or “no” answer (ACOG, 2005). The second component of the 5A’s is Advise. The healthcare provider should advise patients who smoke to stop by providing clear, strong advice to quit with personalized messages about the benefits of quitting and the impact of continued smoking on the woman, fetus, and newborn. The healthcare provider should congratulate patients who report having stopped smoking and affirm their efforts with a statement about the benefits of quitting (ACOG, 2005). The third component of the 5A’s is Assess. The healthcare provider should assess the patient’s willingness to attempt to quit smoking within the next 30 days. If the patient is willing to try to quit within the next 30 days, then the provider can move to the next step. However, if the patient is unwilling to try to quit within the next 30 days,
the provider may consider having a brief discussion with the patient to educate and reassure her about quitting (Fiore et al., 2000). Quitting advice, assessment, and assistance should be offered at subsequent prenatal care visits (ACOG, 2005). The fourth component of the 5A’s is assist. The healthcare provider should assist patients who are interested in quitting smoking by providing pregnancy-specific, self-help smoking cessation materials. The healthcare provider should enhance the patient’s problem solving skills by asking when and where she typically smokes and suggesting how she might avoid these situations that trigger the desire to smoke. The healthcare provider should offer support on the importance of having a smoke-free space at home, seeking out a “quitting buddy”, and understanding nicotine withdrawal symptoms such as irritability and cravings. The provider may also refer the patient to a smoker’s quitline (ACOG, 2005). The last component of the 5A’s is Arrange. The healthcare provider should arrange follow-up visits with the patient to track the progress of the patient’s attempt to quit smoking. For current and former smokers, smoking status should be monitored throughout pregnancy, providing opportunities to congratulate and support success, reinforce steps taken toward quitting, and advise those still considering a cessation attempt (ACOG, 2005). When used properly, the 5A’s method has improved smoking cessation rates by 30-70% compared with rates achieved by more traditional physician advice (Chapin & Root, 2004).

A review of the literature found several studies that specifically examined the smoking cessation counseling practices of obstetrician/gynecologists’ (OB-
These studies show that most obstetricians/gynecologists do a good job of implementing the first two steps of the 5A’s method (ask and advise) but do not do as well implementing the last three steps (assess, assist, and arrange). Most OB-GYNs ask their patients about their current smoking status, less than half of them follow all the current ACOG clinical guidelines (Melvin & Gaffney, 2004). In 1998, ACOG conducted a national survey of 1000 obstetricians in the United States. Most of the respondents reported that they asked their patients about tobacco use at the first prenatal visit (98%), discussed the adverse effects of tobacco use (95%), and advised smoking cessation (95%). A little more than half (56%) of respondents assisted their patients who smoke with the development of a quit plan, and about a third (35%) provided their smoking patients with self-help materials (Floyd et al., 2001).

In Texas, a study of OB-GYNs was conducted and revealed that 95% reported taking a smoking history of most of their patients (Mullen et al., 1998). However, only 65% reported counseling most of their patients that self-report as smoking, only 51% brought the subject of smoking up at follow-up appointments, 30% provided educational materials, and 17% referred their patients to smoking cessation programs (Mullen et al., 1998). In 2001, a study was conducted with 130 OB-GYNs in Alabama that revealed similar findings. Nearly all (93%) OB-GYNs took smoking history information from their pregnant patients and 90% advised pregnant smokers to quit (Grimley et al., 2001). However, only 28% assisted their pregnant smokers with quitting, and even fewer (24%) arranged for follow-up of their pregnant patients who smoke (Grimley et al., 2001). Helwig et
al., found that 98% of the OB-GYNs discussed smoking with their patients at their initial prenatal visits, but only 15% brought up smoking at all prenatal visits, and 18% referred pregnant patients to smoking cessation programs (1998). In Ohio, a study of 125 OB-GYNs revealed that the majority (62%) felt that offering brief smoking cessation advice to pregnant patients was of significant value (Jordan et al., 2006). These OB-GYNs were asked to self-identify their behavior as it directly related to their use of the 5A’s model: “Ask: A majority (98%) of physicians reported always asking their patients about their smoking status. Advise: 66% reported always giving their pregnant smokers clear, strong, and personalized messages to quit smoking. Assess: 42% of physicians reported always assessing whether their pregnant smokers were willing to make a quit attempt. Assist: 29% of respondents reported always suggesting and encouraging the use of problem-solving methods and skills for cessation; 17% always provided pregnancy-specific, self-help materials; 13% always provided for or helped to arrange social support to help the patient quit smoking. Arrange: 6% of physicians reported always scheduling a follow-up contact by phone or in person during the week of the quit day, and 6% helped arrange smoking cessation services from outside agencies” (Jordan et al., 2006). These physician participants were more likely to implement the first two steps (ask and advise) of the 5A’s method than the last 3 steps (assess, assist, and arrange). The authors of the study reported that there may be four possible explanations for the lower levels of implementation of the last three steps of the 5A’s method (Jordan et al., 2006). First, it is possible that some physicians did not believe in the
effectiveness of recommended smoking cessation methods, some physicians may not have believed that maternal smoking during the prenatal period causes severe negative health consequences for the unborn child, still other physicians may feel that explaining the dangers of smoking and referring patients to smoking cessation programs were the most effective in helping patients, and finally, some physicians may not feel that they have the time to do all that is recommended in the last three steps of the 5A’s (Jordan et al., 2006).

Many health-care providers feel that there are barriers to providing smoking cessation treatment or counseling for their patients. The most common barriers cited by physicians include lack of reimbursement, lack of time, lack of training, lack of readily available resources, competing demands on their time for other medical problems, and inertia (Grimley et al., 2001). Jordan et al. found that the two most common barriers to discussing smoking cessation with pregnant patients were lack of time (10%) and not knowing where to send patients for treatment (10%). Other identified barriers included: the perception that pregnant smokers are not responsive to physician’s advice about cessation (7%), lack of reimbursement for cessation services (6%), and previous failures in persuading pregnant patients to quit smoking (6%). The way that physicians treat tobacco use seems to be connected to their knowledge of and experience with smoking cessation methods and their views about the importance of tobacco use as a health-care priority (Bonollo et al., 2002).

Many pregnant women feel that their healthcare providers tell them to quit smoking as a clinical formality, not out of genuine concern for their health or the
health of their babies. In 2002, investigators in Australia found that pregnant women were cynical about their health care provider’s advice to quit smoking, as they perceived it to be influenced by the care provider’s own smoking status (Hotham, Atkinson, & Gilbert, 2002). The pregnant women did not have positive perceptions of the smoking cessation counseling initiated by their healthcare provider and reported that if they told the healthcare provider they had cut back, it usually guaranteed no further mention of smoking (Hotham, Atkinson, & Gilbert, 2002). Also, it is interesting to note that pregnant women felt that reporting they smoked five cigarettes a day was the magic number that would keep their healthcare provider from pressing them about smoking cessation (Hotham, Atkinson, & Gilbert, 2002). These women were surprised at the lack of follow-up about their smoking status from their healthcare provider, and indirectly blamed the healthcare provider for not continuing to encourage smoking cessation. The perception that ‘cutting down’ the number of cigarettes smoked was acceptable to the healthcare provider gave ambivalent messages to the pregnant woman about the seriousness of the health effects of smoking during pregnancy (Hotham, Atkinson, & Gilbert, 2002). Nichter et al., found that pregnant women felt the advice to quit smoking from their healthcare provider was not helpful because they were not given concrete information on how to actually quit smoking, and the doctor’s advice only caused more stress and made them feel worse about their smoking and about themselves, and was not an impetus to change (2007). Women in the study also reported receiving mixed messages about quitting smoking during pregnancy because some women were told by
their healthcare provider that they could stop trying to quit smoking because the stress could be more harmful to the fetus than the nicotine from the cigarettes (2007). Several women noted that it was “just a policy” for the healthcare provider to ask about current smoking status and give the pregnant woman a pamphlet, an approach that appears to be highly impersonal (2007). Nichter and colleagues found that women used a “hierarchy of perceived risk” with some women more concerned about the immediate impact of stress on the fetus than about the long-range consequences of smoking on the baby or themselves.

Knowledge of the health risks of smoking during pregnancy.

One of the factors that is most influential in whether a woman continues to smoke or stops smoking while pregnant is their knowledge about the health effects of smoking. Few studies have focused on the level of knowledge that pregnant women have about the health effects of smoking. It is assumed in many studies that, due to increased knowledge among the general public about the health risks of smoking, pregnant women will also have a high level of knowledge. A 1992 study of a non-pregnant, low-income population showed that the majority of respondents (88.4%) believed that smoking is harmful to health (Brownson et al., 1992). Current smokers were significantly less likely than those who had never smoked to acknowledge the health effects of smoking (OR= 0.5), and less educated respondents were less likely to acknowledge the health benefits of quitting (Brownson et al., 1992). Knowledge of the harmful health outcomes of smoking and knowledge that it is a cause of emphysema, heart disease, and lung cancer was generally lower among older respondents, women,
less-educated participants, and current smokers (Brownson et al., 1992). Current smokers are significantly less likely than non-smokers or former smokers to acknowledge the harmful effects of smoking. Lack of knowledge or unwillingness to acknowledge the health risks of smoking are major barriers to smoking cessation.

**The Health Belief Model.**

An individual needs to feel susceptible to a health risk prior to changing their behavior, and as Brownson et al. demonstrates, current smokers are less likely than those who have never smoked to acknowledge the dangers of smoking, especially smoking during pregnancy (1992). The behavior change theory, the Health Belief Model (Janz & Becker, 1984) posits that individuals will take action to ward off, to screen for, or to control an ill-health condition if they regard themselves as susceptible to the condition, if they believe it to have potentially serious consequences, if they believe that a course of action available to them would be beneficial in reducing either their susceptibility to or the severity of the condition, and if they believe that the anticipated barriers to (or costs of) taking the action are outweighed by its benefits. Tiedje et al. reported that through confirmatory factor analysis the subscales of the HBM that were most consistent in predicting maternal smoking behavior were perceived susceptibility, seriousness, benefits and barriers.
Table 1

The Health Belief Model

<table>
<thead>
<tr>
<th>Concept</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Perceived susceptibility</td>
<td>Beliefs about the chances of getting a condition</td>
</tr>
<tr>
<td>Perceived severity</td>
<td>Beliefs about the seriousness of a condition and its consequences</td>
</tr>
<tr>
<td>Perceived benefits</td>
<td>Beliefs about the effectiveness of taking action to reduce risk or seriousness</td>
</tr>
<tr>
<td>Perceived barriers</td>
<td>Beliefs about the material and psychological costs of taking action</td>
</tr>
<tr>
<td>Cues to action</td>
<td>Factors that activate “readiness to change”</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>Confidence in one’s ability to take action</td>
</tr>
</tbody>
</table>

Research conducted among 2,785 non-pregnant patients of community-based family practitioners found that smokers were more likely to perceive a heightened risk of heart attack, cancer, and stroke than non-smokers (Strecher, Kreuter, & Kobrin, 1995). However, a much larger proportion of smokers compared to non-smokers tended to underestimate their actual risk of a heart attack, cancer, and stroke. Strecher, Kreuter, and Kobrin combined the HBM components of susceptibility to smoking-related illness from continued smoking with susceptibility to illness from quitting smoking (a susceptibility/benefit measure) in a study of smokers who were patients at the Veterans Administration. This susceptibility/benefit measure was strongly associated with a desire to quit smoking, and interacted with a measure of self-efficacy in predicting subsequent smoking cessation. Strecher and colleagues found that health beliefs were not
associated with cessation among smokers who considered their habit to be an addiction (1995).

Barriers to quitting smoking can include fear of stress or anxiety when refraining from cigarettes, weight gain, and pressure from other smokers to relapse (Stretcher, Kreuter, & Kobrin, 1995). Nichter et al. found that in low-income pregnant populations, smoking was used as a form of self-medication in order to cope with the stress in their lives. Many women gave up other forms of self-medication while pregnant (i.e. alcohol use) and used smoking as their primary form of coping and are unable to quit (2007). For the women in Nichter’s study, smoking was commonly spoken about as a resource that helped one manage and absorb anger about those trying to infringe on the small amount of autonomy they had. These women repeatedly asserted that smoking was a refuge for them, a place that they could retreat to when things got bad, and they felt that asking them to quit smoking was like asking them to give up their last coping strategy (Nichter et al., 2007).

Self-efficacy was added to the HBM in order to increase its explanatory power, and has been defined as the “conviction that one can successfully execute the behavior required to produce the outcomes” (Bandura, 1977). In the context of this study, self-efficacy refers to the assessment of one's ability to resist situation-specific temptations to smoke. For behavioral change to be successful, a person must feel competent (self-efficacious) in their ability to overcome perceived barriers to taking action. In a 2007 study of the smoking cessation processes of low-SES women, Crittenden et al. found that pregnancy
was associated with greater self-efficacy to avoid smoking in various high-risk situations (2007). The lack of self-efficacy is strongly related to the barriers component of the HBM, and Strecher and Rosenstock (1996) hypothesized that self-efficacy will be a stronger predictor of behavior change among those with a strong perception of threat and among those aware of the benefits of taking the recommended health action.

**Social support.**

Many studies have analyzed the HBM construct of the perceived benefits of smoking as associated with the health benefits of quitting smoking. However, it is important to view perceived benefits to include positive reinforcement from family and friends or social support. Social support is defined as including the structures of an individual’s social life (i.e. group memberships or existence of familial ties) and the more explicit functions they may serve (i.e. provision of useful advice or emotional support) (Uchino, 2004). Kahn and Antonucci (1981) explained social support as interpersonal transactions that include one or more of the following: the expression of positive affect of one person toward another; affirmation or endorsement of another person’s behaviors, perceptions, or expressed views; the giving of symbolic or material aid to another person. Social support can also include the actual supportive acts that are exchanged between individuals to a personality-like factor based in early interpersonal experiences that then influences how an individual views the likelihood that someone is supportive (Uchino, 2004). It has been shown that effective psychosocial resources, particularly social stability and social participation providing emotional
and instrumental support, have a protective effect by buffering the impact of life stress on the emotional well-being of the mother (Elsenbruch et al., 2007). In women of Mexican descent, social support may be one determinant of lifestyle habits and relevant health behaviors; including alcohol or tobacco use which adversely affects pregnancy (Harley & Eskenazi, 2006). Two predictors of smoking relapse after pregnancy are lack of social support and exposure to others’ smoking (Thompson et al., 2004).

