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ATTRIBUTES OF SUCCESSFUL SMOKING INTERVENTIONS FOR
PREGNANT WOMEN ATTENDING PUBLIC HEALTH CLINICS
IN THE STATE OF OHIO

DISSERTATION

Presented in Partial Fulfillment of the Requirements
for the Degree Doctor of Philosophy in the
Graduate School of The Ohio State University

by

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* * * * *

The Ohio State University
1995

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To Sueann,

for guidance and encouragement from above in the completion of this work.
The one's for you!
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VITA

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CHAPTER I
INTRODUCTION

Nature of the Problem

Smoking and tobacco use continues as the number one public health problem in the United States. Research repeatedly has shown cigarette smoking as a proven risk factor for heart disease, cancer, stroke, the three leading causes of death in the United States (USDHHS, 1989). Furthermore, recent reports of accrued evidence during the past decade clearly implicates environmental tobacco smoke (passive smoke) as a risk factor for nonsmokers (Glantz and Parmley, 1991).

Smoking prevalence has declined considerably since 1965 with approximately 15 million Americans quitting smoking during the last decade. Studies have shown that rates for women have decreased more slowly partly because of the uptake of smoking by adolescent girls. Reports from the Surgeon General have revealed that more educated and affluent smokers quit in greater numbers than their less educated low socioeconomic status counterparts. Tobacco use by minority groups remains relatively high. Evidence reveals that smoking cessation interventions have been slow to adapt to demographic trends (USDHHS, 1989).
Smokers in Ohio are not quitting at rates as high as in other states. Results of the Behavioral Risk Factor Surveillance System Survey reveal that of adults who ever smoked in their life, only 45.3 percent were considered nonsmokers. Ohio's quit ratio fell to the lowest third of 38 states. Quit ratios were lowest for younger age groups, for blacks, for women, and for those with less than a high school education (Centers of Disease Control, 1990).

Smoking is the probable cause of pregnancies not running their full term. Smoking during pregnancy has been linked to 18 percent of all cases of low birth weight, prematurity, respiratory distress syndrome and sudden infant death syndrome (Centers of Disease Control, 1984). Since low-income women are at increased risk for delivering low birth weight infants, factors associated with birth weight among such groups have special relevance.

An Ohio study of maternal smoking during pregnancy revealed that 23 percent of women smoked during their pregnancy. Demographic data showed white women were more likely to smoke than black women (8.8% and 4.7%, respectively). Of live infant births, 5.7 percent were low birth weight (LBW), weighing less than 2500 grams. Infants born to smokers were more than twice as likely to have LBW than infants born to non-smokers. The risk of LBW was directly proportional to smoking status of the mother. Approximately 20 percent of all LBW were attributable to smoking (Hopkins, et al., 1990).
While demographic variables have not consistently differentiated smokers, certain personal history characteristics have been shown to be determinants of smoking behavior. Research has shown that the longer a person has been smoking and the greater number of daily cigarettes smoked, the less probable he or she will quit (Lichtenstein and Glasgow, 1992). Also, studies reveal that the smoking habits of significant others influence the smoker's behavior. A study conducted to examine factors associated with smoking in low income pregnant women revealed that social support, stress and mental health influenced smoking behavior (McCormick, et al., 1990). These findings suggest that smoking cessation interventions must take into account personal characteristics pertaining to pregnant women and their environment, which may make behavioral change difficult.

Conceptual theory which has been articulated during the past decade to examine smoking cessation is the "Stages of Change Model." Quitting smoking is a process involving stages of change: precontemplation, contemplation, preparation, action, maintenance. The model has been utilized to demonstrate how experiential and behavioral processes are important in behavior modification.

Self-change smoking research has emphasized feedback and education as important processes to focus on during precontemplation and contemplation stages. Action stage processes include stimulus control, counterconditioning and reinforcement management. Self-efficacy, continued reinforcement and helping relationships are important during the maintenance stage. Much research has been
conducted to determine predictive factors of self-change, however, the literature
does not point toward any specific interventional strategy which focuses on the
stages of change and produced higher quit rates.

A wide variety of cognitive and behavioral techniques have been used to
achieve and maintain cessation. Many guides have been developed to help smokers
quit on their own (i.e., American Lung Association, 1980; Windsor, 1984; Danaher
and Lichtenstein, 1978). Past research has shown self-help quitting guides as a
promising alternative to clinic intervention (Cummings, Emont, Jaen, and
Sciandra, 1988; Davis, Faust and Ordentlich, 1984; Orleans et al., 1991). Quit
rates with these studies have correlated to the amount of materials read and the
degree of adherence to prescribed quitting activities. Problems of nonadherence
have been common in these studies.

Other studies have examined personal support and adjunct motivational
strategies for their effectiveness in preventing relapse. Numerous studies have
documented the role of social support in the quitting process, however, types of
support (i.e., buddy relationships, peer support, family support) need to be more
definitively examined, for a paradox exists in the reported effectiveness of various
social supports (Cohen et al., 1988; Lichtenstein, Glasgow and Abrams, 1986).

The usefulness of home correspondence, telephone hotline services and printed
reinforcement materials have also been reported in the literature. Studies
conducted by the National Cancer Institute reveal that personalized counselor
phone calls, personalized computer-generated progress reports and nicotine gum have shown promising results in preventing relapse. No conclusive evidence exists and additional research is needed to determine effectiveness of these strategies with different sub-populations of smokers (Glynn, Boyd and Gruman, 1990).

Significance of the Study

A greater understanding of the determinants of self-change leading to smoking cessation for pregnant women is a precursor to the development of effective intervention strategies. Processes of change which influence smoking behavior need to be examined for their potential effectiveness in relapse prevention and long term maintenance. The Stages of Change Model will be used as a conceptual framework to examine the processes of change which are utilized by pregnant women during the action and maintenance stages. The advantages of process-oriented rather than static variables will be assessed in this study for their usefulness in predicting behavior patterns for smoking cessation. Smoking history, the daily living environment of the smoker including significant relationships, will also be evaluated as predictor variables of smoking status. The information from this study will provide baseline data for developing effective intervention strategies which produce higher quit rates and long term maintenance of nonsmoking behavior during and after pregnancy.
Problem Statement

The purpose of this study was to determine what factors other than the primary intervention modality are predictors of smoking cessation for pregnant women who attend public health clinics throughout Ohio. Processes of stimulus control, reinforcement management, counterconditioning and helping relationships were assessed for their relative influence toward improving quit rates for pregnant women who smoke. The primary intervention modality consisted of one-on-one education sessions for smoking cessation at antepartum visits throughout the eighth month of pregnancy and the use of the self-help guide; A Pregnant Woman's Guide to Quit Smoking." (Windsor, 1984). The secondary processes of stimulus control, counterconditioning, reinforcement management and helping relationships were examined as attributes of successful smoking cessation strategies. Also, the factors of smoking history and elements of the smoker's daily living environment were assessed as contributing variables to resultant smoking behavior.

Discussion will focus on stages of self-change for smoking cessation and those factors which improve quit rates and contribute to maintenance of nonsmoking behavior during pregnancy and postpartum. While current estimates indicate between 20-40 percent of pregnant women quit smoking during pregnancy, about half of the women who quit, relapse to smoking by 30 days postpartum (McBride and Pirie, 1990). At this time, the literature does not point to any one strategy for producing substantial initial cessation rates and effective maintenance strategies.
for postpartum women. This research was conducted to determine what factors are predictors of nonsmoking behavior during pregnancy and postpartum for low income women who attend public health clinics in Ohio.

**Research Hypothesis**

The process of change factors; counterconditioning, stimulus control, reinforcement management and helping relationships will predict the likelihood that pregnant women will stop smoking during pregnancy.

**Research Questions**

1) Which processes of change are the most powerful predictors of smoking cessation during pregnancy?

2) What group differences based on the processes of change exist at the postpartum visit for quitters who stayed quit, and smokers who never quit or returned to smoking by the postpartum visit?

**Assumptions**

The process of research often involves varying elements that are beyond the control of the investigator. Results are based on assumptions about the population group and study design which the researcher cannot prove but are generally accepted as facts.
The assumptions for this study are the following:

1) Pregnant women who receive care in public health clinics are a heterogeneous
   population socioeconomically, culturally and developmentally.

2) The interview and questionnaire surveys assume respondent honesty.

3) Self-report data reported on self-administered questionnaires provides an
   accurate measure of actual behavior.

4) The interview survey assumes accuracy and consistency on the part of trained
   interviewers.

Limitations

Limitations are those uncontrolled factors which may affect the generalization
of results of the study. Limitations for this study include:

1) Questionnaire data depends on human beliefs and opinions which may not
   accurately be presented. Survey instruments assume respondent honesty.
   Surveys are intrusive by format. Subject awareness of being investigated may
   change their response. Also, internal and external factors may influence
   respondents' answers.

2) Clinic site locations were chosen based on predetermined factors of
   a) percentages of smoking population, b) clinic services provided to term and
   postpartum, and c) the clinic's willingness to cooperate for research
   procedures. These limit the generalization of results to clinic sites which
participated in the study.

3) External factors which may affect respondents accuracy are the interviewing
room, room lighting, room temperature and method of the interview. These
factors were controlled in the study by having participants undergo the
interviewing and questionnaire completion in a counseling room which
provided the client a quiet, comfortable, confidential atmosphere.

4) Instrumentation factors which may influence data collection biases include
utilization of different interviewers at eight locations. Control over this
limitation was accomplished by providing standardized training for collecting
data via the interview process. Health professionals were trained prior to data
collection to provide standardized educational sessions which included
information about the four processes of change which was utilized by clients to
maintain nonsmoking behavior, (stimulus control, counterconditioning,
reinforcement management, and helping relationships). This training session
was provided prior to the study by the principal investigator conducting this
research. The training session reviewed and clarified the purpose of the training
manual: Training Manual For Health Professionals Providing Educational
Counseling for Smoking Cessation During Pregnancy. Health professionals
at each location were trained and each interviewer interviewed an equal
number of participants per site.
To monitor for standardized education across sites, all sites were visited by the principal investigator to verify quality assurance of educational content being presented. Another monitoring device that was utilized was a checklist which was completed by the health professional following each educational session provided to the client. This checklist served to monitor the educational topics covered at each visit as well as the educational materials and incentives provided for the client during her antepartum and postpartum clinical visits.

5) The personalities and personal characteristics of the data collectors is another limitation of the instrumentation process. The gender, age, ethnicity, language patterns and smoking status of the health professionals who completed the interview and the educational sessions may affect how the participant responds. This limitation was controlled by limiting the number of health professionals who provided the interview and educational sessions across sites to those who attended the initial training session provided by the principal investigator. Also, a monitoring visit completed by the principal investigator to all clinic sites during the first two months of the study, was done to ensure that education was provided in a nonthreatening, unbiased, and objective manner.

6) Internal factors which may influence participants responses include: physical and emotional health on the day of the interview, memory, motivation, commitment and knowledge. Participants may not be motivated to be honest
because they want to present themselves in a favorable light; respondents may not understand the question being asked or may not know the answer and to avoid embarrassment answer the question in terms of their own understanding. Control over these internal participant factors was accomplished by using instruments which were pilot-tested for validity and reliability and by using a biochemical validation measure to determine smoking status and thus verify self-report.

7) Another limitation is participant mortality at the postpartum visit. Historically, this population has not been reliable for keeping the postpartum appointment. This limitation was controlled by conducting a telephone interview with those participants who did not show for the postpartum visit.

Delimitations

Boundaries of the problem area to which this study is confined are delimitations. This study has the following delimitations:

1) Only four processes of change will be analyzed for their effectiveness in changing the smoking behavior. These processes are; stimulus control, counterconditioning, reinforcement management, and helping relationships. These processes of change have been emphasized in previous research as those utilized during the action stage of behavior change (Prochaska and DiClemente, 1983). Other processes of change which are utilized during
precontemplation, contemplation and maintenance stages will not be examined in this study.

2) The study population resides in eight counties throughout Ohio, and include those women who attend public health clinics. Study results may only be generalized to pregnant women who attend public health clinics in areas of similar geographic location and have similar sociodemographic characteristics.

3) The study was limited to eight counties in Ohio due to time, cost, and logistical organizational factors. Pregnant smokers in other counties throughout the state will not be included in the study.

Definitions

The following terms are defined conceptually and operationally for understanding their purpose in the analyses of this study.

Processes of Change - covert and overt activities that individuals use to modify their problem behaviors. These include the constructs of counterconditioning, stimulus control, reinforcement management and helping relationships as measured by a 16 item likert scale questionnaire entitled: Processes of Change (Prochaska and DiClemente, 1983).
**Counterconditioning** - cognitive and behavioral processes which are substituted for a problem behavior such as smoking. The smoker employs replacement thoughts or activities in response to a cue to smoke (DiClemente and Prochaska, 1982). This construct will be measured for frequency of use as a substitution behavior for smoking by response to four likert scale items ranging in value from 1 = never to 5 = repeatedly.

**Stimulus Control** - a physical or mental restraining influence over a substance or agent that arouses the mind or spirit. Activities demonstrating stimulus control in this study would be the removal of items such as ashtrays from one's environment that remind them of smoking (DiClemente and Prochaska, 1982). This construct will be measured by response to four likert scale items ranging in value from 1 = never to 5 = repeatedly, indicating frequency of use in helping a smoker quit smoking.

**Reinforcement Management** - the strengthening of a reaction by the addition of another stimulus or reward. This process will be measured by response to questionnaire items which are typically stated as "I am rewarded by others if I don't smoke" (Prochaska et al., 1985). Responses to four likert scale items ranging in value from 1 = never to 5 = repeatedly, will be analyzed to determine frequency of utilizing reinforcement management as a process in quitting smoking.
Helping Relationships - moral and emotional connections that bring an individual in touch with supporting fellows. This construct is typically measured by the statement "I have someone who listens when I need to talk about my smoking" (Prochaska et al., 1985). Response to four likert scale items ranging in value from 1 = never to 5 = repeatedly, will determine how frequently a smoker utilizes the support of others to quit smoking.
CHAPTER II
REVIEW OF THE LITERATURE

Smoking prevalence has declined considerably in the past twenty years however, smoking and tobacco use remains a major public health problem in the United States. The proportion of women smokers rose from 34 percent to 36 percent from 1965 to 1975, and smoking rates among teenage girls (26%) were higher than among boys aged 17 and 18 (19%) according to 1979 data (Wilner, 1984). Exact rates of smoking during pregnancy are unknown but it is estimated that 20-40 percent of U.S. women smoke at the onset of pregnancy (Prager et al., 1984). National statistics reveal that only about 21 percent of women quit smoking during pregnancy (Thornberry, Wilson and Golden, 1986). Pregnancy offers an ideal time to intervene for smoking cessation since quitting can significantly affect the health of both the mother and infant, and regular clinical visits provide opportunity for continuous education, counseling and support.

Smoking cessation literature is voluminous. Studies conducted on smoking cessation intervention for pregnant women have addressed numerous issues including: smoking effects on maternal and infant health, smoking prevalence rates, determinants of smoking, predictors of relapse, stages and processes of
change, clinical and self-help intervention and postpartum smoking maintenance. This literature synthesis will review pertinent studies in each of these areas; providing an overview of the problems related to smoking during pregnancy, discussing the research trials which have been conducted, documenting the need for continued inquiry making evident the purpose of this study.

I. Major Health Effects of Prenatal Smoking

Despite the overwhelming evidence that clearly shows the harmful effects of smoking during pregnancy, about one in five pregnant women continue to smoke (USDHHS, 1989). National survey results reveal that women who smoke during pregnancy fail to recognize smoking as an etiological factor in perinatal morbidity and mortality (USDHHS, 1981). Reported relative risks for pregnant women who smoke include placenta previa, abrupto placenta and abnormal bleeding during pregnancy (Naeye, 1980; Meyer and Tonascia, 1977). Of greater interest is the fact that one in four infants born each year in the United States is at increased risk for low birthweight due to smoking during pregnancy (Prager et al., 1984). Other studies have implicated maternal smoking as a primary factor for increased sudden death syndrome, pneumonia and other respiratory conditions (Naeye, 1981; USDHHS, 1987).

A recently published meta-analysis provides current estimates supporting the magnitude of morbidity and motality rates attributable to tobacco usage by others.
Pooled statistics indicate that 19,000 to 141,000 fetal deaths per year can be linked to maternal tobacco use during pregnancy. At least three times as many infants die each year of Sudden Death Syndrome, caused by maternal smoking, as are infant deaths by homicide or child abuse. Also, it is estimated that smoking during pregnancy is related to 32,000 to 61,000 low birth weight infants born each year.

Smoking cessation research conducted in the 1970's primarily focused on the harmful effects of maternal smoking on fetal and infant health. These earlier studies focused on the need for intervention to reduce infant mortality and morbidity rates for the nation by decreasing the risk of low birthweight infants being born to pregnant women. A study of smoking cessation patterns for pregnant women revealed that women who quit smoking before the sixteenth week of pregnancy improved their chances of having a low birthweight infant equal to the risk of a nonpregnant smoker (Butler and Goldstein, 1973). Another study reported similar findings for the association of maternal smoking and both low birthweight and preterm delivery. Results of this study revealed that women who quit smoking during their first trimester of pregnancy reduced the incidence of preterm deliveries by 26 percent and low birthweight infants by 18 percent (Mainous and Hueston, 1994).

A 1977 study by Donovan, reported that antismoking advice given as part of prenatal care, was effective for improving infant birthweight of pregnant women
who smoke (Donovan, 1977). This study emphasized the need for participatory smoking cessation educational programs. A prospective study completed to evaluate efficacy of a multicomponent smoking cessation program for pregnant women further supported the need for participatory educational intervention (Qing et al., 1993). Results of this study revealed that women who received one-on-one counseling sessions and a self-help guide, achieved higher reduction rates and increased infant birthweight, than those who received only verbal advice to quit.

The most current published meta-analysis of effective prenatal smoking interventions on smoking cessation and low birthweight outcomes corroborates the need for multicomponent interventions (Dolar-Mullen et al., 1994). Findings of this study support the need for more intensive intervention involving both multiple sessions and educational formats. Individualized counseling accompanied by self-help materials and continued follow-up contacts were suggested for achieving greater smoking cessation rates.

The health effects of passive smoke exposure on the infant is still another issue which has been addressed. Parental smoking after delivery and during early childhood causes additional health risks for children. Numerous studies have documented the increased rates of respiratory infections, including pneumonia, bronchitis, laryngitis and otitis media (Colley et al., 1974; USDHHS, 1987). Rates of hospitalization of infants with these conditions are reported as three times higher than for infants of nonsmokers (Harlap and Davies, 1974).
Smoking Prevalence Among Pregnant Women

Smoking prevalence has declined steadily overall since 1965, however, rates for women have decreased more slowly than for males. From 1965 to 1987, prevalence of smoking among women only decreased from 31.9 percent to 26.8 percent (USDHHS, PHS, 1989). This slow decline in prevalence suggests a need for increased focus on prevention and cessation of smoking among women as a sub-population group.

Identified characteristics of women smokers have implications for planning intervention. Women in the lowest age and socioeconomic categories have the highest likelihood of smoking during pregnancy. A ten year trend study from 1978 to 1988 revealed that unmarried pregnant women were more likely to smoke than married women (Stockbauer and Land, 1991). Data on women of child bearing age (ages 15-44) gathered as part of the 1982 National Survey of Family Growth, showed that 32 percent smoked during their pregnancy. Women smokers with less that 12 years of education showed a much slower decline in smoking during pregnancy between 1967 and 1980 than did women smokers with 16 or more years of education (USDHHS, 1989).

A profile of tobacco use in the State of Ohio reported as part of the Behavioral Risk Factor Surveillance System revealed similar results. Education and living arrangements were identified as major factors related to smoking during pregnancy. This report revealed that smoking prevalence rates decreased as
women's years of education increased, and rates were higher for single than married women. Also, smoking rates increased significantly for women entering into prenatal care later than the first trimester. Rates increased from 19 percent for those who began care during the first month of pregnancy to 45 percent for those who received no prenatal care (Sherwood et al., 1994).

Examination of smoking prevalence during pregnancy by race reveals that rates are slightly higher among whites than blacks. Also, prevalence is lower among Hispanic than non-Hispanic women (Centers of Disease Control, 1992). A report on age patterns of smoking behavior in black and white women revealed that white women begin smoking at younger ages than blacks. Study results revealed that smoking cessation intervention for black women should be tailored to older adults due to a delayed initiation of smoking (Geronimus, Neidert and Bound, 1993).

Regardless of demographic factors, only about 25 percent of mothers who smoke at time of pregnancy, stop smoking shortly after learning they are pregnant. The likelihood of quitting increases for women who are lighter smokers (Fingerhut, Kleinman and Kendrick, 1990). A study conducted in Sweden suggests that factors such as early onset age of smoking and smoking status of closely related persons are risk factors for continued smoking during pregnancy (Cnattingius, 1989). Another study revealed that women who drink during their pregnancy are more likely to smoke (Prager et al., 1984). Before successful intervention can occur, studies investigating women's knowledge of fetal risks of smoking as well as
socioeconomic factors and the magnitude of addiction need to be more closely examined for their relative impact on smoking behavior.

**Determinants of Smoking During Pregnancy**

The expansion of women's professional status and their growing independence has paralleled an increase in smoking prevalence. Changes in social norms for women have been heightened by widespread media and marketing ads by cigarette producers made appealing to women. A survey by Biener of female adolescents, revealed that this age group perceived women smokers as "more socially skilled, self-confident and outgoing than women who do not smoke" (Biener, 1987).

The multiple role image of women in the 80's may have contributed to increased smoking by women as a coping mechanism to stress. One study found that smoking was one of the most frequent coping mechanisms used by mothers in dealing with children (Graham, 1987). Other reported findings show that women in high-stress jobs are more likely to be smokers than women in low-stress jobs (Biener, 1987).

Despite the confirming evidence of the health risks associated with smoking during pregnancy, women continue to smoke. Studies examining women's beliefs reveal that women continue to smoke during pregnancy for a variety of reasons including: an addiction to nicotine, weight control, as a aid to combating depression (Floyd et al., 1993). A study attempting to document reasons for smoking during pregnancy among low-income women found that high levels of
stress, social isolation and distress were associated with continued smoking (McCormick et al., 1990).

An addiction to nicotine is reported as a major reason why women continue to smoke during pregnancy. Evidence reveals that nicotine provides some benefit to smokers to help reduce anxiety and negative affect, and thus helps the smoker to relax (Livison and Leino, 1988). Women have also reported that smoking aids in combating depression which occurs during pregnancy due to metabolic and hormonal changes. Survey results reported by Anda and Associates revealed that depressed smokers were 40 percent less likely than nondepressed smokers to have quit smoking (Anda et al., 1990). In view of the higher reported prevalence of depression among women, researchers must examine more closely the role depression may play in smoking patterns among women.

The most frequently cited reason for smoking reported by women is its usefulness in weight control. Concern over body weight and controlling it through smoking has long been a reason for continued use of cigarettes. Studies have revealed that tobacco use is inversely related to body weight and thus is a strategy used by many women to control weight (Gritz et al., 1989; Waldron, 1991).

Available data seems to point out that the perceived benefits derived from smoking may be considered especially important to women during pregnancy, with its associated stresses and strains. Desire for a healthy pregnancy and infant providemotivation for cessation, however, differences in women's beliefs and
attitudes about smoking effects on healthy outcomes makes effective intervention for cessation difficult. A better understanding of the constellation of factors as antecedents to intervention is in order.

**Stages and Processes of Change in Smoking Cessation**

During the past decade, an integrative model of change has emerged as one of the theories for explaining the processes of behavioral change. Examining the processes of change for smoking cessation as well as other problematic behaviors has been the central focus of the transtheoretical framework developed by Prochaska and DiClemente (Prochaska and DiClemente, 1983). This model addresses the distinction between the action and maintenance segments of the processes of change as well as problem recognition, decision making and preparation for action.

**History and Development**

Initial studies for the development of the model focused on change process activities measured during smoking cessation. An early study was conducted to determine if common cessation techniques could predict successful maintenance across different cessation programs (DiClemente and Prochaska, 1982). This study revealed that change process activity varied at different points in the change cycle. Originally these points in time were called periods of change, similarly described in other models previously recorded in the literature (Janis, 1968; Horn,
Horn's theory had begun outlining the process of change referring to the stages: contemplation, decision to change, short term change and long term change (Horn, 1976). No empirical investigation of these stages appears in the literature and the model failed to describe the relationship between stages and the relevant processes of each stage. Horn's model was based on the premise of decision making for short term change while environmental factors were influential for long term change.

The Stages of Change Theory proposed by Prochaska and DiClemente views the processes of change during the various stages of behavior change. Figure 1 illustrates which processes of change are emphasized during the various stages. Cognitive processes are utilized during the early stages of change while behavioral processes occur more frequently during action and maintenance stages.

A longitudinal analysis of the stages of change revealed a cyclical rather than a linear process. (Prochaska and DiClemente, 1992). Behavioral change usually involves several failed attempts to modify behavior or change the problem. It has been suggested that successful change requires repeated recycling through the Stages of Change. Prochaska and DiClemente further speculate that closure of the process of change takes place when behavior is firmly established or extinguished and that further time and energy are not needed to sustain behavioral change. Once the individual has integrated the adaptive behavior into their lifestyle, termination of the cycle appears feasible.
CONTEMPLATION

Consciousness Raising

Self-Reevaluation

PRECONTEMPLATION

ACTION

Self-liberation

Helping Relationships

Reinforcement Management

MAINTENANCE

Counterconditioning

Stimulus Control

* Processes overlap two Stages of Change in occurrence.

Figure 1: Processes of Change Identified by Stages of Change for Frequency of Occurrence.
The Stages of Change

Five stages of change which have been identified and researched are precontemplation, contemplation, preparation, action and maintenance. Each stage represents a period of time as well as a set of tasks needed for movement to the next stage. Although the time an individual spends in any stage varies, the tasks accomplished during each stage appear to be invariant.

During the precontemplation stage, persons are unaware or unwilling to change the targeted problem behavior. Precontemplators need to take ownership of the problem and increase their awareness of the negative aspects of the problem. Prochaska and DiClemente suggest that activities geared toward consciousness raising and self-regulation are needed for precontemplators to progress to the next stage (Prochaska and DiClemente, 1983).

The contemplation stage involves action thinking about the prospects of changing a behavior. Contemplators begin inquiry and perform self-evaluation in light of the particular target behavior. Contemplators focus on evaluation and preparation for change. Activities directed toward increasing self-regulation are emphasized (Prochaska and DiClemente, 1983). Self-reevaluation which begins to occur during the contemplative stage appears to be associated with both contemplation and action, hence, bridging the transition from being a contemplator to taking action.
The preparation stage indicates a readiness to change encompassing both attitude and behavior. Individuals in this stage are ready to take action, and thus need to set goals and priorities accordingly. In addition, individuals in this stage need to make a commitment to reaching their goal.