A pregnant woman who has a partner or spouse that smokes was more than twice as likely to continue to smoke throughout her pregnancy, than a woman who has a partner or spouse that is a non-smoker (Severson et al., 1995). Also, the strongest predictor for smoking relapse after pregnancy was having a husband or partner that smokes (Severson et al., 1995). Ziebland and Mathews conducted a meta-analysis and found that compared to women without partners who smoke, women whose partners smoke were less likely to quit spontaneously; less likely to quit after taking part in a smoking cessation intervention; and more likely to relapse to smoking after the birth of their babies. Because the husband or spouse has such a significant effect on a pregnant woman’s smoking status, it is important to include them when considering how to assist pregnant women in smoking cessation.

Few studies address smoking cessation efforts directed at men whose partners are pregnant. A study conducted in Australia by Stanton and colleagues (2004) utilized the significant life event of the birth of a child, for participants, as a time of increased receptiveness to smoking cessation by the spouse/partner of
the pregnant woman. A brief minimal intervention was used targeting lower-income males with a pregnant partner, and established that an intervention accompanied with limited access to nicotine replacement therapy and reminder systems can increase the quit rate, compared with simply providing resources about smoking cessation (2004). Interestingly, marital status also plays an important part in the health behavior of a woman during pregnancy. Kiernan and Pickett found that health-related behaviors during pregnancy were worse among cohabitating mothers than married mothers (2006). A meta-analysis of nine cohort studies focusing on the determinants of smoking and cessation in pregnant women found that partner’s smoking status, along with socioeconomic status, level of education, and age at initiation of smoking were all important factors in determining a pregnant woman’s smoking status (Lu, Tong, & Oldenburg, 2001).

Expectant and new fathers who smoke may be optimally targeted for smoking cessation because of the life changes they are experiencing. However, Bottorff and colleagues found that men’s reliance on and commitment to dominant ideals of masculinity seemed to preclude them from viewing their partner’s tobacco reduction or cessation for pregnancy as an opportunity for quitting themselves. The authors of the study concluded that pregnancy is an excellent time for cessation interventions because it is a time when men experience discomfort with their smoking and when discontinuities in everyday life associated with their transition to fatherhood and the presence of a new baby provide opportunities for establishing new routines (Bottorff et al., 2006).
Thompson and colleagues conducted qualitative and quantitative studies about social support for smoking cessation during pregnancy and found that the majority of women indicated that their spouse or partner wanted them to stop smoking while pregnant (2004). This study also found that the partners were exerting some pressure on these pregnant women to quit smoking, however, women with partners who were current smokers felt they were receiving less pressure to quit smoking. There was little evidence that the partners of the pregnant women had changed their smoking behavior substantially since the pregnancy. In general, the partners supported the pregnant women’s smoking cessation, but only to a point, and did not alter their own smoking behavior. Most women felt that the most ‘support’ their partners could offer were “half-hearted attempts and token gestures to help the women reduce or stop smoking” (Thompson et al., 2004).

In a study of pregnant smokers in southern Appalachia, Bailey found that living with a smoker or having a partner who smoked was not predictive of continued smoking throughout pregnancy and may not be as important to cessation if smoking occurs everywhere else the woman goes, and is a social norm (2006). Most of the women in this study knew and spent time with many smokers, even if they did not live with one. This study demonstrated the importance and influence of family and friends, especially in a rural Appalachian population, on smoking status during pregnancy. Qualitative research by Dunn et al. suggested that close female friends and relatives may be important sources of influence during pregnancy for low-income
women (1998). In this study, close female family/friends were described as the most valued advice-givers because they had first-hand knowledge about pregnancy in the context of reduced economic circumstances. These women may also have a profound influence on perceptions and attitudes about smoking during pregnancy, and may be powerful sources of misconceptions that support continued smoking (1998). Serving as potential role-models to the pregnant women, close women may help to shape and modify risk factors, such as social norms and dimensions of social support related to providing advice and guidance. A subsequent study of low-income pregnant smokers and the role of advice-giving female friends and family found that confidantes (female family members and friends that provided advice about pregnancy-related issues) were more persuasive than the women’s partners on pregnancy-related issues and at least as persuasive as partners on smoking-related issues (Dunn et al., 2003).

Schaffer and Lia-Hoagberg found that the relationships of friend, mother, and sister were the most commonly identified sources of social support for low-income women (1997). Giving advice and social support are highly integrated functions, highlighting the important role that friends and family play in determining a pregnant woman’s smoking status. Women who trust their confidante’s experience may be less motivated to quit smoking during pregnancy if their confidante smoked during pregnancy without observable or serious consequences to pregnancy outcomes (Dunn et al., 2003). This research showed that smoking interventions may be more salient to the needs of low-
income pregnant women when focused on the relationship between women and their confidantes rather than women and their partners.

The study by Nichter et al. of low-income pregnant smokers showed that the support networks of these women were so volatile and unstable that when asked about sources of support for whom they could count on, many of the respondents could only name their own young children. Familial support of these low-income pregnant women was not without frustration and cost, living in households on the margin and having a relatively powerless role in decision-making for themselves and their children, especially in terms of smoking. In this study, social networks had an important impact on a woman’s ability to quit or reduce smoking during pregnancy (2007). Although social support is typically assumed to be positive, like Dunn et al., Nichter and colleagues found that many women reported that they received contradictory messages about smoking, even from close family members who offered positive social support in other contexts.

Thompson et al. concluded that support from family and friends was considered to be high and that women reported that the influence of family and friends on their smoking was marginal. These women felt that their friends/family ignored the topic of their smoking and avoided discussing it. This study also showed that some family members and close friends did not alter their smoking behavior in the presence of these pregnant women, further indicating that their actions did not support the smoking cessation of these pregnant women (2004).
Cigarette smoking has been shown to be harmful to the pregnant woman and her baby, therefore, the current study was undertaken to investigate the factors contributing to the smoking status of rural and urban pregnant women.
Chapter 3

Participants

The study population included 71 (35 from each site) women receiving pre-natal care at clinics in Morehead at UK Morehead Women’s Health and in Louisville at the Family Health Centers. The study sample total of 70 was taken from a common rule that behavioral studies should have at least 30 participants in each group. The number of participants was also limited by the high cost of biochemical verification analysis. All pregnant women receiving pre-natal care at these clinics were eligible to be recruited by the researcher and invited to participate in the study while at the clinic. Women under 18 were excluded from participation in the study. Also, women who could not read or understand English were excluded from the study.

UK Morehead Women’s Health Care was established in January 2009 as a partnership between UK HeathCare and St. Claire Regional Medical Center. There are three OB-GYN health-care providers in the practice, Dr. Gordon Crozier, Dr. Stephen Mitchell and Nurse Midwife Mary Dowling. Prior to the opening of the UK Morehead Women’s Health Care practice, all three health care providers were long-time partners of St. Claire Family Medicine which is a regional pre-natal referral center in northeastern Kentucky. Patients have continued to be referred to UK Morehead Women’s Health Care through St. Claire Family Medicine. St. Claire Regional Medical Center is the largest rural hospital in northeastern Kentucky and serves a population of over 160,000 in
Bath, Carter, Elliott, Fleming, Lewis, Magoffin, Menifee, Montgomery, Morgan, Rowan, and Wolfe counties.

Family Health Centers, Inc. is located in Louisville, Kentucky, and provides specialized health care services to more than 43,000 patients annually through their seven locations (Portland, Phoenix, East Broadway, Iroquois, Americana, Southwest, and Fairdale). Three Family Health Center (Portland, East Broadway, and Iroquois) locations were used to collect data for the purposes of this study. The Family Health Centers provide health services to all regardless of their ability to pay.

These two sites (Louisville and Morehead) were selected for this research because of their urban and rural orientation. The urban/rural status of these counties was determined through the use of the 2003 Rural-Urban Continuum Codes, established by the U.S. Census. Rural-Urban Continuum Codes form a classification scheme that distinguishes metropolitan (metro) counties by the population size of their metro area, and nonmetropolitan (nonmetro) counties by degree of urbanization and adjacency to a metro area or areas. The metro and nonmetro categories have been subdivided into three metro and six nonmetro groupings, resulting in a nine-part county codification.
Table 2

2003 Rural-Urban Continuum Codes

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td></td>
<td>Metro Counties:</td>
</tr>
<tr>
<td>1</td>
<td>Counties in metro areas of 1 million population or more</td>
</tr>
<tr>
<td>2</td>
<td>Counties in metro areas of 250,000 to 1 million population</td>
</tr>
<tr>
<td>3</td>
<td>Counties in metro areas of fewer than 250,000 population</td>
</tr>
<tr>
<td></td>
<td>Nonmetro Counties:</td>
</tr>
<tr>
<td>4</td>
<td>Urban population of 20,000 or more, adjacent to a metro area</td>
</tr>
<tr>
<td>5</td>
<td>Urban population of 20,000 or more, not adjacent to a metro area</td>
</tr>
<tr>
<td>6</td>
<td>Urban population of 2,500 to 19,999, adjacent to a metro area</td>
</tr>
<tr>
<td>7</td>
<td>Urban population of 2,500 to 19,999, not adjacent to a metro area</td>
</tr>
<tr>
<td>8</td>
<td>Completely rural or less than 2,500 urban population, adjacent to a metro area</td>
</tr>
<tr>
<td>9</td>
<td>Completely rural or less than 2,500 urban population, not adjacent to a metro area</td>
</tr>
</tbody>
</table>

(US Census, 2003)

Louisville is located in Jefferson County which was established by the 2003 Rural-Urban Continuum Code as a “county in a metro area of 1 million population or more”. Morehead is located in Rowan County which was designated as an “urban population of 2,500 to 19,999, not adjacent to a metro area”. Dr. Crozier and his partners have many patients from the counties surrounding Rowan County, which are all considered to be completely rural and it was assumed that all of the participants from Morehead would be from a nonmetro county. The Family Health Centers are located in Louisville and serve an urban population. Therefore, it is anticipated that the participants from Louisville would be from a metro county.

In 2001, Kentucky had the highest percentage (26%) of births to mothers who reported smoking during pregnancy in the U.S. (CDC, 2001). In Jefferson County, 18% of women who gave birth in 2006 reported that they smoked during
pregnancy. Significantly more women reported smoking during pregnancy in Rowan County (31%) in the same year. The counties surrounding Rowan have considerably higher percentages of reported smoking during pregnancy, with 31% in Lewis County and as high as 59% in Menifee County. Anecdotally, both clinics have reported that they have a high proportion of patients that smoke during pregnancy.

Permission to conduct research at the two sites was granted after meeting with the clinic directors, physicians and office managers. The study procedures were reviewed and approved by each of the study location’s clinic directors. Research approval was also given by the Office of Research Integrity at the University of Kentucky.

Pilot

A brief pilot study was conducted at the urban data collection site. Ten participants were recruited and completed all study procedures. As a result of the pilot, the introduction monologue was simplified and it became apparent that labels and permanent marker were necessary for labeling the salivettes. Generally, most women were receptive to the study and were eager to participate.

Procedure

All women who were in the waiting area at the time of data collection were approached by the researcher and asked if they were currently pregnant and over 18. If they replied in the affirmative, they were subsequently invited to participate in the study while receiving pre-natal care at UK Morehead Women’s
Health and Family Health Centers. The research project was explained, the consent form read aloud, and the patient was given a consent form (Appendix A) to sign if she agreed to participate. The data were collected at UK Morehead Women’s Health and Family Health Centers in June and July of 2009. The researcher collected data at the rural site (UK Morehead Women’s Health) on 8 separate occasions and at the urban site (Family Health Centers) on 15 separate dates. Only one pregnant woman declined to participate and approximately 5 were unable to participate because of their inability to read in English. However, many pregnant women were deemed ineligible to participate simply because they were not 18 or older.

Procedure for Saliva Analysis

After explaining the study and receiving the participant’s written consent, the researcher collected the saliva cotinine sample from the participant according to the procedures and protocol outlined by J2 Laboratories (J2 Labs, 2009). All data collection items (questionnaire, salivette and envelopes) were labeled with the same participant number to avoid any confusion and to clearly identify each participant. The researcher instructed the participant to remove any items in her mouth. The participant chewed on a cotton wool swab for about 2 minutes while they completed the questionnaire. This process yielded approximately 1ml of saliva that was used for cotinine analysis. After the appropriate time elapsed and the participant had finished the questionnaire, the researcher placed the participant swab into the salivette tube and recapped it. All specimen collection tubes were securely capped with an appropriately tight fitting cap to assure that
the saliva sample did not leak or evaporate during storage or shipping. Each individual saliva sample was placed in a separate plastic specimen bag at the time of specimen collection. The sample was placed into a cooler with dry ice where the sample stayed until it was collected for laboratory analysis. Saliva samples were shipped to the laboratory collectively via the commercial carrier Federal Express. Shipping and specimen collection materials were provided by the laboratory.

All participants were informed that their self-reports were anonymous and their participation or non-participation in this study would not affect the care they received from the doctor or nurse. Each participant was informed that their answers to the questions about smoking would be biochemically validated through a saliva test in order to decrease the probability of underreporting, and that the physicians would not be informed of the patient’s smoking status. For the purposes of this study, the cut-off level of 10 ng/ml established by SRNT was used to biochemically determine if a pregnant participant is a smoker or non-smoker. It is important to note that it is possible to absorb nicotine through second-hand smoke, but it would not exceed the cut-off level if 10 ng/ml.