The action stage involves overt modification of the problem behavior. During the action stage, individuals must be trained to develop skills to perform key processes such as counterconditioning, stimulus control and reinforcement management to interrupt habits and adopt more productive behavior patterns. (Fitzgerald and Prochaska, 1988). Action individuals require additional strategies to prevent lapses or slips if they are to progress to the maintenance stage.

The stage of maintenance requires sustained behavioral change for a period of time from six months to as long as three or more years after initial action. Prochaska and DiClemente have reported that stimulus control, self-liberation and reinforcement management continue to be important during maintenance (Prochaska and DiClemente, 1983). Self-efficacy and decisional balance are two additional factors which affect maintenance of behavior or relapse. In a prospective study conducted to analyze patterns of behavior change in smoking cessation, the ten processes of change, self-efficacy, temptations to smoke and smoking pros and cons were found to be better predictors of change in smoking behavior than traditional indicators such as demographics, smoking history and individual reasons for smoking (Wilcox et al., 1985).
Processes of Change

The processes of change are independent factors in the Stages of Change Model. The processes are covert and overt activities that individuals use to modify behavior. Ten processes of change receiving differential application during the five stages of change include: consciousness raising, self-liberation, social liberation, self-reevaluation, environmental reevaluation, counterconditioning, stimulus control, reinforcement management, dramatic relief and helping relationships.

The frequency of use of the ten processes of change during and between counseling sessions was examined in another study conducted by Prochaska (Prochaska et al., 1988). For the clients who were most successful in changing behavior, behavioral processes were used at an above average rate during counseling sessions and between sessions. Clients reported lower use of action-related processes of stimulus control and reinforcement management and increased use of counterconditioning in changing their behavior. Findings appear to demonstrate a need to further examine the utility of various processes of change.

The point at which different processes peak can prove useful in developing interventions. Information about the variance of particular processes of change across different stages of change can be used to develop more comprehensive therapy and self-help programs. Most therapy approaches focus on tracking the processes of change with little emphasis on the integration of skills into the daily
environment of the self-changer. There is a call for more comprehensive research which focuses on utilization of the processes of change within and between therapy sessions (Prochaska and DiClemente, 1992).

Measures of these processes have been developed for smoking cessation (Prochaska et al., 1988). Processes of change vary in intensity of occurrence by stage of change. A 40-item questionnaire that measures the ten processes of change has been developed for use in assessing variance and frequency of the processes of change across the stages of change. A confirmatory analysis by Prochaska and DiClemente supported the use of the ten process model to develop therapy and self-help programs based on how people change their own behavior (Prochaska et al., 1991). The study revealed that the processes of change followed a mountain metaphor with various processes climbing in use during precontemplation and contemplation stages, peaking at a particular stage of change and descending slightly during maintenance. The mountain metaphor can serve as a guide to identify which processes should be emphasized during the various stages of change. Educational materials and counseling efforts can be individualized and thus, emphasize the various processes of change as the client progresses through the stages of change.

Another study by DiClemente et al., illustrated that once the action processes were learned, the smoker moved rapidly into the action stage from any of the precontemplation, contemplation or preparation stages; however, smokers in the
preparation stage entered into action with greater frequency and success (Di Cle-
mente et al., 1991). This study verified that the intensity, duration and type of
intervention should be responsive to the stages of change of the client. Clients
approaching the action stage may benefit from more intense, shorter
action-oriented intervention. For precontemplators and contemplators, repeated
contacts are essential along with emphasis on goal-setting. This study called for
future research to examine the stages and processes of change for the outcomes
they produce and the processes they engender.

Predictors of Smoking Cessation and Relapse

Due to the multitude of reasons why women smoke during pregnancy, much
remains unexplained about the demographic, psychological, sociocultural and
nicotine-related factors that result in continued smoking during pregnancy. The
relationship between subject characteristics and changes in smoking behavior has
received much attention in the literature. While demographic variables have failed
to differentiate smokers, certain smoking history characteristics and the use of
processes of change have been examined as predictors of cessation and relapse.

A study which examined smoking history, reported on numerous factors which
determine self-change in smoking behavior (Stevens, Green and Primavera, 1982).
The longer a person had smoked, the less probable they were to stop smoking.
Findings also indicated that the smoking habits of significant others influences the
smoker's behavior. Successful cessation was more likely to occur when spouses, siblings and friends were nonsmokers.

In another study, subject characteristics which included demographics, smoking history, health history and life experiences were examined as predictors of self-change in the smoking behavior of 961 smokers from Rhode Island and Texas. (Wilcox et al., 1985). The study found that the longer the history of smoking behavior, the less apt the smoker was able to quit or maintain nonsmoking status. Also, health problems, the number of daily cigarettes smoked, previous quit attempts and addiction to nicotine were all significant factors in predicting success in self-change efforts. Of the relapsers, the one's who were likely to try again were lighter smokers who did not perceive themselves as addicted to cigarettes.

Another study examined predictor variables of smoking cessation for patients attending public health clinics. (Buis, Perkins, and Windsor, In Press ). Demographic and health belief variables were examined for possible relationships to smoking cessation. This study reported that quitting was significantly related to being black, having more years of education, having smoked fewer years, smoking fewer cigarettes per day, having quit more times, and not living with a smoker.

McCormick et al., examined the relationship of stressful life events, social support, health behaviors, and mental distress to smoking behavior in low income pregnant women living in Harlem (McCormick et al., 1990). Women who continued to smoke during pregnancy reported that they had less social support,
and more stress than nonsmokers. A study by Albrecht et al., reported similar findings for low income pregnant women, in general (Albrecht et al., 1994). This study promoted the involvement of the health professional to provide continuous contact and reinforcement throughout pregnancy for this sub-population group. Results of these studies support the need for intervention programs to take into account factors other than demographic and smoking history characteristics when modifying health behaviors such as smoking during pregnancy.

Research by Prochaska and DiClemente has examined predictor variables related to processes of change (DiClemente and Prochaska, 1982). Study results suggest that a smoker's stage of change interacts with the processes of change for smoking cessation to occur. Feedback and education are important to decision-making in the contemplation stage while action processes, such as stimulus control and counterconditioning are essential in terminating smoking.

A study was conducted to examine processes of change for predicting self-change efforts at smoking cessation of 866 adults (Prochaska et al., 1985). Processes oriented toward environmental events such as dramatic relief and social liberation tended to predict failure at smoking cessation whereas self-reevaluation and counterconditioning predicted progress. Self-efficacy and smoking decisional balance were identified as two additional variables which affect whether people take action to quit smoking. A recent pilot study measured how readiness and motivation affect smokers decision to quit (Crittenden et al., 1994). The stage of
readiness was found to be positively related to attitudes of perceived health and the social benefits of quitting while readiness to quit was negatively related to habituation. Pregnancy appeared to enhance a readiness to quit. Results suggest that the stage of readiness of the smoker should be assessed before intervention begins.

Other studies have focused on predictors of relapse. Prochaska examined differences between those who maintained nonsmoking behavior and relapsers (Prochaska et al., 1985). Relapsers relied more on environmental processes of change such as social liberation and stimulus control while long term maintainers utilized experiential processes which included: helping relationships, counterconditioning and self-reevaluation. A study by Quinn et al., further examined predictors of relapse for the pregnant smoker (Quinn et al., 1991). Relapse was associated with the quality of the quit attempt, higher self-efficacy, and a strong belief in the harmful effects of maternal smoking.

Results of studies which examine predictors of smoking cessation and relapse have some important implications for the development of more effective intervention programs. First, intervention programs need to enhance self-efficacy, both as a means of achieving smoking cessation and preventing relapse. In addition to behavior expectancies, the intervention must address the effects of maternal smoking on fetal health. A woman's knowledge and beliefs are important variables that are influential in decision weighing. Finally, experiential processes of change
such as helping relationships, counterconditioning and self-reevaluation need to be further examined for their relevance in maintaining nonsmoking behavior.

Biochemical Validation of Smoking Cessation

Smoking cessation intervention effectiveness has been widely reviewed in the literature. A major problem identified in evaluating program effectiveness lies in the validation of disclosure rates of smoking status. Guidelines developed for improving smoking cessation research methodology call for objective biochemical verification of self-report data (Windsor and Orleans, 1986).

Over the years numerous biochemical measures have been used as validation measures of tobacco smoke consumption which include: carbon monoxide, thiocyanate and cotinine. A study to compare the effectiveness of salivary cotinine, salivary thiocyanate and expired air carbon monoxide as biochemical measures revealed that sensitivity and specificity rates were as follows: 99 percent and 100 percent, 67 percent and 95 percent, and 96 percent and 100 percent, respectively (Stookey et al., 1987). Other studies have reported similar results (Luepker et al.; 1981, Petitti et al., 1981).

In smoking cessation studies involving pregnant women, tests which can be analyzed via a urine sample have been utilized most frequently due to the ease of obtaining a specimen as part of the routine office visit (Petersen et al., 1992). Cotinine, a nicotine metabolite, which is present in both saliva and urine has been
identified as the probable best biochemical measure due to its high sensitivity and specificity rates and biological half life (Windsor and Orleans, 1986). Studies completed to evaluate plasma cotinine reported 95 percent sensitivity and 98 percent specificity rates (Williams et al., 1974; Pojer et al., 1984). A study completed to validate cotinine laboratory procedures for frozen samples which had been stored for as long as three years, revealed consistency of cotinine concentration levels even with repetitive freezing and thawing of the urine samples (Spierto et al., 1994). The only drawback to using cotinine testing procedures that has been reported is the costly laboratory analysis (Sexton et al., 1986).

**Smoking Cessation Intervention Trials**

Many experimental and quasi-experimental studies of prenatal smoking cessation interventions have been conducted worldwide. Researchers have used increasingly sophisticated methodologies, particularly for smoking cessation research, since the publication of "Guidelines and Methodological Standards" by Windsor and Orleans (Windsor and Orleans, 1986). These researchers proposed five criteria areas for rating the quality and validity of past or prospective smoking cessation intervention research: 1) Research Design, 2) Sample Size and Representiveness, 3) Specification of Population Characteristics 4) Measurement Quality and 5) Appropriateness and Replicability of Procedures. To provide an overview of the most current state of the art smoking cessation research, this
review will focus on studies of acceptable quality that have added in a formative manner to the extensive body of smoking cessation research for pregnant women. These studies are compared for research standards and methods of intervention and appear in Table 1: Smoking Cessation Intervention Studies. The studies are reviewed in chronological order, and are listed in the table similarly.

The first study by Ershoff et al., evaluated a prenatal nutrition and smoking cessation program conducted at a health maintenance organization. This program utilized an 8 week home correspondence format in which participants received booklets at home each week that presented a standardized quitting program. Reinforcement messages were provided via a telephone answering service reviewing booklet content. The comparison control group received standard prenatal care which included one session of nutritional counseling and a group-based quit smoking clinic sponsored by the American Cancer Society. Results revealed 28 percent of the intervention group quit smoking at the initial postpartum visit compared to 14 percent of the control group. Self-reports of smoking status were verified during pregnancy by thiocyanate urine assays, however, biochemical verification was not completed at the postpartum visit, thus weakening the reliability of reported quit rates (Ershoff et al., 1983). This study represents one of the first studies to follow state of the art behavioral treatment procedures and apply methodological research standards.
<table>
<thead>
<tr>
<th>Study</th>
<th>Setting</th>
<th>Sample Size</th>
<th>Design</th>
<th>Intervention</th>
<th>Cessation Rate</th>
<th>Self-Report Measure</th>
<th>Test Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ershoff, et al., (1983)</td>
<td>Health Maintenance Organization</td>
<td>N=129</td>
<td>Quasi-Experimental</td>
<td>8 sessions: Home Correspondence Telephone Follow-up</td>
<td>C=14% T=28% (8 weeks Postpartum)</td>
<td>Urine Thiocyanate Test</td>
<td>Log Linear p &lt; .05</td>
</tr>
<tr>
<td>Langford, et al., (1983)</td>
<td>Public Health Departments</td>
<td>N=116</td>
<td>Experimental</td>
<td>Education at 7th month visit, Follow-up 4 mo. and 1 year post-partum.</td>
<td>C=15% T=22% (4 mo post) C=5.1% T=23.4% (1 yr post)</td>
<td>none</td>
<td>Chi-square p &lt; .05</td>
</tr>
<tr>
<td>Sexton &amp; Hebel (1984)</td>
<td>University Hospital Clinic</td>
<td>N=935</td>
<td>Random Pretest-Posttest Control Group</td>
<td>C= Routine Care T= One-on-One Counseling, Telephone &amp; Home Visit Follow-up</td>
<td>C=20% T=43% (8 month visit)</td>
<td>Saliva Thiocyanate Test</td>
<td>T-test p &lt; .01</td>
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</tbody>
</table>
Table 1: Smoking Cessation Intervention Studies (continued)

<table>
<thead>
<tr>
<th>Study</th>
<th>Setting</th>
<th>Sample Size</th>
<th>Design</th>
<th>Intervention</th>
<th>Cessation Rate</th>
<th>Self-Report Measure</th>
<th>Test Statistic</th>
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</thead>
<tbody>
<tr>
<td>Mayer, et al., (1990)</td>
<td>WIC Clinics</td>
<td>N=219</td>
<td>Random Posttest Control Group</td>
<td>C= Routine Advice</td>
<td>C=3%</td>
<td>Saliva Thiocyanate Test</td>
<td>ANOVA p &lt; .05</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>MCT= Behavior Modification &amp; Self-Help Manual</td>
<td>MCT=11%</td>
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<td></td>
<td></td>
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<td></td>
<td>RIT=Risk Information Counseling</td>
<td>RIT=7%</td>
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<td></td>
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<td></td>
<td>(9th month visit)</td>
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<td></td>
<td></td>
<td>C=0%</td>
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<td></td>
<td></td>
<td>MCT=7%</td>
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<td>RIT=7%</td>
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<td></td>
<td>(Postpartum visit)</td>
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<tr>
<td></td>
<td></td>
<td>E=417</td>
<td></td>
<td></td>
<td>(Continuously Abstinence)</td>
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<td></td>
<td></td>
<td>C=231</td>
<td></td>
<td></td>
<td>E=12.6% C=8.6%</td>
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<td></td>
<td></td>
<td></td>
<td>(Postpartum)</td>
<td></td>
<td></td>
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<tr>
<td>Petersen, et al., (1992)</td>
<td>Health Maintenance Organization</td>
<td>N=224</td>
<td>Random Pretest Posttest Control Group</td>
<td>C=Routine Care and Smoking References T1=Self-help Manual &amp; Audiocassettes T2=Self-help Manual, Audiocassettes and Follow-up by Physician</td>
<td>C=23.4% T1=20.9% T2=30.8% (6 month visit) C=9.7% T1=29.0% T2=35.6% (Postpartum)</td>
<td>Urine Cotinine Test</td>
<td>Chi-square p &lt; .05</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C=78</td>
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<td></td>
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<td></td>
<td></td>
<td>T1=71</td>
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<td>T2=75</td>
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<td></td>
<td></td>
<td>E=4600</td>
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<td></td>
<td>(8th month visit includes quitters and significant reducers)</td>
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<td></td>
<td></td>
<td>C=414</td>
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A study by Langford et al., evaluated the impact of health education on smoking during pregnancy among women attending prenatal classes at local health departments in Canada (Langford, Thompson and Tripp, 1983). Questionnaire data was collected at the seventh month antepartum visit, four months and one year postpartum. The intervention consisted of educational information about the effects of smoking on maternal and fetal health, and tips for quitting and reducing smoking. The control group received only the regular prenatal education classes with no information on smoking and pregnancy. Treatment Group 1 received a 30 minute presentation and a pamphlet on smoking cessation during pregnancy and a follow-up home visit by the public health nurse as a reinforcement session.

Results revealed that differences between groups were not significant until one year after delivery when the treatment group had a 23.4 percent quit rate compared to 5.1 percent of the control group. Treatment groups were combined for the analysis because of inconsistent delivery of follow-up visits to treatment groups. There was no biochemical verification of self-report data completed. Also, comparison group size was small, which does not make it possible to determine effect size. The study however does present implications of the importance that smoking cessation intervention during pregnancy has on postpartum quit rates.

In 1984, Sexton and Hebel conducted the first prospective study demonstrating high encouraging quit rates in smoking during pregnancy while also improving the birthweight of the infant among women in the experimental group over that of the
control group (Sexton and Hebel, 1984). This research reexamined the use of a multicomponent intervention that included one-on-one counseling sessions, home visits, periodic mailings of self-help materials and follow-up phone calls. This study reported a quit rate of 43 percent for treatment group patients and 20 percent for the control group. Reported results include the 17 percent quit rate for the control group and 16 percent rate for the treatment group who had quit on their own prior to the intervention. Self-report quit status was verified by saliva thiocyanate assays for baseline and eighth month data. Birthweight of infants born to mothers receiving the intervention program had a mean birthweight that was 92 grams heavier than infants born to mothers in the control group. This birthweight difference was statistically significant (p < .05). Study results provided strong evidence of the potential impact of systematic prenatal smoking cessation efforts.

A follow-up study by Hebel and Sexton to assess the effect of smoking cessation intervention during pregnancy with other maternal characteristics further supported the impact of intervention on the birthweight of infants (Hebel, Nowicki, and Sexton, 1985). The study revealed that the effect of intervention on smoking cessation varied according to maternal risk factors. Difference in quit rates at the eighth month visit between treatment and control groups were smaller for low risk women compared to women of high risk and having a history of fetal loss. Also, the research produced evidence to suggest that the effect of the intervention was dependent upon smoking history prior to intervention. Intervention appeared more
effective for lighter smokers than heavier smokers.

A study by Windsor et al., examined the use of self-help guides for smokers in public health settings (Windsor et al., 1985). This study served as a prototype for many studies that followed and set a methodological standard requiring biochemical validation of self-reported quitting behaviors. The study compared the effectiveness of two self-help guides; the American Lung Association's "Freedom From Smoking Manual and Windsor's manual, "A Pregnant Woman's Guide to Quit Smoking." Results of behavioral self-report data at mid-pregnancy and postpartum revealed that the use of self-help guides increased quit rates and reduction rates over the control group who received standard prenatal care and smoking cessation advice. Self-report was validated by saliva thiocyanate assays at baseline, mid-pregnancy and the last month of pregnancy. Only 2 percent of the control group quit compared to 6 percent who used the American Lung Association manual and 14 percent who used Windsor's guide. Study results implied that health education methods and materials tailored to the pregnant smoker appear to be more effective in changing smoking behavior than standard clinic information alone.

In the mid 1980's, prenatal smoking cessation research became focused on efficacy and replicability. Studies began to explore which factors were most effective in helping women to stop smoking during pregnancy. A smoking cessation program conducted for women who attended an HMO prenatal clinic examined the use of a home correspondence format and a telephone answering
system adjunct (Aaronson, Ershoff and Danaher, 1985). A sample of 58 smokers received booklets via mail as part of an 8 week self-help home correspondence program. Taped telephone messages were used to provide follow-up. Both self-report and biochemical validation were used to determine smoking status following the eight week program. At follow-up, the 23 women who reported being self-initiated quitters at baseline, were still not smoking. Of the 35 women who were smoking at baseline, 28.5 percent (n=10) reported nonsmoking status. Of the post program quitters, 90 percent reported that the self-help booklets were useful in quitting smoking followed by 79 percent of the self-initiated quitters. The majority of the participants utilized the call-in telephone answering system at least once, but results revealed this adjunct was an underutilized program element. Program elements reported as most useful by the participants were the smoking diary, relaxation exercises and coping strategies.

Another mail correspondence program completed by Ershoff et al., produced similar results (Ershoff et al., 1989). Prenatal patients who attended a Health Maintenance Organization in California from June 1985 through June of 1987 and reported they were smoking at their first prenatal visit were enrolled. Participants were randomly assigned to control and treatment groups. The control group completed a self-administered screening questionnaire to determine smoking history, participated in a 45 minute health education session and received a pamphlet on the hazards of smoking and references of available smoking cessation
classes. The experimental group completed the questionnaire and participated in
the 45 minute health education session and received instructions for utilizing the
eight self-help booklets for smoking cessation. A telephone interview was
conducted at the twenty-sixth week of pregnancy to determine quit status verified
by urine cotinine analysis completed on urine samples collected at prenatal visits.
Study results revealed a quit rate of 26.2 percent for the experimental group versus
8.6 percent of the control group. Evaluation of the self-help booklets showed that
47.7 percent of the experimental group reported reading all eight booklets, with 93
percent of the group reading at least one of the booklets. The study replicated the
results obtained by Windsor and provided further support for use of materials
tailored to addressing the needs of pregnant women.

The majority of studies conducted in the 1980's were implemented in the
context of the prenatal care visit. In 1990, Mayer et al., reported results of a
randomized smoking cessation trial for pregnant women attending a Women,
Infants, and Children Program (WIC) (Mayer et al., 1990). A volunteer group of
219 women were randomly assigned to the control group or one of two treatment
groups. The control group received printed materials about the risks of smoking
during pregnancy and completed the usual nutritional counseling program. The
multiple component treatment group received one-on-one counseling at the initial
visit which included smoking risk information and behavioral change techniques.
The risk information treatment group received a 10 minute one-on-one counseling
session and factual brochures about smoking during pregnancy. Results during the last month of pregnancy revealed that the multiple component treatment group had a self-reported quit rate of 11 percent while the risk information treatment group had a 7 percent quit rate. The control group's quit rate was 2.6 percent. Postpartum quit rates were 6.9 percent for the multiple component treatment group, 7.1 percent for the risk information group and 0 percent for the control group. Self-reported data were validated by saliva thiocyanate assays for one third of the participants. This study explored the usefulness of smoking cessation programs for pregnant women in alternative care settings and provided implications for the expansion of multiple health education contacts with the potential for improving quit rates.

Hjalmarson et al., conducted a study in Sweden using physicians who provided one-on-one counseling at the initial prenatal visit followed by use of a self-help manual (Hjalmarson et al., 1991). Pregnant smokers who attended public health clinics in Gothenburg, Sweden were randomly assigned to control and treatment groups. The control group was given informational materials about smoking during pregnancy by their doctor. The treatment group was given smoking information by the obstetrician and a self-help guide designed for pregnant women. Smoking information was collected via an interview with a midwife at 12 to 14 and 30 to 34 weeks gestation and postpartum. Self-reported quit rates were verified by blood thiocyanate assays at 30 to 34 weeks. Results revealed that twice as many women in the treatment group maintained abstinence at all three measurements points than
women in the control group. Overall, women decreased their smoking consumption by about 40 percent after entry into the smoking cessation program. Eighty five percent of the women reported using the self-help manual to quit smoking. This study supports the use of self-help manuals as a more cost effective measure in promoting smoking cessation programs for pregnant women.

The most recent studies on smoking reduction during pregnancy have investigated the impact and cost effectiveness of pregnancy specific self-help smoking cessation programs. A study by Petersen et al., evaluated the effectiveness of a self-help program supplemented by periodic clinical support (Petersen et al., 1992). Two hundred seventy four women enrolled in a health maintenance organization were randomly assigned to experimental and control groups. The control group who received standard prenatal care were compared with the two treatment groups, one group receiving self-help materials and routine prenatal care and the second group receiving self-help materials along with regular counseling sessions during their prenatal care visits. Self-report smoking data was collected at the sixth month prenatal and postpartum visits. Urine cotinine assays were completed randomly on half of the participants reporting nonsmoking status at the sixth month prenatal visit. Results revealed that among those who were smoking at baseline, 23.4 percent of the control group, 20.9 percent of treatment Group 1 and 30.8 percent of Treatment Group 2 had quit smoking at the sixth month prenatal visit. Postpartum quit rates revealed 9.7 percent, 29.0 percent and 35.6 percent quit
rates for the control group, Treatment Group 1 and Treatment Group 2, respectively. Among baseline smokers, both interventions significantly increased the proportion of women who were not smoking postpartum. Cost effectiveness figures revealed that a program utilizing self-help materials along with minimal counseling during prenatal visits costs between 50 to 111 dollars per client. Study results appear to promote the use of self-help programs supplemented by routine clinical counseling support as an effective approach to increasing quit rates for pregnant women who smoke and maintenance of nonsmoking behavior postpartum.

A study by Windsor et al., investigated the behavioral impact and cost benefit of a smoking cessation program conducted in the public health clinic setting. (Windsor et al., 1993). Women were interviewed regarding their smoking status at their intake prenatal care visit and 814 women were randomly assigned to the treatment and control groups. The control group received a 30 minute group prenatal education class at the first prenatal visit and a brief discussion of smoking risks during pregnancy. The treatment group received one-on-one counseling during the first visit, a self-directed cessation guide and follow-up reinforcement tips in the form of support letters, quarterly newsletter briefs and smoking cessation pamphlets throughout pregnancy. Self-report data was collected during the eighth month prenatal visit verified by saliva cotinine analysis. Smoking reduction results which included quitters and significant reducers revealed that a behavioral change occurred in 31 percent of the treatment group versus 20.8
percent of the control group. A compliance rate for use of the self-directed cessation guide was reported at 63 percent. The cost analysis which included looking at the percentage of personnel time and materials revealed the cost per client at 6.75 dollars, and further estimated a net economic benefit for the entire 1990 cohort of pregnant women at 20 to 56 million dollars. The study calls for future research to focus on ways to improve smoking cessation counseling methods and the skills of health care practitioners. Much research needs to be done to explore which health education methods are most effective in public and private health maternity care settings and measure their behavioral and clinical impact.

Of the ten studies reviewed, all reported some type of intervention effect and all but one conducted biochemical validation of self-reported data. All of the programs provided in varying degrees, one-on-one educational sessions often accompanied by serialized self-help materials. The most successful programs in terms of quit rates, provided reinforcement and social support through printed materials, home visits and/or telephone contacts (Ershoff et al., 1983; Aaronson et al., 1985; Sexton and Hebel, 1984; Petersen et al., 1992; Windsor et al., 1993). Study results appear to suggest that multicomponent programs which emphasize behavioral skills produce higher reported quit rates as do programs specifically targeting the pregnant smoker (Petersen et al. 1992; Windsor et al., 1985).

An independent review of smoking cessation approaches to behavioral change concurs with the findings reported here (Clark and Maclaine, 1992). This report
indicates that smoking cessation interventions should focus on individualized assessment, client involvement and continuing support for achieving behavioral change. The study further stresses the involvement of the entire team of health professionals for providing the greatest interventional impact.

Cessation trials involving clients in private care settings and health maintenance organizations seem to achieve greater cessation rates than those involving public health clients. Studies conducted in the last decade have produced the highest quit rates with Sexton and Hebel reporting a 43 percent self-reported quit rate at the eighth month of pregnancy verified by biochemical analysis (Sexton and Hebel, 1984). Petersen et al., followed with a 35.6 percent self-reported quit rate at eight weeks postpartum for patients enrolled in a health maintenance organization (Petersen et al., 1992). Windsor's most recent trial conducted in public health clinics reported a 31 percent combined reduction/quit rate at the eighth month prenatal visit (Windsor et al., 1993).