*Procedure for Survey Administration*

After the participant started to chew on the cotton swab, they were given the questionnaire (Appendix A). The participant was instructed to complete the questionnaire while in the waiting room. However, if they were unable to complete it in the waiting room, they were asked to take the questionnaire with them to the exam room and complete it. When completed, the participant put the
questionnaire into a numbered envelope without sealing it. Participants were asked to refrain from writing their name on the questionnaire or envelope to ensure anonymity. Each envelope was clearly labeled with the participant’s number to avoid any confusion. After participants concluded their appointment with their health-care provider and put their questionnaire in the envelope provided, participants were asked to return to the waiting room to complete a few more brief questions about their health-care provider's recommendations. All completed questionnaires were put into the envelope and sealed by the participant and collected by the researcher. All questionnaires, envelopes and salivettes were clearly labeled with the participants’ number to ensure anonymity. Each participant that completed the questionnaire and provided a saliva sample received a $25 gift card for their participation.

In anticipation that there may be a patient who has difficulty reading or cannot read, the researcher offered to assist all patients with completion of the questionnaire. If the participant indicated that they wanted assistance, they were taken to a quiet and private space at each location where the researcher assisted the participant in completing the questionnaire by reading the questions aloud from another questionnaire while the patient marked her answers on her own copy. Those unable to read English were excluded from participating.

**Description of Survey Instrument**

A thorough literature review showed that while various studies focused on parts of this research study, but no instrument included questions sufficient to address all of the research questions in this study. Therefore, this questionnaire
was created using selected questions from other research studies on similar topics and integrates original questions to form a complete research tool that addresses all five research questions. The questions used in this survey instrument integrate questions from seven different academic journal articles (Arnold et al., 2001; Brownson et al., 1992; Crittenden et al., 2007; Hotham, Atkinson, & Gilbert, 2002; Melvin et al., 2000; Nichter et al., 2007; Tiedje, Kingry, & Stommel, 1992; Thompson et al., 2004) and clinical practice guidelines from the American College of Obstetrics and Gynecology (ACOG, 2005). The questionnaire consisted of 82 items, and includes questions about the pregnant woman, the healthcare provider’s recommendations, knowledge of health risks of smoking during pregnancy, social support during pregnancy, and the Health Belief Model (HBM) (Rosenstock, 1960) theoretical constructs and demographic questions.

Question 1 estimates smoking and the influence of the pregnancy on the smoking behavior and question 2 and 3 are detailed questions that assess current smoking/tobacco use behavior. Question 5-7 assess current use of chew/dip. Question 8 establishes when the participant became a regular smoker, and question 9 establishes amount of daily smoking before the pregnancy. Question 10 indicates any other type of nicotine use, i.e. smoking cessation via nicotine patch or gum. Questions 11 through 13 assess how often the healthcare provider asks a pregnant woman about her current smoking status. Items 14-25 briefly estimate the pregnant woman’s knowledge of the health risks of smoking.
The Health Belief Model posits that individuals will take action to ward off, to screen for, or to control an ill-health condition if they regard themselves as susceptible to the condition, if they believe it to have potentially serious consequences, if they believe that a course of action available to them would be beneficial in reducing either their susceptibility to or the severity of the condition, and if they believe that the anticipated barriers to (or costs of) taking action are outweighed by its benefits (Strecher & Rosenstock, 1997). Questions 26-41 are directly related to the Health Belief Model (HBM) (Hochbaum, 1958; Rosenstock, 1960). These questions were developed around the four major constructs of the HBM: perceived susceptibility or whether the respondent believes herself to be vulnerable (items 26-29); perceived seriousness or whether the respondent anticipates negative consequences (items 30-33); the perceived benefits (items 34-37); and the barriers of adhering to the recommended behavior, i.e. smoking cessation during pregnancy (items 38-41). The four barrier questions, were taken from Tiedje, Kingry and Stomme1's (1992) study of the “Patient Attitudes Concerning Health Behaviors during Pregnancy: Initial Development of a Questionnaire.” Questions 38 and 39 explore the fear of quitting smoking because of weight gain and feeling poorly. The barrier questions (40 and 41) also explore if smoking helps deal with stress and the socialization component of smoking.

At this point in the questionnaire, participants who self-identified as non-smokers stopped and continued with the demographics portion of the questionnaire. Participants who self-identified as smokers continued with the rest
of the questionnaire (items 42-75) and then completed the demographics section of the questionnaire.

Items 42-52 refer to healthcare provider recommendations about smoking during pregnancy and their compliance with the current clinical ACOG recommendations. Situational self-efficacy, another construct from the HBM is addressed in items 55-58 and measures how confident respondents are in being able to avoid smoking when upset, angry, having an argument, and under pressure. Questions assessing social support from family/friends and husband/spouse are items 59-71.

Questions 14 through 25 were scored with a 1, “agree” or a 0, “disagree”. The scoring was reversed for negatively worded items so that the larger scores indicated greater knowledge of the health effects of smoking during pregnancy. Items 26 through 41 were scored with a 0, “agree” or a 1, “disagree”. When appropriate, the scoring was reversed so that the lower scores would indicate greater susceptibility, severity, benefits, and barriers to quitting smoking during pregnancy. Frequencies were obtained for questions 42 through 52 which inquired about the total number of the 5A’s that were performed by the healthcare providers. Items 53-70 were scored on a 5-point scale from 5, “disagree very much” to 1, “agree very much”.

The questionnaire was reviewed by Dr. Bernard Strenecky, a reading specialist and special education professor at the University of Louisville. The questionnaire’s reading level was estimated by Dr. Strenecky to be at the fifth grade level.
**Human Subjects Protection**

In order to protect the participants' identities, the questionnaire was anonymous and no identifying information was collected for any participant. All questionnaires, envelopes and salivettes were clearly labeled with the participants' number to ensure anonymity. The researcher received human subjects protection training in accordance with the University of Kentucky's Office of Research Integrity.

Each pregnant woman eligible for participation was assured that her participation or non-participation in the study would not, in any way, affect the care she would receive. Consent forms were explained and participants were given copies of the consent forms prior to their participation in the study.

**Data Analysis**

The purpose of this study was to investigate the influences of smoking on rural and urban pregnant women in Kentucky. More specifically, the variables of the knowledge of health effects, health care provider recommendations, subscores from the HBM, and social support were explored in relation to the smoking behavior of pregnant women. A secondary purpose was to investigate the accuracy of self-reported smoking during pregnancy using biochemical validation. Using PASW 18.0 software, frequencies for actual smoking status was compared with reported smoking status. Chi-square test for significance was used to determine significance.

The participants were classified as smokers or non-smokers according to their responses on the survey. However, when there was an obvious discrepancy
between the self-report and the biochemically verified smoking status, the biochemical test was used to change the participant’s smoking classification. Frequencies were tallied for saliva cotinine levels and self-reported smoking status in order to establish the number of deceivers in the study.

Correlation between living arrangements and healthcare provider inquiry of smoking status were compared with actual smoking status. Chi-square tests were used to determine significance. T-tests were conducted to understand the relationship between smoking status and the participant’s knowledge of the health effects of smoking during pregnancy, the constructs of the HBM, and social support from friends and family as well as the husband or spouse. For each of the 5A’s variables, frequencies were calculated to determine what type of recommendations healthcare providers were making. These results were compared with current clinical guidelines and smoking status.

A logistic regression was used to predict smoking status as the dependent variable and the independent variables were knowledge mean score, inquiry of smoking status, and health-care provider recommendation.
Chapter 4

The purpose of this study was to investigate the influences of smoking on rural and urban pregnant women. More specifically, the variables of the knowledge of health effects, health provider recommendations, subscores from the Health Belief Model and social support were explored in relation to the smoking behavior of pregnant women. A secondary purpose of this study was to investigate the accuracy of self-reported smoking status during pregnancy using biochemical validation. The analysis of the data is presented in this chapter according to the following topics: (1) description of subjects, (2) presentation of results, and (3) discussion of results.

Description of subjects

Data were collected from 71 women who attended pre-natal clinics in either Louisville, KY, or Morehead, KY, and agreed to participate. UK Morehead Women’s Health Care is a rural OB-GYN medical practice serving women from Bath, Carter, Elliott, Fleming, Lewis, Magoffin, Menifee, Montgomery, Morgan, Rowan, and Wolfe counties in Kentucky. Family Health Centers, Inc. was selected to be the urban study location and is located in Louisville, Kentucky. Family Health Centers provide specialized health-care services to more than 43,000 patients annually through their seven locations (Portland, Phoenix, East Broadway, Iroquois, Americana, Southwest, and Fairdale). Three Family Health Center locations (Portland, East Broadway, and Iroquois) were used to collect data for the purposes of this study. The sample population included 30 women
between the ages of 18 and 22 (42.3%), 21 women between the ages of 23-27 (29.6%), and 20 women between the ages of 28-42 (28.1%). The majority of participants (54.9%) were single, while slightly more than one-third were married (33.8%), and 11.3% were separated or divorced.

For almost half of participants (47.8% or 34), the highest level of education attained was grade 12 or GED (General Education Degree or high school equivalency), while 21 participants had completed some college (29.6%), and only 7 were college graduates (9.9%). The race/ethnicity of the participants included was 77.5% white, and 22.5% of non-whites.

Household income for most of the participants (40.6%) was $10,000 per year or less, while 21.8% or 15 participants made $30,000 or more per year. Participants also assessed their personal financial status and 50.7% reported that they made "just enough to get by", while 31% reported that they "struggle to make ends meet". Only 18.3% reported that they feel that they "have more than I need to live well". A majority of participants (50.7% or 36) were currently employed while 49.3% of participants were unemployed. Financial status of the individual participants was also determined by the source of payment of medical and hospital bills for pre-natal care. Fifty-two participants (77.6%) reported that they planned to pay for their pre-natal medical costs by a federal or state medical card, and only 22.4% of participants’ costs were paid by private insurance or cash.

Presentation of the results

The demographic and socioeconomic characteristics of the study
population are presented in Table 3 by smoking category: “smoker” and “non-smoker”. Thirty-seven participants (52%) were classified as non-smokers while 34 participants (48%) were classified as smokers. Of the rural participants, 47% were classified as smokers and 49% of urban participants were also classified as smokers. A majority of rural and urban participants (53% and 51%) were classified as non-smokers.
Table 3
Demographic and socioeconomic characteristics of the study population by smoking status

<table>
<thead>
<tr>
<th>Maternal Characteristic</th>
<th>Non-Smoker N(% group)</th>
<th>Smoker N(% group)</th>
<th>N (% Total)</th>
<th>(X^2) (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Study Location</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>16 [1](^n) (50)</td>
<td>14 [3](^n) (50)</td>
<td>34 (48)</td>
<td>.013 (.909)</td>
</tr>
<tr>
<td>Urban</td>
<td>18 [1](^n) (51)</td>
<td>18 (49)</td>
<td>37 (52)</td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td>2.535 (0.469)</td>
</tr>
<tr>
<td>18-22</td>
<td>16 (53.4)</td>
<td>14 (46.6)</td>
<td>30 (42.3)</td>
<td></td>
</tr>
<tr>
<td>23-27</td>
<td>13 (61.9)</td>
<td>8 (38.1)</td>
<td>21 (29.6)</td>
<td></td>
</tr>
<tr>
<td>28-32</td>
<td>4 (33.3)</td>
<td>8 (66.7)</td>
<td>12 (16.9)</td>
<td></td>
</tr>
<tr>
<td>33-42</td>
<td>4 (50)</td>
<td>4 (50)</td>
<td>8 (11.2)</td>
<td>71</td>
</tr>
<tr>
<td><strong>Race/Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
<td>.037 (0.848)</td>
</tr>
<tr>
<td>White</td>
<td>29 (52.7)</td>
<td>26 (47.3)</td>
<td>55 (77.5)</td>
<td></td>
</tr>
<tr>
<td>Non-white</td>
<td>8 (50)</td>
<td>8 (50)</td>
<td>16 (22.5)</td>
<td>71</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
<td></td>
<td></td>
<td>13.205 (0.001)</td>
</tr>
<tr>
<td>Married</td>
<td>19 (79.2)</td>
<td>5 (20.8)</td>
<td>24 (33.8)</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>17 (43.6)</td>
<td>22 (56.4)</td>
<td>39 (54.9)</td>
<td></td>
</tr>
<tr>
<td>Separated/Divorced</td>
<td>1 (12.5)</td>
<td>7 (87.5)</td>
<td>8 (11.3)</td>
<td>71</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
<td>.713 (0.870)</td>
</tr>
<tr>
<td>Less than Grade 12</td>
<td>4 (44.4)</td>
<td>5 (55.6)</td>
<td>9 (12.7)</td>
<td></td>
</tr>
<tr>
<td>Grade 12 or GED</td>
<td>17 (50)</td>
<td>17 (50)</td>
<td>34 (47.8)</td>
<td></td>
</tr>
<tr>
<td>Some College</td>
<td>12 (57.1)</td>
<td>9 (42.9)</td>
<td>21 (29.6)</td>
<td></td>
</tr>
<tr>
<td>(\leq) College</td>
<td>4 (57.1)</td>
<td>3 (42.9)</td>
<td>7 (9.9)</td>
<td>71</td>
</tr>
<tr>
<td><strong>Employment Status</strong></td>
<td></td>
<td></td>
<td></td>
<td>.347 (.556)</td>
</tr>
<tr>
<td>Employed</td>
<td>20 (55.5)</td>
<td>16 (44.5)</td>
<td>36 (50.7)</td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>17 (48.6)</td>
<td>18 (51.4)</td>
<td>35 (49.3)</td>
<td>71</td>
</tr>
</tbody>
</table>
Table 3, continued

<table>
<thead>
<tr>
<th>Maternal Characteristic</th>
<th>Non-Smoker N(% group)</th>
<th>Smoker N(% group)</th>
<th>N (% Total)</th>
<th>X²</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Household Income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 10,000</td>
<td>11 (39.3)</td>
<td>17 (60.7)</td>
<td>28 (40.6)</td>
<td></td>
<td>3.996 (0.262)</td>
</tr>
<tr>
<td>10,000 to 20,000</td>
<td>8 (61.5)</td>
<td>5 (38.5)</td>
<td>13 (18.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20,000 to 30,000</td>
<td>8 (61.5)</td>
<td>5 (38.5)</td>
<td>13 (18.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30,000 and above</td>
<td>10 (66.6)</td>
<td>5 (33.3)</td>
<td>15 (21.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial Status</td>
<td></td>
<td></td>
<td></td>
<td>5.261 (.072)</td>
<td></td>
</tr>
<tr>
<td>Live Well</td>
<td>8 (61.5)</td>
<td>5 (38.5)</td>
<td>13 (18.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enough</td>
<td>22 (61.1)</td>
<td>14 (38.9)</td>
<td>36 (50.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Struggle</td>
<td>7 (31.8)</td>
<td>15 (68.2)</td>
<td>22 (31.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial Source for Pregnancy</td>
<td></td>
<td></td>
<td></td>
<td>5.970 (.015)</td>
<td></td>
</tr>
<tr>
<td>Private Insurance/Cash</td>
<td>12 (76.9)</td>
<td>3 (23.1)</td>
<td>15 (19.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical Card</td>
<td>23 (44.2)</td>
<td>29 (55.8)</td>
<td>52 (77.6)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Three participants self-reported as non-smokers, but had cotinine levels above 10 (ranging from 170 ng/ml to 18 ng/ml) and were re-classified as smokers.