Numerous studies showed a strong intervention effect for women who entered prenatal care early in pregnancy (Mayer et al., 1990; Petersen et al., 1992; Windsor et al., 1993). This finding might suggest that women may be more open to smoking cessation programs early in pregnancy thus, increasing the number of intervention contacts which result in greater cessation rates. Also, women who enter into early prenatal care may be more prevention-oriented. Ershoff found that 22.2 percent of women stopped smoking before their twentieth week of pregnancy but only 4
percent of the clients quit afterward (Ershoff et al., 1989).

Some studies reported small effects of the intervention on quit rates during pregnancy but found significant differences in the number of nonsmokers during the postpartum period (Langford, Thompson and Tripp, 1983; Aaronson et al., 1985). This delayed effect on cessation rates is not well explained in the literature. A possible explanation of the delayed quit rates could be that some studies include both current smokers and recent quitters and that smoking advice provided to recent quitters contribute to higher long-term cessation rates among these women.

Most studies rely on self-report data for reporting smoking status. Because of the dangers of smoking to the health of the fetus and the woman herself, nondisclosure of true smoking status is a problem for this population group. For this reason, some form of biochemical validation of smoking status has been recommended to confirm self-report and increase the reliability of study results. Studies aimed at decreasing nondisclosure in this population have had encouraging results. (Mullen et al., 1991). Cotinine, which is highly specific to tobacco users, is the current measure of choice because of superior specificity and sensitivity properties (Spierto et al., 1994).

Relapse Prevention and Postpartum Maintenance

While it has been well established that many women are able to quit smoking during pregnancy, very little research is available on relapse and postpartum
maintenance. Studies done to determine postpartum relapse rates indicate that rates may be high (Danaher et al., 1978; Langford, Thompson and Tripp, 1983). High relapse rates are not surprising, considering that most pregnant women who quit smoking during pregnancy do so out of concern for a healthy pregnancy and baby.

A study that examined predictors of relapse before delivery revealed that beliefs about the harmful effects of smoking and low self-efficacy were major factors contributing to relapse during pregnancy (Quinn, Mullen and Ershoff, 1991). Women who had smoked during previous pregnancies and had healthy babies and women who experienced little or no nausea during pregnancy were the major relapsers. Also, the strongest predictor of relapse was how long the woman refrained from smoking during her initial quit attempt. Higher self-efficacy appeared to be correlated to the quality of the quit. Similar findings on predictors of relapse during pregnancy have been reported by others (Fingerhut et al., 1990).

A study by McBride and Pirie examined relapse patterns and high risk situations for postpartum smoking relapse (McBride and Pirie, 1990). A sample of women from a large Midwest metropolitan area were surveyed via telephone interview at 6 months postpartum. Results revealed that 65 percent of the women who had quit smoking during pregnancy had relapsed by 30 days postpartum. Three significant factors were identified as predictors of postpartum relapse: a concern about weight, duration of breastfeeding and the number of cigarettes smoked prior to pregnancy. Also, socializing and living with another smoker had a significant impact on
maintaining smoking abstinence after pregnancy.

In a study to examine the relapse process in ex-smokers, most relapses were associated with negative affects, particularly situations causing anger, anxiety and depression (Shiffman and Saul, 1982). Two other major factors identified for causing relapse were eating and alcohol consumption. A significant finding reported in this study was that cognitive and behavior coping responses were associated with positive outcomes. Results suggest that effective intervention for relapse prevention should include training for both cognitive and behavioral coping strategies to be used during vulnerable periods of maintenance.

A study to examine coping strategies utilized by ex-smokers in preventing smoking relapse corroborated the need for coping skills training for effective relapse prevention (Stevens and Hollis, 1989). The study revealed that while group discussion about coping strategies for maintenance increased self-efficacy and may have contributed to short-term maintenance, an individually tailored coping skills training program following cessation, resulted in improved long-term abstinence. Results revealed a statistically significant difference between the discussion group and coping skills training group in long term maintenance (41.3% verses 33.3%). Overall, there was a 24 percent improvement rate in long term abstinence for the coping skills training group. Another study examining long term maintenance of smoking behavior for women who attended public health clinics revealed that individualized counseling during pregnancy and early postpartum
produced greater long-term cessation rates (Secker-Walker et al., 1994). These studies provide support for the usefulness of individualized education and counseling which includes coping strategies for long-term maintenance beyond pregnancy.

While postpartum relapse studies are few in number, much useful information has been documented on the predictors of relapse and prevention of relapse for smokers in general. If nonsmoking during pregnancy is to result in long-term smoking cessation, more attention must be given to the precipitants of relapse and coping response training in forestalling relapse. Prospective research is needed to look at changes in pre- and postpartum motivations, intentions, and psychosocial factors which may contribute to long-term cessation. Also, strategies for coping with relapse crises and prolonging abstinence must continue to be analyzed for their effectiveness in long-term maintenance.

**Summary Review of the Literature**

Smoking during pregnancy is one of the most preventable causes of low birthweight infants but it has been estimated that one in four pregnant women continue to smoke. Smoking prevalence rates during pregnancy reveal that more white women smoke than Blacks or Hispanics. Also, pregnant smokers tend to be unmarried women who are younger in age and less educated. Smoking history determinants of smoking behavior indicate that daily number of cigarettes smoked
prior to pregnancy, the number of years the woman has smoked and whether the
woman lives with other smokers influence the magnitude of the smoking habit.
Current estimates indicate that between 20 to 40 percent of pregnant women quit
smoking during pregnancy but no interventional strategy has been successful in
producing substantial quit rates that can be maintained beyond pregnancy.

The Stages of Change Model has evolved as a trantheoretical model for
explaining behavioral change associated with smoking cessation and other problem
behaviors (DiClemente and Prochaska, 1982). Five stages of change which are
Precontemplation, Contemplation, Preparation, Action and Maintenance are phases
of behavioral change during which a person utilizes various processes of change to
overcome the targeted problem behavior. Individuals cycle through these stages
numerous times before maintenance of a new behavioral pattern is achieved.
Research has shown that specific processes of change are associated with each
stage of change. During the action stage, the processes of counterconditioning,
stimulus control, reinforcement management and helping relationships are
emphasized most frequently. Research has shown that clients who were most
successful in changing behavior utilized these processes at an above average rate
(Prochaska et al., 1988).

Current research has focused on the development of interventions based on
stages of change. The preponderance of educational materials are geared towards
the action stage of change and there is a call for the development of interventions
which focus on the processes of change during the various stages of change (Prochaska and DiClemente, 1992). Also, there is a need for examining the utilization of the processes of change in various sub-groups of smokers.

The most current state of the art smoking cessation trials reveal that multidimensional smoking cessation interventions have proven most successful for pregnant women who smoke. Overall study results reveal that validated cessation rates have ranged from 10 to 32 percent. Because nondisclosure of smoking is typically high for pregnant women, it has been shown that biochemical validation is essential for verifying nonsmoking behavior (Windsor and Orleans, 1986). The most successful programs in regard to quit rates, provided continuous reinforcement and social support via printed materials, home visits and telephone contacts (Sexton and Hebel, 1984; Petersen et al., 1991; Windsor et al., 1993).

Much has been studied about smoking cessation during pregnancy, however, no one theory or strategy has produced higher quit rates for this population group. Research is needed to further examine nonsmoking maintenance for women postpartum. Future research needs to address factors which are influential in pre- and postpartum motivation and social reinforcements which may contribute to long term cessation.
CHAPTER III
PROCEDURES

Research Design

This study was conducted as ex post facto research utilizing a static-group comparison design. This research examined variables in a naturalistic setting without experimental manipulation techniques. Results of this study are based on data collected via interview and questionnaire format. A urine cotinine assay was completed at the eighth month antepartum visit to verify self-report smoking status of the nonsmoking participants.

Interview and questionnaire data were collected at the intake visit and the eighth month antepartum visit. Additionally, data were collected in the same format if the woman completed her initial postpartum visit by January, 1995. Data collection time intervals were set in accordance with standard time intervals observed in other studies with this population group (Sexton and Hebel, 1984; Ershoff, et al, 1989; Windsor, et al., 1986). Investigators recognize the need for biochemical validation of smoking status, thus urine cotinine assays have been utilized in past research with this population to verify smoking exposure (Mullen, et al., 1991). The sensitivity of this test has been reported at 93 percent with a specificity of 95.
percent for serum in pregnant women (Haddow, et al., 1988).

**Independent and Dependent Variables**

The independent variables in this study are the processes of change, including stimulus control, counterconditioning, reinforcement management and helping relationships. The dependent variable is the smoking status of the participant at the eighth month antepartum visit.

**Population and Sample**

The target population for this study is all women who smoke during pregnancy and attend public health clinics throughout Ohio for their prenatal care. The accessible population included eight clinic sites which were chosen based on the following parameters: 1) clinics having the highest percentage of women who smoke during pregnancy based on birth certificate data; 2) clinics that provide prenatal services to term and provide postpartum visits; and 3) clinics that will involve the entire professional team in the intervention process.

Sample population eligibility was based upon the following: being designated a smoker at the initial prenatal appointment; agreeing to participate in the study by providing informed consent; and completing the eighth month antepartum visit. A training session was held with the clinic coordinators prior to the study to discuss the purpose of the research and the program requirements. Study group formation
was based on the voluntary participation of those women who consented to being a part of the study and having completed their eighth month antepartum visit by December, 1994. The total number of participants needed for purposes of statistical analysis was estimated at n=240, or a minimum of 20 subjects for each tested variable (independent and control, plus one).

The designated sites are clinics which are a part of a grant program sponsored by the Ohio Department of Health Maternity Licensure Program. A request for research approval was sought and approved by the Ohio Department of Health Program Director who funds and supervises these programs. A letter of approval to conduct this research as part of the ongoing grant program is included in Appendix B.

Approval for protection of human subjects was sought. Full approval was given by The Ohio State University Human Subjects Review Committee and the Ohio Department of Health Human Subjects Review Board. Copies of these approval statements appear in Appendix C.

Instrumentation

The instrumentation for this study involved the use of five questionnaires for the purpose of gathering interview and self-report data at the intake, eighth month antepartum and postpartum visits. These questionnaires are displayed in Appendix
D as Intake, Form II, Form III, Form IV, and Form V. The Intake Survey, Form II and Form IV were pilot tested at the study's eight clinic sites prior to this study. Questionnaire Form III and Form V were adopted from a full model instrument utilized by Prochaska in his stages of change studies (Prochaska et al., 1988). Written permission for use of this questionnaire was sought and received and appears in Appendix E.

**Description of the Instruments**

**Intake Questionnaire**

The intake questionnaire was used to conduct an interview at the initial visit to gather information on sociodemographic characteristics of the participants, their smoking history, smoking knowledge and beliefs and their stage of change (Appendix D).

Sections I and II of the intake interview questionnaire (Form I) are open-ended questions which collected identification and demographic information regarding age, race, educational attainment, income level, marital status and family composition. Section III questions pertained to cigarette smoking history. These single response questions provided closed ended response choices of "yes or no." The purpose of the smoking history questions was to collect data about the client's smoking status including: average number of cigarettes smoked per day, hours
exposure to passive smoking, number of previous quit attempts, number of years spent smoking, and present addiction status. Section IV involved items related to the participant's knowledge and beliefs of smoking effects on the fetus and smoking effects on the woman's health. Question 5 is a single response item to identify the stage of change of the client, Precontemplation, Contemplation or Action stage. This information was collected to determine the participant's motivational level to quit smoking.

Form II

The follow-up interview questionnaire (Form II, Appendix D) is similar in design to the intake questionnaire. Section I asks open-ended response items to collect participant identification data. Section II examines smoking status information, asking questions to determine if the client has quit, number of family members who smoke, and how often the woman smokes if she has not quit. Item 6 is a checklist item to assess reasons for continued smoking if the participant did not quit. Items 7 and 8 are single response items to determine amount of counseling and out-of-clinic support contacts the participant received. Section III repeats questions regarding smoking knowledge and beliefs which were used in the intake interview. This section was repeated to determine change in knowledge and beliefs after the educational intervention. Section IV examines the effectiveness of various intervention and motivational techniques by having the
participant rate nine strategies as Very Helpful, Helpful, Not Helpful, Didn't Happen. A tenth item solicits information about the most helpful aid in quitting smoking. This question is a single response item.

Form III

The third questionnaire (Form III) was used to determine which processes of change were utilized by study participants to change their smoking behavior. This questionnaire was the tool used to measure the independent variables of the study. This 16 item instrument measured how frequently the four processes of change (stimulus control, counterconditioning, reinforcement management and helping relationships) were utilized to control smoking behavior. Each of four items of the questionnaire pertain to one process of change. Participants responded to each item on a 5 point likert scale to indicate frequency of use of each process of change measured (1 = never, 3 = occasionally, 5 = repeatedly).

Form IV

The fourth questionnaire (Form IV, Appendix D) was utilized to collect interview data at the postpartum visit or in a telephone interview if the participant did not attend a postpartum visit at the clinic site. This questionnaire was identical in format to Form II to collect postpartum data for comparison with eighth month data. One additional item was added to Form IV. This last item asked relapsers to
respond to a multiple choice question indicating other intervention strategies they might try to stop smoking.

**Form V**

Participants also completed Form V as a self-report questionnaire at the postpartum visit (Appendix D). This questionnaire was identical in format to Form III. The questionnaire was utilized to compare responses of participants at their postpartum visit with that of the eighth month visit regarding utilization of the processes of change.

**Pilot Testing of Instruments**

The Intake and Form II questionnaires are adaptations of a format utilized by Windsor in previous research with this population group (Windsor, et al., 1985). These questionnaires were pilot tested in the same clinics which participated in this study prior to conducting the research. Clinic personnel who utilized these forms for a period of months provided suggestions for revisions to a panel of judges at the Ohio Department of Health. This panel of experts included: a smoking cessation researcher, an epidemiologist, a measurement and evaluation expert, and a nurse, who reviewed the instrument for content, readability and format. The instrument was approved by this panel prior to its use. A listing of the panel of experts appears in Appendix F.
Form III (Appendix D) which examines the processes of change was adapted from a longer questionnaire developed by Prochaska and DiClemente (1982). This 16 item instrument was formulated by including only those items from the longer version which examine the change processes of counterconditioning, stimulus control, reinforcement management and helping relationships. The instrument in its original form was analyzed extensively to determine its reliability, construct validity and external validity.

Results of the analysis revealed that convergent validity coefficients ranged from .34 to .72 with a mean value of .60 (Prochaska, et al., 1988). A panel of judges reviewed these results and approved the construct validity of the instrument. Coefficient alphas for each of four item scales ranged in value from .69 to .92, and were judged as acceptable for establishing the internal consistency of the instrument. A number of studies have utilized the questionnaire to demonstrate its usefulness in naturalistic settings, in behavioral therapy, and across other behavioral problems, i.e., psychic distress, weight control, to demonstrate evidence for the external validity of the instrument (Prochaska, et al., 1985; Prochaska, et al., 1992; Prochaska and Norcross, 1983).

The instrument in its shortened format for purposes of this study was pilot tested for face validity, readability and internal consistency with a sub-group sampling of the population. A sample group of 17 women from the same clinic locations represented in the study completed the questionnaire. Pilot study participants were asked if they had any difficulty with the readability of the
questionnaire or understanding the directions for its completion. No problems were reported. Measurement results which include central tendency and internal consistency values appear in Table 2.

Table 2: Measures of Internal Consistency, Central Tendency and Variation for Pilot Testing of the Processes of Change Questionnaire (n=17)

<table>
<thead>
<tr>
<th>Processes of Change</th>
<th>Cronbach’s Alpha</th>
<th>Mean</th>
<th>SD (Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counterconditioning</td>
<td>.773</td>
<td>3.04</td>
<td>.782 (1.75-5.00)</td>
</tr>
<tr>
<td>Stimulus Control</td>
<td>.824</td>
<td>2.08</td>
<td>1.00 (1.00-5.00)</td>
</tr>
<tr>
<td>Reinforcement Management</td>
<td>.825</td>
<td>2.54</td>
<td>1.22 (1.00-5.00)</td>
</tr>
<tr>
<td>Helping Relationships</td>
<td>.890</td>
<td>3.60</td>
<td>1.15 (1.75-5.00)</td>
</tr>
</tbody>
</table>

Cronbach alphas were computed for each of four processes of change measured by the questionnaire and results revealed acceptable levels of internal consistency: counterconditioning $\alpha = .773$, stimulus control $\alpha = .824$, reinforcement management $\alpha = .825$, helping relationships $\alpha = .890$. 
Implementation

This study was conducted with all pregnant women who were identified as smokers at their intake visit at the eight public health clinic sites listed in Appendix A and completed their eighth month antepartum visit by December, 1994. The purpose of this study was to examine four processes of change involved in smoking cessation (stimulus control, counterconditioning, reinforcement management, helping relationships) via self-report questionnaire. Other predictor variables identified in past research were also examined for their potential significance in explaining smoking cessation. Data to examine demographics and smoking history characteristics was gathered via interviews conducted at the intake and eighth month antepartum visits.

Training Sessions for Health Professionals

All health professionals who provided the educational smoking cessation sessions were required to participate in two training sessions. A training session entitled "Fresh Start" was provided by the American Cancer Society. During this training session, the health professionals were educated about the following:

I. Facts About Smoking and Pregnancy
II. Adverse Health Effects of Smoking
III. Goal Setting for the Smoker
IV. Completion of the Patient Flow Chart and Smoking Record
V. Teaching Coping Skills for Withdrawal, Cravings, Urges

VI. Stress Management and Relaxation Techniques

VII. Approaches to Helping the Client Stop Smoking.

VIII. Counseling for Slips and Relapses

IX. Pitfalls for Counselors to Avoid

X. Providing Support, Encouragement, and Praise

XI. Use of Brochures and Pamphlets.

A second training session was provided by the investigator to explain how to conduct the interview sessions with the client and the utilization of the self-report questionnaire (Form III, Form V, Appendix D). This training session emphasized the use of the processes of change to effectively maintain nonsmoking behavior. A training manual was provided to each health professional participating in the study. This training manual appears in Appendix G. The second training session emphasized the following:

I. Assessment of the Client's Smoking Status

II. Assessment of the Client's Knowledge and Beliefs.

III. Conducting the Initial and Follow-up Interviews


V. Tips for Stimulus Control Training

VI. Tips for Counterconditioning Training

VII. Tips for Reinforcement Management

VIII. Tips for Formulating Helping Relationships.
IX. Counseling Tips for Common Client Concerns

X. Preparing the Client for Relapse and Maintenance

XI. Completion of the Self-Report Questionnaire at the Eighth Month and Postpartum Visits.

XII. Completion of the Health Education Checklist by the Health Professional at each client visit.

XIII. Procedure for Collecting Urine Specimens for Cotinine Analysis.

Data Collection Procedures

Following informed consent and baseline assessment to determine smoker status, clients completed an intake interview with a trained health professional. The consent form appears in Appendix I. The intake interview gathered sociodemographic data, smoking history, knowledge and beliefs about smoking and assessed level of desire to quit smoking during pregnancy (Intake Form, Appendix D). Participants attended a 20 minute educational session about the "Harmful Effects of Smoking During Pregnancy" presented by a trained health professional. This standardized session entitled "Fresh Start" is the educational program developed by the American Cancer Society for smoking cessation during pregnancy.

At the intake interview participants received a copy of Windsor's A Pregnant Woman's Guide to Quit Smoking and received counseling on the use of this self-help guide in the home. The guide served as the primary intervention modality for all participants at the eight clinic sites. This guide utilizes a seven-day plan to
smoking cessation and teaches self-help skills to quit smoking. These skills include: learning smoking signals, making a stop-smoking contract, making a stop-smoking buddy contract, breathing exercises for relaxation, strategies for dealing with physical reactions to quitting, things to do in the place of smoking, rewards and incentives. After the intake interview session participants received individualized counseling sessions by a trained medical staff person at each antepartum visit during pregnancy. Tracking of the women's quit status was recorded at each visit. Pregnant women who continued to smoke received continual counseling to quit. During each counseling session women received information about the utilization of processes of change to control smoking behavior. A record of information provided during the individual counseling sessions was kept by the health professional as part of the client's chart. This tracking instrument was completed for all study participants as a means of ensuring that standardized education was being provided across the eight clinic sites. A copy of this tracking instrument appears in Appendix H.

A second interview was held with all study participants at the eighth month antepartum visit. A trained health professional conducted the interview. This follow-up interview was held to determine the current smoking status of the participant and collect data pertaining to factors which were influencing their current smoking status; smoker or nonsmoker. Four questions addressing knowledge and beliefs were asked to determine participant changes in these areas. Participants were also asked to rate various aspects of the intervention they felt
were helpful in changing their smoking behavior (Form II, Appendix D).

At this visit the participant was asked to complete the self-report questionnaire (Form III, Appendix D). This self-report questionnaire measured whether participants utilized any of four processes of change to modify their smoking behavior. Results of the data gathered from this questionnaire provided evidence to examine the research hypothesis for this study which states: The processes of change factors; counterconditioning, stimulus control, reinforcement management and helping relationships will predict the likelihood of pregnant women who will stop smoking during pregnancy. Analysis was conducted to identify which processes of change were associated with nonsmoking behavior.

At the eighth month antepartum visit urine cotinine samples were collected for the purpose of validating self-report of those women who stated they had quit smoking during pregnancy. Cotinine analysis is the procedure of choice for verifying self-report because of its superior specificity and sensitivity properties (Spierto, et al., 1994). Urine samples were coded to maintain client anonymity and sent to the Centers of Disease Control for analysis.

A follow-up postpartum interview was held for all study participants who completed their postpartum visit by January, 1995. The postpartum visit occurred 6 to 8 weeks following delivery. This is the standard time for follow-up that has been documented in other studies which have examined maintenance of nonsmoking behavior postpartum. (McBride and Pirie; 1990, Quinn, Mullen and Ershoff, 1991.) If the participant was not available by clinic appointment, a
telephone interview was held. The follow-up postpartum interview consisted of questions to determine current smoking information about the client (Form IV, Appendix D). Form V was also completed to address which processes of change continued to be useful in maintaining nonsmoking behavior for those participants who were still nonsmokers at the postpartum visit (Form V, Appendix D).

Data Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) available at The Ohio State University. Statistical significance for this study was set a priori at < .05. Individual mean scores were computed for the study's four independent variables, (counterconditioning, stimulus control, reinforcement management and helping relationships).

Analysis of the data was conducted in two phases. First, frequency distributions and descriptive statistics were computed for all data. Scores were computed for each process of change based on the mean score computed for summated responses to four questionnaire items per process of change. Descriptive statistics for demographic and smoking history characteristics are reported as frequency scores and percentages. Second, after coding nominal variables, Pearson point biserial correlation coefficients were used to determine the nature and strength of relationships between dichotomous variables. Once correlations for individual relationships among variables were assessed, a multivariate analysis was conducted
to determine the degree to which each of four processes of change predicted the
dependent variable, whether a woman quit or continued smoking.

Logistic regression analysis was used to determine the likelihood of a woman
quitting smoking, a dichotomous event, from a set of four processes of change
factors, the independent variables of the study. Logistic regression analysis was
selected for two reasons. First, previous research about the processes of change
factors did not delineate any potential ordering of these constructs, therefore, a
separate logistic regression analysis was conducted at each step of the analysis on
the variables entered into the model at each step. Secondly, previous research of
predictor variables for smoking cessation during pregnancy has repeatedly used
logistic regression analysis, therefore, indicating its usefulness for comparison of
study results.
CHAPTER IV

RESULTS

This study was conducted to examine four of the processes of change proposed by the transtheoretical Stages of Change Model as predictors of smoking cessation during pregnancy. Data for this ex post facto, static group comparison study were collected from a cluster sample of pregnant women seeking care at eight clinic sites throughout Ohio which provide prenatal smoking cessation programs to pregnant women who smoke. Interview and self-report survey data were collected at the eighth month antepartum and initial postpartum visit for women identified as smokers who attended these clinic sites from February through December, 1994. Interpretation of results are presented in table format. This study will contribute to the literature by providing additional knowledge about predictors of smoking cessation for pregnant women, and for future development of effective smoking cessation intervention programs for this population.

Description of the Sample Population

All women who presented themselves for prenatal care and indicated that they were smokers during the intake visit at the eight designated clinic sites were
enrolled in the study. Table 3 organizes the frequency distribution of the sample by site indicating the number of women enrolled at the intake interview and the number who completed their eighth month antepartum visit by December, 1994.

Interview and questionnaire data were completed for 275 women, thus, these women were designated the sample. These women had agreed to participate in the study by signing a consent form at the intake visit.

Of the 363 eligible women who completed their eighth month visit by December, 1994, 21 were lost at follow-up due to incomplete information, another 67 dropped out of the study because of miscarriage, spontaneous abortion, early delivery, or transfer from the clinic site. Thus, interviews and self-report questionnaire data from 275 women were analyzed.

Characteristics of the women who were lost to follow-up were compared to study participants for race, age, education, income, couple status and site location. These characteristics were similarly represented in both groups. Also, subject loss was evenly distributed across site locations.

Demographic characteristics of the sample are presented in Table 4. These variables include race, age, education and living arrangement based on couple status. The sample was predominantly white (89.8%), while 7.6 percent were black. The remaining 2.5 percent indicated race other than white or black. Years of education revealed that 46.0 percent were high school graduates, while 45.8 percent had not completed high school. Seven percent had some college education. The mean age was 21.96 years, with a standard deviation of 4.37 years. Marital
Table 3: Distribution of Sample by Site Location

<table>
<thead>
<tr>
<th>Site Location:</th>
<th>Intake</th>
<th>Eighth Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lawrence County Health Department</td>
<td>24</td>
<td>22</td>
</tr>
<tr>
<td>Community Action of Pike County</td>
<td>66</td>
<td>53</td>
</tr>
<tr>
<td>Tiffin Hospital of Seneca County</td>
<td>26</td>
<td>24</td>
</tr>
<tr>
<td>Ohio Valley Hospital of Jefferson County</td>
<td>114</td>
<td>73</td>
</tr>
<tr>
<td>Community Action of Columbiana County</td>
<td>43</td>
<td>23</td>
</tr>
<tr>
<td>Toledo City Health Department</td>
<td>06</td>
<td>01</td>
</tr>
<tr>
<td>Elyria City Health Department</td>
<td>80</td>
<td>78</td>
</tr>
<tr>
<td>MetroHealth Medical Center of Cleveland</td>
<td>04</td>
<td>01</td>
</tr>
<tr>
<td><strong>Total n</strong></td>
<td>363</td>
<td>275</td>
</tr>
</tbody>
</table>
Table 4: Demographic Characteristics of the Sample (n=275)

<table>
<thead>
<tr>
<th>Demographic Variables:</th>
<th>Percent (%)</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>89.9</td>
<td>247</td>
</tr>
<tr>
<td>Black</td>
<td>7.6</td>
<td>21</td>
</tr>
<tr>
<td>Other</td>
<td>2.5</td>
<td>7</td>
</tr>
<tr>
<td><strong>Education:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; High School Graduate</td>
<td>45.8</td>
<td>126</td>
</tr>
<tr>
<td>High School Graduate</td>
<td>46.0</td>
<td>127</td>
</tr>
<tr>
<td>Some College</td>
<td>7.7</td>
<td>21</td>
</tr>
<tr>
<td><strong>Age (years)</strong> a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 20</td>
<td>31.7</td>
<td>87</td>
</tr>
<tr>
<td>20-24</td>
<td>44.3</td>
<td>122</td>
</tr>
<tr>
<td>25-29</td>
<td>18.2</td>
<td>50</td>
</tr>
<tr>
<td>≥ 30</td>
<td>5.6</td>
<td>16</td>
</tr>
<tr>
<td><strong>Living arrangement</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Couple</td>
<td>53.1</td>
<td>146</td>
</tr>
<tr>
<td>Single</td>
<td>46.9</td>
<td>129</td>
</tr>
</tbody>
</table>

*mean 21.96; SD 4.37; Range 15-38
status included those who reported being married or living with a partner and revealed 53.1 percent were living as a couple while 46.9 percent were single.