2 Participant did not give sufficient saliva sample for cotinine testing, but self reported as a non-smoker.

Forty-three percent of non-smokers and 41% of smokers were between the ages of 18-22. Over three quarters of all participants (77.5%) were white with 22.5% of participants describing themselves as non-white. Three times as many non-smokers (79.2%) were married than smokers (20.8%). A majority of all participants (54.9%) reported to be single, and less than 12% of all participants were separated or divorced. Almost half of all participants (46%) had completed high school or a GED, with equal numbers of smokers (50%) and non-smokers (50%) completing a GED. A similar number of smokers (26%) and non-smokers (32%) reported that they had completed some college. Less than half of non-
smokers (46%) were unemployed while more than half of smokers (53%) were unemployed. A majority of smokers (53%) made $10,000 or less in the last year, while fewer non-smokers (29%) made the same amount in the last year. Less than a third of non-smokers (27%) made $30,000 or more in the last year, while only 16% of smokers made the same amount. Almost half of all smokers (44%) reported that they struggled to make ends meet compared to 19% of non-smokers. A majority of non-smokers (60%) claimed that they had just enough to get by, compared to 41% of smokers. Women whose pre-natal medical costs were paid using federal or state medical cards were more likely to be smokers (90%) than non-smokers (65%).

A bivariate analysis using chi-square was conducted to compare the demographic variables to smoking and non-smoking status. Marital status and financial source for the pregnancy were both found to be significant. A majority of smokers reported to be single (56%) and non-smokers were mostly married (79%). Participants using their medical card to pay for pregnancy-related health care costs were more likely to be smokers than those participants paying for the cost of the pregnancy with private insurance or cash. The variable related to financial status approached significance (p<.072), with a higher percentage of smokers indicating that they struggled financially compared to non-smokers.
Table 4

*Participants’ living arrangements by smoking status*

<table>
<thead>
<tr>
<th>Person with whom the participant lives</th>
<th>Non-smoker N (% of group)</th>
<th>Smoker N (% of group)</th>
<th>N (% Total)</th>
<th>$X^2$ (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Husband/boyfriend</td>
<td>23 (67.7)</td>
<td>11 (32.3)</td>
<td>34 (51.5)</td>
<td>13.463 (0.009)*</td>
</tr>
<tr>
<td>Children only</td>
<td>4 (28.6)</td>
<td>10 (71.4)</td>
<td>14 (21.2)</td>
<td></td>
</tr>
<tr>
<td>Mother</td>
<td>6 (54.5)</td>
<td>5 (45.5)</td>
<td>11 (16.7)</td>
<td></td>
</tr>
<tr>
<td>Other**</td>
<td>3 (42.8)</td>
<td>4 (57.2)</td>
<td>7 (10.6)</td>
<td></td>
</tr>
<tr>
<td>Other**-- Other relatives or no one.</td>
<td></td>
<td></td>
<td>66</td>
<td></td>
</tr>
</tbody>
</table>

As seen in Table 4, the participants were asked to list all of the people that live with them, and their responses were categorized by primary living partner, i.e. husband/boyfriend, children only (no spouse or boyfriend), mother, and other (other relatives or no one). More non-smokers (67.7%) lived with a husband/boyfriend than did smokers (32.3%). A bivariate analysis of this variable was significant (p< .05). Smokers (71.4%) lived with only their children more frequently than non-smokers (28.6%). Almost equal numbers of smokers (45.5%) and non-smokers (54.5%) lived with their mothers, and similar numbers of smokers (57.2%) and non-smokers (42.8%) reported that they lived with other relatives or no one.
Table 5

*Note. Standard deviations appear in parentheses next to means.

Mean scores of the participants’ knowledge of the health effects of smoking during pregnancy are presented in Table 5 by smoking category. Non-smokers (8.0) had a significantly larger mean knowledge score (t=4.732, P<.05) about the health risks of smoking than smokers (6.59).

Table 6 examines three of the HBM constructs by smoking status. This analysis showed that smokers (1.34) had a much higher mean score (p<.001) indicating that they felt less susceptible to the harms of smoking during pregnancy. Non-smokers (.21) had a much lower mean score indicating that they felt more susceptible to the harms of smoking during pregnancy than did smokers. The raw mean severity score for smokers and non-smokers were different, but not statistically significant.

Table 6.

HBM construct means by smoking status

<table>
<thead>
<tr>
<th></th>
<th>Smokers</th>
<th>Non-Smokers</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (% group)</td>
<td>34 (49.3)</td>
<td>35 (50.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge</td>
<td>6.59 (1.01)</td>
<td>8.00 (1.42)</td>
<td>4.732*</td>
<td>67</td>
</tr>
</tbody>
</table>

*= p≤.05.
Smokers had a higher mean score (3.33) than non-smokers (1.74) when assessing the benefits of stopping smoking during pregnancy, which indicates they felt there are fewer benefits to quitting than non-smokers (p<.05).

Table 7

Mean spouse/partner social support score by study location in self-reported smokers (N= 34)

<table>
<thead>
<tr>
<th></th>
<th>Rural (mean, SD)</th>
<th>Urban (mean, SD)</th>
<th>T</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (% total)</td>
<td>17 (50)</td>
<td>17 (50)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spouse/Partner Social Support (sd)</td>
<td>1.94 (2.85)</td>
<td>1.90 (4.29)</td>
<td>.031</td>
<td>32</td>
</tr>
</tbody>
</table>

In table seven, the mean spouse/partner social support scores by rural/urban study location in self-reported smokers are displayed. A t-test revealed no significant differences between rural and urban participants as far as the influence of social support on smoking during pregnancy.
Table 8

Mean friends/family social support score by study location for self-reported smokers (N= 34)

<table>
<thead>
<tr>
<th></th>
<th>Rural</th>
<th>Urban</th>
<th>T</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (% total)</td>
<td>17 (50)</td>
<td>17 (50)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friends/Family</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Support</td>
<td>1.26 (2.73)</td>
<td>2.08 (3.88)</td>
<td>-.714</td>
<td>32</td>
</tr>
<tr>
<td>(sd)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mean scores of social support from friends/family to stop smoking during pregnancy is shown in table eight. No significant differences were found between rural and urban self-reported smoking participants and the social support that they received from friends/family to stop smoking.

Table 9

*Healthcare provider inquiry of current smoking status by study location*

<table>
<thead>
<tr>
<th></th>
<th>Rural (% group)</th>
<th>Urban (% group)</th>
<th>X² (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal inquiry of smoke</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>status today (N=68)</td>
<td>22 (66.7)</td>
<td>11 (33.3)</td>
<td>.74 (.80)</td>
</tr>
<tr>
<td>Filled out papers today</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>with smoke status inquiry</td>
<td>16 (45.7)</td>
<td>19 (54.3)</td>
<td>.22 (.32)</td>
</tr>
<tr>
<td>Verbal inquiry of smoke</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>status at previous visit</td>
<td>6 (17.6)</td>
<td>28 (82.4)</td>
<td>.59 (.76)</td>
</tr>
<tr>
<td>(N=69)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
According to the ACOG, a woman’s healthcare provider should inquire about her current smoking status at each visit. Table nine examines the percentages of rural and urban healthcare providers that verbally inquired about the participants’ current smoking status during their appointment on the day that the data were collected, inquired about the participants smoking status through routine paperwork on the day that data were collected, and finally the percentage who inquired about the participants’ current smoking status at a previous visit. A bivariate analysis of study location and healthcare provider inquiry of current smoking status was conducted. No significant differences were found between the urban and rural healthcare providers inquiries into current smoking status of participants. In the rural sample, 33.3% of healthcare providers made a verbal inquiry of the patient’s current smoking status at that office visit, and 82.4% reported that they had been asked about their smoking status at a previous visit. Urban participants reported that their healthcare provider asked about their current smoking status at that office visit (37.2%) and at a previous visit (77.1%). Twenty-four urban participants (68.6%) and nineteen (54.3%) rural participants reported that they had filled out papers asking about their current smoking status at that office visit.

Table 10 (see below) displays the percentages of healthcare providers that addressed each of the 5A’s with the self-reported smoking participants. Previous tables were split into rural and urban categories but since this table only examines the responses of self-reported smokers, the numbers are too small to be presented by location. Twenty-five participants (86.2%) reported that their
healthcare provider told them to stop smoking and 79.3% reported that their healthcare provider asked them if they wanted to quit smoking, both parts of 1A or “Ask”. Only 5 participants reported that their doctor or nurse congratulated them because they stopped smoking. It is not surprising that such a small number reported being congratulated for quitting smoking because the participants answering these questions were self-reported smokers. Almost all participants (93.1%) recalled the doctor or nurse telling them that stopping smoking would improve their health and the health of their baby, which is 2A or “Advise”. However, less than a quarter of participants (24.1%) reported that their healthcare provider asked them if they would like to quit smoking in the next 30 days, giving the healthcare provider a more accurate picture of the participants willingness to change their smoking behavior, which is 3A or “Assess”. “Assist” or 4A has five possible components. The first component is that the healthcare provider gives the participant information on quitting smoking. A majority of participants (62.1%) reported that they did not receive any information on quitting smoking from their doctor or nurse.
Table 10

Percentages of health care providers that addressed each of the 5A’s with self-reported smoking participants (N=29)

<table>
<thead>
<tr>
<th>5A’s Patient Counseling Method</th>
<th>Yes (%)</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A  -- (Ask) The doctor or nurse asked me if I want to quit smoking</td>
<td>23 (79.3)</td>
<td>6 (20.7)</td>
</tr>
<tr>
<td>1A  -- (Ask) The doctor or nurse advised me to stop smoking</td>
<td>25 (86.2)</td>
<td>4 (13.8)</td>
</tr>
<tr>
<td>1A  –  (Ask) The doctor or nurse congratulated me because I quit smoking</td>
<td>5 (17.2)</td>
<td>24 (82.8)</td>
</tr>
<tr>
<td>2A  – (Advise) The doctor or nurse told me about how quitting smoking would be good for me and my baby</td>
<td>27 (93.1)</td>
<td>2 (6.9)</td>
</tr>
<tr>
<td>3A  – (Assess) The doctor or nurse asked me if I would like to quit smoking in the next 30 days</td>
<td>7 (24.1)</td>
<td>22 (75.9)</td>
</tr>
<tr>
<td>4A  – (Assist) The doctor or nurse gave me information on quitting smoking</td>
<td>11 (37.9)</td>
<td>18 (62.1)</td>
</tr>
<tr>
<td>4A  – (Assist) The doctor or nurse asked me to have a place in my home where no one is allowed to smoke</td>
<td>13* (44.8)</td>
<td>15* (51.7)</td>
</tr>
<tr>
<td>4A  – (Assist) The doctor or nurse asked me to find a person who would like to learn how to quit smoking with me</td>
<td>6* (20.7)</td>
<td>22* (75.9)</td>
</tr>
<tr>
<td>4A  – (Assist) The doctor or nurse told me that getting mad and eating more is normal when trying to quit smoking</td>
<td>5* (17.2)</td>
<td>23* (79.3)</td>
</tr>
<tr>
<td>4A  – (Assist) The doctor or nurse gave me a phone number that I can call when I need help to stop smoking</td>
<td>10 (34.5)</td>
<td>19 (65.5)</td>
</tr>
<tr>
<td>5A  – (Arrange) The doctor or nurse made an appointment with me to help me quit smoking</td>
<td>0</td>
<td>29 (100)</td>
</tr>
</tbody>
</table>

* -- N=28

Less than half of all participants (44.8%) reported that the doctor or nurse asked them to have a space in their home where no one is allowed to smoke. A majority of participants (75.9%) recounted that they had not been asked to find a person who would like to quit smoking with them and an almost equal number
(79.3%) did not remember being told that getting mad and eating more is normal when trying to quit smoking. Nineteen participants (65.5%) were not given the phone number of a stop smoking 24-7 free hotline specifically for pregnant women, which is the last component to 4A or “assist”. “Arrange” or 5A asks healthcare providers to make a special appointment with their patient to discuss and aid them in quitting smoking. However, none of the participants recalled their doctor or nurse asking them to return for an appointment to help them with smoking cessation.
Table 11

*Participants’ Reported Smoking Status and Saliva Cotinine Levels by Study Location*

<table>
<thead>
<tr>
<th></th>
<th>Rural</th>
<th>Urban</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong># of participants</strong></td>
<td>36</td>
<td>35</td>
<td>71</td>
</tr>
<tr>
<td><strong>Self-reported smoking</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smokers</td>
<td>16</td>
<td>14</td>
<td>34</td>
</tr>
<tr>
<td>Non-Smokers</td>
<td>18</td>
<td>18</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>36</td>
<td>35</td>
<td>71</td>
</tr>
<tr>
<td><strong>Inaccurate Self-Report</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smokers</td>
<td>1(^1)</td>
<td>3(^1)</td>
<td>4</td>
</tr>
<tr>
<td>Non-Smokers</td>
<td>1(^2)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Self-reported chew/dip</strong></td>
<td>0</td>
<td>1(^3)</td>
<td>1</td>
</tr>
<tr>
<td><strong>Mean cotinine level</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smokers (s.d.)</td>
<td>195 ng/ml (140)</td>
<td>133 ng/ml (111)</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Number of participants that self-reported as non-smokers, but had cotinine levels above 10 (ranging from 170 ng/ml to 18 ng/ml) and were re-classified as smokers.

\(^2\) Participant did not give sufficient saliva sample for cotinine testing, but self-reported as a non-smoker.

\(^3\) Participant classified as a smoker, self-reported smoking within last 30 days and had cotinine level above 10.

Table 11 displays the participants’ self-reported smoking status and lists the number of inaccurate self-reports that were made by study location. The table also shows the mean cotinine levels of participants by study location. For the purposes of this study, the cut-off level of 10 ng/ml established by SRNT was used to biochemically determine if a pregnant participant was a smoker or non-smoker. Rural smokers had a higher mean cotinine level (195 ng/ml) than urban smokers (133 ng/ml). There were three urban participants and one rural
participant that self-reported as non-smokers but had cotinine levels above 10 and were re-classified as smokers. Also, one urban participant reported using chew/dip in the last 24 hours, last 7 days, and last 30 days. This participant also self-reported as a smoker and had a saliva cotinine level of 12 ng/ml and was classified as a smoker. The overall smoking deception rate for the current study was 5.6%. The deception rate for rural and urban participants in this study was 2.8% and 8.6%, respectively.
Table 12

*Logistic Regression Model to Predict Smoking Behavior*

<table>
<thead>
<tr>
<th></th>
<th>Odds Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthcare provider inquiry of smoke status</td>
<td>.555</td>
<td>(.05,6.6)</td>
</tr>
<tr>
<td>Participant filled out papers that inquired about smoke status</td>
<td>3.024</td>
<td>(.24,38.5)</td>
</tr>
<tr>
<td>Previous visit healthcare provider inquiry of smoke status</td>
<td>2.555</td>
<td>(.16,41.1)</td>
</tr>
<tr>
<td>Knowledge of health risks of smoking during pregnancy</td>
<td>.552</td>
<td>(.18,1.7)</td>
</tr>
<tr>
<td>HBM – Susceptibility</td>
<td>.340</td>
<td>(.08,1.4)</td>
</tr>
<tr>
<td>HBM – Severity</td>
<td>.427</td>
<td>(.16,1.1)</td>
</tr>
<tr>
<td>HBM – Benefits</td>
<td>1.707</td>
<td>(.21,13.8)</td>
</tr>
<tr>
<td>HBM – Barriers</td>
<td>.512*</td>
<td>(.36,.73)</td>
</tr>
<tr>
<td>Constant</td>
<td>198643.885</td>
<td></td>
</tr>
</tbody>
</table>

*-- P<.05

Table 12 displays the results of the logistic regression model used to predict the smoking behavior of pregnant women. The results indicate that participants reporting barriers to stopping smoking during pregnancy were significantly less likely to be smokers. Pregnant women who feel that there are barriers to stopping smoking during pregnancy may be related to increases in stress and depression during pregnancy (Elsenbruch et al., 2007). No other variables predicted smoking behavior.
Discussion

As shown in Table 3, marital status and financial source for pregnancy were found to be significant in predicting smoking status. Marital status has many health-related implications because social support can be found within a marriage which decreases the emotional and financial stress of the pregnant woman. Kiernan and Pickett (2006) found that maternal health and health-related behaviors are worse among cohabitating and single mothers, compared with married women. There is also substantial evidence that women from more disadvantaged backgrounds are more likely to become single or unmarried mothers (Kiernan, 2002). Mothers who are cohabitating or who are single mothers are themselves more likely to have grown up in single parent or loosely bonded families (Kiernan, 2002). In 2006, Kiernan and Pickett found that non-married mothers were more likely to smoke during pregnancy, be post-natally depressed, and be less likely to breastfeed. This study also found that single mothers were more likely to have experienced negative role modeling for health and health-related behaviors during childhood, and this negative health and health behavior modeling may be transmitted inter-generationally. In a 2007 study of female smokers, Manfredi, Cho, Crittenden, and Dolecek found that single parenthood had a negative impact on quitting indirectly by increasing stress and decreasing motivation to quit. This study showed a definitive connection between daily stress, single parenthood, and low education, similar to the results that were found in Table 3.
As shown in Table 3, participants using their medical card (i.e. Medicaid) as the financial source for their pregnancy were more likely to be smokers than those participants who were paying for the cost of pregnancy-related healthcare with cash or private insurance. Of the participants in the study whose pre-natal costs were paid by medical cards, 90% were smokers and only 65% were non-smokers. According to the CDC (2001) one-quarter to one-half of all pregnant women in the U.S. receive their health insurance coverage through Medicaid. In the U.S., it is estimated that 38.5% of women who receive pre-natal services funded by Medicaid smoke during pregnancy. This national percentage of pregnant women who smoke and have Medicaid is much lower than the 90% that was found in this study. Kentucky has a much higher rate (26.5%) of maternal smoking than the rest of the U.S. (10.7%) (MMWR, 2001). Pregnant women on Medicaid are 2.5 times more likely than other pregnant women to smoke, according to Medicaid data collected by the CDC (MMWR, 2001). Smoking-attributable neonatal health-care costs for Medicaid total almost $228 million or about $738 per pregnant smoker.

Table 4 displays participants’ living arrangements by smoking status. The participants’ responses were categorized by primary living partner, showing that more non-smokers (67.7%) lived with a husband/boyfriend than did smokers (32.3%). Smokers (71.4%) also lived with only their children more frequently than non-smokers (28.6%). Considerably more non-smokers lived with a husband/boyfriend, which could be related to the effective psychosocial resources that were provided through this living situation, i.e. social support.
Being married generally facilitates successful smoking cessation in pregnant women (McBride, Pirie, & Curry, 1992), but cessation may be hampered if being married is accompanied by stressful financial and emotional concerns (Bullock et al., 2001). Kiernan and Pickett (2006) found that the key difference for continuing to smoke throughout pregnancy was attributable to mothers involved with partners and those lacking an intimate relationship.

Knowledge of the health effects of smoking during pregnancy was established through a general knowledge score (see Table 5). Non-smokers had a larger mean knowledge score than did smokers which indicated that non-smokers had greater knowledge about the health effects of smoking when compared with smokers. Arnold et al., (2001) found that pregnant women with the lowest reading levels were the least knowledgeable about the health effects of smoking and were the least concerned about the health effects of smoking on their baby. Brownson et al., (1992) found individuals with lower educational levels, women, older respondents and current smokers to be the least knowledgeable about the effects of smoking on health. This study also found that for both general health effects and specific disease threats, smokers were significantly less likely to acknowledge the harmful effects of smoking which is similar to the results of the current study (Brownson et al., 1992). Many smokers underestimate or deny the serious health risks associated with smoking. Misconceptions about the health risks of smoking may help to rationalize continued smoking during pregnancy (Dunn, Pirie, & Lando, 1998). Haslam and Draper (2000) suggested that continuing smokers were less likely to
perceive adverse health effects of smoking during pregnancy than women who stop smoking, and were much less likely to agree with the smoking-related health risks than non-smokers. Wakefield et al., (1993) found that out of four statements regarding health problems associated with the children of smokers, only the statement ‘children of smokers are more likely to get infections’ showed a higher proportion of quitters agreeing with the statement compared to smokers. Conversely, Haslam and Draper (1997) found that there was no significant difference in the levels of knowledge of pregnant smokers, ex-smokers and never-smokers. This study suggested that smoking during pregnancy is not distinguished by a lack of knowledge of the health risks but is more a problem of translating knowledge into behavior change. In the current study, non-smokers had greater knowledge about the health effects of smoking when compared with smokers; the findings of which are consistent with most other studies.

An analysis of three of the HBM constructs by smoking status (see Table 6) demonstrated that smokers (1.34) had a much higher mean score (p<.001) indicating that they felt less susceptible to the harms of smoking during pregnancy. Smokers had a higher mean score (.22) than non-smokers (.16) when assessing the benefits of stopping smoking during pregnancy, which shows that smokers felt that there were fewer benefits than non-smokers to quitting smoking during pregnancy. The two components of the HBM that were significantly correlated with smoking status were susceptibility and benefits. It should be noted that the variable “barriers” was not included in the analysis because of the format of the question. Tiedje, Kingry, and Stommel (1992) found
that in the case of smoking during pregnancy, women who smoked did not distinguish between adverse consequences from smoking and possible benefits from smoking cessation. These scholars also noted that possibly because of anti-smoking campaigns, women who anticipate negative consequences from smoking (susceptibility or seriousness) also know and expect positive consequences from smoking cessation (benefits). Haslam et al., (1997) articulates the point that the ability to cite health risks associated with maternal smoking does not mean that the individual is necessarily convinced that these risks represent a real threat to the health of their unborn child, hence, their continued smoking during pregnancy. Nichter et al., (2007) conducted qualitative interviews with low-income pregnant women who smoke and found that their participants often felt guilt for the harm that their smoking caused to their unborn fetuses and reported that they felt badly when their baby kicked mid-cigarette. In Nichter's, 2007 study, instinctive guilt and the reminder of their baby’s presence helped some participants to reduce their smoking during pregnancy even if they were unable to quit.

The mean spouse/partner social support score by study location (see Table 7) showed that there were no significant differences found between rural and urban participants and the social support that they received from their spouse/partner to stop smoking while pregnant. The researcher was unable to locate any literature that addresses the differences in social support for rural vs. urban pregnant smokers. In a study of rural pregnant smokers living in Missouri, Bullock, Mears, Woodcock, and Record (2001) found that over 90% of the
women that were able to quit smoking were married or living with a partner. Only 66% of the rural women that continued to smoke throughout their pregnancy were married or lived with a partner. These findings indicate that being married or living with a partner increases smoking cessation success during pregnancy, and can be linked to increased social support within the household. Bullock and colleagues (2001) also found that women who continued to smoke had significantly less support from their partner and lower self-esteem than non-smokers. In 2006, Kiernan and Pickett articulate that it is impossible within the current literature to discern whether or not it is marriage itself, living with a partner, lack of an intimate partner, or a broader lack of social support that makes the most difference to, or acts as the best marker of maternal health and/or smoking status during pregnancy. These scholars found that the key difference for continuing to smoke throughout pregnancy lay between mothers involved with partners and those lacking an intimate relationship, placing importance on the social support provided within the home environment. Women who reported high levels of social isolation due to living in a rural area were at higher risk of tobacco use during pregnancy (McCormick & Wallace, 1990).

In a prospective study on the level of perceived social support in pregnant women that was conducted in Berlin, Germany, a significantly greater percentage of women with low social support self-reportedly smoked before and during pregnancy (Elsenbruch et al., 2007). The level of self-reported perceived social support was also highly correlated with depression and the occurrence of pregnancy complications (Elsenbruch et al., 2007). On the contrary, among the
women who had not smoked during pregnancy, social support had no significant effect on the risk of pregnancy complications or depression (Elsenbruch, 2007). Elsenbruch and colleagues concluded that the lack of social support represents an important risk factor during pregnancy, and its consequences may be markedly exacerbated by additional risk factors such as smoking. Their findings support the theory that strong support networks appear to be protective particularly in the presence of additional risk factors such as smoking and chronic distress.

Mean friends/family social support score by study location for smokers is shown in Table 8. No significant differences were found between rural and urban smoking participants and the social support they received from friends/family to stop smoking. These findings are contrary to what has been shown in the literature. For example, Schaffer and Lia-Hoagberg (1997) found that the relationships of mother, friend and sister were the most frequently identified sources of social support for low-income pregnant women. Dunn, Pirie, and Hellerstedt (2003) found that confidantes were, on average, more persuasive than women’s partners on general pregnancy-related issues and at least as persuasive as partners on smoking-related issues. Women who value their confidante’s experience may be less motivated to quit smoking during pregnancy if their confidante smoked during pregnancy without observable or serious consequences to pregnancy outcomes (Dunn, Pirie, Hellerstedt, 2003). Qualitative research conducted by Dunn, Pirie, and Lando (1998) suggested that close female friends and relatives may be important sources of influence during
pregnancy for low-income women. These close female friends/relatives were
described as the most-valuable advice givers because they had first-hand
experience with pregnancy in the context of reduced economic circumstances.
Close women friends and relatives may also have a profound influence on
perceptions and attitudes about smoking during pregnancy, and may be powerful
sources of misconceptions that support continued smoking (Dunn, Pirie, &
Lando, 1998). As potential role models, close women friends/relatives may also
help to shape and modify related risk factors, such as social norms and
dimensions of social support related to providing advice and guidance. This
influence is suggested in studies demonstrating an increased likelihood of
quitting among women who have few or no smokers in their social network
compared with those who socialize or live with a smoker (McBride & Pirie, 1990).

Gender has also shown to be an important contributing factor in the
influence of social support. The social networks of women are larger than men,
and women are often called upon to be the support providers in our society
(Shumaker & Hill, 1991). These social networks, while supportive, can also have
a negative effect on the health behaviors of women. Women tend to be more
relationship-oriented and may be more adversely affected by overload or conflict
within their social support networks, causing an increase in the stress level of the
individual. In a meta-analysis of the marital literature, researchers concluded that
wives tend to be more sensitive to the negative qualities of the marriage
compared to husbands (Kiecolt-Glaser & Newton, 2001). This is important
because spouses tend to be an important source of support, and the presence of
negativity in the marriage may have a differential impact on support processes for women compared to men.

Table 9 examines the percentages of rural and urban healthcare providers that verbally inquired about the participants’ current smoking status during their appointment on the day that the data were collected, inquired about the participants’ smoking status through routine paperwork on the day that data were collected, and if the healthcare provider had asked the participant about their current smoking status at a previous visit. A bivariate analysis of study location and healthcare provider inquiry of current smoking status was conducted. No significant differences were found between the urban and rural healthcare providers inquiry into current smoking status of participants.