In Table 5 descriptive statistics of smoking history characteristics of the sample are presented. Of the 275 participants, 98.5 percent reported being a current smoker at the intake visit, and only 1.5 percent had recently quit smoking. Prepregnancy smoking rates revealed that 76.7 percent of the women smoked 10 or fewer cigarettes per day, 7.6 smoked between 11 and 20, and 15.4 percent smoked 20 or more cigarettes daily. Nearly half of the women (46.9%) had smoked for a total of five years or less, while 36.8 percent smoked between six and ten years and 14.7 percent had smoked longer than ten years. More than half of the women (59.4%) had tried to quit one or more times during the past year with 38.5 percent making no attempt to quit. Response to a questionnaire item asking whether the woman intended to quit smoking during pregnancy revealed that 19.6 percent had either quit or were ready to quit, 29.1 percent expected to quit during pregnancy, 39.3 percent were unsure if they wanted to quit and 11.3 percent did not expect to quit.

Social smoking networks have been shown to have an effect on smoking behavior and therefore should be examined as contributing factors of smoking status (Quinn, Mullen and Ershoff, 1991). Table 6 reports the social smoking networks of the study group. Seventy percent of the participants indicated that other smokers lived in the same household, and 55.5 percent reported being exposed to the cigarette smoking of others for more than 10 hours daily. Only 10.9 percent reported no exposure to cigarette smoking of others in their living environment.
Table 5: Frequency Distributions for Smoking History Variables for Sample (n=275)

<table>
<thead>
<tr>
<th>Reported Smoker at Intake Visit</th>
<th>Percent (%)</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoker</td>
<td>98.5</td>
<td>271</td>
</tr>
<tr>
<td>Quit</td>
<td>1.5</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prepregnancy Smoking Rate</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 10 cigarettes/day</td>
<td>76.7</td>
<td>211</td>
</tr>
<tr>
<td>11-19 cigarettes/day</td>
<td>7.6</td>
<td>21</td>
</tr>
<tr>
<td>≥ 20 cigarettes/day</td>
<td>15.4</td>
<td>42</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Years Cigarette Smoking</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 5</td>
<td>46.9</td>
<td>129</td>
</tr>
<tr>
<td>6-10</td>
<td>36.8</td>
<td>101</td>
</tr>
<tr>
<td>&gt; 10</td>
<td>14.7</td>
<td>43</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quit Attempts in Past Year</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>38.5</td>
<td>106</td>
</tr>
<tr>
<td>1-5</td>
<td>56.0</td>
<td>154</td>
</tr>
<tr>
<td>&gt;5</td>
<td>3.4</td>
<td>9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reported Attempt to Quit at Intake</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Already Quit</td>
<td>19.6</td>
<td>54</td>
</tr>
<tr>
<td>Going to Quit</td>
<td>29.1</td>
<td>80</td>
</tr>
<tr>
<td>Not Sure</td>
<td>39.3</td>
<td>108</td>
</tr>
<tr>
<td>Don't Expect to Quit</td>
<td>11.3</td>
<td>31</td>
</tr>
</tbody>
</table>

273
Table 6: Frequency Distributions for Social Smoking Networks of Sample (n=275)

<table>
<thead>
<tr>
<th>Smoking Social Networks:</th>
<th>Percent (%)</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Smokers in Household</td>
<td>70.2</td>
<td>193</td>
</tr>
<tr>
<td>None</td>
<td>29.8</td>
<td>82</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hours/Day with Other Smokers</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10.9</td>
<td>30</td>
</tr>
<tr>
<td>&lt; 10</td>
<td>32.8</td>
<td>90</td>
</tr>
<tr>
<td>≥ 10</td>
<td>55.5</td>
<td>153</td>
</tr>
</tbody>
</table>

Table 7 reveals a composite picture of the sample by displaying descriptive characteristics of the group at the intake visit, reporting means and standard deviations for these variables. Results revealed that women participants had a mean age of 21.96 (SD=4.37) and completed a mean of 11.22 years of school (SD=1.5). Women reported a mean monthly income of 639.84 dollars (SD=599.77). Women entered the study at a mean of 15.18 weeks gestation (SD=6.97). Smoking history of these women revealed a mean of 9.61 cigarettes smoked daily for the group (SD=10.57) and the woman having smoked an average of 6.77 years (SD=4.23). Women reported a mean of 1.34 quit attempts during the past year (SD=2.17).
Table 7: Descriptive Statistics for Demographic Characteristics of the Sample at Intake Visit (n=275)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>MEAN</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>21.96</td>
<td>4.37</td>
</tr>
<tr>
<td>Education (Grade completed)</td>
<td>11.22</td>
<td>1.50</td>
</tr>
<tr>
<td>Income (monthly)</td>
<td>639.84</td>
<td>599.77</td>
</tr>
<tr>
<td>Weeks Pregnant</td>
<td>15.18</td>
<td>6.97</td>
</tr>
<tr>
<td>Number Cigarettes Smoked Daily</td>
<td>9.61</td>
<td>10.57</td>
</tr>
<tr>
<td>Number Quits in Past Year</td>
<td>1.34</td>
<td>2.17</td>
</tr>
<tr>
<td>Years Cigarette Smoker</td>
<td>6.77</td>
<td>4.23</td>
</tr>
</tbody>
</table>

Table 8 presents descriptive statistics for smoking characteristics at the eighth month antepartum visit. The mean number of daily cigarettes smoked was reduced to 6.18 with a standard deviation of 7.20 cigarettes per day. Study participants reported that they were able to quit smoking during pregnancy a mean of 15.84 weeks (SD = 15.01).

Four questions were asked during the intake interview and repeated at the eighth month antepartum visit to determine if there was a change in knowledge or health beliefs about smoking during pregnancy. This information was collected to assess any change in knowledge and beliefs that occurred as a result of the intervention program for the group in general but was not analyzed statistically. Frequency distributions for knowledge and beliefs at the intake and eighth month antepartum visits are listed in Table 9. The
### Table 8: Descriptive Statistics for Smoking Characteristics at the Eighth Month Antepartum Visit (n = 275)

<table>
<thead>
<tr>
<th></th>
<th>MEAN</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number Daily Cigarettes Smoked</td>
<td>6.18</td>
<td>7.20</td>
</tr>
<tr>
<td>Number Weeks Able To Quit</td>
<td>15.84</td>
<td>15.01</td>
</tr>
</tbody>
</table>

### Table 9: Frequency Distributions for Knowledge and Beliefs at the Intake and Eighth Month Antepartum Visits (N=275)

<table>
<thead>
<tr>
<th>Knowledge and Beliefs:</th>
<th>Intake</th>
<th>Eighth Month</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Don't Know</td>
<td>Agree</td>
</tr>
<tr>
<td>1) Do you agree that cigarette smoking increases a woman's chances of having a smaller sicker baby?</td>
<td>7.3 (n=273)</td>
<td>9.8 (n=269)</td>
</tr>
<tr>
<td>2) Do you agree that cigarette smoking increases a woman's chances of having a miscarriage or stillbirth?</td>
<td>14.6 (n=273)</td>
<td>18.2 (n=270)</td>
</tr>
<tr>
<td>3) Do you agree that you are more likely to have these complications if you smoke during pregnancy?</td>
<td>13.1 (n=272)</td>
<td>13.5 (n=270)</td>
</tr>
<tr>
<td>4) Do you agree that babies whose mother or father smokes are more likely to get ear infections or colds?</td>
<td>39.3 (n=271)</td>
<td>12.4 (n=270)</td>
</tr>
</tbody>
</table>
percentages of women agreeing to these knowledge and belief statements about smoking during pregnancy increased slightly for three of the four questions. There is a slight decrease in the percentage of women at the eighth month visit agreeing that "cigarette smoking increases a woman's chances of having a smaller, sicker baby (Intake = 79.6%, Eighth Month = 74.9%).

Smoking Status of Sample at Eighth Month of Pregnancy

At the eighth month antepartum visit, the participant reported whether she had quit smoking during pregnancy. Smoking status was the dependent variable in this study, measured as a dichotomous event and coded 1 = Quit Smoking or 0 = Not Quit. Table 10 presents the frequency distribution indicating the number of women who reported quitting compared to those who continued to smoke. Results revealed that 36.0 percent of the sample reported they had quit smoking during pregnancy.

Table 10: Frequency Distribution of Smoking Status for Sample at the Eighth Month Antepartum Visit (n = 275)

<table>
<thead>
<tr>
<th></th>
<th>Percent (%)</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quit</td>
<td>36.0</td>
<td>99</td>
</tr>
<tr>
<td>Not Quit</td>
<td>64.0</td>
<td>176</td>
</tr>
</tbody>
</table>

Quit Status Coded as Quit = 1, Not Quit = 0.
Description of Processes of Change Questionnaire Response

During the eighth month antepartum visit a self-report questionnaire was completed by each study participant. This questionnaire of 16 items measured the utilization of four processes of change, (stimulus control, counterconditioning, reinforcement management, helping relationships) as predictors of smoking cessation for women near the end of pregnancy. There were four items on the questionnaire representing each of the processes of change. Subjects were asked to rate on a five point Likert scale how often they employed each item in the last month. The scale of responses ranged from 1 = never to 5 = repeatedly (Appendix D). The descriptive statistics for the processes of change are reported in Table 11. A mean and standard deviation value was computed for each process of change based on summated scores to four questions pertaining to each process, (stimulus control, counterconditioning, reinforcement management and helping relationships). The summated score for stimulus control was computed based on response

Table 11: Descriptive Statistics for the Processes of Change at the Eighth Month Antepartum Visit (n =275)

<table>
<thead>
<tr>
<th></th>
<th>MEAN</th>
<th>SD</th>
<th>RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stimulus Control</td>
<td>1.93</td>
<td>1.10</td>
<td>4</td>
</tr>
<tr>
<td>Counterconditioning</td>
<td>2.99</td>
<td>1.00</td>
<td>4</td>
</tr>
<tr>
<td>Reinforcement Management</td>
<td>2.46</td>
<td>1.08</td>
<td>4</td>
</tr>
<tr>
<td>Helping Relationships</td>
<td>3.63</td>
<td>1.01</td>
<td>4</td>
</tr>
</tbody>
</table>

* Mean scores for each process were the summated score for four questionnaire items ÷ 4.
to questionnaire items 5, 8, 14, 16. The summated score for counterconditioning was based on responses to questionnaire items 2, 4, 9, 11. The summated score for reinforcement management was based on responses to questionnaire items 3, 7, 10, 13. The summated score for helping relationships was based on responses to questionnaire items 1, 6, 12, 15 (Form III, Appendix D). Frequency distributions of the range of summated scores for each process of change are displayed in Table 12.

Correlation Analysis of Study Variables

With the number of confounding and independent variables that were examined in this study, the existence of correlations between variables was explored. Collinearity is the correlation among three or more independent variables that are analyzed simultaneously. Because the independent variables lay claim to shared variance in explaining results, it becomes important to examine the intercorrelations of the independent variables to determine if collinearity exists (Hair, et al., 1992).

Table 13 displays the correlation matrix for all variables examined in the study. The correlations between variables were mostly negligible or low, ranging in value from (r = .003 to r = .394). There were five moderate associations. Age was moderately associated with years spent smoking (r = .641). The other associations were among the processes of change, the independent variables of the study. A moderate association was revealed for counterconditioning with stimulus control (r = .632); counterconditioning with reinforcement management (r = .567); and reinforcement management with stimulus control and helping relationships (r = .610, r = .488, respectively).
Table 12: Frequency Distributions for Summated Scores of the Processes of Change at the Eighth Month Antepartum Visit (n=275)

<table>
<thead>
<tr>
<th>Stimulus Control</th>
<th>Counterconditioning</th>
<th>Reinforcement Management</th>
<th>Helping Relationships</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Summated Score</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>39.3</td>
<td>108</td>
<td>4.0</td>
</tr>
<tr>
<td>5</td>
<td>4.4</td>
<td>12</td>
<td>2.5</td>
</tr>
<tr>
<td>6</td>
<td>6.5</td>
<td>18</td>
<td>2.5</td>
</tr>
<tr>
<td>7</td>
<td>5.1</td>
<td>14</td>
<td>4.0</td>
</tr>
<tr>
<td>8</td>
<td>10.9</td>
<td>30</td>
<td>6.2</td>
</tr>
<tr>
<td>9</td>
<td>6.5</td>
<td>18</td>
<td>5.5</td>
</tr>
<tr>
<td>10</td>
<td>6.9</td>
<td>19</td>
<td>8.0</td>
</tr>
<tr>
<td>11</td>
<td>2.5</td>
<td>7</td>
<td>9.5</td>
</tr>
<tr>
<td>12</td>
<td>4.7</td>
<td>13</td>
<td>13.1</td>
</tr>
<tr>
<td>13</td>
<td>2.5</td>
<td>7</td>
<td>13.8</td>
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<tr>
<td>14</td>
<td>1.8</td>
<td>5</td>
<td>6.9</td>
</tr>
<tr>
<td>15</td>
<td>.7</td>
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<td>4.7</td>
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<tr>
<td>16</td>
<td>1.5</td>
<td>4</td>
<td>6.5</td>
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<tr>
<td>17</td>
<td>.7</td>
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<td>3.6</td>
</tr>
<tr>
<td>18</td>
<td>.7</td>
<td>2</td>
<td>4.0</td>
</tr>
<tr>
<td>19</td>
<td>1.1</td>
<td>3</td>
<td>2.2</td>
</tr>
<tr>
<td>20</td>
<td>4.0</td>
<td>11</td>
<td>2.9</td>
</tr>
</tbody>
</table>
Table 13: Correlation Matrix for Intercorrelations Between Variables (n=275)

<table>
<thead>
<tr>
<th>Variables:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
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<tbody>
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<td>3</td>
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<td>-.01 .35** -.08</td>
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<td>5</td>
<td>.13* -.12 .20** -.10</td>
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</tr>
<tr>
<td>7</td>
<td>-.05 -.10 .06 .19** -.05 .28**</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>-.01 .07 .02 -.04 -.10 -.05 -.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>.00 .11 .02 -.08 -.14* -.08 -.15* .63**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>.05 .04 .01 -.13* -.08 -.16** -.01 .61** .57**</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>.10 .04 .07 -.15* -.01 -.18** -.01 .31** .39** .49**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>.05 .21** .01 -.18** -.02 -.26** -.38** .25** .39** .21** .21** 1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

Note: *= p < .05, **= p < .01, Variable 1 = Income, Variable 2 = Education, Variable 3 = Couple Status, Coded 1 = Lives as Couple, 0 = Single, Variable 4 = Age, Variable 5 = Lives With A Smoker, Coded 1 = Lives with Smokers, 0 = Does not Live with Smokers, Variable 6 = Years Cigarette Smoking, Variable 7 = Daily Cigarettes Smoked, Variable 8 = Stimulus Control, Variable 9 = Counterconditioning, Variable 10 = Reinforcement Management, Variable 11 = Helping Relationships, Variable 12 = Smoking Status, Coded 1 = Quit, 0 = Not Quit.
Demographic information and smoking history factors were analyzed for relationships with the participants' smoking status at the eighth month antepartum visit. Table 14 provides correlation results between demographic variables, smoking history factors and the participants' quit status. Point biserial coefficients were calculated to determine associations between these variables and the dependent variable; whether a participant quit smoking. The dependent variable was coded for the analysis with Quit = 1 and Not Quit = 0. Results reveal that age, education, daily number of cigarettes smoked, and number of years of cigarette smoking were significantly associated with whether a woman quit smoking. Income was the only variable which was not statistically significant. The point biserial coefficient for education ($r = .22, p < .001$) indicated that as years of education increased, the participant was more likely to quit smoking. The three factors of age, daily cigarettes smoked and number of years spent smoking had low to moderate negative correlations with quit status ($r = -.18, p = .003; r = -.39, p < .001; r = -.26, p < .001$, respectively). These results suggest that as the number of daily cigarettes smoked, the number of years spent smoking and as age increased, the likelihood of quitting decreased.

The association of continued cigarette smoking with the risk of living with other smokers was described by chi-square analysis and results are reported in Table 15. The phi coefficient ($\phi$), which is the computation of the Pearson product moment correlation for dichotomous variables is not significant ($\phi = .024, p = .684$). The 2 X 2 table results reveals that while 70.2 percent of the sample lives with a smoker, 36 percent of the study participants were able to quit smoking. A total of 68
Table 14: Point Biserial Coefficients Between Demographic Smoking History Variables and Quit Status at Eighth Month Antepartum Visit *

<table>
<thead>
<tr>
<th>Variable</th>
<th>(r)</th>
<th>p</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily Cigarettes Smoked At Intake</td>
<td>-.39</td>
<td>&lt;.001</td>
<td>274</td>
</tr>
<tr>
<td>Number Years Cigarette Smoking</td>
<td>-.26</td>
<td>&lt;.001</td>
<td>273</td>
</tr>
<tr>
<td>Age</td>
<td>-.18</td>
<td>.003</td>
<td>274</td>
</tr>
<tr>
<td>Income</td>
<td>.05</td>
<td>.398</td>
<td>272</td>
</tr>
<tr>
<td>Education (Grade Level)</td>
<td>.22</td>
<td>&lt;.001</td>
<td>274</td>
</tr>
</tbody>
</table>

* Quit Status Coded 1 = Quit Smoking, 0 = Smoker.

Table 15: The Association of Smoking Status with Whether Living With Other Smokers (n=275)

<table>
<thead>
<tr>
<th>Frequency Distribution by:</th>
<th>Lives With A Smoker</th>
<th>Doesn't Live With A Smoker</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quit</td>
<td>68</td>
<td>31</td>
<td>99 (36.0%)</td>
</tr>
<tr>
<td>Not Quit</td>
<td>125</td>
<td>51</td>
<td>176 (64.0%)</td>
</tr>
<tr>
<td>Total</td>
<td>193 (70.2%)</td>
<td>82 (29.8%)</td>
<td>275 (100%)</td>
</tr>
</tbody>
</table>

chi-square = .17 with 1 df, phi =.02, p = .68
women who quit smoking reported living with a smoker.

The association of quit status during pregnancy was also measured with whether the woman was single or part of a couple relationship. This variable has been measured in past research studies and has been found to be significantly related to smoking behavior (Garvey, Heinold and Rosner, 1989). Table 16 reveals the results of the chi-square analysis. The phi value of .007 is not significant at $p = .912$. Living as a couple and living single were nearly equal with 53.1 percent reporting living in a couple relationship while 46.9 percent reported being single. Fifty three of the women who were living in a couple relationship quit smoking while a nearly equal number ($n = 46$) of women who reported living single also quit.

**Table 16: The Association of Smoking Status with Couple Status During Pregnancy (n=275)**

<table>
<thead>
<tr>
<th>Frequency Distribution by:</th>
<th>Couple</th>
<th>Single</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quit</td>
<td>53</td>
<td>46</td>
<td>99 (36.0%)</td>
</tr>
<tr>
<td>Not Quit</td>
<td>93</td>
<td>83</td>
<td>176 (64.0%)</td>
</tr>
<tr>
<td>Total</td>
<td>146 (53.1%)</td>
<td>129 (46.9%)</td>
<td>275 (100%)</td>
</tr>
</tbody>
</table>

$\chi^2 = .01$ with 1 df, phi=.007, $p = .912$

**Logistic Regression Analysis**

To determine which of the processes of change, (stimulus control, counterconditioning, reinforcement management or helping relationships) were
predictors of the event that a woman would quit smoking during pregnancy, a logistic regression analysis was conducted at each of three steps. For each step, variables were simultaneously entered to determine if all variables were important in the model and examine interrelationships among variables. In the first step the variables of income and education were entered into the model. These two variables were grouped together as control variables representing socioeconomic status due to the intention to focus on women of low socioeconomic status. In Step 2 of the analysis, variables which were identified in the literature as predictors of quit status were entered into the model. These variables included: education, income, daily number of cigarettes smoked prior to pregnancy, years a woman had smoked, age, whether a woman lived with other smokers and whether the woman was part of a couple or lived single. This step was completed to determine if other variable relationships were significant predictors of smoking status and to examine the interrelationships among these variables. Step 3 concluded the logistic regression analysis of the full model with entry of the study’s four major independent variables - the four processes of change. The statistical hypothesis which states: "The processes of change will not predict the likelihood of pregnant women who will stop smoking during pregnancy" was tested at the \( \leq .05 \) level of significance.

Classification tables were constructed for each step of the analysis to assess the goodness of fit of the model. Classification table results compare the predictions for variables of the model entered at each step with observed outcomes. The calculation of the classification table at each successive step reveals how much improvement on predicting the likelihood that a woman would quit smoking was gained by the addition of
the variables at each step. Analysis results are based on a sample of 275 cases. Missing data for the analysis of the processes of change was handled by mean substitution for a total of seven cases.

Table 17 presents the results of the logistic regression analysis for education and income predicting smoking status. The Model chi square value of 15.25 is significant at p < .001, indicating rejection of the statistical hypothesis which states that the logistic coefficients for years of education completed and annual income are equal to zero.

Examination of the individual variables in the model for step 1 indicated that the logistic regression coefficient for education is significant (B = .35, p = .003) while income is not significant (B = .001, p = .60). The factor Exp (B) statistic indicates that a one unit increase in years of education increases the odds of a woman quitting smoking by a factor of 1.42 holding level of income constant.

Table 17: Logistic Regression Analysis for Education and Income Predicting Smoking Status (n=275)

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE</th>
<th>WALD</th>
<th>df</th>
<th>p</th>
<th>R</th>
<th>Exp (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>.35</td>
<td>.10</td>
<td>12.88</td>
<td>1</td>
<td>&lt;.001</td>
<td>.18</td>
<td>1.42</td>
</tr>
<tr>
<td>Income</td>
<td>.001</td>
<td>.001</td>
<td>.28</td>
<td>1</td>
<td>.60</td>
<td>.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Model Chi Square 15.25, df = 2, p = .001
Results of the classification table for education and income predicting smoking status for Step 1 of the analysis are displayed in Table 18. The classification table reveals that the overall percentage of correct classifications is 68 percent which is only a 3 percent increase improvement over a base line prediction of 65 percent correct classification if all cases are predicted to not quit smoking. The model correctly classified 99 percent of the "not quit" group but correctly classified only 11 percent of the "quit" group.

Table 18: Classification Table for Education and Income Predicting Smoking Status (n=275)

<table>
<thead>
<tr>
<th>OBSERVED</th>
<th>PREDICTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Quit</td>
<td>173</td>
</tr>
<tr>
<td>Quit</td>
<td>83</td>
</tr>
<tr>
<td>Overall</td>
<td>68.28%</td>
</tr>
</tbody>
</table>

Results of the logistic regression analysis for Step 2 of the model are displayed in Table 19. The Model chi-square value of 69.10, p < .001 is significant. Improvement chi square of 69.10 is also significant. The statistical hypothesis is rejected which tests that the logistic regression coefficients equal zero for years of education completed, income, daily number of cigarettes smoked, years of cigarette smoking, age, whether a woman lives with a smoker (Coded as 1 = Lives with a smoker, 0 = Does not live with smoker), couple status (Coded as 1 = Part of a Couple, 0 = Living Single).
Table 19: Logistic Regression Analysis for Education, Income, Daily Cigarettes Smoked, Years Smoking, Age, Whether Living With a Smoker, Couple Status Predicting Smoking Status (n =275)

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>WALD</th>
<th>df</th>
<th>p</th>
<th>R</th>
<th>Exp (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>.52</td>
<td>.13</td>
<td>15.09</td>
<td>1</td>
<td>&lt;.001</td>
<td>.20</td>
<td>1.68</td>
</tr>
<tr>
<td>Income</td>
<td>.00</td>
<td>.00</td>
<td>.03</td>
<td>1</td>
<td>.85</td>
<td>.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Daily Cigarettes</td>
<td>-.17</td>
<td>.03</td>
<td>29.41</td>
<td>1</td>
<td>&lt;.001</td>
<td>-.29</td>
<td>.85</td>
</tr>
<tr>
<td>Years</td>
<td>-.02</td>
<td>.05</td>
<td>.12</td>
<td>1</td>
<td>.73</td>
<td>.00</td>
<td>.98</td>
</tr>
<tr>
<td>Age</td>
<td>-.16</td>
<td>.06</td>
<td>7.93</td>
<td>1</td>
<td>&lt;.001</td>
<td>-.13</td>
<td>.85</td>
</tr>
<tr>
<td>Smokers(^a)</td>
<td>-.30</td>
<td>.36</td>
<td>.69</td>
<td>1</td>
<td>.41</td>
<td>.00</td>
<td>.74</td>
</tr>
<tr>
<td>Couple(^b)</td>
<td>.14</td>
<td>.32</td>
<td>.19</td>
<td>1</td>
<td>.66</td>
<td>.00</td>
<td>1.15</td>
</tr>
</tbody>
</table>

Model chi square = 69.10, df = 5, p < .001, Improvement chi square = 69.10
\(^a\) Coded as Lives with Smoker = 1, Does Not live with Smoker = 0
\(^b\) Coded as Living as Couple = 1, Living Single = 0

Results reveal that age, education, and daily number of cigarettes smoked were statistically significant (B = -.16, p = .005; Beta = .52, p < .001; Beta = -.1 p < .001, respectively). The negative values for daily cigarettes smoked and age indicates that as their value increases in number, the likelihood of quitting smoking decreases. The variables of income, years spent smoking cigarettes, whether the woman lives with a smoker and whether the woman lives in a couple relationship were not statistically significant (B = .00, p = .85; B = -.02, p = .73; B = -.30, p = .41; B = .14, p = .66, respectively).
in years of education increases the odds of a woman quitting smoking by a factor of 1.68 holding the other variables constant; a one unit increase in the number of daily cigarettes smoked decreases the odds of a woman quitting smoking by a factor .85 holding the other variables constant; a one unit increase in age (years) decreases the odds of a woman quitting smoking by a factor of .98 holding the other variables constant.