Asking a pregnant woman about her current smoking status is the first “A” in the 5A’s method of smoking cessation counseling. The 5 A’s have been adapted for use with pregnant women (Melvin et al., 2000) and research has shown that brief cessation counseling (5-15 minutes) offered with pregnancy-specific self-help materials by a trained clinician can improve cessation rates by 30% to 70% compared to cessation rates achieved by the healthcare provider simply providing the advice to quit smoking. ACOG conducted a national survey (which would include rural healthcare providers) to determine OB-GYNs practice knowledge and practice of smoking cessation interventions during pregnancy. The results of this survey revealed that 98% of the OB-GYNs asked women about tobacco use at their first prenatal visit. Similar results were found in 2001 when ACOG members in Ohio were sent a survey on smoking cessation
interventions. One-hundred percent of the respondents reported that they asked prenatal patients about smoking and 98% discussed the adverse effects of smoking and advised their patients to stop smoking (Jordan, Dake, & Price, 2006). However, only 62% always identified their patients’ smoking status and documented it in the medical record, as is recommended in the 5A’s (Jordan, Dake, & Price, 2006). The researcher was unable to locate any current literature that addresses the rate of verbal inquiry of smoking status for pregnant women by rural healthcare providers, specifically. In actuality, not much of a difference exists between the experiences of the rural participants and the urban participants where the healthcare provider inquiries are concerned. The current study found that 33.3% of rural participants reported that their healthcare provider asked them about their current smoking status at the office visit when the data were collected 82.4% of the participants reported that they had been asked about their smoking status at a previous visit. Anecdotally, the rural healthcare providers in this study expressed their concern about the number of pregnant women who use illicit drugs during pregnancy. Comparatively, it is more important for the health of the baby that the pregnant woman discontinues her use of illicit drugs than quit smoking. Urban participants reported that their healthcare provider asked them about their current smoking status at that office visit (37.2%) and at a previous visit (77.1%). Results from the current study are from the patient’s perspective and are obviously different than the perspective of the healthcare provider, although it is difficult to determine which is more accurate. The current study found that only 82.4% of rural participants and 77.1%
of urban participants were asked about their smoking status by a healthcare provider at any time or office visit, compared with the 100% of obstetrician gynecologists that reported asking all prenatal patients about their current smoking status in the study by Jordan, Dake and Price (2006). Healthcare providers in the current study did inquire about smoking status at some time during prenatal care a majority of the time, but did not inquire about smoking status at every prenatal visit as recommended by the 5A’s.

Table 10 displays the percentages of healthcare providers that addressed each of the 5A’s with participants who self-identified as smokers. ACOG recommends that providers should ask the patient at the first prenatal visit to choose a statement that best describes her smoking status from a list of statements on smoking behavior. This multiple choice method would typically elicit more accurate responses than a “yes” or “no” smoking status inquiry by a healthcare provider. It is also recommended that the healthcare provider ask about the patient’s smoking status at each subsequent visit in case there are any changes. In this study, twenty-five participants reported that their healthcare provider told them to stop smoking (86.2%) and 79.3% reported that their healthcare provider asked them if they wanted to quit smoking, both parts of 1A or “Ask”. As previously mentioned, ACOG conducted a national survey to determine OB-GYNs practice knowledge and practice of smoking cessation interventions during pregnancy. Ninety-eight percent of the OB-GYNs reported that they asked women about tobacco use at their first prenatal visit. Similar results were found in 2001 when ACOG members in Ohio were sent a survey on
smoking cessation interventions. The respondents reported that they asked prenatal patients about smoking 100% of the time and 98% discussed the adverse effects of smoking and advised patients to stop smoking (Jordan, Dake, & Price, 2006). Okoli, Greaves, Bottorff and Marcellus (2010) conducted a meta-analysis and found that the proportion of healthcare providers that reported “asking” or discussing smoking with their pregnant clients at clinic visits ranged from 73% to 100% (n=14 studies). In comparison, the current study found that 79.3% of healthcare providers asked the participants if they would like to quit smoking, which leaves 20.7% of participants that were not asked if they had a desire to quit which is a considerable amount. While a majority of participants reported that their healthcare provider recommended that they quit smoking while pregnant (86.2%), these percentages are high but certainly not the 100% reported by OB-GYNs in Ohio. The final step of “Ask” is that the healthcare provider is to congratulate the participant because she quit smoking. Only 5 participants reported that their doctor or nurse congratulated them because they stopped smoking. Such a small number is not surprising given that the participants answering these questions were self-reported smokers and had actually not quit.

Almost all participants (93.1%) recalled the doctor or nurse telling them that stopping smoking would improve their health and the health of their baby, which is 2A or “Advise”. ACOG (2005) recommends that healthcare providers should “advise” patients who smoke to stop by using clear, strong language including personalized messages about the benefits of quitting and the impact of
continued smoking on the pregnant woman, fetus, and newborn. In Jordan, Dake and Price’s (2006) study of OhioOB-GYNs, 66% reported that they always give pregnant smokers clear, strong and personalized messages to quit smoking. Hartmann et al., (2007) found that providers almost universally reported that they “usually” or “always” ask their patients about smoking (98%) and advise their patients to quit (100%). Okoli and colleagues’ (2010) meta-analysis found that healthcare providers who consistently reported “advising” clients to quit ranged from 66% to 100% (n=11 studies, in 2 studies healthcare providers advised smoking reduction). The current study found results similar to what has been published in the literature about the 5A’s. Unfortunately, additional research indicates that pregnant patients are not always receptive to the advice given to them by their healthcare provider. Dunn, Pirie and Hellerstedt (2003) conducted focus group research in a major metropolitan area in the Midwest and found that there was a common perception among pregnant smokers that doctors were unrealistic about their prenatal advice and did not understand what it was like to be pregnant with limited financial resources. It is possible that women who smoke perceive advice from doctors to be overly cautious and this may detract from how realistic they view healthcare providers’ advice (Price et al., 1991). Although the current study revealed that a majority of participants (93.1%) recalled their healthcare provider telling them that quitting smoking would improve their health and the health of their baby, the participants did not indicate if they viewed this advice positively or negatively.
The third step in the 5A’s is “Assess”. ACOG advises healthcare providers to assess the patient’s willingness to attempt to quit smoking within the next 30 days. Healthcare providers are directed by ACOG to say, “Quitting smoking is one of the most important things you can do for your health and your baby’s health. If we can give you some help, are you willing to try?” This gives the healthcare provider an accurate picture of the patients’ willingness to change their smoking behavior. If the patient is willing, then the healthcare provider can move on to the next step (4A or “Assist”). If the patient is unwilling to try to quit within the next 30 days, healthcare providers should consider having a brief discussion with the patient to educate and reassure her about quitting. ACOG also recommends that quitting advice, assessment, and assistance should be offered at subsequent pre-natal visits. In the current study, less than a quarter of participants (24.1%) reported that their healthcare provider asked them if they would like to quit smoking in the next 30 days. Whereas, a majority of participants (75.9%) in the current study were never asked if they would like to quit smoking within the next 30 days. The “Assess” component of the 5A’s is usually where providers begin to lessen their persistence in following the best practice intervention (Floyd et al., 2001). The results from the current study where only 24% of healthcare providers completed the “assess” piece of the 5A’s is much lower than the 74% of OB-GYNs that reported regularly assessing a patient’s willingness to quit smoking in Hartmann et al.’s (2007) study. Also much lower was Jordan, Dake and Price’s (2006) findings that 42% of randomly sampled OB-GYNs in Ohio reportedly always assess whether pregnant smokers
were willing to make a quit attempt. Okoli and colleagues (2010) found that healthcare providers who consistently reported “assessing” readiness to quit or asked whether clients were willing to make a quit attempt ranged from 42% to 81% (n=6 studies). The current study’s findings that less than a quarter of healthcare providers (24.1%) asked participants if they would like to make a quit attempt excludes a very large percentage of participants (75.9%) from receiving provider recommended assessment of their willingness to quit within 30 days.

ACOG recommends that healthcare providers assist patients who are interested in quitting by providing pregnancy-specific, self-help smoking cessation materials. “Assist” or 4A has five possible components. The first part of “assist” is that the healthcare provider gives the participant information on quitting smoking. A majority of participants (62.1%) in the current study reported that they did not receive any information on quitting smoking from their doctor or nurse. Windsor et al., (1993) suggests that written information, even when provided to the pregnant smoker, is not used. Dunn, Pirie and Hellerstedt (2003) also report that brief interactions with health professionals may be dismissed by socially disadvantaged women because these interactions are perceived as impersonal and do not explain the effects of smoking within the context of the realities of pregnancy. Okoli and colleagues (2010) reported that healthcare providers who claim consistent “assisting” or counseling clients regarding their tobacco use ranged from 27% to 99% (n=13 studies). Floyd et al., (2001) found in a national survey of U.S. OB-GYNs that only 35% provide their self-reported smoking patients with self-help materials. The 2001 study conducted by ACOG in Ohio
revealed that 43% of OB-GYNs surveyed, reported that they consistently provide pregnancy-specific patient education materials. Jordan, Dake and Price (2006) discovered that only 17% of surveyed Ob-gyns in Ohio reported always providing pregnancy-specific, self-help cessation materials. In the current study, 37.9% of participants reported receiving pregnancy-specific cessation materials from their healthcare provider which is consistent with the findings of the research cited above.

In the second part of 4A or “Assist”, ACOG recommends that the healthcare provider enhance the patient’s problem-solving skills by asking where she typically smokes and suggesting how she might avoid the situations that trigger her desire to smoke. It also recommends that the healthcare provider emphasize the importance of having a smoke-free home. Less than half of all participants (44.8%) in the current study reported that the doctor or nurse asked them to have a space in their home where no one is allowed to smoke.

A majority of participants (75.9%) in the current study recounted that they had not been asked to find a person who would like to quit smoking with them and an almost equal number (79.3%) did not remember being told that getting mad and eating more is normal when trying to quit smoking. ACOG recommends that the healthcare provider emphasize the importance of having a smoke-free space at home, encourage them to seek out a quitting buddy, and communicate that nicotine withdrawal symptoms such as irritability and cravings are perfectly normal. Thirteen percent of OB-GYNs in the Jordan et al. study reported always providing or helping to arrange social support to help the patient quit smoking.
The final part of 4A or fifth component of “Assist” is the referral of the pregnant smoking patient to a smoker’s quitline. Telephone quitlines offer information, direct support, and ongoing counseling. These telephone quitlines have been very successful in helping pregnant smokers quit and remain smoke free (ACOG, 2005). Only ten participants (34.5%) in the current study were given the phone number of a stop smoking 24-7 free hotline specifically for pregnant women.

“Arrange” or 5A asks healthcare providers to make a special appointment with their patient to discuss their quit attempts and to aid them in quitting. However, none of the participants in the current study recalled their doctor or nurse asking them to return for an appointment specifically to help them with smoking cessation. ACOG recommends that healthcare providers arrange follow-up visits to track the progress of the patient’s attempt to quit smoking. For current and former smokers, smoking status should be monitored throughout pregnancy, providing opportunities to congratulate and support success, reinforce steps taken toward quitting, and advise those still considering a cessation attempt. Jordan, Dake and Price (2006) reported that 6% of physicians claim to always schedule a follow-up contact by phone or in-person during the week of the quit
day, and 6% helped to arrange smoking cessation services from outside agencies. Yusem, Rosenberg, Dixon-Gray, and Liu (2004) found that the application of the “Arrange” component was the most difficult for nurses to implement in county public health departments and private prenatal care clinics in Oregon. Yusem and colleagues (2004) felt that the “Arrange” concept was very vague, and were confused about when they were “Arranging” at the visit rather than being back at the beginning of the cycle, “Asking, Advising and Assessing”. In their meta-analysis, Okoli and colleagues (2010) found that “Arranging” or referring clients to smoking cessation programs ranged from 6% to 42% (n=11 studies).

Okoli et al., (2010) found that only 12% and 31% of healthcare providers, respectively, reported that they consistently implemented all of the 5A’s of best practice (n=2 studies [Grimley, Bellis, Raczynski, & Henning, 2001; Hartmann et al., 2007]). Conversely, in the current study, none of the healthcare providers performed all 5A’s of the best practice smoking cessation counseling guidelines as recommended by ACOG. In fact, after “Advise” or telling the patient that quitting smoking would be good for the pregnant woman and her baby, a majority of healthcare providers (51-100%) failed to follow through on “Assess, Assist and Arrange,” the remaining steps of the 5A’s. According to the results of the current study, during a pre-natal care visit a majority of the healthcare providers ask patients if they smoke, if they would like to quit smoking and also inform the pregnant woman that quitting smoking would be beneficial for her and the baby. These quick and procedural questions by the healthcare provider do not provide
sufficient smoking cessation counseling and do not give the pregnant smoker any information about quitting, encouragement to set a quit date or referral to a free quitline for pregnant smokers. The 5 A’s were specifically designed for use with pregnant women (Melvin et al., 2000) and have shown that brief cessation counseling (5-15 minutes) offered with pregnancy-specific self-help materials by a trained clinician can improve cessation rates by 30% to 70% compared with cessation rates achieved with simple health care provider advice to quit smoking. Because the smoking rates are so high in the current study (47% rural & 49% urban), it is essential that the healthcare providers implement all 5A’s in order to have an impact on reducing the number of women who smoke throughout pregnancy.

When researching smoking behavior during pregnancy it is common for the smoking deception rate (the number of people who claim to be non-smokers but are really smokers, compared to the number of people who are true non-smokers) to be higher than the general population. Therefore, it is important to confirm smoking status with a biochemical marker in combination with self-report. Table 11 displays the participants’ self-reported smoking status and lists the number of inaccurate self-reports that were made by study location. The table also shows the mean cotinine levels of participants by study location. For the purposes of this study, the cut-off level of 10 ng/ml established by SRNT was used to biochemically determine if a pregnant participant is a smoker or non-smoker. Rural smokers in the current study had a higher mean cotinine level (195 ng/ml) than urban smokers (133ng/ml) which may indicate that rural
smokers are smoking a greater number of cigarettes than urban smokers. There were three urban participants and one rural participant in the current study that self-reported as non-smokers but they had cotinine levels above 10 and were, therefore, re-classified as smokers. Many recent studies have questioned the validity of self-reported smoking status in pregnant women and have reported significant misclassification rates, with sensitivity values from 62% to 92.6% (average value: 75.2%) (Albrecht et al., 1999; Boyd et al., 1998; Ford et al., 1997; Markovic et al., 2000; Walsh, Redman, & Adamson, 1996). On the contrary, English, Eskenazi and Christianson (1994) as well as Klebanoff et al., (1998) found that pregnant women were very honest in reporting whether they smoked or not. In the general population, self-reported measures have been found to provide reliable estimates of smoking status when cotinine validated (Graham & Owen, 2003). Self-report is seen as a less reliable measure for the pregnant population because smokers can feel increased pressure to provide a more socially desirable answer and describe themselves as non-smokers.