The Step 2 classification table results for the variables; education, income, age, couple status, daily number of cigarettes smoked, years spent smoking and whether the woman lives with a smoker are reported in Table 20. Figures reveal that the overall percentage of correct classifications is 78 percent, which is a 13 percent improvement over a base line prediction of 65 percent correct classifications if all cases are predicted to not quit smoking. The model correctly classified 88 percent of the "not quit" group and correctly classified 59 percent of the "quit" group.

Table 20: Classification Table for Education, Income, Age, Couple Status, Daily Cigarettes Smoked, Years Smoking, Living With a Smoker, Predicting Smoking Status (n=275)

<table>
<thead>
<tr>
<th>OBSERVED</th>
<th>PREDICTED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not Quit</td>
</tr>
<tr>
<td>Not Quit</td>
<td>154</td>
</tr>
<tr>
<td>Quit</td>
<td>38</td>
</tr>
<tr>
<td>Overall</td>
<td></td>
</tr>
</tbody>
</table>
Results of the third step of the logistic regression analysis are presented in Table 21 indicating the entry of the four major independent variables (stimulus control, counterconditioning, reinforcement management and helping relationships) and education, income, age, couple status, daily number of cigarettes smoked, years spent smoking and whether living with a smoker. The Model chi-square statistic of 30.62 was significant at $p < .001$ with the Improvement chi square statistic of 30.62 also significant at $p < .001$. This indicates that the statistical hypothesis stating that the logistic regression coefficients are equal to zero for years of education, annual income, daily number of cigarettes smoked, years spent smoking, age, whether the woman lives with a smoker, whether the woman was part of a couple and the processes of change (stimulus control, counterconditioning, reinforcement management and helping relationships).

Results also reveal that age, education and daily number of cigarettes smoked remain significant ($B = -.149, p = .01; B = .53, p < .001; B = -.17, p < .001$, respectively). The only processes of change variable found to be significant was that of counterconditioning ($B = .93, p < .001$). Counterconditioning refers to the ability to engage in other activity and concentrate on other things to change a behavior such as smoking (Prochaska et al., 1988).

The $\text{Exp}(B)$ statistic for significant variables indicates the following. A one unit increase in age (years) decreases the odds of a woman quitting smoking by a factor of .86, holding all other variables constant. A one unit increase in the years of education increases the odds of a woman quitting smoking by a factor of 1.69, holding all other
variables constant. A one unit increase in the number of daily cigarettes smoked decreases the odds of quitting smoking by a factor of .84, holding other variables constant. A one unit increase in counterconditioning activities increases the odds of a woman quitting smoking by 2.53, holding all other variables constant.

Table 21: Logistic Regression Analysis For All Study Variables Predicting Smoking Status (n=275)

<table>
<thead>
<tr>
<th>Variable:</th>
<th>B</th>
<th>SE</th>
<th>WALD</th>
<th>df</th>
<th>p</th>
<th>R</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>.53</td>
<td>.14</td>
<td>13.20</td>
<td>1</td>
<td>&lt;.001</td>
<td>.21</td>
<td>1.69</td>
</tr>
<tr>
<td>Income</td>
<td>.00</td>
<td>.00</td>
<td>.04</td>
<td>1</td>
<td>.85</td>
<td>.00</td>
<td>.10</td>
</tr>
<tr>
<td>Daily # Cigarettes</td>
<td>-.17</td>
<td>.03</td>
<td>25.86</td>
<td>1</td>
<td>&lt;.001</td>
<td>-.30</td>
<td>.84</td>
</tr>
<tr>
<td>Years</td>
<td>-.03</td>
<td>.06</td>
<td>.27</td>
<td>1</td>
<td>.60</td>
<td>.00</td>
<td>.97</td>
</tr>
<tr>
<td>Age</td>
<td>-.15</td>
<td>.06</td>
<td>6.02</td>
<td>1</td>
<td>.01</td>
<td>-.12</td>
<td>.86</td>
</tr>
<tr>
<td>Smokers*</td>
<td>-.00</td>
<td>.39</td>
<td>.00</td>
<td>1</td>
<td>.99</td>
<td>.00</td>
<td>.10</td>
</tr>
<tr>
<td>Couple*</td>
<td>.13</td>
<td>.35</td>
<td>.14</td>
<td>1</td>
<td>.71</td>
<td>.00</td>
<td>1.14</td>
</tr>
<tr>
<td>SC Score</td>
<td>.09</td>
<td>.21</td>
<td>.19</td>
<td>1</td>
<td>.66</td>
<td>.00</td>
<td>1.10</td>
</tr>
<tr>
<td>CC Score</td>
<td>.93</td>
<td>.26</td>
<td>13.07</td>
<td>1</td>
<td>&lt;.001</td>
<td>.21</td>
<td>2.53</td>
</tr>
<tr>
<td>RM Score</td>
<td>-.16</td>
<td>.23</td>
<td>.49</td>
<td>1</td>
<td>.48</td>
<td>.00</td>
<td>.85</td>
</tr>
<tr>
<td>HR Score</td>
<td>.24</td>
<td>.20</td>
<td>1.39</td>
<td>1</td>
<td>.24</td>
<td>.00</td>
<td>1.27</td>
</tr>
</tbody>
</table>

Model Chi Square = 30.62, df = 4, p < .001, Improvement Chi Square = 30.62, p < .001

^ Coded 1 = Lives With Smoker, 0 = Does Not Live With Smoker
* Coded 1 = Lives as a Couple, 0 = Lives Single
& Stimulus Control = Summated Mean for Questionnaire Items 5,8,14,16
' Counterconditioning = Summated Mean for Questionnaire Items 2,4,9,11
" Reinforcement Management = Summated Mean for Questionnaire Items 3,7,10,13
f Helping Relationships = Summated Mean for Questionnaire Items 1,6,12,15
Results of the classification table for step 3 of the logistic regression analysis in which the four processes of change (stimulus control, counterconditioning, reinforcement management and helping relationships) were entered into the model are displayed in Table 22. The classification table reveals that the overall percentage of correct classifications is 77 percent, which is an eleven percent improvement over the baseline prediction of 65 percent correct classifications if all cases are predicted to not quit smoking. The model correctly classified 87 percent of the "not quit" group and 58 percent of the "quit" group.

Table 22: Classification Table for All Independent Variables Predicting Smoking Status (N=268)

<table>
<thead>
<tr>
<th>OBSERVED</th>
<th>PREDICTED</th>
<th>% Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Quit</td>
<td>Not Quit</td>
<td>Quit</td>
</tr>
<tr>
<td></td>
<td>152</td>
<td>23</td>
</tr>
<tr>
<td>Quit</td>
<td>39</td>
<td>54</td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In reference to the statistical hypothesis stating "The processes of change factors; stimulus control, counterconditioning, reinforcement management and helping relationships will not predict the the likelihood of woman quitting smoking during
pregnancy, overall results revealed that the process of change of counterconditioning
was significant therefore, the statistical hypothesis is rejected and the research
hypothesis is accepted which states: "The processes of change factors: stimulus
control, counterconditioning, reinforcement management and helping relationships will
predict the likelihood of women quitting smoking during pregnancy. Additionally,
study results revealed that the daily number of cigarettes smoked prior to quitting,
education level and age of the woman were also statistically significant in predicting
quitting smoking during pregnancy. In terms of the relative importance of the variables
in predicting that a woman would quit smoking, the daily number of cigarettes smoked
has the highest relative value followed by education and counterconditioning
(R = -.302, R = .207, R = .206, respectively, Table 20). Thus when logistic regression
analysis was applied to the data to answer the research question: "What processes of
change are the most powerful predictors of smoking cessation during pregnancy?" the
independent variable of counterconditioning demonstrated the highest relative
importance in predicting smoking cessation for this population.

Biochemical Validation Results

Due to the self-report basis of the study, biochemical validation of smoking status
by cotinine urinalysis was conducted at the eighth month antepartum visit for women
who reported they had quit smoking. Results of the cotinine analysis are summarized in
Table 23. Urine samples were analyzed for 81 women in the sample. Fourteen urine
samples from women who reported quitting at the eighth month antepartum visit were
not available for analysis. Urine cotinine data confirmed 37 of the participants who reported quitting smoking at the eighth month visit as nonsmokers. Urine test results indicated smoking in 54 percent of those who reported quitting and confirmed 46 percent of the participants as nonsmokers.

Table 23: Cotinine Validation Data on Proclaimed Quitters (n=81)

<table>
<thead>
<tr>
<th>Cut-off Value</th>
<th>Proclaimed Quitters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent (%)</td>
</tr>
<tr>
<td>Cotinine &lt; 79ng/ml</td>
<td>46</td>
</tr>
<tr>
<td>Cotinine ≥ 79ng/ml</td>
<td>54</td>
</tr>
</tbody>
</table>

Postpartum Data Results

A smaller group of participants (n=83) completed their first postpartum visit during the timeframe of the study. An exploratory analysis of questionnaire data was completed to determine changes in quit status and assess group differences on the utilization of the processes of change between smokers and those women who stayed quit from the eighth month antepartum visit. Data were collected to examine the following research question: "What group differences based on the processes of change exist at the postpartum visit for quitters who stayed quit and smokers who never quit or returned to smoking by the postpartum visit?"
Description of the Postpartum Sample Population

All women who had completed their first postpartum visit by January 1995 were asked to participate in an interview survey and complete a self-report questionnaire which examined the processes of change currently being utilized by the participant (Forms IV and V, Appendix D). These forms were identical in format to Forms II and III completed at the eighth month antepartum visit. A total of 83 of the 120 eligible women completed the interview. Thirty-seven were lost at this follow-up due to failure to complete the postpartum visit. No women attending their postpartum visit refused to participate. Demographic characteristics of this group (n = 83) are displayed in Table 24. The sample ranged in age from 15 to 38 years with a mean age of 22.2 years, and standard deviation of 4.74 years. This sample was 86.7 percent white, 10.8 percent, black and 2.4 percent other race. The women completed an average of 11.34 years of school, standard deviation of 1.65 years, with 49.4 percent being high school graduates while 43.4 percent had not completed high school and 7.2 percent had completed some college. Fifty one percent of the women were living in a couple relationship while 48.2 percent reported living single. Statistics for the postpartum sample are very similar in demographic characteristics to the overall sample as reported in Table 4.

Smoking history characteristics of the postpartum sample are presented in Table 25. Postpartum smoking rates revealed that 28.9 percent were not smoking, 31.2 percent of the women reported smoking 10 or less cigarettes a day, 26.5 percent smoked between 11 and 19 cigarettes per day and 13.2 percent smoked more than
Table 24: Frequency Distribution For Demographic Characteristics of
The Postpartum Sample (n=83)

<table>
<thead>
<tr>
<th>Demographic Variables:</th>
<th>Percent (%)</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Race:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>86.7</td>
<td>72</td>
</tr>
<tr>
<td>Black</td>
<td>10.8</td>
<td>09</td>
</tr>
<tr>
<td>Other</td>
<td>2.4</td>
<td>02</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>83</td>
</tr>
<tr>
<td><strong>Education:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; High School Graduate</td>
<td>43.4</td>
<td>36</td>
</tr>
<tr>
<td>High School Graduate</td>
<td>49.4</td>
<td>41</td>
</tr>
<tr>
<td>Some College</td>
<td>7.2</td>
<td>06</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>83</td>
</tr>
<tr>
<td><strong>Age (years):</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 20</td>
<td>31.2</td>
<td>26</td>
</tr>
<tr>
<td>20-24</td>
<td>44.4</td>
<td>37</td>
</tr>
<tr>
<td>25-29</td>
<td>15.6</td>
<td>13</td>
</tr>
<tr>
<td>≥ 30</td>
<td>8.4</td>
<td>07</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>83</td>
</tr>
<tr>
<td><strong>Living Arrangement:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Couple</td>
<td>51.8</td>
<td>43</td>
</tr>
<tr>
<td>Single</td>
<td>48.2</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>83</td>
</tr>
<tr>
<td>Postpartum Smoking Rate</td>
<td>Percent (%)</td>
<td>n</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------</td>
<td>----</td>
</tr>
<tr>
<td>0 cigarettes/day</td>
<td>28.9</td>
<td>24</td>
</tr>
<tr>
<td>≤ 10 cigarettes/day</td>
<td>31.2</td>
<td>26</td>
</tr>
<tr>
<td>11-19 cigarettes/day</td>
<td>26.5</td>
<td>22</td>
</tr>
<tr>
<td>≥ 20 cigarettes/day</td>
<td>13.2</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>83</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Years Cigarette Smoking</th>
<th>Percent (%)</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 5</td>
<td>49.2</td>
<td>41</td>
</tr>
<tr>
<td>6-10</td>
<td>31.6</td>
<td>26</td>
</tr>
<tr>
<td>≥ 10</td>
<td>19.2</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>83</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reported Intent To Stay Quit At Eighth Month Visit:</th>
<th>Percent (%)</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Will remain a nonsmoker</td>
<td>28.9</td>
<td>24</td>
</tr>
<tr>
<td>Will not remain a nonsmoker</td>
<td>6.0</td>
<td>5</td>
</tr>
<tr>
<td>Don't know</td>
<td>2.4</td>
<td>2</td>
</tr>
<tr>
<td>Did not remain a nonsmoker</td>
<td>16.9</td>
<td>14</td>
</tr>
<tr>
<td>Unable to Quit</td>
<td>44.6</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>98.8</td>
<td>82</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Smoking Social Networks</th>
<th>Percent (%)</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Smokers in Household</td>
<td>71.1</td>
<td>59</td>
</tr>
<tr>
<td>None</td>
<td>28.9</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>83</td>
</tr>
</tbody>
</table>
or less. 31.6 percent reported smoking between six and ten years; and 19.2 percent had smoked for more than ten years. The reported intent to stay quit beyond the eighth month visit revealed that 28.9 percent had quit smoking and felt that they would remain a nonsmoker, 6.0 percent reported that they would probably go back to smoking, 2.4 percent didn't know, 16.9 percent reported that they were not able to remain a nonsmoker during pregnancy and 44.6 percent were not able to quit. Figures reveal that 71.1 percent lived with other smokers while 28.9 percent did not have other smokers in their home. It is interesting to note that postpartum smoking history characteristics for years spent smoking and for the percentage of women living with other smokers are nearly equivalent to those reported for the overall study group at intake (Table 5, Appendix D).

A Pearson chi-square analysis was completed to compare quit rates at the eighth month antepartum visit with those who reported quitting at postpartum. The 2 X 2 table analysis is displayed in Table 26. The phi coefficient of .624 is significant at p < .001. This indicates a relatively high relationship between the eighth month smoking status and postpartum smoking status. Ninety two percent of the smokers at the eighth month were smokers at postpartum. Two-thirds of the participants who had quit smoking at the eighth month were nonsmokers at postpartum.

Due to the small sample size at postpartum, further statistical analysis was not feasible for achieving recommended power and effect size. However, central tendency values were computed to answer the following research question: "What group
Table 26: The Association of Cigarette Smoking at the Eighth Month of Pregnancy and at the Initial Postpartum Visit.

<table>
<thead>
<tr>
<th>Postpartum Smoking Status</th>
<th>Smoker</th>
<th>Quit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoker</td>
<td>48</td>
<td>10</td>
<td>58</td>
</tr>
<tr>
<td>Quit</td>
<td>4</td>
<td>20</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>52</td>
<td>30</td>
<td>82 (100%)</td>
</tr>
</tbody>
</table>

$\phi = .624$, 1 df, $p < .001$

differences based on the processes of change exist at the postpartum visit for quitters who stayed quit and smokers who never quit or returned to smoking by the postpartum visit?"

Mean scores and standard deviations for each process of change were calculated and are reported in Table 27. Summated scores for each of four questionnaire items pertaining to a process of change were totaled and averaged to calculate a mean score. The summated score for stimulus control was computed based on response to questionnaire items 5, 8, 14, 16. The mean score for stimulus control was 1.80 which indicates that typically women at postpartum seldom utilized stimulus control activities. The summated score for counterconditioning was computed based on response to questionnaire items 2, 4, 9, 11. The mean score for counterconditioning was 2.79 which
Table 27: Descriptive Statistics for Processes of Change at the Postpartum Visit (n = 83)

<table>
<thead>
<tr>
<th>Process of Change</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stimulus Control</td>
<td>1.01</td>
<td>1.08</td>
<td>4</td>
</tr>
<tr>
<td>Counterconditioning</td>
<td>2.79</td>
<td>.98</td>
<td>4</td>
</tr>
<tr>
<td>Reinforcement Management</td>
<td>2.37</td>
<td>1.10</td>
<td>4</td>
</tr>
<tr>
<td>Helping Relationships</td>
<td>3.53</td>
<td>1.10</td>
<td>4</td>
</tr>
</tbody>
</table>

*Mean scores for each process are the summated score response of four questionnaire items ÷ 4.

indicates that women at postpartum typically utilized counterconditioning techniques occasionally. The summated score for reinforcement management was computed based on response to questionnaire items 3, 7, 10, 13. A mean of 2.37 for reinforcement management indicates that women at postpartum seldom used reinforcement management techniques to help them stay quit. The summated score for helping relationships was computed based on response to questionnaire items 1, 6, 12, 15. A mean of 3.53 for helping relationships indicates that women relied on the support of others occasionally in staying quit.
Summary of Results

This research focused on women who attended public health clinics across the State of Ohio for their prenatal care. Women entered prenatal care early in their second trimester and those identified as smokers were enrolled in a smoking cessation program. The sample of this study is typically white women who are between 18 and 26 years of age, having graduated from high school. These women are considered a low income group, earning a mean monthly income of 639.84 dollars. Fifty-three percent of the women reported living as a couple either married or unmarried.

These women typically smoked less than a pack of cigarettes daily and had smoked an average of 6.77 years. Most women had tried to quit smoking at least once during the past year. Seventy percent of the women reported living with other smokers. When asked if they intended to remain a nonsmoker at the eighth month antepartum visit, 29.0 percent indicated that they wanted to remain a nonsmoker.

Findings of this study investigated the research hypothesis that examined which of the four processes of change were utilized by women for smoking cessation and further identified other factors which predicted the likelihood of whether a woman would stop smoking during pregnancy. A statistically significant positive relationship was revealed for counterconditioning activities and women quitting smoking. Statistically significant relationships were also detected for age, education and daily number of cigarettes smoked, as predictors of smoking cessation. Interpretation of the correlations indicates that the use of counterconditioning processes increased the odds that a woman would quit smoking. As age increased in years, the odds of a woman
quitting smoking decreased. An increase in years of education increased the odds that a woman would quit smoking. Finally, as the daily number of cigarettes smoked increased, the likelihood of a woman quitting smoking decreased.

Logistic regression analysis for the full model revealed that the model was statistically significant (Model Chi-Square = 30.621, p < .001). Figures indicate that the model classified 77 percent of the observations correctly. The full model classified 87 percent of the smokers correctly and 58 percent of the quitters correctly. Partial correlation coefficients were calculated to measure the partial correlation between significant variables and quit status. These values revealed the relative importance of the factor in predicting smoking cessation. Values were calculated to answer the question: "Which processes of change were the most powerful predictors of smoking cessation for pregnant women?"

Relative importance values for each of the statistically significant variables indicated that daily number of cigarettes smoked had the most influence in contributing to a woman quitting smoking. (R = -.302). Next in value were education and counterconditioning and these were of equal importance in predicting whether a woman would quit smoking (R = .207, R = .206, respectively). Lastly, age had a relative value of R = -.124.

An exploratory analysis of the data collected at the initial postpartum visit for a sample of 83 women was completed. Results revealed that the number of women who continued to stay quit through the postpartum visit was statistically significant (phi (o) = .624, p < .001). Figures indicate that 67 percent of women who had quit smoking
by the eighth month of pregnancy remained a nonsmoker through the initial postpartum visit. Another 7.7 percent of the women who had not quit at the eighth month of pregnancy had quit by their postpartum visit. Mean scores for each of four processes of change from data collected via self-report questionnaire at the postpartum visit were reviewed to determine if these processes were being emphasized postpartum. Results indicated that helping relationships and counterconditioning processes were being utilized occasionally while stimulus control and reinforcement management were seldom used.
CHAPTER V
DISCUSSION

Introduction

This study was conducted to determine whether processes of change are predictors of the likelihood that a woman will quit smoking during pregnancy. Four processes of change were analyzed: counterconditioning, stimulus control, reinforcement management and helping relationships. The following discussion will examine the differences between women who quit smoking during pregnancy and those who continue to smoke for these predictor variables and other variables which have been identified in previous research. Results will be useful in the planning of more effective smoking cessation programs for low income women in the State of Ohio.

Demographic Characteristics

The typical participant in this study is a white woman ranging in age between 18 and 26 years, having completed eleven years of school and having a mean monthly income of 639.84 dollars. The woman entered into prenatal care early in her second trimester of pregnancy (mean weeks gestation = 15.18). At the intake visit her smoking history revealed that she smoked an average of 10 cigarettes daily and had
been a smoker for approximately seven years. The woman attempted to quit smoking on her own at least once during the past year. This composite picture is similar in demographic characteristics for women smokers in a study conducted in Alabama public health maternity clinics during 1984 (Windsor et al., 1985). An Ohio Profile of Tobacco Use revealed the same demographic characteristics for women in the state who reported smoking during pregnancy on birth certificates during 1990 (Sherwood et al., 1994).

Past research has examined smoking prevalence during pregnancy and its relationship to race, age, education, income, marital status, smoking history characteristics and smoking social networks. These characteristics were examined in this study to determine their significance as factors affecting smoking cessation for this population. Analysis included Pearson product moment correlations to determine relationships between variables. Logistic regression analysis was conducted to examine the relative importance of these variables in predicting smoking cessation. The analysis of each of these variables will be discussed independently.

Race was not examined in this study as a potential predictor of smoking status due to the majority of the sample population being white (89.8%). Only 7.6 percent of the population were black, and another 2.5 percent reported other race. It was not reasonable to make comparisons between groups due to the small number of participants that were black or other. Prevalence studies completed in 1990 revealed a smoking prevalence of 10 percent among black women in the 18 to 24 year old category. Smoking prevalence rates for blacks were not higher than for whites until a
woman reached the 35-44 year old category (Floyd, 1993). The large majority of this study's participants ranged in age between 18 and 26 which also may have contributed to the low numbers of blacks being participants.

The point biserial coefficient value reported for age ($r = -0.18$, $p < .003$ Table 14) indicates a significant low relationship with quitting. This value reveals that as age increases the likelihood of a woman quitting smoking during pregnancy decreases. The logistic regression analysis for the full model further substantiated age as a significant factor in predicting quit status. The full model analysis examined all of the variables in the study including age, education, annual income, daily number of cigarettes smoked prior to quitting, years spent smoking, whether the woman lives with a smoker, whether the woman was part of a couple and the processes of change (stimulus control, counterconditioning, reinforcement management, helping relationships). The analysis revealed that age was significant in predicting quit status ($B = -0.15$, $p = .01$, Table 21).

These findings are contrary to what is reported in the literature. National and State data indicate that smoking prevalence decreases as age increases (Floyd et al., 1993, Sherwood et al., 1994). The Ohio Profile does acknowledge that prevalence for age held true for women over 18 years of age, but only 26 percent of women under 18 years smoked during pregnancy compared to 33.4 percent of the ages 18 and 19 and 31.5 percent of mothers 20 to 24 years old. Another finding reported in the Ohio Profile which supports the reversal in risk of smoking for age is that among women ranging in age from 20 to 29 with less than a high school education, a greater
proportion smoked than among those under 20 and over 30.

Findings of this study probably reflect the fact that the study participants represented a predominantly young population, with the average age of the group being 22 years. Studies which evaluate age as a factor in smoking cessation have a wider range of ages represented (Sherwood, et al., 1994; Floyd, et al., 1993; Windsor, et al., 1985). Even though age was statistically significant, the correlation coefficient value of -0.18 represents a relatively low relationship (Brown, et al., 1975). Also, age was positively correlated with the number of years spent smoking in this study (r = 0.64, p < 0.01, Table 13). This relationship suggests that as the woman's age increases, the number of years spent smoking also increases, which together reportedly decreases the likelihood of a woman quitting smoking during pregnancy (Wilcox, et al., 1985).

Years of education completed was significantly related to smoking status as evidenced by the point biserial correlation coefficient for this variable. The coefficient value of 0.22 at p < 0.001 is reported in Table 14. This value indicates that as the level of education increases, the likelihood of quitting smoking increases. This finding has been repeatedly substantiated in the literature. The 1989 Behavioral Risk Factor Surveillance Study generated the following prevalence estimates for smoking during pregnancy: 44 percent of women with less than a high school education smoked during pregnancy, 33 percent of high school graduates smoked and 19 percent of those with some college education were smokers (Centers of Disease Control, 1991). Similar findings were reported for the State of Ohio for data collected between 1984 and 1990 (Sherwood, et al., 1994).
The logistic regression results of the full model which analyzed all the variables simultaneously revealed that the level of education was a significant factor in predicting quit status (\(B = .53, p < .001\), Table 21). In fact, the reported \(R\) value of .21 for education revealed that education and counterconditioning were of the same relative importance in predicting that a woman would quit smoking. Education was second in importance as a factor predicting smoking cessation. The \(\text{Exp} (B)\) statistic of 1.69 for education in the full model analysis indicates that a one unit increase in years of education increases the odds of a woman quitting smoking by a factor of 1.69, holding all other variables constant. Level of education must be taken into account when planning smoking cessation intervention programs. Findings suggest that smoking cessation programs for pregnant women with less than a high school education will produce lower quit rates than for women with education beyond the high school level.

Income was not statistically significant as a variable in predicting smoking cessation in this study (\(r = .05, p = .40\), Table 14). Results of the logistic regression analysis for the full model revealed that income was not a statistically significant or important variable for predicting a woman quitting smoking during pregnancy. Due to the study's intent to focus on low-income pregnant women in the State of Ohio, income levels did not vary substantially from the mean monthly income of 639.84 dollars reported in Table 7. Statistics from the Ohio Profile Study reveal that smoking rates decrease with increasing annual household income for the Ohio population, in general (Sherwood, et al., 1994). Income was considered a controlled variable in the
model analysis and therefore no potential impact on smoking status was expected for this variable.