As mentioned previously, there were only 4 participants in the current study that reported their smoking status as a non-smoker but had cotinine levels above 10 ng/ml. The overall smoking deception rate was 5.6%. The deception rates for rural and urban participants in this study were 2.8% and 8.6%, respectively. Windsor et al. (1993) reported follow-up deception rates for pregnant smokers as part of a prospective randomized clinical trial including baseline and follow-up. The overall deception rate for a sample of 814 pregnant women at follow-up was 28% (32% for experimental group vs. 17% for control
Gielen et al., (1997) used similar data collection methods and found deception rates of 37% and 48% for the experimental and control groups. The Smoking Cessation or Reduction in Pregnancy Trial, a statewide evaluation research study conducted in Alabama found a baseline deception rate of 24% and a follow-up deception rate of 10% (Windsor et al., 2000). A prospective study conducted in Australia examined the proportion of pregnant women misclassified as nonsmokers by usual care midwives and compared self-reported data with a biochemical measure (Walsh, Redman & Adamson, 1996). Based on the survey and the biochemical test, the estimated proportion of midwife-identified nonsmokers who could be reclassified as smokers was 7.4%, which is similar to the deception rate for urban smokers of 8.6% in the current study. Another retrospective analysis of self-report and biochemical validation was included in a 1992 study that focused on preeclampsia prevention, found that the accuracy of self-reported smoking status had not changed since the 1960s. Results indicated that 95% of participants who self-reported as non-smokers were confirmed as such via cotinine (Klebanoff et al., 2001). Similar deception rates were observed in a Swedish retrospective study (Lindqvist, Lendahls, Tollbom, Aberg & Hakannson, 2002). Smoking status was obtained from 496 patient charts and serum samples were tested for cotinine. After cotinine level analysis, 6% of the 407 self-reported non-smokers had levels that suggested they were, in fact, smokers. However, it is important to note that many of the studies that have high smoking deception rates among pregnant women were asked about their smoking status by their healthcare provider. In the current study, the researcher
that inquired about the pregnant woman’s smoking status was an outside person that was completely un-involved in the woman’s pre-natal care. This may have contributed to the low rate of deception in the current study. Further study comparing the deception rates of the healthcare provider inquiry of smoking status and an outsider making the same inquiry would be worthwhile to see if the pregnant woman’s response in effected by the person making the inquiry.

As shown in the studies mentioned above, the deception rate for pregnant smokers has great variability. It is possible that the deception rate in the current study is relatively low because of a perceived social acceptability of smoking and smoking during pregnancy among this sample. The biochemical verification of smoking status is an expensive and elaborate process. Based on the findings of the current study, it would be more practical to use self-reported smoking rates instead of saliva cotinine verification. In clinical settings it is important to consider that there will always be a small number of deceivers, still, the extra cost and procedure associated with cotinine verification outweighs its benefit. Since there were a low number of deceivers found in the results of this study, hypothetically, the money used for biochemical verification could be better spent on educating OB-GYNs about the importance and benefits of the implementation of the 5A’s.

Table 12 displays the results of the logistic regression model used to predict the smoking behavior of pregnant women. The results indicate that participants reporting barriers were significantly less likely to be smokers. There is scant research about pregnant smokers that uses the HBM as the theoretical model; therefore, it was important that it was included in the logistic regression.
The regression model included: inquiry of smoking status at pre-natal care visit (part of the ACOG recommended 5A’s), knowledge of health risks of smoking during pregnancy, and the four components of the Health Belief Model (susceptibility, severity, benefits and barriers). It was surprising that only barriers were shown to be significant in the regression model. Knowledge of health risks of smoking during pregnancy is closely related to two components of the HBM, susceptibility and severity, and would logically contribute to the smoking status of a pregnant woman. Behavior change theories, such as the HBM, assert that an individual needs to feel susceptible to a health risk prior to behavior change. Studies have repeatedly shown that smokers underestimate or deny the serious health risks of smoking which indicates that they do not feel susceptible to the health risks of smoking, findings that are echoed in the current study.

Barriers were found to be significant, and may be related to increases in stress and depression during pregnancy (Elsenbruch et al., 2007). In the current study, smokers were more likely to be single, unemployed, have an income of less than $10,000 a year, report that they struggled to get by, and use a medical card as a financial source for pre-natal care. The financial difficulties reported by smokers in this study could be closely related to high levels of stress in the daily lives of these pregnant women. Studies have found that there is an increase in nicotine intake during exposure to a stressor. Todd (2004) found that participants smoked more cigarettes and experienced more urges to smoke during periods with higher numbers of negative events and higher levels of perceived stress. Participants living arrangements were not included in the logistic regression,
however, a bivariate analysis showed that living with a husband/boyfriend was shown to be significant in predicting smoking status. More non-smokers (67.7%) reported living with a husband or partner than did smokers (32.3%).
Chapter 5

This chapter presents a summary of the study findings. The summary is followed by a list of significant findings, conclusions, study limitations, and recommendations for further study.

Summary

The purpose of this study was to investigate the influences of smoking on rural and urban pregnant women in Kentucky. More specifically, the variables of the knowledge of health effects, health care provider recommendations, subscores from the HBM, and social support were explored in relation to the smoking behavior of pregnant women. A secondary purpose was to investigate the accuracy of self-reported smoking during pregnancy using biochemical validation.

Research questions for this study included the following:

- What proportion of pregnant smokers are truthful about their current smoking status?
- What knowledge do pregnant women have about the health risks associated with smoking during pregnancy?
- What percentage of healthcare providers are making recommendations about smoking during pregnancy according to the 5A’s approach? Are these recommendations in compliance with current clinical guidelines?
- What social support member(s) are the most influential on the smoking status of pregnant women?
Can smoking status be predicted by a linear composite of the following variables: knowledge mean score, subscores of the Health Belief Model and healthcare provider inquiry of smoking status?

Data were collected from 71 women who attended pre-natal clinics in either Louisville, KY, or Morehead, KY, and agreed to participate. UK Morehead Women’s Health Care is a rural OB-GYN medical practice serving women from Bath, Carter, Elliott, Fleming, Lewis, Magoffin, Menifee, Montgomery, Morgan, Rowan, and Wolfe counties in Kentucky. Family Health Centers, Inc. was selected to be the urban study location and is located in Louisville, Kentucky. Family Health Centers provide specialized healthcare services to more than 43,000 patients annually through their seven locations (Portland, Phoenix, East Broadway, Iroquois, Americana, Southwest, and Fairdale). Three Family Health Center locations (Portland, East Broadway, and Iroquois) were used to collect data for the purposes of this study. The sample population included 30 women between the ages of 18 and 22 (42.3%), 21 women between the ages of 23-27 (29.6%), and 20 women between the ages of 28-42 (28.1%).

Using PASW 18 software, frequencies for actual smoking status were compared with reported smoking status. Percentages, chi-square, t-tests and logistic regression were applied where appropriate in order to test the hypotheses and to describe the results. A logistic regression was used to predict smoking status as the dependent variable and the independent variables were
knowledge mean score, health-care provider recommendation and healthcare provider inquiry of smoking status were tested for significance.

**Results**

The analysis of the data revealed the following significant findings:

1. Thirty-seven (52%) participants were classified as non-smokers while 34 (48%) participants were classified as smokers. Of the rural participants, 47% were classified as smokers compared to 49% of urban participants. A majority (53% and 51%) of rural and urban participants were classified as non-smokers.

2. Marital status and financial source for the pregnancy were both found to be significant (p<.05) predictors of smoking status. A majority (56%) of smokers reported to be single whereas non-smokers were mostly married (79%). Participants using their medical card as payment for their pregnancy-related healthcare were more likely to be smokers than those participants paying for the cost of the pregnancy with private insurance or cash.

3. Significantly more (p>.05) non-smokers (67.7%) lived with a husband/boyfriend than did smokers (32.3).

4. Non-smokers (8.0) had a significantly larger mean knowledge score (p<.05) than did smokers (6.59) which indicated that the non-smokers had greater knowledge about the health effects of smoking than the smokers.
5. The analysis of HBM constructs by smoking status showed that smokers (1.34) had a much higher mean score (p<.001) indicating that they felt less susceptible to the harms of smoking during pregnancy than non-smokers.

6. Smokers felt that there were fewer benefits to quitting smoking than non-smokers.

7. In the rural sample, 33.3% of healthcare providers made a verbal inquiry of the patient’s current smoking status at that office visit, and 82.4% reported that they had been asked about their smoking status at a previous visit. Urban participants reported that their healthcare provider asked about their current smoking status at that office visit (37.2%) and at a previous visit (77.1%). Twenty-four urban participants (68.6%) and 19 (54.3%) rural participants reported that they had completed papers asking about their current smoking status at that office visit.

8. Twenty-five (86.2%) self-reported smoking participants (n=29) reported that their healthcare provider told them to stop smoking and 79.3% reported that their healthcare provider asked them if they wanted to quit smoking, both parts of 1A or “Ask”.

9. Almost all (93.1%) participants recalled the doctor or nurse telling them that stopping smoking would improve their health and the health of their baby, which is 2A or “Advise”.

10. Less than a quarter (24.1%) of participants reported that their healthcare provider asked them if they would like to quit smoking in the next 30 days, which is 3A or “Assess”.
11. A majority (62.1%) of participants reported that they did not receive any information on quitting smoking from their doctor or nurse. Less than half (44.8%) of all participants reported that the doctor or nurse asked them to have a space in their home where no one is allowed to smoke. A majority (75.9%) of participants recounted that they had not been asked to find a person who would like to quit smoking with them and an almost equal number (79.3%) did not remember being told that getting mad and eating more is normal when trying to quit smoking. Nineteen (65.5%) self-reported smoking participants (n=29) were not given the phone number of a stop smoking 24-7 free hotline specifically for pregnant women, which is the last component to 4A or “Assist”.

12. None of the participants recalled their doctor or nurse asking them to return for an appointment to help them with smoking cessation, which is 5A or “Arrange”.

13. There were three urban participants and one rural participant that self-reported as non-smokers but had cotinine levels above 10 and were, therefore, re-classified as smokers.

14. The results of the logistic regression model used to predict the smoking behavior of pregnant women indicated that participants reporting barriers were significantly less likely to be smokers.

Conclusions

Smoking during pregnancy was a significant issue for the women in this sample from urban and rural Kentucky. Almost half (47% rural, 49% urban) of all
participants in the current study were smoking during pregnancy. The maternal smoking rates found in this study were much higher than the reported 26% maternal smoking rate for the State of Kentucky (CDC, 2008). The deception rates for rural and urban participants in this study were 2.8% and 8.6%, respectively. The current study had high rates of maternal smoking, but relatively low rates of deception. Therefore, based on the findings from this study, instead of spending money to biochemically verify the smoking status of pregnant women, the money would be much better spent educating healthcare providers about the benefits of applying the 5A’s in their interactions with patients on a daily basis. Increasing healthcare knowledge and use of toolkits such as the Robert Wood Johnson Foundation’s “Smoking Cessation during Pregnancy: A Clinician’s Guide to Helping Pregnant Women Quit Smoking” could increase the number of pregnant women who stop smoking during pregnancy. Also, allowing healthcare providers to bill insurance companies or Medicaid for the time that they take to counsel a pregnant woman about quit smoking would increase the likelihood that they perform this task. When being paid for something, anyone is more likely to do something!

In the current study, the non-smokers had greater knowledge of the health risks of smoking during pregnancy than the smokers. Many smokers underestimated or denied the serious health risks associated with smoking. Misconceptions about the health risks of smoking may have helped to rationalize continued smoking during pregnancy; therefore, efforts to educate pregnant women about the health risks of smoking during pregnancy should be
increased. Pregnancy is one of the few times in a woman’s life where she has regular contact with a health-care provider who can give smoking cessation recommendations and counseling. These pre-natal care appointments should be used consistently to educate the pregnant woman about the health risks of smoking during pregnancy as well as the benefits of quitting. There is a plethora of available literature about the health risks of smoking; however, it is unlikely that what pregnant smokers need is another pamphlet telling them to stop smoking. The time that pregnant women spend in the waiting room is a wasted educational opportunity. This time could be better utilized in educating all patients – those who are pregnant and those who aren’t – about the health consequences of smoking during pregnancy. The data indicate that it would be more effective if the healthcare providers followed the ACOG recommended 5A’s and attempted to complete all five components. However, the burden of tobacco education should not fall solely on the shoulders of OB-GYNs, but should be the priority of the public health, health promotion and medical communities. Education about the dangers of smoking should begin at a very early age and continue throughout emotional and physical development. Smoking rates have declined in most parts of the United States, still, the high rates of smoking in the current study show that continued education is very necessary. Local health departments and primary health-care providers should also increase efforts to educate people of all ages, especially of child-bearing age, about the severe health risks associated with smoking. Education about the risks of smoking and smoking during pregnancy should be increased in school health programs because it is important to prevent
women from ever starting smoking. School health curriculums should include lessons on the dangers of smoking during pregnancy, specifically targeted at the women of child-bearing age.

There were no significant differences found between rural and urban healthcare providers in their recommendations about smoking during pregnancy. The healthcare providers in the current study generally completed the first 2 components of the 5A’s, ask and advise. However, many fewer healthcare providers completed all the 5A’s with the last 3 components; assess, assist, and arrange. These last 3 steps of the 5A’s are the least “procedural” and are more focused on counseling the pregnant women to stop smoking. The results of the current study reveal that urban and rural healthcare providers are not following current ACOG guidelines and are insufficiently counseling their pre-natal patients to quit smoking. There is an increased need for healthcare provider training in implementing the 5A’s in their daily practice because of the high rates of smoking found in the rural and urban participants of this study. In a study by the Association of American Medical Colleges (2007), physicians identified the need for “more effective interventions” (78%) and “increased availability of interventions” (60%) as the factors that would most motivate them to more frequently assist patients in quitting smoking. Increased insurance coverage for both cessation interventions (61%) and physician services (43%) that support their efforts would also motivate physicians. Because healthcare providers are not directly compensated for the time that they take to counsel a patient about
smoking cessation, but are reimbursed for other diagnostic services, they are reluctant to consistently implement all 5A’s into daily practice.