Marital status in this study was defined as living in a couple relationship, (married or unmarried) or living single. Pearson chi-square analysis revealed that couple status was not a significant factor for predicting smoking cessation for this study (phi o = .007, p = .91, Table 16). The logistic regression analysis for the full model results concurred with this finding (B = .132, p = .70). The frequency distribution for this variable revealed that the sample population was nearly equivalent in being a part of a couple or living single, 53.1 percent and 46.9 percent, respectively. The literature supports that being married or living as a couple is associated with a woman being less likely to smoke during pregnancy (Fingerhut, et al., 1990; Petersen, et al., 1992). The Ohio Profile Data reveals similar findings with only 19 percent of married women smoking during pregnancy while 39.5 percent of single women reporting having smoked (Sherwood, et al., 1994).

The lack of significance for couple status in this study is probably related to the fact that more than half of the women (54.2%) were under 22 years of age. Also, the association of being part of a couple with that of living with a smoker is of low magnitude but significant (r = .20, p < .01, Table 13). These findings are relative to the sample only and should not be generalized beyond this study.
Smoking History Characteristics

Data collected to analyze smoking history characteristics included daily number of cigarettes smoked at the intake visit, the number of years the participant had smoked and whether the woman lives with a smoker. The daily number of cigarettes smoked reported at the intake visit was significantly correlated to a woman quitting smoking (r = -.39, p < .001, Table 14). Logistic regression analysis further substantiated this finding (B = -.17, p < .001, Table 21). This variable was highest in relative importance of all the variables in the model in predicting the likelihood of a woman quitting smoking (R = -.30, Table 21). The Exp (B) statistic indicates that a one unit increase in daily number of cigarettes smoked decreases the odds of a woman quitting smoking by a factor of .84, holding all other variables constant.

It appears that as the number of daily cigarettes smoked at the beginning of pregnancy increases in number, the likelihood that a woman would quit smoking decreases. Results further corroborate what has been repeatedly emphasized in the literature. Garvey et al., (1989) reports that people who smoke less than a pack a day are most likely to be successful quitters through self-help strategies. An analysis of predictors of smoking cessation in patients at public health clinics in Birmingham, Alabama notes that smoking fewer cigarettes per day is significantly related to quitting (Buis, Perkins and Windsor, In Press). Reports on relapse reveal that women who were heavy smokers prior to pregnancy were more likely to relapse (Fingerhut, et al., 1990, McBride and Pirie, 1990).
The number of years spent smoking prior to pregnancy was analyzed as a contributing factor to smoking cessation. The point biserial correlation coefficient value of -.26 appearing in Table 14 was significant at $p < .001$. The logistic regression analysis did not support this factor as significant in determining the likelihood of quitting smoking during pregnancy. Therefore, in this study, years spent smoking was less important as a factor in predicting that a woman would quit smoking when all other variables were considered simultaneously. In looking at the association between years as a smoker to other variables in the study, correlation values revealed that a moderate relationship exists between years spent smoking and age ($r = .64, p < .01$, Table 13).

The literature supports years spent smoking as a significant factor in predicting smoking cessation for this population. One study indicated that an early onset age of smoking was characteristic of an addiction of cigarettes (Cnattingius, 1989). Other studies have reported years spent smoking significant in relation to other factors such as daily cigarettes smoked at the onset of pregnancy and previous number of quit attempt (McBride and Pirie, 1990; Buis, Perkins and Windsor, In Press). The possibility that daily number of cigarettes smoked prior to pregnancy was of highest relative importance in predicting smoking cessation may have overshadowed the importance of this variable in this study.

Social relationships with other smokers is supported in the literature as a significant factor affecting smoking cessation. Pearson chi-square analysis reveals that living with a smoker is not significantly related to quitting smoking during pregnancy.
in this study (\( \phi = .02, p = .68 \) Table 15). This variable also was not significant in the logistic regression analysis of the full model (\( B = -.30, p = .41 \), Table 21). The 2 X 2 table results reveal that while 70.2 percent of the study sample reported living with a smoker, women who lived with a smoker and quit was twice that of those who lived in a nonsmoking environment and quit (Table 15).

Past research has identified that living with another smoker is a significant risk factor for continued smoking during pregnancy (Cnattingius, 1989). More importantly however, living with a smoker appears to have a powerful negative impact on maintaining smoking cessation postpartum (McBride, and Pirie, 1990). For smoking intervention programs to be considered successful, long term smoking cessation becomes important. While other factors may be more important predictors of a woman quitting smoking during pregnancy, the effects of living with a smoker may be of greater importance in preventing relapse and planning for long term maintenance in postpartum.

**Processes of Change**

The processes of change were examined to test the statistical hypothesis of this study:

"The processes of change factors (counterconditioning, stimulus control, reinforcement management and helping relationships) will not predict the likelihood that pregnant women will stop smoking during pregnancy".
Processes of change were focused upon to determine their relative importance as predictors of smoking cessation during pregnancy. These processes of change are emphasized as self-change processes during action and maintenance stages of behavior change (Prochaska and DiClemente, 1983). These particular processes of change were focused upon in this study to identify which of the processes were utilized most frequently by pregnant women to help them stop smoking and maintain nonsmoking behavior through the postpartum visit.

Logistic regression analysis was employed to determine which process of change variables were significant in predicting the likelihood of women quitting smoking during pregnancy while controlling for demographic and smoking history variables. Results of the full model analysis in Table 21 revealed that only one process of change variable, that of counterconditioning was statistically significant (B = .92, p < .001). The R value of .21 indicates the partial correlation between quit status and the process of counterconditioning and reveals the relative importance of counterconditioning in predicting smoking cessation for pregnant women. Counterconditioning was of equal importance in the model to that of education (R = .21, Table 21).

Logistic regression analysis revealed that the full model was statistically significant (Model Chi Square = 30.621, p < .001) and that the full model classified 87 percent of the smokers correctly and 58 percent of the quitters correctly for an overall hit rate of 77 percent. The classification rate for the full model is an twelve percent improvement over the baseline prediction of 65 percent correct classifications if all cases are predicted to not quit smoking.
The literature supports the importance of counterconditioning as a process of change important in behavioral change for smoking cessation. However, past studies have also identified other processes of change as important in behavioral change that were not significant in this study. A comparison of results is in order for interpretation of these results. Prochaska and DiClemente have conducted research on the use of processes of change during various stages of behavioral change. A study which examined use of processes of change by self-changers revealed that processes of change that were behavioral in nature were used during the action stage of change. The study results implicated the equal use of both counterconditioning and stimulus control processes for smoking cessation by self-changers (Prochaska and DiClemente, 1983). These authors further noted that counterconditioning and stimulus control processes appeared to bridge the action and maintenance stages of change.

Results of the correlation matrix for variables included in this research revealed a significant moderate relationship between counterconditioning and stimulus control processes ($r = .63$, $p < .01$, Table 13). Counterconditioning processes are typically represented by the statement: "I do something else instead of smoking when I need to relax" (Item 4, Form III, Appendix D). A stimulus control process is typically represented by the statement "I remove things from my home that remind me of smoking" (Item 14, Form III, Appendix D). It is possible that when women self-judged the use of these processes during their eighth month of pregnancy as recent experiences, that statements pertaining to the process of counterconditioning were emphasized more frequently than stimulus control processes. If women had quit
smoking early in pregnancy or had been a nonsmoker for a period of two months or more, they might not have utilized stimulus control processes as recently as counterconditioning processes to maintain nonsmoking behavior.

A study comparing self-changers to therapy group changers revealed that self-quitters rated stimulus control as significantly less important in quitting than did the therapy group (DiClemente and Prochaska, 1982). A further interesting finding of this study revealed that behavioral-management subjects rated counterconditioning as the most important process utilized during the action stage of change. It was noted that behavioral management techniques place much more emphasis on counterconditioning processes as effective in managing stress and anxiety. The ability to manage stress and anxiety may have been a motivating factor for study participants since these emotions are highly related to pregnancy.

Lack of evidence supporting the utilization of reinforcement management processes by pregnant women in this study is surprising. The correlation matrix reveals a significant moderate association of reinforcement management to counterconditioning, stimulus control and helping relationship processes (\( r = .57, r = .61, r = .49, p < .01 \), respectively, Table 13). A study to examine patterns of change for smoking cessation of self-changers revealed that the ten change processes followed a pattern of increasing in emphasis over the stages of change, reaching a peak at a particular stage, and then declined and leveled off in use unless it was used for relapse prevention (Prochaska, et al., 1991). The study revealed that the use of reinforcement management by self-changers peaked early during the action stage and gradually
declined during maintenance.

The frequency distribution of likert scale responses to grouped items for reinforcement management reveals that approximately 35 percent of women indicated that they never utilized reinforcement management strategies in controlling their smoking behavior (Table 12). A possible explanation of the low utilization of reinforcement management by this sample is that 47 percent of the women in this study were single and did not look outside themselves for support. Another explanation may be that this process received less emphasis during the educational sessions with the health professionals because other processes of change appeared to be working for the client.

Helping relationships were most likely not significant to this population for many of the same reasons as reinforcement management with \( r = .49, \ p < .01 \) (Table 13). The associations to other processes were low in magnitude ranging from .21 to .39. The patterns of change study completed by Prochaska, et al., (1991) reveals that utilization of helping relationship processes peak early during the contemplation stage when a caring relationship may provide the support needed to change a behavior.

In review of the frequency distribution results reported in Table 12, it is interesting to note that nearly 68 percent of the women had a summated total of less than twelve, indicating that the majority of women rated this process low. Only twelve percent of the women reported utilizing reinforcement management often to repeatedly. A notion that may have influenced the nonsignificance of helping relationships with this population was that 47 percent of the population reported single
status. Many of the women possibly did not have a significant person in their life that they could depend upon for support.

The literature reveals that the influence of supporting relationships in smoking cessation represents a paradox. Studies conducted to examine helping relationships as inherent to the stages of change for predicting smoking cessation report that smoking relationships are particularly useful during maintenance and relapse (Prochaska, et al., 1985; DiClemente and Prochaska, 1982). Other studies have found minimal effects of social relationships on quitting (Garvey, Heinhold and Rosner, 1989; Glasgow, et al., 1985). This study suggests that supporting relationships are not of relative importance in predicting smoking cessation for low-income pregnant women.

**Biochemical Validation of Results**

The study's results are based on self-report questionnaire data. State of the art minimal standards for smoking cessation intervention research requires biochemical validation of smoking status to confirm self-reported abstinence (Windsor and Orleans, 1986). Women who reported they had quit smoking at the eighth month antepartum visit supplied a urine sample for cotinine analysis. Cotinine is the most recommended biochemical measure for verifying self-report as it is highly specific and sensitive (Spierto, et al., 1994).

Cotinine analysis results confirmed that 46 percent of women who reported that they were nonsmokers at the eighth month visit had actually quit. This rate is similar
to other studies using cotinine analysis to verify self-report abstinence (Kendrick, et al., 1995).

Unfortunately, studies of smoking behavior in this population reveal that nondisclosure is very high. These results reveal that quitting rates should be interpreted with some reservation, possibly indicating that more women had significantly reduced their smoking by the eighth month of pregnancy but did not quit.

**Postpartum Data Results**

A total of 83 women were interviewed and completed a self-report questionnaire on the processes of change at a postpartum visit that was scheduled six to eight weeks following delivery (Forms IV, V, Appendix D). This sample represents thirty percent of the original data sample.

**Demographic Characteristics of the Postpartum Participants**

Demographic characteristics for the postpartum sample were similar to that of the entire study group (Table 24). A composite picture of the postpartum sample revealed 87 percent were white, 10 percent were black and 2.4 percent were other than black or white. Forty three percent of the group had not completed high school while 49 percent of the group were high school graduates and seven percent reported having some college education. The mean age for the group was 22.22 years with sixty percent of the group ranging in age between 20 and 24 years, thirteen percent being less
than 18 years, eighteen percent being 18 or 19 years and eight percent of the group being older than thirty years. Fifty two percent reported living as a couple while forty-eight percent reported being single. Similar percentages for these characteristics are reflected in the overall sample for this study.

Frequency distributions for smoking history characteristics of the postpartum sample reveal that 28.9 percent reported they were not smoking at postpartum, 31.2 percent reported smoking less than 10 cigarettes a day, 26.5 percent were smoking between 11 to 19 cigarettes per day and 13.2 percent were smoking more than 20 cigarettes per day. Nearly half of the women (49.2%) reported that they had been smoking for less than five years while 31.6 percent reported being a smoker for six to ten years and 19.2 percent had been smokers for more than ten years. A question to determine intent to stay quit beyond pregnancy revealed that 28.9 percent reported they intended on remaining a nonsmoker. Nearly half of the sample (44.6%) reported being unable to quit smoking. Of the 83 women interviewed at postpartum, 71 percent reported living with other smokers while 28.9 percent were not exposed to smoking in their home environment.

Postpartum Data Analysis

Due to the small sample number, multivariate analysis of the processes of change was not possible, therefore, a Pearson chi-square analysis was completed to compare quit rates at the eighth month visit to quit rates at the postpartum visit. The phi
coefficient for the comparison was statistically significant having a value of $\phi = .62$ at $p < .001$ (Table 26). Results reveal that ninety-two percent of the women who reported smoking at their eighth month antepartum visit were smokers at postpartum. Two-thirds of the participants who reported nonsmoking status at the eighth month visit were nonsmokers at postpartum. These results are encouraging when they are compared to other postpartum studies.

A study completed to evaluate a self-help program for its effectiveness during pregnancy revealed that women who were baseline smokers and who experienced one of two experimental programs during pregnancy had reported quit rates of 29.0 percent and 35.6 percent at eight weeks postpartum (Petersen, et al., 1992). Results of this research are displayed in Figure 2, revealing comparable percentages with 24.4 percent of the women who quit during pregnancy maintaining nonsmoking status at eight weeks postpartum. An additional 5 percent of women who were unable to quit at the eighth month visit had reported quitting by the postpartum visit. Another study reported similar maintenance rates for staying quit through postpartum and also reported that 26 percent of the group relapsed by six weeks postpartum (Mullen, Quinn and Ershoff, 1990). This study's findings reveal that 12 percent of the women who reported being quit before delivery had relapsed by the first postpartum visit.

Results of this research are encouraging when compared to what has been reported in the literature. Figure 2 illustrates a summary of smoking status for the sample from point of entry through the postpartum visit. Of the 275 women who were included in the study, 134 reported that they intended to quit smoking at the intake visit. Ninety-
Figure 2: Summary of Smoking Status at Initial Visit, Eighth Month of Pregnancy and Postpartum
nine women reported quitting at the eighth month antepartum visit. Twenty of the ninety-eight who reported quitting at the eighth month antepartum visit remained a nonsmoker throughout the postpartum visit.

The small number in the postpartum sample limited statistical analysis for comparing importance of the processes of change to postpartum women. However, mean values were calculated for each process of change based on a summated score of four questionnaire items to determine how frequently each process was being emphasized by women postpartum. Mean score values for counterconditioning, stimulus control, reinforcement management and helping relationships appear in Table 27. Results reveal that helping relationships and counterconditioning processes were being emphasized occasionally whereas reinforcement management and stimulus control processes were seldom utilized by postpartum women. These results suggest the need for interim intervention to occur sometime between the eighth month antepartum and initial postpartum visits to prevent postpartum relapse.

Summary of Discussion

Findings of this research revealed which process of change factors along with demographic and smoking history characteristics are predictors of the likelihood that a woman would quit smoking during pregnancy. The analysis further explored the extent to which any factor may have continued to be influential in maintaining nonsmoking behavior through the initial postpartum visit. This study was conducted in eight public
health prenatal clinics throughout the State of Ohio. The typical participant in this study is a white woman with a mean age of 22.22 years (SD = 4.37) who had completed eleven years of school and earned a mean monthly income of 639.34 dollars. Smoking history data revealed that the participant smoked an average of 10 cigarettes per day and had smoked for approximately seven years. Seventy percent of the women reported living with someone who smoked. Nearly half of the participants indicated that they had already quit smoking by the intake visit or intended to quit smoking during pregnancy.

Point biserial correlations reported for study variables revealed negligible to moderate associations between predictor variables and the women's smoking status. Coefficient values for age, education, daily number of cigarettes smoked prior to pregnancy and the number of years spent smoking were statistically significant. The relationship between education and smoking status was positive and moderate, revealing that as the number of years of education increased, the likelihood of a woman quitting smoking increased. Age, daily number of cigarettes smoked and years spent smoking demonstrated negative low to moderate associations with smoking status. Daily number of cigarettes smoked was moderately associated with quit status, while low associations were reported for age and years spent smoking. These relationships may be interpreted as follows: as age, years spent smoking and daily number of cigarettes decreased in number, the likelihood of a woman quitting smoking during pregnancy increased. Therefore, older women who smoked more years and a greater number of cigarettes were less likely to quit.
Logistic regression analysis was used to determine which process of change factors were significant in predicting the likelihood of a woman quitting smoking during pregnancy, controlling for demographic and smoking history characteristics. The only process of change factor which was statistically significant was counterconditioning, while controlling all other factors in the model. Statistical analysis of the full model revealed that the daily number of cigarettes smoked, education and age of the participant were statistically significant. In fact, daily number of cigarettes smoked was rated highest in terms of relative importance to a woman quitting smoking followed by education and counterconditioning which were considered equally important and lastly, age which was of slight importance. Therefore, as the age of the woman and the number of daily cigarettes smoked prior to quitting increases, the odds of a woman quitting smoking during pregnancy decreases. Also, as the educational level of the woman increases, the odds of her quitting smoking increases.

A small number of participants (n=83) were followed through their initial postpartum visit to determine which processes of change were being utilized by women to maintain nonsmoking behavior postpartum. Due to the small number of participants, multivariate analysis was not feasible to analyze the data, however a Pearson chi square analysis was completed to examine quit rates reported at the eighth month visit to nonsmoking status reported postpartum. Results revealed a statistically significant relationship between smoking status at the eighth month antepartum visit and smoking status postpartum. Twenty-nine percent of the postpartum participants
reported maintaining nonsmoker status through the initial postpartum visit. Only 12 percent of the women who reported being quit at the eighth month visit had relapsed to smoking at the postpartum visit.

An exploratory analysis of mean score values calculated for the processes of change being utilized through the postpartum visit revealed that helping relationships and counterconditioning processes were being emphasized occasionally, while reinforcement management and stimulus control were seldom utilized by postpartum women. Further analysis is warranted to determine what factors continue to be important to postpartum women in maintaining nonsmoking behavior and preventing relapse.
CHAPTER VI
STUDY SUMMARY, CONCLUSIONS, IMPLICATIONS
AND RECOMMENDATIONS

Summary

This ex post facto, static group comparison study was conducted to examine predictor variables of smoking cessation for low-income women who smoke during pregnancy. Four processes of change factors: counterconditioning, stimulus control, reinforcement management and helping relationships were evaluated as contributing factors for a woman to quit smoking by the eighth antepartum visit. Other demographic and smoking history variables were also analyzed for their significance in smoking cessation. The development of effective smoking cessation programs for low-income pregnant women depends upon the identification of influential factors which contribute to nonsmoking behavior during pregnancy and the prevention of relapse prevention.

Interview and questionnaire data were collected from 275 pregnant smokers who completed their eighth month antepartum visit between February and December, 1994 at one of eight public health clinic sites throughout Ohio. The typical participant for
this sample was a white woman, ranging in age between 18 and 26 years, having completed eleven years of education and having a mean monthly income of 639.84 dollars. The woman entered into prenatal care early during the second trimester at about 15 weeks gestation. Smoking history characteristics revealed that the typical woman in this sample smoked an average of 10 cigarettes daily, had smoked for about seven years, and had tried to quit at least once during the past year.

Study participants were those women who reported being a smoker at their initial prenatal visit and provided written consent to be in the study. Written consent was a requirement by the two Human Subjects Review Committees who approved this research. These committees were The Ohio State University Biomedical Sciences Review Committee and the Ohio Department of Health Human Subjects Review Board.

All women smokers were enrolled in the smoking cessation intervention program which consisted of individualized education and counseling sessions provided at each antepartum visit throughout the eighth month of pregnancy. These participants received Windsor's self-help guide entitled: "A Pregnant Woman's Guide to Quit Smoking". The intervention program emphasized the use of the utilization of counterconditioning, stimulus control, reinforcement management and helping relationships as helpful strategies in quitting smoking and preventing relapse.

Interview and questionnaire data collected at the eighth month antepartum visit were analyzed to determine changes in smoking status and smoking characteristics of the woman since her initial visit. Data included responses to a likert scale instrument
designed to determine which processes of change were utilized most frequently by women to stop smoking during pregnancy. Biochemical validation of self-report data was completed via urine cotinine analysis for all women who reported nonsmoking status at their eighth month visit. Biochemical validation is indicated for this population because high nondisclosure of smoking status has been reported in instances where patients perceive smoking as undesirable.

A follow-up postpartum interview was held for all study participants who completed their postpartum visit by January, 1995. The postpartum visit was scheduled six to eight weeks following delivery. A total of 83 women were interviewed at postpartum by appointment or by telephone when they did not schedule an appointment. The follow-up interview was a repeat session of the eighth month visit, collecting data regarding change in smoking status, smoking characteristics and those process of change factors which continued to be emphasized by the woman postpartum. A urine sample for cotinine analysis was collected whenever possible.

Data were analyzed by calculating Point biserial correlation coefficients to examine the nature and strength of relationships between variables. Logistic regression analysis was conducted to determine the degree to which the four processes of change (counterconditioning, stimulus control, reinforcement management and helping relationships) best predicted whether a woman quit or continued smoking during pregnancy. This analysis also examined the effects of demographic and smoking history variables on nonsmoking behavior.
Results of this study pertinent to the hypothesis and research questions indicated the following. The only process of change that was statistically significant in predicting the likelihood that a woman would quit smoking during pregnancy was counterconditioning. The process of counterconditioning involves changing the way one responds to smoking cues by making adaptations in one's environment. For example, when the urge to smoke arises, one should alter the thought processes by taking a walk or reading a book. Counterconditioning was ranked third in relative importance as a factor which influenced whether a woman quit smoking during pregnancy.

Logistic regression analysis for the full model which controlled for demographic and smoking history variables revealed that three additional variables were influential in determining smoking cessation during pregnancy. These variables were the daily number of cigarettes smoked prior to quitting, number of years of education the woman had completed and the age of the woman. All these variables remained statistically significant in the full model analysis.

The R value, which is the measure of the partial correlation between the dependent variable and independent variable revealed the relative importance of the daily number of cigarettes smoked, years of education completed and age in predicting that a woman would quit smoking during pregnancy. Daily number of cigarettes smoked was ranked highest with a R value = -.3019. This value indicates that as the number of daily cigarettes smoked by the woman prior to quitting increased, the odds of her quitting smoking during pregnancy decreased. Education ranked next with a R...
value of .2069. The interpretation of this value reveals that as the number of years of education increases, the odds of a woman quitting smoking during pregnancy increases. Education and counterconditioning processes were nearly equal in relative importance with an R value of .2057 being reported for counterconditioning. Finally the R value of -.1239 for age indicates that as age increased in years, the odds of a woman quitting smoking during pregnancy decreased.

These same demographic and smoking history variables have been repeatedly identified in past research as predictors of smoking cessation during pregnancy. Additional findings of this study reveal that counterconditioning processes are important as factors which actively contribute toward smoking cessation when a woman is in the action stage of change. Research completed by Prochaska and DiClemente (1983) has emphasized that all four processes of change (counterconditioning, stimulus control, reinforcement management and helping relationships) are emphasized by self-quitters during the action stage. Results of this study revealed that only counterconditioning activities were emphasized by pregnant smokers who attend public health clinics in Ohio.

Analysis of overall program effectiveness in contributing to smoking cessation during pregnancy revealed that 36 percent of the study participants reported quitting smoking at the eighth month visit. Biochemical validation of self-reported quit rates revealed a cotinine validated quit rate of 13.4 percent. This rate is consistent with previous research completed with this population. Verification of self-report is of importance when participants are in situations where smoking is considered
undesirable.

An exploratory analysis of questionnaire data collected from 83 women at their initial postpartum visit revealed that participants failed to continue emphasizing any process of change factors examined in this study. Mean scores for each of the four processes of change scores were evaluated. Results indicated that counterconditioning and helping relationship processes were being utilized occasionally in maintaining nonsmoking behavior postpartum. The processes of stimulus control and reinforcement management were reported as seldom utilized.

Chi square analysis of quit rates at the postpartum visit revealed that the number of women who reported remaining a nonsmoker through their postpartum visit was statistically significant. Figures revealed that 24 percent of the women who had reported quitting smoking during pregnancy remained a nonsmoker through the initial postpartum visit. An additional five percent of the women who were smoking occasionally at the end of pregnancy reported they had quit by the postpartum visit. Quit rates are similar to what has been reported previously. Results seem to indicate that intervention must continue throughout the interim period between delivery and the initial postpartum visit for effective maintenance of nonsmoking behavior beyond pregnancy.

Conclusions

This investigation examined the usefulness of various processes of change factors in determining smoking cessation for low-income pregnant women receiving their
prenatal care in public health clinics throughout Ohio. Results revealed that counterconditioning processes were significant in helping a woman take action and stop smoking during pregnancy. Other subject characteristics included daily number of cigarettes smoked prior to pregnancy, years of education completed and the participants' age as also influential in modifying one's smoking behavior.

Results appear to indicate that a multidimensional intervention program which emphasizes a self-help approach and additionally provides one-on-one education and counseling throughout pregnancy, is effective in producing higher self-reported quit rates for pregnant smokers who attend public health clinics for their care. An intervention program which emphasizes action-oriented processes of change while being sensitive to the stages of change for an individual, produces promising results in affecting smoking cessation during pregnancy.

Current smoking cessation research has focused on the stage of change theory for increasing effectiveness of interventions (DiClemente et al., 1991; Orleans et al., 1991). This study supports the concept of designing programs on the basis of processes of change and stages of change patterns. Even though only one process of change was emphasized by this population, results suggest that educating the women about action-oriented strategies to help them quit smoking appears to be an effective approach to achieving higher quit rates.

Along with identifying action-oriented processes which are influential in improving quit rates for women who smoke during pregnancy, this study's results provided additional support of other demographic and smoking history characteristics
as equally important factors in smoking cessation. The daily number of cigarettes smoked prior to quitting influences a woman's ability to quit smoking. This factor has been identified as a significant factor in numerous studies examining predictor variables in smoking cessation and relapse (Wilcox, et al., 1985; Quinn, Mullen and Ershoff, 1991; Buis, Perkins and Windsor, In Press). It appears that this research supports the notion that the smoker who is most likely to quit smoking during pregnancy or recover from a relapse and try to quit again, are those that are lighter smokers.