No significant differences were found between rural and urban smoking participants and the social support they received from their husband or partner or friends and family to stop smoking. However, living with a husband or partner was significant in predicting smoking status. More non-smokers (67.7%) reported living with a husband or partner than did smokers (32.3%). This indicates that the social support provided within the home environment has some importance in relationship to smoking status during pregnancy. It is unclear whether it is the social support or the intimate relationship within the home that aids pregnant women in not smoking. It would be important to include the husband or partner in any smoking cessation intervention since they have a significant influence on the smoking status of the pregnant woman. The nature and subtlety of social support suggests that more in-depth studies should be conducted in order to fully understand what part of the social influence is most important in helping women quit smoking during pregnancy.

**Limitations and recommendations for further study**

A limitation of this study was that it was a self-reported survey with the inherent possibility of response bias. The questionnaire length (5 pages for self-reported non-smokers and 8 pages for self-reported smokers) could also be considered another limitation and may have included questions that participants could have misunderstood, resulting in missing or incorrect responses. The
questionnaire was completed in the waiting room of the OB-GYNs office or in the exam room while waiting for the healthcare provider, and it is possible that the participants’ responses were influenced by the person attending the pre-natal appointment with them (i.e. boyfriend, husband or mother).

The current study utilized a convenience sample and therefore the sample was limited to those that were seeking pre-natal care at the clinics in Morehead and Louisville. Thus, the results may not be generally applied to other groups or locations. A larger number of participants and an increased number of data collection sites would permit greater generalizability. The study sample total of 70 was taken from a common rule that behavioral studies should have at least 30 participants in each group. The number of participants was also limited by the high cost of biochemical verification analysis. The lack of variability in the sample may have affected some of the results, especially the non-significant. Because the data collected were from the patient’s point of view, it is possible that the reports of the healthcare providers utilization of the 5A’s are not accurate. To improve reliability, it would be important to gather information from the healthcare providers, in addition, about their use of the 5A’s.

The clinics where the data were collected were notified ahead of time and the healthcare providers were also given information about the current study and its purpose. The presence of the researcher in the clinics may have caused the healthcare providers to increase the number of smoking status inquiries that were made; however, there was no way to control for this.

Additional studies identifying other variables which could be related to
smoking or smoking during pregnancy are needed. Further study focused on the role of the husband or partner as a source of social support and the role of stress in continuing to smoke throughout pregnancy is needed.
Appendix A

Please choose one of the following:

1. I have NEVER smoked.

I have smoked LESS THAN 100 cigarettes in my lifetime.

I stopped smoking BEFORE I found out I was pregnant, and I am not smoking now.

I stopped smoking AFTER I found out I was pregnant, and I am not smoking now.

I smoke now, but have cut down on the number of cigarettes I smoke SINCE I found out that I was pregnant.

I smoke regularly; about the SAME as BEFORE I found out I was pregnant.

I smoke regularly; I smoke MORE now than BEFORE I found out I was pregnant.

Please choose yes/no for each:

2. I have smoked a cigarette in the last 30 days.  
   YES  NO

3. I have smoked a cigarette in the last 7 days.  
   YES  NO

4. I have smoked a cigarette in the last 24 hours.  
   YES  NO

5. I have used chew/dip in the last 30 days.  
   YES  NO

6. I have used chew/dip in the last 7 days.  
   YES  NO

7. I have used chew/dip in the last 24 hours.  
   YES  NO

8. If you smoke, at what age did you begin smoking regularly (at least one cigarette a day for 30 days)?
   ___________________________________________  I DON’T SMOKE  YES  NO

9. How many cigarettes were you smoking each day BEFORE this pregnancy?
   ___________________________________________  I DON’T SMOKE  YES  NO

10. I am trying to quit smoking and am currently using the nicotine patch and/or gum.  
    YES  NO

Please choose yes/no for each:

11. The doctor/nurse that I saw TODAY asked me if I smoke  
    YES  NO

12. I filled out papers TODAY that asked me if I smoke  
    YES  NO

13. The doctor/nurse has asked me before this visit if I smoke  
    YES  NO
<table>
<thead>
<tr>
<th>Please tell me if you agree/disagree:</th>
<th>Agree</th>
<th>Disagree</th>
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<tbody>
<tr>
<td>14. Smoking hurts the smoker’s health.</td>
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<tr>
<td>15. Sometimes a woman can have a healthy baby even if she smoked during her pregnancy.</td>
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<tr>
<td>16. When a woman is pregnant and she quits smoking it can improve the health of the baby.</td>
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<tr>
<td>17. Many women have smoked while they were pregnant and they have had healthy babies.</td>
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<tr>
<td>18. The stress caused by stopping smoking can hurt the baby.</td>
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<td>19. Smoking is NOT the main cause of lung cancer and heart disease.</td>
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<tr>
<td>20. Smoking is addictive.</td>
<td></td>
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<td>21. A baby can become sick because the mother smoked while she was pregnant.</td>
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<tr>
<td>22. A mother’s smoking can cause a baby to be born weighing less than 5 ½ pounds.</td>
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<tr>
<td>23. Being in the room with someone who is smoking is bad for babies.</td>
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<tr>
<td>24. Being in the room with someone who is smoking is okay for pregnant women.</td>
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<tr>
<td>25. Smoking during pregnancy can cause the baby to have mental and physical problems.</td>
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<tr>
<td>26. The more you smoke during pregnancy the greater the risk of heart problems for the baby.</td>
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<tr>
<td>27. During pregnancy, nicotine can get into the area around the baby.</td>
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<tr>
<td>28. Nicotine is as addictive as cocaine or heroin.</td>
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<tr>
<td>29. Women can die 14.5 years earlier from smoking.</td>
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<tr>
<td>30. Women who smoke during pregnancy are more likely to miscarry or to have a baby that weighs less than 5 ½ pounds.</td>
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</tbody>
</table>
31. Babies that weigh less than 5 ½ pounds are more likely to die than other infants. □ □ □

32. Babies that weigh less than 5 ½ pounds are more likely to have learning and physical disabilities. □ □ □

33. Smoking during pregnancy increases the risk of going into labor before the baby is due. □ □ □

34. If a woman stops smoking within the first 3-4 months of her pregnancy, it is almost like she never smoked at all. □ □ □

35. Stopping smoking will help a woman live longer. □ □ □

36. Stopping smoking will give a pregnant woman more money to buy new things for her baby. □ □ □

37. Stopping smoking will help a pregnant woman have more energy and not smell bad. □ □ □

38. I am afraid to quit smoking because I don’t want to gain weight. □ □ □

39. If I quit smoking while I am pregnant I am afraid I will feel bad. □ □ □

40. Smoking helps me deal with stress. □ □ □

41. I enjoy talking to the people that I smoke with. □ □ □

---

**Have you smoked a cigarette within the last 24 hours, 7 days or 30 days?**

If YES, please continue to question 38.

If NO, then please STOP and complete the yellow sheet. Thank you!
The next questions are about THIS and ANY OTHER visits with the doctor or nurse:

Please choose yes/no for each:

42. The doctor or nurse asked me if I want to quit smoking
43. The doctor or nurse advised me to stop smoking
44. The doctor or nurse told me about how quitting smoking would be good for me and my baby
45. The doctor or nurse congratulated me because I quit smoking
46. The doctor or nurse asked me if I would like to quit smoking in the next 30 days
47. The doctor or nurse gave me information on quitting smoking
48. The doctor or nurse asks me to have a place in my home where no one is allowed to smoke
49. The doctor or nurse asks me to find a person who would like to learn how to quit smoking with me
50. The doctor or nurse told me that getting mad and eating more is normal when trying to quit smoking
51. The doctor or nurse gave me a phone number that I can call when I need help to stop smoking
52. The doctor or nurse made an appointment with me to help me quit smoking

Please tell me how much you agree/disagree:

53. It is easy to talk with the doctor or nurse about my smoking.
54. I believe that my doctor or nurse is a smoker.
55. I feel sure that I am able to NOT smoke when I am upset.
56. I feel sure that I am able to NOT smoke when I am angry.  
57. I feel sure that I am able to NOT smoke when I am having an argument.  
58. I feel sure that I am able to NOT smoke when I am stressed.  
59. Since becoming pregnant, my friends and family have been asking me to quit smoking.  
60. My friends/family help me quit smoking  
61. I feel that my friends/family have the most influence on my smoking.  
62. My family/friends want me to stop smoking while I am pregnant.  
63. My friends/family tell me that I am going good when I am not smoking.  

Please tell me how much you agree/disagree with the following:

<table>
<thead>
<tr>
<th>Agree</th>
<th>Agree</th>
<th>Do not agree or disagree</th>
<th>Disagree</th>
<th>Disagree very much</th>
<th>Don’t</th>
</tr>
</thead>
<tbody>
<tr>
<td>64. Since becoming pregnant, I fight with my friends/family about smoking.</td>
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<tr>
<td>65. My spouse/partner supports my quitting smoking.</td>
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<tr>
<td>66. Since becoming pregnant my spouse/partner has been asking me to quit smoking.</td>
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<td>67. My spouse/partner has the most influence on my smoking.</td>
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<td>68. My spouse/partner wants me to stop smoking while I am pregnant.</td>
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<td>69. My spouse/partner tells me that I am doing good when I am not smoking.</td>
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<tr>
<td>70. Since becoming pregnant, I fight with my spouse/partner about smoking.</td>
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<td>Question</td>
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<td><strong>Please select one of the following:</strong></td>
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<td><strong>few/none</strong></td>
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<tr>
<td>71. How many of your friends/family smoke (friends you see about once a week)                                                                                              NO</td>
<td></td>
<td></td>
<td>YES</td>
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<td>72. Before I got pregnant, my spouse/partner used to smoke.</td>
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<td>73. Before I got pregnant, my spouse/partner never smoked.</td>
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<tr>
<td>74. Has your spouse/partner changed his smoking since you became pregnant?                                                                                           NO</td>
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<td>YES</td>
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<td>If yes, please tell how:</td>
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<td>____________________________________________________________________________________________________________________________________________</td>
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<td>75. How many cigarettes does your spouse/partner smoke each day?</td>
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<td>____________________________________________________________________________________________________________________________________________</td>
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<td>Thank you very much!</td>
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</tbody>
</table>
Please answer the following questions:

1. How old are you? _________________________________

2. What county do you live in? _________________________________

3. What is your zip code? __________

4. How would you best describe your race or ethnic background? (mark all that apply)
   - Black/African-American □
   - White/Caucasian □
   - Hispanic/Latino □
   - Asian/Pacific Islander □
   - Native American □
   - Other: ____________________

5. What is the highest grade you finished? _________________________________

6. Are you currently employed?
   - Yes □
   - No □

7. What is your marital status?
   - Single □
   - Married □
   - Separated/Divorced □
   - Widowed □

8. Please list all of the people that live with you.

________________________________________________________________________
________________________________________________________________________
9. What is your yearly household income?

- Less than 10,000 □
- 10,000 to 15,000 □
- 15,000 to 20,000 □
- 20,000 to 30,000 □
- 30,000 and above □

10. How would you describe your current financial status?

- I have more than I need to live well □
- I have just enough to get by □
- I sometimes struggle to make ends meet □

11. How will most of your doctor and hospital bills for this pregnancy be paid for?

- Private insurance □
- Medical card □
- Billed to me (cash) □
- Other:___________________
References


and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office of Smoking and Health.


EDUCATION

Masters of Public Health
May 2005
College of Public Health, University of Kentucky, Lexington, KY

Area of Specialization: Health behavior
Thesis: Correlates of HIV Testing in Uninsured Hispanic Women

Bachelor of Arts
May 2003
College of Arts and Sciences, University of Louisville, Louisville, KY

Major: Cultural Anthropology

TEACHING EXPERIENCE

University of Kentucky (2005-2006) Lexington, KY
Teaching Assistant, Department of Kinesiology and Health Promotion

- Human Health and Wellness (KHP 230)

University of Louisville (2002-2003) Louisville, KY
Learning Assistant, Department of Anthropology

- Introduction to Cultural Anthropology (ANT 201)

Kentucky Governor’s Scholar’s Program Danville, KY
Staff Instructor and Resident Assistant (2002)

- Governor’s Scholar Seminar on Global Health

Apia Montessori School Apia, Samoa
ESL/Montessori Teacher (2001)

Papua New Guinea Ministry of Health Samurai, Papua New Guinea
Rural Public Health Educator (2000)

- Pre-natal health, nutrition, and basic sanitation courses in rural highlands villages

RESEARCH EXPERIENCE

Rural Cancer Control Fellowship University of Kentucky
Pre-Doctoral Fellow (2006-2008)

Research Assistant University of Kentucky
College of Public Health
• Project manager for Agency for Healthcare Research and Quality (AHRQ) grant
• Assisted in the Council on Education for Public Health (CEPH) accreditation/site visit
• Project manager for Council for International Exchange of Scholars (CIES)/Uzbekistan grant
• Composed and published weekly College of Public Health newsletter

PUBLICATIONS


Fellowships and Awards

<table>
<thead>
<tr>
<th>Fellowship/Award</th>
<th>Institution/Grant</th>
</tr>
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<tbody>
<tr>
<td>Dissertation Fellowship (2008-2010)</td>
<td>National Cancer Institute</td>
</tr>
<tr>
<td>Markey Cancer Center Research Grant (2008)</td>
<td>University of Kentucky</td>
</tr>
<tr>
<td>Rural Cancer Control Pre-Doctoral Fellowship (2006-2008)</td>
<td>National Cancer Institute</td>
</tr>
<tr>
<td>College of Public Health Travel/Research Award (2005)</td>
<td>University of Kentucky</td>
</tr>
<tr>
<td>Undergraduate Research Grant (2003)</td>
<td>University of Louisville</td>
</tr>
<tr>
<td>International Research Grant (2003)</td>
<td>University of Louisville</td>
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</tbody>
</table>