The educational status of the woman has repeatedly been identified as a significant factor in smoking cessation and this study fully corroborates that as the years of education increases, the likelihood of a woman quitting smoking increases. Findings of this study revealed that mothers with less than a high school education continued to smoke during pregnancy more than mothers of higher education levels. These same results have been verified for the general population of pregnant women in the state of Ohio and in other states which have conducted similar studies (Sherwood, et al., 1994; Kendrick, et al., 1995). The educational level of the smoker is of great importance when planning interventions for smoking cessation. Awareness of a woman's level of knowledge and her beliefs about smoking during pregnancy can be helpful in choosing educational materials which are appropriate for individualized instruction.

Results of this study indicated that age was inversely related to a woman quitting smoking during pregnancy. The literature supports the reversal of this finding
indicating that older women tend to be more inclined to quit smoking than younger women. The Ohio Profile on Tobacco Use provides supporting evidence for the findings of this study. Birth certificate data from 1990 revealed that women who were younger than 18 years tended to smoke less than mothers who were 18 to 24 years old. Smoking rates for mothers over 24 years of age again decreased as age increased (Sherwood et al., 1994). This unanticipated reversal in the risk of smoking by age is important for planning smoking cessation programs. The changing of a smoking habit can be dependent upon the age of the smoker and programs must focus on contributing factors which may influence the smoking behavior of a particular age group. This study's population consisted of the majority of women ranging between 18 and 26 years of age. Educational strategies which proved most useful in quitting were action oriented activities.

The smoking history characteristics which have been identified in other studies as predictors of smoking cessation but did not appear influential toward improving quit rates in this study were the number of years spent smoking and whether a woman lived with other smokers. Past research has found that the longer a person has been a smoker, the less likely they were able to take action and modify their habit (Wilcox et al., 1985). In this study women smoked an average of seven years prior to pregnancy and tended to be lighter smokers overall, smoking an average of 10 cigarettes or less per day. A random comparison of smoking status at the end of pregnancy for women who reported being lighter smokers (<10 cigarettes per day at intake) to those who reported smoking for more years and more than 20 cigarettes per day, appeared to
indicate that the heavier smokers were women who did not quit smoking and had reported that they did not intend to quit. A study which examined the strength of the smoking habit to postprogram quitting suggested that heavier smokers may require more intense intervention to stop smoking (Aaronson, Ershoff and Danaher, 1985). The intervention provided in this research was of moderate intensity, providing the woman with a self-help guide and educating her about some aspect of smoking behavior at each antepartum visit. Study results appear to suggest that a program of moderate intensity which offers individualized education and counseling in public health clinics can produce significant quit rates for younger women who are lighter smokers.

Living with other smokers did not appear to interfere with the woman's ability to quit smoking in this study. Seventy percent of the women reported living with another smoker and only eleven percent of the women reported not being exposed to the smoking of others in their daily environment. Cohen, et al., (1988) found that daily exposure to other smokers provides smoking cues that trigger biologic and cognitive responses making it more difficult to control smoking urges. Perhaps results of this study are related more to the women being lighter smokers who have a weaker addiction to cigarettes and therefore, living with another smoker did not affect their ability to quit.

Women in this study did not look to others for support in quitting smoking. The majority of women indicated they had quit smoking on their own without the support of others. Inconsistent findings are reported in the literature on the usefulness of social
support in smoking cessation. Research by Lichenstein, et al., (1986) failed to find an increase in quit rates when co-workers or significant others were trained in giving support. Results of this study suggest that supporting relationships were seldom utilized by women for help in quitting smoking.

The self-reported quit rate of 36 percent for this study reflects a higher quit rate than what has been reported for women attending public health prenatal clinics in other states (Windsor, et al., 1985; Kendrick, et al., 1995). Also, self-reported quit rates at the pospartum visit for a sample of 83 women revealed that 24 percent of the women continued to stay quit through the initial postpartum visit. These results are encouraging for the behavioral impact of this smoking cessation program. However, the cotinine validated quit rate revealed an overall quit rate of 13.4 percent for women who received smoking cessation intervention. These results are comparable to a reported validated quit rate of 14.3 percent for women who received smoking cessation intervention at public health clinics in Colorado, Maryland and Missouri (Kendrick, et al., 1995). Results of this research seem to indicate that it is difficult to achieve higher quit rates for smoking cessation even when a multidimensional program is implemented. These results confirm the need to provide individualized education and counseling which focuses on processes of change that are emphasized during various stages of change. Knowing more about what factors motivate pregnant women to stop smoking may improve quit rates for this population in the future.

Postpartum self-reported quit rates for this study appear to indicate that a significant number of women will stay quit after having experienced a smoking
cessation program of moderate intensity during pregnancy. Results of this study were encouraging with twenty four percent of the women reporting that they remained a nonsmoker through their first postpartum visit. Women in this study reported that they utilized the processes of change less frequently in postpartum. Perhaps these findings suggest that some form of intervention is needed to prevent relapse in postpartum.

Research Implications for Health Education

Smoking is probably the single most important preventable risk factor for improving pregnancy outcomes, yet pregnant women continue to smoke. A multitude of factors have been identified as predictors of smoking cessation but no intervention to date has been successful in producing higher quit rates. The findings from this study provide insight for health educators into which processes of change are utilized by low-income pregnant women in quitting smoking.

More recent research conducted in smoking cessation focuses on the development of interventions which are responsive to the stages of behavioral change. Once the smoker has decided to quit, they enter into the action stage mode of behavioral change and intervention strategies must focus on emphasizing action-oriented processes of varying intensity and duration to help the smoker quit. Results of this study reinforce the importance of using the Stages of Change Model to develop intervention programs.
One finding which remains consistently true for all prenatal smoking programs, is that the greater majority of women continue to smoke during pregnancy even after they learn about the increased risks of adverse consequences for themselves and the developing fetus. Evidence suggests that other factors such as stress, depression and an addiction to nicotine far outweigh the consequences and the woman continues to smoke as a coping mechanism (Floyd, et al., 1993). Success in planning a program is dependent upon the health professional recognizing confounding factors and providing individualized intervention for these problems before smoking cessation can be addressed. In some cases when other risk behaviors must take precedence, the health professional needs to weigh the benefits of reducing smoking over achieving smoking cessation.

Educational efforts must go beyond providing facts and demonstrating adverse effects and focus on health related beliefs and motivations. Programs which have looked at the processes of change as they relate to stages of change appear to produce the most successful results (Prochaska, et al., 1991). The first step in such a program involves identifying the smoker's intent to quit and their level of self-efficacy. Precontemplators tend to lack self-efficacy about their ability to quit, whereas contemplators are experiencing self-reevaluation and are more easily motivated to take action. Research by Prochaska and DiClemente (1983) suggests that affective and cognitive processes are used more often by precontemplators and contemplators, whereas behavioral processes are emphasized during the later stages of change. The health professional must be able to judge the stage of change for a particular smoker.
and emphasize those processes which will help the smoker progress to the next stage of change. Once the woman quits smoking, other action-oriented processes must be introduced to help the smoker maintain nonsmoking status.

Findings of this research suggest that counterconditioning activities are most useful during the action stage for prenatal women who are younger and of low socioeconomic status. Counterconditioning refers to cognitive or behavioral substitution for smoking. The woman responds to a cue to smoke by doing something else or thinking other thoughts. According to Prochaska and DiClemente (1983) use of counterconditioning processes occurs during action and maintenance stages of change. Their research supports the use of counterconditioning and also stimulus control processes for coping with temptations to smoke and the reliance on helping relationships to help in maintenance of nonsmoking behavior. The findings of this study reveal that women seldom utilized stimulus control and helping relationship processes in quitting smoking. Perhaps these results suggest that processes of change will vary in emphasis for sub-groups of smokers and success of the intervention will depend upon recognizing which processes are utilized most in a given population.

It is important to note that this intervention program targeted all women who presented for care at eight public health clinics. All women including those who were considered Precontemplators and Contemplators were provided the same intervention program and received one-on-one counseling to quit at each antepartum visit. Nearly half of the women reported that they had either quit or intended to quit smoking at their initial prenatal appointment. This multidimensional intervention which utilized a
self-help guide and one-on-one counseling sessions to stress action-oriented processes of change was successful in producing slightly higher validated quit rates for this population group when compared to other studies (Mayer, et al., 1990; Petersen, et al., 1992; Windsor, et al., 1985). These results provide encouraging evidence that an intervention program of moderate intensity can be effective when health education and counseling are provided continually as part of routine prenatal care.

The analysis of postpartum quit rates in this study provides additional evidence that continuous education and counseling are needed to prevent relapse in postpartum. Twenty-eight percent of the women who reported quitting at their eighth month antepartum visit indicated that they were still nonsmokers at their first antepartum visit. This intervention did not however, provide interim counseling between delivery and the postpartum visit. The implication of these results to health professionals should be enlightening. If nearly one third of women can remain nonsmokers while receiving little or no reinforcement or support, a program which is implemented to provide ongoing reinforcement after delivery may succeed in achieving higher nonsmoking maintenance rates. It is well documented that a large percentage of women who attend public health clinics do not return for their postpartum care. Therefore, it is important for the health professional to find a way of providing continuous reinforcement and support for women who indicate they wish to remain nonsmokers after pregnancy.
Recommendations for Future Research

The conclusions and implications of this study indicate that further research is needed to ensure and expand the success of smoking interventions. To produce meaningful results beyond what has been extensively reported in the literature to date, researchers must test models of behavioral change and examine how processes of change influence behavior. The Stages of Change Model is currently being focused upon to match educational approaches to stages of readiness to quit. The vast amount of educational materials are designed for smokers who are in the action stage of quitting. Future research needs to concentrate on the development of materials for the various stages of change while focusing on motivational strategies to advance smokers from one stage to the next. Materials should be designed so smokers can recycle through the stages in times of relapse. In addition, more emphasis should be placed on processes which are important to the smoker during maintenance. Much research has been conducted on the development of interventions aimed at quitting but more studies need to examine strategies that are effective in maintenance.

Educational materials and interventions need to be tested with different populations of smokers. The results of this research revealed that some processes of change were emphasized more frequently than others by younger women who were of lower socioeconomic status than has been reported for smokers in general (Prochaska and DiClemente, 1983). It is well known that motivational cues are different for sub-populations for a variety of reasons. Women smokers who are young and minimally addicted to nicotine will require less intensive intervention than women who have
been smoking for years. The results of this intervention, which was of moderate intensity, revealed that heavier smokers were minimally affected by the program. Nicotine gum and transdermal patches are currently being tested for smokers who report being addicted.

Smokers in general are difficult to follow-up over extended periods of time and smoking cessation research is lacking overall in longitudinal studies. Even though pregnancy is of short duration, postpartum follow-up is difficult because so few women return for routine care after delivery. More research is needed to examine what processes of change are emphasized after relapse by the smoker and what intervention strategies are most effective during relapse recovery and maintenance.

Because smoking cessation is so difficult to achieve for the majority of women during pregnancy, more research is needed to determine the clinical implications of significantly reduced rates of smoking during pregnancy. Research has repeatedly shown that women who are multigravida and have not experienced adverse health conditions are less likely to change their beliefs about smoking during pregnancy. With the advances which have been made in testing nicotine concentrations, future research needs to examine smoking intensity in relation to birth outcomes.

Biochemical validation of self-report must continue as a standard practice in future research. Biochemical analysis is not only useful in verifying smoking cessation but more importantly can be used to evaluate significant reduction rates. Currently, the best biochemical laboratory procedures are relatively expensive and therefore used to a limited extent for research purposes. A simple and effective procedure for testing
nicotine concentrations in the body would be advantageous. Nicotine testing procedures which can be analyzed quickly have the potential of being utilized during intervention for strengthening impact and influencing results.

Results of this research indicate that a significant percentage of women (24%) who reported quitting smoking during pregnancy remained nonsmokers through the initial postpartum visit. These findings point toward the importance of examining factors which are influential in maintenance of nonsmoking behavior postpartum. A study which examined contributing factors of maintenance for women receiving care through a managed care organization revealed that maintenance was not related to sociodemographic or smoking history characteristics or the prenatal smoking intervention (Ershoff, Mullen and Quinn, 1989).

Finally, from a public health perspective, broad based smoking prevention initiatives must continue to focus on populations at risk. Results of this study revealed that smoking during pregnancy continues to be a major risk factor for younger pregnant women, especially teenagers. Research must be done to determine the impact of mass media anti-smoking campaigns on younger age groups. More intensive prevention efforts directed at adolescents could result in fewer teen smokers and a decline in smoking prevalence for the general population.

In addition, more prospective research is needed to compare motivational and psychosocial processes which are being emphasized during the first few months of nonsmoking maintenance for postpartum women.
APPENDICES

A. Alphabetical Listing of Participant Perinatal Clinic Sites for this Study
B. Letter of Approval by The Ohio Department of Health Perinatal Consultation & Licensure Program
C. Human Subjects Approvals by The Ohio State University Biomedical Sciences Review Committee and the Ohio Department of Health Human Subjects Review Board
D. Study Survey Instruments
E. Written Permission to Use Survey Instruments
F. Listing of Panel of Experts by Name and Business Address
G. Training Manual for Health Professionals Providing Educational Counseling for Smoking Cessation During Pregnancy
H. Health Provider Checklist for Educating Clients About Smoking Cessation
I. Participant Consent Form
APPENDIX A: Alphabetical Listing of Participant Perinatal Clinic Sites for this Study.
Listing of Clinic Sites

1. City of Toledo, Board of Health
   635 N. Erie Street
   Toledo, Ohio 43624

2. Community Action Agency of Columbiana County
   East Liverpool Community Health Center
   1563 Pennsylvania Avenue
   East Liverpool, Ohio 43920

3. Community Action Committee of Pike County
   Family Health Center
   227 Valley View Drive
   Waverly, Ohio 45690-9135

4. Elyria City Health Department
   202 Chestnut Street
   Elyria, Ohio 44035

5. Lawrence County Health Department
   2122 S. Eighth Street
   Ironton, Ohio 45638

6. Mercy Hospital of Tiffin
   485 W. Market Street
   Tiffin, Ohio 44883

7. MetroHealth Medical Center
   Maternity & Infant Health Care
   3104 W. 25th Street
   Cleveland, Ohio 44109

8. Ohio Valley Hospital
   1 Ross Park
   Steubenville, Ohio 43952
Appendix B: Letter of Approval by The Ohio Department of Health Perinatal Consultation & Licensure Program.
January 10, 1994

Donna Solovan
The Ohio Department of Health
Bureau of Maternal and Child Health
246 N. High Street
Columbus, Ohio 43266

Dear Ms. Solovan:

This letter is written to inform you that approval has been granted for you to conduct your study entitled "Attributes of Successful Smoking Interventions for Pregnant Women Attending Public Health Clinics in the State of Ohio." As we have discussed, you have permission to conduct your study at the eight designated sites which currently receive grants from The Ohio Department of Health to provide smoking cessation intervention programs for pregnant women.

Permission is granted for you to conduct this study provided that you receive approval from the Ohio Department of Health Human Subjects Review Committee. Also, we would like to receive a copy of your completed study for internal evaluation of our program.

Your research proposal has been presented to the clinic coordinators who currently administer the smoking cessation grant program at the eight designated sites and they have all consented to having you conduct your study as part of their clinical programs. All clinic personnel who will be implementing your study have agreed to attend your training session scheduled for January 25, 1994.

Wishing you much success with this research endeavor!

Truly yours,

Carol Jaeger
Carol Jaeger R.N.C., M.S.
Program Administrator
Perinatal Consultation & Licensure Program
Appendix C: Human Subjects Approval by The Ohio State University Biomedical Sciences Review Committee and The Ohio Department of Health Human Subjects Review Board.
BIOMEDICAL SCIENCES REVIEW COMMITTEE
RESEARCH INVOLVING HUMAN SUBJECTS
THE OHIO STATE UNIVERSITY

ACTION OF THE REVIEW COMMITTEE

With regard to the employment of human subjects in the proposed research:

94H0022  ATTRIBUTES OF SUCCESSFUL SMOKING INTERVENTIONS FOR PREGNANT WOMEN ATTENDING PUBLIC HEALTH CLINICS IN THE STATE OF OHIO, Philip Heit, Donna F. Soeussen, School of HPER

__ APPROVED  __ DISAPPROVED

__ APPROVED WITH STIPULATIONS  __ WAIVER OF WRITTEN CONSENT GRANTED

*Stipulations stated by the Committee have been met by the investigator and, therefore, the protocol is APPROVED.*

It is the responsibility of the principal investigator to retain a copy of each signed consent form for at least three (3) years beyond the termination of the subject's participation in the proposed activity. Should the principal investigator leave the University, signed consent forms are to be transferred to the Human Subjects Committee for the required retention period. This application has been approved for the period of one year. You are reminded that you must promptly report any problems to the Review Committee, and that no procedural changes may be made without prior review and approval. You are also reminded that the identity of the research participants must be kept confidential.

Date: January 24, 1984

Signed __________________________

HS-00231 (Rev. 2/84)
with regard to the employment of human subjects in the proposed research entitled:

Attributes of Successful Smoking Interventions for pregnant women attending Public Health clinics in the State of Ohio

CC or DOD Federall Project Number (if any): None

Principal Investigator: Donna Salovan

Agency: Ohio Department of Health

Bureau: Maternal & Child Health Division: MCH

The Institutional Review Board has taken the following action:

[ ] Approved  [ ] Expedited Review  [ ] Waiver of Written Consent

[ ] Disapproved  [x] Full Board Review  [ ] Exempt

It is the responsibility of the principal investigator to retain a copy of each signed consent form for at least three (3) years beyond the termination of the subject's participation in the proposed activity. Should the principal investigator leave the ODH, signed consent forms are to be retained by the Division Chief for the required retention period. This application has been approved for the period of one year. No procedural changes may be made without prior review and approval. You are reminded that the identity of the research participants must be kept confidential.

Date: 3/14/94  Signed: [Signature]

cc: Investigator Division Chief
    Bureau Chief

2/87
APPENDIX D: Study Survey Instruments
SECTION I: IDENTIFICATION

1) Date Survey Was Administered:

Month Day Year

2) Client's Name:

(First) (Last)

3) Social Security Number:

4) Clinic Name:

SECTION II: SMOKING INFORMATION

1) Age: Years

2) Race:

White Black Other

3) Formal Education Level (Last Grade Completed):

4) Monthly Household Income:

5) How many persons share household with her?

6) Is she part of a couple married or unmarried who live together?

Yes No

7) When is the baby due?

Date:

Month Day Year

ODH-BMCH
11/33
signature
SECTION III: CIGARETTE SMOKING INFORMATION

1) Has the client smoked any cigarettes during this pregnancy?
   - Yes
   - No

2) Has the client smoked any cigarettes, even a puff in the last 7 days?
   - Yes
   - No

3) On average, how many cigarettes does the client smoke per day?

4) In the past 12 months, how many times has the client tried to quit?

5) On an average, how many hours per day is the client around other people when they are smoking?

6) How many smokers share the client’s household?

7) Altogether, how many years has the client smoked cigarettes regularly?

8) How soon after the client wakes up does she have her first cigarette?
   - less than 30 minutes
   - 30 minutes to 1 hour
   - after more than 1 hour
   - quit smoking
Ask the client to answer the following questions; do not indicate to the client what the correct answer is.

1) Do you agree that cigarette smoking increases a woman's chances of having a smaller, sicker baby?
   - Agree
   - Disagree
   - Don't know

2) Do you agree that cigarette smoking increases a woman's chances of having a miscarriage or stillbirth?
   - Agree
   - Disagree
   - Don't know

3) Do you agree that you are more likely to have these complications if you smoke during your pregnancy?
   - Agree
   - Disagree
   - Don't know

4) Do you agree that babies whose mother or father smoke are more likely to get ear infections and colds?
   - Agree
   - Disagree
   - Don't know

5) Of the following sentences, which applies to you?
   - I would like to stop smoking, but I'm not sure if I can do it.
   - I am smoking now but I am going to quit smoking during this pregnancy.
   - I am smoking now and don't expect to quit.
   - I have already quit smoking for this pregnancy, but want some assistance to maintain myself as a non-smoker.

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smokecom.co2
FORM II
FOLLOW-UP PREGNATAL SMOKING CESSATION SURVEY

Complete during the 6th month of pregnancy

SECTION I: IDENTIFICATION
1) Date Survey Was Administered:
   Month Day Year

2) Client's Name ________________________________ (First) ________________________________ (Last)

3) Social Security Number ________________________________

4) Clinic Name ________________________________

SECTION II: SMOKING INFORMATION
1) Has the client smoked any cigarettes, even a puff, in the last 7 days? (If No, go to question 3)
   Yes ☐ No ☐

2) If Yes, on average how many cigarettes does the client smoke per day? (This average of last week)
   ☐ ☐

3) How many weeks was the client able to quit smoking? (If unable to quit smoking for more than one week, write a zero in the box)
   ☐ ☐

4) Have any of the client smoked up before she had her first cigarette?
   ☐ Less than 10 minutes
   ☐ 10 minutes to 1 hour
   ☐ More than 1 hour
   ☐ quit smoking

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SECTION III: KNOWLEDGE AND BELIEFS

Ask the client to answer the following questions and indicate to the client what the correct answer is.

1) Do you agree that cigarette smoking increases a woman's chances of having a smaller, sicker baby?
   - Agree
   - Disagree
   - Don't know

2) Do you agree that cigarette smoking increases a woman's chances of having a miscarriage or stillbirth?
   - Agree
   - Disagree
   - Don't know

3) Do you agree that you are more likely to have these complications if you smoke during your pregnancy?
   - Agree
   - Disagree
   - Don't know

4) Do you agree that babies whose mother or father smoked are more likely to get ear infections and colds?
   - Agree
   - Disagree
   - Don't know

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SECTION IV:

Ask the clients who have cut down or quit smoking the following questions. If the client has not cut down or quit smoking go to Question 2.

1) How helpful were the following in helping you to quit or cut down your smoking?

- Talking with the nurses at the health department.
  - Very helpful
  - Helpful
  - Not helpful
  - Didn't happen

- Talking with the staff in WIC.
  - Very helpful
  - Helpful
  - Not helpful
  - Didn't happen

- Reading the pamphlets you were given in the prenatal clinic.
  - Very helpful
  - Helpful
  - Not helpful
  - Didn't happen

- Having a friend or buddy to help you quit smoking.
  - Very helpful
  - Helpful
  - Not helpful
  - Didn't happen
- Rewarding yourself for not smoking.
  - Very helpful
  - Helpful
  - Not helpful
  - Didn't happen

- Reading the self-help guide given in the prenatal clinic.
  - Very helpful
  - Helpful
  - Not helpful
  - Didn't happen

- Receiving support from personal friends or family.
  - Very helpful
  - Helpful
  - Not helpful
  - Didn't happen

- Receiving "out of clinic" support contacts by clinical staff.
  - Very helpful
  - Helpful
  - Not helpful
  - Didn't happen

- Removing smoking items from my home and workplace.
  - Very helpful
  - Helpful
  - Not helpful
  - Didn't happen
2) Where did you get the most help in trying to quit or cut down on your smoking? (Check only one)

- I didn't try to quit or cut down
- Radio, TV, newspaper, or magazine
- Friends or family members
- Prenatal Clinic
- Anti-smoking program (other than prenatal clinic)
- I did it myself
- Other (specify): ________________________________

For Researchers Only

3) Would you want to try any of the following strategies to help you quit again?

- Hypnosis
- Aversive smoking techniques (i.e., make enough bad cigarettes to make you sick)
- Nicotine gum or patches
- Other: ________________________________
FORM III
EIGHTH MONTH VISIT
PROCESSES OF CHANGE QUESTIONNAIRE
This questionnaire is to be filled out by the client at the 8th month visit.

1) Date:
   Month   Day   Year

2) Client Name: ____________________________  (First)   ____________________________  (Last)

3) Social Security Number:
   ____________________________   ____________________________   ____________________________   ____________________________   ____________________________   ____________________________   ____________________________   ____________________________   ____________________________   ____________________________

The following experiences can affect the smoking behavior of some people. Think of any similar experiences that have happened or you have thought about during the past few weeks. Rate how often you had these thoughts or feelings on a 5 point scale with 5 = REPEATEDLY and 1 = NEVER.

      5
      4
      3
      2
      1

CIRCLE THE NUMBER THAT INDICATES HOW YOU FEEL ABOUT THE STATEMENT

1) Special people in my life expect me to smoke whether I smoke or not.
   1  2  3  4  5

2) Instead of smoking, I engage in some physical activity.
   1  2  3  4  5

3) I am expect to be smoked by others if I don't smoke.
   1  2  3  4  5

4) I do something else instead of smoking when I need a release.
   1  2  3  4  5

5) I keep things around my place of work that reminded me not to smoke.
   1  2  3  4  5

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11/93
smokefree.com
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<tr>
<th>Frequency</th>
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<td>16)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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</tbody>
</table>

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FORM IV
POSTPARTUM VISIT
FOLLOW-UP SMOKING CESSATION SURVEY

Complete during the postpartum visit

SECTION I: IDENTIFICATION
1) Date Survey Was Administered:
   Month Day Year

2) Client's Name
   (First) (Last)

3) Social Security Number

4) Clinic Name

5) Client not available
   Date of unsuccessful attempt Date Date

SECTION II: SMOKING INFORMATION
1) Has the client smoked any cigarettes, even a puff, in the last 7 days? (If No, go to question 3)
   Yes No

2) If Yes, on average how many cigarettes does the client smoke per day? (Take average of last week)

3) How many weeks was the client able to quit smoking? (If unable to quit smoking for more than one week, write a zero in the box)

4) How soon after the client wakes up does she have her first cigarette?
   Early Less than 30 minutes
   30 minutes to an hour
   More than an hour
   Quit smoking

11/93
smoke cessation
5) If the client quit smoking during pregnancy, does she plan to remain a non-smoker?

[ ] Yes
[ ] No
[ ] Don't know
[ ] Was not able to remain a non-smoker for this pregnancy
[ ] She was unable to quit

6) Did any of the following keep the client from quitting or cutting down on smoking during this pregnancy?

True False
[ ] [ ] I had no problem quitting or cutting down.
[ ] [ ] I was under a lot of stress and couldn't quit.
[ ] [ ] I didn't think it was important.
[ ] [ ] People I live with smoked.
[ ] [ ] People I work with smoked.
[ ] [ ] There wasn't enough help or support from my friends and family.
[ ] [ ] Smoking helps me control my weight.
[ ] [ ] When I am depressed, smoking gives me a boost.
[ ] [ ] Cigarettes calm me down.
[ ] [ ] I'm hooked on cigarettes.
[ ] [ ] Other (Specify):

7) How many anti-smoking educational sessions did this client have? (If in control group or anti-intervention group, write in 'C')

[ ] [ ]

8) How many anti-smoking one-on-one support sessions did this client have? (Include postcards, telephone calls, etc.) (If in the control group or anti-intervention group, write in 'C')

[ ] [ ]
SECTION III: KNOWLEDGE AND BELIEFS

Ask the client to answer the following questions: do not indicate to the client what the correct answer is.

1) Do you agree that cigarette smoking increases a woman's chance of having a smaller, sicker baby?
   - Agree
   - Disagree
   - Don't know

2) Do you agree that cigarette smoking increases a woman's chance of having a miscarriage or stillbirth?
   - Agree
   - Disagree
   - Don't know

3) Do you agree that you are more likely to have these complications if you smoke during your pregnancy?
   - Agree
   - Disagree
   - Don't know

4) Do you agree that babies whose mothers or fathers smoke are more likely to get ear infections and colds?
   - Agree
   - Disagree
   - Don't know

* * * * *
SECTION IV:

Ask the clients who have cut down or quit smoking the following questions. If the client has not cut down or quit smoking go to Question 2.

1) How helpful were the following in helping you to quit or cut down your smoking?

   - Talking with the nurses at the health department.
     - Very helpful
     - Helpful
     - Not helpful
     - Didn't happen

   - Talking with the staff in WIC.
     - Very helpful
     - Helpful
     - Not helpful
     - Didn't happen

   - Reading the pamphlets you were given in the prenatal clinic.
     - Very helpful
     - Helpful
     - Not helpful
     - Didn't happen

   - Having a friend or buddy to help you quit smoking.
     - Very helpful
     - Helpful
     - Not helpful
     - Didn't happen
- Rewarding yourself for not smoking.
  - Very helpful
  - Helpful
  - Not helpful
  - Didn't happen

- Reading the self-help guide given in the prenatal clinic.
  - Very helpful
  - Helpful
  - Not helpful
  - Didn't happen

- Receiving support from personal friends or family.
  - Very helpful
  - Helpful
  - Not helpful
  - Didn't happen

- Receiving "out of clinic" support contacts by clinical staff.
  - Very helpful
  - Helpful
  - Not helpful
  - Didn't happen

- Removing smoking home from my home and workplace.
  - Very helpful
  - Helpful
  - Not helpful
  - Didn't happen
2) Where did you get the most help in trying to quit or cut down on your smoking? (Check only one)

- I didn't try to quit or cut down
- Radio, TV, newspaper, or magazine
- Friends or family members
- Prenatal Clinic
- Anti-smoking program (other than prenatal clinic)
- I did it myself
- Other (spaddly): ________________________________

For Responders Only:
3) Would you want to try any of the following strategies to help you quit again?

- Hypnosis
- Aversive smoking techniques (i.e., smoke enough cigarettes to make you sick)
- Nicotine gum or patch
- Other ________________________________
FORM V
POSTPARTUM VISIT
PROCESSES OF CHANGE QUESTIONNAIRE

This questionnaire is to be filled out by the client at the postpartum visit.

1) Date:  
Month Day Year

2) Client Name:  
(First)  
(Last)

3) Social Security Number:  

The following experiences can affect the smoking behavior of some people. Think of any similar experiences that have happened or you have thought about during the past four weeks. Rate how often you had these thoughts or feelings on a 5 point scale with 5 = REPEATEDLY and 1 = NEVER.

<table>
<thead>
<tr>
<th>Experience</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</tbody>
</table>

CIRCLE THE NUMBER THAT INDICATES HOW YOU FEEL ABOUT THIS STATEMENT

1) Special people in my life except me the same whether 1 2 3 4 5
I smoke or not.

2) Instead of smoking, I engage in some physical activity. 1 2 3 4 5

3) I can expect to be rewarded by others if I don't smoke. 1 2 3 4 5

4) I do something else instead of smoking when I need to relax. 1 2 3 4 5

5) I keep things around my place of work that remind me not to smoke. 1 2 3 4 5

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emphasos: sus
<table>
<thead>
<tr>
<th>Item</th>
<th>Scale</th>
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</thead>
<tbody>
<tr>
<td>I have someone whom I can count on when I'm having problems with smoking.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Other people in my daily life try to make me feel good when I don't smoke.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I put things around my home that remind me not to smoke.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I find that doing other things with my hands is a good substitute for smoking.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I am rewarded by others if I don't smoke.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>When I am tempted to smoke, I think about something else.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I have someone who listens when I need to talk about my smoking.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I reward myself when I don't smoke.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I remove things from my home that reminded me of smoking.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I can be open with at least one special person with my smoking.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I remove things from my place of work that reminded me of smoking.</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>
Appendix E: Written Permission to Use Survey Instruments
Dear Mrs. Sullivan,

Thank you for your interest in our work at the Cancer Prevention Research Center. At this point in time, our assessment inventories are available for research purposes only, rather than for clinical use. Dr. James O. Prochaska, our Director, is pleased to extend his permission for you to use the Transtheoretical Model measure(s) checked off for research purposes.

A copy of the measure(s) you requested and some relevant journal articles are enclosed. Please don't hesitate to contact us if we can help you further.

We act as a National clearing house for Transtheoretical Model based material and would greatly appreciate a copy of your defended dissertation. If you would like a copy of Jeff Bellis or Mary Medeiros's dissertations, we can send them to you at cost of xeroxing and mailing. This may run close to $25-30 each.

Sincerely,

Susan R. Rossi, M.S., R.N.
Postdoctoral Research Fellow

Articles sent: 7, 25, 10, 5, 210, 607, 74, 18, 22, 916, 916, 72, 70, 4, 603, 713

Problem area  
1x_Smoking _adolescents  _x_Stage of Change  
2 _Weight Control  _algorithm _x_URICA  
3 _Dietary Fat  _x_Processes of Change  
4 _Alcohol  _short form _x_longform  
5 _Psychotherapy _9a client _9b therapist _9cwithin _9dbetween  
6 _Exercise  _x_Self Efficacy  
7 _Sun Exposure  _Confidence _short form _longform  
8 _Cocaine  _Temptation _short form _longform  
9 _Aids  
10 _Psychic Distress  _x_Decisional Balance  
11 _Mammography  
12 _Cervical Pap  _short form _x_longform  
13 _HIV  
14 _Delinquents  
15 _Coping  _20 _Back pain  
16 _PTSD  _21 _Drug Use  
17 _Academic performance  _22 _Being in Therapy  
18 _Head Trauma  
19 _Safer Sex

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Flagg Road, University of Rhode Island, Kingston, RI 02881-0808
Telephone: (401) 792-2830 FAX: (401) 792-5562 BITNET: KZP101@URIACC
Appendix F: List of Panel of Experts by Name and Business Address
LISTING OF PANEL OF EXPERTS

1. Jean DuScheid, R.N.
   Prenatal Smoking Cessation Program Coordinator
   The Ohio Department of Health
   Bureau of Maternal & Child Health
   246 N. High Street
   Columbus, Ohio 43266

2. Al Herzog
   Measurement and Evaluation Consultant
   The Ohio Department of Health
   Bureau of Maternal & Child Health
   246 N. High Street
   Columbus, Ohio 43266

3. Mary Plummer
   Epidemiologist
   The Ohio Department of Health
   246 N. High Street
   Columbus, Ohio 43266

4. Ronald Sherwood
   Coordinator of Ohio Tobacco Risk Reduction Program
   The Ohio Department of Health
   246 N. High Street
   Columbus, Ohio 43266
Appendix G: Training Manual for Health Professionals Providing Educational for Smoking Cessation During Pregnancy.
Protocols for Providing Smoking Cessation Education During Pregnancy

These educational protocols are to be used as guidelines for providing one-on-one educational sessions on smoking cessation with the client. The intent of these protocols is to provide the health professional with educational strategies and tips to help pregnant women achieve and maintain smoking cessation during pregnancy and thereafter. Numerous processes of change strategies will be discussed which should be incorporated into the educational counseling sessions held during the antepartum visits. The health professionals can adapt the educational sessions at each visit based on the client's smoking status at the visit. All educational strategies presented in these protocols should be discussed at some point during the first few months of pregnancy, preferably when the woman stops smoking. The assessment of the woman's smoking status and the provision of support, encouragement and praise are to remain constant throughout all patient visits. Information is included on "Tips for Responding to Smokers with Barriers to Quitting" and "How to be Sensitive to Problems of Relapse and Nonsuccess."
# THE BASICS

<table>
<thead>
<tr>
<th>TIME FRAME</th>
<th>1 - 8 minutes</th>
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<tbody>
<tr>
<td>FREQUENCY OF INTERVENTION</td>
<td>Each clinic visit</td>
</tr>
<tr>
<td>MODE OF INTERVENTION</td>
<td>A one-on-one educational session. Supportive handouts or pamphlets can be given at each session.</td>
</tr>
<tr>
<td>STAFF PROVIDING THE INTERVENTION</td>
<td>The Physician, Certified Nurse Midwife Nurse, Physician’s Assistant, Health Educator or other Clinician who counsels client’s on smoking cessation.</td>
</tr>
<tr>
<td>ATTITUDE AND APPROACH OF THE INTERVENTION</td>
<td>Staff should be supportive, in counseling the clients. Staff should never show disappointment or condemnation.</td>
</tr>
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</table>
FIRST INTERVENTION VISIT

I. Assess client's smoking status.

II. Assess client's knowledge and beliefs.
   (refer to IntakeSurvey Form)

III. Discuss adverse health effects of smoking.
   a. Smoking and low birthweight.
   b. Smoking risks for miscarriage, prematurity, still birth, Sudden Infant Death Syndrome.
   c. Infant susceptibility to pneumonia, bronchitis, asthma, recurrent colds, ear infections.

IV. Review of Quitting Tips.

V. Discuss Goal Setting.
   It is important to introduce goal setting at the initial visit for women who may be ready to quit. Review quitting methods (cold turkey or tapering - refer to Windsor's manual.) Ask the client to present a goal at the next visit and plans she has to achieve the goal. If the client is ready to set a goal, have her state it and the methods she will use to achieve it. Document goal and methods in client record.

VI. Provide support, encouragement and praise.

VII. Self-Help Guide
    Provide "A Pregnant Woman's Guide to Quit Smoking" (Windsor, 1985). Client should be instructed to read the guide and try to begin to stop smoking before the next visit.
SECOND AND SUBSEQUENT VISITS

The client is to be provided educational counseling at every visit.

I. Assess the client's smoking status.

Examples of Questions to Ask:
* How many cigarettes a day are you smoking now?
* How are you doing to stay away from cigarettes?
* What have you done about your smoking since your last visit?
* Did you read the information from the last visit and set a goal or think of a goal?
* Have your smoking habits changed since your last appointment?

II. Determine Goal Setting.

III. Review Quitting Methods and Tips.

IV. Discuss Processes of Change
(refer to Processes of Change Strategies and review selectively at each visit on the basis of the client's smoking status. Processes of Change include; Stimulus Control, Counterconditioning, Reinforcement Management and Helping Relationships.

V. Discuss Coping Strategies, Relapse and Maintenance

VI. Provide support, encouragement and praise.
PROCESSES OF CHANGE
I. STIMULUS CONTROL
II. COUNTERCONDITIONING
III. REINFORCEMENT MANAGEMENT
IV. HELPING RELATIONSHIPS
EDUCATING ABOUT THE PROCESS OF STIMULUS CONTROL

Stimulus control requires effort to produce a physical or mental restraining influence over the substance or agent that arouses the mind or the spirit.

To educate about maintenance of nonsmoking behavior through stimulus control, you need to illustrate ways in which the client can make mental and physical changes to overcome the urge to smoke. Educating about stimulus control is important during the early stages of quitting as a training exercise for coping with urges to smoke.

TIPS FOR STIMULUS CONTROL TRAINING

Suggest the client make the following changes:

* Throw away cigarettes and matches.
* Hide lighters and ashtrays.
* Have your clothes laundered to rid them of cigarette smell.
* Buy yourself flowers—develop a clean, fresh, nonsmoking environment
* Have your teeth cleaned to get rid of tobacco stain and give your mouth a feeling of freshness.
* Stay away from other smokers whenever possible.
* Do not drink alcoholic beverages.
* Frequent non-smoking sections of restaurants.
* When having an urge to smoke, chew on candy, gum, a toothpick, or sunflower seeds.
* Practice Deep Breathing Exercises.
* Drink Water.
The process of counterconditioning involves changing the way one experiences or responds to smoking situations.

To educate about maintenance of nonsmoking behavior through the use of counterconditioning, you need to illustrate ways in which the client can make adaptations in their physical environment to remove apparatus which reminds them of smoking.

**TIPS FOR COUNTERCONDITIONING TRAINING**

Suggest the client make the following changes:

* Exercise

* Alter your daily routine

* Doodle with a pen or pencil or type a letter.

* Work on a hobby or crossword puzzle.

* Take a shower.

* Brush your teeth, or swish with mouthwash.

* Take a walk.

* Read a book, engross your thoughts on something requiring concentration.

* Cut a drinking straw into cigarette-sized pieces and inhale air through the straw.

* Change your activity when the urge hits; get up and move around or do something else.

* Don't sit in your favorite chair.

* Eat your lunch in a different location.
EDUCATING ABOUT THE PROCESS OF REINFORCEMENT MANAGEMENT

Reinforcement management is the strengthening of a reaction by the addition of another stimulus or reward.

To educate about maintenance of nonsmoking behavior through the use of reinforcement management, you need to illustrate ways in which the client should use incentives and rewards for accomplishing the daily goal of remaining a nonsmoker.

TIPS FOR REINFORCEMENT MANAGEMENT

Suggest the client do the following:

* Keep a daydream ready to go: Start planning a perfect vacation, or that dreamhouse you always wanted to build; work on that plan when you have the urge to smoke.

* Think positive thoughts about yourself; I have now quit smoking for _____ days or weeks.

* Sign a contract with yourself or someone else to remain a nonsmoker.

* Treat yourself to something really special; new clothes, a dinner out, a movie, a new hair style, ice-cream.

* Start a Health Bank and put the money you save from not smoking in your Health Bank.

* Tell people you have stopped smoking.

* Write down reasons why you quit and post them on your refrigerator or bathroom mirror.

* Think of yourself as a non-smoker and keep picturing that in your mind.
EDUCATING ABOUT THE PROCESS OF HELPING RELATIONSHIPS

Helping relationships are the moral and emotional connections that bring an individual in touch with her supporting fellows.

To educate about the use of helping relationships in the maintenance of nonsmoking behavior, you need to illustrate the importance of social support systems as motivating influences to help cope with urges to smoke and relapse.

TIPS FOR FORMULATING HELPING RELATIONSHIPS

The following are suggestions for client and clinic personnel:

* Sign a buddy contract

* Ask a spouse or a good friend to stop smoking with you.

* Tell your family, friends, and co-workers that you have stopped smoking for good!

* Provide for follow-up phone calls and/or mail messages by the clinic.

* Provide words of genuine support, encouragement, and praise for the client at each clinical visit.

* Provide list of support group activities and resources which are available in the community.
TEACHING COPING STRATEGIES

Coping strategies are used to help the client effectively manage difficult situations or emotions without resorting to smoking. Coping strategies are aimed at controlling both thoughts and behavior.

THOUGHT MANAGEMENT

I. Tell the client to try to think of positive thoughts about not smoking. For example: "If I can stop smoking, I know I can do anything I want to do.

II. Have the client think about the benefits of quitting:
   * When I stop smoking, I will feel better.
   * Think of the money I will save by quitting smoking.

BEHAVIOR MANAGEMENT

I. Avoid triggers whenever possible.
   * Surround yourself with nonsmoking friends.
   * Frequent non-smoking sections of restaurants.
   * Involve yourself in activities not associated with smoking.

II. Alter those smoking situations you can't avoid.
   * Ask friends not to offer you cigarettes.
   * Think about the benefits of being smoke-free.

III. Find alternatives to help you deal with urges.
   * Chew gum or hard candy.
   * Chew toothpicks or straws
   * Carry sunflower seeds in your pocket to chew.

IV. Keep an active schedule
   * Plan ahead for difficult situations and who you can turn to for support.
   * Establish a regular exercise routine.
   * Play your favorite music or pursue a hobby that keeps your mind and hands occupied.
PROVIDING QUITTING TIPS

As a health professional, you need to acknowledge that for many people, quitting smoking is difficult because nicotine is addictive. You need to reassure the client that "quitting" is not impossible and that many people are successful at becoming a nonsmoker. Not all people will be ready for goal setting but some may want information on how to go about quitting.

TIPS FOR QUITTING

* Cut a drinking straw in cigarette-sized pieces and smoke the straw as if it were a cigarette, inhaling fresh air through the straw.

* Chew gum when you have the urge to smoke. Try cinnamon gum, it kills the taste of cigarette smoke.

* Keep sunflower seeds in your pocket. Chew on these when you have an urge to smoke.

* Wear a rubber band around your wrist and snap it when you have the urge to smoke, as a reminder not to smoke.

* Keep paper clips or pencils handy and twist or play with them to rid yourself of nervous energy when you have the urge to smoke.

* Smoke a cinnamon stick as though it were a cigarette, or chew on it for the cinnamon flavor.
EDUCATING FOR RELAPSE AND MAINTENANCE

In the case of a client who has not quit or has a relapse, try to determine what factors are making her smoke. Ask if there are barriers to quitting. Information such as this can reveal some stress factors in her life that may need to be addressed to help her quit smoking. You need to make clear that “quitting” takes a lot of practice and positive thinking.

REMEMBER:

"A LAPSE DOES NOT A RELAPSE MAKE"

As a health professional, you need to respond constructively to slips so that relapse (a chain of slips) does not occur. You need to help the client to continue to think positively about quitting. You need to teach the client to cope with urges to smoke. Urges usually last 3-5 minutes so strategies need to be practiced that will be effective in overcoming urges to smoke.

TIPS TO COPE WITH URGES

* Take a drive or a walk.
* Read an interesting book.
* Wash the car.
* Write or type a letter.
* Brush your teeth.
* Take up a hobby, such as needlepoint or knitting.
* Visit a friend.
* Listen to music
* Take a shower.
* Walk the dog.

Maintenance requires educating about the activities which helped the client to quit in the first place. Emphasize the use of activities outlined under "Tips for stimulus control, counterconditioning, reinforcement management and helping relationships." Also, provide the client with tips for managing stress once the baby arrives.

TIPS FOR HANDLING STRESS

* Make time for yourself to go for a walk, take a hot bath, or read a good book.
* Do less housework and plan simple meals.
* Lie down whenever the baby is sleeping. Occupy older children with puzzles or coloring books.
* Have fun walking or dancing with your baby for 20 minutes each day.
COUNSELING FOR CLIENT CONCERNS

Clients will always have common reasons for having a relapse or not being able to quit. You can help the client by responding in a constructive and supportive manner. Some of the common concerns of clients are addressed below with suggestions on ways to handle common client problems.

<table>
<thead>
<tr>
<th>CLIENT CONCERN</th>
<th>YOUR RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;I feel irritable and anxious when I don't smoke.&quot;</td>
<td>This is to be expected. It's a normal reaction to breaking a difficult habit. This feeling will go away in time. Try taking a walk or shower when you feel irritable.</td>
</tr>
<tr>
<td>&quot;I don't know what to do with my hands.&quot;</td>
<td>You can keep your hands occupied in other ways. Try holding something like a pencil, straw or paper clip. Practice clasping your hands together.</td>
</tr>
<tr>
<td>&quot;I'm gaining weight.&quot;</td>
<td>Weight gain is a concern not only during pregnancy but by women in general. I can give you information about calorie content of foods and exercising methods to burn calories. Also, we will watch your weight more carefully to detect changes.</td>
</tr>
<tr>
<td>&quot;Sometimes I have a strong desire to have a cigarette.&quot;</td>
<td>This feeling is common with smokers who are trying to quit. Usually this desire hits at a time when you have grown accustomed to having a cigarette. Try to avoid those &quot;high risk&quot; situations as much as possible. Decide in advance how you will handle those situations.</td>
</tr>
<tr>
<td>CLIENT CONCERN</td>
<td>YOUR RESPONSE</td>
</tr>
<tr>
<td>----------------</td>
<td>---------------</td>
</tr>
<tr>
<td>&quot;I blew it, I smoked a cigarette.&quot;</td>
<td>Smoking one cigarette doesn't mean you've blown it. You have been successful and you can't use this as an excuse to start smoking again. Just think you have not smoked for _______ days. You are an exsmoker and can continue to be an exsmoker.</td>
</tr>
<tr>
<td>&quot;You're asking me to do too many things at once and to also quit smoking.&quot;</td>
<td>I am asking you to make some healthy choices for you and your baby. It is hard to change habits, but being successful at making one change can give you encouragement to make another. I am confident you can do this.</td>
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</tbody>
</table>
DEEP BREATHING EXERCISE

Deep breathing is a key relaxation skill for new non-smokers. If, when you smoked you inhaled deeply, you probably were breathing in a way which actually prompted relaxation. People who stop smoking often forget to continue such deep breathing and therefore experience increased tension. This exercise will show you how to breathe without cigarettes in a way which slows down the pace of your whole body and therefore, promotes general relaxation.

Correct deep breathing should be done with your belly muscles. The idea is to let your stomach go out as far as possible as you inhale. In this way you will fill your lungs more completely. Try one breath this way before doing the exercise. Put a hand on your abdomen and, as you inhale deeply, feel your stomach expand as though it were being filled by a balloon. Now let the air out and feel your stomach return to its normal position. As you do the exercise, pause comfortably at the end of each exhalation until you feel ready to take the next deep breath. You can achieve even greater relaxation if you close your eyes during deep breathing and let your mind focus on a restful scene or a word like "calm" or anything else which gives you a feeling of mental quiet.

Now, keeping your eyes closed, breathe in deeply, letting your stomach expand until your lungs are filled. Now pause for a moment and then exhale until you have emptied your lungs. Pause for a moment. Now take another deep breath in, filling your lungs from the bottom. Hold a moment... and now let the air flow out, focusing your mind on restful thoughts. Keeping the pace regular, again breathe in deeply...hold a moment... and now let the air out, feeling more and more relaxed. Take another breath in...hold it for a moment... now gently breathe out, letting the tension escape from your body. Once more breathe in... pause a moment...now exhale, feeling deep relaxation. This ends the exercise.

Source:

American Lung Association, "Freedom From Smoking"
Appendix H: Health Provider Checklist for Educating Clients about Smoking Cessation.
HEALTH PROVIDER CHECKLIST FOR EDUCATING CLIENTS ABOUT SMOKING CESSATION

<table>
<thead>
<tr>
<th>Activity</th>
<th>DATE</th>
<th>SIGNED</th>
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<tbody>
<tr>
<td>Patient Flowchart and Smoking Record</td>
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<tr>
<td>Ambivalence</td>
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<tr>
<td>Adverse Effects on Fetus</td>
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<tr>
<td>Goal Setting/Quit date</td>
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<tr>
<td>Tips For Quitting</td>
<td></td>
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<tr>
<td>Managing the First Few Days/Withdrawal</td>
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<tr>
<td>Signing a Contract to Quit</td>
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<tr>
<td>Starting a Smoking Diary</td>
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<tr>
<td>Tips for Stimulus Control*</td>
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<tr>
<td>Tips for counterconditioning*</td>
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<td></td>
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<tr>
<td>Tips on Reinforcement Management*</td>
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<tr>
<td>Tips on Forming Helping Relationships*</td>
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<tr>
<td>Buddy Contracts</td>
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<tr>
<td>Coping Strategies</td>
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<tr>
<td>Stress Management and Relaxation</td>
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<tr>
<td>Slips and Relapses*</td>
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<tr>
<td>Counseling For Common Client Concerns</td>
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<tr>
<td>Support, Encouragement and Praise*</td>
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<td></td>
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<tr>
<td>Follow-up Support, Letter or Phone Call</td>
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<td></td>
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<tr>
<td>Maintenance Tips to Stay Quit*</td>
<td></td>
<td></td>
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<tr>
<td>Postpartum Visit*</td>
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</tbody>
</table>

EDUCATIONAL MATERIALS PROVIDED TO THE CLIENT

- Windsor’s Guide: A Pregnant Woman’s Guide to Stop Smoking*
- "Special Delivery—Stop Smoking Book," Am. Cancer Society
- "Facts About Smoking and Pregnancy," CDC
- "Fresh Start Guide" Am. Cancer Society
- "I'm in Charge Now... What's My Secret"
- "Tick, Tick, Tick"
- "The Smoke Around You—The Risks of Involuntary Smoking"
- "Smart Move A Stop Smoking Guide"
- "Double Trouble—Drugs, Alcohol and Tobacco Abuse"
- "Give Your Baby A Healthy Start: Stop Smoking"
- "Why Start Life Under A Cloud"
- List of Other Community Nonsmoking Programs
- Infant Tee-shirts "Born a Nonsmoker"
- Survival Help Kits (gum, stickers, straws, etc.)
- Smoke Free Certificate.

* Denotes that these activities and educational materials are requirements of the educational process and must be presented to the client.

CLIENT NAME ____________________________
SOCIAL SECURITY NUMBER _______________________________________
CLINIC NAME ___________________________________________
Appendix I: Participant Consent Form
CONSENT TO INVESTIGATIONAL PROCEDURE

I, hereby authorize Professor Phil Helt of The Ohio State University and his associates: Donna Solovan to perform the following as part of the smoking cessation research project:

a) collect information regarding my smoking status and history through use of a questionnaire and personal interview process,

b) collect a urine specimen for lab analysis at my eighth month clinic visit to verify my nonsmoking status.

This research is being completed as part of an investigation entitled: "Attributes of Successful Smoking Interventions for Pregnant Women Attending Public Health Clinics in the State of Ohio."

I understand the following points about the study:

1. The purpose of this study is to determine which factors influence a pregnant woman's decision to stop smoking.

2. The option of not participating in the study has been explained.

3. The only risk involved may be emotional stress from answering questions about my health and the health of my baby.

4. The benefit of participating in the study is that I will receive one-on-one education/counseling and support to stop smoking.

5. I will be participating in the study through my postpartum visit. An educational session will be presented at my regularly scheduled monthly visits for approximately 8-10 minutes.

I acknowledge that I have been provided with information about the study, about my rights as a subject, and that all my questions have been answered to my full satisfaction. I understand that I may contact Donna Solovan at (614) 464-5312 should I have additional questions or concerns about any risks of participating in the study.

I understand that, where appropriate, the U.S. Food and Drug Administration may inspect records pertaining to this study. I also understand that my urine sample will only be analyzed to verify if I have stopped smoking. I have been told that records that may contain my name or other identifying information may be made available to the researchers and that my participation in this study will be held confidential.

I understand that I am free to withdraw my consent at any time and discontinue participation in the study after notifying the clinic. I also have been told that my refusal will not in any way affect my future care or services.

I understand in signing this form that, beyond giving consent, I am not waiving any legal rights that I may otherwise have, and that I am not releasing the investigators, the institution, or its agents from any legal liability for damages that they may otherwise have.

I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date: ___________________ Signed ___________________

I certify that I have personally completed all the blanks in this form and explained the form to the client before requesting the subject to sign it.

Date: ___________________ Signed ___________________
LIST OF REFERENCES


